VEICHI

AC70T Crane Purpose
AC Drive Manual

Preface

First of all, thank you for using AC70T series crane special AC drive.

VEICHI Electric is committed to creating safe, efficient and highly reliable lifting products. Combined with years of experience in the lifting industry, the AC70T series of special machines for lifting industry are launched with excellent control performance and functions, integrating brake control, smooth lifting, constant power, zero-speed hovering, variable amplitude anti-shaking, brake torque detection and other special functions, which are applied to AC drive lifting, slewing and translating mechanisms of lifting equipment.

This manual introduces how to properly use the AC70T series AC drive for lifting, providing users with notes on how to install, parameter setting, operation and troubleshooting, etc.

In order to use this product correctly, be sure to read the manual carefully before use, if you have doubts about the contents of this manual, please consult our technical staff to provide you with assistance, which will help you use this series of products safely and correctly.

Our company is always committed to product innovation and technological breakthroughs to provide the best products and solutions to meet the field applications in various fields of lifting. The content is subject to change without prior notice due to continuous product updates and upgrades.

Version change records

Date	Change content	Changed version
2022.01	1、New debugging guide 2、New FE group lifting special function code 1 3、Modify FF group lifting special function code 2 4、Modify special function	V1.5

Catalogue

1 Overview

Thank you for using the AC70T high performance crane AC drive designed and manufactured by VEICHI Electric Co. This manual describes how to use this product properly to get good benefits. Please be sure to read this manual carefully before using the product (installation, wiring, operation, maintenance, inspection, etc.).

1.1 Safety Precautions

To ensure safe, reliable and reasonable use of this product, please use the product only after fully understanding the safety precautions described in this manual.

Warning signs and meaning

The following marks are used in this manual to indicate that the place is important regarding safety. Failure to observe these precautions may result in personal injury or death, damage to this product and associated systems.

Danger	**Danger：** If operated incorrectly, it may result in death or a major safety accident.
Warning	**Warning：** If operated incorrectly, it may result in death or a major safety accident.
Caution	**Caution：** If done incorrectly, minor injuries may result.
Important	**Important：** If operated incorrectly, this product and the associated system may be damaged.

Operating Requirements

This product must be installed, wired, operated, and maintained by trained professionals. By "trained professionals" in this manual, we mean that the personnel working on this equipment must be trained in the installation, wiring, operation, and maintenance of the equipment, and must be able to respond properly to emergencies that occur during use.

Security Guidance

The safety rules and warning signs are presented for your safety and are measures to prevent personal injury to the operator and damage to this product and associated systems. Please read this manual carefully before use and strictly follow the safety rules and warning

signs in this manual. The safety rules and warning signs are divided into the following categories: general instructions, instructions for transportation and storage, instructions for installation and wiring, instructions for operation, instructions for maintenance, and instructions for disassembly and scrap disposal.

● General guidance

Warning	● This product carries a hazardous voltage and it controls a potentially hazardous motion mechanism. Failure to comply with the regulations or to follow the requirements of this manual may result in personal injury or death, damage to this product and associated systems. ● Only trained professionals are allowed to operate this product, and before using this product, be familiar with all the safety instructions and regulations for operation in this manual; proper operation and maintenance is a reliable guarantee to achieve safe and stable operation of this product. ● Do not perform wiring work when the power is on, otherwise there is a risk of death by electric shock; when wiring, inspection, maintenance, etc., please cut off the power of all associated equipment and make sure that the DC voltage of the main circuit has dropped to a safe level, and wait 5 minutes before performing related work.
Caution	● Prevent children and the public from coming into contact with or near this product. ● This product can only be used in accordance with the manufacturer's specified purpose and may not be used in special areas related to emergency, rescue, marine, medical, aviation, nuclear facilities, etc. without permission. ● Unauthorized modifications, use of spare parts not sold or recommended by the manufacturer of this product may result in malfunction.
Important	● Be sure to deliver this manual to the actual user to ensure that the actual user reads it carefully before using it. ● Please make sure you read and fully understand these safety rules and warning signs before installing and commissioning the AC drive.

● Guidance for transportation and storage

Warning	● Proper transportation, storage, installation, and careful operation and maintenance are essential to the safe operation of the AC drive.
Caution	● During transportation and storage to ensure that the AC drive is not subject to shock and vibration, must also ensure storage in a dry, non-corrosive gas, no conductive dust and the ambient temperature is less than 60 ℃.

● Guidance on installation wiring

Warning	● Only trained professionals should operate this product. ● The power line, motor line and control line must be tightly connected, and the grounding terminal must be reliably grounded, and the grounding resistance is less than 10Ω. ● Before opening the AC drive panel, disconnect the power to all associated equipment and make sure the main circuit DC voltage has dropped to a safe level, and wait 5 minutes before performing related operations. ● Human static electricity can seriously damage the internal sensitive devices. Before carrying out related operations, please observe the measures and methods specified in the electrostatic preventive measures (ESD), otherwise the AC drive may be damaged. ● Since the AC drive output voltage is pulse waveform, if there are capacitors or varistors for lightning protection installed on the output side to improve the power factor, be sure to remove or modify them on the input side of the AC drive. ● Do not add switching devices such as circuit breakers and contactors on the output side of the AC drive (if you must connect a switching device on the output side, you must ensure that the output current of the AC drive is zero when the switch is operated in the control).

● Guidance for running

Warning	● AC drives operate at high voltages, and dangerous voltages are inevitably present on some parts of this product. ● Regardless of where the fault occurs in the control equipment, it may cause a major accident or even personal injury, i.e., there is a potentially dangerous fault; therefore, additional external precautions or other devices to ensure safe operation must be taken, e.g., installation of independent current-limiting switches, mechanical guards, etc. ● In order to ensure that the motor overload protection can operate correctly, the motor parameters input to the AC drive must match exactly with the actual motor used.

● Guidance on maintenance

Warning	● Maintenance of this product should only be performed by the service department of VEICHI Electric Limited, by an authorized VEICHI Electric Limited repair center, or by professionals trained and authorized by VEICHI Electric Limited, who are fully familiar with the safety warnings and operating instructions presented in this manual. ● Any defective device must be replaced in a timely manner.

	● Before opening the equipment for maintenance, be sure to disconnect the power supply and confirm that the main circuit DC voltage has dropped to a safe level, and wait 5 minutes before performing related operations.

● Guidance on disassembly and scrap disposal

Caution	● The box of the AC drive is reusable, please keep the box for future use or please return it to the manufacturer. ● The disassembled metal parts are recyclable. ● Some of the devices can have an adverse effect on the environment, such as electrolytic capacitors, so please dispose of such devices in accordance with the requirements of the environmental protection department.

1.2 Technical Specifications

Item		Specification
Power input	Voltage / Frequency	Three phase 380V 50Hz/60Hz
	Allowable fluctuations	Voltage：320V～440V；Voltage imbalance rate:<3%；Frequency: ±5% Aberration rate: IEC61800-2 required
	Power factor	≥0.94(with DC reactor)
	Efficiency	≥96%
Power Output	Output Voltage	Output under rated condition: 3 phase, 0～input voltage, inaccuracy<5%
	Output current	Please refer to "Product Ratings"
	Output frequency	0Hz-320Hz
	Output frequency	Max frequency ±0.5%
Main control performa-nce	Control method	0：V/F control 3：High performance vector control without PG 4：High performance vector control with PG
	Motor type	Asynchronous motor
	Carrier frequency	0.6kHz～15.0kHz
	Steady-state speed	VC without PG: ≤1% rated synchronized speed;
	Starting torque	flux VC without PG:180% of rated torque at 0.5Hz
	Frequency accuracy	Digit setting: max frequency×±0.01%; Analog setting: max frequency×±0.2%;
	Frequency resolution	Digit setting: 0.01Hz; Analog setting: max frequency×0.05%
	Speed fluctuation	±1%（VC without PG） ±2%（VC with PG）
	Overload capacity	150% rated current/1 min, 180% rated current/10s, 200% rated current/0.5s
	Braking capacity	100% braking power for long-term operation, 120% braking power for one minute, 160% braking power for two minutes
Product Basic Function	DC braking capacity	Starting frequency：0.00Hz～60.00Hz Braking time：0.0s～60.0s Braking current：0.0%～150.0% rated current
	Acceleration and deceleration curves	Two ways: linear acceleration and deceleration, S-curve acceleration and deceleration； Four sets of acceleration and deceleration time, time unit 0.01s, maximum 650.00s

	Automatic voltage adjustment	When the grid voltage fluctuates, it can automatically keep the output voltage constant	
	Automatic current limiting	Automatic current limitation during operation to prevent frequent overcurrent fault tripping	
	Instantaneous power-	Uninterrupted operation through bus voltage control during transient power	
	Frequency setting channel	Keypad digital settings, keypad potentiometers, analog voltage terminal VS1, analog voltage terminal VS2, analog current terminal AS, communication feed and multi-channel terminal selection, primary and secondary channel combinations	
	Feedback input channel	Voltage terminal VS1, voltage terminal VS2, current terminal AS, communication feed	
	Operation command	Operator panel feed, external terminal feed, communication feed	
	Input command signal	Start, stop, forward and reverse rotation, jogging, multi-speed, free stop, reset, acceleration and deceleration time selection, frequency setting channel selection, external fault alarm	
	External output signal	2 relay outputs, 1 collector output, 0V to 10V output, 4 to 20mA output, frequency pulse output	
	Brake control	Built-in brake control function for lifting	
Keyboard display	Keyboard display	Two-line 4-digit digital tube display	2 AC drive status quantities can be monitored
	Parameter copy	Upload and download the function code information of the AC drive for fast parameter copying	
	Status monitoring	Output frequency, given frequency, output current, input voltage, output voltage, motor speed, module temperature, input and output terminal conditions, etc.	
	Fault Alarm	Over-voltage, under-voltage, over-current, short-circuit, phase-loss, overload, overheat, stall, current limit, data protection corrupted, current fault operating conditions, historical faults	
Environm -ent	Installation site	Indoor, not more than 1000m above sea level, no corrosive gas and direct	
	Temperature, humidity	-10℃～+40℃（Wall-mounted type）、20%RH～90%RH（No condensation）	
	Vibration	Less than 0.5G below 20Hz	
	Storage temperature	-25℃～+65℃	
	Installation method	Wall-mounted type	
	Protection level	IP20	
	Cooling method	Forced air cooling	
Protection function	Overvoltage, undervoltage, current limiting, overcurrent, overload, electronic thermal relay, overheating, stall, data protection		

1.3 Product Features

Function Name	Function Description
Brake failure protection	When the AC drive detects the rotation of the motor shaft in the standby state, it automatically triggers zero-servo operation to hover the weight at the current position, and at the same time issues an alarm signal to prompt the operator to operate the lower hook, providing maximum safety for the operation of the equipment.
Smooth Lifting	In the process of tower crane hoisting, when the AC drive detects that the wire rope changes from slack state to tight state, it will automatically trigger low speed hoisting, and then accelerate hoisting after the heavy load is stabilized, in order to inhibit the "nodding" phenomenon of the tower arm caused by excessive stretching of the wire rope.
Lifting anti-hang	During the lifting process of the tower crane, if the main hook is hung by a foreign object, the AC drive will issue an alarm or fault signal.
Constant power	The speed limit is automatically calculated according to the current load during the lifting operation to realize "high speed for light load and low speed for heavy load".
Full torque monitoring	When abnormal torque output is detected during operation, the output is immediately blocked and emergency stop is realized.
Smooth rotation	Low-speed operation is smooth and consistent, no stop-and-go phenomenon, smooth gear change, large arm coherent and smooth, no "stop" phenomenon.
Anti-rocking of variable amplitude	Anti-swaying algorithm based on rope length ensures no swaying of heavy loads after stopping.
Lifting special open brake control	Through the release frequency, release current, brake release time, brake holding time, etc., to achieve special holding logic control, to ensure the safety and reliability of the system.

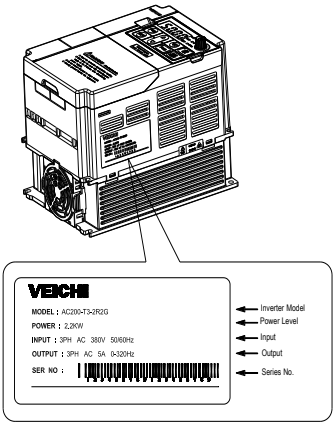
2 Before Using

2.1 Product Arrival Inspection

When you receive the product you ordered, please check the outer packaging for damage, open the outer packaging after confirming that it is intact, and confirm that the AC drive is free of damage, scratches or dirt (damage caused by the product during shipping is not covered by our warranty). If you receive the product with shipping damage, please contact our company or the shipping company immediately.

After confirming that the product you received is intact, please confirm that the model number of the AC drive you received is the same as the product you ordered. Please refer to the "MODEL" column on the nameplate on the side of the AC drive for the model number. If you find that the model number does not match the product, please contact the dealer from whom you purchased the product or our sales department immediately.

2.2 Nameplate



AC70T - T 3 - 011 B

Symbol	Series
AC70T	

Symbol	Phase
T	Three-phase

Symbol	Power Level
2	220V
3	380V

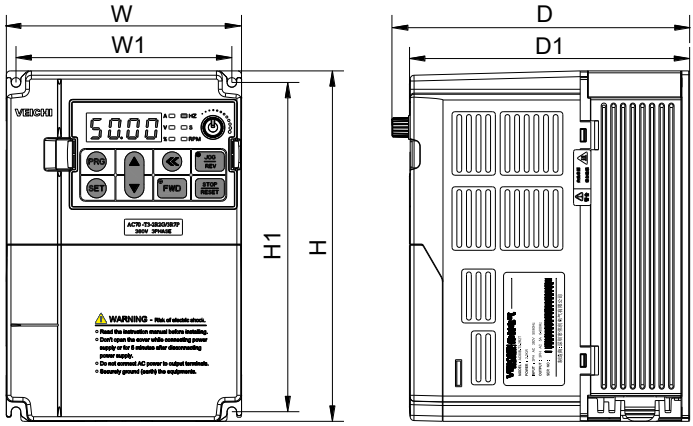
Symbol	Power Level
B	built-in brake

Symbol	Power Level
7R5	7.5
011	11
018	18.5
132	132

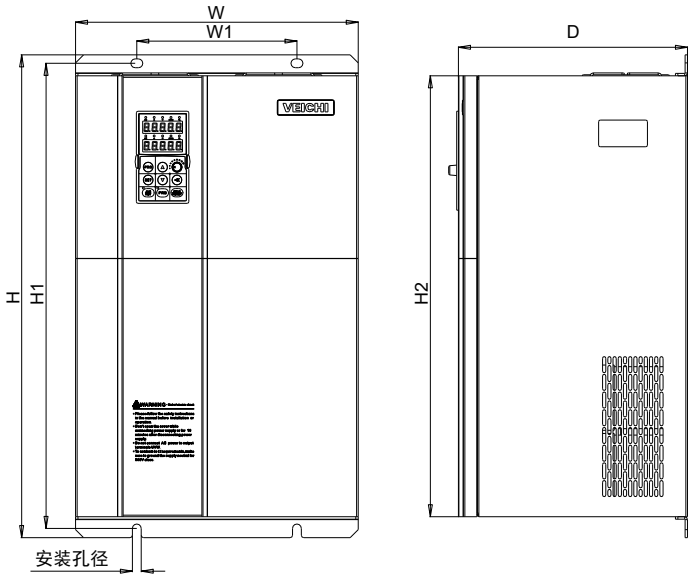
2.3 Technical Specifications

Model	Adaptable motor power	Rated input voltage	Rated current
AC70T-T2-1R5-B	1.5KW	Two-phase 220VAC	5A
AC70T-T2-2R2-B	2.2KW		10A
AC70T-T2-004-B	4KW		13A
AC70T-T2-5R5-B	5.5KW		25A
AC70T-T2-7R5-B	7.5KW		32A
AC70T-T2-011-B	11KW		38A
AC70T-T2-015-B	15KW		60A
AC70T-T3-R75-B	0.75kW	Three-phase 380VAC	2.3A
AC70T-T3-1R5-B	1.5kW		3.7A
AC70T-T3-2R2-B	2.2kW		5A
AC70T-T3-004-B	4kW		10A
AC70T-T3-5R5-B	5.5kW		13A
AC70T-T3-7R5-B	7.5kW		17A
AC70T-T3-011-B	11kW		25A
AC70T-T3-015-B	15kW		32A
AC70T-T3-018-B	18kW		38A
AC70T-T3-022-B	22kW		45A
AC70T-T3-030-B-2	30kW		60A
AC70T-T3-037-B-2	37kW		75A
AC70T-T3-045-B-2	45kW		90A
AC70T-T3-045-B	45kW		90A
AC70T-T3-055-B-	55kW		110A
AC70T-T3-075-B	75kW		150A
AC70T-T3-090-B	90kW		180A
AC70T-T3-110	110kW		210A
AC70T-T3-132	132kW		250A
AC70T-T3-160	160kW		310A
AC70T-T3-185	185kW		340A
AC70T-T3-200	200kW		380A

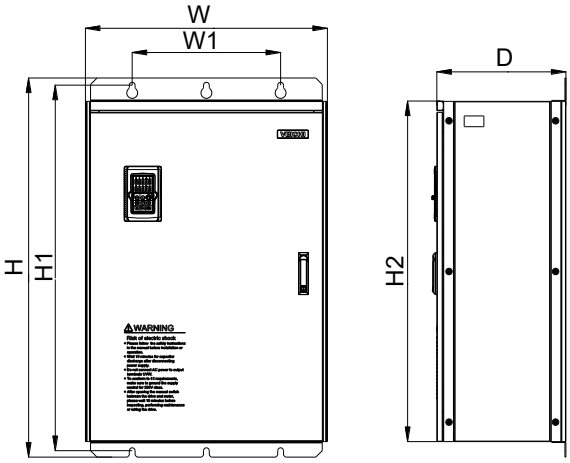
2.4 Product Size



AC Drive model	Overall Dimension				Instillation Position		Installation aperture
	W	H	D	D1	W1	H1	
AC70T-T2-1R5-B	122	182	154.5	145	112	171	ϕ5
AC70T-T2-2R2-B	159	246	157.5	148	147.2	236	ϕ5.5
AC70T-T2-004-B							
AC70T-T2-5R5-B	195	291	167.5	158	179	275	ϕ7
AC70T-T2-7R5-B	230	330	200	190	208	315	ϕ7
AC70T-T2-011-B							
AC70T-T2-015-B	255	410	225	370	180	395	Φ7
AC70T-T3-R75-B	122	182	154.5	145	112	171	ϕ5
AC70T-T3-1R5-B							
AC70T-T3-2R2-B							
AC70T-T3-004-B	159	246	157.5	148	147.2	236	ϕ5.5
AC70T-T3-5R5-B							
AC70T-T3-7R5-B	195	291	167.5	158	179	275	ϕ7
AC70T-T3-011-B							
AC70T-T3-015-B	230	330	200	190	208	315	ϕ7
AC70T-T3-018-B							
AC70T-T3-022-B							



AC Drive model	Overall Dimension				Instillation Position		Installation aperture
	W	H	D	H2	W1	H1	
AC70T-T3-030-B-2	255	410	200	370	180	395	Φ7
AC70T-T3-037-B-2							
AC70T-T3-045-B-2							
AC70T-T3-045-B	305	570	260	522	180	550	Φ9
AC70T-T3-055-B							
AC70T-T3-075-B	380	620	290	564	240	595	ϕ11
AC70T-T3-090-B							
AC70T-T3-110							



AC Drive model	Overall Dimension				Instillation Position		Installation aperture
	W	H	D	H2	W1	H1	
AC70T-T3-132	500	780	340	708	350	755	ϕ11
AC70T-T3-160	650	1060	400	950	400	1023	ϕ16
AC70T-T3-185							
AC70T-T3-200							

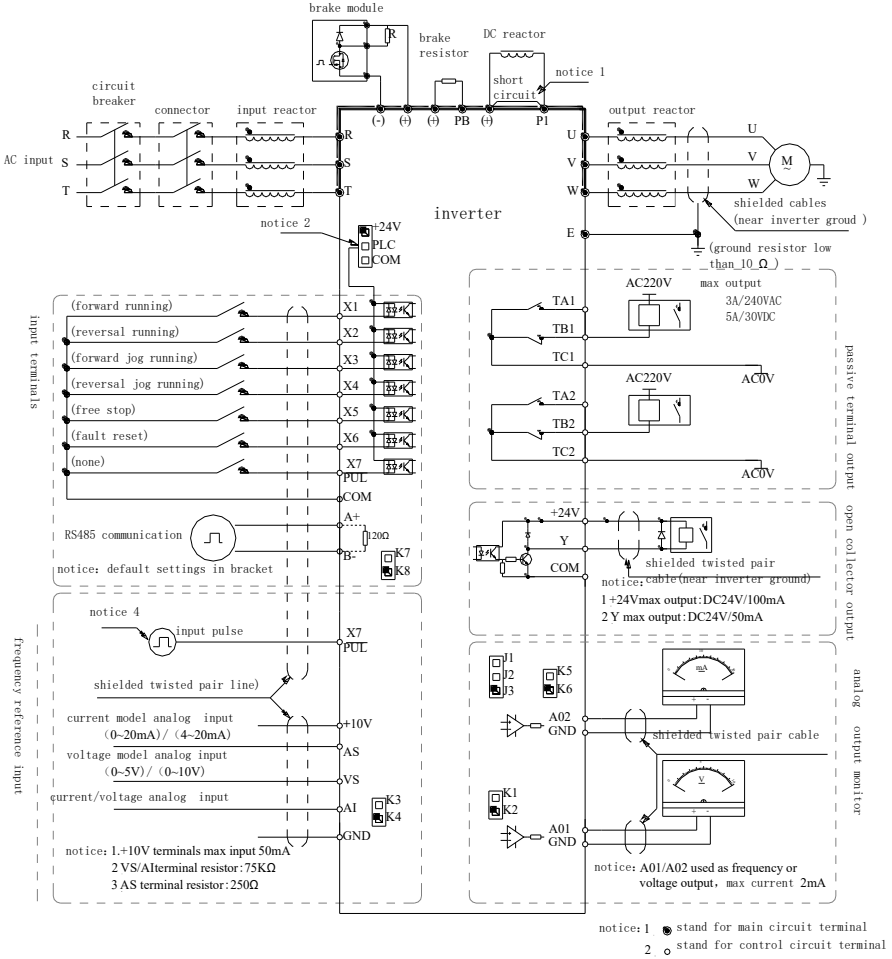
2.5 Electrical Installation

This section describes the various precautions and requirements necessary to ensure the safe use of the product, to maximize the performance of the AC drive, and to ensure the reliable operation of the AC drive.

Safety Precautions

Warning	● The AC drive must be reliably grounded when it is put into operation, otherwise it may lead to personal injury or death and the equipment cannot work reliably. ● To ensure the safe operation of the AC drive, it must be installed and wired by trained professionals. ● Do not carry out the relevant work when the power is on, otherwise there is a risk of death by electric shock. ● Before carrying out the related operation, please cut off the power of all associated equipment and confirm that the DC voltage of the main circuit has dropped to a safe level, and wait for 5 minutes before carrying out the related operation.
Caution	● The control cable of the AC drive, the power cable and the connection cable with the motor must be isolated from each other and not arranged in the same cable trunk or cable rack. ● This equipment can only be used for the purpose specified by the manufacturer. If you need to use it in other special occasions, please consult our sales department.
Important	● It is prohibited to test the insulation of the AC drive and the insulation of the cable connected to the AC drive with high-voltage insulation test equipment. ● When the AC drive and peripheral equipment (filter, reactor, etc.) need insulation test, the insulation resistance to ground should be measured first with a 500-volt megohmmeter, and the insulation resistance should not be less than 4MΩ.

2.6 Standard Connection Diagram



Note:

1、When installing the DC reactor, be sure to remove the shorting tab between the P1 and (+) terminals;

2、The multi-function input terminals (X1 to X7/PUL) can select NPN or PNP transistor signal as input, and the bias voltage can select the internal power supply of the AC drive (+24V terminal) or the external power supply (PLC terminal), and the factory value icon switch is pulled to the +24 gear to indicate that '+24V' and 'PLC' are in short connection.

3、The analog monitoring output is dedicated to frequency meters, ammeters, voltmeters, and other indicator meters, and cannot be used for control-type operations such as feedback control.

4、The control board uses AC80CC0N-A1.1 and above.

Multi-contact input connection

● NPN characteristic transistor connection method

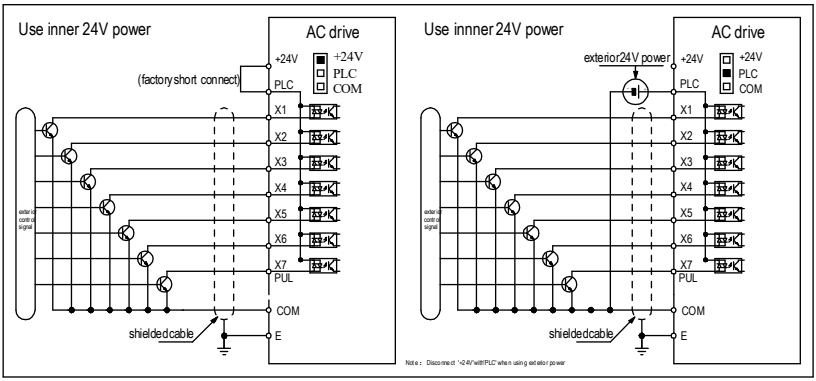


Figure 2-1：NPN characteristic transistor digital input signal connection method

● PNP characteristic transistor connection method

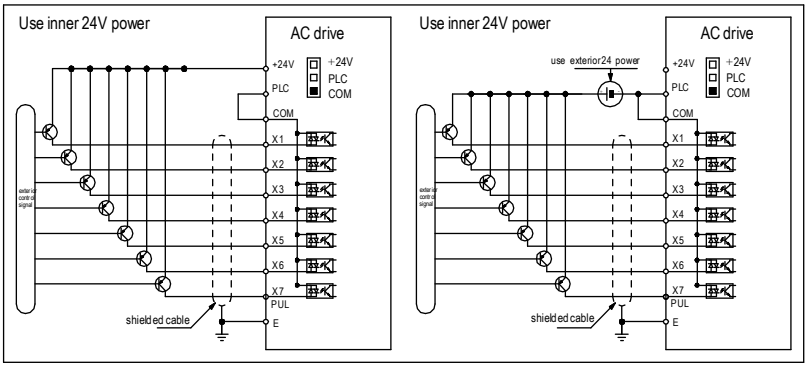


Figure 2-2：PNP characteristic transistor digital input signal connection method

Digital output signal connection

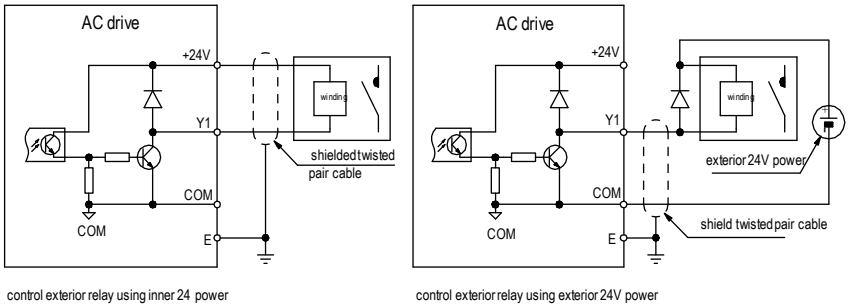


Figure 2-3: Connection method of digital output signal of AC70T crane AC drive

Analog Output Signal Connection

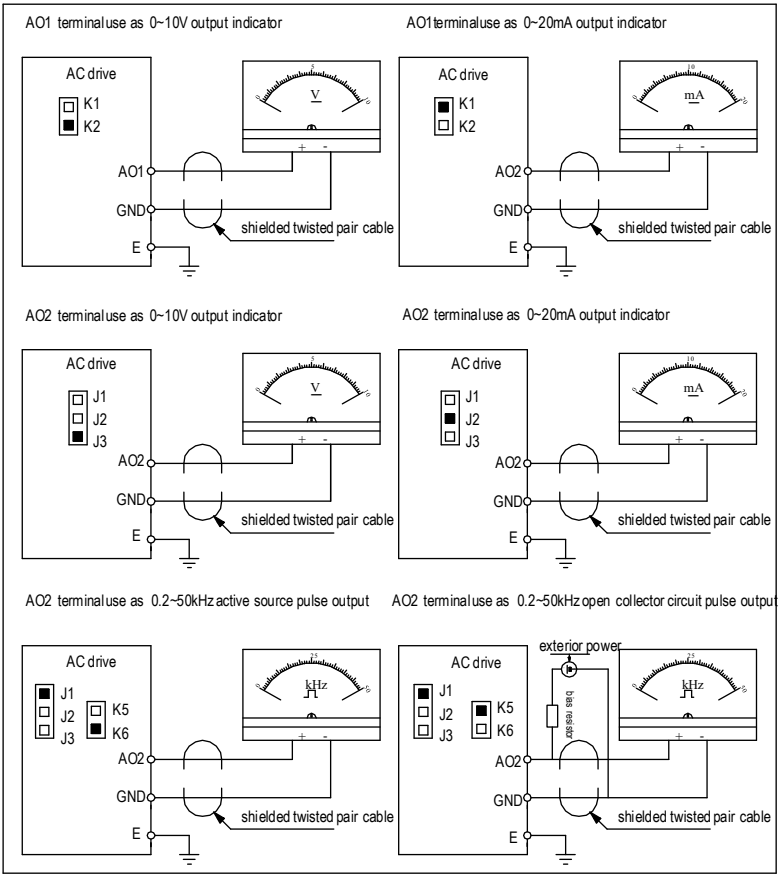


Figure 2-4: Connection of analog output signal of AC70T crane special AC drive

Connection of Pulse Input Signal

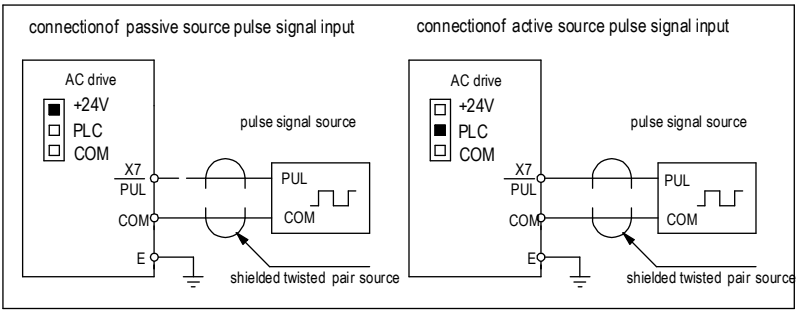
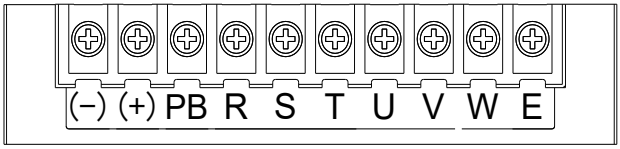


