VEICHI

Manual

ACP30 Series Medium Voltage Drive

Catalog

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Chapter 1 Overview

1.1 Safety Precaution

To ensure safe and proper use of this product, please fully understand the safety precautions outlined in this manual before using.

Warning notice

The following signs are used in this manual to highlight the safety key points. Failure to observe these points may result in damages to this product and the associated system, or personal injuries and even loss of life.

⚠ Danger	**DANGER:** incorrect operation may result in death or major safety incidents
⚠ Caution	**CAUTION:** incorrect operation may result in minor injuries

Qualified personnel

This product is only intended for operation by trained professionals. The personnel working on this product must be trained with specialized skills and knowledge about installation, wiring, operation and maintenance of the equipment, so they can respond correctly to various emergencies that arise during use.

Security guidelines

The warning signs presented for safety are measures taken to prevent personal injuries and damages to the product and the associated system. Please read this manual carefully before use and strictly follow the safety guidelines and warning signs in this manual.

- The safe operation of AC drives requires proper transportation, storage, installation, and diligent operation and maintenance. During transportation and storage, it is crucial to protect the AC drive from shocks and vibrations. Additionally, it should be stored in a dry, free of corrosive gases, free of conductive dust environment with an ambient temperature below 60℃.
- This product is equipped with hazardous voltage to control potentially dangerous motion mechanisms. Non-compliance with regulations or failure to operate in accordance with this manual may lead to damage to the product and associated systems, or even personal injury and death.
- Do not work on wiring while power is on, as it poses a risk of fatal electric shock. Prior to any wiring, inspection, or guarding work, ensure that the power supply to all associated equipment is disconnected, and confirm that the DC voltage in the main circuit has dropped to a safe level. Wait for 15 minutes before commencing the work.
- Ensure that the power line, motor line, and brake line are securely connected, and that the grounding terminal is reliably grounded with a resistance of less than 4Ω.
- The static electricity of human body may cause significant harm to sensitive internal devices. It is crucial for professionals to adhere to the measures and methods outlined in the Electrostatic Discharge Prevention (ESD) guidelines before commencing work on the AC drive, otherwise the AC drive may be damaged.
- Due to the pulse waveform output voltage of the AC drive, it is essential to remove the installed power factor improvement capacitors, lightning protection varistor or other device on the output side of the AC drive, or modifier the device to the input side.
- Do not add switching devices such as circuit breaker and contactor to the output side of the AC drive. (If it is necessary to connect switching devices to the output side, the control system must ensure that the output current of the AC drive is zero when the switch operates.)
- Failure of the control device could lead to production stoppage and significant accidents. Therefore, it is crucial to implement necessary external protective measures or backup devices.
- This product is intended for use in accordance with the manufacturer's specified purpose. Unauthorized use for special fields such as emergency, rescue, marine, medical, aviation, or facility-related settings is prohibited.
- Maintenance should only be performed by VEICHI or authorized professionals. Any unauthorized modification or use of unapproved accessories may lead to product failure. During maintenance, any defective devices must be replaced promptly.

1.2 Unpacking

Please inspect the outer packaging for any damage upon receiving the ordered products. Only open the package after confirming the integrity of the AC drive, checking for any damage, scratches, or dirt. (Please note that damage

resulting from transportation is not covered by the company's Three Guarantees warranty policy.) If the product you receive is damaged in shipping, please contact us or the shipping company immediately. Please confirm that the type of the received product matches the model you ordered.

Chapter 2 Product Information

2.1 Nameplate Description and Naming Convention

Nameplate description

MODEL: ACP30-T11-400-34CA

INPUT: 3PH AC1140V 50/60Hz

OUTPUT: 400kW 260A 0Hz-599Hz

Figure 2-1

Naming convention

Model description: product platform-voltage rating-rated power-model type

ACP30 - T11 – 400 – 3 4 C A
① ② ③ ④ ⑤ ⑥ ⑦

Table 2-1 Model description and naming convention

No.	Meaning	Description
①	Platform	ACP30: ACP30 series medium-voltage AC drives ACP32: ACP32 series special AC drives
②	Voltage	T3: three-phase 380V T4: three-phase 440V T6: three-phase 660V T11: three-phase 1140V T23: three-phase 2300V T33: three-phase 3300V
③	Power	400: 400kW rated power
④	Topology	2: two-level 3: three-level
⑤	Rectification	2: two-quadrant 4: four-quadrant
⑥	Type	C: whole machine M: movement+fittings K: knock-down parts A: renovation
⑦	Cooling	P: heat pipe A: air-cooled L: liquid-cooled N: natural cooling

2.2 Working Principle and System Composition

2.2.1 Basic Rectification

2.2.1.1 Six-Pulse

The core of the basic rectification of the ACP30 series drive is the diode. The basic rectification converts three-phase AC power into DC power which is supplied to the intermediate DC bus of the AC drive. The inversion part of the operating motor is powered by the intermediate DC bus. The schematic diagram is as below:

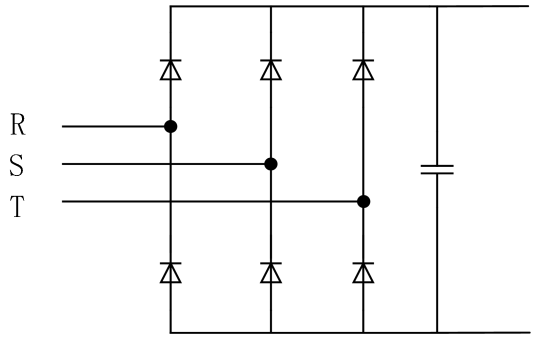


Figure 2-2

2.2.1.1 Twelve-Pulse

The 12-pulse rectification removes the fifth and seventh harmonics so as to significantly reduce harmonic distortion and conducted interference in grid currents. Generally, it is used in applications demanding stringent harmonic standards. The 12-pulse rectification has a higher power factor compared to the 6-pulse one. The system requires a phase-shifting transformer which must have the same primary and secondary ratios and a 30° phase difference between the secondary windings.

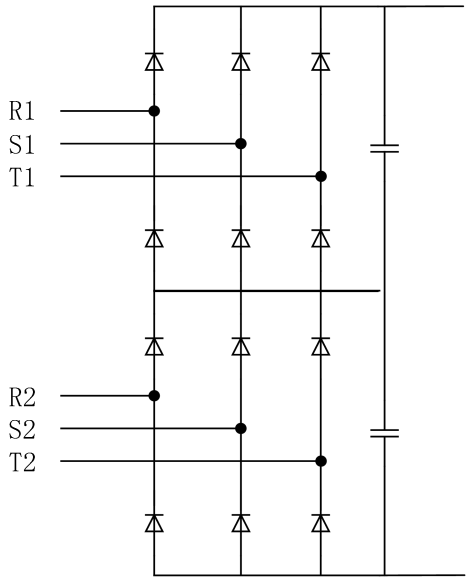


Figure 2-3

2.2.2 Active Rectification

Active rectification is a four-quadrant system that consists of the active rectification filtering part and the active rectification part. The system rectifies three-phase AC power into stable DC power, supplying energy to DC bus-connected loads. Additionally, it facilitates energy feedback by channeling the feedback energy from the motor and other load back to the power grid. The active rectification filtering part refers to the LCL filter which suppresses the harmonics of the AC voltage and current and controls the harmonic content at a low level. Active rectification can output stable and adjustable bus voltage. Its main circuit topology is shown in the figure below:

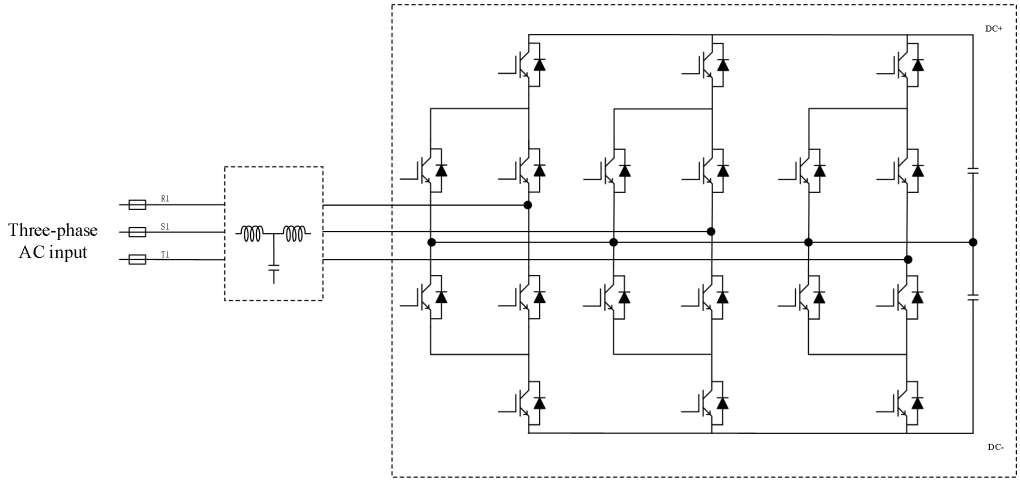


Figure 2-4

2.2.3 Feedback Rectification

Feedback rectification is a four-quadrant system that consist of the feedback rectification part and the feedback rectification filtering part. The system rectifies three-phase AC power into stable direct current for the AC drive to drive motors and other loads. At the same time, it feeds back the energy returned by the motors and other loads to the power grid. The feedback rectification filtering part refers to the L filter which suppresses the harmonics of the input current. It cannot adjust the bus voltage. Its main circuit topology is shown in the figure below:

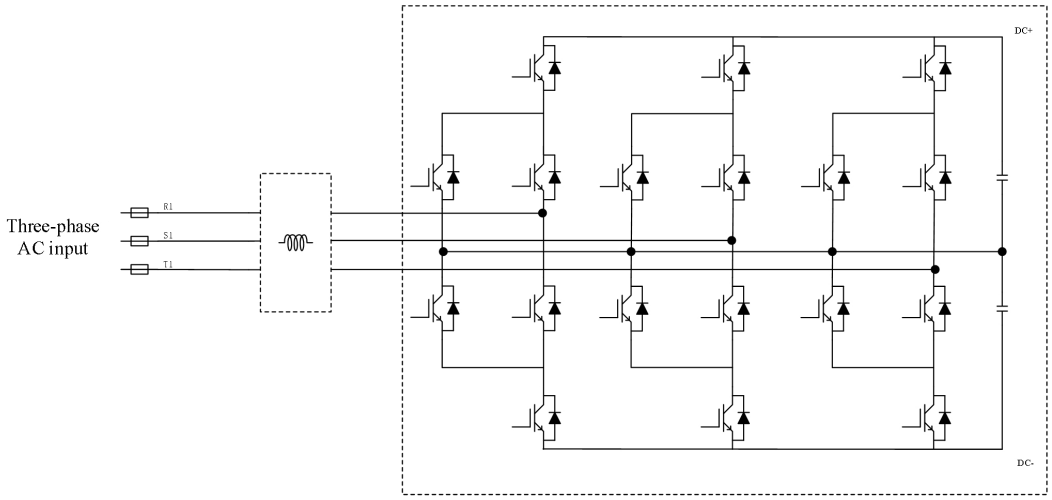


Figure 2-5

2.2.4 Three-Level NPC

The three-level topology facilitates multi-level control through cutting in various levels of the power supply. The diode-clamped three-level NPC topology achieves multi-level voltage control by introducing two clamping diodes. The three-level topology and the output voltage waveform are shown as below:

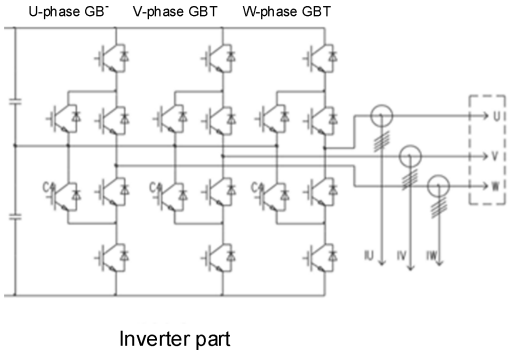


Figure 2-6

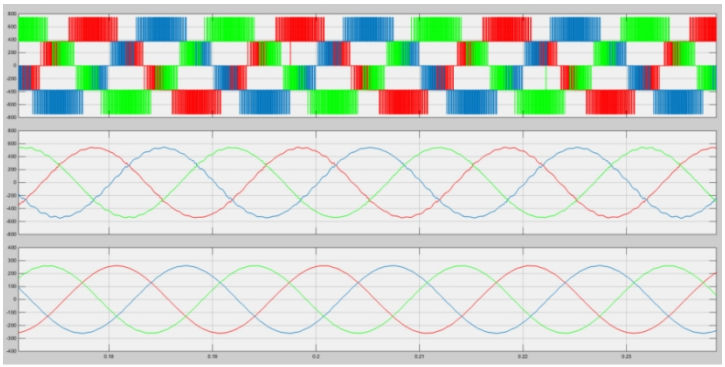


Figure 2-7

Advantages

1. Low voltage spikes on the output side, more friendly to motor insulation. When the drive cable is up to 2000m long, it can accurately obtain the motor parameters, optimize the narrow pulse, and drive the synchronous motor for low-frequency and heavy-load starting.
2. No dynamic voltage sharing problem. Each switching tube is subjected to only half of the total DC bus voltage during the entire phase changing process.
3. Smaller current and voltage harmonics.
4. Achieve static voltage balance with no need for additional switching devices.
5. Good sinusoidal output.

2.3 Technical Specifications

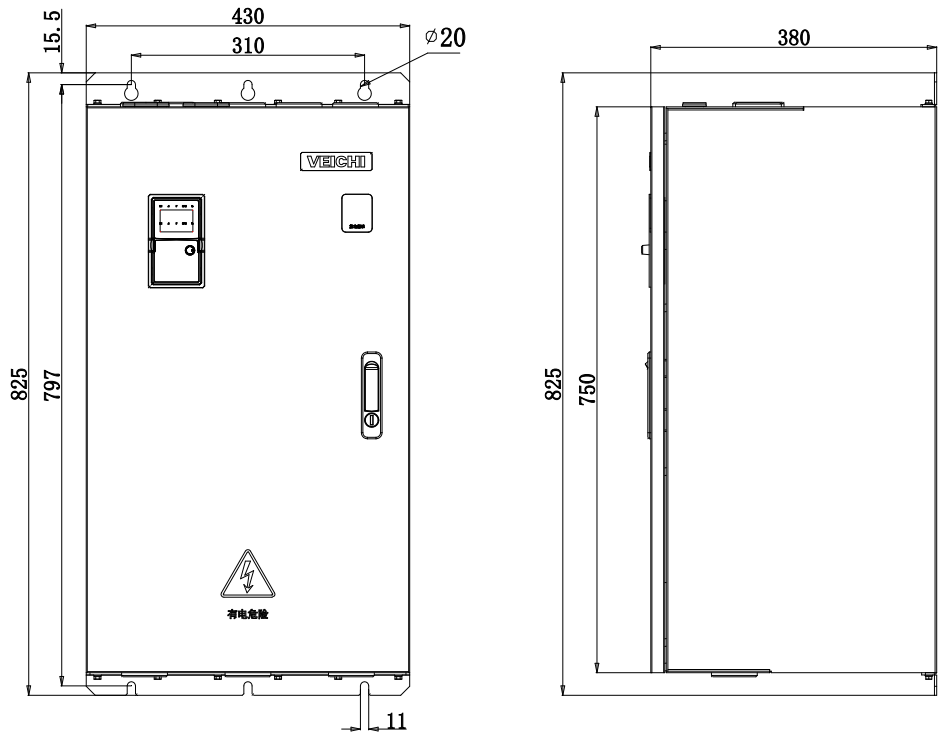
Item		Specification
Power input	Voltage, frequency	T3: three-phase 380V~480V 50Hz/60Hz T6: three-phase 660V~730V 50Hz/60Hz T11: three-phase 1000V~1300V 50Hz/60Hz T33: three-phase 3000V~3600V 50Hz/60Hz
	Allowable fluctuation	T3: -15%~10% T6: -10%~10% T11: -15%~15% T33: -10%~10% Voltage imbalance rate: <3%; frequency ±5% Distortion rate meets IEC61800-2 requirements
	Power factor	two-quadrant ≥ 85%, four-quadrant ≥ 99%
	AC drive efficiency	≥96%
Output	Voltage	Under rated output conditions: 3-phase, 0~input voltage
	Frequency	0.00Hz~100.00Hz
	Accuracy	±0.5% of max. frequency
	Overload capacity	G-type: 150% rated current for 89s, 180% rated current for 10s, 200% rated current for 3s P-type: 120% rated current for 35s, 140% rated current for 7s, 150% rated current for 3s
Main control performance	Motor control	V/F control, open-loop vector control, close-loop vector control
	Modulation	Optimized space vector PWM (SVPWM)

	Carrier frequency	Rectification rated at 2kHz, inversion rated at 1kHz
	Speed control range	Vector control without PG, rated load 1: 100 Vector control with PG, rated load 1: 1000
	Steady state accuracy	Vector control without PG: ≤0.5% rated synchronous speed (asynchronous), ≤0.1% rated synchronous speed (synchronous) Vector control with PG: ≤0.02% rated synchronous speed
	Starting torque	Open-loop vector control: 150% of rated torque at 0.5Hz Closed-loop vector control: 200% of rated torque at 0 Hz
	Torque response	Open-loop vector control of speed: <10ms; closed-loop vector control of speed: <5ms
	Torque accuracy	Vector control without PG: ±5%, vector control with PG: ±2.5%
	Frequency resolution	Digital setting: 0.01Hz; analog setting: max. frequency x 0.05%
	Torque boost	Automatic torque boost 0.0%~100.0% Manual torque boost 0.0%~30.0%
	V/F curve	4 patterns: linear torque characteristic curve, self-setting V/F curve, torque drop curves (1.1~2.0 power), square V/F curve
	ACC./DEC. curve	2 patterns: linear acc./dec., S curve acc./dec. 4 sets of acc./dec., time unit: 0.01s, up to 650.00s
	Rated output voltage	With the power supply voltage compensation function, it can be set within the range of 50%~100% by taking the rated voltage of the motor as 100% (the output cannot exceed the input voltage)
	Automatic voltage regulation	Automatically keep a constant output voltage when the grid voltage varies
	Automatic energy-saving operation	Automatically optimize the output voltage according to the load in V/F control mode for energy-saving operation
	Automatic current limiting	Automatic limitation of current during operation to prevent tripping due to frequent overcurrent faults
	Instantaneous power-down handling	Uninterrupted operation by bus voltage control in case of instantaneous power down
	Standard function	PID control, speed tracking and power-down restart, frequency jumping, upper and lower frequency limit control, programmed operation, multi-speed, RS485 communication, analog output, frequency pulse output
	Frequency setting channel	Keyboard number given, analog voltage/current terminal AI1, analog voltage/current terminal AI2, pulse input PUL, communication given and multi-channel terminal selection, combination of main and auxiliary channels (channels can be switched in various ways)
	Feedback input channel	Analog voltage/current terminal AI1, analog voltage/current terminal AI2, communication given, pulse input PUL
	Command running channel	Operator panel given, external terminal given, communication given
	Input command signal	Start, stop, forward and reverse, jog, multi-speed, free stop, reset, acc./dec. time selection, frequency setting channel selection, or external fault alarms
	External output signal	1-channel RO, 1-channel open-collector output, 1-channel AO (can be selected as 0V~10V, 0mA~20mA, 4mA~20mA) or frequency pulse output
Protection		For short-circuit, overcurrent, overvoltage, undervoltage, overload,

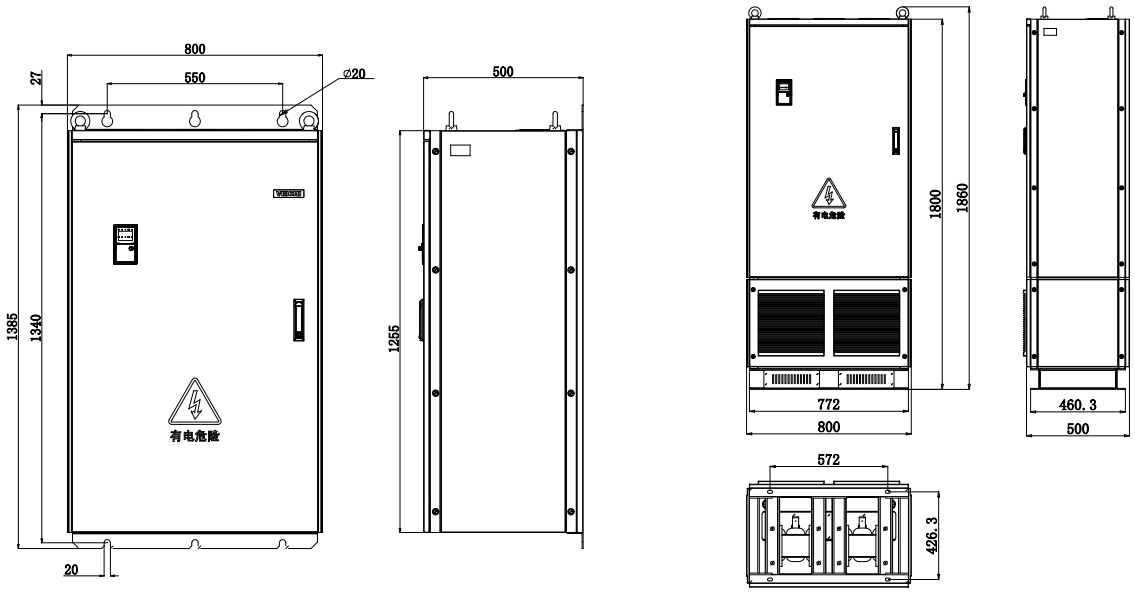
		overtemperature, current limit, data, stall, I/O phase loss
Keyboard display	LED display	Double-line 5-digit digitron display, 2 AC drive status parameter displays
	Parameter copy	Function code information of AC drives can be transmitted upwards and downwards so as it realizes fast parameter copying
	Status monitoring	Output frequency, given frequency, output current, I/O voltage, motor speed, PID feedback, PID setting, module temperature, and all other monitoring parameters
	Fault alarm	Overvoltage, undervoltage, overcurrent, short-circuit, phase loss, overload, overtemperature, stall, data protection failure, operating status of current faults, historical fault
Peripheral interface	AI×2	1. Input current: DC 0V~10V/0mA~20mA 2. Voltage input impedance: 100kΩ 3. Current input impedance: 500Ω
	DI×6	Optocoupler isolation, compatible with bipolar input 1. Input impedance: 4.4kΩ 2. Voltage at high-level input: 10V~30V 3. Voltage at low-level input: 0V~8V
	AO×2	4. Output voltage: DC 0V~10V 5. Output current: DC 0mA~20mA 6. Output pulse: 0kHz~20kHz
	RO×2	Normally open/closed terminals Contact drive capacity 240VAC, 3A 30VDC, 5A
	Communication	Standard with RS485 communication interface×2, CAN communication interface×1, and optional with TCP/IP×1
	Operation panel	Standard with LED keyboard, optional with touch screen
	Feedback signal of contactor	Input feedback×1, output feedback×1
	Temperature detection	Standard with NTC×6, optional with motor temperature detection PT100/PT1000/KTY84×1
Ambient conditions	Installation	Altitude below 1000m; derated at 1000m or above with a 1% derated per additional 100m. No condensation, icing, rain, snow, hail, etc., solar radiation below 700W/m², air pressure 70kPa~106kPa
	Temperature, humidity	-10℃~+50℃, derated above 40℃, max. temperature 60℃ (no-load operation) 5%RH~95%RH (non-condensing)
	Storage ambient temperature	-30℃~+60℃
	Vibration	5.9m/s² (0.6G) at 9Hz~200Hz
	Installation	Wall-mounted, cabinet
	Protection rating	IP20
	Pollution rating	2
	Cooling method	Forced air-cooled, liquid-cooled

2.4 Product Specifications

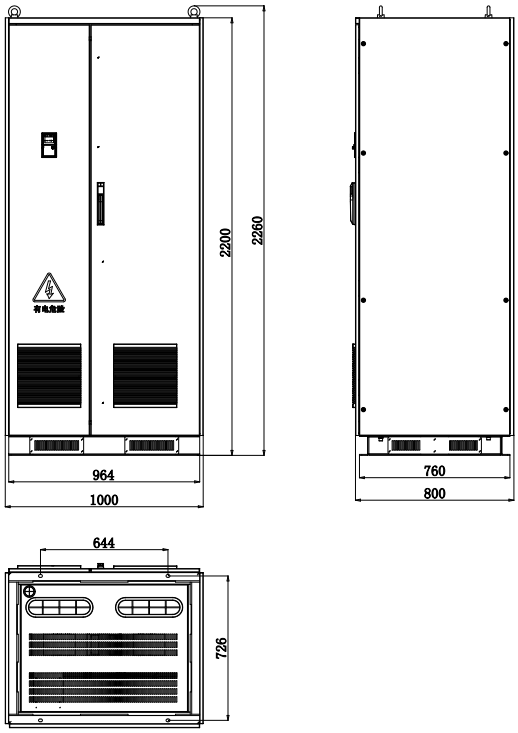
1140V two-quadrant

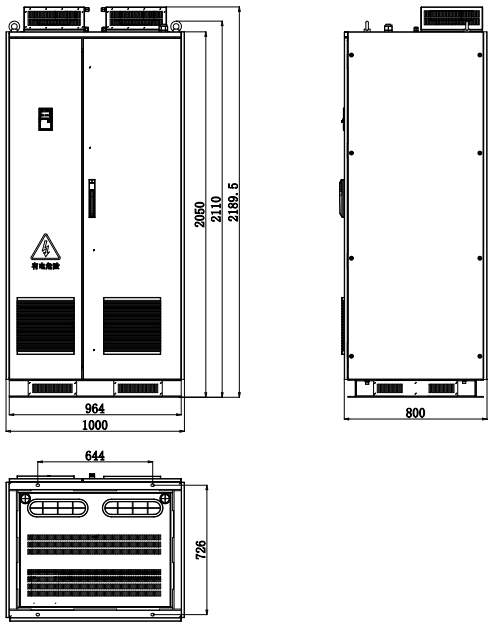


Model	Rated power (kW)	Rated current (A)	Dimensions W*D*H (mm)	Description
ACP30-T11-037-32CA	37	25	Wall-mounted: 430*380*750 Installation: 310*797	Wall-mounted: no I/O reactor
ACP30-T11-045-32CA	45	31		
ACP30-T11-055-32CA	55	38		
ACP30-T11-075-32CA	75	52		
ACP30-T11-090-32CA	90	58		

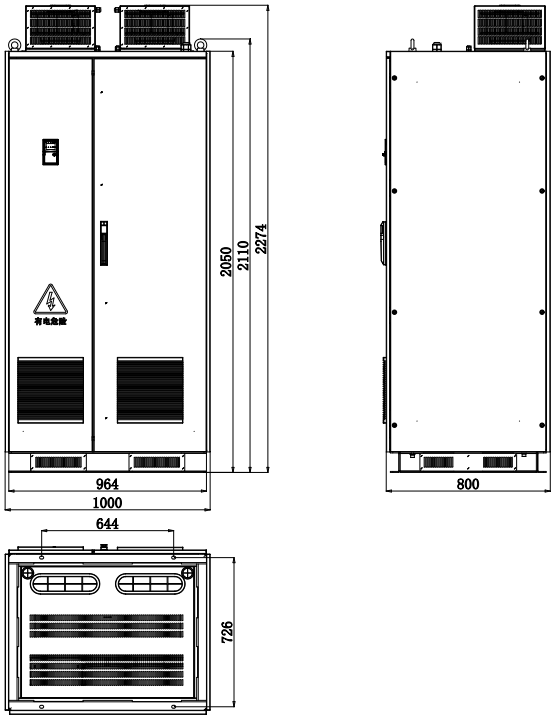


Wall-mounted Cabinet

ACP30-T11-110-32CA	110	75	Wall-mounted: 800*500*1385 Cabinet: 800*500*1800	Wall-mounted: no I/O reactor Cabinet: Standard AC I/O reactor
ACP30-T11-132-32CA	132	86		
ACP30-T11-160-32CA	160	105		
ACP30-T11-185-32CA	185	115		
ACP30-T11-200-32CA	200	132		
ACP30-T11-220-32CA	220	144		
ACP30-T11-250-32CA	250	162		
ACP30-T11-280-32CA	280	175		
ACP30-T11-315-32CA	315	208		
				
ACP30-T11-355-32CA	355	230	Cabinet: 1000*800*2260	Cabinet: Standard AC I/O reactor
ACP30-T11-400-32CA	400	260		
ACP30-T11-450-32CA	450	290		
ACP30-T11-500-32CA	500	325		
ACP30-T11-560-32CA	560	365		
ACP30-T11-630-32CA	630	400		

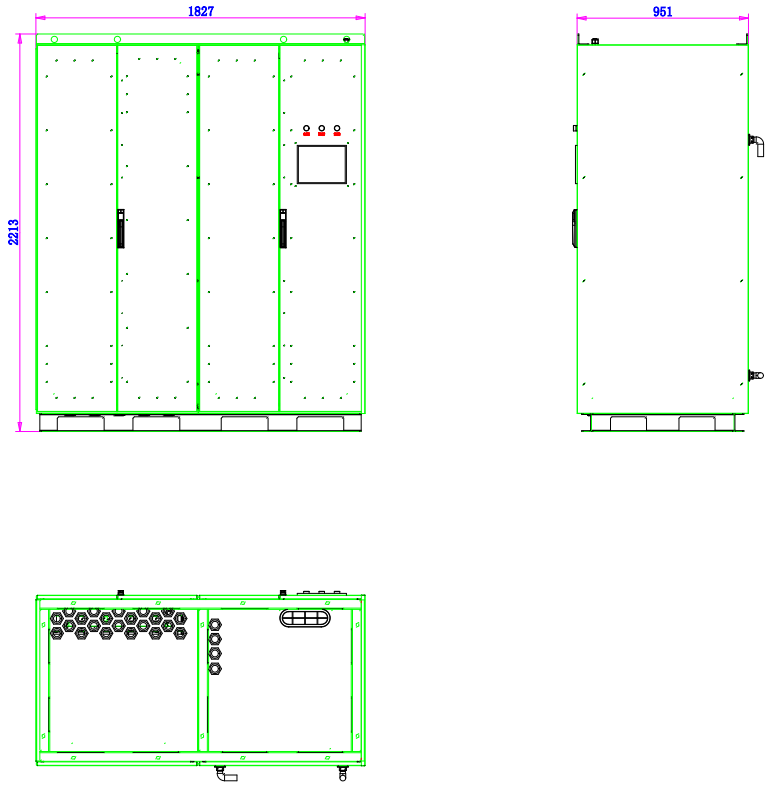


ACP30-T11-710-32CA	710	450	Cabinet: 1000*800*2190	Cabinet: Standard AC I/O reactor
ACP30-T11-800-32CA	800	505		
ACP30-T11-900-32CA	900	570		
ACP30-T11-1000-32CA	1000	635		
ACP30-T11-1120-32CA	1120	700		



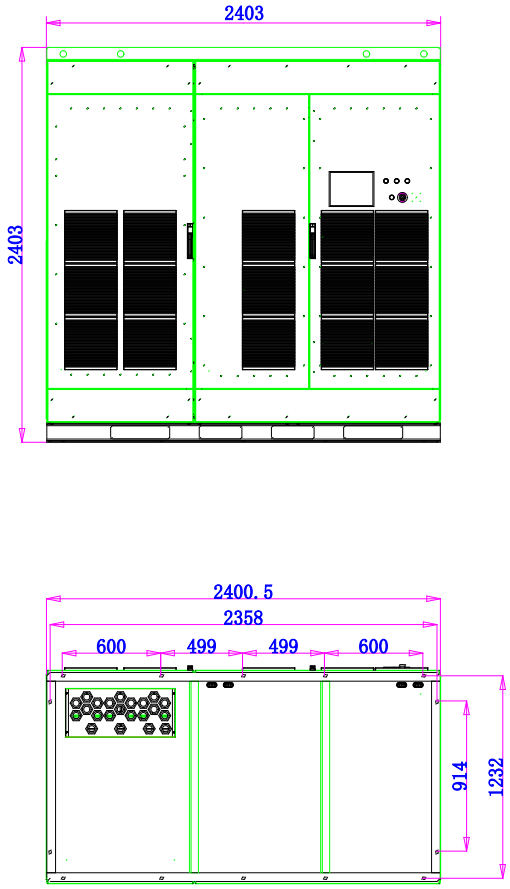
ACP30-T11-1250-32CA	1250	750	Cabinet: 1000*800*2274	Cabinet: Standard AC I/O reactor

3300V two-quadrant (liquid-cooled)



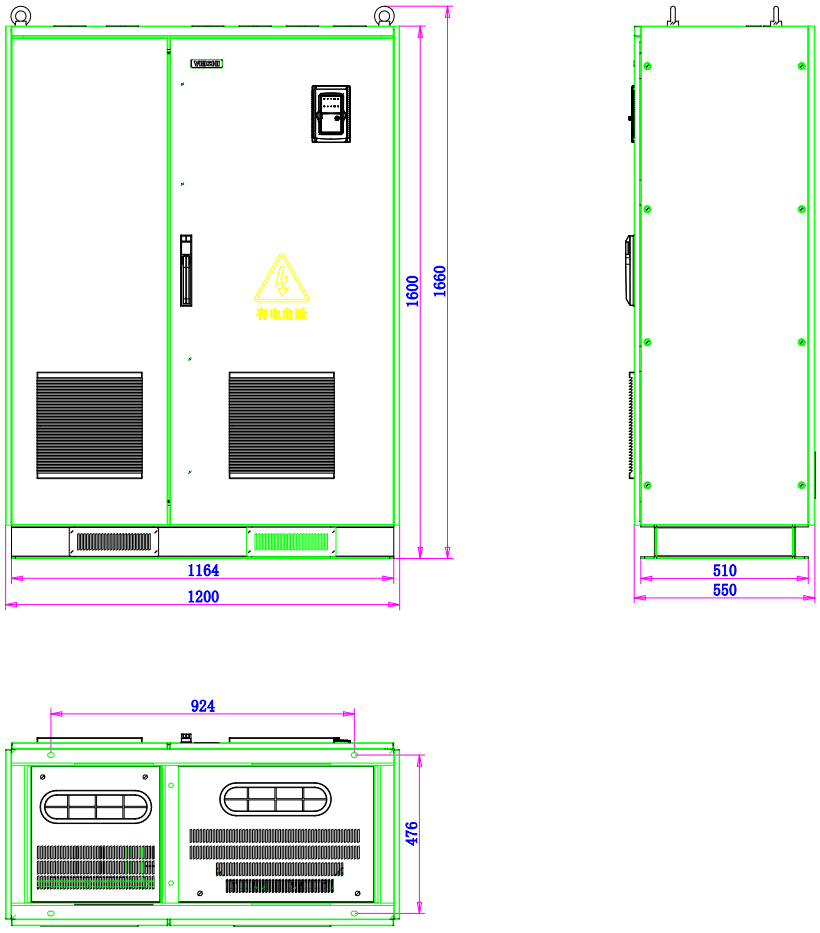
Model	Rated power (kW)	Rated current (A)	Dimensions W*D*H (mm)	Description
ACP32-T33-855-32CL	855	188	1827*951*2213	Inversion: three-level NPC topology Rectification: 12-pulse input Standard with output reactor, touch screen Optional with liquid-cooling system Optional with 24-pulse and 36-pulse inputs
ACP32-T33-1000-32CL	1000	220		
ACP32-T33-1250-32CL	1250	280		
ACP32-T33-1400-32CL	1400	300		
ACP32-T33-1600-32CL	1600	350		
ACP32-T33-1800-32CL	1800	394		
ACP32-T33-2000-32CL	2000	437		
ACP32-T33-2250-32CL	2250	495		
ACP32-T33-2500-32CL	2500	550		

3300V two-quadrant (air-cooled)

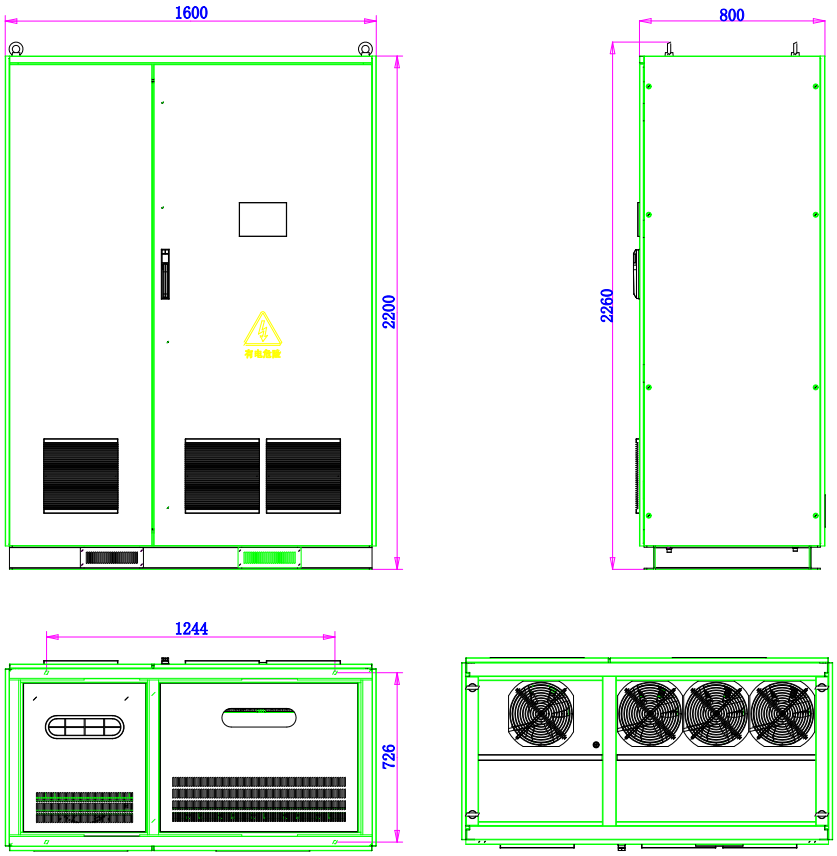


Model	Rated power (kW)	Rated current (A)	Dimensions W*D*H (mm)	Description
ACP32-T33-855-32CA	855	188	2403*1299*2403	Inversion: three-level NPC topology Rectification: 12-pulse input Standard with output reactor, touch screen Optional with 24-pulse and 36-pulse inputs
ACP32-T33-1000-32CA	1000	220		
ACP32-T33-1250-32CA	1250	280		
ACP32-T33-1400-32CA	1400	300		
ACP32-T33-1600-32CA	1600	350		
ACP32-T33-1800-32CA	1800	394		
ACP32-T33-2000-32CA	2000	437		
ACP32-T33-2250-32CA	2250	495		
ACP32-T33-2500-32CA	2500	550		

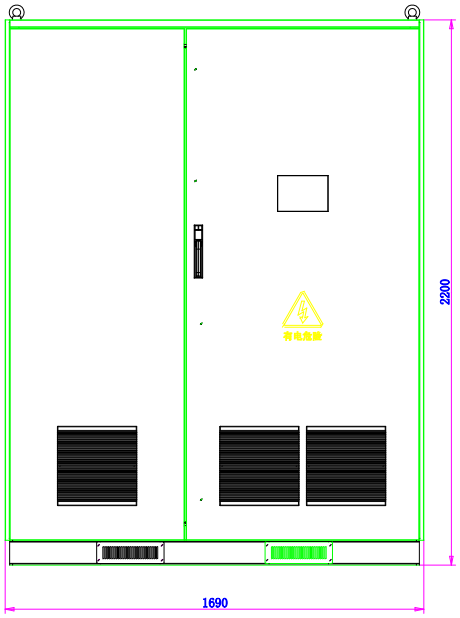
Four-quadrant

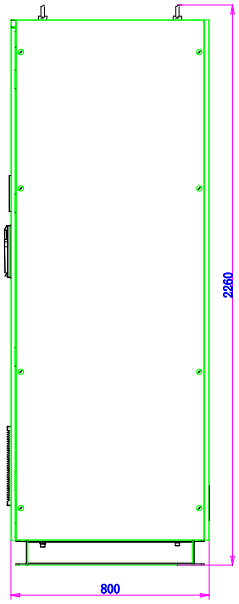


Model	Rated power (kW)	Rated current (A)	Dimensions W*D*H (mm)	Description
ACP30-T3-110-24CA	110	210	Cabinet: 1200*550*1600	Air-cooled cabinet: standard with LCL filter and AC output reactor
ACP30-T3-132-24CA	132	250		
ACP30-T3-160-24CA	160	310		
ACP30-T3-185-24CA	185	340		
ACP30-T3-200-24CA	200	380		
ACP30-T3-220-24CA	220	415		
ACP30-T3-250-24CA	250	470		

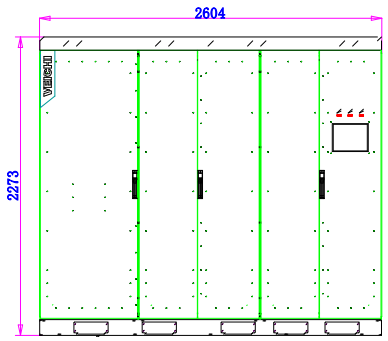


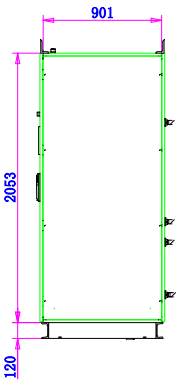
ACP30-T6-280-24CA	280	330	Cabinet: 1600*800*2260	Air-cooled cabinet: with LCL filter, touch screen as standards, AC output reactor as an option
ACP30-T6-315-24CA	315	345		
ACP30-T6-355-24CA	355	380		
ACP30-T6-400-24CA	400	430		
ACP30-T6-450-24CA	450	466		
ACP30-T6-500-24CA	500	540		

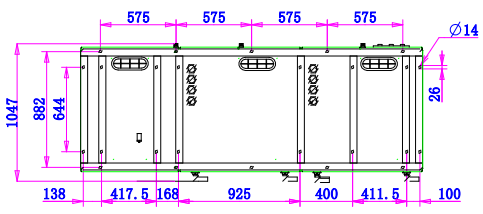




ACP30-T11-355-34CA	355	230	Cabinet: 1690*800*2260	Air-cooled cabinet: with LCL filter, touch screen as standards, AC output reactor as an option
ACP30-T11-400-34CA	400	260		
ACP30-T11-450-34CA	450	290		
ACP30-T11-500-34CA	500	325		
ACP30-T11-560-34CA	560	365		
ACP30-T11-630-34CA	630	400		







ACP30-T33-855-34CL	855	188	Cabinet: 2604*1047*2273	Liquid-cooled cabinet: standard with LCL filter, touch screen, AC output reactor, liquid-cooling, and with as liquid-cooling system as an option
ACP30-T33-1250-34CL	1250	280		
ACP30-T33-1600-34CL	1600	350		
ACP30-T33-2000-34CL	2000	437		
ACP30-T33-2500-34CL	2500	550		

2.5 Expansion Cards

2.5.1 IO Expansion Card

AC300IO1 expansion card is a terminal expansion card for VEICHI ACP30 full series AC drives. It is equipped with extensive functions of DI, DO, AI, AO of AC drives to meet various application requirements in specific occasions. Please read the "AC300IO1 Expansion Card Manual" carefully before using.

The AC300IO1 expansion card utilizes terminal wiring for its interface and can be mounted on expansion interface1 of the control board.

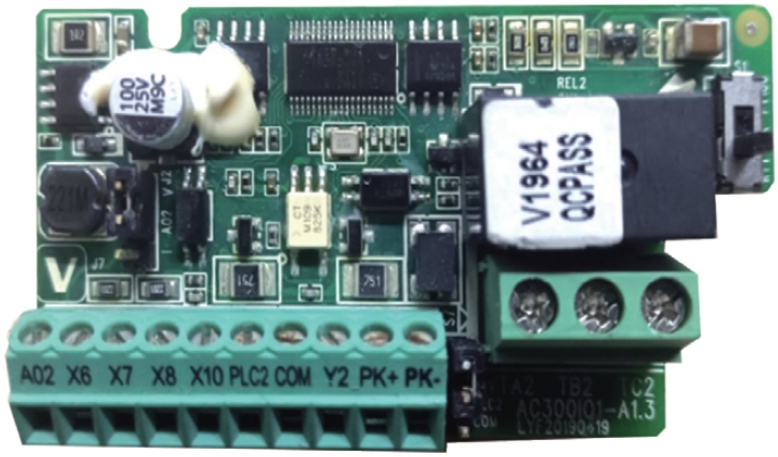


Figure 2-8

Technical specifications

Item	DI signal characteristics			
	Name	Response frequency	Input impedance	Effective level
Input signal	X6, X7, X8	0kHz~5kHz	4.4kΩ	High-level: 10V~30V Low-level: 0V~5V
	X10	0kHz~50kHz	1.5kΩ	High-level: 10V~30V Low-level: 0V~5V
Connect PLC2 to 24V or COM via jumper switch S7, supporting the input of NPN and PNP transistor signals.				
Item	DO signal characteristics			
	Name	Mode	Max. output	
Output signal	Y2	NPN transistor open collector output	DC 24V/50mA	
	TA2, TB2, TC2	Relay normally open and normally closed output	3A/250VAC 3A/30VDC	
Item	AO2 signal characteristics (selected by J2 jumper switch)			
	Name	Output capacity		Note

AO2	AO2-V (voltage output)	DC 0V~10V		Max. output 2mA
	AO2-I (current output)	DC 0mA~20mA or 4mA~20mA		-
PK+/PK- temperature sensor signal				
Name	Thermocouple	Selection mode	Input method	Detection temperature
PK+/PK-	PT100	DIP switch S1 selection	Differential two-wire input	0℃~220℃
	KTY84	By setting DIP switch S1 in conjunction with F10.26		
	PT1000			

2.5.2 PG Expansion Card

ACP30 is equipped features a range of feedback cards mainly used in vector-controlled AC drives , enabling precise detection of motor speed and direction. Please select the proper PG card according to the corresponding encoder.

2.5.2.1 Classification and Selection

VEICHI provides two types of PG cards: incremental encoder and rotary transformer. The supported encoder signal inputs and feedback card output signals are listed below:

PG card	Signal	Output signal	Adaptable motor
Incremental encoder PG card	1. differential signal input 2. Collector signal input	1. Open collector output (frequency division on/off) 2. Collector signal output (frequency division on/off)	Asynchronous/synchronous
Rotary transformer PG card	Rotary transformer signal input	None	Asynchronous/synchronous

2.5.2.2 Incremental Encoder PG Card Use Guide

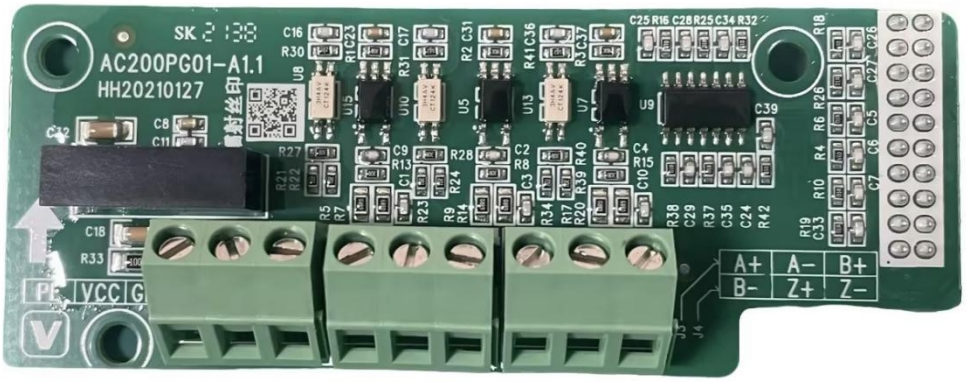


Figure 2-9

Technical Specifications

Power supply	Input signal characteristics			Output signal characteristics	
	Input signal	Response frequency	Input impedance	Output frequency	Output current
5V/12V±5% 200mA (Default 5V)	ABZ	0kHz~300kHz	1kΩ	1. Collector output: 0kHz~80kHz 2. Differential output: 0kHz~300kHz	≤100mA

Terminal Function Description

Function	Terminal	Description
Power supply	VCC	5V/12V power supply, up to 200mA current
	PE	Earth (ground terminal of shielded wire)
	COM	Power supply reference point (output open-collector signal reference point)
Encoder signal input	A+	Encoder A-phase differential input
	A-	
	B+	Encoder B-phase differential input
	B-	
	Z+	Encoder Z-phase differential input
	Z-	

Related Parameter Setting

Set the related parameters of the AC drive according to the actual situation. The relevant function codes are as follows:

Name	Description
F0.00 Motor control mode	4: closed-loop vector for asynchronous machine 7: closed-loop vector for synchronous machine
F5.30 Speed feedback or encoder types	Ones-bit set as 0
F5.31 ABZ encoder line number	Set according to the encoder

Wiring Notice

1. PG card signal lines should be separated from power lines, and parallel routing is prohibited.
2. Please select a shielded cable for the PG card signal line in order to avoid interference with the encoder signals.
3. The encoder shielding cable should be connected to earth (or the PE terminal of the AC drive), preferably with one end grounded to avoid signal interference.

2.5.2.3 RT Card Use Guide

Function Description

The signal output of the rotary transformer is a two-phase quadrature analog signal. Their amplitude varies sin-cosine with the angle of rotation, and their frequency is the same as the excitation frequency.



Figure 2-10

Terminal Function Description

Function	Terminal	Description
Output	PE	Earth (connect signal lines to shielded lines)
	EXC+	Excitation source output
	EXC-	
Input	COS+	COS signal input
	COS-	
	SIN+	SIN signal input
	SIN-	

DIP Description

S1	S2	Transformation ratio
1	1	0.286
2	2	Reserved
3	3	0.5

Related Parameter Setting

Name	Description
F0.00 Motor control mode	4: closed-loop vector for asynchronous machine 7: closed-loop vector for synchronous machine
F5.30 Speed feedback or encoder types	Ones-bit set as 1
F5.33 Rotary transformer pole number	Set according to the encoder

2.6 Terminal Electrical Characteristics and Wiring Description

2.6.1 Output Capacity of Auxiliary Terminals

Item	Mark	Name	Description
Power supply	+10V	10V auxiliary power output, looped with GND	50mA
	+24V	24V auxiliary power output, looped with COM	100mA
	PLC	External common terminal	Connect to +24V by factory default When utilizing external signals to drive X1~X6, ensure the PLC is connected to an external power supply and disconnected from the +24V supply. (Refer to the wiring diagrams for "+24V," "PLC," and "COM" for details.)
AI	AI1	Voltage or current-mode analog input, looped with GND	1. Input current range: DC 0V~10V/0mA~20mA 2. Voltage input impedance: 100KΩ 3. Current input impedance: 500Ω
	AI2	Voltage or current-mode analog input, looped with GND	
AO	A01	Analog monitoring output, looped with GND	Max. output of 10V/20mA for voltage/current-mode signals.
AO	A02	Analog monitoring output, looped with GND	Max. output of 10V/20mA for voltage/current-mode signals.
DI	X1	Multi-functional contact input1	Optocoupler isolation, compatible with bipolar input. 1. Input impedance: 4.4KΩ 2. Voltage at high-level input: 10V~30V 3. Voltage at low-level input: 0V~8V
	X2	Multi-functional contact input2	
	X3	Multi-functional contact input3	
	X4	Multi-functional contact input4	
	X5	Multi-functional contact input5	
	X6	Multi-functional contact input6	
RO	TA1/TB1/TC1	Normally open terminals TA1-TC1, normally closed terminals TB1-TC1	Contact drive capacity: 240VAC, 3A 30VDC, 5A
	TA2/TB2/TC2	Normally open terminals TA2-TC2, normally closed terminals TB2-TC2	
485 communication terminal	485+	Communication terminal 485+	The RS485 DIP switch position determines whether the RS485 communication is connected to the 120Ω terminal resistance or not, according to the legend and description of S1 switch functions.
	485-	Communication terminal 485-	
CAN communication terminal	CANH	Communication terminal CANH	The CAN DIP switch position determines whether the CAN communication is connected to the 120Ω terminal resistance or not, according to the legend and description of S1 switch functions.
	CANG	Communication terminal CANG	
	CANL	Communication terminal CANL	

2.6.2 Legend and Description of S1 Switch Functions

Tag number	Tag	Position	Description
	1	B485-ON	RS485 communication is connected to 120Ω terminal resistance

	2	CAN-ON	CAN communication is connected to 120Ω terminal resistance
	3	AO2V-ON	0V~10V voltage output from AO interface
	4	AO2I-ON	0mA~20mA or 4mA~20mA current output from AO interface
	5	AO1V-ON	0V~10V voltage output from AO interface
	6	AO1I-ON	0mA~20mA or 4mA~20mA current output from AO interface
	7	AI1-I-ON	0mA~20mA input into AI1
		AI1-V-OFF	0V~10V input into AI1
	8	AI2-I-ON	0mA~20mA input into AI2
		AI2-V-OFF	0V~10V input into AI2

Note:

When using CAN communication, a CAN communication terminal resistance must be connected, and if any terminal resistance in the CAN communication master or slave is dialed to CAN-ON, it means that the DIP switch selects CAN-ON. See the details in the picture above.

