PREFACE

Thanks for choosing A510 series heavy-duty closed-loop vector frequency inverter produced by Shenzhen Sunfar Electric Technologies Co., Ltd.

This Manual is the operating manual for A510 series closed-loop vector frequency inverter. It provides all relevant instructions and precautions for installation, wiring, functional parameters, daily care and maintenance, fault diagnosis and troubleshooting of A510 series inverter.

In order to use this series of inverters correctly, guarantee product's best performance whilst ensuring the safety of users and equipment, be sure to read this manual carefully before using A510 series inverters. Improper use may cause malfunction of the drive, reduce its service life and damage other equipments and lead to personal injury and death, etc

A user manual is provided with each Variable frequency Drive. Please keep it in a convenient location so it can be referred to for installation and maintenance. Owing to the constant improvement of products, the data within future versions of this manual may be changed without further notice.

A510 Series Heavy-Duty Closed-Loop Vector Inverter User Manual

Version: V1.1

Revision Date: July 2014

This Manual is applicable to V6005 and above programs.

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1. PRODUCT CONFIRMATION AND OPERATION CAUTIONS

1.1 PRODUCT CONFIRMATION

This unit has been subject to strict packaging before release from factory. However, in consideration of various factors during transportation, please check the outer packing carefully to see if there is any damage hat may have occurred during transportation; please check the label on the outer packing, and confirm the model and specifications are in accordance with your order. If any damage or discrepancy is found, please contact the supplier promptly for a solution.

1.1.1 CONFIRMATION OF FREQUENCY INVERTER AND ACCESSORIES

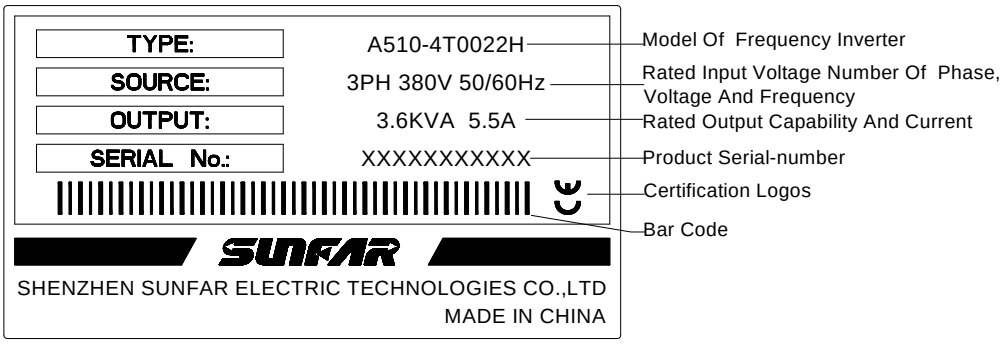
Confirm the frequency inverter nameplate details, and check for any damage that may have occurred during the transit, if any parts and components have sustained damage, and that the frequency inverter is complete with the following accessories:

- Operation instruction;
- Certification;
- Product list;
- Other ordered accessories;

If there is any omission or damage, please contact the supplier promptly for solution.

1.1.2 NAMEPLATE OF FREQUENCY INVERTER

On the frequency inverter, there is a nameplate marked with model, rated parameters, product serial-number and bar code of frequency inverter. The content of nameplate is shown as below:



1.2 SAFETY CAUTIONS

Read the Safety Cautions regarding, wiring, operation and maintenance, carefully prior to installation to ensure proper operation of this product.

1

"Tips", "Attention", "Warning and "Danger" in this operation manual are defined as follows:

- Tips: Tips for some useful information.

- Attention: Matter requires attention during operation.

- Warning: These requirements must be followed to avoid the risk of injuries to personnel and the loss of material

- Danger: Without operation according to these requirements, serious damage to equipment or injuries to personnel may result.

1.2.1 NOTICES REGARDING INSTALLATION

1. The frequency inverter shall not be installed on combustibles that may induce the risk of fire.
2. The frequency inverter shall not be installed at places with direct sunlight.
3. The frequency inverter shall not be installed in areas with hazardous ratings; eg environment with explosive gases or combustible dusts.
4. Do not install the Frequency inverter if damaged or If components are missing. Installation may lead to personal injury, fire or other accidents.
5. Do not remove or modify the frequency inverter without authorization.
6. Do not drop foreign matter into the frequency inverter (eg: wire off cuts of wire, metal fillings, dust etc) Entry of foreign matter may result in destruction of the frequency inverter.
7. The frequency inverter shall be installed only where the supporting structure is able to bear its weight.

1.2.2 NOTICES REGARDING INSTALLATION

1. All wiring must be completed by a certified electrician. If the wiring must be accordance to local regulations. All wiring must be done in a manner to ensure the safety of the equipment and all individuals.
2. Do not open the front cover of the frequency inverter for 10 minutes after removing power from the unit, Doing so may result in electric shock.
3. The earth terminal of frequency inverter must be reliably grounded. A poor earth connection may result in electric shock.
4. Connection of AC power onto the output terminals U、V and W of frequency inverter, will damage the frequency inverter, and may lead to personal injury.
5. Confirm that the input voltage and frequency converter are in consistent with rated voltage value
6. To avoid the risk of damage to the frequency inverter, confirm that the motor and frequency converter are of equivalent voltage and current ratings.
7. A brake resistor cannot be connected onto the (+), (-) of DC bus directly. Direct connection to the DC Bus will cause excessive heat and may cause a fire.

1.2.3 CAUTIONS REGARDING SAFE OPERATION

1. Do not operate the frequency inverter with wet hands. To do so may result in electric shock.
2. Please install the front cover prior to power up and do not remove the cover while power is on. Removal of front cover may result in electric shock.
3. Do not touch the terminals of frequency inverter, while the frequency inverter is powered on, even if the motor is stopped. To do so will result in electric shock.
4. If the auto-restart function is enabled, do not approach the load as it may restart suddenly after the alarm has been removed and this may result in a personal injury.
5. To avoid the risk of personal and property damage, ensure the system is safe before restarting.
6. Please set additional emergency stop and isolation switches to avoid the risk of personal injury.
7. Do not touch the cooling fins of the heat sink and direct current (DC) choke as temperature can be very high. This may result in personal injury.

1.2.4 CAUTIONS REGARDING SAFE MAINTENANCE

1. Maintenance operations and device replacement only can be done by trained professional maintenance staff. During operation use only insulated tools. It is strictly prohibited to leave debris and metal in the frequency inverter. Doing so will increase the likely hood of electric shock, fire, and personal and property damage.
2. After replacement of the control board, corresponding parameters must be set before placing into operation to avoid the risk of property damage.

1.3 GENERAL OPERATION INFORMATION

1.3.1 GENNERAL INFORMATION REGARDING MOTOR OPERATION

1. The temperature of the driven motor when being run from a frequency inverter can be a little higher than if run from standard industrial power supply, especially with long-term operation at low speed, the operation life of a motor can be affected due to the effect of poorer heat dissipation. In these cases, the load on the motor can be reduced or additional cooling can be applied to the motor .
2. With some equipment there can sometimes be resonance due to the natural vibration frequency of the mechanical system. To remove this consider applying a flexible coupling and insulation rubber, or using the frequency skipping parameters within of the frequency to avoid the resonant frequency points within the operating range.
3. When operating a motor from a frequency inverter, there can more motor noise than when running from a fixed industrial power supply. In order to reduce the noise, the carrier frequency of frequency inverter can be changed if required.

1.3.2 GENERAL INFORMATION FOR USE WITH SPECIAL MOTORS

1. For high-speed motors, if the set frequency of frequency inverter is above 120Hz, please conduct combination test with the motor to ensure it can be operated safely.
2. For synchronous motors, please contact the manufacturer for consultation.
3. Operation of single-phase motors cannot be achieved with this model frequency inverter. Even if using a single input phase, there will be a three-phase output. Please use with three-phase motors only.

1.3.3 AMBIENT ENVIRONMENT

For indoor use with temperature range of 10 to +45°C, humidity below 95% (without condensation of moisture), no dust, no direct sunlight, no corrosive gas, no combustible gas, no oil mist, no steam, no water or floating fiber or metal particles. If special requirements beyond these are required, please consult your supplier.

1.3.4 GENERL INFORMATION FOR THE CONNECTION OF PERIPHERAL EQUIPMENT

1. For the protection of wiring and the Frequency Inverter, please include circuit breakers on the input side. Please select devices with an appropriate capacity that provides the best protection.
2. If installing electromagnetic contactor on the output side of frequency inverter, please ensure the after frequency inverter and motor have stopped running before operating the contactor.
3. When using a thermal relay with a frequency inverter and when long cable runs are used, nuisance tripping may occur due to high-frequency current flowing and the capacitive effect within wiring. In this case, please lower the carrier frequency, or apply an output filter.
4. To reduce noise interference and to meet emissions standards the Frequency Inverter is fitted with a RFI filter. Screened cable must be used between the motor and the Frequency Inverter. The screen of the cable must be effectively earthed at both ends.
5. It is recommended that all control wiring is done using cable with a compact low impedance shield. Failure to use a shielded control cable may lead to the Frequency Inverter receiving false input signals.

1.3.5 TRANSPORTATION AND STORAGE

1. During product handling, please capture the both sides of the bottom of the entity, rather than the cover or parts only.
2. Please do not make the parts of plastic excessive forced, otherwise, there can be falling down or damage.
3. When it is for temporary storage and long-term storage, pay attention to the followings:

   1）Try to be packaged in the packing case of our company as the original package for storage.

   2）Long-term of storage will lead to the characteristics of electrolytic capacitor worsen, therefore, it shall be powered on every half year at least, and with conduction time more than half an hour, and the input voltage must be risen to the rated value gradually with voltage regulator.

1.4 SAFE DISPOSAL

1. Electrolytic capacitor in the frequency converter may explode if incinerated.
2. Harmful and toxic gas will be produced if the frequency inverter is incinerated.
3. Please classify and dispose of the frequency inverter as industrial waste.

1.5 OTHER CAUTIONS

1. This product should not be used in life support devices and other applications directly concerned with human safety.
2. If serious accidents or serious losses could be caused due to the operation or failure of this product, please install appropriate safety devices to ensure total safety.

2. PRODUCTION INTRODUCTION

2.1 INVERTER MODEL

A510 – 4 T 0150H

Product Series Number	
A510	Heavy-duty closed-loop vector inverter
V350	Mini closed-loop vector inverter
V560	High-performance closed-loop vector inverter
E550	Mini universal inverter
E380	Universal inverter
C320	Sensorless current vector type inverter

Power Grade（KW）	
0011	1.1
0015	1.5
0022	2.2
0030	3.0
0040	4.0
0055	5.5
0075	7.5
0090	9.0
.	.
.	.
1100	110
1320	132

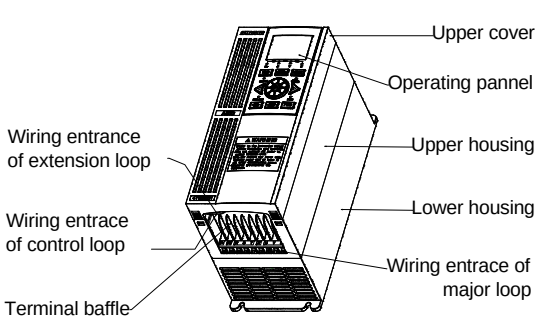
Voltage Grade	
2	220V
4	380V

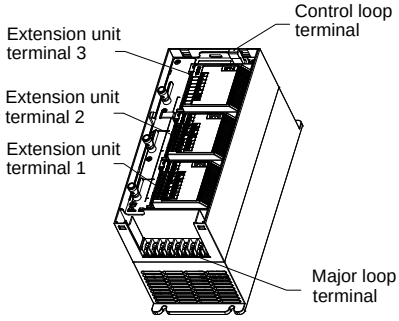
Power Supply Phase	
T	Three-phase
S	Single-phase

2.2 PRODUCT APPEARANCE

- Appearance Type I

Suitable Mode: A510-4T0011H ~ A510-4T0110H





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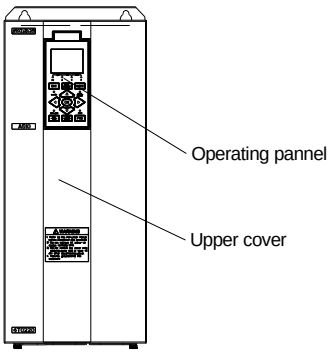
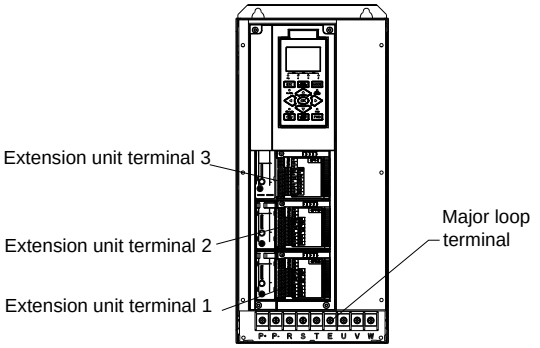
- Appearance Type II

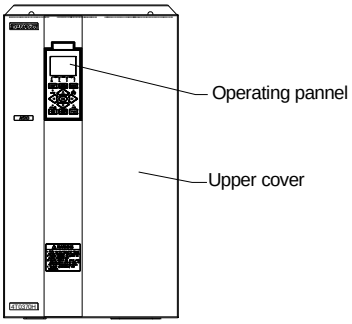
Suitable Mode: A510-4T0150H ~ A510-4T0220H

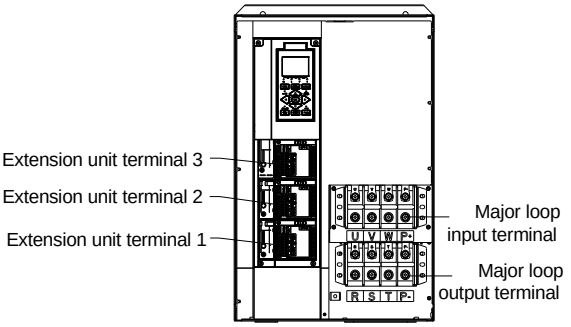




- Appearance Type III

Suitable Mode: A510-4T0300H ~ A510-4T0550H





2.3 MODEL TABLE

Voltage Grade	Model	Constant Torque Load			Variable Torque Load		
		Rated capacity (KVA)	Adaptive motor (KW)	Rated current (A)	Rated capacity (KVA)	Adaptive motor (KW)	Rated current (A)
Three phase 380V	A510-4T0011H	2.0	1.1	3.0	2.4	1.5	3.7
	A510-4T0015H	2.4	1.5	3.7	3.6	2.2	5.5
	A510-4T0022H	3.6	2.2	5.5	4.9	3.0	7.5
	A510-4T0030H	4.9	3.0	7.5	6.3	4.0	9.5
	A510-4T0040H	6.3	4.0	9.5	8.6	5.5	13.0
	A510-4T0055H	8.6	5.5	13.0	11.2	7.5	17.0
	A510-4T0075H	11.2	7.5	17.0	13.8	9.0	21
	A510-4T0090H	13.8	9.0	21	16.5	11	25
	A510-4T0110H	16.5	11	25	21.7	15	33
	A510-4T0150H	21.7	15	33	25.7	18.5	39
	A510-4T0185H	25.7	18.5	39	29.6	22	45
	A510-4T0220H	29.6	22	45	39.5	30	60
	A510-4T0300H	39.5	30	60	49.4	37	75
	A510-4T0370H	49.4	37	75	62.5	45	95
	A510-4T0450H	62.5	45	95	75.7	55	115
	A510-4T0550H	75.7	55	115	98.7	75	150
	A510-4T0750H	98.7	75	150	115.8	90	176
	A510-4T0900H	115.8	90	176	138.2	110	210
	A510-4T1100H	138.2	110	210	171.1	132	260
	A510-4T1320H	171.1	132	260	204	160	310

2.4 PRODUCT SPECIFICATIONS

Input Output	Rated voltage &frequency	380V~460V 50/60Hz		
	Output voltage	0~380 V		
	Output frequency	0.0~300.0Hz		
	Digital input	Standard configuration: 5-circuit digital input (DI)		
	Digital output	Standard configuration: 2-circuit digital output (DO)		
	Pulse in and out	0~100.0KHz pulse input, can receive OC or 0~24V level signal (applicable to standard expansion I/O card)		
	Pulse output	0~100.0KHz pulse output (optional), PWM output mode can be selected to extend analog output terminal.		
	Analog input	Standard configuration: 0~10V voltage output (AI1); 0~20mA current output (AI2) Standard I/O board : -10V~10V voltage input		
	Analog output	Two-circuit 0~10V analog output signal (can be set to 0~20mA current output mode)		
	Contact output	Standard one group of AC 250V/1A normally open and closed contacts for standard interface card		
Control Characteristics	Control Mode	Closed-loop vector control	Open-loop vector control	V/F control
	Starting torque	0 speed 220%	0 speed 200%	0 speed 180%
	Speed adjustable range	1: 1000	1: 200	1: 100
	Steady speed precision	±0.02%	±0.2%	±0.5%
	Torque control precision	±5%	±5%	--
	Torque response time	≦5ms	≦25ms	--
	Frequency resolution	Low-frequency operation mode: 0.01Hz		
	Frequency resolution	Low-frequency operation mode: digital setting-0.01 Hz, analog setting-highest frequency ×0.1%		
	Load capacity	**Constant Torque mode:** 120% - long-term; 160% - 60s; 200% -1s		
		Variable Torque mode (capacity increase mode): 105% - long-term; 135% - 60s; 165% - 1s		
	Carrier frequency	Low-frequency operation mode:1.5 ~15.0KHz;		
	Deceleration and acceleration time	0.01~600.00Sec. / 0.01~6000.0Min.		
	Magnetic flux brake	Achieve rapid brake of the motor by increasing the motor's magnetic flux (30-120% allowed)		
	DC brake / band-type	DC brake/band-type brake initial frequency: 0.0~ upper limiting frequency, brake/band-type brake injection current 0.0~100.0%		
	Strike frequency	Low-frequency mode: 0.0~ 50.00Hz;		

Typical Function	Multi-segment running	16-segment frequency/speed running, independent setting of the running direction, time and acceleration and deceleration of each segment
	Setting combinations	Hundreds of setting combinations of frequency, revolution and torque
	Setting priority	Users can choose the priority of frequency./revolution setting channels, hence allows for different kinds of setting combinations in application design.
	Process PID	Built-in PID controller (process PID, compensation PID), can be either used independently by external equipment or be used to create complicated internal compensation control There are 7-segment optional settings and flexible setting combination ways for the process PID
	Waking & sleeping	Process PID has simple sleeping and wakening functions
	MODBUS communication	Standard MODBUS communication protocol (optional) allowing for flexible parameter reading and mapping
	Temperature detection	Able to detect PT100 or PTC thermo-sensitive elements, hence allows for over-temperature protection for the motor or external equipment
	Dynamic braking	(standard configuration for models below A510-4T0185H) Actuating voltage: 700~760V, braking ratio: 50~100%
	General Functions	Power cut restart; fault self-recovery, motor parameter dynamic/ static self-identification. Start enabling, operation enabling, start delay, over current suppression, over voltage /under voltage suppression, V/F custom curve, analog input curve correction, line brake detection, textile machinery disturbance (frequency swing) operation
Function Features	Simulated I/O terminal	8-circuit one-to-one virtual output and input terminals, allowing for complicated engineering onsite application in an easy way
	V/F separate control	Users can flexibly and separately set the output frequency and output voltage value for special engineering application
	Spindle scaling control	To precisely control the spindle angle, for achieving scaling positioning
	Zero-speed torque holding	Hold the zero speed and lock the torque, and in the mode of PG feedback VC control, to enable for constant locking of the rotating spindle while it is pulled with load
	Communication linkage synchronization	Easily allows for synchronized rotation of multiple rotation, and free selection of linkage balance of multiple machines based on current, torque and power, and the exclusive position synchronized balance function can precisely eliminate accumulative position error caused by synchronized revolution error
	Load dynamic balance	Also allows for dynamic balance of multi-machine load (not limited to communication linkage) and able to achieve torque motor characteristics
	Strong starting torque	For load featuring high inertia and high static friction, super strong starting torque for certain period can be set
	Dual motor parameter	With two sets of motor parameters (two for both asynchronous motor and synchronous motor), allowing for dual motor switch even in the mode of vector control
	Synchronous motor driving	Built-in permanent magnet synchronous motor control algorithm

Function Features	Compensation PID	Especially built-in compensation PID, flexibly allowing for tension control, drawing machine control and other special applications
	Timer	3 built-in timers: 5 kinds of time, 5 kinds of trigger modes, multiple door access signals and working modes, and 7 kinds of output signals
	Counter	2 built-in counters: time margin selection, 4 kinds of trigger modes and 7 kinds of output signal
	Quick Setup	Application macro: allowing for conveniently setting and partially curing multiple common group parameters and simplifying parameter setting for common applications
		System macro: allowing for conveniently switching equipment's working mode, and automatically redefining local parameters
	Parameter testing	Any un-stored parameter tested on site can be stored with one key or abandoned and restored to original value
	Parameter display	Allowing for automatically shielding parameters of unused functional modules or selectively displaying modified, stored or changed parameters
Protection Function	Power supply	Under voltage protection, input phase failure protection and three-phase power supply unbalancing protection
	Running protection	Over current protection, over voltage protection, inverter over temperature protection, inverter overload protection, motor overload protection, output phase lack protection, and module drive protection
	Equipment abnormity	Current detected abnormity, EEPROM memory abnormity, and abnormal control unit, motor over temperature, MC pull-in fault, and temperature acquisition loop fault
	Motor connection	Motor not connected, motor's three-phased parameters unbalanced and parameter misidentification
	Extension card	Detect and protect the extension card for compatibility or conflict
Environment	Installation environment	Indoor vertical installation, not subjecting to direct sunshine, free of dust, corrosive and flammable gas, oil mist, vapor and free of drips or salt
	Altitude	0~1000m. The output current capability drops by 10% for every rise of 1000 m
	Ambient temperature	Working ambient temperature: -10℃ ~ +45℃; storage ambient temperature: -20℃ ~ +60℃
	Humidity	Below 95%, no condensation
	Vibration	< 6m/s^2

3. INSTALLATION OF FREQUENCY INVERTER

3.1 INSTALLATION OF FREQUENCY INVERTER

This series of frequency inverters are wall-mounted or cabinet frequency inverters, which should be installed vertically. Please install the frequency inverter within an appropriate enclosure with sufficient ventilation.

Please refer to 1.3.3 for installation environment. If there is special installation requirement from customer, please contact with manufacturer in advance.

3.1.1 MOUNTING SURFACE

When the ambient temperature is exceeds the specified rating, or the load is too heavy, the temperature of frequency inverters heat sink and base may rise to around 90°C, therefore the frequency inverter must be installed on surfaces which can withstand temperatures in excess of this.

! DANGER

Please install it on flame-retardant object such as metal, otherwise may cause fire.

3.1.2 INSTALLATION SPACE

Requirements for installation spacing distance of single frequency inverter are as shown in Figure 3-1-A and Figure 3-1-B. Reserve enough space around the frequency inverter.

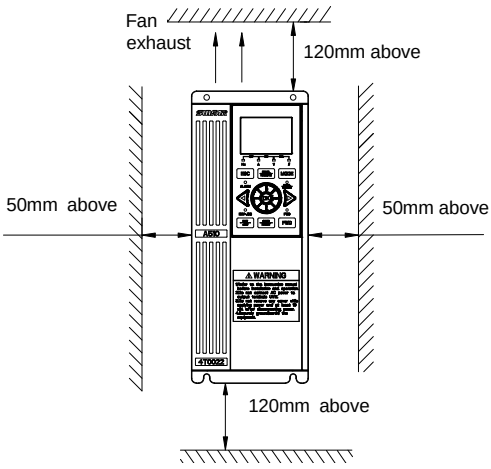


Figure 3-1-A
Installation spacing distance (11KW below)

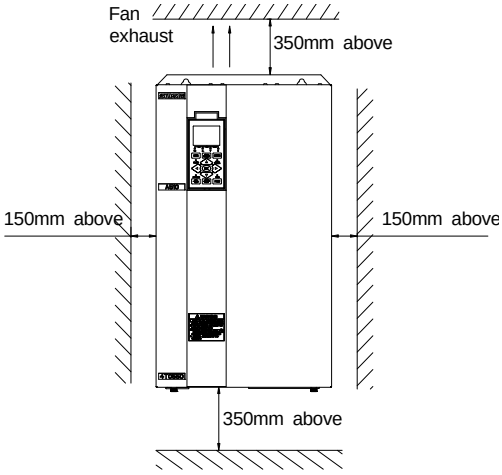


Figure 3-1-B
Installation spacing distance (15KW above)

3.1.3 MULTIPLE INSTALLATIONS

For installations with more than 2 frequency inverters mounted in an enclosure together, please conduct parallel installation as shown in Figure 3-3. If there is no choice but vertical installation, please consider using a partition plate as shown in Figure 3-2, to make ensure there is no influence on upper frequency inverter from the lower frequency inverter.

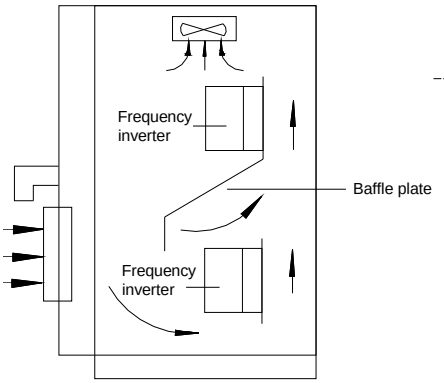


Figure 3-2 Installation spacing between upper and lower frequency inverters

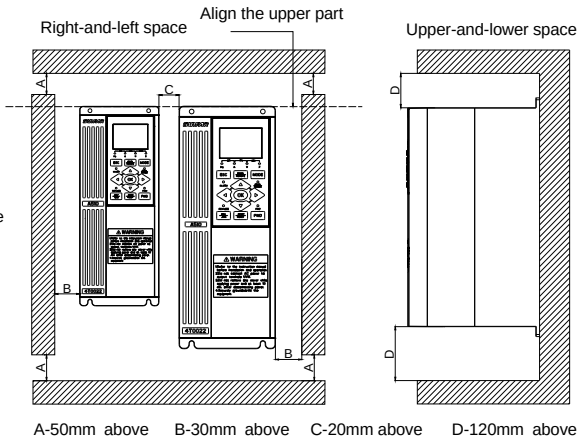


Figure 3-3 Installation sizes of right and left frequency inverters (4.0KW above)

- Horizontally close installations (Figure 3-2) are allowed for 4.0KW below, and -10℃～45℃ environmental temperature.
- For parallel installation of frequency inverters with different sizes, please install by aligning the upper parts of all the frequency inverters, allowing room for replacement of cooling fan.
- Please don't install frequency inverter in the environment where loose particles (eg. cotton, lint, dust etc) may cause a blockage of the cooling fan. When operating in such environment, please install in a suitable cabinet that offers suitable protection.
- If installing at a location beyond 1000m above sea level, the frequency inverters output must be de-rated. See 2.4 product technical indexes and specifications for details.

3.2 SIZE AND ASSEMBLY OF OPERATION PANEL

A510 series inverters are configured as standard with the following two kinds of LCD operational panel; The models below 11KW are configured with shuttle-type panel.

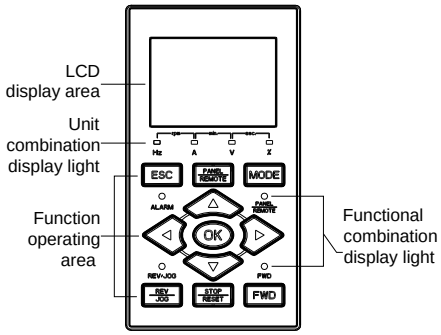


Figure 3-4-A LCD standard type
(Model DPNL360CA /PN 050M007360001）

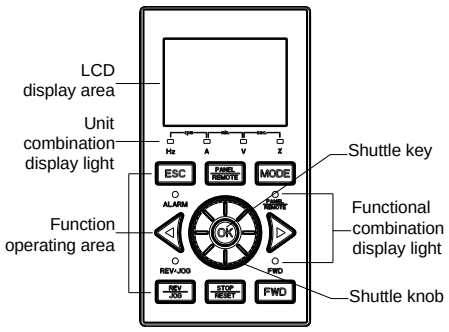


Figure 3-4-B LCD shuttle type
(Model DPNL360CB /PN 050M007360002）

3.2.1 KEYPAD REMOVAL

Using your middle finger on the top edge of the keypad, gently press the top down and pulls outward. The operation panel will then disengage as shown in Figure 3-5.

3.2.2 KEYPAD INSTALLATION

Gently align the keypad on the clasps and connector. Push panel in gently, whilst keep it parallel to the front panel. Check that all three clasps have clicked into position, as shown in Figure 3-6.

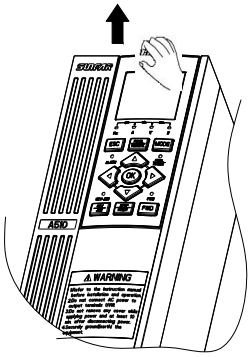


Figure 3-5
Disassembly schematic diagram of operation panel

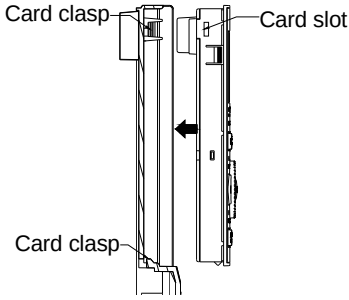


Figure 3-6
Installation schematic diagram of operation panel

3.2.3 KEYPAD REMOTE CONNECTION

When the keypad needs to be mounted away from the frequency inverter (eg: on an enclosure door), remove the keypad as shown in Figure 3-5, and mount in the designated position. Use an extension cable as Figure 3-7 below to connect frequency inverter and operation panel.

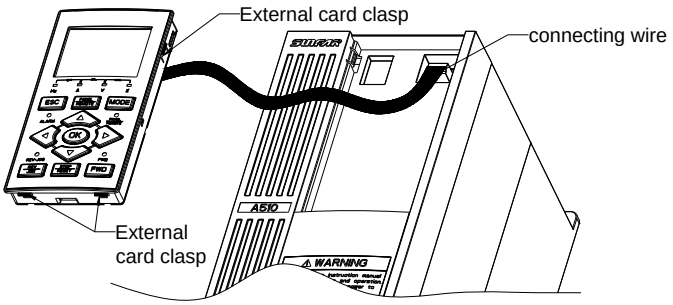


Figure 3-7 Connection diagram of extension keyboard

- Use a standard LAN cable (Ethernet RJ45 / RJ45) as the extension between the drive and keypad. This can be readily sourced from various sources.
- The extension cable shall not exceed 15 meters; shielding layer is connected with ground terminal of frequency inverter. Please select fittings of remote operation panel for more than 15 meters.
- Do not run the keypad extension cable in close proximity or parallel to power cables.
- The Keypad should be fixed to an even surface to avoid damage.

3.3 DISASSEMBLY OF TERMINAL COVER

3.3.1 DISASSEMBLY AND INSTALLATION OF PLASTIC TERMINAL COVER

♦ Disassembly:

To remove the plastic terminal cover, press the two buckles on the lower right and left corners, and then swing the bottom out, as shown in Figure3-8.

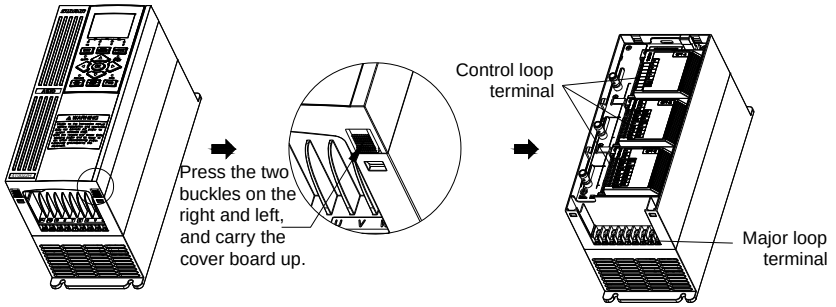


Figure 3-8 Disassembly and installation schematic diagram of plastic cover plate

♦ Installation：

Hold the bottom of the plastic terminal cover out at a 15° angle. Locate the top clips of the terminal plate cover in the slots of the shell. Gently swing the bottom of the cover plate down until it clicks into place.

3.3.2 DISASSEMBLY AND INSTALLATION OF METAL COVER PLATE

Disassembly and installation of sheet-metal cover plate are as shown in Figure 3-9

♦ Disassembly:

① Undo the two thumb screws at the bottom of cover plate;

② Swing the bottom of the cover plate out to a 15° angle and lift up to remove it.

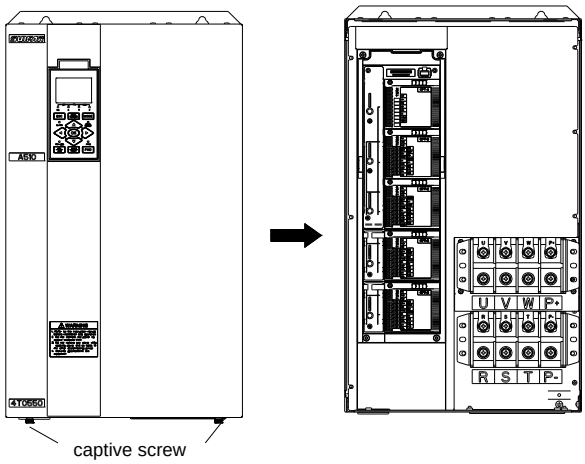


Figure 3-9
Schematic diagram of disassembly and installation of sheet-metal cover plate

♦ Installation:

① Holding the bottom of the cover plate at an angle of 15° to the body, place the locator pin at the top of the cover plate firmly into the fixed groove on the top of the body.

② Swing the bottom of the cover plate down and onto the body.

③ Tighten up the two thumb screws at the bottom of the cover plate.

3.4 REMOTE INSTALLATION OF PANEL

1. When remote mounting the keypad directly onto a panel or cabinet door, refer to Figure 3-10-C for the size of the hole.

2. When remote mounting the keypad using a Remote Door Mount Kit, refer to Figure 3-10-B for the size of the hole.

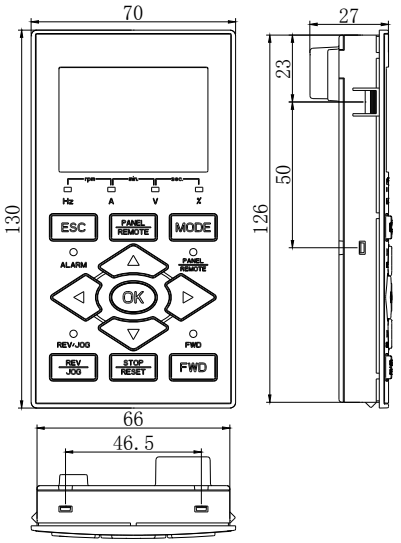


Figure 3-10-A
Installation size **1** of operation panel

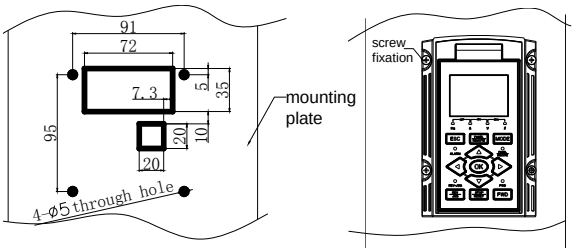


Figure 3-10-B Installation size **2** of operation panel

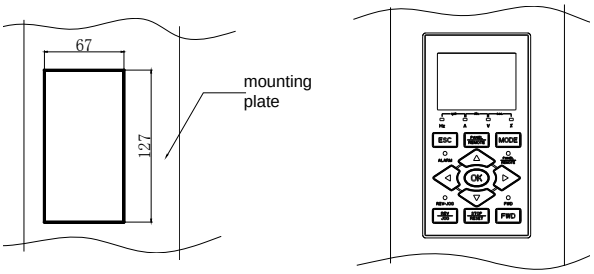


Figure 3-10-C Installation size **3** of operation panel

3.5 DISASSEMBLY AND DISASSEMBLY OF EXPANSION CARD

Please refer to Figure 3-11 for disassembly and removal of expansion card. (Note: there are large and small sockets corresponding to the expansion card and the pallet, and the expansion card of the same size are exchangeable).

♦ Installation:

① Place the expansion card horizontally in direction as shown in figure, to align the socket on the card with the socket on the pallet of the card, and then press down until the expansion card sticks tightly to the pallet;

② Tighten the fastening screw M3 at the left upper corner of the expansion card.

♦ Disassembly：

① Loosen the fastening screw M3 at the left upper corner of the expansion card;

② Pull expansion card up out from the pallet.

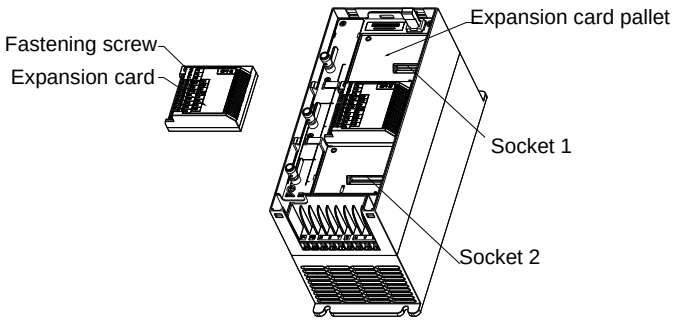
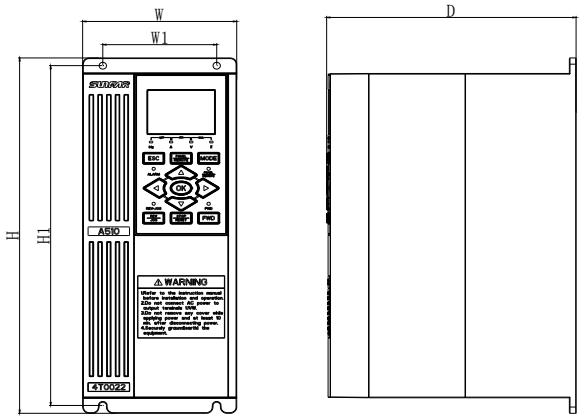


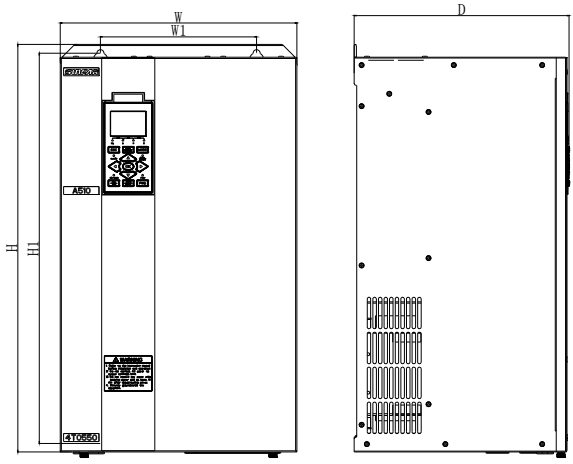
Figure 3-11 Schematic diagram of disassembly & installation of expansion board

3.6 INSTALLATION SIZE OF FREQUENCY INVERTER

Type Ⅰ suitable model: A510 - 4T0011H ~ A510 - 4T0110H



Type Ⅱ suitable model: A510 - 4T0150H ~ A510 - 4T1320H



Specific installation sizes of A510 series frequency inverters as listed below:

Model of frequency inverter (three-phase 380V)	W1 (mm)	W (mm)	H1 (mm)	H (mm)	D (mm)	Specification of screw
A510-4T0011H	85	115	272.5	285	185	M5
A510-4T0015H						
A510-4T0022H						
A510-4T0030H	115	150	345	360	205	M5
A510-4T0040H						
A510-4T0055H						
A510-4T0075H	140	180	400	420	225	M6
A510-4T0090H						
A510-4T0110H						
A510-4T0150H	160	225	480	508	270	M8
A510-4T0185H						
A510-4T0220H						
A510-4T0300H	222.7	303	552	581	272	M8
A510-4T0370H						
A510-4T0450H	222.7	338	564	591	306	M8
A510-4T0550H						
A510-4T0750H	--	--	--	--	--	--
A510-4T0900H						
A510-4T1100H	--	--	--	--	--	--
A510-4T1320H						

4. WIRING OF FREQUENCY INVERTER

4.1 WIRING CAUTIONS

- Make sure a circuit breaker is connected between the Frequency Inverter and power supply to provide a safety trip if the frequency inverter is faulty.
- In order to reduce electromagnetic interference, please connect surge absorber on the coil of electromagnetic contactor, relay and etc. in the surrounding circuit of the frequency inverter.
- Please use shielded wire greater than 0.3mm² for the wiring of analog signals. The shielding shall be connected on the grounding terminal of the frequency inverter (keep single-end-earthed shielding layer) with wiring length of less than 30m.
- Screened wire or shielded wire greater than 0.75mm² shall be selected for the wiring of input and output loop of relays.
- The control wiring shall be run separately from the power cables; it shall be at a distance greater than 10cm for parallel wiring and vertical for cross wiring.
- All the supply and motor cables shall be fastened within the terminal to ensure good contact. The leading wires of major loop shall be adopted cables or copper bar. When using cables, wiring must not be carried out until they are cold pressed or welded well by lug plate with corresponding section.
- The pressurization of all the leading wires shall be in compliance with the voltage class of the frequency inverter.
- Please reliably ground the frequency inverter and motor locally.

➢ Absorption capacitor or other RC absorbers shall not be installed at U, V and W output end of the frequency inverter, as shown in Figure 4-1.

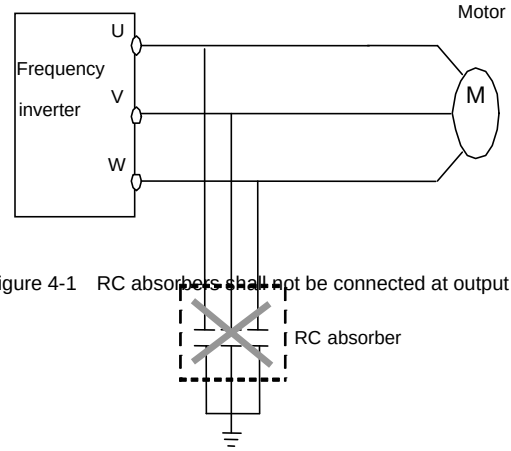


Figure 4-1 RC absorbers shall not be connected at output end

4.2 CONNECTION OF OPTIONAL FITTINGS AND FREQUENCY INVERTER

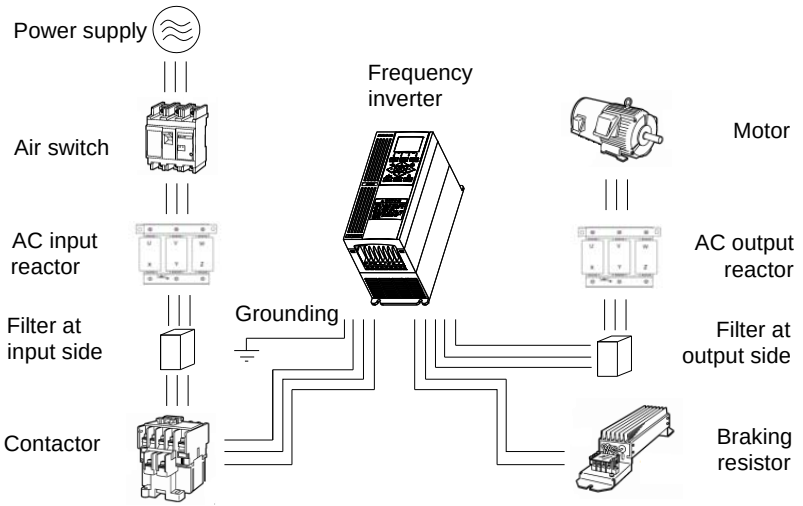


Figure 4-2 Wiring of frequency inverter

♦ Power supply

The power supply shall be in accordance with the specification of input power supply designated by this operating manual.

♦ Air switch

① When the frequency inverter is maintained or not in use for a long time, the air switch will separate the frequency inverter from the power supply;

② When the input side of the frequency inverter has failures like short circuit, the air switch can protect.

♦ AC input reactor

When the interaction of higher harmonic between the frequency inverter and power supply can not meet the requirements after serious wave form distortion of power grid or the frequency inverter is equipped with DC reactor, the AC input reactor can be added. The AC input reactor can improve the power factors at input side of the inverter and reduce the influence caused by unbalanced voltage of three-phase power supply.

♦ Filter at input side

EMI filter can be selected to restrict the high-frequency noise interference from the power cord of the frequency inverter.

♦ Contactor

It can cut off the power supply when the system protective function acts to prevent failure expanding.

➢ The A510 range comes standard with a built-in DC reactor: An external DC reactor can be connected if the built-in DC reactor does not meet the requirements.

- Filter at output side

EMI filter can be selected to restrict the interference noise generated at the output side of the inverter and wire leakage current.

- AC output reactor

When the wiring from the frequency inverter to the motor is longer (exceeding 20m), it can restrict radio interference and leakage current.

- Braking resistor

Improve the braking capacity of frequency inverter to avoid over voltage failure when slowing down.

The specification of recommended electric appliances is as follows:

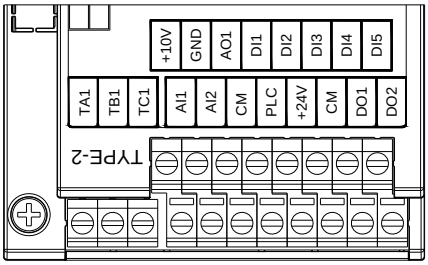
Model of frequency inverter	Adaptive motor(KW)		Wire gauge (major loop) (mm^2)	Air circuit breaker(A)	Electro-magnetic contactor(A)
	General loads	Load for fan and water pump			
A510-4T0011H	1.1	1.5	1.5	16	12
A510-4T0015H	1.5	2.2	2.5	16	12
A510-4T0022H	2.2	3.0	4	16	12
A510-4T0030H	3.0	4.0	4	20	16
A510-4T0040H	4.0	5.5	4	25	16
A510-4T0055H	5.5	7.5	6	32	22
A510-4T0075H	7.5	9.0	6	40	32
A510-4T0090H	9.0	11	10	50	32
A510-4T0110H	11	15	10	63	32
A510-4T0150H	15	18.5	10	63	38
A510-4T0185H	18.5	22	16	80	45
A510-4T0220H	22	30	16	100	63
A510-4T0300H	30	37	25	125	75
A510-4T0370H	37	45	25	160	85
A510-4T0450H	45	55	35	200	110
A510-4T0550H	55	75	50	225	140
A510-4T0750H	75	90	70	250	170
A510-4T0900H	90	110	70	315	205
A510-4T1100H	110	132	95	400	250
A510-4T1320H	132	160	95	400	330

➢ The power of motor can be increased by one size when the A510 series frequency inverter is connected with Variable Torque loads (capacity increase).

4.3 WIRING OF STANDARD INTERFACE CARD

4.3.1 WIRING OF STANDARD INTERFACE CARD CON1 AND CON2 (EX-WORK STANDARD CONFIGURATION)

CON1 and CON2 terminals are arranged as follows:



4.3.2 FUNCTION DESCRIPTION OF CONTROL TERMINAL

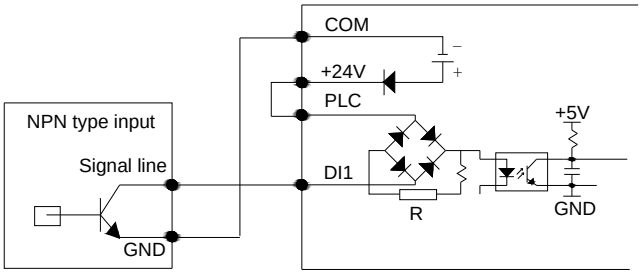
Type	Label of terminal	Name	Function description of terminal	Specification
Control terminal	DI1—CM	Multifunctional input terminal DI1	5-circuit programmable switching value input terminal can be selected 98 kinds of operational control commands by function code in F3.0 group by programming. See Reference Table for Function Selection of Multifunctional Terminal for detail.	Input voltage: 5~24VDC Input current: 1~5mA. See the following figure for the wiring way.
	DI2—CM	Multifunctional input terminal DI2		
	DI3—CM	Multifunctional input terminal DI3		
	DI4—CM	Multifunctional input terminal DI4		
	DI5—CM	Multifunctional input terminal DI5		
Operating status output	PLC	Common terminal of multifunctional input	The common terminal of the multifunctional input terminal (connected to 24V by default). When external signal is used to drive DI1~DI5, PLC should be connected to external power supply, and disconnected from +24V.	Maximum load current is 150mA; the highest withstand voltage is 24V.
	DO1—CM	Multifunctional output terminal DO1	2-circuit programmable open collector output and 1-circuit programmable relay output terminal; 63 kinds of operating status output can be selected by the function code in F3.1 group by programming. See Reference Table for Variables of Multifunctional Output Terminal for detail.	
	DO2—CM	Multifunctional output terminal DO2		
	TA1	Multifunctional relay output TA1-TB1 normally closed TA1-TC 1normally open		Contact capacity: AC 250V/2A
	TB1			
	TC1			

Type	Label of terminal	Name	Function description of terminal	Specification
Power supply	CM	+24V power supply reference place	Power supply of switching value terminal	Maximum output current:100mA
	+24V	+24V power supply		
Analog input	AI1—GND	Analog input AI1	Select input voltage range, polarity and other functions with function code in F4 group.	Input voltage: 0~10V, Input current: 0~20mA
	AI2—GND	Analog input AI2		
Analog output	AO1—GND	Multifunctional analog output AO1	The programmable voltage/current signal output terminal has 45 kinds of monitoring status to be selected by programming. See Reference Table for Monitor Variables for detail. For JP1, current/voltage output is selected (see DIP Switch Jumper Selection in 4.3.3 for detail)	Current output: 0~20mA Voltage output: 0~10V
Power supply	GND	Common terminal of analog signal		
	VS—GND	+10V reference power supply	External signal reference source	Maximum current : 10mA

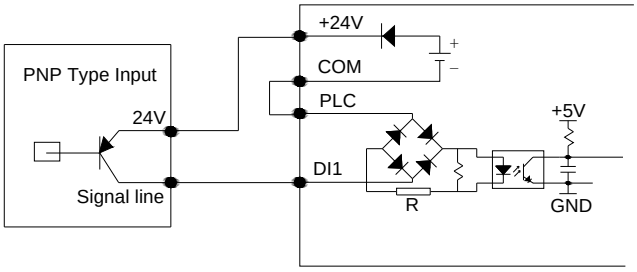
4

Wiring method of multifunctional input and output terminal

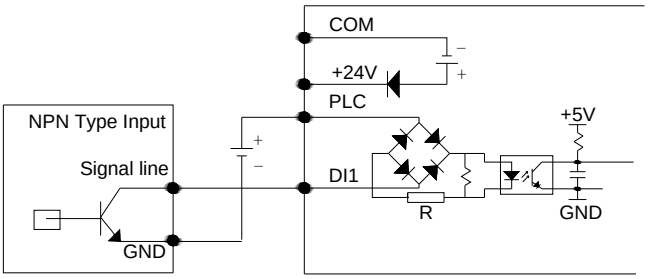
Use the input mode with internal inverter 24VDC, and external input terminal being NPN leak-type (connect PLC and +24V terminal with conductor):



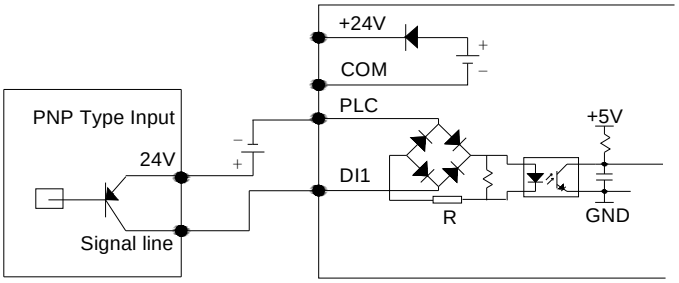
Use the input mode with internal inverter 24VDC, and external input terminal being NPN source type (connect PLC and COM terminal with conductor):



Use the input mode with external power supply (5-28VDC) and external input terminal being NPN leak-type:



Use the input mode with external power supply (5-28VDC) and external input terminal being NPN source-type:



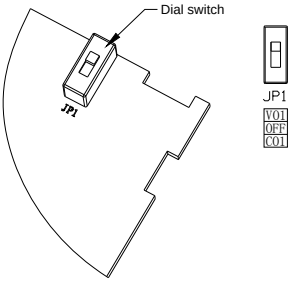
4.3.3 WIRING CAUTIONS FOR THE STANDARD INTERFACE CARD

Three shifts available for JP1 dial switch:

VO1: indicating AO1 terminal output voltage signal;

OFF: Indicating AO1 terminal is suspended in mid air;

CO1: Indicating AO1 terminal output current signal.



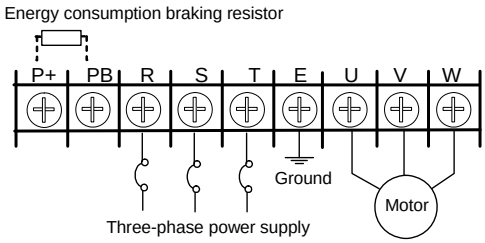
4.4 WIRING OF MAJOR TERMINAL

4.4.1 TERMINAL FUNCTIONS

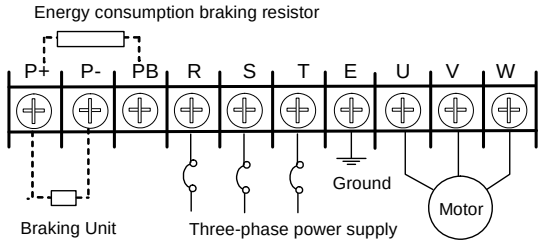
Terminal symbols	Functions	Terminal symbols	Functions
P+	DC side voltage positive terminal	**PB**	DC braking resister can be connected between P+ and PB
P-	DC side voltage negative terminal, Bus voltage input terminal of DC braking unit can be connected between P+ and P-	**E**	Grounding terminal
R,S,T	Connect three-phase AC power supply of grid	**U, V, W**	Connect three-phase AC motor

4.4.2 WIRING OF MAJOR TERMINAL AND TERMINAL BLOCKS

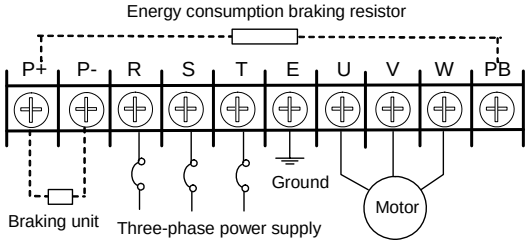
Class I Applicable type: A510-4T0011H ～ A510-4T0055H



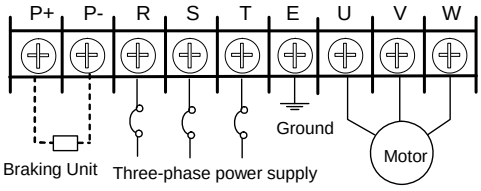
Class II Applicable type: A510-4T0075H ～ A510-4T0110H



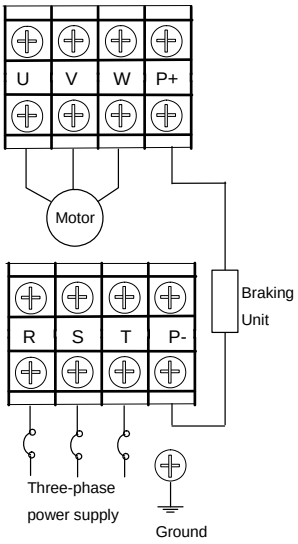
Class III Applicable type: A510-4T0150H



Class Ⅳ Applicable type: A510-4T0185H ～ A510-4T0220H



Class Ⅴ Applicable type: A510-4T0300H ~ A510-4T0550H



4.5 CONNECTION WIRING OF BASIC OPERATION

Applicable type: A510-4T0011H ～ A510-4T1320H

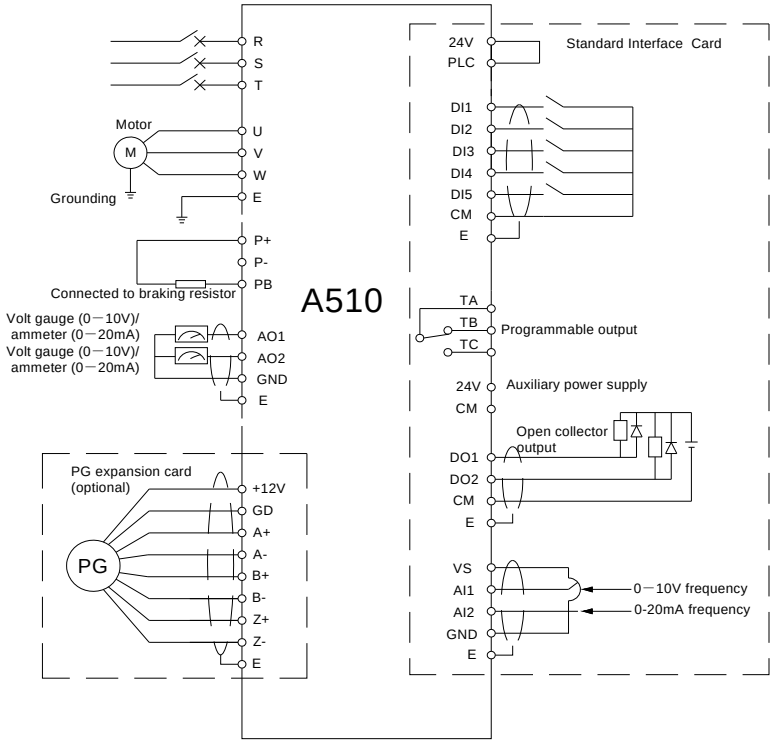


Figure 4-3 Basic wiring diagram for A510 series frequency inverter

5. BASIC OPERATION AND RUNNING OF FREQUENCY INVERTER

5.1 BASIC FUNCTION OF PANEL

The LCD operating panel comes standard with all 7100 series frequency inverters. It is used for parameter setting, status monitoring and controlling the operation of the inverter. Aside from basic start and stop control, the operating panel of the inverter mainly has following three functions: monitoring of status parameters, modification of parameter settings and displaying these parameters in an easy to read format. The operating panel has three modes of operation: monitoring mode, parameter modification mode and graph display mode.

5.1.1 DESCRIPTION OF OPERATING PANEL

When it is initially powered on, the main display shows the text “SUNFAR”, and also statically shows the inverter’s model (e.g. “A510-4T0022H”), product series number (e.g: sn.20110201022), and software version (e.g. 7000). Then the unit will turn to normal status show in 3 second. At this time, the operation parameters shown on the operating panel are determined by the internal parameters [F0.0.12] and [F0.0.13] of the inverter. The operating panel will return to normal monitoring mode if no keys are pressed within 1 minute at any state.

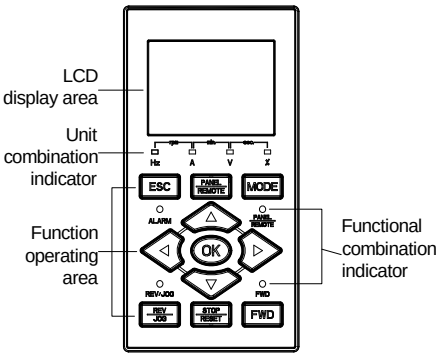
The LCD operating panel consists of LED indicator, navigation buttons and LCD display, and its appearance is as shown in following figure.

1. Description of buttons

   Please refer to Table 5-1 for the functions of the buttons on the panel.

2. Description of the indicators

   There are totally eight LED indicators on the operating panel, four of which are used for unit combination and the other four are used for indicating function combination. LED indicators may be on, off or flashing at different state. Please refer to Table 5-1 for the functions.



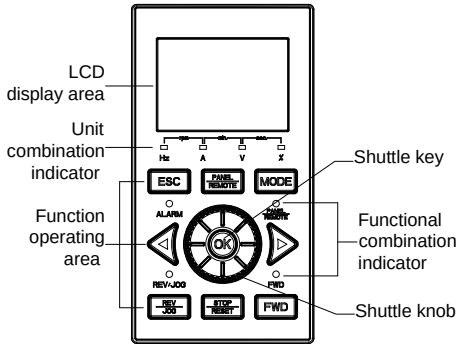


Table 5-1 Functions of Keys

Items		Functions
Display function	LCD display area	Displays the current operating status parameters and set parameters of the inverter.
	A、Hz、V、%	A, Hz, V displays the corresponding measurement unit of the data of the main digital display. % displays compound unit. The compound unit indicator is defined as follows: Hz+A = RPM; V+% = Sec. ; A + V = Min.
	FWD、REV	Indicator for operating status, its flicker shows the frequency inverter is in F/R operation and has voltage output.
	PANEL/REMOTE	The indicator is off: The external terminal command is valid; The indicator is on: the operation panel command is valid; The indicator is flashing: the communication interface (or expanded communication board or expanded function board) command is valid.
	ALARM	The indicator is on: the frequency inverter is in warning status. It shall check up and eliminate abnormalities; otherwise, the frequency inverter may be faulty and shut down.
Keyboard function		Forward operation command key. Press this key to send forward operation command when the operation command channel of the frequency inverter is set as operation panel control ([F0.3.33]) or [F0.3.34] =0).
		Reverse/inching operation command key. ♦ Press this key to send reverse operation command when the reverse function ([FF.4.42=# # # 0]) is selected and the operation command channel of the frequency inverter is set as operation panel control ([F0.3.33] or[F0.3.34]=0). ♦ Press this key to send inching operation command when inching function ([FF.4.42=# # # 1])is selected.
		Stop/reset key. When this key is pressed in operating status, the frequency inverter will shut down as per set mode; And when pressing this key in fault conditions, the frequency inverter will reset and return to normal stopped status. Keys can be locked or functions can be changed by users (refer to Functional Parameter F0.011).
		Return key. At any status, it will return to the status of last level till normal monitoring mode by pressing this key.
		Mode key. Switch display function parameter set and monitoring parameter set in parameter modification status. The corresponding “EROM stored value”, “value at this time of energizing” and “panel backup value” of the current function code will be displayed at auxiliary display by pressing this key.
		Data modification key. Used to mofidy function code or parameter. If digital setting mode is set currently, the digital setting value can be modified directly by using this key in normal monitoring mode.
		Left shift key. At any status using  key to modify data, the modified data bit can be selected from right to left by pressing this key and the modified bit is at the selection status and flashes.

Keyboard function		Right shift key. At any status using ▲▼ key to modify data, the modified data bit can be selected from left to right by pressing this key and the modified bit is at the selection status and flashes.
		Local, terminal and communication control function switch key. The keyboard control, external terminal control and communication control functinos can be swithced with each other through setting [F0.0.11]=#1## (the switch status is not stored and lost after power down).
		Shuttle selection key. Adjust data after addition in clockwise rotation and adjust data after subtraction in counterclockwise rotation. When [F0.0.25]=3, select panel shuttle setting.
		Ok key. Confirm the current status and parameters (the parameters are stored in the internal memory) and enter into next-level function menu.

5.2 BASIC FUNCTIONS AND OPERATING METHODS OF PANEL

5.2.1 BASIC FUNCTIONS OF KEYPAD

The operation panel also has the following special functions on top of the basic functions of forward / reverse operation, inching operation, shut down, fault reset, parameter modification and query and operating status parameter monitoring.

1. Parameter copy and read/backup (parameter upload)

This operation panel allows for copying the internal parameters of the frequency inverter to the operation panel (only the internal parameters opened to users) and storing permanently. Therefore, users can backup their typical setting parameters to the operation panel for emergency. The backup parameters in the operation panel do not influence the operation of the frequency inverter and can be checked and modified separately.

When [F0.0.08]=# # # 1, the keyboard will begin to read the internal parameters of the frequency inverter and the operation panel will display the process of reading parameters in real time.The LCD display shows “parameter uploading”, and after backup of parameters, the LCD display shows “Prameter uploading completed”, and the display mode will be automatically resumed to the normal status monitoring. During parameter backup, the operation can be stopped at any time by pressing  key and the display will switch to normal monitoring mode. If alarm information is occurred, please refer to Chapter 8.

2. Parameter copy/write in (parameter download)

This operation panel allows for copying the backup parameters to the internal memory of the frequency inverter (only the internal parameters opened to users) and users can write in their typical setting parameters backed up in the operation panel into the frequency inverter at one time without separate modification.