Figure 2-5: Connection of pulse input signal of AC70T crane special AC drive

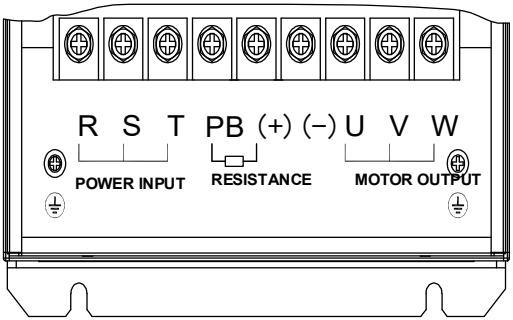
2.7 Main Circuit Terminal

● Main circuit terminal arrangement and definition

22kW and below power main circuit terminal arrangement order：



30kW ~110kW power main circuit terminal arrangement sequence：

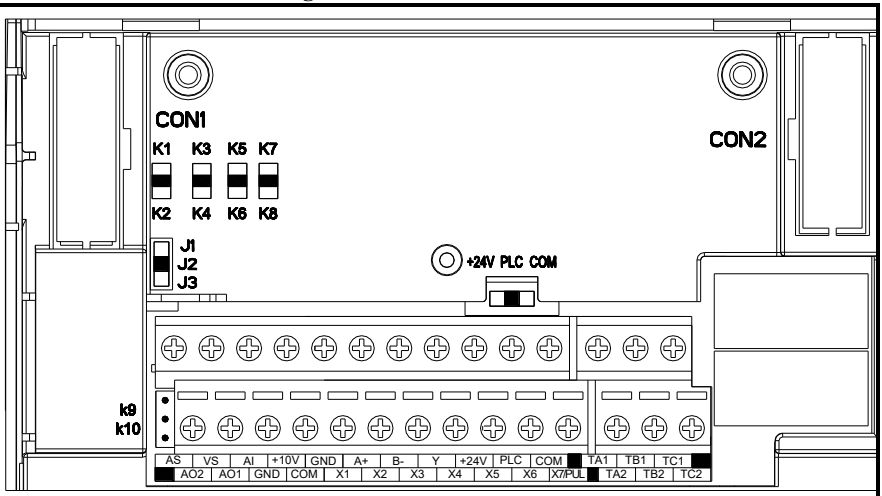


Terminal symbol	Terminal name	Terminal function definition
(-)	DC Power terminal	(-) is the negative terminal of the DC bus.
(+)	Brake resistor terminal	

PB		Used for external braking resistor. (+) is the positive DC bus terminal.
R	AC Drive input terminal	For connection to three-phase AC power.
S		
T		
U	AC Drive output terminal	Used to connect the motor.
V		
W		
⏚	Grounding	Grounding terminal, grounding resistance <10 ohms.
E		

2.8 Control Circuit Terminal

● Control circuit terminal arrangement



Type	Terminal symbol	Terminal name	Terminal function definition
Power Supply	+10V-GND	DC+10V Power supply	Provide external +10V power supply, maximum output current: 50 mA Generally used as an external potentiometer working power supply, potentiometer resistance value range: 1kΩ ~ 5kΩ.
	+24V-COM	DC+24V Power supply	The +24V power supply is provided externally and is generally used as the working power supply for digital input and output terminals and external sensor power supply. Maximum output current: 100 mA
	PLC	External common terminal	The factory default is connected to +24V. When using external signals to AC drive X1 to X7/PUL, the PLC needs to be connected to external power supply and disconnected from +24V power supply.
Analog Input	AS-GND	Current type analog input	1.Input current range：DC 0mA～20mA 2.Input resistance：500Ω
	VS-GND	Voltage type analog input	1.Input Voltage Range：DC 0V～10V 2.Input resistance：75 kΩ

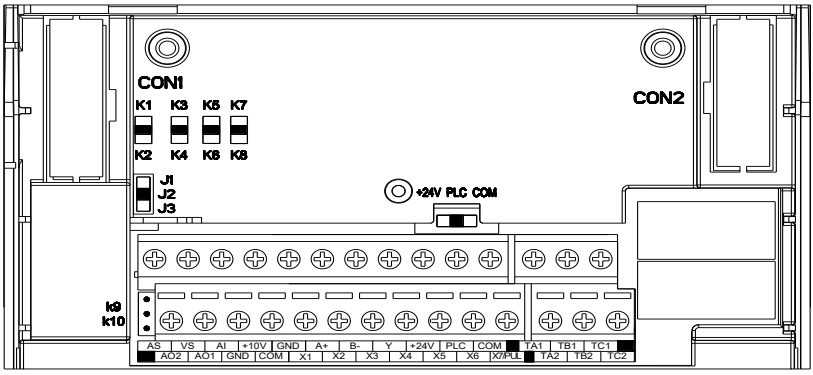
	AI-GND	Voltage or current type analog input	1.Input range: DC 0V to 10V/0mA to 20mA, to be selected by toggle switch S2 on the control board. 2.Voltage input resistance：75 kΩ 3.Current input resistance：500Ω
Digital Input	X1-PLC	Multi-function contact input 1	Optocoupler isolation, compatible with bipolar input. 1.Input impedance: 4.4 kΩ 2. Voltage range at level input: 10~30V
	X2-PLC	Multi-function contact input 2	
	X3-PLC	Multi-function contact input 3	
	X4-PLC	Multi-function contact input 4	
	X5-PLC	Multi-function contact input 5	
	X6-PLC	Multi-function contact input 6	
	X7-PLC	Multi-function contact input 7	
Analog Output	AO1-GND	Analog output 1	Select by toggle switch S1 to decide voltage or current output. 1. Output voltage range: DC 0V～10V 2. Output current range: DC 0mA～20mA
	AO2-GND	Analog output 2	Selected by toggle switch S5 to determine the voltage, current, and high-speed pulse output. 1.Output voltage range: DC 0V～10V 2. Output current range: DC 0mA～20mA 3. Pulse output range: 0 to 100kHz For pulse output, parameter [F3.53] decimal=3 needs to be set, and toggle switch S3 selects to decide active pulse or pole electric set open circuit output.
Digital Output	Y-COM	Digital Output 1	Optocoupler isolated, open collector output. 1.Output voltage range: DC 0V～30V 2.Output current range: DC 0mA～50mA
Relay Output	TA1-TC1	Normally open terminal 1	Contact AC drive capability： 240VAC，3A 30VDC，5A
	TB1-TC1	Normally closed terminal 1	
	TA2-TC2	Normally open terminal 2	
	TB2-TC2	Normally closed terminal 2	
Communication terminal	A+	Communication terminal A+	RS485 communication interface.

	B-	Communication terminal B-	Selection by toggle switch S4 determines the RS485 communication access 120 ohm termination resistor.

● Auxiliary terminal output capability

Terminal	Function Definition	Max Output
+10V	10V auxiliary power supply output, constitutes loop with GND.	50mA
A01/A02	Analog monitor output, constitutes loop with GND.	Maximum output 2mA as frequency and voltage type signal
+24V	24V auxiliary power supply output, constitutes loop with COM.	100mA
Y	Collector open circuit output; can set the action-object by program.	DC24V/50mA
TA1/TB1-/TC1 TA2/TB2-TC2	Passive connector output; can set the action-object by program.	3A/240VAC 5A/30VDC

● Connection Function Specification of Switch Terminals



Switch	Selecting	Function Specification

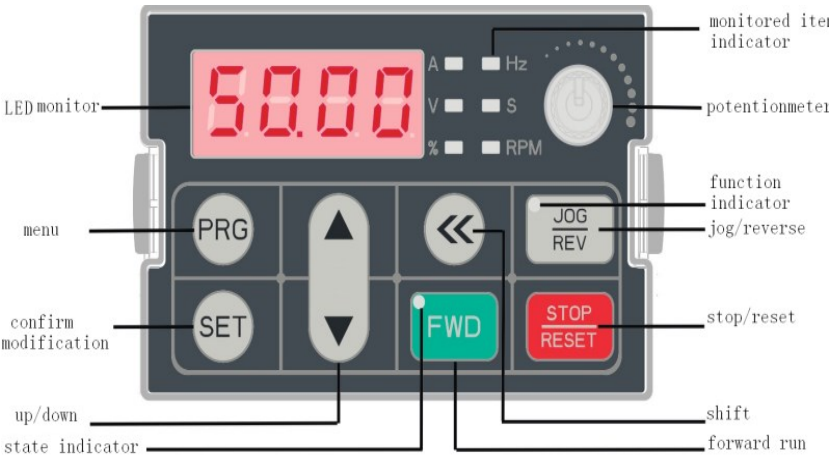
Terminal	Position	
S1	K1	AO1:0～20mA or 4～20mA current output
	K2	AO1:0～10V voltage output
S2	K3	AI:0～20mA or 4～20mA input current
	K4	AI: 0～10V input voltage
S3	K5	AO2: 0.0～100kHz (J1 on), open collector circuit output
	K6	AO2:0.0～100kHz (J1 on), active source output
S4	K7	RS485: connect with 120Ω terminal resistor
	K8	RS485: Connect without 120Ω terminal resistor
S5	J1	AO2:0.0～100kHz frequency output
	J2	AO2:0～20mA or 4～20mA current output
	J3	0～10V voltage output
S6	+24V	Short +24V terminal and PLC terminal
	PLC	PLC terminal receiving external power input
	COM	Short PLC terminal and COM terminal
S7	K9	Disconnect GND terminal and PE discharge loop
	K10	Connect GND terminal and PE discharge loop

3 Basic Operation

3.1 Safety Precautions

Danger	● Do not conduct wiring work when the power is on, otherwise there is a risk of electric shock；
Warning	● Do not operate the AC drive with the outer cover open, otherwise there is a risk of electric shock； ● Please be sure to ground the motor casing, otherwise there is a risk of electric shock or fire.； ● Disconnect all associated equipment and ensure that the DC voltage of the main circuit has dropped to a safe level before wiring, and wait for more than 5 minutes before performing the related work. ● Do not perform maintenance, inspection or replacement of parts by non-specialists. ● Do not remove the outer cover of the AC drive in the energized state, otherwise there is a risk of electric shock. ● Do not touch the printed circuit board of the AC drive in the energized state, otherwise there is a risk of electric shock. ● Make sure that the main circuit cable is reliably and securely connected, as a loose main circuit cable may cause the connection to overheat and cause a fire. ● Please confirm the power supply voltage again before powering on, wrong power supply voltage will cause the AC drive not to work properly or damage the AC drive, or even cause a fire. ● Do not install the AC drive on flammable materials or attach flammable items to the AC drive, and remove debris from around the AC drive before powering it on.
Important	● When operating the AC drive, observe the measures and methods specified in the electrostatic preventive measures (ESD), otherwise the AC drive may be damaged. ● When the AC drive is running with the motor, please do not cut off or put in the motor directly, it must be cut off or put in the motor when the AC drive is stopped, otherwise the AC drive may be damaged. ● Please use double stranded shielded cable for the control cable and connect the shield to the grounding terminal of the AC drive to ground it to prevent the AC drive from working abnormally. ● Do not operate, install, wire, debug, maintain and repair without professional staff. ● Private alteration, disassembly and repair may result in damage to the AC drive, and this situation is not covered by our quality assurance.

3.2 Keyboard Layout and Function Description



Key	Name	Function
PRG	Menu key	Enter menu while standby or running. Press this key to return while modify parameter. While standby or running, press for 1 sec to enter condition monitoring interface.
SET	Set/Modify key	Press to modify parameter while in menu interface. Press again to confirm after modifying. While standby or running, press to change LED monitoring items at stop.
▲ ▼	Up/Down key	Select parameter group in menu interface. Modify parameter in modify state. Modify given frequency, PID given while at standby or monitoring state (While given frequency, PID are set by keyboard and [F4.09] needs to be set.
≪	Shift key	Select digit of function No. modified by up/down key; Select parameter digits modified by up/down key.

	Forward run key	While run/stop is controlled by keyboard, press this key, AC drive forward runs, and the indicator is always on. While reverse, the indicator sparks.
	Jog/Reverse key	This key can be defined by [F4.07]. Press it, machine reverses and indicator are off if it is defined as REVERSE. Machine will jog and indicator is on if it is defined as JOG.
	Stop/Reset key	Machine stops if press it while run/stop is controlled by keyboard. Its efficiency range is defined by [F4.08]. AC Drive resets if press it in fault state (no reset if fault is not solved).

3.3 Keyboard Indicator Meaning

Name		State	Meaning
Unit indicator light	Hz	Flashing	The value displayed in the digital tube is the given frequency.
	Hz	On	The value displayed by the digital tube is the output frequency.
	A	On	The value displayed by the digital tube is the actual value of the output current.
	V	On	The value displayed by the digital tube is the input voltage.
	V	Flashing	The value displayed by the digital tube is the output voltage.
	S	On	Indicates the time unit in seconds.
	S	Flashing	Indicates the time unit in milliseconds, minutes or hours.
	RPM	On	Indicates that the value of 4-digit display is the motor speed.
State indicator light	FWD	On	The AC drive is running in forward rotation.
	FWD	Flashing	The AC drive is running in reverse rotation.
	FWD	Off	Frequency converter stop.
Function indicator light	REV/JOG	On	This key is defined as a toggle key.
	REV/JOG	Off	This key is defined as the reverse key.

3.4 Digital Text Cross-reference Table

Word	LED show	Word	LED show	Word	LED show
0		C		O	
1		D		P	
2		E		Q	
3		F		R	
4		G		S	
5		H		T	
6		I		U	
7		J		V	
8		K		W	
9		L		X	None
A		M		Y	
B		N		Z	None

Table 3-1: Digital text cross-reference table

3.5 Basic Operation

● Parameter initialization

Setting F0.19=1 will complete the initialization of the parameters. The specific operation is as follows：

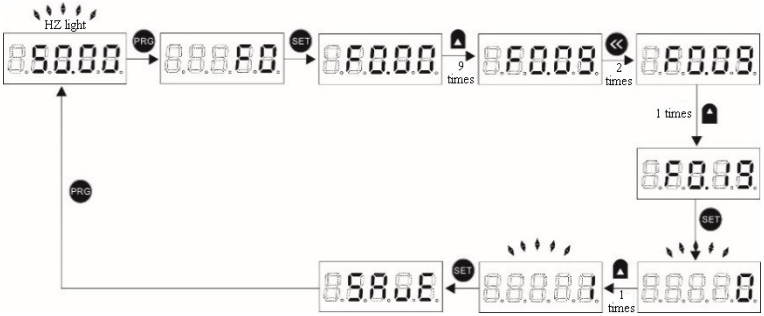


Figure 3-1: Parameter initialization

● Run command instruction

There are 4 types of operation command channels: 0: keypad control, 1: terminal control, 2: RS485 communication control, which can be set by [F0.02]. The following is an example of setting F0.02=1 (terminal control) ：

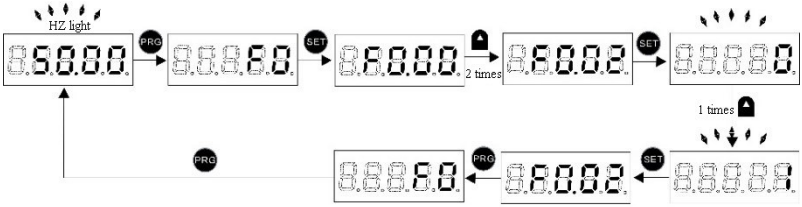


Figure 3-2: Run command instruction

The above diagram describes the terminal control two-wire system 1, only one of the terminal control methods, other control methods are detailed in Chapter 9.

● Frequency Command Instruction

There are various selection items for frequency command selection, please refer to section 9 for the specific selection items. The following is an example of setting F0.03=1 (the frequency given by the keyboard potentiometer) ：

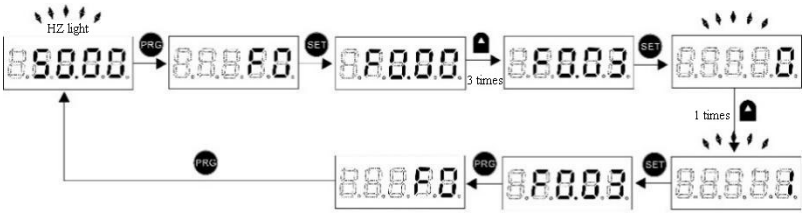


Figure 3-3：Frequency command instruction

● Acceleration/deceleration time selection

There are 4 groups of acceleration/deceleration times in the parameters, and the default acceleration/deceleration time is acceleration/deceleration time 1 when not specified.

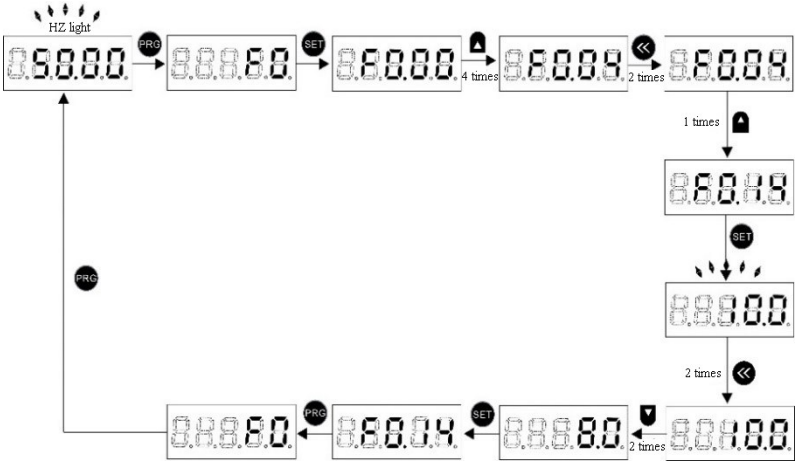


Figure 3-4: Acceleration/deceleration time selection

● Operation monitoring setting

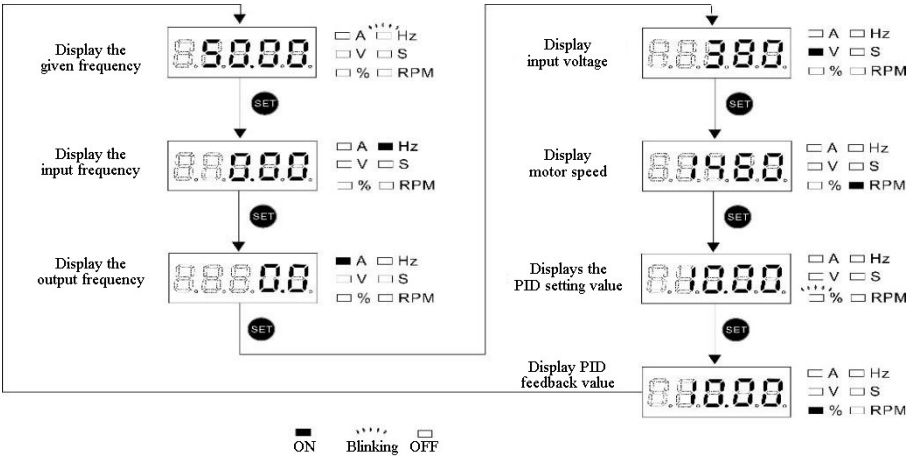


Figure 3-5: Operation monitoring setting

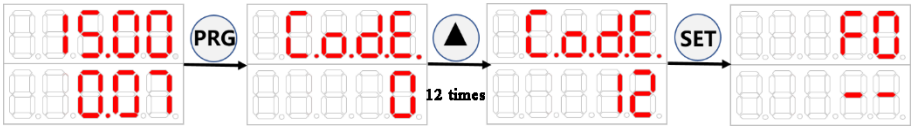
4 Debugging Guidance

4.1 Panel Unlocking

AC70T provides a password protection function, enter the password to unlock before parameter setting, the unlocking steps are as follows：

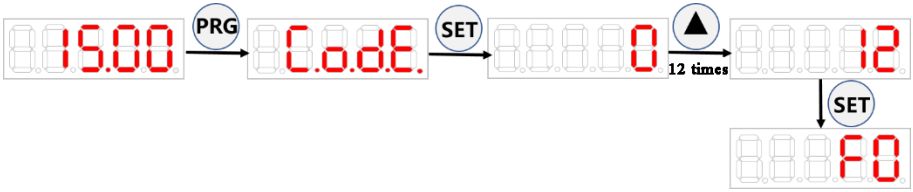
1、Two-line digital tube keypad unlocking

Press “PRG” Menu button，the first line of the keyboard digital tube display “CodE” ，After entering the correct user password in the second line with the up and down keys, press the "SET" key to unlock the device.



2、Single line digital tube keypad unlocking

Press "PRG" menu key and the keyboard will display "CodE", press "SET" key and the digital tube will start flashing, then press "SET" key again to unlock the device after entering the correct user password through the up and down keys.



4.2 Commissioning Guide

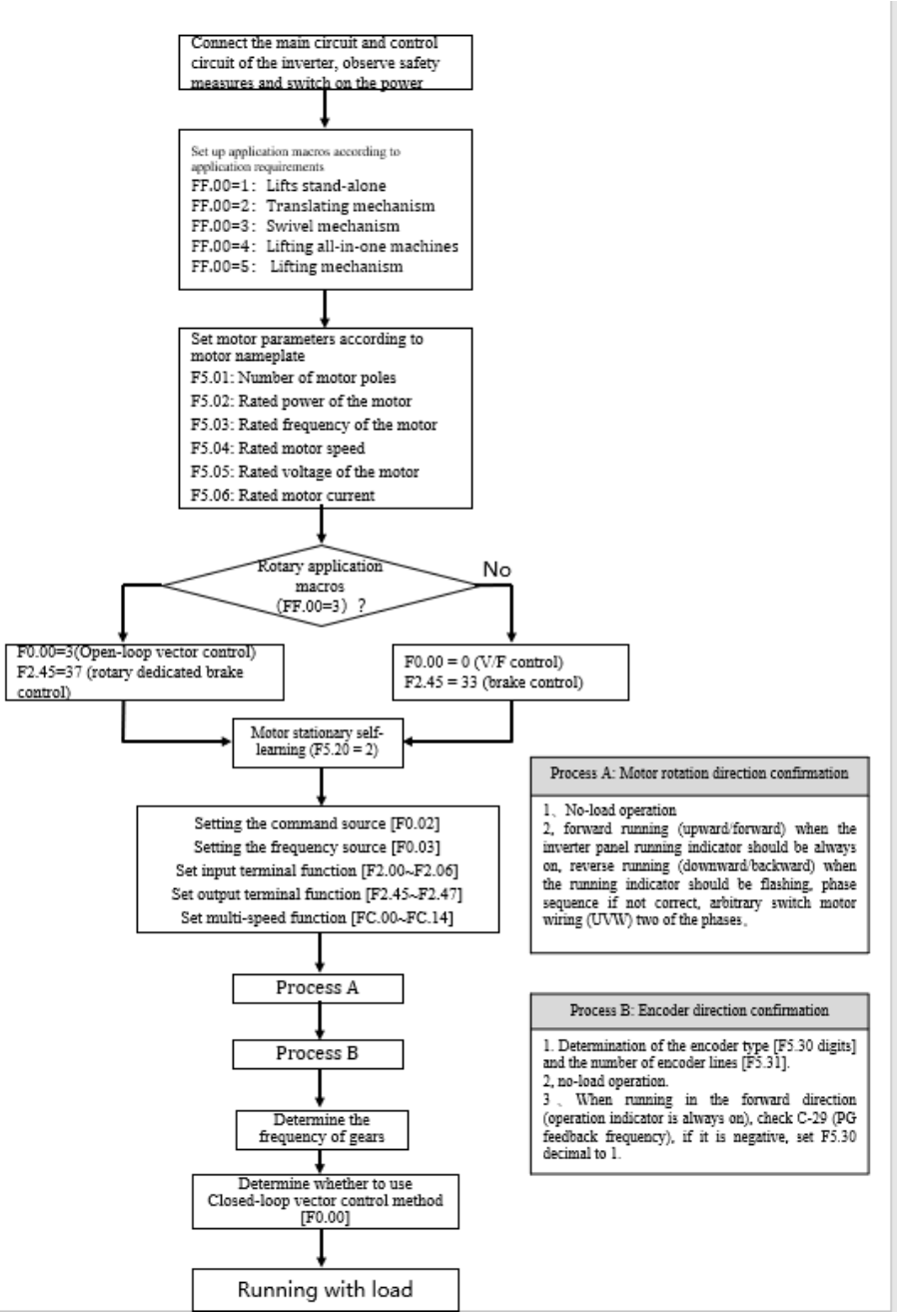


Figure 4-1 Commissioning guide for trial runs

4.3 Confirmation before Turning on Power

Be sure to check the following items before turning on the power

Item	Content
Power supply voltage	Please make sure the power supply voltage is correct
	Please check if the R/S/T/N power terminal wiring is reliable
	Make sure the AC drive and motor are reliably grounded
Connection of AC drive output and motor	Please check whether the AC drive output U/V/W and motor wiring are connected reliably
Connection of AC drive control circuit	Please check whether the connection between AC drive control circuit and other near devices is reliable

4.4 Confirmation after Turning on Power

When the power is turned on, the operator in normal condition is displayed as shown below.

Status	Display	Description
normal		Factory default keyboard display xxHz
In case of failure		The AC drive is in the shutdown state when the fault occurs and the fault code is displayed

4.5 Self-Learning of Motor Parameters

4.5.1 Self-Study Methods and Instructions

Self-learning method	Applicable situation	Effect	Parameter Setting
Rotational self-learning	Applicable to the situation where there is no load at the end of the motor shaft at all	Excellent	F5.20=1

Stationary self-learning	Applicable to all occasions (the lifting industry is recommended to use this method)	Excellent	F5.20=2
Fast stationary self-learning	Applicable to the occasions requiring general control accuracy	Good	F5.20=3

4.5.2 Self-study Steps

1、Confirm whether the high and low voltage harnesses are properly connected and whether the motor is well secured or the operating environment is safe.;

2、According to the motor nameplate, enter the correct motor parameters F5.01～F5.06

Attention:

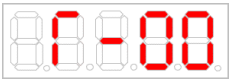
When a single AC drive controls multiple motor,

F5.02= Number of rotating motors*Rated power of motors marked on the motor nameplate;

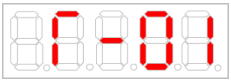
F5.06= Number of rotating motors * Rated motor current identified on the motor nameplate.

3、Choose a self-study method

Lifting is generally done using F5.20 = 2 stationary self-learning and then pressing SET. at this point the keypad displays.:



Then press the green button FWD on the keyboard, the panel will show:



If the self-learning is successful, the keyboard will display the frequency, if it fails, it will report the fault E.TE1, you can check the fault according to the fault record [FA.39], see the fault information for details

4.6 Motor Control Method

Function code number	Definition	Applications
F0.00	0：V/F control	Suitable for lifting or translating mechanism
	3：Open-loop vector control	Suitable for rotary mechanism
	4：Closed-loop vector control	For high precision speed control (encoder must be installed at the motor end, and the AC drive must

		be equipped with a PG card of the same type as the encoder)

4.7 Start and Shutdown Commands

Function code number	Function code name	Definition
F0.02	Run command channel	0: Keypad control 1：Terminal control 2：RS485 communication control

0： Keyboard Control

Controlled by RUN and STOP on the operation panel, press to take effect

Operated by keypad, set F0.02=0, i.e. keypad control, press RUN on the keypad, the AC drive starts running, the indicator of RUN lights up, press STOP on the keypad, the AC drive stops running, the indicator of RUN goes out

1： Terminal Control

Run command control by multi-function input terminal function, set F0.02=1, i.e. terminal control

Need to set the terminal control function F2.00 ~ F2.06, terminal function, please see 8 terminal output function selection

Example: X1 terminal is set to run in the forward direction, you need to set F2.00 to 1, short the terminal block on X1 and COM, disconnect to stop

X2 terminal is set to run in the reverse direction, you need to set F2.00 to 2, short the terminal row on X2 and COM, disconnect to stop

Note: The running terminal command cannot be shorted at the same time, the wiring diagram can be seen in 2.8 control circuit terminals

2： Communicate Control

Control by 485 communication port write response command, set F0.02 = 2, that is, communication control, please see Appendix 1: Modbus communication protocol for specific protocols

Connected to terminal AB through the upper computer and 485 serial port, need to set FD.00～FD.06

Example: Communication command positive rotation operation:0106 30 01 00 01 16 CA

4.8 Multi-Speed Setting

The multi-segment speed is set by the X terminal function with terminal numbers 16,17,18,19 corresponding to multi-segment speed 1,2,3,4 respectively. The target frequency is determined according to the multi-segment speed setting table by the following schematic wiring.

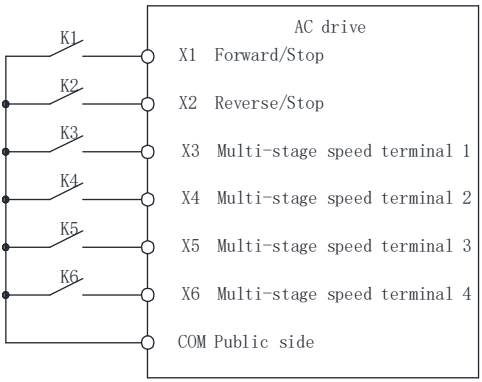


Diagram of terminal connections

When FC.00 sets the frequency 10.00Hz, X3 terminal is turned on, corresponding to the function multi-speed terminal 1, at this time the given frequency is 10.00Hz；

When FC.05 sets the frequency 20.00Hz, X4, X5 terminals are turned on, corresponding to multi-function terminals 2,3, at this time the given frequency is 20.00Hz

Multi-segment speed control has a priority second only to pointing, and the multi-segment speed setting table is as follows：

Multi-Speed Terminal 4	Multi-Speed Terminal 3	Multi-Speed Terminal 2	Multi-Speed Terminal 1	Terminals / Speed
OFF	OFF	OFF	ON	1X【**FC.00**】
OFF	OFF	ON	OFF	2X【**FC.01**】
OFF	OFF	ON	ON	3X【**FC.02**】
OFF	ON	OFF	OFF	4X【**FC.03**】
OFF	ON	OFF	ON	5X【**FC.04**】
OFF	ON	ON	OFF	6X【**FC.05**】
OFF	ON	ON	ON	7X【**FC.06**】
ON	OFF	OFF	OFF	8X【**FC.07**】
ON	OFF	OFF	ON	9X【**FC.08**】

ON	OFF	ON	OFF	10X［**FC.09**］
ON	OFF	ON	ON	11X［**FC.10**］
ON	ON	OFF	OFF	12X［**FC.11**］
ON	ON	OFF	ON	13X［**FC.12**］
ON	ON	ON	OFF	14X［**FC.13**］
ON	ON	ON	ON	15X［**FC.14**］

4.9 Analog Input Port

The AC70T AC drive supports 3 analog inputs, AI, VS and AS on the control board, as follows：

Port	Input Signal Characteristics
AI	Dipswitch to K3 accepts 0～20mA and 4～20mA signals Dipswitch to K4 accepts 0～10VDC signals
AS	0～20mA and 4～20mA signals can be accepted
VS	Accepts 0～5V and 0～10VDC signals

Through the analog input terminals VS, AI and AS, the AC drive can use external voltage and current signals as frequency source feeds for setting and modifying the given frequency. The actual given or feedback physical quantity relationship corresponding to the current or voltage values can be set through the F3 group of related parameters; the VS, AI and AS port analog quantities can be read through C-16, C-17 and C-18, respectively.