2.6.3 Earthing Terminal Description

Tag	Description
S2	X-terminal COM earth switch, shorted to ON to enable grounding
S3	Control system reference ground switch, shorted to ON to enable grounding
S4	CAN terminal resistance ground switch, shorted to ON to enable grounding

2.6.4 Expansion Card Interface Description

Tag	Description
Expansion card interface1	AC300IO expansion card
Expansion card interface2	Burner card interface, ACP30 communication card, PG card, Profinet, CANopen
Expansion card interface3	AC200 rotary transformer card interface and AC200 photoelectric encoder interface

2.6.5 Control Circuit Wiring

Two-quadrant

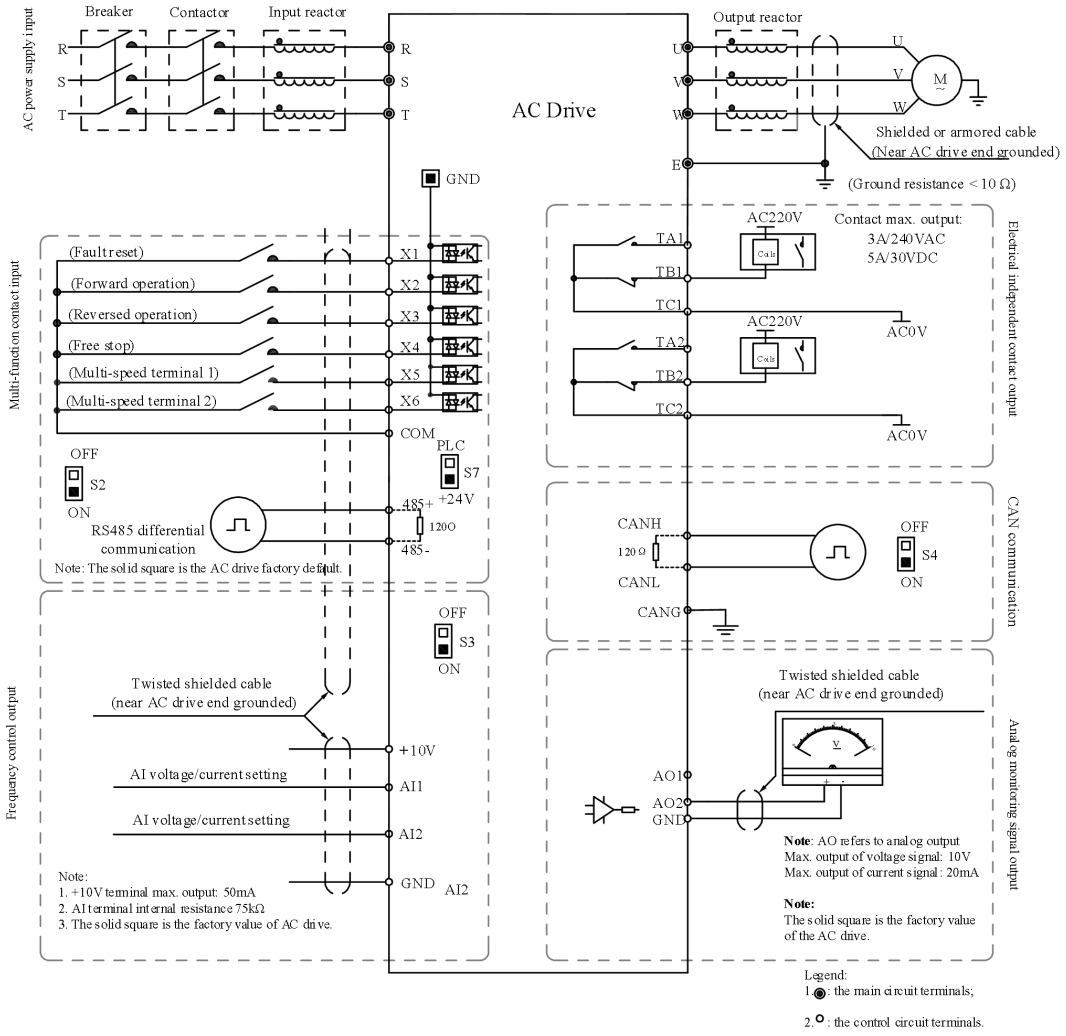

AC power supply input
Breaker
Contactor
Input reactor
R
S
T
AC Drive
Output reactor
U
V
W
E
M
Shielded or armored cable
(Near AC drive end grounded)
(Ground resistance < 10 Ω)
GND
Multi-function contact input
(Fault reset)
(Forward operation)
(Reversed operation)
(Free stop)
(Multi-speed terminal 1)
(Multi-speed terminal 2)
X1
X2
X3
X4
X5
X6
COM
PLC
OFF
S2
ON
S7
+24V
485+
485-
120Ω
RS485 differential communication
Note: The solid square is the AC drive factory default.
Electrical independent contact output
TA1
TB1
TC1
TA2
TB2
TC2
AC220V
Coils
Contact max. output:
3A/240VAC
5A/30VDC
AC0V
CAN communication
CANH
CANL
CANG
120Ω
OFF
S4
ON
Frequency control output
OFF
S3
ON
Twisted shielded cable
(near AC drive end grounded)
+10V
AI voltage/current setting
AI1
AI voltage/current setting
AI2
GND
AI2
Note:
1. +10V terminal max. output: 50mA
2. AI terminal internal resistance 75kΩ
3. The solid square is the factory value of AC drive.
Analog monitoring signal output
Twisted shielded cable
(near AC drive end grounded)
AO1
AO2
GND
Note: AO refers to analog output
Max. output of voltage signal: 10V
Max. output of current signal: 20mA
Note:
The solid square is the factory value of the AC drive.
Legend:
1. : the main circuit terminals;
2. : the control circuit terminals.

Figure 2-30

Four-quadrant

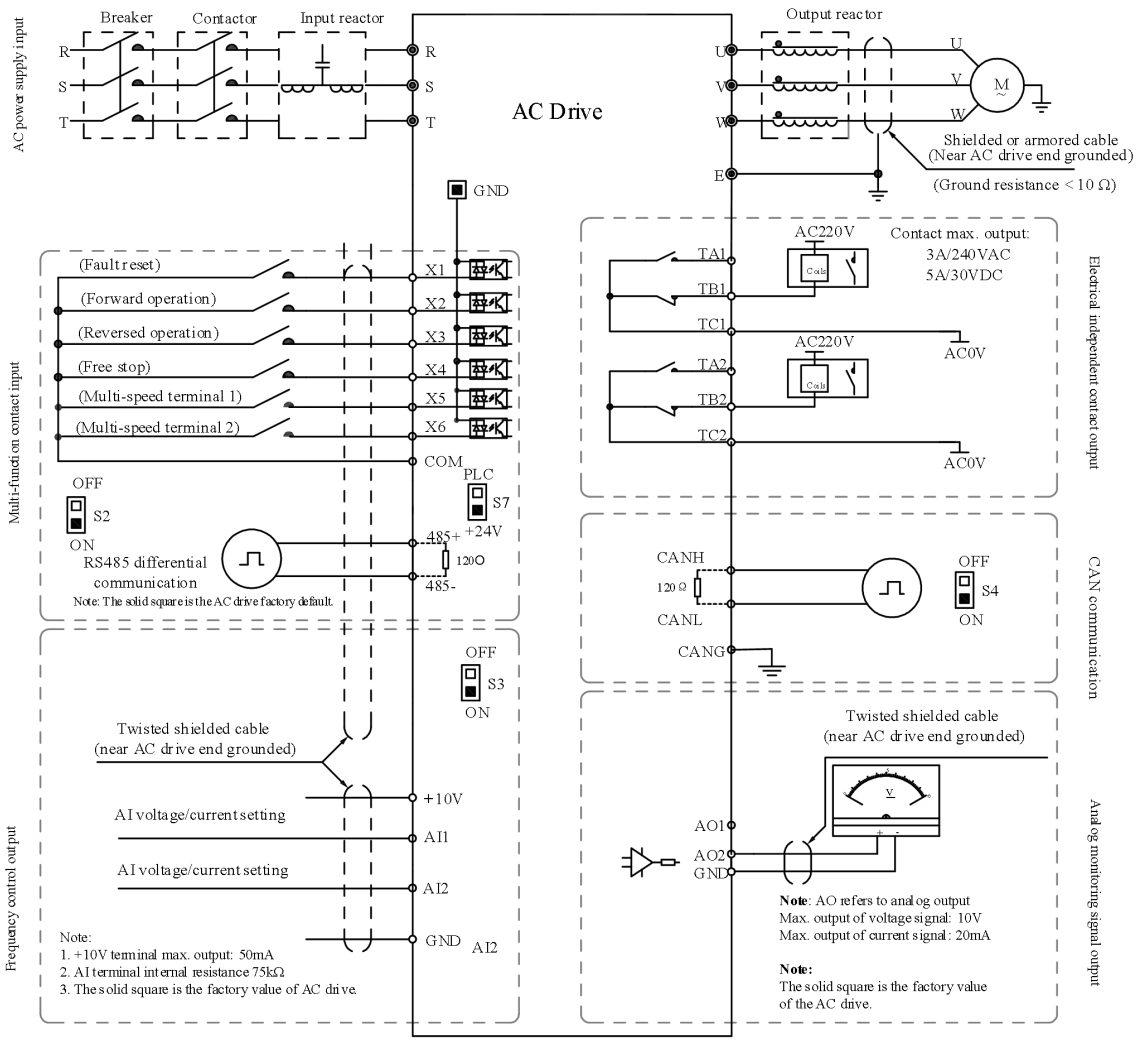


Figure 2-31

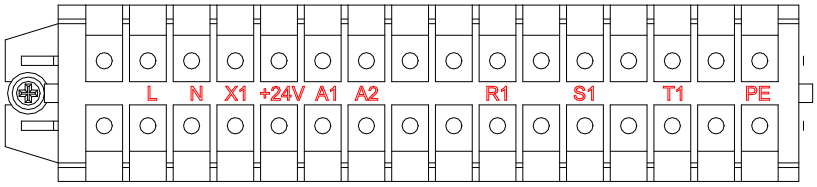


Figure 2-32

Terminal	Description
L	For power control, generally connected to the secondary side of the transformer
N	
X1	Connect to the normally open input contactor
+24V	
A1	Connect to the coils of the input contactor
A2	
R1	Connect to RST input detection
S1	
T1	
PE	Earthing terminal

Chapter 3 Debugging and Operation

3.1 Basic Function and Trial Operation

3.1.1 AC Drive Keyboard Layout and Function

3.1.1.1 Control Keyboard Panel Appearance

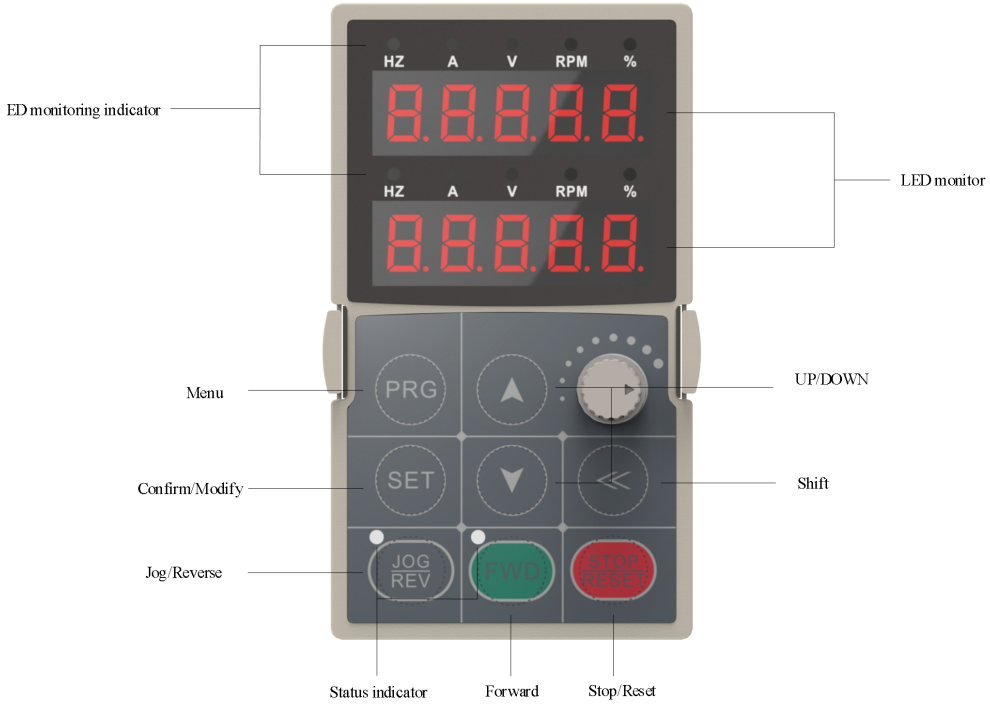


Figure 3-1

3.1.1.2 Keypress Function

Key	Function	Description
PRG	Menu	Enter the function menu interface during standby or operation; press the key to exit editing mode while modifying parameters; hold the key for 1 second during standby or operation to directly enter the status monitoring interface.
SET	Confirm/ Modify	To modify parameters, press the key to enter the edit mode in the menu interface, and press the key again to confirm changes upon completion. To modify LED monitoring items during shutdown, press the key in standby or operation mode.
▲ ▼	UP/DW	Select the parameter group in the menu interface; modify the parameter values when in edit mode; to change the given frequency and PID setting during standby or operational monitoring. (Set [F4.09] when given frequency, PID setting are given via keyboard numbers.)
≪	Shift	In the menu interface, it is used to select the digits of the function code for modification via the up/down keys; in parameter modification mode, it is used to select the digits of the modified parameters.
FWD	Forward	When Run/Stop is controlled by the keyboard, press this key to make the AC drive operate in forward direction. The status indicator is on for forward operation and flashing for reverse operation.

JOG REV	Jog/ Reverse	[F4.07] can define the function of the key. As a “reverse key” (REV), it makes the AC drive to operate in reverse direction, and the function indicator of the key is off. As a “Jog” key, it makes the AC drive jog, and the function indicator of the key is on.
STOP RESET	Stop/ Reset	When the command given channel is set as keyboard, the key can stop the AC drive; the valid range of this function can be set via [F4.08]; in the fault status, press the key and the AC drive is reset. (The AC drive will not be reset until the fault is cleared.)

Keyboard back wiring guidelines

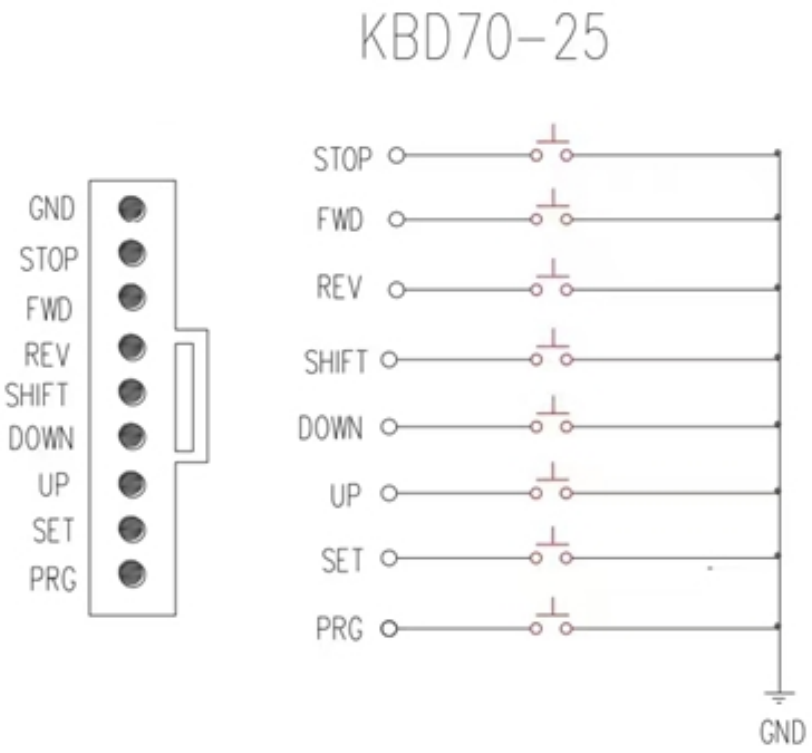


Figure 3-2

3.1.1.3 Indicator Description

Name		Status	Meaning
Unit indicator	Hz	Flash/on	Frequency unit
	A	On	Current unit
	V	Flash/on	Voltage unit
	S	On	Time unit
	RPM	On	Speed unit
	%	Flash/on	Percentage unit
Status indicator	FWD	On	AC Drive in forward operation
	FWD	Flash	AC Drive in reverse operation
	FWD	Off	AC drive shutdown
Function indicator	REV/JOG	On	As a JOG key
	REV/JOG	Off	As a REV key

3.1.1.4 Cross Reference Table

Character	LED	Character	LED	Character	LED
0	0	C	C	O	8
1	1	D	d	P	P
2	2	E	E	Q	9
3	3	F	F	R	r
4	4	G	G	S	5
5	5	H	H	T	t
6	6	I	I	U	U
7	7	J	J	V	V
8	8	K	K	W	W
9	9	L	L	X	No display
A	A	M	n	Y	y
B	b	N	n	Z	No display

3.1.1.5 Basic LED Keyboard Operation

Display a maximum set frequency of 50.00Hz in shutdown. Take F0.09=100.00 as an example to illustrate the basic operations of the LED keyboard.

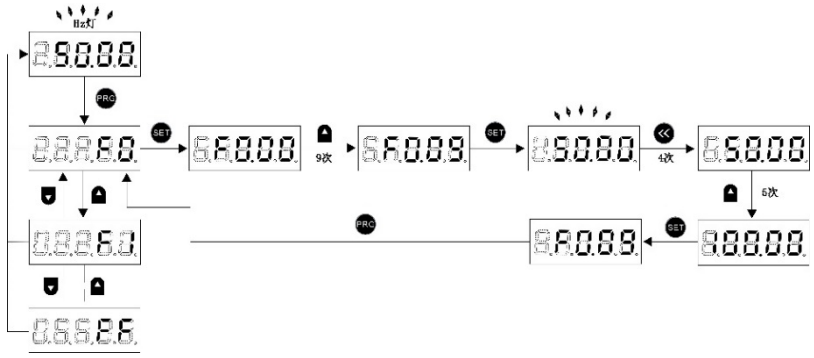


Figure 3-3

3.1.2 Basic Function

3.1.2.1 Parameter Initialization

Parameter initialization is completed by setting F0.19=1 (1: not to resume motor parameters and FD parameter group, 2: resume motor parameters, not to resume FD parameter group, 3: resume all parameters) See the details as below:

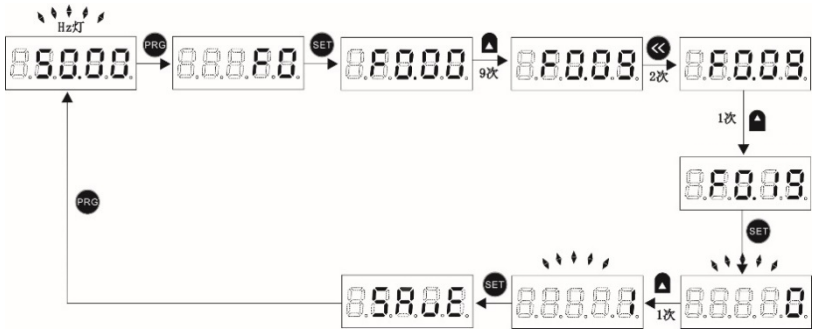


Figure 3-14

3.1.2.2 Control Mode Selection

There are 6 control modes:
Asynchronous motor:
0: V/F control
3: high-performance vector control without PG
4: high-performance vector control with PG
Synchronous motor:
6: high-performance vector control without PG
7: Vector control with PG
Others:
8: V/F-SPLIT control (voltage-frequency separated output)

The following is an example by setting F0.00=0 (V/F control).

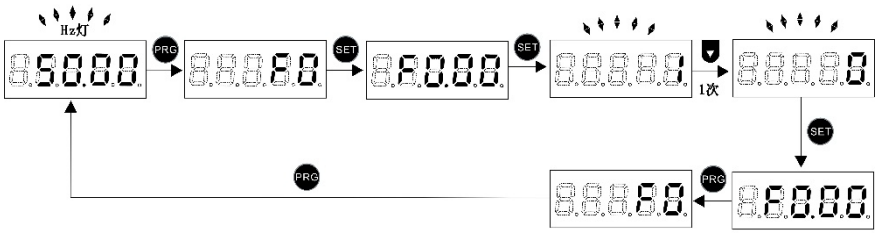


Figure 3-15

3.1.2.3 Command Running Channels

There are 4 command running channels, including: 1: terminal control; 2: RS485 communication control; 3: CAN communication control, which can be set via [F0.02]. The following is an example by setting F0.02=1 (terminal control).

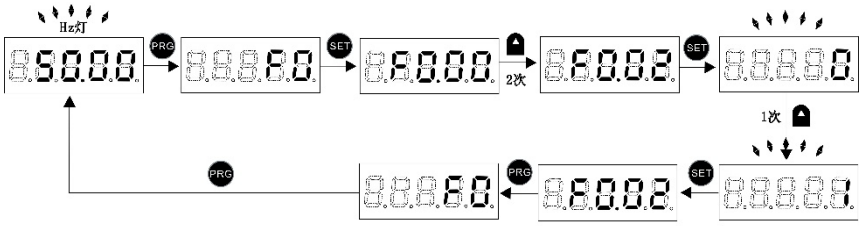


Figure 3-16

The two-line terminal control mode1 in the figure is only one method of terminal control, and other methods are detailed in Chapter 8.

3.1.2.4 Frequency Setting Channels

There are multiple sources to set frequency, please see those options in Chapter 8 for details. The following is an example by setting F0.03=1 (give frequency via keyboard).

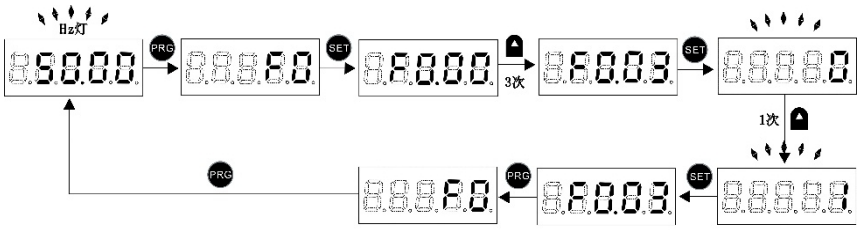


Figure 3-17

3.1.2.5 Start Modes

There are 3 modes to start operation, including: 0: start by starting frequency, 1: start by DC braking, 2: start by speed tracking. The following is an example by setting F1.00=2 (start by speed tracking, and then judge the operation direction)

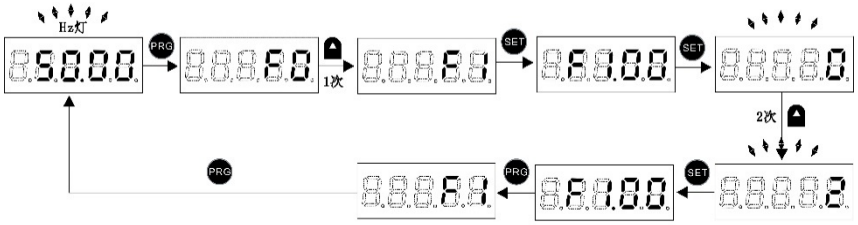


Figure 3-18

3.1.2.6 Stop Modes

There are 2 modes to stop operation, including: 0:deceleration stop, 1: free stop. The following is an example by setting F1.10=1 (free stop).

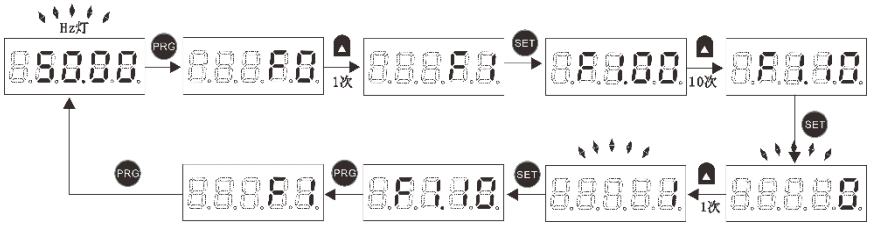


Figure 3-19

3.1.2.7 Acceleration/Deceleration Time Selections

There are 4 groups of the acc./dec. times. Unless specified, acceleration/deceleration time 1 is the default setting. The following is an example by setting F0.14=8.0 (acceleration time 1).

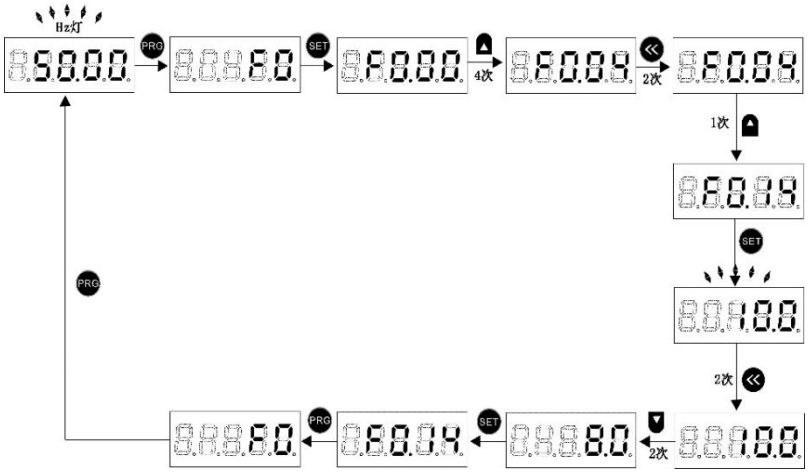


Figure 3-20

3.1.2.8 Motor Parameters

Set [F5.02] (rated power), [F5.03] (rated frequency), [F5.04] (rated speed), and [F5.05] (rated voltage) according to the motor nameplate.

Other motor parameters can be obtained by auto-tuning the AC drive as shown below:

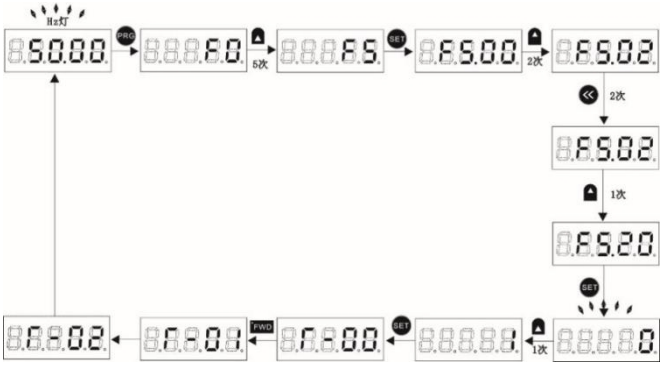


Figure 3-21

3.1.2.9 Parameter Copy Selections

The AC drive parameters are transmitted to the keyboard and saved by setting F4.05=1, as shown in the following figure:

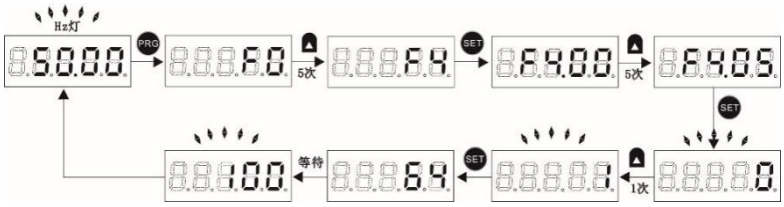


Figure 3-22

The parameters saved in the keyboard are transmitted to the AC drive by setting F4.05=2, as shown in the following figure:

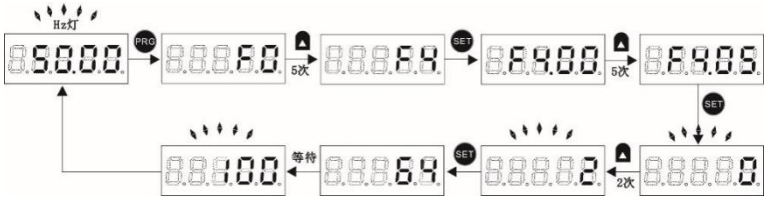


Figure 3-23

3.1.2.10 Operation Monitoring Settings

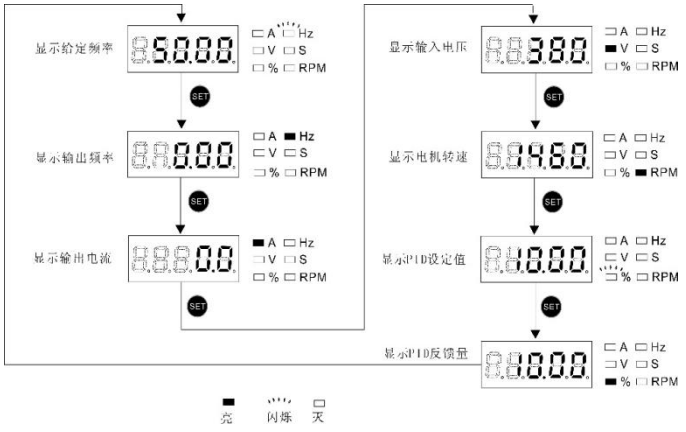


Figure 3-24

3.1.3 Trial Operation

3.1.3.1 Commissioning Guidelines

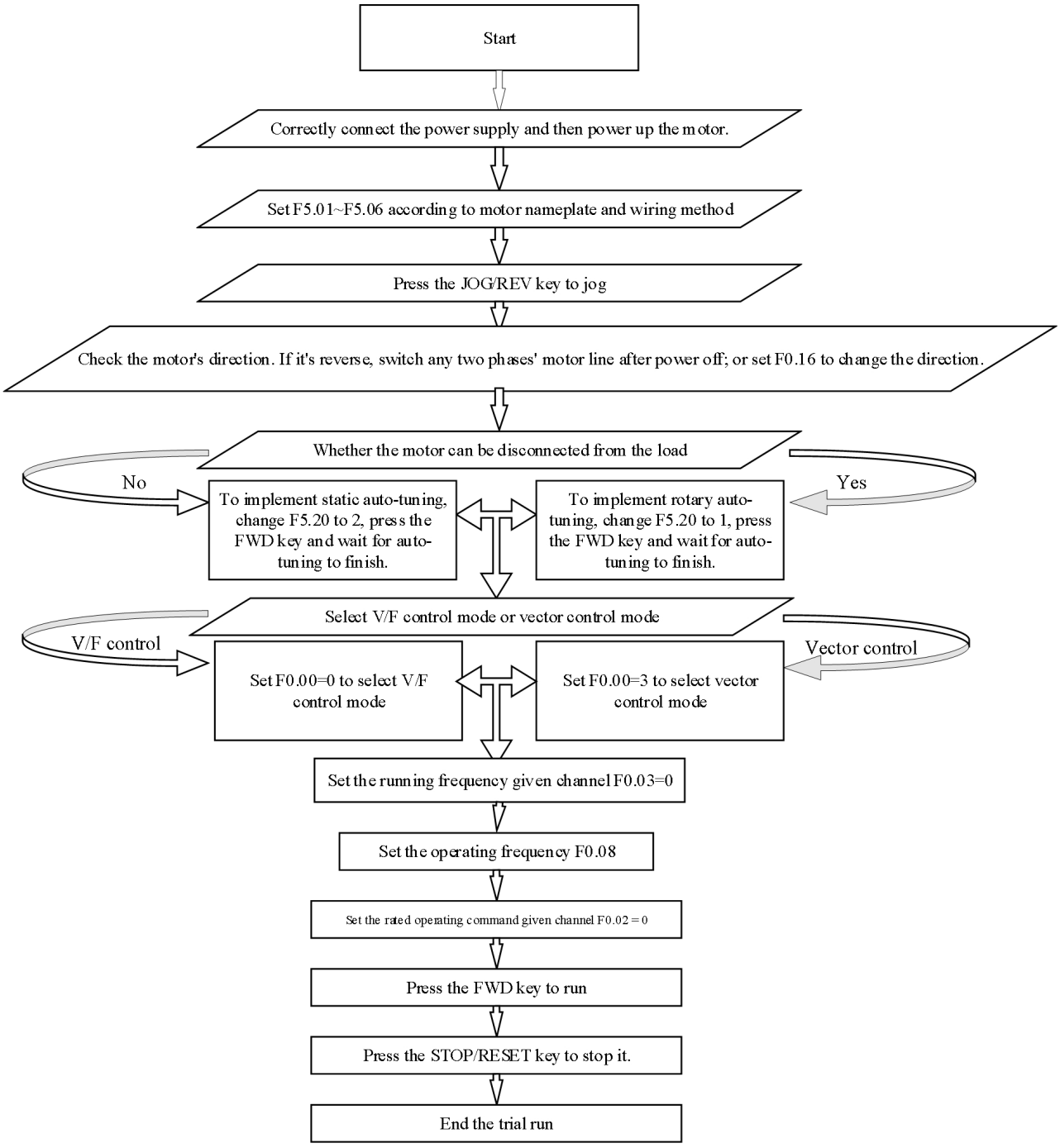


Figure 3-25

3.1.3.2 Motor Parameter Auto-tuning Selection

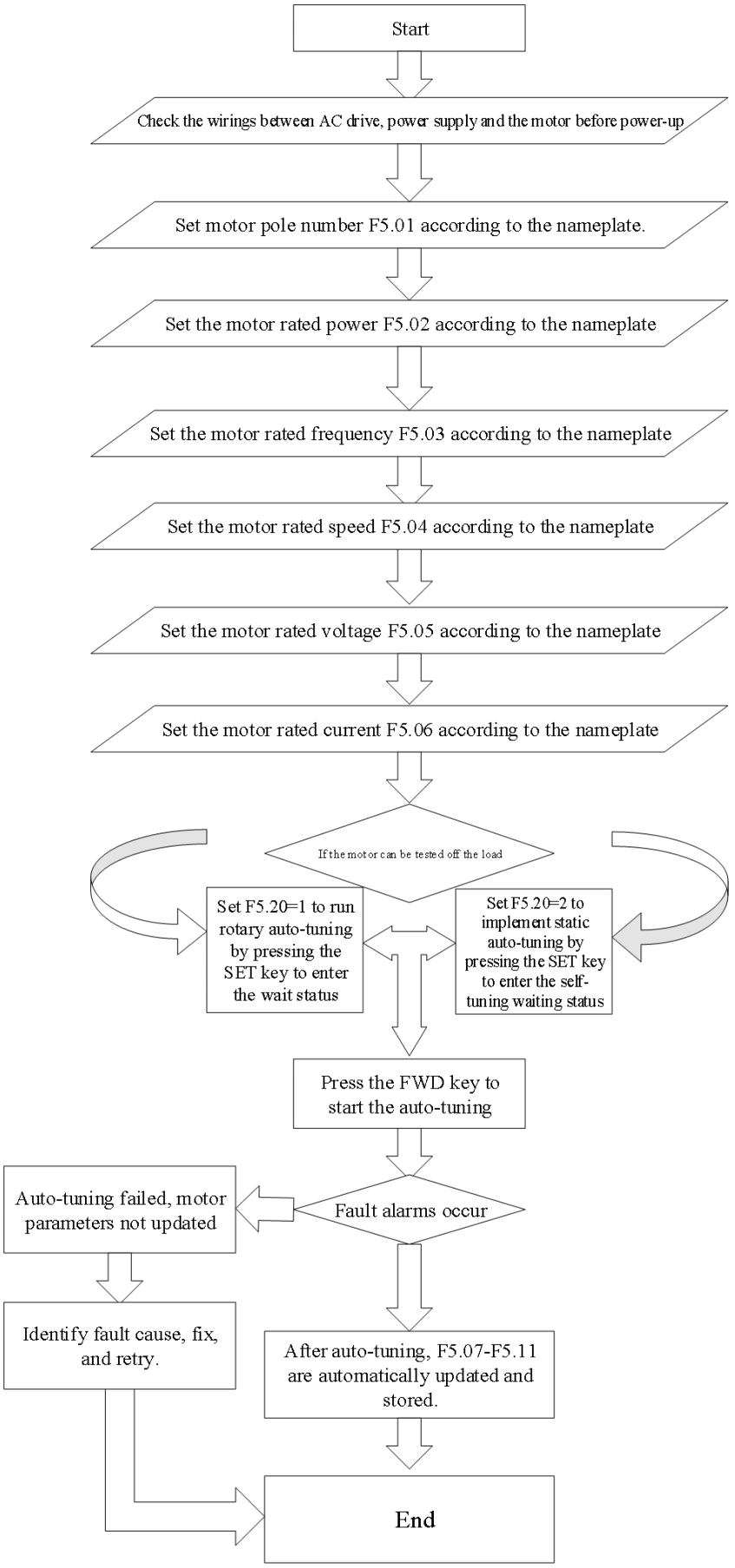


Figure 3-26

3.1.3.3 Frequency Setting Process

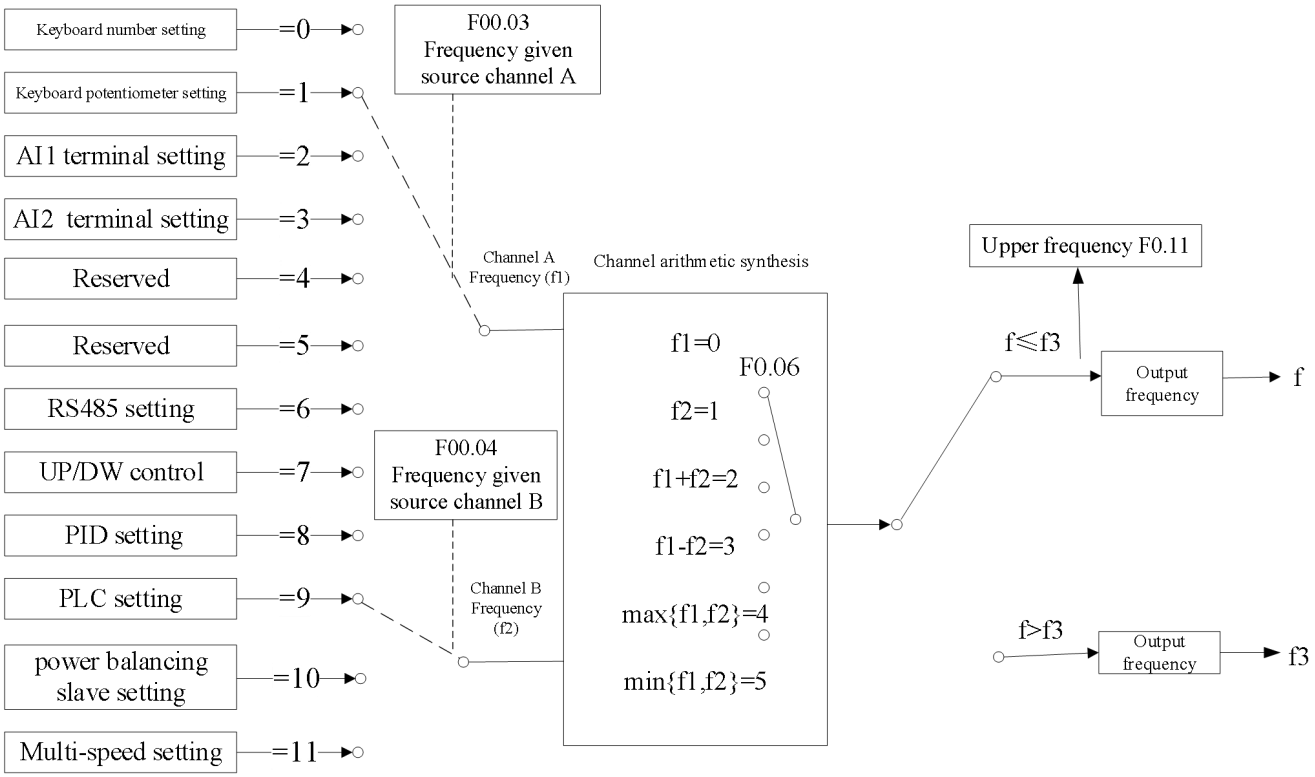


Figure 3-27

3.1.3.4 Start/Stop Control Process

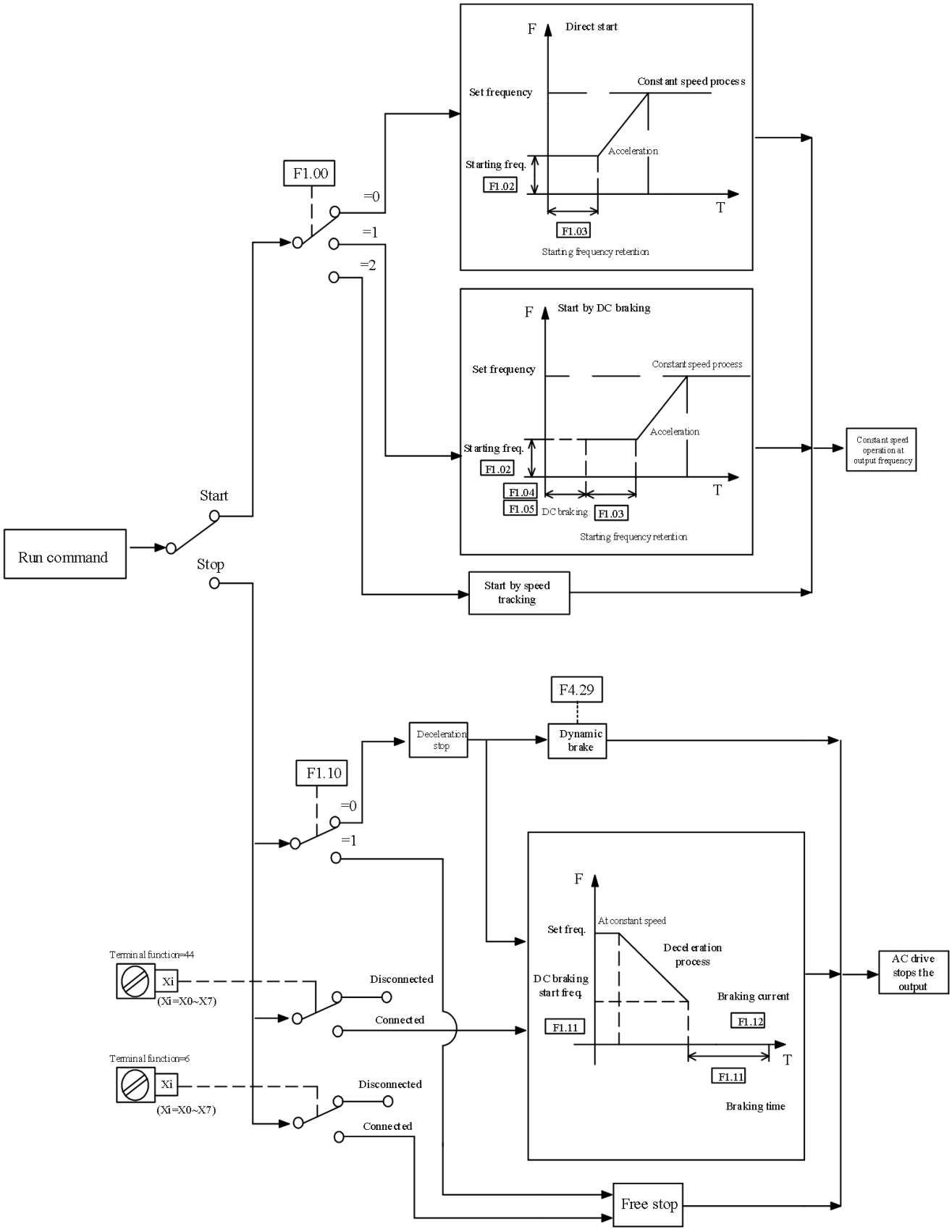


Figure 3-28

3.1.4.5 Vector Control Without PG

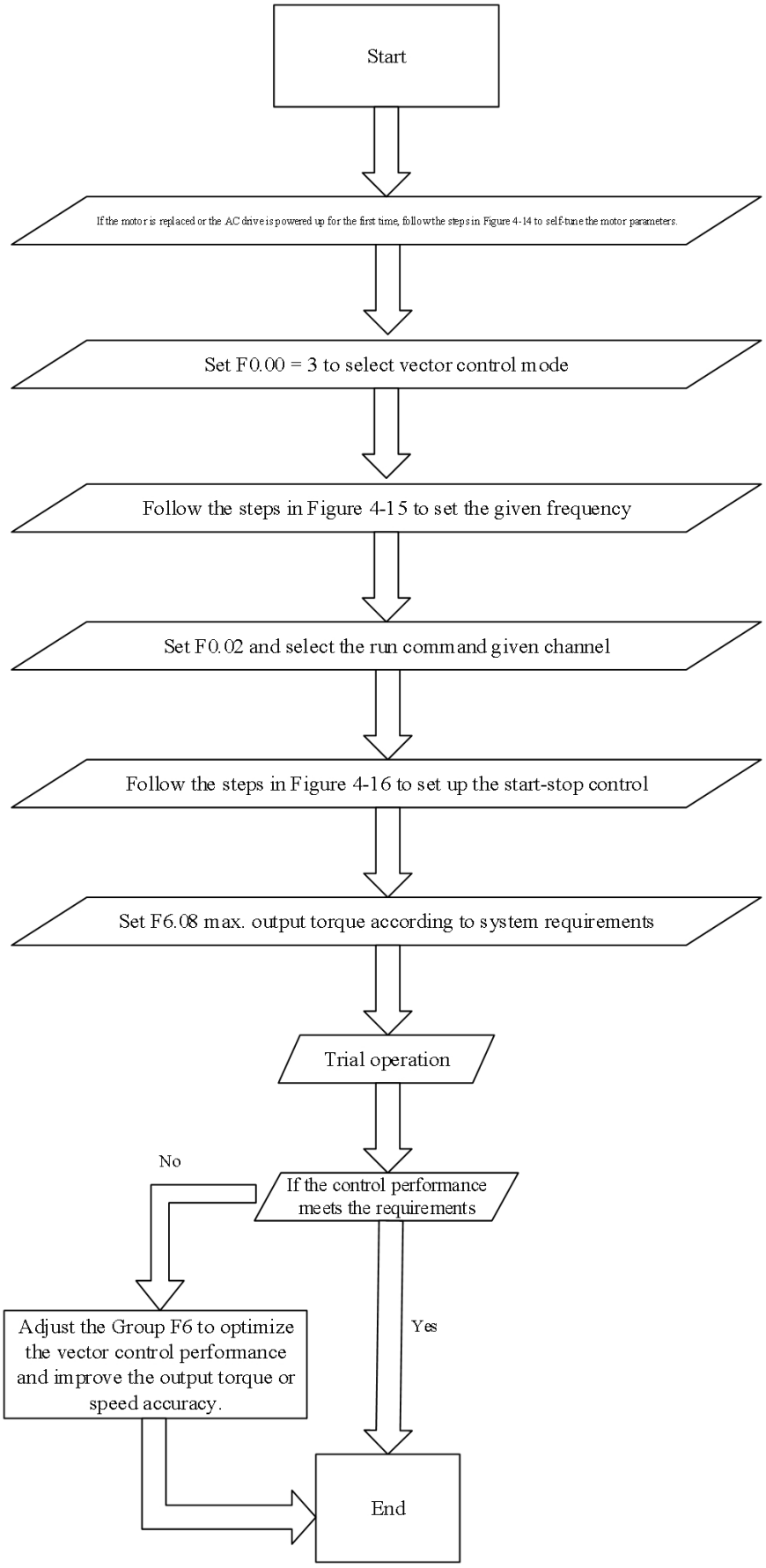


Figure 3-29

3.2 Commissioning Precautions

It mainly includes: A. differences from the original product when using it; B. matters to be noted about the software and hardware.

3.2.1 Product Differences

Software-compatible: three-level, two-level rectification control.
Software-compatible: three-level, two-level inversion control.
Software-compatible: synchronous/asynchronous motor drives.
Software-compatible: two-quadrant and four-quadrant control.
Hardware differences: two-level rectification and inversion by a control board and power supply board; three-level inversion by a control board and power supply board, three-level rectification by a control board and power supply board.

3.2.2 Notice

CAN communication DIP switch

When using CAN communication, a CAN communication terminal resistance must be connected, and if any terminal resistance in the CAN communication master or slave is dialed to CAN-ON, it means that the DIP switch selects CAN-ON.

Chapter 4 Applications

4.1 Power Balancing System

AC drives specializing in power balancing are primarily utilized in belt conveyors which facilitate the transport of diverse items, ranging from lightweight to heavyweight, via continuous or intermittent conveyor belt movement. For instance, in the transportation of heavy loads or across extended distances, it is necessary it is necessary to use two motors to drive the conveyor at the same time. Unsynchronized motors can result in one motor driving while the other generates power. The motor in the power generation mode will waste energy and be easily overheating. This mismatch also overburdens the motor in drive mode. It will hinder power distribution.

The AC drive for power balancing is mainly used to solve the problem of average power distribution when two or more motors are running synchronously. It can make the output power of each motor on the same output device equal.

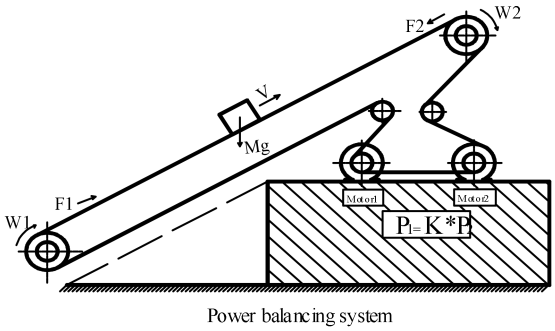


Figure 4-1

The power balance-specific AC drive's dynamic adjustment function ensures perfect power synchronization across multiple motors.

4.2 Power Balancing Method

Th AC drive for power balancing adopts the master-slave control. The master sends its own information to the slave through CAN communication, and the slave receives the information and arithmetically derives its own frequency from the information occurring in the master. The operation of the slave is controlled by the information from the master. The actual operating frequency of the slave is calculated as follows:

Slave frequency = master frequency + auxiliary channel (auxiliary channel selects PID)

The slave mainly performs PID calculations from the master current and its own current.

4.3 Pre-operation Debugging

Start debugging after the AC drive main circuit line and control line are completely connected as required.

1. Ensure correct connections for the power supply, motor wiring, and CAN communication between devices before powering on.
2. Check the AC drive's power rating and voltage rating.
3. Set [F0.00] to select the control mode and input motor specifications into the F5 parameter group as indicated on the motor's nameplate.
4. Adjust [F5.20] to enable the parameter auto-tuning function based on site conditions.

4.4 Master Debugging

1. Select an AC drive as the master, typically opting for the AC drive that controls the motor that operates first.
2. To reset to factory defaults, first set [FF.00] to 1, followed by [F0.19] to 1.
3. Set the master's max. given frequency to 49Hz to ensure that the slave frequency is adjusted within 50Hz.

4.5 Slave Debugging

1. Select an AC drive as the slave.
2. To reset to factory defaults, first set [FF.00] to 2, followed by [F0.19] to 1.

4.6 Master Recommended Parameters

Code	Name	Recommended setting
F0.00	Motor control mode	Up to model type
F0.02	Command running channel	1: terminal control
F0.03	Frequency given source channel A	0: give frequency via keyboard
F0.14	Acceleration time1	100.0s
F0.15	Deceleration time1	100.0s
F1.10	Stop mode	1: Free stop
FD.00	Master-slave selection	Tens-bit=1: CAN communication master
FD.02	Communication baud rate selection	Tens-bit=3: as 125Kbps
FD.11	CAN protocol selection	1: CAN customized protocol

4.7 Slave Recommended Parameters

Code	Name	Recommended setting
F0.00	Motor control mode	Up to model type
F0.02	Command running channel	1: terminal control
F0.03	Frequency given source channel A	10: CAN communication setting
F0.14	Acceleration time1	2.0s
F0.15	Deceleration time1	2.0s
F1.10	Stop mode	1: Free stop
FB.00	PID given selection	9: active current component (CAN communication)
FB.03	PID feedback selection	9: active current component
FB.11	PID ratio	0.100
FB.12	PID integral	1.0
FB.22	PID output upper limit	2.0%
FB.23	PID output lower limit	-2.0%
FD.00	Master-slave selection	Tens-bit=0: CAN communication slave
FD.02	Communication baud rate selection	Tens-bit=3: as 125Kbps
FD.11	CAN Communication protocol selection	1: CAN customized protocol

Chapter 5 Troubleshooting

5.1 Safety Precaution

⚠ Warning	● This product is equipped with hazardous voltage to control potentially dangerous motion mechanisms. Non-compliance with regulations or failure to operate in accordance with this manual may lead to damage to the product and associated systems or even personal injury and death. ● This product is exclusively for use by trained professionals who must thoroughly understand all safety precautions and operational procedures outlined in the manual prior to use. Proper operation and maintenance are essential for safe operation and stable performance of the product. ● Do not work on wiring while power is on, as it poses a risk of fatal electric shock. Prior to any wiring, inspection, or maintenance work, ensure that the power supply to all associated equipment is disconnected, and confirm that the DC voltage in the main circuit has dropped to a safe level. Wait for 5 minutes before commencing the work.
⚠ Caution	● Prevent children and the public from contacting or approaching this product ● This product is intended for use in accordance with the manufacturer's specified purpose. Unauthorized use for special fields such as emergency, rescue, marine, medical, aviation, nuclear facility-related settings is prohibited. ● Unauthorized modifications or using of spare parts not sold or recommended by the manufacturer of this product may cause malfunctions.
Note	● Ensure this manual is provided directly to the actual user, who must read it thoroughly prior to use. ● Ensure that you have thoroughly read and comprehended the associated safety guidelines and warning notices before installing and adjusting the AC drive.