When the frequency inverter set F0.0.08 as # # 1 2 or # # 1 3 in stopped mode, the keyboard will begin to copy the backup parameters to frequency inverter and the operation panel will display the process in real time. The LCD display shows “parameter downloading”, and after backup of parameters, the LCD display shows “Prameter downloading completed”, and the display mode will be automatically resumed to the normal status monitoring.

During parameter copying, the operation can be stopped at any time to abandon the copied parameters by pressing  key and the display mode will switch to normal monitoring mode. If alarm information is occurred, please refer to Chapter 8.

3. Check and modification of internal parameters

In normal monitoring mode, the internal parameters of the frequency inverter can be checked and modified as per general methods by pressing MODE key. LCD display has the picture display function, allowing for viewing the funtional pictures ser by F0.0.12 main monitoring parameter at any time.

4. Check and modification of panel backup parameters

In normal monitoring mode, the backup parameters in the operation panel can be checked and modified by pressing ESC and MODE key simultaneously (double key compound use). The LCD display prompts: The first line shows the current operation status: Setting of panel parameters; and the second line shows the current function code and set parameters, to indicate that those currently inquired and modified are backup parameters. The modification methods of backup parameters are the same as that of internal parameters.

5. Locking and unlocking of panel

① Locking: part of or all the keying functions of the panel can be locked through setting the application parameter F0.0.11. If the parameter is set as panel locking mode, the panel will be locked immediately after the frequency inverter is energized.

② Unlocking: the panel will be unlocked for 5 minutes temporarily by pressing OK and maintaining and pressing ◄► twice in order within 5 seconds and it will automatically recover to locking if there's no keying within 5 minutes.

➢ To unlock the panel thoroughly, the panel locking parameter [F0.0.11] should be modified into "unlocked" status during the temporary unlock of the panel.

6. [redacted] Key function

[redacted] Key function is limited by the application parameter F0.0.11. In function enabling and "normal monitoring mode", press [redacted] key to switch the operation command channel in order "operation panel⟶ local terminal ⟶communication interface ⟶operation panel". [redacted] Indicator displays the selected command channel which will be valid by pressing OK within 3 seconds. It will abandon the switch and return to original status by pressing ESC or without pressing OK within 3 seconds.

The operation command channel switched by this function is not stored permanently. It will recover to original setting after the frequency inverter is power down and restarted. Relevant application parameters of the frequency inverter should be modified to permanently change the command channel.

➢ When switching command channel, if the original setting is "operation panel" or "local terminal", the "communication interface" will be defaulted as local MODBUS field bus.

5.2.2 OPERATING METHODS OF PANEL

♦ Query for status parameters (e.g.)

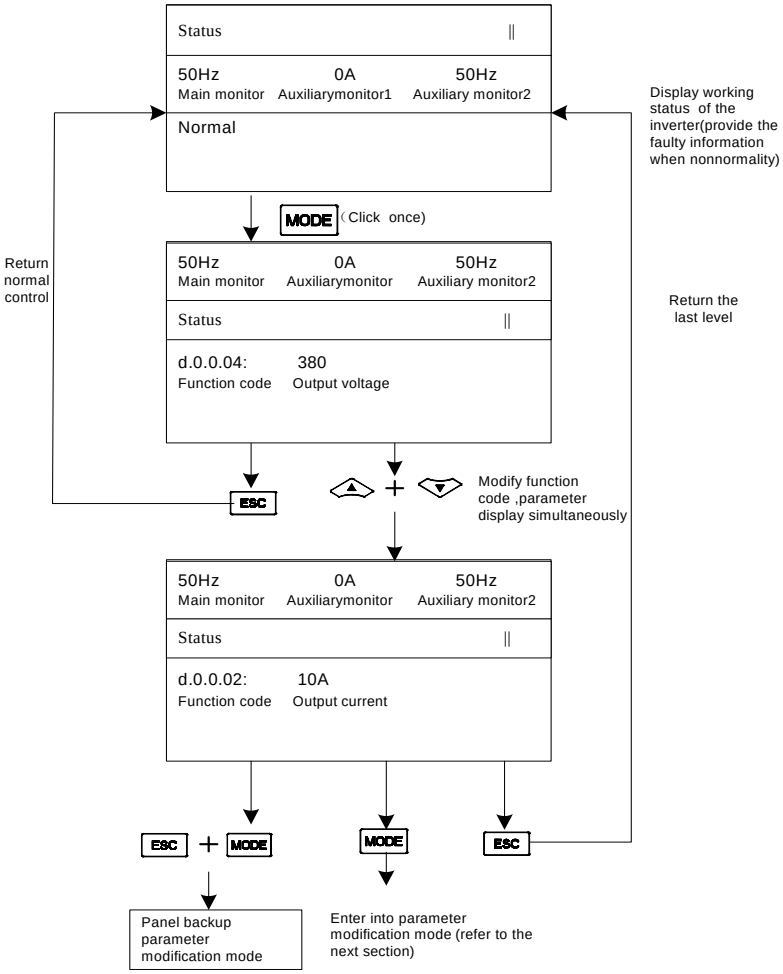


Figure 5-1 Query for status parameters

♦ Parameter query and modification (example.)

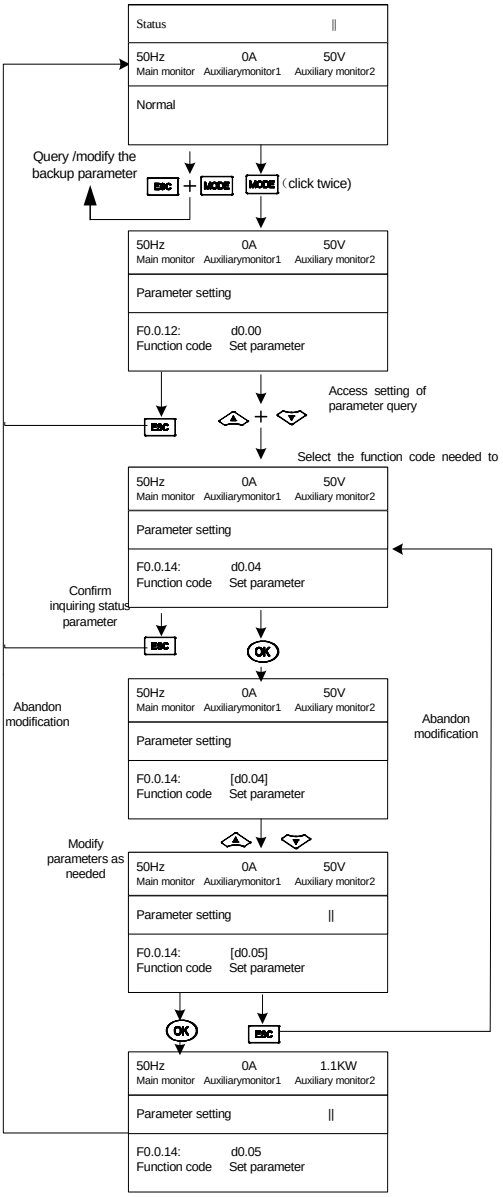


Figure 5-2 Parameter check and modification

Remark: in this status, the auxiliary display column will display the following in turn by pressing MODE key repeatedly.

Default auxiliary monitoring parameters (original state)⟶ EROM regional numerical value ⟶ parameter values at initial energizing ⟶ backup parameters in operation panel, the numerical value will flicker when “EROM regional numerical value”, “parameter values at initial energizing” and “backup parameters in operation panel” are displayed.

♦ Backup parameter query and modification on the panel (example)

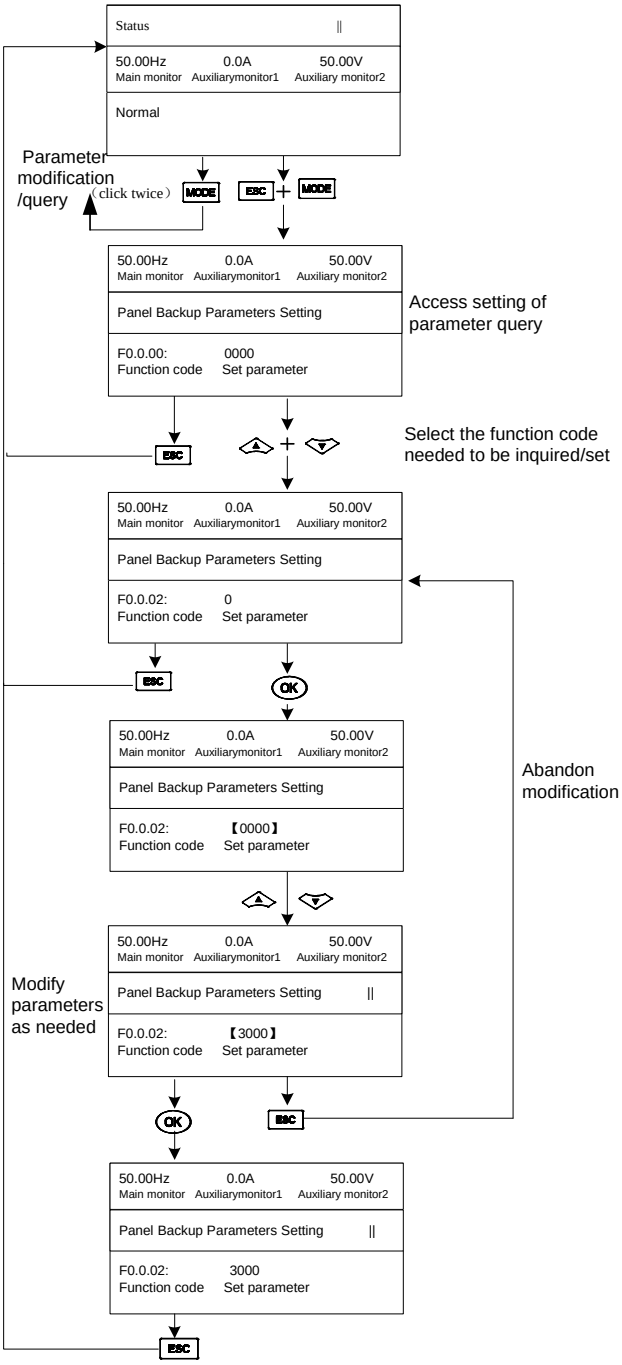


Figure 5-3 Panel backup Parameters check and modification

5.3 BASIC RUNNING OF FREQUENCY INVERTER

5.3.1 OPERATION PROCESS

Process	Operations	References
Installation and operating environment	Install frequency inverter in an environment which complies with the products technical specification. consider ambient conditions (temperature, humidity, etc.) and heat dissipation of frequency inverter, etc.	Refer to Chapter 1 and 3
Wiring of frequency inverter	Wiring of main circuit input and output terminal; Wiring of grounding wire; Wiring of switching value control terminal, analog terminal, encoder and communication interface	Refer to Chapter 4
Inspection before energizing	Make sure the voltage of input power supply is correct and the input power supply loop is connected with breaker; The frequency inverter has been correctly and reliably grounded; The power cord has been correctly connected with R, S, T power input terminal of the frequency inverter; The output terminal of the frequency inverter U, V, W is correctly connected with the motor; the encoder is correctly connected with PG card; The terminal block is correctly connected and all the external switches are correctly preset; The motor is empty-load (the mechanical load is disconnected with motor).	Refer to Chapter 4
Inspection in energizing	Whether the frequency has abnormal sound, smoking and peculiar smell, etc; And the operation panel displays normally without fault alarm information. If there are abnormalities, please cut off the power supply immediately.	Refer to Chapter 3 and 5
Parameter initialization	When the frequency inverter is operated initially, changed internal control panel or controlled motor, it is recommended to conduct the next operation and setting after setting function code F0.0.07 and conducting parameter initialization.	Refer to F0.0.07 parameter function
Correctly input the name plate of the motor	Make sure the name plate parameter of the motor is input correctly and carefully checked by users; Otherwise, serious problems may be occur in operation.	Refer to F2.0.00~F2.1.51 Motor parameter group
Protection parameter setting for motor and frequency inverter	Correctly set the limit parameter, protection parameter and protection mode of the frequency inverter and the motor, mainly including: The maximum frequency, upper frequency limit, motor overload protection, external fault input, fault relay output and encoder disconnection protection, etc.	Refer to F1.4.39~F1.4.52 parameter operation parameter group, , F3.1.12~F3.1.35 parameter set for multifunctional terminal output, F4.3.36~F4.3.50 parameter set for analog input disconnection detection

Process		Operations	References
Automatic learning		The automatic learning for motor parameters should be conducted before selecting vector control mode for the first operation so as to get accurate electric parameters of the controlled motor. If the motor is rotating, please conduct after the motor is completely stopped.	Refer to F2.2.53 parameter set for parameter determination
Set operation control parameters	General parameters	Correctly set direction of rotation, acceleration time, deceleration time, starting frequency, starting mode, acceleration and deceleration mode and stop mode, etc. As per the operating conditions of driving system.	Refer to F0.0.17 parameter set, F0.1.20~F0.1.24 parameter set, F0.4.37~F0.4.52 parameter set for starting and stopping, and F1.0.00~F1.0.10 parameter set for acceleration and deceleration characteristics
	Vector control	Adjust the parameters of regulator in accordance with load conditions, if necessary, set torque control and limit parameters. For vector control with PG, make sure to correctly set the parameters of encoder.	Refer to F8.0.01~F8.0.15 parameter set for rotating speed setting and feedback
Empty-load commissioning inspection		Empty-load motor; start the frequency inverter with keyboard or control terminals; Inspect and confirm the operating conditions of driving system; Motor: stable operation, normal rotation, correct direction, normal acceleration and deceleration process, no abnormal vibration, noise and smell. Frequency inverter; Normal display data of operation panel, normal operation of fan, normal sequence of operation of relay, no vibration and noise, etc. If there are abnormalities, please stop and inspect immediately.	Refer to Chapter 3 and 5
Commissioning inspection with load		Connect the load of driving system after normal empty-load commissioning. Start the frequency inverter with keyboard or control terminal and gradually increase load. When the load is increased to 50% and 100%, operate the system for a period of time respectively to inspect whether the operation of the system is normal or not. It shall inspect overall during operation and observe whether there are abnormalities, or it shall stop and inspect immediately.	Refer to Chapter 3 and 5
Basic operation		The frequency inverter can carry out such basic operations as general starting, running, stopping and F/R, etc.	Refer to Chapter 3 and 5

Process		Operations	References
Function operation	PLC operation	Frequency conversion operation can be set as single cycle execution or recycle execution. One cycle process includes 15 execution phases whose operating frequency, acceleration and deceleration time, operating time and direction, etc can be set separately.	Refer to F6.0.00~F6.0.14 parameter set for multi-frequency setting function, F6.0.15~F6.0.45 parameter set for simple and programmable multi-section operation function
	PID operation	Users can set the preset channel and feedback channel for PID process control as well as parameters of PID regulator to realize the control to industrial process.	Refer to F7.0.00~F7.0.26 parameter set for process PID function
	Torque control	Torque control is used under vector control mode and can control the output torque of the motor as per torque command value.	Refer to F8.3.39~F8.3.51 parameter set for torque control function
	S acceleration and deceleration	In order to make acceleration and deceleration process smooth and reduce mechanical impact, users can set S curve acceleration and deceleration function to make the speed of the motor vary smoothly in the initial and end phase of acceleration and deceleration.	Refer to F1.0.00~F1.0.10 function parameter set
	DC braking	Access DC current to rotating motor before starting or in the stopping process to produce braking torque to stop the motor quickly.	Refer to F0.4.44~F0.4.47 parameter set for DC braking function
	Rotating speed tracking	The frequency inverter will automatically track the speed of rotating motor caused by inertia in starting and execute the set starting procedure after smoothly cutting over the current speed of the motor so as to reduce starting impact.	Refer to F0.4.38 parameter functions for starting and stopping mode
	Special terminal control	The switching value has strong control functions and can be used in combination with external control period to constitute various application solutions. Before using the control functions of special terminals, corresponding settings must be conducted in function code.	Refer to F3.0.00~F3.0.11 parameter set for multifunctional input terminal function
Inspection during operation		● Whether the motor is steadily rotated and the direction of rotation is correct; ● Whether there's abnormal vibration or noise; whether the acceleration and deceleration process is stable; ● Whether the output state and panel display of the frequency inverter is correct; ● Whether the fan is normally operated and there's abnormal vibration or noise; ● If there are abnormalities, it shall stop and cut off the power supply for inspection immediately.	Refer to Chapter 3 and 5

5.3.2 INITIAL SETTING OF FREQUENCY INVERTER

1. Selection of control mode

A510 frequency inverter has five control modes: vector control without PG, vector control with PG, torque control, V/F control and V/F separate control. The operation control mode is selected by the application parameter F0.0.09.

- **Mode 0**

  Vector control without PG, i.e. Vector control without velocity sensor, also called open loop vector control. It is applicable to the place where encoder is not installed, has higher requirement to starting torque and speed control precision and the normal V/F control mode can not satisfied.

- **Mode 1**

  Vector control with PG, i.e. Vector control with velocity sensor, also called closed loop vector control. It is applicable to the place where faster response of torque and higher control precision is required.

- **Mode 2**

  V/F control mode. Aside from normal V/F control application, it can also be applied to the occasions where a single inverter is used to drive multiple motors in parallel.

  The control modes of frequency inverter vary from the type and control requirements of motor and set by parameter F0.0.09=# # # #. For instance, the field where three-phase asynchronous motor is used can be selected through setting F0.0.09=# # # 0 and the field where the control precision is highly required with velocity sensor can be set F0.0.09=# # 1 # speed closed loop vector control mode.

- **Mode 3**

  V/F separate control mode. It is applicable to some special equipment (e.g. torque motor). Under this control mode, the output voltage and output frequency of the frequency inverter are not related and set by the user itself. It should be especially noticed that, this mode is not applicable to common asynchronous motors, variable frequency inverter and permanent magnet synchronous motor; Otherwise the equipment may be damaged if it is forcibly set in this mode.

- **Mode 4**

  Torque control. It can be acquired in the open-loop vector mode and closed-loop vector mode, and is selected via parameter F8.3.39.

2. Selection of frequency input channel (F0.1.16 and F0.2.25, F0.2.26, F0.2.29 and F0.2.32)

A510 frequency inverter has two frequency channels to select parameters with 31 frequency setting modes for each of the channel (refer to parameter F0.2.25, F0.2.26). The two channels can both work independently and set in combination (refer to F0.1.16 parameter). For instance, if F0.1.16 is set as frequency setting channel 1 which is valid separately and F0.2.25 is set as 2 valid panel digital setting (maintaining after stopping and storing after power down), the frequency setting of the frequency inverter will be determined by F0.2.29.

3. Operation command input channel ([F0.1.15], [F0.3.33],[F0.3.34])

A510 frequency inverter has 2 control command channels to select parameters with 4 control command forms for each of the channel (refer to F0.3.33, F0.3.34). The two control commands can be selected through external terminal (refer to DI function selection table for multifunctional terminal). For instance, when this parameter is set as [F0.1.15] =0 (control command 1 is valid) and F0.3.33 is set as 0 operation panel command is valid, the start-stop control of the frequency inverter will be completed by FWD and key on the operation panel.

5.3.3 SIMPLE OPERATION

- It is absolutely forbidden to connect the power cord to the output U, V, W of the frequency inverter.

5.3.3.1 SIMPLE WIRING DIAGRAM

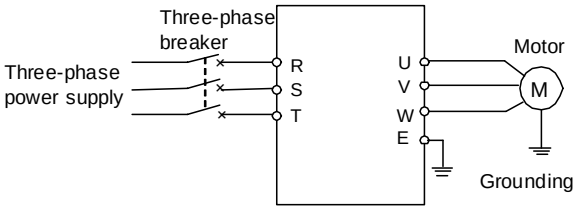


Figure 5-4 Wiring for the operation of SVC mode

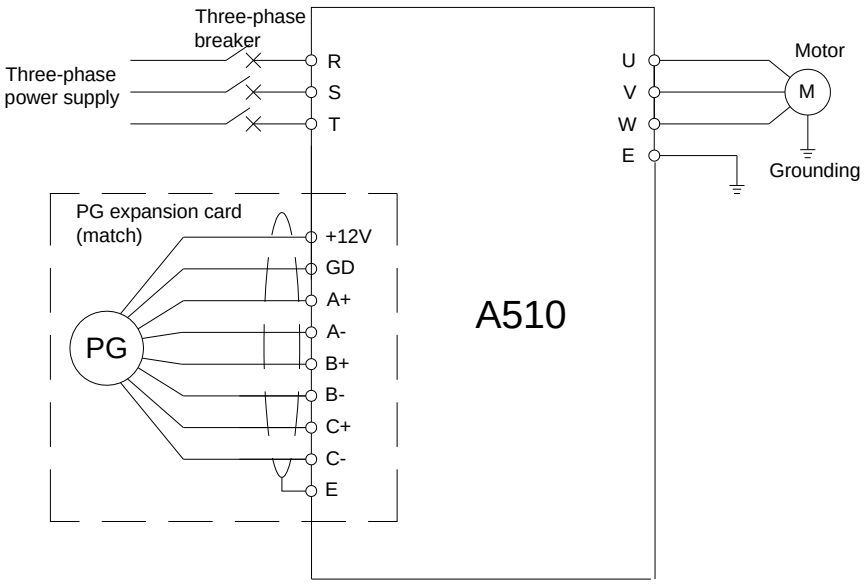


Figure 5-5 Wiring for the operation of VC mode

5.3.3.2 SVC (NON-INDUCTIVE VECTOR) OPERATION

Take 7.5KW frequency inverter which drives 7.5KW three-phase AC asynchronous motor as the example to indicate the operation process. The name plate parameters of the motor are:

Rated power: 7.5KW	Rated voltage: 380V	Rated current: 15.4A
Rated frequency: 50.00Hz	Rated speed: 1440rpm	Pulse of encoder: 1000PPR

Use operation panel to conduct digital frequency setting and start-stop control.

1. Connect as per Figure 5-3;
2. Power on after making sure the wiring is correct;
3. Set parameters as follows:

   [F0.0.09]=0000 (Noninductive vector control)

   [F0.0.00]=0001 (Apply macro parameters, set as panel operation digital setting for shortcut)

   [F2.0.00]=7.5 (Rated power of motor)

   [F2.0.01]=380 (Rated voltage of motor)

   [F2.0.02]=15.4 (Rated current of motor)

   [F2.0.03]=50.00 (Rated frequency of motor)

   [F2.0.04]=1440 (Rated speed of motor)

4. Press FWD key to start frequency inverter. If the name plate parameters (F2.0.00 ~ F2.0.04)of the motor are modified in ③, the primary static parameter identification will be started automatically, the frequency inverter will output 0 frequency and the auxiliary display column will display the current output current (not limited by F0.0.13 at this time). When the display current is stable as 0.0, the automatic learning is finished and operation is started;
5. Press ▲ key to increase set frequency, where the output frequency of the frequency inverter will be increased and the speed of motor will accelerate;
6. Observe the operation of motor, if there are abnormalities, stop it immediately and power off and re-operate it after finding out the causes;
7. Press ▼ key to reduce set frequency;
8. Press STOP/RST key to stop operation and cut off the power supply.

5.3.3.3 VC (INDUCTIVE VECTOR) OPERATION

The following parameters also need to be set except the above set parameters required by SVC operation. The wiring diagram is as shown in Figure 5-4.

[F0.0.09]=0010 (inductive vector control)

[F8.0.04]=0 (speed feedback channel)

[F8.0.05]=1000 (pulse of encoder per revolution)

[F8.0.06] if F/R periodic vibration is occurred in starting, this parameter shall be set as 1 (or exchange the wiring of A, B pulse); Other operations are the same as that of SVC operation.

- If the motor is completely empty-load, slight oscillation may occur sometimes in the operation under high carrier frequency. At this time, please reduce the setting value of the carrier frequency. (Parameter [F1.1.13]).

6. FUNCTIONAL PARAMETER TABLE

6.1 EXPLANATIONS

1. The symbols in the Table are explained as below:

- "×" indicates that the set value of the parameter cannot be changed when the inverter is running.
- "☆" indicates the parameter is relevant with the model of the inverter.
- "R" indicates the parameter is just for reading and cannot be changed;
- "R/I" indicates the parameter is just for reading and cannot be changed, but can be cleared by initialization.
- "—" indicates the parameter is relevant with the type or status of connected accessories.

2. Variables: (H) - hexadecimal number; only bitwise data change is permitted (carry bit is not allowed), and the upper and lower limit for bitwise change.

6.2 FUNCTION TABLE

6.2.1 SYSTEM MANAGEMENT PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F0.0.00	Quick Setup Mode	**_ _ _ X: Control Method (0~F)** 0: Void (customized setting) 1: Keypad Control (via buttons) (default) 2: Keypad Control (via wheel) 3: 2 Wire Control 1 (AT1 setting) 4: 2 Wire Control 2 (AT1 setting) 5: 3 Wire Control (AT1 setting) **_ _ X _: Reserve** **_ X _ _: Reserve** **X _ _ _: Load Type (0~F)** 0: Constant Torque Load 1: Variable Torque Load (eg. fans and pumps)	1	0000	×
F0.0.01	Parameter Setting and Modification (H)	**_ _ _ X: Parameter Display Options** 0: Display all parameters 1: Display effective configuration parameters 2: Display parameters different from factory default 3: Display modified and stored parameters after power-on this time 4: Display modified and un-stored parameters after power-on this time **_ _ X _: Saving Modified Parameters** 0: Effective and permanently stored after modification 1: Effective after modification but not stored, and getting lost after power-off **_ X _ _: Reserve** **X _ _ _: Parameter Batch Recover Store** 2: Abandon modifying all un-saved parameters	1	0001	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		(restoring to original value) 5: Batch storing all modified and un-saved parameters 9: Resume all parameters to initial values at the last power-on			
F0.0.02	Password to Change Control Mode	0~65535 (1580)	1	0	×
F0.0.03	Select Language for Text Display	0: Chinese 1: English	1	0	
F0.0.04	LCD Display Settings (H)	_ _ _ **X: Contrast 0~7** _ _ **X _: Status Display** 0: Steady mode 1: Single parameter display 2: Dual parameters display 3: Three parameters display	1	0023	-
F0.0.05	Parameter Security (H)	_ _ _ **X: Access to Parameters** 0: All parameters are permitted to be modified 1: Except for this parameter, frequency digital setting, PID digital setting, revolution digital setting, torque digital setting, locking password parameter (F0.0.06), other parameters are forbidden to be modified. 2: All parameters are forbidden to be modified except for this parameter and the locking password. _ _ **X _: Security Coded Parameter Lock** 0: Void 1: Effective – once the password is set, this parameter cannot be modified unless correct password is entered.	1	0000	
F0.0.06	Security Code	0~65535	1	0	
F0.0.07	Factory Reset	0: No action 1: Factory Reset parameter groups F0>F9 2: Factory Reset parameter groups F0>FA 3: Factory Reset parameter groups F0>FB 4: Factory Reset parameter groups F0>FC 5: Factory Reset parameter groups F0>FD 6: Factory Reset parameter groups F0>FE 7: Factory Reset parameter groups F0>FF 8: Delete Fault Log	1	0	×
F0.0.08	Parameter Transfer(H)	_ _ _ **X: Upload and Download** 0: No action 1: Parameter upload 2: Parameter download 3: Parameter download (except for motor prameter/F2 Group)	1	0000	×

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		_ _ X _: Allow Local Upload 0: Parameter download forbidden 1: Parameter download permitted			
F0.0.09	Motor Design and Control Selection (H)	**_ _ _ X: Motor 1 Type Selection** 0: Induction asynchronous motor 1: conical motor 2: Permanent magnet synchronous motor **_ _ X _: Motor 1 Control Mode** 0: SVC mode/open-loop vector control 1: VC mode/closed-loop vector control 2: V/F control 3: V/F separate control **_ X _ _: Motor 2 Type Selection** 0: Induction asynchronous motor 1: AC asynchronous servo motor 2: Permanent magnet synchronous motor **X _ _ _: Motor 2 Control Mode** 0: SVC mode/open-loop vector control 1: VC mode/closed-loop vector control 2: V/F control 3: V/F separate control	1	0000	×
F0.0.10	Motor selection	0: Motor 1 1: Motor 2 2: Select Motor 1 or 2 via terminal (Function No. 41)	1	0	×
F0.0.11	Keypad Operation (H)	**_ _ _ X: Keypad Locking** 0: No locking 1: All keys are locked except for UP/DW (Shuttle), STOP and RUN. 2: All keys are locked except for STOP and RUN 3: All keys are locked except for STOP. 4: Lock all keys **_ _ X _: STOP Button Function** 0: Non-panel control mode void 1: Press STOP key in any control mode to stop the device slowly 2: Press STOP key in any control mode to stop the device freely **_ X _ _: PANEL / REMOTE Button Function** 0: Void 1: Stop effective 2: Continuously effective **X _ _ _: Reserve**	1	0000	×
F0.0.12	Main Monitoring Option (H)	d0.0~d0.55 / d1.0~d1.55	1	d0.00	
F0.0.13	Auxiliary Monitoring Option 1	d0.0~d0.55 / d1.0~d1.55	1	d0.02	
F0.0.14	Auxiliary Monitoring Option 2	d0.0~d0.55 / d1.0~d1.55	1	d0.09	

6.2.2 SELECTION OF RUNNING COMMANDS

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F0.1.15	Control Place Selection	0: Control Place 1 On 1: Control Place 2 On 2: Select control place via input terminal (Function NO. 11)	1	0	
F0.1.16	Frequency Source Selection	0: Channel 1 Hz setting 1: Channel 2 Hz setting 2: Select Channel 1 or 2 via input term (Function No. 12) 3: Selected via Control Place Selection 4: Channel 1 + Channel 2 5: Channel 1 amplified by Channel 2 6: Channel 1 - Channel 2 7: Channel 1 reduced by Channel 2 8: Channel 1 reduced by Channel 2 9: Highest value Channel 1 OR Channel 2 10: Lowest value Channel 1 OR Channel 2 11: √(Channel 1) + √(Channel 2) 12: √(Channel 1 + Channel 2) 13: (Channel1 x Scaling1) + (Channel 2 x Scaling2) 14: (Channel1 x Scaling1) + (Channel 2 x Scaling2)	1	0	
F0.1.17	Direction of Rotation (H)	_ _ _ **X: Direction Switching** 0: Void 1: Negate _ _ **X _: JOG Direction Locking** 0: Void (determined by the direction command) 1: FWD locking 2: REV locking	1	0000	
F0.1.18	Channel 1 Scaling Factor	0.01~100.00	0.01	1.00	
F0.1.19	Channel 2 Scaling Factor	0.01~100.00	0.01	1.00	
F0.1.20	Maximum Output Frequency	10.00~320.00Hz/100.0~3000.0Hz	0.01	60.00	
F0.1.21	Upper Limit Frequency	[F0.1.22]~Min.(300.00Hz,[F0.1.20])	0.01	50.00	
F0.1.22	Lower Limit Frequency	0.0Hz~[F0.1.21]	0.01	0.0	
F0.1.23	FWD Jog Frequency	0.0Hz~[F0.1.21]	0.01	10.00	
F0.1.24	REV Jog Frequency	0.0Hz~[F0.1.21]	0.01	10.00	

6.2.3 FREQUENCY SETTINGS

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F0.2.25	Frequency Setting Channel 1	0: Keypad Entry 1 (keep value when stopped) 1: Keypad Entry 2 (go to zero when stopped) 2: Keypad Entry 3 (keep value at power off) 3: Setting of Wheel Potentiometer 4: Remote UP/DW 1 (keep value at power off) 5: Remote UP/DW 2 (go to zero when stopped) 6: Remote UP/DW 3 (keep value at power off) 7: Remote UP/DW Bipolar Setting 1 (keep bipolar when stopped) 8: Remote UP/DW Bipolar Setting 2 (keep at power off) 9: Analog input 1 (AI1, 0-10VDC) 10: Analog input 2 (AI2, 4-20mA) 11: Analog input 3 (AI3, 0-10VDC) 12: AI1 Bipolar setting (-10V to +10V) 13: AI3 Bipolar setting (-10V to +10V) 14: Pulse Follower Input 15: Pulse Follower Bipolar Input 16: MODBUS Communications1 Relative 17: MODBUS Communications2 Absolute 18: AI1+AI2 19: AI2+AI3 20: AI2+Pulse Input 21: (AI1 x AI2) / full scale of AI2 22: AI1/AI2 23: Standard PID Output 24: High Speed PID Output 25: Disturbed Running Frequency 26: Auto Preset Speeds 27: Preset Speeds via terminals 28: Simulated Analog Input SAI1 29: Simulated Analog Input SAI2 30: Comms Ext card1 Relative 31: Comms Ext card1 Absolute In the case of V/F separate control, F0.2.25 changes to frequency giving channel, and F0.2.26 changes to voltage giving channel.	1	2	
F0.2.26	Frequency Setting Channel 2			0	
F0.2.27	Min Frequency Channel 1	0.0~[F0.2.28]	0.01	0.0	
F0.2.28	Max Frequency Channel 1	[F0.2.27]~[F0.1.21]	0.01	50.00	
F0.2.29	Keypad Incremental Value Channel 1	0.0~[F0.2.28]	0.01	0.0	
F0.2.30	Min Frequency Channel 2	0.0~[F0.2.31]	0.01	0.0	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F0.2.31	Max Frequency Channel 2	[F0.2.30]~[F0.1.21]	0.01	50.00	
F0.2.32	Keypad Incremental Value Channel 2	0.0~[F0.2.31]	0.01	0.0	

6.2.4 CONTROL COMMAND SOURCE

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F0.3.33	Control Place 1	0: Running command 1: External control terminals 2: MODBUS Exp card 3. BUS Exp card	1	0	
F0.3.34	Control Place 2		1	0	
F0.3.35	External Control Quick setup (H)	**_ _ _ X: Control Command** 0: Two-line mode 1 1: Two-line mode 2 2: Three wire mode 1 3: Three wire mode 2 **_ _ X _: Command First Starting Mode** 0: Running signal level starting 1: Running signal rising edge starting (two-line mode 1 and 2) **_ X _ _: Reserve** **X _ _ _: Reserve**	1	0000	×

6.2.5 START AND STOP

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F0.4.37	Start Run Control Interlock (H)	**_ _ _ X: Start Allowed When** 0: Function closed 1: Permitted when the multifunctional terminal is effective (Function No. 42) 2: Command word from standard fieldbus (standard expansion card) 3. Command word from expansion communication module **_ _ X _: Reserve** **_ X _ _: Running Allowed When** 0: Function closed 1: Permitted when the multifunctional terminal is effective (Function No. 43) 2: Command word from standard fieldbus (standard expansion card) 3: Command word from expansion communication module **X _ _ _: Stop Method** 0: Free stop 1: Deceleration stop	1	0000	×

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F0.4.38	Start and Stop Methods (H)	_ _ _ **X: Start Method** 0: Normal start 1: Revolution tracking start _ _ **X** _**: Reserve** _ **X** _ _**: Stop Method** 0: Deceleration stop 1: Free stop **X** _ _ _**: Reserve**	1	0000	×
F0.4.39	Start Frequency	0.0~50.00Hz	0.01	0.50	
F0.4.40	Start Frequency Hold Time	0.00~10.00Sec.	0.01	0.0	
F0.4.41	Start Pre-excitation Current	0.0~100.0(%)	0.1	35.0	
F0.4.42	Start Pre-excitation Time	0.00~10.00Sec.	0.01	0.10	
F0.4.43	Start Delay	0.00~100.00Sec.	0.01	0.0	
F0.4.44	DC Injection Brake Control	_ _ _ **X: DC Injection Braking Function** 0: Closed 1: Open	1	0	
F0.4.45	DC Injection Brake Application Frequency	0.0~[F0.1.21]	0.01	2.00	
F0.4.46	DC Injection Braking Application Time	0.0~10.00Sec.	0.01	0.0	
F0.4.47	DC Injection Braking Current Level	0.0~100.0(%)	0.1	50.0	
F0.4.48	Restart After Power Interruption	0: Forbidden 1: Effective	1	0	
F0.4.49	Restart Delay Time	0.1~10.0Sec.	0.1	0.5	
F0.4.50	Direction Change Delay Time	0.00~5.00Sec.	0.01	0.0	
F0.4.51	Direction Change Start Hz	0: Switch at zero point 1: Start frequency switch	1	0	
F0.4.52	Zero-speed Detection Level	0.00~100.00Hz	0.01	0.10	
F0.4.53	Zero-speed Delay Time	0.00~10.00Sec.	0.01	0.05	
F0.4.54	Emergency Stop Method (EMS)	0: Emergency Stop By Deceleration 1: Emergency Stop by Coast To Stop	1	0	

6.2.6 ACCELERATION AND DECELERATION PARAMETERS

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F1.0.00	Acceleration and Deceleration Modes	_ _ _ **X: Accel Decel Mode** 0: Liner acceleration and deceleration 1: S curve acceleration and deceleration _ _ **X** _**: Accel And Decel Unit** 0: Sec. (Second) 1: Min. (Minute)	1	0000	×
F1.0.01	% of S-curve At The Bottom	5.0~100.0-[F1.0.02]	0.1	15.0	
F1.0.02	% of S-curve At Mid Section	20.0~100.0-[F1.0.01]	0.1	70.0	
F1.0.03	Acceleration Time 1	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.04	Deceleration Time 1	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.05	Acceleration Time 2	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.06	Deceleration Time 2	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.07	Acceleration Time 3	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.08	Deceleration Time 3	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.09	Acceleration Time 4 / JOG	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.10	Deceleration Time 4 / JOG	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.11	Emergency Stop Deceleration Time	0.01~ 600.00 (Sec. /Min.)	0.01	☆	
F1.0.12	Reserve				

6.2.7 CARRIER FREQUENCY

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F1.1.13	Carrier Frequency	1.5~15.0KHz（relevant with the model）	0.1	☆	
F1.1.14	Carrier Frequency Tuning	_ _ _ **X: Auto Load Adjust** 0: Void 1: Effective _ _ **X** _**: Auto Temp Adjust** 0: Void 1: Effective _ **X** _ _**: Auto Modulation Adjust** 0: Void 1: Effective **X** _ _ _**: Modulation Mode** 0: Asynchronous modulation 1: Synchronous modulation 2~5: Sound smooth	1	0111	

6.2.8 V/F PARAMETERS AND OVERLOAD PROTECTION FOR MOTOR 1

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F1.2.15	Rated Frequency of Motor 1	5.00 ~ 300.00Hz	0.01	50.00	×
F1.2.16	Rated Voltage of Motor 1	50 ~ 500V	1	380/220	
F1.2.17	V/F Curve Selection of Motor 1	0: Customized curve 1: 1.2 times squares curve 2: 1.5 times squares curve 3: Second square curve	1	0	×
F1.2.18	Torque Boost Motor 1	0.0 ~ 20.0%	0.1	☆	
F1.2.19	V/F Curve 1st Frequency of Motor 1	0.0 ~ [F0.1.21]	0.01	0.0	×
F1.2.20	V/F curve 1st Voltage of Motor 1	0 ~ 500V	0.1	0.0	
F1.2.21	V/F curve 2nd Frequency of Motor 1	0.0 ~ [F0.1.21]	0.01	0.0	×
F1.2.22	V/F curve 2nd Voltage of Motor 1	0 ~ 500V	0.1	0.0	
F1.2.23	V/F curve 3rd Frequency of Motor 1	0.0 ~ [F0.1.21]	0.01	0.0	×
F1.2.24	V/F curve 3rd Voltage of Motor 1	0 ~ 500V	0.1	0.0	
F1.2.25	Slip Frequency Compensation Motor 1	0 ~ 150(%)	1	0	

6.2.9 V/F PARAMETERS AND OVERLOAD PROTECTION FOR MOTOR 2

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F1.3.27	Rated Frequency of Motor 2	5.00 ~ 300.00Hz	0.01	50.00	×
F1.3.28	Rated Voltage of Motor 2	50 ~ 500V	1	380/220	
F1.3.29	V/F Curve Selection of Motor 2	0: Customized curve 1: 1.2 times squares curve 2: 1.5 times squares curve 3: Second square curve	1	0	×
F1.3.30	Torque Boost Of Motor 2	0.0 ~ 20.0%	0.1	☆	
F1.3.31	V/F Curve 1st Frequency of Motor 2	0.0 ~ [F0.1.21]	0.01	0.0	×
F1.3.32	V/F curve 1st Voltage of Motor 2	0 ~ 500V	0.1	0.0	
F1.3.33	V/F curve 2nd Frequency of Motor 2	0.0 ~ [F0.1.21]	0.01	0.0	×
F1.3.34	V/F curve 2nd Voltage of Motor 2	0 ~ 500V	0.1	0.0	
F1.3.35	V/F curve 3rd Frequency of Motor 2	0.0 ~ [F0.1.21]	0.01	0.0	×
F1.3.36	V/F curve 3rd Voltage of Motor 2	0 ~ 500V	0.1	0.0	
F1.3.37	Slip Frequency Compensation Motor 2	0 ~ 150(%)	1	0	

6.2.10 STEADY RUNNING

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F1.4.39	Accel / Decel Current Limit Level	120 ~ 200(%)	1	170	
F1.4.40	Forced Start Current Limit Level	120 ~ 220(%)	1	170	
F1.4.41	Forced Start Current Time	0.0 ~ 5.00Sec.	0.01	0.0	
F1.4.42	Trip Suppression Selection	_ _ _ **X: Over volts Hz Increase** 0: Closed 1: Effective (Frequency increasing suppression) _ _ **X** _**: Under volts Hz Reduction** 0: Closed 1: Effective (Frequency increasing suppression) _ **X** _ _**: Over volts Hz Reduction** 0: Closed 1: Effective **X** _ _ _**: Reserve**	1	0111	
F1.4.43	Over volts Trip Level (DC BUS)	660~800V	1	750	
F1.4.44	Over volts Trip Level Gain	0.10~10.00	0.01	1.00	
F1.4.45	Over volts Trip Level (AC Input)	[FF.2.35]~480V	1	400V	
F1.4.46	Over volts Trip Level Gain	0.10~10.00	0.01	1.00	
F1.4.47	Current Limit Trip Level	20~220(%)	1	200	
F1.4.48	Current Limit Trip Level Gain	0.10~10.00	0.01	1.00	
F1.4.49	Number of Auto Reset Attempts	0~5(the self-recovery function is deactivated when it is set to 0)	1	0	
F1.4.50	Time Between Auto Resets	0.2~5.0Sec.	0.1	1.0	
F1.4.51	Auto Reset Cycle Time	900~36000Sec.	1	3600	
F1.4.52	Auto reset Selection	_ _ _ **X: Over Current** 0: Self resetting forbidden 1: Self resetting permitted _ _ **X** _**: Over Voltage** 0: Self resetting forbidden 1: Self resetting permitted _ **X** _ _**: Output Grounding** 0: Self resetting forbidden 1: Self resetting permitted **X** _ _ _**: Under volts Running** 0: Self resetting forbidden 1: Self resetting permitted	1	0000	
F1.4.53	Display coefficient	0.001~60.000	0.001	1.000	

6.2.11 PARAMETERS OF MOTOR 1

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F2.0.00	Rated Power	0.1~315.0KW	0.1KW	☆	×
F2.0.01	Rated Voltage	30~480V	1V	380/220	×
F2.0.02	Rated Current	0.01~650.00A	0.01A	☆	×
F2.0.03	Rated Frequency	Max{5.00,[F2.0.04]/60}~300.00Hz	0.01Hz	50.00	×
F2.0.04	Rated Speed	10~min.{30000,60*[F2.0.03]}rpm	1rpm	☆	×
F2.0.05	Current Unloaded	0.15*[F2.0.02]~0.8*[F2.0.02]	0.01A	☆	×
F2.0.06	Electrical Resistance of Stator	0.01~65000mΩ	☆	☆	×
F2.0.07	Induction of Stator	0.001~6500.0mH	☆	☆	×
F2.0.08	Total Leakage Inductance	0.001~6500.0mH	☆	☆	×
F2.0.09	Rotor Time Constant	5.0~6500.0ms	0.1	☆	×
F2.0.10	Slip Compensation Coefficient	0.50~1.50	0.01	1.00	
F2.0.11	Rated Torque of PMSM	0.1~5000.0NM	0.1NM	☆	×
F2.0.12	Rated Voltage of PMSM	30~480V	1V	380 /220	×
F2.0.13	Rated Current of PMSM	0.01~650.00A	0.01A	☆	×
F2.0.14	Rated Frequency of PMSM	5.00~300.00Hz	0.01Hz	50.00	×
F2.0.15	Rated Revolution of PMSM	10~60000rpm	1	1500	×
F2.0.16	Pairs of Poles PMSM	1~32	1	2	×
F2.0.17	EMS Constant of PMSM	0.010~5.000V/rpm	0.001	0.215	×
F2.0.18	Torque Coefficient of PMSM	0.10~500.00 Nm/A	0.01	3.00	×
F2.0.19	Identification Current of PMSM	1.0~80.0%* [F2.0.13]	0.1	20.0	×
F2.0.20	Stator Resistance of PMSM	0.01~65000mΩ		☆	×
F2.0.21	Vertical Axis Inductance of PMSM	0.001~6500.0mH		☆	×
F2.0.22	Quadrature Axis inductance of PMSM	0.001~6500.0mH		☆	×
F2.0.23	Initial Angle of PMSM	0~65535	1	0	×
F2.0.24	Z pulse Original Angle	0.0~359.9	0.1	0.0	×
F2.0.25	Overload Protection Setting Motor 1	50.0~131.0(%) (131—closed)	0.1	115.0	

6.2.12 VECTOR PARAMETERS OF MOTOR 2

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F2.1.26	Rated Power	0.1~315KW	0.1 KW	☆	×
F2.1.27	Rated Voltage	30~480V	1V	380/220	×
F2.1.28	Rated Current	0.01~650.00A	0.01A	☆	×
F2.1.29	Rated Frequency	Max{5.00,[F2.1.30]/60}~ 300.00Hz	0.01Hz	50.00	×
F2.1.30	Rated Speed	10~min.{30000,60* [F2.1.29]}rpm	1rpm	☆	×
F2.1.31	Current Unloaded	0.15*[F2.1.28]~ 0.8*[F2.1.28]	0.01A	☆	×
F2.1.32	Electrical Resistance of Stator	0.01~65000mΩ	☆	☆	×
F2.1.33	Induction of Stator	0.001~6500.0mH	☆	☆	×
F2.1.34	Total Leakage Inductance	0.001~6500.0mH	☆	☆	×
F2.1.35	Rotor Time Constant	5.0~6500.0ms	0.1ms	☆	×
F2.1.36	Slip Compensation Coefficient	0.50~1.50	0.01	1.00	
F2.1.37	Rated Torque of PMSM	0.1~5000.0NM	0.1NM	☆	×
F2.1.38	Rated Voltage of PMSM	30~480V	1V	380/220	×
F2.1.39	Rated Current of PMSM	0.01~650.00A	0.01A	☆	×
F2.1.40	Rated Frequency of PMSM	5.00~300.00Hz	0.01Hz	50.00	×
F2.1.41	Rated Revolution of PMSM	10~60000rpm	1	1500	×
F2.1.42	Pairs of Poles PMSM	1~32	1	2	×
F2.1.43	EMS Constant of PMSM	0.010~5.000V/rpm	0.001	0.215	×
F2.1.44	Torque Coefficient of PMSM	0.10~500.00 Nm/A	0.01	3.00	×
F2.1.45	Identification Current of PMSM	1.0~80.0%*[F2.1.39]	0.1	20.0	×
F2.1.46	Stator Resistance of PMSM	0.01~65000mΩ		☆	×
F2.1.47	Vertical Axis Inductance of PMSM	0.001~6500.0mH		☆	×
F2.1.48	Quadrature Axis inductance of PMSM	0.001~6500.0mH		☆	×
F2.1.49	Initial Angle of PMSM	0~65535	1	0	×
F2.1.50	Z pulse Original Angle	0.0~359.9	0.1	0.0	×
F2.1.51	Overload Protection Setting Motor 2	50.0~131.0(%) (131—closed)	0.1	115.0	

- The stator resistance, stator inductance and the resolution of total leakage inductance of asynchronous motors is relevant with different models.

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6.2.13 PARAMETER MEASUREMENT AND PRE-EXCITATION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F2.2.52	Excitation Time For Vector Mode	0.02~2.50Sec.	0.01	0.50	
F2.2.53	Motor Auto Tune	0: Off 1: Static Identification 2: Static + Running Identification (void for synchronous motor)	1	0	×

6.2.14 MULTIFUNCTIONAL INPUT TERMINAL

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F3.0.00	Multifunctional Input DI1	0~96	1	0	×
F3.0.01	Multifunctional Input DI2	0~96	1	0	×
F3.0.02	Multifunctional Input DI3	0~96	1	7	×
F3.0.03	Multifunctional Input DI4	0~96	1	8	×
F3.0.04	Multifunctional Input DI5	0~96	1	13	×
F3.0.05	Multifunctional Input DI6 Std Ext Card	0~96	1	0	×
F3.0.06	Multifunctional Input DI7 Std Ext Card	0~96	1	0	×
F3.0.07	Multifunctional input DI8 Std Ext Card	0~96	1	0	×
F3.0.08	Multifunctional input DI9/Fin Std Ext Card	0~98	1	97	×
F3.0.09	Filtering Time - DI1 to DI5	1~50ms	1	5	
F3.0.10	Filtering Time - DI6 to DI9	1~50ms	1	5	
F3.0.11	Multifunctional Input Signal Inversion (H)	_ _ _ **X: Terminal DI1-DI4** 0~F: 4-bit binary, bit=0 power-on effective, 1 disconnection effective _ _ **X** _**: Terminal DI5-DI8** 0~F: 4-bit binary, bit=0 power-on effective, 1 disconnection effective _ **X** _ _**: DI9 terminal** 0~F: 4-bit binary, bit=0 power-on effective, 1 disconnection effective **X** _ _ _**: Reserve**	1	0000	×

6.2.15 MULTIFUNCTIONAL OUTPUT TERMINAL

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F3.1.12	Multifunctional Output DO1	0~71	1	1	
F3.1.13	Multifunctional Output DO2	0~71	1	2	
F3.1.14	Multifunctional Output DO3	0~71	1	63	
F3.1.15	Delay Time for DO1 Switching On	0.0~10.00Sec.	0.01	0.0	
F3.1.16	Delay Time for DO1 Switching Off	0.0~10.00Sec.	0.01	0.0	
F3.1.17	Delay Time for DO2 Switching On	0.0~10.00Sec.	0.01	0.0	
F3.1.18	Delay Time for DO2 Switching Off	0.0~10.00Sec.	0.01	0.0	
F3.1.19	Delay Time for DO3 Switching On	0.0~10.00Sec.	0.01	0.0	
F3.1.20	Delay Time for DO3 Switching Off	0.0~10.00Sec.	0.01	0.0	
F3.1.21	Multifunctional Relay Output RO1	0~71	1	4	
F3.1.22	Multifunctional Relay Output RO2	0~71	1	5	
F3.1.23	Delay time for RO1 switching-on	0.0~10.00Sec.	0.01	0.0	
F3.1.24	Delay time for RO1 switching-off	0.0~10.00Sec.	0.01	0.0	
F3.1.25	Delay time for RO2 switching-on	0.0~10.00Sec.	0.01	0.0	
F3.1.26	Delay time for RO2 switching-off	0.0~10.00Sec.	0.01	0.0	
F3.1.27	Monitor 1 Variable selection	0~44 (referring to the monitor variable comparison table)	1	0	
F3.1.28	Monitor 2 Variable selection	0~44 (referring to the monitor variable comparison table)	1	1	
F3.1.29	Monitor 3 Variable selection	0~44 (referring to the monitor variable comparison table)	1	2	
F3.1.30	Lower limit of Monitor 1 Variable	0.0~100.0 (%)	0.1	0.0	
F3.1.31	Upper Limit of Monitor 1 Variable	0.0~100.0 (%)	0.1	100.0	
F3.1.32	Lower limit of Monitor 2 Variable	0.0~100.0 (%)	0.1	0.0	
F3.1.33	Upper Limit of Monitor 2 Variable	0.0~100.0 (%)	0.1	100.0	
F3.1.34	Lower limit of Monitor 3 Variable	0.0~100.0 (%)	0.1	0.0	
F3.1.35	Upper Limit of Monitor 3 Variable	0.0~100.0 (%)	0.1	100.0	

6.2.16 PULSE INPUT

(Configured With Standard Expansion I/O Board, And This Group Of Parameters Are Effective When D19 Selects The Frequency Input Function)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F3.2.36	Min Pulse Input frequency DI9	0.0~100.00KHz	0.01	0.0	
F3.2.37	Max Pulse Input frequency DI9	0.01~100.00KHz	0.01	10.00	
F3.2.38	Pulse Detection Cycle	1ms~20ms	1	10	
F3.2.39	Encoder Pulse Single Channel	1~4096	1	1024	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F3.2.40	Mechanical Transmission Ratio (=pulse shaft revolution: motor shaft revolution)	0.010 ~ 10.000	0.001	1.000	
F3.2.41	Diameter of Driving Wheel	0.1~2000.0mm	0.1	100.0	
F3.2.42	Max Length Counting Value	10m~50000m	1m	50000	
F3.2.43	Max Linear speed	0.01~500.00m/ Sec.	0.01	10.00	
F3.2.44	Current Length Count Value	0~50000m	1m	—	R
F3.2.45	Current Linear Speed	0.0~500.00m/Sec.	0.01	—	R

6.2.17 PULSE OUTPUT

(Equipped With Standard Expansion I/O Board, And This Group Of Parameters Are Effective When DO3 Terminal Selects The Frequency Output Function)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F3.3.46	Signal Type Pulse Output DO3	0: Frequency Signal 1 (0.25~100.00KHz) 1: Frequency signal 2 (10.0~1000.0Hz) 2: Pulse Width Signal (PWM) (reference frequency 0.25 ~100.00KHz)	1	0	
F3.3.47	Min Output Frequency DO3	0.25~100.00KHz	0.01	0.25	
F3.3.48	Max Output Frequency DO3 / Fout	0.25~100.00KHz (PWM signal reference frequency)	0.01	10.0	
F3.3.49	Monitored Value Of Pulse Output	0~45 (Monitor Variable Comparison Table)	1	0	
F3.3.50	Lower limit of DO3	0.0~[F3.3.51]	0.1	0.0	
F3.3.51	Upper limit of DO3	[F3.3.50]~100.0 (%)	0.1	100.0	

6.2.18 ANALOG INPUT

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F4.0.00	AI1 Min Value	0.00~[F4.0.01]	0.01	0.0	
F4.0.01	AI1 Max Value	[F4.0.00]~10.00V	0.01	10.00	
F4.0.02	AI2 Min Value	0.00~[F4.0.03]	0.01	4.00	
F4.0.03	AI2 Max Value Analog input AI2 max. (4~20mA)	[F4.0.02]~20.00mA	0.01	20.00	
F4.0.04	AI3 Min Value	-10.00~[F4.0.05]	0.01	0.00	
F4.0.05	AI3 Max value	[F4.0.04]~10.00V	0.01	10.00	
F4.0.06	AI1 Filtering Time Constant	1~1000ms	1	10	
F4.0.07	AI2 Filtering Time Constant	1~1000ms	1	10	
F4.0.08	AI3 Filtering Time Constant	1~1000ms	1	10	

6.2.19 ANALOG INPUT CURVE CORRECTION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F4.1.09	AI1 curve correction point 1	[F4.0.00]~[F4.0.01]	0.01	0.0	
F4.1.10	AI1 curve correction value1	[F4.0.00]~[F4.0.01]	0.01	0.0	
F4.1.11	AI1 curve correction point 2	[F4.0.00]~[F4.0.01]	0.01	10.00	
F4.1.12	AI1 curve correction value 2	[F4.0.00]~[F4.0.01]	0.01	10.00	
F4.1.13	AI2 curve correction point 1	[F4.0.02]~[F4.0.03]	0.01	4.00	
F4.1.14	AI2 curve correction value 1	[F4.0.02]~[F4.0.03]	0.01	4.00	
F4.1.15	AI2 curve correction point 2	[F4.0.02]~[F4.0.03]	0.01	20.00	
F4.1.16	AI2 curve correction value 2	[F4.0.02]~[F4.0.03]	0.01	20.00	
F4.1.17	AI3 Hysteresis Band Dead Zone	0.0~2.00	0.01	0.10	
F4.1.18	AI3 Curve Correction Point 1	[F4.0.04]~[F4.0.05]	0.01	0.0	
F4.1.19	AI3 Curve Correction Value 1	[F4.0.04]~[F4.0.05]	0.01	0.0	
F4.1.20	AI3 Curve Correction Point 2	[F4.0.04]~[F4.0.05]	0.01	10.00	
F4.1.21	AI3 Curve Correction Value 2	[F4.0.04]~[F4.0.05]	0.01	10.00	

6.2.20 ANALOG OUTPUT

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F4.2.22	AO1 Function Selection	0~45 (monitor variable comparison table)	1	0	
F4.2.23	AO2 Function Selection	0~45 (monitor variable comparison table)	1	2	
F4.2.24	AO1 Min Value	0.00~10.00V	0.01	0.0	
F4.2.25	AO1 Max Value	0.00~10.00V	0.01	10.00	
F4.2.26	AO1 Lower Limit Scaling	0.0~[F4.2.27]	0.1	0.0	
F4.2.27	AO1 Upper Limit Scaling	[F4.2.26]~100.0 (%)	0.1	100.0	
F4.2.28	AO1 Filtering Time Constant	0.01~10.00Sec.	0.01	0.10	
F4.2.29	AO1 Output Signal Selection	0.0~20.00mA (0.0~10.00V)	0.01	0.0	
F4.2.30	AO2 Min Value	0.00~10.00V	0.01	0.0	
F4.2.31	AO2 Max Value	0.00~10.00V	0.01	10.00	
F4.2.32	AO2 Lower Limit Scaling	0.0~[F4.2.33]	0.1	0.0	
F4.2.33	AO2 Upper Limit Scaling	[F4.2.32]~100.0 (%)	0.1	100.0	
F4.2.34	AO2 Filtering Time Constant	0.01~10.00Sec.	0.01	0.10	
F4.2.35	AO2 Output Signal Selection	0.0~20.00mA (0.0~10.00V)	0.01	0.0	

6.2.21 ANALOG INPUT POWER FAILURE DETECTION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F4.3.36	Analog Input Power Failure Detection	_ _ _ **X: AI1 Power-Failure detection** 0: Void 1: Effective _ _ **X** _**: AI2 Power-Failure detection** 0: Void 1: Effective _ **X** _ _**: AI3 Power-Failure detection** 0: Void 1: Effective	1	0000	×
F4.3.37	AI1 Power Failure Detection Threshold	0.00~10.00V	0.01	0.25	
F4.3.38	AI1 Power Failure Detection Delay Time	0.01~50.00Sec.	0.01	2.00	
F4.3.39	AI1 Power Failure Detection Response	0: No action (for non-stop alarm) 1: Forcedly set to the minimum 2: Forcedly set to the maximum 3: Forcedly set to the defaults value (F4.3.40) 4: Inverter forced trip stop	1	0	×
F4.3.40	AI1 Power Failure Default Value	0.00~10.00V	0.01	0.0	
F4.3.41	AI2 Power Failure Detection Threshold	0.00~20.00mA	0.01	4.00	
F4.3.42	AI2 Power Failure Detection Delay Time	0.01~50.00Sec.	0.01	2.00	
F4.3.43	AI2 Power Failure Detection Response	0: No action (for non-stop alarm) 1: Forcedly set to the minimum 2: Forcedly set to the maximum 3: Forcedly set to the defaults value (F4.3.44) 4: Inverter forced trip stop	1	0	×
F4.3.44	AI2 Power Failure Default Value	0.00~20.00mA	0.01	4.00	
F4.3.45	AI3 Power Failure Detection Upper Threshold	-10.00~10.00V	0.01	0.25	
F4.3.46	AI3 Power Failure Detection Lower Threshold	-10.00~10.00V	0.01	-0.25	
F4.3.47	AI3 Power Failure Detection Delay Time	0.01~50.00Sec.	0.01	2.00	
F4.3.48	AI3 Power Failure Detection Response	0: No action (for non-stop alarm) 1: Forcedly set to the minimum 2: Forcedly set to the maximum 3: Forcedly set to the defaults value (F4.3.49) 4: Inverter forced trip stop	1	0	×
F4.3.49	AI3 Power Failure Default Value	-10.00~10.00V	0.01	0.0	

6.2.22 SIMULATED ANALOG INPUT (PSEUDO INPUT)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F4.4.50	Simulated Analog Input 1 SAI1	0: Void (0 value) 1: SAI_COF1*AI1 2: SAI_COF1*AI2	1	0	×
F4.4.51	Simulated Analog Input 2 SAI2	3: SAI_COF1*AI3 4: SAI_COF1*AO1 5: SAI_COF1*AO2 6: SAI_COF1*AI1+SAI_COF2*AI2+SAI_CST 7: SAI_COF1*AI1+SAI_COF2*AI3+SAI_CST 8:SAI_COF1*AO1+SAI_COF2*AO2+SAI_CST 9: SAI_COF1*AI1+SAI_COF2*AO1+SAI_CST 10:SAI_COF1*AI2+SAI_COF2*AO2+SAI_CST 11:SAI_COF1*AI1+SAI_COF2*AO1 12:SAI_COF1*AI3+SAI_COF2*AO2 13:SAI1_COF*AI1/AI2+SAI_CST 14:SAI2_COF*AI2/AI3+SAI_CST 15:SAI1_COF*AI1/AI3+SAI_CST	1	0	×
F4.4.52	Simulated Input Scaling Factor 1 (SAI_COF1)	0.01~500.00	0.01	1.00	×
F4.4.53	Simulated Input Scaling Factor 2 (SAI_COF2)	0.01~500.00	0.01	1.00	×
F4.4.54	Simulated Input Combination Constant (SAI_CST)	-4080~4080	1	0	×

6.2.23 SKIPPING FREQUENCY

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F5.0.00	Skipping Frequency 1 Midpoint	0.0~[F0.1.21]	0.01	0.0	×
F5.0.01	Skipping Frequency 1 Band	0.0~10.00Hz	0.01	0.0	×
F5.0.02	Skipping Frequency 2 Midpoint	0.0~[F0.1.21]	0.01	0.0	×
F5.0.03	Skipping Frequency 2 Band	0.0~10.00Hz	0.01	0.0	×
F5.0.04	Skipping Frequency 3 Midpoint	0.0~[F0.1.21]	0.01	0.0	×
F5.0.05	Skipping Frequency 3 Band	0.0~10.00Hz	0.01	0.0	×

6.2.24 BUILT-IN AUXILIARY TIMER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F5.1.06	Configuration of Timer 1 (H)	**LED _ _ _ X: Clock selection** 0: 1ms 1: 1Sec. 2: 1min. 3: Timer 1cycle reaching pulse (Effective for UT2, UT3) 4: Timer 2 cycle reach pulse (Only effective for UT3) **LED _ _ X _: Start and stop** 0: Multifunctional terminal triggering start (Edge triggering/Function No. 52~54) 1: Stop→Run status change triggering (Edge triggering) 2: Run→Stop status change triggering (Edge triggering) 3: Synchronously started with timer 1 (Effective for UT2, UT3) 4: Timer 1cycle reach pulse (Effective for UT2, UT3) 5: Timer 2 cycle reach pulse (Effective for UT3) **LED _ X _ _: Timer Reset Options** 0: Multifunctional terminal (Function No. 55~57) 1: Automatic resetting when the cycle is reached 2: Automatic resetting when timer is stopped **LED X _ _ _: Timing cycle** 0: Single-cycle timing (resetting and re-triggering required) 1: Multi-cycle timing (start again after auto clearing)	1	0000	×
F5.1.07	Configuration of Timer 2 (H)				
F5.1.08	Configuration of Timer 3 (H)				
F5.1.09	Timer 1 Cycle Time	0~65535 (clock cycle)	1	30000	
F5.1.10	Timer 1 Threshold	0~[F5.1.10]	1	10000	
F5.1.11	Timer 2 Cycle Time	0~65535 (clock cycle)	1	30000	
F5.1.12	Timer 2 Threshold	0~[F5.1.11]	1	10000	
F5.1.13	Timer 3 Cycle Time	0~65535 (clock cycle)	1	30000	
F5.1.14	Timer 3 Threshold	0~[F5.1.13]	1	10000	
F5.1.15	Timer Function Selection	**_ _ _ X: Timer 1 Function Selection** 0: No gating function 1: Multifunctional terminal (Function No. 58) 2: Timer 1 comparative value reached (effective for UT2, UT3) 3: Timer 1 cycle reached (effective for UT2, UT3) 4: Timer 2 comparative value reached (effective for UT3) 5: Timer 2 cycle reached	1	0000	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		(effective for UT3) **_ _ X _: Timer 2 Output Selection** The same as above, 1: Multifunctional terminal (Function No. 59) **_ X _ _: Timer 3 Output Selection** The same as above, 1: Multifunctional terminal (Function No. 60)			
F5.1.16	Timer 1 Output	**_ _ _ X: Output signal1** 0: Comparative value reached (0.5s pulse) 1: Comparative value reached (level) 2: Comparative value reached and reversed 3: Cycle reached (0.5s pulse) 4: Cycle reached (level) 5: Cycle reached and reversed 6: Comparative value or cycle reached and reversed **_ _ X _: Output signal 2** The same as above **_ X _ _: Reserved** **X _ _ _: Reserved**	1	0041	
F5.1.17	Timer 2 Output		1	0041	
F5.1.18	Timer 3 Output		1	0041	
F5.1.19	Timer Display Unit (H)	**_ _ _ X: Timer 1** 0: Clock unit (original value) 1: Sec. 2: Min. 3: H. **_ _ X _: Timer 2** The same as above **_ X _ _: Timer 3** The same as above	1	0000	

6.2.25 BUILT-IN AUXILIARY COUNTER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F5.2.20	Counter 1 Configuration (H)	**LED _ _ X _: Counting pulse selection** (Function No. 44, 45) 0: Multifunctional terminal "Void→effective" 1: Multifunctional terminal "effective→void" 2: Both of the above **LED _ _ X _: Start Manner** 0: Start immediately after power-on (no trigger start) 1: Multifunctional terminal trigger (Function No. 46, 47) 2: Stop→Run status change triggering (edge triggering) 3: Run→Stop Status change triggering (edge triggering) 4: Running status (status gated triggering) 5: Stop status (status gated triggering) **LED _ X _ _: Counter Reset source** 0: Multifunctional terminal	1	0000	
F5.2.21	Counter 2 Configuration (different from timer: If the counter is not reset, it will overflow and start again from 0) (H)		1	0000	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		(Function No.48, 49) 1: Set value 1 reaches auto resetting 2: Set value 2 reaches auto resetting			
F5.2.22	Counter 1 Value 1	0~65535	1	1000	
F5.2.23	Counter 1 Value 2	0~65535	1	2000	
F5.2.24	Counter 2 Value 1	0~65535	1	1000	
F5.2.25	Counter 2 Value 2	0~65535	1	2000	
F5.2.26	Counter 1 output (H)	**LED _ _ _ X: Output signal 1** 0: Reach set value 1 (0.5Sec.pulse) 1: Reach set value 2 (level) 2: Set value 1 reached and reversed 3: Reach set value 2 (0.5Sec.pulse) 4: Reach set value 2 (level) 5: Set value 1 reached and reversed 6: Set value 1 or set value 2 reached and reversed **LED _ _ X _: Output signal 2** The same as above **LED _ X _ _: Reserved** **LED X _ _ _: Reserved**	1	0000	
F5.2.27	Counter 2 output (H)		1	0000	

6.2.26 AUXILIARY FUNCTIONS

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F5.3.28	Frequency Reference Priority Selection	**_ _ _ X: 1st priority (highest)** 0: No definition 1: Standard PID output 2: High Speed PID output 3: Swing frequency running command 4: Automatic multi-stage frequency running command 5: Multi-stage operating frequency selected by external terminals 6: Revolution setting channel (F8.0.00) 7: Frequency Setting channel (F0.1.16) **_ _ X _: 2nd priority** The same as above **_ X _ _: 3rd priority** The same as above **X _ _ _: 4th priority** The same as above	1	0000	×
F5.3.29	Below Minimum Frequency Action	0: Stop 1: Maintain Lower Limit Frequency	1	0	
F5.3.30	Automatic voltage regulation (only effective in VVV control mode)	0: Off 1: Valid 2: Invalid During Deceleration	1	0	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F5.3.31	Energy Saving Mode (only effective for asynchronous motors)	0: Void 1: Effective	1	0	
F5.3.32	DC Injection Braking	0: Void 1: Effective 2: Multifunctional terminal effective (Function No. 65)	1	0	
F5.3.33	DC Injection Braking Intensity	30~120%	1	40~80	
F5.3.34	Voltage Disturbance Ride-Through	0: Void 1: Effective	1	1	
F5.3.35	Brake Chopper Power Ratio(for some models)	50~100(%)	1	100	
F5.3.36	Brake Chopper Active Voltage	700~760V	1	720	
F5.3.37	Oscillating Output Current Suppression (only effective in VF control mode)	0.0, 0.01~10.00	0.01	0.0	
F5.3.38	Load Balancing Feature	0: Void 1: Effective 2: Multifunctional terminal effective (Function No. 38)	1	0	
F5.3.39	Load Balancing Reference	0: Digital setting (F5.4.40) 1: AI1 input 2: AI2 input 3: AI3 input 4: Fieldbus set value 1 5: High Speed PID output	1	0	
F5.3.40	Load Balancing Reference Value	0.0~ 200.0 (%)	0.1	100.0	
F5.3.41	Load Balancing Adjustment Gain	0.00~100.00	0.01	50.00	
F5.3.42	Load Balancing Adjustment Limit	0.00~100.00 (%)	0.01	1.00	

6.2.27 MOTOR TEMPERATURE DETECTION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F5.4.43	Motor Temperature Sensor	0: None 1: 1 X PT100 2: 2 X PT100 3: 3 X PT100 4: PTC sensor 5: Thermoswitch (normally closed) 6: Thermoswitch (normally open)	1	0	
F5.4.44	Sensor Current Source	0: None 1: AO1 2: AO2	1)	2)	
F5.4.45	Temperature input Source	0: None 1: AI1 input (PT100 or PTC) 2: AI3 input (PT100 or PTC) 3: DI1~DI9 (thermoswitch)	1	0	
F5.4.46	Alarm action threshold value	-10.0~500.0 (0~5000 Ω/PTC)	0.1	110.0	
F5.4.47	Protection action threshold value	-10.0~500.0 (0~5000 Ω/PTC)	0.1	130.0	

NOTE:

1) This parameters is beyond modifying and locking relevant position parameters of AO1 and AO2 (F4.2.22,F4.2.23,F4.2.29,F4.2.35). When PT100 sensor is used, the terminal provides 4.00mA constant current, and when PTC sensor is used, it provides 1.6mA constant current.