4.10 Analog Output Port

The AC70T AC drive supports 2 analog outputs, AO1 and AO2 on the control board, as follows：

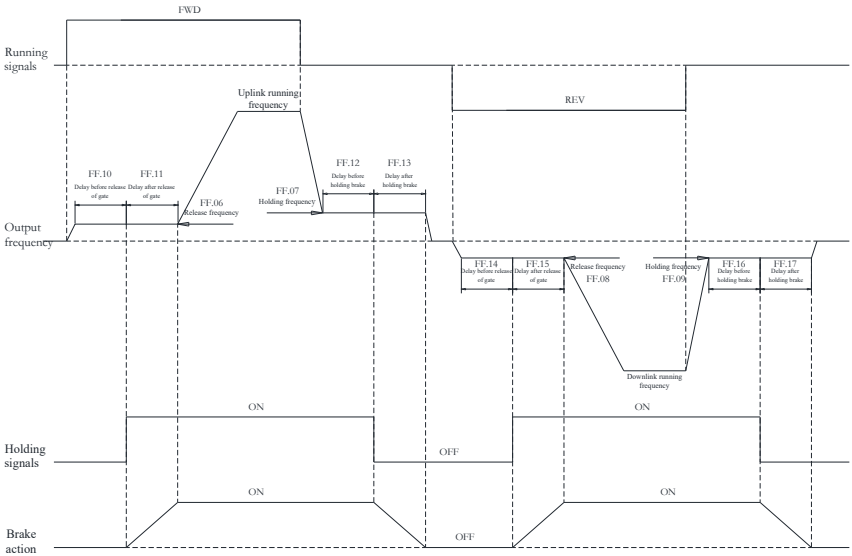
Port	Input Signal Characteristics
AO1-GND	Dipswitch to K1 can output 0～20mA and 4～20mA signal Dipswitch to K2 can output 0～10V
AO2-GND	Dipswitch to J1 can output 0.0～50kHz frequency Dipswitch to J2 can output 0～20mA current or 4～20mA current Dipswitch to J3 to output 0～10V voltage

AO1 and AO2 can be used to indicate the internal operating parameters of the AC drive-in analog form. The indicated parameters can be selected via F3.54 and F3.55. The indicated operating parameters can be corrected by means of F3.56 and F3.57 before being output in analog form.

5. Dedicated Function Description

5.1 Brake Control

The AC70T series AC drive has a built-in brake control function, which requires one digital output port (DO) to be selected as 33 (brake control), and the control timing is shown below.



Holding brake logic diagram

The brake is held when the brake mechanism is not powered, and will only release when power is applied; the brake is controlled by the release frequency, release current, release delay time and hold delay time to avoid the phenomenon of skidding and ensure safe and reliable operation of the system. The relevant parameters are listed below：

Function code number	Function code name	Setting value range and definition	Factory settings
FF.01	Brake control selection	**“0” bit：Release brake condition** 0: Frequency arrives 1：Frequency and current arrive at the same time 2: Output torque arrives (can be set in vector mode) **“00” bit：Release brake direction** 0: The release torque is the same as the running direction 1: The release torque is always in the positive direction **“000” bit：Hold brake direction**	1001

		0：The holding torque is the same as the running direction 1：The holding torque is always in the positive direction **“0000” bit：Reserved**	
FF.02	Run command control	**“0” bit：Run command reverse control** 0：Invalid If the reverse operation command is given during operation, the AC drive stops the output according to the normal stopping process and then restarts the reverse operation. 1：valid If the reverse operation command is given during the operation, the frequency will directly enter the reverse operation after passing zero, and no holding command will be output during the process.	0010
FF.03	Run command interval delay	If the running command is received during the stopping and holding process, the running command can be responded after the parameter setting time when the holding is completed. Setting range：0.00s～10.00s	0.30s
FF.04	Release current coefficient	0.0%～100.0%	20.0%
FF.05	Over zero jump frequency	0.00Hz～10.00Hz	1.00Hz
FF.06	Positive release frequency	0.00Hz～10.00Hz	2.00Hz
FF.07	Forward holding frequency	0.00Hz～10.00Hz	2.00Hz
FF.08	Reverse release frequency	0.00Hz～10.00Hz	2.00Hz
FF.09	Reverse clamping frequency	0.00Hz～10.00Hz	2.00Hz
FF.10	Forward release delay	0.00s～1.00s	0.20s
FF.11	Delay after forward release	0.00s～1.00s	0.10s
FF.12	Delay before positive locking	0.00s～1.00s	0.0s
FF.13	Delay after forward holding	0.00s～1.00s	0.50s
FF.14	Reverse pre-release delay	0.00s～1.00s	0.20s
FF.15	Reverse release delay	0.00s～1.00s	0.10s
FF.16	Reverse hold before delay	0.00s～1.00s	0.00s
FF.17	Reverse holding time delay	0.00s～1.00s	0.30s

5.2 Brake Failure Protection

5.2.1 Function Description

1、This function is available in closed-loop vector control mode (F0.00=4) ；

2、When the brake failure protection function is turned on (FF.60=1) and the AC drive is in the stop state, if the motor shaft frequency from the encoder feedback reaches the brake failure protection detection threshold [FF.61] and the duration exceeds the brake failure filtering time [FF.63], the AC drive will automatically enter zero servo operation and the weight will remain hovering, and the zero servo operation time will reach the brake failure protection maintenance time [FF.62]. After the zero-servo operation time reaches the brake failure protection maintenance time [FF.62], the machine will stop；

3、When the brake failure protection function is triggered, the panel will display the alarm message A.078, and the status can be output through the digital output terminal with the terminal function number 35 (brake failure protection in operation) ；

4、During brake failure protection operation, the AC drive can respond to up and down commands, and the up and down frequency limits are determined by FF.64 and FF.65.

5.2.2 Cautions

1、The brake failure protection function needs to be triggered and maintained when the AC drive is powered on and no fault is reported, and the other electrical and mechanical mechanisms should be in normal condition except for the brake failure.；

2、As long as the above conditions are met, the protection can be triggered, with no limit on the number of times；

3、When there is no forced air cooling of the hoist motor, the brake failure protection maintenance time (FF.62) needs to consider the motor temperature rise during zero servo operation

5.2.3 Related Parameters

Function code number	Function code name	Setting value range and definition	Factory settings
FF.60	Brake Failure Protection Function	0：Closed 1：Open	1
FF.61	Brake Failure Protection Activation Threshold	0.00Hz～5.00Hz	0.50Hz
FF.62	Brake Failure Protection Maintenance Time	0.0s～3000.0s	60.0s
FF.63	Brake failure filtering time	0.000s～2.000s	0.050s

FF.64	Brake failure uplink frequency limit	0.00Hz～100.00Hz	0.00Hz
FF.65	Brake failure downlink frequency limit	0.00Hz～100.00Hz	50.00Hz

5.3 Brake Torque Detection

Brake torque detection is an active scheme to detect if the brake torque is normal, and this function is valid in the closed-loop vector control mode.

5.3.1 Activation Method

Turn on the brake torque detection function (FF.55=1) ；
Using the digital input terminals (X1 to X7), set the corresponding parameter (F2.00 to F2.06) to 82 (brake torque detection), and this function is activated when the corresponding terminal is switched from the invalid state to the valid state.

5.3.2 Working Process

In the stop state, after the brake torque detection is activated, the AC drive runs automatically with 5.00Hz as the target frequency and FF.57 as the torque limit. Forward rotation for 5s, stopping for 3s, reverse rotation for 5s and stopping for 3s are considered as completing one detection, and stopping after the number of detections reaches FF.56. During this period, if the encoder feedback frequency reaches the brake torque detection frequency threshold (FF.58) after filtering (filtering time FF.59), the AC drive reports an E.061 fault. This fault can be output digitally and corresponds to terminal number 36 (insufficient brake torque fault detection).

5.3.3 Related Parameters

Function code number	Function code name	Setting value range and definition	Factory settings
F2.00~F2.06	X1~x7 terminal	82：Brake torque detection Note: Only one of the terminals needs to be defined as 82	
FF.55	Brake torque testing	0：Closed 1：Open	1
FF.56	Brake torque detection times	0～10	3
FF.57	Brake torque detection torque	0.0%～150.0%	100.0%
FF.58	Brake torque detection frequency threshold	0.00Hz～5.00Hz	2.00Hz
FF.59	Brake torque detection filtering time	0.000s～2.000s	0.200s

5.4 Constant Power Control

Constant power control, also known as speed with load, automatically calculates the frequency limit according to the current load size to achieve the effect of "high speed for light load and low speed for heavy load", which can improve the operating efficiency of the hoisting mechanism and is especially suitable for hoisting applications without weight limiters installed, the relevant parameters are as follows：

Function code number	Function code name	Setting value range and definition	Factory settings
FE.82	Lifting control	**"0000" bit：** Constant power control 0：Closed 1：Open	0
FE.83	Load measurement frequency	In the constant power control, the target frequency is greater than the load measurement frequency [FE.83], and the load measurement is performed with FE.83 as the target frequency to obtain the current load torque. Setting range：0.00Hz～50.00Hz	20.00Hz
FE.84	Load measurement time	In constant power control, it refers to the holding time of the load measurement frequency [FE.83]. Setting range：0.0s～3.000s	0.500s
FE.85	Light load torque setting value	Used to define the light load condition, 100.0% corresponds to the rated torque of the motor. In constant power control, the frequency limit value is FE. A3 when the measured torque of the load is less than this value. Setting range：0.0%～50.0%	15.0%
FE. A1	Lifting up power limit	Automatic calculation of frequency limit value based on load measured torque, power limit [FE. A1 to FE. A2] and correction factor [FE. A4 to FE. A7]. Setting range：0%～150.0%	90.0%
FE. A2	Lifting down power limit		80.0%
FE. A3	Max. frequency of constant power operation	100.0% corresponding to the rated frequency of the motor Setting range：0%～300.0%	200.0%
FE. A4	Closed-loop upward power coefficient	The power correction factor in constant power control, the frequency limit value increases with the increase of the correction factor. Setting range：0%～120%	100%
FE. A5	Closed-loop downward power factor		90%
FE. A6	Open-loop upstream power factor		80%
FE. A7	Open-loop downward power factor		70%

5.5 Smooth Lift

In the process of tower crane hoisting, when the AC drive detects that the wire rope changes from slack state to tight state, it will automatically trigger low speed hoisting, and then accelerate hoisting after the heavy load is stabilized, in order to inhibit the "nodding" phenomenon of the tower arm caused by excessive stretching of the wire rope.

5.5.1 Function Description

1、Applicable in closed-loop vector control mode (F0.00=4) ；

2、Start load measurement after upward release, and get the current load torque after running a certain time (FE.84) with the smooth start tight rope frequency [FE.90] as the target frequency. If the load torque is less than the set value of light load torque [FE.85], enter the tight rope detection; otherwise, it is judged to start with load and exit smooth start；

3、The output frequency in tight rope detection will change according to the block frequency, and the motor acceleration will decrease when tight rope occurs, and the decrease will reach the speed change threshold [FE.88] and then run at the tight rope frequency [FE.90].

4、After running with tight rope frequency tight rope frequency holding time [FE.92], exit smooth lifting and enter normal operation.

Attention：

1、Tight rope detection has a time limit, after the maximum time of tight rope detection [FE.93] exit smooth lifting；

2、During the tight rope detection and tight rope frequency holding phase, if there is a deceleration or stop command, exit smooth lift.

5.5.2 Related Parameters

Function code number	Function code name	Setting value range and definition	Factory settings
FE.82	Lifting control	**"0" bit：** Smooth lift 0：closed 1：open	0
FE.84	Load measurement time	In smooth lift and lift anti-hang control, it refers to the holding time of the smooth lift tight rope frequency [FE.90]. Setting range：0.0s～3.000s	0.500s
FE.85	Light load torque setting value	Used to define light load conditions, 100.0% corresponds to the rated torque of the motor. In smooth lift and lift anti-hang control, empty hook judgment is made based on this value. Setting range：0.0%～50.0%	15.0%
FE.88	Speed change threshold	When the occurrence of a tight rope is detected, the motor acceleration decreases to that value and then runs at the tight rope frequency [FE.90]. Setting range：0.00Hz～5.00Hz	2.00Hz
FE.90	Tight rope frequency	For load judgment during smooth lifting Setting range：0.00Hz～10.00Hz	3.00Hz
FE.91	Max. frequency of smooth lifting	Setting range：0.00Hz～100.00Hz	100.00Hz
FE.92	Tight rope frequency holding time	In the occurrence of tight rope process tight rope frequency running time.	6.000s

		Setting range：0.000s～20.000s	
FE.93	Tight rope detection max. time	Tight rope detection time, after the time will not be tight rope detection. Setting range：0.0000s～40.000s	15.000s

5.6 Lifting and Anti-hanging

During the lifting process of tower crane, if the main hook is hung by a foreign object during the upward movement, the AC drive can provide fault reporting or alarm indication.

5.6.1 Working Process

1、Start load measurement after the upward release, and obtain the current load torque after running for a certain time (FE.84) with the smooth start tight rope frequency [FE.90] as the target frequency. If the load torque is greater than the light load torque setting [FE.85], the initial load is recorded; otherwise, it is judged to be an empty hook start and the torque will continue to be detected until the initial load is obtained；

2、When the output torque level is detected in constant speed operation and is greater than the lifting and anti-hanging torque increment [FE.98] and the duration reaches FE. A0, the alarm or fault will be reported according to FE.82 ten-digit setting.

5.6.2 Related Parameters

Function code number	Function code name	Setting value range and definition	Factory settings
FE.82	Lifting control	**"00 bit**：Lifting and anti-hanging 0: Closed 1: Report fault (E.059) 2: Alarm and continue operation (A.079)	0
FE.84	Load measurement time	In smooth lift and lift anti-hang control, it refers to the holding time of the smooth lift tight rope frequency [FE.90]. Setting range：0.0s～3.000s	0.500s
FE.85	Light load torque setting value	Used to define light load conditions, 100.0% corresponds to the rated torque of the motor. In smooth lift and lift anti-hang control, empty hook judgment is made based on this value. Setting range：0.0%～50.0%	15.0%
FE.90	Tight rope frequency	Used for load judgment during smooth lift and lift anti-hang control. Setting range：0.00Hz～10.00Hz	
FE.98	Hoist anti-hanging torque increment	0.0%～100.0%	20.0%
FE.99	Hoist anti-hanging torque change rate threshold	If the rate of change of torque is less than this value and the maintenance time is greater than 1200ms, the load is considered stable. Setting range：0.0%～100.0%	1.5%
FE. A0	Lifting anti-hanging detection time	When a hanging weight is detected, a warning or fault is reported after that time has elapsed Setting range：0.000s～20.000s	2.000s

5.7 Variable Anti-sway

5.7.1 Function Description

The hoisting AC drive adopts closed-loop vector control (F0.00=4), and sends its calculated rope length parameters to the luffing AC drive by means of host communication, and the luffing AC drive implements anti-rocking control according to the received real-time rope length, see operation guide for details.
In addition, through the fixed rope length to enable without lifting AC drive settings, can also achieve a certain degree of rocking reduction effect, just set FE.68 after activating the anti-rocking, see operation guide 4.

5.7.2 Operation Guidance

1、Master-slave communication connection and setup

Lifting AC drive, A+ connected to luffing AC drive A+, lifting AC drive B- connected to luffing AC drive B-.
Lifting AC drive: FD.00=0001, FD.02=0003, FD.09=000d
(FD.09=000d can send the rope length to the amplitude AC drive)
Variable amplitude AC drive: FD.02=0003

2、Rope length calculation

2.1、Self-learning of lifting motor parameters (F5.20=2) ；

2.2、Determining the direction of rotation of the hoist motor and the direction of the encoder speed measurement.

See Process A and Process B in the Commissioning Guide for Trial Operation.

2.3、Identification of lifting mechanism ratios.

The following steps can be performed to identify the lifting gear ratio, and the relevant parameters refer to the parameters of the lifting AC drive.

A，Lower the hook to a certain position, operate the luffing mechanism to run 3s and then stop, make the hook swing up, observe and record the hook swing cycle. Start timing when the hook swings to the front limit position, return to the front limit position again for a cycle, record the time of 5 cycles (reduce the measurement error), seek the average value to get the swing cycle T1; according to the rope length formula L=T*T*0.2485 to get L1 (unit is meter, keep two decimal points), write L1 into the parameter FE.64 (rope length estimation value 1).

B，Operate the hoisting mechanism a gear up 15s and then stop, operate the luffing mechanism to run 3s and then stop, make the hook swing up again, use the same method to calculate the swing period T2, according to the rope length formula L=T*T*0.2485 to get L2 (unit is meter, keep two decimal points), write L2 into the parameter FE.65 (rope length estimation value 2).

2.4、Calculation of the equivalent rope length of the upper lifting limit.

The equivalent rope length of the upper lift limit is obtained in order to eliminate the cumulative error to correct the rope length by the following method：

A，Connect the rising limit to the AC drive multi-function input terminal (X terminal) and write the terminal function number 89 to the corresponding parameter (F2.00 to F2.06);

B，If the rope length when reaching the upper limit position is known, write FE.63 (rising limit equivalent rope length) directly (unit is meter, keep two decimal points); otherwise, operate the hoisting mechanism to go up in one gear until reaching the upper limit position, operate the luffing mechanism to stop after running for 3s, make the hook swing up,

use the method described in 2.3 to calculate the swing period T3, according to the rope length formula to get L3 (unit is meter, keep (two decimal points), write L3 into parameter FE.63 (rise limit equivalent rope length).

2.5、Check the lifting AC drive C-08 to see the real-time rope length, if not need to re-operation.

2.6、Variable amplitude AC drive C-08 is the data sent by the host communication. When the communication is normal, variable amplitude AC drive C-08 = lifting AC drive C-08.

Note: If you find that the anti-shaking effect becomes worse after running operation for a period of time, operate the hoisting mechanism up to the upper limit to automatically correct the rope length, the anti-shaking effect will be improved after correction.

3、Estimation of the distance between the lifting weight and the main hook

Write the equivalent rope length to the FE.66 of the luffing AC drive, this parameter refers to the height from the weight center to the main hook, in order to ensure the effect of anti-shaking, the actual rope length of the luffing anti-shaking needs to take this parameter into account.

The actual rope length C-09 = C-08 + FE.66

4、Turn on the variable anti-sway switch

Set the following parameters in the amplitude variation AC drive：

FE.67 bits are set to 1 and enable the amplitude variation anti-sway via the multi-function terminal with the terminal number 90；

5.7.3 Related Parameters

Function code number	Function code name	Setting value range and definition	Factory settings
FE.60	Lifting ratio identification of minimum running time	0.000s～30.000s	10.000s
FE.61	Hoist transmission coefficient high	0～65535	0
FE.62	Hoisting mechanism transmission coefficient low	0～65535	0
FE.63	Lifting limit equivalent rope length	0.00m～25.00m	4.00m
FE.64	Estimated rope length1	0.00m～300.00m	0.0m
FE.65	Estimated rope length2	0.00m～300.00m	0.0m
FE.66	Lifting weight equivalent rope length	Refers to the height from the weight center of the hoist to the main hook. Setting range：0.00m～20.00m	2.00m
FE.67		**“0” bit：** Anti-rocking switch 0：closed	0001

	Anti-sway control	1：open **“00” bit：** Fixed rope length to enable 0：closed Closure will be controlled with the rope length obtained from the lifting AC drive for anti-sway. 1：open When switched on the anti-sway control is performed using the rope length set in FE.68. If the rope length is known, the anti-sway effect can be checked here.	
FE.68	Fixed rope length setting	0.00m～300.00m	10.00m

5.8 Antspeed

Ant speed, also known as slow in place, is designed to cope with the need for inching in tower crane applications.
FC.51 is set to 1 or 2 to activate the antspeed function via the multi-function input terminal, corresponding to terminal number 87.
FC.51 = 1, target frequency = current block frequency * FC.52 (antspeed proportional gain).
FC.51 = 2, target frequency = FC.53.

Relevant parameters：

Function code number	Function code name	Setting value range and definition	Factory settings
FC.46	Antspeed 1st gear	0.00Hz～50.00Hz	3.00Hz
FC.47	Antspeed 2nd gear	0.00Hz～50.00Hz	4.00Hz
FC.48	Antspeed 3rd gear	0.00Hz～50.00Hz	5.00Hz
FC.49	Antspeed 4th gear	0.00Hz～50.00Hz	6.00Hz
FC.50	Antspeed 5th gear	0.00Hz～50.00Hz	7.00Hz
FC.51	Speed selection	0: Tower crane integrated machine (FC.46 to FC.50) 1: Single antspeed 1 (block frequency*FC.52) 2: Single machine antspeed 2 (FC.53)	0
FC.52	Antspeed gain ratio	0.0%～100.0%	20.0%
FC.53	Antspeed frequency	0.00Hz～50.00Hz	5.00Hz

5.9 Slewing Control

The AC70T AC drive offers two rotary control solutions, with and without eddy current control, as listed below：

Slewing control solutions	Slewing motors	Control method

Without eddy current control (recommended)	General motors (non-torque motors)	Open-loop vector/closed-loop vector control
With eddy current control	Torque motors, General motors with eddy current brakes	V/F control + eddy current control

Note: Some rotary mechanisms are equipped with common motors with eddy current brakes, the eddy current-free control solution is still recommended and the eddy current coil on the motor side can be left unwired.

5.9.1 Eddy Current-free Control

1、Debugging methods

See 4.2 Commissioning guide for commissioning.

2、Relevant parameters

Function code number	Function code name	Setting value range and definition	Factory settings
FF.36	Slewing control 1	**"0000" bit：** Eddy current-free rotary frequency control 0：Closed 1：Open	1101
FE.55	Smoothing control gain	This parameter can be increased when there is a rebound from a stop. Setting range：0.00～50.00	8.00
FE.57	Base value for shutdown frequency	This parameter can be increased when there is a bounce in the stop, it is recommended that it is no greater than 1.00Hz, otherwise there may be a problem with a longer distance travelled by pointing. Setting range：0.00Hz～10.00Hz	0.50Hz
FF.84	Slewing arm length	Set according to actual tower arm length. Setting range：0m～200m	60m
FF.85	Slewing acceleration gain	The higher the value, the longer the acceleration time; increasing arm length requires increasing the value. Setting range：50%～500%	110%
FF.86	Slewing reduction gain	The higher the value, the longer the deceleration time; increasing arm length requires increasing the value. Setting range：50%～500%	90%
FF.87	Slewing control 2	**"0" bit：** Reserved **"00" bit：** Reserved **"000" bit：** Reverse gear to deceleration 0：Closed 1：Open The deceleration time can be adjusted by FF.97 when reversing to reverse gear. **"0000" bit：** Smooth control of vortex-free rotation	4100

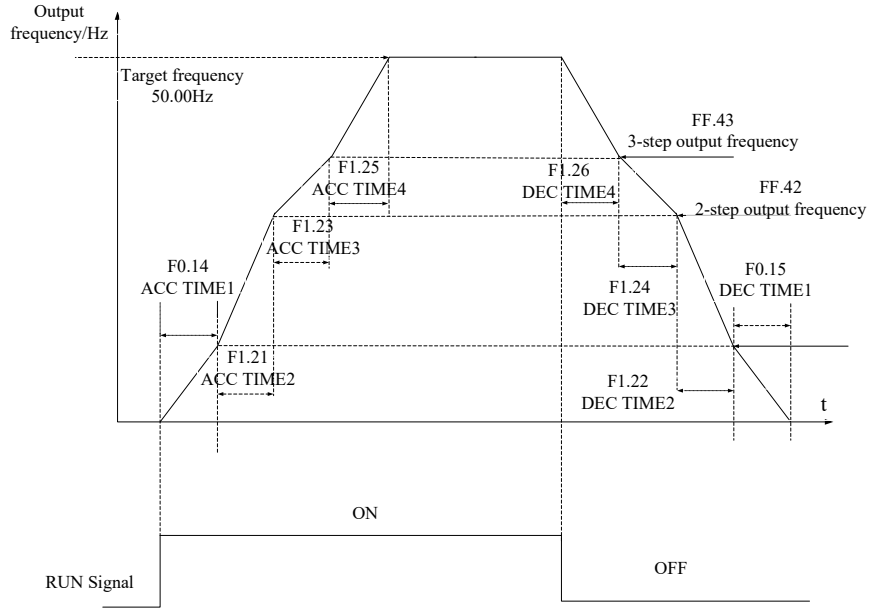
		0：Closed Others：Open	
FF.97	Reverse gear to deceleration factor	If the reverse gear change deceleration is enabled (FF.87 hundreds set to 1), the actual deceleration time = FF.97 * original deceleration time. Setting range：0.0%～100.0%	70.0%

5.9.2 Eddy Current Control

The control scheme with eddy current is divided into frequency control and eddy current control. The motor control method needs to be set to V/F control (F0.00 = 0) and the eddy current-free slew frequency control needs to be switched off (FF.36 kilobits set to 0).

1、Frequency control

When V/F control is used, acceleration and deceleration times from acceleration and deceleration time 1 to acceleration and deceleration time 4 are used by default, and the acceleration and deceleration curves are shown in the figure below：



Relevant parameters：

Function code number	Function code name	Setting value range and definition	Factory settings
F0.14	Acceleration time 1	0.01s～650.00s	8.00s
F0.15	Deceleration time 1	0.01s～650.00s	20.00s
F1.21	Acceleration time 2	0.01s～650.00s	20.00s
F1.22	Deceleration time 2	0.01s～650.00s	20.00s

F1.23	Acceleration time 3	0.01s～650.00s	25.00s
F1.24	Deceleration time 3	0.01s～650.00s	15.00s
F1.25	Acceleration time 4	0.01s～650.00s	25.00s
F1.26	Deceleration time 4	0.01s～650.00s	10.00s
FF.41	Segmented acceleration/deceleration switching frequency 1	0.00Hz～ Max. frequency	9.00Hz
FF.42	Staged acceleration/deceleration switching frequency 1	0.00Hz～ Max. frequency	21.00Hz
FF.43	Staged acceleration/deceleration switching frequency 1	0.00Hz～ Max. frequency	36.00Hz

2、See 6.10 for eddy current control.

5.10 Eddy Current Control

Slewing eddy current control is achieved by means of a DC voltage output from the eddy current module acting on the eddy current coil of the slewing motor, which generates a magnetic field to brake the rotating motor. A suitable eddy current control is beneficial for the smooth operation of the tower arm. The eddy current module works on the following principle：

The higher the eddy current output voltage at the same motor speed, the higher the braking force.

At the same eddy current output voltage, the higher the motor speed, the stronger the braking force.

In order to ensure the smooth operation of the tower arm, the eddy current control basically follows the principle of "the higher the output frequency, the lower the eddy current output voltage". The vortex control parameters are set as follows：

5.101 Determination of Eddy Current Control Method

Eddy current control method	Vortex module and control volume selection	Port usage restrictions and parameter settings
Method 1	The control quantity of the eddy current module is 0 to 10 V DC and the control variable does not use the eddy current duty cycle (F3.53/F3.54 is not equal to 20).	AO1 or AO2 may be used. F3.53 digit or tens digit needs to be set to 0; see step 2 for polarity setting.
Method 2	The control volume of the eddy current module is a pulse signal (PWM+, PWM-).	Only AO2 can be used. F3.53 decimal needs to be set to 4. See step 2 for polarity setting.
Method 3	The control quantity for the eddy current module is 0 to 10 V DC and the control variable uses the eddy current duty cycle (F3.53/F3.54 = 20).	AO1 or AO2 may be used. F3.53 digits or tens need to be set to 0. See step 2 for polarity setting.

5.10.2 Eddy Current Module Polarity Determination

The polarity of the eddy current module is determined according to the principle "the higher the motor speed, the lower the eddy current output voltage", if this does not correspond, the control polarity has to be adjusted according to the eddy current control method.

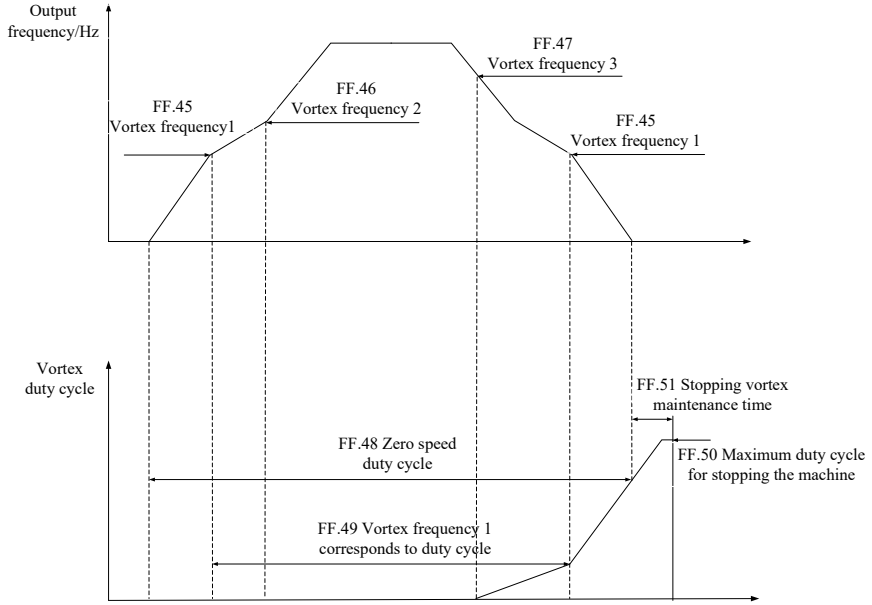
Mode 1: F3.53 hundred or thousand digits set to 1.

Mode 2 or Mode 3: FF.53 set to 0.

5.10.3 Eddy Current Control Adjustment

Mode 1: overall adjustment via F3.56 (AO1 output gain) or F3.59 (AO2 output gain).

Mode 2 or Mode 3: Eddy current duty cycle control, as illustrated below.



Eddy current duty cycle control schematic

During operation： When the run command is received, the eddy current duty cycle is output according to the set value FF.48; when the output frequency reaches the set frequency FF.45, the eddy current duty cycle is output according to the set value FF.49; when the output frequency reaches the set frequency FF.46, the eddy current duty cycle drops to 0.

During the shutdown： When the output frequency drops to the set frequency FF.47, the eddy current duty cycle starts to increase, when the output frequency drops to the set frequency FF.45, the eddy current duty cycle is output according to the set value FF.49; when the output frequency drops to 0Hz, the eddy current duty cycle is output according to the set value FF.48, after stopping, the eddy current duty cycle will increase (or decrease) to the set value FF.50 at the rate of change of the set value FF.54 After shutdown, the vortex duty cycle will increase

(or decrease) to the FF.50 setting at the rate of FF.54. In addition, the eddy current duty cycle will remain at the FF.51 setting after shutdown and will become 0 after the time has elapsed:

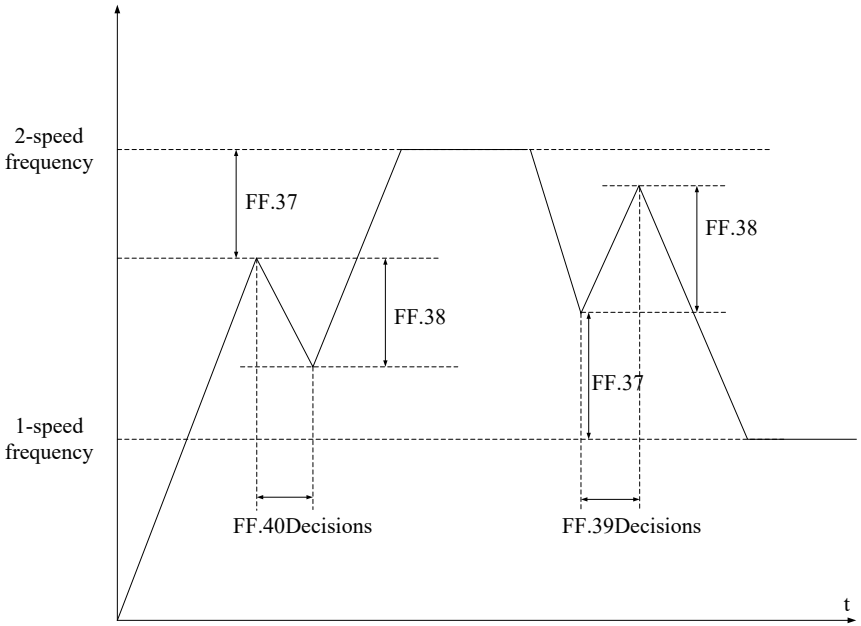
Function code number	Function code name	Setting value range and definition	Factory settings
FF.45	Vortex frequency 1	0.00Hz～Max. frequency	20.00Hz
FF.46	Vortex frequency 2	0.00Hz～Max. frequency	40.00Hz
FF.47	Vortex frequency 3	0.00Hz～Max. frequency	40.00Hz
FF.48	Zero speed duty cycle	0.0%～100.0%	0.0%
FF.49	Duty cycle corresponding to eddy current frequency 1	0.0%～100.0%	0.0%
FF.50	Maximum duty cycle at standstill	0.0%～100.0%	80.0%
FF.51	Standstill eddy current maintenance time	0.0s～3000.0s	60.0s
FF.52	Eddy current output carrier	0.20kHz～4.00kHz	0.20kHz
FF.53	Duty cycle polarity selection	0: Forward polarity 1: Reverse polarity	1
FF.54	Stopping duty cycle variation rate	0.0%～50.0% Time units are 100ms	0.5%

5.11 Slewing Flexibility Control

The flexible slewing control is designed to improve the "stop and go" problem when the tower jib is slewing.