5.2 Fault, Warning, and Relevant Codes

● If the AC drive or motor operates abnormally, first check that the displayed code and prompts on the keyboard.

● If the issue still exists despite consulting the manual, please double-check the following items prior to contacting our agent or calling VEICHI’s customer service (refer to the back cover for details).

1. Type of the AC drive
2. Software version
3. Purchase date
4. Inquiry content (malfunction status)

See the table for the description of the faults, warnings, and prompts that occur during operation of the AC drive.

Item	AC drive response during malfunction
Fault	The following conditions will occur upon a fault is detected. The AC drive fails to operate until it is restored to a normal status by fault reset. ● An error warning appears on the keyboard. ● The AC drive cuts off output and the motor stops freely. ● When a fault is detected, set the terminal for F2.46~F2.47 = 4 [Output terminal function selection = Fault output] to ON. Without the setting, the terminal will not output a signal even if a fault is detected.
Warning	The following conditions occur when a warning is detected, and no fault reset operation is required. ● A warning appears on the keyboard. ● The AC drive continues to operate. ● When a fault is detected, set the terminal for F2.46~F2.47 = 29 [Output terminal function selection = Warning output] to ON. Without the setting, the terminal will not output a signal even if a warning is detected.
Note:	● "Save" is displayed when it is reset to factory settings. ● Via auto-tuning setting, "T-00" is displayed to indicate the auto-tuning is on. ● "Copy" is displayed in parameters uploading, and "Load" is displayed in parameters downloading.

5.3 Fault, Warning, and Relevant Codes

Fault, warning and the relevant codes are shown in the table. When the keyboard displays the characters in the table, please refer to the corresponding page number according to the reference source to check the detailed cause of the fault and the solutions.

Note: The numbers in parentheses within the communication code column are fault codes or warning codes (Dec indicates decimal).

Code	Fault	Name	Code	Fault	Name
0	--	Failure-free	28	E.OU4	Outage overvoltage
1	E.SC	Module failure 1	29	E.PID	PID disconnection
2	E.SC	Module failure 2	30	LIFE	Keyboard fails to recognize fault prompt
3	E.SC	Module failure 3	31	E.IAE	Initial angle tuning failure
4	E.OC1	Overcurrent in acceleration	32	E.DEF	Excessive speed deviation
5	E.OC2	Overcurrent in deceleration	33	E.SPD	Overspeed protection
6	E.OC3	Overcurrent in constant speed operation	34	E.LD1	Load protection 1
7	E.OU1	Overvoltage in acceleration	35	E.LD2	Load protection 2
8	E.OU2	Overvoltage in deceleration	36	E.CPU	CPU timeout
9	E.OU3	Overvoltage in constant speed operation	37	E.lOC	FLASH locked fault
10	E.LU2	Bus undervoltage	38	-	-
11	E.oL1	Motor overload	39	E.039	Input contactor failure
12	E.oL2	Inverter overload	40	E.040	Output contactor failure
13	E.ILF	Input phase loss	41	E.CAN	CAN disconnection
14	E.oLF	Output phase loss	42	E.PLF	Rectification-side frequency abnormality
15	E.oH2	Rectifier overheat	43	E.043	Product failure
16	E.oH1	Inverter overheat	44	E.LU3	15V power supply undervoltage
17	E.EF	External fault	45	E.LFE	Midpoint voltage imbalance

18	E.CE	485 communication failure	46	E.OL3	Rectification-side overloaded
19	E.HAL	Current detection failure	47	E.OC4	Rectification-side overcurrent protection
20	E.TE1	Motor auto-tuning failure	48	E.OU5	AC input overvoltage
21	E.EEP	EEPROM error	49	E.SD1	Rectification SD failure
22	-	-	50	E.HL2	Rectification HALL failure
23	E.bRU	Braking unit failure	51	E.051	Test mode abnormality
24	-	-	52	E.LU4	AC input undervoltage
25	-	-	53	E.SE	Slave failure or emergency stop
26	E.CPE	Parameter copy abnormality	55	E.OH3	Motor overtemperature fault
27	E.PG	Expansion card connection abnormality	56	E.CHR	Buffer contactor failure
28	E.PAn	Keyboard communication fault	57	E.BUS	Expansion card fault
Code	**Warning**	**Name**	**Code**	**Warning**	**Name**
64	LU1	Outage undervoltage	73	A.073	GPRS lockout warning
65	A.LIF	Input phase loss alert	74	A.074	485 communication alert
66	A.PID	PID disconnection alert	75	A.075	Input contactor alert
67	A.LD1	Load protection 1 alert	76	A.076	Output contactor alert
68	A.LD2	Load protection 2 alert	77	A.077	CAN disconnection alert
69	A.EEP	Storing alert	78	A.SE	Slave failure alert
70	A.DEF	Excessive speed deviation warning	79	A.RUN	Terminal start protection
71	A.SPD	Overspeed protection alert	80	A.080	One-button for rectification and output blocking
72	A.072	Lockout alert	81	A.BUS	Expansion card disconnection alert

5.4 Motor Auto-tuning Fault Subcode

Please find the troubleshooting details for auto-tuning faults in the table below. “20xx” displayed in the subcode "FA.39" denotes auto-tuning fault subcodes.

FA.39 Subcode	Fault diagnosis	Measure
2001	Current saturation, Hall detection errors or excessive output current	Check motor wiring for short circuits between phases.
2002	Excessive zero-bias of the current	Check if the Hall sensor failures.
2003	Current imbalance	Check motor wiring for output phase loss.
2004	Current oscillation	1. Check motor wiring for short circuits between phases. 2. Check if the input motor nameplate parameters are correct.
2005	Current above limit during stationary tuning	1. Check motor wiring for short circuits between phases. 2. Check if the input motor nameplate parameters are correct.
2006	U-phase current above limit during stationary tuning	Check the U-phase motor wiring for short circuits between phases or to ground.
2007	V-phase current above limit during stationary tuning	Check the V-phase motor wiring for short circuits between phases or to ground.

2008	W-phase current above limit during stationary tuning	Check the W-phase motor wiring for short circuits between phases or to ground.
2009	Current above limit during dynamic tuning	1. Check motor wiring for short circuits between phases. 2. Check if the input motor nameplate parameters are correct.
2010	Voltage saturation	1. Check motor wiring for short circuits between phases. 2. Check if the input motor nameplate parameters are correct.
2011	Output voltage above limit	Output voltage is maxed out, but the current output is small (motor impedance is large or the tuning frequency is set to a too large value).
2015	Excessive rotor resistance	Check if the input motor nameplate parameters are correct.
2016	Excessive inductance	Check if the input motor nameplate parameters are correct.
2040	Tuning timeout	1. Check if the input motor nameplate parameters are correct. 2. Check if the selected motor control mode and the motor are matched
2041	Parameter setting fault	Re-enter the motor nameplate parameters
2043	Carrier above limit	Check if the input motor nameplate parameters are correct.
2044	Negative rotor resistance	1. Check motor wiring for short circuits between phases. 2. Check if the input motor nameplate parameters are correct.
2045	Output voltage of synchronous motor above limit	Check if the input motor nameplate parameters are correct.
2046	High back emf. voltage during tuning	Check if the rated voltage is input correctly.
2047	Low back emf. voltage during tuning	Check if the rated voltage is input correctly.
2048	Asynchronous motor no-load current tuning value (rotary auto-tuning) not within the range of 5%~90% of rated current	—
2050	Wrong motor operation direction	1. Check if the motor wiring is correct. 2. Check if the PG card wiring is correct. 3. Re-tuning after separating the motor from the machinery
2051	Failure to tune the direction of the PM encoder	Encoder disconnection, signal interference or motor rotor locking
2052	Z-pulse not detected by synchronous motor	Check if the PG card wiring is correct.
2053	Excessive deviation of Z-pulse of synchronous motor	Check if the PG card wiring is correct. Check if the PG card parameter settings are correct.
2060	Excessive deviation between rated motor current and AC drive current	Larger than 10 times of the rated current of the drive or lower than 1/15 of the rated current of the drive
2061	Low max. frequency	The set max. frequency of AC drive is lower than the rated frequency of the motor, please reset the max. frequency of AC drive and the upper limit frequency and then perform tuning again.
2062	Excessive deviation between the AC drive and motor currents	Check if there's a large difference between the power levels of the AC drive and the motor.
2064	Motor no-load current tuning above range	1. Check if the input motor nameplate parameters are correct. 2. Check if the selected motor control mode and the motor are matched
2065	Motor mutual inductance above range	1. Check if the input motor nameplate parameters are correct. 2. Check if the selected motor control mode and the motor are matched.
2066	Motor rotor resistance tuning above range	1. Check if the input motor nameplate parameters are correct. 2. Check if the selected motor control mode and the motor are matched.
2090	Shutdown command given in auto-tuning	Failure to complete the parameter tuning, need to re-tune it.

Other subcodes	Multiple faults at the same time while tuning	1. Check if the motor wiring is correct. 2. If the subcode fault is still reported in tuning after rewiring, please seek technical support from the manufacturer.

5.5 Fault Handling

The AC drive must cease operation in the event of a malfunction. Refer to the table below for potential causes and remedial actions.

Code	Name	Cause	Measure
E.SC	Module failure	A part on the AC drive output side is short-circuited to ground.	Use a multimeter to check whether the three-phase stator resistance is balanced, and a megger to measure the insulation resistance between the phase and the chassis. Generally, the insulation resistance resistance should be greater than 0.5MΩ. Replace the motor if it is abnormal.
		AC drive output cable exceeds the max. permissible value.	Shorten the distance between AC drive and motor or add output reactor.
		Malfunction caused by interference	Check the grounding of the main circuit and eliminate external interference sources.
		Damaged IGBT module	If the static value is abnormal, it is a AC drive hardware problem. Please replace the relevant parts if necessary.
		Abnormal AC drive hardware circuit	Replace the AC drive hardware.
Code	**Name**	**Cause**	**Measure**
E.oC	Overcurrent	The acc./dec. time is set short and the load is too heavy	Increase acceleration/deceleration time or switch to vector control.
		Insulation on the output side or to ground of the AC drive dropped	Measure the insulation resistance between the phase and the chassis with a megger. Generally, the insulation resistance value should be more than 0.5MΩ. Replace the motor if it is abnormal.
		Malfunction caused by interference	Check the grounding of the main circuit and eliminate interference sources.
		Abnormal current detection circuit	Replace the power board, control board or current sensor of the AC drive.
		Start the operating motor and an OC fault is triggered by the high current at the moment of motor stop	Ensure the motor has completely stopped before restart, and monitor the output current to see if it is normal.
Code	**Name**	**Cause**	**Measure**
E.HAL	Current detection failure	The power supply board and the control board are not well-connected.	Check the pin jack to see if the control board and power board are in good contact with each other.
		Abnormal current detection circuit, abnormal hardware	Generally occurs at the time of power-up, if this fault can not be eliminated after re-plugging, it can be confirmed as a hardware failure.
		Strong external electromagnetic interference	Ground the AC drive and motor separately for troubleshooting, if it is normal after grounding then the cause can be confirmed as the interference.
Code	**Name**	**Cause**	**Measure**
E.oU	Overvoltage	Short deceleration time for large inertia loads, not 4-quadrant AC drive	Increase the deceleration time.
		Start an operating motor, or report OU when speed tracking, residual magnetization voltage	Wait for the motor to come to a complete standstill and then start it again to see if it's normal.

		The insulation of the motor to ground drops, which is equivalent to have a large inductor to ground, charging the inductor when the bridge arm is on. When the inductor charges the bus when it is turned off, an OU fault occurs in the drive.	Run it after removing the motor wires to see if it works properly, and check motor phase-to-ground insulation with a megger.
		High transient surges in the grid voltage, or high voltage across the grid	Add a voltage regulator to AC drive input front end
		Hardware bus voltage detection abnormality	Replace the power supply board or control board
		Auto-tuning of the motor parameters is not performed before the synchronous machine is started, and the synchronous machine is out of step during startup.	Complete static or dynamic auto-tuning by manually entering the motor parameters according to the nameplate.
		The load varies suddenly during operation	Change the control mode to vector control and adjust FA.07 [Bus overvoltage suppression point], FA.08 [Bus overvoltage suppression gain] and other parameters.
		Bus capacitor with problems like bulge, leakage, etc.	Replace the damaged capacitor
Code	**Name**	**Cause**	**Measure**
E.Lu	Undervoltage	Low input voltage on site	In the shutdown status, use the AC stage of the multimeter to measure the input of the AC drive, as well as the DC stage to check if the bus voltage is positive or negative, and compare it with the C-12 and C-13 bus voltages, if it is below the under-voltage point, then the low input voltage can be confirmed as the cause.
		In the case of volatile input voltage, see if there is an occasional undervoltage fault reported by the AC drive, and if there is a large-scale equipment starting up on the same grid at the time of reporting the fault.	Enable the bus overvoltage suppression function via FA.09 and at the same time lower the undervoltage suppression point value via FA.10 and higher the undervoltage suppression gain via FA.11.
Code	**Name**	**Cause**	**Measure**
E.oL1	Motor overload	The selected motor power is too small for the power of the AC drive.	Enlarge the motor power appropriately
		Small motor overload start threshold	Default the motor overload parameter or adjust the overload start threshold value higher
		The AC drive torque boost is set too large, or the hardware current detection circuit is abnormal. This fault generally occurs when the drive power is greater than the motor power.	It can be identified as the drive hardware current detection error if anomalies in no-load operation and the motor is problem-free.
Code	**Name**	**Cause**	**Measure**
E.oL2	Inverter overload	Excessive load for drive capacity	Enlarge the drive capacity by one or two grades according to the load characteristics.

		Abnormal current detection circuit (leads to the detected current being larger than the actual value)	Replace the power board or the control board or the current sensor.
		No motor parameter auto-tuning in open-loop or closed-loop vector control mode	Complete the motor parameter auto-tuning.
		Motor blocked, incorrect rotation direction in the cases of pump or fan, inactive holding brake if applicable	Ensure that the motor is running in the correct direction. In addition, make sure that the brake is switched off during startup if applicable.
		Excessive set torque boost in V/F control (leads to flux saturation and excessive output current)	Set F8.12 to the default value or 0. Perform the motor parameter auto-tuning function for automatic torque boosting.
		Abnormal magnetic pole search (results in an excessive torque output and reporting an overload for no-load startup in open-loop vector control of synchronous motor)	Complete static or dynamic auto-tuning by manually entering the motor parameters.
		Demagnetization of the synchronous motor	The motor may be considered demagnetized if the current is high without any load or drive changes in normal motor operation. In this case, motor parameter auto-tuning is recommended to re-perform.
		Inaccurate encoder feedback frequency in closed-loop vector control	Complete static or dynamic auto-tuning by manually entering the motor parameters.
Code	**Name**	**Cause**	**Measure**
E.iLf	Input phase loss	Poor contact or disconnection of three-phase input power wiring or terminals at the air switch	First measure whether the voltage is normal, and then check if the terminals are connected tightly.
		Large input grid harmonics, high volatility of the voltage	Add an input reactor to the AC drive input side or perform optimization via parameters
		Imbalanced three-phase voltage	Improve the power grid
Code	**Name**	**Cause**	**Measure**
E.oLF	Output phase loss	Drive three-phase output voltage imbalance	There can be a hardware drive abnormality if the output voltage is unbalanced.
		Drive output terminals not screwed in	Tighten the drive output lines.
		Drive output lines disconnected	Check the wiring between the drive and the motor
		Motor damaged, imbalanced motor three-phase stator resistance	Replace the motor.
		Operation without motor connected in vector mode	In the case of not connecting the motor line, the AC drive control mode should be set to V/F control.
		AC drive hardware current detection circuit abnormality	Replace the power board or the control board or the current sensor.
Code	**Name**	**Cause**	**Measure**
E.oH	Overtemperature	Radiator air duct blocked	Remove the fan and check if there is any blockage inside the radiator, if so, use an air gun to clean it.

		High set carrier frequency of AC drive set, high temperature rise	After lowering the carrier frequency, the cause can be confirmed if the temperature becomes normal. In the case of necessary high carrier, the power of AC drive can be enlarged appropriately.
		High external ambient temperature or too small installation space	Communicate with the electrical cabinet manufacturer to add a heat dissipation fan to the electrical cabinet so as to increase the airflow of the air inlet and outlet.
		Temperature sensor damaged	Replace the temperature sensor.
Code	**Name**	**Cause**	**Measure**
E.TE	Motor auto-tuning failure	Incorrect setting of control mode, the control mode of synchronous motor is set to the one for asynchronous motor	Reset the control mode.
		Abnormal motor parameter settings, motor parameters not set according to the nameplate	Manual input according to nameplate.
		Motor out of phase	Check the motor terminals for poor contact.
		Identify the cause by fault subcodes	Refer to the fault subcodes for troubleshooting
Code	**Name**	**Cause**	**Measure**
E.SPD	Stall protection	In closed-loop mode, incorrect setting of the number of encoder lines or rotary transformer stages may lead to inaccurate frequency feedback, or shaky encoder mounting	Set the encoder parameters correctly or re-fix the encoder
		Improper setting of stall detection-related parameters	Set the detection threshold and stall detection time appropriately.
		Large inertia of the load and inappropriate adjustment of the speed loop parameters	Adjust to the appropriate F6.00 [Speed loop proportional gain] and F6.01 [Speed loop integral time].
Code	**Name**	**Cause**	**Measure**
E.PG	Encoder failure	Encoder feedback signal abnormality	Set the relevant parameters of the encoder according to the encoder nameplate. Check if the encoder wiring is abnormal. Monitor the encoder feedback signals via an open-loop mode.
		Interference	Separate routing for encoder and power lines, shielded line for encoder line
		Incorrect PG card selection	Choose the appropriate PG card according to the encoder type.
Code	**Name**	**Cause**	**Measure**
E.039	Input contactor failure	The control board does not receive an input contactor closing signal	Check if the contactor is properly closed, and if the normally open point wiring is properly connected, check FF.02 if it is not connected.
E.040	Output contactor failure	The control board does not receive an output contactor closing signal	Check if the contactor is properly closed, and if the normally open point wiring is properly connected, check FF.02 if it is not connected.
Code	**Name**	**Cause**	**Measure**

E.043	Product failure	Problems with factory parameter settings	Seek support from the manufacturer
		Excessive difference between three-level upper and lower buses	Check if the detection bus is corresponding to the actual bus.
Code	**Name**	**Cause**	**Measure**
E.LFE	Midpoint voltage imbalance	Excessive difference between upper and lower buses	Check if the detection bus is corresponding to the actual bus.
		Current transducer installed wrong or reverse	Correct current sensor wiring.
Code	**Name**	**Cause**	**Measure**
E.051	Test mode abnormality	AC power is detected in low voltage test mode	In the low voltage test, it is not allowed to connect the AC drive main circuit power supply.
Code	**Name**	**Cause**	**Measure**
E.PLF	Grid frequency abnormality	The four-quadrant machine phase lock problem	Check if the front end RST wiring corresponds to the detection line
Code	**Name**	**Cause**	**Measure**
E.SE	Slave failure	Slave failure detected by CAN communication master	Check for slave failures and troubleshoot accordingly

5.6 Warning Handling

The table below describes the potential causes and remedial actions for the alerts or warnings.
Note: All warnings and alerts can be eliminated automatically if they do not meet the detection conditions.

Code	Name	Cause	Measure
LU1	Shutdown undervoltage	Low input power supply voltage	Increase the input supply voltage.
		Input power supply phase loss	Check if the main circuit wiring is normal.
		Input power supply terminals loosened	Screw in the main circuit terminals.
		Aged AC drive main circuit capacitor	Seek technical support.
Note: The occurrence of LU1 during power outage is a normal response attributed to an extended capacitor voltage discharge time when the AC drive is powered off.			
Code	**Name**	**Cause**	**Measure**
A.ILF	Input phase loss alert	AC drive main circuit terminals loosened	Restart the machine after tightening the screws and power it up.
		Excessive input voltage volatility	Optimize power supply to comply with AC drive's nominal voltage requirements. If the main circuit power supply is OK, check whether there is any problem with the electromagnetic contactor on the main circuit side.
		Imbalanced three-phase voltage	Check input voltage for abnormalities and improve the situation of power supply imbalance.
Note: Via FA.15 [I/O phase loss protection], set the tens-bit to select whether or not to enable the input phase loss warning detection function.			
Code	**Name**	**Cause**	**Measure**
A.PID	PID disconnection feedback alert	Improper setting of stall PID disconnection-related parameters	Adjust FB.27 [Disconnection detection upper limit], FB.28 [Disconnection detection lower limit] and FB.26 [Disconnection detection time].
		Improper PID feedback wiring	Check the PID feedback wiring for abnormalities.
		PID feedback sensor malfunction	Check if the sensor works.
		PID feedback circuit abnormality on AC drive control board	Seek support from the manufacturer
Note: The PID feedback input is not within the range set by FB.27 [Disconnection detection upper limit] and FB.28 [Disconnection detection lower limit], and this fault is reported when it exceeds the set value of FB.26 [Disconnection detection time]. Via FB.25 [PID feedback disconnection detection time], users can set the motor operation when the fault is detected.			
Code	**Name**	**Cause**	**Measure**
A.LD1	Load warning1	Failure on the mechanical side, such as a broken pulley belt	Check the machine for troubleshooting.
		Improper parameter settings	Adjust FA.18 [Load detection warning1] and FA.19 [Load detection warning time1].
Note: The warning is reported if the output current of AC drive exceeds FA.18 [Load detection warning1], the duration exceeds FA.19 [Load detection warning time1], and the warning detection is enabled by the ones and tens-bit of FA.17 [Load detection setting] and the motor operation mode is set to “alarm and continue to run”.			
Code	**Name**	**Cause**	**Measure**
A.LD2	Load warning2	Failure on the mechanical side, such as a broken pulley belt	Check the machine for troubleshooting.
		Improper parameter settings	Adjust FA.20 [Load detection warning2] and FA.21 [Load detection warning time2].
Note: The warning is reported if the output current of AC drive exceeds FA.20 [Load detection warning2], the duration exceeds FA.21 [Load detection warning time2], and the warning detection is enabled by the ones and tens-bit of FA.17 [Load detection setting] and the motor operation mode is set to “alarm and continue to run”.			
Code	**Name**	**Cause**	**Measure**

A.EEP	EEPROM read/write warning	Interference during read and write parameter operation to EEPROM	Re-read and write parameters after checking and removing interference sources
Code	**Name**	**Cause**	**Measure**
A.DEF	Excessive speed deviation warning	Overload	Reduce the load.
		Short acc./dec. time	Increase the acc./dec. time via F0.14 and F0.15
		Improper setting of speed detection-related parameters	Adjust FA.24 [Excessive speed deviation detection threshold] and FA.25 [Excessive speed deviation detection time].
		Motor electromagnetic brake in holding position	Release the brake.
Note: The percentage of the output motor speed relative to F0.09 [Max. frequency] is greater than FA.24 [Excessive speed deviation detection threshold], alarm for a period of FA.25 [Excessive speed deviation detection time]. FA.23 [Excessive speed deviation protection] can be used to enable fault detection and set the motor operation mode when the fault is detected.			
Code	**Name**	**Cause**	**Measure**
A.SPD	Overspeed alert	Improper setting of the number of encoder lines or poles	Adjust F5.31 [ABZ encoder line number] or F5.33 [Rotary transformer pole number].
		Improper setting of overspeed detection-related parameters	Adjust FA.27 [Overspeed detection threshold] and FA.28 [Overspeed detection time].
Note: The percentage of the output motor speed relative to F0.09 [Max. frequency] is greater than FA.27 [Overspeed detection threshold], alarm for a period of FA.28 [Overspeed detection time]. FA.26 [Overspeed protection selection] can be used to enable fault detection and set the motor operation mode when the fault is detected.			
Code	**Name**	**Cause**	**Measure**
A.072	Lockout alert	AC drive usage time is about to reach the set time.	Seek support from the manufacturer.
A.073	GPS lockout	AC drive usage time reaches the set time.	Seek support from the manufacturer.
		GPRS lockout	Seek support from the manufacturer.
Note: GPS function requires optional GPRS expansion card.			
Code	**Name**	**Cause**	**Measure**
A.074	Modbus communication warning	Communication line failures, such as short circuit, disconnection, etc.	Check the communication wiring for abnormalities.
		Abnormal communication data due to interference.	Check the whole machine grounding wirings for abnormalities. Change to shielded communication lines
Note: Report this warning if the communication data is incorrect and the time exceeds FD.06 [Modbus timeout duration]. Via FD.07 [Modbus failure action mode], the motor operation can be set when the fault is detected.			
Code	**Name**	**Cause**	**Measure**
A.075	Input contactor alert	Abnormal input contactor feedback signal wiring	Check the input contactor wiring for abnormalities.
		Abnormal input contactor feedback polarity setting	Adjust the tens-bit setting of FF.06.
Note: The warning can be blocked by setting the tens-bit of FF.02 to zero.			
Code	**Name**	**Cause**	**Measure**
A.076	Output contactor alert	Abnormal output contactor feedback signal wiring	Check the output contactor wiring for abnormalities.
		Abnormal output contactor feedback polarity setting	Adjust the ones-bit setting of FF.06.
Note: The warning can be blocked by setting the ones-bit of FF.02 to zero.			
Code	**Name**	**Cause**	**Measure**

A.077	CAN disconnection alert	Communication line malfunction, such as short circuit, disconnection, etc.	Check the communication wiring for abnormalities.
		Abnormal communication data due to interference.	Check the whole machine grounding wirings for abnormalities. Change to shielded communication lines
Note: Via FD.17 [CAN disconnection detection], the motor operation can be set when the fault is detected.			
Code	**Name**	**Cause**	**Measure**
A.SE	Slave failure or emergency stop	Slave failure	Slave reset failure
		Slave emergency stop or slave free stop terminals active	Disable the free or emergency stop terminals of the slave.
Note: A.SE warning can be eliminated automatically when the slave is fault-free or its emergency stop terminal is invalid.			
A.RUN	Terminal start protection	Operation command conflict	Remove shutdown signals, including st
A.BUS	Expansion card disconnection alert	-	Check the expansion card connection for abnormalities.

5.7 Fault Reset Methods

If the AC drive stops running due to a malfunction, follow the steps below for troubleshooting and restart the AC drive after taking appropriate solutions.

5.7.1 Troubleshooting for Powered-on AC Drive

1. Confirm the fault code displayed on the keyboard and the FA.39 fault subcode.
2. Please refer to the sections on troubleshooting to eliminate the causes.
3. Perform a fault reset.

5.7.2 Fault Reset

To restore the AC drive to normal operation, first rectify the cause of the malfunction and then reset the fault. There are four fault reset methods:
1. Press the STOP/RESET key on the keyboard when a fault occurs.
2. Select fault reset via multi-function input terminal function, and note to enable the terminal.
3. Send fault reset command through communication.
4. Repower the AC drive up.

Chapter 6 Network Communications

6.1 Modbus RTU Communication Protocol

The ACP30 series drive is equipped with RS485 communication interface as standard, and its communication adopts international standard Modbus protocol. Via PC/PLC or master AC drive, centralized control (which allows for AC drive commands setting, operational frequency setting, function parameters adjustment, and AC drive status and faults monitoring) can be realized to satisfy unique application requirements.

6.1.1 Communication Rule

The format of MODBUS communication is shown in the table below.

Item	Description
Interface	RS-485 (RS232 interface requires additional RS232/RS485 converter)
Synchronization method	Unsynchronized
Communication frame	Baud rate: 1200, 2400, 4800, 9600, 19200, 38400 or 57600bps
	Data length: 8 bits (fixed)
	Parity: odd, even, none
	Stop bit: 1 bit (fixed)
Communication protocol	Modbus protocol (RTU (mode) only)

Note: The ACP30 series only supports RTU mode.

6.1.2 Information Components

In RTU mode, a new frame requires to start with a transmission pause interval of at least 3.5 character. Then it is followed by the data transmission field, which consists of a sequence that includes the slave address, operation command code, data and parity words. After the final byte of these words has been transmitted, there is a minimum of a 3.5-byte transmission pause interval to indicate the end of this frame. The format of RTU data frame is shown in the table below.

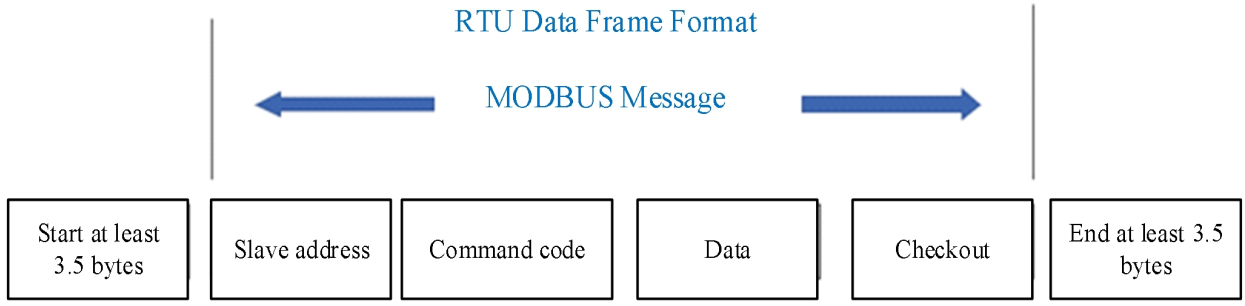


Figure 6-1

6.1.2.1 Slave Address

Please set a value in the range of 0~247 (decimal). When the slave address is set to 0, the master is for broadcasting and all slaves receive commands. For broadcast mode, the slave does not send response messages to the master.

6.1.2.2 Command Code

Code	Function
03H	Read slave parameters
06H	Write slave parameters

6.1.2.3 Data

Data is formed from AC drive parameter code and its associated data which includes data for reading and writing codes or specific addresses.

6.1.2.4 Parity

Standard Modbus communication uses two kinds of error checking methods. Parity check is for each characteristic and the Cyclical redundancy check (CRC) is for a frame.

1. Parity Check

Users can configure controllers for odd or even parity check, or for no parity check. This will determine how the parity bit is set in each character.

If either even or odd parity is specified, the quantity of "1 " bits will be counted in the data portion of each character (7 data bits for ASCII mode, or 8 for RTU). For example, the RTU character frame contains the following 8 data bits: 1 1 0 0 0 1 0 1, and the total quantity of "1" bits is 4.

If even parity is used, the frame's parity bit will be a 0, making the total quantity of "1" bits remains 4. If odd parity check is used, the frame's parity bit will be a 1, making the total quantity of "1" bits is 5.

If no parity bit is specified, no parity bit is transmitted and no parity check can be made. An additional stop bit is transmitted to fill out the character frame.

2. CRC-16 (Cyclical Redundancy Check)

In RTU mode, messages include an error–checking field that is based on a CRC method. The CRC field checks the contents of the entire message. The CRC field is two bytes, containing a 16–bit binary value. The CRC value is calculated by the transmitting device. The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error results.

The CRC is started by first storing 0xFFFF. Then a process begins of applying successive 6–bit bytes of the message to the current contents of the register. Only the 8Bit data in each character is valid for CRC. Start and stop bits, and the parity bit are invalid.

During the generation of the CRC, each 8–bit character is exclusive ORed (XOR) with the register contents. Then the result is shifted in the direction of the least significant bit, with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a 1, the register is then exclusive ORed with a preset, fixed value. If the LSB was a 0, no exclusive OR takes place. This process is repeated until eight shifts have been performed. After the last (8^{th}) shift, the next 8–bit byte is exclusive ORed with the register's current value. The final contents of the register, after all the bytes of the message have been applied, is the CRC value.

This calculation of CRC adopts the international standard CRC checksum rule. When editing the CRC algorithm, users can refer to the relevant standard CRC algorithm to write a CRC calculation program that truly meets the requirements.

6.1.3 Communication Frame Format

The format of communication frame is shown below:

Byte components: start bit, 8 data bits, parity bit and stop bit.

Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Parity bit	Stop bit

The entire message must be transmitted as as a continuous stream. If a silent interval of more than 1.5 characters times occurs before completion of the frame, the receiving device flushes the incomplete message and assumes that the next byte will be the address field of a new message. Similarly, if a new message begins earlier than 3.5 character times following a previous message, the receiving device will consider it a continuation of the previous message. This will set an error, as the value in the final CRC field is not correct.

6.1.4 Communication Command

For reading slave parameters command code: 03H, it allows for reading N words, up to 20 words consecutively.

For example, if an AC drive with a slave address of 01H and a memory starting address of 2100H ([C-00]) that reads three consecutive words, the framing is described as follows:

RTU master command:

START	Transmission time for 3.5 characters
Slave address	01H
Command	03H
Starting address high byte	21H
Starting address low byte	00H
No. of data high byte	00H
No. of data low byte	03H
CRC CHK low byte	0FH
CRC CHK high byte	F7H
END	Transmission time for 3.5 characters

RTU slave response (normal):

START	Transmission time for 3.5 characters
Slave address	01H
Command	03H
Byte count low position	06H
Data address 2100H high position	13H
Data address 2100H low position	88H
Data address 2101H high position	00H
Data address 2101H low position	00H
Data address 2102H high position	00H
Data address 2102H low position	00H
CRC CHK (low)	90H
CRC CHK (high)	A6H
END	Transmission time for 3.5 characters

RTU slave response (abnormal):

START	Transmission time for 3.5 characters
Slave address	01H
Command	83H
Error	04H
CRC CHK (low)	40H
CRC CHK (High)	F3H
END	Transmission time for 3.5 characters

For writing slave parameters command code: 06H, it allows for writing a word into the designated address, which can be used to modify the AC drive parameters.

For example: write 5000 (1388H) to the address 3000H of the AC drive at slave address 1. The description for the fame format is as below:

RTU master command:

START	Transmission time for 3.5 characters
Slave address	01H
Command	06H
Write data address high position	30H
Write data address low position	00H
Data content high byte	13H
Data content low byte	88H
CRC CHK low byte	8BH
CRC CHK high byte	9CH
END	Transmission time for 3.5 characters

RTU slave response (normal):

START	Transmission time for 3.5 characters

Slave address	01H
Command	06H
Write data address high position	30H
Write data address low position	00H
Data content high byte	13H
Data content low byte	88H
CRC CHK low byte	8BH
CRC CHK high byte	9CH
END	Transmission time for 3.5 characters

RTU slave response (abnormal):

START	Transmission time for 3.5 characters
Slave address	01H
Command	86H
Error	01H
CRC CHK low byte	83H
CRC CHK high byte	A0H
END	Transmission time for 3.5 characters

For circuit self-examination command code: 06H, it sends back the same slave response information as the command information of the master, which is applied to check if the signal transmission between the master and the slave is normal or not. The check code and data can be set arbitrarily, and the check code has nothing to do with the parameter address of the AC drive.

For example: write 5000 (1388H) to the check address 0000H of the AC drive at slave address 1. The description for the fame format is as below:

RTU master command:

START	Transmission time for 3.5 characters
Slave address	01H
Command	08H
Check code high byte	00H
Check code low byte	00H
Data high byte	13H
Data low byte	88H
CRC CHK low byte	EDH
CRC CHK high byte	5DH
END	Transmission time for 3.5 characters

RTU slave response (normal):

START	Transmission time for 3.5 characters
Slave address	01H
Command	08H
Check code high byte	00H
Check code low byte	00H
Data high byte	13H
Data low byte	88H
CRC CHK low byte	EDH
CRC CHK high byte	5DH
END	Transmission time for 3.5 characters

RTU slave response (abnormal):

START	Transmission time for 3.5 characters
Slave address	01H
Command	88H
Error	03H
CRC CHK low byte	06H
CRC CHK high byte	01H
END	Transmission time for 3.5 characters

6.1.5 Communication Control Parameter Group Description

Rules for ACP30 series function parameter address presentation

The AC drive function parameter serial number is used as the register address, which is divided into two parts: the high byte and the low byte. The high byte indicates the serial number of the function parameter group, and the low byte indicates the serial number of the function parameter in the group, which needs to be converted to hexadecimal.

Address field high byte:

Parameter group	Corresponding parameter address
F0 basic parameters	0x00xx (not stored in EEPROM) 0x10xx (stored in EEPROM)
F1 motion control parameters	0x01xx (not stored in EEPROM) 0x11xx (stored in EEPROM)
F2 switch terminal parameters	0x02xx (not stored in EEPROM) 0x12xx (stored in EEPROM)
F3 analog terminal parameters	0x03xx (not stored in EEPROM) 0x13xx (stored in EEPROM)
F4 keyboard parameters	0x04xx (not stored in EEPROM) 0x14xx (stored in EEPROM)
F5 motor parameters	0x05xx (not stored in EEPROM) 0x15xx (stored in EEPROM)
F6 vector control parameters	0x06xx (not stored in EEPROM) 0x16xx (stored in EEPROM)
F7 torque control parameters	0x07xx (not stored in EEPROM) 0x17xx (stored in EEPROM)
F8 V/F control parameters	0x08xx (not stored in EEPROM) 0x18xx (stored in EEPROM)
FA protection parameters	0x0Axx (not stored in EEPROM) 0x1Axx (stored in EEPROM)
FB process PID control parameters	0x0Bxx (not stored in EEPROM) 0x1Bxx (stored in EEPROM)
FC multi-speed and simple PLC	0x0Cxx (not stored in EEPROM) 0x1Cxx (stored in EEPROM)
FD communication parameters	0x0Dxx (not stored in EEPROM) 0x1Dxx (stored in EEPROM)
FE rectification parameters	0x0Exx (not stored in EEPROM) 0x1Exx (stored in EEPROM)
FF specific function parameters	0x0Fxx (not stored in EEPROM) 0x1Fxx (stored in EEPROM)
C monitoring parameters	0x21xx
MODBUS control parameters	0x30xx or 0x20xx

Note: There is a possibility of frequent rewriting of parameter values for communication. And the service life of EEPROM can be reduced due to excessive write operations. Users do not need to save specific function codes in communication mode; adjusting the values in the on-chip RAM is adequate for their requirements. The ACP30 protocol dictates that for the write command (06H), if the highest bit in the function code's address field is 0, it is only written in AC drive's RAM, namely, data will not be stored in power loss, if the high nibble is 1, it is written to EEPROM, namely, data will be stored in power loss.

Take rewriting the function parameter [F0.14] as an example, if it is not stored in the EEPROM, the address is 000EH, and if it is stored in the EEPROM, the address is 100EH.

MODBUS control parameter group address description:

Function	Address	Data description	R/W
Communication given frequency	0x3000 or 0x2000	0~32000 corresponds to 0.00Hz~320.00Hz	W/R

Communication command setting	0x3001 or 0x2001	0000H: none 0001H: forward operation 0002H: reverse operation 0003H: forward jogging 0004H: reverse jogging		0005H: deceleration stop 0006H: fee stop 0007H: fault reset 0008H: operation off 0009H: operation on 258: rotary auto-tuning and run 259: static auto-tuning and run	W/R
AC drive status	0x3002 or 0x2002	Bit0	0: shutdown	1: running	R
		Bit1	0: not accelerated	1: accelerated	
		Bit2	0: not decelerated	1: decelerated	
		Bit3	0: forward	1: reverse	
		Bit4	0: failure-free	1: AC drive failure	
		Bit5	0: normal slave	1: slave in failure or emergency stop status	
		Bit6	0: no alert	1: AC drive alert	
		Bit7	0: power-on not completed	1: power-on completed	
AC Drive fault code	0x3003 or 0x2003	AC Drive current fault code (see fault code list)			R
Set upper limit frequency via communications	0x3004 or 0x2004	0~10000 corresponds to 0.00Hz~100.00Hz			W/R
Communication torque setting	0x3005 or 0x2005	0~1000 corresponds to 0.0%~100.0%			W/R
Torque-controlled upper forward frequency limit	0x3006 or 0x2006	0~1000 corresponds to 0.0%~100.0%			W/R
Torque-controlled upper reverse frequency limit	0x3007 or 0x2007	0~1000 corresponds to 0.0%~100.0%			W/R
PID given	0x3008 or 0x2008	0~1000 corresponds to 0.0%~100.0%			W/R
PID feedback	0x3009 or 0x2009	0~1000 corresponds to 0.0%~100.0%			W/R
Voltage-frequency separated voltage value	0x300A or 0x200A	0~1000 corresponds to 0.0%~100.0%			W/R
Fault No. 1~16	0x300B or 0x200B	0~FFFF; bit0~bit15 corresponds to Fault 1~16			R
Fault No. 17~32	0x300C or 0x200C	0~FFFF; bit0~bit15 corresponds to Fault 17~32			R
Fault No. 33~48	0x300D or 0x200D	0~FFFF; bit0~bit15 corresponds to Fault 33~48			R
Fault No. 49~64	0x300E or 0x200E	0~FFFF; bit0~bit14 corresponds to Fault 49~63			R
AC drive special status	0x300F or 0x200F	Bit0	0: shutdown	1: running	R
		Bit1	0: not accelerated	1: accelerated	
		Bit2	0: not decelerated	1: decelerated	
		Bit3	0: forward	1: reverse direction	
		Bit4	0: failure-free	1: AC drive failure	
		Bit5	0: chip unlocked	1: chip locked	
		Bit6	0: rectification off	1: rectification on	
		Bit7	0: inversion off	1: inversion on	
Fault and warning	0x3010 or 0x2010	0-63: fault code 64-~: warning code			R

code reading				
Output terminal status	0x3020 or 0x2020	External borrowed AC drive output terminal, BII0-Y	BIT1-TA1-TB1-TC1 BIT2-TA2-TB2-TC2	R
AO1	0x3021 or 0x2021	External borrowed AC drive AO 0-10000 corresponds to 0V-10V, 0mA-20mA		W/R
AO2	0x3022 or 0x2022	0-10000 corresponds to output 0V-10V, 0mA-20mA		W/R
Touch screen given operation command	0x3201	0: off 1: forward 2: reverse 3: forward jogging 4: reverse jogging 5: deceleration stop 6: free stop 7: fault reset 8: run stop command, when communication to 3001 address, set it to 8, when AC drive free stop, it needs to set to 9 to address 3001 or re-power on to run. 9: operation on		W
AC drive status	0x3202	Bit0: 0—off 1—on Bit1: 0—not accelerated 1—accelerated Bit2: 0—not decelerated 1—decelerated Bit3: 0—forward 1—reverse Bit4: 0—normal AC drive 1—faulty Bit5: 0—normal slave 1—slave in failure or emergency stop statuses BIT6: 0—no alert 1—alert BIT7: 0—power-on not completed 1—power-on completed		R
AC drive fault code	0x3203	Fault code		R
Auto-tuning	0x2803	1: static auto-tuning 2: rotary auto-tuning		R
Cumulative running time	0x2813	-		R

Note: For other function code addresses, please see the "communication address" column in the function code list. For the write command (06H), if the highest bit in the function code's address field is 0, it is only written in AC drive's RAM, namely, data will not be stored in power loss, if the high nibble is 1, it is written to EEPROM, namely data will be stored in power loss, as group F0: 0x00XX (write RAM) 0x10XX (stored in EEPROM).

6.1.6 Fault Codes Description for Slave Response to Exception Messages

The fault codes of MODBUS communication are shown in the table below. Upon malfunction, please eliminate the cause before re-establishing communication.

Code	Description	Code	Description	Code	Description
1	Command code error	3	CRC failure	4	Illegal address
5	Illegal data	6	Parameters cannot be modified during operation	8	AC drive is busy (information being stored in EEPROM)
9	Parameter value above range	10	Reserved parameters can't be modified	11	Read parameter byte count error

6.2 Modbus TCP Communication Protocol

6.2.1 Supported Function Code

See the following for the Modbus TCP framing:

Serial number	Protocol ID	Length	Device address	Command code	Starting address H	Starting address L	Count H	Count L

The function code description is shown in the following table:

Command code	Description	Available
0x01	Read coils	No
0x02	Read discrete inputs	No
0x03	Read holding registers	Yes
0x04	Read input registers	Yes
0x05	Write a single coil	No
0x06	Write a single holding register	Yes
0x0F	Write multiple coils	No
0x10	Write multiple holding registers	No

6.2.2 Communication Address

Parameter group	Corresponding parameter address
F0 basic parameters	0x00xx (not stored in EEPROM) 0x10xx (stored in EEPROM)
F1 motion control parameters	0x01xx (not stored in EEPROM) 0x11xx (stored in EEPROM)
F2 switch terminal parameters	0x02xx (not stored in EEPROM) 0x12xx (stored in EEPROM)
F3 analog terminal parameters	0x03xx (not stored in EEPROM) 0x13xx (stored in EEPROM)
F4 keyboard parameters	0x04xx (not stored in EEPROM) 0x14xx (stored in EEPROM)
F5 motor parameters	0x05xx (not stored in EEPROM) 0x15xx (stored in EEPROM)
F6 vector control parameters	0x06xx (not stored in EEPROM) 0x16xx (stored in EEPROM)
F7 torque control parameters	0x07xx (not stored in EEPROM) 0x17xx (stored in EEPROM)
F8 V/F control parameters	0x08xx (not stored in EEPROM) 0x18xx (stored in EEPROM)
FA protection parameters	0x0Axx (not stored in EEPROM) 0x1Axx (stored in EEPROM)

FB process PID control parameters	0x0Bxx (not stored in EEPROM) 0x1Bxx (stored in EEPROM)
FC multi-speed and simple PLC	0x0Cxx (not stored in EEPROM) 0x1Cxx (stored in EEPROM)
FD communication parameters	0x0Dxx (not stored in EEPROM) 0x1Dxx (stored in EEPROM)
FE rectification parameters	0x0Exx (not stored in EEPROM) 0x1Exx (stored in EEPROM)
FE specific function parameters	0x0Fxx (not stored in EEPROM) 0x1Fxx (stored in EEPROM)
C monitoring parameters	0x21xx
MODBUS control parameters	0x30xx or 0x20xx

6.2.3 Fault Code

See the following for this device's Modbus TCP communication fault codes. Upon malfunction, please eliminate the cause before re-establishing communication.

Fault code	Description
1	Command code error
2	Reserved
3	Reserved
4	Illegal address
5	Illegal data
6	Parameters cannot be modified during operation
7	Reserved
8	AC drive is busy (information being stored in EEPROM)
9	Parameter value above range
10	Reserved parameters can't be modified
11	Read parameter byte count error
12	Reserved
13	Byte count error
14	Communication is busy

Chapter 7 Function Codes

"●": the parameter can be modified when AC drive is operating;
"○": the parameter can't be modified when AC drive is operating;
"×": the parameter is read-only and cannot be modified;
"-": the parameter is “factory default" and can only be set by the manufacturer;
"※": the parameter is related to the AC drive model type;
"▲": the parameter is only valid in rectification mode, and invalid for inversion;
"△": the parameter is only valid in inversion mode, and invalid for rectification;
Note: The parameter without "△" and "▲" markings indicates that there is no specific requirements to differentiate between rectification and inversion modes.