2) When the sensor serves as thermo-sensitive switch, if the contact point is effective, it is equivalent to temperature value 250, and if the contact point is void, it is equivalent to temperature value 0. when PTC sensor is used, the value identified by INV is the resistance value of PTC sensor at due time, and the unit of relevant parameters will change correspondingly.

6.2.28 MULTI-STAGE FREQUENCY SETTING

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F6.0.00	Preset Speed 1	[F0.1.22]~[F0.1.21]	0.01	5.00	
F6.0.01	Preset Speed 2	[F0.1.22]~[F0.1.21]	0.01	10.00	
F6.0.02	Preset Speed 3	[F0.1.22]~[F0.1.21]	0.01	15.00	
F6.0.03	Preset Speed 4	[F0.1.22]~[F0.1.21]	0.01	20.00	
F6.0.04	Preset Speed 5	[F0.1.22]~[F0.1.21]	0.01	25.00	
F6.0.05	Preset Speed 6	[F0.1.22]~[F0.1.21]	0.01	30.00	
F6.0.06	Preset Speed 7	[F0.1.22]~[F0.1.21]	0.01	35.00	
F6.0.07	Preset Speed 8	[F0.1.22]~[F0.1.21]	0.01	40.00	
F6.0.08	Preset Speed 9	[F0.1.22]~[F0.1.21]	0.01	45.00	
F6.0.09	Preset Speed 10	[F0.1.22]~[F0.1.21]	0.01	50.00	
F6.0.10	Preset Speed 11	[F0.1.22]~[F0.1.21]	0.01	25.00	
F6.0.11	Preset Speed 12	[F0.1.22]~[F0.1.21]	0.01	5.00	
F6.0.12	Preset Speed 13	[F0.1.22]~[F0.1.21]	0.01	15.00	
F6.0.13	Preset Speed 14	[F0.1.22]~[F0.1.21]	0.01	35.00	
F6.0.14	Preset Speed 15	[F0.1.22]~[F0.1.21]	0.01	50.00	

6.2.29 SIMPLE PROGRAMMABLE MULTI-STAGE OPERATION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F6.1.15	Programmable Multi-step Mode(H)	_ _ _ **X: Function selection** 0: Function closed 1: Multi-stage frequency / revolution operation effective 2: Multi-stage frequency / revolution operation condition effective (Function No. 23) 3: Multi-stage PID setting operation effective 4: Multi-stage PID setting operation condition effective (Function No. 23) _ _ **X** _**: Running mode** 0: Single cycle 1: Single cycle stop mode 2: Continuous cycle 3: Continuous cycle stop mode 4: Keeping the final value 5: Keeping the final value stop mode _ **X** _ _**: Restart Function** 0: Restore running at the first stage 1: Start running at the interruption time (effective for multi-stage frequency/revolution operation) 2: Start running at the stage of interruption **X** _ _ _**: Power-off status storage** 0: Not stored 1: Stored	1	0000	×
F6.1.16	Stage 1 setting (H)	_ _ _ **X: Hz of Each Stage** 0: multi-stage frequency setting 1~15/Standard PID multi-stage setting 1~7 1: Frequency command (F0.1.16)/Standard PID setting (F7.0.01) _ _ **X** _**: Direction Setting** 0: FWD 1: REV 2: Determined by the running command channel _ **X** _ _**: Accel/Decel Of Each Stage** 0: Acceleration and deceleration time 1 1: Acceleration and deceleration time 2 2: Acceleration and deceleration time 3 3: Acceleration and deceleration time 4 **X** _ _ _**: Each Stage Time Unit** 0: Sec. 1: Min.	1	0000	
F6.1.17	Stage 2 setting (H)		1	0000	
F6.1.18	Stage 3 setting (H)		1	0000	
F6.1.19	Stage 4 setting (H)		1	0000	
F6.1.20	Stage 5 setting (H)		1	0000	
F6.1.21	Stage 6 setting (H)		1	0000	
F6.1.22	Stage 7 setting (H)		1	0000	
F6.1.23	Stage 8 setting (H)		1	0000	
F6.1.24	Stage 9 setting (H)		1	0000	
F6.1.25	Stage 10 setting (H)		1	0000	
F6.1.26	Stage 11 setting (H)		1	0000	
F6.1.27	Stage 12 setting (H)		1	0000	
F6.1.28	Stage 13 setting (H)		1	0000	
F6.1.29	Stage 14 setting (H)		1	0000	
F6.1.30	Stage 15 setting (H)		1	0000	
F6.1.31	Running Time Of Stage 1	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.32	Running Time Of Stage 2	0.0~6500.0(Sec./Min.)	0.1	0.0	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F6.1.33	Running Time Of Stage 3	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.34	Running Time Of Stage 4	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.35	Running Time Of Stage 5	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.36	Running Time Of Stage 6	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.37	Running Time Of Stage 7	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.38	Running Time Of Stage 8	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.39	Running Time Of Stage 9	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.40	Running Time Of Stage 10	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.41	Running Time Of Stage 11	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.42	Running Time Of Stage 12	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.43	Running Time Of Stage 13	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.44	Running Time Of Stage 14	0.0~6500.0(Sec./Min.)	0.1	0.0	
F6.1.45	Running Time Of Stage 15	0.0~6500.0(Sec./Min.)	0.1	0.0	

6.2.30 SWING FREQUENCY OPERATION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F6.2.46	Function selection (H)	_ _ _ **X: Function Setting** 0: Function closed 1: Function effective 2: Terminal selectivity effective (Function No. 24) _ _ **X** _**: Restart Manner** 0: Start with the memory status before stop 1: Restart _ **X** _ _**: Swing control** 0: Fixed swing (relative maximum frequency) 1: Variable swing (relative central frequency) **X** _ _ _**: Status storage** 0: Not saved after power-off, and run again after restart 1: Save the status after power-off, and run again from the saved status.	1	0000	×

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F6.2.47	Preset Frequency of Traverse	0.0~[F0.1.21]	0.01	10.00	
F6.2.48	Waiting Time For Preset Frequency	0.0~6000.0Sec.	0.1	0.0	
F6.2.49	Swing Value Of Traverse	0.0~50.0(%)	0.1	10.0	
F6.2.50	Kick frequency	0.0~50.0(%)	0.1	10.0	
F6.2.51	Rise Time Of Triangular Wave	0.1~1000.0Sec.	0.1	10.0	
F6.2.52	Fall Time Of Triangular Wave	0.1~1000.0Sec.	0.1	10.0	
F6.2.53	Center Frequency Setting Of Traverse	0.0~[F0.1.21]	0.01	10.00	

6.2.31 STANDARD PID (4ms CONTROL CYCLE)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F7.0.00	Selection of Standard PID Reference	**_ _ _ X: Standard PID controller selection** 0: Standard PID closed 1: Unconditionally effective 2: External multifunctional terminal selectivity effective (Function No. 22) **_ _ X _: Reserved** **_ X _ _: Standard PID controller output** 0: frequency /revolution set value 1: Independent PID (can be AO terminal output or setting for torque) **千位：主辅叠加模式参照频率基准** 0：本通道频率设定上限 1：叠加通道设置值 2：叠加通道设定值/上限频率-叠加通道设定	1	0000	×
F7.0.01	Standard PID Reference	0: PID Reference Channel 1 1: PID Reference Channel 2 2: Select Channel Via Terminal (Function No. 31) 3: Channel 1 + Channel 2 4: Channel 1 - Channel 2 5: Channel 1 * (1+ Channel 2/100.0) 6: Channel 1 * (1- Channel 2/100.0) 7: Channel 1 * Channel 2/100.0	1	0	
F7.0.02	PID Reference Channel 1	0: PID Internal Reference (F7.0.08) (power-off save) 1: Keypad Potentiometer 2: Analog input AI1 3: Analog input AI2	1	0	×
F7.0.03	PID Reference Channel 2		1	0	×

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		4: Analog input AI3 5: Remote UP/DW 1 (clear after stop) 6: Remote UP/DW 2 (maintained after stop and saved after power-off) 7: Analog input AI3 8: Remote UP/DW 3(clear after stop) 9: U Remote UP/DW 4 (maintained after stop and saved after power-off) 10: MODBUS value 1 11: MODBUS value 2 12: Expansion Communication Setting 1 (reserved) 13: Communication Setting 2 (reserved)			
F7.0.04	Analog Input Minimum Value(Channel 1)	0.0V~[F7.0.05]/AI2: 0.0mA~[F7.0.05]	0.01	0.0	
F7.0.05	Analog Input Maximum Value (Channel 1)	[F7.0.04]~10.00 /AI2: [F7.0.04]~20.00mA	0.01	10.00	
F7.0.06	Analog Input Minimum Value (Channel 2)	0.0V~[F7.0.07]/AI2: 0.0mA~[F7.0.07]	0.01	0.0	
F7.0.07	Analog Input Maximum Value (Channel 2)	[F7.0.06]~10.00 /AI2: [F7.0.06]~20.00mA	0.01	10.00	
F7.0.08	PID Internal Reference	-100.0~100.0(%)	0.1	0.0	
F7.0.09	Standard PID Actual Value Function	0: PID Actual Value 1 1: PID Actual Value 2 2: Select Via Remote Input (Function No. 32) 3: Actual Value 1+ Actual Value 2 4: Actual Value 1- Actual Value 2 5: Actual Value 1* Actual Value 2/100.0 6: 100.0* Actual Value 1/ Actual Value 2 7: Min.{ Actual Value 1, Actual Value 2} 8: Max{ Actual Value 1, Actual Value 2} 9: √ (|Actual Value 1- Actual Value 2|) 10: √ (|Actual Value 1|)+√ (|Actual Value 2|)	1	0	
F7.0.10	PID Actual Value 1	0: Analog input AI1 1: Analog input AI2 2: Analog input AI3 3: Analog input AI3 4: Fin pulse input	1	0	
F7.0.11	PID Actual Value 2		1	0	
F7.0.12	Actual Value 1 Minimum	0.0~[F7.0.13]/AI2: 0.0mA~[F7.0.13]	0.01	0.0	
F7.0.13	Actual Value 1 Maximum	[F7.0.12]~10.00V /AI2: [F7.0.12]~20.00mA	0.01	5.00	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F7.0.14	Actual Value 2 Minimum	0.0~[F7.0.15]/AI2: 0.0mA~[F7.0.15]	0.01	0.0	
F7.0.15	Actual Value 2 Maximum	[F7.0.14]~10.00V /AI2: [F7.0.14]~20.00mA	0.01	5.00	
F7.0.16	Actual Value multiplication factor(e.g. differential voltage calculate flow rate with differential voltage)	0.01~100.00	0.01	1.00	
F7.0.17	Proportional gain	0.0~100.00	0.01	2.00	
F7.0.18	Integration time	0.0, 0.1~1000.0Sec.	0.1	20.0	
F7.0.19	Differential Quotient	0.0, 0.01~10.00	0.01	0.0	
F7.0.20	Differential inertia filtering time	0.01~100.00Sec.	0.01	10.00	
F7.0.21	Configuration Of Standard PID Controller	_ _ _ **X: Deviation polarity** 0: Positive deviation 1: Negative deviation (negation) _ _ **X** _**: Output polarity** 0: Single polarity 1: Dual polarity (the symbol can be reversed) _ **X** _ _**: Action when PID Removed** 0: PID control closed 1: PID output held up and current setting status is maintained.	1	0000	
F7.0.22	Static Deviation (relative 100% setting)	0.0~20.0%	0.1	5.0	
F7.0.23	PID output preset (at the time of output frequency as compared to the upper limiting frequency)	0.0~100.0 (%)	0.01	0.0	
F7.0.24	Preset Running Time	0.0~3600.0Sec.	0.1	0.0	
F7.0.25	Sensor Value When Actual Value is 100%	0.01~100.00	0.01	1.00	
F7.0.26	Sensor Value When Actual Value is 0%	-100.00~100.00	0.01	0.0	

6.2.32 STANDARD PID MULTI-STAGE SETTING

Function Code	Name	Setting range and description	Minimum Unit	Factory default	Change Limit
F7.1.27	PID Preset Setting 1	-100.0~100.0 (%)	0.1	0.0	
F7.1.28	PID Preset Setting 2	-100.0~100.0 (%)	0.1	0.0	
F7.1.29	PID Preset Setting 3	-100.0~100.0 (%)	0.1	0.0	
F7.1.30	PID Preset Setting 4	-100.0~100.0 (%)	0.1	0.0	
F7.1.31	PID Preset Setting 5	-100.0~100.0 (%)	0.1	0.0	
F7.1.32	PID Preset Setting 6	-100.0~100.0 (%)	0.1	0.0	
F7.1.33	PID Preset Setting 7	-100.0~100.0 (%)	0.1	0.0	

6.2.33 STANDARD PID SLEEP FUNCTION (Effective When PID Output Is Used As The Frequency Command)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F7.2.34	Sleep function	0: Off 1: On 2: Select Via Remote Input (Function No. 33)	1	0	
F7.2.35	Sleep frequency	0.0~[F0.1.21]	0.01	0.0	
F7.2.36	Sleep delay	0.1~3600.0Sec.	0.1	60.0	
F7.2.37	Wakeup Limit (compared with the set value)	0.0~100.0(%)	0.1	25.0	
F7.2.38	Wakeup Delay	0.1~3600.0Sec.	0.1	60.0	

6.2.34 REVOLUTION SETTING AND FEEDBACK

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.0.00	Rotation Speed Reference Scource (only applicable to VC and SVC mode)	0: Set by frequency setting parameter (F0.1.16) 1: Keypad Reference (F8.0.03) (maintained after stop and saved after power-off) 2: Keypad Potentiometer 3: Analog inputAI1 4: Analog inputAI2 5: Analog inputAI3 (dual polarity) 6: Pulse Input (Fin) 7: MODBUS Fieldbus set value 1 8: MODBUS Fieldbus set value 2 9: Simulated Analog Input SAI1 10: Simulated Analog Input SAI2 11: Comms Ext Value 1 12: Comms Ext Value 2	1	0	
F8.0.01	Rotational Speed Minimum	0~60*[F0.1.21]/pairs of motor poles (rpm)	1	0	
F8.0.02	Rotational Speed Maximum	0~60*[F0.1.21]/pairs of motor poles (rpm)	1	1500	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.0.03	Digital Rotational Reference (Keypad Reference)	0~60*[F0.1.21]/pairs of motor poles (rpm)	1	0	
F8.0.04	Rotational Feedback Source	0: Decoder (PG card needs to be equipped) 1: Single pulse input (Fin port) 2: Analog input AI1 3: Analog input AI2 4: Analog input AI3 (dual polarity)	1	0	×
F8.0.05	Pulse Per Revolution (PG)	1~8192	1	1024	×
F8.0.06	Encoder Rotation Direction (Effective for PG card)	0: Phase A Leads 1: Phase B Leads	1	0	×
F8.0.07	Encoder zero pulse (Z pulse)	0: Void 1: Effective	1	0	×
F8.0.08	Encoder	0: ABZ incremental decoder 1: ABZUVW incremental type 2: SINCOS type 3: Rotary transformer	1	0	×
F8.0.09	Encoder Detection Speed	**_ _ _ X：PG speed detection period**1~5ms **_ _ X _**：Reserved **_ X _ _**：Speed closed loop period（*0.25ms）1~8	1	0401	
F8.0.10	Loss of Rotational Feedback Signal	**_ _ _ X: Speed Signal Detection** 0: Not detect 1: Detect and treat **_ _ X _: Speed Signal Detection Action** 0: Fault alarm and free stop 1: Continue running after switching to SVC control mode (reserved) 2: DC bind-type brake (reserved)	1	0001	×
F8.0.11	Loss of Rotational Feedback Signal Delay	0.01~5.00Sec.	0.01	2.00	
F8.0.12	Power Failure Speed(as compared to the maximum set speed)	0~20.0 (%)	0.1	0.0	
F8.0.13	Rotational Feedback Sensitivity (as compared to the maximum set speed)	0.1~100.0	0.1	5.0	
F8.0.14	Rotational Feedback Filter Time	1~50ms	1	0	
F8.0.15	Rotational Feedback Minimum Value (not PG)	0~30000rpm	1	0	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.0.16	Rotational Feedback Maximum Value (not PG)	0~30000rpm	1	1500	
F8.0.17	Rotational Feedback Ratio (motor shaft speed: measured shaft speed)	0.010~50.000	0.001	1.000	×

6.2.35 REVOLUTION CLOSED-LOOP PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.1.18	Controller PID Selection	0: Single PID parameter (the second group of parameters are effective separately) 1: Dual PID parameter (hysteresis switching) 2: Dual PID parameter (continuous switching)	1	2	
F8.1.19	Minimum Rotation Speed for PID Switching (ASR1 group parameter low revolution Effective)	0~[F8.1.20]	1	100	
F8.1.20	Maximum Rotational Speed for PID Switching (ASR2group parameter high revolution effective)	[F8.1.19]~60*[F0.1.21]/pairs of motor poles (rpm)	1	300	
F8.1.21	Proportional gain 1 (ASR-P1)	0.05~1.00	0.01	0.90	
F8.1.22	Integration time 1 (ASR-I1)	0.0, 0.01~50.00 Sec.	0.01	2.50	
F8.1.23	Differential Quotient 1 (ASR-D1)	0.0, 0.01~10.00	0.01	0.0	
F8.1.24	Differential output filtering Time1 (ASR-DT1)	0.10~5.00 Sec.	0.01	0.80	
F8.1.25	Proportional gain 2 (ASR-P2)	0.05~1.00	0.01	5.00	
F8.1.26	Integration time 2 (ASR-I2）	0.0, 0.01~50.00 Sec.	0.01	2.50	
F8.1.27	Differential Quotient 2 (ASR-D2)	0.0, 0.01~10.00	0.01	0.0	
F8.1.28	Differential output filtering Time 2 (ASR-DT2)	0.10~10.00 Sec.	0.01	1.00	
F8.1.29	Maximum Torque Output	0.0~300.0% (corresponding to parameter F1.4.47 in V/F control mode)	0.1	200.0	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.1.30	Minimum Torque Output	-300.0~0.0%	0.1	-200.0	
F8.1.31	Time coefficient of Torque output filtering	0.0, 0.01~1000.00ms	0.1	0.0	

6.2.36 PROTECTION PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.2.32	Excessive Rotation (DEV)	0: No action 1: Alarm free stop 2: Alarm deceleration stop 3: Alarm continuing running	1	0	×
F8.2.33	Over speed (OS) Protection		1	1	×
F8.2.34	Over speed Protection Limit (DEV)	0.0~50.0% (as compared to upper limiting frequency)	0.1	20.0	
F8.2.35	Over speed protection Period (DEV)	0.0~10.00Sec.	0.01	10.00	
F8.2.36	Over Speed Detection Value(OS)	0.0~150.0% (as compared to upper limiting frequency)	0.1	120.0	
F8.2.37	Over Speed Detection Time (OS)	0.0~2.00Sec.	0.01	0.10	
F8.2.38	Speed estimate gain	0.10 ~ 10.00	0.01	1.00	

6.2.37 TORQUE CONTROL

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.3.39	Torque Control Activation	0: Void 1: Effective 2: Multifunctional terminal selection effective (Function No. 34)	1	0	×
F8.3.40	Torque control Refernece (selecting the command direction)	0: Digital setting (F8.3.41) 1: Panel shuttle potentiometer setting 2: Analog inputAI1 3: Analog inputAI2 4: Analog inputAI3 5: Analog inputAI3 (dual polarity) 6: Frequency signal input (Fin) 7: Standard PID output 8: High Speed PID output 9: MODBUS Fieldbus set value 1 10: MODBUS Fieldbus set value 2 11: Virtual analog input SAI1 12: Virtual mode input SAI2 13: Set value 1 of expansion communication module 14: Set value 2 of expansion communication module	1	0	
F8.3.41	Torque digital setting	-300.0~300.0 (%)	0.1	0.0	
F8.3.42	Torque Digital rise time	0.0~50.000Sec.	0.001	0.01	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.3.43	Torque Digital Fall time	0.0~50.000Sec.	0.001	0.01	
F8.3.44	Torque Control Speed Limit Source	_ _ _ **X: Source of FWD Speed** 0: Setting of FWD revolution limiting value (F8.3.45) 1: Determination of frequency Setting channel 1 (F0.2.25) _ _ **X** _**: Reserved** _ **X** _ _**: Source of REV Speed** 0: Setting of REV revolution limiting value (F8.3.46) 1: Determination of frequency Setting channel 2 (F0.2.26)	1	0000	
F8.3.45	Speed limit in FWD Direction	0~60*[F0.1.21]/pairs of motor poles (rpm)	1	1500	
F8.3.46	Speed limit in REV Direction	0~60*[F0.1.21]/pairs of motor poles (rpm)	1	1500	
F8.3.47	Torque Limit Source	_ _ _ **X: Minimum torque Limit source (negative torque limit)** 0: Minimum torque set value 1 (F8.3.48) 1: Minimum torque set value 2 (F8.3.49) 2: Multifunctional selection terminal setting 1 or 2 3: AI1 set value 4: AI2 set value 5: MODBUS Fieldbus set value 1 6: MODBUS Fieldbus set value 2 7：Expand communication module value 1 8：Expand communication module value 2 _ _ **X** _**: Reserved** _ **X** _ _**: Maximum torque Limit source** 0: Maximum torque set value 1 (F8.3.50) 1: Maximum torque set value 2 (F8.3.51) 2: Multifunctional selection terminal setting 1 or 2 (Function No. 36) 3: AI1 set value 4: AI2 set value 5: MODBUS Fieldbus set value 1 6: MODBUS Fieldbus set value 2 7: Set value 1 of expansion communication module 8: Set value 2 of expansion communication module	1	0000	
F8.3.48	Minimum torque limit 1	-300.0~0.0%	0.1	-230.0	
F8.3.49	Minimum torque limit 2	-300.0~0.0%	0.1	-230.0	
F8.3.50	Maximum torque limit 1	0.0~300.0%	0.1	230.0	
F8.3.51	Maximum torque limit 2	0.0~300.0%	0.1	230.0	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F8.3.52	Torque zero offset	-25.0~25.0%	0.1	0.0	

6.2.38 HIGH SPEED PID (RUNNING CYCLE: 1ms)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F9.0.00	High Speed PID Function	**_ _ _ X: Controller Input** 0: Closed 1: Synchronously effective with inverter running command 2: Activated when the Multifunctional terminal is effective (Function No. 25) 3: Immediately effective after the inverter is powered on. **_ _ X _: Reserved** **_ X _ _: Controller output** 0: Feed FWD compensation - added with the frequency integrator output, and the complementation ratio is set by parameterF9.0.01. 1: Independent PID- the output can be set by the AO terminal output/torque. 2: Set PID – output used as frequency/revolution command **X _ _ _： Feedforward compensation frequency benchmark** 0：Elative to up limiting frequency 1：Relative to frequency integrator output	1	0100	×
F9.0.01	Proportional Compensation (as compared to upper limiting frequency)	0.0~100.0(%)	0.1	50.0	
F9.0.02	High Speed PID Configuration	**_ _ _ X: Deviation polarity** 0: Positive deviation 1: Negative deviation (negation) **_ _ X _: Output polarity** 0: Single polarity 1: dual polarity **_ X _ _: Loss Of Signal Response** 0: PID control closed 1: PID output held on (maintaining current running setting)	1	0010	
F9.0.03	Proportional gain 1	0.0~100.00	0.01	2.00	
F9.0.04	Integration time 1	0.0, 0.01~100.00Sec.	0.01	2.00	
F9.0.05	Differential Quotient 1	0.0, 0.01~10.00	0.01	0.0	
F9.0.06	Differential Internal filtering time 1	0.01~25.00Sec.	0.01	5.00	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F9.0.07	High speed PID Output Filter Time	0.0, 0.01 ~ 20.00Sec.	0.01	1.00	
F9.0.08	High Speed PID Reference	0: Internal digital setting (F9.0.11) (auto save after power off) 1: Panel shuttle potentiometer preset value 2: Analog inputAI1 3: Analog inputAI2 4: Analog inputAI3 5: UP/DW terminal (clear after stop) 6: UP/DW terminal (maintaining after stop and save after power-off) 7: MODBUS Fieldbus set value 1 8: MODBUS Fieldbus set value 2 9: Set value 1 of expansion communication module 10: Set value 2 of expansion communication module	1	0	
F9.0.09	Analog input Minimum Value	0.0V~[F9.0.10]/AI2: 0.0mA~[F9.0.10]	0.01	0.0	
F9.0.10	Analog input Maximum Value	[F9.0.09]~10.00 /AI2: [F9.0.09]~20.00mA	0.01	10.00	
F9.0.11	PID Internal Reference	0.0~100.0 (%)	0.1	0.0	
F9.0.12	High Speed PID Actual Value Selection	0: Analog input AI1 1: Analog input AI2 2: Analog input AI3 3: Output current 4: Output torque 5: Output power	1	0	
F9.0.13	Actual Value Analog Input Minimum	0.0V~[F9.0.14]/AI2: 0.0mA~[F9.0.14]	0.01	0.0	
F9.0.14	Actual Value Analog Input Maximum	[F9.0.13]~10.00 /AI2: [F9.0.13]~20.00mA	0.01	10.00	
F9.0.15	Actual Value multiplication factor	0.01~100.00	0.01	1.00	
F9.0.16	Sensor Value When Actual Value is 100%	0.01~100.00	0.01	1.00	
F9.0.17 ~ F9.0.20	Reserved				

6.2.39 HIGH SPEED PID CONTROLLER PARAMETER SELECTION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
F9.1.21	High Speed PID Parameter Selection	_ _ _ **X: PID parameters** 0: Single PID parameter 1: Dual PID parameters 2: Three PID parameters 3: Four PID parameters	1	0020	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		_ _ X _: PID parameter switching mode 0: As per set value 1: As per feedback value 2: As per output frequency 3: Selected by multifunctional terminal (Function No. 63 and 64)			
F9.1.22	Parameter Switching Factor	0.01 ~ 50.00	0.01	1.00	
F9.1.23	Lower limit for group 1/2 parameter switching	0.0~[F9.1.24]	0.1	0.0	
F9.1.24	Upper limit for group 1/2 parameter switching	[F9.1.23]~100.0 (%)	0.1	0.0	
F9.1.25	Lower limit for group 2/3 parameter switching	[F9.1.24]~[F9.1.26]	0.1	100.0	
F9.1.26	Upper limit for group 2/3 parameter switching	[F9.1.25]~100.0 (%)	0.1	100.0	
F9.1.27	Lower limit for group 3/4 parameter switching	[F9.1.26]~[F9.1.28]	0.1	100.0	
F9.1.28	Upper limit for group 3/4 parameter switching	[F9.1.27]~100.0 (%)	0.1	100.0	
F9.1.29	Proportional gain 2	0.0~100.00	0.01	2.00	
F9.1.30	Integration time 2	0.0~100.00Sec	0.01	2.00	
F9.1.31	Differential Quotient 2	0.0~10.0	0.01	0.0	
F9.1.32	Differential output filtering Time 2	0.01~25.00Sec.	0.01	5.00	
F9.1.33	Output Filtering Time 2	0.0~20.00Sec	0.01	1.00	
F9.1.34	Proportional gain 3	0.0~100.00	0.01	2.00	
F9.1.35	Integration time 3	0.0~100.00Sec	0.01	2.00	
F9.1.36	Differential Quotient 3	0.0, 0.01~10.00	0.01	0.0	
F9.1.37	Differential output filtering Time 3	0.01~25.00Sec.	0.01	5.00	
F9.1.38	Output Filtering Time 3	0.0~20.00Sec.	0.01	1.00	
F9.1.39	Proportional gain 4	0.0~100.00	0.01	2.00	
F9.1.40	Integration time 4	0.0~100.00Sec.	0.01	2.00	
F9.1.41	Differential coefficient4	0.0~10.00	0.01	0.0	
F9.1.42	Differential output filtering Time 4	0.01~25.00Sec.	0.01	5.00	
F9.1.43	Output Filtering Time 4	0.0 ~ 20.00Sec.	0.01	1.00	

- 100% PID setting corresponds to 100% rated output current of the motor, motor rated torque and rated power. It needs to appropriately set up the feedback factor, output torque and power to be values with symbols according to actual application.

6.2.40 MODBUS FIELDBUS (STANDARD EXPANSION CARD CONFIGURATION)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FA.0.00	Communication card connection and bus status	0: The communication card not connected 1: Standard MODBUS communication card connected 2: Listen only status 3: Communication interrupted	1	—	**R**
FA.0.01	Parameters Configuration	**_ _ _ X: Baud rate selection** 0: 1200kbit/s 1: 2400kbit/s 2: 4800kbit/s 3: 9600kbit/s 4: 19200kbit/s 5: 38400kbit/s 6: 76800kbit/s **_ _ X _: Data format** 0: 1-8-1-N, RTU 1: 1-8-1-E, RTU 2: 1-8-1-O, RTU 3: 1-8-2-N, RTU	1	0003	×
FA.0.02	Equipment Address	0~247 (0 stands for broadcasting address)	1	1	×
FA.0.03	The device response delay	0~1000ms	1	5	
FA.0.04	Judgment Time Of Communication Failure	0.01~10.00Sec.	0.01	1.00	×
FA.0.05	Loss of signal Response	0: Deceleration stop 1: Run as per last received command	1	0	
FA.0.06	Selection of communication configuration files	0: CMG standard configuration file 1: CMG standard configuration file 2	1	0	

6.2.41 MAPPING ACCESS PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FA.1.08	Mapping application parameter 1 (H)	F0.00 ~ FF.55	1	F0.29	×
FA.1.09	Mapping application parameter 2 (H)	F0.00 ~ FF.55	1	F0.29	×
FA.1.10	Mapping application parameter 3 (H)	F0.00 ~ FF.55	1	F0.29	×
FA.1.11	Mapping application parameter 4 (H)	F0.00 ~ FF.55	1	F0.32	×
FA.1.12	Mapping application parameter 5 (H)	F0.00 ~ FF.55	1	F0.32	×
FA.1.13	Mapping application parameter 6 (H)	F0.00 ~ FF.55	1	F0.32	×

FA.1.14	Mapping status parameter 1 (H)	d0.00 ~ d1.49	1	d0.00	
FA.1.15	Mapping status parameter 2 (H)	d0.00 ~ d1.49	1	d0.01	
FA.1.16	Mapping status parameter 3 (H)	d0.00 ~ d1.49	1	d0.02	
FA.1.17	Mapping status parameter 4 (H)	d0.00 ~ d1.49	1	d0.03	
FA.1.18	Mapping status parameter 5 (H)	d0.00 ~ d1.49	1	d0.04	
FA.1.19	Mapping status parameter 6 (H)	d0.00 ~ d1.49	1	d0.05	
FA.1.20	Mapping status parameter 7 (H)	d0.00 ~ d1.49	1	d0.06	
FA.1.21	Mapping status parameter 8 (H)	d0.00 ~ d1.49	1	d0.07	
FA.1.22	Mapping status parameter 9 (H)	d0.00 ~ d1.49	1	d0.08	
FA.1.23	Mapping status parameter 10 (H)	d0.00 ~ d1.49	1	d0.09	

6.2.42 COMMUNICATION LINKAGE SYNCHRONOUS CONTROL

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FA.2.25	Synchronous Coupling Control Options	**_ _ _ X: Selection of Coupling function** 0: Void 1: The device is the salve device 2: The device is the master device **_ _ X _: Coupling target value (Master device parameter)** 0: Proportional linkage of frequency /revolution set value 1: Proportional linkage of frequency /revolution integrator output value **_ X _ _: Coupling command (slave device parameter)** 0: Independent control of slave device (start and stop not linked) 1: Start and stop command linked 2: Start-stop/jog linked 3: Start-stop/jog/excitation linked 4: Start-stop/jog/excitation /DC bind-type brake/DC braking linked **X _ _ _: Reserved**	1	0310	×
FA.2.26	Set the correction coefficient of the unit via communication	0.010~10.000	0.001	1.000	
FA.2.27	Coupling Fine Proportional Adjustment	0: No fine adjustment 1: Analog inputAI1 2: Analog inputAI2 3: Analog inputAI3	1	0	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FA.2.28	Slave offset frequency / Rotation speed	0: No offset 1: Determined by frequency setting source 1 2: Determined by frequency setting source 2	1	0	
FA.2.29	Coupling balancing function	0: Void 1: Current balancing 2: Torque balancing 3: Power balancing 4: Position synchronous balancing	1	0	
FA.2.30	Coupling balancing gain	0.001~10.000	0.001	1.000	
FA.2.31	Amplitude limit of synchronous position balancing	0.10~10.00Hz	—	1.00	
FA.2.32	Reserved	—	—	—	

6.2.43 PARAMETERS OF EXPANSION COMMUNICATION MODULE

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FA.3.33	Communication Extension Module Type	0: Unexpanded bus communication adaptor 1: Expansion RS485 bus (MODBUS standard) 2: PROFIBUS-DP 3: INTERBUS 4: LONWORKS 5: CANOPEN 6: DEVICENET 7: MODBUSPLUS 8: CONTROLNET	1	—	R
FA.3.34~ FA.3.55		Refer to user manual of “Expansion Communication Module”.			

6.2.44 EXPANSION MULTIFUNCTIONAL INPUT TERMINAL (EDI1~ EDI8)/ EFFECTIVE AFTER CONNECTING EXPANDING ACCESSORIES

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
Fb.0.00	Multifunctional Input DI1	0~96	1	0	×
Fb.0.01	Multifunctional Input DI2	0~96	1	0	×
Fb.0.02	Multifunctional Input DI3	0~96	1	0	×
Fb.0.03	Multifunctional Input DI4	0~96	1	0	×
Fb.0.04	Multifunctional Input DI5	0~96	1	0	×
Fb.0.05	Multifunctional Input DI6	0~96	1	0	×
Fb.0.06	Multifunctional Input DI7	0~96	1	0	×
Fb.0.07	Multifunctional Input DI8	0~96	1	0	×
Fb.0.08	Filter Time Multifunctional	1~50ms	1	5	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
	Terminals				
Fb.0.09	Multifunctional Input Configuration (H)	_ _ _ **X: EDI1~EDI4 terminal** 0~F: 4-bit binary system, bit=0 power-on effective, 1 Disconnection Effective _ _ **X** _ **: EDI5~EDI8 terminal** The same as above _ **X** _ _ **: Reserved** **X** _ _ _ **: Reserved**	1	0000	×

6.2.45 EXPANSION MULTIFUNCTIONAL INPUT TERMINAL (EDO1/ ERO1~ EDO4/ ERO4)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
Fb.1.10	Multifunctional Output DO1	0 ~ 62	1	0	
Fb.1.11	Multifunctional Output DO2	0 ~ 62	1	0	
Fb.1.12	Multifunctional Output DO3	0 ~ 62	1	0	
Fb.1.13	Multifunctional Output DO4	0 ~ 62	1	0	
Fb.1.14	Relay Output RO1	0 ~ 62	1	0	
Fb.1.15	Relay Output RO2	0 ~ 62	1	0	
Fb.1.16	Relay Output RO3	0 ~ 62	1	0	
Fb.1.17	Relay Output RO4	0 ~ 62	1	0	

6.2.46 ZERO-SPEED TORQUE AND POSITION CONTROL

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
Fb.2.18	Automatic Step Switching Frequency	0~5.00Hz	0.01	1.00	
Fb.2.19	Automatic Step Switching cycle Holding	0.10~2.00Sec	0.01	0.30	
Fb.2.20	Torque at 0 Hz (DC bind-type brake preferred)	0: Void 1: Bind-type brake torque effective 2: Position locking (PG feedback VC mode) 3. Locked to given stop angle (PG feedback VC mode)	1	0	×
Fb.2.21	Position locking gain (positioning gain)	0.10~100.00	0.01	1.00	
Fb.2.22	Linear Distance per Encoder Turn	0.001~50.000mm	0.01	0.500	
Fb.2.23	Servo control function	_ _ _ **X: Function selection** 0: Void 1: Effective 2: External terminal selection (Function No. 69)	1	0000	×

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		_ _ X _: Action mode 0: Common mode 1: Spindle orientation			
Fb.2.24	Position setting source in common mode	0: Reserved 1: Fin input 2: Digital setting 3: Analog inputAI1 4: MODBUS bus set value 1 5: MODBUS bus set value 2 6. Expansion bus set value 1 7. Expansion bus set value 2	1	1	
Fb.2.25	Position digital setting (lower)	0~65535	1	0	
Fb.2.26	Position digital setting (upper)	0~5000	1	0	
Fb.2.27	Electronic gear (numerator)	0~65535	1	1000	
Fb.2.28	Electronic gear (denominator)	0~65535	1	1000	
Fb.2.29	Position command filtering time coefficient	1~1000.0ms	1	10	
Fb.2.30	Position gain 2	0.01~100.00	0.01	1.00	
Fb.2.31	Position gain selection mode	0: Gain 1 Effective 1: Gain 2 Effective 2: External terminal selection (Function No. 75) 3: Position deviation selection	1	0	
Fb.2.32	Position gain selected threshold value (Position deviation)	0~30000	1	10	
Fb.2.33	Speed feed-FWD gain	0.0~200.0 (%)	0.1	100.0	
Fb.2.34	Revolution limiting mode in common servo mode	0: Limited by upper limiting frequency 1: Frequency setting channel	1	0	
Fb.2.35	Reserved				
Fb.2.36	Spindle orientation mode	**_ _ _ X: Selection of reference signal for positioning zero point** 0: Z pulse positioning 1: Photoelectric switch positioning (Function No. 70) **_ _ X _: Command** 0: External terminal selection 1: Pulse command setting **_ X _ _: Positioning direction** 0：Positioning according to instruction direction 1：Positioning according to minimum angle	1	0000	×
Fb.2.37	Spindle orientation frequency/speed	0.01~100.00Hz	0.01	5.00	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
Fb.2.38	Spindle orientation angle 1	0~359.9	0.1	45.0	
Fb.2.39	Spindle orientation angle 2	0~359.9	0.1	90.0	
Fb.2.40	Spindle orientation angle 3	0~359.9	0.1	135.0	
Fb.2.41	Spindle orientation angle 4	0~359.9	0.1	180.0	
Fb.2.42	Spindle orientation angle 5	0~359.9	0.1	225.0	
Fb.2.43	Spindle orientation angle 6	0~359.9	0.1	270.0	
Fb.2.44	Spindle orientation angle 7	0~359.9	0.1	315.0	
Fb.2.45	Spindle stop angle	0~359.9	0.1	0.0	
Fb.2.46	Spindle transmission ratio (detection spindle speed: Spindle Revolution)	0.010~50.000	0.001	1.000	×
Fb.2.47	Spindle orientation/Position reach error	0~500	1	50	

6.2.47 SIMULATED INPUT AND OUTPUT

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FF.0.00	FF configuration parameter locking function (H)	_ _ _ **X: FF parameter Modification Forbidden** 0: Modification forbidden 1: Modification permitted _ _ **X** _: **Reserved** _ **X** _ _**: Reserved** **X** _ _ _**: Initialization of FF parameter group** 0: Forbidden 1: Permitted	1	0000	
FF.0.01	Definition of virtual output node (SDO1)	0~71	1	0	
FF.0.02	Definition of virtual output node (SDO2)	0~71	1	0	
FF.0.03	Definition of virtual output node (SDO3)	0~71	1	0	
FF.0.04	Definition of virtual output node (SDO4)	0~71	1	0	
FF.0.05	Definition of virtual output node (SDO5)	0~71	1	0	
FF.0.06	Definition of virtual output node (SDO6)	0~71	1	0	
FF.0.07	Definition of virtual output node (SDO7)	0~71	1	0	
FF.0.08	Definition of virtual output node (SDO8)	0~71	1	0	
FF.0.09	Definition of virtual input function (SDI1)	0~96	1	0	×
FF.0.10	Definition of virtual input function (SDI2)	0~96	1	0	×
FF.0.11	Definition of virtual	0~96	1	0	×

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
	input function (SDI3)				
FF.0.12	Definition of virtual input function (SDI4)	0~96	1	0	×
FF.0.13	Definition of virtual input function (SDI5)	0~96	1	0	×
FF.0.14	Definition of virtual input function (SDI6)	0~96	1	0	×
FF.0.15	Definition of virtual input function (SDI7)	0~96	1	0	×
FF.0.16	Definition of virtual input function (SDI8)	0~96	1	0	×
FF.0.17	Virtual output- input connection polarity	_ _ _ **X: SDO1-SDI1** 0: Homopolar connection 1: Antipolar connection _ _ **X** _**: SDO2-SDI2** 0: Homopolar connection 1: Antipolar connection _ **X** _ _**: SDO3-SDI3** 0: Homopolar connection 1: Antipolar connection **X** _ _ _**: SDO4-SDI4** 0: Homopolar connection 1: Antipolar connection	1	0000	×
FF.0.18	Virtual output- input connection polarity	_ _ _ **X: SDO5-SDI5** 0: Homopolar connection 1: Antipolar connection _ _ **X** _**: SDO6-SDI6** 0: Homopolar connection 1: Antipolar connection _ **X** _ _**: SDO7-SDI7** 0: Homopolar connection 1: Antipolar connection **X** _ _ _**: SDO8-SDI8** 0: Homopolar connection 1: Antipolar connection	1	0000	×

6.2.48 PROTECTION FUNCTION CONFIGURATION PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FF.1.19	Protective action configuration 1 (H)	**_ _ _ X: Operation undervolts protection** 0: No action 1: Act **_ _ X _: Output grounding protection** 0: No action 1: Act **_ X _ _: input voltage phase shortage protection (Void for single camera)** 0: No action 1: Trip and stop 2: Nonstop alarm **X _ _ _: Output current phase shortage or unbalancing protection** 0: No action 1: Trip and stop 2: Nonstop alarm	1	1111	
FF.1.20	Protective action configuration 2 (H)	**_ _ _ X: Temperature sensor fault** 0: No action 1: Trip and stop 2: Nonstop alarm **_ _ X _: Inverter overheat alarm** 0: Closed 1: Act **_ X _ _: Input voltage unbalancing protection** 0: No action 1: Trip and stop 2: Nonstop alarm **X _ _ _: Motor over temperature protection** 0: No action 1: Trip and stop 2: Nonstop alarm	1	1111	
FF.1.21	Protective action configuration 3 (H)	**_ _ _ X: Relay action fault protection** 0: No action 1: Act **_ _ X _: Internal data memory abnormity protection** 0: No action 1: Act **_ X _ _: Inverter undervoltage operation alarm** 0: Closed 1: Act **X _ _ _: Reserved**	1	0110	
FF.1.22	Protective action configuration 4 (H)	**_ _ _ X: Drive protection action** 0: Closed 1: Act **_ _ X _: Reserved** **_ X _ _: A/B pulse phase sequence errors protection** **0:** Off **1：** Effective	1	0101	
FF.1.23	Configuration of protection operation 5（H）	**_ _ _ X:Warning block** 0: Off 1: Effective **_ _ X _:Output power phase sequence protection** 0：Off	1	0000	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		1：R、S、T phase sequence fault tripping 2：R、S、T phase sequence fault warning **_ X _ _：Drive interference self-recovery** **0**：Void **1**：Effective			
FF.1.24	**Reserved**	——			

6.2.49 CORRECTION PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FF.2.25	AI1 zero offset adjustment	-0.500~0.500V	0.001	0.0	
FF.2.26	AI1 gain Adjustment	0.950~1.050	0.001	1.000	
FF.2.27	4mA offset adjustement for AI2	-0.500~0.500mA	0.001	0.0	
FF.2.28	AI2 gain Adjustment	0.950~1.050	0.001	1.000	
FF.2.29	AI3 zero offset adjustment	-0.500~0.500V	0.001	0.0	
FF.2.30	AI3 gain Adjustment	0.950~1.050	0.001	1.000	
FF.2.31	AO1 zero offset correction	-0.500~0.500V	0.001	0.0	
FF.2.32	AO1 gain Adjustment	0.950~1.050	0.001	1.000	
FF.2.33	AO2 zero offset correction	-0.500~0.500V	0.001	0.0	
FF.2.34	AO2 gain Adjustment	0.950~1.050	0.001	1.000	
FF.2.35	Undervoltage Proctection level	320~450V	1	370	×
FF.2.36	DC Bus Volts Dectection Level Gain	0.950~1.050	0.001	1.000	

6.2.50 SPECIAL FUNCTIONAL PARAMETERS

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FF.3.37	Torque Limit Configuration (H)	**_ _ _ X: Constant torque area torque limitation** 0: Only limited by torque limiting parameter (including Revolution PID output limit) 1: Also limited by acceleration and deceleration current level and maximum permitted current. **_ _ X _: Reserved** **_ X _ _: Constant power area torque limitation** 0: Treated the same as the constant torque area 1: Simultaneously adjusted as per constant power algorithm	1	0101	
FF.3.38	Current closed-loop proportional gain	0.10 ~ 10.00	0.01	1.00	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FF.3.39	Current closed-loop integration time constant	0.10 ~ 10.00 (Sec.)	0.01	1.00	
FF.3.40	Total leakage inductance compensation constant	0.10 ~ 10.00	0.01	1.00	

6.2.51 OTHER CONFIGURATION PARAMETERS

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
FF.4.41	Cooling fan control	**_ _ _ X: Soft start function (effective for model 7100N-0095B4C220 and below)** 0: No action 1: Act **_ _ X _: Air volume auto adjustment (effective for model 7100N-0095B4C220 and below)** 0: No action 1: Act **_ X _ _: Start time** 0: Start immediately after power-on 1: Start after running **X _ _ _: Reserved**	1	0101	
FF.4.42	Keypad Control Running Options	**_ _ _ X: REV/JOG key function selection** 0: REV (REV running key) 1: JOG (FWD jog key) **_ _ X _: Reserved** **_ X _ _: Reserved** **X _ _ _: Keypad control selection (except STOP key)** 0: Standard panel interface control (can be connected to monitoring panel via RS485) 1: RS485 port external panel control(standard panel, only for monitoring) 2: Multifunctional terminal switching (Function No. 40)	1	0000	×
FF.4.43	Special function configuration	**_ _ _X: Motor parameter identification** 0: Forbidden 1: Permitted **_ _ X _: Voltage vector Configuration** 0: Three-phase composition 1: Two-phase composition **_ X _ _: Voltage small pulse shielding** 0: Void 1: Effective **X _ _ _: SVC Speed Detection mode** 0: Current open-loop mode 1: Current closed-loop mode (Reserved)	1	0001	
FF.4.44	Asynchronous motor parameter Auto Tune	**LED _ _ _X: Stator resistance** 0: Forbidden 1: Permitted **LED _ _ X _: Total leakage inductance** 0: Forbidden 1: Permitted **LED _ X _ _: Rotor time constant** 0: Forbidden 1: Permitted **LED X _ _ _: Torque increasing function** 0: Void	1	0011	

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		1~5: Effective（gradually better）			
FF.4.45	Random reference value	0~65535	1		R
FF.5.46	Factory Universal Code	-	-	-	-

6.2.52 HISTORICAL FAULT RECORDING

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
dE.0.00	Last Fault	-	-	-	R/I
dE.0.01	Fault 1	-	-	-	R/I
dE.0.02	Fault 2	-	-	-	R/I
dE.0.03	Fault 3	-	-	-	R/I
dE.0.04	Fault 4	-	-	-	R/I
dE.0.05	Fault 5	-	-	-	R/I
dE.0.06	Fault 6	-	-	-	R/I
dE.0.07	Fault 7	-	-	-	R/I

6.2.53 OPERATION STATUS AT THE LAST FAULT

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
dE.0.08	Operating frequency (rotor synchronous frequency)	-300.00~300.00Hz	0.01	0	R/I
dE.0.09	Output current	0.0~3000.0A	0.1	0	R/I
dE.0.10	Output voltage	0~1000V	1	0	R/I
dE.0.11	Motor Speed	0~30000rpm	1	0	R/I
dE.0.12	DC Bus Voltage	0~1000V	1	0	R/I
dE.0.13	Output torque	-300.0~ 300.0%	0.1	0	R/I
dE.0.14	Target frequency	0.0~300.00Hz	0.01	0	R/I
dE.0.15	Highest Drive temperature	0.0~150.0	0.1	0	R/I
dE.0.16	Command status	_ _ _ **X:** 0: Stop command 1: Running command _ _ **X** _**: Reserved** _ **X** _ _**: Reserved** **X** _ _ _**: Reserved**	1	0000	R/I
dE.0.17	Run Conditions at Time of Fault	_ _ _ **X : Operation mode** 0: VF mode 1: Open-loop vector speed 2: Closed-loop vector speed 3: Open-loop torque control 4: Closed-loop torque control 5: V/F separated control	1	0000	R/I

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		_ _ X _: Operation status 0: Stop 1: Start acceleration 2: Stop deceleration 3: Decreasing frequency and deceleration 4: Steady operation **_ X _ _: Electric/braking status** 0: Electric operation 1: Power generation operation **X _ _ _: Limit suppression** 0: No action 1: Overcurrent suppression action 2: Overvoltage suppressor action 3: Undervoltage suppression action			
dE.0.18	Total Run Hours at Last Fault	0~65535	1H	65535	**R/I**
dE.0.19	Time Since last Trip	0~65535	1H	65535	**R/I**
dE.0.20	Synchronous output frequency	-300.00~300.00Hz	0.01	0	**R/I**

6.2.54 BASIC STATUS PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
d0.0.00	Output frequency and direction (rotor synchronous frequency)	-300.0Hz ~ 300.00Hz	0.01Hz	-	**R**
d0.0.01	Motor Rotational Speed and direction	-30000~30000rpm	1rpm	-	**R**
d0.0.02	Output current	0.0~ 6000.0A	0.1A	-	**R**
d0.0.03	Output torque	-300.0~300.0%	0.1%	-	**R**
d0.0.04	Output voltage	0~500V	1V		**R**
d0.0.05	Output power	-1000.0~1000.0KW	0.1KW	-	**R**
d0.0.06	Highest Temperature of Machine Body	0~150.0℃	0.1℃	-	**R**
d0.0.07	DC Lateral Voltage	0~1000V	1V	-	**R**
d0.0.08	Drive running status	**_ _ _ X: Operation mode** 0: VF mode 1: Open-loop vector speed 2: Closed-loop vector speed 3: Open-loop torque control 4: Closed-loop torque control 5: V/F separated control **_ _ X _: Operation status** 0: Stop 1: Start acceleration 2: Stop deceleration 3: Decreasing frequency and	1		**R**

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
		deceleration 4: Steady operation **_ X _ _: Electric/braking status** 0: Electric operation 1: Power generation operation **X _ _ _: Limit suppression** 0: No action 1: Overcurrent suppression action 2: Overvoltage suppressor action 3: Undervoltage suppression action			
d0.0.09	Command Value Frequency (frequency)	-300.00Hz ~ 300.00Hz	0.01Hz		**R**
d0.0.10	Command Value Rotation Speed (Revolution)	-30000~30000rpm	1rpm		**R**
d0.0.11	Torque command value (set input)	-300.0~300.0%	0.1%		**R**
d0.0.12	Target frequency External Input (integrator input)	-300.0Hz ~ 300.00Hz	0.01Hz		**R**
d0.0.13	Target Rotation Speed External Input (integrator input)	-30000~30000rpm	1rpm		
d0.0.14	Output Speed Variation	-3200~3200rpm	1rpm		
d0.0.15	Output Torque Variation	-300.0~300.0(%)	0.1%		
d0.0.16	Course PID setting	-100.0~100.0(%)	0.1%		
d0.0.17	Course PID feedback	-100.0~100.0(%)	0.1%		
d0.0.18	Course PID deviation	-100.0~100.0(%)	0.1%		
d0.0.19	Course PID output	-100.0~100.0(%)	0.1%		
d0.0.20	High Speed PID setting	-100.0~100.0(%)	0.1%		
d0.0.21	High Speed PID feedback	-100.0~100.0(%)	0.1%		
d0.0.22	High Speed PID deviation	-100.0~100.0(%)	0.1%		
d0.0.23	High Speed PID output	-100.0~100.0(%)	0.1%		
d0.0.24	Total running time (H)	0~65535h	1h		
d0.0.25	Total power-on time (H)	0~65535h	1h		
d0.0.26	Power-on (hh.mm.s) cycling timing	00.00.0~23.59.9	1		
d0.0.27	Kilowatthour counter (low)	0~1000.0KWh	0.1KWh		
d0.0.28	Kilowatthour counter (high)	0~60000KKWh	1KKWh		
d0.0.29	Megawatt hour counter	0~60000 MWh	1 MWh		

6.2.55 AUXILIARY STATUS PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
d0.1.30	Set Value Frequency Source 1	0.0~300.00Hz	0.01Hz	-	R
d0.1.31	Set Value Frequency Source 2	0.0~300.00Hz	0.01Hz	-	R
d0.1.32	External Hz/RPM Input Value	-300.0Hz ~ 300.00Hz	0.01Hz	-	R
d0.1.33	Determinant Synchronous Frequency	-300.0Hz ~ 300.00Hz	0.01Hz	-	R
d0.1.34	Actually Detected Rotation Speed Value	-30000~30000rpm	1rpm	-	R
d0.1.35	Inverter overload integrator value	0 ~ 1020	1	-	
d0.1.36	Standard PID set variable (physical quantity)	0.01~60000	0.01	-	R
d0.1.37	Standard PID feedback variable(physical quantity)	0.01~60000	0.01	-	R
d0.1.38	High Speed PID set Value(physical quantity)	0.01~60000	0.01	-	R
d0.1.39	High Speed PID feedback Value (physical quantity)	0.01~60000	0.01	-	R
d0.1.40	Torque current	-3000.0~3000.0A	0.1A	-	R
d0.1.41	Excitation current	0.0~3000.0A	0.1A	-	R
d0.1.42	Drive Temperature Sensor 1	0~150.0℃	0.1℃	-	R
d0.1.43	Drive Temperature Sensor 2	0~150.0℃	0.1℃	-	R
d0.1.44	Drive Temperature Sensor 3	0~150.0℃	0.1℃	-	R
d0.1.45	Motor temperature	0~250.0℃	0.1℃	-	R

6.2.56 MODBUS FIELDBUS STATUS PARAMETER (STANDARD EXPANSION I/O CARD)

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
d0.2.46	Bus communication set 1	-10000~10000	1		R
d0.2.47	Bus communication set 2	-30000~30000	1		R
d0.2.48	Bus command word 1 (HEX)	0~0FFFFH	1		R
d0.2.49	Bus command word 2 (HEX)	0~0FFFFH	1		R
d0.2.50	Bus status word 1 (HEX)	0~0FFFFH	1		R
d0.2.51	Bus status word 2 (HEX)	0~0FFFFH	1		R
d0.2.52	Total Bus information	0~65535	1		R
d0.2.53	Number of bus CRC check errors	0~65535	1		R
d0.2.54	Amount of Bus Misdata Recieved	0~65535	1		R
d0.2.55	Amount of Vaild Bus Data	0~65535	1		R

6.2.57 TERMINAL STATUS AND VARIABLE

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
d1.0.00	Terminal input (DI1~DI9)	Segment marker	-	-	R
d1.0.01	Terminal input (EDI1~EDI10)	Segment marker	-	-	R
d1.0.02	Pulse input (Fin)	0.0~100.00KHz	0.01		R
d1.0.03	Analog input AI1	0.00~10.00V	0.01		R
d1.0.04	Analog input AI2	0.00~20.00mA	0.01		R
d1.0.05	Analog input AI3	-10.00~10.00V	0.01		R
d1.0.06	Digital outputs (DO1~DO4, EDO1~ EDO6)	Segment marker	-	-	R
d1.0.07	Relay outputs (RO1~RO4, ERO1~ERO6)	Segment marker	-	-	R
d1.0.08	Pulse Output Fout (indicating the duty ratio in the case of PWM signal output)	0.0~100.0KHz	0.01		R
d1.0.09	Analog output AO1	0.00~10.00V	0.01		R
d1.0.10	Analog output AO2	0.00~10.00V	0.01		R

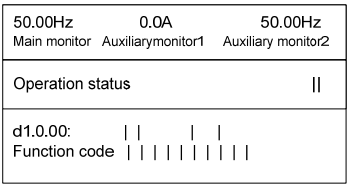


Figure 6-1 Terminal effective sketch

- As shown in figure 6-1, DI1, DI2, DI6 DI8 terminal input is in effective status, and other terminals are at void status.