FF.36 digit set to 1 to open the rotary flex control.

When FF.36 decimal is set to 1, the flex control acceleration and deceleration times are determined by FF.39 and FF.40 respectively. The diagram below shows the 2-speed acceleration and deceleration flex control.



Flexible control diagram

The relevant parameters are as follows：

Function code number	Function code name	Setting value range and definition	Factory settings
FF.36	Slewing control 1	**"0" bit：** Flexible control 0：Closed 1：Open To improve the "stop and go" problem of the tower arm, see the flexible control instructions. **"00" bit：** Flexible control of acceleration and deceleration times 0：Closed 1：Open To improve the "stop and go" problem of the tower arm, see the flexible control instructions.	1101
FF.37	Flexible control of the starting deviation frequency	0.00 Hz～20.00Hz	2.50Hz
FF.38	Flexible control of direction changes deviation frequency	0.00 Hz～20.00Hz	2.50Hz
FF.39	Flexible control of acceleration time 1	0.00 s～650.00s	20.00s

FF.40	Flexible control of deceleration time 2	0.00 s～650.00s	20.00s

5.12 Rotation-specific Acceleration and Deceleration

Function code number	Function code name	Setting value range and definition	Factory settings
FF.36	Rotation control 1	**"000" bit：** Rotation-specific acceleration and deceleration 0：Closed 1：Open The rotation acceleration and deceleration times are determined by the Fb parameter.	1101
Fb.00	Acceleration area 1	0.1%～Fb.02	10.0%
Fb.01	Step acceleration time 1	0.0s～30.00s	0.50s
Fb.02	Acceleration area 2	Fb.00～Fb.04	20.0%
Fb.03	Step acceleration time 2	0.0s～30.00s	0.70s
Fb.04	Acceleration area 3	Fb.02～Fb.06	30.0%
Fb.05	Step acceleration time 3	0.0s～30.00s	0.90s
Fb.06	Acceleration area 4	Fb.04～Fb.08	40.0%
Fb.07	Step acceleration time 4	0.0s～30.00s	1.10s
Fb.08	Acceleration area 5	Fb.06～Fb.10	50.0%
Fb.09	Step acceleration time 5	0.0s～30.00s	1.30s
Fb.10	Acceleration area 6	Fb.08～Fb.12	60.0%
Fb.11	Step acceleration time 6	0.0s～30.00s	1.50s
Fb.12	Acceleration area 7	Fb.10～Fb.14	80.0%
Fb.13	Step acceleration time 7	0.0s～30.00s	3.40s
Fb.14	Acceleration area 8	Fb.12～300.0%	100.0
Fb.15	Step acceleration time 8	0.0s～30.00s	3.80s
Fb.16	Deceleration area 1	0.1%～Fb.18	10.0%
Fb.17	Step deceleration time 1	0.0s～30.00s	3.00s
Fb.18	Deceleration area 2	Fb.16～Fb.20	20.0%
Fb.19	Step deceleration time 2	0.0s～30.00s	2.40s
Fb.20	Deceleration area 3	Fb.18～Fb.22	30.0%
Fb.21	Step deceleration time 3	0.0s～30.00s	2.00s
Fb.22	Deceleration area 4	Fb.20～Fb.24	40.0%
Fb.23	Step deceleration time 4	0.0s～30.00s	1.80s
Fb.24	Deceleration area 5	Fb.22～Fb.26	50.0%
Fb.25	Step deceleration time 5	0.0s～30.00s	1.60s

Fb.26	Deceleration area 6	Fb.24～Fb.28	60.0%
Fb.27	Step deceleration time 6	0.0s～30.00s	1.50s
Fb.28	Deceleration area 7	Fb.26～Fb.30	80.0%
Fb.29	Step deceleration time 7	0.0s～30.00s	2.40s
Fb.30	Deceleration area 8	Fb.28～300.0%	100.0%
Fb.31	Step deceleration time 8	0.0s～30.00s	2.00s

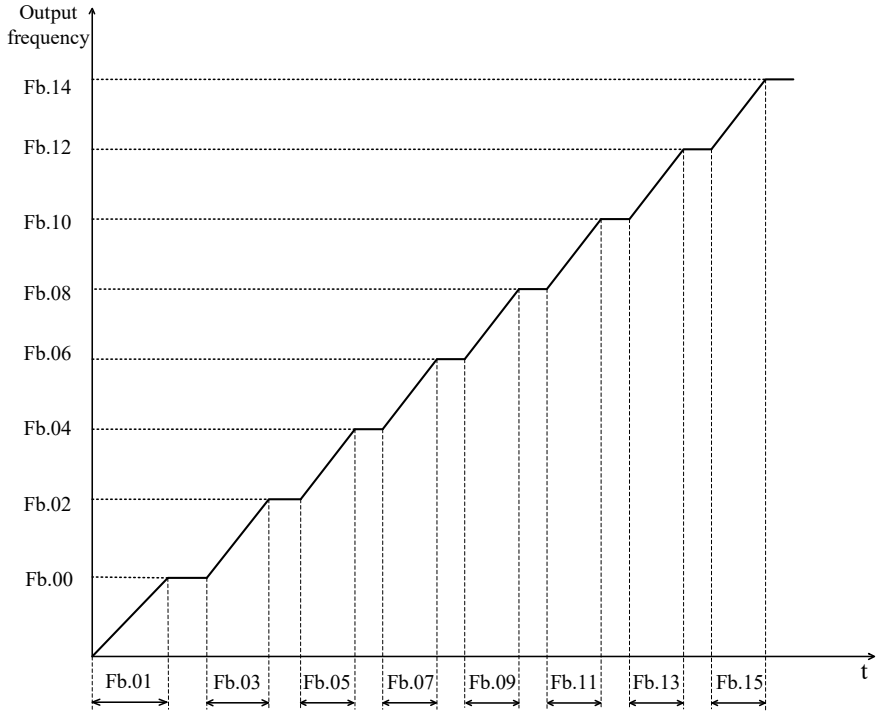


Diagram of the acceleration phase

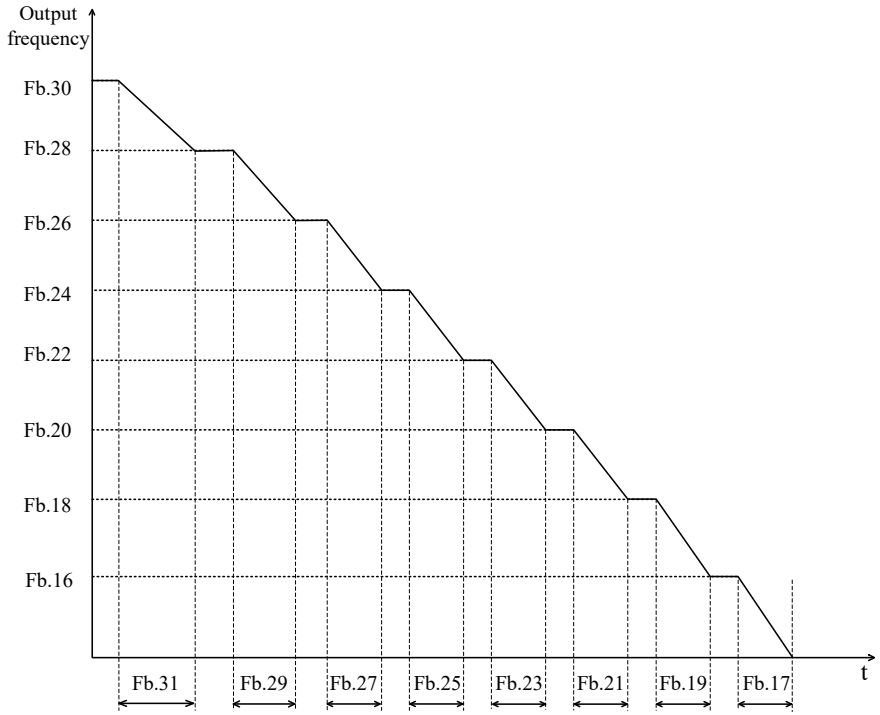


Diagram of the deceleration phase

6. Function Parameter Table

"●" ：Indicates that this parameter can be changed when the AC drive is in operation；
"○" ： Indicates that the parameter cannot be changed when the AC drive is in operation；
"×" ：Indicates that the parameter can only be read, not changed.

6.1 F0 Basic Parameters Group

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F0.00	Motor control mode	Asynchronous motor control mode: 0: V/F control 3: High-performance VC without PG 4: High-performance VC with PG	0	○	0x000
F0.01	Reserved				
F0.02	Run command channel	0: Keyboard control 1: Terminal control 2: RS485 communication control	1	•	0x002
F0.03	Frequency given source channel A	0: Keyboard number given 1: Keyboard potentiometer given 2: VS voltage analog given 3: AI analog current/voltage given 4: AS current analog given 5: Reserved 6: RS485 communication given 7～10： Reserved 11：Multi-Speed Feeding	0	•	0x003
F0.04	Frequency given source channel B		1	•	0x004
F0.05	Frequency channel B reference source	0: Max. output frequency as reference source 1: A set frequency as reference source	0	•	0x005
F0.06	Frequency given source selection	0: Channel A 1: Channel B 2: Channel A+Channel B 3: Channel A-Channel B 4: Max. value of Channel A and Channel B 5: Min. value of Channel A and Channel B	0	•	0x006

F0.07	Reserved				
F0.08	Keyboard number setting	0.00Hz～upper limit frequency	10.00Hz	•	0x008
F0.09	Max frequency output	upper limit ～600.00Hz	100.00Hz	○	0x009
F0.10	Upper limit frequency source selection	0：Upper frequency limit is given digitally Set via parameter F0.11	0	•	0x00A
F0.11	Upper frequency limit digital setting	F0.12～F0.09	100.00Hz	•	0x00B
F0.12	Lower limit frequency	0.00Hz～ upper limit frequency	0.00Hz	•	0x00C
F0.13	Lower limit frequency running mode	0: Stop output and enter suspended operation. 1: Run at lower limit frequency	1	○	0x00D
F0.14	ACC time 1	0.01s～650.00s	6.00s	※	0x00E
F0.15	DEC time 1	0.01s～650.00s	2.00s	※	0x00F

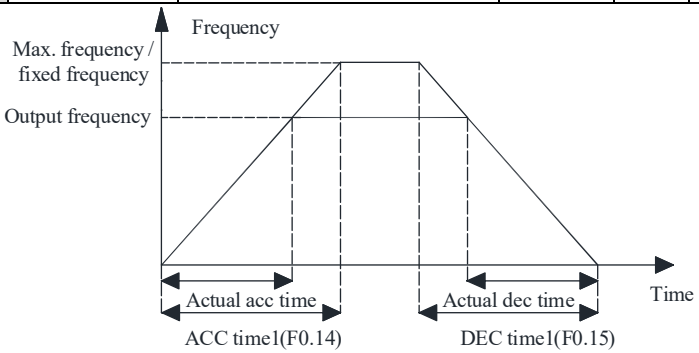


Diagram of acceleration and deceleration times

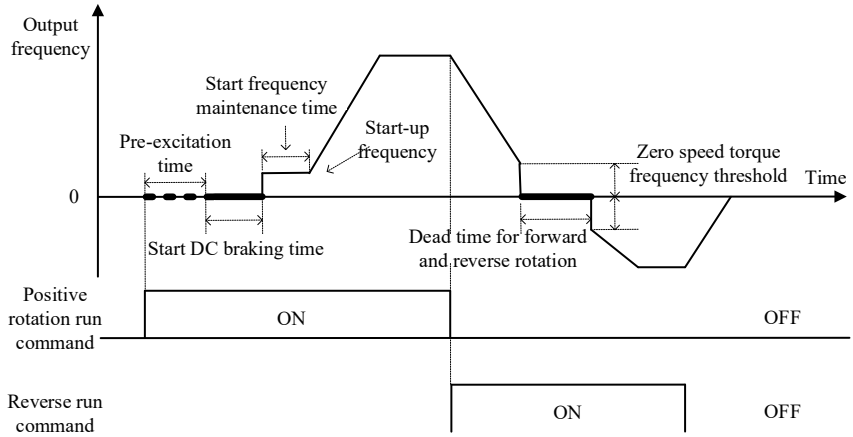
Acceleration time refers to the time required to accelerate the output frequency from 0.00Hz to the time base frequency, deceleration time refers to the time required to decelerate the output frequency from the time base frequency to 0.00Hz. The maximum frequency, the fixed frequency of 50 Hz and the given frequency can be selected as the time reference frequency by [F1.16].

F0.16	Rotary direction selection	**LED "0" digit: running direction takes the opposite** 0: Direction unchanged 1: Direction takes the opposite **LED "00" digit: running direction prohibited**	0000	○	0x010

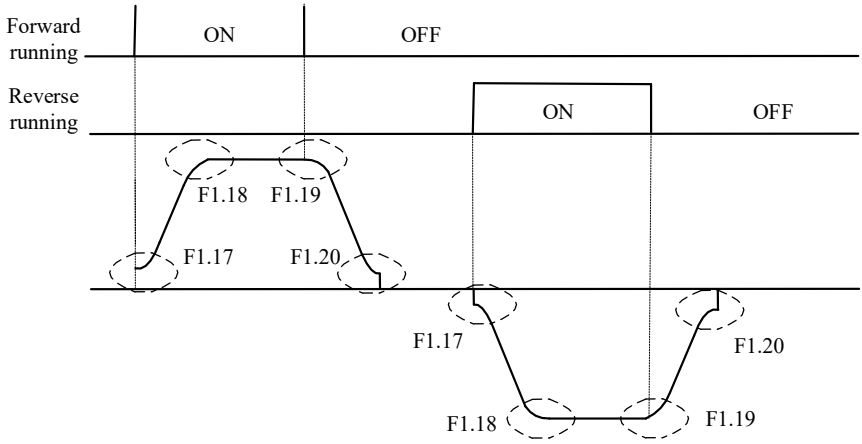
		0: Forward and reverse commands are allowed 1: Only FWD command allowed 2: Only REV command allowed **LED "000" digit：Reserved** **LED "0000" digit: ：Reserved**			
F0.17～F0.18		Reserved			
F0.19	Parameter initialization	0: No action 1: Restore factory default (not restoring motor parameters) 2: Restore factory default (restoring motor parameters) 3: Clear malfunction records	0	○	0x013

6.2 F1 Run Control Parameters

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F1.00	Start-up mode running	0: Start by start-up frequency 1: Braking first then start by start-up frequency	0	○	0x100
F1.01	Start pre-excitation time	Setting range：0.00s～60.00s	0.00s	○	0x101
F1.02	Start-up frequency	The AC drive's initial frequency at start-up. Setting range：0.00Hz～60.00Hz	0.50Hz	○	0x102
F1.03	Start-up frequency holding time	Setting the start frequency maintenance time is the maintenance time to run at the start frequency when the frequency converter receives a run command and then goes into normal acceleration and deceleration. Setting range：0.0s～50.0s	0.0s	○	0x103
F1.04	Braking current before start	The magnitude of the braking current fed into the motor by the AC drive during DC braking, 100.0% corresponds to the rated motor current.	60.0%	○	0x104

		Setting range：0.0%～150.0%			
F1.05	Braking time before start	The DC braking duration at start-up, when set to 0.0s, renders the DC braking ineffective. Setting range：0.0s～60.0s	0.0s	○	0x105
Diagram of the start-up and forward/reverse switching process  					
F1.06～F1.09		Reserved			
F1.10	Stop mode	**0：DEC stop** Deceleration stop at the set deceleration time. If the DC brake is switched on (F1.14 is not equal to 0.0s), during the deceleration stop, when the output frequency is less than the stopping DC brake start frequency [F1.11], the frequency converter enters the DC brake and holds it for the [F1.14] set time before stopping. **1： Free stop** The frequency converter will block the output as soon as it receives the stop command and the motor will run freely until it stops.	0	•	0x10A
F1.11	DC braking initial frequency when stop	During the deceleration stop, the DC brake is applied when this frequency is reached. Setting range：0.00Hz～50.00Hz	0.50Hz	○	0x10B

F1.12	DC braking current when stop	The magnitude of the braking current fed into the motor by the AC drive during DC braking, 100.0% corresponds to the rated motor current. Setting range：0.0%～150.0%	80.0%		0x10C
F1.14	DC braking holding time when stop	DC brake holding time at stop, when set to 0.0, the stop DC brake is invalid. Setting range：0.0s～60.0s	0.5s	○	0x10E
F1.15	Detection frequency when stop	When decelerating and stopping, the output is blocked when the frequency converter output frequency is less than this value and enters the stop state. Setting range：0.00Hz～50.00Hz	0.50Hz	•	0x10F
F1.16	ACC/DEC selection	**LED "0" digit: time base selection** 0: max frequency 1: fixed frequency 50Hz 2: set frequency **LED "00" digit:**S ACC/DEC selection 0：Linear ACC/DEC Linear acceleration and deceleration, the output frequency follows a straight line for acceleration and deceleration. 1：S ACC/DEC The output frequency follows the S-curve for acceleration and deceleration. **LED "000" digit: Reserved** **LED "0000" digit: Reserved**	0011	○	0x110
F1.17	ACC start S curve time	Duration of the S-curve at the start of acceleration. Setting range：0.00s～10.00s	0.00s	○	0x111
F1.18	ACC finish S curve time	Duration of the S-curve before the acceleration is about to reach the set frequency Setting range0.00s～10.00s	0.00s	○	0x112
F1.19	DEC start S curve time	Duration of the S-curve at the start of deceleration.	0.00s	○	0x113

		Setting range：0.00s～10.00s			
F1.20	DEC finish S curve time	Duration of the S-curve before the deceleration is about to reach 0Hz. Setting range：0.00s～10.00s	0.20s	○	0x114
The S-curve characteristics for forward and reverse rotation operation are shown below  					
F1.21	ACC time 2	0.01s～650.00s	20.00s	•	0x115
F1.22	DEC time 2	0.01s～650.00s	20.00s	•	0x116
F1.23	ACC time 3	0.01s～650.00s	25.00s	•	0x117
F1.24	DEC time 3	0.01s～650.00s	15.00s	•	0x118
F1.25	ACC time 4	0.01s～650.00s	25.00s	•	0x119
F1.26	DEC time 4	0.01s～650.00s	10.00s	•	0x11A
F1.27	Emergency stop DEC time	Deceleration time of the frequency converter on receipt of an emergency stop command Setting range：0.01～650.00s	1.00s	•	0x11B
F1.28	FWD&REV dead time	Hold time at 0.0Hz when switching the AC drive in forward and reverse Setting range：0.0s～120.0s	0.0s	○	0x11C
F1.29	Zero speed torque frequency threshold	0.00Hz～10.00Hz	0.50Hz	•	0x11D
F1.30	Zero speed torque holding coefficient	0.0%～150.0%	60.0%	•	0x11E
F1.31	Zero speed torque holding time	When set to 6000.0s, it is always maintained. Setting range：0.0s～6000.0s	0.0s	•	0x11F
F1.32～F1.34		Reserved			
F1.35	Power failure restart action	0: Invalid	0	○	0x123

		The AC drive can only run after the power has been turned on again and it has received a run command. 1: Valid If the frequency converter is in operation before the power supply is cut off, the frequency converter will automatically speed track and restart after the F1.36 set time after the power supply is restored. During the waiting time for power failure restart, the frequency converter does not accept a run command, but if a stop command is entered during this period, the frequency converter is released from the restart state. **Caution：** **The power failure restart function allows the AC drive to start running automatically after power is restored. Please use it with caution for personal and equipment safety.**			
F1.36	Power off restart waiting time	Waiting time after power has been obtained and before running. Setting range：0.00s～60.00s	0.50s	○	0x124
F1.37	Reserved				
F1.38	JOG running frequency setting	0.00Hz～Max. frequency	5.00Hz	•	0x126
F1.39	JOG ACC time	0.01s～650.00s	10.00s	•	0x127
F1.40	JOG DEC time	0.01s～650.00s	10.00s	•	0x128
F1.41～F1.44		Reserved			

6.3 F2 Digital Terminal Parameter Group

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F2.00	Multifunction input	0: No function 1: Forward running 2: Reverse rotation operation	1	○	0x200
F2.01	Multifunction input		2	○	0x201
F2.02	Multifunction input		16	○	0x202

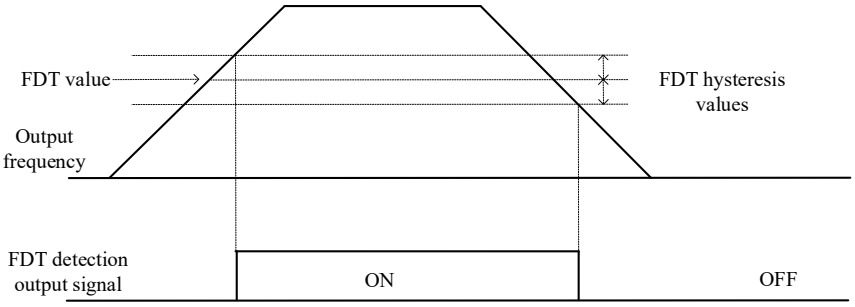
F2.03	Multifunction input terminal 4(X4)	3: Three-wire operation control (Xi) 4: Forward rotation pointing 5: Reverse rotation jogging 6: Free stop 7: Emergency stop 8: Fault reset 9: External fault input 10 to 12: Reserved 13: Channel A switches to channel B 14: Frequency channel combination switching to A 15: Frequency channel combination switching to B 16：Multi-segment speed terminal 1 17: Multi-speed terminal 2 18: Multi-speed terminal 3 19: Multi-speed terminal 4 20 to 31: Reserved 32: Acceleration/deceleration time selector terminal 1 33: Acceleration/deceleration time selector terminal 2 34: Acceleration/deceleration pause 35～39：Reserved 40: Timer trigger terminal 41: Timer clear terminal 42: Counter clock input terminal 43: Counter clear terminal 44: DC brake command 45: Pre-excitation command terminal 46：Reserved 47: Reserved 48: Command channel switch to keypad 49: Command channel switch to terminal 50: Command channel switch to communication	17	○	0x203
F2.04	Multifunction input terminal 5(X5)		18	○	0x204
F2.05	Multifunction input terminal 6(X6)		19	○	0x205
F2.06	Multifunction input terminal 7(X7)		8	○	0x206

		51: Command channel switch to expansion card 52：Running disabled 53：Forward rotation disable 54：Reverse disable 55 to 79: Reserved 80: Weighing alarm switch terminal 81: Empty cage weighing calibration terminal 82: Brake torque detection 83: Input phase failure detection shield 84: Deceleration-optimized lower limit 85: Upper limit for deceleration optimization. 86: Invalid delay interrupt for digital output 87: Ant-speed switch 88: Slewing advance brake 89: Lifting upper limit 90: Anti-rocking switch 91: Brake feedback			
F2.07	Reserved				
F2.08	X1-X4 terminal trait selection	This function code is used to set the polarity of the input terminals. 0: On valid 1: Off valid **LED "0" digit:** X1 terminal **LED "00" digit:** X2 terminal **LED "000" digit:** X3 terminal **LED "0000" digit:** X4terminal	0000	•	0x208
F2.09	X5-X7 terminal trait selection	This function code is used to set the polarity of the input terminals. 0: On valid 1: Off valid **LED "0" digit:** X5 terminal **LED "00" digit:** X6 terminal **LED "000" digit:** X7 terminal **LED "0000" digit:** reserved	0000	•	0x209
F2.10	X1 valid detection delay	Valid checkout delay: the delay time corresponding to the transition of input terminals X1 to	0.010s	•	0x20A
F2.11	X1 invalid detection delay		0.010s	•	0x20B

F2.12	X2 valid detection delay	X7 from the invalid state to the valid state. Invalid detection delay: the delay time corresponding to the transition from a valid state to an invalid state for input terminals X1 to X7. Setting range：0.010s～6.000s	0.010s	•	0x20C
F2.13	X2 invalid detection delay		0.010s	•	0x20D
F2.14	X3 valid detection delay		0.010s	•	0x20E
F2.15	X3 invalid detection delay		0.010s	•	0x20F
F2.16	X4 Valid detection delay		0.010s	•	0x210
F2.17	X4 invalid detection delay		0.010s	•	0x211
F2.18	X5 valid detection delay		0.010s	•	0x212
F2.19	X5 invalid detection delay		0.010s	•	0x213
F2.20	X6 valid detection delay		0.010s	•	0x214
F2.21	X6 invalid detection delay		0.010s	•	0x215
F2.22	X7 valid detection delay		0.010s	•	0x216
F2.23	X7 invalid detection delay		0.010s	•	0x217
F2.24～F2.25		Reserved			
F2.26	Terminal control operation mode	**0：2-line 1** Run and direction in one. This mode is the most commonly used two-wire mode. The factory default is for the X1 (forward run) and X2 (reverse run) terminal commands to determine forward and reverse motor operation. **1：2-line 2** Separation of run and direction. The forward run terminal X1 (forward run) defined when using this mode is the run enable terminal. The direction is defined by the status of the reverse run terminal X2 (reverse run).	0	○	0x21A

		2：3-line 1 In this mode the 3-wire run control terminal (Xi) is the stop run terminal, the run command is generated by the forward run terminal X1 (forward run) and the direction is controlled by the reverse run terminal X2 (reverse run). The 3-wire operation control terminal (Xi) is a valid input. **3：3-line 2** In this mode the 3-wire operation control terminal (Xi) is the stop operation terminal and the operation command are generated by the forward operation terminal X1 (forward operation) or the reverse operation terminal X2 (reverse operation) and both control the direction of operation at the same time.			
F2.27	Terminal activation protection	When the frequency converter is stopped due to abnormality in the running state, if the protection is turned off, it will start directly after the abnormality is lifted; if the protection is turned on, the start command needs to be withdrawn and restarted after the abnormality is lifted. 0：Closed 1：Open **LED "0" digit:** Terminal operate protection when abnormal exit **LED "00" digit:** Jog terminal operate protection when abnormal exit **LED "000" digit**: Operate protection when command channel switched to terminal **LED "0000" digit：** Reserved	0111	○	0x21B

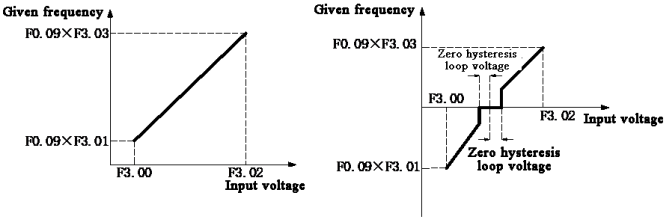
F2.28～F2.43		Reserved			
F2.44	Output terminal polarity selection	Set the polarity of the output terminals. 0: Positive 1: Negative **LED "0" digit:** Terminal Y **LED "00" digit:** Relay output terminal 1 **LED "000" digit:** Relay output terminal 2 **LED "0000" digit:** reserved	0000	•	0x22C
F2.45	Output terminal Y	0: No output 1: AC Drive in operation 2: AC Drive running in reverse 3: AC Drive running in forward rotation 4: Fault trip alarm 1 (alarm during fault self-recovery) 5: Fault trip alarm 2 (no alarm during fault self-recovery) 6: AC Drive undervoltage 8: AC Drive operation ready 9: Output frequency level detection 1 (FDT1) 10: Output frequency level detection 2 (FDT2) 11: The given frequency is reached 12: Zero speed operation in progress 13～23：Reserved 24: Energy braking in progress 25: PG feedback disconnection 26: Emergency stop in progress 27：Load pre-alarm output 1 28：Load pre-alarm output 2 29～32：Reserved 33：Brake control 34：Input out of phase 35：Brake failure protection in operation	33	•	0x22D
F2.46	Relay output 1 (TA1/TB1-TC1)		4	•	0x22E
F2.47	Relay output 2 （TA2/TB2-TC2)		33	•	0x22F

		36: Insufficient brake torque fault detection 37: Rotation-specific brake control			
F2.48	Y1 output delay time	The timing starts when the control quantity corresponding to the output terminal changes from the invalid state to the valid state, and the corresponding output terminal outputs the valid state only when the timing reaches the set value. Setting range：0.010s～6.000s	0.010s	•	0x230
F2.49	Relay 1 output delay time		0.010s	•	0x231
F2.50	Relay 2 output delay time		0.010s	•	0x232
F2.51	Output frequency level 1 (FDT1)	During acceleration, when the AC drive output frequency exceeds F2.51/F5.53, a valid signal is output after F2.52/F5.54 hysteresis time. When decelerating, when the AC drive output frequency is lower than F2.51/F5.53, an invalid signal is output after F2.52/F5.54 hysteresis time. Setting range： 0.00Hz ～ Max. frequency	2.00Hz	•	0x233
F2.52	FDT1 lag		1.00Hz	•	0x234
F2.53	Output frequency level 2 (FDT2)		2.00Hz	•	0x235
F2.54	FDT2 lag		1.00Hz	•	0x236
Schematic of frequency level detection  					
F2.55	Given frequency arriving checkout range	When the output frequency of the frequency converter reaches or is close to the given frequency value, the output terminals (Y/TA1-TB1-TC1, TA2-TB2-TC2) are selected to output a valid signal if the "given frequency is reached"; this function allows the upper and	2.00Hz	•	0x237

		lower offset of the detection amplitude to be adjusted. Setting range：0.00Hz～50.00Hz			
F2.56	Y output invalid delay time	The timing starts when the control quantity corresponding to the output terminal changes from a valid state to an invalid state, and the corresponding output terminal only outputs an invalid state when the timing reaches the set value. Setting range：0.000s～6.000s	0.010s	•	0x238
F2.57	(TA1/TB1-TC1) Relay 1 output invalid delay time		0.010s	•	0x239
F2.58	(TA2/TB2-TC2) Relay 2 output invalid delay time		0.010s	•	0x23A
F2.59～F2.99		Reserved			