7.1 Parameter List

7.1.1 Group F0: Basic Parameters

Code	Name	Description	Factory default	Attribute	Address
F0.00	Motor control mode	**AM control mode:** 0: V/F control 1: reserved 2: reserved 3: high-performance vector control without PG 4: high-performance vector control with PG **PM control mode:** 5: reserved 6: high-performance vector control without PG 7: Vector control with PG **Other control mode:** 8: V/F-SPLIT control (voltage-frequency separated output)	0	○△	0x000
F0.01	Two-level four-quadrant start mode	0: rectification on, inversion on 1: rectification on, inversion off 2: rectification off, inversion on **Note**: This code is invalid in three-level mode.	0	○	0x001
F0.02	Command running channel	0: keyboard control 1: terminal control 2: RS485 communication control 3: CAN communication control 4: touch screen control	1	●	0x002
F0.03	Frequency given source channel A	0: give frequency via keyboard 1: reserved 2: AI1 current/voltage setting 3: AI2 current/voltage setting 6: RS485 communication setting	0	●△	0x003

F0.04	Frequency given source channel B	7: terminal UP/DW control 8: PID setting 9: PLC setting 10: power balancing slave setting 11: multi-speed setting	1	●△	0x004
F0.05	Frequency setting channel B reference source	0: max. output frequency as the reference source 1: frequency set by channel A as the 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: the higher one from Channel A and Channel B 5: the lower one from Channel A and Channel B	0	●△	0x006
F0.07	Running command binding	Ones-bit: bound frequency given by keyboard commands Tens-bit: bound frequency given by terminal commands Hundreds-bit: bound frequency given by RS485 communication commands Thousands-bit: bound frequency given by CAN communication commands 0: no binding 1: give frequency via keyboard 2: reserved 3: VS voltage analog setting 4: reserved 5: AS current analog setting 6: reserved 7: RS485 communication setting 8: terminal UP/DW control 9: PID setting A: PLC setting B: CAN communication setting C: multi-speed setting D: reserved	0000	●△	0x007
F0.08	Give frequency via keyboard	0.00Hz~upper limit frequency	50.00Hz	●△	0x008
F0.09	Max. frequency	Upper limit frequency~100.00Hz	50.00Hz	○△	0x009
F0.10	Upper limit frequency setting	0: Upper limit frequency setting 1: reserved 2: VS voltage analog setting 3: reserved 4: AS current analog setting 5: reserved 6: RS485 communication setting 7: CAN communication setting	0	●△	0x00A
F0.11	Upper limit frequency keyboard setting	Lower limit frequency~max. frequency	50.00Hz	●△	0x00B
F0.12	Lower limit frequency	0.00Hz~upper limit frequency	0.00Hz	●△	0x00C
F0.13	Lower limit frequency operation mode	0: stop the output, enter the paused operation status 1: run at the lower limit frequency	1	○△	0x00D
F0.14	Acceleration time1	0.01s~650.00s	According to motor	※●△	0x00E

			type		
F0.15	Deceleration time1	0.01s~650.00s	According to motor type	※●△	0x00F
F0.16	Rotation direction	LED ones-bit: reverse running direction 0: direction unchanged 1: reverse direction LED tens-bit: running direction disabled 0: forward and reserve commands are both allowed 1: only forward command is allowed 2: only reverse command is allowed LED hundreds-bit: frequency-based direction control 0: off 1: on LED thousands-bit: torque-based direction control 0: off 1: on	0000	○△	0x010
F0.17	Bus voltage setting	0.0V~6500.0V	Related to voltage ratings	●▲	0x011
F0.18	Test mode	Setting range: 0~FFFF	0000	○	0x012
F0.19	Parameters initialized	0: none 1: restore to factory default (not restore motor parameters and FD communication parameters, not clear fault records) 2: restore to factory default (restore motor parameters, not restore FD communication parameters, not clear fault records) 3: restore to factory default (restore all parameters, not clear fault records) 4: clear fault records Other values: no operation	0	○	0x013

7.1.2 Group F1: Running Control

Code	Name	Description	Factory default	Attribute	Address
F1.00	Start mode	0: start by starting frequency 1: start by DC braking 2: start by speed tracking	0	○△	0x100
F1.01	Pre-excitation start time	0.00s~60.00s	0.00s	○△	0x101
F1.02	Starting frequency	0.00Hz~60.00Hz	0.50Hz	○△	0x102
F1.03	Starting frequency retention time	0.0s~50.0s	0.0s	○△	0x103
F1.04	Braking current before startup	0.0%~150.0%	60.0%	○△	0x104
F1.05	Braking time before startup	0.0s~60.0s	0.0s	○△	0x105
F1.07	Speed tracking time	0.00s~60.00s	0.50s	○△	0x107
F1.08	Speed tracking stop	0.00s~60.00s	1.00s	○△	0x108

	delay				
F1.09	Speed tracking current	80.0%~400.0%	120.0%	○△	0x109
F1.10	Stop mode	0: deceleration stop 1: free stop	1	●△	0x10A
F1.11	DC braking start frequency at shutdown	0.00Hz~5.00Hz	1.00Hz	○△	0x10B
F1.12	DC braking current at shutdown	0.0%~150.0%	60.0%	○△	0x10C
F1.14	DC braking retention time at shutdown	0.0s~60.0s	0.0s	○△	0x10E
F1.15	Stop detection frequency	0.00Hz~50.00Hz	0.50Hz	●△	0x10F
F1.16	Acceleration/deceleration selection	LED ones-bit: time reference selection 0: max. frequency 1: fixed frequency 50Hz 2: set frequency LED tens-bit: S-curve acc./dec. selection 0: linear curve acc./dec. 1: S-curve acc./dec.	0000	○△	0x110
F1.17	S-curve acceleration start time	0.00s~10.00s	0.20s	○△	0x111
F1.18	S-curve acceleration stop time	0.00s~10.00s	0.20s	○△	0x112
F1.19	S-curve deceleration start time	0.00s~10.00s	0.20s	○△	0x113
F1.20	S-curve deceleration stop time	0.00s~10.00s	0.20s	○△	0x114
F1.21	Acceleration time2	0.01s~650.00s	10.00s	●△	0x115
F1.22	Deceleration time2	0.01s~650.00s	10.00s	●△	0x116
F1.23	Acceleration time3	0.01s~650.00s	10.00s	●△	0x117
F1.24	Deceleration time3	0.01s~650.00s	10.00s	●△	0x118
F1.25	Acceleration time4	0.01s~650.00s	10.00s	●△	0x119
F1.26	Deceleration time4	0.01s~650.00s	10.00s	●△	0x11A
F1.38	Jogging frequency	0.00Hz~max. frequency	5.00Hz	●△	0x126
F1.39	Jogging acceleration time	0.01s~650.00s	10.00s	●△	0x127
F1.40	Jogging deceleration time	0.01s~650.00s	10.00s	●△	0x128
F1.41	Jump Frequency 1	0.00Hz～650.00Hz	0.00Hz	○△	0x129
F1.42	Jump Frequency Range 1	0.00Hz～650.00Hz	0.00Hz	○△	0x12A
F1.43	Jump Frequency 2	0.00Hz～650.00Hz	0.00Hz	○△	0x12B
F1.44	Jump Frequency Range 2	0.00Hz～650.00Hz	0.00Hz	○△	0x12C

7.1. 3 Group F2: Switch Terminal

Code	Name	Description	Factory default	Attribute	Address
F2.00	Input terminal1 (X1)	See 7.2 Terminal I/O Function Selection; 0~50	8	○	0x200
F2.01	Input terminal2 (X2)	See 7.2 Terminal I/O Function Selection; 0~50	1	○	0x201
F2.02	Input terminal3 (X3)	See 7.2 Terminal I/O Function Selection; 0~50	2	○	0x202
F2.03	Input terminal4 (X4)	See 7.2 Terminal I/O Function Selection;	6	○	0x203

		0~50			
F2.04	Input terminal5 (X5)	See 7.2 Terminal I/O Function Selection; 0~50	16	○	0x204
F2.05	Input terminal6 (X6)	See 7.2 Terminal I/O Function Selection; 0~50	17	○	0x205
F2.08	X1~X4 polarity selection	Ones-bit: X1 Tens-bit: X2 Hundreds-bit: X3 Thousands-bit: X4 0: on 1: off	1000	●	0x208
F2.09	X5~X6 polarity selection	Ones-bit: X5 Tens-bit: X6 0: on 1: off	0000	●	0x209
F2.10	X1 on detection delay	0.000s~6.000s	0.010s	●	0x20A
F2.11	X1 off detection delay	0.000s~6.000s	0.010s	●	0x20B
F2.12	X2 on detection delay	0.000s~6.000s	0.010s	●	0x20C
F2.13	X2 off detection delay	0.000s~6.000s	0.010s	●	0x20D
F2.14	X3 on detection delay	0.000s~6.000s	0.010s	●	0x20E
F2.15	X3 off detection delay	0.000s~6.000s	0.010s	●	0x20F
F2.16	X4 on detection delay	0.000s~6.000s	0.010s	●	0x210
F2.17	X4 off detection delay	0.000s~6.000s	0.010s	●	0x211
F2.18	X5 on detection delay	0.000s~6.000s	0.010s	●	0x212
F2.19	X5 off detection delay	0.000s~6.000s	0.010s	●	0x213
F2.20	X6 on detection delay	0.000s~6.000s	0.010s	●	0x214
F2.21	X6 off detection delay	0.000s~6.000s	0.010s	●	0x215
F2.26	Terminal-controlled operation mode	0: two-line 1 1: two-line 2 2: three-line 1 3: three-line 2	0	○	0x21A
F2.27	Terminal start protection	LED ones-bit: terminal start protection in case of abnormal exit LED tens-bit: jogging terminal start protection in case of abnormal exit LED hundreds-bit: start protection in case of switch from command channel to terminal LED thousands-bit: reserved 0: off 1: on	0111	○	0x21B
F2.30	PUL input min. frequency	0.00kHz~50.00kHz	0.00kHz		0x21E
F2.31	PUL min. frequency corresponding	0.00%~100.00%	0.00%		0x21F

	setting				
F2.32	PUL input max. frequency	0.00kHz~100.00kHz	50.00 kHz		0x220
F2.33	PUL max. frequency corresponding setting	0.00%~100.00%	100.00 %		0x221
F2.34	PUL filter time	0.000s~9.000s	0.100s		0x222
F2.35	PUL cutoff frequency	0.000kHz~1.000kHz	0.010 kHz		0x223
F2.44	Output terminal polarity selection	LED ones-bit: Y terminal (reserved) LED tens-bit: RO terminal1 LED hundreds-bit: RO terminal2 0: positive 1: negative	0000	●	0x22C
F2.46	RO1	See 7.2 Terminal I/O Function Selection;	33	●	0x22E
F2.47	RO2	See 7.2 Terminal I/O Function Selection;	4	●	0x22F
F2.49	Relay1 output delay	0.000s~6.000s	0.010s	●	0x231
F2.50	Relay2 output delay	0.000s~6.000s	0.010s	●	0x232
F2.74	Expansion card disconnection selection	Ones-bit: expansion card interface1 0: disconnection detection off 1: report an alarm and free stop 2: warning and continue running 3: warning and free stop Tens-bit: interface2 initialization selection F: PG mode Others: SPI communication	F0	●	0x24A
F2.75	Multi-function input terminal EX6 (expansion card X6)	See the functions of terminal X	9	●	0x24B
F2.76	Multi-function input terminal EX7 (expansion card X7)	See the functions of terminal X	38	●	0x24C
F2.77	Multi-function input terminal EX8 (expansion card X8)	See the functions of terminal X	0	●	0x24D
F2.79	Multi-function input terminal EX10 (expansion card X10)	See the functions of terminal X	0	●	0x24F
F2.81	Multi-function output terminal Y (expansion card Y)	See the functions of terminal Y	0	●	0x251
F2.82	Multi-function relay terminal (expansion card relay)	See the functions of terminal Y	34	●	0x252
F2.83	EX6~X8 polarity selection	0: on 1: off LED ones-bit: terminal EX6 LED tens-bit: terminal EX7 LED hundreds-bit: terminal EX8 LED thousands-bit: reserved	0000	●	0x253
F2.84	EX10 polarity selection	0: on 1: off LED ones-bit: terminal EX10 LED tens-bit: reserved LED hundreds-bit: reserved LED thousands-bit: reserved	0000	●	0x254
F2.85	Expansion card output terminal	0: positive 1: negative	0000	●	0x255

	polarity selection	LED ones-bit: expansion card terminal Y LED tens-bit: expansion card RO terminal1 LED hundreds-bit: reserved LED thousands-bit: reserved			
F2.89	Expansion card temperature selection	Reserved	0	●	0x259
F2.90	Expansion card AO selection	LED ones-bit: output selection, see F3.54 for details LED hundreds-bit: output signal selection 0: 0V~10V 1: 4.00mA~20.00mA 2: 0.00mA~20.00mA	0000	●	0x25A
F2.91	Expansion card AO gain	30.0%~200.0%	100.0%	●	0x25B
F2.92	Expansion card AO signal deviation	-10.0%~10.0%	0.0%	●	0x25C
F2.93	Expansion card AO filter time	0.000s~6.000s	0.010s	●	0x25D
F2.94	Actual AO with 0% duty cycle of the expansion card	0~2000	0	●	0x25E
F2.95	Actual AO with 100% duty cycle of the expansion card	0~2000	1000	●	0x25F
F2.96	PUL input setting	0: reserved 1: expansion card	1	●	0x260

7.1. 4 Group F3: Analog Terminal

Code	Name	Description	Factory default	Attribute	Address
F3.00	AI1 (VS) lower limit	0.00V~10.00V	0.00V	●	0x300
F3.01	AI1(VS) lower limit corresponding setting	0.00%~100.00%	0.00%	●	0x301
F3.02	AI1 (VS) upper limit	0.00V~10.00V	10.00V	●	0x302
F3.03	AI1(VS) upper limit corresponding setting	0.00%~100.00%	100.00%	●	0x303
F3.04	AI1 (AS) lower limit	0.00mA~20.00mA	4.00mA	●	0x304
F3.05	AI1(AS) lower limit corresponding setting	0.00%~100.00%	0.00%	●	0x305
F3.06	AI1 (AS) upper limit	0.00mA~20.00mA	20.00mA	●	0x306
F3.07	AI1(AS) upper limit corresponding setting	0.00%~100.00%	100.00%	●	0x307
F3.08	AI1 filter time	0.000s~6.000s	0.100s	●	0x308
F3.09	AI2 (VS) lower limit	0.00V~10.00V	0.00V	●	0x309
F3.10	AI2(VS) lower limit corresponding setting	0.00%~100.00%	0.00%	●	0x30A
F3.11	AI2 (VS) upper limit	0.00V~10.00V	10.00V	●	0x30B
F3.12	AI2(VS) upper limit corresponding setting	0.00%~100.00%	100.00%	●	0x30C
F3.13	AI2 (AS) lower limit	0.00mA~20.00mA	4.00mA	●	0x30D
F3.14	AI2(AS) lower limit corresponding setting	0.00%~100.00%	0.00%	●	0x30E
F3.15	AI2 (AS) upper limit	0.00mA~20.00mA	20.00mA	●	0x30F
F3.16	AI2(AS) upper limit	0.00%~100.00%	100.00%	●	0x310

	corresponding setting				
F3.17	AI2 filter time	0.000s~6.000s	0.100s	●	0x311
F3.18	AI selection	Ones-bit: AI1 selection 0: VS 1: AS Tens-bit: AI2 selection 0: VS 1: AS	0000	●	0x312
F3.30	AI curve selection	LED ones-bit: AI1 0: linear curve (default) 1: Curve 1 2: Curve 2 LED tens-bit: terminal AI2 0: linear curve (default) 1: Curve 1 2: Curve 2 LED hundreds-bit: reserved LED thousands-bit: reserved	0000	●	0x31E
F3.32	Curve 1 lower limit	0.00V~10.00V	0.00V	●	0x320
F3.33	Curve 1 lower limit percentage	0.00%~100.00%	0.00%	●	0x321
F3.34	Curve 1 inflection point1 input voltage	0.00V~10.00V	3.00V	●	0x322
F3.35	Curve 1 inflection point1 percentage	0.00%~100.00%	30.00%	●	0x323
F3.36	Curve 1 inflection point2 input voltage	0.00V~10.00V	6.00V	●	0x324
F3.37	Curve 1 inflection point2 percentage	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 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 percentage	0.00%~100.00%	0.00%	●	0x329
F3.42	Curve 2 inflection point1 input voltage	0.00V~10.00V	3.00V	●	0x32A
F3.43	Curve 2 inflection point1 percentage	0.00%~100.00%	30.00%	●	0x32B
F3.44	Curve 2 inflection point2 input voltage	0.00V~10.00V	6.00V	●	0x32C
F3.45	Curve 2 inflection point2 percentage	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 setting	0.00%~100.00%	100.00%	●	0x32F
F3.53	AO signal type	LED ones-bit: AO1 0: 0V~10V 1: 4.00mA~20.00mA 2: 0.00mA~20.00mA LED tens-bit: AO2 0: 0V~10V 1: 4.00mA~20.00mA 2: 0.00mA~20.00mA LED hundreds-bit: reserved LED thousands-bit: reserved	0000	●	0x335
F3.54	AO1 selection	0: given frequency 1: output frequency 2: output current 3: input voltage 4: output voltage	1	●	0x336
F3.55	AO2 selection		2	●	0x337

		5: mechanical speed 6: given torque 7: output torque 8: PID given 9: PID feedback 10: output power 11: bus voltage 12: AI1 value 13: AI2 value 14~16: RST module max. temperature 17~19: UVW module max. temperature 20: RS485 setting			
F3.56	AO1 gain	0.0%~200.0%	100.0%	●	0x338
F3.57	Expansion card AO1 signal deviation	-10.0%~10.0%	0.0%	●	0x339
F3.58	A01 filter	0.000s~6.000s	0.010s	●	0x33A
F3.59	AO2 gain	0.0%~200.0%	100.0%	●	0x33B
F3.60	Expansion card AO2 signal deviation	-10.0%~10.0%	0.0%	●	0x33C
F3.61	A02 filter	0.000s~6.000s	0.010s	●	0x33D

7.1.5 Group F4: Keyboard Parameters

Code	Name	Description	Factory default	Attribute	Address
F4.00	Parameter and key locking	0: locking off 1: parameters locked 2: parameters and keys locked (except RUN/STOP/JOG) 3: parameters and keys all locked	0	●	0x400
F4.01	User passwords	0~9999	0	●	0x401
F4.04	LCD keyboard language	Ones-bit: language selection 0: Chinese 1: English	0		0x404
F4.05	Parameter copy	0: none 1: AC drive parameters are transmitted to the keyboard and saved 2: parameters saved in the keyboard are transmitted to the AC drive Other values: no operation 0~9999	0	○	0x405
F4.06	Special keyboard function	LED ones-bit: D\E monitoring 0: off 1: on LED tens-bit: potentiometer-less sampling lock 0: off 1: on	0000	○	0x406
F4.07	REV/JOG key selection	0: REV 1: JOG	0	○△	0x407
F4.08	STOP key selection	0: non-keyboard control off 1: stop as stop mode in non-keyboard control 2: stop as free stop in non-keyboard control	0	○	0x408

F4.09	UP/DW key selection	LED ones-bit: UP/DW modification 0: off 1: adjust F0.08 [Give frequency via keyboard] 2: adjust FB.01 [PID given/feedback via keyboard] LED tens-bit: power-down storage 0: frequency not stored in power-down 1: frequency stored in power-down LED hundreds-bit: action limit 0: adjustable in operation and shutdown 1: adjustable only in operation, maintained in shutdown 2: adjustable during operation, zeroed after shutdown	0011	○△	0x409
F4.14	First line keyboard content in operation mode	LED ones- and tens-bit: the first group displays monitoring parameter C00~69 LED hundreds- and thousands-bit: the second group displays monitoring parameter C00~69	1201	●	0x40E
F4.15	First line keyboard content in operation mode	LED ones- and tens-bit: the third group displays monitoring parameter C00~63 LED ones- and tens-bit: the fourth group displays monitoring parameter C00~63	0302	●	0x40F
F4.16	First line keyboard content in shutdown mode	LED ones- and tens-bit: the first group displays monitoring parameter C00~69 LED hundreds- and thousands-bit: the second group displays monitoring parameter C00~69	1200	●	0x410
F4.17	First line keyboard content in shutdown mode	LED ones- and tens-bit: the third group displays monitoring parameter C00~63 LED ones- and tens-bit: the fourth group displays monitoring parameter C00~63	0302	●	0x411
F4.18	Second line keyboard content in operation mode	LED ones- and tens-bit: the first group displays monitoring parameter C00~69 LED hundreds- and thousands-bit: the second group displays monitoring parameter C00~69	1201	●	0x412
F4.19	Second line keyboard content in operation mode	LED ones- and tens-bit: the third group displays monitoring parameter C00~63 LED ones- and tens-bit: the fourth group displays monitoring parameter C00~63	0302	●	0x413
F4.20	Second line keyboard content in shutdown mode	LED ones- and tens-bit: the first group displays monitoring parameter C00~69 LED hundreds- and thousands-bit: the second group displays monitoring parameter C00~69	1200	●	0x414
F4.21	Second line keyboard content in shutdown mode	LED ones- and tens-bit: the third group displays monitoring parameter C00~63 LED ones- and tens-bit: the fourth group displays monitoring parameter C00~63	0302	●	0x415
F4.22	Keyboard displayed item	LED ones-bit: output frequency display selection 0: target frequency 1: running frequency LED tens-bit: reserved LED hundreds-bit: power display dimension 0: power displayed in percentage (%) 1: power displayed in kilowatt (kW) LED thousands-bit: C-00~C-39	0100	●△	0x416

		0: normal 1: debugging			
F4.23	Monitor display selection	LED ones-bit: C-40~69 LED tens-bit: monitoring group C05 LED hundreds-bit: monitoring group C06 LED thousands-bit: reserved 0: normal display 1: normal display 2: V/F internal parameter 3: vector internal parameter 4: tuning internal parameter 1 5: reserved 6: rectification basic parameter 7: rectification internal parameter 1 8: tuning internal parameter 2 9: expansion parameter 10: test parameter 11: rectification internal parameter 2	3420		0x417
F4.24	Speed display coefficient	0.0%~500.0%	100.0%	●△	0x418
F4.25	Power display coefficient	0.0%~500.0%	100.0%	●△	0x419
F4.26	Alarm selection1	LED ones-bit: E. EEP fault (EEPROM memory fault) 0: alarm and free stop 1: alarm and continue running	0000	○	0x41A
F4.28	Fan control	0: fan runs after the drive is powered up 1: shutdown is temperature-dependent, AC drive running means the fan is running. 2: AC drive shutdown means fan stops, operation is temperature-dependent	1	●	0x41C
F4.29	Dynamic brake	0: off 1: on	0	●△	0x41D
F4.30	Dynamic brake voltage	115.0%~140.0%	Motor setting	●△	0x41E
F4.32	Inversion-side PWM carrier frequency	0.7kHz~16.0kHz	Motor setting	※●△	0x420
F4.33	Inversion-side PWM control mode1	LED ones-bit: carrier dependency on temperature 0: independent of temperature 1: dependent of temperature LED tens-bit: carrier dependency on output frequency 0: independent 1: dependent LED hundreds-bit: random PWM enabling 0: disabled 1: enabled LED thousands-bit: PWM modulation mode 0: three-phase modulation only 1: automatic switch between two-phase and three-phase modulation	1110	●△	0x421

F4.34	Inversion-side PWM control mode2	LED ones-bit: over-debugging switch 0: off 1: on LED tens-bit: double sampling and double update mode switch 0: on 1: off LED hundreds-bit: dead-zone compensation switch 0: off 1: on LED thousands-bit: reserved	9110	●△	0x422
F4.35	Inversion-side dead-zone compensation time	0~65535	306	●△	0x423

7.1.6 Group F5: Motor Parameters

Code	Name	Description	Factory default	Attribute	Address
F5.00	Type	0: asynchronous motor (AM) 1: permanent magnet synchronous motor (PM)	0	×△	0x500
F5.01	Pole number	2~98	4	○△	0x501
F5.02	Rated power	0.1kW~1000.0kW	Motor setting	※○△	0x502
F5.03	Rated frequency	0.01Hz~max. frequency	Motor setting	※○△	0x503
F5.04	Rated speed	1rpm~65000rpm	Motor setting	※○△	0x504
F5.05	Rated voltage	1V~1311V	Motor setting	※○△	0x505
F5.06	Rated current	0.1A~3000.0A	Motor setting	※○△	0x506
F5.07	AM no-load current	0.1A~3000.0A	Motor setting	※○△	0x507
F5.08	AM stator resistance	0.01%~50.00%	Motor setting	※○△	0x508
F5.09	AM rotor resistance	0.01%~50.00%	Motor setting	※○△	0x509
F5.10	AM stator leakage inductance	0.01%~50.00%	Motor setting	※○△	0x50A
F5.11	AM stator inductance	0.1%~2000.0%	Motor setting	※○△	0x50B
F5.12	PM stator resistance	0.01%~50.00%	Motor setting	※○△	0x50C
F5.13	PM D-axis inductance	0.01%~200.00%	Motor setting	※○△	0x50D
F5.14	PM Q-axis inductance	0.01%~200.00%	Motor setting	※○△	0x50E
F5.15	PM back emf	0V~3500V	Motor setting	※○△	0x50F
F5.16	PM encoder installation angle	0.0°~360.0°	Motor setting	※●△	0x510
F5.20	Motor parameter auto-tuning selection	0: none 1: rotary auto-tuning 2: static auto-tuning 3: stator resistance auto-tuning	0	○△	0x514
F5.21	PM magnetic pole search	LED ones-bit: closed-loop vector 0: off 1: on 2: turn on at the first power-up LED tens-bit: open-loop vector 0: off 1: on 2: turn on at the first power-up LED hundreds-bit: reserved LED thousands-bit: reserved	3110	○△	0x515
F5.22	PM magnetic pole search current	0.0%~400.0%	100.0%	○△	0x516
F5.23	Magnetic pole search current feedback	0.0%~400.0%	300.00%	○△	0x517
F5.30	Speed feedback or	LED ones-bit: encoder type	1000	○△	0x51E

	encoder type	0: ABZ encoder 1: rotary transformer LED tens-bit: encoder direction 0: in the same direction 1: in the opposite direction LED hundreds-bit: disconnection detection 0: off 1: on LED thousands-bit: Z-pulse correction 0: off 1: on			
F5.31	Line number of ABZ encoder	1~10000	1024	○△	0x51F
F5.32	Disconnection detection time	0.100s~60.000s	0.500s	●△	0x520
F5.33	Rotary transformer pole number	2~128	2	○△	0x521
F5.34	Encoder transmission ratio numerator	1~32767	1	○△	0x522
F5.35	Encoder transmission ratio denominator	1~32767	1	○△	0x523
F5.36	Encoder speed measurement first-order filter	0.0ms~100.0ms	1.0ms	●△	0x524
F5.39	Open-loop PG feedback display switch	Ones-bit: C-29 PG feedback display switch 0: off 1: on	0000	●△	0x527

7.1.7 Group F6: Motor Vector Control

Code	Name	Description	Factory default	Attribute	Address
F6.00	ASR (speed loop) high-speed proportional gain	0.01~100.00	4.00	●△	0x600
F6.01	ASR (speed loop) high-speed integral time	0.000s~6.000s	0.500s	●△	0x601
F6.02	ASR high-speed filter time	0.0ms~100.0ms	0.0ms	●△	0x602
F6.03	ASR high-speed switching frequency	0.00Hz~max. frequency	0.00Hz	●△	0x603
F6.04	ASR (speed loop) low-speed proportional gain	0.01~100.00	10.00	●△	0x604
F6.05	ASR (speed loop) low-speed integral time	0.000s~6.000s	0.100s	●△	0x605
F6.06	ASR low-speed filter time	0.0ms~100.0ms	0.0ms	●△	0x606
F6.07	ASR low-speed switching frequency	0.00Hz~max. frequency	0.00Hz	●△	0x607
F6.08	Torque limit in drive mode	0.0%~400.0%	180.0%	●△	0x608
F6.09	Torque limit in power generation mode	0.0%~400.0%	180.0%	●△	0x609
F6.10	Current loop D-axis proportional gain	0.001~4.000	0.400	●△	0x60A
F6.11	Current loop D-axis integral gain	0.001~4.000	1.000	●△	0x60B
F6.12	Current loop Q-axis	0.001~4.000	0.400	●△	0x60C

	proportional gain				
F6.13	Current loop Q-axis integral gain	0.001~4.000	1.000	●△	0x60D
F6.15	Vector slip compensation	0.0%~250.0%	100.0%	●△	0x60F
F6.16	Vector starting torque limit	0.0%~250.0%	0.0%	●△	0x610
F6.27	Motor shaft power limit	0.0%~250.0%	200.0%	●△	0x61B
F6.28	Motor flux weakening current upper limit	0.0%~250.0%	60.0%	○△	0x61C
F6.29	Motor flux weakening feed-forward gain	0.0%~200.0%	10.0%	●△	0x61D
F6.30	Motor flux weakening gain	0.0%~500.0%	10.0%	●△	0x61E
F6.32	MTPA gain	0.0%~400.0%	100.0%	●△	0x620
F6.33	MTPA filter time	0.0ms~100.0ms	1.0ms	●△	0x621
F6.34	Flux weakening voltage coefficient	0.0%~400.0%	97.0%	●△	0x622
F6.35	Low frequency pull-in current	0.0%~50.0%	30.0%	●△	0x623
F6.36	High frequency pull-in current	0.0%~50.0%	10.0%	●△	0x624
F6.37	Pull-in current frequency	0.0%~100.0%	10.0%	●△	0x625
F6.61	IF control current	-	60%	○△	0x63D
F6.62	IF control frequency	-	0%	○△	0x63E

7.1.8 Group F7: Torque Control

Code	Name	Description	Factory default	Attribute	Address
F7.00	Torque/speed control	0: speed control 1: torque control	0	●△	0x700
F7.01	Torque setting channel selection	0: keyboard digit setting 1: reserved 2: AI1 current/voltage setting 3: AI2 current/voltage setting 6: RS485 communication setting 7: CAN	0	●△	0x701
F7.02	Torque setting via keyboard	0.0%~100.0%	0.0%	●△	0x702
F7.03	Torque input lower limit	0.00%~100.00%	0.00%	●△	0x703
F7.04	Lower limit corresponding setting	-250.00%~250.00%	0.00%	●△	0x704
F7.05	Torque input upper limit	0.00%~250.00%	100.00%	●△	0x705
F7.06	Upper limit corresponding setting	-250.00%~250.00%	100.00%	●△	0x706
F7.07	Given first-order filter time	0.000s~6.000s	0.010s	●△	0x707
F7.08	Output torque upper limit	0.0%~250.0%	150.0%	●△	0x708
F7.09	Output torque lower limit	0.0%~250.0%	0.0%	●△	0x709
F7.10	Forward running speed limit	0: F7.12 setting 1: reserved × F7.12 2: AI1 × F7.12 3: AI2 × F7.12 6: RS485 setting × F7.12 7: CAN setting × F7.12	0	●△	0x70A

F7.11	Reverse running speed limit	0: F7.13 setting 1: reserved × F7.13 2: AI1 × F7.13 3: AI2 × F7.13 6: RS485 setting × F7.13 7: CAN setting ×F7.13	0	●△	0x70B
F7.12	Max. forward running speed limit	0.0%~100.0%	100.0%	●△	0x70C
F7.13	Max. reverse running speed limit	0.0%~100.0%	100.0%	●△	0x70D

7.1.9 Group F8: V/F Control

Code	Name	Description	Factory default	Attribute	Address
F8.00	Linear V/F curve selection	0: linear V/F curve 1~9: reserved 10: square V/F curve 11: custom V/F curve	0	○△	0x800
F8.01	V1 self-setting voltage	0.0%~100.0%	3.0%	○△	0x801
F8.02	F1 self-setting frequency	0.00Hz~max. frequency	1.00Hz	○△	0x802
F8.03	V2 self-setting voltage	0.0%~100.0%	28.0%	○△	0x803
F8.04	F2 self-setting frequency	0.00Hz~max. frequency	10.00Hz	○△	0x804
F8.05	V3 self-setting voltage	0.0%~100.0%	55.0%	○△	0x805
F8.06	F3 self-setting frequency	0.00Hz~max. frequency	25.00Hz	○△	0x806
F8.07	V4 self-setting voltage	0.0%~100.0%	78.0%	○△	0x807
F8.08	F4 self-setting frequency	0.00Hz~max. frequency	37.50Hz	○△	0x808
F8.09	V5 self-setting voltage	0.0%~100.0%	100.0%	○△	0x809
F8.10	F5 self-setting frequency	0.00Hz~max. frequency	50.00Hz	○△	0x80A
F8.11	output voltage percentage	25.0%~120.0%	100.0%	○△	0x80B
F8.12	Torque boost	0.0%~30.0%	Motor setting	●△	0x80C
F8.13	Torque boost cutoff frequency	0.0%~100.0%	100.0%	●△	0x80D
F8.14	Slip compensation gain	0.0%~200.0%	100.0%	●△	0x80E
F8.15	Slip compensation range	0.0%~300.0%	10.0%	●△	0x80F
F8.16	Slip compensation filter time	0.000s~6.000s	0.500s	●△	0x810
F8.17	Oscillation suppression gain	0.0%~900.0%	100.0%	●△	0x811
F8.18	Oscillation suppression filter coefficient	1.0~100.0	1.0		0x812
F8.19	Automatic energy-saving control	0: off 1: on	0	○△	0x813
F8.20	Lower limit of the step-down frequency	0.00Hz~50.00Hz	15.00Hz	○△	0x814
F8.21	Lower limit of the step-down voltage	20.0%~100.0%	50.0%	○△	0x815
F8.22	Step-down voltage regulation rate	0.000V/ms~0.200V/ms	0.010 V/ms	●△	0x816
F8.23	Step-down voltage recovery rate	0.000V/ms~2.000V/ms	0.200 V/ms	●△	0x817

F8.30	V/F separation output voltage setting	0: F8.31 setting 1: reserved 2: AI1 current/voltage setting 3: AI2 current/voltage setting 6: PID setting 7: RS485 communication setting 8: CAN communication setting	0	●△	0x81E
F8.31	V/F separation output voltage keyboard setting	0.0%~100.0%	0.0%	●△	0x81F
F8.32	Voltage acceleration time	0.00s~100.00s	10.00s	●△	0x820
F8.33	Voltage deceleration time	0.00s~100.00s	10.00s	●△	0x821
F8.34	Stop mode	0: the ACC./DEC. of output voltage and that of output frequency do not affect each other 1: the output frequency drops again after the output voltage drops to 0V	0	●△	0x822
F8.35	V/F control overcurrent suppression down-conversion lower limit frequency	0.00%~50.00%	0.00%		0x823

7.1.10 Group FA: Protection and Fault

Code	Name	Description	Factory default	Attribute	Address
FA.00	Overcurrent suppression	0: suppression on 1: suppression on during acceleration and deceleration and off during constant speed	0	●△	0xA00
FA.01	Overcurrent suppression point	0.0%~300.0%	160.0%	●△	0xA01
FA.02	Overcurrent suppression gain	0.0%~500.0%	100.0%	●△	0xA02
FA.03	Current hardware protection setting	LED ones-bit: CBC current limiting 0: off 1: on LED tens-bit: OC protection interference suppression 0: off 1: level 1 interference suppression 2: level 2 interference suppression LED hundreds-bit: SC protection interference suppression 0: off 1: level 1 interference suppression 2: level 2 interference suppression LED thousands-bit: reserved	0001	○	0xA03
FA.04	Input overvoltage protection point	100%~200%	115%	○	0xA04
FA.05	Protection selection1	Ones-bit: Hardware bus overvoltage protection point 0: off 1: on Tens-bit: supply undervoltage protection 0: off 1: on Hundreds-bit: R/S/T-phase temperature	7711	○	0xA05

		protection switch 0: R/S/T-phase temperature protection off 1: R-phase temperature protection on 2: S-phase temperature protection on 4: T-phase temperature protection on 7: R/S/T-phase temperature protection on Hundreds-bit: U/V/W-phase temperature protection switch 0: U/V/W-phase temperature protection off 1: U-phase temperature protection on 2: V-phase temperature protection on 4: W-phase temperature protection on 7: U/V/W-phase temperature protection on			
FA.06	Busbar overvoltage suppression	LED ones-bit: overvoltage suppression 0: disabled 1: enabled only during deceleration 2: enabled during both acceleration and deceleration LED tens-bit: over-excitation control 0: off 1: on LED hundreds-bit and thousands-bit: reserved	0002	○△	0xA06
FA.07	Busbar overvoltage suppression point	110.0%~140.0%	Motor setting	※○△	0xA07
FA.08	Bus overvoltage suppression gain	0.0%~500.0%	100.0%	●△	0xA08
FA.09	Bus undervoltage suppression	0: disabled 1: enabled	0	○△	0xA09
FA.10	Busbar undervoltage suppression point	60.0%~90.0%	80.0%	○△	0xA0A
FA.11	Bus undervoltage suppression gain	0.0%~500.0%	100.0%	○△	0xA0B
FA.12	Busbar undervoltage protection point	50.0%~90.0%	60.0%	※○	0xA0C
FA.13	Protection selection2	LED ones-bit: rectification-side overload protection switch 0: off 1: on LED tens-bit: input overvoltage protection switch 0: off 1: on LED hundreds-bit: product selection fault protection switch 0: off 1: on LED thousands-bit: test mode AC detection fault selection 0: off 1: on	1111	○	0xA0D
FA.15	Protection selection3	LED ones-bit: output phase loss protection 0: off 1: on 2: slightly unbalanced output phase loss LED tens-bit: input phase loss protection 0x00XX: decimal value 0: off 1: software input phase loss on (three-phase AC detection + busbar fluctuation cycle detection) 2: hardware input phase loss on 0xXX: select the action when the busbar detects a phase loss after shifting the decimal value to the right by two bits 1: software input phase loss alert Other values: software input phase loss	1112	○	0xA0F

		fault LED hundreds-bit: CPU overload 0: off 1: on LED thousands-bit: grid abnormality 0: off 1: on			
FA.16	Motor overload protection coefficient	0.0%~250.0%	100.0%	○△	0xA10
FA.17	Load detection setting	LED ones-bit: detection selection (protection1) 0: detection off 1: detect overload 2: detect overload only at constant speed 3: detect underload 4: detect underload at constant speed only LED tens-bit: alarm selection 0: alarm and continue running 1: fault protection and free stop LED Hundreds-bit: detection selection (protection2) 0: detection off 1: detect overload 2: detect overload only at constant speed 3: detect underload 4: detect underload at constant speed only LED thousands-bit: alarm selection 0: alarm and continue running 1: fault protection and free stop	0000	○△	0xA11
FA.18	Load detection warning1	0.0%~200.0%	130.0%	○△	0xA12
FA.19	Load detection warning time1	0.0s~60.0s	5.0s	○△	0xA13
FA.20	Load warning detection level2	0.0%~200.0%	30.0%	○△	0xA14
FA.21	Load warning detection time2	0.0s~60.0s	5.0s	○△	0xA15
FA.22	Software input phase loss threshold	0.0%~30.0%	10.0%	○	0xA15
FA.23	Excessive speed deviation protection	LED ones-bit: detection selection 0: detection off 1: detect overload 2: keep detecting LED tens-bit: alarm selection 0: free stop and alarm 1: alarm and continue running LED hundreds-bit and thousands-bit: reserved	0000	○△	0xA17
FA.24	Excessive speed deviation detection threshold	0.0%~60.0%	10.0%	○△	0xA18
FA.25	Excessive speed deviation detection time	0.0s~60.0s	2.0s	○△	0xA19
FA.26	Overspeed protection action	LED ones-bit: detection selection 0: detection off 1: detect only at constant speed 2: keep detecting LED tens-bit: alarm selection 0: free stop and report errors 1: alarm and continue running LED hundreds-bit and thousands-bit: reserved	0002	○△	0xA1A

FA.27	Overspeed detection threshold	0.0%~150.0%	110.0%	○△	0xA1B
FA.28	Overspeed detection time	0.000s~2.000s	0.050s	○△	0xA1C
FA.29	Three-level neutral point voltage loop proportion	0.01~100.00	1.00	●	OxA1D
FA.30	Three-level neutral point voltage loop integral	0.000~10.000	0.008	●	OxA1E
FA.31	AC action selection	Ones-bit: AC-side undervoltage selection 0: off 1: on Tens-bit: AC-side input contactor selection 0: invalid 1: valid Hundreds-bit: low frequency overload protection 0: on 1: off Thousands-bit: reset delay 0: delay on 1: delay off	0011	○	0xA1F
FA.32	AC input undervoltage point	0%~90%	60%	○	0xA20
FA.33	Special action1	Ones-bit: fault record saving action at 50% undervoltage point 0: saved 1: not saved Tens-bit: main contactor action in case of AC-side overvoltage 0: disconnected 1: still connected Hundreds-bit: reserved Thousands-bit: terminal protection after main contactor disconnected 0: on 1: off	0000	○	0xA21
FA.37	Failure self-recovery times	0~5	0	○	0xA25
FA.38	Failure self-recovery interval	0.1s~100.0s	10.0s	○	0xA26
FA.39	Fault diagnosis	See the fault diagnosis code table for details	-	×	0xA27
FA.40	Fault type	See the fault diagnosis code table for details	-	×	0xA28
FA.41	Operation frequency at fault	0.00Hz~max. frequency	0.00Hz	×	0xA29
FA.42	Output voltage at fault	0V~1500V	-	×	0xA2A
FA.43	Output current at fault	0.1A~2000.0A	-	×	0xA2B
FA.44	Bus voltage at fault	0V~3000V	-	×	0xA2C
FA.45	R-phase module temperature at fault	0℃~100.0℃	-	×	0xA2D
FA.46	S-phase module temperature at fault		-	×	0xA2E
FA.47	T-phase module temperature at fault		-	×	0xA2F
FA.48	U-phase module temperature at fault		-	×	0xA30
FA.49	V-phase module temperature at fault		-	×	0xA31
FA.50	W-phase module temperature at fault		-	×	0xA32

FA.51	AC drive status during fault	LED ones-bit: operation direction 0: forward 1: reverse LED tens-bit: operating status 0: stop 1: steady speed 2: acceleration 3: deceleration LED hundreds-bit: reserved LED thousands-bit: reserved	-	×	0xA33
FA.52	Input terminal status at fault	See the input terminal status figure	-	×	0xA34
FA.53	Output terminal status at fault	See the output terminal status figure	-	×	0xA35
FA.54	RS input voltage at fault	0.0V~6553.5V	-	×	0xA36
FA.55	ST input voltage at fault	0.0V~6553.5V	-	×	0xA37
FA.56	TR input voltage at fault	0.0V~6553.5V	-	×	0xA38
FA.57	R input current at fault	0.0A~6553.5A	-	×	0xA39
FA.58	S input current at fault	0.0A~6553.5A	-	×	0xA3A
FA.59	T input current at fault	0.0A~6553.5A	-	×	0xA3B
FA.60	Input current effective value at fault	0.0A~6553.5A	-	×	0xA3C
FA.61	Grid frequency at fault	0.0Hz~6553.5Hz	-	×	0xA3D
FA.62	Previous fault type	See the fault diagnosis code table for details	-	×	0xA3E
FA.63	Previous fault operation frequency	0.00Hz~max. frequency	-	×	0xA3F
FA.64	Previous fault output voltage	0V~1500V	-	×	0xA40
FA.65	Previous fault output current	0.1A~2000.0A	-	×	0xA41
FA.66	Previous fault bus voltage	0V~3000V	-	×	0xA42
FA.67	Previous fault R-phase module temperature	0℃~100.0℃	-	×	0xA43
FA.68	Previous fault S-phase module temperature		-	×	0xA44
FA.69	Previous fault T-phase module temperature		-	×	0xA45
FA.70	Previous fault U-phase module temperature		-	×	0xA46
FA.71	Previous fault V-phase module temperature		-	×	0xA47
FA.72	Previous fault W-phase module temperature		-	×	0xA48

FA.73	AC drive status during previous fault	LED ones-bit: operation direction 0: forward 1: reverse LED tens-bit: operating status 0: stop 1: steady speed 2: acceleration 3: deceleration LED hundreds-bit: reserved LED thousands-bit: reserved	-	×	0xA49
FA.74	Input terminal status at previous fault	See the input terminal status figure	-	×	0xA4A
FA.75	Output terminal status at previous fault	See the output terminal status figure	-	×	0xA4B
FA.76	RS input voltage at previous fault	0.0V~6553.5V	-	×	0xA4C
FA.77	ST input voltage at previous fault	0.0V~6553.5V	-	×	0xA4D
FA.78	TR input voltage at previous fault	0.0V~6553.5V	-	×	0xA4E
FA.79	R input current at previous fault	0.0A~6553.5A	-	×	0xA4F
FA.80	S input current at previous fault	0.0A~6553.5A	-	×	0xA50
FA.81	T input current at previous fault	0.0A~6553.5A	-	×	0xA51
FA.82	Input current effective value	0.0A~6553.5A	-	×	0xA52
FA.83	Grid frequency	0.0Hz~6553.5Hz	-	×	0xA53
FA.84	Previous two fault type	See the fault diagnosis code table for details	-	×	0xA54
FA.85	Previous three fault type	See the fault diagnosis code table for details	-	×	0xA55
FA.86	Previous fault diagnosis information	See the fault diagnosis code table for details	-	×	0xA56
FA.87	Previous two fault diagnosis information	See the fault diagnosis code table for details	-	×	0xA57
FA.88	Previous three fault diagnosis information	See the fault diagnosis code table for details	-	×	0xA58
FA.89	Previous four fault diagnosis information	See the fault diagnosis code table for details	-	×	0xA59
FA.90	Previous five fault diagnosis information	See the fault diagnosis code table for details	-	×	0xA5A

7.1.11 Group FB: Process PID control Parameters

Code	Name	Description	Factory default	Attribute	Address
FB.00	PID controller setting source	0: PID keyboard number setting 1: reserved 2: AI1 current/voltage setting 3: AI2 current/voltage setting 6: RS485 communication setting 7: CAN communication setting 8: terminal selection 9: active current component (CAN communication)	9	●△	0xB00
FB.01	PID given/feedback via keyboard number entering	0.00%~100.00%	50.00%	●△	0xB01

FB.02	PID given change time	0.00s~60.00s	1.00s	●△	0xB02
FB.03	PID controller feedback signal source	0: PID keyboard number entering setting 1: reserved 2: AI1 current/voltage setting 3: AI2 current/voltage setting 6: RS485 communication setting 7: CAN communication setting 8: terminal selection 9: active current component (local machine)	9	●△	0xB03
FB.04	Feedback signal filter time	0.000s~6.000s	0.010s	●△	0xB04
FB.05	Feedback signal gain	0.00~10.00	1.00	●△	0xB05
FB.06	Setting and feedback range	0.0~100.0	100.0	●△	0xB06
FB.07	PID control selection	LED ones-bit: feedback characteristics selection 0: positive characteristics 1: negative characteristics LED tens and hundreds-bit: reserved LED thousands-bit: differential adjustment property 0: differentiate deviation 1: differentiate feedback	0100	●△	0xB07
FB.08	PID preset output	0.0%~100.0%	100.0%	●△	0xB08
FB.09	Preset output running time	0.0s~6500.0s	0.0s	●△	0xB09
FB.10	PID control deviation limit	0.0%~100.0%	0.0%	●△	0xB0A
FB.11	Proportional gain 1 (P1)	0.000~4.000	0.100	●△	0xB0B
FB.12	Integral time 1 (I1)	0.0s~600.0s	5.0s	●△	0xB0C
FB.13	Differential gain 1 (D1)	0.000s~6.000s	0.000s	●△	0xB0D
FB.14	Proportional gain 1 (P2)	0.000~4.000	0.500	●△	0xB0E
FB.15	Integral time 1 (I2)	0.0s~600.0s	5.0s	●△	0xB0F
FB.16	Differential gain 1 (D2)	0.000s~6.000s	0.000s	●△	0xB10
FB.17	PID parameter switching condition	0: no switch 1: switch via DI terminal 2: switch according to deviation	0	●△	0xB11
FB.18	Lower value of switching deviation	0.0%~100.0%	20.0%	●△	0xB12
FB.19	Higher value of switching deviation	0.0%~100.0%	80.0%	●△	0xB13
FB.21	Differentiation limit	0.0%~100.0%	5.0%	●△	0xB15
FB.22	PID output upper limit	0.0%~100.0%	2.0%	●△	0xB16
FB.23	PID output lower limit	-100.0%~0.0%	-2.0%	●△	0xB17
FB.24	PID output filter time	0.000s~6.000s	0.000s	●△	0xB18
FB.25	Feedback disconnection detection time	0.0s~120.0s	1.0s	●△	0xB19
FB.26	Feedback disconnection selection	0: PID on without alarm 1: stop it and report errors 2: PID on and output the alarm signal	0	●△	0xB1A

		3: run at the current frequency and output the alarm signal			
FB.27	Disconnection alarm upper limit	0.0%~100.0%	100.0%	●△	0xB1B
FB.28	Disconnection alarm lower limit	0.0%~100.0%	0.0%	●△	0xB1C
FB.29	Sleep function switch	0: sleep off 1: sleep on	0	●△	0xB1D
FB.30	Sleep frequency	0.0Hz~max. frequency	10.0Hz	●△	0xB1E
FB.31	Sleep delay	0.0s~3600.0s	60.0s	●△	0xB1F
FB.32	Wake-up deviation	0.0%~50.0%	5.0%	●△	0xB20
FB.33	Wake-up delay time	0.0s~600.0s	1.0s	●△	0xB21
FB.34	PID range	0.0MPa~200.0MPa	60.0MPa	●△	0xB22
FB.35	PID keyboard given pressure	0MPa~range	30.0MPa	●△	0xB23
FB.36	Given sleep pressure	0MPa~range	31.0MPa	●△	0xB24
FB.37	PID setting upper limit	0.0%~100.0%	60.0MPa	●△	0xB25
FB.38	PID setting lower limit	0.0%~100.0%	0.0MPa	●△	0xB26
FB.39	Wake-up pressure	0MPa~range	27.0MPa	●△	0xB27
FB.40	PID setting source switch (ON for pressure)	0: percentage 1: pressure	0	●△	0xB28

7.1.12 Group FC: Multi-speed, PLC Function Parameters

Code	Name	Description	Factory default	Attribute	Address
FC.00	PLC multi-speed 1	0.00Hz~max. frequency	10.00Hz	●△	0xC00
FC.01	PLC multi-speed 2	0.00Hz~max. frequency	20.00Hz	●△	0xC01
FC.02	PLC multi-speed 3	0.00Hz~max. frequency	30.00Hz	●△	0xC02
FC.03	PLC multi-speed 4	0.00Hz~max. frequency	40.00Hz	●△	0xC03
FC.04	PLC multi-speed 5	0.00Hz~max. frequency	50.00Hz	●△	0xC04
FC.05	PLC multi-speed 6	0.00Hz~max. frequency	40.00Hz	●△	0xC05
FC.06	PLC multi-speed 7	0.00Hz~max. frequency	30.00Hz	●△	0xC06
FC.07	PLC multi-speed 8	0.00Hz~max. frequency	20.00Hz	●△	0xC07
FC.08	PLC multi-speed 9	0.00Hz~max. frequency	10.00Hz	●△	0xC08
FC.09	PLC multi-speed 10	0.00Hz~max. frequency	20.00Hz	●△	0xC09
FC.10	PLC multi-speed 11	0.00Hz~max. frequency	30.00Hz	●△	0xC0A
FC.11	PLC multi-speed 12	0.00Hz~max. frequency	40.00Hz	●△	0xC0B
FC.12	PLC multi-speed 13	0.00Hz~max. frequency	50.00Hz	●△	0xC0C
FC.13	PLC multi-speed 14	0.00Hz~max. frequency	40.00Hz	●△	0xC0D
FC.14	PLC multi-speed 15	0.00Hz~max. frequency	30.00Hz	●△	0xC0E
FC.00	PLC multi-speed 1	0.00Hz~max. frequency	10.00Hz	●△	0xC00
FC.01	PLC multi-speed 2	0.00Hz~max. frequency	20.00Hz	●△	0xC01
FC.02	PLC multi-speed 3	0.00Hz~max. frequency	30.00Hz	●△	0xC02
FC.03	PLC multi-speed 4	0.00Hz~max. frequency	40.00Hz	●△	0xC03

FC.04	PLC multi-speed 5	0.00Hz~max. frequency	50.00Hz	●△	0xC04
FC.05	PLC multi-speed 6	0.00Hz~max. frequency	40.00Hz	●△	0xC05
FC.06	PLC multi-speed 7	0.00Hz~max. frequency	30.00Hz	●△	0xC06
FC.07	PLC multi-speed 8	0.00Hz~max. frequency	20.00Hz	●△	0xC07
FC.08	PLC multi-speed 9	0.00Hz~max. frequency	10.00Hz	●△	0xC08
FC.09	PLC multi-speed 10	0.00Hz~max. frequency	20.00Hz	●△	0xC09
FC.10	PLC multi-speed 11	0.00Hz~max. frequency	30.00Hz	●△	0xC0A
FC.11	PLC multi-speed 12	0.00Hz~max. frequency	40.00Hz	●△	0xC0B
FC.12	PLC multi-speed 13	0.00Hz~max. frequency	50.00Hz	●△	0xC0C
FC.13	PLC multi-speed 14	0.00Hz~max. frequency	40.00Hz	●△	0xC0D
FC.14	PLC multi-speed 15	0.00Hz~max. frequency	30.00Hz	●△	0xC0E
FC.15	PLC running mode	LED ones-bit: cycle mode 0: stop after single circle 1: run in continuous circles 2: keep the final value after single circle LED tens-bit: timing unit 0: second 1: minute 2: hour LED hundreds-bit: reserved LED thousands-bit: start mode 0: rerun from stage one 1: rerun from the stage upon stop last time 2: rerun from the remaining time of the stage upon stop last time	0000	●△	0xC0F
FC.16	Segment1 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC10
FC.17	Segment2 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC11
FC.18	Segment3 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC12
FC.19	Segment4 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC13
FC.20	Segment5 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC14
FC.21	Segment6 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC15
FC.22	Segment7 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC16
FC.23	Segment8 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC17
FC.24	Segment9 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC18
FC.25	Segment10 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC19
FC.26	Segment11 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC1A
FC.27	Segment12 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC1B
FC.28	Segment13 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC1C
FC.29	Segment14 running	0.0 (s/m/h)~6500.0 (s/m/h)	10.0	●△	0xC1D

	time		(s/m/h)		
FC.30	Segment15 running time	0.0 (s/m/h)~6500.0 (s/m/h)	10.0 (s/m/h)	●△	0xC1E
FC.31	Segment1 direction and ACC./DEC. time	LED Ones-bit: operating direction of this segment 0: forward 1: reverse LED tens-bits: acc./dec. time of this segment 0: acc./dec. time 1 1: acc./dec. time 2 2: acc./dec.time 3 3: acc./dec. time 4 LED hundreds-bit: reserved LED thousands-bit: reserved	0000	●△	0xC1F
FC.32	Segment2 direction and ACC./DEC. time		0000	●△	0xC20
FC.33	Segment3 direction and ACC./DEC. time		0000	●△	0xC21
FC.34	Segment4 direction and ACC./DEC. time		0000	●△	0xC22
FC.35	Segment5 direction and ACC./DEC. time		0000	●△	0xC23
FC.36	Segment6 direction and ACC./DEC. time		0000	●△	0xC24
FC.37	Segment7 direction and ACC./DEC. time		0000	●△	0xC25
FC.38	Segment8 direction and ACC./DEC. time		0000	●△	0xC26
FC.39	Segment9 direction and ACC./DEC. time		0000	●△	0xC27
FC.40	Segment10 direction and ACC./DEC. time		0000	●△	0xC28
FC.41	Segment11 direction and ACC./DEC. time		0000	●△	0xC29
FC.42	Segment12 direction and ACC./DEC. time		0000	●△	0xC2A
FC.43	Segment13 direction and ACC./DEC. time		0000	●△	0xC2B
FC.44	Segment14 direction and ACC./DEC. time		0000	●△	0xC2C
FC.45	Segment15 direction and ACC./DEC. time		0000	●△	0xC2D

7.1.13 Group FD: Communication Control

Note: There are two channels for 485 communication, the 485 communication terminal named as 485-1 and RJ45 485 communication named as 485-2.