6.2.58 COUNTER TIMER VALUE

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
d1.1.11	Current Value of Counter 1	0~65535	1		R
d1.1.12	Current Value of Counter 2	0~65535	1		R
d1.1.13	Current Value of Timer 1	0~65535	1		R
d1.1.14	Current Value of Timer 2	0~65535	1		R
d1.1.15	Current Value of Timer 3	0~65535	1		R

6.2.59 SPINDLE CONTROL AND SCALE POSITIONING STATUS PARAMETER

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
d1.2.16	Encoder (PG installation shaft) position angle	0~359.9			R
d1.2.17	Encoder (PG installation shaft) travelling circle number	0~65536			R
d1.2.18	Accumulative number of position pulse s(low)	0~65535			R
d1.2.19	Accumulative number of position pulses (middle)	0~65535			R
d1.2.20	Progressive distance	0.0~5000.0mm			R
d1.2.21	Number of position setting pulse (lower)	0~65535			R
d1.2.22	Number of position setting pulse (middle)	0~65535			R
d1.2.23	Number of position setting pulse (upper)	0~65535			R

6.2.60 EQUIPMENT INFORMATION

Function Code	Name	Setting Range and Description	Minimum Unit	Factory Default	Change Limit
d1.4.40	Expansion Card Access Information	**_ _ _X: Reserved** **_ _ X _: Standard expansion board** 0: Not connected 1: Connected **_ X _ _: Functional expansion board 1** 0: Not connected 1~F: Connected (the value stands for the type of expansion board) **X _ _ _: Functional expansion board 2** 0: Not connected 1~F: Connected (the value stands for the type of expansion board)	1	—	R
d1.4.41	Total of Panel Comms Info	0~65535	1	—	R
d1.4.42	Number of panel communication CRC check errors + number of errors accepted	0~65535	1	—	R
d1.4.43	Total of Panel Comms Effective Info	0~65535	1	—	R
d1.4.44	Equipment model	Reserved	1	—	R
d1.4.45	Equipment capacity	0.1~1000.0KW	0.1KW	—	R
d1.4.46	Motherboard program version (H)	7000~7999	1	—	R
d1.4.47	Reserved		1	—	R
d1.4.48	Motherboard check date (H)	2009~2100	1	—	R
d1.4.49	Motherboard check date (H)	0101~1231	1	—	R
d1.4.50	Motherboard check serial number	0 ~ 50000	1	—	R

TABLE 1: COMPARISON TABLE OF MULTIFUNCTIONAL TERMINAL (DI/EDI/SDI) FUNCTIONS

S/N	Function	S/N	Function
0	No function	1	Multi-speed control 1
2	Multi-speed control 2	3	Multi-speed control 3
4	Multi-speed control 4	5	FWD jog
6	REV jog	7	Forward (FWD) running command terminal
8	Reverse (REV)running command terminal	9	Acceleration and deceleration time selection 1
10	Acceleration and deceleration time selection 2	11	Running command switching
12	Frequency command switching	13	Fault resetting input (RESET)
14	Emergency stop (EMS)	15	Frequency or Standard PID set value ascending (UP)
16	Frequency or Standard PID set value descending (DW)	17	UP/DW set frequency clear
18	External equipment fault	19	Three wire running control
20	Stop DC braking command	21	Acceleration and deceleration forbidden
22	Standard PID effective	23	Simple PLC multi-stage running effective
24	Swing frequency running effective	25	High Speed PID effective
26	Simple PLC multi-stage running status (when stopping) resetting	27	Swing frequency status resetting (effective when stopping)
28	Multi-stage Standard PID giving terminal 1	29	Multi-stage Standard PID giving terminal 2
30	Multi-stage Standard PID giving terminal 3	31	Standard PID setting selection (switching)
32	Standard PID feedback selection (switching)	33	Standard PID sleep activation
34	Torque/speed control mode switching	35	Minimum torque limiting set value selection
36	Maximum torque limiting set value selection	37	Zero-torque tracking free run
38	Load dynamic balancing effective	39	linkage set condition input
40	RS485 external/Standard operation panel control switching	41	Load motor switching
42	Start permission	43	Running permitted
44	Counter 1 clock terminal	45	Counter 2 clock terminal
46	Counter 1 trigger signal	47	Counter 2 trigger signal
48	Counter 1 resetting terminal	49	Counter 2 resetting terminal
50	Counter 1 gated signal	51	Counter 2 gated signal
52	Timer 1 trigger signal	53	Timer 2 trigger signal
54	Timer 3 trigger signal	55	Timer 1 resetting
56	Timer 2 resetting	57	Timer 3 resetting
58	Timer 1 gated signal	59	Timer 2 gated signal
60	Timer 3 gated signal	61	Single pulse accumulative length value resetting
62	Motor temperature detection contact input	63	High Speed PID parameter selection1
64	High Speed PID parameter selection2	65	Magnetic flux brake
66	Position pulse counting (PG pulse counting	67	Automatic shifting (Spindle shifting jog

S/N	Function	S/N	Function
	accumulation) resetting		running)
68	Servo pulse command direction (Fin)	69	Servo control effective
70	Spindle positioning origin photoelectric signal input	71	Spindle origin homing
72	Spindle positioning selection 1	73	Spindle positioning selection 2
74	Spindle positioning selection 3	75	Position gain selection
76	Reserved	77	Servo command pulse value clear
78	low speed servo torque compensation	79~96	Reserved（Functional Expand Card）
97	0.1Hz~100.00Hz pulse input (DI9/Fin Effective)	98	1.0Hz~1000.0KHzpulse input (DI9/Fin Effective)

TABLE 2: COMPARISON TABLE OF MULTIFUNCTIONAL OUTPUT TERMINAL (DO/EDO/SDO) VARIABLES

S/N	Function	S/N	Function
0	No definition	1	Inverter running ready(normal voltage, no emergency stop input)
2	Inverter is running	3	Equipment normal (fault-free running)
4	Equipment fault (trip)	5	Equipment alarm
6	Equipment fault or alarm	7	REV running
8	Running command input (irrelevant with start or running signal)	9	Running with zero frequency
10	Speed not at zero	11	Inverter undervoltage stop
12	Terminal control effective	13	In the process of acceleration running
14	In the process of deceleration running	15	Braking power generation running status
16	Determined by standard MODBUS Fieldbus	17	Determined by Extended communication module
18	Reserved	19	Completion of current stage of multi-stage running (0.5s pulse)
20	Multi-stage running completed (0.5S pulse)	21	Multi-stage running completed (continuous level output)
22	Multi-stage running cycle completed (0.5Spulse)	23	Swing frequency upper and lower limit
24	Encoder direction positive (A pulse surpassing B pulse)	25	Decoder direction negative (A behind B)
26	Monitor 1 input variable below the lower limit (Void when above the upper limit)	27	Monitor 1 input variable above the upper limit(void when below the lower limit)
28	Monitor 1 input variable between the upper limit and the lower limit	29	Monitor 2 variable below the lower limit (void when above the upper limit)
30	Monitor 2 input variable above the upper limit(void when below the lower limit)	31	Monitor 2 input variable between the upper limit and the lower limit
32	Monitor 3 input variable below the lower limit(void when above the upper limit)	33	Monitor 3 input variable above the upper limit(void when below the lower limit)
34	Monitor 3 input variable between the upper limit and the lower limit	35	Position or spindle orientation position reached

S/N	Function	S/N	Function
36	Analog input AI1 wire breakage detection effective	37	Analog input AI2 wire breakage detection effective
38	Analog input AI3 wire breakage detection effective	39	Reserved
40	Counter 1 output signal 1	41	Counter 1 output signal 2
42	Counter 2 output model 1	43	Counter 2 output signal 2
44	Timer 1 output signal 1	45	Timer 1 output signal 2
46	Timer 2 output signal 1	47	Timer 2 output signal 2
48	Timer 3 output signal 1	49	Timer 3 output signal 2
50	Extension modules retained	51	Extension modules retained
52	Extension modules retained	53	Extension modules retained
54	Extension modules retained	55	DI1 terminal status effective
56	DI2 terminal status effective	57	DI3 terminal status effective
58	DI4 terminal status effective	59	DI5 terminal status effective
60	DI6 terminal status effective	61	DI7 terminal status effective
62	DI8 terminal status effective	63	Terminal as frequency output (only applicable to DO3/Fout terminal)
64	SDO1 Logic	65	SDO2 Logic
66	SDO1⊙SDO2（logic and）	67	SDO3⊙SDO4（logic or）
68	SDO5⊙SDO6（logic and）	69	SDO3⊕SDO4（logic or）
70	SDO5⊕SDO6（logic or）	71	SDO7⊕SDO8（logic or）

TABLE 3: COMPARISON TABLE OF MONITOR VARIABLES

S/N	Monitoring Parameter Variable	100% full-scale output
0	Output frequency (rotor synchronous frequency)	Upper limiting frequency
1	Motor Revolution	Upper limiting frequency*60/pairs of motor poles
2	Output current	250%*Inverter rated current
3	Output torque	300% rated torque
4	Output voltage	Motor rated voltage (reference voltage in VF mode)
5	Output power	2* motor rated power
6	Maximum temperature of the equipment	150.0℃
7	Voltage at the DC side	1000V (single phase 500V)
8	Motor temperature/ PTC resistance	500.0℃/5000 Ohm
9	Frequency setting channel set value	Upper limiting frequency
10	Speed command	Upper limiting frequency*60/pairs of motor poles
11	Torque command	300% rated torque
12	Target operating frequency	Upper limiting frequency
13	Reserved	——
14	Speed adjuster deviation	Upper limiting frequency*60/pairs of motor poles
15	Speed adjuster output	300.0%
16	Standard PID setting	100.0%
17	Standard PID feedback	100.0%

S/N	Monitoring Parameter Variable	100% full-scale output
18	Standard PID deviation value	200.0%
19	Standard PID output	100.0%
20	High Speed PID setting	100.0%
21	High Speed PID feedback	100.0%
22	High Speed PID deviation	200.0%
23	High Speed PID output	100.0%
24	AI1 input (0.00~10.00)	10.00 V
25	AI2 input (0.00~20.00)	20.00mA
26	AI3 input (-10.00~10.00)	10.00V
27	Fin input	Maximum input frequency
28	Current liner speed (Fin calculation)	Maximum permitted liner speed
29	Accumulative counted length (liner speed accumulation)	Maximum counted length
30	Counter 1 value	Counter 1 set value 2
31	Counter 2 value	Counter 2 set value 2
32	Timer 1 value	Timer 1 timing cycle
33	Timer 2 value	Timer 2 timing cycle
34	Timer 3 value	Timer 3 timing cycle
35	Built-in Fieldbus set value 1	10000
36	Extended communication module set value 1	10000
37	Built-in Fieldbus set value 2	30000
38	Extended communication module set value 2	30000
39~44	Reserve	
45	Fixed output (current or voltage)	20.00mA (10.00V)

7. DETAILED FUNCTION INSTRUCTIONS

Remark: Unless especially instructed, the status of terminals will be defined under positive logic conditions ("ON" terminals effective, and "OFF" terminals void).

7.1 SYSTEM MANAGEMENT (GROUP F0.0)

Group **F0.0** parameters are especially used to define system control parameters, e.g. locking, initializing, motor type and control mode as well as display of monitoring parameters, etc.

F0.0.00 Macro parameters	Setting range: 0000~2005	Factory default: 0000

Macro parameters include application macro, system macro and configuration macro; the application macro allows for conveniently setting and curing multiple common parameters and simplifying parameter setting for general applications; the system macro allows for conveniently switching equipment's work mode and automatically defining partial parameters; the special macro allows for internal integration and settings for special functions or parameters with one key according to typical industrial applications.

Macro parameters are not influenced by the initializing parameter F0.0.07 and partial macro-related parameters are locked at specific value or within specific range.

The unit: Application macro

0: Void

Customized settings, all parameters can be customized without being influenced by the application macro parameters.

1: Digital setting of panel operation

Refer to Figure 7-1 for the application wiring diagram, and refer to Table 7-1 for macro-related parameters.

2: Shuttle setting panel operation

Refer to Figure 7-1 for the application wiring diagram, and refer to Table 7-1 for macro-related parameters.

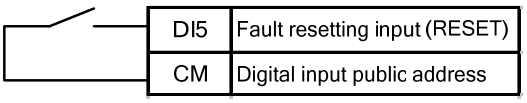


Figure 7-1 Wiring diagram for panel operation digital/Shuttle setting

3: Two-Line Control 1/AI1 Setting

Refer to Figure 7-2-A for the application wiring diagram, and refer to Table 7-1 for macro-related parameters.

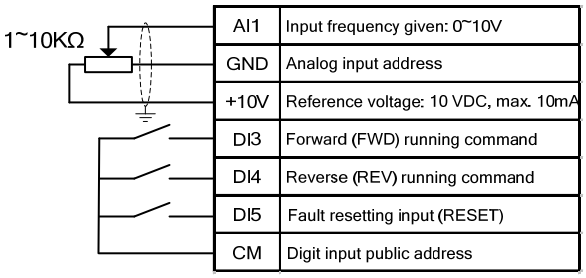


Figure 7-2-A Two-line control 1/AI1 setting wiring diagram

4: Two-Line Control 2 /AI1 Setting

Refer to Figure 7-2-B for the application wiring diagram, and refer to Table 7-1 for macro-related parameters.

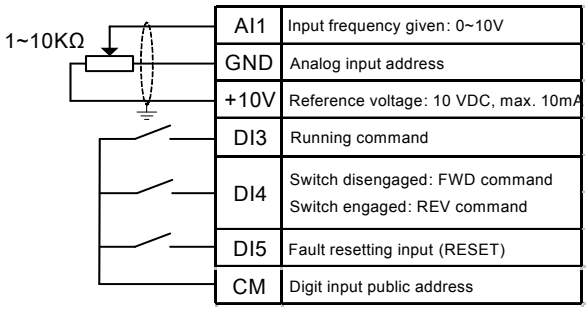


Figure 7-2-B Two-line control 2/AI1 setting wiring diagram

5: Three-line control 1/AI1 setting

Refer to Figure 7-3 for the application wiring diagram, and refer to Table 7-1 for macro-related parameters.

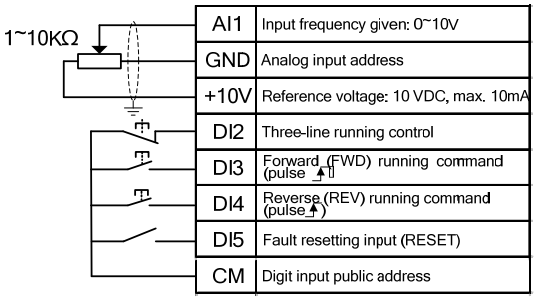


Figure 7-3 Three-line control 1/AI1 setting wiring diagram

Table 7-1 Table Application Macro Association Self-Setting Parameters

Parameters	Application Macro 1	Application Macro 2	Application Macro 3	Application Macro 4	Application Macro 5	Remarks
F0.1.15	0	0	0	0	0	Locked
F0.1.16	0	0	0	0	0	Locked
F0.1.18	1.00	1.00	1.00	1.00	1.00	Locked
F0.2.25	2 (0~2)	3	9	9	9	Locked
F0.3.33	0	0	1	1	1	Locked
F0.3.35	—	—	0	1	2	Locked
F0.4.37	0	0	0	0	0	Locked
F0.4.38	0	0	0	0	0	Locked
F3.0.01	—	—	—	—	19	Locked
F3.0.02	—	—	7	7	7	Locked
F3.0.03	—	—	8	8	8	Locked
F3.0.04	13	13	13	13	13	Locked
F6.1.15	0	0	0	0	0	Relocatable
F6.2.46	0	0	0	0	0	Relocatable

Parameters	Application Macro 1	Application Macro 2	Application Macro 3	Application Macro 4	Application Macro 5	Remarks
F7.0.00	0	0	0	0	0	Relocatable
F8.0.00	0	0	0	0	0	Relocatable
F9.0.00	0	0	0	0	0	Relocatable
FA.2.25	0	0	0	0	0	Relocatable

Kilobit: System macro (0~F)

The system macro cannot be modified unless correct modification password [F0.0.02] is set. Refer to the instructions of F0.0.02 parameter for details. Modification of system macro will automatically lead to initialization of all functional parameters (Group FF parameters will not be initialized unless FF.0.00 allows for initialization).

0: Standard operation mode

1: Steady load operation

It is applicable to steady load (e.g. fan and pump load). In this mode, the load capacity of the equipment will be automatically increased by one power grade, and the initialization value of motor parameters will be also automatically increased by one function grade.

2:Reserved

F0.0.01 Parameter display and modification (H)	**Setting range: 0000~9014**	**Factory default: 0001**

The unit: Parameter display mode

0: Display all parameters

1: Display effective configuration parameters

To automatically hide the parameters irrelevant with current command or hardware according to different parameter setting commands or different current hardware configuration (e.g. various expansion boards), so as to simplify field commissioning.

- F0.0.00 and F0.0.01 are not limited by the parameter display mode, and will not be concealed in any display mode. The panel displaying parameters concealed due to parameter display mode will not influence the access to the concealed parameter via communication port.

2: Display parameters different from factory default

3: Display modified and stored parameters after power-on this time

4: Display modified and un-stored parameters after power-on this time

Tens: Parameter modification mode

The macro parameter F0.0.00 is also limited by this function.

0: Effective and permanently stored after modification

Parameters modified will be immediately stored in the memory and permanent saved, and will not lose after power-off.

1: Effective after modification but not stored, and getting lost after power-off

Parameters modified are effective but are not saved in the memory. And parameters modified will automatically restore to the values saved in the memory after completion of relevant operation or power-off. This function is used for tentative modification of undetermined parameters for field commissioning; After commissioning, all modified and unsaved parameters can be displayed for view separately (when the unit of this parameter is set to 4), and batch recovery or batch storage will be conducted (when the kilobit of this parameter is set to 2 or 5).

Kilobit: Batch recovery or batch storage of parameters

The macro parameter F0.0.00 is not subject to the influence of this function.

2: Abandon modifying all un-saved parameters restoring to original value

All unsaved parameters will be rapidly restored to the values stored in the memory with one key.

This function can only be used when the device is stopped. If this function is activated when the device is running, the inverter will send alarm aL.058 and give up operation.

5: Batch storing all modified and unsaved parameters

All modified and unsaved parameters will be saved in the memory.

9: Resume all parameters to initial values at the last power-on

To restore all parameters to the initial values at the last power-on. Even after initialization, all parameters can be restored to the preliminary power-on values with this function. This function is used to make correction during field commissioning when the system works abnormally because no one knows which parameter is modified incorrectly at the current power-on. This function can only be used when the device is stopped. If this function is activated when the device is running, the inverter will send alarm aL.059 and give up operation.

F0.0.02 System macro parameter modification password	Setting range: 0~65535	Factory default: 0

For modifying the system macro setting (kilobit) of the macro parameter F0.0.00, the modification password 1580 must be entered. This password will automatically disappear after 30 seconds. The macro parameter cannot be modified once within 30 seconds upon input of the password. If it is intended to make modification once again,the password should be entered again.

F0.0.04 LCD display setting (H)	Setting range: 0000~0037	Factory default: 0023

This function is only effective for the operating panel equipped with LCD.

Tens: Normal display mod

0: Steady mode

1: Single parameter display

The LCD panel will only display the status parameters set for F0.0.12 in the normal monitoring mode.

2: Dual parameter display

The LCD panel will display the status parameters set for F0.0.12 and F0.0.13 in the normal monitoring mode.

3: Three parameter display

The LCD panel will display the status parameters set for F0.0.12, F0.0.13 and F0.0.14 in the normal monitoring mode.

F0.0.05 Parameter locking (H)	Setting range: 0000~0012	Factory default: 0000
F0.0.06 Parameter locking password	Setting range: 0~65535	Factory default: 0

After presetting password ,this parameter can only be modified by correct password. And if after the parameter locking is effective, during modification of the locked parameter, LED panel will display “---”; LCD panel will prompt “password locked and modification forbidden”. This function is used to forbid modification of functional parameters by unauthorized personnel.

The password setting will take effect if **OK** key is pressed down within **30** seconds. If no confirmation (**OK** key) is conducted beyond **30** seconds or any other key is pressed down within **30** seconds, the password setting will be given up. The sketch of locking operation is as below:

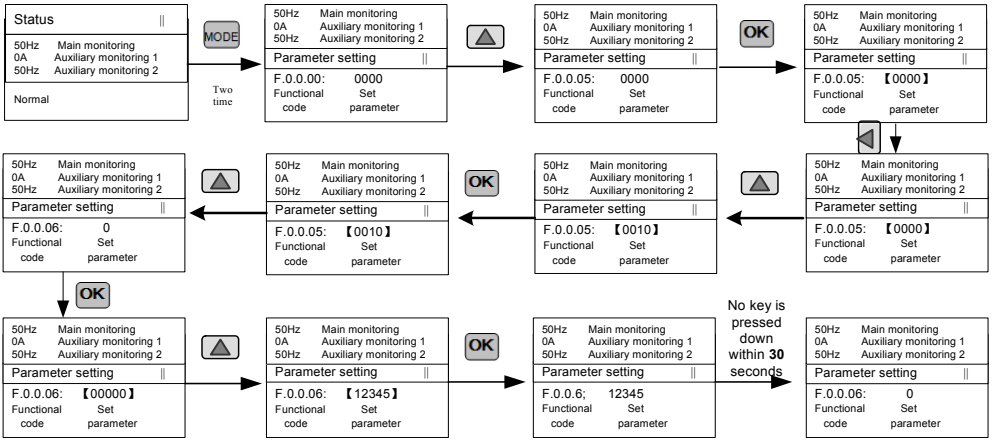


Figure 7-4 Parameter locking flow

Enter preset password and then press **OK**, and then the parameter locking status will be relieved. The sketch of unlocking operation is as below:

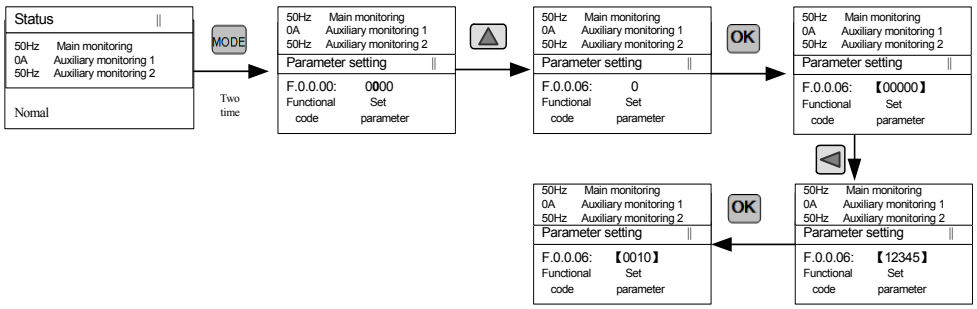


Figure 7-5 Parameter unlocking flow

F0.0.07 Parameter initialization	Setting range: 0~8	Factory default: 0

When the macro parameter **F0.0.00** is effective, the self-setting parameter relevant with the macro will not be influenced by the initialization. Refer to the function description of **F0.0.00**.

FF group parameters will not be initialized by this parameter until the kilobit of FF.0.00 parameter is set to 1.

F0.0.08 Parameter copying (H)	Setting range: 0000~0013	Factory default: 0000

The unit: Upload and download operation

0: No action

1: Parameter upload

The inverter will upload parameter values in the control board memory to the panel memory.

2: Parameter download

The parameter values in the panel memory will be downloaded to the control board memory.

3: Parameter download (except for F2 group parameters)

The parameter values in the panel memory will be downloaded to the control board memory (motor parameters will not be downloaded).

Note: When the inverter is running, the action of upload and download is forbidden, and the setting for this parameter will not take effect.

During parameter upload and download, all keys except for **STOP** key on the panel are temporarily locked. Press **STOP** key to forcedly terminate upload and download; When the unload operation is forcedly terminated, the parameters uploaded will be stored in the panel memory, and the parameters not unloaded will be kept unchanged; When the download operation is forcedly terminated, the inverter will give up all parameters already downloaded into the control board memory, and automatically restore to the values before download.

The alarm signal relevant with this parameter is as below:

aL.071 – Parameter unload failed. Uploaded parameters will be saved in the panel memory, and parameters not uploaded will be kept unchanged.

aL.072 – Uploaded parameter storage failed. The panel memory is damaged or the memory is unavailable.

aL.073 – The board memory parameters are forbidden to be weitten and can not download parameter.

aL.074 – Parameter download failed. Terminate the parameter download process, and all parameters downloaded will be automatically restored to the values before download.

aL.075 – The board memory parameters are not consistent with the frequency inverter parameters in terms of the version.

aL.076 – There are no effective parameters in the board memory.

aL.077 – Some set values among the panel parameters are out of the allowable range. Terminate the parameter download process, and all parameters downloaded will be automatically restored to the values before download.

F0.0.09 Selection of motor type and control mode (H)	Setting range: 0000~3131	Factory default: 0000

The unit: Motor type 1 selection

0: Induction asynchronous motor

1: Conical motor

2: Permanent magnet synchronous motor

Tens:Control Mode of motor 1

0: SVC (open-loop vector control) mode

The vector control operation mode without the speed sensor features low frequency, high torque, steady speed and high precision. It can precisely control the motor's speed and torque, and is often used in the occasion in which **V/F** control mode cannot meet the requirements of high-performance universal variable speed drive.

1: VC (closed-loop vector control) mode

The vector control operation mode with the speed sensor is applicable to the accusation in which the torque response is faster and the control precision of torque and speed is higher. It enables for certain precision of position control so as to achieve control over simple servo positioning in the process of dragging the asynchronous motor. When dragging the synchronous motor, high precision of position service control (optional function) can be achieved.

2: V/F control

It refers to the constant control voltage/frequency ratio. It can be used to the occasion in which the performance is not required to be very high, and is also applicable to the occasion in which single inverter drives several motors.

3: V/F separated control

It is used for special application occasions, and is also applicable to V/F separated control for torque motors. In this mode, the output voltage and output frequency of the inverter have no connection with each other, and are set separately by users.

In the case of V/F separated control, F0.2.25 is forcedly set to the frequency preset channel, and F0.2.26 is forcedly set to the voltage giving channel.

Note: This control mode cannot be used for common asynchronous motors and synchronous motors. The equipment may be damaged if this mode is mistakenly set.

Hundreds: Motor 2 type selection

0: Induction asynchronous motor

1: AC asynchronous servo motor

2: Permanent synchronous motor

It is a must to make correct setting according to the actually driven motors.

Kilobit: Control mode of motor 2

The same as the tens.

F0.0.11 Selection of panel key functions (H)	Setting range: 0000~0224	Factory default: 0000

The unit: Locking of panel keys

After the key locking function is set with this function, the locking will not take effect until **ESC** key is pressed to back to the normal control mode. For details, please refer to *5.2 Basic Functions and Operating Methods of the Panel.*

0: Not locked.

All keys are effective on the operating panel.

1: All keys except for UP/DW (shuttle), STOP and RUN are locked.

Only **UP/DW** (shuttle), **STOP** and **RUN** keys on the operating panel are effective.

2: All keys except STOP and RUN are locked.

Only the **STOP** and **RUN** keys on the operating panel are effective.

3: All keys except STOP are locked.

Only the **STOP** key on the operating panel is effective.

4: Locking all keys.

All keys are void on the operating panel.

Tens: Function of STOP key.

0: The modes other than the panel control are void.

Only when the running command channel is the operating panel is it effective to press down the **STOP** key.

1: Press STOP key in any control mode for deceleration stop.

No matter the running command preset channel is the operating panel, external terminals or the communication port, when **STOP** key is pressed, the inverter will control the motor to achieve deceleration stop according to the current effective deceleration time. The priority of this stop mode is higher than that of parameter **F0.4.38**.

2: Press STOP key in any control mode for free stop.

No matter the running command preset channel is the operating panel, external terminals or the communication port, when **STOP** key is pressed, the inverter will stop output, and the motor stop in free sliding mode. The priority of this stop mode is higher than that of parameter **F0.4.38**.

Hundreds: Function of PANEL/REMOTE keys

When the functional setting of **PANEL/REMOTE** keys is effective, and in the normal monitoring mode, the **PANEL/REMOTE** keys can be used to switch the running command channel. The switching status is not saved, and will get lost after power-off. The running command channel for the inverter is still the operating panel after power-on once again.

If **PANEL/REMOTE** keys are used to circularly switch to desired running command channel, it is required to press "**OK**" key for confirmation within **5s**. Otherwise, it will not get effective.

The switching sequence of the running command channel: Operating panel running command channel (**PANEL/REMOTE** light on**)**→external terminal operating running command channel (**PANEL/REMOTE** light off**)** → communication port running command channel (**PANEL/REMOTE** light off) → operating panel running command channel (**PANEL/REMOTE** light on**).**

0: Void

The running command channel cannot be switched with **PANEL/REMOTE** key.

1: Effective at stop

PANEL/REMOTE key is effective at the stop status, but it is void to switch the running command channel with this key when the device is running.

2: Continuous effective

PANEL/REMOTE keys can be used to switch the running command channel both at the stop and running status.

- The command channel switching at the running status of the inverter should be used carefully. Be sure the safety before operation. If the running command (FWD/REV/JOG) after switching is inconsistent with that before switching, the inverter will change its current running status (stop, run or REV), which may cause accident.

F0.0.12 Principal monitoring parameter (H)	**Setting range: d0.00~d0.55 / d1.00~d1.55**	**Factory default: d0.00**
F0.0.13 Auxiliary monitoring parameter 1 (H)	**Setting range: d0.00~d0.55 / d1.00~d1.55**	**Factory default: d0.02**
F0.0.14 Auxiliary monitoring parameter 2 (H)	**Setting range: d0.00~d0.55 / d1.00~d1.55**	**Factory default: d0.09**

This group of parameters is used to determine display contents on the operating panel at the status monitoring mode, and bitwise operation must be followed for setting.

The Principal monitoring parameter is used to determine display contents on the main display column of the **LED** panel, or the first display parameter on the **LCD** panel (signal parameter display).

The auxiliary monitoring parameter 1 is used to determine display contents on the auxiliary display column of the **LED** panel, or the second display parameter on the **LCD** panel (dual parameter display) when the inverter is running.

The auxiliary monitoring parameter 2 is used to determine display contents on the auxiliary display column of the **LED** panel, or the third display parameter on the **LCD** panel (three parameter display) when the inverter is stopped.

The corresponding physical quantity of the display data can be referred to the status monitoring parameter table. When the inverter is conducting detection of motor parameters, the auxiliary display will display the value of the current output current, which is not restricted by the parameter F0.0.13.

7.2 RUNNING COMMAND SELECTION (GROUP F0.1)

F0.1.15 Selection of running command source	**Setting range: 0, 1, 2**	**Factory default: 0**

This function defines three kinds of modes for selecting the control command source, as shown in Figure 7-7:

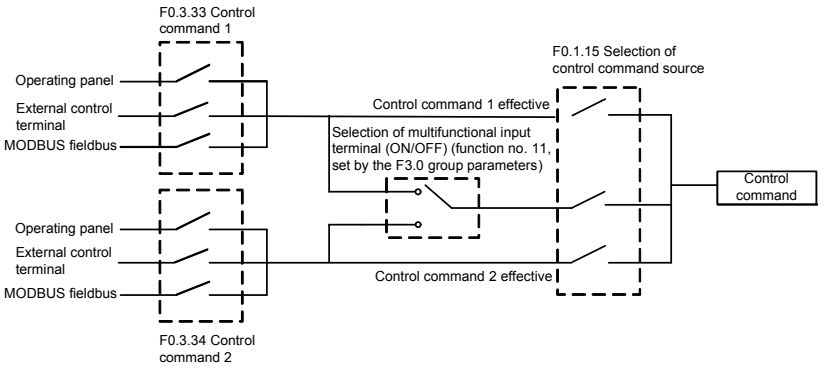


Figure 7-6 Sketch of selecting the control command sources

F0.1.16 Selection of frequency set value	**Setting range: 0~14**	**Factory default: 0**

The **A510** series inverter has two frequency setting sources (corresponding parameters **F0.2.25**, **F0.2.26).** This parameter determines **14** kinds of combined calculation methods for the two frequency setting sources. Figure 7-7 shows the structure sketch of the frequency setting channel.

The actual running direction of the inverter is the result of “XOR” between the set value direction (always being **FWD** direction for single polarity setting) and the running command direction.

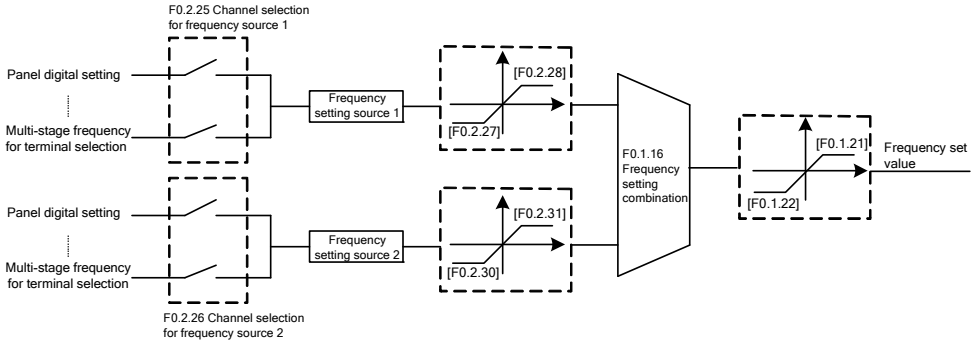


Figure 7-7 Structure sketch of frequency setting channel

0: Frequency setting source 1 is independently effective

The frequency setting source **1** is independently effective. In this case, the frequency set value is solely determined by the frequency setting source **1** and is named as the set value **1**.

1: Frequency setting source 2 is independently effective

The frequency setting source **2** is independently effective. In this case, the frequency set value is solely determined by the frequency setting source **2** and is named as the set value **2**.

2: Selection of multifunctional input terminal (Function No. 12)

The frequency setting source is selected by the functional input terminal (Function No. **12**) and the terminal function is set with **F3.0** group parameters.

3: Bound with the start-stop command channel

The selection of frequency setting source is bound with the start-stop command. In this case, the running command source is bound with the frequency setting source. That is to say, if the running command source **1** is effective, the frequency setting source **1** is also effective; And if the running command source **2** is effective, the frequency setting source **2** is effective as well.

4: Frequency setting source 1+frequency setting source 2

Frequency set value = set value **1** + set value **2**

The frequency combination curves under different status are shown as below:

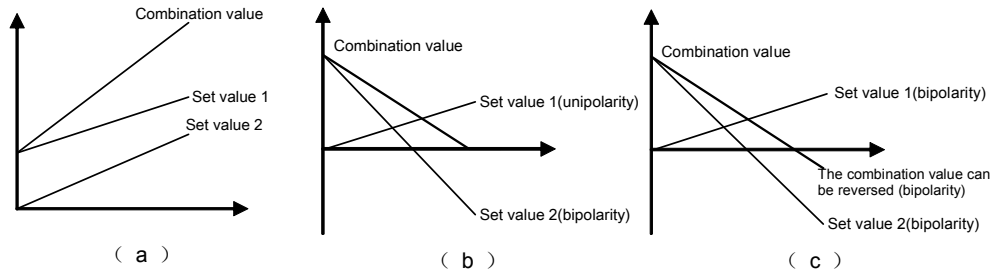


Figure 7-8-A Frequency combination sketch 1

- The combination result will only be in bipolarity when only two setting sources are set in bipolarity way. (Figure c)

5: Frequency setting source 1* (1+frequency setting source 2/frequency setting source 2 maximum value)

Frequency set value = set value **1*** (**1**+set value **2** /[**F0.2.31**])

The sketch of frequency combination setting is shown as below:

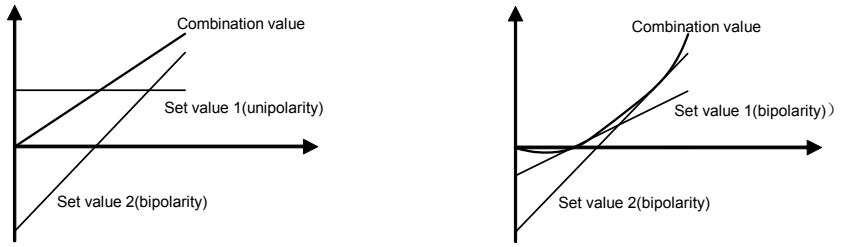


Figure 7-8-B Frequency combination sketch 2

- The combination results will only be in bipolarity when the setting source **1** is set in bipolarity way. (Figure b)

6: Frequency setting source 1-frequency setting source 2

Frequency set value = setting **1** - set value **2**

The sketch of frequency combination setting is shown as below:

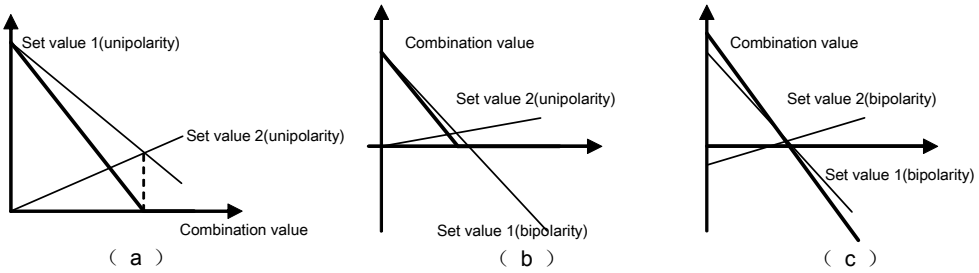
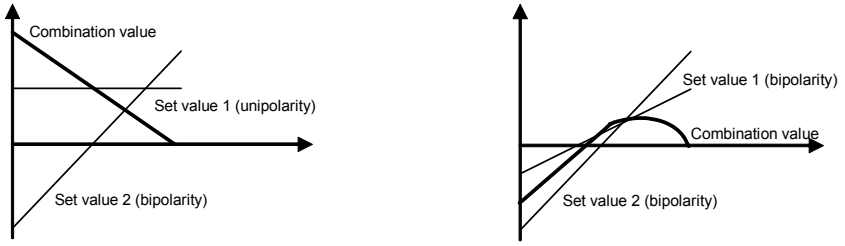


Figure 7-8-C Frequency combination sketch 3

- The combination result will only be in bipolarity when only two setting sources are set in bipolarity way. (Figure c)

7: Frequency setting source 1* (1-frequency setting source 2/frequency setting source 2 maximum value)

Frequency set value = set value **1*** (**1**-set value **2** /[**F0.2.31**])



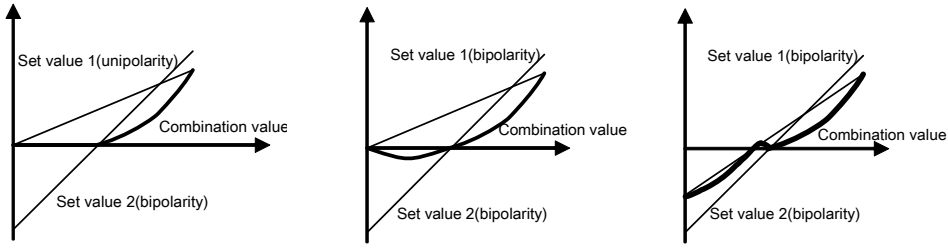
（ a ） （ b ）

Figure 7-8-D Frequency combination sketch 4

- The combination results will only be in bipolarity when the setting source 1 is set in bipolarity way. (Figure b)

8: Frequency setting source 1* frequency setting source 2/frequency setting source 2 maximum value)

Frequency set value = set value **1** * set value **2** /[**F0.2.31**]



（ a ） （ b ） （ c ）

Figure 7-8-E Frequency combination sketch 5

- The combination results will only be in bipolarity when the setting source 1 is set in bipolarity way. (Figure c)

9: Max (|frequency setting source 1|, |frequency setting source 2|)

Frequency set value = **Max** (|set value **1**|，|set value **2**|)

The maximum value between the absolute values of set value **1** and set value **2** is taken as the frequency set value, and the combination value must be unipolar.

10: Min (|frequency setting source 1|, |frequency setting source 2|)

Frequency set value = **Min** (|set value **1**|，|set value **2**|)

The minimum value between the absolute values of set value **1** and set value **2** is taken as the frequency set value, and the combination value must be unipolar.

11: Sqrt |frequency setting source 1|+sqrt|frequency setting source 2|

Frequency set value = sqrt |set value **1**|+sqrt|set value **2**|

The frequency set value is the total of the square root of the absolute value of set value **1** and set value **2**, and the combination value must be unipolar.

12: Sqrt (frequency setting source 1+frequency setting source 2)

Frequency set value = **Sqrt |**set value **1+**set value **2|**

The frequency set value is square root of the absolute value of the total of set value **1** and set value **2**, and the combination value must be unipolar.

13: Frequency setting source **1*coefficient 1**+frequency setting source **2** *coefficient **2**

Frequency set value=set value **1***[**F0.1.18**]**+**set value **2***[**F0.1.19**]

Only when the two setting channels are both in the mode of bipolar setting, the combination results will show the characteristics of the bipolar setting.

14: Frequency set value=frequency setting source **1*coefficient 1-**frequency setting source **2** *coefficient **2**

Set value **1***[**F0.1.18**]**-** set value **2***[**F0.1.19**] Only when the two setting channels are both in the mode of bipolar setting, the combination results will show the characteristics of the bipolar setting.

Remarks: after selecting the combination way of the frequency set value, the following aspects must be considered in order to get correct frequency set value:

①. To set **F0.2.25** (channel selection for the frequency setting source **1**) and **F0.2.26** (channel selection for the frequency setting source **2**) to determine the given channel of the frequency setting source;

②. To set **F0.1.18** (action coefficient of the frequency setting source **1**) and **F0.1.19** (action coefficient of the frequency setting source **2**) to determine the weighting coefficient of the frequency setting source;

③. To Set **F0.2.27** (minimum set value of frequency source **1**) and **F0.2.28** (maximum set value of frequency source **1**) to limit the range of frequency set value of the frequency source **1**, and to set **F0.2.30** (minimum set value of frequency source **2**) and **F0.2.31** (maximum set value of frequency source **2**) to limit the range of frequency set value of the frequency source **2**;

④. To set **F0.1.21** (upper limiting frequency) and **F0.1.22** (lower limiting frequency) to limit the range of the frequency set value.

F0.1.17 Running direction(H)	Setting range: 0000~0021	Factory default: 0000

The unit: Direction switching

0: Void The running direction is controlled by the direction command.

1: Negate The running direction is opposite to that directed by the direction command

Tens: Direction locking

0: Void The running direction is controlled by the direction command.

1: FWD locking

The motor will run in **FWD** direction no matter the **FWD** running command or **REV** running command is given.

2: REV locking

The motor will run in **REV** direction no matter the **FWD** running command or **REV** running command is given.

- The function of “Direction locking” (Tens) has precedence over the function of “Direction switching” (The unit).
- It can be set when the inverter is running. Be sure that the operation is safe.

F0.1.20 Maximum output frequency	**Setting range: 10.00~320.00Hz**	**Factory default: 60.00**
F0.1.21 Upper limiting frequency	**Setting range: [F0.1.22]~Min (300.00Hz,[F0.1.20])**	**Factory default: 50.00**
F0.1.22 Lower limiting frequency	**Setting range: 0.0Hz~[F0.1.21]**	**Factory default: 0.0**

The maximum output frequency is the allowable output maximum frequency of the inverter as set by users (maximum stator synchronous frequency of the asynchronous motor); the upper limiting frequency is the maximum frequency allowed for running of the asynchronous motor as set by users (the maximum frequency corresponding to the mechanical rotor of the asynchronous motor).The maximum output frequency must be higher than the upper limiting frequency; the lower limiting frequency is the minimum frequency allowed for running of the motor as set by users.

The maximum output frequency, upper limiting frequency and lower limiting frequency shall carefully set according to the actual nameplate parameters and operating status of the controlled motor and. The relationship among the three kinds of frequency is shown in Figure 7-9.

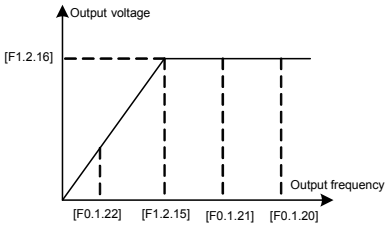


Figure 7-9 Frequency parameter definition sketch

- [F1.2.15] in Figure 7-7 represents the motor's reference frequency, and [F1.2.16] represents the motor's reference voltage.

7

F0.1.23 FWD jog frequency	**Setting range: 0.0Hz~[F0.1.21]**	**Factory default:10.00**
F0.1.24 REV jog frequency	**Setting range: 0.0Hz~[F0.1.21]**	**Factory default:10.00**

Jog running is a special running mode of the inverter. No matter the inverter is initially stopped or running, as long as the jog command is inputted, the inverter will transit to the jog frequency according to the preset jog acceleration and deceleration time. However, it is also influenced by the startup frequency and startup frequency duration as well as the functions of DC band-type braking, startup delay and startup pre-excitation.

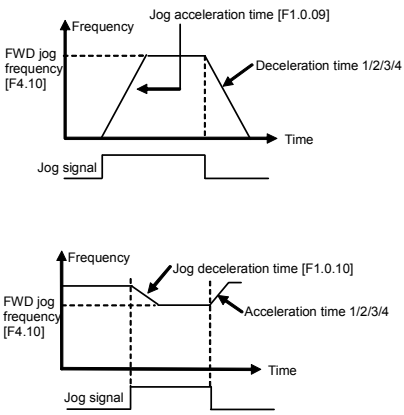


Figure 7-10 FWD jog running curve

7.3 FREQUENCY SETUP (GROUP F0.2)

F0.2.25 Frequency setting source 1	**Setting range: 00~31**	**Factory default: 2**
F0.2.26 Frequency setting source 2	**Setting range: 00~31**	**Factory default: 0**

The frequency set value determined via the frequency setting source **1** is named as the set value **1**; And the frequency set value determined via the frequency setting source **2** is named as the set value **2**.

0: Panel digital setting (maintained after stop)

The frequency set value is determined by the value of the parameter **F0.2.29** (or **F0.3.32**). In the normal monitoring mode, it is applicable to make direct modification with the ▲ and ▼ keys (or shuttle) on the panel. If the modified values has not be saved it will get lost power-on.

1: Panel digital setting (zero clearing after stop)

Similar to the case of "0" as above, the inverter will automatically clear current set value after stop.

2: Panel digital setting (maintained after stop and saved after power-off)

Similar to the case of "**0,1**" as above, the inverter will automatically save the current set value after power-off, and take the saved value as the initial set value after power-on once again.

3: Setting of panel shuttle potentiometer

Its function is equivalent to the high-precision panel potentiometer. The set resolution is the minimum quantitative value (e.g. **0.01 Hz**), and data are saved in the internal memory of the panel.

4: Terminal UP/DW setting (maintained after stop)

Multifunctional terminals are used to directly increase, decrease (Function No. **15**, **16**) or clear (Function No. **17**) the set frequency. The terminal function is selected by parameters **F3.0.00 ~ F3.0.08.**The set data will not be saved and will get lost after power-off.

The relationship between the status setting combination of the three external switches and the current frequency set value of the inverter is shown in **Table 7-2**.

Preconditions for below instruction: multifunctional terminal **DI1** frequency or process **PID** setting **UP** function ([**F3.0.00**]=**15**), **DI2 sets frequency or process PID DW** function ([**F3.0.01**]=**16**), and **DI5** sets **UP/DW** with frequency clear function ([**F3.0.04**]=**17**).

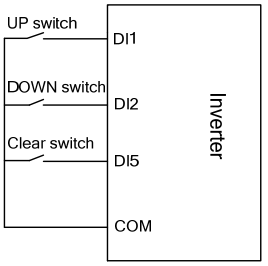


Figure 7-11 Terminal UP/DW wiring sketch

Table 7-2 External Switch Status and Current Frequency Set Value of the Inverter

Terminal Status			Set frequency
DI5	**DI2**	**DI1**	
OFF	**OFF**	**OFF**	Maintained
OFF	**OFF**	**ON**	Increased
OFF	**ON**	**OFF**	Deceased
OFF	**ON**	**ON**	Maintained
ON	Any	Any	Zero

5: Terminal UP/DW setting (maintained after stop)

Similar to the case of "**4**" as above, the inverter will automatically clear current set value after stop.

6: Terminal UP/DW setting (maintained after stop and saved after power-off)

Similar to the case of "**4**" as above, the set value will be saved automatically after power-off, and the initial set data will be the set value at the last power-off when the inverter is powered on once again.

7: Terminal UP/DW two-way setting (maintained in bipolar mode after stop)

The basic operation is slimier to that as stated in "the" and the difference is that: in the mode of "**4**", the set frequency is unsigned values (not containing direction information), and the setting range of the frequency is: **0**~upper limiting frequency; while in the mode of "**7**", the set frequency is signed values (containing direction changing information), and the setting range of the frequency is: - upper limiting frequency upper limiting frequency.

The inverter's actual running direction is according to "XOR" calculation of the command direction (**FWD**, **REV**) and the set frequency direction.

8: Terminal UP/DW two-way setting (maintained in bipolar mode after stop and saved after power-off)

The basic operation is similar to the case of "**7**" as above. The set value will be saved automatically after power-off, and the initial set data will be the set value at the last power-off when the inverter is powered on once again.

9: Analog input AI1

The frequency set value is given via the analog input **AI1**; For relevant characteristics please see the instructions of the parameters **F4.0.00** and **F4.0.01**.

10: Analog input AI2

The frequency set value is given via the analog input **AI2**; For relevant characteristics please see the instructions of the parameters **F4.0.02** and **F4.0.03**.

11: Analog input AI3

The frequency set value is given via the analog input **AI3**; For relevant characteristics please see the instructions of the parameters **F4.0.04** and **F4.0.05**.

12: Given by the analog input AI1 bipolarity

The frequency set value is given by the bipolarity of the analog **AI1** (**[F4.0.00] ~ [F4.0.01]**), and AI1 contains the direction changing information. For relevant characteristics please see the instructions of the parameters **F4.0.00** and **F4.0.01.**

13: Given by the analog input AI3 bipolarity

The frequency set value is given by the bipolarity of the analog **AI3** (**[F4.0.04]~[F4.0.05]**), and AI3 contains the direction changing information. For relevant characteristics please see the instructions of the parameters **F4.0.04** and **F4.0.05**.

14: Pulse input Fin

The frequency set value is given by the pulse input **Fin**.

15: Given by the pulse input bipolarity

The frequency set value is given by the pulse input Fin bipolarity, and the pulse signal contains the direction changing information.

16: MODBUS fieldbus set value 1 (relative set value)

The frequency set value is given by the principal computer through **MODBUS** fieldbus (**RS485** communication port), and the set value (-**10000** ~ **10000**) is relative data and is corresponding to the upper limiting frequency.

17: MODBUS fieldbus set value 2 (absolute set value)

The frequency set value is given by the principal computer through **MODBUS** fieldbus (**RS485** communication port), and the set value (-**30000** ~ **30000**) is absolute value neglecting the decimal point) (e.g. the value **1500** corresponds to the set frequency **150.00Hz**.

18: AI1+AI2

The frequency set value = the frequency value corresponding to the analog input **AI1 +** the frequency value corresponding to the analog input **AI2**

19: AI2+AI3

The frequency set value = the frequency value corresponding to the analog input **AI2 +** the frequency value corresponding to the analog input **AI3**

20: AI2+pulse input Fin

The frequency set value = the frequency value corresponding to the analog input **AI2 +** the frequency value corresponding to the pulse input **Fin**

21: AI1*AI2/rail-to-rail input (10V)

The frequency set value = the frequency value corresponding to **AI1 ***the frequency value corresponding to **AI2**/the frequency corresponding to the maximum input of **AI2.**

22: AI1/AI2

The frequency set value= the frequency value corresponding to **AI1/**the frequency value corresponding to **AI2.**

23: Process PID output

The frequency set value is given by the process **PID** output. This option is mainly for the system in which the **PID** running output needs to be combined with other setting channel for running. In general running system, this value does not need to be selected. **PID** output will automatically participate in setting competition according to the frequency setting priority.

24: Compensation PID output

The frequency set value is given by the compensation **PID** output. This option is mainly for the system in which compensation **PID** running output needs to be combined with other setting channel for running. In general running system, this value does not need to be selected. The compensation **PID** output will automatically participate in setting competition according to the frequency setting priority.

25: Disturbance running frequency

The frequency set value is given by the disturbance running frequency. This option is mainly for the system in which the disturbance running output needs to be combined with other setting channel for running. In general running system, this value does not need to be selected. The disturbance output will automatically participate in setting competition according to the frequency setting priority.

26: Automatic multi-sage running frequency

The frequency set value is given by the multi-stage running frequency. This option is mainly for the system in which the multi-stage running output needs to be combined with other setting channel for running. In general running system, this value does not need to be selected. The multi-stage running output will automatically participate in setting competition according to the frequency setting priority.

27: Terminal selection multi-stage frequency

The frequency set value is determined by the combination status of the four multifunctional input terminals (function no. **1**, **2**, **3**, **4),** and the terminal function is set by the parameters **F3.0.00~F3.0.08.**This way allows for multi-stage frequency running.

28: Virtual analog input SAI1

29: Virtual analog input SAI2

The frequency setting source and set value are determined by the virtual input parameter Group **F4.4.50** ~ **F4.4.54**.

30: Extended address bus setting value 1 (set)

31: Extended address bus setting value 2 (absolute setting)

When the V/F separation of control, **F0.2.25** changes to a given channel frequency, **F0.2.26** changes to a given voltage channels..

F0.2.27 Minimum value of frequency setting source 1	**Setting range: 0.0Hz~[F0.2.28]**	**Factory default: 0.0**
F0.2.28 Maximum value of frequency setting source 1	**Setting range: [F0.2.27]~[F0.1.21]**	**Factory default: 50.00**
F0.2.30 Minimum value of frequency setting source 2	**Setting range: 0.0Hz~[F0.2.31]**	**Factory default: 0.0**
F0.2.31 Maximum value of frequency setting source 2	**Setting range: [F0.2.30]~[F0.1.21]**	**Factory default: 50.00**

This group of parameters confines the range of frequency allowed to be set for two frequency setting sources.

F0.2.29 Panel digital set value of frequency setting source 1	**Setting range: 0.0Hz~[F0.2.28]**	**Factory default: 0.0**
F0.2.32 Panel digital set value of frequency setting source 2	**Setting range: 0.0Hz~[F0.2.30]**	**Factory default: 0.0**

The frequency command value at the time of panel digital setting can be directly modified with the ▲, ▼ keys **(**or **shuttle)** on the panel in the normal monitoring mode, and the set frequency can be also modified by means of parameter modification.

7.4 CONTROL COMMAND SOURCE (GROUP F0.3)

F0.3.33 Control command 1	**Setting range: 0~3**	**Factory default: 0**
F0.3.34 Control command 2	**Setting range: 0~3**	**Factory default: 0**

To select the input physical channel of the inverter control commands (start, stop, forward, reverse, jog and reset, etc).

0: Operating panel

The running control command is given via the operating panel. Please see Chapter **5** for the use of the operating panel.

1: External control terminal

The running control command is given via external control commands, and the terminal function is set by the parameter **F3.0.**

2: MODBUS fieldbus/standard expansion card configuration

The running control command is given via MODBUS fieldbus.

3: Expansion communication module

The operation command is specified through the expansion communication mode.

F0.3.35 External control terminal action mode(H)	**Setting range: 0000~0013**	**Factory default: 0000**

The unit: Control command action mode

Preconditions for below instructions: the multifunctional terminal DI3 is for FWD command function ([F3.0.02]=7), DI4 is for REV function ([F3.0.03]=8), and DI5 is for three-line running control function ([F3.0.04]=19).

0: Two-line mode 1

DI4	DI3	Running command
OFF	**OFF**	Stop
OFF	**ON**	FWD
ON	**OFF**	REV
ON	**ON**	Stop

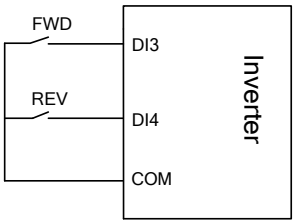


Figure 7-12-A Two-Line running mode 1

1: Two-line mode 2

DI4	DI3	Running command
OFF	**OFF**	Stop
OFF	**ON**	FWD
ON	**OFF**	Stop
ON	**ON**	REV

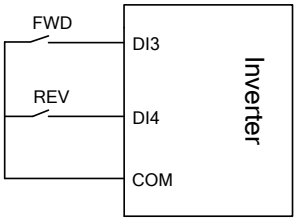


Figure 7-12-B Two-line running mode 2

2: Three-line mode 1

When **K0** is engaged, **FWD** and **REV** control is effective; and when **K0** is unengaged, **FWD** and **REV** control is void, and the inverter will stop.

DI3 terminal ascending edge indicates **FWD** running command and **DI4** terminal ascending edge indicates **REV** running command, as shown in Figure 7-13-A.

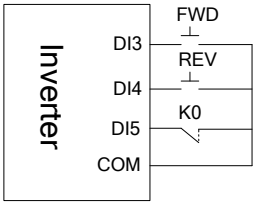


Figure 7-13-A Three-line running mode 1

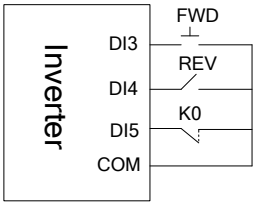


Figure 7-13-B Three-line running mode 2

3: Three-line mode 2

When **K0** is engaged, **FWD** and **REV** control is effective; and when **K0** is unengaged, **FWD** and **REV** control is void, and the inverter will stop.

DI3 terminal ascending edge indicates running command; **DI4** terminal disconnection indicates **FWD** running command, and **DI4** terminal engagement indicates **REV** running command, as shown in Figure 7-13-B.

Tens: Control command power-on initial start mode

0: Running signal level starting

1: Running signal rising edge starting

Note: The signal given by two-line mode running command is level signal, and when the terminal is at effective status, the inverter will automatically start after power-on. And in the system in which power-on auto start is not expected, it is applicable to select the way of rising edge start.

7.5 START AND STOP (GROUP F0.4)

F0.4.37 Start/Running permission(H)	Setting range: 0000~1303	Factory default: 0000

The unit: Start permission

0: Function closed

The inverter can start without start permission signal.

1: Permitted when the multifunctional terminal is effective

The inverter will not start until it is defined that the multifunctional input terminal (Group **F3.0)** of the start permission (Function No. 42) is continuously effective; start is forbidden when it is void, and the inverter which is running will stop freely (alarm code: **aL.031**). The inverter will not start again until the rising edge of the starting signal is detected.

2: Command word from standard fieldbus (effective when standard expansion card is equipped)

The start permission signal is from the bus command word.

3: Command word from expansion communication module

The start permission signal is from the expansion communication module command word.

Hundreds: Running permission

0: Function closed

The inverter can run without running permission signal.

1: Permitted when the multifunctional terminal is effective (Function No. 43)

The inverter will not start until the multifunctional input terminal (Group **F3.0**) which is defined to be running permissible (Function No. **43**) is effective; if it is void, the inverter will stop in the way defined by the kilometer of this parameter, and will then automatically run again after signal recovery.

2: Command word from standard fieldbus (effective when standard expansion card is equipped)

The start permission signal is from the bus command word.

3: Command word from expansion communication module

The start permission signal is from the expansion communication module command word.

Kilobit: The action mode when the running permission signal is void

0: Free stop

The inverter stops outputting, and the motor stops freely.

1: Deceleration stop

The inverter will stop at deceleration mode according to preset deceleration time.

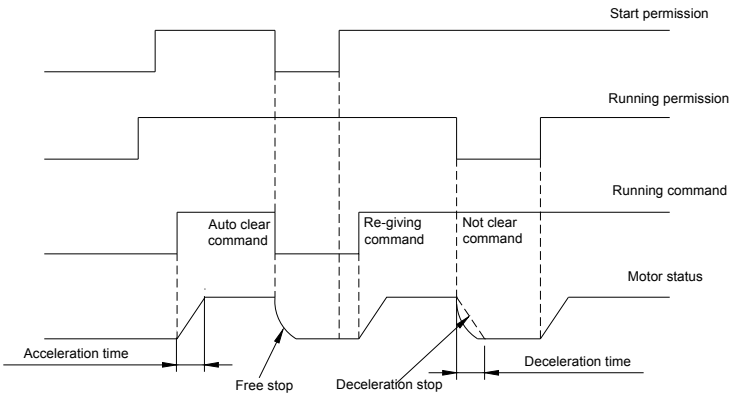


Figure 7-14 Schematic diagram of start process

F0.4.38 Start/Stop Mode (H)	Setting range: 0000~0101	Factory default: 0000

The unit: Start mode

0: Normal start

There are no special requirements for most load start mode. Normal start mode will be adopted.

1: Revolution tracking start

It is applicable to the occasion of fault resetting and restart and restart after power-off. The inverter will automatically judge the running speed and direction of the motor, and starts the rotating motor in a smooth and impact-free way according to the detection and judge results; see below figure for the revolution tracking start sketch.

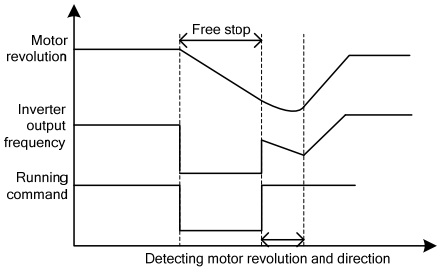


Figure 7-15 Revolution tracking start sketch

Hundreds: Stop mode

0: Deceleration stop

In the case of deceleration stop, the inverter will gradually reduce the output frequency according to the preset deceleration time until it stops.

1: Free stop

At stop, the inverter outputs zero frequency and clocks output signals, and the motor will stop in a free sliding way according to inertia.

At free stop, if it is needed to restart the motor before the motor stops running completely, it is necessary to appropriately configure the revolution tracking start function; otherwise, it will leads to overcurrent or overvoltage fault protection.

If the motor has not stopped completely in deceleration way, because of high load inertia of the field work and short deceleration time, it is then applicable to start DC band-type braking control. See the instructions of the parameter **F0.4.44** for details.

F0.4.39 Start frequency	**Setting range: 0.0Hz~50.00Hz**	**Factory default: 0.50**
F0.4.40 Start frequency holding time	**Setting range: 0.00~10.00Sec.**	**Factory default: 0.0**

The start frequency means the initial frequency when the inverter starts up, and is not limited by the lower limiting frequency **F0.1.22.**

The start frequency holding time means the duration of operation at the start frequency, and can be set according to actual needs. When it is set to **0**, the start frequency is void.

For the system with high inertia, heavy load and high requirement of start torque, the start frequency can effectively overcome the difficult of start, and the start frequency is also effective in each acceleration process when the inverter switches between forward and reverse running.

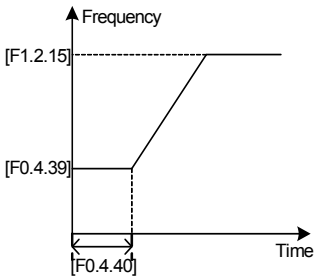


Figure 7-16 Start frequency sketch

F0.4.41 Start pre-excitation current	Setting range: 0.0~100%	Factory default: 35.0
F0.4.42 Start pre-excitation time	Setting range: 0.00~10.00Sec.	Factory default: 0.10

It costs some time to develop air gap flux for asynchronous motor (approaching to the constant of the rotor time). When it is at stop status before the motor is started, in order to get enough start torque, it is a must to develop the air gap flux. Therefore, it is needed to start pre-excitation for the asynchronous motor. See Figure 7-18 for the pre-excitation process.

The set value of start pre-excitation current is the percentage with respect to the inverter rated output current.

The start pre-excitation time means the duration in which the inverter inputs start pre-excitation current for the motor.

- When the rated current of the adapter motor differs greatly from the rated current of the inverter, please carefully set the pre-excitation current (**F0.4.41),** as excessive setting may damage the motor.

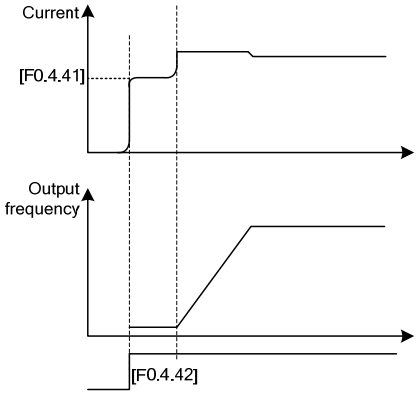


Figure 7-17 Start pre-excitation output

F0.4.43 Start delay	Setting range: 0.00~100.00Sec.	Factory default: 0.0

Start delay means the waiting time before the inverter starts after receiving the running command.

F0.4.44 DC band-type brake control	Setting range: 0000~0001	Factory default: 0

The unit: DC band-type brake control

The DC band-type brake means to lead DC current into the motor rotor so as to generate braking torque. The DC band-type braking function cannot be used when synchronous motor is driven.

When both the set value and the actual speed of the motor has decreased below [**F0.4.45**], the inverter will stop generating sine current but will inject direct current to the motor, and the current value is to be set by the parameter [**F0.4.47**]. When the given speed or the motor speed has surpassed the parameter [**F0.4.45**], the inverter will stop DC power supply and restore to the normal running status.If it is started, the permission signal will be disconnected, and the DC band-type brake will be void.

The DC band-type braking function does not work when matching the permanent synchronous motor.

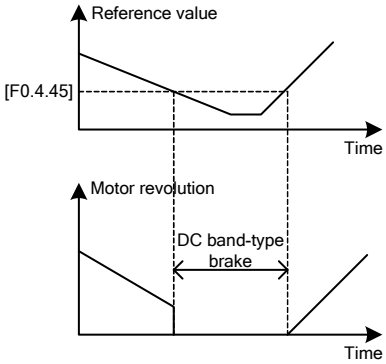


Figure 7-18 DC band-type brake sketch

- Injecting current to the moor may lead over-temperature of the motor. In the circumstances where long-time DC band-type brake is needed, forced air-cooling motor should be used. During the long time of band-type braking, if there is constant load in the motor band-type brake, DC band-type brake will not guarantee that the motor shaft will not rotate.