6.4 F3 Analog Terminal Parameter Group

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F3.00	VS Lower limit	This function defines the signal received by the analogue input terminal (VS) below which the AC drive will process the voltage signal as the VS lower limit value. Setting range：0.00V～10.00V	0.0V	•	0x300
F3.01	VS Lower limit corresponding setting	Used to set the percentage of the set value corresponding to the VS lower limit input analogue quantity Setting range： -100.00%～100.00%	0.0%	•	0x301
F3.02	VS upper limit	This function defines the signal received by the analogue input terminal (VS), voltage signals exceeding this value are processed by the frequency converter as the VS upper limit value. Setting range：0.00V～10.00V	10.00V	•	0x302

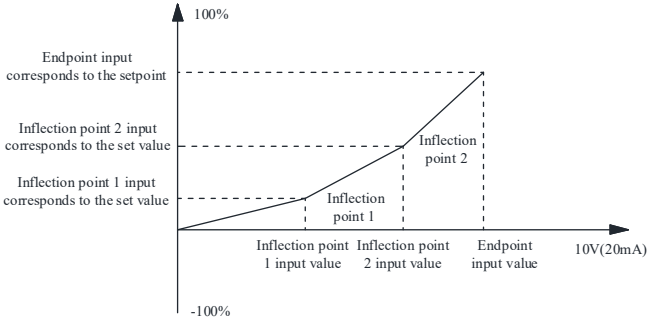
F3.03	VS upper limit corresponding setting	Used to set the percentage of the set value corresponding to the VS upper limit input analogue quantity. Setting range： 100.00% ～ 100.00%	100.00%	•	0x303
F3.04	VS filter time	This parameter is defined as the size of the filtering of the (VS) input analogue signal for the elimination of interfering signals. The longer the filtering time, the greater the immunity to interference but the slower the response time; the shorter the filtering time, the weaker the immunity but the faster the response time. Setting range：0.000s～6.000s	0.010s	•	0x304
F3.05	VS zero-point loop voltage	0.00V～10.00V	0.00V	•	0x305
Diagram of the analogue feed frequency  Schematic diagram of analogue given frequency					
F3.06	AI (VS) lower limit	0.00V～10.00V	0.00V	•	0x306
F3.07	AI (VS)lower limit corresponding setting	0.00%～100.00%	0.00%	•	0x307
F3.08	AI used as VS upper limit	0.00V～10.00V	10.00V	•	0x308
F3.09	AI (VS)upper limit corresponding setting	0.00%～100.00%	100.00%	•	0x309
F3.10	AI filter time	0.000s～6.000s	0.010s	•	0x30A
F3.11	AS lower limit	0.00mA～20.00mA	4.00mA	•	0x30B

F3.12	AS lower limit corresponding setting	0.00%～100.00%	0.00%	•	0x30C
F3.13	AS upper limit	0.00mA～20.00mA	20.00mA	•	0x30D
F3.14	AS upper limit corresponding setting	0.00%～100.00%	100.00%	•	0x30E
F3.15	AS filter time	0.000s～6.000s	0.010s	•	0x30F
F3.16	AI used as AS lower limit	0.00mA～20.00mA	4.00mA	•	0x310
F3.17	AI (AS) lower limit corresponding setting	0.00%～100.00%	0.00%	•	0x311
F3.18	AI used as AS lower limit	0.00mA～20.00mA	20.00mA	•	0x312
F3.19	AI (AS) upper limit corresponding setting	0.00%～100.00%	100.00%	•	0x313
F3.20	Vs terminal function selection (used as X)	See X terminal function	0	○	0x314
F3.21	VS high level setting	0.00%～100.00%	70.00%	•	0x315
F3.22	VS low level setting	0.00%～100.00%	30.00%	•	0x316
F3.23	AI terminal function selection (used as X)	See X terminal function	0	○	0x317
F3.24	AI high level setting	0.00%～100.00%	70.00%	•	0x318
F3.25	AI low level setting	0.00%～100.00%	30.00%	•	0x319
F3.26	AS terminal function selection (as X)	See X terminal function	0	○	0x31A
F3.27	AS high-level setting	0.00%～100.00%	70.00%	•	0x31B
F3.28	AS low-level setting	0.00%～100.00%	30.00%	•	0x31C
F3.29	Valid state setting when analog used as terminal	This function code is used to set the polarity of the input terminals. 0: low level 1: high level	0000	•	0x31D

		LED 0 digit: VS **LED 00 digit:** AI **LED 000 digit:** AS **LED 0000 digit:** reserved			
F3.30	Analog input curve selection	**LED "0" digit: VS** 0: Beeline (default) 1: curve 1 2: curve 2 **LED "00" digit: AI (Select voltage or current input by wire jumper)** **LED "000" digit: AS** **LED "0000" digit: reserved**	0000	•	0x31E
F3.31	Reserved				
F3.32	Curve 1 lower limit	0.00V～10.00V	0.00V	•	0x320
F3.33	Curve 1 lower limit corresponding setting	0.00%～100.00%	0.00%	•	0x321
F3.34	Curve 1 inflection point 1 input voltage	0.00V～10.00V	3.00V	•	0x322
F3.35	Curve 1 inflection point1 corresponding setting	0.00%～100.00%	30.00%	•	0x323
F3.36	Curve 1 inflection point 2 input voltage	0.00V～10.00V	6.00V	•	0x324
F3.37	Curve 1 inflection point2 corresponding setting	0.00%～100.00%	60.00%	•	0x325
F3.38	Curve 1 upper limit	0.00V～10.00V	10.00V	•	0x326
F3.39	Curve 1 upper limit corresponding setting	0.00%～100.00%	100.00%	•	0x327
F3.40	Curve 2 lower limit	0.00V～10.00V	0.00V	•	0x328
F3.41	Curve 2 lower limit corresponding setting	0.00%～100.00%	0.00%	•	0x329
F3.42	Curve 2 inflection point 1 input voltage	0.00V～10.00V	3.00V	•	0x32A

F3.43	Curve 2 inflection point1 corresponding setting	0.00%～100.00%	30.00%	•	0x32B
F3.44	Curve 2 inflection point 2 input voltage	0.00V～10.00V	6.00V	•	0x32C
F3.45	Curve 2 inflection point2 corresponding setting	0.00%～100.00%	60.00%	•	0x32D
F3.46	Curve 2 upper limit	0.00V～10.00V	10.00V	•	0x32E
F3.47	Curve 2 upper limit corresponding setting	0.00%～100.00%	100.00%	•	0x32F

Multi-point curve diagram



Multi-point curve diagram

F3.48～F3.52		Reserved			
F3.53	AO 输出信号选择	**LED "0" digit: AO1** 0: 0～10V 1: 4.00～20.00mA 2: 0.00～20.00mA **LED "00" digit: A02** 0: 0～10V 1: 4.00～20.00mA 2: 0.00～20.00mA 3: FM frequency pulse output 4: PWM frequency pulse output **LED "000" digit: AO1 output voltage polarity selection**	0040	•	0x335

		0: Positive 1: Negative **LED 0000 digit: AO2 output voltage polarity selection** 0: Positive 1: Negative			

Tip: After the parameters have been selected for the output mode, it is also necessary to select the on/off mode of the control board changeover switches J1, J2 and J3, which are selected as follows:

1、Turning the changeover switch to J1 when the frequency pulse output is selected (LED decimal set to 3 or 4). ;

2、Turn the changeover switch to J2 when selecting 0.00mA～20.00mA or 4.00mA～ 20.00mA output;

3、Turn the changeover switch to J3 when selecting 0V to 10V output;

The AC drive factory default hardware and software are 0V ~ 10V output, if you need to change, please change the hardware and software at the same time according to the actual output signal.

Transfer switches	Select location	Illustration	Function description
	J1		0kHz～50kHz Frequency output
	J2		0mA～20mA Current output 4mA～20mA Current output
	J3		0V～10V Voltage output

F3.54	A01 output selection	0: Target frequency 1: Output frequency 2: Output current 3: Input voltage 4: Output voltage 5: Mechanical speed 6: Given torque 7: Output torque 8: PID dosing amount 9: PID feedback amount 10: Output power 11: Bus voltage 12: VS input value 13: AI input value 14: AS input value 15: PUL input value 16: Module temperature 1	0	•	0x336
F3.55	A02 output selection		1	•	0x337

		17: Module temperature 2 18: RS485 given 19: Reserved 20: Eddy current duty cycle control			
F3.56	AO1 output gain	25.0%～200.0%	100.0%	•	0x338
F3.57	A01 output signal bias	-10.0%～10.0%	0.0%	•	0x339
F3.58	A01 output filtering	0.000s～6.000s	0.010s	•	0x33A
F3.59	AO2 output gain	25.0%～200.0%	100.0%	•	0x33B
F3.60	A02 analogue output signal bias	-10.0%～10.0%	0.0%	•	0x33C
F3.61	A02 output filtering	0.000s～6.000s	0.010s	•	0x33D
F3.62	A02 FM frequency output lower limit	0.00kHz～100.00kHz	0.20kHz	•	0x33E
F3.63	A02 FM frequency output upper limit	0.00kHz～100.00kHz	50.00kHz	•	0x33F
F3.64～F3.79		Reserved			

6.5 F4 System Parameter Group

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F4.00	Parameter and key lock selection	**0： Not locked** **1： Function parameter locked** Prohibition of parameter modification **2：Function parameter and key locked (except for RUN/STOP/JOG)** Disables modification of parameters and locks all keys on the keyboard except FWD/STOP/JOG/PRG. **3：All function parameter and key locked** Disables modification of parameters and locks all keys on the keyboard except the PRG. Note 1: How to unlock a two-line digital keyboard: The first line of the keyboard shows "CodE" after pressing the "PRG" menu key. Then you can directly enter the user password (F4.01) in the second line through the up and down keys and press the "SET" key to unlock it. 2: Single line digital tube keyboard unlock method: single line digital tube keyboard in the "PRG" menu key after the keyboard display "CodE". Then press the "SET" key digital tube display flashing input cursor, through the up and down keys to enter the user password (F4.01) and press the "SET" key again to determine, then can be unlocked. 3: The user password is a protective parameter set by the	1	•	0x400

		customer to protect the AC drive parameters from arbitrary tampering. After the password has been set, it should be kept in a safe place to prevent any inconvenience in the event of subsequent parameter changes			
F4.01	User Password	Used to set the user password. When the parameter and key lock selection [F4.00] is locked (not "0"), the password must be entered to unlock it. The factory default password is 0. Please keep the password set in a safe place. Setting range：0～9999	****	•	0x401
F4.04	Reserved				
F4.05	Parameter copy	0: No function 1: Send AC drive parameters to keyboard and save 2: Send keyboard parameters to AC drive **Note：** **1. The parameter values saved by the keypad cannot be transferred to the AC drive when the AC drive is in operation or in a fault state or when there are no parameters saved in the keypad.** **2. When the parameter values of the AC drive are transferred to the keypad and saved, if the keypad is pulled out, the copying cannot be completed and the parameter copying operation needs to be performed again.** **3. If the keyboard is removed when the parameter values are transferred from the keyboard to the AC drive, the first part of the parameters will be modified and the second part will not be**	0		0x405

		modified, so the operation needs to be repeated. **4. The current operating status of the AC drive will not be maintained when the parameter values of the AC drive are transferred to the keyboard, and all keys are invalid when the parameter values saved in the keyboard are transferred to the AC drive.** **5. The keyboard displays E.CPE (parameter copy abnormality) when there is an error in the parameter copy, at this time the copy is aborted and the parameter copy operation needs to be carried out again, you need to press the PRG key to exit E.CPE and return to monitoring.**			
F4.06	Reserved				
F4.07	Keyboard REV/JOG selection	Used to select the function of the keyboard key REV/JOG. 0: REV Defined as the reversing key (at this time the keypad function indicator REV/JOG is not lit), when the run command given channel is selected for keypad control, press this key to reverse the AC drive operation. 1: JOG The key is defined as the JOG key (at this time the keypad function indicator REV/JOG is illuminated), when the run command giving channel is selected as keypad control, press this key to run the AC drive-in jog.	0	○	0x407
F4.08	Keyboard STOP key setting	0: Non-keypad control is not valid 1: Non-keypad control mode stops in the shutdown mode	0	○	0x408

		2: Non-keypad control mode shutdown by free mode			
F4.09	Keyboard up and down keys to select	**LED "0" digit: keyboard UN/DOWN key modify selection** 0: Invalid 1: Modify frequency setting by key board numbers F0.08 2: Modify PID give setting by key board numbers Fb.01 **LED "00" digit: power down save** 0: No save frequency after power down 1: Save frequency after power down **LED "000" digit: action limit** 0: Adjusting in operation& stop 1: Adjusting only in operation, stop for holding 2: Adjusting in operation, stop for clearing **LED "0000" digit: reserved**	0010	○	0x409
F4.10	Keypad potentiometer lower limit	0.00V～5.00V	0.50V	•	0x40A
F4.11	The lower limit of the keypad potentiometer corresponds to the setting	0.00%～100.00%	0.0%	•	0x40B
F4.12	Keypad potentiometer upper limit	0.00V～5.00V	4.50V	•	0x40C
F4.13	Setting corresponding to the upper	0.00%～100.00%	100.00	•	0x40D

	limit of the keypad potentiometer				
F4.14	Keypad display in the first line of operation	The first line of the keypad is displayed in the running state: the first line of the keypad can be cyclically monitored when it is running, and the contents of the monitoring can be modified by the keypad "SET" key during the running state, one item will be jumped for each key press. The cyclic monitoring parameters do not have a power-off memory function after changes, the default display after power-on is the value set by the LED digit 10. The first line of the keypad is displayed in the shutdown state: the first line of the keypad can be cyclically monitored when the keypad is shutdown, and the contents of the monitoring can be modified by the keypad "SET" key during the shutdown state. The cyclic monitoring parameters do not have a power-off memory function after changes, the default display after power-on is the value set by the LED digit 10. The content of the LED digit to thousand-digit setting is the same as the C monitoring number, i.e. C monitoring number = thousand-digit x 10 + hundred-digit, C monitoring number = ten-digit x 10 + individual digit. **See the table of monitoring codes for details of the meaning** **LED "0" and "00" digit: display the first group** 0000～6969 **LED "000" and "0000" digit: display the second group**0000～6969	1101	•	0x40E
F4.15	Keypad first line running		0402	•	0x40F
F4.16	Keypad first line stop		1100	•	0x410
F4.17	Keypad first line stop		1100	•	0x411
F4.18	Contents of the second line of the keypad	Valid for double row keyboards only, see details（F4.14～F4.17）description	0201	•	0x412

F4.19	Contents of the second line of the keypad		1004	•	0x413
F4.20	Contents of the second line of the keyboard in stop state		1100	•	0x414
F4.21	Keypad second line down		1100	•	0x415
F4.22	Keypad display settings	**LED "0" digit: output frequency selection** 0: Target frequency Displays the target frequency of the currently controlled motor. 1: Synchronous frequency Displays the output frequency of the AC drive after calculation. **LED "00" digit: Reserved** **LED "000" digit: power display dimension** Select the unit of output power for C-10 0: Power display percentage (%) Displays the percentage of output power, 100.0% corresponds to the rated power of the motor. 1: Power display kW (kilowatt) Displays the actual value of output power. **LED "0000" digit: Reserved**	0000	•	0x416
F4.23	Monitoring display options	**LED "0" digit: C-00～C-39** 0: Normal 1: Debug **LED "00" digit: C-40～C-69** 0: Internal AC drive parameters 1: Internal AC drive parameters 2: V/F internal parameters 3: VC internal parameters 4: TUNE internal parameters 5: Lift control parameters 6: Tower crane control parameters **LED "000" digit: Reserved** **LED "0000" digit:** Reserved	0050	•	0x417

F4.24	Speed display coefficients	Display coefficient for keypad monitoring item C-05 "Mechanical speed". Setting range：0.0%～500.0%	100.0%	•	0x418
F4.25	Power display coefficient	Used to calibrate the display factor of the keypad monitoring item C-10 output power value. Setting range：0.0%～500.0%	100.0%	•	0x419
F4.26	Alarm selection 1	LED “0” digit: E.EEP fault (EEPROM storage fault) 0: Alarm and free stop 1: Alarm and continue operation LED “00” digit: reserved LED “000” digit: reserved LED “0000” digit: reserved	0000	○	0x41A
F4.28	Fan control	0: After power on the fan runs 1: Stop associated with temperature, running is rotary 2: Running associated with temperature, stop while the fan stops	1	•	0x41C
F4.29	Energy brake enable	0：OFF The AC drive does not control the energy braking of the motor, regardless of the bus voltage. 1：ON The bus voltage exceeds the energy braking action voltage and the AC drive controls the energy braking of the motor.	1	•	0x41D
F4.30	Energy consumption brake operating voltage	When the AC drive DC bus voltage rises and exceeds [F4.30], the AC drive energy brake starts to operate. Setting range：115.0%～140.0%	128.0%	•	0x41E
F4.31	Energy consumption brake usage	0.0%～100.0%	100.0%	•	0x41F
F4.32	PWM carrier frequency	Used to set the switching frequency of the AC drive IGBT. Set this parameter when adjusting electromagnetic noise and reducing leakage current. This function is mainly used to improve noise and vibration phenomena that may occur during the operation of the AC drive. The current waveform is ideal at	1.5kHz	※	0x420

		higher carrier frequencies and the motor is less noisy. This is very suitable in places where silence is required. However, at this time the switching losses of the main components are higher, the machine generates more heat, the efficiency decreases and the power output is reduced. Another problem when operating at high carrier frequencies is the increase in capacitive leakage currents, which can lead to malfunctioning and overcurrent when a leakage protector is fitted. When operating at low carrier frequencies, the opposite is true. When the user uses more than the default carrier frequency, a derating of 5% is required for each additional 1kHz carrier frequency. Setting range：0.7kHz～16.0kHz			
F4.33	PWM control mode	**LED "0" digit: carrier associated with temperature** 0: Temperature independent 1: Temperature dependent When the temperature of the AC drive is too high, the AC drive will automatically reduce the carrier frequency; using this function reduces the switching losses of the power devices and prevents frequent alarms of overheating faults in the AC drive. **LED "00" digit: Carrier associated with output frequency** 0: Independent of output frequency 1: Related to the output frequency When the carrier frequency is associated with the output frequency, the frequency converter can automatically adjust the carrier frequency according to the output frequency, this function can improve the low frequency performance of the frequency	1000	•	0x421

		converter and the high frequency silence effect. **LED "00" digit: random PWM valid** **0: Prohibited** **Fixed frequency of motor noise.** **1: Valid** This method enables the harmonic spectrum of the AC drive output voltage to be evenly distributed over a wide frequency range, effectively suppressing high frequency motor noise. **LED "0000" digit: PWM modulation mode** Selects the PWM mode of the AC drive. 0: Only three-phase modulation is used 1: Automatic switching between two-phase and three-phase modulation			
F4.34～F4.37		Reserved			

6.6 F5 Motor Parameter Group

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F5.00	Motor mode	0: Asynchronous motors (AM) 1: Permanent magnet synchronous motors (PMSM)	0	×	0x500
F5.01	Number of motor poles	2～98	4	○	0x501
F5.02	Motor rated power	0.1kW～1000.0kW	Model set	※	0x502
F5.03	Motor rated frequency	0.01Hz～Max. frequency	Model set	※	0x503
F5.04	Motor rated speed	1rpm～65000rpm	Model set	※	0x504
F5.05	Motor rated voltage	1V～1500V	Model set	※	0x505

F5.06	Motor rated current	0.1A～3000.0A	Model set	※	0x506
F5.07	Asynchronous motor no-load current	0.1A～3000.0A	Model set	※	0x507
F5.08	Asynchronous motor stator resistance	0.01%～50.00%	Model set	※	0x508
F5.09	Asynchronous motor rotor resistance	0.01%～50.00%	Model set	※	0x509
F5.10	Asynchronous motor stator leakage inductance	0.01%～50.00%	Model set	※	0x50A
F5.11	Asynchronous motor stator inductance	0.1%～2000.0%	Model set	※	0x50B
F5.20	Motor parameters auto-tuning selections	0: No operation 1: Rotary type auto-tuning 2: Static type auto-tuning 3: Stator resistance fast self-learning	0	○	0x514
F5.21～F5.29		Reserved			
F5.30	Speed feedback or encoder mode	**LED “0” digit: encoder mode** 0: Common ABZ encoder 1: Rotary encoder **LED “00” digit: encoder direction** 0: same direction 1: reverse direction **LED “000” digit: wire break** inspection 0: OFF 1: ON **LED “0000” digit: Z pulse correction enabled** 0: OFF	0000	○	0x51E

		1: ON			
F5.31	ABZ encoder lines	1～10000	1024	○	0x51F
F5.32	wire break inspection time	0.100s～60.000s	0.500s	•	0x520
F5.33	Rotary encoder poles	The number of poles is set according to the actual choice of resolver, generally 2-pole resolver. Setting range：2～128	2	○	0x521
F5.34	Encoder ratio numerator	If the motor encoder is not mounted on the motor shaft, the motor speed and motor position can be obtained indirectly by setting the transmission ratio in order to realise the closed-loop vector function, provided that the motor shaft and the encoder are rigidly connected and that the number of encoder lines converted to the motor shaft is not too low for synchronous motor control. Setting range：1～32767	1	○	0x522
F5.35	Encoder ratio denominator		1	○	0x523
F5.36	Encoder speed first order filtering time	If the motor encoder feedback interference is large, the filtering time of the speed measurement can be increased appropriately, but the increase of the filtering time will reduce the response performance of the system, in some occasions with high requirements for response performance, the filtering time is too large will lead to system oscillation. Setting range：0.0ms～100.0ms	1.0ms	•	0x524
F5.37-F5.38		Reserved			
F5.39	PG feedback frequency control word	**LED "0" digit:** Open loop speed measurement 0：OFF 1：ON **LED "00" digit:** Reserved	0001	•	0x527

		LED "000" digit: Reserved **LED "0000" digit:** Reserved			
F5.40～F5.49		Reserved			

6.7 F6 Motor VC Parameter Group

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F6.00	ASR (speed loop) proportional gain 1	The proportional gain and integration time of the ASR (speed loop) can be adjusted: increasing the proportional gain speeds up the dynamic response of the system; however, if the proportional gain is too large, the system is prone to oscillation. Decreasing the integration time speeds up the dynamic response of the system; however, if the integration time is too small, the system will overshoot and oscillate easily. The proportional gain is usually adjusted first to ensure that the system does not oscillate, and then the integration time is adjusted so that the system has a fast response and does not overshoot too much. Note: When the proportional gain is too large and the integration time is too small, the system may produce an overvoltage fault after a fast start to high speed (if there is no external braking resistor or braking unit), which is due to the system regenerating braking state energy back during the descent after speed overshoot. This can be avoided by reducing the proportional gain and	10.00	•	0x600
F6.01	ASR integral time 1		0.100s	•	0x601
F6.02	ASR filter time1		0.0ms	•	0x602
F6.03	ASR switch frequency 1		0.00Hz	•	0x603
F6.04	ASR (speed loop) proportional gain 2		10.00	•	0x604
F6.05	ASR (speed loop) integral time 2		0.100s	•	0x605

F6.06	ASR filter time 2	increasing the integration time parameter. ASR (speed loop) in high and low speed operation occasions proportional gain, integration time parameters adjustment: If the system has fast response requirements for both high and low speed with load operation, the ASR switching frequency can be set [F6.03] and [F6.07]. Usually the system is operated at low frequencies, to improve the dynamic response characteristics, the proportional gain can be relatively increased and the integration time reduced. The speed regulator parameters are generally adjusted in the following order: select the appropriate switching frequencies [F6.03] and [F6.07]. When the output frequency is above the switching frequency 1 [F6.03], the first set of ASR (speed loop) parameters is valid; when the output frequency is below the switching frequency 2 [F6.07], the second set of ASR (speed loop) parameters is valid; when the output frequency is between the switching frequency 1 [F6.03] and the switching frequency 2 [F6.07], the parameters move from the first set of ASR (speed loop) parameters to the second set of ASR (speed loop) parameters. ASR (speed loop) parameters to the second set of ASR (speed loop) parameters in a proportional linear transition. Adjust the ASR (speed loop) proportional gain2 [F6.04] and	0.0ms	•	0x606
F6.07	ASR switch frequency 2		0.00Hz	•	0x607

		ASR (speed loop) integration time2 [F6.05] at low speeds to ensure no oscillations and good dynamic response characteristics at low frequencies. Adjust the ASR (speed loop) proportional gain 1 [F6.00] and ASR (speed loop) integration time 1 [F6.01] at high speed to ensure that the system does not oscillate and has good dynamic response characteristics. When the switching frequency 1 [F6.03] is set to zero, only the first set of speed loop parameters is used. Setting range： F6.00：0.01～100.00 F6.01：0.000s～6.000s F6.02：0.0ms～100.0ms F6.03：0.00Hz～F6.07 F6.04：0.01～100.00 F6.05：0.000s～6.000s F6.06：0.0ms～100.0ms F6.06 ： 0.00Hz ～ Max. frequency F6.07：0.00Hz～F6.03			
F6.08	Electric motor torque limit	Set the upper torque output limit of the motor, percentage relative to the rated torque of the motor, valid under open-loop and closed-loop vectoring for asynchronous and synchronous machines. The motor torque output is also limited by the AC drive output current limit point [FA.01] and the output power [F6.27]. Setting range：0.0%～250.0%	180.0%	•	0x608
F6.09	Power generation torque limit		180.0%	•	0x609
F6.10	Current loop D-axis proportional gain	Set the PI parameters of the current loop during vector control of asynchronous and synchronous machines. When vector control, if speed and	1.000	•	0x60A
F6.11	Current loop D-axis integral gain		1.000	•	0x60B

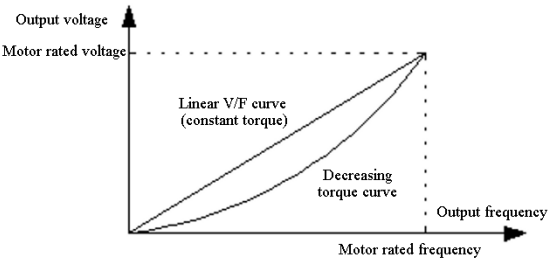
F6.12	Current loop Q-axis proportional gain	current oscillation and instability occur, each gain can be reduced appropriately to achieve stability; at the same time, increasing each gain helps to improve the dynamic response of the motor. Setting range：0.001～4.000	1.000	•	0x60C
F6.13	Current loop Q-axis integral gain		1.000	•	0x60D
F6.15	Vector controlled electric differential compensation	Asynchronous vector control is effective, when open-loop vectoring, the differential compensation coefficient is used to adjust the motor's speed stabilization accuracy, which needs to be increased when the motor speed is lower than the set value after carrying a load, and vice versa. This value is used to adjust the linearity of the motor output torque and output current when the motor is loaded with a rated load and the motor current deviates significantly from the rated value on the nameplate, the value is reduced for larger deviations and increased for smaller deviations. Setting range：0.0%～250.0%	100.0%	•	0x60F
F6.16	Vector controlled power generation differential compensation		0.0%	•	0x610
F6.18	Position compensation control	Closed-loop vector control is effective, using this function motor zero speed can achieve zero servo function, non-zero speed operation can increase the rigidity of the motor. When compensation control is enabled, compensation gain is used to adjust the strength of the compensation and compensation limit is used to limit the amplitude of the compensation, relative to the maximum output frequency of the AC drive and valid below	0	○	0x612

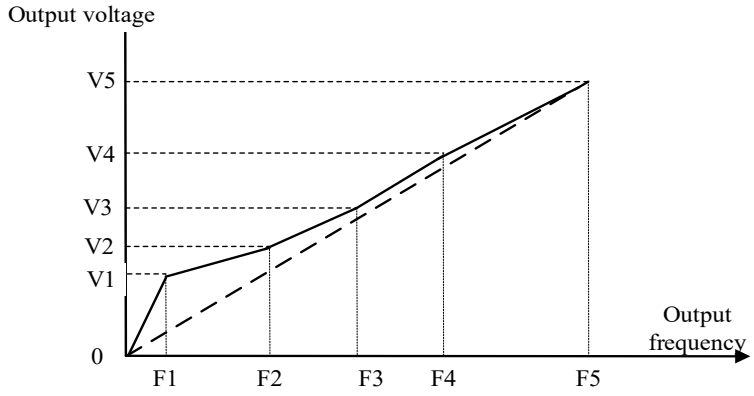
		the compensation action range frequency, relative to the maximum output frequency of the AC drive. 0：OFF 1：ON			
F6.19	compensation gain	Closed-loop vector control is effective, using this function motor zero speed can achieve zero servo function, non-zero speed operation can increase the rigidity of the motor. When compensation control is enabled, compensation gain is used to adjust the strength of the compensation and compensation limit is used to limit the amplitude of the compensation, relative to the maximum output frequency of the AC drive and valid below the compensation action range frequency, relative to the maximum output frequency of the AC drive. Setting range： F6.19：0.0%～250.0% F6.20：0.0%～100.0% F6.21：0.0%～100.0%	0.0%	○	0x613
F6.20	compensation limit		0.0%	○	0x614
F6.21	compensation effective range		10.0%	○	0x615
F6.22	Over excitation braking gain	The greater the overexcitation gain, the faster the control response and the greater the braking limit relative to the motor's rated excitation, the better the braking effect. The higher the overexcitation gain, the faster the control response. Setting range：0.0%～500.0%	100.0%	○	0x616
F6.23	Over excitation braking amplitude limit		100.0%	○	0x617
F6.24	Vector control energy saving function	Vector control of asynchronous machines is effective, and energy-saving operation is achieved by analysing the torque output and automatically	0	○	0x618
F6.25	Energy saving control gain		50.0%	•	0x619

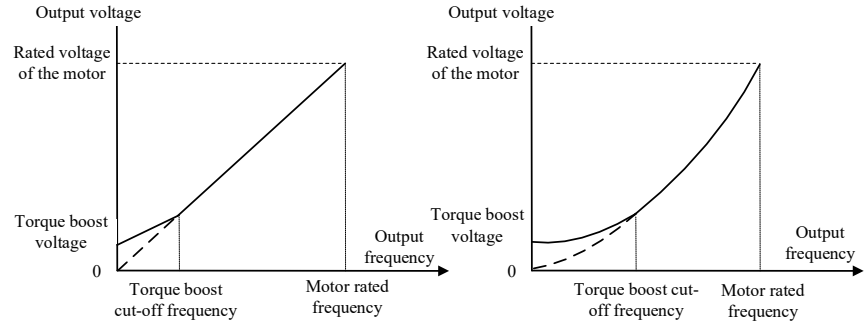
F6.26	Energy saving control low-pass filter	reducing the output current in order to reduce the heat loss of the motor. Setting range： F6.24： 0：OFF 1：ON F6.25：0.0%～80.0% F6.26：0.000s～6.000s	0.010s	•	0x61A
F6.27	Motor constant power area power limit	Under vector control, the motor's shaft output power size is controlled. When the motor is running at low and medium speeds, the motor output power is small, when the motor torque is mainly limited by the electric/generating torque [F6.08 to F6.09], when running at high speeds and above rated speed, when the output power is limited by [F6.27], the motor torque output decreases in inverse proportion to the speed. Setting range：0.0%～250.0%	200.0%	•	0x61B
F6.28	Motor weak magnetic current upper limit	When vector control of asynchronous and synchronous motors, if the motor running speed is above the rated speed, or if the bus voltage is low and the motor running speed is near the rated speed, the AC drive needs to control the motor with weak magnetism to make the motor speed track the set speed. [F6.28] sets the upper limit of the demagnetisation current, which is valid for synchronous motors, as the motor will be irreversibly demagnetised if the demagnetisation current is too high in relation to the rated motor current. When instability occurs during the weak magnetisation process, adjust this set of parameters for commissioning.	60.0%	○	0x61C
F6.29	Motor weak magnetic feed forward gain		10.0%	•	0x61D
F6.30	Motor weak magnetic gain		10.0%	•	0x61E