Code	Name	Description	Factory default	Attribute	Address
FD.00	Master-slave selection	LED ones-bit: Modbus communication terminal 0: slave 1: master LED tens-bit: CAN communication 0: slave 1: master 2: single machine LED hundreds-bit: Modbus communication RJ45 port 0: slave 1: master 2: special slave, response slave status 3: special master, receive slave status LED thousands-bit: Modbus communication DB9 port 0: keyboard 1: slave 2: master 3: special slave, response slave status 4: special master: receive slave status	0000	○	0xD00
FD.01	485 communication terminal address	1~247	1	●	0xD01
FD.02	Communication baud rate selection	LED ones-bit: 485 communication 0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps LED tens-bit: CAN communication 0: 20 kbps 1: 50 kbps 2: 100 kbps 3: 125 kbps 4: 250 kbps 5: 500 kbps 6: 1Mbps LED hundreds-bit: RJ45-485 communication 0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps	0333	○	0xD02
FD.03	Modbus data format	LED ones-bit: RJ45 port terminal data format LED tens-bit: A+/B- terminal data format 0: (N, 8, 1) no parity, data bit: 8, stop bit: 1 1: (E, 8, 1) even parity, data bit: 8, stop bit: 1 2: (0, 8, 1) odd parity, data bit: 8, stop bit: 1 3: (N, 8, 2) no parity, data bit: 8, stop bit: 2 4: (E, 8, 2) even parity, data bit: 8, stop bit: 2 5: (0, 8, 2) odd parity, data bit: 8, stop bit: 2	0000	○	0xD03

FD.04	Communication ratio setting	0.00~5.00	1.00	●	0xD04
FD.05	Communication response delay	0ms~500ms	0ms	●	0xD05
FD.06	Communication timeout duration	0.1s~100.0s	1.0s	●	0xD06
FD.07	Communication failure action mode	Ones-bit: terminal Modbus Tens-bit: port Modbus Hundreds-bit: DB9 Modbus 0: timeout detection off 1: report an alarm and free stop 2: report an alarm and continue running 3: forced stop	0	●	0xD07
FD.08	Modbus response handling	LED ones-bit: A+/B- terminal data format LED tens-bit: RJ45 port terminal data format 0: write operation responds 1: write operation does not respond	0	●	0xD08
FD.09	Master sending selection	LED ones-bit: the first group sending selection 0: invalid 1: running command 2: given frequency 3: output frequency 4: upper limit frequency 5: given torque 6: master output torque 7: forward speed limit in torque control 8: reverse speed limit in torque control 9: PID setting from master A: PID feedback from master B: reserved C: torque current component LED tens-bit: the second group sending selection (the same as above) LED hundreds-bit: the third group sending selection (the same as above) LED thousands-bit: the fourth group sending selection (the same as above)	0C31	●	0xD09
FD.11	CAN Communication protocol selection	0: reserved 1: CAN customized protocol	1	●	0xD0B
FD.12	RJ45-485 communication slave address	0~127	1	●	0xD0C

FD.13	CAN master sending selection	LED ones-bit: the first group transmitting selection 0: invalid 1: running command 2: given frequency 3: output frequency 4: upper limit frequency 5: given torque 6: master output torque 7: forward speed limit in torque control 8: reverse speed limit in torque control 9: PID setting from master A: PID feedback from master B: voltage setting value in V/F separation mode C: active current component LED tens-bit: the second group transmit frame selection LED hundreds-bit: the third group transmit frame selection LED thousands-bit: the fourth group transmit frame selection Same	01C3	●	0xD0D
FD.14	Received PID given data correction enabling	0: off 1: on	0	●	0xD0E
FD.15	Received PID given data correction	0~9999	170	●	0xD0F
FD.16	Master sending command/status selection	0: sending command 1: sending status	1	●	0xD10
FD.17	CAN disconnection detection	LED ones-bit: master/slave actions after disconnection LED ones-bit: master action after slave failure LED ones-bit: master action after slave disconnection 0: detection off 1: detection on and report error 2: detection on and alarm, and free stop 3: detection on and alarm, and continue running	0000	●	0xD11
FD.18	CAN Communication Slave ID No.	Range: 1~5	1	○	0xD12
FD.19	CAN communication connection abnormality active detection	LED ones-bit: slave1 active detection enabling LED tens-bit: slave2 active detection enabling LED hundreds-bit: slave3 active detection enabling LED thousands-bit: slave4 active detection enabling	0000	○	0xD13
FD.20	CAN communication disconnection delay	-	2.0	○	0xD14
FD.25	Communication expansion card control mode	0: Ethernet, WIFI AP 1: WIFI STA	0	○	0xD19
FD.26	WANIP address 0	0~255	192	○	0xD1A

FD.27	WANIP address 1	0~255	168	○	0xD1B
FD.28	WANIP address 2	0~255	0	○	0xD1C
FD.29	WANIP address 3	0~255	200	○	0xD1D
FD.30	WAN subnet mask 0	0~255	255	○	0xD1E
FD.31	WAN subnet mask 1	0~255	255	○	0xD1F
FD.32	WAN subnet mask 2	0~255	255	○	0xD20
FD.33	WAN subnet mask 3	0~255	0	○	0xD21
FD.34	Gateway 0	0~255	192	○	0xD22
FD.35	Gateway 1	0~255	168	○	0xD23
FD.36	Gateway 2	0~255	0	○	0xD24
FD.37	Gateway 3	0~255	1	○	0xD25
FD.38	Port	0~65535	8080	○	0xD26
FD.39	LANIP address 0	0~255	192	○	0xD27
FD.40	LANIP address 1	0~255	168	○	0xD28
FD.41	LANIP address 2	0~255	1	○	0xD29
FD.42	LANIP address 3	0~255	1	○	0xD2A
FD.43	LAN subnet mask 0	0~255	255	○	0xD2B
FD.44	LAN subnet mask 1	0~255	255	○	0xD2C
FD.45	LAN subnet mask 2	0~255	255	○	0xD2D
FD.46	LAN subnet mask 3	0~255	0	○	0xD2E
FD.47	WIFI name No.	0~199	1	○	0xD2F
FD.48	WIFI password 0	0~9999	1234	○	0xD30
FD.49	WIFI password 1	0~9999	5678	○	0xD31
FD.50	STA SSID character 0	0~65535	4b61	○	0xD32
FD.51	STA SSID character 1	0~65535	6943	○	0xD33
FD.52	STA SSID character 2	0~65535	6865	○	0xD34
FD.53	STA SSID character 3	0~65535	6e67	○	0xD35
FD.54	STA SSID character 4	0~65535	0000	○	0xD36
FD.55	STA SSID character 5	0~65535	0000	○	0xD37
FD.56	STA SSID character 6	0~65535	0000	○	0xD38
FD.57	STA SSID character 7	0~65535	0000	○	0xD39
FD.58	STA SSID character 8	0~65535	0000	○	0xD3A
FD.59	STA SSID character 9	0~65535	0000	○	0xD3B
FD.60	STA SSID character 10	0~65535	0000	○	0xD3C
FD.61	STA SSID character 11	0~65535	0000	○	0xD3D
FD.62	STA SSID character 12	0~65535	0000	○	0xD3E
FD.63	STA SSID character 13	0~65535	0000	○	0xD3F
FD.64	STA SSID character 14	0~65535	0000	○	0xD40
FD.65	STA SSID character 15	0~65535	0000	○	0xD41
FD.66	SAT Passwd character 0	0~65535	0000	○	0xD42
FD.67	SAT Passwd character 1	0~65535	0000	○	0xD43
FD.68	SAT Passwd character 2	0~65535	0000	○	0xD44
FD.69	SAT Passwd character 3	0~65535	0000	○	0xD45
FD.70	SAT Passwd character 4	0~65535	0000	○	0xD46
FD.71	SAT Passwd character 5	0~65535	0000	○	0xD47
FD.72	SAT Passwd character 6	0~65535	0000	○	0xD48
FD.73	SAT Passwd character 7	0~65535	0000	○	0xD49
FD.74	SAT Passwd character 8	0~65535	0000	○	0xD4A
FD.75	SAT Passwd character 9	0~65535	0000	○	0xD4B
FD.76	SAT Passwd character 10	0~65535	0000	○	0xD4C
FD.77	SAT Passwd character 11	0~65535	0000	○	0xD4D

FD.78	SAT Passwd character 12	0~65535	0000	○	0xD4E
FD.79	SAT Passwd character 13	0~65535	0000	○	0xD4F
FD.80	SAT Passwd character 14	0~65535	0000	○	0xD50
FD.81	SAT Passwd character 15	0~65535	0000	○	0xD51
FD.82	WIFI STA IP0	0~255	192	○	0xD52
FD.83	WIFI STA IP1	0~255	168	○	0xD53
FD.84	WIFI STA IP2	0~255	43	○	0xD54
FD.85	WIFI STA IP3	0~255	5	○	0xD55
FD.86	WIFI STA MASK0	0~255	255	○	0xD56
FD.87	WIFI STA MASK1	0~255	255	○	0xD57
FD.88	WIFI STA MASK2	0~255	255	○	0xD58
FD.89	WIFI STA MASK3	0~255	0	○	0xD59
FD.90	WIFI STA gateway 0	0~255	192	○	0xD5A
FD.91	WIFI STA gateway 1	0~255	168	○	0xD5B
FD.92	WIFI STA gateway 2	0~255	43	○	0xD5C
FD.93	WIFI STA gateway 3	0~255	1	○	0xD5D
FD.94	WIFI STA port	0~65535	8080	○	0xD5E
FD.95	Mac0	0~FFFF	0000	○	0xD5F
FD.96	Mac1	0~FFFF	0000	○	0xD60
FD.97	Mac2	0~FFFF	0000	○	0xD61
FD.99	Enabling	0~1	0	○	0xD62

7.1.14 Group FE: Rectification Parameters

Code	Name	Description	Factory default	Attribute	Address
FE.01	Starting delay time	0.000s~10.000s	0.500s	●▲	0xE01
FE.02	Bus voltage curve	Ones-bit: bus voltage setting curve 0: set via linear function 1: set via step function Tens-bit: initial bus voltage 0: as the given bus voltage 1: as the current bus voltage	0000	○▲	0xE02
FE.03	Voltage loop proportional coefficient	0.10~40.00	10.00	●▲	0xE03
FE.04	Voltage loop integral coefficient	0.01~2.00	0.05	●▲	0xE04
FE.05	Bus voltage filter coefficient	0.01~1.00	0.50	●▲	0xE05
FE.06	Current loop D-axis proportional coefficient	0.01~40.00	10.00	●▲	0xE06
FE.07	Current loop D-axis integral coefficient	0.01~2.00	0.05	●▲	0xE07
FE.08	D-axis current filter coefficient	0.01~1.00	0.20	●▲	0xE08
FE.09	Current loop D-axis output limit	0%~200%	50%	●▲	0xE09
FE.10	Current loop Q-axis proportional coefficient	0.01~40.00	10.00	●▲	0xE0A
FE.11	Current loop Q-axis integral coefficient	0.01~2.00	0.05	●▲	0xE0B
FE.12	Q-axis current filter coefficient	0.01~1.00	0.20	●▲	0xE0C
FE.13	Current loop Q-axis output limit	0%~200%	50%	●▲	0xE0D
FE.14	Phase-locked loop proportional coefficient	0.00~40.00	Related to voltage ratings	●▲	0xE0E
FE.15	Phase-locked loop integral coefficient	0.00~2.00	Related to voltage ratings	●▲	0xE0F
FE.16	Vd filter coefficient	0.00~1.00	0.05	●▲	0xE10
FE.17	Vq filter coefficient	0.00~1.00	0.05	●▲	0xE11
FE.18	Grid frequency abnormal coefficient	0.0%~10.0%	2.0%	●▲	0xE12
FE.19	Power factor angle	0.0%~10.0%	0.0%	●▲	0xE13
FE.20	Active current range limit	5.0%~200.0%	150.0%	●▲	0xE14
FE.30	Feedback rectification action voltage	0.0V~2150.0V	1850.0V	●▲	0xE1E
FE.31	Feedback rectification stop voltage	0.0V~2150.0V	1350.0V	●▲	0xE1F
FE.32	Feedback rectification stop delay	0s~65535s	60s	●▲	0xE20

7.1.15 Group FF: Specific Function

Code	Name	Description	Factory default	Attribute	Address
FF.00	Master/slave setting	1: restore to master default parameters 1: restore to slave default parameters 3: restore to single machine	0000	○	0xF00
FF.01	Fan or contactor function	0: control the fan 1: control the output contactor	1	○△	0xF01
FF.02	Contactor feedback judgment selection	Ones-bit: output contactor 0: invalid 1: valid Tens-bit: input contactor 0: invalid 1: valid	0011	○	0xF02
FF.03	Connected output contactor starting delay	0.800s~10.000s	5.000	●△	0xF03
FF.04	Input contactor feedback delay	0.000s~1.000s	0.500s		0xF04
FF.05	Contactor fault/warning report selection	0: report error 1: report warning	0	●	0xF05
FF.06	Contactor feedback polarity selection	Ones-bit: output contactor: 0: normal when control signal and feedback signal levels are the same 1: normal when control signal and feedback signal levels are reversed Tens-bit: input contactor: 0: normal when input feedback signal is high level contactor connected 1: normal when input feedback signal is low level after contactor connected	0010	○	0xF06
FF.07	Product type monitoring	0: three-level 1: two-level	According to motor type	×	0xF07
FF.08	Rectifier stop delay	0.0s~600.0s	0.0s	●▲	0xF08
FF.09	Tens-bit: input contactor by-pass	0: off 1: on	0	●▲	0xF09
FF.14	Four-quadrant start/stop logic	0: original logic, given by single command setting source, for startup, start the rectification first, then the inversion; for shutdown, stop the inversion first then the rectification 1: interlocking, given by two command setting sources, respectively control rectification and inversion, for startup, start the rectification first, for rectification operation, inversion can be started and stopped independently, when rectification stops, rectification and inversion are stopped. 2: independent, given by two command setting sources, the start/stop of both rectification and inversion are completely	0	○	0xF0E

		independent.			
FF.15	Motor overtemperature point	0.0℃~200.0℃ When this value is 0, motor over-temperature fault will not be handled.	120.0℃	●△	0xF0F
FF.17	Rectification-side control enabling 1	Ones-bit: locking output switch enabling 0: invalid 1: valid	0001	●△	0xF11
FF.18	Three-level four-quadrant inversion start delay	0.0s~6000.0s	0.0s	●	0xF12
FF.19	Output contactor fault filter delay	0.000s~1.000s	0.200s	●	0xF13
FF.22	Special function	Ones-bit: undervoltage warning code enabling 0: off 1: on, warning code 83 Tens-bit: reset enabling at undervoltage 0: off 1: on	0000	●	0xF16

7.2 Terminal I/O Function Selection

X selection	Description	X selection	Description	X selection	Description
0	No functions	21	PID control paused	43	Counter reset terminal
1	Forward operation	22	PID characteristic switching	44	DC brake command
2	Reverse operation	23	PID parameter switching	45	Pre-excitation command terminal only for AM vector control
3	Three-line operation (Xi)	24-26	PID setting switching 1-3	46	Reserved (Motor selection terminal)
4	Forward jogging	27-29	PID feedback switching 1-3	47	Four-quadrant rectifier start alone
5	Reverse jogging	30	PLC pause	48	Command channel to keyboard
6	Free stop	31	PLC reboot	49	Command channel to terminal
7	Enabling	32	Acc./dec. time selection terminal1	50	Command channel to communication
8	Fault reset	33	Acc./dec. time selection terminal2	51	Command channel to expansion card
9	External fault input	34	Acceleration/ deceleration pause	52	Operation off
10	Frequency Up (UP)	35	Swing frequency input	53	Forward operation off
11	Frequency Down (DW)	36	Swing frequency paused	54	Reverse operation off
12	Frequency UP/DOWN reset (UP/DW reset)	37	Swing frequency reset	59	Output contactor feedback
13	Channel A to channel B	38	Buffer contactor feedback input	60	Speed/ torque switching
14	Frequency channel combination to A	39	PUL input	61	Position control switch

15	Frequency channel combination to B	40	Timer triggering terminals	—	—
16-19	Multi-speed terminal 1-4	41	Timer reset terminals	—	—
20	PID control canceled	42	Counter clock input terminal	—	—
Y selection	Description	Y selection	Description	Y selection	Description
0	No output	1	AC drive in operation	2	AC drive in reverse operation
3	AC drive in forward operation	4	Fault trip alarm 1 (alarm during fault auto-recovery)	5	Fault trip alarm 2 (no alarm during fault auto-recovery)
6	External fault shutdown	7	AC drive undervoltage	8	AC drive ready for operation
9	Output frequency level detection 1 (FDT1)	10	Output frequency level detection 2 (FDT2)	11	Given frequency reached
12	Zero-speed operation in progress	13	Upper limit frequency reached	14	Lower limit frequency reached
15	Program running cycle completed	16	Program running phase completed	17	PID feedback above upper limit
18	PID feedback below lower limit	19	Sensor disconnection feedback from PID	21	Timer time up
22	Max. value of counter reached	23	Set value of the counter reached	24	Dynamic brake in progress
25	PG disconnection feedback	26	Emergency stop in progress	27	Load warning output 1
28	Load warning output 2	29	Warning output	30	RS485 setting
31	Reserved	32	Rectification on	33	Inversion on
34	Buffer contactor control output	—	—	—	—

Note: 47 (two-level four-quadrant rectifier start alone) in the input terminal function is only valid for terminal control mode two-line 1.

7.3 Monitoring Parameter Group

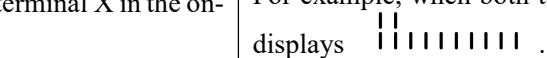
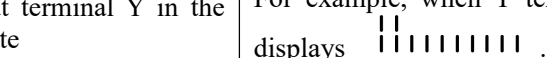
Code	Name	Description	Address	Code	Name	Description	Address
C-00	Given frequency	0.01Hz	0x2100	C-32	T-phase temperature	0.1℃	0x2120
C-01	Output frequency	0.01Hz	0x2101	C-33	U-phase temperature	0.1℃	0x2121
C-02	Output current	0.1A	0x2102	C-34	V-phase temperature	0.1℃	0x2122
C-03	output voltage	0.1V	0x2103	C-35	W-phase temperature	0.1℃	0x2123
C-04	Input current	0.1A	0x2104	C-36	Fault alarm code	1	0x2124
C-05	Input voltage	0.1V	0x2105	C-37	AO2	0.01V	0x2125
C-06	Given bus voltage	0.1V	0x2106	C-38	Motor temperature	0.1℃	0x2126
C-07	Mechanical speed	1RPM	0x2107	C-39	Output active current	0.1A	0x2127
C-08	Given torque	0.1%	0x2108	C-40	Grid frequency	0.1Hz	0x2128
C-09	Output	0.1%	0x2109	C-41	R-phase input	0.1A	0x2129

	torque				current		
C-10	Given via PID	0.1%	0x210A	C-42	S-phase input current	0.1A	0x212A
C-11	PID feedback	0.1%	0x210B	C-43	T-phase input current	0.1A	0x212B
C-12	Bus voltage1	0.1V	0x210C	C-44	RS input voltage	0.1V	0x212C
C-13	Bus voltage2	0.1V	0x210D	C-45	ST input voltage	0.1V	0x212D
C-14	Input terminal X in the on-state	See 7.3.1	0x210E	C-46	TR input voltage	0.1V	0x212E
C-15	Output terminal Y in the on-state	See 7.3.1	0x210F	C-47	Input current effective value	0.1A	0x212F
C-16	Output power	0.1%	0x2110	C-48	Grid voltage input phase sequence	123 or 132	0x2130
C-17	AI1	0.001V	0x2111	C-49	Rated input current	0.1A	0x2131
C-18	AI2	0.001mA	0x2112	C-50	U-phase output current	0.1A	0x2132
C-19	AO1	0.01V	0x2113	C-51	V-phase output current	0.1A	0x2133
C-20	Power factor angle	1	0x2114	C-52	W-phase output current	0.1A	0x2134
C-21	Fault No. 1	0xFFFF	0x2115	C-53	AC drive overload percentage	0.1%	0x2135
C-22	Fault No. 2	0xFFFF	0x2116	C-54	Motor overload percentage	0.1%	0x2136
C-23	Fault No. 3	0xFFFF	0x2117	C-55	Rectification-side overload percentage	0.1%	0x2137
C-24	Fault No. 4	0xFFFF	0x2118	C-56	Expansion card software version	—	0x2138
C-25	AC drive power rating	kW	0x2119	C-57	Expansion card X terminal status	See the input terminal status figure	0x2139
C-26	AC drive rated voltage	V	0x211A	C-58	Expansion card Y terminal status	See the output terminal status figure	0x2140
C-27	AC drive rated current	A	0x211B	C-59	Expansion card AO	0.01V	0x2141
C-28	Software version	—	0x211C	C-60	Expansion card motor temperature	0.1℃	0x2142
C-29	PG feedback frequency	0.01Hz	0x211D	C-61	Expansion card PUL input frequency	0.01kHz	0x2143
C-30	R-phase temperature	0.1℃	0x211E	C-62	Expansion card PUL input percentage	0.01%	0x2144

C-31	S-phase temperature	0.1℃	0x211F	C-63	Warning diagnosis	0	0x2145

Note: The monitoring value of C-50~52 three-phase output current is required only when the output phase loss protection is ON (the ones-bit of FA.15 is not zero).

7.3.1 I/O Terminal State Figure

C-14	Input terminal X in the on-state	The status of the multi-functional input terminal is displayed by 1 (ON), 0 (OFF). For example, when both terminals X1 and X2 are ON, the C-14 keyboard displays  . For example, when both terminals X1 and X2 are ON, the C-14 touch screen displays 000011.
C-15	Output terminal Y in the on-state	The status of the multi-functional output terminal is displayed by 1 (ON), 0 (OFF). For example, when Y terminal and relay1 are ON, the C-15 keyboard displays  . For example, when Y terminal and relay1 are ON, the C-15 touch screen displays 000011.

C-14	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8
Description	X1	X2	X3	X4	X5	X6	24V-X1	24V-X2

C-15	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8
Description	—	Relay1	Relay2	—	—	—	NO21-NO22	NO11-NO12

7.3.2 Fault Number Description

7.3.2.1 C-21 Fault No. 1

C-21 indicate Faults No.1~16; it is indicated by bit, with 1 indicating a fault in that bit.

Bit	0	1	2	3	4	5	6	7
Code	1	2	3	4	5	6	7	8
Code	Module failure 1	Module failure 2	Module failure 3	Module failure 4	Module failure 5	Module failure 6	Overcurrent	Overvoltage
Bit	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Code	9	10	11	12	13	14	15	16
Code	Reserved	Bus undervoltage	Motor overload	Inverter overload	Input phase loss	Output phase loss	Rectifier overheat	Inverter overload

7.3.2.2 C-22 Fault No. 2

C-22 indicate Faults No.1~32; it is indicated by bit, with 17 indicating a fault in that bit.

Bit	0	1	2	3	4	5	6	7
Code	17	18	19	20	21	22	23	24
Code	External fault	485 communication failure	Current detection failure	Motor auto-tuning failure	EEPROM error	Reserved	Braking unit failure	Reserved
Bit	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Code	25	26	27	28	29	30	31	32
Code	Reserved	Parameter	Expansion	Outage	PID	Keyboard	Initial	Excessive

		copy abnormality	card connection abnormality	overvoltage	disconnection	fails to recognize fault prompt	angle tuning failure	speed deviation

7.3.2.3 C-23 Fault No. 3

C-23 indicate Faults No.1~48; it is indicated by bit, with 33 indicating a fault in that bit.

Bit	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Code	33	34	35	36	37	38	39	40
Code	Overspeed protection	Load protection 1	Load protection 2	CPU timeout	FLASH locked fault	Reserved	Input contactor failure	Output contactor failure
Bit	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Code	41	42	43	44	45	46	47	48
Code	CAN disconnection	Rectification-side frequency abnormality	Product failure	Power supply undervoltage	Midpoint voltage imbalance	Rectification-side overloaded	Input overcurrent protection	Input overvoltage

7.3.2.4 C-24 Fault No. 4

C-24 indicate Faults No.1~63; it is indicated by bit, with 49 indicating a fault in that bit.

Bit	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Code	49	50	51	52	53	54	55	56
Code	Rectification SD failure	Rectification HALL failure	Test mode abnormality	AC input undervoltage	Slave failure or emergency stop	Reserved	Motor overheat	Reserved
Bit	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Code	57	58	59	60	61	62	63	64
Code	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

Chapter 8 Function Code Detailed Description

8.1 Group F0: Basic Parameters

F0.00	Control mode	Range: 0~8	Default: 0

AM control mode:

0: V/F control

When the frequency (F) is adjustable, the ratio of the control frequency to the voltage (V) remains constant. This control mode suits all variable speed control applications that do not require fast response and precise speed control, or scenarios where one AC drive powers multiple motors. It is also used when the motor parameters are not clear or auto-tuning cannot be performed.

1: reserved

2: reserved

3: high-performance vector control without PG

This mode, which also called speed sensorless vector control (SVC), is used for speed control that requires high accuracy. In this mode, the torque responds quickly even without the motor's speed feedback signal, and a large torque can be obtained with low-speed motor operation. For better control, please perform motor parameter auto-tuning.

4: high-performance vector control with PG

This mode, which also called speed sensor vector control (FVC), is used for speed control that requires fast torque response and high performance torque control. It is mainly used for applications requiring strict control performance, such as high-precision speed control, torque control, and simple servo control. For better control, please perform motor parameter auto-tuning. In order to receive the speed feedback signal from the motor, the PG option card is required.

PM control mode:

5: reserved

6: high-performance vector control without PG

Permanent magnet synchronous motor (PM) vector control without PG feedback employs a comprehensive software algorithm with an embedded PM motor model and an observer. This enables the real-time tracking of the motor's magnetic pole position and rotational speed. This mode requires comprehensive no-load identification to the motor and is ideal for applications that demand rapid acceleration and deceleration as well as high tolerance for impact loads.

7: high-performance vector control with PG

This mode features dynamic responsiveness and superior control performance, suitable for torque control, flux weakening operation at high speeds, and high-power servo applications. This mode requires comprehensive no-load identification to the motor.

Other control mode:

8: voltage-frequency separation control

This control mode is used for applications where the output voltage and frequency are controlled separately.

Note:

1. PG (pulse generator) stands for speed measurement encoder and is utilized for the mode of vector control with PG. It commonly involves a photoelectric encoder or rotary transformer. Selection of the suitable PG card is based on the PG type and specific parameters. Refer to function code [F5.30] for details.
2. For vector control mode, please accurately input the motor parameters and perform auto-tuning to ensure proper configuration of motor parameters prior to the first operation. See the "Group F5: Motor Parameters" for details.
3. It is important to set the parameters of the vector control parameter group correctly to ensure good steady state and dynamic control performance. For vector control parameters setting and debugging, please see “Group F6: Motor Vector Control” for details.

For vector control mode, please note that an AC drive can only empower one motor concurrently. Additionally, the capacity of the AC drive should closely match that of the motor, with the drive's power rating allowable to be either two levels higher or one level lower than that of the motor. Discrepancies beyond this range could result in diminished control performance or potential malfunction of the drive system.

F0.01	Two-level four-quadrant start selection	Range: 0~2	Default: 0

It is used to select the startup mode of the rectification side and inversion side of the two-level AC drive. This function code is invalid when the product type is three-level.

0: rectification on, inversion on

Both two-level rectification and inversion are activated. Start the rectification first, then the inversion.

1: rectification on, inversion off

The two-level rectification is activated.

2: rectification off, inversion on

The two-level inversion is activated.

F0.02	Command running channel	Range: 0~4	Default: 1

It is used to select the channel that enables the AC drive to receive operation and stop commands, as well as to determine the operating direction; it is only utilized for start/stop control in torque control mode.

0: keyboard control

The running and stopping of the AC drive is controlled by the keyboard keys as the forward operation key PRG and stop key STOP/RESET. The JOG/REV key in the two-line keyboard is defined as jogging or reserve. It can be selected via [F4.07], set "0" for reverse and "1" for jogging.

1: terminal control

Operation commands such as forward and reverse are controlled by the multi-function input terminals, see [F2.00~F2.05] for details. See [F2.23] for details of terminal operation control mode and [F2.24] for details of terminal start-up protection.

2: communication control

The operation command is given by the host computer via communication. See group FD for communication parameter settings.

In point-to-point broadcast communication, the slave device performs the operation command sent by the master. Please refer to [FD.09] for details.

3: CAN communication

The running and stopping of the AC drive is controlled by CAN communication, which is a customized protocol and is only used for master-slave communication.

4: touch screen control

The running and stopping of the AC drive is controlled by the touch screen communication. The communication address used is 0x3201.

Note: To reset a fault, all the following reset commands are valid reset instruction: the STOP/RESET key on the keyboard, the multifunction terminal reset command, and the RS485 communication port.

Tip: Users can select the functions of the STOP/RESET key on the keyboard. In external terminal control or communication control, the key can act as a stop key or others. Pleas refer to parameter [F4.08] for details. In scenarios involving external terminal operation control, if the STOP/RESET key is used to stop the AC drive, the AC drive will stop and concurrently locked the external terminal operation commands. To resume normal external terminal operation, an external terminal stop command must be issued to unlock the control. The case of communication control is the same.

F0.03	Frequency given source channel A	Range: 0~11	Default: 0
F0.04	Frequency given source channel B	Range: 0~11	Default: 1

Select the setting source of the given frequency of the AC drive in [F0.03] and [F0.04], and via [F0.06], the relationship between channel A and channel B can be set.

0: give frequency via keyboard

Via [F0.08], the frequency can be set via keyboard. F0.08 (give frequency via keyboard) can be quickly modified by setting [F4.09] (LED ones-bit: UP/DW modification). For parameters power-down storage and UP/DW key action limit, please see [F4.09] for more details.

1: reserved

2: AI1 current/voltage setting

3: AI2 current/voltage setting

In this mode, the frequency is given and modified by AI1 and AI2, by linearizing the input analog value, and the calibration 100% corresponds to the maximum frequency, see "F3" parameter group analog processing for details.

6: RS485 communication setting

In this mode, the frequency is given by communication, see group FD for communication parameter settings.

In point-to-point broadcast communication, the slave device selects the given frequency or the output frequency sent by the master as the set frequency. Please refer to [FD.09] for details.

When Modbus RS485 communication is valid, the set frequency can be set and modified via address 0x3000/0x2000, see “Appendix: Modbus Protocol” for details.

7: terminal UP/DW control

The set frequency is incrementally raise (UP) and decrementally lower (DW) by the control terminals. It is controlled by the on-off of (COM) and the (UP) /(DW) terminals, which set by the multifunction terminals (X1~X6). See [F2.00~F2.05] terminal function description for details.

8: PID setting

When the channel is selected in [F0.03] or [F0.04], the AC drive operation mode is process PID control, the set

frequency is the control parameters such as the output value after the PID action, the PID control setting, feedback value and so on, see the process PID control parameter group "FB" for details.
FB.01 (PID given/feedback via keyboard number entering) can be quickly modified by setting [F4.09] (LED ones-bit: UP/DW modification). For parameters power-down storage and UP/DW key action limit, please see [F4.09] for more details.
For multi-function input terminals for changing the status and characteristics during PID control, etc., see parameter [F2.00~F2.05] for details.

9: PLC setting

The set frequency and the operating direction of AC drive are controlled by the simple PLC inside the AC drive, and up to 15 speed segments can be controlled in the process; see "Group FC: Multi-speed, PLC Function Parameters" for details.
If the operation time of one speed segment is set to "0", the segment is skipped when the program is running, thus the speed segment of the running program can be easily set. When the [F0.16] LED hundreds-bit is set to "0", the frequency control direction is invalid or [F0.16] LED tens-bit is set to "1", the inversion is prohibited, if any speed segment operation command direction is set to reverse, then to the speed segment the AC drive runs at 0.00Hz frequency.
Both program operation and multi-speed operation are designed to realize variable speed operation of AC drive according to a certain rule. In multi-speed operation, switching of multi-speeds and change of operating direction are realized by combining "multi-speed control terminals 1-4" and (COM) defined in the "multi-function input terminal". The program operation function can not only define all the multi-segment frequencies of a cycle in the function parameters, but also the time, direction, acceleration and deceleration time, and the way of the cycle for the multi-segment frequencies. Multi-speed control terminals can be defined by any multi-function terminal, see parameter [F2.00~F2.05] for detailed terminal function description.

10: power balancing slave setting

The set frequency is given and modified by CAN communication, which is a customized protocol used only for master-slave communication.

11: multi-speed setting

Given frequency is selected by "multi-speed terminal". If frequency given channels A and B are not selected for multi-speed setting, the multi-speed terminal will not be switched to multi-speed given when it is valid; if one of the channels A and B is selected for multi-speed setting, it will be performed in accordance with the combination of the frequency given sources, and when the multi-speed terminals are invalid, the multi-speed setting will be set to zero. See [F2.00~F2.05] for details of "multi-speed terminals".

F0.05	Reference source of Channel B	Range: 0~1	Default: 0

The reference source for frequency given channel B is selected by this parameter, and the reference source for frequency given channel A is [F0.09] (max. frequency).
0: max. frequency as the reference source
1: frequency set by channel A as the reference source
Frequency set by channel B = channel B frequency given source × Absolute value/max. frequency set by channel A

F0.06	Frequency given source combination	Range: 0~5	Default: 0

It is used to select the combination method of frequency given channel A and channel B of AC drive.
0: Channel A, only [F0.03] (frequency given channel A) is valid and [F0.04] (frequency given channel B) is invalid.
1: Channel B, only [F0.04] (frequency given channel B) is valid and [F0.03] (frequency given channel A) is invalid.
2: Channel A + Channel B, frequency set by [F0.03] + frequency set by [F0.04], the sum of the two is the AC drive set frequency.
3: Channel A - Channel B, frequency set by [F0.03] + frequency set by [F0.04], the difference of the two is the AC drive set frequency. This approach may result in a negative frequency. Whether the output is valid when a negative frequency is generated is determined by the [F0.16] setting.
4: max. (Channel A, Channel B), the AC drive set frequency is the greater frequency between the frequencies set by [F0.03] and [F0.04].
5: min. (Channel A, Channel B), the AC drive set frequency is the lower frequency between the frequencies set by [F0.03] and [F0.04].

Note:

1. When the jogging command is valid, the jogging setting frequency is used as the AC drive set frequency.
2. For neither Channel A nor B has selected the multi-speed setting, if the multi-speed terminal selection is valid, the frequency corresponding to the multi-speed terminal selection will be used as the set frequency for the AC drive.
3. When Channel A and Channel B select the same given source, no superposition calculation is performed. The given source frequency of Channel A is used as the AC drive's set frequency.
4. The frequency given source priority from high to low is as following order: jogging frequency setting, multi-speed setting, operating command binding given frequency, and frequency given source channel.
5. If [F0.16] (the rotation direction selection) is set as reverse running disabled, AC drive will output 0.00Hz frequency

when the result of frequency calculation is negative regardless of the frequency control direction selection.

Tip: The given frequency set by the frequency given channel A and frequency given channel B combination is still limited by the upper limit frequency and lower limit frequency.

F0.07	Running command binding	Range: 0000~DDDD	Default: 0000

When the code is valid, it is used to set each given channel for running command binding frequency. When the command source has a valid binding frequency source, the set frequency is given by the [F0.07] bound frequency source, and the set frequency obtained from [F0.03~F0.06] will no longer be valid, but the [F0.16] LED hundreds-bit of frequency direction control is still valid.

LED ones-bit: bound frequency given by keyboard commands

0: no binding, frequency given according to [F0.03~F0.06] setting
1: give frequency via keyboard
2: reserved
3: VS voltage analog setting
4: reserved
5: AS current analog setting
6: reserved
7: communication setting
8: terminal UP/DW control
9: PID setting
A: PLC setting
B: CAN card
C: multi-speed setting, the settings above are the same as those described in [F0.03] (frequency from source channel A).

LED tens-bit: bound frequency given by terminal commands

The 12 settings above are the same as the ones-bit: bound frequency given by keyboard commands.

LED hundreds-bit: bound frequency given by communication commands

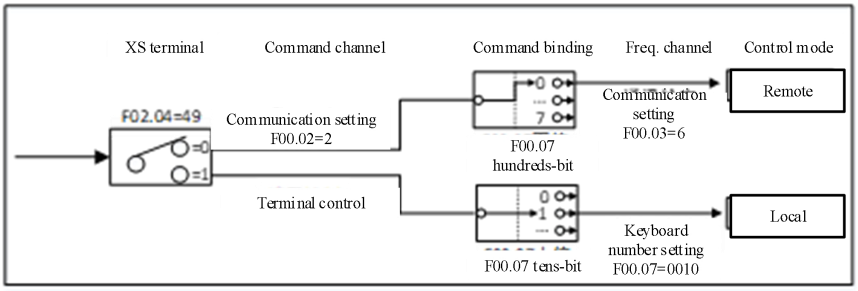
The 12 settings above are the same as the ones-bit: bound frequency given by keyboard commands.

LED thousands-bit: bound frequency given by CAN communication commands

The 12 settings above are the same as the ones-bit: bound frequency given by keyboard commands.

Example: For remote/local switching, remote mode adopts the given channels as the communication commands and frequency, while local mode adopts terminal commands and frequency set via keyboard number entering.

Setting parameters are as follows: [F0.02=2: communication control] [F0.03=6: communication setting] [F0.07=0010: Tens-bit: keyboard number-given frequency bound frequency given by terminal commands] [F2.04=49: command channel to terminal].



F0.08	Give frequency via keyboard	Range: 0.00Hz~upper limit frequency	Default: 50.00Hz

This parameter is valid when the frequency setting channel [F0.03, F0.04] is set to "0: keyboard digit setting". It is used to set and modify the frequency set by the keyboard numbers.

F0.09	Max. frequency	Default: upper limit frequency0~100.00Hz	Default: 50.00Hz
F0.10	Upper limit frequency source setting	Range: 0~7	Default: 0
F0.11	Upper limit frequency keyboard setting	Range: lower limit frequency~max. frequency	Default: 50.00Hz
F0.12	Lower limit frequency	Range: 0.00Hz~upper limit frequency	Default: 0.00Hz
F0.13	Lower limit frequency operation mode	Range: 0~1	Default: 1

Max. frequency:

When analog input, multi-speed, etc. as the frequency given source of AC drive, their 100% value are respectively calibrated to the max. frequency. When the LED ones-bit of [F1.16] is set to "0", the max. frequency is used as the

reference frequency for acceleration and deceleration time.

Upper limit frequency setting source:

Select the setting source for the AC drive upper limit frequency. The upper limit frequency is the upper limit of the given frequency.

0: upper limit frequency keyboard setting (set via F0.11)
1: reserved
2: AI1 current/voltage setting
3: AI2 current/voltage setting
6: RS485 communication (set via address 0x3004/0x2004, see “Appendix: Modbus Protocol” for details)
7: CAN communication

The case of using keyboard potential, analog (AI1, AI2), RS485 communication setting, and CAN communication is similar to frequency given channel A. Please see [F0.03] for details.

Upper limit frequency keyboard setting:

Keyboard is the upper limit frequency setting channel in the case of F0.10=0.

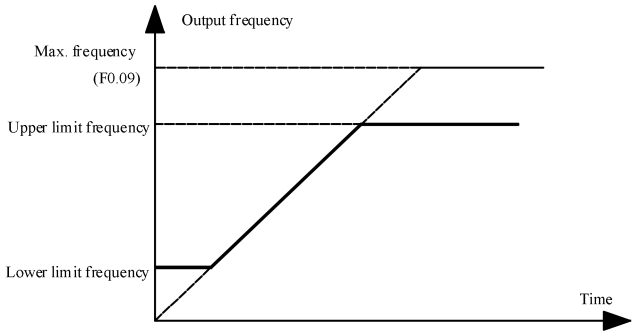
Lower limit frequency:

The lower limit frequency is the lower limit of the given frequency. When the set frequency is lower than the lower limit frequency, the lower limit frequency operation mode is set by [F0.13] for AC drive.

Lower limit frequency operation mode:

0: stop the output, enter the paused operation status
1: run at the lower limit frequency when the actual set frequency is lower than the lower limit frequency

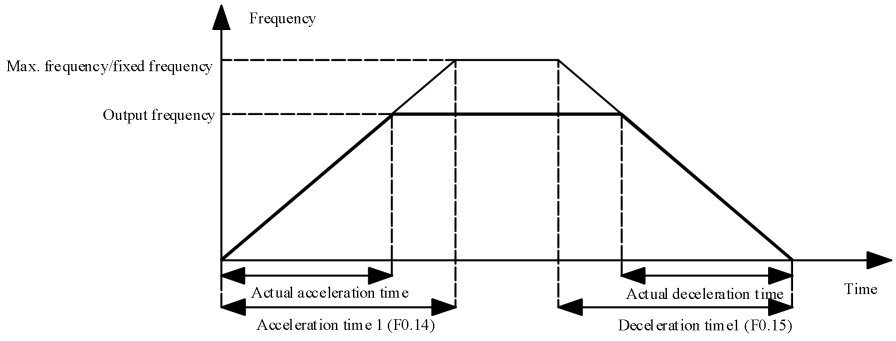
Note: The max. frequency, upper limit frequency and lower limit frequency should be set carefully according to the requirements of the operating conditions. In addition to the upper limit frequency and the lower limit frequency, the output frequency during AC drive operation is also limited by the set values of parameters such as the start frequency, the stop detection frequency, the stop DC braking start frequency, and the jump frequency. The relationship between max. frequency, upper limit frequency and lower limit frequency is shown in the figure below:



The relationship between the upper/lower limit frequencies and the max. frequency

F0.14	Acceleration time1	Range: 0.00s~650.00s	Default: model setting
F0.15	Deceleration time1	Range: 0.00s~650.00s	Default: model setting

The acceleration time refers to the time required for the output frequency to accelerate from 0.00Hz to the time reference frequency; the deceleration time refers to the time required for the output frequency to decelerate from the time reference frequency to 0.00Hz. There are 3 options, max. frequency, LED bit to choose the max. frequency, fixed frequency 50Hz, fixed frequency 50Hz, set frequency in [F1.16] ones-bit to be chosen as the time base frequency; and two acceleration/deceleration curves, linear curve acc./dec. and S-curve acc./dec. can be chosen in [F1.16] LED tens-bit. See [F1.16] for details.



Acceleration/deceleration time diagram

Normally, there are 4 sets of acc./dec. time for frequency. Acc./dec. time 1 is set by [F0.14~F0.15], and Acc./dec. time 2, Acc./dec. time 3, and Acc./dec. time 4 are set by [F1.21~F1.26]. Acc /dec. time 1 is the default setting. To select other acc /dec. time sets, please select them via the control terminal, see [F2.00～F2.05] for details.

When the program is running, each program operation segment can select one of the 4 sets of acc./dec. times, which are independent of the terminal selection, see [FC.31~FC.45] for details.
Jogging acceleration/deceleration time is set by [F1.39, F1.40].

F0.16	Rotation direction	Range: 0000~0121	Default: 0000

LED ones-bit: reverse running direction
It is used for the adjustment of the motor operation control direction.
0: direction unchanged. The actual motor steering is the same as the requested steering, and the current motor direction is not changed.
1: reverse direction. The actual motor steering is opposite to the required steering, reverse the current motor direction.
LED tens-bit: running direction disabled
It is used to enable the motor operation control direction.
0: forward and reserve commands are both allowed. The AC drive accepts forward and reverse operation commands to control motor operation.
1: only forward command is allowed. The AC drive only accepts forward operation command in order to control the motor, and the AC drive will not operate if it is given a reverse operation command.
2: only reverse command is allowed. The AC drive only accepts reverse operation command to control the motor, and the AC drive will not operate if it is given a forward operation command.
LED hundreds-bit: frequency-based direction control
It is used to determine whether negative frequency is allowed to change the current AC drive running direction when the frequency given value is negative.
0: off. The AC drive will output 0.00Hz frequency when the calculation result is negative.
1: on. The AC drive changes the current running direction and outputs the corresponding frequency if the calculation result is negative.
LED thousands-bit: torque-based direction control
0: off.
1: on.
Note:
The value of this parameter will remain unchanged when the factory value is restored. When this parameter is set to a certain value, the commands from all operation command channels (operation keyboard, external terminals, RS485 communication, CAN communication and program running) are affected by the selected value.

F0.17	Bus voltage setting	Range: 0.0V~2500.0V	Related to voltage ratings

Set the bus voltage of the four-quadrant rectifier, which varies with input voltage changes. For a 380V AC input rating, the max. set value is 800V; for 660V, it's 1250V; and for 1140V, it is 2250V.
Factory default
T6: 1000V
T11: 1700V
T33: 5200V

F0.18	Test mode	Range: 0~FFFF	Default: 0000

Thousands-bit=8, enter test mode and virtual bus voltage will be given.

F0.19	Parameters initialized	Range: 0~4	Default: 0

0: none.
1: restore to factory default (not restore motor parameters and FD communication parameters, not clear fault records): By performing it, the function parameters are restored to the factory defaults, excluding the motor parameter group.
2: restore to factory default (restore motor parameters, not restore FD communication parameters, not clear fault records): By performing it, the function parameters are restored to the factory defaults, including the motor parameter group.
3: restore to factory default (restore all parameters, not clear fault records).
4: clear fault records: Clear all historical fault information recorded in [FA.39~FA.85].

8.2 Group F1: Running Control

F1.00	Start mode	Range: 0~2	Default: 0

0: start by starting frequency
[F1.02] (starting frequency) and [F1.03] (starting frequency retention time) control the AC drive's startup. This mode is ideal for high static friction torque and low load inertia scenarios, or used with external mechanical brakes. (Restart after the motor has stopped. An overcurrent fault may appear if the motor is rotating before starting.)

1: start by DC braking

Start by applying DC braking force (electromagnetic brake) with predefined [F1.04] (braking current before startup) and[F1.05] (braking time before startup) on the load motor. Then, start by the starting frequency. This method is ideal for small inertia loads exhibiting forward or reverse operation upon stopping.

2: start by speed tracking

The AC drive first detects the speed and direction of the motor and then starts running at the detected speed to the given frequency by acceleration/deceleration time.

F1.01	Pre-excitation start time	Range: 0.00s~60.00s	Default: 0.00

This parameter is used to set the time for pre-excitation of the asynchronous motor at startup. It can establish the magnetic field before starting the motor, which can effectively improve the starting performance of the motor and reduce the starting current and starting time.

Note:

It is set to 0.00s by default, and the actual start time of pre-excitation is automatically calculated according to the motor parameters.

When it is not set to 0.00s, pre-excitation is started at the set time.

F1.02	Starting frequency	Range: 0.00Hz~60.00Hz	Default: 0.50Hz

This parameter is used to set the initial output frequency when the AC drive starts. Optimizing the starting frequency ensures a high initial torque and delivers a momentary impact to overcome static friction in loads at the startup. However, if the setting value is too large, malfunctions such as overcurrent may occur.

Note:

When the set frequency is lower than the start frequency, the AC drive does not start, and is in standby mode, and the run indicator is on.

When the control mode is set to AM closed-loop control or PM closed-loop control, the default value of the start frequency will be changed to 0Hz.

F1.03	Starting frequency retention time	Range: 0.0s~50.0s	Default: 0.0s

This parameter sets the duration the AC drive remains at the start frequency before entering normal acceleration/deceleration.

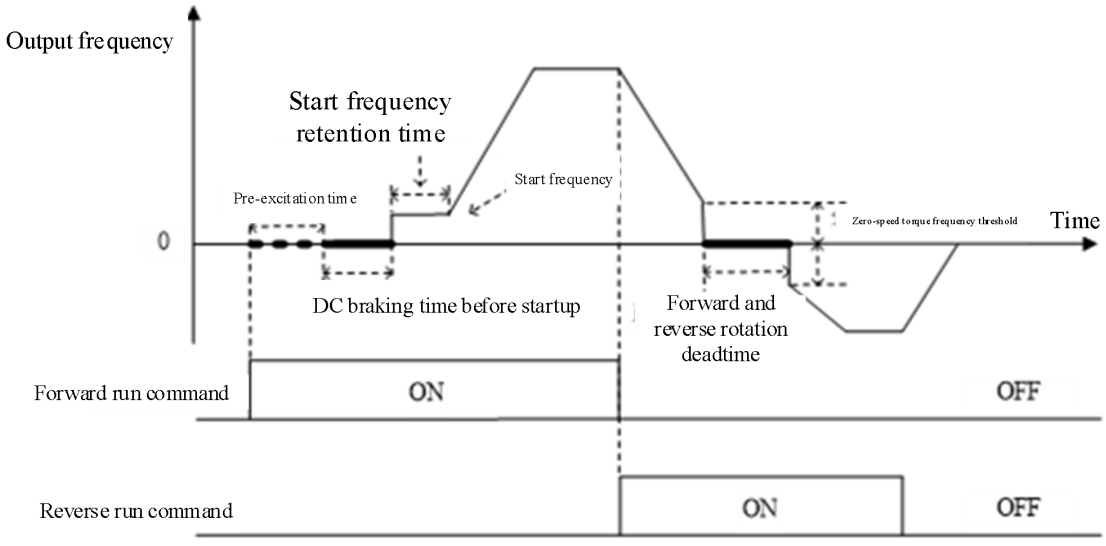
F1.04	Braking current before startup	Range: 0.0%~150.0%	Default: 60.0%

This parameter is used to set the size of the braking current fed to the motor by the AC drive during DC braking. 100.0% of it corresponds to the motor rated current. DC braking at startup is available only when [F1.00] is set to "1". When it is set to 0, the DC braking function is off.

F1.05	Braking time before startup	Range: 0.0s~60.0s	Default: 0.0s

This parameter sets the startup DC braking current duration. The function of DC braking upon startup is valid only if [F1.00] is set to "1". A braking time of 0.0 seconds disables the DC braking process.

Note: The starting frequency is not limited by the lower frequency limit [F0.12] and the zero-speed torque frequency threshold [F1.29].



Schematic diagram of startup and forward/reverse switching process

F1.07	Speed tracking time	Range: 0.0s~60.0s	Default: 0.5s
F1.08	Speed tracking stop delay	Range: 0.0s~60.0s	Default: 1.0s
F1.09	Speed tracking current	Range: 80.0%~400.0%	Default: 120.0%

F1.10	Stop mode	Range: 0~1	Default: 1

0: Deceleration stop

The AC drive ceases output at 0.00Hz after decelerating as per the predetermined dec. time and method.

During deceleration stop, if the output frequency drops below the DC braking start frequency [F1.11], the AC drive's output frequency will jump to zero, DC braking is started and ceased after completion. Or the AC drive will slow down to the minimum output frequency and then stop.

1: Free stop

The AC drive blocks the output immediately after receiving the stop command and the motor runs freely until it stops. When this mode is selected, it is generally used in conjunction with an external mechanical holding brake to achieve a quick stop.

F1.11	DC braking start frequency at shutdown	Range: 0ms~500ms	Default: 1.00Hz
F1.12	DC braking current at shutdown	Range: 0.0%~150.0%	Default: 60.0%
F1.14	DC braking retention time at shutdown	Range: 0.0s~60.0s	Default: 0.0s

DC braking start frequency at shutdown:

When the AC drive slows down to this frequency, it ceases output and initiates DC braking; upon stopping, DC braking is on if the output frequency falls below the DC braking start frequency threshold.

During deceleration and stops, if the set frequency falls below the DC braking threshold, DC braking is on and the output frequency drops to zero. If the operating conditions do not strictly require shutdown braking, the DC braking start frequency should be set as low as possible.

DC braking current at shutdown:

It refers to the amount of braking current fed to the motor by the AC drive during DC braking. 100.0% of it corresponds to the motor rated current.

The DC braking function provides zero-speed torque. It is usually used to improve stopping accuracy and to realize fast stopping, but it cannot be used for deceleration braking during normal operation; namely, once DC braking is started, the AC drive will stop output. If the DC braking current is set too high, the AC drive is prone to overcurrent faults during shutdown. When it is set to 0, the DC braking function is invalid.

DC braking retention time at shutdown:

It refers to the duration of DC braking current at shutdown. There is no DC braking process when the braking time is 0.0 seconds, that is, the DC braking function is invalid. When it is set to 0, the DC braking function is invalid.

F1.15	Stop detection frequency	Range: 0.00Hz~50.00Hz	Default: 0.50Hz

In deceleration stop mode, the drive will stop if the output frequency is lower than this value.

F1.16	Acceleration/deceleration selection	Range: 0000~0012	Default: 0000

LED ones-bit: acc./dec. time reference frequency

This parameter is used as a reference for selecting the acc./dec. time.

0: max. frequency. Acc./dec. time reference is max. frequency [F0.09].

1: fixed frequency. Acc./dec. time reference is fixed frequency 50Hz.

2: set frequency. Acc./dec. time reference is the set frequency. Please be aware that frequent fluctuation of the set frequency may result in motor acceleration changes.

LED tens-bit: acc./dec. selection

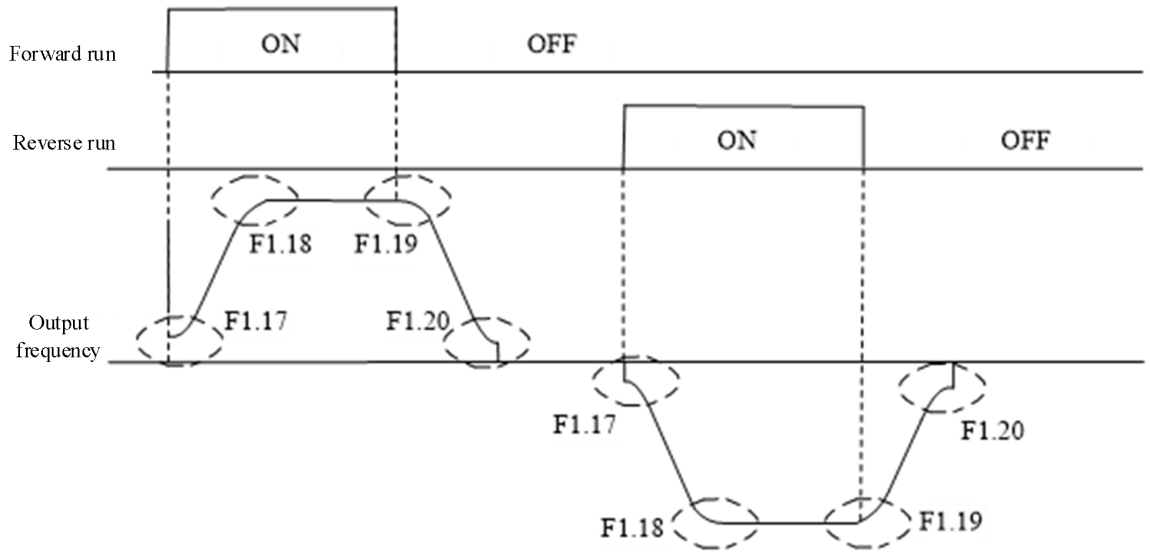
This series of AC drives provide two kinds of acc./dec. methods which are both valid during normal startup, shutdown, forward/reverse running, acceleration and deceleration.

0: linear curve, suits for general load

1: S-curve, an acc./dec. curve suits for loads that require noise and vibration mitigation during acceleration and deceleration, reduction of start/stop impact, or low-frequency decreasing torque and high-frequency short-term acceleration.

F1.17	S-curve acceleration start time	Range: 0.00s~10.00s	Default: 0.20s
F1.18	S-curve acceleration stop time	Range: 0.00s~10.00s	Default: 0.20s
F1.19	S-curve deceleration start time	Range: 0.00s~10.00s	Default: 0.20s
F1.20	S-curve deceleration stop time	Range: 0.00s~10.00s	Default: 0.20s

The S-curve characteristics during forward and reverse operation are shown below:



Schematic diagram of S-curve characteristics

Note:

After setting the S-curve, the acc./dec. time will be extended as shown below:

Acceleration time = selected acceleration time + ([F1.17]+[F1.18])/2

Deceleration time = selected deceleration time + ([F1.19]+[F1.20])/2

The acceleration S-curve is divided into three parts. S-curve acceleration start time [F1.17], acceleration time [F0.14], S-curve acceleration stop time [F1.18]. Total acceleration time = acceleration time [F0.14] + ([F1.17] + [F1.18])/2 , try to ensure that the selected acceleration time [F0.14] ≥ ([F1.17] + [F1.18])/2 when used. When [F0.14]<([F1.17]+[F1.18])/2, the total acceleration time will be calculated by the software itself internally and will deviate from the set time.

The deceleration S-curve is the same as the acceleration S-curve.