F0.4.45 DC band type brake / brake initial frequency/speed	Setting range: 0.0Hz~[F0.1.21]	Factory default: 2.00

In the deceleration and stop process of the inverter, when the output frequency is lower than the DC band-type brake/brake start frequency/speed, the DC band-type brake/brake function will be started.

F0.4.46 DC brake action time	Setting range: 0.00~10.00Sec.	Factory default: 0.0
F0.4.47 DC band-type brake / brake injection current	Setting range: 0.0~100%	Factory default: 50.0

The DC brake time is the duration of the output DC braking current. If it is selected that the external terminal stop DC braking is effective, the parameter of DC braking action time will be void.

The DC band-tape brake/brake injection current means the brake current outputted at the time of inverter DC band-type brake/brake. Its set value is the percentage with respect to the rated current. The DC band-type braking function does not work when matching the permanent synchronous motor.

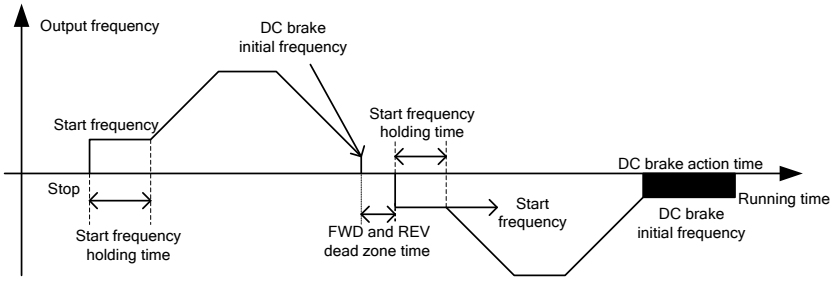


Figure 7-19 Stop DC brake sketch

F0.4.48 Restart after power-off	Setting range: 0, 1	Factory default: 0

It is mainly for the trigger starting modes including “panel control, bus control and three-line control”. If the function of restart after power-off is set to be effective, when the inverter is powered off, the running command/status before power-off will be automatically saved, and it will automatically restore to the running status before power-off after the waiting time after power-on again.

In case of the restart after power-off, it will resume running in the mode of restart at detected speed.

F0.4.49 Standby time for restart after power-off/free stop	Setting range: 0.1~10.0Sec.	Factory default: 0.5

It means the time of waiting status before the inverter automatically executes the function of restart after power-off.

F0.4.50 Forward and reverse transition dead time	Setting range: 0.00~5.00Sec.	Factory default: 0.0

The forward and reverse transition dead time is used to set the waiting time for **t**he motor to shift from **FWD to REV** or from **REV** to **FWD.** This function is used to overcome reversal current compact caused by mechanical dead zone, as shown in Figure 7-21.

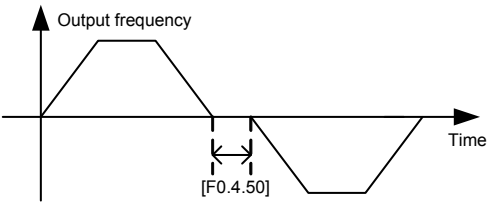


Figure 7-20 FWD and REV transition dead zone sketch

F0.4.51 Forward and reverse switch mode	Setting range: 0, 1	Factory default: 0

0: Switch at zero point

To switch between **FWD** and **REV** at the zero point.

1: Start frequency switch

To switch between the **FWD** and **REV** at the start frequency. See the following figure:

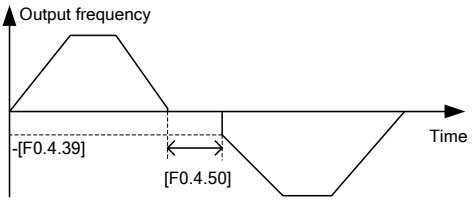


Figure 7-21 Sketch of start frequency FWD and REV switching

F0.4.52 Zero speed (frequency) detection level	Setting range: 0.00~100.00Hz	Factory default: 0.10 Hz
F0.4.53 Zero speed delay time	Setting range: 0.00~10.00Sec.	Factory default: 0.05

When the inverter output frequency is lowered to zero, it will immediately lock the output. At this time, the

motor revolution may not at zero, but the motor is completely at the free stop status, and will slide to stop.

Within the delay time, when the inverter output frequency is lower than the zero speed (frequency) detected level [**F0.4.52**], within the zero speed delay time [**F0.4.53**], the inverter will keep working and output a DC current, and the motor will keep excitation. The inverter may rapidly restart at any time.

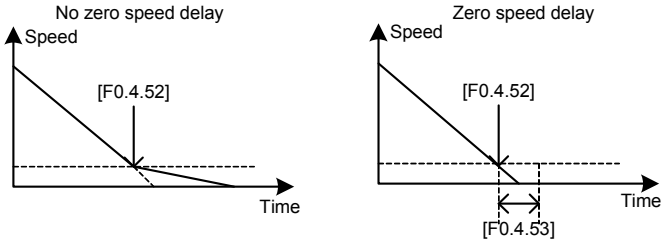


Figure 7-22 Comparison diagram when with or without zero speed delay

F0.4.54 Emergency stop mode (EMS)	Setting range: 0, 1	Factory default: 0

This parameter defines the stop mode after the inverter has received an emergency command (Function No. **14**, to be set by the Group **F3.0** parameters).

7.6 ACCELERATION AND DECELERATION CHARACTERISTICS (GROUP F1.0)

F1.0.00 Acceleration and decelera -tion characteristics parameters	Setting range: 0000~0011	Factory default: 0000

The unit: Acceleration and deceleration mode

0: Liner acceleration and deceleration

The output frequency of the inverter increases or decreases according to fixed speed. The output frequency has liner relationship with the acceleration and deceleration time, and steadily increases or decreases according to constant gradient.

1: S curve acceleration and deceleration

The output frequency of the inverter increases or decreases according to grading speed, and the characteristics of **S** curve is determined by the parameter **[F1.0.01]** and **[F1.0.02]**. This function is mainly to reduce noise and ventilation during acceleration and deceleration, and decrease impact of the starting and stop load. When the load inertia is excessive, leading to overload fault during deceleration, it can be improved by adjusting the parameter setting (**[F1.0.01] and [F1.0.02])** of **S** deceleration curve, so as to reasonably adjust the deceleration rate at different frequency.

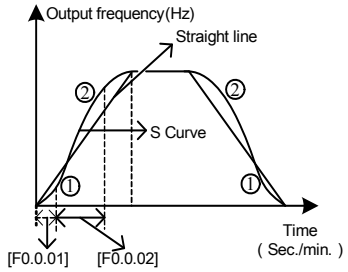


Figure 7-23 Acceleration and deceleration curve

Tens: Unit of acceleration and deceleration time

0: Sec. (Second**)**

The acceleration and deceleration time is in the unit of second, and is at factory default value.

1: Min. (Minute**)**

The acceleration and deceleration time is in the unit of minute.

F1.0.01 Time ratio of S curve acceleration starting/deceleration ending period	**Setting range: 5.0~100.0-[F1.0.02]**	**Factory default: 15.0**
F1.0.02 Time ratio of S curve acceleration rising/deceleration decreasing period	**Setting range: 20.0~100.0-[F1.0.01]**	**Factory default: 70.0**

Define the curve parameters of acceleration and deceleration of **S** curve.

As shown in item

①.In Figure 7-24, the acceleration starting/deceleration ending period of **S** curve is indicated by the percentage of the total acceleration and decoration time.

As shown in item

②. In Figure 7-24, the acceleration rising/deceleration decreasing period of **S** curve is indicated by the percentage of the total acceleration and decoration time.

F1.0.03~F1.0.08 Acceleration/deceleration time 1/2/3	**Setting range: 0.01~600.00**	**Factory default: ☆**
F1.0.09 Acceleration 4/jog acceleration time	**Setting range: 0.01~600.00**	**Factory default: ☆**
F1.0.10 Deceleration 4/jog deceleration time	**Setting range: 0.01~600.00**	**Factory default: ☆**

The acceleration time means the time required for the inverter to accelerate from **0.00Hz** to maximum output frequency [**F0.1.20**].

The deceleration time means the time required for the inverter to decelerate from the maximum output frequency [**F0.1.20**] to **0.00Hz**.

A510 series inverters are defined with **4** kinds of acceleration/deceleration time. The acceleration/ deceleration time **1~4** during the running process of the inverter can be selected through different combinations of external terminals. During simple PLC running, it is also applicable to use them as the acceleration and deceleration time at the time of switching among different running frequency at each stage. See instructions of **F6.1** group parameters for detail.

The acceleration/deceleration time 4/jog acceleration/deceleration time are also used as the acceleration and declaration running time at the status of jog running. The jog frequency has the highest priority. At any state, the inverter will immediately transit to the jog frequency running state according to the preset jog acceleration and deceleration time as long as the jog command is inputted. (See the instructions of the functional parameter **F0.1.23** and **F0.1.24**) the unit (Sec., min.) of the acceleration and deceleration time is determined by the tens' digit of the parameter **F1.0.11**.

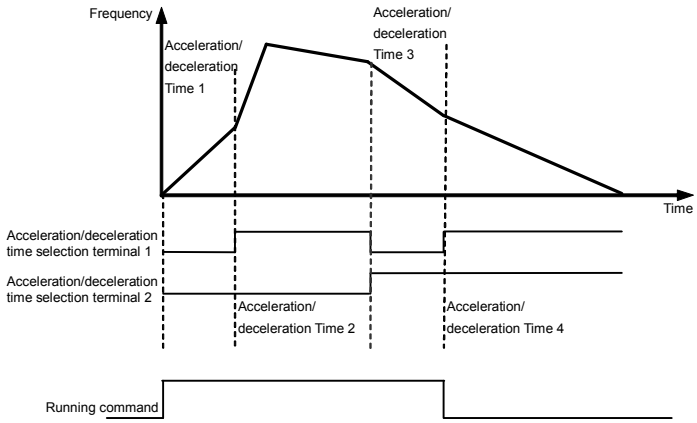


Figure 7-24 External terminal selection mode for acceleration and deceleration time

F1.0.11 EMS emergency stop and deceleration time	Setting range: 0.01~600.00	Factory default: ☆

The time for decelerating from the maximum output frequency [**F0.1.20**] to the zero frequency will only function when the inverter stops in deceleration way (**F0.4.54** is set to **0**) after receiving **EMS** emergency stop command (Function No. **14**).

7.7 CARRIER FREQUENCY (GROUP F1.1)

F1.1.13 Carrier frequency	Setting range: 1.5~15.0KHz	Factory default: ☆

It is the switch frequency determining the inverter's internal power module. The allowable maximum carrier frequency is relevant with the inverter model. The carrier frequency mainly influences the audio noise and heat effect during running. When mute running is required, it is applicable to appropriately increase the value of the carrier frequency, but the maximum load allowable for the inverter may be somewhat reduced, accompanied by somewhat increase of interference of the inverter to the outside world. For the circumstances where the motor wire is too long, it may lead to leaking current between motor wires and between the wire and the ground. When the ambient temperature is too high and the motor load is too high, or the inverter is failed due to above reasons, it is suggested to appropriately decrease the carrier frequency to improve thermal characteristics of the inverter.

F1.1.14 Carrier characteristics	Setting range: 0000~2111	Factory default: 0111

This parameter is used to set some characteristics relevant with the carrier (binary system setting), and usually needs not be modified.

The unit: Load linkage adjustment

When this function is effective, if the load current is excessive, the carrier frequency will be automatically decreased in order to ensure safe running of the inverter.

Tens: Temperature linkage adjustment

When this function is effective, the inverter will automatically decrease the carrier frequency if the ambient temperature is too high.

Hundreds: Reference frequency linkage adjustment

The inverter will appropriately decrease the carrier frequency if the output frequency is too low.

Kilobit: Modulation mode

0: Asynchronous modulation – It is application to most applicaitons with the outout below 300Hz.

1: Synchronous modulation –The carrier frquency and base frequency keep constant ratio.

2~5: Noise smoothing – When this function is effective, the inverter will automatically adjust carrier frequency to smooth audio noise.

7.8 V/F PARAMETERS AND OVERLOAD PROTECTION (MOTOR 1) (GROUP F1.2)

F1.2.15 Reference frequency of motor 1	**Setting range: 5.00~300.00Hz**	**Factory default: 50.00**
F1.2.16 Reference voltage of motor 1	**Setting range: 50~500V**	**Factory default: 380/220**

The reference frequency means the minimum frequency when the inverter outputs the maximum voltage, and generally is rated frequency of the motor.

The reference voltage means the output voltage when the inverter outputs the reference frequency, and generally is rated voltage of the motor.

This group of parameters is set according to the motor's parameters, and do not need to be modified except for special circumstances.

F1.2.17 V/F curve selection for motor 1	**Setting range: 0, 1, 2, 3**	**Factory default: 0**

Set the corresponding curve between the inverter output voltage and output frequency. See the following figure.

0: Customized curve

When this mode is selected, users can set any desired **V/F** curve via this group of parameters (Group **F1.2**).

1: 1.2 times squares curve

The outputted is **1.2** times-square descending torque characteristics curve. See the curve **1** in the Figure 7-25.

It is suitable for torque load of fans and pumps.

2: 1.5 times squares curve

The outputted is **1.5** times-square descending torque characteristics curve. See the curve **2** in the Figure 7-25. It is suitable for torque load of fans and pumps. The energy saving effect of the descending torque curve is slightly increased compared with the constant torque curve.

3: Second square curve

The outputted is **2.0** times-square descending torque characteristics curve. See the curve **3** in the Figure 7-25. It is suitable for torque load of fans and pumps. If it is not steady during light load operation, please switch to **1.5** times-square curve for operation.

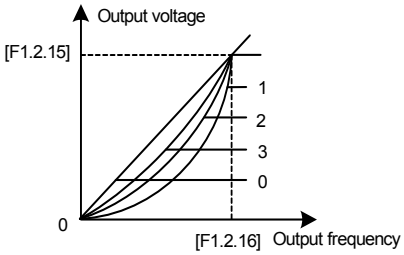


Figure 7-25 V/F curve

F1.2.18 Torque increasing voltage for motor 1	Setting range: 0.0~20.0%	Factory default: ☆

It is used to improve the inverter's low frequency torque characteristics. When the inverter runs at low frequency, it will make compensation for the inverter's output voltage. Its set value is the percentage relative to the motor's reference voltage **[F1.2.16]**. See figure 7-27-A and 7-27-B.

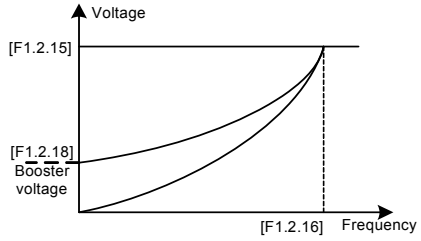


Figure 7-26-A Sketch of torque booster for descending torque curve

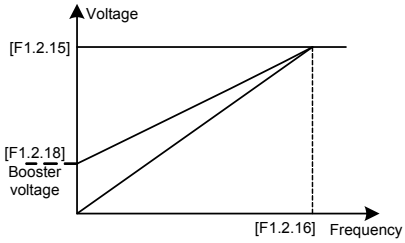


Figure 7-26-B Sketch of torque booster for constant torque curve

F1.2.19 Frequency point 1 of motor 1 V/F curve	Setting range: 0.0~[F0.1.21]	Factory default: 0.0
F1.2.20 Voltage point 1 of Motor 1 V/F curve	Setting range: 0~500V	Factory default: 0.0
F1.2.21 Frequency point 2 of motor 1 V/F curve	Setting range: 0.0~[F0.1.21]	Factory default: 0.0
F1.2.22 Voltage point 2 of Motor 1 V/F curve	Setting range: 0~500V	Factory default: 0.0
F1.2.23 Frequency point 3 of motor 1 V/F curve	Setting range: 0.0~[F0.1.21]	Factory default: 0.0
F1.2.24 Voltage point 3 of Motor 1 V/F curve	Setting range: 0~500V	Factory default: 0.0

This group of parameters is used to flexibly set **V/F** curve desired by users, as shown in Figure 7-27.

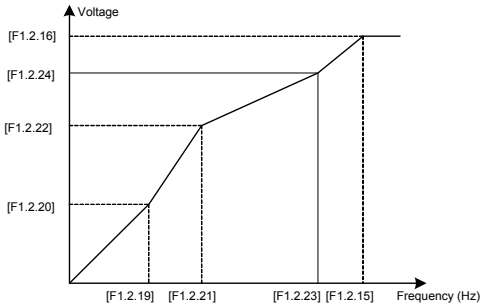


Figure 7-27 V/F customized curve

F1.2.25 Slip frequency compensation for motor 1	Setting range: 0~150%	Factory default: 0

The actual revolution difference of the motor may vary with the change of the load. Through setting of this parameters, the inverter will automatically adjust the inverter's output frequency according to the load, so as to offset the influence of the load to the motor revolution.

This parameter is only effective to **V/F** control mode.

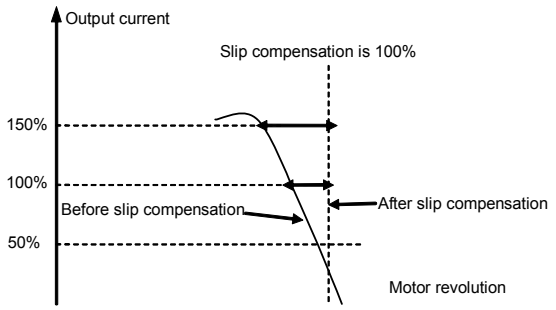


Figure 7-28 Slip frequency compensation sketch

7.9 STEADY RUNNING (GROUP F1.4)

F1.4.39 Acceleration/deceleration current limiting level	Setting range: 120~200%	Factory default: 170

When the frequency inverter is in acceleration and deceleration running, for the acceleration and deceleration time does not match to the motor inertia or load breaks, there can be phenomenon of steep current rise. This parameter is used for setting the allowed output level when frequency inverter is in state of acceleration. Setting value is the relevant percentage of rated output current of frequency inverter.

When the output current of frequency inverter exceeds the specified level of this parameter, acceleration and deceleration time will be automatically delayed, to ensure the output current limited within the range of this level, refer to the figure below. Thus, for occasions requiring shorter acceleration time, acceleration torque level shall be properly improved.

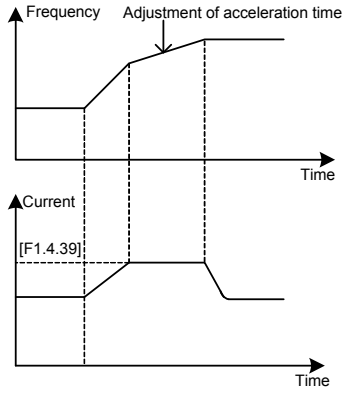


Figure 7-29 Schematic diagram of current limit for acceleration and deceleration

F1.4.40 Strong start current limiting level	**Setting range: 120~220%**	**Factory default: 170**
F1.4.41 Strong start current holding time	**Setting range: 0.00~5.00Sec.**	**Factory default: 0.0**

Function is similar with [**F1.4.39**], limit the current value when frequency inverter is in acceleration and starting. For some systems with large inertia, or requires to overcome great static friction at start, large starting current can be set for a certain time ([**F1.4.41**]), to meet the requirement. Setting value is the relevant percentage of rated output current of frequency inverter.

- When F1.4.41 is set as zero, it means the function of current limit of strong start is closed.

7

F1.4.42 Function selection for adjustors	**Setting range: 0000~0111**	**Factory default: 0111**

The unit: Overvoltage suppression adjustor

When setting is valid, for load with energy feedback, in order to suppress overvoltage, frequency inverter may lift output frequency automatically, making it exceed selected frequency (limited by upper limiting frequency). Be attention if it is dangerous to the equipment safety when setting.

Tens: Undervoltage suppression adjustor

When setting is valid, undervoltage caused by sudden fall of grid voltage, frequency inverter may lower output frequency automatically, accessing into feedback braking state, to keep running with mechanical energy for a certain time to ensure the normal running of equipment.

Hundreds: Frequency modulation and current

When setting is valid, if the output current exceeds the maximum current **[F1.4.47]**, frequency inverter will lower output frequency automatically.

F1.4.43 Action level of the over voltage adjustor	**Setting range: 660~800V**	**Factory default: 750**
F1.4.44 Over voltage adjusting gain	**Setting range: 0.10~10.00**	**Factory default: 1.00**

When the motor is dragging over voltage or in process of deceleration stop with large inertia, it may access into recycle braking state, causing rapid rise of direct current bus voltage of frequency inverter, leading to over voltage protection action. When frequency inverter detects the direct current bus voltage exceeds **[F1.4.43]**, it will adjust output frequency (extended deceleration time or increase frequency), to ensure continually safe running.

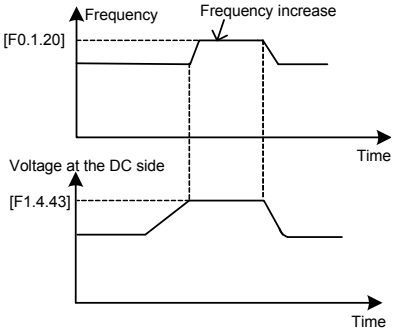


Figure 7-30-A Over voltage suppression during steady running

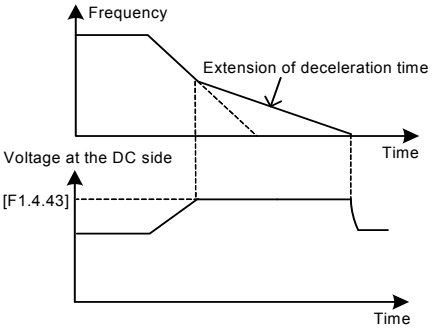


Figure 7-30-B Over voltage suppression during deceleration process

- The larger the overvoltage adjusting gain is, the more obvious the suppression is, but it may lead to unsteady running.

F1.4.45 Action level of the under voltage adjustor	**Setting range:[FF.2.35]~480V**	**Factory default: 400**
F1.4.46 Under voltage adjusting gain	**Setting range: 0.10~10.00**	**Factory default: 1.00**

When frequency inverter detects the direct current bus voltage is below **[F1.4.45]**, it may lower output frequency automatically, accessing into recycle braking state, keep running with mechanical energy. The larger the under voltage adjusting gain is, the stronger under voltage suppression is.

This function plays very efficiently in large inertia load application occasions like centrifugal pump and draught fan.

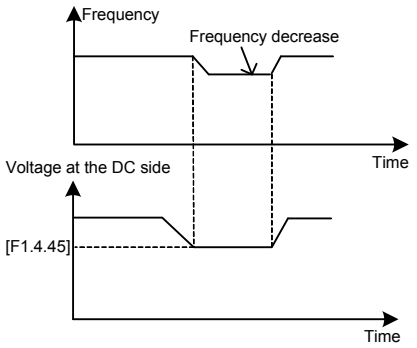


Figure 7-31-A Sketch of under voltage adjusting

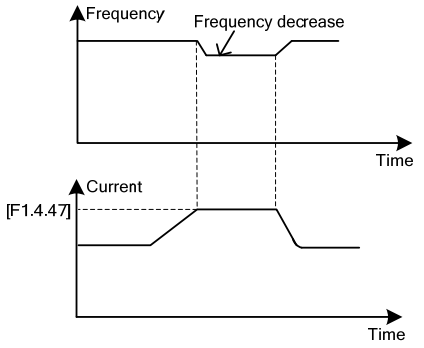


Figure 7-31B Sketch of current-limiting adjusting and under voltage adjusting

F1.4.47 Action level of current limiting adjustor	**Setting range: 20~220%**	**Factory default: 200**
F1.4.48 Adjusting gain of the current limiting adjustor	**Setting range: 0.10~10.00**	**Factory default: 1.00**

When the output current of frequency inverter exceeds [**F1.4.47**], it may lower output frequency automatically to suppress current from further increasing, to ensure continually safe running. The bigger [**F1.4.48**] gain is, the stronger current suppression is. Setting value is relevant percentage of rated output current of frequency inverter.

F1.4.49 Recovery times of fault self resetting	**Setting range: 0~5**	**Factory default: 0**
F1.4.50 The recovery waiting time of fault self resetting	**Setting range: 0.2~5.0Sec**	**Factory default: 1.0**
F1.4.51 Time period for self resetting timing	**Setting range: 900~36000Sec.**	**Factory default: 3600**

Fault self resetting refers to that when the frequency inverter breaks down, with a period of time, fault self resetting can be operated and recover to run with starting way of speed inspection. When accumulated resetting times exceeds setting value **[F1.4.49]**, self resetting action terminates. When self resetting time **[F1.4.49]** is set as zero, it means this function is banned.

Recovery waiting time of fault self resetting gets longer with resetting times: Waiting time=**[F1.4.50]** * Already reset times.

Each time it passes the set parameter period **[F1.4.51]**, or external forced fault reset, it will automatically eliminate one self resetting record.

F1.4.53 Display coefficient	**Setting range: 0.001~60.000**	**Factory default: 1.000**

It is used for correction values of monitoring parameters (d0.0.00, d0.0.01, d0.0.09, d0.0.10), to match with site parameters.

7.10 VECTOR PARAMETERS (GROUP F2.0)

F2.0.00~F2.0.04 Rated parameters of asynchronous motor 1	**——**	**Factory default: ☆**
F2.1.26~F2.1.30 Rated parameters of asynchronous motor 2	**——**	**Factory default: ☆**

Nameplate parameters of asynchronous motor, for ensure performance control, it must:

- Correctly set nameplate parameters;
- Power level of motor and frequency inverter shall be match with each other, generally motor only can be two levels less or one level more than frequency inverter.

Change the rated power setting (**F2.0.00**), it may match with later parameters automatically. Please change the settings in order.

Any one of the nameplate parameters changed, frequency inverter can set static identification of motor parameters once automatically. With motor accessed to start running, an additional static identification of parameters will be conducted prior to running (parameter **FF.4.43** can shield this function).

F2.0.05 ~ F2.0.09 Internal parameters of asynchronous motor 1	**——**	**Factory default: ☆**
F2.1.31 ~ F2.1.35 Internal parameters of asynchronous motor 2	**——**	**Factory default: ☆**

This group of parameters can be auto updated after parameter identification, generally free of necessity of setting.

F2.0.10 Motor 1 slip compensation coefficient	**Setting range: 0.50~1.50**	**Factory default: 1.00**
F2.1.36 Motor 2 slip compensation coefficient	**Setting range: 0.50~1.50**	**Factory default: 1.00**

Slip compensation coefficient is used for slip frequency calculation, valid with vector control mode. With SVC running, this parameter can be amended to adjust speed for compensation control.

F2.0.11~F2.0.15 Rated parameters of synchronous motor 1	**——**	**Factory Default: ☆**
F2.1.37~F2.1.41 Rated parameters of synchronous motor 2	**——**	**Factory Default: ☆**

Rated parameters of synchronous motors must be correctly entered before operation according to actual statusof the connected motor.

The maximum voltage parameters **F2.0.12** and **F2.2.38** are the maximum output voltage of the synchronous motors. When the revolution is beyond the critical point corresponding to this voltage, the permanent magnet synchronous motor will be automatically injected into weak magnetic current, hence changing into weak magnet control.

F2.0.17 EMF constant of synchronous motor 1	**Setting range: 0.010~5.000V/rpm**	**Factory Default: 0.215**
F2.1.43 EMF constant of synchronous motor 2	**Setting range: 0.010~5.000V/rpm**	**Factory Default: 0.215**

This parameter is also one of rated parameters of the synchronous motors, equaling to “rated voltage/rated revolution” of the permanent magnet motor.

In order to secure better dynamic performance, please correctly input this parameter.

F2.0.16 Pole pairs of synchronous motor 1	**1~32**	**Factory Default: 2**
F2.1.42 Pole pairs of synchronous motor 2	**1~32**	**Factory Default: 2**

It is one of rated parameters of the synchronous motors, and is corresponding to the rated revolution parameter. It is only needed to set one of the two parameters, and the equipment will automatically figure out the values of the other group of parameters.

F2.0.20~F2.0.23 Internal parameters of synchronous motor 1	**——**	**Factory Default: ☆**
F2.1.46~F2.1.49 Internal parameters of synchronous motor 2	**——**	**Factory Default: ☆**

Internal parameters of synchronous motors, will update automatically after running of the self-identification, and do not need to be set.

F2.0.24 Motor 1 Z pulse initial angle	**Setting range: 0.0~359.9**	**Factory default: 0.0**
F2.1.50 Motor 2 Z pulse initial angle	**Setting range: 0.0~359.9**	**Factory default: 0.0**

This parameter is valid when **Z** pulse selection is valid ([**F8.0.07**] = **1**), used for set corresponding mechanical rotating angle of **Z** pulse position. It is continuously effective when it is selected to drive the permanent magnet motor, and is automatically set after running of parameter self-identification.

F2.0.25 Motor 1 overload protection coefficient	**Setting range: 50.0~131.0%**	**Factory default: 115.0**
F2.0.51 Motor 2 overload protection coefficient	**Setting range: 50.0~131.0%**	**Factory default: 115.0**

This parameter is used for setting sensitivity of heat relay protection to load motor of frequency inverter. When the rated current of the load motor does not match with the rated current of the inverter, correct thermal protection can be secured by setting this value.

The set value of this parameter can be confirmed through below formula:

[F2.0.25]=Motor rated current /Inverter rated current*100%

When fixed value of this parameter is **131.0%**, overload protection function of motor closes.

- When a frequency inverter runs with several motors in parallel, function of heat relay protection of frequency inverter will out of action automatically. In order to protect motor efficiently, it is suggested that installation of heat protection relay in each motor.

7.11 MOTOR PARAMETER TUNING (GROUP F2.2)

F2.2.52 Start pre-excitation time in vector mode	**Setting range: 0.02~2.50Sec.**	**Factory default: 0.50**

This parameter is valid with vector operation; the pre-excitation action must be conducted prior to start of motor, to build air gap flux to obtain enough starting torque. This excitation process shall be conducted after action defined of parameter **F0.4.42**, excitation current shall be calculated automatically as selected time. The shorter the excitation time is, the larger the current is.

F2.2.53 Motor parameter measurement	**Setting range: 0, 1, 2**	**Factory default: 0**

Motor parameter measurement function must be started when vector control mode is selected (Tens of **F0.0.09** is set as **0** or **1**).

When this function (when **F2.2.53** is set as **1** or **2**) is operated, there will be a identification operation when the frequency inverter is start. After parameter identification is over, **F2.2.53** will automatically reset. Obtained motor parameters will be stored in internal storage of frequency inverter, and value of parameter **F2.0.05** ~ **F2.0.09** will be automatically updated.

Before identification operation, please confirm that:

1. Nameplate parameter of motor (**F2.0.01~F2.0.04**) has been input correctly;

2. The motor is in stopped condition.

0: Closed

1: Static identification

During the process of parameter tuning of the asynchronous motor, the motor shall be always kept in stopped condition.

During tuning of parameters of the permanent magnet synchronous motor, the motor shaft will slowly rotate at low speed. Please ensure the motor shaft is free of load and damping.

2: Static + operating parameter identification + revolution ratio identification (void when the synchronous motor is operating)

Frequency inverter will conduct static identification previously, and then automatically start operation identification process. During operation identification process, stop order can be input to forcedly terminate identification process. It won't be eliminated of application of identification then. When restarted, identification process will be operated again.

Top operating frequency of operation identification will reach **80**% of rated frequency of motor. Before identification starts, please be sure to confirm the equipment safety, and it will automatically stop operating when identification ends.

- During the process of operation identification of motor parameter, it must sure that no load of motor during the whole process, otherwise, incorrect motor parameters will be obtained.

7.12 MULTIFUNCTIONAL INPUT TERMINAL (GROUP F3.0)

F3.0.00~F3.0.04 Multifunctional input terminals DI1~DI5	**Setting range: 0~96**	**——**
F3.0.05 Multifunctional input terminal DI6 / standard expansion card	**Setting range: 0~96**	**Factory default: 0**
F3.0.06 Multifunctional input terminal DI7 / standard expansion card	**Setting range: 0~96**	**Factory default: 0**
F3.0.07 Multifunctional input terminal DI8 / standard expansion card	**Setting range: 0~96**	**Factory default: 0**
F3.0.08 Multifunctional input terminal DI9 /Fin（0~98）/ standard expansion card	**Setting range: 0~98**	**Factory default: 97**

Control terminals **DI1~DI9**/**Fin** are functional programmable switch input terminals; they can define the **DI1~DI9**/**Fin** functions respectively by way of the setup of **F3.0.00~F3.0.08** values; see their set values and relevant functions as **Table 1** (Contrast Table of Multifunctional Terminals (**DI/EDI/SDI)** Function).

For example: Define **F3.0.00** as **23**, so the function of **DI1** can be defined as "Simple PLC Multi-stage Operation Input"; when the **DI1** terminal status validates, simple PLC multi-stage operation input function can be realized.

The function specifications in the table as following:

1~4: Multi-speed control terminals 1~4

By means of the **ON/OFF** status combinations of these four functional terminals, select the set frequencies relevant to **F6.0.00~F6.0.15** parameters as the current set frequencies of frequency converter. The priority of the frequency instruction is higher than frequency set channel **F0.1.16**.

Table 7-3 Multi-speed operation selection table

Multi-speed control 4	Multi-speed control 3	Multi-speed control 2	Multi-speed control 1	Frequency set
OFF	OFF	OFF	OFF	Ordinary operation frequency (F0.1.16 determined)
OFF	OFF	OFF	ON	Multi-stage operation frequency 1
OFF	OFF	ON	OFF	Multi-stage operation frequency 2
OFF	OFF	ON	ON	Multi-stage operation frequency 3
OFF	ON	OFF	OFF	Multi-stage operation frequency 4
OFF	ON	OFF	ON	Multi-stage operation frequency 5
OFF	ON	ON	OFF	Multi-stage operation frequency 6
OFF	ON	ON	ON	Multi-stage operation frequency 7
ON	OFF	OFF	OFF	Multi-stage operation frequency 8
ON	OFF	OFF	ON	Multi-stage operation frequency 9
ON	OFF	ON	OFF	Multi-stage operation frequency 10
ON	OFF	ON	ON	Multi-stage operation frequency 11
ON	ON	OFF	OFF	Multi-stage operation frequency 12
ON	ON	OFF	ON	Multi-stage operation frequency 13
ON	ON	ON	OFF	Multi-stage operation frequency 14
ON	ON	ON	ON	Multi-stage operation frequency 15

5~6: External forward/Reverse jog control

Apply to jog operation control under the external terminal control (regard **F0.3.33/F0.3.34** as **1**).

7~8: Forward (FWD)/Reverse (REV) running command terminal

Apply to forward (FWD)/reverse (REV) running command under the external terminal control (regard **F0.3.33/F0.3.34** as **1**); according to the setup of **F0.3.35**, it can jog two-line mode and three-line mode (regard another external control terminal as three-line running command function (Function No. **19**)).

9~10: Acceleration and deceleration time 1 and 2

By means of the acceleration and deceleration time, selecting the **ON/OFF** status combinations of terminals can realize the selection of acceleration and deceleration time **1~4** (refer to parameter specifications of **F1.0.03~F1.0.10**). If the user doesn't define this function, frequency inverter can automatically select acceleration and deceleration 1, except simple **PLC** jog. See the acceleration and deceleration time selection as following table.

Table 7-4 Contrast table of acceleration and deceleration time selection

Acceleration and deceleration time selection2	Acceleration and deceleration time selection1	Acceleration and deceleration time
OFF	OFF	Acceleration time 1 /Deceleration time 1
OFF	ON	Acceleration time 2 /Deceleration time 2
ON	OFF	Acceleration time 3 /Deceleration time 3
ON	ON	Acceleration time 4 /Deceleration time 4

11: Running command switching

This function is applied to switch running command of frequency inverter between control command **1** and control command **2**. See the running command switching status as following table:

Table 7-5 Contrast table of jog command switching

Terminal status	Running command of frequency inverter
ON	Running command 2
OFF	Running command 1

12: Frequency command switching

This function is applied to switch frequency setting source of frequency inverter between frequency setting source **1** and frequency setting source **2**. See the frequency command switching status as following table:

Table 7-6 Contrast table of frequency command switching

Terminal status	Frequency setting source of frequency inverter
ON	Frequency setting source 2
OFF	Frequency setting source 1

13: Fault resetting input (RESET)

Once frequency inverter occurs to fault alarm, reset it through external terminals and be valid to input rising edge; The function is coincident to operation board's **STOP/RESET** buttons'.

14: Emergency stop (EMS)

Whatever status frequency inverter operates, if the functional terminal is effective, frequency inverter stops in terms of set emergency stop mode (**F0.4.54**) and starts to operate with rising edge of running command.

15~16: Frequency or Process PID set value ascending (UP)/descending (DW)

A510 frequency inverter can achieve the setup of operation frequency via external terminal and long-distance frequency set operation. If the terminal is effective, set frequency increases progressively or decreases progressively in the light of set speed; If the terminal is ineffective, set frequency keeps same. If both terminals are effective, set frequencies keep same. See 4~8 parameter functional specifications of **F0.2.25** or **F0.2.26**.

17: UP/DW set frequency zero clearing

Set frequency of external terminal can be cleared to zero through the functional terminal (set frequencies of frequency increasing progressively command **UP**/decreasing progressively command **DW**). The function invalidates frequencies set by other frequencies setting modes.

18: External equipment fault

Inputting external equipment fault signal through the terminal is easy for frequency inverter to fault supervision and communication to external equipment. Since frequency converter receives external equipment fault, displaying "**Fu.017**" is the external equipment fault and making a stop forcefully.

19: Three-line running control

When select the three-line running mode under the external terminal control (regard **F0.3.33/F0.3.34** as **1**), define three-line running control for input terminal. See Three-line Mode Introduction (regard **F0.3.35 as 2** or **3**).

20: Stop DC braking command

When frequency inverter is in the process of deceleration stop and running frequency is lower to straight flow brake or brake starting frequency or speed, the function is effective. When the terminal status is effective, execute DC brake; only when the terminal status is ineffective, DC brake can be stopped. When operate this function, DC braking functional time **F0.4.46** is ineffective.

21: Acceleration and deceleration forbidden

When the terminal is effective, suspend acceleration and deceleration forbidden and frequency inverter keeps current frequency operation as the acceleration and deceleration achieves; if the terminal is ineffective, execute ordinary acceleration and deceleration command.

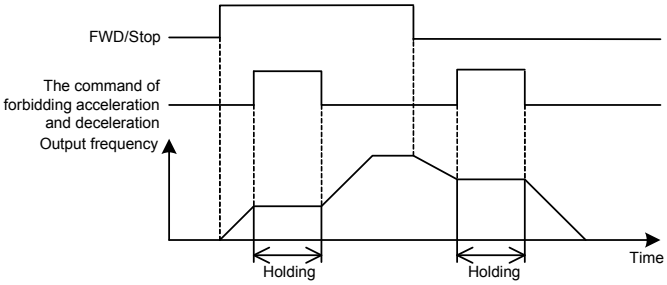


Figure 7-32 Sketch of acceleration and deceleration forbidden

22: Process PID effective

When selecting the multifunctional input terminals in the process **PID**, the function can achieve process **PID**'s input and cutting off.

23: Simple PLC multi-stage running effective

When select the multi-stage frequencies or rotation running condition input in the programmable multi-stage speed operation mode (regard **F6.1.15** as **###2**), the functional terminal can achieve simple PLC multi-stage running's input and cutting off.

24: Swing frequency running effective

If swing frequency running selects effective terminal (set **F6.2.46** as **###2**), the functional terminal can input and cut off swing frequency running.

If terminal status is effective, frequency converter runs swing frequency. If terminal status is ineffective, frequency inverter can accelerate and decelerate into swing frequency preset frequency **[F6.2.47]** for running according to effective acceleration and deceleration time (regard acquiescent value as acceleration and deceleration time 1).

25: Compensation PID effective

When the function of compensation **PID** is activated from external effective terminal selection (regard

F9.0.00 as **###2**), the functional terminal can input and cut off the function of compensation **PID**.

26: Simple PLC multi-stage running status (when stopping) resetting

Simple PLC multi-stage running status when stopping can select the automatic memorized (**[F6.1.15] = #1##/#2##**). The functional terminal can reset the automatic memorized status forcefully.

27: Swing frequency status resetting (effective when stopping)

If the swing frequency's current running status is (**[F6.2.46] = ##0#**) when swing frequency operation selects automatic memory stop, the functional terminal can reset the status of swing frequency forcefully.

28~30: Process PID multi-stage given terminals 1~3

Using **ON/OF**F status combinations of multi-stage process **PID** given terminals **1~3** can achieve multi-stage process **PID** given terminals selection as following table.

Table 7-7 Contrast table of multi-stage process PID given terminals selection

Multi-stage process PID given terminal 3	Multi-stage process PID given terminal 2	Multi-stage process PID given terminal 1	Process PID multi-stage given selection
OFF	OFF	OFF	Ordinary process **PID** given (determined by F7.0.01)
OFF	OFF	ON	Process **PID** multi-stage given 1
OFF	ON	OFF	Process **PID** multi-stage given 2
OFF	ON	ON	Process **PID** multi-stage given 3
ON	OFF	OFF	Process **PID** multi-stage given 4
ON	OFF	ON	Process **PID** multi-stage given 5
ON	ON	OFF	Process **PID** multi-stage given 6
ON	ON	ON	Process **PID** multi-stage given 7

31: Process PID setting selection (switching)

The functional terminal is applied to switch process **PID** setting of frequency inverter between process **PID** setting **1** and process **PID** setting **2**. See process **PID** setting switching status as following table:

Table 7-8 Contrast table of process PID setting switching status

Terminal status	Process PID setting of frequency inverter
ON	Process **PID** setting 2
OFF	Process **PID** setting 1

32: Process PID feedback selection (switching)

This functional terminal is applied to switch Process **PID** feedback of frequency inverter between process **PID** setting **1** and process **PID** setting **2**. See process **PID** switching status as following table:

Table 7-9 Contrast table of process PID feedback switching status

Terminal status	Process PID feedback of frequency inverter
ON	Process **PID** feedback 2
OFF	Process **PID** feedback 1

33: Process PID sleep activation

When the sleep function is activated by multifunctional input terminals (set **F7.2.34** as **2**), the functional terminal can activate process **PID** sleep function.

34: Torque/speed control mode switching

The functional terminal is applied to switch closed loop control mode of frequency inverter between torque control and speed control. See the closed loop control mode of frequency inverter as following table:

Table 7-10 Contrast table of closed loop control mode of frequency inverter

Terminal status	Closed loop control mode of frequency inverter
ON	Speed control mode
OFF	Torque control mode

35: Minimum torque limiting set value selection

This function is applied to switch minimum torque limiting set value of frequency inverter (negative torque limiting) between minimum torque limiting **1** and minimum torque limiting **2**. See switching status as following table:

Table 7-11 Minimum torque limiting selection contrast table of frequency inverter

Terminal status	Minimum torque limiting set value of frequency inverter
ON	Minimum torque limiting 2
OFF	Minimum torque limiting 1

36: Maximum torque limiting set value selection

This function is applied to switch maximum torque limiting set value of frequency inverter between maximum torque limiting **1** and maximum torque limiting **2**. See switching status as following table:

Table 7-12 Maximum torque limiting selection contrast table of frequency inverter

Terminal status	Maximum torque limiting set value of frequency inverter
ON	Maximum torque limiting 2
OFF	Maximum torque limiting 1

40: RS485 external/Standard operation panel switching

When two operation panels are inserted to frequency inverter at the same time, one is for master control panel switching, and the other is only for monitoring, and the order cannot be inputted in.

Table 7-13 Control command channel switching and selecting table for frequency inverter

Terminal state	Control command channel of frequency inverter
ON	RS485 external panel
OFF	Standard operation panel

42: Start permission

When parameter **F0.4.37** is set as **###1or ###2**, the function terminal is valid.

43: Running permission

When parameter **F0.4.37** is set as **#1## or #2##**, the function terminal is valid.

44~45: Counter clock terminal

This function terminal is used for counter clock inputting.

46~47: Counter trigger signal

This terminal is used as counter trigger end.

48~49: Counter resetting terminal

This terminal is used for counter resetting signal inputting.

50~51: Counter auto control signal

This terminal is used for counter gated signal inputting.

52~54: Timer trigger signal

This terminal is used as timer trigger end.

55~57: Timer resetting

This terminal is used for timer resetting signal inputting.

58~60: Timer gated signal

This terminal is used for timer gated signal inputting.

61: Single pulse accumulative length value

This terminal is used for single pulse accumulative length value resetting.

62: Motor temperature detection contact input

When thermo switch is used as the external temperature transmitter (see parameter **F5.4.43** specification), this terminal is used for external thermo switch inputting.

63~64: Compensation PID parameter selection

When **[F9.1.21] = # # 3 3**, this terminal is used for controller parameter of compensation **PID** selecting.

Table 7-14 Parameter selecting table for compensation PID

Compensation PID parameter selection 2	Compensation PID parameter selection 1	PID effective parameter group
OFF	OFF	Group1（F9.0.03~ F9.0.07）
OFF	ON	Group 2（F9.1.29~F9.0.33）
ON	OFF	Group 3（F9.1.34~F9.1.38）
ON	ON	Group 4（F9.1.39~F9.1.43）

65: Magnetic flux brake effective

It is applied to magnetic flux brake function input and removal during the deceleration halt process.

66: Position pulse counting resetting

Adjust the position pulse counting to 0, which is used for position origin preset default counting.

67: Automatic shifting jog

It is the machinery shifting dedicated function of the spindle or machinery variable speed gear. When this function is invalid, frequency drive system will operate both sides alternatively at certain period or revolving speed/moment of force so as to achieve the machinery shifting, avoiding the dead(relative function parameter: Fb.2.18, Fb.2.19).

68: Servo pulse command direction

This function is valid when pulse input port (**DI9//Fin**) is used as servo command pulse, and representative pulse direction is: invalid is positive (add plus), valid is negative (minus pulse).

69: Servo control effective

Switching terminal of servo control and moment of force control (relative function parameter **Fb.2.23**).

70: Spindle positioning origin photoelectric signal input

When reference signal of spindle positioning origin is photoelectric switch positioning (parameter **Fb.2.36**), this signal stands for spindle origin.

71: Spindle origin homing

When this function is valid, spindle auto positions to origin position to maintain the moment of force, and after the signal is cancelled, there is no moment of force output.

72: Spindle positioning selection 1

73: Spindle positioning selection 2

74: Spindle positioning selection 3

When the spindle positioning command selects external terminal selecting source (relative function parameter **Fb.2.36**), these multi-function terminal are used for spindle positioning angle selecting, when the following groups are valid, the spindle positions to the assigned angle and maintains the moment of force. When these terminals are invalid, there is no moment of force output.

Spindle positioning selection 3	Spindle positioning selection 2	Spindle positioning selection 1	Positioning angle values
OFF	OFF	OFF	Common operation
OFF	OFF	ON	Positioning angle1(Fb.2.38)
OFF	ON	OFF	Positioning angle 2(Fb.2.39)
OFF	ON	ON	Positioning angle 3(Fb.2.40)
ON	OFF	OFF	Positioning angle 4(Fb.2.41)
ON	OFF	ON	Positioning angle 5(Fb.2.42)
ON	ON	OFF	Positioning angle 6(Fb.2.43)
ON	ON	ON	Positioning angle 7(Fb.2.44)

75: Position gain selection

Position gain of servo control or spindle positioning selecting.

76: Reserved

77: Servo command pulse value zero clearing

78~96: Reservation function

97: Pulse input (0.1~100.00 KHz)

This function is applied to multi-function input terminal **DI9/Fin** (**F3.0.08**), and 0.10~100.00 KHz signal can be received effectively.

98: pulse input (1.0~1000.0Hz)

This function is applied to multi-function input terminal **DI9/Fin** (**F3.0.08**) and 1.0~1000.0Hz low frequency signal can be received effectively.

F3.0.09 Multifunctional terminal filtering time (DI1~DI5)	**Setting range: 1~50ms**	**Factory default: 5**
F3.0.10 Multifunctional terminal filtering time (DI6~DI9)/standard expansion card	**Setting range: 1~50ms**	**Factory default: 5**

Set the filtering time of the input terminal detection. When state of the input terminal changes, if it remains the same even after the filtering time setting, the terminal state change is effective, or otherwise it will remains the former state, thus the interference triggered false operation can be reduced.

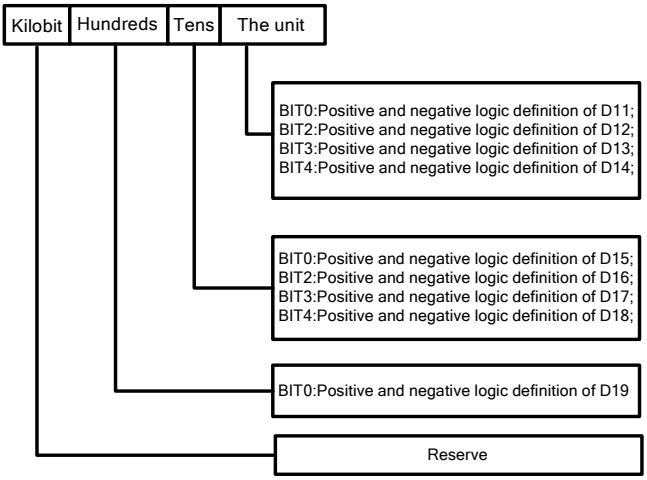
F3.0.11: Input terminal effective level (H)	Setting range: 0000~0FFF	Factory default: 0000

Define the positive and negative logic of the input terminal.

Positive logic: When **DIx** terminal and common port **COM** are connected, it is valid, or otherwise it is invalid.

Negative logic: When **DIx** terminal and common port **COM** are disconnected, it is valid, or otherwise it is invalid.

Bit place as **0** represents the positive logic; **1** represents negative logic.



7

Determination methods of parameter setting value are shown as following:

Table 7-15 Correspondence between Binary Number Setting and Digital Show Value

Binary number setting				Hexadecimal(digital show value)
BIT3	BIT2	BIT1	BIT0	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	b
1	1	0	0	C
1	1	0	1	d
1	1	1	0	E
1	1	1	1	F

7.13 MULTIFUNCTIONAL OUTPUT TERMINAL (GROUP F3.1)

F3.1.12 Multifunctional output terminal DO1	**Setting range: 0~71**	**Factory default: 1**
F3.1.13 Multifunctional output terminal DO2	**Setting range: 0~71**	**Factory default: 2**
F3.1.14 Multifunctional output terminal DO3/Fout/standard expansion card	**Setting range: 0~71**	**Factory default: 63**
F3.1.21 Multifunctional relay output (RO1A/B/C)	**Setting range: 0~71**	**Factory default: 4**
F3.1.22 Multifunctional relay output(RO2A/B/C) /standard expansion card	**Setting range: 0~71**	**Factory default: 5**

The control terminal **D01-D03** is the on-off output terminal with programmable function, and its functions can be defined by set values of **F3.1.12-F3.1.14**; functions of output **RO1**and **RO2** of relay, on-off output terminal with programmable function, can be defined by set values of **F3.1.21** and **F3.1.22**. Please refer to the attached list for their set values and corresponding functions (Reference table of variables of multi-function output terminal (**DO/EDO/SDO**).

1: Inverter running ready

When inverter is in normal running ready state, terminal will output effective signal/relay will pull in (connection of TA and TC).

2: Inverter is running

When inverter is in running state, terminal will output effective signal/relay will pull in.

3: Equipment normal

When inverter is fault free, and DC busbar voltage is normal, terminal will effectively indicate signal/relay will pull in.

4: Equipment fault

When inverter goes wrong and sends fault signal, terminal will output effective signal/relay will pull in.

5: Equipment alarm

When there is exception of inverter and sending warning signal, terminal will output effective signal/relay will pull in.

6: Equipment fault or alarm

When there is fault for exception of inverter and sending fault or warning signal, terminal will output effective signal/relay will pull in.

7: Reverse running

When electric motor rotates reversely, the terminal will output the valid signal/relay will pull in.

8: Running command valid

When running instruction of inverter is valid, the terminal will output the valid signal/relay will operate.

9: Running at zero speed

When running instruction is valid but output frequency of inverter is at zero and there is current output, terminal will output effective signal/relay will pull in.

10: Speed not at zero

When the speed of rotator of electric motor is not at zero (**VC** mode) or output frequency is not at zero (**VF** or **SVC** mode), terminal will output the valid signal/relay will pull in.

11: Inverter undervoltage stop

When inverter is in under-voltage stop and reporting **Fu.0.08**, the terminal will output the valid signal/relay will pull in.

12: External control valid

When control command of frequency converter is given not on panel, terminal will output the valid signal/relay will pull in.

14: Running at power generating status (braking)

When inverter is in regenerative braking running state, terminal will output the valid signal/relay will pull in.

19: Completion of current stage of multi-stage running (0.5s pulse)

After completion of current stage of multi-stage running, terminal will output the valid pulse signal with **0.5s** width/relay will disconnect after pulling in for **0.5s**.

20: Multi-stage running completed (0.5S pulse)

After completion of one cycle of multi-stage speed running, terminal will output the valid impulse signal with **0.5s** width/relay will disconnect after pulling in for **0.5s**.

21: Multi-stage running completed (continuous level output)

After completion of one cycle of multi-stage speed running, terminal will output continuous valid signal/relay will pull in.

22: Multi-stage running cycle completed (0.5Spulse)

After completion of one cycle of multi-stage speed running, terminal will output effective impulse signal with **0.5s** width/relay will disconnect after pulling in for **0.5s.**

23: Swing frequency upper and lower limit

After selection of wobbulation, if the frequency fluctuation range of wobbulation, which calculated based on center frequency, is above upper limit frequency **F0.1.21** or below lower limit frequency **F0.1.22**, then terminal will output effective signal/relay will pull in.

24: Encoder direction

It is used to indicate the directional signal output by current encoder frequency division.

26/29/32: Monitoring parameters 1/2/3 below the lower limit

When monitoring parameters **1/2/3** are below the lower limit values, terminal will output the valid signal/relay will pull in, which keeps until monitoring parameters 1/2/3 are above the upper limit values, then output the invalid signal/relay disconnects (as shown in Figure 7-34-A).

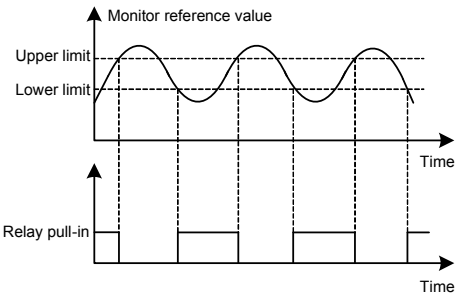


Figure 7-33-A Monitor functional sketch 1

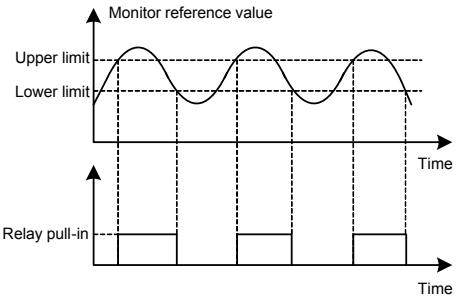


Figure 7-33-B Monitor functional sketch 2

27/30/33: Monitoring parameters 1/2/3 above the lower limit

When monitoring parameters **1/2/3** are above the upper limit values, terminal will output effective signal/relay will pull in, which keeps until monitoring parameters 1/2/3 are below the lower limit values, then output ineffective signal/relay disconnects (as shown in Figure 7-34-A)

28/31/34: Monitoring parameters 1/2/3 between the upper limit and the lower limit

When monitoring parameters **1/2/3** are between upper and lower limit values (including equal to upper and lower limit values), the terminal will output the indicator signal/relay will pull in, as shown in Figure 7-33-C.

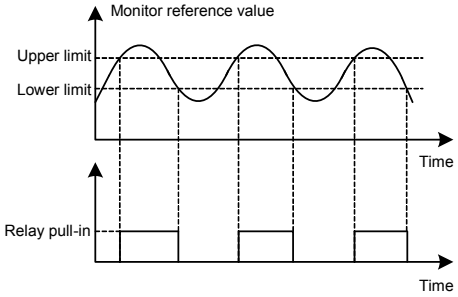


Figure 7-33-C Functional sketch 3 of monitor

36~38: Analog input AI1 wire-break detection effective

When inverter detects wire-break of analog input, it will choose to make corresponding operation according to operation after wire-break; meanwhile terminal will output effective signal/relay will pull in.

40~43: Counter output signal

When counting of counter reaches to setting value, terminal will output effective signal/relay will pull in. Please refer to function specifications for **F5.2.20~F5.2.27** parameters

44~49: Timer output signal

When comparative value /periodic value of timer reaches to setting value, terminal will output effective signal/relay will pull in. Please refer to function specifications for **F5.1.06~F5.1.19** parameters

55~62: Status of multifunctional input terminal

If D10~D18 terminals are effective, terminal will output effective signal/relay will pull in.

63: DO3/Fout terminal as the frequency output terminal

As frequency output terminal, frequency range of signal output by **D03**/Fout: 0.07-100.0KHz.

64~71：虚拟输出端子的逻辑运算，请参照第 6 章“附表 2：多功能输出端子（DO/EDO/SDO）变量对照表”

F3.1.15~F3.1.20 DO1~DO3 delay time for terminal effective/ineffective signal output	**Setting range: 0.01~10.00Sec.**	**Factory default: 0.0**
F3.1.23~F3.1.26 RO1/RO2 power-on / disconnection delay time	**Setting range: 0.01~10.00Sec.**	**Factory default: 0.0**

This group of parameters are used to define multi-function output terminal DO1~DO3 and time delay of change for signal state output by multi-function relay RO1/RO2. When signal output by multi-function terminal and pulled in by relay is effective, terminal will output indicator signal, and relay will pull in(connection of TA and TC) after delay time set by parameters F3.1.15~F3.1.20, F3.1.23~F3.1.26.

F3.1.27~ F3.1.29 Input variables of monitor 1~3	**Setting range: 0~44**	**Factory default: 0~2**

Different state parameters can be monitored by setting the values of **F3.1.27 ~ F3.1.29**.

F3.1.30~F3.1.35 Upper and lower limit of monitor 1~3 variables	**Setting range: 0.0~100.0%**	**Factory default: 0.0/100.0**

This group of parameters restricts the range of monitoring parameter variables, of which the set values are relative to the percentages of full monitoring variable output.

7.14 PULSE INPUT (GROUP F3.2)

F3.2.36 Minimum pulse input frequency DI9/F in	**Setting range: 0.0~100.00KHz**	**Factory default: 0.0**
F3.2.37 Maximum pulse input frequency DI9/Fin	**Setting range: 0.01~100.00KHz**	**Factory default: 10.0**
F3.2.38 Pulse detection cycle	**Setting range: 1~20ms**	**Factory default: 10**

This group of parameters defines multi-function input terminal **DI9/Fin** as frequency range and detection cycle of external pulse signal for pulse input (**F3.0.08** is set as **97-98**), effective breadth of external pulse signal is **5-30V**.

F3.2.39 Number of single-loop pulse	**Setting range: 1~4096**	**Factory default: 1024**

When input frequency signal of **DI9/Fin** terminal is used for length accumulation or speed measurement, these parameters are used to set pulse signal quantity for each rotation of encoder.

7

F3.2.40 Mechanical transmission ratio(=pulse shaft revolution: motor shaft revolution)	**Setting range: 0.010~10.000**	**Factory default: 1.000**
F3.2.41 Driving wheel diameter (for liner speed calculation)	**Setting range:0.1~2000.0mm**	**Factory default: 100.0**

This group of parameters is used for linear speed calculation or length accumulation.Mechanical drive ratio=Revolution of the driving wheel/Revolution of the speed measuring code wheel

F3.2.42 Maximum accumulative length value	**Setting range: 10m~50000m**	**Factory default: 50000**
F3.2.43 Maximum liner speed	**Setting range: 0.01~500.00m/Sec.**	**Factory default: 10.00**

To limit the maximum accumulative length and maximum liner speed. The terminal signal can be input when it reaches or exceed the maximum value.

F3.2.44 Current accumulative length value	**Setting range: 0~50000m**	**Factory default: ——**
F3.2.45 Current liner speed	**Setting range: 0.0~500.00m/Sec.**	**Factory default: ——**

Parameters in read-only state are used to display calculated results of current length and linear speed.

7.15 PULSE OUTPUT (GROUP F3.3)

F3.3.46 Type of output pulse signal DO3/Fout	Setting range: 0, 1, 2	Factory default: 0

0: Frequency signal (0.25-100.00KHz)

1: Frequency signal

2: Pulse width modulation (PWM) signal/0.25-100.00KHz

It can be used as expansion AO port, and the modulation frequency is set through the maximum pulse output frequency parameter F3.3.48.

F3.3.47 Minimum pulse output frequency DO3/Fout	Setting range: 0.25~100.00KHz	Factory default: 0.25
F3.3.48 Maximum pulse output frequency DO3/Fout	Setting range: 0.25~100.00KHz	Factory default: 10.0

This group of parameters define the frequency range of the output pulse when the multifunctional output terminal **DO3**/Fout is used as pulse output (Function No. 63). Different setting of output type of pulse signal results in different output frequency range.

F3.3.49 Pulse output mapping variable	Setting range: 0~45	Factory default: 0

Please refer to “Table of Monitoring Parameter Variables”.

F3.3.50 DO3/Fout assignment lower limit	Setting range: 0.0~[F3.3.51]	Factory default: 0.0
F3.3.51 DO3/Fout assignment upper limit	Setting range: [F3.3.51]~100.0%	Factory default: 100.0

This group of parameters can determine the corresponding relationship between maximum, minimum frequency and pulse output mapping variables, while the set values are the percentages of full pulse output mapping variables. Corresponding relationship between the two is as shown in Figure 7-34:

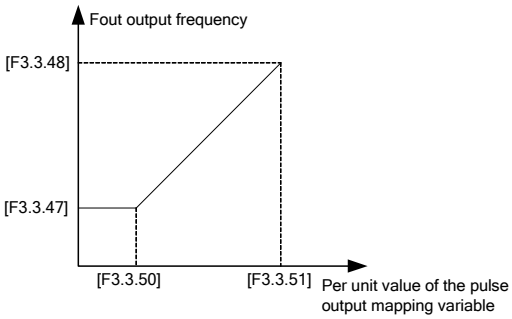


Figure 7-34 Characteristic curve of pulse output Fout

7.16 ANALOG INPUT (GROUP F4.0)

F4.0.00~F4.0.05 Minimum and maximum values of analog input AI1~AI3	—	—

This group of parameters is used to define the setting range of analog input signal, which need to be set according to actual situation of access signal.

AI1 analog input port is unipolar voltage signal; **AI2** analog input port is unipolar current signal; **AI3** analog input signal is bipolar voltage signal.

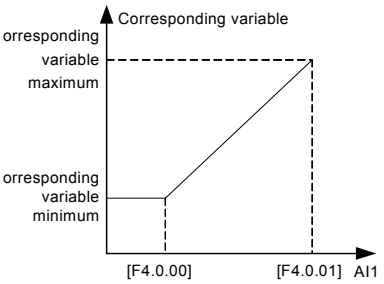


Figure 7-35-A Sketch of AI1 analog input and corresponding variables (unipolarity)

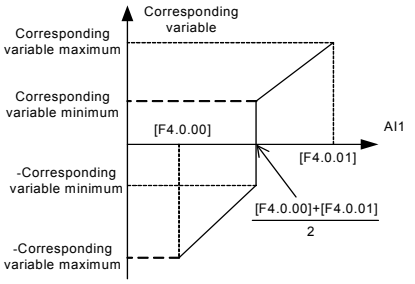


Figure 7-35-B Sketch of AI1 analog input and corresponding variables(biolarity)

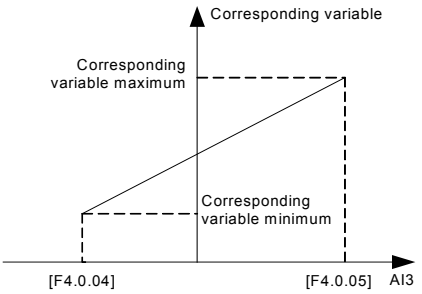


Figure 7-36-A Sketch of AI3 analog input and corresponding variables (unipolarity)

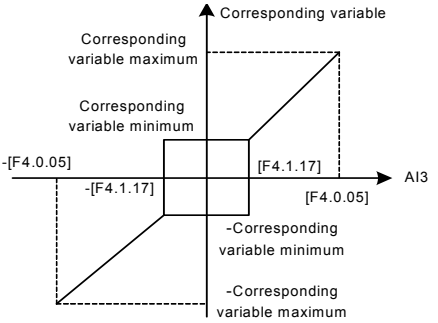


Figure 7-36-B Sketch of AI3 analog input and corresponding variables bipolarity)

- When the unipolar input signal AI1 and AI2 are applied as bipolar signal, if input signal breaks and input value is maximum reserve setting, it may be dangerous to human and property safety. Please use in combination with broken-line fault detection function of analog input port.