		Setting range： F6.28：0.0%～250.0% F6.29：0.0%～200.0% F6.30：0.0%～500.0%			
F6.31～F6.79		Reserved			

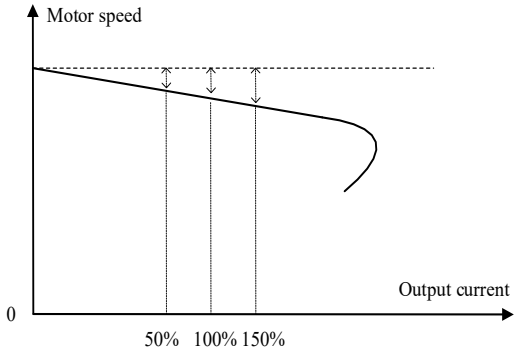
6.8 F8 Motor V/F Control Parameter

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F8.00	Linear VF curve selection	Used to select the type of V/F curve to suit different load characteristics. 0: linear V/F 1-9: 1.1-1.9 power V/F down **torque curves respectively, as shown below** 10: Square V/F curve 11: Custom V/F curve Refer to [F8.01 ~ F8.10] and [F8.25 ~ F8.34]. The default linear V/F curve is suitable for most general-purpose applications; the multiple power curve and square V/F curve are generally used for fans or pumps to reduce high frequency currents and achieve energy savings.	0	○	0x800
Schematic diagram of straight V/F vs. reduced torque curve  					
F8.01	Self-setting voltage V1	[F8.01 to F8.10] is used to customize the V/F curve, if FF.02 hundred is set to 1, it only indicates the custom V/F curve for forward	4.5%	○	0x801
F8.02	Self-setting frequency F1		0.0%	○	0x802

F8.03	Self-setting voltage V2	operation, the custom V/F curve for reverse operation is determined by [F8.25 to F8.34], the first/two/three/four/five voltages (100.0% corresponds to the rated voltage of the motor) of the user-set V/F curve correspond to F1/F2/F3/F4/F5 frequency points (100.0% corresponds to the motor rated frequency); the user sets the first/two/three/four/five frequency values of the V/F curve, which correspond to V1/V2/V3/V4/V5 respectively. The following conditions must be met for this set of parameters to be set. 0≤F1≤F2≤F3≤F4≤F5≤100.0%; 0≤V1≤V2≤V3≤V4≤V5≤100.0% Setting range：0.0%～100.0%	5.6%	○	0x803
F8.04	Self-setting frequency F2		1.0%	○	0x804
F8.05	Self-setting voltage V3		15.6%	○	0x805
F8.06	Self-setting frequency F3		10.0%	○	0x806
F8.07	Self-setting voltage V4		24.0%	○	0x807
F8.08	Self-setting frequency F4		20.0%	○	0x808
F8.09	Self-setting voltage V5		100.0%	○	0x809
F8.10	Self-setting frequency F5		100.0%	○	0x80A
Self-setting V/F curve  					
F8.11	Output voltage percentage	The output voltage adjustment factor of the frequency converter. This function is used to adjust the output voltage of the frequency converter to suit different V/F characteristics. Setting range：25.0%～120.0%	100.0%	○	0x80B
F8.12	Torque boost	Torque boost: [F8.12] is set to 0.0 for automatic torque boost, which automatically compensates the output voltage according to the size	0.0%	•	0x80C
F8.13	Torque boost cut-off frequency		100.0%	•	0x80D

		of the load; [F8.12] is set to other values for fixed torque boost, which compensates the output voltage according to the output frequency to improve the low frequency torque characteristics of the AC drive. Please select the torque boost value according to the load size. If the torque boost value is too high in low frequency operation, the motor may be over-excited and overheat easily for a long time, and the AC drive may be over-current fault protected or the AC drive may not start normally in serious cases. **Note:** When parameter [F8.00] is set to "11" for the custom V/F curve, the torque boost value set in parameter [F8.12] is invalid and the frequency converter operates according to the custom V/F curve. Setting range: F8.12: 0.0%～30.0% F8.13: 0.0%～100.0%			
Torque boost diagram  					
F8.14	Differential compensation gain	This function enables the output frequency of the AC drive to be automatically adjusted within a set range in response to changes in the motor load; to dynamically compensate for the differential frequency of the motor, thus	0.0%	•	0x80E

F8.15	Transition compensation limit	enabling the motor to maintain a basically constant speed, effectively reducing the impact of load changes on the motor speed. If used in conjunction with the automatic torque boost function, the low frequency torque characteristics of the AC drive can be significantly improved. The 100.0 % of the differential frequency compensation corresponds to the nominal motor rpm. Setting the compensation value too high may cause the motor speed to exceed the set value and therefore requires [F8.15] to set a limit. The differential compensation filtering time is the size of the filtering of the differential compensation, which is used to eliminate disturbing signals. The longer the filtering time, the stronger the immunity to interference but the slower the response time; the shorter the filtering time, the weaker the immunity but the faster the response time. Setting range： F8.14：0.0%～200.0% F8.15：0.0%～300.0% F8.16：0.000s～6.000s	100.0%	•	0x80F
F8.16	Rotation difference compensation filtering time		0.200s	•	0x810
Differential compensation diagram					



F8.17	Oscillation rejection gain	0.0%～900.0%	100.0%	•	0x811
F8.18	Oscillation rejection filtering factor	0.0～100.0	1.0		0x812
F8.19	Auto energy saving control	0：OFF 1：ON	0	○	0x813
F8.20	Energy saving frequency lower limit	0.00Hz～50.00Hz	15.00Hz	○	0x814
F8.21	Energy saving voltage lower limit	20.0%～100.0%	50.0%	○	0x815
F8.22	Energy saving voltage regulation rate	0.000 V/ms～0.200 V/ms	0.010V /ms	•	0x816
F8.23	Energy saving voltage recovery rate	0.000V/ms～2.000 V/ ms	0.200V /ms	•	0x817
F8.24	Reserved				
F8.25	Reverse running self-setting voltage V1	[F8.25 to F8.34] is used to define a custom curve for reverse operation. The user sets the first/two/three/four/five voltages of the V/F curve (100.0% corresponds to the rated voltage of the motor), which correspond to the frequency points of F1/F2/F3/F4/F5 (100.0% corresponds to the rated frequency of the motor); the user sets the	5.6%	○	0x819
F8.26	Reverse operation self-setting frequency F1		0.0%	○	0x81A
F8.27	Reverse operation self-		5.6%	○	0x81B

	setting voltage V2	first/two/three/four/five frequency values that correspond to V1/V2/V3/V4/V5 respectively. The following conditions must be met for this set of parameters to be set. 0≤F1≤F2≤F3≤F4≤F5≤100.0%; 0≤V1≤V2≤V3≤V4≤V5≤100.0% Setting range：0.0%～100.0%			
F8.28	Reverse operation self-setting frequency F2		1.0%	○	0x81C
F8.29	Reverse operation self-setting voltage V3		11.6%	○	0x81D
F8.30	Reverse operation self-setting frequency F3		10.0%	○	0x81E
F8.31	Reverse operation self-setting voltage V4		21.0%	○	0x81F
F8.32	Reverse operation self-setting frequency F4		20.0%	○	0x820
F8.33	Reverse operation self-setting voltage V5		100.0%	○	0x821
F8.34	Reverse running self-setting frequency F5		100.0%	○	0x822
F8.35	Stator resistance thermal compensation factor	100.0%～150.0%	110.0%	•	0x823
F8.36	Compensation initial value	0.0%～2.0%	0.0%	•	0x824
F8.37	Automatic torque boosts proportional gain	0.00～1.00	0.06	•	0x825

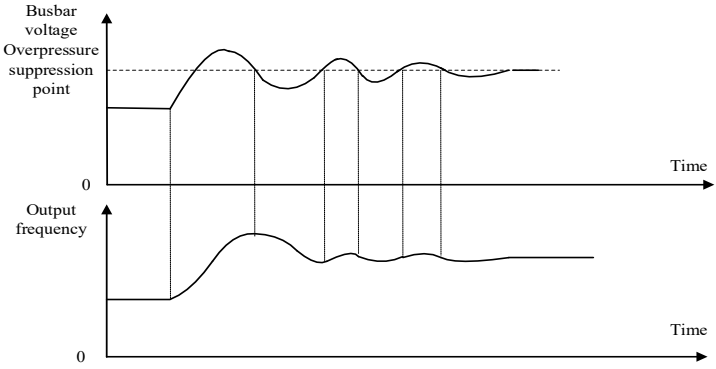
F8.38	Automatic torque boosts integral gain	0.00～1.00	0.01	•	0x826
F8.39	Overcurrent suppression cut-off frequency	0.00Hz～10.00Hz	2.00Hz	•	0x827

6.9 FA Protection and Fault Parameter Groups

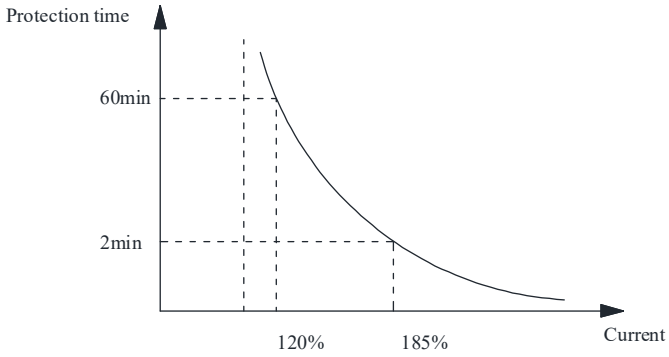
NO.	Function description	Range of settings and definition	Factory default	Feature	Address
FA.00	Overcurrent suppression function	By monitoring the load current in real time during operation, it is automatically limited not to exceed the set overcurrent suppression point in order to prevent fault tripping caused by excessive current, which is particularly suitable for some loads with large inertia or drastic changes 0：Valid throughout； 1：Valid for acceleration and deceleration, not for constant speed 2：Invalid	2	•	0xA00
FA.01	Overcurrent suppression point	Overcurrent suppression point：Set current limit level (the AC drive controls the output current by stopping acceleration or deceleration or by lowering or raising the output frequency) Overcurrent suppression gain：This parameter allows the speed of response of the overcurrent suppression to be adjusted. **Notes:** The use of this function may extend the acceleration/deceleration time. If the output frequency does not run at the desired acceleration/deceleration time to the given frequency in the event of a high current during the start/stop process of the AC drive, this indicates that the current limiting function is operating,	180.0%	•	0xA01
FA.02	Overcurrent suppression gain		100.0%	•	0xA02

		so please reduce the load or adjust the relevant parameters. Setting range: FA.01: 0.0%～300.0% FA.02: 0.0%～500.0%			
FA.03	Current hardware protection settings	**LED "0" digit: Wave-by-wave current limiting** Wave-by-wave current limiting can limit the rise of current to a certain extent through hardware protection, so that the current does not exceed the protection value of the AC drive, avoiding a jump overcurrent fault and shutdown. 0: Off 1: On **LED "0" digit: OC protection interference suppression** When this function is active, the AC drive makes an intelligent judgement on the E. OC alarm, eliminates interference and only alerts on the real fault signal. This function may delay the alarm time, please use it with caution. 0: Off 1: First grade interference suppression 2: Second grade interference suppression **LED "000" digit: SC protection First grade interference suppression** When this function is active, the AC drive makes an intelligent judgement on the E. SC alarm, eliminates interference and only alerts on the real fault signal. This function may delay the alarm time, so please use it with caution.	0000	○	0xA03

		0: Off 1: First grade interference suppression 2: Second grade interference suppression			
FA.04	Reserved				
FA.05	Bus over voltage hardware protection	Protection against bus voltage rise by hardware is a backup and complement to the software protection and improves equipment reliability. 0: Off 1: On	0	○	0xA05
FA.06	Bus over voltage suppression function	**LED "0" digit: Over voltage suppression control** 0: disable 1: Enabled only during deceleration 2: Enabled under both acceleration and deceleration Selects whether the voltage suppression function is valid when the frequency converter is decelerating. If this function is valid, when the AC drive bus voltage reaches or exceeds the value set in [FA.07] during deceleration, the AC drive will slow down or stop deceleration, thus ensuring that the AC drive does not trip the overvoltage protection because the bus voltage is too high. Selects whether the voltage suppression function is effective when the frequency converter is accelerating. When the AC drive accelerates to a bus voltage that reaches or exceeds the value set in [FA.07], the AC drive will automatically adjust the operating frequency to suppress the bus voltage increase, thus ensuring that the AC drive is not protected against overvoltage due to high bus voltage. This function is particularly effective for eccentric loads.	0000	○	0xA06

		LED "00" digit: Over-excitation control 0: Off 1: On **LED "000" digit： Reserved** **LED "0000" digit： Reserved** Setting range：0000～0012			
FA.07	Bus over voltage suppression point	When the bus voltage reaches or exceeds the bus over-voltage suppression point [FA.07] during the operation of the AC drive, the AC drive will automatically adjust the operating frequency to suppress the bus voltage increase, thus ensuring that the AC drive is not protected from over-voltage due to high bus voltage. Adjusting [FA.08] improves the overvoltage suppression effect. Setting [FA.08] to 0 is equivalent to switching off the overvoltage suppression function, which is effective for any motor control method. Setting range： FA.07：110.0%～150.0% FA.08：0.0%～500.0%	128.0%	○	0xA07
FA.08	Bus over voltage suppression gain		100.0%	○	0xA08
Overpressure suppression diagram  					
FA.09	Bus under voltage suppression function	When the bus voltage reaches or falls below the bus undervoltage suppression point [FA.10] during the operation of the AC drive, the AC drive will automatically adjust the operating frequency to suppress the bus voltage	0	○	0xA09
FA.10	Bus under voltage		80.0%	○	0xA0A

	suppression point	reduction, thus ensuring that the AC drive does not cause undervoltage protection due to low bus voltage. Adjusting [FA.11] can improve the undervoltage suppression effect, and setting [FA.09] to 0 is equivalent to turning off the overvoltage suppression function, and undervoltage suppression is effective for any motor control mode. Setting range： FA.09： 0: prohibit 1: Enabled FA.10：60.0%～90.0% FA.11：0.0%～500.0%			
FA.11	Bus under voltage suppression gain		100.0%	○	0xA0B
FA.12	Bus under voltage protection point	Bus under-voltage protection point: This parameter specifies the lower limit voltage allowed for the bus voltage when the AC drive is working normally. For some occasions where the power grid is low, the under-voltage protection level can be reduced appropriately to ensure the normal operation of the AC drive. **Note**: When the grid voltage is too low, the output torque of the motor will drop. For constant power loads and constant torque loads, too low a grid voltage will increase the AC drive input and output current, thus reducing the reliability of the AC drive operation. Setting range：60.0%～90.0%	60.0%	○	0xA0C
FA.15	Loss phase protection	**LED "0" digit: Output loss phase protection** 0: Off 1: On Output phase failure fault when motor is running out of phase E. oLF LED "00" digit: Input loss phase protection	0031	○	0xA0F

		0：Off 1：Open the alarm（A. iLF） 2：Open the fault（E. iLF） 3：Stop alarm, operating fault report **LED "000" digit**：Reserved **LED "0000" digit**：Reserved			
FA.16	Motor overload protection curve coefficient	Current entering the protection curve = (actual motor current / motor overload protection coefficient) x 100%, so increasing [FA.16] can improve the motor overload capacity; [FA.16] sets the motor overload warning coefficient, when the motor overload degree reaches the coefficient set by [FA.16], the AC drive will warn through the terminal output, see Y terminal function for details **Note**: When one AC drive is running in parallel with more than one motor, the thermal relay protection function of the AC drive will lose its function. To effectively protect the motor, please install a thermal protection relay at the inlet end of each motor. Setting range：0.0%～250.0%	100.0%	○	0xA10
Schematic diagram of the overload protection curve  					
FA.17	Load advance alarm detection setting	**LED "0" digit: Detection selection (protection 1)** 0: Not detected 1: Detected load is too large	0000	○	0xA11

		2: Detected load is too large only at constant speed 3: Insufficient load detected 4: Insufficient load only at constant speed **LED "00" digit: Alarm selection** 0: Alarm and continue operation 1: Fault protection and free stop **LED "000" digit: Detection selection (protection 2)** 0: Not detected 1: Detected load is too large 2: Detected load is too large only at constant speed 3: Insufficient load detected 4: Insufficient load only at constant speed **LED "0000" digit: Alarm selection** 0: Alarm and continue operation 1: Fault protection and free stop			
FA.18	Load warning detection level1	The motor output current is used as the load warning judgement value, 100.0% corresponds to the rated motor current; the load warning judgement value is compared with the detection threshold [FA.18/FA.20] both within the detection time [FA.19/FA.21] and the corresponding action is made according to [FA.17], the warning can be made via the terminal output, see Y terminal function for details. Setting range: FA.18: 0.0%～200.0% FA.19: 0.0s～60.0s FA.20: 0.0%～200.0% FA.21: 0.0s～60.0s	130.0%	○	0xA12
FA.19	Load warning detection time1		5.0s	○	0xA13
FA.20	Load warning detection level 2		20.0%	○	0xA14
FA.21	Load warning detection time 2		0.5s	○	0xA15
FA.22	Reserved				

FA.23	Excessive speed deviation protection action	**LED "0" digit: Detection selection** 0: Not detected 1: Detected at constant speed 2: Detecting **LED "00" digit: Alarm selection** 0: Free stop and report fault 1: Alarm and continue operation **LED "000" digit: Reserved** **LED "0000" digit: Reserved**	0001	○	0xA17
FA.24	Excessive speed deviation detection threshold	Under vector control, when the deviation between the speed feedback value and the speed setting value is greater than the detection threshold [FA.24] within the detection time [FA.25], the frequency converter considers the detection deviation to be too large and takes the corresponding action according to [FA.23]. The speed deviation detection threshold of 100.0% corresponds to Max. frequency Setting range: FA.24: 0.0%～60.0% FA.25: 0.0s～60.0s	10.0%	○	0xA18
FA.25	Excessive speed deviation detection time		2.0s	○	0xA19
FA.26	Flying speed protection action	**LED "0" digit: Detection selection** 0: Not detected 1: Detected at constant speed 2: Detecting **LED "00" digit: Alarm selection** 0: Free stop and report fault 1: Alarm and continue running **LED "000" digit: Reserved** **LED "0000" digit: Reserved**	0002	○	0xA1A
FA.27	Speed detection threshold	When the speed feedback value is greater than the detection threshold [FA.27] within the detection time [FA.28], the frequency converter considers the motor speed to be abnormally high and acts accordingly according to [FA.26]. Speed detection	110.0%	○	0xA1B
FA.28	Speed detection time		0.050s	○	0xA1C

		threshold 100% corresponds to Max. frequency Setting range： FA.27:0.0%～150.0% FA.28:0.000s～2.000s			
FA.29	Current imbalance detection threshold 1	If the ratio of the maximum phase current to the minimum current is greater than FA.29/FA.31 and lasts for a number of times FA.30/FA.32, an output imbalance fault E. oLF is reported (FA.29 = 1404) This function is not valid when the threshold is set to less than 110.0%. FA.29/30 for V/F control, FA.31/32 for vector control FA.29/FA.31 Setting range：0.0%～400.0% FA.30/FA.32 Setting range：0～50	180.0%	•	0xA1D
FA.30	Number of current unbalance detections 1		30	•	0xA1E
FA.31	Current unbalance detection threshold 2		125.0%	•	
FA.32	Number of current unbalance detections 2		10	•	
FA.33～FA.36		Reserved			
FA.37	Malfunction self-recovery times	Fault self-recovery times： 0：Off No automatic reset function, only manual reset. 1～5：ON Function on, 1 ~ 5 is the number of self-recoveries after a fault (defined as the maximum number of self-recoveries after each fault). Frequency converters can be shut down during operation due to load fluctuations, fluctuations in grid voltage and other accidental factors. At this point, in order to ensure the continuity of system work, the frequency converter is allowed to automatically reset and resume operation for fault types such as overload, overcurrent, system abnormality, overvoltage and undervoltage in operation. During the self-recovery process the frequency	0	○	
FA.38	Malfunction self-recovery interval		1.0	○	

		converter resumes operation in the form of speed tracking and restart. If the AC drive does not successfully resume operation within the set number of times, it is fault-protected, stops output and automatically clears the fault recovery count. The number of fault recovery counts is recommended to be set to 1, as several consecutive fault restarts may cause damage to the AC drive. The fault output terminals can be selected to operate or not to operate during fault self-recovery, see [F2.45 to F2.47] for details. Fault self-recovery interval: This parameter is defined as the waiting time after a fault has occurred in the frequency converter until each reset. **Attention：** 1、This function is only valid for faults such as overload, overcurrent, system abnormality, overvoltage and undervoltage during operation, but not for other faults. 2、The AC drive cannot be reset when the fault is not lifted. Tip: The start-up characteristics of the machinery and equipment must be carefully considered in use. Please use this function carefully for occasions where it is not possible to start with a load or where the AC drive must alarm immediately when there is no output. FA.37 Setting range:0～5 FA.38 Setting range:0.1s～100.0s			
FA.39	Malfunction diagnosis information	See fault code table	--	×	0xA27
FA.40	Malfunction types	See fault code table	--	×	0xA28
FA.41	Malfunction running frequency	0.00Hz～Max. frequency	--	×	0xA29

FA.42	Malfunction output voltage	0V～1500V	--	×	0xA2A
FA.43	Malfunction output current	0.1A～2000.0A	--	×	0xA2B
FA.44	Malfunction bus voltage	0V～3000V	--	×	0xA2C
FA.45	Malfunction module temperature	0℃～100℃	--	×	0xA2D
FA.46	Malfunction machine state	**LED "0" digit:** Running direction 0: FWD 1: REV **LED "00" digit:** Running status 0: Stop 1: Accelerate 2: Deceleration 3: Constant speed **LED "000" digit: Reserved** **LED "0000" digit: Reserved**	--	×	0xA2E
FA.47	Malfunction input terminal status	See input terminal chart	--	×	0xA2F
FA.48	Malfunction output terminal status	see output terminal chart	--	×	0xA30
FA.49	The last malfunction types	Please see malfunction code table	--	×	0xA31
FA.50	The last malfunction running frequency	0.00Hz～Max. frequency	--	×	0xA32
FA.51	The last malfunction	0V～1500V	--	×	0xA33
FA.52	The last malfunction output current	0.1A～2000.0A	--	×	0xA34
FA.53	The last malfunction bus voltage	0V～3000V	--	×	0xA35
FA.54	The last malfunction module temperature	0℃～100℃	--	×	0xA36
FA.55	The last machine state	**LED "0" digit:** Running direction 0: FWD 1: REV	--	×	0xA37

		LED "00" digit: Running status 0: Stop 1: Accelerate 2: Deceleration 3: Constant speed **LED "000" digit: Reserved** **LED "0000" digit: Reserved**			
FA.56	The last malfunction input terminal state	See input terminal chart	--	×	0xA38
FA.57	The last malfunction output terminal state	See output terminal chart	--	×	0xA39
FA.58	The first two malfunction types	Please see malfunction code table	--	×	0xA3A
FA.59	The first three malfunction types	Please see malfunction code table	--	×	0xA3B

6.10 Fb Step Acceleration and Deceleration

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
Fb.00	Acceleration Zone 1	0.1%～Fb.02	10.0%	•	0xB00
Fb.01	Step acceleration time 1	0.00s～30.00s	0.50s	•	0xB01
Fb.02	Acceleration zone 2	Fb.00～Fb.04	20.0%	•	0xB02
Fb.03	Step acceleration time 2	0.00s～30.00s	1.00s	•	0xB03
Fb.04	Acceleration zone 3	Fb.02～Fb.06	30.0%	•	0xB04
Fb.05	Step acceleration time 3	0.00s～30.00s	1.50s	•	0xB05
Fb.06	Acceleration zone 4	Fb.04～Fb.08	40.0%	•	0xB06
Fb.07	Step acceleration time 4	0.00s～30.00s	1.10s	•	0xB07
Fb.08	Acceleration zone 5	Fb.06～Fb.10	50.0%	•	0xB08

Fb.09	Step acceleration time 5	0.00s～30.00s	1.30s	•	0xB09
Fb.10	Acceleration zone 6	Fb.08～Fb.12	60.0%	•	0xB0A
Fb.11	Step acceleration time 6	0.00s～30.00s	1.50s	•	0xB0B
Fb.12	Acceleration zone 7	Fb.10～Fb.14	80.0%	•	0xB0C
Fb.13	Step acceleration time 7	0.00s～30.00s	3.40s	•	0xB0D
Fb.14	Acceleration	Fb.12～300.0%	100.0	•	0xB0E
Fb.15	Step acceleration time 8	0.00s～30.00s	3.80s	•	0xB0F
Fb.16	Deceleration zone 1	0.1%～Fb.18	6.0%	•	0xB10
Fb.17	Step deceleration time 1	0.00s～30.00s	2.00s	•	0xB11
Fb.18	Deceleration zone 2	Fb.16～Fb.20	20.0%	•	0xB12
Fb.19	Step deceleration time 2	0.00s～30.00s	2.00s	•	0xB13
Fb.20	Deceleration zone 3	Fb.18～Fb.22	30.0%	•	0xB14
Fb.21	Step deceleration time 3	0.00s～30.00s	1.50s	•	0xB15
Fb.22	Deceleration zone 4	Fb.20～Fb.24	40.0%	•	0xB16
Fb.23	Step deceleration time 4	0.00s～30.00s	1.50s	•	0xB17
Fb.24	Deceleration zone 5	Fb.22～Fb.26	50.0%	•	0xB18
Fb.25	Step deceleration time 5	0.00s～30.00s	1.50s	•	0xB19
Fb.26	Deceleration zone 6	Fb.24～Fb.28	60.0%	•	0xB1A
Fb.27	Step deceleration time 6	0.00s～30.00s	1.50s	•	0xB1B
Fb.28	Deceleration zone 7	Fb.26～Fb.30	80.0%	•	0xB1C
Fb.29	Step deceleration time 7	0.00s～30.00s	2.40s	•	0xB1D
Fb.30	Deceleration zone 8	Fb.28～300.0%	100.0%	•	0xB1E

Fb.31	Step deceleration time 8	0.00s～30.00s	2.00s	•	0xB1F

6.11 FC Multi-speed Parameter Setting

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
FC.00	PLC Multi-Speed 1	0.00Hz～600.00Hz	25.00Hz	•	0xC00
FC.01	PLC multi-speed 2	0.00Hz～600.00Hz	5.00Hz	•	0xC01
FC.02	PLC multi-speed 3	0.00Hz～600.00Hz	40.00Hz	•	0xC02
FC.03	PLC multi-speed 4	0.00Hz～600.00Hz	40.00Hz	•	0xC03
FC.04	PLC multi-speed 5	0.00Hz～600.00Hz	50.00Hz	•	0xC04
FC.05	PLC multi-speed 6	0.00Hz～600.00Hz	40.00Hz	•	0xC05
FC.06	PLC multi-speed 7	0.00Hz～600.00Hz	60.00Hz	•	0xC06
FC.07	PLC multi-speed 8	0.00Hz～600.00Hz	20.00Hz	•	0xC07
FC.08	PLC multi-speed 9	0.00Hz～600.00Hz	10.00Hz	•	0xC08
FC.09	PLC multi-speed 10	0.00Hz～600.00Hz	20.00Hz	•	0xC09
FC.10	PLC multi-speed 11	0.00Hz～600.00Hz	30.00Hz	•	0xC0A
FC.11	PLC multi-speed 12	0.00Hz～600.00Hz	40.00Hz	•	0xC0B
FC.12	PLC multi-speed 13	0.00Hz～600.00Hz	5.00Hz	•	0xC0C
FC.13	PLC multi-speed 14	0.00Hz～600.00Hz	40.00Hz	•	0xC0D
FC.14	PLC multi-speed 15	0.00Hz～600.00Hz	80.00Hz	•	0xC0E
FC.15～FC.45		Reserved			
FC.46	Antspeed 1st gear	0.00Hz～50.00Hz	3.00Hz	•	0xC2E
FC.47	Antspeed 2nd gear	0.00Hz～50.00Hz	4.00Hz	•	0xC2F

FC.48	Antspeed 3rd gear	0.00Hz～50.00Hz	5.00Hz	•	0xC30
FC.49	Antspeed 4th gear	0.00Hz～50.00Hz	6.00Hz	•	0xC31
FC.50	Antspeed 5th gear	0.00Hz～50.00Hz	7.00Hz	•	0xC32
FC.51	Speed selection	0: Tower crane integrated machine (FC.46 ~ FC.50) 1: Single antspeed 1 (block frequency*FC.52) 2: Single machine antspeed 2 (FC.53)	0	○	0xC33
FC.52	Antspeed	0.0%～100.0%	20.0%	•	0xC34
FC.53	Antspeed frequency	0.00Hz～50.00Hz	5.00Hz	•	0xC35

6.12 Fd Communication Control Function Parameter Group

NO.	Function	Range of settings and definition	Factory	Feature	Address
Fd.00	Master-Slave Selection	Choose the frequency converter to act as a host or slave when doing Modbus communication. see Appendix II (Modbus communication protocol) for a detailed description of Modbus communication. **LED "0" digit: Modbus main-slave selection** 0: Slave machine The frequency AC drive acts as a slave and the communication address is set by parameter [Fd.01]. At this time the frequency converter accepts the command from the master on the communication network and selects whether to reply to the data during the write operation according to parameter [Fd.08], the	0000	○	0xD00

		delay time for the reply command is set by parameter [Fd.05]. 1: Main machine The frequency converter acts as the master and sends the data from the master to the communication network by means of broadcast commands, all slaves accept the commands from the master. The data sent by the master is set by parameter [Fd.09]. **LED "00" digit: reserved** **LED "000" digit: reserved** **LED "0000" digit: reserved** Notes. 1. When the AC drive is used as the host group network, all network slaves must also be Weitron AC drives in order to be properly networked. The host is sending broadcast data via custom free protocol. 19200bps [Fd.03] 0: Data format (N, 8, 1) No parity, data bits: 8, stop bits: 1			
Fd.01	485 communication address	This parameter defines the communication address of the machine when it is used as a Modbus communication slave. If the machine is acting as a master, this parameter has no meaning. 0 is the broadcast address. Setting range：1～247	1	○	0xD01
Fd.02	Communication baud rate selection	**LED "0" digit: RS 485 communications** 0：1200 bps 1：2400 bps 2：4800 bps 3：9600 bps 4：19200 bps 5：38400 bps	0005	○	0xD02

		LED “00” digit: reserved **LED “000” digit: reserved** **LED “0000” digit: reserved**			
Fd.03	Modbus data format	0：(N，8，1) No calibration Data bits：8 Stop bits：1 1：(E，8，1) even calibration Data bits：8 Stop bits：1 2：(O，8，1) Odd calibration Data bits：8 Stop bits：1 3：(N，8，2) No calibration, Data bits：8 Stop bits：2 4：(E，8，2) even calibration Data bits：8 Stop bits：2 5：(O，8，2) No calibration, Data bits：8 Stop bits：2	0	○	0xD03
Fd.04	Communication ratio setting	The data in the communication address 0x2000 or 0x3000 sent by the upper computer is multiplied by this parameter and used as the communication feed value for the machine. The communication frequency of the upper computer can be modified proportionally. Setting range：0.00～5.00	1.00	•	0xD04