F1.21	Acceleration time2	Range: 0.01s~650.00s	Default: 10.00s
F1.22	Deceleration time2	Range: 0.01s~650.00s	Default: 10.00s
F1.23	Acceleration time3	Range: 0.01s~650.00s	Default: 10.00s
F1.24	Deceleration time3	Range: 0.01s~650.00s	Default: 10.00s
F1.25	Acceleration time4	Range: 0.01s~650.00s	Default: 10.00s
F1.26	Deceleration time4	Range: 0.01s~650.00s	Default: 10.00s

Acceleration time 2/3/4:
When [F1.16] LED ones-bit is set to "0", it refers to the time required to accelerate the output frequency from 0.00 Hz to the max. frequency;
When [F1.16] LED ones-bit is set to "1", it refers to the time required to accelerate the output frequency from 0.00 Hz to 50.00Hz;
When [F1.16] LED ones-bit is set to "2", it refers to the time required to accelerate the output frequency from 0.00 Hz to the set frequency;
Deceleration time 2/3/4:
When [F1.16] LED ones-bit is set to "0", it refers to the time required to decelerate the output frequency from the max. frequency to 0.00Hz;
When [F1.16] LED ones-bit is set to "1", it refers to the time required to decelerate the output frequency from 50.00 Hz to 0.00Hz;
When [F1.16] LED ones-bit is set to "2", it refers to the time required to decelerate the output frequency from the set frequency to 0.00Hz;
Acceleration/deceleration time 2/3/4 can be selected via the combination of the "Acc./dec. time terminal 1", "Acc./dec. time terminal 2" and (COM), excluding PLC program operation. Without configuration, the default is acc./dec. time 1, and the drive accelerates/decelerates accordingly.
For the acc./dec. time for PLC program operation, see parameters [FC.31~ FC.45] for details.
Jogging acc./dec. time is not included in this range. It is set individually via [F1.39, F1.40].
Acceleration/deceleration time selection comparison table:

Terminal 2	Terminal 1	Acceleration/deceleration time selection
OFF	OFF	Acceleration time 1/ Deceleration time 1
OFF	ON	Acceleration time 2/ Deceleration time 2
ON	OFF	Acceleration time 3/ Deceleration time 3
ON	ON	Acceleration time 4/ Deceleration time 4

For clarification on the table above, please see the “Group FC: Multi-speed, PLC Function Parameters”.

F1.38	Jogging frequency	Range: 0.00Hz~max. frequency	Default: 5.00Hz
F1.39	Jogging acceleration time	Range: 0.01s~650.00s	Default: 10.00s
F1.40	Jogging deceleration time	Range: 0.01s~650.00s	Default: 10.00s

Jogging frequency setting: set the output frequency of AC drive during jogging.
Jogging acceleration time: jogging acceleration/deceleration time is defined as the same as the acc./dec. time.
When [F1.16] LED ones-bit is set to "0", it refers to the time required to accelerate the output frequency from 0.00 Hz to the max. frequency;
When [F1.16] LED ones-bit is set to "1", it refers to the time required to accelerate the output frequency from 0.00 Hz to 50.00Hz;
When [F1.16] LED ones-bit is set to "1", it refers to the time required to accelerate the output frequency from 0.00 Hz to the set frequency;
Jogging deceleration time: jogging acceleration/deceleration time is defined as the same as the acc./dec. time.
When [F1.16] LED ones-bit is set to "0", it refers to the time required to decelerate the output frequency from the max. frequency to 0.00Hz;
When [F1.16] LED ones-bit is set to "1", it refers to the time required to decelerate the output frequency from 50.00 Hz to 0.00Hz;
When [F1.16] LED ones-bit is set to "2", it refers to the time required to decelerate the output frequency from the set frequency to 0.00Hz;
Note:
AC drive jogging can be controlled through jogging command given by the keyboard and communication.
The jogging command has priority only when its channel is the same as the operation command channel. For example, keyboard jogging is only valid in keyboard control mode and it takes precedence over the keyboard forward/reverse operation commands.
The set value of the jogging frequency is limited by the [F0.09] (max. frequency).
The actual output frequency during jogging is limited by the [F0.11] (upper limit frequency).

F1.41	Jump Frequency 1	0.00Hz～650.00Hz	0.00Hz	○△	0x129

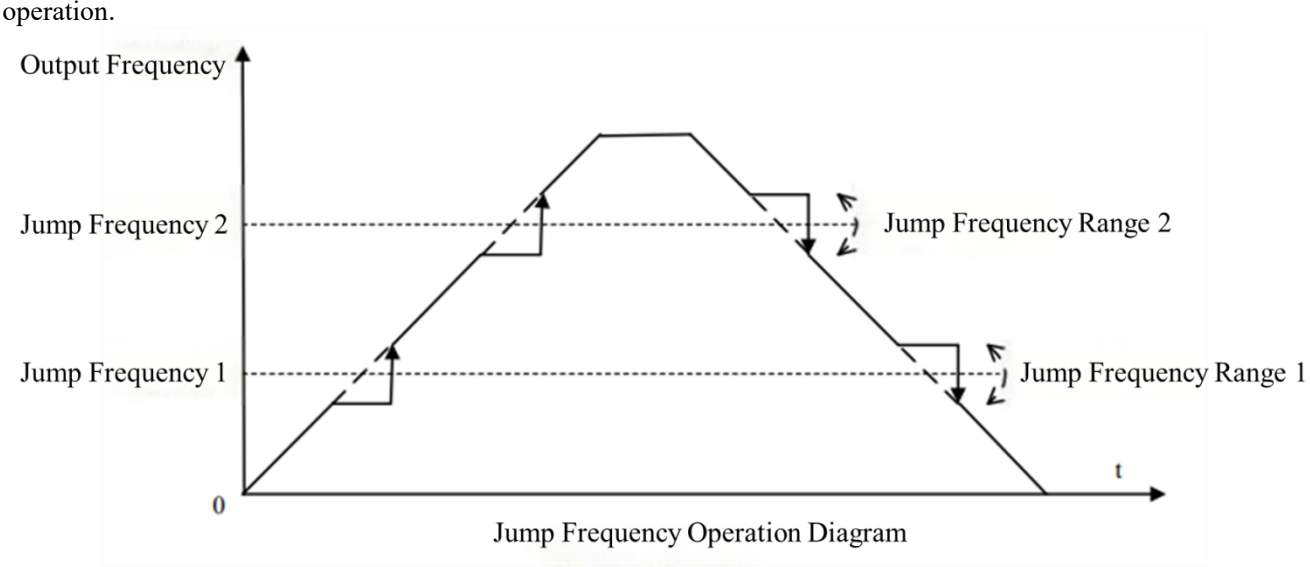
F1.42	Jump Frequency Range 1	0.00Hz～650.00Hz	0.00Hz	○△	0x12A
F1.43	Jump Frequency 2	0.00Hz～650.00Hz	0.00Hz	○△	0x12B
F1.44	Jump Frequency Range 2	0.00Hz～650.00Hz	0.00Hz	○△	0x12C

The jump-frequency function creates dead zones around specified frequency bands. When machinery that previously operated at a constant speed is run at variable speed, resonance may occur. To prevent resonance at the mechanical system's natural frequency, certain frequency bands must be bypassed.

Up to two jump frequencies can be configured. Use F1.41 [Jump Frequency 1] and F1.43 [Jump Frequency 2] to set the center values of the jump bands, and use F1.42 [Jump Frequency Range 1] and F1.44 [Jump Frequency Range 2] to set their widths.

When the input frequency command reaches or approaches a jump band, the drive automatically adjusts the command.

The motor will smoothly accelerate or decelerate until it exits the jump band, following the active acceleration/deceleration time settings. Once the command is outside the jump band, the drive resumes constant-speed operation.



Jump Frequency Operation Diagram

8.3 Group F2: Switch Terminal Parameters

F2.00	Multifunction input terminal 1 (X1)	Range: 0~60 See 7.2 Terminal I/O Function Selection;	Default: 8
F2.01	Multifunction input terminal 2 (X2)		Default: 1
F2.02	Multifunction input terminal 3 (X3)		Default: 2
F2.03	Multifunction input terminal 4 (X4)		Default: 6
F2.04	Multifunction input terminal 5 (X5)		Default: 16
F2.05	Multifunction input terminal 6 (X6)		Default: 17

There are 7 multifunction input terminals, and the functions of the multifunction input terminals (X1-X6) can be defined separately by parameters [F2.00~F2.05]. The characteristics and detection delay of the multi-function input terminals can be set by [F2.08~F2.21], see those parameters for details.

The multifunction input terminals are versatile and can be easily set and selected as needed. The set values and functions are shown in the table below:

Set value	Set value	Set value	Set value
0	No functions	29	PID feedback switching 3
1	Forward operation	30	PLC pause
2	Reverse operation	31	PLC reboot
3	Three-line operation control (Xi)	32	Acceleration/deceleration time selection terminal1

4	Forward jogging	33	Acceleration/deceleration time selection terminal2
5	Reverse jogging	34	Acceleration/ deceleration pause
6	Free stop	35	Swing frequency input
7	Emergency stop	36	Swing frequency paused
8	Fault reset	37	Swing frequency reset
9	External fault input	38	Buffer contactor feedback input
10	Frequency Up (UP)	39	PUL input
11	Frequency Down (DW)	40	Timer triggering terminals
12	Frequency UP/DOWN reset (UP/DW reset)	41	Timer reset terminals
13	Channel A to channel B	42	Counter clock input terminal
14	Frequency channel combination to A	43	Counter reset terminal
15	Frequency channel combination to B	44	DC braking command
16	Multi-speed terminal 1	45	Pre-excitation command terminal
17	Multi-speed terminal 2	46	Motor selection terminal
18	Multi-speed terminal 3	47	Four-quadrant rectifier start alone
19	Multi-speed terminal 4	48	Command channel to keyboard
20	PID control canceled	49	Command channel to terminal
21	PID control paused	50	Command channel to communication
22	PID characteristics switching	51	Command channel to expansion card
23	PID parameter switching	52	Operation off
24	PID setting switching 1	53	Forward operation off
25	PID setting switching 2	54	Reverse operation off
26	PID setting switching 3	59	Output contactor feedback
27	PID feedback switching 1	60	Speed/ torque switching
28	PID feedback switching 2	61	Position control switch

0: no functions; it indicates that the terminal is invalid. It is advisable to set its value to "0" for the prevention of misoperation when the terminal is not in use.

1: forward operation; when the operation command is given by the terminal, if [F2.26] is set to two-line 1 mode, the terminal is valid, the AC drive will run forward, for other modes, please see [F2.26].

1: reverse operation; when the operation command is given by the terminal, if [F2.26] is set to two-line 1 mode, the terminal is valid, the AC drive will run reverse, for other modes, please see [F2.26].

1: three-line operation control (Xi); when the operation command is given by the terminal, if [F2.26] is set to three-line 1/2 mode, the terminal is Xi, please see [F2.26] for details.

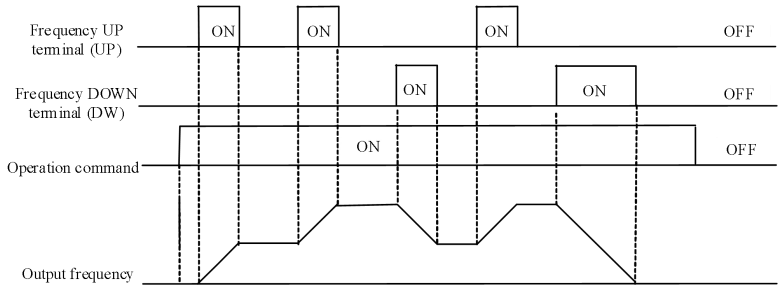
4: Forward jogging;

5: Reverse jogging;

6: Free stop; command input port. When this terminal is valid, the AC drive immediately blocks the output, at which time the motor is in a free-running status.

When the free stop terminal remains active, the AC drive will not accept any start command and remains stopped. See [F2.27] for details on parameter description for restoring the initial operation command upon cancellation of the free stop terminal command in two-line control mode. When operation is controlled by keyboard, RS485, CAN communication and terminal 3-line mode, the original operation command will not be restored after the free stop terminal command is canceled. Please re-enter the operation command if you need to start the AC drive.

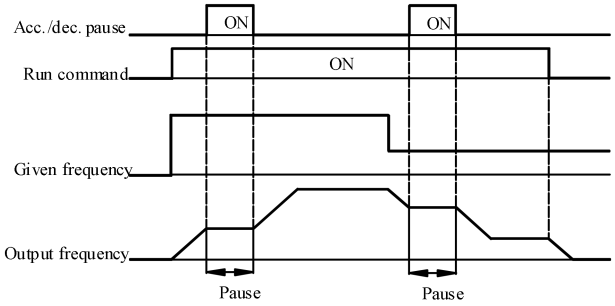
7: emergency stop; if an emergency stop command is entered during AC drive operation, the AC drive will operate as a free stop. When the emergency stop terminal remains active, the AC drive will not accept any start command and remains stopped. See [F2.27] for details on parameter description for restoring the initial operation command upon cancellation of the emergency stop terminal command in two-line control mode.
When operation is controlled by keyboard, communication, CAN communication and terminal 3-line mode, the original operation command will not be restored after the emergency stop terminal command is canceled. Please re-enter the operation command if you need to start the AC drive.
8: fault reset; when a fault alarm appears on the AC drive, this terminal allows the fault reset to be performed. See [F2.27] for details on parameter description for restoring the initial operation command after fault reset in two-line control mode.
9: external fault input; this terminal allows for the input of external device fault signals, enabling the AC drive to conveniently monitor and protect against device malfunctions. When the AC drive receives an external fault input signal, the output is blocked immediately, the motor is in a free-running state, and the fault code E.EF is displayed.
10: frequency up (UP)
11: frequency down (DW)
12: frequency UP/DOWN reset (UP/DW reset)
Frequency adjustments, both incremental (UP) and decremental (DW), are achieved through the control terminal. It is valid only when [F0.03] is set to "7" terminal UP/DW control. The way of memorizing and reset the given frequency adjusted by UP/DW terminal setting can be set by [F2.36], see [F2.36] for details. The acc./dec. rate for terminal UP/DW control to run the given frequency is set by [F2.37].
The UP/DW adjusted frequency can be reset via the “frequency UP/DW reset” terminal at any time.



Schematic diagram of increasing or decreasing frequency via terminals

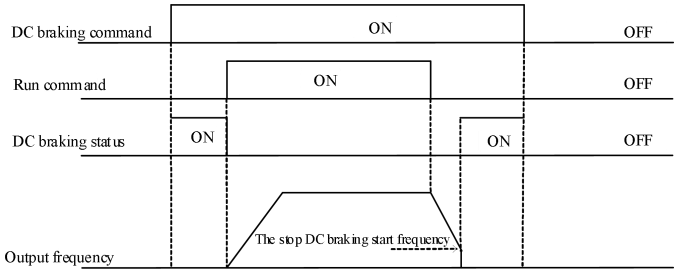
13: Channel A to Channel B
14: frequency channel combination to Channel A
15: frequency channel combination to Channel A
Switch the combination of frequency-given channels via the terminals.
16: multi-speed terminal 1
17: multi-speed terminal 2
18: multi-speed terminal 3
19: multi-speed terminal 4
Input port for multi-speed commands, there are 15 speeds realized by code combinations; multi-speed commands are valid only when F0.03=11. See “Group FC: Multi-speed, PLC Function Parameters” for details.
20: PID control canceled; when the terminal is valid, it disables the PID function, resets the output and internal status to zero; when it is invalid, PID calculations resume.
21: PID control paused; when the terminal is valid, the PID process is paused, the PID output and internal status maintain the current value; when it is invalid, the PID continues to operate on the basis of the current value.
22: PID characteristics switching; when this terminal is valid, the characteristics set by the LED ones-bit of parameter [FB.07] will be changed, and when this terminal is invalid, the PID output characteristics will be changed again to the characteristics set by the LED ones-bit of [FB.07].
23: PID parameter switching
When the PID parameter switching condition [FB.17] is set to "1", the terminal selection is valid. When the function is invalid, the PID adjustment proportional, integral, and differential parameters are [FB.11~FB.13], and when valid, they are [FB.14~FB.16].
24: PID setting switching 1
25: PID setting switching 2
26: PID setting switching 3
When the PID controller setting source [FB.00] is set to the "8" (terminal selection), the PID controller setting source is switched through this terminal group. Refer to [FB.00] for details.
27: PID feedback switching 1
28: PID feedback switching 2
29: PID feedback switching 3

When the PID controller feedback signal source [FB.03] is set to the "8" (terminal selection), the PID controller feedback signal source is switched through this terminal group. Refer to [FB.03] for details.
30: PLC pause; when the main frequency given channel is selected as [F0.03]= "9" (PLC setting), if the signal is valid, it will make the running program pause, and the AC drive runs at the current frequency. When the signal disappears, it continues to run according to the status before the pause. See "Group FC: Multi-speed, PLC Function Parameters" for more details.
31: PLC reboot; when the main frequency given channel is selected as [F0.03]= "9" (PLC setting), if the signal is valid during shutdown and program running, it will reboot the running program from the first stage. See "Group FC: Multi-speed, PLC Function Parameters" for more details.
32: acc./dec. time selection terminal1
33: acc./dec. time selection terminal2
Input port for acc./dec/ time selection commands, there are 4 acc./dec. sets realized by code combinations. If no parameter is set and the terminal is inactive, the default is the valid ACC./DEC. time1. See [F1.21~F1.26] for details.
34: acceleration/ deceleration pause
When this terminal is valid during the AC drive operating status, the AC drive stops acc./dec. and keeps the current speed unchanged.



Acc./dec. pause diagram

35: swing frequency input
36: swing frequency paused
37: swing frequency reset
38: buffer contactor feedback input
39: PUL input
40: timer triggering terminal
41: timer reset terminal
42: counter clock input terminal
43: counter reset terminal
44: DC braking command; the DC braking function of the AC drive can be started at the AC drive stop status. For the current during DC braking, see [F1.12] (DC braking current at shutdown). If a running or jogging command is entered, the DC braking will be canceled.



DC braking command schematic

45: pre-excitation command terminal; this function is only valid in AM vector control, and the AC drive pre-excitation function is valid at the AC drive stop status. If a running or jogging command is entered, the pre-excitation will be canceled.
46: reserved
47: four-quadrant rectifier start alone; when FF.14 is not zero, this terminal function is valid as a separate start/stop command on the rectification side.
48: command channel to keyboard; when all options are valid, the priority should be as follows: keyboard > terminal > communication > expansion card.
49: command channel to terminal
50: command channel to communication
51: command channel to expansion card

52: operation off
53: forward operation off
54: reverse operation off
55~58: reserved
59: output contactor feedback
60: speed/ torque switching
61: position control switch

F2.08	X1~X4 polarity selection	Range: 0000~1111	Default: 1000

X1~X4 polarity selection: separately set the characteristics of multifunction input terminals X1, X2, X3, and X4.

LED ones-bit: terminal X1
0: on
1: off

LED tens-bit: terminal X2
0: on
1: off

LED hundreds-bit: terminal X3
0: on
1: off

LED thousands-bit: terminal X4
0: on
1: off

F2.09	X5~X6 polarity selection	Range: 0000~1111	Default: 0000

Same.

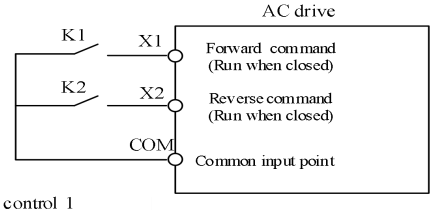
F2.10	X1 on detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.11	X1 off detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.12	X2 on detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.13	X2 off detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.14	X3 on detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.15	X3 off detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.16	X4 on detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.17	X4 off detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.18	X5 on detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.19	X5 off detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.20	X6 on detection delay	Range: 0.000s~6.000s	Default: 0.010
F2.21	X6 off detection delay	Range: 0.000s~6.000s	Default: 0.010

Valid detection delay: the delay taken for input terminals X1~X6 to transition from invalid to valid state.
Invalid detection delay: the delay taken for input terminals X1~X6 to transition from valid to invalid state.

F2.26	Terminal-controlled operation mode	Range: 0~3	Default: 0

This parameter defines four different ways of controlling AC drive operation via external terminals.
0: two-line control 1: operation and direction in one This is the most commonly used two-line mode. The factory default is that the X1 (forward running) and X2 (reverse running) terminal control the motor to running forward and reverse. This is shown in the figure below:

K1	K2	Run command
0	0	Stop
1	0	Forward
0	1	Reverse
1	1	Stop

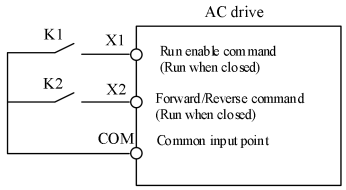


0: two-line control 1

1: two-line control 2: running and direction are separated. The forward running terminal X1 (forward operation) defined in this mode is used to enable motor running.

This is shown in the figure below:

K1	K2	Run command
0	0	Stop
1	0	Forward
0	1	Reverse
1	1	Stop

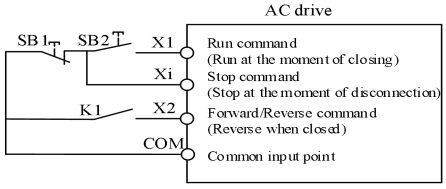


1: two-line control 2

2: three-line control 1: the three-line control terminal (Xi) of this mode is the stop terminal and the operation command is generated by X1 (forward operation) and the direction is controlled by X2 (reverse operation).

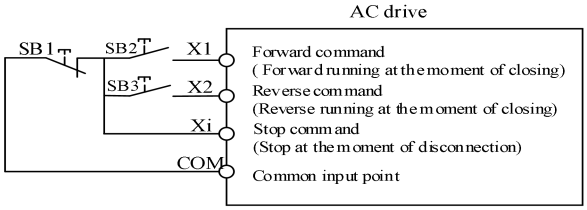
The three-line operation control terminal (Xi) is a valid input.

K1	Direction control
0	Forward
1	Reversal



2: three-line control 1

3: three-line control 2: the three-line control terminal (Xi) of this mode is the stop terminal and the operation command is generated by X1 (forward operation) and the direction is controlled by X2 (reverse operation).



3: three-line control 2

Note: SB1: Stop; SB2: Forward operation; SB3: Reverse operation; "Xi": a multifunction input terminal that is set to "3" [three-line control (Xi)].

F2.27	Terminal start protection	Range: 0000~0111	Default: 0111

The following status is valid only when terminal control operation [F0.02] is set to "1" and it is a 2-line control mode, namely, [F2.26] is set to "0" or "1".

For 3-line control mode, the operation command must be re-entered.

LED ones-bit: terminal start protection in case of abnormal exit

0: off

1: on

LED tens-bit: jogging terminal start protection in case of abnormal exit

0: off

1: on

LED hundreds-bit: start protection in case of switch from command channel to terminal

0: off

1: on

LED thousands-bit: reserved

Note: When the start/stop command is given by terminal and the control mode is set to two-line, the AC drive will shut down upon detecting malfunction (as fault, undervoltage, or an external abnormal stop command, including free stop, emergency stop, or forced stop). Upon abnormality clearance, the AC drive will instantly restart the motor if the protection is off. If the protection is on, the previous running command must be canceled before the new running command to start the motor is responded.

F2.30	PUL input min. frequency	0.00kHz~50.00kHz	0.00kHz
F2.31	PUL min. frequency corresponding setting	0.00%~100.00%	0.00%

F2.32	PUL input max. frequency	0.00kHz~100.00kHz	50.00kHz
F2.33	PUL max. frequency corresponding setting	0.00%~100.00%	100.00%
F2.34	PUL filter time	0.000s~9.000s	0.100s
F2.35	PUL cutoff frequency	0.000kHz~1.000kHz	0.010kHz

PUL related parameters are only valid for version 7520 and later, and need to be used with the I expansion card.

F2.44	Output terminal polarity selection	Range: 0000~0111	Default: 0000

LED tens-bit: RO terminal1

0: positive

1: negative

LED hundreds-bit: RO terminal2

0: positive

1: negative

F2.46	RO1 (TA1-TB1-TC1)	Range: 0~33	Default: 33
F2.47	RO2 (TA2-T2B-TC2)		Default: 4

0: no output; it indicates that the terminal is invalid. It is advisable to set its value to "0" for the prevention of misoperation when the terminal is not in use.

1: AC drive in operation; output a valid signal when the AC drive is in the running status.

2: AC drive in reverse operation; output a valid signal when the AC drive is in the reverse running status.

3: AC drive in forward operation; output a valid signal when the AC drive is in the forward running status.

4: fault trip alarm 1 (alarm during fault auto-recovery); output a signal when the AC drive is faulty and it is in the process of fault auto-recovery.

5: fault trip alarm 2 (no alarm during fault auto-recovery); output a valid signal when the AC drive is faulty but it is not in the process of fault auto-recovery.

6: external fault shutdown; when the multifunction input terminal inputs an external fault signal, the AC drive external fault E. EF is reported, a valid signal is output.

7: AC drive undervoltage; output a valid signal when the AC drive is in the undervoltage status.

8: AC drive ready for operation; when this signal is valid, it indicates that the AC drive is fault-free, the bus voltage is normal, the operation prohibition terminals such as emergency stop or emergency stop of the AC drive are invalid, and the AC drive can run after accepting the start command.

9: output frequency level detection 1 (FDT1)

10: output frequency level detection 2 (FDT2); when the AC drive's output frequency is above the value of detection threshold ([F2.51]/[F2.53]), the AC drive terminal outputs a valid signal after the process of the hysteresis frequency ([F2.52]/[F2.54]). Conversely, it sends an invalid signal if the output frequency falls below the detection threshold processed by the same hysteresis frequency. See [F2.51~F2.54] for details.

11: given frequency reached; when the output frequency of AC drive approaches or reaches a certain range given frequency (the range is determined by [F2.55]), a valid signal is output, otherwise an invalid signal is output. See [F2.55] for details.

12: run at zero speed; a valid signal is output when the AC drive is running and the output is 0.00 Hz.

13: upper limit frequency reached; a valid signal is output when the AC drive is running at the upper limit frequency.

14: lower limit frequency reached; a valid signal is output when the AC drive is running at the lower limit frequency.

15: program running cycle completed; a valid signal of 500ms is output when a cycle of the program running is finished.

16: program running phase completed; a valid signal of 500ms is output when a phase of the program running is finished.

17: PID feedback above upper limit; when the PID feedback reaches the upper limit of the disconnection alarm [FB.27], the feedback signal is above the limit after the time of delay [FB.25], and a valid signal is output.

18: PID feedback below lower limit; when the PID feedback is detected to reach the lower limit of the disconnection alarm [FB.28], the feedback signal is above the limit after the delay time of [FB.25], and a valid signal is output.

19: sensor disconnection feedback from PID; output a valid signal when a PID feedback sensor disconnection is detected, which is not affected by the feedback disconnection action selection of FB.26. See [FB.25~FB.28] for details.

20: reserved

24: dynamic brake in progress; the AC drive outputs a valid signal when the dynamic braking condition is met. See [F4.29] for details.

25: PG disconnection feedback; output a valid signal when the PG feedback disconnection is detected. See [F5.30~F5.32] for details.

26: emergency stop in progress; output a valid signal when the AC drive is in the emergency stop status.

27: load warning output 1

28: load warning output 2 When AC drive is in operation, under VF control mode, the motor output current is used as the judgment value of load warning; under vector control mode, the motor output torque is used as the

judgment value of load warning, and the judgment value of load warning is compared with the detection level of load warning to determine whether to output a valid signal. See [FA.17~FA.21] for details.
30: reserved
Tip: RO terminals TA1-TC1, TA2-TC2 connected, TB1-TC1, TB2-TC2, disconnected are valid signals.
31: reserved
32: rectification on; a valid signal is output when the rectification side is actually operating with wave generation.
33: inversion on; a valid signal is output when the inversion side is actually operating with wave generation.
34: buffer contactor control output; it can control the buffer contactor.

F2.49	Relay1 output delay	Range: 0.000s~6.000s	Default: 0.010s
F2.50	Relay2 output delay	Range: 0.000s~6.000s	Default: 0.010s

When the internal logic operation of AC drive is to change the status of relay terminals, the actual status of relay terminals will be output only after the set delay, in which the time setting precautions are the same as the input terminals.

F2.74	Expansion card disconnection selection	Ones-bit: expansion card interface1 0: disconnection detection off 1: report an alarm and free stop 2: warning and continue running 3: warning and free stop Tens-bit: expansion interface2 initialization selection F: Pg mode Others: spi mode, communication or IO expansion cards can be connected.	0
F2.75	Multi-function input terminal EX6 (expansion card X6)	See the functions of terminal X	9
F2.76	Multi-function input terminal EX7 (expansion card X7)		38
F2.77	Multi-function input terminal EX8 (expansion card X8)		0
F2.78	Reserved		0
F2.79	Multi-function input terminal EX10 (expansion card X10)		0
F2.81	Multi-function output terminal Y (expansion card Y)	See the functions of terminal Y	0
F2.82	Multi-function relay terminal (expansion card relay)		34
F2.83	EX6~X8 polarity selection	0: on; 1: off LED ones-bit: terminal EX6 LED tens-bit: terminal EX7 LED hundreds-bit: terminal EX8 LED thousands-bit: reserved	0000
F2.84	EX10 polarity selection	0: on; 1: off LED ones-bit: terminal EX10 LED tens-bit: reserved LED hundreds-bit: reserved LED thousands-bit: reserved	0000

F2.85	Expansion card output terminal polarity selection	0: positive 1: negative LED ones-bit: expansion card terminal Y LED tens-bit: expansion card RO terminal1 LED hundreds-bit: reserved LED thousands-bit: reserved	0000
F2.89	Expansion card temperature selection	Reserved	0
F2.90	Expansion card AO selection	LED ones-bit: output selection, see F3.54 for details LED hundreds-bit: output signal selection 0: 0V~10V 1: 4.00mA~20.00mA 2: 0.00mA~20.00mA	0000
F2.91	Expansion card AO gain	30.0%~200.0%	100.0%
F2.92	Expansion card AO signal deviation	-10.0%~10.0%	0.0%
F2.93	Expansion card AO filter time	0.000s~6.000s	0.010s
F2.94	Actual AO with 0% duty cycle of the expansion card	0~2000	0
F2.95	Actual AO with 100% duty cycle of the expansion card	0~2000	1000
F2.96	PUL input setting	0: reserved 1: expansion card	1

Expansion card related parameters must be used in conjunction with the expansion card.

8.4 Group F3: Analog Terminal Parameters

F3.00	AI1 (VS) lower limit	0.00V~10.00V	0.00V
F3.01	AI1(VS) lower limit corresponding setting	0.00%~100.00%	0.00%
F3.02	AI1 (VS) upper limit	0.00V~10.00V	10.00V
F3.03	AI1(VS) upper limit corresponding setting	0.00%~100.00%	100.00%
F3.04	AI1 (AS) lower limit	0.00mA~20.00mA	4.00mA
F3.05	AI1(AS) lower limit corresponding setting	0.00%~100.00%	0.00%
F3.06	AI1 (AS) upper limit	0.00mA~20.00mA	20.00mA
F3.07	AI1(AS) upper limit corresponding setting	0.00%~100.00%	100.00%
F3.08	AI1 filter time	0.000s~6.000s	0.010s

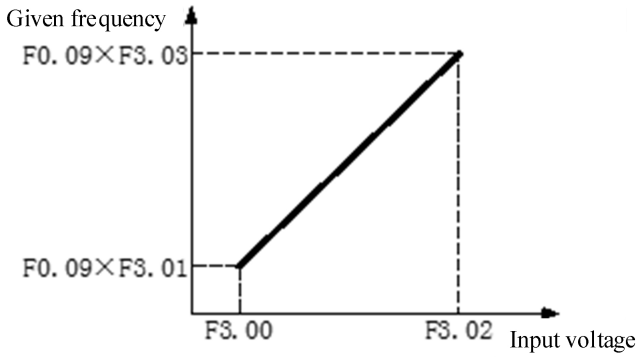
AI1(VS) : the setting when a voltage analog is input to the AI1 terminal, where AI1(AS) indicates the setting when a current analog is input to the AI1 terminal.

AI1(VS) lower limit: this function defines the signal received by the AI terminal (VS), and the voltage signal lower than this value will be processed by AC drive as VS lower limit.

AI1(VS) lower limit corresponding setting: it is used to set the percentage of the set value corresponding to the VS lower limit.

AI1(VS) upper limit: this function defines the signal received by the AI terminal (VS), and the voltage signal greater than this value will be processed by AC drive as VS upper limit.

AI1(VS) upper limit corresponding setting: it is used to set the percentage of the set value corresponding to the VS upper limit.



AI1 filter time: it defines the size of the filter applied to the AI (VS) signal to remove interference signals. The longer the filter time, the stronger the anti-interference ability, but the response becomes slower; the shorter the filter time, the weaker the anti-interference ability, but the response becomes faster.

F3.09	AI2 (VS) lower limit	0.00V~10.00V	0.00V
F3.10	AI2(VS) lower limit corresponding setting	0.00%~100.00%	0.00%
F3.11	AI2 (VS) upper limit	0.00V~10.00V	10.00V
F3.12	AI2(VS) upper limit corresponding setting	0.00%~100.00%	100.00%
F3.13	AI2 (AS) lower limit	0.00mA~20.00mA	4.00mA
F3.14	AI2(AS) lower limit corresponding setting	0.00%~100.00%	0.00%
F3.15	AI2 (AS) upper limit	0.00mA~20.00mA	20.00mA
F3.16	AI2(AS) upper limit corresponding setting	0.00%~100.00%	100.00%
F3.17	AI2 filter time	0.000s~6.000s	0.10s

For functions related to AI2, please see the AI1-related description. The AI2(VS) denotes the setting for voltage analog input at the AI2 terminal, while AI2(AS) signifies settings for current analog input at the AI2 terminal.

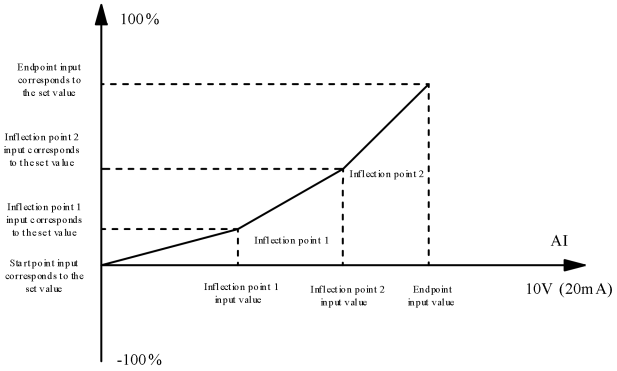
F3.18	AI selection	Range: 0000~0011	Default: 0000

LED ones-bit: AI1 (voltage or current input can be selected via DIP switch on the control board); select AI1 (VS) curve or AI1 (AS) curve via ones-bit of F3.18.
0=ones-bit of F3.18: AI1 is processed according to the AI1 (VS) curve correspondence (F3.00~F3.03), and C-17 is in V units.
1=ones-bit of F3.18: AI1 is processed according to the AI1 (VS) curve correspondence (F3.04~F3.07), and the unit of C-17 is mA.
LED tens-bit: AI2 (voltage or current input can be selected via DIP switch on the control board); select AI2 (VS) curve or AI2 (AS) curve via tens-bit of F3.18.
0=tens-bit of F3.18: AI2 is processed according to the AI2 (VS) curve correspondence (F3.09~F3.12), and C-18 is in V units.
1=tens-bit of F3.18: AI2 is processed according to the AI2 (VS) curve correspondence (F3.13~F3.16), and the unit of C-18 is mA.
LED ones-bit: AI1
LED tens-bit: AI2
0: linear curve as default, the common two-point straight line. Please refer to the "analog given frequency schematic" above.
1: Curve1 Multi-point broken line, see function codes [F3.32~F3.39] for details.
2: Curve2 Multi-point broken line, see function codes [F3.40~F3.47] for details.

F3.32	Curve 1 lower limit	Range: 0.00V~10.00V	Default: 0.00V
F3.33	Curve 1 lower limit percentage	Range: 0.00%~100.00%	Default: 0.00%
F3.34	Curve 1 inflection point1 input voltage	Range: 0.00V~10.00V	Default: 3.00V
F3.35	Curve 1 inflection point1 percentage	Range: 0.00%~100.00%	Default: 30.00%
F3.36	Curve 1 inflection point2 input voltage	Range: 0.00V~10.00V	Default: 6.00V
F3.37	Curve 1 inflection point2 percentage	Range: 0.00%~100.00%	Default: 60.00%
F3.38	Curve 1 upper limit	Range: 0.00V~10.00V	Default: 10.00V
F3.39	Curve 1 upper limit setting	Range: 0.00%~100.00%	Default: 100.00%
F3.40	Curve 2 lower limit	Range: 0.00V~10.00V	Default: 0.00V

F3.41	Curve 2 lower limit percentage	Range: 0.00%~100.00%	Default: 0.00%
F3.42	Curve 2 inflection point1 input voltage	Range: 0.00V~10.00V	Default: 3.00V
F3.43	Curve 2 inflection point1 percentage	Range: 0.00%~100.00%	Default: 30.00%
F3.44	Curve 2 inflection point2 input voltage	Range: 0.00V~10.00V	Default: 6.00V
F3.45	Curve 2 inflection point2 percentage	Range: 0.00%~100.00%	Default: 60.00%
F3.46	Curve 2 upper limit	Range: 0.00V~10.00V	Default: 10.00V
F3.47	Curve 2 upper limit setting	Range: 0.00%~100.00%	Default: 100.00%

Curve 1 and Curve 2 can be set with two inflection points and divided into three linear sections, each with a distinct slope for enhanced adaptability, as illustrated below:



Multipoint curve diagram

If either AI1 or AI2 selects Curve 1 or Curve 2, the corresponding current must be converted into voltage to establish a proportional relationship between current and voltage (current value is twice the voltage); specifically, 4mA should correspond to 2V, and 20mA to 10V.

Note: For [F3.32, F3.34, F3.36, F3.38] and [F3.40, F3.42, F3.44, F3.46], voltage input values and the corresponding set values must be set in an incremental relationship.

F3.53	AO signal type	Range: 0000~0022	Default: 0000

LED ones-bit: AO1

0: 0V~10V

1: 4.00mA~20.00mA

2: 0.00mA~20.00mA

LED tens-bit: reserved

0: 0V~10V

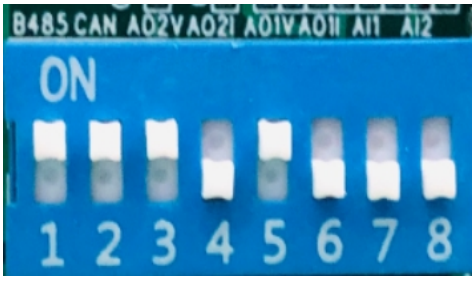
1: 4.00mA~20.00mA

2: 0.00mA~20.00mA

LED hundreds-bit: reserved

LED hundreds-bit: reserved

After selecting the output mode for the parameter, please choose the control board's changeover switch S1 on/off mode as follows:

Tag	Position	Function
	AO2V-ON	0V~10V voltage output from AO interface
	AO2I-ON	0mA~20mA or 4mA~20mA current output from AO interface
	AO1V-ON	0V~10V voltage output from AO interface
	AO1I-ON	0mA~20mA or 4mA~20mA current output from AO interface

F3.54	AO1 selection	Range: 0~20	Default: 1
F3.55	AO2 selection	Range: 0~20	Default: 2

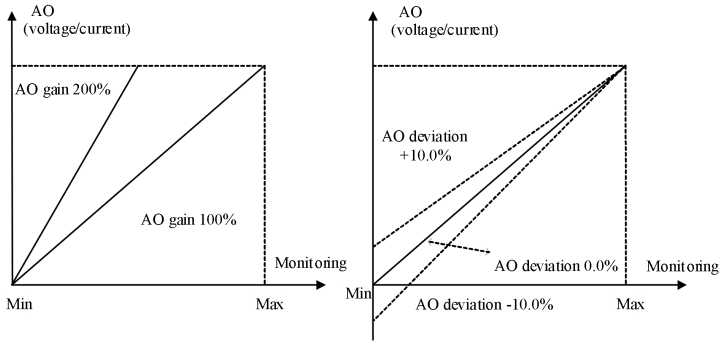
It is used to set the AC drive monitoring items corresponding to the AO1 (multifunction output terminal). The signal output from AO1 terminal is set by ones-bit of [F3.53].

Set value	Monitoring item	Description	Min. AO	Max. AO
0	Given frequency	Correspond to the current given frequency of the AC drive	Min. output corresponds to 0.00 Hz	Max. output corresponds to max. frequency
1	Output frequency	Correspond to the current output frequency of the AC drive	Min. output corresponds to 0.00 Hz	Max. output corresponds to max. frequency
2	Output current	Correspond to the actual output current of the AC drive	Min. output corresponds to 0.00A	Max. output corresponds to 2 times the rated current of the motor
3	Input voltage	Correspond to the current input voltage of the AC drive	Min. output corresponds to 0V	Max. output corresponds to 2 times the rated voltage of the AC drive
4	output voltage	Correspond to the current output voltage of the AC drive	Min. output corresponds to 0V	Max. output corresponds to the rated voltage of the motor
5	Mechanical speed	Correspond to the mechanical speed corresponding to the current output frequency of the AC drive	Min. output corresponds to 0rpm	Max. output corresponds to the speed corresponding to the max. frequency
6	Given torque	Correspond to the current output torque of the AC drive	Min. output corresponds to 0.00% of torque	Max. output corresponds to 200% of torque
7	Output torque	Correspond to the current output torque of the AC drive	Min. output corresponds to 0.00% of torque	Max. output corresponds to 200% of torque
8	Given via PID	Correspond to the current PID given value of the AC drive	Min. output corresponds to 0.00% of the PID given value	Max. output corresponds to 100% PID given value
9	PID feedback	Correspond to the current PID feedback of the AC drive	Min. output corresponds to 0.00% PID feedback	Max. output corresponds to 100% PID feedback
10	Output power	Correspond to the current motor output power	Min. output corresponds to 0 power	Max. output corresponds to twice the rated output power
11	Bus voltage	Correspond to the current input voltage of the AC drive	Min. output corresponds to 0V	Max. output corresponds to 2 times the rated DC voltage of the AC drive
12	AI1 value	Correspond to the current AI1 of the AC drive	Min. output corresponds to AI1 lower limit	Max. output corresponds to AI2 upper limit
13	AI2 value	Correspond to the current AI2 of the AC drive	Min. output corresponds to AI2 lower limit	Max. output corresponds to AI2 upper limit
14	RST module max. temperature	Correspond to the current module temperature 1 of the AC drive	Min. output corresponds to module temperature 1 of 0 °C	Max. output corresponds to module temperature1 of 100 °C

15	RST module max. temperature	Correspond to the current module temperature 2 of the AC drive	Min. output corresponds to module temperature 2 of 0 °C	Max. output corresponds to module temperature 2 of 100 °C
16	RST module max. temperature	Correspond to the current module temperature 3 of the AC drive	Min. output corresponds to module temperature 3 of 0 °C	Max. output corresponds to module temperature 3 of 100 °C
17	UVW module max. temperature	Correspond to the current module temperature 4 of the AC drive	Min. output corresponds to module temperature 4 of 0 °C	Max. output corresponds to module temperature 4 of 100 °C
18	UVW module max. temperature	Correspond to the current module temperature 5 of the AC drive	Min. output corresponds to module temperature 5 of 0 °C	Max. output corresponds to module temperature 5 of 100 °C
19	UVW module max. temperature	Correspond to the current module temperature 6 of the AC drive	Min. output corresponds to module temperature 6 of 0 °C	Max. output corresponds to module temperature 6 of 100 °C
20	RS485 setting	AO1 address 0x3021/0x2021 AO2 address 0x3022/0x2022	Min. output corresponds to 0	Max. output corresponds to 1000

F3.56	A01 gain	Range: 25.0%~200.0%	Default: 100.0%
F3.57	Expansion card AO1 signal deviation	Range: -10.0%~10.0%	Default: 0.0%
F3.58	A01 filter	Range: 0.000s~6.000s	Default: 0.010s

AO1 gain: used to adjust the value of the analog output from the (AO1) terminal.
AO1 signal deviation: used to adjust the zero point of the (AO1) terminal signal.

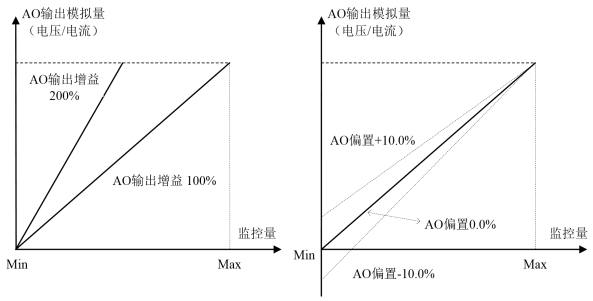


Schematic of analog output, gain and deviation

AO1 filter time: it defines the size of the filter applied to the AO1 signal to remove interference signals. The longer the filter time, the stronger the anti-interference ability, but the response becomes slower; the shorter the filter time, the weaker the anti-interference ability, but the response becomes faster.

F3.59	AO2 gain	Range: 25.0%~200.0%	Default: 100.0%
F3.60	AO2 signal deviation	Range: -10.0%~10.0%	Default: 0.0%
F3.61	AO2 filter	Range: 0.000s~6.000s	Default: 0.010s

AO2 gain: used to adjust the value of the analog output from the (AO2) terminal.
AO2 signal deviation: used to adjust the zero point of the (AO2) terminal signal.



AO schematic of analog output, gain and deviation

AO2 filter time: it defines the size of the filter applied to the AO2 signal to remove interference signals. The longer the filter time, the stronger the anti-interference ability, but the response becomes slower; the shorter the filter time, the weaker the anti-interference ability, but the response becomes faster.

8.5 Group F4: Keyboard Parameters

F4.00	Parameter and key locking	Range: 0~3	Default: 0

0: locking off

Parameter and key locking function is invalid.

1: parameters locked

Lock the set function parameters and disable parameter modification (except for F0.08, which can be modified with the UP/DW key). Parameter modification interface is not accessible from the keyboard, users can select the keyboard monitoring items via the shift key.

All key functions on the keyboard are unlocked.

2: parameters and keys locked (except RUN/STOP)

Lock all the set function parameters and disable parameter modification (including F0.08, which also can’t be modified with the UP/DW key). Parameter modification interface is not accessible from the keyboard, users can't select the keyboard monitoring items via the shift key.

All keys on the keyboard except RUN/STOP are locked.

3: parameters and keys all locked

Lock all the set function parameters and disable parameter modification. Parameter modification interface is not accessible from the keyboard, users can't select the keyboard monitoring items via the shift key.

All keys on the keyboard except PRG are locked.

Tip:

1. Method for unlocking double-line digitron keyboard: press the menu key “PRG” and the first line of the double-line digitron keyboard will display "Code". Then enter the user password (F4.01-user password) on the second line via the UP/DW key and press the "SET" key to unlock it.
2. Method for unlocking single-line digitron keyboard: press the menu key “PRG” and the single-line digitron keyboard will display "Code". Then press the "SET" key, the digitron displays the blinking input cursor, and enter the user password (F4.01-user password) through the UP/DW key. Press the "SET" key again to confirm, and then it can be unlocked.
3. The user password is a protection parameter set for the customer to protect the AC drive parameters from being changed arbitrarily. Please keep the password safe after setting it in case of any subsequent inconvenience when modification of the parameters is required.

F4.01	User passwords	Range: 0~9999	Default: 0

It is used to set the user password. When the parameter and key locking selection [F4.00] is locked (when it is not "0"), this password must be entered to unlock it. The factory default password is 0. Please keep the set password safe.

F4.04	LCD keyboard language	Range: 0~1	Default: 0

0: Chinese

1: English

F4.05	Parameter copy	Range: 0~9999	Default: 0

Set the function parameter copy, the parameter will be changed to "0" automatically after copying.

0: none.

1: AC drive parameter values are transferred to the keypad and saved, copy AC drive F0 to FF parameter group data to the current operating keyboard and save them.
2: parameter values saved in the keyboard are transmitted to the AC drive, and the data already copied in the current operating keyboard are downloaded to the AC drive.

Note:

1. When AC drive is in operation or faulty status or there is no parameter saved in the keyboard, the parameter value saved in the keyboard cannot be transmitted to AC drive.
2. When AC drive parameter values are transmitted to the keyboard and saved, if the keyboard is disconnected it will not complete the copying and the parameter copying operation needs to be performed again.
3. When the parameter values saved in the keyboard are transmitted to the AC drive, if the keyboard is disconnected, it will appear that the previous part of the parameters are modified and the latter part of the parameters are not modified, so it is necessary to carry out this operation again.
4. When the AC drive parameters are transmitted to the keyboard, the current operating status of the AC drive will not be maintained, that is, all keys will be invalid when the parameters saved in the keyboard are transmitted to the AC drive.
5. If an error occurs during parameter copying, the keyboard displays E.COP (parameter copying abnormality), the copy is aborted, and the parameter copying operation needs to be resumed by pressing the PRG key to exit the the interface that displays E.COP and return to the monitoring interface.
6. When the software version is not compatible, it will prompt the error E.EDI, and the parameter values saved by the keyboard cannot be transmitted to the AC drive.

F4.07	REV/JOG key selection	Range: 0~1	Default: 0

It is used to selection the function of REV/JOG key.
0: REV
This key is defined as the reverse key (the keyboard function indicator REV/JOG is off), when the operation command given channel is selected as the keyboard control, press this key and the AC drive will run in reverse.
1: JOG
This key is defined as the jogging key (the keyboard function indicator REV/JOG is on), when the operation command given channel is selected as the keyboard control, press this key and the AC drive will jog.

F4.08	STOP key selection	Range: 0~2	Default: 0

0: non-keyboard control mode off; STOP (the keyboard stop key) can not be used as a stop key to stop the machine when the operation signal is not controlled by the keyboard.
1: stop as stop mode in non-keyboard control; STOP (the keyboard stop key) can be used as a stop key to stop the machine when the operation signal is not controlled by the keyboard, and the AC drive will stop as the stop as stop mode set in [F1.10]
2: stop as free stop in non-keyboard control, STOP (the keyboard stop key) can not be used as a stop key when the operation signal is not controlled by the keyboard, and the AC drive will realize free stop.
Note: If [F4.08] selects 1 or 2, the AC drive will be in the shutdown locked status after pressing the keyboard stop key in terminal control or RS485 control. To make AC drive run again at this time, it must first send a stop command with the selected operation command channel so that the AC drive can run again after the lock status is unlocked.

F4.09	UP/DW key selection	Range: 0000~0212	Default: 0011

LED ones-bit: UP/DW quick modification
0: off; UP/DW quick modification is invalid.
1: adjust F0.08 [Give frequency via keyboard], the UP/DW key provides a quick way to modify [F0.08].
2: adjust FB.01 [PID given/feedback via keyboard], the UP/DW key provides a quick way to modify [FB.01].
LED tens-bit: power-off storage mode
0: frequency not stored in power-down
1: frequency stored in power-down
After quick modification of the parameters via the keyboard UP/DW key and confirmation, select whether or not the AC drive should save the modified value to the corresponding parameter in case of a power outage.
LED hundreds-bit: action limit
0: adjustable in operation and shutdown.
1: adjustable only in operation, maintained in shutdown.
2: adjustable during operation, zeroed after shutdown.
LED thousands-bit: reserved

F4.14	First line keyboard content in operation mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	1201
F4.15	First line keyboard content in operation mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	0302

F4.16	First line keyboard content in shutdown mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	1200
F4.17	First line keyboard content in shutdown mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	0302
F4.18	Second line keyboard content in operation mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	1201
F4.19	Second line keyboard content in operation mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	0302
F4.20	Second line keyboard content in shutdown mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	1200
F4.21	Second line keyboard content in shutdown mode	LED ones-bit and tens-bit: the first group displays 00~69 LED hundreds-bit and thousands-bit: the second group displays 00~69	0302

Keyboard displayed parameters: it is used to set the content of parameters displayed on single-line keyboard and double-line keyboard. According to the selected rectification or inversion mode, the default values of the above parameters are modified.

For example, when F4.14 is set to 0102, first line keyboard in operation mode displays C-01, C-02.

After the displayed content is switched, there is no memory function after power failure, and the content of "F4.14 displayed parameter 1" is displayed by default after power on.

F4.22	Keyboard displayed item	Range: 0000~1111	Default: 0100

LED ones-bit: output frequency display selection

0: target frequency; display the current target frequency of the controlled motor.

1: synchronized frequency; display the output frequency of AC drive after calculation.

LED tens-bit: reserved

LED hundreds-bit: power display dimension It is used to correct the AC drive output power displayed by the C-10, and the unit of the displayed power can be selected:

0: power displayed in percentage (%); the output power is displayed as a percentage, 100.0% is the rated power of the motor.

1: power displayed in kilowatt (kW); display the actual value of the output power.

LED thousands-bit: reserved

F4.23	Monitor display selection	LED ones-bit: C-40~69 LED tens-bit: monitoring group C05 LED hundreds-bit: monitoring group C06 LED thousands-bit: reserved 0: normal display 1: normal display 2: V/F internal parameter 3: vector internal parameter 4: tuning internal parameter 1 5: reserved 6: rectification basic parameter 7: rectification internal parameter 1 8: tuning internal parameter 2 9: expansion parameter 10: test parameter 11: rectification internal parameter 2	3420

For 7523 and the following, the order and serial number of internal monitoring parameter parameter groups are unified to facilitate uniform setting of monitoring parameter groups.