F4.0.06~F4.0.08 Analog input AI1~AI3 filtering time coefficient	Setting range: 1~1000ms	Factory default: 10

Carry out filtering treatment to external analog input quantity to effectively eliminate interference signal. Filtering time constant (time needed for given signal rising to **63**% of stable value) should be set properly according to fluctuation range of external input signal, if set it too high, anti-interference capacity will be strong while delaying the speed of response to setting signal.

7.17 ANALOG INPUT CURVE CORRECTION (GROUP F4.1)

F4.1.09~F4.1.21 Analog input AI1~AI31 curve correction point/value 1~3	**——**	**——**

This group of parameters is used to conduct nonlinear correction to analog input value as required. Curve correction of analog input AI1 is as shown in figure 7-37, while the curve correction methods of AI2 and AI3 are similar to analog input AI1.

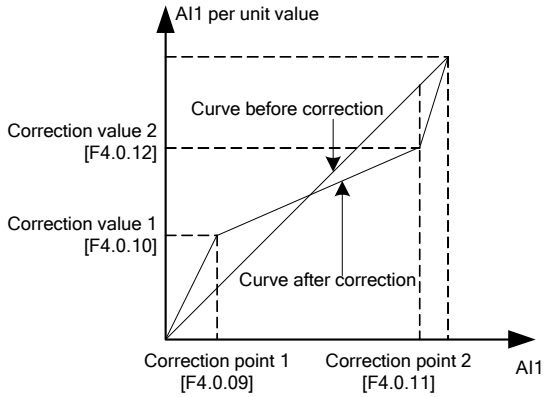


Figure 7-37 Curve correction of analog input AI1

F4.1.17 Analog input AI3 zero hysteresis /standard expansion card	**Setting range: 0.00~2.00**	**Factory default: 0.10**

Set hysteresis width of middle point between maximum value and minimum value of **AI3**, when it is applied as bipolar signal, forward and reverse fluctuation of zero setting value will be frequent as shown in Figure 7-38. It should be set as 0 when applied as unipolar signal.

7.18 ANALOG OUTPUT (GROUP F4.2)

F4.2.22 Mapping variable of multifunctional analog output AO1	**Setting range: 0~45**	**Factory default: 0**
F4.2.23 Mapping variable of multifunctional analog output hddaaaAO2/standard expansion card	**Setting range: 0~45**	**Factory default: 2**

Multifunction analog output **AO1**, **AO2** can output voltage signal of 0~10V or current signal of 1~20mA, selected by the dial switch on the control board. Frequency inverter status represented by the analog output signal is set by this group of parameters. Please see Appendix 3 (comparison table of monitor variables).

F4.2.24 AO1 minimum	**Setting range: 0.00~10.00V**	**Factory default: 0.0**
F4.2.25 AO1 maximum	**Setting range: 0.00~10.00V**	**Factory default: 10.00**
F4.2.30 AO2 minimum /standard expansion card	**Setting range: 0.00~10.00V**	**Factory default: 0.0**
F4.2.31 AO2 maximum /standard expansion card	**Setting range: 0.00~10.00V**	**Factory default: 10.00**

This group of parameters defines the maximum and minimum of multifunction analog output **AO1**, **AO2** allowed to output.

F4.2.26 AO1 lower limiting value	**Setting range: 0.0~[F4.2.27]**	**Factory default: 0.0**
F4.2.27 AO1 upper limiting value	**Setting range: [F4.2.26]~100.0%**	**Factory default: 100.0**
F4.2.32 AO2 lower limiting value/standard expansion card	**Setting range: 0.0~[F4.2.33]**	**Factory default: 0.0**
F4.2.33 AO2 upper limiting value/standard expansion card	**Setting range: [F4.2.32]~100.0%**	**Factory default: 100.0**

Corresponding relationship between maximum and minimum of **AO1**, **AO2** output given by this group of parameters and mapping variable (see figure below), whose set value is the percentage relevant to the full output of mapping variable of **AO1**, **AO2**.

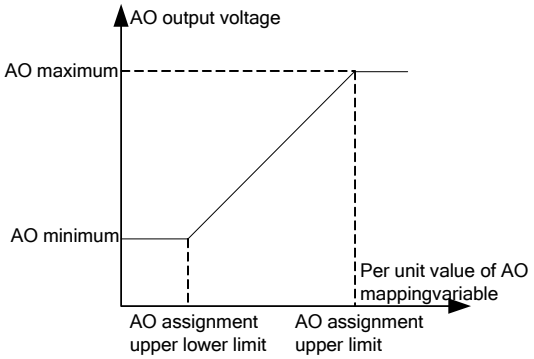


Figure 7-38 AO output characteristic curve

F4.2.28 AO1 filtering time coefficient	**Setting range: 0.01~10.00Sec.**	**Factory default: 0.10**
F4.2.34 AO2 filtering time coefficient/standard expansion card	**Setting range: 0.01~10.00Sec.**	**Factory default: 0.10**

This group of parameters is used to set the filtering time coefficient of **AOI**, **AO2** analog output signal, according to selection of requirements of the rapidity and wave character of signal. The larger the time coefficient is, the smoother the output signal is, and the slower the response is.

F4.2.29 AO1 fixed output value	**Setting range: 0.00~20.00mA (0.00~10.00V)**	**Factory default: 0.0**
F4.2.35 AO2 fixed output value/standard expansion card	**Setting range: 0.00~20.00mA (0.00~10.00V)**	**Factory default: 0.0**

When the mapping variable of multifunction analog output **AO1**, **AO2** is a fixed value (**F4.02.22**, **F4.2.23** is set as **45**), fixed value of **AO1** output is **[F4.2.29]**, and the fixed value of **AO2** output is [**F4.2.35**], which can output voltage and current signal.

7.19 ANALOG INPUT WIRE-BREAK DETECTION (GROUP F4.3)

On condition that break detection function of analog input is valid, when the value of **AI1**, **AI2** and **AI3** analog input is within the range of detection threshold level, when the frequency inverter passes the action of break detection delay, conduct corresponding action according to the selected setting after the wire-break action.

F4.3.39 Action selection after AI1 wire-break	**Setting range:0~4**	**Factory default:0**
F4.3.43 Action selection after AI2 wire-break	**Setting range:0~4**	**Factory default:0**
F4.3.48 Action selection after AI3 wire-break	**Setting range:0~4**	**Factory default:0**

Define corresponding actions after frequency inverter detects analog input wire-breakage.

0: No action (for non-stop alarm)

When detecting analog input wire-break, if the frequency inverter operates normally, it only reports **aL.036-aL.038** warning signal. If the wire-break fault is cleared, the warning signal can be cleared automatically.

1: Forcedly set to the minimum

When detecting analog input wire-break, if the frequency inverter operates normally, it reports **aL.036-aL.038** warning signal. Meanwhile, forcedly set the analog input signal to the minimum of analog input. If the wire-break fault is cleared, the warning signal can be cleared automatically, meanwhile, the analog input signal recovers to input value.

2: Forcedly set to the maximum

When detecting analog input wire-break, if the frequency inverter operates normally, it reports **aL.036-aL.038** warning signal. Meanwhile, forcedly set the analog input signal to the maximum of analog input. If the wire-break fault is cleared, the warning signal can be cleared automatically, meanwhile, the analog input signal recovers to input value.

3: Forcedly set to the default value

When detecting analog input wire-break, if the frequency inverter operates normally, it reports **aL.036-aL.038** warning signal. Meanwhile, forcedly set the analog input signal to the default input value of analog input. If the wire-break fault is cleared, the warning signal can be cleared automatically, meanwhile, the analog input signal recovers to input value.

4: Inverter forced trip stop

When detecting analog input wire-break, it reports **Fu.036~Fu.038** fault signal and lock output, and load motor freely sliding down. If the wire-break fault is cleared, fault signal shall be cleared with hand-reset.

7.20 HOPPING FREQUENCY (GROUP F5.0)

Hopping frequency function makes the output frequency of frequency inverter to avoid the mechanical resonant frequency point of machine loaded.

Setting frequency of frequency inverter can operate with hopping frequency near some frequency point as the method in the figure below, with **3** hopping ranges defined at most.

After hopping frequency parameters are set, even the setting frequency of frequency inverter is within the mechanical resonant frequency band of driving system; output frequency of frequency inverter will still adjust out of the mechanical resonant band, operating with lower limiting value of the hopping range of this hopping frequency.

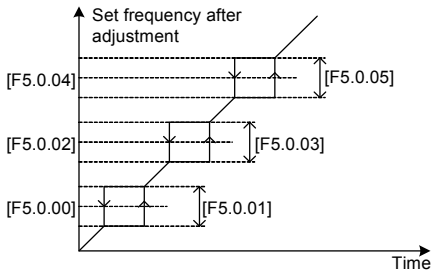


Figure 7-39 Schematic diagram of hopping frequency output

7.21 BUILT-IN AUXILIARY TIMER (GROUP F5.1)

This group of parameters is mainly instructed by taking example of timer 1.

7.21.1 BASIC FUNCTIONS OF THE TIMER

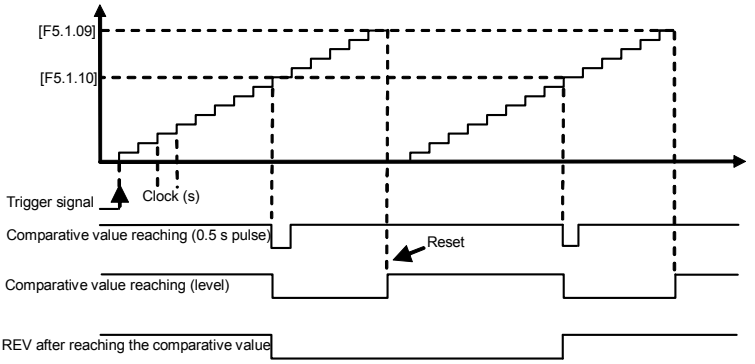


Figure 7-40-A Schematic diagram of comparison value of Timer 1 reaching for the basic function (F5.1.06=11#1)

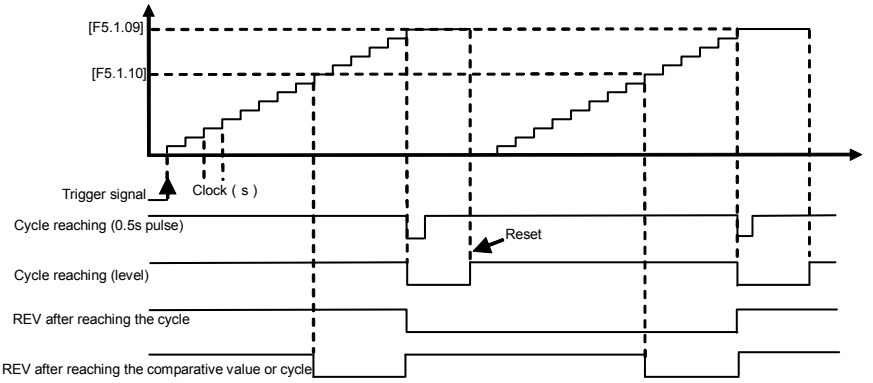


Figure 7-40-B Schematic diagram of comparison value of Timer 1 reaching for the basic function (F5.1.06=11#1)

7.21.2 TRIGGER AND GATE CONTROL FUNCTION SETTING OF TIMER

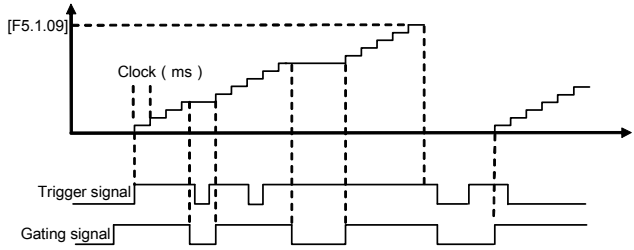


Figure 7-40-C
Starting trigger and gate control signal function of timer 1 (UT1) (F5.1.06=1111；F5.1.15=0001)

7.21.3 CLOCK CONCATENATION FUNCTION SETTING OF TIMER

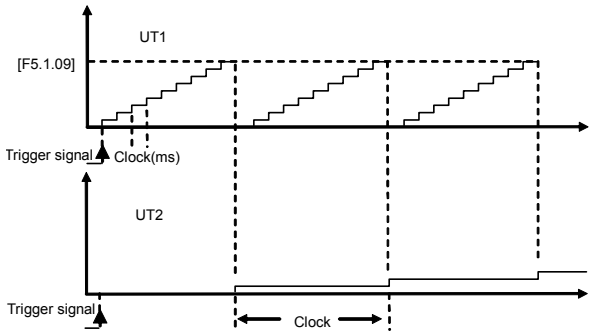


Figure 7-40-D Pulse concatenation function of timer 1 (UT1) (F5.1.06=11#1；F5.1.07=###3)

7.21.4 CONCATENATION TRIGGER FUNCTION SETTING OF TIMER

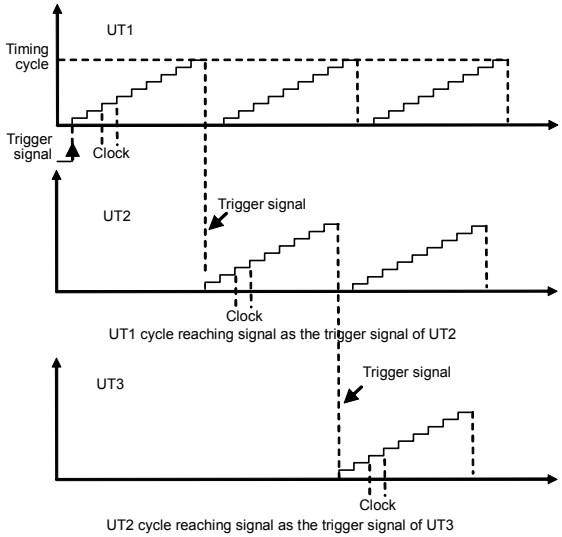


Figure 7-40-E Concatenation trigger function setting of timer (UT1, UT2, UT3)

7.22 BUILT-IN AUXILIARY COUNTER (GROUP F5.2)

Similar to the function of timer, the counter is designed for external clock (unknown frequency variable), and timer is designed for the internal clock (known and determined frequency). With the terminal function of analog input output, it can transfer the counter into the function of timer.

Differences: Counter will continue to count upwards without reset, and start from 0 on until overflow.

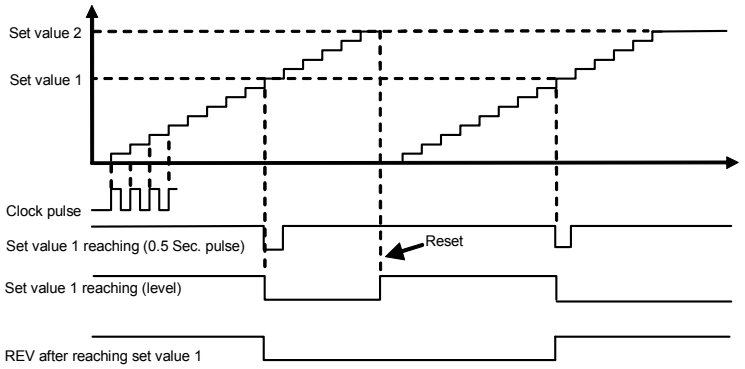


Figure 7-41-A Counter function 1

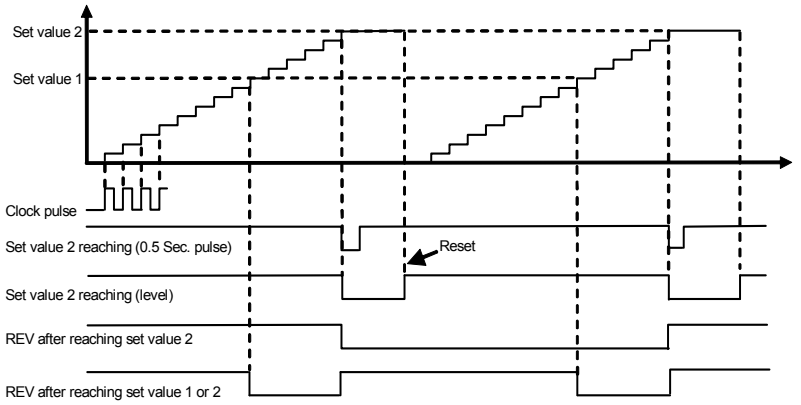


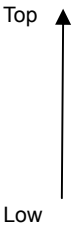
Figure 7-41-B Counter function 2

7.23 AUXILIARY FUNCTIONS (GROUP F5.3)

F5.3.28 Priority selection of frequency (revolution) command source	Setting range: 0000~7777	Factory default:0000

This parameter is used to define the priority order of (revolving speed) instructions source of given frequency. When the setting channel with higher priority is invalid, frequency set value of frequency inverter will automatically set value with the frequency of next top priority.

Table 7-16 Frequency Setting Order of A510 Frequency Inverter:

Priority	Setting	Remarks
1	Inching frequency setting	Top priority
2	Torque control method	In case of torque control method, frequency setting is invalid
3	Priority defined by this parameter (four at most)	Priority defined by this parameter shall be deleted from the list of lower priority automatically
4	process **PID** output	
5	Swing frequency Operating frequency	
6	compensation **PID** output	
7	Revolving speed setting channel (**F8.0.00**)	
8	Automatic multiple frequency operating order	
9	Multiple operating frequency of external terminal selection	
10	Frequency setting channel (**F0.1.16**)	Lowest priority

F5.3.29 Lower limiting frequency action mode	**Setting range: 0, 1**	**Factory default: 0**

0: Output 0 frequency when it is below the lower limiting frequency

1: Output the lower limiting frequency when it is below the lower limiting frequency

F5.3.30 Automatic voltage regulation (only effective in V/F mode)	**Setting range: 0, 1, 2**	**Factory default: 0**

This parameter applies to the situation that frequency inverter operates with **V/F** mode, forcedly operate with **VC**, **SVC** modes. Automatic voltage regulation function is used for ensuring the output voltage of frequency inverter not fluctuate as the input voltage fluctuates. In condition that grid voltage fluctuates greatly, while stable stator voltage and current of motor is required, this function shall be operated.

0: Closed

1: Effective

2: Void during deceleration

F5.3.31 Automatic energy-saving operation (only effective for asynchronous motors)	**Setting range: 0, 1**	**Factory default: 0**

Magnetic flux operates optimally, and valid with asynchronous machine. Automatic energy saving operation refers to frequency inverter can detect the load condition of motor automatically, and adjust output voltage timely to make the motor operate at high efficient status, to reach optimal effect of energy saving.

Automatic energy saving operation has the best effect when the load change of motor is with low frequency and wide range. The major energy saving way is to obtain additional energy saving effect from adjusting the status of motor excitation, to make the motor operate at optimal high efficient status, and greatly lower the energy consumption of motor.

Due to the specific corresponding relationship of draught fan, pump load and revolving speed, load

condition can be judged according to the output frequency. It is a typical special case of automatic energy saving operation applying drop torque V/F curve. When applying drop torque **V/F** curve (**F1.2.17**, **F1.3.29** selection as **1**, **2**, **3**), without necessary of operating the automatic energy saving operation function.

F5.3.32 Magnetic flux brake	Setting range: 0, 1, 2	Factory default: 0

Frequency inverter can increase the magnetic flux when the motor slows down to stop, to make the motor stops more rapidly (see the figure below).

The electric energy produced during the braking process is manly consumed in form of heat inside of the motor. Therefore, frequent braking with magnetic flow will lead to the internal temperature of the motor increase. Please be sure the motor temperature shall not over the maximum admissible value.

When input operation order during magnetic flow braking, magnetic flow will be canceled, and frequency inverter will speed up again to the selected frequency.

When applying braking resistor, please set the flux braking void.

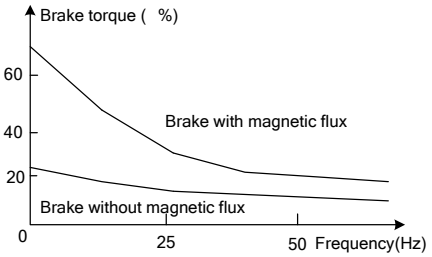


Figure 7-42 Magnetic flow braking curve

F5.3.33 Magnetic flux braking strength	Setting range: 30~120%	Factory default: 40~80

This parameter defines the increased amplitude of motor magnetic flow when magnetic flow braking, selected value is the relevant percentage of rated magnetic flow.

F5.3.34 Voltage over modulation	Setting range: 0, 1	Factory default: 1

Voltage over modulation refers to that in condition of lasting low grid voltage or lasting heavy load operation, frequency inverter improve the output voltage with improving the utilization rate of its bus voltage. When over modulation function is valid, output current harmonic will increase slightly.

0: Void **1: Effective**

F5.3.35 Use ratio of dynamic braking	Setting range: 50~100%	Factory default: 100
F5.3.36 Level of dynamic braking starting action	Setting range: 700~760V	Factory default: 720

These two parameters is valid to frequency inverters with built-in braking unit (18.5 KW below), used to define action parameters of built-in braking unit of frequency inverters. When the voltage at internal direct current side of frequency inverter is higher than starting action level of dynamic braking **[F5.3.36]**, build in braking unit action. If there is external braking resistor, it shall make the direct current voltage fall back, via releasing pumped-up voltage energy with braking resistor. When the voltage at DC side drops down to a specific value, the built-in braking unit of the frequency inverter closes.

Utilization rate of dynamic braking is used to define the average voltage value forced on braking resistor of braking unit action. Voltage on braking resistor is pulse width modulation wave. Duty ratio equals to action ratio of dynamic braking. The large the action ratio is, the faster energy releases, and the more obvious the effect is, as well as the larger power consumed on braking resistor is. Operator may consider setting the parameters comprehensively according to the resistance of braking resistor, power and required braking effect.

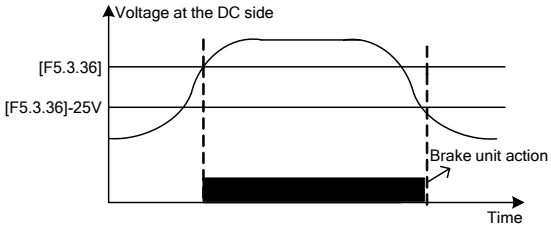


Figure 7-43 Dynamic braking

F5.3.37 Vibration suppression coefficient	**Setting range: 0.0；0.1~10.00**	**Factory default: 0.0**

Only valid with V/F control method. Selecting this parameter can restrain the output current oscillation.

Setting 0.0 to close this function. The larger the value is, the slower restraining action is and the wider the biggest adjustment range is.

F5.3.38 Load dynamic balance function	**Setting range: 0, 1, 2**	**Factory default: 0**
F5.3.39 Reference source for dynamic balance load	**Setting range: 0 ~ 5**	**Factory default: 0**
F5.3.40 Reference value for dynamic balance load	**Setting range: 0.0~200.0%**	**Factory default: 100.0**
F5.3.41 Dynamic balance adjustment gain	**Setting range: 0.0 ~ 100.00**	**Factory default: 50.00**
F5.3.42 Dynamic balance adjustment limit	**Setting range:0.00~100.00(%)**	**Factory default: 1.00**

Load dynamic balance function is used for balancing load with multiple motors linkage, or occasions requiring torque motor characteristics of Frequency inverter-asynchronous electrical units.

When this function is valid, frequency inverter shall take the input value of dynamic balance load reference source (relative value of rated current) as reference, automatically amend the input of frequency/ revolving speed integrator, adjusting output frequency to balance the load. The adjustment to output frequency for dynamic balance function is relatively slow, and influenced by selections of acceleration and deceleration time.

If rapid response of linkage balance operation is required, please apply with linkage operation self-balancing function (referring to instruction of parameters in FA group), or applying with compensation **PID** to build flexibly as necessary, which can conduct adjustment directly to the output of frequency integrator.

Adjusting gain value=**[F5.3.41]***rated current of equipment/100, when the difference of output current and reference value reaches the adjusting gain value, output frequency will drop to the adjusting amplitude limit value.

Adjusting amplitude limit value= **[F5.3.42]***current selected frequency/100, this value is the amplitude peak of dynamic balance adjustment.

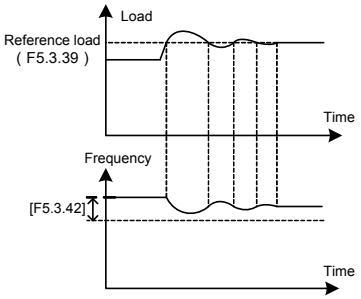


Figure 7-44
Sketch of load dynamic balance function

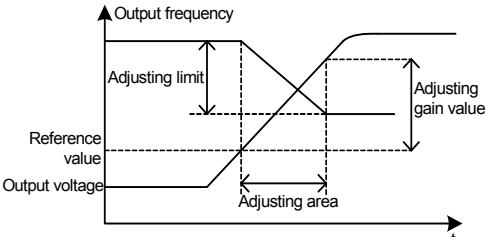


Figure 7-45
Sketch of dynamic balance variables

7.24 MOTOR TEMPERATURE DETECTION (GROUP F5.4)

F5.4.43 Type 2 of motor temperature sensor	Setting range: 0~6	Factory default: 0

This parameter is referred to types of the selected motor temperature sensor; the different selected motor temperatures sensor with different internal algorithms results in corresponding changes in units of **F5.4.46** and **F5.4.47:** When the sensor is the thermoswitch/**PT100**, their units are ℃; When the sensor is **PTC**, their units are Ω.

0: None

1: 1 X PT100

2: 2 X PT100

3: 3 X PT100

4: PTC sensor

5: Thermoswitch (normally closed)

6: Thermoswitch (normally open)

The motor temperature can be measured by connecting the PT100 or PTC sensor to the analog input and output interfaces of frequency converter. See Figure 7-46-A and Figure 7-46-B for wiring:

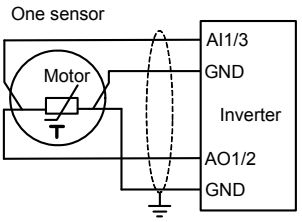


Figure 7-46-A Motor temperature measurement wiring 1

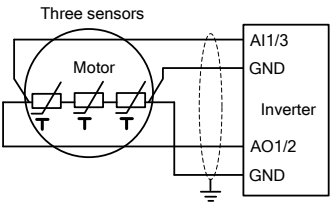


Figure 7-46-B Motor temperature measurement wiring 2

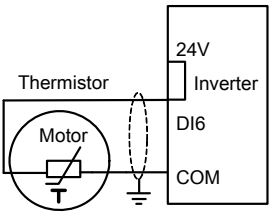


Figure 7-46-C Motor temperature measurement wiring 3

The motor temperature can also be measured by connecting the thermoswitch to multifunctional input terminals of frequency inverter (Function No. 62). See Figure 7-46-C for wiring (such as DI6 terminal, that is, **F3.0.05 = 62**):

F5.4.44 Sensor current source providing terminal	Setting range: 0~2	Factory default: 100.0

The functional parameter is used to define the current source port of PT100 or PTC sensor.

0: None

1: AO1

Sensor current source port is the multifunctional analog output **AO1** and the signal type of output should be current signal (dial switch of control panel).

2: AO2

Sensor current source port is the multifunctional analog output **AO2** and the signal type of output should be current signal (dial switch of control panel).

- The parameter will not only modify but also lock the selected AO port's relevant parameters, and set them forcibly as fixed value output. When using PT100 sensor, the port supplies 4.00mA's constant current; When using PTC sensor, the port supplies 1.60mA's constant current.

F5.4.45 Temperature input channel	Setting range: 0~3	Factory default: 0

This parameter is used to define the input channel of temperature signal.

0: None

1: AI1 input (PT100 or PTC)

The temperature signal of **PT100** or **PTC** sensor should be inputted through analogy input Channel **AI1**.

2: AI3 input (PT100 or PTC)

The temperature signal of **PT10**0 or **PTC** sensor should be inputted through analogy input Channel **AI3**.

3: DI1~DI9 (thermoswitch)

The temperature signal of thermoswitch should be inputted through multifunctional input terminals Channel D1-D19 (Function No. 62).

F5.4.46 Warning action threshold value	Setting range: -10.0~500.0℃ (0~5000Ω/PTC)	Factory default: 110.0
F5.4.47 Protection action threshold value	Setting range: -10.0~500.0℃ (0~5000Ω/PTC)	Factory default: 130.0

This parameter is used to define the alert action point and protective action point for over-temperature detection; the unit should be determined by the motor temperature sensor used.

7.25 MULTI-STAGE FREQUENCY SETTING (GROUP F6.0)

F6.0.00~ F6.0.14 Opening frequency 1st ~ 15th	Setting range: [F0.1.22]~[F0.1.21]	Factory default: 5.00~50.00

The parameter is for the setup of multi-stage operation's frequency and can be used to multistage velocity operation and simple programmable multi-stage operation. Refer to the detailed specifications of multi-velocity control function **1**, **2**, **3**, **4** of multifunctional input terminals **F3.0.00-F3.0.07** and simple programmable multistage operation in **F6.1** group parameters. Frequency inverter can transform frequency and direction automatically according to the running time to satisfy the requirement of technology, as Figure 7-47-A shown.

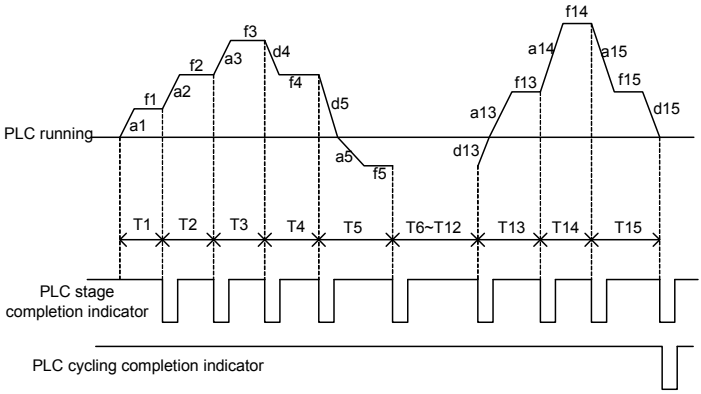


Figure 7-47-A Simple PLC operation

In the figure, **a1-a15** and **d1-d15** are current stage's time of acceleration and deceleration, while **f1-f15** and **T1-T15** are current stage's given frequency and operating time. All these will be defined in this parameter respectively.

The completion of simple programmable multi-stage operation for stage, cycle and so on can access to multifunctional output terminals or relay's output index signal. Refer to Function **20, 21** (multi-stage operation completed) and **22** (multi-stage operating cycle completed) among the **F3.1.15-F3.1.20.**

F6.0.15 Selection of programmable multi-stage speed operation mode	Setting range: 0000~1254	Factory default:0000

The unit: Function selection

0: Function closed

1: Multi-stage frequency/revolution operation effective

In case of frequency (revolution) instruction source allowed to the priority, the frequency converter operates in multi-stage frequency/revolution.

2: Multi-stage frequency/revolution operation condition effective

When multifunctional input terminal (Function No.**23**) is valid, frequency inverter operates in multi-stage frequency/revolution; when it is invalid, frequency inverter will automatically access to frequency setup mode allowed to the lower priority.

3: Multi-stage PID setting operation effective

When the process **PID** starts its function, the setup of **PID** should be set automatically according to given time cycle, at most 7 stages being set (**F7.1.27 ~ F7.1.33**).

4: Multi-stage PID setting operation condition effective

When multifunctional input terminal (Function No. **23**) is valid, the multi-stage setting of process **PID** is also valid, at most 7 stages being set (**F7.1.27 ~ F7.1.33**).

Tens: Operation mode

0: Single cycle

Frequency inverter should firstly operate with first multi-stage speed set frequency and output each velocity's frequency according to given operating time. If the given operating time of a certain velocity is of zero, jump out of the velocity; with a cycle's operation, the frequency inverter should stop outputting and input an effective operating instruction once again to run the next cycle. See as Figure 7-47-B.

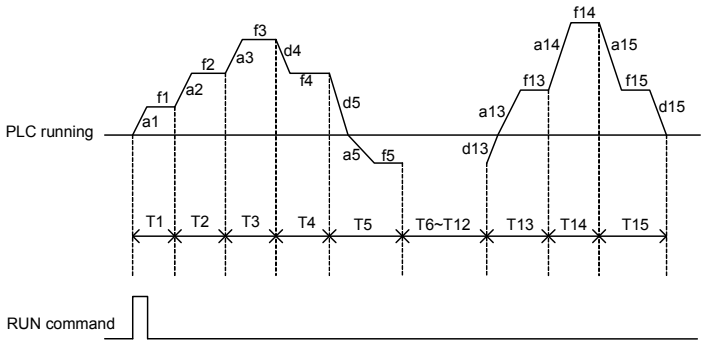


Figure 7-47-B Simple PLC operation single cycle mode

1: Single cycle stop mode

The basic operation mode is the same as mode **0** and its difference is that after frequency inverter operates a stage speed, it firstly lowers the output frequency to zero according to specified deceleration time, then outputs next stage's frequency.

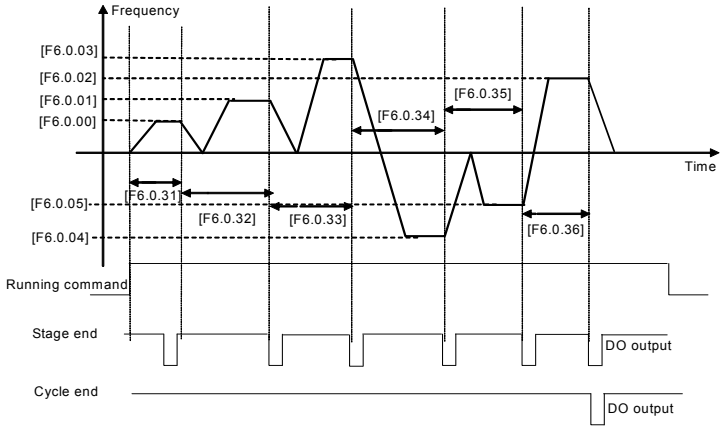


Figure 7-47-C Single cycle stop mode of simple PLC operation

2: Continuous cycling mode

As the figure shown, the frequency inverter starts next cycle after automatically after it finishes a cycle until it receives stop instruction.

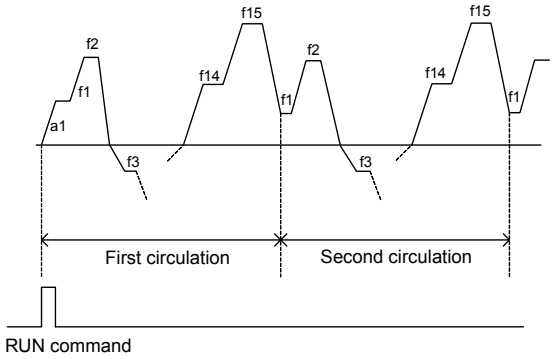


Figure 7-47-D Continuous cycling mode of simple PLC operation

3: Continuous cycle stop mode

Basic operation mode is the same as mode **2** and its difference is that after frequency inverter operates a stage speed, it firstly lowers the output frequency to zero according to specified deceleration time, then outputs next stage's frequency.

4: Keeping the final value

As the figure shown, the frequency inverter will keep the last stage's operation frequency and direction automatically after it finishes a cycle.

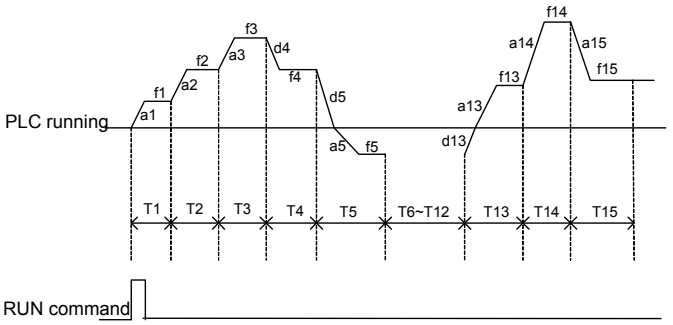


Figure 7-47-E Simple PLC operation keeping the final value mode

5: Keeping the final value stop mode

Basic operation mode is the same as mode **4** and its difference is that after frequency inverter operates a stage speed, it firstly lowers the output frequency to zero according to specified deceleration time, then outputs next stage's frequency.

Hundreds: Selection of breakpoint/stop recovery mode

0: Restore running at the first stage

In simple programmable multi-stage operation, frequency inverter will clear out current operation state automatically after it stops because of error stop or stop instruction; restore running at the first stage after it starts again.

1: Start running at the interruption time (effective for multi-stage frequency/revolution operation)

In simple programmable multi-stage operation, frequency inverter will record the stage operation time and operation frequency automatically at the interrupting time after it stops because of error stop or stop instruction; start running at the interruption time after it starts again.

2: Start running at the stage of interruption

In simple programmable multi-stage operation, frequency inverter will record the stage operation time and operation frequency automatically at the interrupting time after it stops because of error stop or stop instruction; start running at the stage of interruption after it starts again. The single difference between mode 1 and 2 is the different frequencies at the stage of interruption. See as Figure 7-48.

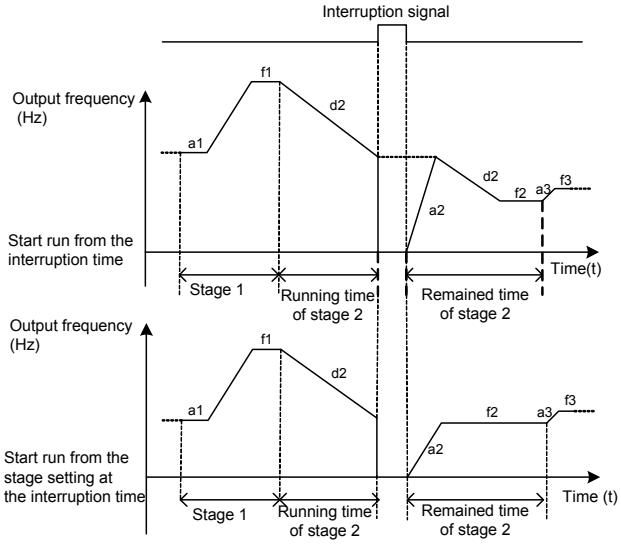


Figure 7-48 Breakpoint recovery sketch

Kilobit: Power-off status storage

0: Not stored

When the frequency converter fails power, it does not store the simple programmable multi-stage operation and starts operating from the first stage after power comes again.

1: Stored

When the frequency converter fails power, it stores the simple programmable multi-stage operation, including the power-off status, operation frequency, operated time, and operates according to the parameter's breakpoint/stop recovery mode of hundred definition after power comes again.

7.26 SIMPLE PROGRAMMABLE MULTI-STAGE OPERATION (GROUP F6.1)

F6.1.16~ F6.1.30 Setting of stage1~15	Setting range:0000~1321	Factory default:0000

The unit: Operating frequency source/setting source at each stage

0: Multi-stage frequency setting 1~15/Process PID multi-stage setting (1~7)

Stage operation frequency set values should be set by multi-stage frequency setting **1~15** (Group **F6.0**) / Process **PID** multi-stage setting **1~7** (Group **F7.1**).

1: Frequency command (F0.1.16)/Process PID setting (F7.0.01)

Stage operation frequency set values should be set by frequency command (**F0.1.16**)/Process **PID** setting (**F7.0.01**).

F6.1.31~ F6.1.45 Stage 1 running time	Setting range: 0.0~6500.0	Factory default: 0.0

The parameter is used to the setting of each stage's operation time; when it occurs to a zero, it means jumping over this operation stage.

7.27 SWING FREQUENCY OPERATION (GROUP F6.2)

Swing frequency operation is regulated by upper and lower boundary of frequency. If the function's parameter group is improper, swing frequency operates properly.

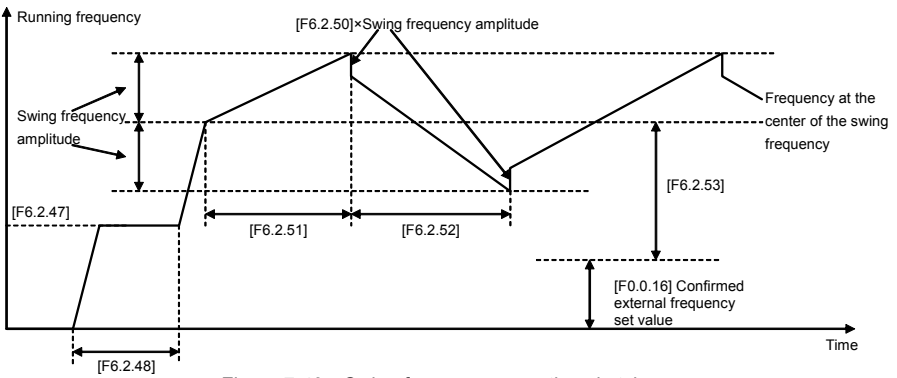


Figure 7-49 Swing frequency operation sketch

F6.2.46 Function selecting (H)	Setting range: 0000~1112	Factory default:0000

The unit: Function Setting

0: Function closed

The functional parameter of Group **F6.2** is void.

1: Function effective

In case of frequency (revolution) instruction source allowed to the priority, the frequency inverter adopts

swing function.

2: Terminal selectivity effective

When the multifunctional input terminal of definition **24** (swing operation input) is valid, the frequency inverter adopts swing function In case of frequency (revolution) instruction source allowed to the priority. If it invalidates, frequency converter operates with the set value of swing frequency preset frequency **F6.2.47**. In this mode, preset frequency waiting time invalidates.

F6.2.47 Swing frequency preset frequency	**Setting range: 0.00~[F0.1.21]**	**Factory default: 10.00**
F6.2.48 Preset frequency waiting time	**Setting range: 0.0~6000.0Sec.**	**Factory default: 0.0**

Preset frequency is referred to the operation frequency before frequency inverter adopts swing frequency operation or breaks away from operation frequency of swing frequency operation. Determine the operation mode of preset frequency according to the instruction of swing frequency function.

When the selected swing frequency function is valid (**[F6.2.46]＝###1**), frequency inverter starts swing frequency preset frequency after running, then runs the swing frequency operation status via the process of preset frequency waiting time.

In case of the selected swing frequency function terminal available (**[F6.2.46]＝###2**), when swing frequency operation input terminal is valid, frequency inverter runs the swing frequency operation status; When it invalidates, frequency converter outputs preset frequency (**[F6.2.47]**), and the preset frequency waiting time is unavailable.

F6.2.49 Swing frequency amplitude	**Setting range: 0.0~50.0%**	**Factory default:10.0**

Swing frequency amplitude is the ratio of swing frequency amplitude.

When it occurs to fixed swing frequency amplitude (**[F6.2.46]＝#0##**), mathematics of practical swing frequency amplitude is:

Practical Swing frequency amplitude= **[F6.2.49]** × maximum frequency **[F0.1.20]**

When it occurs to changeable swing frequency amplitude (**[F6.2.46]＝#1##**), mathematics of practical swing frequency amplitude is:

Practical Swing frequency amplitude= [**F6.2.49**] × (preset frequency of swing frequency center [**F6.2.53**] +frequency set value **F0.1.16**)

F6.2.50 Sudden jump frequency	**Setting range: 0.0~50.0%**	**Factory default: 10.0**

Sudden jump frequency is the amplitude of frequency's fast descending after it reaches upper boundary in swing frequency cycle, that is, the amplitude of frequency's fast ascending after it reaches lower boundary.

Practical sudden jump frequency = **[F6.2.50]** × practical swing frequency amplitude.

F6.2.51 Triangular wave rising time	**Setting range:0.0~1000.0Sec.**	**Factory default:10.0**
F6.2.52 Triangular wave decreasing time	**Setting range: 0.0~1000.0Sec.**	**Factory default:10.0**

The parameter in this group is referred to acceleration and deceleration slope in the process of swing frequency.

Triangular wave rising time is referred to the time spent from the lower boundary frequency to the upper boundary frequency in swing frequency operation, that is, the acceleration time in the cycle of swing

frequency operation.

Triangular wave decreasing time is referred to the time spent from the upper boundary frequency to the lower boundary frequency in swing frequency operation, that is, the deceleration time in the cycle of swing frequency operation.

The sum of triangular wave rising time and decreasing time is the swing frequency operation cycle.

F6.2.53 Frequency setting in the center of the swing frequency	**Setting range: 0.00~[F0.1.21]**	**Factory default: 10.00**

Frequency setting in the center of the swing frequency is referred to the center value of frequency converter output frequency in the process of swing frequency operation.

Center frequency of practical output = **[F6.2.53]** + **F0.1.16** certain set frequency.

Refer to the following figure for the structure of Process PID and functions of each functional parameters:

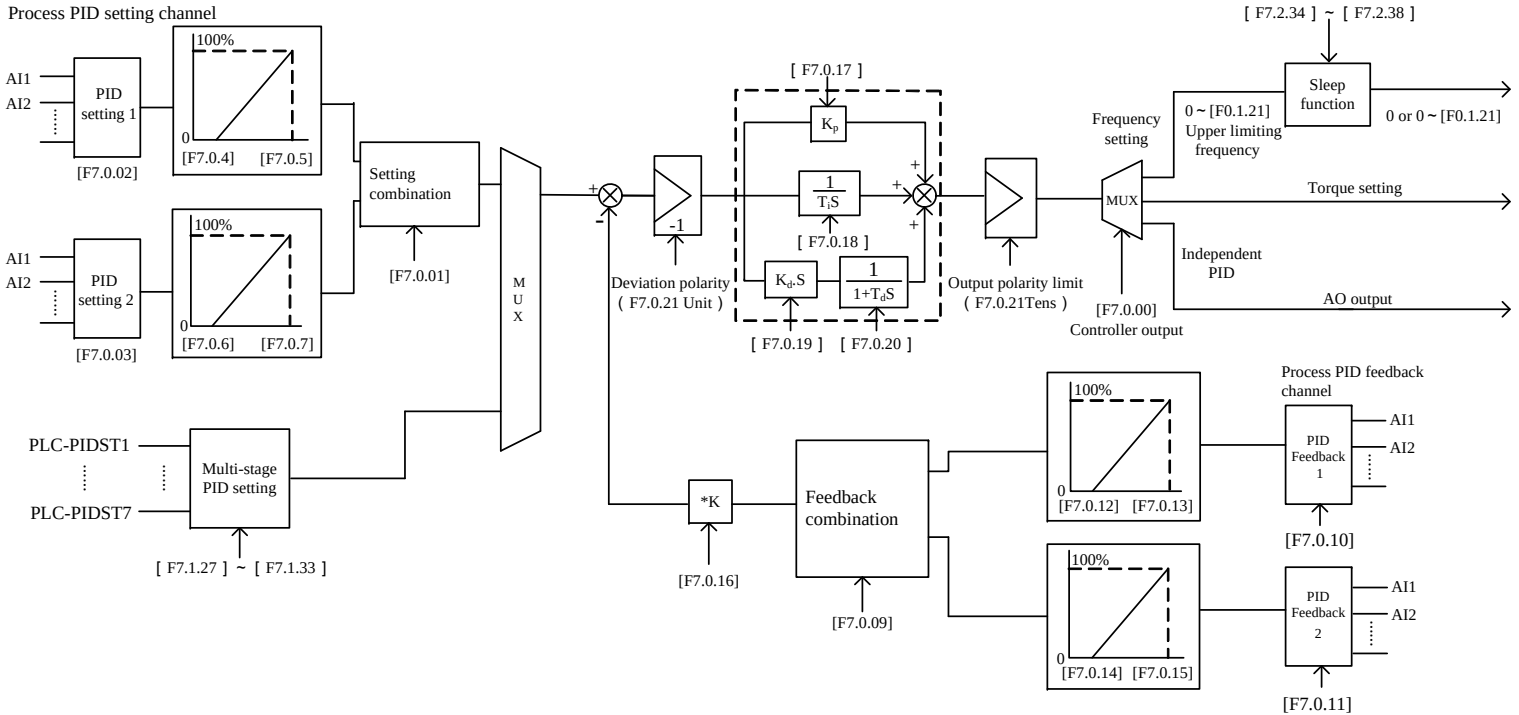


Figure 7-51 Schematic block of process PID control

7.28 PROCESS PID (4ms CONTROL CYCLE) (GROUP F7.0)

F7.0.04 Analog input quantity corresponding to 0% setting (Channel 1)	**Setting range: 0.0V~[F7.0.05]/ AI2: 0.0mA~[F7.0.05]**	**Factory default: 0.0**
F7.0.05 Analog input quantity corresponding to 100% setting (Channel 1)	**Setting range: [F7.0.04] ~10.00 / AI2: [F7.0.04] ~20.00mA**	**Factory default:10.00**
F7.0.06 Analog input quantity corresponding to 0% setting (Channel 2)	**Setting range: 0.0V~[F7.0.07]/ AI2: 0.0mA~[F7.0.07]**	**Factory default: 0.0**
F7.0.07 Analog input quantity corresponding to 100% setting (Channel 2)	**Setting range: [F7.0.06] ~10.00 / AI2: [F7.0.06] ~20.00mA**	**Factory default:10.00**

When analog channel input is selected for setting source of process **PID**, corresponding relationship between set value of process **PID** and analog port can be altered with this group of parameters. The corresponding relationship is shown in Figure 7-51.

F7.0.12 Analog feedback quantity corresponding to 0% feedback (feedback channel 1)	**Setting range: 0.0~[F7.0.13]/ AI2: 0.0mA~[F7.0.13]**	**Factory default: 0.0**
F7.0.13 Analog feedback quantity corresponding to 100% feedback (feedback channel 1)	**Setting range: [F7.0.12]~10.00V / AI2: [F7.0.12] ~20.00mA**	**Factory default: 5.00**
F7.0.14 Analog feedback quantity corresponding to 0% feedback (feedback channel 2)	**Setting range: 0.0~[F7.0.15]/AI2: 0.0mA~[F7.0.15]**	**Factory default: 0.0**
F7.0.15 Analog feedback quantity corresponding to 100% feedback (feedback channel 2)	**Setting range: [F7.0.14]~10.00V / AI2: [F7.0.14] ~20.00mA**	**Factory default: 5.00**

When the analog channel input is selected for feedback source of process **PID**, corresponding relationship between feedback value of process **PID** and analog port can be altered with this group of parameters. The corresponding relationship is shown in Figure 7-52.

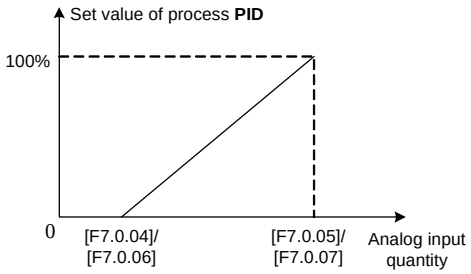


Figure 7-52 Sketch of definition of set value of process **PID**

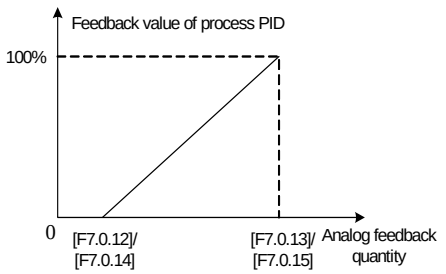


Figure 7-52 Sketch of corresponding relationship of feedback value of process **PID**

F7.0.16 Feedback multiplication factor	Setting range:0.01~100.00	Factory default:1.00

This function is mainly applied in occasions of flow calculation with differential pressure. When the feedback value is not in accordance with the given value of process **PID**, while there is a certain linear relation, this group of parameters can be selected to make it accordant of the meaning expressed by feedback value and given value of process **PID**. For example, if the given value of process **PID** means flow of the pipe, feedback value of process **PID** means flow rate of the pipe, supposing the set value of this parameter means cross sectional area (CSA) of the pipe, then the given value and feedback value of process **PID** shall be in accordance.

F7.0.17 Proportional gain	**Setting range: 0.0~100.00**	**Factory default: 2.00**
F7.0.18 Integral time	**Setting range: 0.0, 0.1~1000.0Sec.**	**Factory default: 20.0**
F7.0.19 Differential coefficient	**Setting range: 0.0,0.01~10.00**	**Factory default: 0.0**
F7.0.20 Differential inertia filtering time	**Setting range: 0.01~100.00 Sec.**	**Factory default: 10.00**

Proportional gain defines the magnification of deviation. The bigger the set value is, the faster the response of system is, but oscillation can be caused when it's too big; the smaller the set value is, the slower the response is.

Adjusting only with proportional gain will not eliminate the deviation completely. In order to eliminate the remained deviation, integral time shall be selected. The smaller the integral time is set, the faster the response is, but oscillation of system can be caused when it's too big or too small.

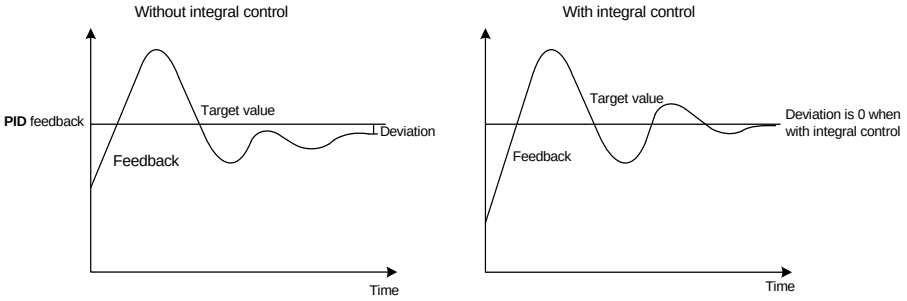


Figure 7-53 Function of integral control

Differentiator can make response to the change rate of deviation. The larger the change is, the larger the output gain is, and that is, its gain is in proportion to change rate of deviation. But it won't make response to constant deviation. When differential coefficient is 0.0, it means the differential function closing the controller. Differential function can improve the responsibility of system.

The larger the differential coefficient is set, the stronger the differential function is. In general system, there is no need to introduce differential link.

Larger differential inertia filtering time can make the differential adjustment more smooth, generally, it's set in proportion to the inertia of system.

F7.0.21 PID controller characteristics configuration	Setting range: 0000~0111	Factory default: 0000

The unit: Dviation polarity

0: Positive deviation

When feedback signal gets weaker, **PID** output is increased.

1: Negative deviation

When feedback signal gets weaker, **PID** output is decreased.

Tens: output polarity

0: Unipolarity

1: Bipolarity

For unipolarity of **PID** control mode, output of PID adjuster is always positive value, lower limit is 0. For frequency settings, operation direction of frequency inverter is determined with external control order, while PID output can't change the operation direction. Generally, it applies for devices without motor reversal for water and pressure delivery.

For bipolarity of **PID** control mode, output of PID adjuster is negative value. For frequency settings, operation direction of frequency inverter is determined with external control order and "exclusive OR" calculation of PID output direction, and PID output can change the operation direction. If the direction lock parameter (F0.1.17) is valid, efficient PID output shall take the absolute value. Refer to Figure 7-54-A and Figure 7-54-B.

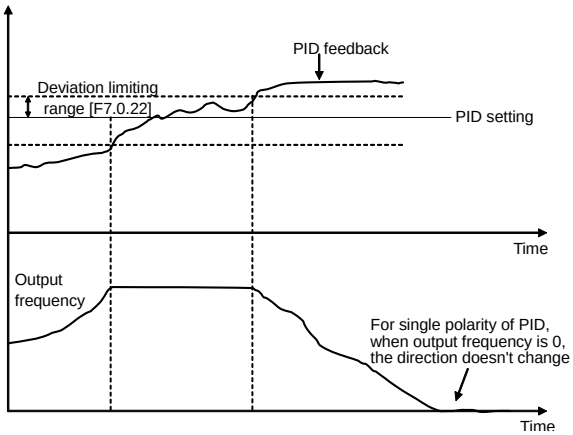


Figure 7-54-A Single polarity of PID control mode

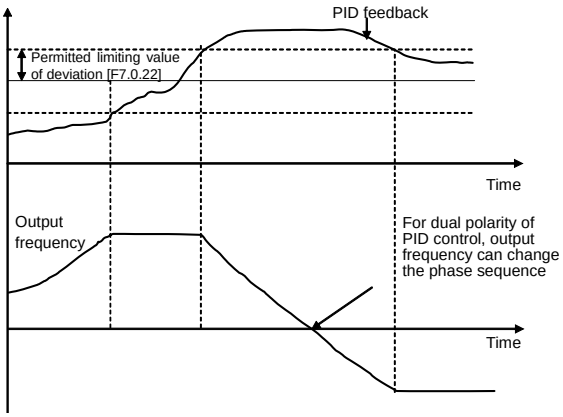


Figure 7-54-B Dual polarity of PID control mode

F7.0.22 Permitted static deviation (relative 100% setting)	Setting range:0.0~20.0%	Factory default: 5.0

Controller output value is the permitted maximum deviation amount with given value of controller. When feedback value is within the range of maximum deviation range, the controller stops adjusting. Proper setting of his function contributes to covering the accuracy and stability of output of system.

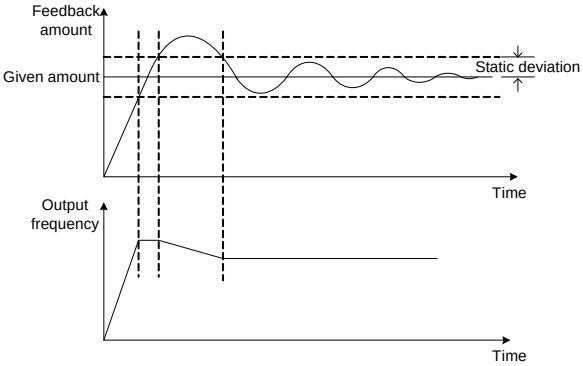


Figure 7-55 Sketch of static deviation

F7.0.23 PID output preset	Setting range: 0.0~100.0%	Factory default: 0.0
F7.0.24 Preset hold time before PID starting	Setting range: 0.0~3600.0Sec.	Factory default: 0.0

This function can make it earlier to access to the sable stage for **PID** adjustment. Preset value of **PID** output is the relevant percentage of upper limiting frequency [**F0.1.21**].

When frequency inverter start to operate, first of all, it shall be sped up to the preset frequency of **PID**, and operate as closed-loop characteristics after running continually for a while at this point of frequency [**F7.0.24**].

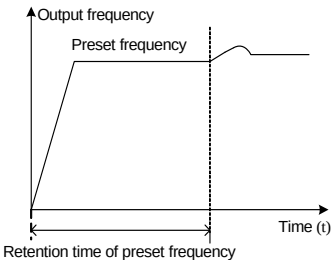


Figure 7-56 Sketch of closed-loop corresponding sensor value

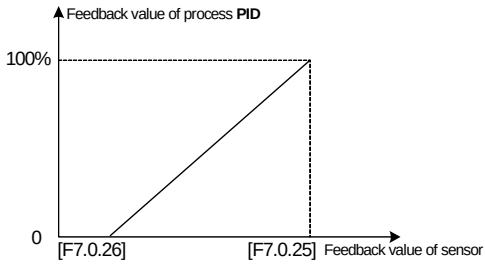


Figure 7-57 Relationship curve of feedback percentage and preset Frequency Operation

F7.0.25 Actual sensor value (range) corresponding to 100% feedback	Setting range:0.01~100.00	Factory default: 1.00
F7.0.26 Actual sensor value corresponding to 0% feedback	Setting range:-100.00~100.00	Factory default: 0.0

This group of parameter determines the corresponding relationship between feedback percentage and

feedback physical quantity, which determines display values of monitoring parameters d0.1.36 and d0.1.37. Corresponding relationship curve is shown in Figure 7-57.

7.29 PROCESS PID MULTI-STAGE SETTING (GROUP F7.1)

F7.1.27~F7.1.33 Process PID multi-stage preset	Setting range:-100.0~100.0%	Factory default: 0.0

This group of parameter defines the set value of process **PID** multi-stage operation. Set value is the relevant percentage of process PID set value determined in **F7.0.01.**

Multi-stage operation of process **PID** can be flexibly realized with multifunction input terminal, please refer to function instruction of given terminal **1, 2, 3(28~30)** of multi-stage process **PID** of terminal function **F3.0.00~F3.0.08.**

7.30 PROCESS PID SLEEPING FUNCTION (GROUP F7.2)

This function is valid when **PID** output conducts frequency order; Sketch is shown as below:

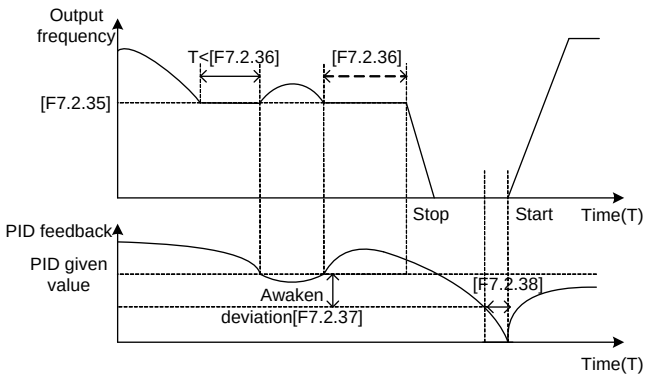


Figure 7-58 Sketch of PID sleeping function

- Set value of awakens deviation is the relevant percentage of PID given value

7.31 REVOLUTION SETTING AND FEEDBACK (GROUP F8.0)

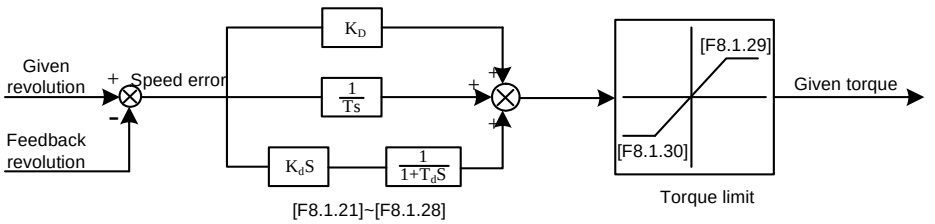


Figure 7-59 Closed-loop block diagram of revolution

This group of parameter is valid with VC and SVC modes.

F8.0.00 Revolution setting channel	Setting range: 0~12	Factory default: 0

This parameter is used to define revolution setting channel. Selecting mode of revolution setting channel is similar with that of frequency setting source channel. Refer to instruction of **F0.2.25** parameter.

0: Set by frequency setting parameter (F0.1.16)

Revolution set value is obtained from transition of frequency set value selected by **F0.1.16**: revolution setting = frequency set value*60/ pairs of motor polarity

1: Digital setting (F8.0.03)

Value of **F8.0.03** is set as revolution set value, automatically preserved when outage.

2: Panel shuttle potentiometer setting

Revolution set value is given by revolving panel shuttle potentiometer.

3: Analog input AI1

4: Analog input AI2

5: Analog input AI3 (Bipolarity)

6: Frequency signal input (Fin)

Take the pulse signal input by pulse input port **Fin** as revolution set value.

7: MODBUS Fieldbus set value 1 (relative setting)

8: MODBUS Fieldbus set value 2 (absolute setting)

Note: Select revolution setting channels 3~7, upper and lower limiting parameters shall be correctly selected F8.0.01 and F8.0.02.

9: Virtual analog input SAI1

10: Virtual analog inputSAI2

11: Set value 1 of expansion communication module

12: Set value 2 of expansion communication module

F8.0.01 Minimum set signal corresponding revolution	Setting range: 0~60*[F0.1.21]/ pairs of motor poles (rpm)	Factory default: 0
F8.0.02 Maximum set signal corresponding revolution	Setting range: 0~60*[F0.1.21]/ pairs of motor poles (rpm)	Factory default: 1500

This parameter is used to set the relationship curve of set value and corresponding motor revolution when revolution channel is analog input port of this parameter.