Fd.05	Modbus communication answer time delay	This parameter defines the intermediate interval between the frequency converter as a Modbus communication slave and the sending of the answer data to the host computer after the data reception is finished. If the answer delay time is less than the system processing time, the answer delay time will be based on the system processing time. If the answer delay time is longer than the system processing time, the system will delay waiting after processing the data until the answer delay time is up before sending the data to the host computer.	0ms	•	0xD05
Fd.06	Modbus communication timeout failure time	Modbus communication timeout failure time: If the interval between one communication and the next communication exceeds the communication timeout time, the communication will be considered as a disconnection failure and the fault disconnection action mode will be determined by [Fd.07]. Setting range：0.1s～100.0s	1.0s	•	0xD06
Fd.07	Modbus communication fault action mode selection	Modbus communication fault action mode selection. 0: No detection of timeout faults The frequency converter does not do fault detection and always operates according to the last communication command. 1: Fault reported When the communication given command set by the frequency converter has not received the next frame command or any other communication command after the time set in [Fd.06] has elapsed, the	0000	•	0xD07

		frequency converter reports fault E.074 and stops. 2: Alarm and continue operation When the AC drive operation command mode is given by the communication mode, after the set communication given command has exceeded the time set in [Fd.06] and still no new communication command has been received, the AC drive reports warning A.074 and runs according to the last communication command. 3: Forced stop After the set communication feed command of the frequency converter has exceeded the time set in [Fd.06] and still no next frame command has been received or no other communication command is available, the frequency converter stops in the shutdown mode.			
Fd.08	Modbus Transmission	0: Write operation with response 1: No response to write operation	0	•	0xD08

Fd.09	Host sending options	Sets the data sent to the slaves when the frequency converter acts as a Modbus communication master. In this case the master AC drive sends a broadcast command and all slaves will receive the command sent by the master. The master can send up to 4 frames of data in polling mode, corresponding to the set values of the LED digits, tens, hundreds and thousands. When set to invalid, no data is sent. **LED "0" digit: the first group transmitting frame selection** 0: Invalid 1: Main machine run command 2: Main machine given frequency 3: Main machine output frequency 4: Main machine upper limit frequency 5～9： Reserved A～D：Reserved **LED "00" digit: the second group transmitting frame selection Same as above** **LED "000" digit: the third group transmitting frame selection Same as above LED "0000" digit: the fourth group transmitting frame selection Same as above**	000d	•	0xD09
Fd.10	RS485 communication port configuration	0: Configured for Modbus communication 1: Configured for serial communication 2: Reserved	0	•	0xD0A
Fd.11～Fd.13		Reserved			

6.13 FE Lifting-specific Function Group 1

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
FE.00	Low-speed gear operation frequency	0.00Hz～50.00Hz	15.00Hz	•	0xE00
FE.01	High-speed gear running frequency	0.00Hz～50.00Hz	50.00Hz	•	0xE01
FE.02	Operation box operating frequency	0.00Hz～50.00Hz	25.00Hz	•	0xE02
FE.03～FE.06		Reserved			
FE.07	Load function selection	0：ON 1：OFF	0	•	0xE07
FE.08	Load calibration options	0:no movement 1: Empty cage calibration 2: Full calibration	0	○	0xE08
FE.09	Empty cage benchmark	0kg～2000kg	800kg	○	0xE09
FE.10	Empty cage reference weight	0kg～500kg	70kg	○	0xE0A
FE.11	Load calibration weight	0kg～10000kg	2000kg	○	0xE0B
FE.12	Load factor	0.0%～500.0%	150.0%	○	0xE0C
FE.13	Rated load capacity	0kg～10000kg	2000kg	○	0xE0D
FE.14	Load display factor	0.0%～150.0%	100.0%	○	0xE0E
FE.15	Load alarm factor	50.0%～200.0%	105.0%	○	0xE0F
FE.16	Pin breakage fault	**LED “0” digit:** Pin break detection 0: all off 1: Detect only 1# 2: Detect only 2# 3: Detect all on **LED “00” digit:** Brake plate fault protection 0: closed 1: Open **LED “000” digit:** Low input voltage voice alert 0: Closed	0	○	0xE10

		1: Open **LED "0000" digit:** Automatic empty cage calibration 0：ON 1：OFF			
FE.17	Reserved				
FE.18	Power on voice selection	0～1000	0	○	0xE12
FE.19～FE.34		Reserved			
FE.35	Cyclic test mode	0：ON 1：OFF	0	•	0xE23
FE.36	Test run time	0.0h～48.0h	4.0h	•	0xE24
FE.37	Test run cycle	0.0s～600.0s	30.0s	•	0xE25
FE.38	Test motor operating system	0%～100%	80%	•	0xE26
FE.39～FE.44		Reserved			
FE.45	Running acceleration limit 1	0.0%～100.0%	30.0%	•	0xE2D
FE.46	Running acceleration limit 2	0.0%～100.0%	20.0%	•	0xE2E
FE.47	Tower arm vibration cycle	0.0s～50.000s	14.000s	○	0xE2F
FE.48	Stopping acceleration limit 1	0.0%～100.0%	30.0%	•	0xE30
FE.49	Stopping acceleration limit 2	0.0%～100.0%	20.0%	•	0xE31
FE.50	Acceleration/deceleration factor 1	0.0%～1000.0%	200.0%	•	0xE32
FE.51	Acceleration/deceleration factor 2	0.0%～1000.0%	70.0%	•	0xE33
FE.52	Acceleration/deceleration factor 3	0.0%～1000.0%	75.0%	•	0xE34
FE.53	Acceleration/deceleration factor 4	0.0%～1000.0%	100.0%	•	0xE35
FE.54	Smoothing control torque threshold	0.0%～50.0%	2.0%	•	0xE36
FE.55	Smoothing control gain	This parameter can be increased when there is a rebound from a stop. Setting range：0.00～50.00	8.00	•	0xE37

FE.56	Smoothing control frequency limit	0.00Hz～20.00Hz	10.00Hz	•	0xE38
FE.57	Downtime frequency base value	This parameter can be increased when there is a bounce in the stop, it is recommended that it is no greater than 1.00Hz, otherwise there may be a problem with a longer distance travelled by pointing. Setting range:0.00Hz～10.00Hz	0.50Hz	•	0xE39
FE.58	Stopping frequency hold frequency	0.00Hz～10.00Hz	0.00Hz	•	0xE3A
FE.59	Stopping frequency holding time	0.000s～60.000s	1.000s	•	0xE3B
FE.60	Lifting ratio identification minimum running time	0.000s～30.000s	10.000s	○	0xE3C
FE.61	Hoist transmission coefficient high	0～65535	0	○	0xE3D
FE.62	Hoist transmission coefficient low	0～65535	0	○	0xE3E
FE.63	Lift limit equivalent rope length	0.00m～25.00m	4.00m	○	0xE3F
FE.64	Estimated rope length 1	0.00m～300.00m	0.0m	○	0xE40
FE.65	Estimated rope length 2	0.00m～300.00m	0.0m	○	0xE41
FE.66	Weight equivalent rope length	Refers to the height from the center of the lifting weight to the main hook. Setting range：0.00m～20.00m	2.00m	•	0xE42
FE.67	Anti-sway control	**LED "0" digit: Anti-rocking switch** 0：OFF 1：ON **LED "00" digit: Fixed rope length to enable** 0：OFF	0001	•	0xE43

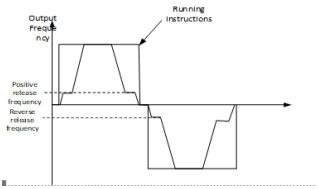
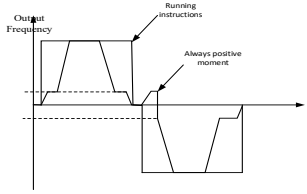
		Anti-sway control will be performed with the rope length obtained from the lifting AC drive when closed 1：ON When switched on the anti-sway control is performed using the rope length set in FE.68. If the rope length is known, the anti-sway effect can be checked here.			
FE.68	Fixed rope length setting	0.00m～300.00m	10.00m	•	0xE44
FE.69	Reserved				
FE.70	Speed reduction optimization function selection	0: Invalid 1: Valid	0	○	0xE46
FE.71	Lift line speed	1.0 m/min～200.0 m/min	34.0 m/min	○	0xE47
FE.72	Frequency corresponding to line speed	1.00Hz～100.00Hz	50.00Hz	○	0xE48
FE.73	Deceleration stopping distance	0.000m～10.000m	0.400m	○	0xE49
FE.74	Selection of deceleration optimization mode	**LED “0” digit: greater than lower limit state maintenance frequency deceleration mode selection** 0: Segmented deceleration stop 1: Direct deceleration stop **LED “00” digit: less than lower limit state maintenance frequency deceleration mode selection** 0: Segmented deceleration stop 1: Operation at FE.75 frequency **LED “000” digit: Terminal upstream command processing method when upper limit is active** 0: Free stop 1: Deceleration stop	1000	○	0xE4A

		LED “0000” digit: after deceleration is complete, still in lower limit state, downstream command selection 0：Valid, running at FE.75 frequency 1: invalid, valid only when exiting the lower limit position			
FE.75～FE.81		Reserved			
FE.82	Lifting control	**LED “0” digit: Steady rise and fall** 0：OFF 1：ON **LED “00” digit: Lifting and anti-hanging** 0：OFF 1：Report a fault (E.059) 2：Alarm and continue operation (A.079) **LED “000” digit: Reserved** **LED “0000” digit: Constant power control** 0：OFF 1：ON	0000	•	0xE52
FE.83	Load measurement frequency	In constant power control, the target frequency is greater than the load measurement frequency [FE.83] and the load measurement is carried out with FE.83 as the target frequency to obtain the current load Setting range：0.00Hz～50.00Hz	20.00Hz	○	0xE53

FE.84	Load measurement time	In smooth lift and lift anti-hang control, it is the holding time of the tight rope frequency [FE.90]; in constant power control, it is the holding time of the load measuring frequency [FE.83]. Setting range：0.000s～3.000s	0.500s	○	0xE54
FE.85	Light load torque setting	Used to define light load conditions, 100.0% corresponds to the rated torque of the motor. In constant power control, the frequency limit value is FE. A3 when the measured torque of the load is less than this value. In smooth lift control, the empty hook is judged according to this value. Setting range：0.0%～50.0%	15.0%	•	0xE55
FE.86～FE.87		Reserved			
FE.88	Speed change threshold	0.00Hz～5.00Hz	2.00Hz	•	0xE58
FE.89	Reserved				
FE.90	Frequency of rope tightening	For load judgement during smooth lift and lift anti-hang control. Setting range：0.00Hz～10.00Hz	3.00Hz	•	0xE5A
FE.91	Steady rise and fall Max. frequency	0.00Hz～120.00Hz	100.00Hz	•	0xE5B
FE.92	Tight rope frequency holding	0.000s～20.000s	6.000s	•	0xE5C
FE.93	Tight rope detection max. time	0.000s～40.000s	15.000s	•	0xE5D
FE.94～FE.97		Reserved			
FE.98	Lifting anti-hanging torque increment	0.0%～100.0%	20.0%	•	0xE62

FE.99	Hoist anti-hanging torque change rate threshold	0.0%～100.0%	1.5%	•	0xE63
FE. A0	Lifting anti-hang detection time	0.000s～20.000s	2.000s	•	0xE64
FE. A1	Lifting up power limit	0.0%～150.0%	90.0%	•	0xE65
FE. A2	Lifting down power limit	0.0%～150.0%	80.0%	•	0xE66
FE. A3	Lifting Max. frequency limit	0.0%～300.0%	200.0%	•	0xE67
FE. A4	Closed-loop upstream power factor	0%～120%	100%	•	0xE68
FE. A5	Closed-loop downstream power factor	0%～120%	90%	•	0xE69
FE. A6	Open-loop upstream power factor	0%～120%	80%	•	0xE6A
FE. A7	Open-loop downlink power factor	0%～120%	70%	•	0xE6B
FE. A8	Closed-loop upstream detection factor	0%～100%	90%	•	0xE6C
FE. A9	Closed-loop downlink detection factor	0%～100%	80%	•	0xE6D
FE. b0	Open-loop uplink detection factor	0%～100%	90%	•	0xE6E
FE. b1	Open-loop downlink detection factor	0%～120%	80%	•	0xE6F

6.14 FF Lifting-specific Function Group 2

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
FF.00	Application type selection	0：Reserved 1: Lift alone 2: Translating mechanism 3：Rotary mechanism 4: Lifting all-in-one 5: Lifting mechanism 6：Reserved	5	○	0xF00
FF.01	Brake control options	**LED "0" digit: Release gate conditions** 0: Frequency arrives 1: Frequency and current arrive at the same time 2: Output torque arrives (settable in vector mode) **LED "00" digit: Release gate running direction** 0：Release torque is the same as the direction of operation  1：Release torque is always in the positive direction  **LED "000" digit: Holding brake operation direction** 0: The holding torque is the same as the direction of operation 1: The holding torque is always in the positive direction	1001	○	0xF01

		LED "0000" digit: Reserved			
FF.02	Run command control	**LED "0" digit: Run command reverse control** 0: Invalid Not allowed to run in reverse during a run. 1: Valid Allowed to run in reverse during a run. **LED "00" digit: Over-zero frequency jumps** 0: Invalid 1: Valid When switching from forward to reverse, the frequency jumps from forward FF.05 to reverse FF.05; when switching from reverse to forward, the turn frequency jumps from reverse FF.05 to forward FF.05; during this period, the acceleration and deceleration times are [FF.73] and [FF.74] respectively. **LED "000" digit: Forward and reverse V/F curve separation** **0: Off** The custom V/F curve is determined by [F8.01 to F8.10]. **1: On** The custom V/F curve for forward operation is determined by [F8.01 to F8.10]. The custom V/F curve for reverse operation is determined by [F8.25 to F8.34]. **LED "0000" digit: Braking feedback** 0: No brake feedback 1: Enables only release feedback 2: Only the holding feedback is enabled 3: Enables both release feedback and brake feedback	0010	○	0xF02
FF.03	Run command interval delay	If the running command is received during the stopping and holding process, the running command can be	0.30s	○	0xF03

		responded after the parameter setting time when the holding is completed. Setting range：0.00s～10.00s			
FF.04	Release current coefficient	0.0%～100.0%	20.0%	○	0xF04
FF.05	Over zero jump frequency	0.00Hz～10.00Hz	1.00Hz	○	0xF05
FF.06	Positive release frequency	0.00Hz～10.00Hz	2.00Hz	○	0xF06
FF.07	Forward holding frequency	0.00Hz～10.00Hz	2.00Hz	○	0xF07
FF.08	Reverse release frequency	0.00Hz～10.00Hz	2.00Hz	○	0xF08
FF.09	Reverse clamping frequency	0.00Hz～10.00Hz	2.00Hz	○	0xF09
FF.10	Forward release delay	0.00s～1.00s	0.20s	○	0xF0A
FF.11	Delay after forward release	0.00s～1.00s	0.10s	○	0xF0B
FF.12	Delay before positive locking	0.00s～1.00s	0.00s	○	0xF0C
FF.13	Delay after forward holding	0.00s～1.00s	0.50s	○	0xF0D
FF.14	Reverse pre-release delay	0.00s～1.00s	0.20s	○	0xF0E
FF.15	Reverse release delay	0.00s～1.00s	0.10s	○	0xF0F
FF.16	Reverse hold before delay	0.00s～1.00s	0.00s	○	0xF10

FF.17	Reverse holding time delay	0.00s～1.00s	0.30s	○	0xF11
FF.18	Lifting multifunction settings	**LED "0" digit: Reserved** **LED "00" digit: Reserved** **LED "000" digit: Emergency stop warning and fault indication** 0: Displayed 1: Not displayed **LED "0000" digit: Reserved**	1100	○	0xF12
FF.19	Reserved	Setting range：0.00Hz～10.00Hz	4.50Hz	○	0xF13
FF.20	Reserved	**LED "0" digit: V/F release gate optimization** 0: closed Non-0: open **LED "00" digit: Independent modification of motor parameters** 0: Closed 1: Open	0000	○	0xF14
FF.21～FF.24		Reserved			
FF.25	Output abnormality protection	The AC drive continuously detects the output current during operation. When the current is lower than [FF.26] (100% corresponding to the rated motor current) and lasts longer than [FF.27], the output is judged to be abnormal and a fault is reported (E.063). FF.25 0: off 1: On FF.26：0%～50% FF.27：0.000s～1.000s	1	○	0xF19
FF.26	Output current abnormality detection threshold		5%	○	0xF1A
FF.27	Output current abnormality detection time		0.400s	○	0xF1B
FF.28	Light load frequency rise selection	0: Invalid 1: Judged by current 2: Judged by torque	0	○	0xF1C
FF.29	Load measurement time	0.000s～5.000s	1.000s	○	0xF1D
FF.30	Uplink boost	0.0%～80.0%	60.0%	○	0xF1E

	judgment threshold				
FF.31	Uplink boost upper limit frequency	0.00Hz～Max. frequency	65.00Hz	•	0xF1F
FF.32	Downstream Boost Judgement Threshold	0.0%～80.0%	40.0%	○	0xF20
FF.33	Downstream ramp-up upper frequency	0.00Hz～Max. frequency	65.00Hz	•	0xF21
FF.34	Follower selection	0: Invalid 1: Valid	0	○	0xF22
FF.35	Step-down coefficient	80%～100%	90%	○	0xF23
FF.36	Rotation control 1	**LED "0" digit: Flexible control** 0: Off 1: On To improve the "stop and go" problem of the tower arm, see the flexible control instructions. **LED "00" digit: Flexible control of acceleration and deceleration times** 0: closed 1: open To improve the "stop and go" problem of the tower arm, see the flexible control instructions. **LED "000" digit: Rotation-specific acceleration and deceleration** 0: closed 1: open The slewing acceleration and deceleration times are determined by the Fb parameter, see the slewing-specific acceleration and deceleration instructions for details. **LED "0000" digit: Eddy current-free rotary frequency control** 0: closed 1: open	1101	○	0xF24

FF.37	Flexible control of the starting deviation frequency	0.00Hz～20.00Hz	1.00Hz	•	0xF25
FF.38	Flexible control of direction changes deviation frequency	0.00Hz～20.00Hz	2.50Hz	•	0xF26
FF.39	Flexible control of acceleration time 1	0.00s～50.00s	20.00s	•	0xF27
FF.40	Flexible control of deceleration time 2	0.00s～50.00s	20.00s	•	0xF28
FF.41	Staged acceleration/ deceleration switching frequency 1	0.00Hz～Max. frequency	0.00Hz	•	0xF29
FF.42	Staged acceleration/ deceleration switching frequency 2	0.00Hz～Max. frequency	0.00Hz	•	0xF2A
FF.43	Staged acceleration/ deceleration switching frequency 3	0.00Hz～Max. frequency	0.00Hz	•	0xF2B
FF.44		Reserved			
FF.45	Vortex frequency 1	0.00Hz～Max. frequency	20.00Hz	•	0xF2D
FF.46	Vortex frequency 2	0.00Hz～Max. frequency	40.00Hz	•	0xF2E
FF.47	Vortex frequency 3	0.00Hz～Max. frequency	40.00Hz	•	0xF2F
FF.48	Zero speed duty cycle	0.0%～100.0%	0.0%	•	0xF30
FF.49	Duty cycle correspondi	0.0%～100.0%	0.0%	•	0xF31

	ng to eddy current frequency 1				
FF.50	Maximum duty cycle at standstill	0.0%～100.0%	80.0%	•	0xF32
FF.51	Standstill eddy current maintenance time	0.0s～3000.0s	60.0s	○	0xF33
FF.52	Eddy current output carrier	0.20kHz～4.00kHz	0.20kHz	○	0xF34
FF.53	Duty cycle polarity selection	0: Forward polarity 1: Reverse polarity	1	•	0xF35
FF.54	Stopping duty cycle variation rate	0.0%～50.0% Time units are 100ms	0.5%	•	0xF36
FF.55	Brake Torque Testing	0：Closed 1：Open	1	○	0xF37
FF.56	Brake torque detection times	0～10	3	○	0xF38
FF.57	Brake Torque Detection Torque	0.0%～150.0%	100.0%	○	0xF39
FF.58	Brake Torque Detection Frequency Threshold	0.00Hz～5.00Hz	2.00Hz	○	0xF3A
FF.59	Brake torque detection filtering time	0.000s～2.000s	0.200s	○	0xF3B

FF.60	Brake Failure Protection Function	0：Closed 1：Open	1	○	0xF3C
FF.61	Brake Failure Protection Activation Threshold	0.00Hz～5.00Hz	0.50Hz	○	0xF3D
FF.62	Brake Failure Protection Maintenance Time	0.0s～3000.0s	60.0s	○	0xF3E
FF.63	Brake failure filtering time	0.000s～2.000s	0.050s	○	0xF3F
FF.64	Brake failure uplink frequency limit	0.00Hz～100.00Hz	0.00Hz	•	0xF40
FF.65	Brake failure downlink frequency limit	0.00Hz～100.00Hz	50.00Hz	•	0xF41
FF.66	Reserved	0.0%～200.0%	15.0%	•	0xF42
FF.67	Reserved	0.0%～200.0%	15.0%	•	0xF43
FF.68	Reserved	0.0%～100.0%	8.0%	•	0xF44
FF.69	Holding brake feedback detection delay	0.00s～5.00s	0.30s	•	0xF45
FF.70	Reserved	0～60000	0	•	0xF46
FF.71	PG break detection time	Setting range：10ms～3000ms	50ms	○	0xF47
FF.72	PG broken wire	**LED "0" digit: A/B break detection** 0：OFF 1：ON	0001	○	0xF48

	detection option	**LED "00" digit: Z break detection** 0：OFF 1：ON **LED "000" digit: Reserved** **LED "0000" digit: Reserved**			
FF.73	Over-zero jump acceleration time	0.00s～600.00s	0.01s	•	0xF49
FF.74	Over-zero jump deceleration time	0.00s～600.00s	0.01s	•	0xF4A
FF.75	Stop command lock frequency	0.00Hz～600.00Hz	6.00Hz	•	0xF4B
FF.76	Wind turbine stop delay time	0s～3600s	60s	•	0xF4C
FF.77	Rotary advance holding frequency threshold	After activation of the rotary advance brake function (the corresponding digital input terminal number is set to 88 and the rotary brake signal is connected to this terminal), the frequency converter stops output when the given frequency is less than this Setting range：0.00Hz～50.00Hz	5.00Hz	○	0xF4D
FF.78	Reserved	0.0%～200.0%	20.0%	•	0xF4E
FF.79	Reserved	0.0%～200.0%	50.0%	•	0xF4F
FF.80	Delay after slewing brake	0ms～60000ms	1000ms	○	0xF50
FF.81	Bus voltage filtering depth	0～9	6	•	0xF51
FF.82	Lifting undervoltage point	0.0%～90.0%	72.0%	•	0xF52
FF.83	Buffer resistor bypass delay	0ms～6000ms	1500ms	•	0xF53
FF.84	Tower jib length	Set according to actual tower arm length.	60	○	0xF54

		Setting range：0m～200m			
FF.85	Slewing acceleration gain	The higher the value, the longer the acceleration time; increasing arm length requires increasing the value. Setting range：50%～500%	110%	•	0xF55
FF.86	Rotation deceleration gain	The higher the value, the longer the deceleration time; increasing arm length requires increasing the value. Setting range：50%～500%	90%	•	0xF56
FF.87	Slewing control 2	**LED "0" digit: Reserved** **LED "00" digit: Reserved** **LED "000" digit: Reverse gear to deceleration** 0：OFF 1：ON The deceleration time can be adjusted by FF.97 when reversing to reverse gear. **LED "0000" digit: Smooth control of vortex-free rotation** 0：OFF Others：ON	4100	○	0xF57
FF.88～FF.89		Reserved			
FF.90	Start-up stabilisation frequency	0.00Hz～10.00Hz	6.00Hz	•	0xF5A
FF.91	Reserved	0.0%～200.0%	10.0%		
FF.92	Start-up stability time	0ms～5000ms	1500ms	•	0xF5C
FF.93	Reserved				
FF.94	Reverse Response Frequency	0.00Hz～10.00Hz	3.00Hz	•	0xF5E
FF.95	Reverse gear filter time	0.000s～5.000s	1.500s	•	0xF5F
FF.96	Reverse torque gain	0.0%～200.0%	80.0%	•	0xF60
FF.97	Reverse-gear	If the reverse gear change deceleration is enabled (FF.87 hundreds set to 1),	70.0%	•	0xF61

	deceleration factor	the actual deceleration time = FF.97 * original deceleration time. Setting range：0.0%～100.0%			
FF.98	Reserved	0.01s～50.00s	4.00s	•	0xF62
FF.99	Reserved	0.01s～50.00s	2.00s	•	0xF63
FF. A0	Stopping frequency thresholds	0.00Hz～20.00Hz	10.00Hz	•	0xF64
FF. A1	Stopping torque thresholds	0.0%～50.0%	10.0%	•	0xF65
FF. A2～FF.A5		Reserved			
FF. A6	Slewing fault holding time delay	0.000s～50.000s	10.000s	•	0xF6A
FF. A7～FF.b9		Reserved			

7 Terminal Function Selection

X selection	Function Specification	X selection	Function Specification	X selection	Function Specification
0	No function	32	Acceleration and deceleration time selector terminal 1	53	Forward banned
1	FWD	33	Acceleration/deceleration time selector terminal 2	54	Reverse banned
2	REV	34	Acceleration/deceleration pause	55~79	Reserved
3	3-line running (Xi)	35~39	Reserved	80	Weighing alarm switch terminals
4	FWD JOG	40	Timer trigger terminal	81	Empty cage weighing calibration terminals
5	REV JOG	41	Timer clear terminal	82	Brake torque detection
6	Free stop	42	Counter clock input terminal	83	Input phase loss detection shield
7	Emergency stop	43	Counter clear terminal	84	Lower limit for speed reduction optimization
8	Malfunction reset	44	DC braking command	85	Upper limit for speed reduction optimization
9	External fault input	45	Pre-excitation command terminal	86	Digital output invalid delay interrupt
10~12	Reserved	46~47	Reserved	87	Antispeed switch
13	Switch channel A to channel B	48	Command channel switch to keyboard	88	Rotation advance brake
14	channel combination switch to A	49	Command channel switch to terminal	89	Lifting upper limit
15	channel combination switch to B	50	Command channel switch to communication	90	Anti-rocking switch
16~19	Multispeed terminal 1~4	51	Command channel switch to expansion card	91	Brake feedback
20~31	Reserved	52	Operation banned		
Y selection	Function Specification	**Y selection**	Function Specification	**Y selection**	Function Specification
0	No output	12	0 speed running	37	Slewing-specific brake

					control
1	Running	13~23	Reserved	38~40	Reserved
2	REV running	24	Dynamic braking	41	X1 terminal status mapping
3	FWD running	25	PG feedback wire break	42	X2 terminal status mapping
4	Fault trip alarm1, alarm when fault self-recovery	26	Emergency stop	43	X3 terminal status mapping
5	Fault trip alarm 2(no alarm when fault self-recovery)	27	Load pre-alarm output 1	44	X4 terminal status mapping
6	External fault stops	28	Load pre-alarm output 2	45	X5 terminal status mapping
7	Under voltage	29~32	Reserved	46	X6 terminal status mapping
8	Finish ready for running	33	Brake output	47	X7 Terminal status mapping
9	Output frequency level test 1(FDT1)	34	Input out of phase		
10	Output frequency level test 2(FDT2)	35	Brake failure protection in operation		
11	Reach given frequency	36	Insufficient brake torque fault detection		

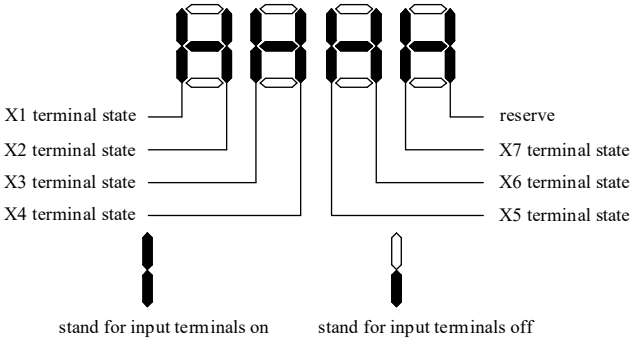
8 Monitoring Code

Access ‘C’ parameter group by pressing ‘PRG’ for more than 2s. Check the current state of AC drive.

Function Code	Function name	Range of settings and definition	Address
C-00	Given frequency	0.01Hz	2100H
C-01	Output frequency	0.01Hz	2101H
C-02	Output current	0.1A	2102H
C-03	Input voltage	0.1V	2103H
C-04	Output voltage	0.1V	2104H
C-05	Mechanical speed	1RPM	2105H
C-06	Given torque	0.1%	2106H
C-07	Output torque	0.1%	2107H
C-08	Reserved	0.1%	2108H
C-09	Reserved	0.1%	2109H
C-10	Output power	0.1%	210AH
C-11	Bus voltage	0.1V	210BH
C-12	Module temperature 1	0.1℃	210CH
C-13	Module temperature 2	0.1℃	210DH
C-14	Input terminal X on	See input terminal diagram	210EH
C-15	Output terminal Y on	See output terminal diagram	210FH
C-16	Analog VS input value	0.001V	2110H
C-17	Analog AI input value	0.001V/0.001mA	2111H
C-18	Analog AS input value	0.001mA	2112H
C-19	Pulse signal PUL input	0.001kHz	2113H
C-20	Analogue output AO1	0.01V	2114H
C-21	Analogue output AO2	0.01V/0.01mA/0.01kHz	2115H
C-22	Counting value of the counter		2116H
C-23	Current power-up	0.1h	2117H
C-24	Cumulative running	Hour	2118H
C-25	AC Drive power rating	kW	2119H
C-26	Frequency converter	V	211AH
C-27	Frequency converter	A	211BH
C-28	Software version		211CH
C-29	PG feedback frequency	0.01Hz	211DH
C-30	Extension terminal input status	See input terminal diagram	211EH
C-31	Extension terminal	See output terminal diagram	211FH
C-35	Timer timing time	sec/min/h	2123H

C-36	Fault warning code		2124H
C-40	Reserved	0～9999	2128H
C-41	Reserved	0.01	2129H
C-42	Reserved	1	212AH
C-43	Reserved	0.1%	212BH
C-44	Reserved	2017H	212CH
C-45	Reserved	1201H	212DH
C-46	Reserved	1001H	212EH
C-47	Reserved	0000～5000	212FH
C-48	Reserved	0000～5000	2130H
C-50	Eddy current output duty cycle	%	2132H

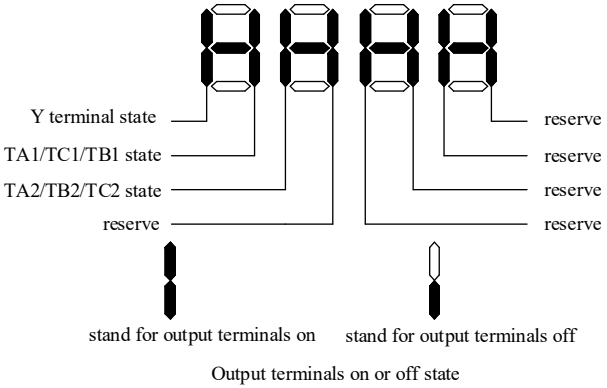
Input Terminal on/off State Diagram:



Input terminals on or off sketch map

Tip: connection diagrams of C-30 monitor expansion input terminals X8 ~ X10 are the same as above, but only displaying the first three valid.