Among them, C04~06 need to be viewed in the virtual oscilloscope of VEICHI's host computer software.

F4.24	Speed display coefficient	Range: 0.0%~500.0%	Default: 100.0%

This parameter sets the displayed coefficient of the keyboard monitoring item " mechanical speed ", 100.0% corresponds to the motor's rated speed.

F4.25	Power display coefficient	Range: 0.0%~500.0%	Default: 100.0%

This parameter sets the displayed coefficient ratio of the keyboard monitoring item " output power"; for example, if the output power is 10% of the motor's rated value, when F4.25 is set to 100.0%, C-10 displays 10.0%; when 50.0% is set, C-10 displays 5.0%.

F4.26	Alarm selection1	Range: 0000~0001	Default: 0000

LED ones-bit: E. EEP fault (EEPROM memory fault)

0: alarm and free stop

1: alarm and continue running

F4.27	Reserved

LED tens-bit, hundreds-bit and thousands-bit: reserved

F4.28	Fan control	Range: 0~2	Default: 1

It is used to select the fan operation mode (when FF.01=0, the output contactor is in fan control).

0: fan runs after the drive is powered up. The fan runs when the AC drive is powered up, regardless of the module temperature;

1: shutdown is temperature-dependent, AC drive running means the fan is running. Whether the fan runs during shutdown is related to the module temperature, the fan runs when the temperature exceeds 50 °C, otherwise the fan stops after a delay of 30 seconds. Fan running with 1s delay when AC drive is running;

2: AC drive shutdown means fan stops, operation is temperature-dependent. Whether the fan runs or not during AC drive operation is related to the module temperature, the fan runs immediately when the temperature exceeds 50 °C, otherwise the fan stops after a delay of 30 seconds. Fan stops with 30s delay during shutdown.

Tip: Correct use of this feature can effectively extend the service life of the cooling fan.

F4.29	Dynamic brake	Range: 0~2	Default: 0

It is used as a switch for motor dynamic brake.

0: off. The AC drive does not control the motor with dynamic braking regardless of the bus voltage;

1: on, with overvoltage suppression off. When the bus voltage exceeds the dynamic braking action voltage, AC drive carries out dynamic braking control on the motor, and over-voltage suppression function is off at this time;

2: dynamic braking and overvoltage suppression are both on. When the bus voltage exceeds the dynamic braking action voltage, AC drive carries out dynamic braking control on the motor, and over-voltage suppression function is on at the same time;

F4.30	Dynamic brake voltage	Range: 115.0%~140.0%	Default: model setting

Dynamic brake action voltage:

It is defined that when the AC drive DC bus voltage rises and exceeds [F4.30], the AC drive dynamic braking begins to act. This function is only valid for machines with a built-in brake assembly;

Tip: When using the dynamic braking function, please turn off the over-voltage suppression function and set FA.06 to 0; otherwise, it may suppress the rise of bus voltage and the dynamic braking action point will not be reached.

F4.32	Inversion-side PWM carrier frequency	Range: 0.7kHz~16.0kHz	Default: model setting

It is used to set the switch frequency of the IGBT on the AC drive inversion side. Set this parameter to adjust electromagnetic noise and reduce leakage current. This function is mainly used to reduce the noise and vibration that may occur during AC drive operation. When the carrier frequency is higher, the current waveform is more ideal and the motor noise is low. It is ideal for scenarios that require silence. Despite this, the switching loss of key components is up, which causes increased heat generation throughout the whole machine, decreased efficiency, and diminished output. At the same time radio interference is large, high carrier frequency operation increases capacitive leakage current. And false operation or overcurrent may be caused by the leakage protector installation. During low carrier frequency operation, it is the opposite of the above phenomenon.

Different motors respond differently to the carrier frequency. The optimum carrier frequency is obtained by adjusting the frequency according to the actual situation. For increased motor capacity, a lower carrier frequency should be selected.

VEICHI reserves the right to limit the maximum carrier frequency.

Carrier frequency	Motor noise	Electrical interference	Radiator temperature
Low ↓ High	Large ↓ Small	Small ↓ Large	Small ↓ Large

Tip: In order to obtain better control characteristics, the ratio of carrier frequency to the highest running frequency of AC drive is recommended not to be lower than 36. If the AC drive works in low frequency band for a long time, it is recommended to reduce the carrier frequency to minimize the effect of dead time.

Note: When the carrier frequency is higher than the factory setting, the rated power of AC drive should decrease by 5% for every 1kHz increase in carrier frequency.

F4.33	Inversion-side PWM control mode1	Range: 0000~1111	Default: 1110

LED ones-bit: carrier dependency on temperature

0: independent of temperature

1: dependent of temperature

When the AC drive overheats, it will automatically reduce the carrier frequency; this function reduces the switching loss of the power devices and prevents frequent alarms for overheating faults of the AC drive.

LED tens-bit: carrier dependency on output frequency

0: independent of output frequency

1: dependent of output frequency

When the association between carrier and output frequency is valid, AC drive can automatically adjust the carrier frequency according to the output frequency, and this function can improve the low-frequency performance of AC drive and the mute effect of high frequency.

LED hundreds-bit: reserved

LED thousands-bit: PWM modulation mode Select the PWM mode of the AC drive.

0: three-phase modulation only

1: automatic switch between two-phase and three-phase modulation

8.6 Group F5: Motor Parameters

F5.00	Type	Range: 0~1	Default: 0

Type: read-only parameter, it indicates the current motor type. It is determined by the motor control mode [F0.00].

0: asynchronous motor (AM)

1: permanent magnet synchronous motor (PM)

F5.01	Pole number	Range: 2~98	Default: 4

Set the motor pole number. Set the parameter according to the motor nameplate.

F5.02	Rated power	Range: 0.1kW~1000.0kW	Default: model setting

Set the motor rated power in units of 0.1kW. Each time the motor power is changed, the AC drive automatically adjusts the corresponding parameter as the default value of [F5.03~F5.11]. If parameter auto-tuning is performed, the values of [F5.07~F5.11] will be changed automatically according to the results of auto-tuning. When high accuracy motor control is required, be sure to perform motor parameter auto-tuning with motor parameters [F5.01~F5.06] are set correctly.

F5.03	Rated frequency	Range: 0.01Hz~max. frequency	Default: model setting

Set the rated frequency of the motor. Set the parameter according to the rated frequency recorded on the motor nameplate. If the motor rated frequency is greater than 50Hz, it is necessary to make the maximum frequency and upper limit frequency consistent with motor rated frequency, and then change the motor rated frequency.

F5.04	Rated speed	Range: 1rpm~65000rpm	Default: model setting

Set the motor rated speed according to the rated current value recorded on the motor nameplate.

F5.05	Rated voltage	Range: 1V~1311V	Default: model setting

Set the motor rated voltage according to the rated current value recorded on the motor nameplate.

F5.06	Rated current	Range: 0.1A~3000.0A	Default: model setting

Set the motor rated current according to the rated current value recorded on the motor nameplate.

F5.07	AM no-load current	Range: 0.01A~3000.0A	Default: model setting
F5.08	AM stator resistance	Range: 0.01%~50.00%	Default: model setting
F5.09	AM rotor resistance	Range: 0.01%~50.00%	Default: model setting
F5.10	AM stator leakage inductance	Range: 0.01%~50.00%	Default: model setting
F5.11	AM stator inductance	Range: 0.1%~2000.0%	Default: model setting

For AM model parameters, when [F5.20] is set for parameter auto-tuning, the contents of [F5.07 to F5.11] will be changed automatically. If the accurate motor model parameters are known, the motor model parameters can also be entered manually for debugging with no need of parameter auto-tuning.

F5.12	PM stator resistance	Range: 0.01%~50.00%	Default: model setting
F5.13	PM D-axis inductance	Range: 0.01%~400.00%	Default: model setting
F5.14	PM Q-axis inductance	Range: 0.01%~400.00%	Default: model setting
F5.15	PM back emf	Range: 1V~3500V	Default: model setting

For PM model parameters, the PM back emf indicates the line-to-line voltage measured on the motor stator when the motor rotor speed is the rated frequency speed; the motor model parameters are automatically identified and modified during the auto-tuning. [F5.15] can only be identified under rotary auto-tuning.

F5.16	PM encoder installation angle	Range: 0.0°~360.0°	Default: model setting

This parameter is required to detect the rotor pole position when the PM is running under PG vector (F0.00=7) control. There is no need to adjust this parameter as it will be automatically recognized and modified during parameter auto-tuning.

F5.20	Motor parameter auto-tuning selection	Range: 0~3	Default: 0

0: none

Motor auto-tuning is off. Motor parameters are set as default.

1: rotary auto-tuning

Before using auto-tuning, make sure the nameplate parameters of the controlled motor [F5.01~F5.06] are entered correctly. During rotary auto-tuning, motor parameters such as stator and rotor resistances, and stator and rotor inductances (PM D-axis and Q-axis inductances) are automatically measured while the motor is in idle status. In motor rotation, the no-load current and mutual inductance (PM rated back emf.) are automatically measured. These measured parameters are then auto-updated in the function code upon completion of the rotary auto-tuning. After the parameters are set, press the RUN key on the keyboard to start the rotary auto-tuning. At this time, the keyboard displays "t-01", the motor stops automatically upon completion of parameter auto-tuning, and AC drive returns to standby mode.

2: static auto-tuning

Before using auto-tuning, make sure the nameplate parameters of the controlled motor [F5.01~F5.06] are entered correctly. During static auto-tuning, the motor is in an idle status. At this time, the stator resistance, the rotor resistance, and stator and rotor inductances (PM D-axis and Q-axis inductances) are automatically measured. These measured parameters are then auto-updated in the function code. After the parameters are set, press the RUN key on the keyboard to start the static auto-tuning. At this time, the keyboard displays "t-01", the motor indicator is off upon completion of parameter auto-tuning, and AC drive returns to standby mode.

3: stator resistance auto-tuning

Before using auto-tuning, make sure the nameplate parameters of the controlled motor [F5.01~F5.06] are entered correctly. During the stator resistance auto-tuning, the motor is in an idle status. At this time, the stator resistance of the motor is measured automatically.

Tip: F5.20 will be automatically set to "0" upon the completion of parameter auto-tuning.

Note:

1. Before setting [F5.20] to "1" for rotary auto-tuning, please remove the load from the motor shaft if possible. Do not perform rotary auto-tuning with a heavy load on the motor, as it may cause the AC drive to report an auto-tuning fault. For optimal learning accuracy, it is advisable to keep the load light: asynchronous motor should operate below 30% of its rated load, while synchronous motors should stay under 20%.
2. In some cases (e.g., when the motor cannot be detached from the load, etc.), the static auto-tuning can be selected when it is not convenient to carry out the rotary auto-tuning. For asynchronous motors, static auto-tuning enables all motor parameter to be tuned except for the encoder parameters, while the encoder direction needs to be entered manually if AM closed-loop vector mode is running. For synchronous motors, the motor back emf [F5.15] needs to be set after the static auto-tuning is completed. If closed-loop vector control is selected, the PM will run at a lower frequency for several cycles during the auto-tuning process in order to acquire the encoder angle parameter regardless of whether it is a static auto-tuning or a dynamic auto-tuning.
3. Users are not recommended to manually enter motor parameters as they are displayed in the form of per-unit value, and in most cases, the open-loop vector mode is enabled in static auto-tuning. In V/F control, the motor parameter auto-tuning will further optimize the automatic torque boost and slew rate compensation functions.
4. Before starting the auto-tuning, make sure that the motor is in the stop status, otherwise the auto-tuning can not be carried out normally.
5. When [F5.20] is set to "1", if over-voltage and over-current faults occur during auto-tuning, the acc./dec. time [F0.14, F0.15] can be extended accordingly.
6. If AC drive auto-tuning fails, report E.TE1 fault.

F5.21	PM magnetic pole search	Range: 0000~3112	Default: 3110

LED ones-bit: closed-loop vector

0: off

1: on

2: on, start only for the first power-up

LED tens-bit: open-loop vector

0: off

1: on

2: on, start only for the first power-up

PM control is valid, and the initial position of the motor rotor can be obtained at startup via the pole search function. In closed-loop vector mode, the motor startup initial position is required to be obtained via this function when the initial position of the motor encoder has not been learned. In open-loop vector mode, obtaining the motor initial position ensures a high output at startup and that the motor does not run in reverse.
For synchronous closed-loop applications with ABZ encoder, the motor pole position is unknown until the Z-pulse is detected, so it is recommended to enable the pole search function, which ensures a smooth start-up process without reverse rotation.

F5.22	PM magnetic pole search	0.0%~400.0%	100.0%

In the PM control mode, the initial position of the motor rotor can be obtained at startup by the pole search function.

In closed-loop vector mode, the motor startup initial position is required to be obtained via this function when the initial position of the motor encoder has not been learned.

In open-loop vector mode, obtaining the motor initial position ensures a high output at startup and that the motor does not run in reverse

For synchronous closed-loop applications with ABZ encoder, the motor pole position is unknown until the Z-pulse is detected, so it is recommended to enable the pole search function, which ensures a smooth start-up process without reverse rotation

F5.30	Speed feedback or encoder type	Range: 0000~1111	Default: 1000

LED ones-bit: encoder type; set the encoder type according to the actual setting of the selected encoder.
0: common ABZ encoder
1: rotary transformer
LED tens-bit: encoder direction; when the motor speed and the encoder speed measurement direction are not consistent, exchange the direction by setting this parameter.
0: in the same direction
1: in the opposite direction
LED hundreds-bit: disconnection detection; with disconnection detection is on, the AC drive will report an encoder fault and shut down when the encoder is found disconnected.
0: off
1: on
LED thousands-bit: Z-pulse correction enabling
0: off
1: on

F5.31	ABZ encoder line number	Range: 1~10000	Default: 1024

ABZ encoder line number: it is used to set the number of output pulses per cycle for the speed feedback sensor. Please set it correctly according to the sensor specifications.

F5.32	Disconnection detection time	Range: 0.000s~60.000s	Default: 0.500s

Disconnection detection time: It is used to set the time of delay for confirming the sensor disconnection when the sensor disconnection detection is on. When it is set to 0sec, it means the disconnection detection function is off.

F5.33	Rotary transformer pole number	Range: 2~128	Default: 2

Rotary transformer pole number: set it according to the actual selected rotary transformer. Generally, it is a 2-pole rotary transformer.

F5.34	Encoder transmission ratio numerator	Range: 1~32767	Default: 1
F5.35	Encoder transmission ratio denominator	Range: 1~32767	Default: 1

To enable closed-loop vector function, motor speed and position can be derived indirectly via transmission ratio settings if the motor encoder is not directly mounted on the motor shaft. However, a rigid connection between the motor shaft and encoder is essential, and the encoder must have sufficient lines in synchronous motor control.
The transmission ratio should be controlled within the range of 100~0.01, otherwise the AC drive will report abnormal PG parameters.

F5.36	Encoder speed measurement first-order filter	Range: 0.0ms~100.0ms	Default: 1.0ms

If the motor encoder feedback interference is large, the filter time of the speed measurement can be appropriately increased. But the increase of the filter time will reduce the response performance of the system. In some cases of high requirements on the response performance, long filter time will lead to system oscillation.

F5.39	PG feedback monitoring selection	Ones-bit: C-29 monitors PG feedback speed 0: invalid, 1: valid	Default: 0000

8.7 Group F6: Vector Control Parameters

F6.00	ASR (speed loop) high-speed proportional gain	Range: 0.01~100.00	Default: 4.00
F6.01	ASR (speed loop) high-speed integral time	Range: 0.000~6.000	Default: 0.500
F6.02	ASR high-speed filter time	Setting range: 0.0ms~100.0ms	Factory value: 0.0ms
F6.03	ASR high-speed switching frequency	Range: [F6.07]~max. frequency	Default: 0.00Hz
F6.04	ASR (speed loop) low-speed proportional gain	Range: 0.01~100.00	Default: 10.00
F6.05	ASR (speed loop) low-speed integral time	Range: 0.000s~6.000s	Default: 0.100s
F6.06	ASR low-speed filter time	Setting range: 0.0ms~100.0ms	Factory value: 0.0ms
F6.07	ASR low-speed switching frequency	Range: 0.00Hz~[F6.03]	Default: 0.00Hz

Setting of proportional gain and integral time of ASR (speed loop): increasing the proportional gain can enhance the system's dynamic response, but an excessively high proportional gain may lead to system oscillation. Decreasing the integral time can accelerate the system's dynamic response; however, an excessively short integral time may lead to system overshoot and a tendency toward oscillation. Start by setting the proportional gain high enough to avoid oscillation; then adjust the integral time for a quick response with minimal overshoot.

Note: If the proportional gain is too high and the integral time too short, an overvoltage fault may occur in the system (especially without an external braking resistor or unit) when the system is quickly started and accelerated to a high speed. This is due to energy feedback from regenerative braking during deceleration after overshooting the set speed. This can be avoided by turning down the proportional gain and increasing the integral time.

Adjustment of proportional gain and integral time of ASR (speed loop) for high and low speed operation:

When ASR switching frequency 1 [F6.03] is zero, only gain parameter group 1 is valid, that is, [F6.00] to [F6.02]. For most applications, the requirements can be met with only one set of gain parameters. When the system has different requirements for high and low speed operation with load, the switching of two sets of gain parameters can be realized by setting the ASR switching frequencies [F6.03] and [F6.07].

When the system is operated at low frequency, usually, by increasing the proportional gain and decreasing the integral time relatively can improve the dynamic response characteristics. The speed regulator parameters are generally adjusted in the following order: Select the appropriate switching frequencies ([F6.03] and [F6.07]). The first group of ASR (speed ring) parameters is valid when the output frequency is above the switching frequency 1 [F6.03]. The second group of ASR (speed loop) parameters is valid when the output frequency is below the switching frequency 2 [F6.07]. When the output frequency is between switching frequency 1 [F6.03] and switching frequency 2 [F6.07], the parameter transitions proportionally and linearly from the first group to the second group. Adjust the ASR (speed loop) proportional gain2 [F6.04] and ASR (speed loop) integral time2 [F6.05] at low speeds to prevent oscillations and achieve optimal dynamic response at low-frequency operations. Adjust the ASR (speed loop) proportional gain1 [F6.00] and ASR (speed loop) integral time1 [F6.01] at high speeds to prevent oscillations from the system and achieve optimal dynamic response. When switching frequency 1 [F6.03] is set to zero, only use the first group of speed loop parameters.

F6.08	Torque limit in drive mode	Range: 0.0%~400.0%	Default: 180.0%
F6.09	Torque limit in power generation mode	Range: 0.0%~400.0%	Default: 180.0%

Set the output upper limit of the motor torque. The percentage corresponds to the rated torque of the motor, and is valid under vector mode. The motor torque output is also limited by the AC drive output current limit point [FA.01] and the output power [F6.27], as described in the function code.

F6.10	Current loop D-axis proportional gain	Range: 0.001~4.000	Default: 0.400
F6.11	Current loop D-axis integral gain	Range: 0.001~4.000	Default: 1.000
F6.12	Current loop Q-axis proportional gain	Range: 0.001~4.000	Default: 0.400
F6.13	Current loop Q-axis integral gain	Range: 0.001~4.000	Default: 1.000

Set the PI parameters of the current loop for AM and PM vector controls. In vector control, if the speed and current oscillations and instability occur, the gains can be accordingly reduced to stabilize the speed and current; on the other hand, increasing the gains helps to improve the dynamic response of the motor.

F6.15	Vector slip compensation	Range: 0.0%~250.0%	Default: 100.0%

When AM vector control is valid, the slip compensation coefficient is used to adjust the motor accuracy at a stable speed in the open-loop vector control. The value should be increased when the motor speed in the with-load cases is lower than the set value, vice versa. Recommended range for this parameter: 60.0%~160.0%.

For closed-loop vector mode, the slip compensation coefficient is used to adjust the linearity of the motor output torque and output current. For a motor with a rated load, decrease the value when the motor current is higher than the nameplate rated value. Increase the value when the motor current is smaller than the nameplate rating. Recommended range for this parameter: 80%~120%.

F6.16	Vector starting torque limit	Range: 0.0%~250.0%	Default: 0.0%

Set the initial value of the starting torque to improve the vector control starting torque.

F6.27	Motor shaft power limit	Range: 0.0%~250.0%	Default: 200.0%

It refers to the size of the controlled motor's shaft output power under vector control. When the motor is running at low and medium speeds, the motor output power is small, and at this time the motor torque is mainly limited by the torques in drive/power generation modes [F6.08~F6.09]. When it is running at high speed and above the rated speed, the output power is limited by [F6.27], and the motor torque output decreases inversely proportional to the speed.

F6.28	Motor flux weakening current upper limit	Range: 0.0%~250.0%	Default: 60.0%
F6.29	Motor flux weakening feed-forward gain	Range: 0.0%~200.0%	Default: 10.0%
F6.30	Motor flux weakening gain	Range: 0.0%~500.0%	Default: 10.0%

For AM and PM vector control modes, 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 adopt flux weakening control of the motor for the motor, so as to make the motor speed track the set speed.

[F6.28] can be used to set the upper limit of demagnetization current and is valid for PM. But an irreversible demagnetization of the motor will occur if the flux weakening current is too large. Normally, this will not happen if the field-weakening current is within the rated range.

[F6.29~F6.30] can be used to set parameters of field-weakening control. Adjust these parameters when instability occurs in the field weakening process.

F6.32	MTPA gain	Range: 0.0%~400.0%	Default: 100.0%
F6.33	MTPA filter time	Range: 0.0ms~100.0ms	Default: 1.0ms

MTPA function is to optimize the PM excitation to maximize the motor output/motor current. When there is a big difference between the inductance of D and Q axes of the PM motor, [F6.32] can be used to reduce the motor current in the case of the same loads; [F6.33] can be used to improve the stability of the motor operation. This function is only valid for the PM closed-loop vector mode.

F6.35	Low frequency pull-in current	Range: 0.0%~50.0%	Default: 30.0%
F6.36	High frequency pull-in current	Range: 0.0%~50.0%	Default: 10.0%
F6.37	Pull-in current frequency	Range: 0.0%~100.0%	Default: 10.0%

When PM open-loop vector control is valid, the current corresponds to the rated motor current, the frequency corresponds to the rated motor frequency, and the pull-in current is mainly used to improve the motor's load carrying capacity at low frequencies. The pull-in current frequency [F6.37] serve as the boundary between high and low frequencies. When the low-frequency load is large, increase the pull-in current at low frequency appropriately. But a too large pull-in current will impair the operating efficiency of the motor, please set the value according to the actual load.

8.8 Group F7: Torque Control Parameters

F7.00	Torque/speed control	Range: 0~1	Default: 0

0: speed control; the speed is used as the control quantity, and the AC drive coordinates with the system's usage demand, and the speed output control is used to satisfy the system's speed demand;

1: torque control; this option is only valid under vector control. Torque output control takes the size of motor torque output as the main control target and adjusts the output torque to realize control, which is mainly used in tension equipment and torque required equipment.

Note: Basic parameter groups F0.03-F0.07, F0.10-F0.16 are valid only in speed mode. For frequency control in torque mode, see F7.10-F7.13 for details.

F7.01	Torque setting channel selection	Range: 0~7	Default: 0

The torque setting adopts relative value, 100.0% corresponds to the motor rated torque. The setting range 0.0% to 200.0% indicates that the maximum torque of AC drive is 2 times the AC drive rated torque.

0: keyboard number setting; when this option is selected, the torque value is given by function code [F7.02];

1: reserved;

2: AI1 current/voltage setting; the value is given by AI1 current/voltage setting. The voltage or current input can be

selected by the switch on the control board;
3: AI2 current/voltage setting; the value is given by AI2 current/voltage setting. The voltage or current input can be selected by the switch on the control board;
6: RS485 communication setting; the value is given by RS485 serial communication, the communication address is 0x3005/0x2005;
7: CAN communication.

F7.02	Torque setting via keyboard	Range: 0.0%~100.0%	Default: 0.0%

When [F7.01] = 0, the torque is given by [F7.02].

F7.03	Torque input lower limit	Range: 0.00%~100.00%	Default: 0.00%
F7.04	Lower limit corresponding setting	Range: -250.00%~250.00%	Default: 0.00%
F7.05	Torque input upper limit	Range: 0.00%~250.00%	Default: 100.00%
F7.06	Upper limit corresponding setting	Range: -250.00%~250.00%	Default: 100.00%
F7.07	Given first-order filter time	Range: 0.000s~6.000s	Default: 0.010s

The given torque is derived from the linear relationship between the value of the torque setting channel and the given torque via [F7.03~F7.06].
Given first-order filter time: the given torque value is processed through a filtering system to ensure a smooth change of the given torque.

F7.08	Output torque upper limit	Range: 0.0%~250.0%	Default: 150.0%
F7.09	Output torque lower limit	Range: 0.0%~250.0%	Default: 0.0%

Output torque upper limit: it is used to set the upper limit of output torque for torque control; actual upper limit output torque = rated torque * F7.08.
Output torque lower limit: it is used to set the lower limit of output torque for torque control; actual lower limit output torque = rated torque * F7.09.

F7.10	Forward running speed limit	Range: 0~7	Default: 0

This parameter is the frequency control channel in the torque mode and is used to limit the forward maximum running frequency of the AC drive.
In case of AC drive torque control, if the load torque is less than the motor output torque, the motor speed will keep increasing. To prevent accidents such as galloping from the machinery system, it is necessary to limit the maximum speed of the motor in torque control.
0: keyboard number setting; it is given by function code [F7.12];
1: reserved;
2: AI1×F7.12; the value is given by AI1 current/voltage setting. The voltage or current input can be selected by the switch on the control board;
3: AI2×F7.12; the value is given by AI2 current/voltage setting. The voltage or current input can be selected by the switch on the control board;
6: RS485 communication setting×F7.12; the value is given by RS485 serial communication, the communication address is 0x3006/0x2006;
7: CAN communication×F7.12.
Note: 100.0% setting for each channel corresponds to the maximum frequency F0.09.
It is the forward direction when the AC drive given torque is ranging from 0% to 250%, the direction of AC drive operation is not related to F0.16.
It is the reverse direction when the AC drive given torque is ranging from 0% to -250%, the direction of AC drive operation is not related to F0.16.

F7.11	Reverse running speed limit	Range: 0~7	Default: 0

0: keyboard number setting; it is given by function code [F7.13];
1: reserved;
2: AI1×F7.13; the value is given by AI1 current/voltage setting. The voltage or current input can be selected by the switch on the control board;
3: AI2×F7.13; the value is given by AI2 current/voltage setting. The voltage or current input can be selected by the switch on the control board;
6: RS485 communication setting×F7.13; the value is given by RS485 serial communication, the communication address is 0x3007/0x2007;
7: CAN communication × F7.13.
Note: 100.0% setting for each channel corresponds to the maximum frequency F0.09.
It is the forward direction when the AC drive given torque is ranging from 0% to 200%, the direction of AC drive operation is not related to F0.16.
It is the reverse direction when the AC drive given torque is ranging from 0% to -200%, the direction of AC drive operation is not related to F0.16.

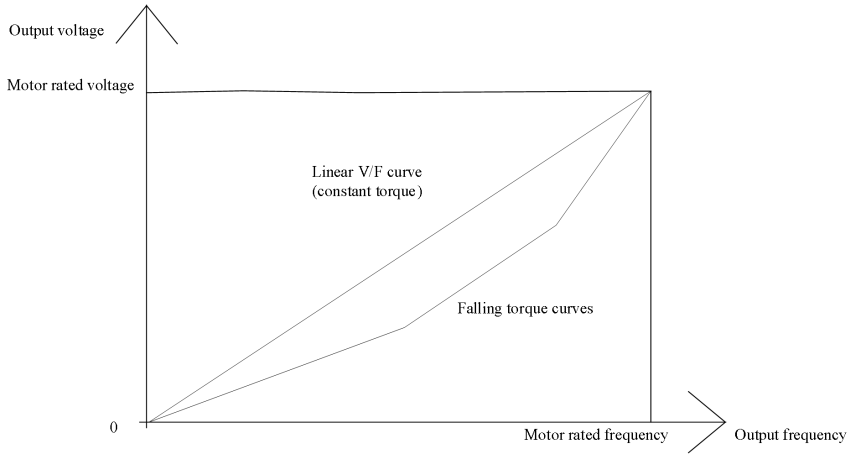
F7.12	Max. forward running speed limit	Range: 0.0%~100.0%	Default: 100.0%
F7.13	Max. reverse running speed limit	Range: 0.0%~100.0%	Default: 100.0%

When function codes [F7.10] and [F7.11] are set to 0, the maximum speed limit will be set by [F7.12] and [F7.13]. To prevent initial commissioning of the torque function, a default of 100.0% for a lesser speed setting occurs, acting as a protection.

8.9 Group F8: V/F Control Parameters

F8.00	V/F curve selection	Range: 0~11	Default: 0

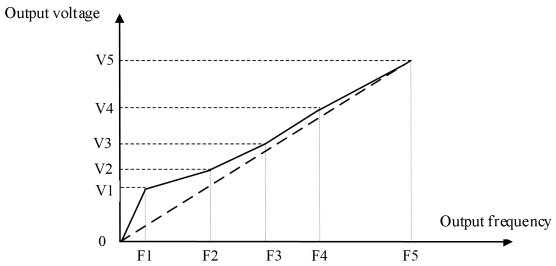
This parameter is used to select the type of V/F curve according to different load characteristics.
0: linear V/F curve;
1~9: reserved;
10: square V/F curve;
11: customized V/F curve; See [F8.01~F8.10];
The linear V/F curve by default is suitable for most general-purpose applications. The multiple power curve and square V/F curve are generally used for fans or pumps. It can reduce the high-frequency current and achieve energy-saving effect.



The schematic diagram of linear V/F and falling torque curves

F8.01	V1 (self-setting voltage)	Range: 0.0%~100.0%	Default: 3.0%
F8.02	F1 (self-setting frequency)	Range: 0.00Hz~max. frequency	Default: 1.00Hz
F8.03	V2 (self-setting voltage)	Range: 0.0%~100.0%	Default: 28.0%
F8.04	F2 (self-setting frequency)	Range: 0.00Hz~max. frequency	Default: 10.00Hz
F8.05	V3 (self-setting voltage)	Range: 0.0%~100.0%	Default: 55.0%
F8.06	F3 (self-setting frequency)	Range: 0.00Hz~max. frequency	Default: 25.00Hz
F8.07	V4 (self-setting voltage)	Range: 0.0%~100.0%	Default: 78.0%
F8.08	F4 (self-setting frequency)	Range: 0.00Hz~max. frequency	Default: 37.50Hz
F8.09	V5 (self-setting voltage)	Range: 0.0%~100.0%	Default: 100.0%
F8.10	F5 (self-setting frequency)	Range: 0.00Hz~max. frequency	Default: 50.00Hz

The self-setting V/F curve:



Customized curve schematic

The 1st/ 2nd/ 3rd/ 4th/ 5th voltage percentage of the user-set V/F curve take 100.0% of the AC drive rated output

voltage as the reference, and respectively correspond to the frequency point of F1/F2/F3/F4/F5; the 1st/ 2nd/ 3rd/ 4th/ 5th frequency value of the user-set V/F curve corresponds to V1/V2/V3/V4/V5, respectively. The group parameter settings must satisfy the following conditions:
0≤F1≤F2≤F3≤F4≤F5≤max. frequency; 0≤V1≤V2≤V3≤V4≤V5≤100.0%
V1/V2/V3/V4/V5 take the rated voltage of the motor as a reference.

F8.11	output voltage percentage	Range: 25.0%~120.0%	Default: 100.0%

The output voltage regulation coefficient of the AC drive. This function is used to adjust the output voltage of the AC drive for different V/F characteristics.

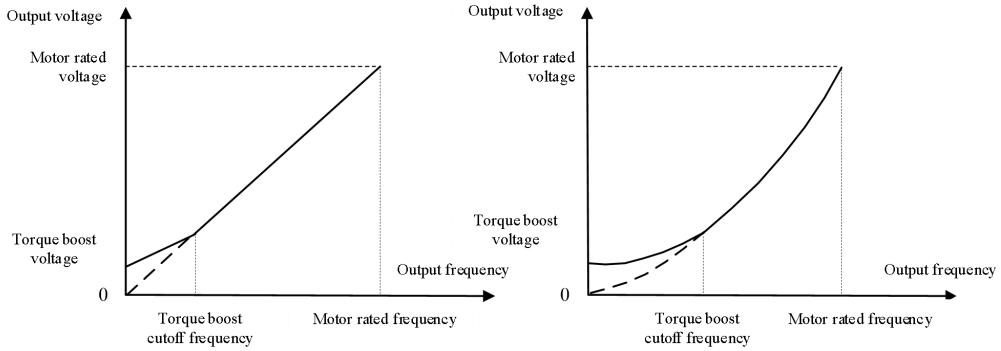
F8.12	Torque boost	Range: 0.0%~30.0%	Default: 1.0%
F8.13	Torque boost cutoff frequency	Range: 0.0%~100.0%	Default: 100.0%

Torque boost: when [F8.12] is set to 0.0, it is the automatic torque boost, which automatically compensates the output voltage according to the size of the load; when [F8.12] is set to any other value, it is the fixed torque boost, which compensates the output voltage according to the output frequency to improve the low-frequency torque characteristic of AC drive. Please select the torque boost according to the load size. If the torque boost is too high during low frequency operation, the motor may be overexcited and overheated after long time operation, and in some serious cases, the AC drive may be protected against overcurrent faults or the AC drive may not be able to start normally.

Note:

1. Automatic torque boost requires motor static auto-tuning for optimal performance.
2. When parameter [F8.00] is set to "11" (customized V/F curve), the torque boost set in [F8.12] is invalid, and AC drive runs only according to the customized V/F curve.

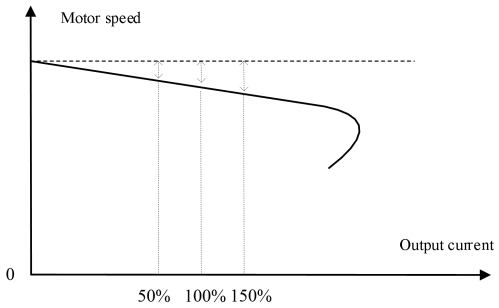
Torque boost cutoff frequency: set the range of the torque boost function. The torque boost function will be cut off when the output frequency exceeds this value. 100.0% of it corresponds to the motor rated frequency.



Torque boost schematic

F8.14	Slip compensation gain	Range: 0.0%~200.0%	Default: 100.0%
F8.15	Slip compensation range	Range: 0.0%~300.0%	Default: 10.0%
F8.16	Slip compensation filter time	Range: 0.000s~6.000s	Default: 0.500s

This function enables the output frequency of the drive to automatically change with the motor load within the set range to dynamically compensate the motor slip frequency, so as to keep the motor at a constant speed, thus reducing the effect of load variation on the motor speed.



Slip compensation schematic

The low frequency torque characteristics of the drive can be significantly improved when this function is used with the automatic torque boost function. The 100.0% of slip frequency compensation corresponds to the motor rated slip. But a too large setting may cause the motor speed to exceed the set value, so a limit needs to be set in [F8.15]. Slip compensation filter time defines the size of the filter applied to the slip compensation to remove interference signals. The longer the filter time, the stronger the anti-interference ability, but the response becomes slower; the shorter the

filter time, the weaker the anti-interference ability, but the response becomes faster.
Please enter the parameters on the motor's nameplate correctly to implement parameter tuning for best effect.

F8.17	Oscillation suppression gain	Range: 0.0%~900.0%	Default: 100.0%
F8.18	Oscillation suppression filter coefficient	1.0~100.0	Default: 1.0

When motor control mode is selected as the V/F control (F0.00=0), motor current instability or speed oscillation may occur in devices that require medium or high power. This low-frequency resonance is caused by the electrical and mechanical factors. Via [F8.17], low frequency resonance can be suppressed. But an excessive value will cause stability problems. When F8.17, F8.18 are set to 0, suppression is not valid.

F8.19	Automatic energy-saving control	Range: 0~1	Default: 0
F8.20	Lower limit of the step-down frequency	Range: 0.0Hz~50.00Hz	Default: 15.00Hz
F8.21	Lower limit of the step-down voltage	Range: 0.0%~100.0%	Default: 50.0%
F8.22	Step-down voltage regulation rate	Range: 0.000V/ms~0.200V/ms	Default: 0.010V/ms
F8.23	Step-down voltage recovery rate	Range: 0.000V/ms~2.000V/ms	Default: 0.200V/ms

Automatic energy-saving control:
When the motor is light-loaded, the drive will automatically adjust the output voltage after achieving a constant speed to improve motor efficiency and save energy.
0: off
1: on
Lower limit of the step-down frequency:
The function is off when the motor output frequency is below this value.
Lower limit of the step-down voltage:
It is the lower limit of output step-down voltage when automatic energy-saving is on. The 100.0% value is the output voltage which corresponds to the output frequency without energy-saving control.
Step-down voltage regulation rate:
It is the rate adjusted by voltage in the energy-saving step down process.
Step-down voltage recovery rate:
It is the rate at which the voltage returns to normal in the energy-saving step-down existing process.

F8.30	V/F separation voltage setting	0: F8.31 setting 1: keyboard potentiometer setting 2: VS voltage analog setting 3: AI current/voltage setting 4: AS current analog setting 5: PUL terminal pulse setting 6: PID output setting 7: RS485 communication setting 8: CAN card	0
F8.31	V/F separation output voltage keyboard setting	0.0%~100.0%	0.0%
F8.32	Voltage acceleration time	0.00s~100.00s	10.00s
F8.33	Voltage deceleration time	0.00s~100.00s	10.00s
F8.34	Stop mode	0: the ACC./DEC. of output voltage and that of output frequency do not affect each other 1: the output frequency drops again after the output voltage drops to 0V.	0
F8.35	V/F control overcurrent suppression down-conversion lower limit frequency	0.00%~50.00%	0.00%

When voltage-frequency separation is on, voltage and frequency are increased independently for forward and reverse switching, the voltage is first reduced to 0, and then the frequency is reduced to 0; it is selected during shutdown.
F8.35 is presented as a percentage of the motor's rated frequency, when F8.35 defaults to 0, it is equivalent to no limit.

8.10 Group FA: Fault and Protection Parameters

FA.00	Overcurrent suppression	Range: 0~1	Default: 0
FA.01	Overcurrent suppression point	Range: 0.0%~300.0%	Default: 160.0%
FA.02	Overcurrent suppression gain	Range: 0.0%~500.0%	Default: 100.0%

Overcurrent suppression:

The overcurrent suppression function prevents fault tripping by capping the load current to a predetermined point by real-time monitoring on load current in operation, ideal for loads with large inertia or significant changes. This feature is exclusive to V/F control, while it is always on in vector mode.

0: suppression on

1: suppression on during acceleration and deceleration and off during constant speed

Overcurrent suppression point:

It is the set current limit (AC drives control the size of the output current by stopping acceleration, deceleration, or lowering or raising the output frequency).

Overcurrent suppression gain:

Via this parameter, the response speed of the overcurrent suppression can be adjusted.

Note: This function may prolong the acceleration and deceleration time. When AC drive is starting or stopping, if the output frequency can not reach the given frequency according to the desired acceleration and deceleration time in case of high current, it indicates that the current limiting function is on, then please reduce the load or adjust the related parameter.

FA.03	Current hardware protection setting	Range: 0000~0221	Default: 0001

LED ones-bit: CBC current limiting

Through hardware protection, CBC current limiting can limit the rise of current to some extent, so that the current does not exceed the protection value of AC drive, avoiding overcurrent fault and shutdown.

0: off

1: on

LED tens-bit: OC protection interference suppression

When this function is on, the AC drive will intelligently diagnose the E.OC alarm, exclude the interference, and only alarm the real fault signal. This function may delay the alarm time, so please use it with caution.

0: off

1: level 1 interference suppression

2: level 2 interference suppression

LED hundreds-bit: SC protection interference suppression

When this function is on, the AC drive will intelligently diagnose the E.SC alarm, exclude the interference, and only alarm the real fault signal. This function may delay the alarm time, so please use it with caution.

0: off

1: level 1 interference suppression

2: level 2 interference suppression

LED thousands-bit: reserved

FA.04	Input overvoltage protection point	Range: 100%~200%	Default: 115%

When the tens-bit of FA.13 is 1, the ratio of RS input voltage (C-44), ST input voltage (C-45) and TR input voltage (C-45) to rated voltage (C-26) is greater than FA.04, it will report input overvoltage (E.OU5).

FA.05	Protection selection1	Range: 0000~7711	Default: 7711

Ones-bit: hardware bus overvoltage protection

0: off

1: on

Tens-bit: supply undervoltage protection (E.LU3: 15V power supply)

0: off

1: on

Hundreds-bit: R/S/T-phase temperature protection switch

0: R/S/T-phase temperature protection off

1: R-phase temperature protection on

2: S-phase temperature protection on

4: T-phase temperature protection on

7: R/S/T-phase temperature protection on

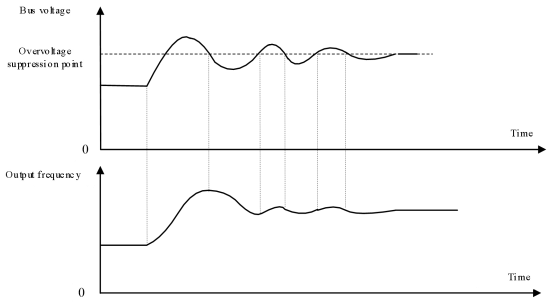
Hundreds-bit: U/V/W-phase temperature protection switch
0: U/V/W-phase temperature protection off
1: U-phase temperature protection on
2: V-phase temperature protection on
4: W-phase temperature protection on
7: U/V/W-phase temperature protection on

FA.06	Busbar overvoltage suppression	Range: 0000~0012	Default: 0002

LED ones-bit: overvoltage suppression control
0: off
1: on only during deceleration
2: on during both acceleration and deceleration
Select whether to enable the voltage suppression function when the AC drive decelerates. If this function is on, the AC drive will slow down or stop decelerating when its bus voltage reaches or exceeds the value set in [FA.07] during deceleration, so as to ensure that the AC drive does not trip the over-voltage protection due to the excessive bus voltage.
Select whether to enable the voltage suppression function when the AC drive accelerates. When the AC drive acceleration bus voltage reaches or exceeds the value set in [FA.07], the AC drive will automatically adjust the operation frequency to suppress the bus voltage increase, so as to ensure that the AC drive does not cause over-voltage protection due to the excessive bus voltage. This function is ideal for eccentric loads.
LED tens-bit: over-excitation control
0: off
1: on
LED hundreds-bit: reserved
LED thousands-bit: reserved
Note: For dynamic braking function, please select whether to enable the overvoltage suppression control based on the conditions at the site.

FA.07	Busbar overvoltage suppression point	Range: 110.0%~140.0%	Default: model setting
FA.08	Bus overvoltage suppression gain	Range: 0.0%~500.0%	Default: 100.0%

In AC drive operation, if the bus voltage reaches or exceeds the bus overvoltage suppression point set in [FA.07], the AC drive will automatically adjust the operation frequency to suppress the bus voltage increase, so as to ensure that the AC drive does not trigger over-voltage protection due to the excessive bus voltage. [FA.08] adjustment can enhance the overvoltage suppression function. Setting [FA.08] to 0 turns off this function, which is valid for all motor control modes.



Overvoltage suppression schematic diagram

FA.09	Bus undervoltage suppression	0: disabled 1: enabled	Default: 0
FA.10	Busbar undervoltage suppression point	Range: 60.0%~90.0%	Default: 80.0%
FA.11	Bus undervoltage suppression gain	Range: 0.0%~500.0%	Default: 100.0%

Note: Overvoltage suppression function is valid for all motor control modes.
When the bus voltage reaches or falls below FA.10 [bus undervoltage suppression point] during AC drive operation, the AC drive will automatically adjust the operating frequency to suppress the bus voltage reduction, thus ensuring that the AC drive does not trigger an undervoltage fault due to low bus voltage. FA.11 [bus undervoltage suppression gain] is used to adjust the undervoltage suppression gain effect.

FA.12	Busbar undervoltage protection point	Range: 60.0%~90.0%	Motor setting

Bus undervoltage protection point: this parameter specifies the allowable lower limit of bus voltage when AC drive is working normally. For some occasions where the power grid is low, the undervoltage protection level can be appropriately lowered to ensure that the AC drive works normally.
Note: The output torque of the motor will drop when the grid voltage is too low. For constant power loads and constant

torque loads, an excessively low grid voltage will increase the AC drive I/O currents, which will reduce the reliability of the AC drive operation.

FA.13	Protection selection2	Range: 0000~1111	Default: 1111

LED ones-bit: rectification-side overload protection switch (E.OL3)

0: off

1: on

LED tens-bit: input overvoltage protection switch (E.OU5)

0: off

1: on

LED hundreds-bit: product selection fault protection switch (E.043)

0: off

1: on

LED thousands-bit: test mode AC detection fault selection (E.051)

0: off

1: on

FA.15	Protection selection3	Range: 0000~1121	Default: 1111

LED ones-bit: output phase loss protection

0: off

1: on

2: slightly unbalanced output phase loss

LED tens-bit: input phase loss protection

0: off

1:software input phase loss on

2: hardware input phase loss on

LED hundreds-bit: CPU overload (E.CPU)

0: off

1: on

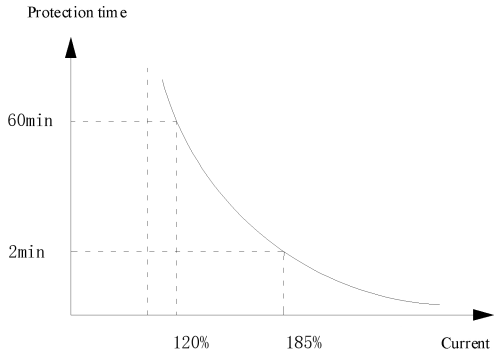
LED thousands-bit: grid abnormality (E.OLF)

0: off

1: on

FA.16	Motor overload protection curve coefficient	Range: 0.0%~250.0%	Default: 100.0%

Long time overloaded operation will cause the serious motor heating. [FA.16] is used to set the coefficient of AC drive overload protection for load motor. Motor overload protection and motor current is inverse time characteristic curve. When FA.16=100.0%, the protection curve is as follows. **Note**: The overload protection time changes when switching between G- and P-type machines of the same model.



The current entering the protection curve = (actual motor current/motor overload protection coefficient) × 100%, so increasing [FA.16] can improve the overload capacity of the motor; [FA.16] sets the motor overload warning coefficient, and when the motor overload degree reaches the coefficient set in [FA.16], AC drive will alarm through the terminal outputs. Please refer to the function of Y-terminal for details.

Note: When an AC drive with multiple motors runs in parallel, the thermal relay protection function of the AC drive will be invalid. In order to effectively protect the motors, please install a thermal protection relay at the inlet end of each motor.

FA.17	Load detection setting	Range: 0000~1414	Default: 0000

LED ones-bit: detection selection (protection1)

0: detection off

1: detect overload

2: detect overload only at constant speed
3: detect underload
4: detect underload at constant speed only

LED tens-bit: fault selection

0: continue running and output fault warning A.LD1
1: free stop and output fault warning E.LD1

LED Hundreds-bit: detection selection (protection2)

0: detection off
1: detect overload
2: detect overload only at constant speed
3: detect underload
4: detect underload at constant speed only

LED thousands-bit: fault selection

0: continue running and output fault warning A.LD2
1: free stop and output fault warning E.LD2

FA.18	Load detection warning1	Range: 0.0%~200.0%	Default: 130.0%
FA.19	Load detection warning time1	Range: 0.0s~60.0s	Default: 5.0s
FA.20	Load warning detection level2	Range: 0.0%~200.0%	Default: 30.0%
FA.21	Load warning detection time2	Range: 0.0s~60.0s	Default: 5.0s

In V/F control mode, the motor output current is used as the load warning judgment value, and 100.0% of it corresponds to the rated motor current; in vector control mode, the motor output torque is used as the load warning judgment value, and 100.0% of it corresponds to the rated motor output torque, and the load warning judgment value is compared with the detection threshold value [FA.18/FA.20] in the detection time [FA.19/FA.21]. The corresponding action is taken according to [FA.17]. A warning is available via the terminal outputs, see Y terminal function for details.

Detection selection (protection1):

1: detect overload

A valid signal is output when the detected value in operation is greater than [FA.18] (load detection warning1) and after [FA.19] (load detection warning time1).

2: detect overload only at constant speed

At constant speed, a valid signal is output when the detected value is greater than [FA.18] (load detection warning1)and after [FA.19] (load detection warning time1).

3: detect underload

A valid signal is output when the detected value in operation is less than [FA.20] (load detection warning2)and after [FA.21] (load detection warning time2).

4: detect underload at constant speed only

At constant speed, a valid signal is output when the detected value is less than [FA.20] (load detection warning2)and after [FA.21] (load detection warning time2).

Detection selection (protection2): same as the protection1.

FA.22	Software input phase loss threshold	Range: 0.0%~30.0%	10.0%

Input phase loss threshold: when the software input phase loss detection function is on, when the site voltage fluctuation is large, the threshold can be raised appropriately, which will not affect the normal work of the machine.

FA.23	Excessive speed deviation protection	Range: 0000~0012	Default: 0000

LED ones-bit: detection selection

0: detection off
1: detect only at constant speed
2: detect on

LED tens-bit: fault selection

0: free stop and output fault warning E.DEF
1: continue running and output fault pre-warning A.DEF

LED hundreds-bit: reserved

LED thousands-bit: reserved

FA.24	Excessive speed deviation detection threshold	Range: 0.0%~60.0%	Default: 10.0%
FA.25	Excessive speed deviation detection time	Range: 0.0s~60.0s	Default: 2.0s

When the deviation of the speed feedback and speed setting is greater than the detection threshold [FA.24] within the detection time [FA.25], the AC drive considers that the detection deviation is too large, and takes the corresponding action according to [FA.23]. The speed deviation detection threshold of 100% corresponds to the maximum frequency.

FA.26	Overspeed protection action	Range: 0000~0012	Default: 0002

LED ones-bit: detection selection

0: detection off
1: detect only at constant speed
2: detect on

LED tens-bit: fault selection

0: free stop and output fault warning E.SPD
1: continue running and output fault pre-warning A.SPD

LED hundreds-bit: reserved

LED thousands-bit: reserved

FA.27	Overspeed detection threshold	Range: 0.0%~150.0%	Default: 110.0%
FA.28	Overspeed detection time	Range: 0.000s~2.000s	Default: 0.050s

When the speed feedback is greater than the detection threshold [FA.27] within the detection time [FA.28], the AC drive considers it as a motor overspeed error and takes the corresponding action according to [FA.26]. The overspeed detection threshold of 100% corresponds to the maximum frequency.

FA.29	Three-level neutral point voltage loop proportion	Range: 0.01~10.00	Default: 1.00
FA.30	Three-level neutral point voltage loop integral	Range: 0.000~10.000	Default: 0.008

It is valid only for three levels, used for dynamic adjustment of three-level midpoint balance voltage.

FA.31	AC action selection	Ones-bit: AC-side undervoltage selection 0: off 1: on Tens-bit: input contactor selection 0: invalid 1: valid Hundreds-bit: low frequency overload protection 0: on 1: off	Default: 0011
FA.32	AC input undervoltage point	Range: 0%~90%	Default: 60%

When the ones-bit of FA.31 is 1, the ratio of RS input voltage (C-44), ST input voltage (C-45) and TR input voltage (C-45) to rated voltage (C-26) is lower than FA.32, it will report AC input undervoltage (E.LU4).
When FA.31 tens-bit=1 and over-voltage, under-voltage or input phase loss occurs on the AC input side, it will disconnect the input contactor.

FA.33	Special action 1	Ones-bit: 50% undervoltage fault record save 0: ON 1: OFF Tens-bit: AC-side overvoltage main contactor action 0: Open 1: Not open Hundreds-bit: Reserved Thousands-bit: Terminal protection after main contactor opens 0: ON 1: OFF	0000	○	0xA21

When the thousands-bit of FA.33 is set to 1, terminal protection is disabled after abnormal main contactor opening. This is generally used when voltage fluctuations trigger buffer contactor action. According to normal protection logic, restart is not allowed after undervoltage recovery. In scenarios where stopping is not permitted (e.g., fans), this function can be masked.

FA.37	Failure self-recovery times	Range: 0~5	Default: 0
FA.38	Failure self-recovery interval	Range: 0.1s~100.0s	Default: 10.0s

Failure self-recovery times:
0: off, no automatic reset function, it can only be reset manually;
1~5: on, the function is on, and 1~5 is the number of times of self-recovery after failure (defined as the maximum number of times self-recovery is possible after each failure);

During operation, the AC drive may be malfunctioned and stopped due to load fluctuation, grid voltage fluctuation and other accidental factors. To maintain system operation continuity, the AC drive is allowed to automatically reset and recover from operational issues such as overload, overcurrent, system anomalies, overvoltage, and undervoltage. The AC drive resumes operation at the start frequency in the self-recovery process. If the AC drive does not successfully resume operation within the set number of times, fault protection is enabled, and the output is stopped and the fault recovery counting times are automatically cleared. It is recommended to set the number of fault self-recovery times to 1 as multiple consecutive fault restarts may cause damage to the AC drive.
Whether or not to enable the output terminal action during fault self-recovery can be selected, see [F2.46~F2.47] for details.
Failure self-recovery interval: this parameter represents the wait time between an AC drive failure and each subsequent reset.