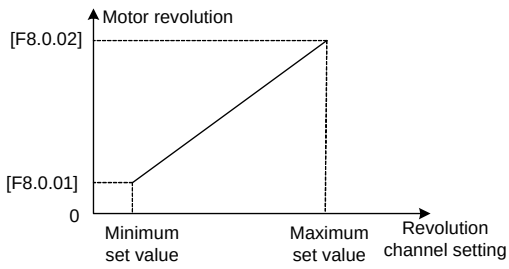


Figure 7-60 Corresponding relation of revolution set value and motor revolution

F8.0.06 PG rotation direction	Setting range: 0,1	Factory default: 0

In the system of inductive vector controlling， frequency inverter output phase sequence (depending on the connection order between the motor and frequency inverter U, V, W) and the connection order between pulses of encoder Phase A and Phase B should keep uniform. Or it can't function normally and cause the **Fu. 020** fault or 0 speed shock when starting. Then it can be solved with modifying the parameter.

- Systems of tension control or hoisting equipment, etc, which may lead to motor shaft side-pulling, may result in Fu.020 fault and at this moment please shield the protective function (FF.1.22 = # 0 # #).

F8.0.09 Revolution check cycle	Setting range: 0000~0805	Factory default: 0401

When revolution feedback channel selects an encoder, the parameter sets speed check cycle.

The parameter should set smaller values; overlarge revolution check cycle may lead to unstable closed-loop running and decelerate response. When use larger check cycle for ensuring the exactness of measuring speed, please lower the proportionality factors F8.1.21, F8.1.25 (default parameter)of revolution closed-loop regulator and enlarge integral time constants F8.1.22, F8.1.26 moderately.

F8.0.10 Detection of loss of speed detecting signal and action	Setting Range:0000~0021	Factory Default: 0001

Unit: Detection of loss of speed detecting signal

0: No detection

1: Detection and processing

Tens: Action after loss of speed detecting signal

0: Stop freely after fault alarming

1: Continue running by switching to SVC control mode and display alarm information.

2: DC band-type braking

F8.0.11 Missing detection and action of speed detection signal	Setting range: 0.01~5.00Sec.	Factory default: 2.00
F8.0.12 Wire breakage zero speed signal level	Setting range: 0~20.0%	Factory default: 0.0

When set revolution is bigger than the wire breakage zero speed signal level (its set value is relative to the percentage of the largest set speed [**F8.0.02**]), while feedback speed is smaller than wire breakage zero speed signal level, and revolution of frequency inverter checks wire breakage protective function after keeping the set time of **F8.0.11**.

F8.0.13 Speed measuring loop wire breakage detection flexibility	Setting range: 0.1~100.0	Factory default: 5.0

If speed measuring loop interference is great, it can enlarge **[F8.0.13]** to prevent wrong judgments from interference; otherwise decrease the set value to strengthen the response speed of the system to wire breakage check.

F8.0.14 Detection revolution filtering time coefficient	Setting range: 1~50ms	Factory default: 0ms

Filtering time coefficient of set revolution feedback in this parameter is available to all of the speed measuring modes (channels). When use encoder for speed measuring, the function is similar to check

cycle parameter (**F8.0.09**), therefore there is a need to set smaller values for the system of fast-speed response.

F8.0.15 The minimum revolution corresponding to the feedback signal (not PG)	**Setting range: 0~30000rpm**	**Factory default: 0**
F8.0.16 Corresponding revolution of the largest feedback signal (non-PG)	**Setting range: 0~30000rpm**	**Factory default: 1500**

The parameter is used to set relations between revolution feedback signal (feedback channel 1~4) and the corresponding to the motor feedback.

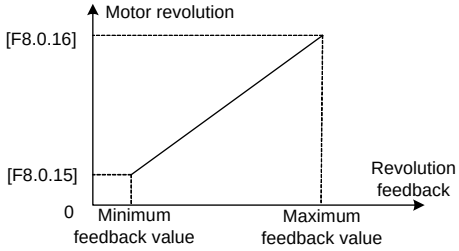


Figure 7-61 Corresponding relation of revolution feedback value and motor revolution

F8.0.17 Feedback revolution ratio	**Setting Range: 0.010~50.000**	**Factory Default: 1**

This parameter is used to set the feedback revolution ratio, and the ratio equals to motor shaft speed: speed of the speed detecting shaft.

7.32 REVOLUTION CLOSED-LOOP PARAMETER (GROUP F8.1)

F8.1.18 Controller parameter selection	**Setting range: 0,1,2**	**Factory default: 2**

0: Single PID parameter (the second group of parameters is effective by default)

1: Dual PID parameter (hysteresis switching)

2: Dual PID parameter (continuous switching)

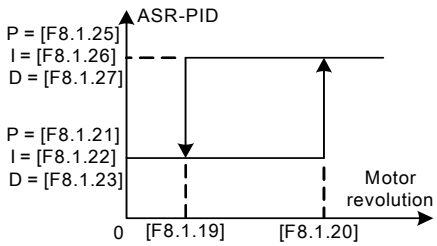


Figure 7-62-A Double PID parameter (hysteresis switching)

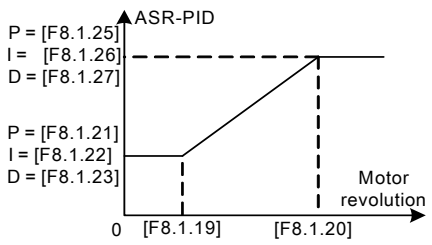


Figure 7-62-B Double PID parameter (continuous switching)

F8.1.19 PID revolution with parameter switching	**Setting range: 0~[F8.1.20]**	**Factory default: 100**
F8.1.20 PID parameter switching upper limiting revolution	**Setting range: [F8.1.19]~60*[F0.1.21] Motor pole pairs (rpm)**	**Factory default: 300**

The parameters are effective in the condition of double PID parameter hysteresis switching; the first group parameter is effective when it is lower to switching lower revolution [F8.1.18]; the second group parameter is effective when it is higher than switching upper revolution [F8.1.19].

F8.1.21 Proportional gain 1 (ASR-P1)	**Setting range: 0.05~1.00**	**Factory default: 0.90**
F8.1.22 Integral time 1 (ASR-I1)	**Setting range: 0.0, 0.01~50.00Sec.**	**Factory default: 2.50**
F8.1.23 Differential coefficient 1(ASR-D1)	**Setting range: 0.0, 0.01~10.00**	**Factory default: 0.0**
F8.1.24 Differential output filtering constant 1 (ASR-DT1)	**Setting range: 0.10~5.00 Sec.**	**Factory default: 0.80**
F8.1.25 Proportional gain 2 (ASR-P2)	**Setting range: 0.05~1.00**	**Factory default: 5.00**
F8.1.26 Integral time 2 (ASR-I2)	**Setting range: 0.0, 0.01~50.00Sec.**	**Factory default: 2.00**
F8.1.27 Differential coefficient 2 (ASR-D2)	**Setting range: 0.0, 0.01~10.00**	**Factory default: 0.0**
F8.1.28 Differential output filtering constant 2 (ASR-DT2)	**Setting range:0.0, 0.10~10.00 Sec.**	**Factory default: 1.00**

The parameters are applied to adjust proportional gain of speed adjuster, integral time and differential coefficient. Each parameter should be set as following:

1). Proportional gain P: as value is bigger, the response id faster, however the stability of system is worse and overlarge gain can lead to revolution shock.

2). Integral time coefficient I: as value is greater, the response id faster, and the revolution over-adjusting is greater, while the stability is worse. In general, the parameters are direct proportional to system inertia. When inertia is great, the parameter also set with great value.

3). Differential coefficient D: it is the reverse to differential time constant; there is no need in general system and it should be set to be zero. Differential adjusting in reality is a kind of trend forecasting adjustment; the parameter set is bigger, the differential function is stronger. Proper differential set can fast the response speed, improve the stability, and it is used to the system with requirements of less inertia and fast response.

4). Differential output filtering time constant DT: differential output to the adjuster for a stage of inertia filtering time constant is generally set direct proportion to system inertia.

F8.1.29 Adjustor output upper limit amplitude	**Setting range: 0.0~300.0%**	**Factory default: 250.0**
F8.1.30 Adjuster output lower limit amplitude	**Setting range: -300.0~0.0%**	**Factory default: -250.0**

The parameter is applied to set adjuster output amplitude and limit system's transient forward and backward torque. Its set value is the percentage corresponding to rated torque.

- Actual output torque is also limited by adjuster output lower limit amplitude [F1.4.47] and should pick up the lower among the two. When running acceleration and deceleration, it is mainly limited by electricity limit level.

7.33 PROTECTIVE PARAMETERS (GROUP F8.2)

F8.2.32 Excessive action of revolution deviation (DEV)	**Setting range: 0~3**	**Factory default: 0**
F8.2.33 Over speed (OS) detection action	**Setting range: 0~3**	**Factory default: 1**

The parameter is used to set excessive action of revolution deviation **(DEV)** and over speed **(OS)** detection action.

0: No action

Inverter keeps on running without reporting any fault or warning message.

1: Alarm free stop

Inverter immediately blockades output and reports overlarge deviation of rotating speed of **Fu.018 (DEV)/Fu.019** over-speed fault, while electric motor freely coasts to stop

2: Alarm deceleration stop

Inverter slows down to stop according to effective time of deceleration, and reports overlarge deviation of rotating speed **(Fu.018)** or over-speed fault **(Fu.019)**.

3: Alarm continuing running

Inverter keeps on running, whereas reports overlarge deviation of rotating speed **(aL.018)** or over-speed warning **(aL.019)** at the same time.

7

F8.2.34 Detected value of excessive revolution deviation (DEV)	**Setting range: 0.0~50.0%**	**Factory default: 20.0%**
F8.2.35 Detection time of excessive revolution deviation (DEV)	**Setting range: 0.0~10.00Sec.**	**Factory default: 10.00**

These parameters are used to set detecting value and time for overlarge deviation of rotating speed (DEV).

Provided that deviation of rotating speed is continuously greater than given DEV detecting value within given DEV detecting time [F8.2.35], then inverter shall be in line with the setting action of F8.2.32. Set value of F8.2.34 is corresponding to the percentage of upper limit frequency [F0.1.21].

F8.2.36 Detected value of over speed (OS)	**Setting range: 0.0~150.0%**	**Factory default: 120.0%**
F8.2.37 Detection time of over speed (OS)	**Setting range: 0.0~2.00Sec.**	**Factory default: 0.10**

These parameters are used to set detecting value and time of over-speed (OS).

Provided that feedback rotating speed is continuously faster than given OS detecting value within given OS detecting time [F8.2.37], then inverter shall be in line with the setting action of F8.2.33. Set value of F8.2.36 is corresponding to the percentage of upper limit frequency [F0.1.21].

7.34 TORQUE CONTROL (GROUP F8.3)

F8.3.40 Selection of torque command channel	Setting range:0~14	Factory default: 0

0: Digital setting (F8.3.41)

Take the set value of **F8.3.41** as given value of torque, and conduct power failure storage.

1: Panel shuttle potentiometer setting

Set value of torque is given by rotational shuttle potentiometer

2: Analog input AI1

AI1 input voltage value of **0**~**10V** is corresponding to **0~300%** of rated torque

3: Analog input AI2

AI2 input current value of **4**~**20mA** is corresponding to **0~300%** of rated torque

4: Analog input AI3

AI3 input voltage value of **-10**~**10V** are corresponding to **0~300%** of rated torque

5: Analog input AI3 (bipolarity)

AI3 input voltage value of **-10**~**10V** is corresponding to **-300%~300%** of rated torque; positive and negative input of **AI3** are corresponding to positive and negative instruction value of torque.

6: Frequency signal input (Fin)

Maximum value of input frequency of **Fin** terminal is corresponding to **300%** of rated torque.

7: Process PID output

For process **PID** output that given as torque instruction, **F7.0.00** parameter needs to be set as **#1##** for matching.

8: Compensation PID output

For compensation **PID** output that given as torque instruction, **F9.0.00** parameter needs to be set as **#1##** for matching.

9: MODBUS Fieldbus set value 1 (relative set value)

Current torque instruction of inverter is set by principal computer through built-in standard **RS485** communication interface of inverter.

10: MODBUS Fieldbus set value 2 (absolute set value)

11: Virtual analog input SAI1

12: Virtual analog input SAI2

13: Set value 1 of expansion communication module 1

14: Set value 2 of expansion communication module 2

F8.3.41 Torque digital setting	Setting range: -300~300%	Factory default: 0.0

Its set value, the setting with symbols (direction), is corresponding to the percentage of rated torque; actual given direction of torque is “Exclusive OR” of control command direction and set value direction.

Refer to the following figure for the structure of compensation PID and functions of each functional parameter:

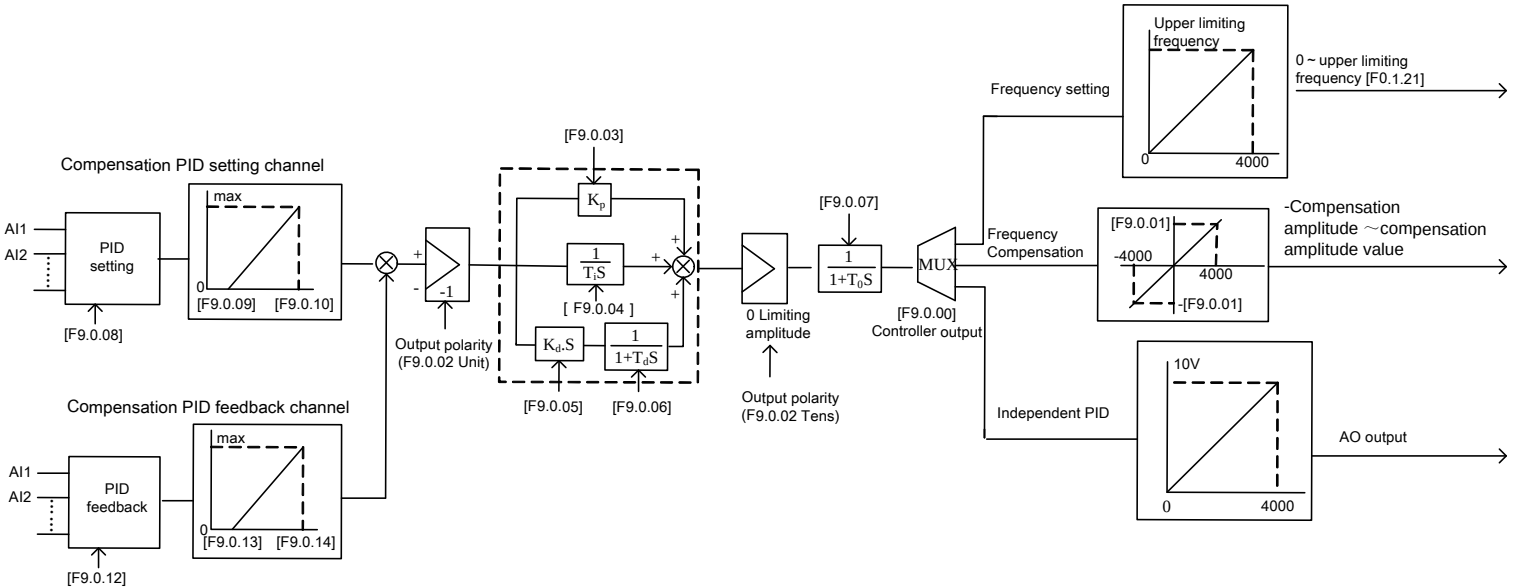


Figure 7-63 Schematic block of compensation PID

7.35 COMPENSATION PID (1ms CONTROL CYCLE) (GROUP F9.0)

F9.0.09 Analog input quantity corresponding to 0% set value	**Setting range: 0.0V~[F9.0.10] / AI2: 0.0mA~[F9.0.10]**	**Factory default: 0.0**
F9.0.10 Analog input quantity corresponding to 100% set value	**Setting range: [F9.0.09]~10.00V /AI2: [F9.0.09] ~20.00mA**	**Factory default:10.00**

When the compensation **PID** setting source channel selects the analog channel input, this group of parameters can be used to modify the correspondence relationship between the compensation **PID** set value and the analog pot. The correspondence relationship is shown in Figure 7-64.

F9.0.13 Feedback input corresponding to 0% feedback	**Setting range: 0.0V~[F9.0.14] / AI2: 0.0mA~[F9.0.14]**	**Factory default: 0.0**
F9.0.14 Feedback input corresponding to 100% feedback	**Setting range:[F9.0.13]~10.00V /AI2: [F9.0.13] ~20.00mA**	**Factory default: 10.00**

This group of parameters can be used to modify the correspondence relationship between the compensation **PID** feedback value and the analogy port. The correspondence relationship is shown in Figure 7-65.

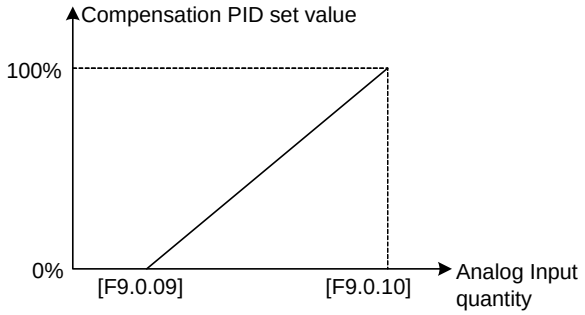


Figure 7-64 Sketch of compensation PID set value definition

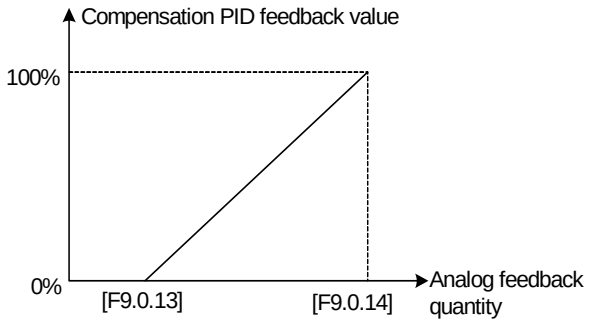


Figure 7-65 Sketch of compensation PID feedback value definition

7.36 PARAMETER SELECTION OF COMPENSATION PID CONTROLLER (GROUP F9.1)

There are 4 Groups of compensation **PID** controller parameters, and their switching means are shown in Figure 7-66 ([9.1.21=0023]):

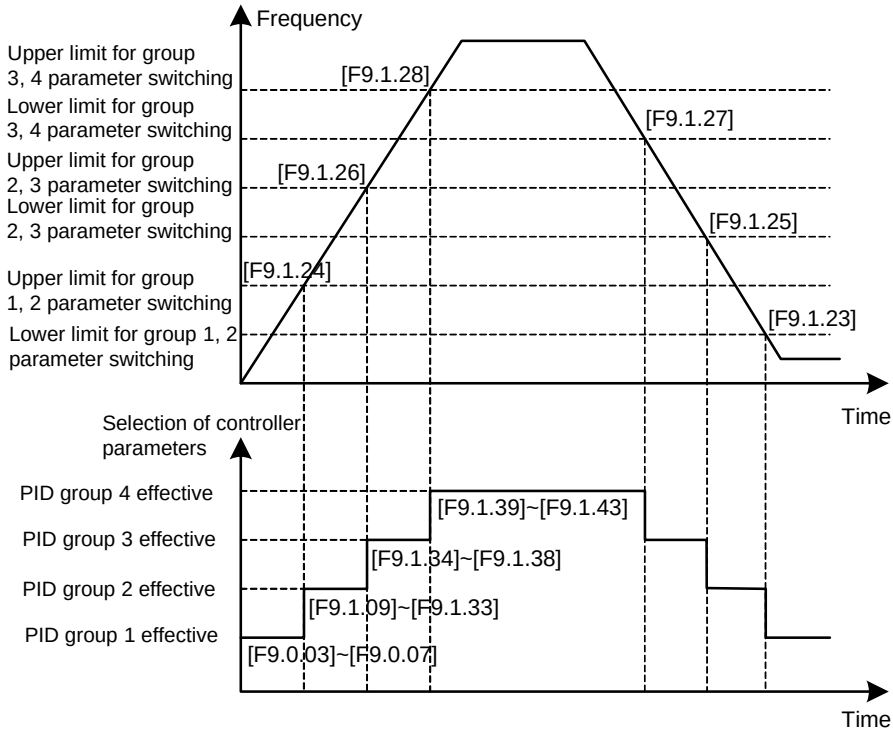


Figure 7-66 Sketch of compensation PID parameter switching

7.37 MODBUS FIELDBUS (STANDARD EXPANSION CARD CONFIGURATION) (GROUP FA.0)

FA.0.02 The inverter station address	Setting range: 0~247	Factory default: 1

This parameter is used to set the address of the local inverter in the case of serial port communication. It is only effective when the inverter is a slave one. During communication, the local device only receives commands for the data frames consistent with the address of this device, and then sends back response frames.

- 0 is the broadcasting address. When it is set to the broadcasting address, the device will only receive and execute broadcasting commands and will not respond to the master device.

FA.0.03 Local inverter response delay of	Setting range: 0~1000ms	Factory default: 5ms

The response delay of the inverter refers to the waiting time since the inverter serial port has received and explained the command sent from the slave device till the response frames are sent.

FA.0.04 Communication failure judging time	Setting range: 0.01~10.00Sec.	Factory default: 1.00

If the local inverter has not received correct data signal beyond the time interval defined by this parameter, then the communication is judged to be failed for the local inverter. The inverter will report **Fu.071** Fault, and will act as set by **FA.0.05**.

FA.0.05 Action after communication failure	Setting range: 0~1	Factory default: 0

0: Deceleration stop

1: Run according to the command received at last

7.38 MAPPING PARAMETER ACCESS (GROUP FA.1)

FA.1.08~FA.1.13 Mapping application parameter 1~6 (H)	Setting range: F0.00~FF.55	Factory default: F0.29F0.32
FA.1.14~FA.1.23 Mapping status parameter 1~10 (H)	Setting range: d0.00~d1.49	Factory default: d0.00~d0.09

When A510 series inverter makes access to functional parameters or monitoring parameters via the buss, corresponding address can be predicted directly with the functional code. However, when it is needed to access multiple functional parameters or monitoring parameters with discontinuous address, multiple-frame data are needed in this method.

The mapping parameter access is actually a needle access mode. When accessing (reading or writing) several functional parameters or status parameters with discontinuous address, these parameters can be mapped into an area with continuous address (bus-control parameter area) for accessing.

See the following table for the bus-control parameters of A510 frequency inverter.

Register Name	Access address	Remarks
Control word	0x1300	Can be read as per the loops (1~16)
Set value 1	0x1301	Setting of relative values
Set value 2	0x1302	Setting of absolute values
Mapping application parameter 1	0x1303	The access parameter is set by FA.1.08.
Mapping application parameter 2	0x1304	The access parameter is set by FA.1.09.
Mapping application parameter 3	0x1305	The access parameter is set by FA.1.10
Mapping application parameter 4	0x1306	The access parameter is set by FA.1.11.
Mapping application parameter 5	0x1307	The access parameter is set by FA.1.12.
Mapping application parameter 6	0x1308	The access parameter is set by FA.1.13.
Status word	0x1309	Can be read as per the discrete quantity (1~16)
Mapping status parameter 1	0x130A	The access parameter is set by FA.1.14.
Mapping status parameter 2	0x130B	The access parameter is set by FA.1.15.
Mapping status parameter 3	0x130C	The access parameter is set by FA.1.16.
Mapping status parameter 4	0x130D	The access parameter is set by FA.1.17.
Mapping status parameter 5	0x130E	The access parameter is set by FA.1.18.
Mapping status parameter 6	0x130F	The access parameter is set by FA.1.19.
Mapping status parameter 7	0x1310	The access parameter is set by FA.1.20.
Mapping status parameter 8	0x1311	The access parameter is set by FA.1.21.
Mapping status parameter 9	0x1312	The access parameter is set by FA.1.22.
Mapping status parameter 10	0x1313	The access parameter is set by FA.1.23.

The mapping parameters are determined by FA.1 Group of parameters.

For example, in one frame of standard **MODBUS** protocol data, it's impossible to read the status parameters **d0.0.02**, **d0.0.05**, **d1.0.01** and **d1.1.31** and status word once and for all with a common method. To map status parameters into the bus-controlled parameter area with continuous address, set with the following method:

[**FA.1.14**]=**d0.02** [**FA.1.15**]=**d0.05**

[**FA.1.16**]=**d1.01** [**FA.1.17**]=**d1.31**

Then it just needs to read the data in the continuous address **0x130A** ~ **0x130D.**

7.39 COMMUNICATION LINKAGE SYNCHRONOUS CONTROL (GROUP FA.2)

FA.2.26 Set the correction coefficient of the unit via communication	**Setting range: 0.010~10.000**	**Factory default: 1.000**

During linkage control, this parameter defines the proportion between the output frequency of the master machine and the slave machine; the parameter of the master inverter does not function.

FA.2.27 Fine adjustment source for linkage proportion coefficient	**Setting range: 0~3**	**Factory default: 0**

0: No fine adjustment

If the fine adjustment source for linkage proportion coefficient is void, then: Slave frequency command = master frequency command * **[FA.2.26]** of the salve machine.

1: Analog input AI1

If **AI1** is selected for the fine adjustment source for linkage proportion coefficient, then: Slave frequency command = master frequency command * **[FA.2.26]** of the salve machine ***AI1/AI1** maximum.

2: Analog input AI2

If **AI2** is selected for the fine adjustment source for linkage proportion coefficient, then: Slave frequency command = master frequency command * **[FA.2.26]** of the salve machine ***AI2/AI2** maximum.

3: Analog input AI3

If **AI3** is selected for the fine adjustment source for linkage proportion coefficient, then: Slave frequency command = master frequency command * **[FA.2.26]** of the salve machine ***AI3/AI3** maximum.

FA.2.28 Slave machine offset frequency /revolution	**Setting range: 0, 1, 2**	**Factory default: 0**

This parameter of the master inverter does not function, and it is used to select the auxiliary frequency of the slave machine:

Actual output frequency of the salve machine=master machine frequency command * slave machine linkage proportion (including fine adjustment) + offset frequency

0: No offset

No offset frequency/revolution; The frequency set value of the slave machine is determined by the frequency command of the master device and the setting of **FA.2.26** and **FA.2.27.**

1: Determined by frequency setting source 1

The frequency set value of the slave machine frequency setting source 1 is regarded as the offset frequency/revolution of the slave machine.

2: Determined by frequency setting source 2

The frequency set value of the slave machine frequency setting source 2 is regarded as the offset frequency/revolution of the slave machine.

FA.2.29 Linkage balance function	**Setting range: 0~4**	**Factory default: 0**

0: Void

1: Current balance

With reference to the load current of the master device, each slave device will automatically conduct fine adjustment to the output of local device so as to keep consistency with the master device's current.

2. Torque balance

With reference to the torque of the master device, each slave device will automatically conduct fine adjustment to the output of local device so as to keep consistency with the master device's torque.

3: Power balance

With reference to the power of the master device, each slave device will automatically conduct fine adjustment to the output of local device so as to keep consistency with the master device's torque.

4: Position synchronous balance

In the multi-device linkage running system with PG closed-loop vector control, the position synchronous balance function can be adopted to eliminate accumulative displacement deviation caused by slight deviation of each drive's revolution. In this mode, all the motor's PG speed measuring devices which are subject to linkage running shall have the same parameters (pulse per revolution).

The position synchronous balance can only allow for correction of slight revolution deviation, and the revolution synchronous balance function should be well adjusted before use of this function.

FA.2.30 Linkage balancing gain	**Setting range: 0.001~10.000**	**Factory default: 1.000**

When the linkage balancing function is effective, this parameter is used to set the adjusting gain output by this device, and it is only effective for the slave device. The higher the gain is, the higher the amplitude of the self-balancing adjustment is.

7.40 EXPANSION MULTIFUNCTIONAL INPUT TERMINAL (GROUP FB.0)

Fb.0.00~Fb.0.07 Expansion multifunctional input terminal EDI1~8	**Setting Range: 0~96**	**Factory default: 0**

FF group parameters contain special and internal functional parameters, and their setting and initialization is limited. This parameter is used to set the user's authority for FF parameters.

Fb.0.08 Filtering time of expansion multifunctional terminal	**Setting Range: 1~50ms**	**Factory default: 5ms**
Fb.0.09 Effective level of expansion multifunctional input terminal (H)	**Setting Range: 0000~00FF**	**Factory default: 0000**

7.41 EXPANSION MULTIFUNCTIONAL INPUT TERMINAL (GROUP FB.1)

Fb.0.10~ Fb.0.13 Expansion multifunctional output EDO1~EDO4	**Setting Range: 0~62**	**Factory default: 0**
Fb.0.14~ Fb.0.17 Expansion relay output ERO1~ERO4	**Setting Range: 0~62**	**Factory default: 0**

7.42 SERVO CONTROL AND SCALE POSITIONING (GROUP FB.2)

Fb.2.18 Automatic shift frequency	**Setting range: 0~5.00Hz**	**Factory default: 1.00**

For equipments with mechanical speed change gear like the spindle, during mechanical shifting, shift jogging can be adopted to avoid mechanical dead. This group of parameters defines the running parameters for shift jogging.

Fb. 2.19 Automatic shift switching cycle	**Setting Range: 0.10~2.00Sec.**	**Factory default: 0.3**
Fb.2.20 Zero frequency torque holdup (DC bind-type brake preferred)	**Setting range: 0~3**	**Factory default: 0**
Fb.2.21 Position gain 1 (positioning gain)	**Setting range: 0.10~100.00**	**Factory default: 1.00**

0: Void

1: Bind-type brake torque effective

2: Position locking (PG feedback VC mode)

3: Locked to designated stop angle

When the equipment stops, it will always tops at the angel preset by parameter **Fb.2.45**, which is convenient for operating equipment with requirement of fixed operation orientation for stop.

In the running mode of **V/F** and **SVC**, the function of zero frequency torque holdup is similar with that of the DC braking function. It cannot guarantee that the motor shaft is absolutely static when it is dragged by the load, and the position gain is void.

In the PG feedback **VC** control mode, if the zero frequency torque holdup **2** is selected, the drive will automatically memorize the shaft position at stop, and shift to the position serve running mode, so as to guarantee that the shaft will not rotate even under the load dragging. The higher the position gain is, the stronger the locking torque is.

Fb.2.22 PG speed shaft propulsion distance per revolution	**Setting range: 0.001~50.000mm**	**Factory default: 0.500**

This parameter is set the liner displacement of the transmission structure for each revolution of PG speed shaft. The accumulative displacement is shown in the monitoring parameter **d1.2.20**.

Fb.2.23 Servo control function	**Setting range:0000~0012**	**Factory default: 0000**

The unit: Function selection

0: Void – servo control void, and running in the speed or torque control mode.

1: Effective – must be in the closed-loop vector control mode.

2: External terminal selection (Function No. 69).

The closed-loop vector control mode must be selected for this function, and the selection will not be effective until the inverter has completely stopped.

Tens: Action mode

0: Common mode

1: Spindle orientation

Fb. 2.24 Position setting source in common mode	**Setting range: 0~5**	**Factory default: 1**
Fb. 2.25 Position digit setting (lower)	**Setting range: 0~65535**	**Factory default: 0**
Fb. 2.26 Position digit setting (upper)	**Setting range: 0~5000**	**Factory default: 0**

This group of parameters is used to define the position command source in the mode of common serve control.

When the analog setting is used to set the position, the maximum analog input is corresponding to 5000 pulse commands.

When digital setting (**[Fb.2.24] = 2**) is selected as the position setting source, **Fb.2.25** and **Fb.2.26** are used to set the command position.

Fb. 2.27 Electronic gear (numerator)	**Setting range:0~65535**	**Factory default: 1000**
Fb. 2.28 Electronic gear (denominator)	**Setting range:0~65535**	**Factory default: 1000**

The electronic gear is used to transform the command pulse to the amount of movement. If the encoder is set to a (pulse per revolution), the displacement per revolution of the motor is B, and the pulse command unit is C, then the electronic gear can be calculated as below: Electronic gear = 4AC/B

The numerator and denominator can be figured out after approximating the common divider.

For example, the encoder of a certain transmission is 1000 lines (A=1000), and motor displacement per revolution is 2 mm (B=2), and the pulse command unit is 1 um (C=0.001m), then the electronic gear is 4AC/B = 4000*0.001/2 = 2/1. Hence, the numerator and the denominator for the electronic gear is respectively 2 and 1.

Fb. 2.30 Position gain 2	**Setting range: 0.01~100.00**	**Factory default: 1.00**
Fb. 2.31 Position gain selection mode	**Setting range: 0~3**	**Factory default: 0**
Fb. 2.32 Position gain selection position deviation	**Setting range: 0~30000**	**Factory default: 100**

In the position gain selection mode, the position gain 1 (**Fb. 2.21**) is effective when the gain (**[Fb.2.31] =3**) is selected according to the position deviation, and the position deviation is lower than the set pulse value (**Fb.2.32**). Otherwise, the position gain 2 (**Fb. 2.30**) will be effective.

Fb.2.33 Speed feed-forward gain	**Setting range : 0.0~200.0(%)**	**Factory default:100.0**

The higher the position speed feed-forward gain is set, the Faster the tracking speed is. However, excessive set value may worsen the stability.

Fb.2.34 Revolution limiting mode in the mode of common servo mode	**Setting Range: 0~1**	**Factory default: 0**

0: Limited by upper frequency

Automatically calculate current operation speed according to the position deviation, preset acceleration and deceleration time (simple information of load inertia) and limited by the upper frequency.

1: Limited by the frequency setting channel

Automatically calculate the current operation speed according to the position deviation, preset acceleration and deceleration time (simple information of load inertia), and limited by the value of frequency setting channel. This way can help avoid sudden acceleration during position control occurred due to insufficient speed restraining conditions.

Fb. 2.36 Spindle orientation mode	**Setting range: 0000~0100**	**Factory default: 0000**

The unit: Selection of positioning zero point reference signals

0: Z Pulse positioning

Z pulse is used to be the reference signal for spindle 0 point (any offset angle can be set according to usual practice). In this mode, the encoder should be installed on the spindle.

1: Photoelectric switch positioning

The photo electricity (or other sensor signal) on the spindle is used as the zero point reference signal.

Tens: Positioning command

0: External terminal selection

The value preset by the external functional terminal (**Function No. 72~74**) selection is used as the current positioning command. It is required to correctly set the transmission ratio (**Fb.2.46**) of the spindle, and when the encoder is installed on the spindle, this vale is set to be 1.000.

1: Pulse command setting

The positioning angle will be determined according to received command pulse. In this mode, it is applicable to adjust the transmission gear with the electronic gear or directly change the command pulse number. Please note that the direction of command pulse should be consistent with the spindle rotation direction, and the spindle transmission ratio (**Fb.2.46**) should be correctly set.

Fb. 2.37 Spindle orientation frequency/speed	**Setting range: 0.01~100.00Hz**	**Factory default: 5.00Hz**

To define the maximum search frequency at the time of spindle positioning.

Fb. 2.38~ Fb. 2.44 Spindle positioning angle 1~7	**Setting range: 0~359.9**	**Factory default: 0.0~315.0**
Fb. 2.45 Spindle stop angle	**Setting range: 0~359.9**	**Factory default: 0.0**

Setting for multi-stage spindle positioning angle and stop angle.

Fb. 2.46 Spindle transmission ratio	**Setting range:0.010~50.000**	**Factory default:1.000**

When the encoder is not directly installed on the spindle, this parameter needs need to be set to achieve correct spindle orientation. This parameter only functions for the spindle orientation function.

Spindle transmission ratio = revolution of the speed shaft: spindle revolution.

7.43 VIRTUAL INPUT AND OUTPUT (GROUP FF.0)

FF.0.00 FF configuration parameter locking function (H)	Setting range: 0000~1001	Factory default: 0000

FF group parameters include special and internal function parameters, and their setting and initialization are confined. This group of parameters is used to set the user's authority for operating FF parameters.

FF.0.01~FF.0.08 Definition of virtual output node (SDO1~ SDO8)	Setting range: 0~62	Factory default: 0

The virtual output nodes **SDO1~SDO8** are functionally the same as the multifunctional output terminals **DO1~DO3**, but do not output any signal. They are directly connected in the controller of the inverter to the virtual input nodes **SDI1~SDI8** one to one.

Using virtual nodes can not only help simplify wiring but can also avoid interference. The function of **SDO1~SDO8** can be defined by setting the value of **FF.0.01~FF.0.08**. Please refer to Table 2 (Comparison Table for Variables of Multifunctional Output Terminals **(DO/EDO/SDO)** for the variables corresponding to the set value.

FF.0.09~FF.0.016 Definition of virtual input node (SDI1~ SDI8)	Setting range: 0~96	Factory default: 0

The virtual input nodes **SDI1~SDI8** are functionally the same as the multifunctional input terminals **DI1~DI9.** But there are no actual physical input nodes. They are connected to the virtual output **SDO1~SDO8** one to one, and are directly taken from the virtual output signal.

The virtual input nodes **SDI1~SDI8** are functionally programmable, and their function can be defined by setting the values of **FF.0.09~FF.0.16**. Please refer to Table 1 (Comparison table for functions of multifunctional terminals **(DI/EDI/SDI)**)for functions corresponding to the set value.

FF.0.17 Virtual output - input connection polarity	Setting range: 0000~1111	Factory default: 0000
FF.0.18 Virtual output - input connection polarity	Setting range: 0000~1111	Factory default: 0000

The parameters are used to set the connection logic status of the virtual output nodes **SDO1~SDO8** and virtual input nodes **SDI1~SDI8**. When it is set to be reverse polarity connection, the virtual output signal will be negated before being inputted to the virtual input port, as shown in Figure 7-67.

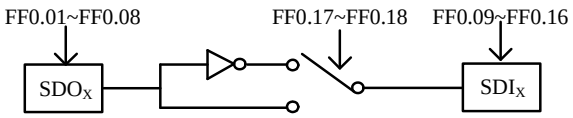


Figure 7-67 Block diagram of virtual output – input

7.44 PROTECTING FUNCTION CONFIGURATION PARAMETERS (GROUP FF.1)

This group of parameters is used to define if the protecting function needs to be activated or not. Generally no modification is required.

7.45 CORRECTION PARAMETERS (GROUP FF.2)

FF.2.25 AI1 Zero offset adjustment	**Setting range: -0.500~0.500V**	**Factory default: 0.0**
FF.2.26 AI1 gain correction	**Setting range: 0.950~1.050**	**Factory default:1.000**

This group of parameters is used to make fine adjustment to **AI1** zero point and **AI1.** The relationship before and after adjustment:

AI1 input value= **AI1** gain correction* **AI1** value before adjustment + **AI1** zero offset.

FF.2.27 4mA deviation adjustment for AI2	**Setting range:-0.500~0.500mA**	**Factory default: 0.0**
FF.2.28 AI2 gain correction	**Setting range: 0.950~1.050**	**Factory default: 1.000**
FF.2.29 AI3 Zero offset adjustment	**Setting range: -0.500~0.500V**	**Factory default: 0.0**
FF.2.30 AI3 gain correction	**Setting range: 0.950~1.050**	**Factory default: 1.000**
FF.2.31 AO1 zero offset correction	**Setting range: -0.500~0.500V**	**Factory default: 0.0**
FF.2.32 AO1 gain correction	**Setting range: 0.950~1.050**	**Factory default: 1.000**
FF.2.33 AO2zero offset correction	**Setting range: -0.500~0.500V**	**Factory default: 0.0**
FF.2.34 AO2 gain correction	**Setting range: 0.950~1.050**	**Factory default: 1.000**

The correction principle for each analog input/output port is the same as **AI1.** The relationship curves with zero offset adjustment and gain correction are respectively as below. Generally, users do not need to set these parameters.

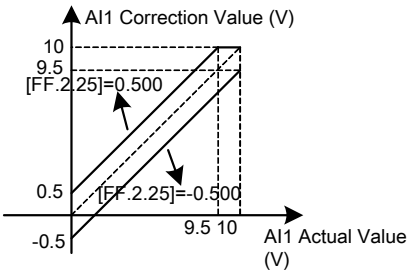


Figure 7-68-A
AI1 zero offset correction curve

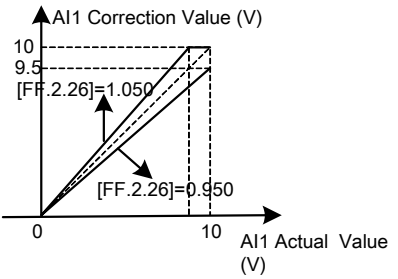


Figure 7-68-B
AI1 Gain correction curve

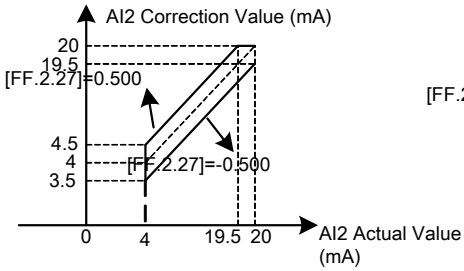


Figure 7-69-A
AI2 Zero offset correction curve

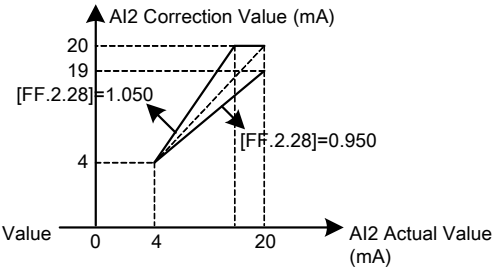


Figure 7-69-B
AI2 Gain correction curve

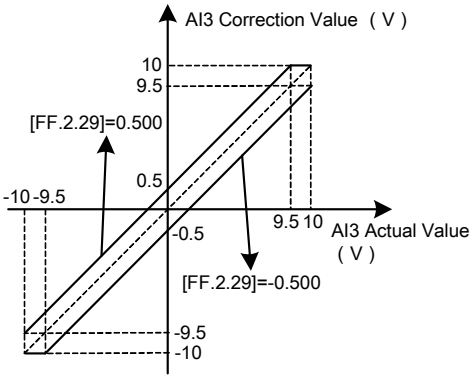


Figure 7-70-A
AI3 Zero offset correction curve

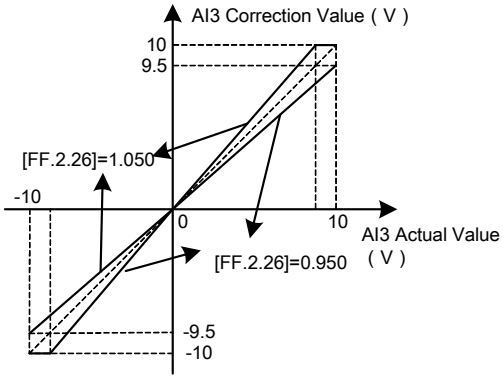


Figure 7-70-B
AI3 Gain correction curve

7

FF.2.35 Under voltage protection action level	Setting range: 320~450V	Factory default: 370 V

This parameter sets the allowable lower limiting voltage at the DC side during normal operation of the inverter. For some occasions with lower power grid, it is applicable to appropriately reduce the under voltage protection level, so as to ensure normal operation of the inverter.

- When the power grid is under excessive low voltage, the output torque of the motor will decrease. In the occasion of constant power load and constant torque load, excessive low voltage of the power grid will lead to increase of the inverter's input current, hence reducing the reliability of inverter operation.

The set value for this parameter [**FF.2.35**] must be no more than the under voltage adjustment action level [**F1.4.45**].

FF.2.36 Correction coefficient of DC side voltage detection value	Setting range: 0.950~1.050	Factory default: 1.000

When the actual bus of the inverter is deviated from the value of the DC side voltage monitoring parameter **d0.0.07**, it is applicable to set this parameter combined with the correction of potentiometer in the bus voltage detection circuit.

7.46 SPECIAL FUNCTIONAL PARAMETERS (GROUP FF.3)

The modification of this group of parameters should be conducted under the guidance of professionals, and no modification is needed generally.

7.47 OTHER CONFIGURATION PARAMETERS (GROUP FF.4)

FF.4.41 Cooling Fan control	Setting range: 0000~0111	Factory default: 0101

The unit: Soft start function (effective for model 4T0370 below)

This function helps effectively reducing the instantaneous power required for starting the Fan, hence guarantee stable and reliable operation of the switch power supply.

Tens: Air volume auto adjustment (effective for model 4T0370 below)

The revolution of the cooling Fan can be automatically adjusted according to the ambient temperature and operation status of the inverter, so as to maximize service life of the cooling Fan.

Hundreds: Start time

0: Start immediately after power-on

The fan will run according to the settings in the unit and ten's digit of this parameter immediately after the inverter is powered on.

1: Start during running

The fan will run according to the settings in the unit and ten's digit of this parameter after the inverter is powered on and has received the running command.

7

FF.4.42 Operating panel control options	Setting range: 0000~2001	Factory default: 0000

Kilobit: Panel control selection (except STOP key)

0: Standard panel interFace control

The control command can only be given through the standard operating panel, and external monitoring panel can be connected via **RS485.**

1: RS485 port external panel control

The control command can only be given via **RS485** port, and the standard panel is only used for monitoring.

2: Multifunctional terminal switching

The master control panel is selected by the multifunctional input terminal (Function No. 40) and the terminal function is set with the parameters **F3.0.00**~ **F3.0.08.**

FF.4.43 Special function configuration	Setting range: 0000~1111	Factory default: 0001

The unit: Motor parameter identification auto-start

0: Forbidden

1: Permitted

After modifying the motor nameplate parameters, the inverter will automatically set static self identification

of motor parameters once.

Tens: Voltage vector composition mode

0: Three-phase composition

1: Two-phase composition

Another modulation method for space voltage vector. This method can help appropriately reduce heating of the inverter, but audio noise may somewhat increase.

Hundred: Small pulse shielding

0: Void

1: Effective

Kilobit: SVC Revolution identification mode

0: SVC Revolution identification mode

1: SVC Revolution identification mode

8. WARNING, ALARM DIAGNOSIS AND COUNTER MEASURES

When the frequency inverter sends warning signals, the auxiliary display column displays warning code. Some warnings have no influence on the operation of the inverter. Those warnings which may influence the operation of the frequency inverter should be eliminated as much as possible; otherwise, more serious failures may be caused. When the frequency inverter fails to alarm, its protective function will act and display fault code and the inverter will stop outputting with the motor freely sliding and shutting down.

8.1 TROUBLESHOOTING WITH WARNING OR ALARM DISPLAY

8.1.1 ALARM DISPLAY AND TROUBLESHOOTING

Fault code	Fault description	Possible causes	Solutions
Fu.001	Over current during acceleration	1. The acceleration time is too short. 2. V/F curve or torque boosting is set improperly. 3. After it is re-energized upon transient stop, the rotating motor is restarted. 4. The frequency inverter has smaller capacity. 5. The encoder is faulty or disconnected during the operation and acceleration with PG	1. Adjust acceleration time 2. Adjust V/F curve or torque boosting parameters 3. It is valid to set [F0.4.38] as 1; Recover operation in the mode of deceleration and restart after power off. 4. Select frequency inverter with matched capacity level 5. Inspect encoder and its connection
Fu.002	Over current during deceleration	1. The deceleration time is too short. 2. The potential energy load or load inertia is too large. 3. The frequency inverter has smaller capacity 4. The encoder is faulty or disconnected during the operation and deceleration with PG	1. Adjust deceleration time 2. Connect braking resistor or unit externally 3. Select frequency inverter with matched capacity level 4. Inspect encoder and its connection
Fu.003	Over current during operation	1. The load changes suddenly 2. The grid has over-low voltage. 3. The frequency inverter has smaller capacity. 4. The load is overweight. 5. After it is re-energized upon transient stop, the rotating motor is restarted. 6. The three-phase output line of the frequency inverter has interphase short circuit or phase line short circuit to ground. 7. The encoder is faulty or disconnected during operation.	1. Reduce load sudden change 2. Inspect voltage of power supply 3. Select frequency inverter with matched capacity level 4. Inspect load or replace a frequency inverter with larger capacity 5. It is valid to set [F0.4.38] as 1; recover operation in the mode of deceleration and restart after power off. 6. Eliminate short circuit failure. 7. Inspect the connection of encoder
Fu.004	Over voltage during acceleration	1. The input voltage is abnormal 2. The rotating speed closed loop parameters are set improperly during vector control operation 3. Start the rotating motor (without rotating speed tracking)	1. Inspect input power supply 2. Adjust rotating speed closed loop parameters, please refer to the description of F8.1 parameter set 3. It is valid to set [F0.4.38] as 1; Recover operation in the mode of deceleration and restart after power off.

Fault code	Fault description	Possible causes	Solutions
Fu.005	Over voltage during deceleration	1. The deceleration period is too short. 2. The load potential energy or inertia is too large 3. The input voltage is abnormal	1. Adjust deceleration time 2. Connect braking resistor or unit externally 3. Inspect input power supply
Fu.006	Over voltage during operation	1. The input voltage is abnormal. 2. The parameters of regulator are set improperly during vector control operation	1. Install input reactor 2. For adjusting parameters of regulator, please refer to the description of parameter set in F8.1
Fu.007	Over voltage when shutting down	The voltage of the power supply is abnormal	Inspect voltage of power supply
Fu.008	Under voltage during operation (can be shielded)	1. The voltage of the power supply is abnormal 2. Large load is started in the grid.	1. Inspect voltage of power supply 2. Supply power separately
Fu.009	Drive protection action	The major loop is abnormal	Seek for manufacturer's support
Fu.010	Output grounding (can be shielded)	The motor or the motor cable is detected to be abnormally Grounded.	Check and eliminate grounding fault.
Fu.011	Electromagnetic interference	False operation caused by the surrounding electromagnetic interference.	Seek for technical service
Fu.012	Overload of frequency inverter	1. The load is overweight 2. The acceleration period is too short. 3. The booster voltage of torque is too high or V/F curve is set improperly 4. Acceleration torque is set too high 5. The rotating speed tracking restart function is not activated, and rotating motor is directly started. 6. In closed loop vector mode, the direction of pulse of the encoder is opposite to that of the motor	1. Reduce load or replace a frequency inverter with larger capacity 2. Prolong acceleration time 3. Reduce torque lifting voltage and adjust V/F curve 4. Reduce the value of [F1.4.39], [F1.4.40] 5. Set the starting/stopping mode ([F0.4.38]) as rotating speed tracking restarting mode. 6. Check whether the encoder is reverse
Fu.013	Overload protection action of motor	1. V/F curve is set improperly 2. The grid has over-low voltage. 3. The motor is operated for long time with low speed and large load. 4. The overload protection coefficient of the motor is too small. 5. Locked-rotor operation of motor or overlarge load. 6. In closed loop vector mode, the direction of pulse of the encoder is opposite to that of the motor.	1. Adjust V/F curve 2. Inspect the input voltage of grid 3. Select special motor for frequency conversion for long-term low speed operation 4. Increase the overload protection coefficient of the motor ([F2.0.25]) 5. Adjust the working conditions of the load or select frequency inverter with matched capacity level 6. Adjust the connection of encoder or change the function setting for direction of the encoder
Fu.014	Overheating of frequency inverter (sensor 1)	1. The air duct is blocked 2. The ambient temperature is over high 3. The fan is abnormal 4. The temperature detecting circuit or power module is abnormal	1.Clean the air duct or improve ventilation conditions 2. Improve ventilation conditions and reduce carrier frequency 3. Replace the fan 4. Seek for the manufacturer's support

Fault code	Fault description	Possible causes	Solutions
Fu.015	Overheating of frequency inverter (sensor 2)	Same with above.	Same with above.
Fu.016	Overheating of frequency inverter (sensor 3)	Same with above.	Same with above.
Fu.017	External equipment is faulty or the panel has forced stoppage	The external equipment of the frequency inverter is faulty, the input terminal has signal input	Inspect signal source and relevant equipment and find the root leading to the stoppage of the panel.
Fu.018	Excessive protection of rotating speed deviation (DEV)	1. The load is too large. 2. The acceleration time is too short. 3. The load is locked. 4. The detection value ([F8.2.34]) and time ([F8.2.35]) for DEV is set improperly.	1. Reduce load 2. Prolong acceleration and deceleration time. 3. Confirm the mechanical system of the load 4. Reset the detection value ([F8.2.34]) and time ([F8.2.35]) for DEV.
Fu.019	Over speed failure (OS)	1. Overshoot or undershoot is occurred. 2. The frequency is too high 3. The detection value ([F8.2.36]) and time ([F8.2.37]) for over speed is set improperly.	1. Adjust the gain 2. Adjust the set value of frequency 3. Reset the set value of the detection value ([F8.2.36]) and time ([F8.2.37]) of OS.
Fu.020	Reverse connection of A, B pulse of PG card	The encoder's feedback pulse connection order is inconsistent with the motor's rotation direction.	1. Change the connection order of A, B pulse, 2. Exchange any two wires from U, V, W 3. Modify the setting of parameter F8.0.06
Fu.021	The master contactor is not actuated well. Or the thyristor of major loop is not conducted.	1. The DC side master contactor in the frequency inverter is not actuated well. 2. The power supply voltage is unstable with frequent sudden change	1. Clean and Check the major loop contactor 2. Check the grid voltage. 3. Disable this protective function (FF.1.21)
Fu.022	Internal data memory is faulty	1. There is intense noise around in the process of writing in function code data 2. The internal memory is damaged	1. Retry after reset 2. Seek for manufacturer's service
Fu. 023	R phase input voltage loss (can be shielded)	1. Broken circuit of R phase incoming line of the inverter. 2. Loosing of input R phase power wiring terminal 3. Excessive fluctuation of R phase input voltage	1. Eliminate peripheral faults. 2. Seek for manufacturer's support
Fu.024	S phase input voltage loss (can be shielded)	1. Broken circuit of S phase incoming line of the inverter. 2. Loosing of input S phase power wiring terminal 3. Excessive fluctuation of S phase input voltage	
Fu.025	T phase input voltage loss (can be shielded	1. Broken circuit of T phase incoming line of the inverter. 2. Loosing of input T phase power wiring terminal 3. Excessive fluctuation of T phase input voltage	

Fault code	Fault description	Possible causes	Solutions
Fu.026 Fu.027 Fu.028	The output current of U phase is deficient/ smaller The output current of V phase is deficient/ smaller The output current of W phase is deficient/ smaller	1. The lead from frequency inverter to motor is disconnected. 2. The driving or control panel of the frequency inverter is faulty 3. The three-phase winding of the motor is faulty	1. Eliminate peripheral failures 2. Seek for manufacturer's support 3. Eliminate the failure of motor
Fu.032	The three-phase input voltage is unbalanced (can be shielded)	The imbalance rate of three-phase voltage is larger.	1. Check the connection status of the input power supply. 2. Add AC or DC reactor.
Fu.036 Fu.037 Fu.038	AI1 input is disconnected A12 input is disconnected A13 input is disconnected	1. The wiring of input analog signal is disconnected or analog input signal source is inexistent. 2. Parameters related to disconnection detection are configured improperly	1. Inspect the wiring of analog input signal and the analog input signal source 2. Modify the configuration parameters
Fu.039	Fin input is disconnected	1. The wiring of pulse input signal is disconnected or analog input signal source is inexistent 2. Parameters related to disconnection detection are configured improperly	1. Inspect the wiring of pulse input signal and analog input signal source 2. Modify the configuration parameters
Fu.040	The rotating speed detection loop is disconnected	1.The speed measuring module is incorrectly connected. 2.The wiring of speed measuring module is disconnected 3.The output of speed measuring module is abnormal 4.Relevant function codes are set improperly.	1. Inspect the connection of speed measuring module 2. Seek for manufacturer's support
Fu. 041	The motor fails to be connected when the motor parameters are identified.	The motor fails to be connected when the motor parameters are identified.	Connect motor
Fu.042	U phase output is disconnected or the parameters are seriously unbalanced	1. The lead from frequency inverter to motor is disconnected. 2. The driving or control panel of the frequency inverter is faulty 3. The three-phase winding of the motor is faulty	1. Eliminate peripheral failures 2. Seek for manufacturer's support 3. Eliminate the failure of motor
Fu.043	V phase output is disconnected or the parameters are seriously unbalanced	1. The lead from frequency inverter to motor is disconnected. 2. The driving or control panel of the frequency inverter is faulty 3. The three-phase winding of the motor is faulty	1. Eliminate peripheral failures 2. Seek for manufacturer's support 3. Eliminate the failure of motor
Fu.044	W phase output is disconnected or the parameters are seriously unbalanced	1. The lead from frequency inverter to motor is disconnected. 2. The driving or control panel of the frequency inverter is faulty 3. The three-phase winding of the motor is faulty	1. Eliminate peripheral failures 2. Seek for manufacturer's support 3. Eliminate the failure of motor
Fu.045	Over temperature of motor	1. Abnormal motor temperature 2. Abnormal motor temperature detecting function	1. Reduce motor load 2. Improve operating environment 3. Eliminate the failure of motor
Fu.046	Motor stalling	1. Overload of the motor 2. Insufficient motor power	Connect appropriate motor

Fault code	Fault description	Possible causes	Solutions
Fu.047	PG feedback signal abnormal u, v, w	PG cards or spinning the UVW variable signal loss	Check that the signal cable or PG card is faulty
Fu.048	Magnetic pole the initial rotor position error	Suitable for initial settings of the synchronous machine rotor pole position error	Identification of rotor position again, check the signal connection
Fu.049	Z-exception signal identification	Parameter identification of synchronous machine is not detected correctly when z signals	Check PG feedback cards and cabling
Fu.051	U phase current is detected faulty(sensor or circuit)	1. The current sensor or circuit is damaged 2. The auxiliary power supply is faulty 3. The control and driving panel are bad connected.	Seek for manufacturer's support
Fu.052	V phase current is detected faulty (sensor or circuit)	1. The current sensor or circuit is damaged 2. The auxiliary power supply is faulty 3. The control and driving panel are bad connected.	Seek for manufacturer's support
Fu.053	Error of W phase current detection (sensor or circuit)	1. The current sensor or circuit is damaged. 2. The auxiliary power supply is faulty 3. The control and driving panel are bad connected.	Seek for manufacturer's support
Fu.054	The temperature sensor 1 is faulty(can be shielded)	The temperature detecting circuit is abnormal	Seek for manufacturer's support
Fu.055	The temperature sensor 2 is faulty(can be shielded)	The temperature detecting circuit is abnormal	Seek for manufacturer's support
Fu.056	The temperature sensor 3 is faulty(can be shielded)	The temperature detecting circuit is abnormal	Seek for manufacturer's support
Fu.067	Fault of functional expansion unit 1	The communication linkage of the functional expansion unit 1 is abnormally interrupted.	Check the expansion card 1 for connection
Fu.068	Fault of functional expansion unit 2	The communication linkage of the functional expansion unit 2 is abnormally interrupted.	Check the expansion card 2 for connection
Fu.071	Abnormal communication of the control board		
Fu.072	The connection of accessories is abnormal		
Fu.130	Dedicated fault code for expansion function		
Fu.201	Conflicting parameter setting		Please contact the direct supplier
Fu.301 ~ Fu.311	Control panel is faulty		Seek for manufacturer's support

8.1.2 WARNING DISPLAY AND TROUBLESHOOTING

Display	Warnings	Can be shielded or not	Solutions other than shielding
aL.003	Over high power supply voltage		Inspect input power supply
aL.008	Lower input voltage (under voltage early warning)		Inspect input power supply
aL.011	Bad electromagnetic environment		Improve working environment or seek for manufacturer's support
aL.012	The load is overweight and protection maybe occurred.		Reduce load, or replace a frequency inverter with larger power
aL.014	INV overheating early warning		Improve ventilation conditions and reduce carrier
aL.018	Overlarge DEV		1. Reduce load 2. Prolong acceleration and deceleration time 3. Confirm mechanical system of load 4. Confirm the detection value ([F8.2.34]) and time ([F8.2.35]) for DEV
aL.019	Over speed (OS)		1. Adjust frequency setting loop 2. Inspect the setting value of detection value [F8.2.36]) and time ([F8.2.37]) for OS
aL.023 aL.024 aL.025	Loss of U phase input voltage Loss of V phase input voltage Loss of W phase input voltage		
aL.026 aL.027 aL.028	The out put current of U phase is deficient/smaller The out put current of V phase is deficient/smaller The out put current of W phase is deficient/smaller	Can be shielded	Inspect the connecting wire between frequency inverter and motor or the winding of motor
aL.031	The starting enabling signal is deficient		1. Inspect the enabling connection (42) in multifunctional input terminal and the status of the terminal (ON/OFF) 2. Inspect whether the starting enabling signal in bus command word is effective or not
aL.032	Early warning of unbalanced three-phase input voltage	Can be shielded	Measure the input voltage of all the phases, install ACR and reduce imbalance rate among phases
aL.036 aL.037 aL.038	AI1 input is disconnected AI2 input is disconnected AI3 input is disconnected		1. Inspect the connection of analog input signal 2. Inspect whether there're signals in the signal source
aL.039	Fin input is disconnected		Seek for manufacturer's support
aL.040	The rotating speed detecting loop is disconnected	Can be shielded	1. Inspect the connection of speed measuring module 2. Seek for manufacturer's support
aL.041	No-load operation fails to identify the parameters of motor		
aL.042 aL.043 aL.044	The parameters of U phase of motor is abnormal The parameters of V phase of motor is abnormal The parameters of W phase of motor is abnormal		Inspect whether the winding of motor is faulty
aL.045	Over temperature of the motor		Long-term low-speed operation and selecting dedicated motor for the inverter.

Display	Warnings	Can be shielded or not	Solutions other than shielding
aL.046	Breaking bounds of dynamic tracking of the magnetic pole position of the synchronous motor rotor		Check the PG feedback card and the connection
aL.047	Loss of Z signal or abnormity of parameter identification		Check the PG feedback card and the connection
aL.048	Excessive deviation of feedback UVW signal		Check the PG feedback card and the connection
aL.049	The driving circuit is abnormal and unbalanced		Seek for manufacturer's support
aL.050	Incorrect connection of the motor		
aL.054 aL.055 aL.056	The temperature sensor 1 is faulty The temperature sensor 2 is faulty The temperature sensor 3 is faulty	Can be shielded	1. Increase the action point for over temperature warning ([F5.4.46]) 2. Replace the temperature sensor 1,2,3
aL.058	The parameters can not be recovered in batch during operation		Seek for manufacturer's support
aL.059	The numerical value when energized can not be recovered during operation		Seek for manufacturer's support
aL.061	The connection between expanded communication module and master control board is interrupted abnormally		Seek for manufacturer's support
aL.062	The function expansion unit 1 has a hardware conflict		1. The expansion unit selected is inappropriate and can not be used with such type of frequency inverter 2. The function expansion unit has a internal fault
aL.063	The function expansion unit 2 has a hardware conflict		1. The expansion unit selected is inappropriate and can not be used with such type of frequency inverter 2. The function expansion unit has a internal fault
aL.064	The function expansion unit has a resource conflict		This expansion unit can not be used with other expansion units
aL.065	Fail to establish communications with function expansion unit 1		
aL.066	Fail to establish communications with function expansion unit 2		
aL.067	The communication links of function expansion unit 1 is interrupted abnormally		
aL.068	The communication links of function expansion unit 2 is interrupted abnormally		
aL.071	The parameter download is failed (note: download is from operation panel to control panel of frequency inverter; upload is from control panel to operation panel)		Inspect whether the communication interface between operation panel and control panel is normal or not
aL.072	The memory of panel fails to be operated		
aL.073	The memory of panel inhibits write and can not download parameters		
aL.074	The upload of parameters is failed (automatically recover to the numerical value before uploading)		1. Inspect whether the communication interface between panel and control panel is normal or not. 2. In the parameter F0.0.08, parameter upload is forbidden in terms of local upload.
aL.075	The version of panel parameters is different from that of equipment		Re-upload panel parameters same as the version of equipment parameters

Display	Warnings	Can be shielded or not	Solutions other than shielding
	parameters; it can not be uploaded		
aL.076	The panel has no effective parameters and can not be uploaded		The panel parameters are not modified effectively and need not to be uploaded
aL.077	The panel parameters exceed the setting scope INV allowed and fail to be uploaded		Confirm the allowed parameter scope, reset and upload
aL.099	The operation panel is abnormally connected		After power off, reinsert and pull out of the panel or replace the panel
aL.100	The control program is failed resulted from electromagnetic interference		Improve electromagnetic environment
aL.101	The setting parameters are conflicted		Reset the parameters correctly
aL.102	The setting parameters fail to connect the corresponding expansion card		Reset the parameters or inspect the connection of expansion card
aL.103	The setting motor parameters are conflicted (rated frequency, rotating speed conflict)		Reset the motor parameters
aL.104	The setting motor parameters are conflicted (no-load current, rated current, rated rotating speed, rated frequency and rotor time constant)		Reset the motor parameters
aL.105	The inductance parameters of motor stator overflow		Reset the inductance parameters of motors stator
aL.106	Contradictive settings of the rated frequency, revolution and pole pairs of synchronous motor		Check the settings of the motor parameters and make correct modification
aL.130	Dedicated for the expansion		
aL.201	The setting parameters are conflicted and it's about to shut down		Immediately contact the direct supplier

8.2 ABNORMAL OPERATION WITHOUT PROMPTS AND THE SOLUTIONS

1. THE MOTOR IS NOT ROTATED:

Possible causes	Solutions
The operation command channel is wrongly selected	Switch the operation command channel into correct one via PANEL/REMOTE key in operation panel or remote terminal
The operation command source is wrongly selected	According to the need on the site, reset the selection of operation command source ([F0.1.15]), control command 1([F0.3.33]) and control command 2([F0.3.34])
The setting frequency is below the starting frequency	1. Set the setting frequency to be above the starting frequency ([F0.4.39]) 2. Inspect whether the frequency setting channel is normal or not, eliminate possible analog input frequency setting failures and shuttle potentiometer failures, etc. 3. Correctly connect the external terminals related to frequency setting
Other frequency command sources with higher priority are valid	According to the need on the site, reset the frequency (rotating speed) setting priority ([F5.3.28])
The upper and lower frequency limit is set improperly.	Inspect the data of upper ([F0.1.21]) and lower ([F0.1.22]) frequency limit and reset
The motor has insufficient torque	In V/F control mode 1. Increase the torque of motor and boost voltage ([F1.2.18]) 2. Adjust V/F curve In SVC/VC control mode 1. Re-measure the parameters of motor ([F2.2.53]) 2. Adjust vector mode and start pre-excitation time ([F2.2.52])

2. THE MOTOR IS ROTATING BUT THE SPEED CAN NOT BE INCREASED:

Possible causes	Solutions
The setting value of maximum output frequency is too low.	Increase the value of maximum output frequency ([F0.1.20]).
The setting value of upper frequency limit is too low.	1. Increase the data of upper frequency limit ([F0.1.21]). 2. Increase the maximum value of frequency setting channel 1 ([F0.2.28]) and 2 ([F0.2.31]).
The set frequency is too low.	Inspect whether the setting of selection of frequency setting channel ([F0.1.16]) is correct or not; the set frequency value is lower or the frequency setting channel is faulty.
The acceleration period is too long.	Set appropriate acceleration time ([F1.0.03], [F1.0.05], [F1.0.07], [F1.0.09]).
The parameter values of motor are set improperly	1. Confirm whether ([F2.0.00] ~[F2.0.09]) is compatible with the parameters of motor. 2. In vector control mode, make the motor re-self measured and get correct internal motor parameters.
The output frequency is not rising resulted from current limit protection	1. According to the requirements on the site, reasonably configure the acceleration/deceleration current limit level ([F1.4.39]), strong starting current limit level (F1.4.40) and maintenance time ([F1.4.41]). 2. Restart after reducing torque and boosting voltage (F1.2.18) and observe whether the output frequency is rising or not. 3. Confirm whether V/f setting ([F1.2.15], [F1.2.16], and [F1.2.17]) is appropriate or not. Adjust V/F setting into rated value of motor.
The output frequency is not rising resulted from torque setting limit	Confirm the torque setting limit ([F8.3.47]，[F8.3.48]~[F8.3.51])sets correct value.