Output Terminal on/off State Diagram:



Output terminals on or off state

9 Fault Information

This chapter explains the display content and measures of the AC drive fault, alarm and operation fault. In addition, the poor condition caused by the AC drive and motor failures and the corresponding processing measures will be briefly described. Tuning Guide on trial use is also referred to in this chapter

9.1 Fault Types

Type	AC Drive Action When Fault Happens
Equipment Fault	When AC drive detects a fault, the following conditions would happen: ● Keyboard display character showing fault content. ● AC Drive output stops. Motor free slide stops. ● When function [F2.29] is 3(output fault), Y terminal outputs valid open-collector digital output. ● When function [F2.30\F2.31] is 3(fault output), TA1-TC1, TA2-TC2 terminals output open passive digital output. ● For faults like OL, OC, SC, OV, UL2, if [FA.22] is not 0, the AC drive will restart automatically after the time interval set by [FA.23].
External Fault	In certain application occasions, external related equipment fault signals are considered in the AC drive control system as usage of monitoring, protect and switch control. At this time, if one multi-function terminal is defined as “external fault”, and when the external related equipment fault signals are effective, the AC drive stops output and give out alarm signal.

9.2 Fault Information and Details

Keyboard display	Fault code	Fault type	Possible causes	Treatment
	64	Too low voltage while stop	● Power supply is too low ● Voltage detection circuit is abnormal	● Check input power, clear fault. ● Seek support from factory.
	10	Too low voltage in run	● Power supply is too low ● Power capacitance is too small, or there is big impact current in the power grid.	● Check input power, clear fault. ● Improve power supply. ● Seek support from factory.

			● Inner DC main contractor is not connected well	
	7	ACC over-voltage	● Power voltage fluctuation over limit. ● Start when motor is running	● Detect power voltage and clear fault. ● Restart motor until it was completely stopped. Set [F1.00]as 1 or 2.
	8	DEC over-voltage	● Deceleration time is too short. ● Load potential energy or inertia is too large. ● Power voltage fluctuation over limit.	● Prolong Deceleration time. ● Reduce load inertia or improve AC drive capacitance or add braking unit. ● Detect power voltage and clear fault.
	9	Constant speed over-voltage	● Power voltage fluctuation over limit.	● Detect power voltage and clear fault. ● Install input reactor.
	28	Over-voltage while stop	●Power voltage fluctuation over limit.	● Check input power, clear fault. ● Seek support from factory.
	4	ACC over-current	● Acceleration time is too short. ● Start running motor. ● V/F curve setting is not suitable. Or torque boost too high. ● AC Drive capacitance is too small.	● Prolong acc time. ● Restart motor until it totally stops. Set [F1.00] as 1or2. ● Reset V/F curve or torque boost value. ● Select AC drive with right capacitance.
	5	DEC over-current	● Deceleration time is too short. ● Load potential energy or inertia is too large. ● Power voltage fluctuation over limit.	● Prolong Deceleration time. ● Connect external braking resistance or braking unit. ● Select AC drive with right capacitance.
	6	Constant speed over-current	● Sudden load change. ● Power grid voltage is too low.	● Check load change and clear it. ● Check input power clear fault.
	11	Motor over-load	● V/F curve setting is not suitable. Or torque boost too high. ● Power grid voltage is too low. ● incorrect overload protection setting. ● Locked-rotor run or too heavy load.	● Reset V/F curve or torque boost value. ● Check input power, clear fault. ● Unreasonable[F5.06/FA.16] setting. ● Adjust load or select AC drive with right capacitance.

			● Universal motor long time low speed run.	● If need long time low speed run, please choose special motor for AC drive.
	12	AC Drive over-load	● Load is too heavy. ● Acceleration time is too short. ● Start running motor. ● V/F curve setting is not suitable. Or torque boost too high.	● Select AC drive with right capacitance. ● Prolong acceleration time ● Restart motor until it totally stops. Set [F1.00] as 1or2. ● Reset V/F curve or torque boost value.
	1	System abnormality	● Acceleration time is too short. ● Short circuit between AC drive output phases or earth. ● Module is damaged. ● Electromagnetic disturb.	● Prolong acceleration time. ● Check periphery equipment and restart after fault cleared. ● Seek support from factory. ● Check system wiring, earth, shield and deal as required.
	16	AC Drive over-heat	● Temperature is too high. ● Air channel is blocked. ● Fan connection parts is loose. ● Fan is damaged. ● Temperature detection circuit fault	● Make the environment meet the requirement. ● Clear the air channel. ● Check and reconnect the wire ● Change the same new fan. ● Seek support from factory.
	15	Rectifier over-heat	● Temperature is too high. ● Air channel is blocked. ● Fan connection parts is loose. ● Fan is damaged. ● Temperature detection circuit fault	● Make the environment meeting the requirement. ● Clear the air channel. ● Check and reconnect the wire. ● Change the same new fan. ● Seek support from factory.
	20	Motor static detection fault	● Detection overtime ● Start static detection while motor is running. ● Capacitance difference is too big between motor and AC drive. ● Motor parameter setting mistake.	● Check motor connection wire. ● Detect after motor stopping totally. ● Change AC drive model. ● Reset parameter according to nameplate.
	21/69	Memory fault	● Electromagnetic disturb in memory period. ● EEPROM damage.	● resume load and save. ● Seek support from factory.
	30	Reserved	●	● Seek support from factory.
	13/65	Input side open phase	● 3-phase input power open phase.	● Check 3-phase power supply and the phase. ● Check 3-phase power supply wiring.

	14	Output side open phase	● 3-phase output power open phase	● Check 3-phase output voltage and current. ● Check wiring.
	E. Gnd	Output earth	● Output earth terminal short circuit.	● Check wiring and insulation.
	19	Current detection fault	● Detect circuit fault. ● Phase imbalance	● Seek for technic support. ● Check motor and wiring.
	17	AC Drive external fault	● Peripheral equipment fault protection.	● Check peripheral equipment.
	E. PAn	Keyboard connect fault	● Keyboard wire fault. ● Keyboard component damage.	● Check keyboard wire. ● Seek support from factory.
	18	Rs485comm unication fault	● Unsuitable baud rate setting. ● Communication wire breaks. ● Communication format does not match upper machine.	● Set suitable baud rate setting. ● Check communication wire. ● Set right communication format.
	26	Parameter copy fault	● Parameter copy communication is fault. ● Copy keyboard is not match the AC drive.	● Check wire. ● Select the specified external keyboard model.
	E.ECF	Extend card connection fault	● Communication between extend card and frequency AC drive overtime. ● Extend card does not match frequency AC drive.	● Check connector, and re-insert wire. ● Choose the named card.
	27	PG card connection abnormal	● PG card and AC drive connection failure	● Check the connection
 	29/66	PID feedback failure	● PID feedback upper limit of disconnection alarm is improper ● PID feedback lower limit of disconnection alarm is improper ● PID feedback wiring unreliable ● Sensor with feedback failure ● Feedback input loop failure	● Confirm the sensor state, if broken, change it. ● Repair the wiring. ● Confirm the setting value of [Fb.27] and [Fb.28].
	31	Initial position angle learning failed	● Check motor parameters	● Check motor parameters; ● Learn after the motor is stationary; ● Seek technical support from manufacturers.

	32/70	Speed deviation is too large	●Checkout time or check level setting is unreasonable ● Motor parameter is abnormal	● Check the motor parameters and re-learn again; ● Check the [FA.24]/[FA.25] parameter settings; ● Seek technical support from manufacturers.
	33/71	Speed protection	●[FA.27]/[FA.28] parameter setting is abnormal ● Motor parameter is abnormal ● Check the F6 group vector control parameters	● Check the motor parameters and re-learn again; ● Check the [FA.27]/[FA.28] parameter settings;
	34/67	Load protection 1	● The checkout time or check level setting is unreasonable	●Check the [FA.18]/[FA.19] parameter settings;
	35/68	Load protection 2	● The checkout time or check level setting is unreasonable	●Check the [FA.20]/[FA.21] parameter settings;
	36	CPU timeout	● CPU timing timeout	● Seek technical support from manufacturers.
E.042	42	PG card AB phase disconnection failure	● Encoder AB phase disconnected	● Check the encoder and PG card cable
E.043	43	PG card B phase disconnection failure	● Encoder B phase disconnected	● Check the encoder and PG card cable
E.044	44	PG card A phase disconnection failure	● Encoder A phase disconnected	● Check the encoder and PG card cable
E.045	45	PG card Z phase disconnection failure	● Encoder Z phase disconnected	● Check the encoder and PG card cable
E.061	61	Brake failure detection failure	Insufficient brake braking torque	● Check if the brake braking torque is insufficient
E.062	62	Current or torque detection failure before opening the brake	If the detection current reaches the opening frequency, the current is reported to be lower than the opening judgment current.	● Check if the AC drive motor parameters match the actual motor parameters ●The output side of the AC drive is connected to the motor reliably.

E.063	63	Current detection failure during operation	The running current abnormality is less than the FF.26 setting value.	●Check if the AC drive motor parameters match the actual motor parameters ●The output side of the AC drive is connected to the motor reliably.

9.3 Fault Warning

Fault display	Communication code	Fault name
A.072	72	Agent GPRS Lockout Alarm
A.073	73	Non-agent GPRS lockout alarm
A.074	74	485 communication alarm
A.075	75	PG card AB phase disconnection alarm
A.076	76	PG card B-phase disconnection alarm
A.077	77	PG card A phase disconnection alarm
A.078	78	Slip hook alarm
A.079	79	Weighing alarm

10 Recommended Selection of Accessories

10.1 Braking Resistor Selection

Selection of brake resistance according to generate power of motor, which associated with inertia, DEC time, potential energy load, etc. the bigger inertia of system, the shorter DEC time, more frequent braking, the more power, smaller resistance of resistor.

VFD Model	Rated current	Brake unit	Resistor power for lifting	Resistor power for Slewing & Luffing	Resistor Value	Set
AC70T-T3-R75-B	2.3A	Built-in	≥300W	≥150W	≥300Ω	1
AC70T-T3-1R5-B	3.7A	Built-in	≥750W	≥300W	≥250Ω	1
AC70T-T3-2R2-B	5A	Built-in	≥1.1kW	≥550W	≥200Ω	1
AC70T-T3-004-B	8.5A	Built-in	≥2kW	≥750W	≥120Ω	1
AC70T-T3-5R5-B	13A	Built-in	≥3kW	≥1.1kW	≥80Ω	1
AC70T-T3-7R5-B	17A	Built-in	≥4kW	≥1.5kW	≥65Ω	1
AC70T-T3-011-B	25A	Built-in	≥5.5kW	≥2.2kW	≥43Ω	1
AC70T-T3-015-B	32A	Built-in	≥7.5kW	≥3kW	≥32Ω	1
AC70T-T3-018-B	38A	Built-in	≥10kW	≥3.6kW	≥20Ω	1
AC70T-T3-022-B	45A	Built-in	≥11kW	≥4.4kW	≥18Ω	1
AC70T-T3-030-B	60A	Built-in	≥15kW	≥6kW	≥15Ω	1

AC70T-T3-037-B	75A	Built-in	≥19kW	≥7.4kW	≥12Ω	1
AC70T-T3-045-B	90A	Built-in	≥23kW	≥9kW	≥10Ω	1
AC70T-T3-055-B	110A	Built-in	≥28kW	≥11kW	≥8Ω	1
AC70T-T3-075-B	150A	Built-in	≥38kW	≥15kW	≥6Ω	1
AC70T-T3-090-B	180A	Built-in	≥23kW	≥9kW	≥12Ω	2
AC70T-T3-110	210A	BU30-3-100*2	≥28kW	≥11kW	≥10Ω	2
AC70T-T3-132	250A	BU30-3-100*2	≥33kW	≥13kW	≥9Ω	2
AC70T-T3-160	310A	BU30-3-100*2	≥40kW	≥16kW	≥8Ω	2
AC70T-T3-185	340A	BU30-3-100*2	≥45kW	≥18kW	≥7Ω	2
AC70T-T3-200	380A	BU30-3-100*2	≥48kW	≥20kW	≥6Ω	2

10.2 PG Card Selection

1、Overview

AC70T is equipped with a variety of feedback cards mainly used for vector type AC drives (AC70T series) for motor speed and direction detection signal feedback, in order to achieve more accurate control of the AC drive motor speed and direction, please select the corresponding PG card according to the corresponding encoder.

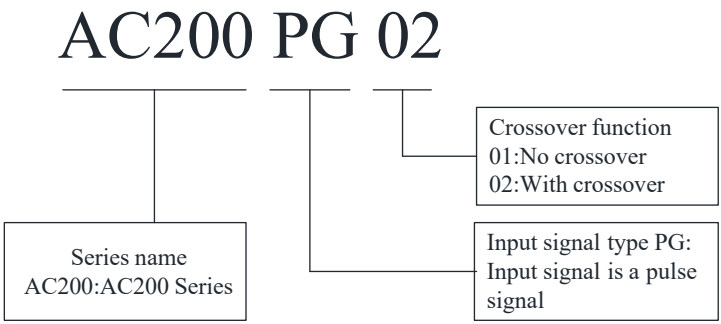
2、PG card classification and selection

The AC200PG01/02 feedback card is mainly used in the QT series tower crane integrated hoisting closed loop and AC70T series lifting special AC drive, through the motor speed and direction detection signal feedback, in order to achieve the hoisting mechanism closed loop anti-slip hook and other functions.

PG Card Types	Support for encoder signal types	PG card output signal	Applicable motor types
Incremental encoder PG card	1- Differential signal input 2- Collector signal input 3- Push-pull signal input	1- Open collector output (crossed/uncrossed) 2- Differential signal output (divided/unbroken)	Asynchronous/synchronous

3、PG card order type

Product order type description



Ordering Instructions：

Domestic encoders are generally supplied with 5V or 12V power, foreign encoders are generally supplied with 5V power, please select the appropriate power supply according to the encoder model.

The resolution, i.e. the number of pulses per revolution of the encoder, must meet the accuracy requirements of the design. Please select whether a frequency division function is required depending on the frequency at which the pulse signal is received.

PG card output signal receiving device please choose according to the actual needs of the occasion, such as monitorable equipment PLC can choose OC output type, other special equipment with anti-interference application needs can choose differential output type.

Remarks：

1）The recommended order number for the incremental encoder PG card is PG01-ABZ-05-C1, for other products please refer to the order notes.

2）The recommended order type for the PG card is PG01-RT, for other products please refer to the order notes.

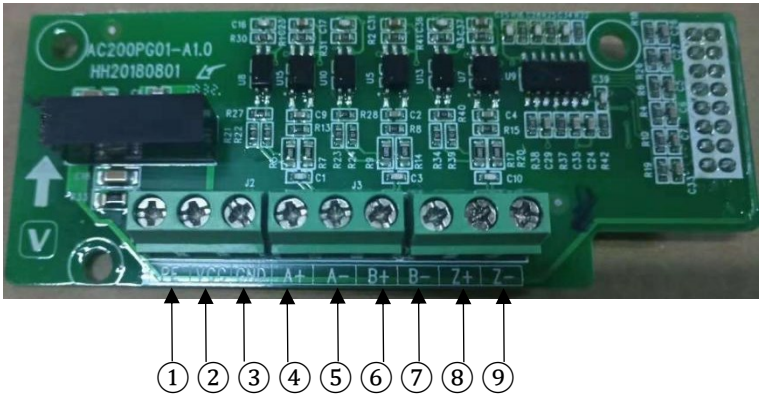
4、Instructions for use of the incremental encoder PG card

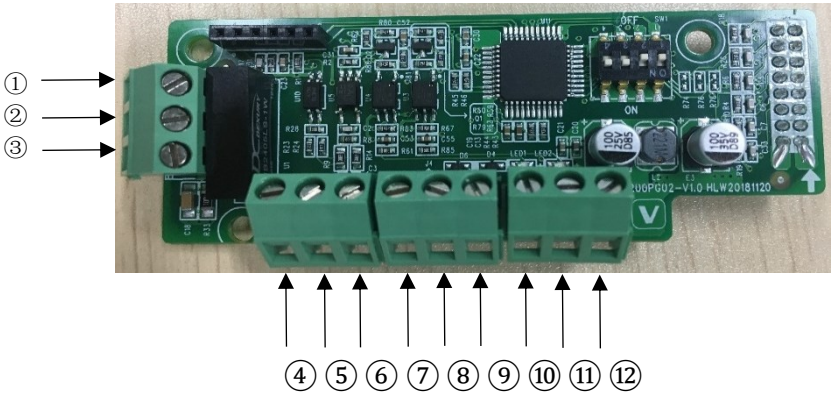
4.1 Product technical parameters

Model number	Power supply	Function	Input signal characteristics		Output signal characteristics	
			Response frequency range	Input impedance	Output frequency range	Output current
AC200PG01	5V±5% 200mA	Broken wire detection	Differential 0 kHz～ 80kHz	About 1KΩ	0 kHz～80kHz	≤100mA
AC200PG02		Broken wire detection Crossover output			0 kHz～80kHz Crossover available	

4.2 Introduction to terminal functions

The arrangement of the incremental encoder PG card terminals is shown in the diagram below





4.3 Functional description of the main signal terminals

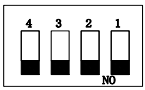
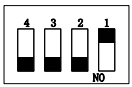
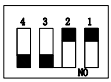
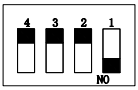
Definition of terminals	Terminal name	Function
①	PE	Ground
②	VCC	+5V output power (for encoder power)
③	GND	Output signal power ground
④	A+	Differential input A+ signal
⑤	A-	Differential input A- signal
⑥	B+	Differential input B+ signal
⑦	B-	Differential input B- signal
⑧	Z+	Differential input Z+ signal
⑨	Z-	Differential input Z- signal
⑩	OA	OC divider output A
⑪	OB	OC divided output B
⑫	COM	OC divided output common ground

Remarks：The above terminal function descriptions are suitable for the AC200PG01 and AC200PG02.

K5 dipswitch instructions (AC200PG02 only): OFF to disconnect shield ground, ON to open shield ground.

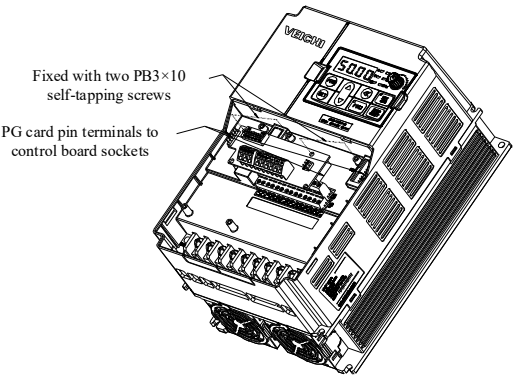
4.5： Select terminal function description

Function name	Select a location	Schematic	Function description

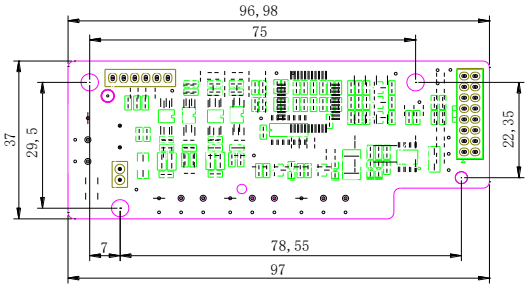
PG card output signal crossover coefficient selection terminal	SW1		fo=fi
			fo=fi/2
			fo=fi/4
			fo=fi/6
		…	
			fo=fi/28
			fo=fi/30

5 Installation and dimensions

5.1： Installation diagram



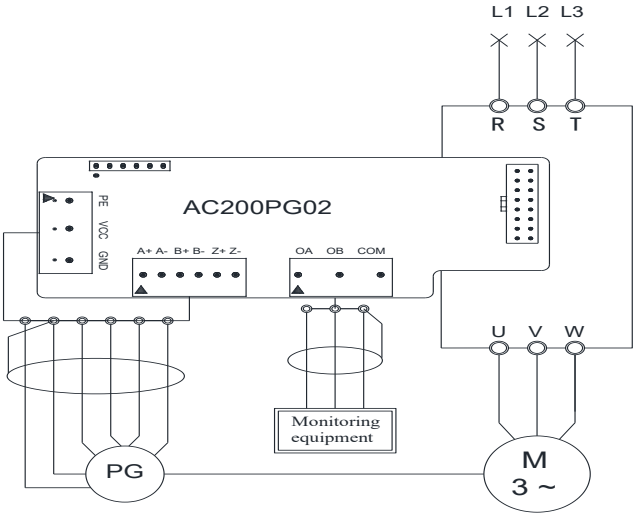
5.2： Installation dimension drawing



6 Electrical connection and operating instructions

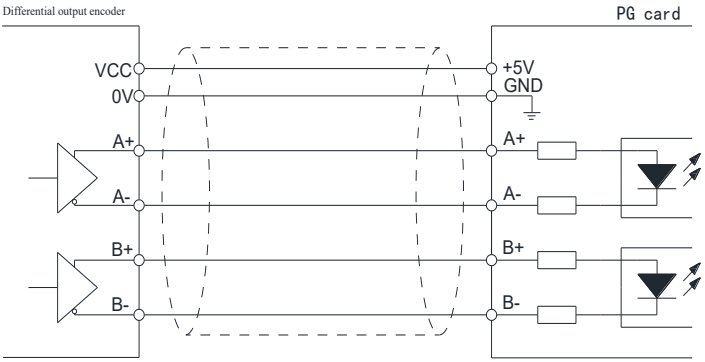
6.1 Electrical connection diagram

6.1.1 Wiring diagram of the whole machine



6.1.1 Wiring diagram of the whole machine

6.1.2 Application connection diagram



5.1.2. Diagram of differential output encoder wiring

6.2 Method of use

1、Install the PG card according to the installation diagram in 5.1；

2、Connect the PG card to the encoder according to the electrical connection diagram in 6.1；

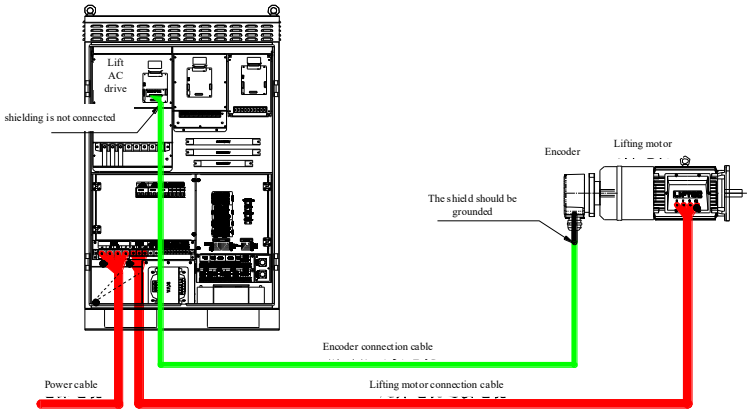
3、Set the relevant parameters of the frequency converter according to the actual usage. Specifically, the following parameters are involved：

NO.	Function description	Range of settings and definition	Factory default	Feature	Address
F0.00	Motor control mode	Asynchronous motor control mode: 0: V/F control 3: High-performance VC without PG 4: High-performance VC with PG	0	○	0x000
F5.30	Speed feedback or encoder mode	**LED "0" digit: encoder mode** 0: Common ABZ encoder 1: Rotary encoder	0000	○	0x51E

		LED "00" digit: encoder direction 0: same direction 1: reverse direction **LED "000" digit: wire break** inspection 0: OFF 1: ON **LED "0000" digit: Z pulse correction enabled** 0: OFF 1: ON			
F5.31	Number of ABZ encoder lines	Used to set the number of ABZ encoder lines, please set according to the sensor specification. Setting range：1～10000	1024	○	0x51F
FF.71	PG break detection time	Setting range：10ms～3000ms	50ms	○	0xF47
FF.72	PG broken wire detection option	**LED "0" digit: A/B break detection** 0：OFF 1：ON **LED "00" digit: Z break detection** 0：OFF 1：ON **LED "000" digit: Reserved** **LED "0000" digit: Reserved**	0001	○	0xF48

Grounding instructions

For closed-loop control, the shield of the encoder connection cable and the motor side must be effectively earthed to prevent electromagnetic interference with the feedback signal from the encoder; the shield of the encoder connection to the PG card side of the AC drive must not be earthed (as shown below).


Lift
AC
drive
shielding is not connected
Encoder
Lifting motor
The shield should be
grounded
Encoder connection cable
Power cable
Lifting motor connection cable

Appendix1: Modbus Communication Protocol

Communication Frame Structure

Communication data format is as follows:

The byte composition: Including initiation bit, 8 data bits, check bit and stop bit.

Initiati	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Check	Stop

One frame message must be transmitted as a continued data flow, and if there is an interval over 1.5 byte before ending, the receiving equipment will clear the half-baked information. And the next byte will be considered as the address field of a new frame. Similarly, if the interval between a new frame start-up and the former frame is smaller than 3.5-byte time, the receiving equipment will consider that it is the continuation of former one frame. Since the jumbled frame, the final CRC checking value is incorrect, which would lead to the communication mistake.

- **Communication Control Parameter Group Address Specification:**

Function Specification	Address Definition	Data Meaning Specification	R/W Characteristic
Communication Given Frequency	0x3000 or 0x2000	0～32000 is corresponding to 0.00Hz～320.00Hz	W/R
Communication Command Setting	0x3001 or 0x2001	0000H: No order	W/R
		0001H: FWD running	
		0002H: REV running	
		0003H: FWD jog	
		0004H: REV jog	
		0005H: DEC stop	
		0006H: free stop	
		0007H: malfunction reset	
		0008H: Running banned	
		0009H: Running allowed	
State of AC Drive	0x3002 or 0x2002	Bit 0: stop 1:	R
		Bit 0: non-acc 1: ACC	
		Bit 0: non-dec 1: DEC	
		Bit 0: Forward 1: REV	
		Bit 0: normal 1: fault	
		Bit 0: GPRS 1: GPRS	

		Bit 0: no pre- 1: pre	
Frequency AC Drive Fault Code	0x3003 or 0x2003	current AC drive fault code（refer to fault code table）	R
Communication Given Upper Frequency	0x3004 or 0x2004	0～32000 is corresponding to 0.00Hz～320.00Hz	W/R
Communication torque setting	0x3005 or 0x2005	0～1000 is corresponding to 0.0～100.0%	W/R
The FWD Max Frequency limit in Torque Control	0x3006 or 0x2006	0～1000 is corresponding to 0.0～100.0%	W/R
The REV Max Frequency limit in Torque Control	0x3007 or 0x2007	0～1000 is corresponding to 0.0～100.0%	W/R
Communication Given PID Setting	0x3008 or 0x2008	0～1000 is corresponding to 0.0～100.0%	W/R
Communication Given PID Feedback	0x3009 or 0x2009	0～1000 is corresponding to 0.0～100.0%	W/R
Voltage Frequency separation voltage value setting	0x300A or 0x200A	0～1000 is corresponding to 0.0～100.0%	W/R
Fault and pre- alarm code reading	0x3010 or 0x2010	0-63 is the fault code 64- is the pre-alarm code	R
Output terminal state	0x3010 or 0x2010	External borrowing AC drive output terminal BII0 -- Y BIT1 -- TA1-TB1-TC1; BIT2 -- TA2-TB2-TC2	R

AO1 output	0x3021 or 0x2021	0-10000 corresponds output 0-10V,0-20mA	R
AO2 output	0x3022 or 0x2022	0-10000 corresponds output 0-10V,0-20mA,0-50kHz	R

Note: The other function code addresses refer to “Communication Address” of function code table. While using writing command (06 H), if the highest digit of parameter function code address domain is 0, it only write in the RAM of AC drive, and on storage when power off; if the high half digit of parameter function code address is 1, it writes in EEPROM, which means power off storage. For instance, F0 parameter group:0X00XX (RAM);0X10XX(EEPROM)

- **List of fault code meanings for abnormal response information from salve machine:**

Fault Code	Meanings
1	Order code fault
3	CRC checking fault
4	Illegal address
5	Illegal data
6	Unable to modify when running
8	AC Drive busy（EEPROM is storing）
9	Value over limit
10	Reserved parameters can’t be modified
11	Number of Bytes wrong when reading

Example: communication write frequency, F0.03 = 6

Write 0x3000 address and the general-purpose AC drive is not the same, AC70T is divided into gears

0x3000=100(0x64)	FC.46	3Hz
0x3000=200(0xC8)	FC.47	5Hz
0x3000=300(0x12C)	FC.48	10Hz
0x3000=400(0x190)	FC.49	15Hz
0x3000=500(0x1F4)	FC.50	20Hz
0x3000=1000(0x3E8)	F0.08	10Hz
0x3000=2000(0x7D0)	FC.00	25Hz
0x3000=3000(0x BB8)	FC.02	40Hz
0x3000=4000(0x FA0)	FC.06	60Hz

0x3000=5000(0x1388)	FC.14	80Hz

Appendix 2: EMC specifications

The EMC product standard (EN 61800-3:2004) specifies the EMC requirements for AC drive products.

Classification of application environments.

Type I environment: residential environments. This includes those applications which are connected directly to the low voltage supply network for the domestic supply without passing through an intermediate transformer.

Type II environments: All environments except those connected directly to the low voltage power supply to the consumer.

Four classifications of frequency converters.

Class C1 AC drives: AC drives with a rated voltage of less than 1000 V and which are used in Class I environments.

AC Drive category C2: AC drives with a rated voltage of less than 1000V, not plug, socket or mobile type devices; power supply AC drive systems that must be installed and operated by specialist personnel when used in a category 1 environment.

Note: The EMC standard IEC/EN 61800-3 no longer restricts the distribution of AC drives, but defines their use, installation and commissioning. Professionals or organisations need to have the necessary skills to install and/or commission electrical AC drive systems, including EMC related knowledge.

AC70T frequency AC drive Technical data

AC Drive category C3: rated voltage below 1000 V, for use in category II environments, not for use in category I environments.

Class C4 AC drive: rated voltage above 1000V or rated current ≧ 400A and used in complex systems in a Class II environment.

Category C2

Conducted nuisance limits conform to the following.

1. Select the optional EMC filter in accordance with the "Peripheral Options" and install in accordance with the instructions in the EMC filter manual.

2. The motor and control cables are selected according to the instructions in this manual.

3. Install the AC drive-in accordance with the method described in this manual.

In domestic environments, this product may generate radio interference and additional mitigation measures need to be implemented.

Class C3

The immunity of the frequency converter to interference is in accordance with the requirements of IEC/EN 61800-3 standard for Class II environments.

The limits of conducted disturbances are in accordance with the following.

1. Select the optional EMC filter according to the "Peripheral options" and install it according to the instructions in the EMC filter manual.
2. The motor and control cables are selected in accordance with the instructions in this manual.
3. Install the frequency converter in accordance with the method described in this manual.

Type C3 AC drives must not be used in a residential low-voltage public power grid. If the inverter is used in such a grid, then radio frequency electromagnetic interference will occur