3. THE DIRECTION OF ROTATION OF THE MOTOR IS OPPOSITE TO THE COMMAND:

Possible causes	Solutions
Operation direction	Inspect the setting of operation direction ([F0.1.17]).
The F/R function code in multifunctional input terminal is wrongly selected	Inspect whether the multifunctional input terminal ([F3.0.00] ~[F3.0.08]) correctly selects the function code of FWD operation command terminal, REV operation command terminal and three-wire operation control.
The action mode of external control terminal is wrongly selected	Inspect the action mode of external control terminal (F0.3.35).
Inspect the wiring connecting with the motor	Exchange the connection of any two phases of U, V, and W of frequency inverter or motor.
Inspect the connection of F/R control terminal	Inspect the connection of multifunctional input terminal set as FWD operation command terminal, REV operation command terminal and three-wire operation control.

4. ROTATING SPEED VARIATION AND CURRENT FLUCTUATION OCCURS IN CONSTANT SPEED OPERATION

Possible causes	Solutions
The frequency setting varies	When the frequency is set by adopting analog input terminal, the analog input filtering time constant can be increased. ([F4.0.06], [F4.0.07], [F4.0.08])
The carrier frequency is set lower	Increase the carrier frequency of the frequency inverter ([F1.1.13]), change the carrier characteristics ([F1.1.14]) and observe whether the oscillation is disappeared.
The load type is set improperly	Set steady load operation in macro parameter ([F0.0.0]) and confirm whether there's vibration or not.

Possible causes	Solutions
The motor parameters are set inaccurately	1. Make sure the motor parameters ([F2.0.00~F2.0.09]) are set correctly or reself adjust the internal parameters of the motor. 2. Adjust motor speed closed loop PID parameter ([F8.2.25 ~ F8.2.27]).
The wiring between frequency inverter and motor is long	Shorten the output wiring as much as possible or install AC reactor.
Vibration is caused due to the vibration system with lower rigidity at the side of the load	Cancel the increasing of automatic torque, automatic energy-saving operation, anti-overload control, current limit, torque limit and confirm whether the vibration is disappeared.

5. THE MOTOR ROARS OR HAS ABNORMAL SOUND

Possible causes	Solutions
The carrier is lower	Increase the carrier frequency of the frequency inverter ([F1.1.13]).
The surrounding temperature of the frequency inverter is higher	1. If the temperature exceeds 40℃, it shall strengthen Ventilation and reduce temperature. 2. Reduce load and the temperature of frequency inverter (reduce upper frequency limit for fan and pump ([F0.1.21])). 3. Select temperature associated adjustment function in carrier characteristics ([F1.1.14]).
Output phase failure	1. Inspect the connection between frequency inverter and motor. 2. Inspect whether the three-phase winding of the motor is faulty or damaged.
The motor parameters are set improperly	Adjust motor speed closed loop PID parameter ([F8.2.25~F8.2.27]).
Mechanical resonance	1. Operate the motor separately, find the reasons of resonance and improve the characteristics at one side of the motor 2. Adjust hopping frequency ([F5.0.00] ~)[F5.0.05]) and avoid continuous operation in the frequency area where resonance occurs.

6. THE MOTOR DOES NOT ACCELERATE OR DECELERATE WITHIN THE SETTING ACCELERATION AND DECELERATION TIME

Possible causes	Solutions
Operate in the form of S acceleration and deceleration curve	1. Set the acceleration and deceleration characteristic parameter ([F1.0.00]) into linear acceleration and deceleration mode and observe the acceleration and deceleration conditions. 2. Shorten the acceleration and deceleration time ([F1.0.03] ~[F1.0.10]) and observe the acceleration and deceleration conditions.
Current limit action, the frequency rising is restricted (in acceleration)	1. Increase the data of acceleration current limit level ([F1.4.39]) and strong starting current limit level ([F1.4.40]). 2. Prolong acceleration time ([F1.0.03], [F1.0.05], [F1.0.07], and [F1.0.09]).
The motor has insufficient torque	Increase torque and boost voltage ([F1.2.18]) and confirm whether it is started.
The acceleration and deceleration of frequency is limited due to the limitation of torque	1. Reset the torque setting limit ([F8.3.47]) and maximum and minimum torque limit value. ([F8.3.48] ~ [F8.3.51]). 2. Prolong acceleration and deceleration time ([F1.0.03] ~ [F1.0.10]).
Wrongly select the acceleration and deceleration time	Inspect whether the selection signal for acceleration and deceleration time of multifunctional input terminal ([F3.0.00] ~ [F3.0.08]) is correct or not.

7. AFTER TRANSIENT POWERED OFF, THE MOTOR CAN NOT BE STARTED EVEN IT IS POWERED ON.

Possible causes	Solutions
Restart function after power off (F0.4.48) is prohibited	Set the restart function after transient power off ([F0.4.48]) as valid.
The operation command is maintained in OFF status when it is power on.	Confirm the reset sequence of external circuit, if necessary; discuss whether to adopt the holding relay of operation command.

8. THE PARAMETERS ARE SET IMPROPERLY AND THE ORIGINAL VALUE OR DELIVERY VALUE NEEDS TO BE RECOVERED.

Possible causes	Solutions
The function code is conducted unnecessary parameter setting	Recover the parameters not necessary to be set into default.
The function code is conducted wrong parameter setting	Reset necessary function codes after initialization of parameter set as needed and confirm actions.

8.3 FAILURES IN SETTING OPERATION OF FREQUENCY INVERTER

1. NO DISPLAY IN THE OPERATION PANEL

Possible causes	solutions
The operation panel is not correctly connected to the frequency inverter	1. Confirm whether the operation panel is correctly connected to the frequency inverter, take it down and reinstall. 2. Replace other operation panels and confirm display.

2. THE FUNCTION CODE CAN NOT BE CHANGED

Possible causes	Solutions
Some codes can not be changed during operation	Confirm whether it is operating and whether the function code to be changed in the function code list can be changed during operation.
The parameters are locked	Confirm the locking conditions of parameters ([F0.0.05]), ([F0.0.06]); If the parameters are subject to be modified, the locking password with corresponding modification permissions shall be input first.
Did not press OK key	Confirm whether the OK key is pressed after the modification of function code data.
There's failure in the connection between operation panel and frequency inverter	Remove the operation panel and reinstall or replace a new operation panel.

8.4 INQUIRY FOR FAILURE RECORD

This series of frequency inverter records the failure code for the recent 8 times and the output parameters of frequency inverter for the last failure. Looking up such information can help find the reasons of failure.

The failure information and status monitoring parameters are stored uniformly. Please look up the information referring to operating methods of keyboard.

Monitoring items	Content	Monitoring items	Content	Monitoring items	Content
dE.0.00	The last failure	dE.0.09	The output current in the last failure	dE.0.18	The accumulative running time (h) in the last failure.
dE.0.01	Historical failure 1	dE.0.10	The output voltage in the last failure.	dE.0.19	The interval time (h) of running between the recent two failures.
dE.0.02	Historical failure 2	dE.0.11	Detected motor speed (with speed sensor) in the last failure.	dE.0.20	The sync output frequency in the last failure.
dE.0.03	Historical failure 3	dE.0.12	DC side voltage in the last failure.	dE.0.21	
dE.0.04	Historical failure 4	dE.0.13	The output torque in the last failure.	dE.0.22	
dE.0.05	Historical failure 5	dE.0.14	The target frequency in the last failure.	dE.0.23	
dE.0.06	Historical failure 6	dE.0.15	The highest temperature of the equipment in the last failure.	dE.0.24	
dE.0.07	Historical failure 7	dE.0.16	Command status in the last failure (See the following table for detail).	dE.0.25	
dE.0.08	The operation frequency in the last failure (rotor sync)	dE.0.17	The operating conditions of frequency inverter in the last failure (see the following table for detail).		

Description of command and operation status

dE.0.16	**LED units** 0:Stop command 1:Operation command **LED tens, hundreds, thousands: retained**
dE.0.17	**LED unit: operation mode** 0: VF mode 1: Open loop vector speed 2. Closed loop vector speed 3. Open loop torque control 4: Closed loop torque control 5: V-F separation control **LED tens: operation status** 0: Shut down 1:Start and accelerate 2: Stop and decelerate 3: Reduce frequency and decelerate 4:Stable operation **LED hundreds: electric/braking status** 0: Electric operation 1: Power generation operation **LED thousands: limit suppression** 0: No action 1: Over current suppression action 2: Over voltage suppressor action 3: Under voltage suppressor action

8.5 RESET OF WARNING OR ALARM FAILURE

When warning or alarm failure appears, the following operations can be selected:

1. When failure code displays, press **STOP/RESET** key.
2. When external terminal operation command channel is adopted and the terminal for failure reset is defined as valid in multifunctional input terminal Dix, the failures are reset.
3. When the field bus operation command channel is adopted, the upper computer can send fault reset command to frequency inverter through RS485 interface.
4. Power off.

- The failures causes must be checked thoroughly and eliminated before reset, otherwise, the frequency inverter may be damaged permanently.
- If it can not reset or failures reoccur after reset, it should check the causes; continuous reset will damage the frequency inverter.
- The reset shall be conducted 5 minutes later in overload and overheating protection action.
- When external terminals control, the fault reset shall be conducted after the removal of terminal operation command.

9. MAINTENANCE

Many factors such as temperature, humidity, dust and vibration of the use environment, and internal components aging, wear of frequency inverter, which may lead to hidden fault of frequency inverter. In order to ensure the frequency inverter of long and steady operation, its maintenance is required in the storage and the process of use.

After long-distance transportation of the frequency inverter, users should check whether the components are in good condition, or the screws are fastened before use them. During the normal use period, users shall regularly clean the internal dust of frequency inverter and check whether the screws are loose.

- The inspection shall be carried out by professional technician, and the power of frequency inverter shall be cut off.
- For frequency inverter with more than half year of storage time, when an electric current is applied, users shall boost the voltage slowly through voltage regulator to supply the power, or otherwise will lead to the risk of electric shock and explosion (internal electrolysis condenser).

Due to the high voltage of frequency inverter in service, the wrong operation can result in serious injury or death, therefore, the power supply of the frequency inverter shall be cut off, and the maintenance operation after ten minutes after the nixie tube of the frequency inverter panel extinguishing can be carried out.

9.1 ROUTINE MAINTENANCE

Through routine maintenance, all kinds of abnormal condition and abnormal cause can be found promptly, and the faults and hidden dangers can be eliminated as soon as possible. Thus, the normal operation of equipment can be guaranteed and also the service life of the frequency inverter can be prolonged. Refer to the following table for routine maintenance.

Table 9-1 Tips for inspection and maintenance

Object checked	Inspection cycle		Scope of inspection	Assessment criterion
	Irregularly	Regularly		
Operation environment	√		1. Humidity, temperature 2. Dust, moisture 3. Gas	1. Open the frequency inverter when the temperature is above 45℃, keep humidity below 95%, without frost deposit 2. Free from peculiar odor, inflammable and explosive gas
Cooling system		√	1. Installation environment 2. Frequency inverter fan	1. The installation environment shall be well ventilated and the duct has no block 2. Fan is in well operation and without abnormal noise
Frequency inverter	√		1.Vibration, temperature rise 2. Noise 3. Wire, terminal	1. Vibration is smooth and outlet temperature is normal 2. No abnormal noise and no peculiar smell 3. No loose for fastening screw
Generator	√		1.Vibration, temperature rise 2. Noise	1. Smooth operation and normal temperature 2. No abnormalities and inconsistent noise
Input and output parameter	√		1. Input voltage 2. Output current	1. The input voltage is in the specified scope 2. Output current is under the rated value

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- Electrical insulation experiment of frequency inverters has been conducted before leaving the factory, and users do not need to conduct the compression test again, or the internal components could be damaged.
- If the frequency inverter is required to undergo the insulation testing, just make sure that all the input and output terminals connected in a reliable way. For a single terminal, insulation testing is strictly prohibited and conduct the test with 500 V tramegger
- Do not use tramegger to measure the control circuit. As the frequency inverter has internal static sensitive element, the direct touch is therefore prohibited.
- When conducting the insulation testing for the generator, remove the connection line between generator and the frequency inverter.

9.2 INSPECTION AND DISPLACEMENT OF THE VULNERABLE COMPONENTS

During operation, some components of frequency inverter may be worn or the performance is slowed down. In order to ensure the stable reliable operation of frequency inverter, the users shall carry out preventative maintenance for frequency inverter, and replace the components when necessary.

9.2.1 FILTER CAPACITOR

Possible causes of damage: Environmental temperature and the pulsating current are high, and electrolyte is aging.

Assessment criterion: When frequency inverter operate with load, uses check whether there occur fault such as over current, over voltage; whether liquid leaks out, whether the relief valve bulge; whether the determination of electrostatic capacitive and insulation resistance are abnormal.

The pulsating current of main loop would affect the performance of the aluminum electrolysis filter capacitor, and the degree of influence depends on the environment temperature and the using conditions. Replace electrolytic capacitors of frequency inverter every three to four years under normal conditions.

Filter capacitor shall be replaced immediately if any of the following occurs: electrolyte of the electrolyte capacitor leaks, relief valve emits out, and subject of the capacitor expands.

9.2.2 COOLING FAN

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Possible causes of damage: Bearing wear, leaf aging.

Assessment criterion: When the power of frequency inverter is cut out, check the fan blades and other parts to see whether there is any abnormality such as crack. With the power on, just check whether the fan operation situation is normal, and whether it has abnormal vibration and noise.

Service life of the entire cooling fan in frequency converter is about 15000 hours (i.e. frequency inverter use continuously for about two years), if the fan has unusual voice or vibration, it should be replaced immediately.

9.3 STORAGE

After purchase the frequency inverter, if the frequency inverter will be spared for a while or stored for a long time, users shall pay attention to the following items:

1. Storage environment should comply with the following table:

Environmental characteristics	Requirements	Remarks
Ambient temperature	－10 ℃～ 45 ℃	Long-term storage temperature is no more than 45 ℃, so as to avoid the degradation of capacitance characteristics. It shall avoid condensation and frozen environment caused by sudden change of temperature.
Relative humidity	5 ～ 95%	It can adopt measurement like plastic film sealing and desiccant.
Storage environment	Free from direct sunlight, no dust, no corrosive, no combustible gas, no oil, no steam, no gas, no drip, no vibration, and with little salt	

2. If the frequency inverter is not in use for a long time, the current shall be applied to restore filter capacitor characteristics every half year, and at the same time other features of the frequency converter shall also be checked. When the current is applied, it shall increase the voltage gradually through autotransformer, and the conduction time should be above half an hour.

- If the frequency inverter is not in use for a long time, the internal filter capacitance characteristics would decline.

9.4 WARRANTY

If the frequency inverter body has the following cases, the company will provide guarantee service:

1. If failures or damages occur in normal use within the warranty period (within 18 months from the date of purchase), our company will provide free maintenance. Our company will charge a reasonable cost of maintenance in case of more than 18 months above.
2. Even in the guarantee period, if any failure is caused by the following cases, our company will charge some of the maintenance cost:

   ①Malfunction due to that the users do not operate according to the operation manual or beyond the standard;

   ②Malfunction due to repair and modification without permission;

   ③Malfunction caused by poor preservation;

   ④Malfunction caused by improper use;

   ⑤Damage to the machine due to fire, corrosive salt, gas corrosion, earthquake, storms, floods, thunder, abnormal voltage or other force majeure.

3. The company will provide lifelong paid maintenance services even the warranty period expires.

10. EXAMPLE OF USAGE

10.1 ENERGY-SAVING TRANSFORMATION OF ESCALATORS

Operating requirements: Activate operation when it senses people approaching and operate a frequency of 50Hz; if there is no input of sensor signal in 10 seconds, it comes that: Plan 1) automatically stop; Plan 2) lower the frequency to 20Hz.

10.1.1 SCHEME DESCRIPTION

Scheme 1:

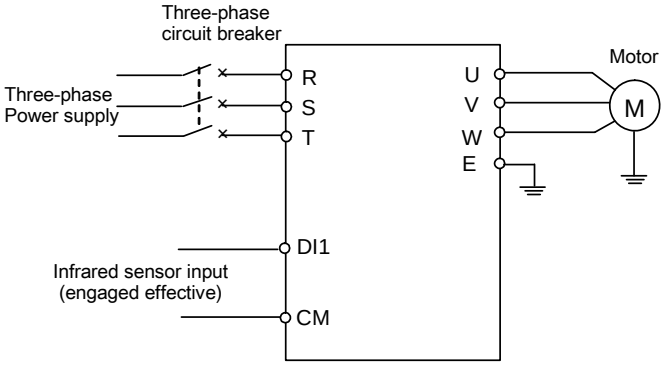
1. F0.1.16 = 0 (Factory Default)	Frequency setting channel
2. F0.2.25 = 2 (Factory Default)	Frequency digital setting
3. F0.2.29 = 50.00	Frequency settings
4. F0.3.33=1	Select the external terminal control of control commands
5. F0.3.35=0002	Three-line model 1
6. F5.1.06=1010	Timer 1's clock cycle: 1ms; stop- operate trigger-start; state reset of multifunctional terminal; multi-cycle timing.
7. F5.1.09=10000	Timer 1: cycle reaches 10000ms.
8. F5.1.16=0003	Timer 1 outputting signal 1: cycle reaches 0.5ms pulse.
9. F3.0.00=7	Multifunctional terminal D11 is defined as FWD operating terminal (to receive sensor signals)
10. FF.0.01=55	Virtual output of SDO1 signal - state of Dl1
11. FF.0.09=55	Virtual input of SDl1 signal - timer 1 resets terminals
12. FF.0.02=44	Virtual output of SDO2 signal - timer 1’s cycle reaches 0.5ms pulse.
13. FF.0.10=19	Virtual input of SDl2 signal - three-line operates controlling terminal
14. FF.017=0010	Phase-reversing connection between SD02 and SDl2

Scheme 2:

1. F0.1.16=2	Multifunctional terminal selection of frequency settings
2. F0.2.25=2	Digital setting of frequency channel 1
3. F0.2.26=2	Digital setting of frequency channel 2
4. F0.2.29=50	Frequency setting of frequency channel 1
5. F0.2.32=20	Frequency setting of frequency channel 2
6. F0.3.33=1	External terminal controlling
7. F0.3.35=0002	Three-line model 1
8. F3.0.00=7	Multifunctional terminal D11 is defined as FWD operating terminal (to receive sensor signals)
9. F5.1.06=0000	Timer 1's clock cycle: : 1ms; stop- operate trigger-start of multifunction terminals; state reset of multifunctional terminal; single-cycle timing.

10. F5.1.09=10000 Timer 1: cycle reaches 10000ms.
11. F5.1.16=0004 Timer 1 outputting signal 1: cycle reaches level output.
12. FF.0.01=55 Virtual output of SDO1 signal - state of DI1
13. FF.0.09=55 Virtual input of SDI1 signal - timer 1 resets terminals
14. FF.0.02=44 Virtual output of SDO2 - timer1's cycle reaches the output level signals.
15. FF.0.10=12 Virtual input of SDI2 signal - change of frequency order
16. FF.0.03=46 Virtual output of SDO3 signal - timer 2's cycle arrives.
17. FF.0.11=19 Virtual input of SDI3 signal - three-line operating control
18. FF.0.04=13 Virtual output of SDO4 - frequency inverter quickens operation
19. FF.0.12=52 Virtual input of SDI4 signal - timer 1 triggers signal.
20. FF.017=0100 Phase-reversing connection between SDO3 and SDI3

10.1.2 WIRING DIAGRAM



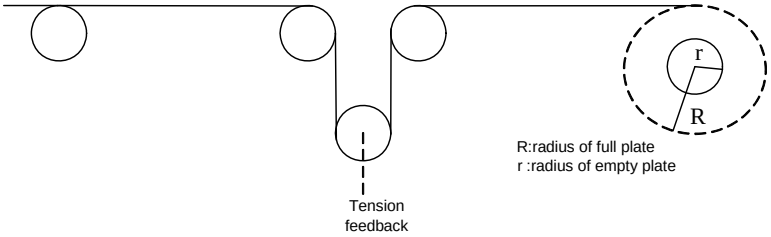
10.2 MAKE SIMPLE TENSION CLOSED-LOOP CONTROL WITH OFFSET PID

Use requirements: Frequency inverter adopts closed-loop torque controlling in leather rolling and meets the demand of production rolling. Users only need to make out a torque and a limited speed and then adjust torque output through tension feedback for a constant tension.

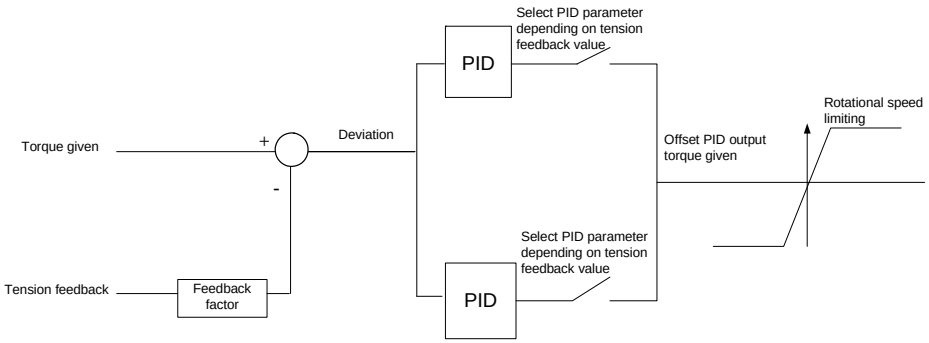
Site requirements:

Motor rolling: power: 5.5KW	Rated torque 36: Nm
Pole number: 2	Tension sensor: Measuring range 0-40N
Signal outputting: 0-10V	Winding diameter: Diameter of hollow winding 0.5m
Diameter of full winding: 1m	

10.2.1 DIAGRAM OF CONSTANT TENSION CONTROL



10.2.2 DIAGRAM OF CONTROL STRUCTURE

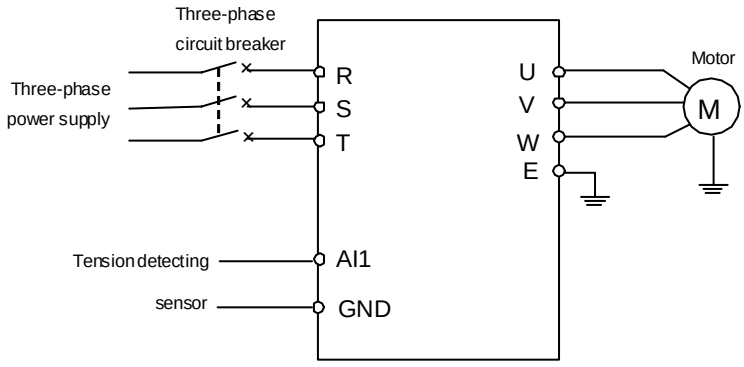


10.2.3 CONFIGURATION

1. F0.0.09=0010 Closed-loop vector controlling mode
2. F8.3.39=1 Torque model
3. F8.3.40=8 Torque channel selects offset PID output
4. F8.3.42=1 Time of torque ascending 1s
5. F8.3.43=1 Time of torque descending 1s
6. F8.3.45=1500 Positive rotated speed limited set on the basis of motor's actual rated rotated speed
7. F8.3.46=1500 Reverse rotated speed limited set on the basis of motor's actual rated rotated speed
8. F8.3.47=0000 Torque limited channel setup
9. F8.3.48=-100 Smallest torque limited:-K*R*F/T*100% R: biggest semidiameter F: tension value setting T: torque given $T_{(\text{rated torque of motor output})}$ =9550*P/N, N: rated speed given 100 %< K<250%
10. F8.3.50=100 Biggest torque limited: K*R*F/T*100%
11. F9.0.00=0101 Input together of offset PID and frequency inverter Independent PID
12. F9.0.01=100 Offset proportion: R*F/T (rated torque of motor output)*%
13. F9.0.02=0010 Offset PID outputs bipolar positive deviation

14. F9.0.03=20	Proportional gain of PID in first part (relatively bigger than parameter value in second part)
15. F9.0.04=2	Integral time of PID in first part (relatively smaller than parameter value in second part)
16. F9.0.05=0.2	Differential coefficient of PID in first part
17. F9.0.06=5	Differential inertia filtering time PID in first part
18. F9.0.07=1	Offset PID output of Inertia filtering time
19. F9.0.08=0	Offset PID internal figure setup
20. F9.0.11=62.5	Offset PID internal figure given: (R+r)*F/2T*100%
21. F9.0.12=0	Offset PID feedback selects analog quantity AI1
22. F9.0.13=0	Feedback input being 0V contrary to 0% feedback
23. F9.0.14=8.3	Feedback input contrary to 100% feedback: Fm*(R+r)/2T*10, (Fm: full-scale tension value of tension sensor; tension sensor output signal: 0-10V.
24. F9.0.15=(R+r)/2	Feedback multiplication factor transform feedback tension signal into torque signal depending on feedback factor
25. F9.1.21=0011	Offset PID selects double-PID parameter switch PID parameter according to feedback value
26. F9.1.23=0060	Feedback value of lower-limited switching value 60%
27. F9.1.24=0080	Feedback value of top-limited switching value 80%
28. F9.1.29=2	Proportional gain of PID in second part
29. F9.1.30=18	Integral time of PID in second part
30. F9.1.31=0.5	Differential coefficient of PID in second part
31. F9.1.33=5	Regulator output of filtering time constant

10.2.4 WIRING DIAGRAM



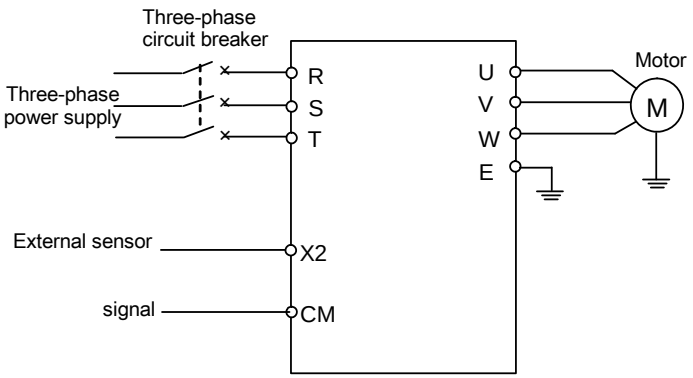
10.3 APPLICATION IN MECHANICAL FACTORY

Use requirements: After 50 times' external sensor signal receiving, operate the frequency inverter with first step from 20Hzto 20s forwardly and second step from 30Hz to 40s reversely. Then make a stop and wait for the next operation.

10.3.1 CONFIGURATION

1. F0.3.33=1 Controlling order to be the external terminal controlling
2. F0.3.35=0002 Function model of external controlling terminal to be the three-line model 1
3. F1.0.03=5 Time for accelerating 5s
4. F1.0.04=5 Time for slowing down 5s
5. F3.0.00=44 DI1 terminal id defined as timer 1's clock terminal
6. F5.2.20=0100 Select timer 1 work model
7. F5.2.22=50 Set number counting as 50
8. F6.0.00=20 Set first velocity as 20Hz
9. F6.0.01=30 Set second velocity as 30Hz
10. F6.1.15=0011 Operation model selects the stop model of multi-velocity single cycle
11. F6.1.17=0010 Set operating direction in second velocity as the reverse
12. F6.1.31=20 Time running for first velocity: 20s
13. F6.1.32=40 Time running for second velocity: 40s
14. FF.0.01=40 Virtual output of SDO1 signal - timer 1's cycle arrives
15. FF.0.09=7 Virtual input of SDI1 signal - positive shift FWD terminal
16. FF.0.02=46 Virtual output of SDO2 signal - timer 2's cycle arrives.
17. FF.0.10=19 Virtual input of SDI2 - three-line operating control
18. FF.0.17=0010 Phase-reversing connection between SDO2 and SDI2

10.3.2 EXTERNAL CIRCUIT WIRING DIAGRAM

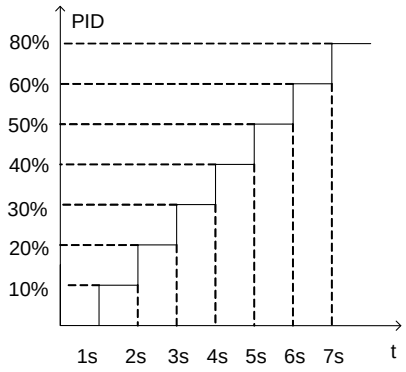


10.4 MULTI-PID SETUP, MULTI-PART PID SETUP, FORM A MULTI-STEP PIDSETUP (TO REDUCE OVERSTRIKE)

10.4.1 PARAMETER SETUP

1. F6.1.15=0053	Multi-part PID operating input(keep the final value stop model)
2. F6.1.31=1	Time for operating in part 1: 1s
3. F6.1.32=1	Time for operating in part 2: 1s
4. F6.1.33=1	Time for operating in part 3: 1s
5. F6.1.34=1	Time for operating in part 4: 1s
6. F6.1.35=1	Time for operating in part 5: 1s
7. F6.1.36=1	Time for operating in part 6: 1s
8. F6.1.37=5	Time for operating in part 7: 5s
9. F7.0.00=0001	Process PID input without requirements
10. F7.0.13=10	100% feedback corresponding simulation: 10V
11. F7.0.17=15.85	Proportional gain: 15.85
12. F7.0.18=14	Integral time: 14
13. F7.1.27=10	Part 1 in process PID given with 10%
14. F7.1.28=20	Part 2 in process PID given with 20%
15. F7.1.29=30	Part 3 in process PID given with 30%
16. F7.1.30=40	Part 4 in process PID given with 40%
17. F7.1.31=50	Part 5 in process PID given with 50%
18. F7.1.32=60	Part 6 in process PID given with 60%
19. F7.1.33=80	Part 7 in process PID given with 70%

10.4.2 DIAGRAM OF STEP PID VALUE GIVEN



11. DESCRIPTION OF COMMUNICATION PROTOCOL

11.1 MODBUS PROTOCOL DESCRIPTION

11.1.1 PROTOCOL OVERVIEW

Modbus protocol is a universal protocol used in the industrial control unit. Because this protocol can be conveniently applied, this protocol has been considered as the general industry standard and is widely applied to the integrated system of master controllers and slave units. By applying this protocol, units of various brands can be connected together and functioning as an industrial network.

Modbus defines 3 types of transmission modes: ASCII, RTU and TCP. A510 Frequency inverter only supports RTU mode.

11.1.2 INTERFACE AND TRANSMISSION METHOD

A510 utilizes RS485 (RS232, optional, which has to be converted by a level) as the physical interface for Modbus, and one host can control one or more (maximum 247 units) frequency inverters.

Terminal Identifier	Terminal Usage	Function
RS+	Data Transceiving Terminal(+)	When connected to PC/PLC via RS 485 communication interface, connect to (+) signal
RS-	Data Transceiving Terminal(-)	When connected to PC/PLC via RS 485 communication interface, connect to (-) signal

By applying the asynchronous serial half-duplex transmission method, only master unit or slave unit can transmit data at one particular moment, and the other unit can only receive data.

11.1.3 DATA STRUCTURE

1. 4 Optional Data Transmission Formats

① 1 start bit, 8 data bits, 1 stop bit, without parity bit (factory setting)

② 1 start bit, 8 data bits, 1 stop bit, even parity

③ 1 start bit, 8 data bits, 1 stop bit, odd parity

④ 1 start bit, 8 data bits, 2 stop bit, without parity bit

2. Baud rate

Seven optional baud rates: 1200bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400bps, 79600 bps

3. Communication rules

Starting interval between data frames is longer than 3.5 byte transmission cycle (standard), but the minimum interval should not be shorter than 0.5 ms.

11.1.4 PARAMETER CONFIGURATION FOR FREQUENCY INVERTERS

FA.0.00 is a read-only parameter, and is used to display the status of the communication card connection and bus;

FA.0.01 = 00XX, unit digit is used to choose baud rate, and tens digit is used to choose data format;

FA.0.02 = X, choose the address of this station;

FA.0.03~ FA.0.06, configure supporting communication parameters; refer to functional parameter table for detailed functions.

- X indicates that this digit can be any value in the allowed range.

11.1.5 BRIEF INTRODUCTION OF FUNCTIONS

The Modbus functional codes supported by A510 are listed below:

Function	Code (Hexadecimal)	Description of Functions
Read coil status	0x01	Read coil status by digit. Each digit for the controlling character is mapped to coil 0~15 respectively.
Read discrete input status	0x02	Read discrete input status. Each digit for the status character is mapped to coil 0~15 respectively.
Read multiple hold registers	0x03	Read multiple hold registers. It can read all the application parameters, status parameters, controlling characters, status characters and setting values of A510.
Read multiple input registers	0x04	Read multiple input registers. The address for analog input register starts from 0x1200.
Enforce single coil	0x05	Perform writing action for a single output digit. Each digit for the controlling character is mapped to coil 1~16 respectively.
Write to a single hold register	0x06	Perform writing action for a single hold register. All the parameters, controlling characters, status characters and setting values of A510 are mapped to the hold register.
Query for the anomaly status	0x07	Query for the anomaly status information. In A510, the failure information of the frequency inverter can be queried.
Failure diagnosis	0x08	Execute field diagnosis for the bus failure. Support the sub-codes, like querying (0x00), rebooting (0x01), monitoring (0x04) and zero-clearing(0x0A) etc.
Enforce multiple coils	0x0F	Perform writing action for multiple output digits respectively. Each digit for the controlling character is mapped to coil 1~16 respectively.
Write to multiple hold registers	0x10	Perform writing action for multiple hold registers. All the parameters, controlling characters, status characters and setting values of A510 are also mapped to the hold register.
Read/write to multiple hold registers	0x17	This function equals to combining 0x03 and 0x10 into a new command.

11.1.6 ACCESS ADDRESS SUMMARY

A510	Access Address	Functional Codes Supported (Hexadecimal)
Controlling digit Multi-purpose terminal output Relay output	Coil (0x1000-0x1100)	0x01- Read coil status 0x05- Enforce single coil 0x0F- Enforce multiple coils
Multi-purpose terminal input for status digit	Discrete input (0x1100-0x1200)	0x02- Read input status
Analog input	Input register (0x1200-0x1300)	0x04- Read input register
Application parameters Status parameters Controlling characters, Status characters Setting values Mapping status parameters Mapping application parameters	Hold registers (application parameter area, status parameter area, 0x1300-0x1400)	0x03- Read multiple registers 0x06- Write to a single register 0x10- Write to multiple registers 0x17- Read/write to multiple registers

For detailed address distribution, please refer to below section of Modbus detailed address-finding distribution.

11.1.7 DETAILED MODBUS ADDRESS-FINDING DISTRIBUTION

1. Coil Address Summary (0x1000-0x1100)

Relevant Modbus functional codes: 0x01 (read coil status), 0x05 (write to a single coil), 0x0F (write to multiple coils)

Register name	Function Description	Access Address
Controlling Digit – Digit 0	Keep	0x1000
Controlling Digit – Digit 1	Operation Allowed 0: Operation banned 1: Operation allowed	0x1001
Controlling Digit – Digit 2	Starting allowed 0: Starting banned 1: Starting allowed	0x1002
Controlling Digit – Digit 3	Keep	0x1003
Controlling Digit – Digit 4	Operation instruction 0: Stop 1: Operation	0x1004
Controlling Digit – Digit 5	Operation direction 0: Positive 1: Negative	0x1005
Controlling Digit – Digit 6	Emergency Stop 0: Invalid 1: Valid	0x1006
Controlling Digit – Digit 7	Free slide stop 0: Invalid 1: Valid	0x1007
Controlling Digit – Digit 8	Keep	0x1008
Controlling Digit – Digit 9	Keep	0x1009
Controlling Digit – Digit 10	Keep	0x100A
Controlling Digit – Digit 11	Keep	0x100B
Controlling Digit – Digit 12	Acceleration/deceleration banned 0: Allowed 1: Banned	0x100C
Controlling Digit – Digit 13	Zero-clearing for integrator input 0: Invalid 1: Valid	0x100D

Register name	Function Description	Access Address
Controlling Digit – Digit 14	Remote Control 0：Invalid 1: Valid	0x010E
Controlling Digit – Digit 15	Failure Reset 0->1 Reset	0x100F
DO1	Multi-purpose output terminal 1	0x1020
DO2	Multi-purpose output terminal 2	0x1021
EDO1	Multi-purpose output terminal 3 (extendable card)	0x1030
RO1	Multi-purpose relay output 1	0x1040
ERO1	Multi-purpose relay output 2 (extendable card)	0x1050
Keep		0x1051~0x1099

2. Discrete Input Address Summary (0x1100 ~ 0x1200)

Relevant Modbus functional codes：0x02 (read input status)

Register name	Function Description	Access Address
Status character–digit 0	Ready	0x1100
Status character–digit 1	Operation allowed	0x1101
Status character–digit 2	Starting allowed	0x1102
Status character–digit 3	Keep	0x1103
Status character–digit 4	Operation status	0x1104
Status character–digit 5	Direction	0x1105
Status character–digit 6	Zero speed	0x1106
Status character–digit 7	Acceleration	0x1107
Status character–digit 8	Deceleration	0x1108
Status character–digit 9	Arrival	0x1109
Status character–digit 10	Keep	0x110A
Status character–digit 11	Keep	0x110B
Status character–digit 12	Instruction source	0x110C
Status character–digit 13	Command source	0x110D
Status character–digit 14	Warning	0x110E
Status character–digit 15	Failure	0x110F
DI1	Multi-functional input terminal 1	0x1120
DI2	Multi- functional input terminal 2	0x1121
DI3	Multi- functional input terminal 3	0x1122
DI4	Multi- functional input terminal 4	0x1123
DI5	Multi- functional input terminal 5	0x1124
EDI1	Multi-purpose input terminal 6 (extendable card)	0x1125
EDI2	Multi-purpose input terminal 7 (extendable card)	0x1130
EDI3	Multi-purpose input terminal 8 (extendable card)	0x1131
EDI4	Multi-purpose input terminal 9 (extendable card)	0x1132
Keep		0x1133~0x1199

3. Input Register Address Summary (0x1200 ~ 0x1300)

Relevant Modbus functional codes：0x04 (read input register)

Register name	Function Description	Value Range	Access Address
AI1	Analog input value 1	0 ~ 4080	0x1200
AI2	Analog input value 2	0 ~ 4080	0x1201
AI3	Analog input value 3 (extendable card)	0 ~ 4080	0x1202
Fin	Pulse input value (extendable card)	0 ~ 4080	0x1203
Keep			0x1204~0x1299

4. Hold Register Address Summary

Relevant Modbus functional codes: 0x03 (read multiple registers), x06 (write to multiple registers), 0x10 (write to multiple registers), 0x17 (read/write to multiple registers).

Application parameter address

The application parameter access address can be obtained from the parameter's identifier when ascertaining the access address, the method is to ignore the sub-class code in the identifier (following referred to as "*"); let's see an example, for parameter identifier: HH.*.DD (eg.F2.0.33), it will obtain HHDD directly (hexadecimal format), and the access address for F2.0.33 is: 0xF233H. Below attached is the table for respective conversion of access addresses:

Parameter identifier	RAM Access Address①	ROM Access Address
F0.#.00 ~ F0.#.55	0xF000~0xF055	0xE000~0xE055
•••••••	•••	•••
F9.#.00 ~ F9.#.55	0xF900~0xF955	0xE900~0xE955
FA.#.00 ~ FA.#.55	0xFA00~0xFA55	0xEA00~0xEA55
•••••••	•••	•••
FF.#.00 ~ FF.#.55	0xFF00~0xFF55	0xEF00~0xEF55
dE.#.00 ~ dE.#.55 (read-only)	0xDE00~0xDE55	0xBE00~0xBE55

Status parameter address (read-only): The address conversion method for status parameter is similar to that for application parameter. However, there is no ROM access address.

Parameter Identifier	RAM Access Address
d0.#.00 ~ d0.#.55	0xD000~0xD055
d1.#.00 ~ d1.#.55	0xD100~0xD155

Bus Controlling Parameter Address (0x1300 ~ 0x1400)

Register Name	Value Range	Access Address
Controlling character (mapping coils 0-15)②	0 ~ 0xFFFF	0x1300
Modbus setting value 1 (Relative Value) ③	-10000 ~ 10000	0x1301
Modbus setting value 2 (Absolute Value)	-30000 ~ 30000	0x1302
Mapping application parameters 1④	[F0.00 ~FF.55]	0x1303
Mapping application parameters 2	[F0.00 ~FF.55]	0x1304

Register Name	Value Range	Access Address
Mapping application parameters 3	[F0.00 ~FF.55]	0x1305
Mapping application parameters 4	[F0.00 ~FF.55]	0x1306
Mapping application parameters 5	[F0.00 ~FF.55]	0x1307
Mapping application parameters 6	[F0.00 ~FF.55]	0x1308
Status Character (Mapping discrete range 0-15)	0 ~ 0xFFFF	0x1309
Mapping status parameters 1	[d0.00 ~d1.49]	0x130A
Mapping status parameters 2	[d0.00 ~d1.49]	0x130B
Mapping status parameters 3	[d0.00 ~d1.49]	0x130C
Mapping status parameters 4	[d0.00 ~d1.49]	0x130D
Mapping status parameters 5	[d0.00 ~d1.49]	0x130E
Mapping status parameters 6	[d0.00 ~d1.49]	0x130F
Mapping status parameters 7	[d0.00 ~d1.49]	0x1310
Mapping status parameters 8	[d0.00 ~d1.49]	0x1311
Mapping status parameters 9	[d0.00 ~d1.49]	0x1312
Mapping status parameters 10	[d0.00 ~d1.49]	0x1313
Keep	Undefined	0x1314 ~0x 1400

Notes:

①If there is no need to keep the parameters permanently, it suffices to write the parameters to the RAM area. However, if the parameters have to be maintained permanently, it is required to write the parameter values into the ROM area. The service life of ROM area will be shortened if parameters are frequently written to the ROM area. If value F2.1.13 needs to be written and maintained permanently, the register address where it should be written to is 0xF213.

②When reading/writing controlling characters, it can be achieved via reading/writing to the coil mapped to each digit of controlling characters, and it can also be achieved via reading/writing to the hold register corresponding to the controlling characters. Both methods can achieve identical results. If it is needed to set the value for operation allowed， we can set the value of the digit 1 for controlling character (address 0x1001) as 1 via functional code 05, we can also set the value of controlling character (address 0x1300) as 0x0002 via functional code 06. When reading the status characters, the method is similar to that for reading/writing controlling characters. It can be achieved via reading the discrete input mapped to each digit of status characters, and it can also be achieved via reading the hold register corresponding to the status characters. If we need to read the operation direction, we can read the status digit 5 (address 0x1105) via functional code 02, we can also read the status character (address 0x1309) via functional code 03.

③Range for relative values is between -10000 ~ 10000, and correspondingly, they falls in -100.00%~100.00% range of the upper limit value that has been set.

④When we need to access several application parameters or monitoring parameters of discrete addresses, we can first map these parameters to bus control parameter area, and then we access to that area instead.

As a matter of fact, access for mapped parameters is a type of pointer access, and the mapping parameters can be set in the FA.1 parameter group.

5. Anomaly Status Information：Relevant Modbus functional code 0x07 (Query)

The frequency inverter's failure warning status and code corresponding to each digit of the returned data
Returned data – digit 7:0 — No failure on frequency inverter，1 — Failure on frequency inverter
Returned data – digit 6:0 — No warning on frequency inverter，1 — Warning on frequency inverter
Returned data – digit 5~0:each code of failure information corresponds to the identifier code following Fu in the failure code of the frequency inverter.

Each code of warning information corresponds to the identifier code following AL. in the warning code of the frequency inverter.

If data 0x8C (10001100) is returned, it indicates that the failure code of the frequency inverter is Fu. 012; if data 0x64 (01100100) is returned, it indicates that warning code of the frequency inverter is AL.036.

6. Failure Diagnosis：Relevant Modbus functional code 0x08 (Diagnosis)

Sub-function code list

Sub-function code	Function	Query Data	Response Data
00	Return the identical query data	Random	Image query data
01	Re-start communication option (restore the “listen only" status for 04 sub-code)	FF00/0000	FF00/0000
04	Enforce slave unit into “Listen Only" status and the salve unit will not reply; the failed salve unit can be removed from the communication chain.	0000	No reply
0A	Clear all calculators and diagnosing registers	0000	Image query data
0B	Return the number of bus information items	0000	Total number of bus information items
0C	Return the number of bus communication failures (CRC error calculation)	0000	CRC error calculation
0D	Return the number of bus anomaly failures	0000	Number of anomaly data items
0E	Return the number of salve unit information items (corresponding with slave unit address or the broadcasting information)	0000	Number of valid data items

11.1.8 EXAMPLES

1. Start 1＃ Frequency inverter Operation

Host request:

Slave Unit Address	Functional Code	Coil Starting Address High Digit	Coil Starting Address Low Digit	Write Values High Digit	Write Values Low Digit	CRC Check Low Digit	CRC Check High Digit
01	05	10	04	FF	00	C9	3B

Slave Unit Response: Frequency inverter will operate in positive direction, and return the identical data as requested by the host.

2. Set the operation frequency as 25.00Hz for frequency inverter, and correspondingly, it is 50.00% of the upper limit frequency 50.00 Hz.

Host request:

Slave Unit Address	Functional Code	Register Starting Address High Digit	Register Starting Address Low Digit	Register Data High Digit	Register Data Low Digit	CRC Check Low Digit	CRC Check High Digit
01	06	13	01	13	88	D1	D8

Slave Unit Response: Set the value for frequency inverter's frequency as 25.00Hz, and return the identical data as requested by the host.

3. Return the frequency inverter's current operational frequency and rotation speed, the positive rotating frequency of frequency inverter is 50.00Hz, and positive rotation speed of the electrical motor is 1440rpm.

Host request:

Slave Unit Address	Functional Code	Register Starting Address High Digit	Register Starting Address Low Digit	Number of Registers High Digit	Number of Registers Low Digit	CRC Check Low Digit	CRC Check High Digit
01	03	D0	00	00	02	FC	CB

Slave Unit Response:

Slave Unit Address	Functional Code	Number of bytes read	The 1st register data high digit	The 1st register data low digit	The 2nd register data high digit	The 2nd register data low digit	CRC Check Low Digit	CRC Check High Digit
01	03	04	13	88	05	A0	7D	B5

4. Query the number of bus communication failures (CRC error calculation), return the number of bus communication failure as 35.

Host request:

Slave Unit Address	Functional Code	Sub-function Code High Digit	Sub-function Code Low Digit	Query data High Digit	Query data Low Digit	CRC Check Low Digit	CRC Check High Digit
01	08	00	0C	00	00	20	08

Slave Unit Response:

Slave Unit Address	Functional Code	Sub-function Code High Digit	Sub-function Code Low Digit	Response Data High Digit	Response Data Low Digit	CRC Check Low Digit	CRC Check High Digit
01	08	00	0C	00	23	61	D1

5. Query the model description for frequency inverter

Host request:

Slave Unit Address	Functional Code	CRC Check Low Digit	CRC Check High Digit
01	11	C0	2C

Slave Unit Response:

Slave Unit Address	Functional Code	Number of Bytes	Model Data	Operation Status	Extra Data	CRC Check Low Digit	CRC Check High Digit
01	11	10	00 00 03 05 10	FF	04 03 00 75 20 11 02 03 70 00	E2	33

Model of frequency inverter: A510-4T0075, frequency inverter in operation, production batch of 2011-2-3, version number: 7000.

12. ACCESSORIES

12.1 BRAKING UNIT

Operating Principle: When the inverter drags the motor for acceleration and reversing, the voltage of the DC bus inside the inverter may increase due to the motor's energy feedback. In order to prevent the inverter from stopping as a result of over voltage protection, the brake unit will automatically connect to the energy dissipation circuit before the voltage of the DC bus reaches the protection point. Hence the energy can be released in the way of heat energy via the braking resistance, so as to prevent voltage rising continuously.

12.1.1 MODEL OF BRAKE UNIT

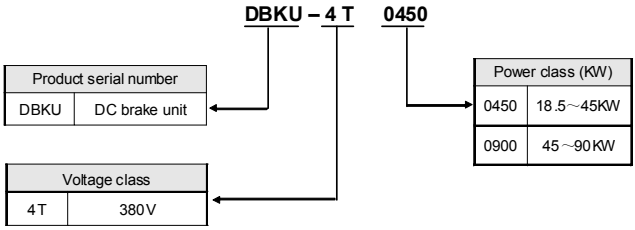


Figure 12-1 Sketch of model description

12.1.2 MODEL SELECTION FOR BRAKE RESISTANCE

Below lists the power of brake resistance and resistance values recommended for part of models of SUNFAR. Users can appropriately change values according to the load conditions but within the range specified for SUNFAR brake unit.

Inverter capacity (KW)	Brake unit		Power of brake resistance (KW)	Brake resistance value (Ω)	Quantity of brake resistance
	Specification	Quantity (set)			
18.5	DBKU-4T0450	1	2.5	30	1
22			2.5	27.2	1
30			3	20	1
37			4	15	1
45			5	13.6	1
55	DBKU-4T0900	1	6	10	1
75			8	8	1
90			9	7.5	1
110	DBKU-4T0900	2	6	12	2
132			8	10	2
160			9	8	2
185			10	7	2
200	DBKU-4T0900	3	8	9	3
220			9	9	3
280			10	7.5	3

The above configuration is for the brake resistance when the brake usage rate is 10% and the brake torque is 100%. In order to get the brake torque above 100%, it is needed to correspondingly reduce brake resistance value and promote the power glass of the brake resistance. But it is a must to guarantee that the current of the brake resistance is lower than the maximum current permitted for the brake unit.

12.1.3 APPEARANCE OF BRAKE UNIT

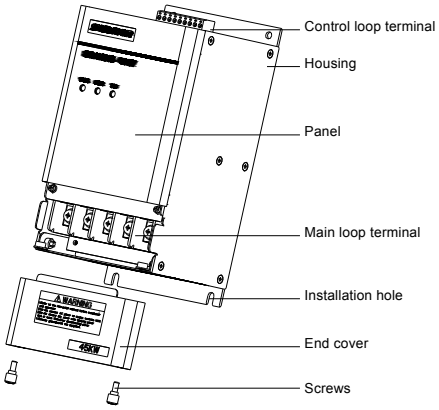


Figure 12-2 Appearance sketch

12.1.4 INSTALLATION SIZE OF BRAKE UNIT

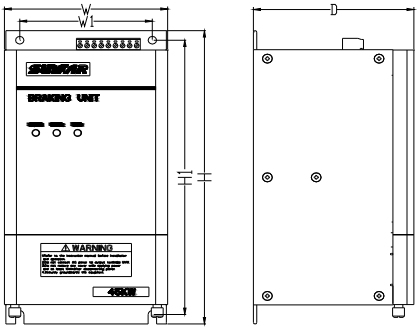


Figure 12-3 Installation size diagram

The installation size of brake unit is shown in the following table:

Model of the brake unit	W1(mm)	W(mm)	H1(mm)	H(mm)	D(mm)	Screw specification
DBKU-4T0450(4T0900)	95	117	215	230	115	M5

12.1.5 SINGLE BRAKE UNIT AND INVERTER REFERENCE WIRING SKETCH

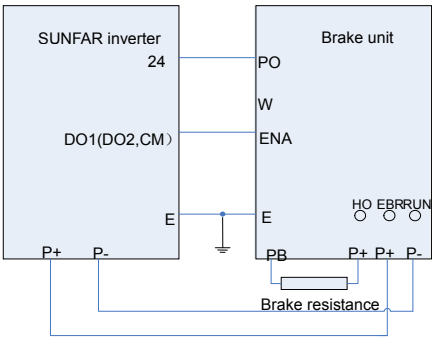


Figure 12-4 Wiring sketch

When the braking enabling (forbidding) function of the brake unit is applied, before the inverter starts running, it is a must to set the function of the inverter's deceleration effective control terminal (the control terminal corresponding to SUNFAR inverter is DO1 or DO2) connected to ENA to be effective during the deceleration process. If this function is not needed, please connect ENA to 24V common port CM.

12.1.6 WIRING PRECAUTIONS

1. When connecting wires between the inverter and brake unit, reverse connection of P+ and P- will burn the brake unit and damage the inverter. Be sure to check carefully before powering on the inverter.

2. For installation and wiring of the main loop, be sure to disconnect the inverter or power it off and wait for 5-10 minutes until the power indicator of the inverter or the brake unit goes off. The wiring of the control loop cannot be done with the mains power is connected principally.

3. Be sure to keep the control loop wires away from the connecting wires of main power circuit, in order to prevent improper action caused by interfering noise. If the control loop wires have to pass through the main loop connecting wires, be sure to make it pass through vertically. If the distance between the connecting wires is excessive, be sure to use twisted pair or shielded wires.

For more instructions of the brake unit please refer to the operating manual of the brake unit by visiting our website to download: http://www.sunfars.com/.

12.2 I/O INTERFACE CARD (STANDARD TYPE: DEC5I0AS, PN: 050M008005000)

12.2.1 OUTSIDE VIEW OF I/O STANDARD INTERFACE CARD

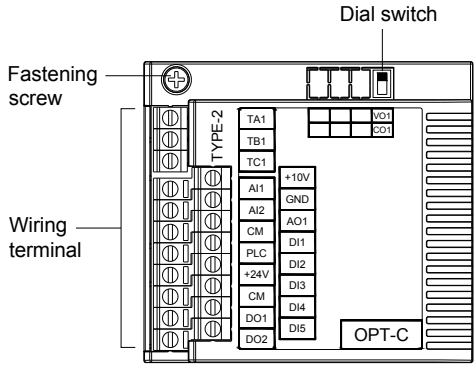


Figure 12-5 I/O standard interface

12.2.2 FUNCTIONS OF I/O STANDARD INTERFACE CARD TERMINAL

Terminal Type	Terminal Name	Functions
+24V power supply	+24V	Externally provide +24V power supply, and maximum output current 100mA
±10V power supply	+10V，-10V	Externally provide +10V power supply, and maximum output current 10mA
Analog input	AI1	To input analog voltage 0~10V, input impedance ≥1M ohm
	AI2	To input analog current 0~20mA
Analog output	AO1	Providing programmable analog voltage (0~10V) / current (0~20mA) output
Digital input	DI1~DI5	Programmable switch input, input frequency ≤1KHz
Digital output	DO1~DO2	Programmable OC output, output frequency ≤1KHz
Relay output	TA1	Programmable output, TA1-TB1 normally closed; TA1-TC1 normally open ; Contact capacity AC 250V/1A。
	TB1	
	TC1	
Common port	PLC	Common port of DI1~DI5
	GND	+10V, AI1, AI2，AO1 reference address
	CM	+24V, DO1, DO2 reference address

12.2.3 ASSEMBY OF STANDARD INTERFACE CARD

The extended card is assembled and disassembled as shown in Figure 2.

(Note: there're two sizes of jackets on the tray and card sockets. The extended cards may be inserted in either jacket of the same size on the tray.)

♦ Assembly:

1. Place the extended card horizontally in the direction as shown in the figure and align socket of the card with the jacket of card tray, and press until the extended card hug the tray closely;

2. Tighten the M3 fixing screw at top left corn of the extended card.

♦ Disassembly:

1. Loosen M3 fixing screw at top left corn of the extended card;

2. Pull the extended card upward from card tray.

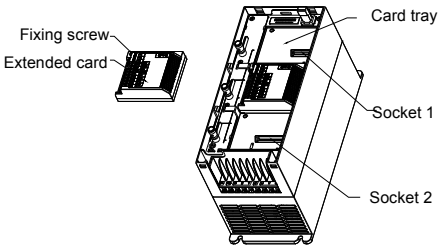


Figure 12-6 Assembly and Disassembly of Extended Card

12.2.4 WIRING FOR STANDARD INTERFACE CARD

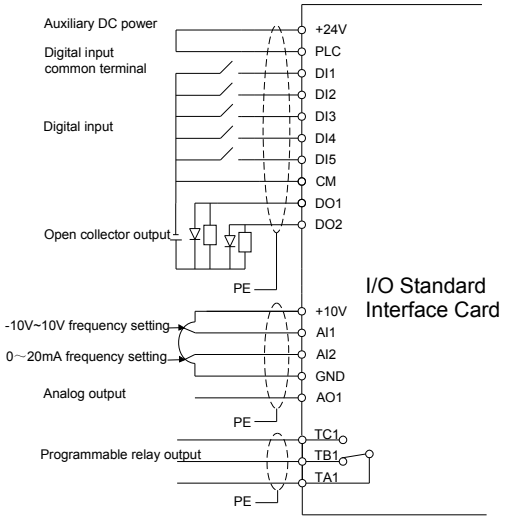


Figure 12-7 Wiring for I/O Standard Interface Card

12.3 I/O EXPANSION CARD STANDARD (STANDARD FORM DEC5I0AE, PN: 050M008004000)

12.3.1 I/O EXPANSION CARD STANDARD DIMENSIONS

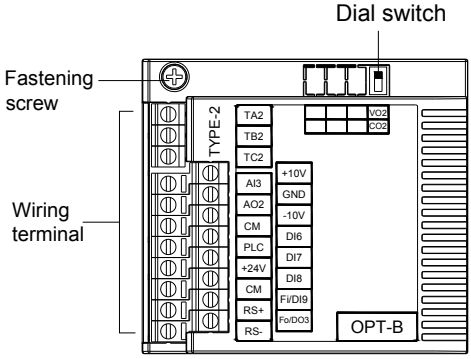


Figure 12-8 I/O expansion card

12.3.2 FUNCTIONS OF I/O STANDARD INTERFACE CARD TERMINAL

Terminal Type	Terminal Name	Functions
485 communication	RS+,RS-	Standard RS485 differential input communication physical port
+24V power supply	+24V	Externally provide +24V power supply, and maximum output current 100 mA
±10V power supply	+10V，-10V	Externally provide +10V power supply, and maximum output current 10 mA
Analog input	AI3	Analog -10~10V input, input impedance≥1M Ohm; see F4 parameter for details.
Analog output	AO2	Providing programmable analog voltage (0-10V)/current (0~20mA) output
Digital input	DI6~DI8	Programmable switch input, and input frequency≤1KHz
	FI/DI9	Programmable switch input, and input≤100KHz
Digital output	Fo/DO3	Programmable OC output, output frequency≤100KHz
Relay output	TA2	Programmable output TA2-TB2 normally closed; TA2-TC2 normally open; Contact capacity AC 250V/1A。
	TB2	
	TC2	
Common port	PLC	Common port of DI6~DI8, FI/DI9
	GND	±10V, AI3, AO2 reference address
	CM	+24V，FO/DO3 reference address

- Refer to “User Manual of I/O Standard Expansion Card” for the using method and detailed instructions of I/O standard expansion card.

12.4 PG FEEDBACK CARD (STANDARD TYPE DEC3PG12AA, PN: 050M009012001)

12.4.1 OUTSIDE VIEW OF PG FEEDBACK CARD (STANDARD)

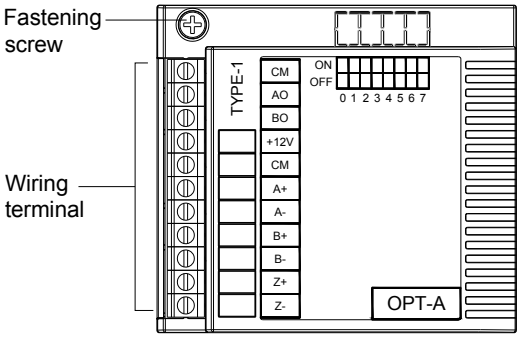


Figure 12-9 PG card (Standard)

12.4.2 FUNCTIONS OF PG CARD (STANDARD) TERMINAL

Terminal Type	Terminal Name	Functions
+12V power supply	+12V	Externally provide +12V power supply, and maximum output current 250mA
Common port	GD	+12V power reference address
Output	AO	Reserved
	BO	Reserved
Differential input	A+，A-	Encoder A phase differential input
	B+，B-	Encoder B phase differential input
	Z+，Z-	Encoder Z phase differential input

- Refer to “User Manual of PG feedback card (Standard)” for the using method and detailed instructions of PG feedback card (Standard).

12.5 DESCRIPTION OF LED OPERATING PANEL

12.5.1 OUTSIDE VIEW OF LED OPERATING PANEL

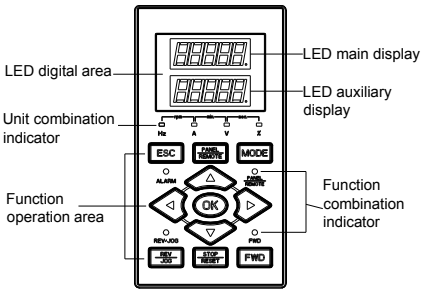


Figure 12-10-A LED button-type
(Model DPNL360EA /PN: 050M007360003）

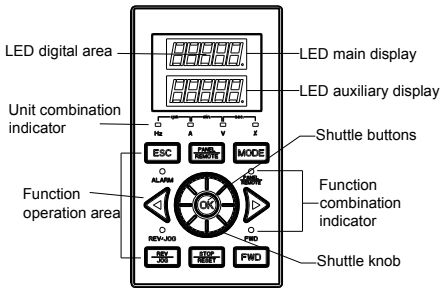


Figure 12-10-B LED shuttle-type
(Model DPNL360EB/PN: 050M007360004)

Please refer to the product catalogue if you want to know more about optional accessories.