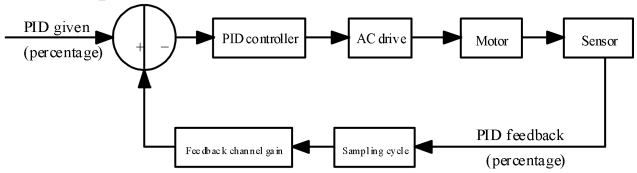
Note:

1. This function is only valid for faults such as overload, overcurrent, system abnormality, overvoltage, and undervoltage during operation, and is invalid for other faults;
2. The AC drive will not be reset until the fault is cleared.

Note: It is crucial to consider the start-up characteristics of mechanical equipment before operation, especially in cases where it cannot be started with load, or when the AC drive requires an immediate alert in the absence of output. Please use this feature with caution.

8.11 Group FB: Process PID Control Parameters

PID control is a common method used for process control. The AC drive output frequency is adjusted by the proportional, integral, and differential operations on the difference between the PID feedback from the controlled object and AC drive PID given value. Thus, a negative feedback loop for PID control is established, which ensures that the controlled object is kept within the set parameters.



PID control schematic diagram

FB.00	PID controller setting source	Range: 0~9	Default: 9

Set the input channel for the PID controller's given signal.

0: PID keyboard number setting The PID given value is determined by the set value in [FB.01].
1: reserved
2: AI1 current/voltage setting The PID given value is given by AI1.
3: AI2 current/voltage setting The PID given value is given by AI2.
6: RS485 communication setting The PID given value is given by RS485 communication setting, the communication address is 0x3008/0x2008.
7: CAN communication setting The PID given value is given by CAN communication.
8: terminal selection The PID given value is selected by the combination of multifunction input terminals, which are set in [F2.00~F2.05].
9: active current set via communication

Terminal switching selection diagram:

Terminal 3	Terminal 2	Terminal 1	PID setting switching terminal selection
OFF	OFF	OFF	PID given via keyboard number entering
OFF	OFF	ON	Reserved
OFF	ON	OFF	AI1 current/voltage setting
OFF	ON	ON	AI2 current/voltage setting
ON	ON	OFF	RS485 communication setting
ON	ON	ON	CAN communication setting

For clarification on the table above, please see the multi-speed sequence diagram in the “Group FB”.

FB.01	PID given/feedback via keyboard	Range: 0.0%~100.0%	Default: 50.0%

This parameter is valid only when [FB.00]/[FB.03] is set to "PID setting/feedback via keyboard"; when this parameter is changed, the PID given/feedback value in the monitoring object will be automatically and synchronously modified. If the LED ones-bit of [F4.09] LED digit is set to "2", the value can be quickly modified by the keyboard UP/DW key.

The the LED tens-bit of [F4.09] will determine whether the modified value will be saved by AC drive in case of power failure.

FB.02	PID given change time	Range: 0.00s~60.00s	Default: 1.00s

PID given change time.

FB.03	PID control feedback signal source	Range: 0~9	Default: 9

It refers to the time it takes for the PID setting percentage to change from 0.0% to 100.0%; when the PID setting changes, the PID given value changes linearly in accordance with the given change time, so as to reduce the negative impact on the system caused by sudden changes in the setting.

Set the input channel for the PID controller's feedback signal.

0: PID keyboard number setting The PID feedback channel is determined by [FB.01].

1: reserved

2: AI1 current/voltage feedback The PID feedback is given by AI1 current/voltage.

3: AI2 current/voltage feedback The PID feedback is given by AI2 current/voltage.

6: RS485 communication feedback The PID feedback is given by RS485 communication setting, the communication address is 0x3009/0x2009.

7: CAN communication The PID feedback is given by CAN communication.

8: terminal selection The PID feedback is selected by the combination of multifunction input terminals, which are set by [F2.00~F2.05].

9: local active current

Terminal switching selection diagram:

Terminal 3	Terminal 2	Terminal 1	PID setting switching terminal selection
OFF	OFF	OFF	PID feedback given by keyboard number entering
OFF	OFF	ON	Reserved
OFF	ON	OFF	AI1 current/voltage feedback
OFF	ON	ON	AI2 current/voltage feedback
ON	ON	OFF	RS485 communication feedback
ON	ON	ON	CAN communication

For clarification on the table above, please see the multi-speed sequence diagram in the “Group FB”.

Note: The PID controller signal setting source and the PID controller feedback signal source cannot be set to the same channel, otherwise the PID will not work normally.

FB.04	Feedback signal filter time	Range: 0.000s~6.000s	Default: 0.010s
FB.05	Feedback signal gain	Range: 0.00~10.00	Default: 1.00
FB.06	Setting and feedback range	Range: 0.0~100.0	Default: 100.0

Feedback signal filter time:

It is used to filter the feedback signal, which reduces the interference on the feedback quantity. The longer the filter time, the stronger the anti-interference ability, but the response becomes slower.

Feedback signal gain:

It is used for linear proportional adjustment of the feedback input signal.

Setting and feedback range:

The PID given and feedback ranges in dimensionless units are used to adjust the PID given display (C-08) and the PID feedback display (C-09). Relative value of 100.0% for PID given and feedback corresponds to the given and feedback range [FB.06]. For example, if [FB.06] is set to 80.0, then when the PID is given 50.0%, the PID given display C-08 is 40.0.

FB.07	PID control selection	Range: 0000~1111	Default: 0000

LED ones-bit: feedback characteristics selection

0: the positive characteristic is suitable for the occasions when the PID feedback is larger than the PID given value, and the output frequency of AC drive is required to decrease in order to keep the PID balance; such as the constant-pressure water supply, air supply, and the tension control of the winding;

1: the negative characteristic is suitable for the occasion when the PID feedback is larger than the PID given value, and the AC drive output frequency is required to rise in order to keep the PID balance; such as the central air-conditioning thermostat control, the tension control of unwinding.

LED tens-bit: reserved

LED hundreds-bit: reserved

LED thousands-bit: differential adjustment attribute

0: differentiate deviation

1: differentiate feedback

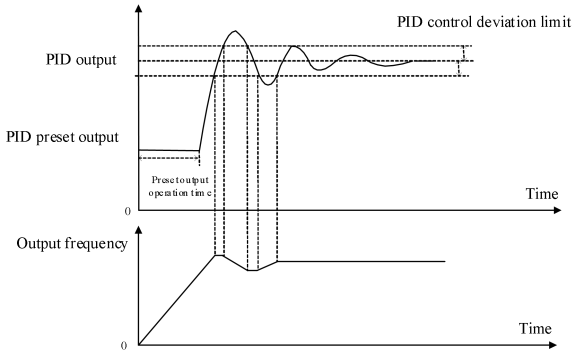
FB.08	PID preset output	Range: 0.00%~100.00%	Default: 100.00%
FB.09	PID preset output running time	Range: 0.0s~6500.0s	Default: 0.0s

This function initiates as a PID operation by first adhering to the preset output [FB.08] for a duration specified by [FB.09], after which it transitions to operate in PID closed-loop control.

Note: When PID is used for frequency given source, [F0.03=8], 100.0% of the preset output corresponds to the maximum frequency output.

FB.10	PID control deviation limit	Range: 0.0%~100.0%	Default: 0.0%

PID feedback corresponds to the maximum permissible deviation from the PID given value; when the feedback is within this range, the PID adjustment stops, and the output remains unchanged; the rational use of this function helps to harmonize the contradiction between the precision and stability of the system output.



Schematic diagram of PID adjustment

FB.11	Proportional gain 1 (P1)	Range: 0.000~4.000	Default: 0.100
FB.12	Integral time 1 (I1)	Range: 0.0s~600.0s	Default: 5.0s
FB.13	Differential gain 1 (D1)	Range: 0.000s~6.000s	Default: 0.000s
FB.14	Proportional gain 1 (P2)	Range: 0.000~4.000	Default: 0.500
FB.15	Integral time 1 (I2)	Range: 0.0s~600.0s	Default: 5.0s
FB.16	Differential gain 1 (D2)	Range: 0.000s~6.000s	Default: 0.000s

The PID controller adjustment parameters should be set according to the actual system characteristics. PID parameter group 1 (FB.11~FB.13), PID parameter group 2 (FB.14~FB.16) are selected based on PID parameter switching conditions in [FB.17].

Proportional gain:

It determines the PID controller's adjustment efficacy. A higher gain yields stronger adjustmentbut risks causing oscillations if excessive.

Integral time:

It determines the PID controller integral adjustment efficacy. The shorter the integral time, the greater the adjustment efficacy.

Differential gain:

It sets the efficacy of the PID controller's offset or the feedback signal
change rate. The differential control feature can be selected in the thousands-bit of [FB.07]; the longer the differential time, the greater the adjustment efficacy. Differential adjustment serves to suppress changes in the feedback signal by adjusting to the trend of the change when the feedback signal changes.

FB.17	PID parameter switching condition	Range: 0~2	Default: 0
FB.18	Lower value of switching deviation	Range: 0.0%~100.0%	Default: 20.0%
FB.19	Higher value of switching deviation	Range: 0.0%~100.0%	Default: 80.0%

In some applications, a set of PID adjustment parameters cannot satisfy the needs of the whole process, and different sets of PID parameters are required for different situations.

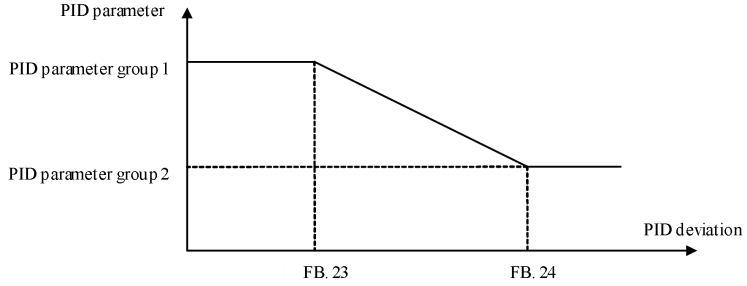
PID parameter switching condition:

0: no switch PID parameter group 1 (FB.11 to FB.13) is selected;

1: switch via DI terminal Multi-function terminal function selection should be set to 23 (PID parameter

switching), when the terminal is invalid, select PID parameter group 1 (FB.11～FB.13), when the terminal is valid, select PID parameter group 2 (FB.14～FB.16);

2: switch according to deviation If the absolute deviation between the PID given and feedback values is less than the low switch threshold [FB.18], PID parameters group 1 should be selected. If it exceeds the high switch threshold [FB.19], PID parameters group 2 should be selected. For absolute deviations between [FB.18] and [FB.19], a linear interpolation of the two parameter groups is applied, as illustrated in the figure below.



Schematic diagram of switching PID parameters according to deviation

FB.21	Differentiation limit	Range: 0.0%~100.0%	Default: 5.0%

The differential limit is used to set the range of the PID differential output. In a PID controller, the differential term is highly sensitive and can lead to system oscillation, so it is typically limited to a smaller range.

FB.22	PID output upper limit	Range: 0.0%~100.0%	Default: 2.0%
FB.23	PID output lower limit	Range: -100%~0%	Default: -2.0%
FB.24	PID output filter time	Range: 0.000s~6.000s	Default: 0.000s

[FB.22] sets the upper limit of PID output, [FB.23] sets the lower limit of PID output.

The PID output filter time [FB.24] smooths sudden changes in the PID control output, but this can impair the response performance of the precess closed-loop system.

FB.25	Feedback disconnection detection time	Range: 0.0s~120.0s	Default: 1.0s
FB.26	Feedback disconnection selection	Range: 0~3	Default: 0
FB.27	Disconnection alarm upper limit	Range: 0.0%~100.0%	Default: 100.0%
FB.28	Disconnection alarm lower limit	Range: 0.0%~100.0%	Default: 0.0%

For feedback disconnection detection function: when using PID setting as the channel to give the AC drive frequency, if the feedback signal exceeds [FB.27] or falls below [FB.28] and is maintained for the delay time [FB.25] during AC drive operation, the sensor will be deemed disconnected.

Feedback disconnection action selection:

0: continue PID operation without reporting faults

This function is off, the AC drive does not perform disconnection detection;

1: shutdown and output fault warning E.PID

Upon detecting a sensor disconnection, the AC drive immediately ceases its output, and the motor stops freely and alarms E.PID;

2: continue PID operation and output the fault pre-warning A.PID

Upon detecting a sensor disconnection, it still runs as PID adjustment, but the keyboard displays the pre-warning A. PID;

3: run at the current frequency and output the fault pre-warning A.PID

Upon detecting a sensor disconnection, it keeps the same output frequency as that before the fault, but the keyboard displays the warning A. PID.

Disconnection alarm upper limit:

Set the upper limit of PID sensor disconnection detection. When the feedback signal exceeds the upper limit of disconnection alarm and lasts for delay time set in [FB.25] , the sensor is considered disconnected.

Disconnection alarm lower limit:

Set the lower limit of PID sensor disconnection detection. When the feedback signal is below the lower limit of disconnection alarm and lasts for delay time set in [FB.25] , the sensor is considered disconnected.

FB.29	Sleep function switch	Range: 0~1 0: off 1: on	Set value: 1
FB.30	Sleep frequency	0Hz~50Hz	Set value: 10Hz
FB.31	Sleep delay	0s~3600s	Set value: 30s
FB.32	Wake-up deviation	0.0%~50.0%	Set value: 5.0%

FB.33	Wake-up delay time	0s~600s	Set value: 1s
FB.34	Pressure sensor range	0MPa~200MPa	Set according to the pressure sensor range on site.
FB.35	PID keyboard given pressure	0~pressure sensor range	This value modifies the system operating pressure.
FB.36	Given sleep pressure	0~pressure sensor range	Set the value according to site requirements.
FB.37	PID setting upper limit	0~pressure sensor range	Set the value according to actual pressure sensor range.
FB.38	PID setting lower limit	0~pressure sensor range	0MPa
FB.39	Wake-up pressure	0~pressure sensor range	Set the value according to actual pressure sensor range.
FB.40	Pressure-given enabling switch	Range: 0~1 0: off 1: on	Set value: 1

The PID parameter is in the form of the given pressure. This function is used for constant pressure control systems.

Note: Version 7609 and above are supported.

When the feedback pressure [FB.03] is equal to the set sleep pressure [FB.36] * [FB.20], after the sleep delay time [FB.31], the AC drive running frequency drops below the sleep frequency [FB.30] and the system enters into sleep operation. The system is awakened when the feedback pressure drops to the wake-up pressure * wake-up deviation and after a wake-up delay.

Note:

1. When FB.40 = 0, the given source in the form of pressure setting is not valid, and at this time, the function codes FB.34-FB.39 are invalid and do not serve any purpose.
2. When FB.40=1 (on) and FB.00=0 (keyboard setting as the given source), the two function codes are set to 1 and 0 at the same time, and then FB.34-FB.3 as well as the FB.20 function code settings are valid.
3. Positive characteristics: for wake-up activation, the set pressure must be lower than the specified pressure value; if it exceeds this value, the wake-up deviation defaults to zero.

4: negative characteristics: For wake-up activation, the set pressure must be greater than the specified pressure value; if it is below the given value, the wake-up deviation defaults to zero.

Sleep calculation.

FB.35: set to 30MPa, of which the maximum value is 60MPa, FB.36: set to 31MPa, FB.20: set to 1%.

31*1% = 0.31 (31-0.31)=30.69 (31+0.31) = 31.31

The sleep status is entered when the feedback value was between 30.69 and 31.31.

For a given 30MPa, a maximum value of 60MPa, and a user wakeup of 27MPa, the feedback pressure needs to be reduced to 27MPa in order to wake up the AC drive.

8.12 Group FC: Multi-speed and PLC Parameters

FC.00	PLC multi-speed 1	Range: 0.00Hz~max. frequency	Default: 10.00Hz
FC.01	PLC multi-speed 2	Range: 0.00Hz~max. frequency	Default: 20.00Hz
FC.02	PLC multi-speed 3	Range: 0.00Hz~max. frequency	Default: 30.00Hz
FC.03	PLC multi-speed 4	Range: 0.00Hz~max. frequency	Default: 40.00Hz
FC.04	PLC multi-speed 5	Range: 0.00Hz~max. frequency	Default: 50.00Hz
FC.05	PLC multi-speed 6	Range: 0.00Hz~max. frequency	Default: 40.00Hz

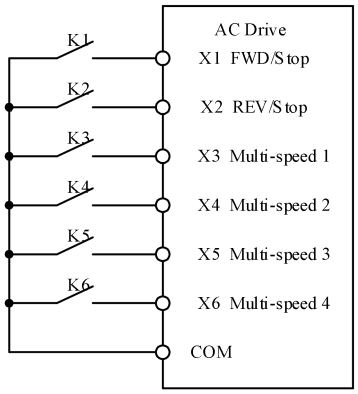
FC.06	PLC multi-speed 7	Range: 0.00Hz~max. frequency	Default: 30.00Hz
FC.07	PLC multi-speed 8	Range: 0.00Hz~max. frequency	Default: 20.00Hz
FC.08	PLC multi-speed 9	Range: 0.00Hz~max. frequency	Default: 10.00Hz
FC.09	PLC multi-speed 10	Range: 0.00Hz~max. frequency	Default: 20.00Hz
FC.10	PLC multi-speed 11	Range: 0.00Hz~max. frequency	Default: 30.00Hz
FC.11	PLC multi-speed 12	Range: 0.00Hz~max. frequency	Default: 40.00Hz
FC.12	PLC multi-speed 13	Range: 0.00Hz~max. frequency	Default: 50.00Hz
FC.13	PLC multi-speed 14	Range: 0.00Hz~max. frequency	Default: 40.00Hz
FC.14	PLC multi-speed 15	Range: 0.00Hz~max. frequency	Default: 30.00Hz

This group of parameters is used to set the operating frequency of the fifteen speeds in program operation and multi-speed control.

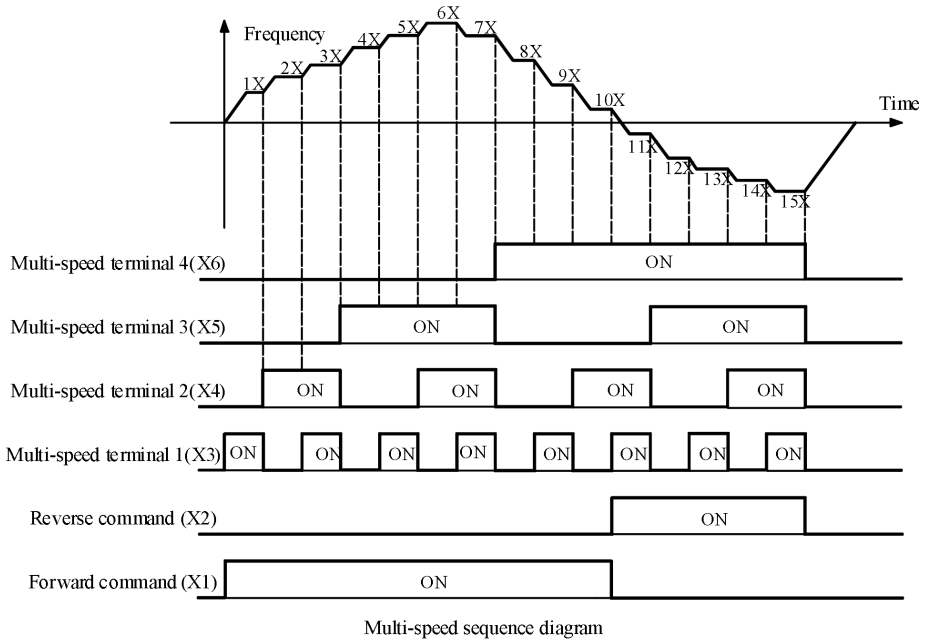
When the user selects multi-speed operation, 4 multifunction input terminals need to be set as multi-speed control terminals. See [F2.00~F2.05] for setting details.

The combination of the (ON/OFF) states of the four multi-speed control terminals with (COM) controls which speed the AC drive is running at. Its operation and direction are controlled by the operation signal and direction given by the operation command channel [F0.02]. Its acceleration and deceleration time is defaulted to acc./dec. time 1 [F0.14], [F0.15], or the acc./dec. time can be selected through the acc./dec. time selection terminal set by the multi-function input terminals [F2.00~F2.05].

Multi-speed 4	Multi-speed 3	Multi-speed 2	Multi-speed 1	Terminal / 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]



Terminal wiring



Multi-speed sequence diagram

FC.15	PLC running mode	Range: 0000~2122	Default: 0000

It is used to select the PLC operation mode when the program control is given.

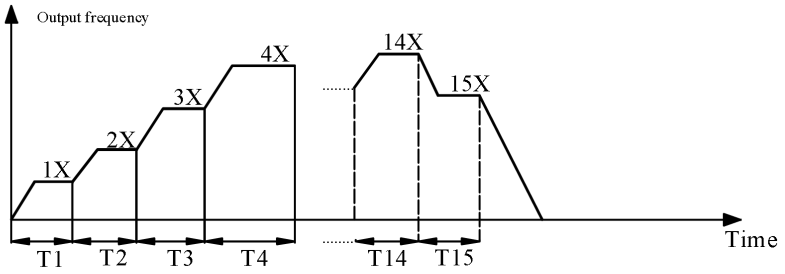
LED ones-bit: cycle mode

0: stop after single circle. Upon receiving the running command, the AC drive starts at the speed set in the first segment, with the LED tens-bit of [FC.15] determining the time unit. The duration of operation is set via parameters [FC.16~FC.30], while running direction and acc./dec. times are set through [FC.31~FC.45]. When the set time is up, the AC drive proceeds to the next speed segment. Each segment's running time, direction, and acc./dec. times are individually adjustable. After completing the 15th speed segment, the AC drive outputs a "0" frequency. If the operating time of a segment is zero, it will be skipped during the operation.

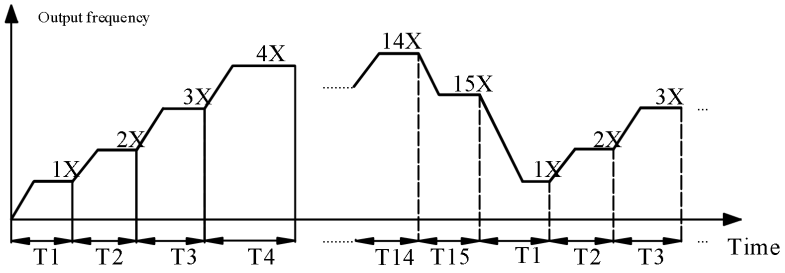
1: run in continuous circles. After the AC drive finishes running at the multi-speed15, it returns to the Multi-speed1 to restart running, and the cycle continues without stopping. The time unit is set by the LED tens-bit of [FC.15]; the running time is set by the parameter [FC.16~FC.30]; the running direction and acc./dec. time are selected by [FC.31~FC.45].

2: keep the final value after single circle. The AC drive does not stop after running a single cycle and continues to run at the speed of the segment where the last operating time is not zero. The time unit is set by the LED tens-bit of [FC.15]; the running time is set by the parameter [FC.16~FC.30]; the running direction and acc./dec. time are selected by [FC.31~FC.45].

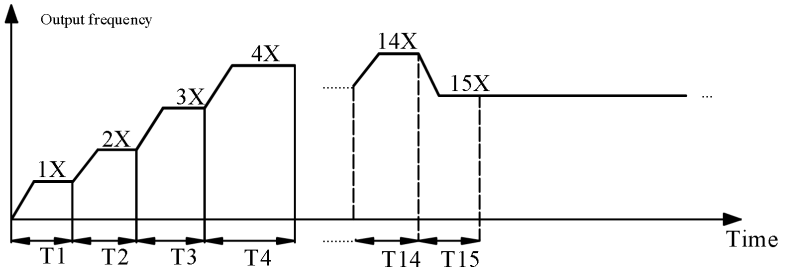
Note: When the PLC is executed, the acc./dec. time is specified by the LED tens-bit of the [FC.31~FC.45] and it is not affected by the terminal selection.



A program running in a single cycle



A program running in continuous circles



A program running continuously in a single cycle

LED tens-bit: the timing unit is used for set program running timing

0: second
1: minute
2: hour

LED thousands-bit: start mode

0: rerun from stage one
1: rerun from the stage upon stop last time
2: rerun from the remaining time of the stage upon stop last time

This parameter defines the mode of operation when the program is started again after it has been interrupted for various reasons (shutdown, malfunction, power failure, etc.) during its operation.

If "0" is selected, the AC drive will restart at the multi-speed1.

If "1" is selected, the AC drive will rerun from the instantaneously interrupted operating segment and re-time the operation.

If "2" is selected, the AC drive will rerun from the instantaneously interrupted operating segment for its remaining time.

Note: The output frequency when the program is running is limited by the upper and lower limit frequencies. When the given frequency is less than the lower limit frequency, it operates in the [F0.13] lower limit frequency operation mode.

FC.16	PLC Segment1 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.17	PLC Segment2 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.18	PLC Segment3 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.19	PLC Segment4 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.20	PLC Segment5 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.21	PLC Segment6 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.22	PLC Segment7 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.23	PLC Segment8 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.24	PLC Segment9 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.25	PLC Segment10 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.26	PLC Segment11 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.27	PLC Segment12 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0

FC.28	PLC Segment13 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.29	PLC Segment14 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0
FC.30	PLC Segment15 running time	Range: 0.0 (s/m/h)~6500.0 (s/m/h)	Default: 10.0

Set the running time for each of the 15 speeds, and the time unit is determined by the LED tens-bit value of [FC.15].

FC.31	Segment1 direction and ACC./DEC. time	Range: 0000~0031	Default: 0000
FC.32	Segment2 direction and ACC./DEC. time		Default: 0000
FC.33	Segment3 direction and ACC./DEC. time		Default: 0000
FC.34	Segment4 direction and ACC./DEC. time		Default: 0000
FC.35	Segment5 direction and ACC./DEC. time		Default: 0000
FC.36	Segment6 direction and ACC./DEC. time		Default: 0000
FC.37	Segment7 direction and ACC./DEC. time		Default: 0000
FC.38	Segment8 direction and ACC./DEC. time		Default: 0000
FC.39	Segment9 direction and ACC./DEC. time		Default: 0000
FC.40	Segment10 direction and ACC./DEC. time		Default: 0000
FC.41	Segment11 direction and ACC./DEC. time		Default: 0000
FC.42	Segment12 direction and ACC./DEC. time		Default: 0000
FC.43	Segment13 direction and ACC./DEC. time		Default: 0000
FC.44	Segment14 direction and ACC./DEC. time		Default: 0000
FC.45	Segment15 direction and ACC./DEC. time		Default: 0000

When the program is running, set the direction of operation and acceleration/deceleration times for each of the 15 speeds separately.

LED ones-bit: operating direction of this segment

0: forward
1: reverse direction

Note: When the operation direction of this segment is set to reverse, the [F0.16] tens-bit must be set to 0 and the [F0.16] hundreds-bit must be set to 1.

LED tens-bit: ACC./DEC. time of this segment

0: ACC./DEC. time1
1: ACC./DEC. time2
2: ACC./DEC. time3
3: ACC./DEC. time4

8.13 Group FD: Communication Control Parameters

FD.00	Master-slave selection	Range: 0000~4311	Default: 0000

Select the AC drive to be used as a master or a slave in Modbus communication or CAN communication. For a detailed description of Modbus communication, please see Appendix II (Modbus Communication Protocol).

LED ones-bit: Modbus communication terminal

0: slave
1: master

LED tens-bit: CAN communication

0: slave
1: master
2: single machine

LED hundreds-bit: Modbus communication RJ45 port

0: slave
1: master
2: special slave, response slave status
3: special master, receive slave status

LED thousands-bit: Modbus communication DB9 port

0: keyboard
1: slave
2: master
3: special slave: response slave status
4: special master: receive slave status

Among them, DB9 communication is fixed to adopt 9600 baud rate, and no other baud rate can be selected for it.

Note:

When the AC drive functions as the network master, all connected network slaves must also be VEICHI AC drives to ensure proper network integration. The master sends the broadcast data through the customized free protocol.

FD.01	485 communication terminal address	Range: 1~247	Default: 1
FD.02	Communication baud rate selection	Range: 0000~0666	Default: 0333

This parameter defines the communication address of the machine when it is used as a Modbus communication slave. This parameter is invalid if the machine is acting as a master. 0 is the broadcast address.

LED ones-bit: Modbus communication RS485-1 baud rate Set the baud rate for Modbus communication

0: 1200 bps
1: 2400 bps
2: 4800 bps
3: 9600 bps
4: 19200 bps
5: 38400 bps
6: 57600 bps

LED tens-bit: CAN (VEICHI CAN)

0: 20 kbps
1: 50 kbps
2: 100kbps
3: 125kbps
4: 250kbps
5: 500kbps
6: 1Mbps

LED hundreds-bit: RJ45-485 communication baud rate

0: 1200 bps
1: 2400 bps
2: 4800 bps
3: 9600 bps
4: 19200 bps
5: 38400 bps
6: 57600 bps

LED thousands-bit: reserved

FD.03	Modbus data format	Range: 0~5	Default: 0000

Set the data format for Modbus communication. If the data format is set differently, communication is not available.

LED ones-bit: A+/B- terminal data format

LED tens-bit: RJ45 port terminal data format

0: (N, 8, 1) no parity, data bit: 8, stop bit: 1
1: (E, 8, 1) even parity, data bit: 8, stop bit: 1
2: (O, 8, 1) odd parity, data bit: 8, stop bit:1
3: (N, 8, 2) no parity, data bit: 8, stop bit: 2
4: (E, 8, 2) even parity, data bit: 8, stop bit: 2
5: (O, 8, 2) odd parity, data bit: 8, stop bit: 2

FD.04	Communication ratio setting	Range: 0.00~5.00	Default: 1.00

The data in the communication address 0x3000 or 0x2000 sent from the host computer multiplied by this parameter is used as the communication given value of this machine. It is possible to proportionally modify the frequency given by the host computer communication.

FD.05	Modbus communication response delay	Setting range: 0ms~500ms	Default: 0ms

This parameter defines the interval time between the end of data reception and the end of sending response data to the host computer when the AC drive is used as a Modbus communication slave. If the response delay time is less than the system processing time, the response delay time is based on the system processing time. If the response delay time is longer than the system processing time, the system processes the data and waits for a delay until the response delay time arrives before sending the data to the host computer.

FD.06	Modbus timeout duration	Setting range: 0.1s~100.0s	Default: 1.0s

If the interval between one communication and the next exceeds the communication timeout time, a communication disconnection fault is considered to have occurred and the fault disconnection action mode is determined by [FD.07].

FD.07	Modbus failure action mode	Setting range: 0000~0333	Default: 0

Ones-bit: terminal Modbus

Tens-bit: port Modbus

Hundreds-bit: DB9 Modbus

0: timeout detection offThe AC drive does not perform fault detection and always operates according to the last communication command;
1: shutdown and report an error E.CE When the communication given command set by the AC drive does not receive the next frame command or any other communication command after the time set by [FD.06], the AC drive reports the fault E.CE and stops;
2: continue running and report an alarm A.074 When the AC drive operation command is given by the communication, after the duration set by [FD.06] is exceeded, and the AC drive still does not receive a new communication command, the AC drive reports the alarm A.074 and operates according to the last received communication command;
3: forced stop After the communication given command set by the AC drive has exceeded the duration set by [Fd.06] and the next frame command is still not received or there is no any other communication command, the AC drive stops according to the stopping mode.

FD.08	Modbus transmission response	Range: 0~1	Default: 0

This parameter determines if the AC drive responds to write operation commands from the host computer. If the host computer needs the AC drive to reply information, the AC drive will occupy the communication bus by time, and for communication control, the host computer needs to reserve enough time to reply information to the AC drive. If the host computer only needs to send commands to the AC drive with no requirements for AC drive to reply information, it can opt for write-only operations to enhance the communication bus's efficiency. This parameter is only valid for write operations, and has no effect on read operations.

LED ones-bit: A+/B- terminal data format

LED tens-bit: RJ45 port terminal data format

0: write operation responds
1: write operation does not respond

FD.09	Modbus master sending selection	Range: 0000~CCCC	Default: 0C31

It is the data that is sent to the slave when the AC drive is set as a Modbus communication master. At this point, 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, which correspond to the setting values of LED ones, tens, hundreds, and thousands bits, respectively. When it is set to invalid, no data is sent.

LED ones-bit: the first group transmitting selection

0: invalid
1: running command setting
2: master given frequency

3: master output frequency
4: master upper limit frequency
5: master given torque
6: master output torque
7: forward speed limit in torque control
8: reverse speed limit in torque control
9: PID setting from master
A: PID feedback from master
B: V/F separation voltage setting
C: active current component

LED tens-bit: the second group transmit frame selection

Same

LED hundreds-bit: the third group transmit frame selection

Same

LED thousands-bit: the fourth group transmit frame selection

Same

The master broadcasts the data.	The slave receives the corresponding address and application.
1: running command setting	0x3001, it can be used as a running command given source. Data: 0x01: forward operation 0x02: reverse operation 0x03: forward jogging 0x04: reverse jogging 0X05: shutdown command (the slave stops according to the shutdown mode)
2: master given frequency	0x3000, which can be used as a communication given frequency
3: master output frequency	0x3000, which can be used as a communication given frequency
4: master upper limit frequency	0x3004, which can be used as a communication-given upper limit frequency
5: master given torque	0x3005, which can be used as a communication-given torque
6: master output torque	0x3005, which can be used as a communication-given torque
7: forward speed limit in torque control	0x3006, which can be used as a communication-given torque control forward speed limit
8: reverse speed limit in torque control	0x3007, which can be used as a communication-given torque control reverse speed limit
9: PID setting from master	0x3008, which can be used to give PID via communication
A: PID feedback from master	0x3009, which can be used to give PID via communication

FD.13	CAN master sending selection	Range: 0000~CCCC	Default: 01C3

LED ones-bit: the first group transmitting selection

0: invalid
1: running command
2: given frequency
3: output frequency
4: upper limit frequency
5: given torque
6: master output torque
7: forward speed limit in torque control
8: reverse speed limit in torque control
9: PID setting from master
A: PID feedback from master
B: V/F separation voltage setting
C: active current component

LED tens-bit: the second group transmit frame selection

LED hundreds-bit: the third group transmit frame selection

LED thousands-bit: the fourth group transmit frame selection

Same

FD.14	Received PID given data correction enabling	Correction enable switch for PID given by communication	Default: 0
FD.15	Received PID given data correction	Range: 0~9999	Default: 170

This function corrects for compatibility with the old product's 485 power balance and adjusts the PID setting of the active current.

Correction is on when the FD.14 is not set to zero. When the ACP30 is used as a slave, the received active current component value is corrected, and the calibration value is the received value * Fd.15/100.

FD.16	Master sending command/status selection	Range: 0~1	Default: 1

0: sending command

It refers to the command received by the master. The master sends the corresponding command it receives: a forward command triggers a forward operation, a reverse command initiates a reverse action, and a shutdown command leads to shutdown command.

1: sending status

What is sent is the current running status of the master or its shutdown status. If the master is running, it sends the running command; if the master is shutdown, it sends the shutdown command.

FD.17	CAN disconnection detection Enabling	Range: 000~222	0000

CAN communication fault selection

0: detection off

1: detection on and report error

2: detection on and alarm, and free stop

3: detection on and alarm, and continue running

LED ones-bit: slave action after disconnection

It refers to the slave action selection after CAN communication disconnection.

LED ones-bit: master action after slave failure

The slave sends its own status to the master in real time during CAN communication, and this bit indicates the action selection of the master when the slave fails.

LED ones-bit: master action after slave disconnection

It refers to the master action selection after CAN communication disconnection.

FD.18	CAN Communication Slave ID	Range: 1~5	Default: 1
FD.19	CAN communication connection abnormality active detection	Range: 0000~3111	Default: 0000

It is only valid for the master to judge the slave disconnection. After the master and the slave are turned on, the master will directly detect whether the slave is disconnected , and will no longer judge by whether it has ever received data from the slave. A thousands-bit of 2 indicates that both 4 and 5 detections are on. After the parameter is enabled, the disconnection can be detected even if the master and slave are not wired before power-up.

FD.25	Communication expansion card control mode	0: Ethernet, WIFI AP 1: WIFI STA	0	○	0xD19
FD.26	WANIP address 0	0~255	192	○	0xD1A
FD.27	WANIP address 1	0~255	168	○	0xD1B
FD.28	WANIP address 2	0~255	0	○	0xD1C
FD.29	WANIP address 3	0~255	200	○	0xD1D
FD.30	WAN subnet mask 0	0~255	255	○	0xD1E
FD.31	WAN subnet mask 1	0~255	255	○	0xD1F
FD.32	WAN subnet mask 2	0~255	255	○	0xD20
FD.33	WAN subnet mask 3	0~255	0	○	0xD21
FD.34	Gateway 0	0~255	192	○	0xD22
FD.35	Gateway 1	0~255	168	○	0xD23
FD.36	Gateway 2	0~255	0	○	0xD24
FD.37	Gateway 3	0~255	1	○	0xD25
FD.38	Port	0~65535	8080	○	0xD26
FD.39	LANIP address 0	0~255	192	○	0xD27
FD.40	LANIP address 1	0~255	168	○	0xD28

FD.41	LANIP address 2	0~255	1	○	0xD29
FD.42	LANIP address 3	0~255	1	○	0xD2A
FD.43	LAN subnet mask 0	0~255	255	○	0xD2B
FD.44	LAN subnet mask 1	0~255	255	○	0xD2C
FD.45	LAN subnet mask 2	0~255	255	○	0xD2D
FD.46	LAN subnet mask 3	0~255	0	○	0xD2E
FD.47	WIFI name No.	0~199	1	○	0xD2F
FD.48	WIFI password 0	0~9999	1234	○	0xD30
FD.49	WIFI password 1	0~9999	5678	○	0xD31
FD.50	STA SSID character 0	0~65535	4b61	○	0xD32
FD.51	STA SSID character 1	0~65535	6943	○	0xD33
FD.52	STA SSID character 2	0~65535	6865	○	0xD34
FD.53	STA SSID character 3	0~65535	6e67	○	0xD35
FD.54	STA SSID character 4	0~65535	0000	○	0xD36
FD.55	STA SSID character 5	0~65535	0000	○	0xD37
FD.56	STA SSID character 6	0~65535	0000	○	0xD38
FD.57	STA SSID character 7	0~65535	0000	○	0xD39
FD.58	STA SSID character 8	0~65535	0000	○	0xD3A
FD.59	STA SSID character 9	0~65535	0000	○	0xD3B
FD.60	STA SSID character 10	0~65535	0000	○	0xD3C
FD.61	STA SSID character 11	0~65535	0000	○	0xD3D
FD.62	STA SSID character 12	0~65535	0000	○	0xD3E
FD.63	STA SSID character 13	0~65535	0000	○	0xD3F
FD.64	STA SSID character 14	0~65535	0000	○	0xD40
FD.65	STA SSID character 15	0~65535	0000	○	0xD41
FD.66	SAT Passwd character 0	0~65535	0000	○	0xD42
FD.67	SAT Passwd character 1	0~65535	0000	○	0xD43
FD.68	SAT Passwd character 2	0~65535	0000	○	0xD44
FD.69	SAT Passwd character 3	0~65535	0000	○	0xD45
FD.70	SAT Passwd character 4	0~65535	0000	○	0xD46
FD.71	SAT Passwd character 5	0~65535	0000	○	0xD47
FD.72	SAT Passwd character 6	0~65535	0000	○	0xD48
FD.73	SAT Passwd character 7	0~65535	0000	○	0xD49
FD.74	SAT Passwd character 8	0~65535	0000	○	0xD4A
FD.75	SAT Passwd character 9	0~65535	0000	○	0xD4B
FD.76	SAT Passwd character 10	0~65535	0000	○	0xD4C
FD.77	SAT Passwd character 11	0~65535	0000	○	0xD4D
FD.78	SAT Passwd character 12	0~65535	0000	○	0xD4E
FD.79	SAT Passwd character 13	0~65535	0000	○	0xD4F
FD.80	SAT Passwd character 14	0~65535	0000	○	0xD50
FD.81	SAT Passwd character 15	0~65535	0000	○	0xD51
FD.82	WIFI STA IP0	0~255	192	○	0xD52
FD.83	WIFI STA IP1	0~255	168	○	0xD53
FD.84	WIFI STA IP2	0~255	43	○	0xD54
FD.85	WIFI STA IP3	0~255	5	○	0xD55
FD.86	WIFI STA MASK0	0~255	255	○	0xD56
FD.87	WIFI STA MASK1	0~255	255	○	0xD57
FD.88	WIFI STA MASK2	0~255	255	○	0xD58
FD.89	WIFI STA MASK3	0~255	0	○	0xD59
FD.90	WIFI STA gateway 0	0~255	192	○	0xD5A
FD.91	WIFI STA gateway 1	0~255	168	○	0xD5B
FD.92	WIFI STA gateway 2	0~255	43	○	0xD5C

FD.93	WIFI STA gateway 3	0~255	1	○	0xD5D
FD.94	WIFI STA port	0~65535	8080	○	0xD5E
FD.95	Mac0	0~FFFF	0000	○	0xD5F
FD.96	Mac1	0~FFFF	0000	○	0xD60
FD.97	Mac2	0~FFFF	0000	○	0xD61
FD.99	Enabling	0~1	0	○	0xD62

FD.25~FD.99 need to be used with communication expansion card, please refer to the manual for details.

8.14 Group FE: Rectification Parameters

FE.01	Starting delay time	0.000s~10.000s	Default: 0.500s

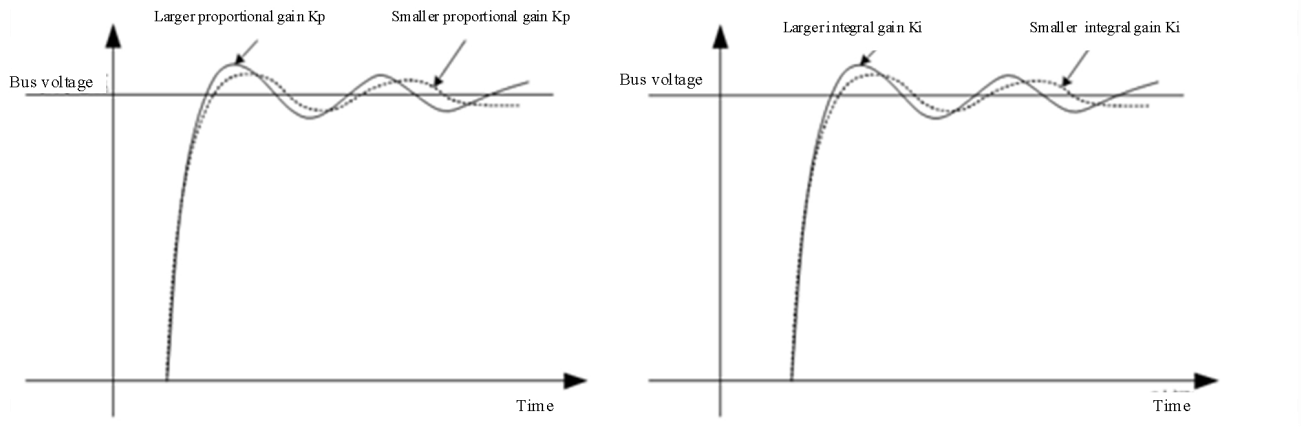
The startup delay is the time delay for the inverter to start after the rectifier starts; if the rectifier is set to not start, the startup delay is invalid.

FE.02	Bus voltage curve	0000~0011	Default: 0000

Ones-bit: bus voltage setting curve
0: set via linear function The bus voltage changes linearly to the initial value of the bus voltage.
1: set via step function The bus voltage steps change to the initial value of the bus voltage.
Tens-bit: initial bus voltage
0: as the given bus voltage The initial value of the bus voltage is the given value of F0.17 bus voltage.
1: as the current bus voltage The initial value of the bus voltage is the current bus voltage.

FE.03	Voltage loop proportional coefficient	0.1~40.0	Default: 10.0
FE.04	Voltage loop integral coefficient	0.01~2.00	Default: 0.05

The proportional coefficient Kp and the integral coefficient Ki of the voltage loop can be set by adjusting the parameters [FE.03] and [FE.04]. The output of the bus voltage PI regulator is the reference for the active current, which is limited by the active current range of parameter [FE.20].
The rectification curves of the proportional coefficient Kp and integral coefficient Ki of the bus voltage regulator are shown below:



Increasing the proportion coefficient Kp enhances the voltage's dynamic response. But if Kp is too high, it can lead to oscillation and excessive overshooting. Increasing the integral coefficient Ki enhances the voltage's dynamic response. But if Ki is too high, it can lead to oscillation and overshooting. Generally the proportion coefficient Kp is adjusted first. Maximize Kp value under the premise of ensuring that the system does not oscillate, and then adjust the integration coefficient Ki, so that the system has a fast dynamic response and the overshoot is not too large.

FE.05	Bus voltage filter coefficient	0.01~1.00	Default: 0.50

This value is used to adjust the bus voltage stabilization time, the larger the value, the faster the bus voltage is stabilized to the set value; when the setting is small, it will report an overvoltage fault at startup.

FE.06	Current loop D-axis proportional coefficient	0.01~40.00	Default: 10.00
FE.07	Current loop D-axis integral coefficient	0.01~2.00	Default: 0.05
FE.08	D-axis current filter coefficient	0.01~1.00	Default: 0.20
FE.09	Current loop D-axis output limit	0%~200%	Default: 50%

The D-axis proportional coefficient Kp and the integral coefficient Ki of the current loop can be set by adjusting the parameters [FE.06] and [FE.07]. Thus, the dynamic response of the active current component can be changed. The

current loop is rectified in a similar way to the voltage loop. Increasing the proportion coefficient Kp enhances the current loop's dynamic response. But if Kp is too high, it can lead to oscillation. Increasing the integral coefficient Ki enhances the voltage's dynamic response but if Ki is too high, it can lead to oscillation and overshooting. Generally the proportion coefficient Kp is adjusted first. Maximize Kp value under the premise of ensuring that the current does not oscillate, and then adjust the integration coefficient Ki, so that the system has a fast dynamic response and the overshoot is not large.

FE.10	Current loop Q-axis proportional coefficient	0.01~40.00	Default: 10.00
FE.11	Current loop Q-axis integral coefficient	0.01~2.00	Default: 0.05
FE.12	Q-axis current filter coefficient	0.01~1.00	Default: 0.20
FE.13	Current loop Q-axis output limit	0%~200%	Default: 50%

The Q-axis proportional coefficient Kp and the integral coefficient Ki of the current loop can be set by adjusting the parameters [FE.10] and [FE.11]. Thus, the dynamic response of the inactive current component can be changed. The current loop is rectified in a similar way to the voltage loop. Increasing the proportion coefficient Kp enhances the current loop's dynamic response. But if Kp is too high, it can lead to oscillation. Increasing the integral coefficient Ki enhances the voltage's dynamic response but if Ki is too high, it can lead to oscillation and overshooting. Generally the proportion coefficient Kp is adjusted first. Maximize Kp value under the premise of ensuring that the current does not oscillate, and then adjust the integration coefficient Ki, so that the system has a fast dynamic response and the overshoot is not large.

FE.14	Phase-locked loop proportional coefficient	0.00~40.00	Related to voltage ratings
FE.15	Phase-locked loop integral coefficient	0.00~2.00	Related to voltage ratings

Phase-locked loop proportional and phase-locked loop integral coefficients are used to regulate the grid frequency phase-locked dynamic response. Increasing the proportion coefficient Kp enhances the current loop's dynamic response. But if Kp is too high, it can lead to oscillation. Increasing the integral coefficient Ki enhances the voltage's dynamic response but if Ki is too high, it can lead to oscillation and overshooting. Generally the proportion coefficient Kp is adjusted first. Maximize Kp value under the premise of ensuring that the current does not oscillate, and then adjust the integration coefficient Ki, so that the system has a fast dynamic response and the overshoot is not large.

FE.16	Vd filter coefficient	0.01~1.00	Default: 0.05
FE.17	Vq filter coefficient	0.01~1.00	Default: 0.05
FE.18	Grid frequency abnormal coefficient	0.00%~10.00%	Default: 2.00%

Grid frequency abnormality in the shutdown state will not be reported as a fault immediately, and the operation will report the grid frequency abnormality fault E.OL immediately; when the grid frequency fluctuation is detected above the grid frequency abnormality coefficient during operation, the grid frequency abnormality E.PLF will be reported.

FE.20	Active current range limit	50%~200%	Default: 150%

This value is used to set the limit of the active feedback current of the four-quadrant rectifier, 100% means that the feedback is given back as rated current. The rectifier will report an overvoltage error if the rectifier feedback current exceeds the active current limit.

FE.30	Feedback rectification action voltage	0.0V~2150.0V	1850.0V	●▲	0xE1E
FE.31	Feedback rectification stop voltage	0.0V~2150.0V	1350.0V	●▲	0xE1F
FE.32	Feedback rectification stop delay	0s~65535s	60s	●▲	0xE20

FE.30 (0.1 V): 1850.0
Definition: upper limit of bus voltage feedback threshold, when the bus voltage is greater than this value, the feedback function is on;
Setting value: it needs to be greater than the uncontrolled rectification bus voltage, less than the overvoltage point. For T11, it is recommended to be 1850.0 (1850 V), and for T6, it is recommended to be 1050.0 (1050 V).
FE.31 (0.1 V): 1350.0
Definition: lower limit of bus voltage feedback threshold, when the bus voltage is lower than this value, the feedback function is off;
Set value: it needs to be lower than the uncontrolled rectification bus voltage. For T11, it is recommended to be 1350.0 (1350 V), and for T6, it is recommended to be 800.0 (800 V). It is not recommended to set other values.
FE.32 (1 s): 60
Definition: feedback time, when the motor switches from the power generation mode to the drive mode, if it is still in the electric drive mode after 60 seconds, the feedback rectification automatically stops outputting until the bus voltage exceeds the upper limit value again;
Setting value: 60 seconds recommended, equivalent to 1 minute.

8.15 Group FF: Specific Parameters

FF.00	Master/slave setting	Range: 0000~0013	Default: 0

1: After performing reset function, the function code is restored to master default parameters;
2: After performing reset function, the function code is restored to slave default parameters;
3: After performing reset function, the function code is restored to single machine default parameters;
11: the function code restores to master default parameters;
12: the function code restores to slave default parameters;
13: the function code restores to slave default parameters.
Note: When the tens-bit is set to 1, set the ones-bit to the desired model. Upon confirmation, the respective parameter will be updated, and the tens-bit will automatically reset to 0, acting as a self-locking feature.

FF.01	Fan or contactor function	Range: 0~1	Default: 1

0: control the fan The output contactor is handled according to the fan control logic;
1: control the output contactor The output contactor outputs when the whole machine is operating.

FF.02	Contactor feedback judgment selection	Range: 0000~0011	Default: 0011

Ones-bit: output contactor:
0: invalid The output contactor feedback function is off;
1: valid The output contactor feedback function is on, the machine will receive the output contactor feedback signal and judge it accordingly.
Tens-bit: input contactor:
0: invalid The input contactor feedback function is off;
1: valid The input contactor feedback function is on, the machine will receive the input contactor feedback signal and judge it accordingly.

FF.03	Connected output contactor starting delay	Range: 0.500s~10.000s	Default: 5.000

This function defines the time delayed from the moment that the output contactor is closed and connected to the moment that the AC drive starts with an output. If the output contactor feedback function is off, the start-up delay time is internally treated as 0.5s.

FF.04	Input contactor feedback delay	Range: 0.000s~2.000s	Default: 1.000

Input contactor feedback delay.

FF.05	Contactor fault/warning report selection	Range: 0~1	Default: 0

0: report error:
The I/O contactor feedback signals are valid and report an E.040 fault.
1: report warning:
The I/O contactor feedback signals are valid and report an A.076 alarm.

FF.06	Contactor feedback polarity selection	Range: 0000~0111	Default: 0010

Ones-bit: output contactor:
0: normal when control signal and feedback signal levels are the same;
1: normal when control signal and feedback signal levels are reversed.
Tens-bit: input contactor:
0: normal when input feedback signal is high level contactor connected;
1: normal when input feedback signal is low level after contactor connected.
Note:
Both the I/O contactors are connected when the control signal is in the low level and disconnected when it is in the high level.
When the feedback signal is connected to the normally open contact, the feedback is high when the contactor is not connected and low when it is connected.
When it is set to 0010, the field are required to connect the normally open contact.

FF.07	Product type monitoring	0: three-level 1: two-level	It is up to the product type.

This function is a read-only parameter to monitor whether the product type is two-level or three-level.

FF.08	Rectifier stop delay	0.0s~600.0s	Default: 0

The PC shutdown delay time is the rectifier shutdown delay time after the the inverter side is shutdown.

FF.09	Tens-bit: input contactor by-pass	0: off 1: on	Default: 0

0: off The input contactor bypass is invalid; the input contactor is disconnected in undervoltage condition, and the input contactor is connected in non-undervoltage condition;
1: on When the bus voltage is less than 15% of the rated bus, the input contactor bypass is valid and the input

contactor is connected; when the bus voltage is more than 15% of the rated bus, the input contactor bypass is invalid and the input contactor is disconnected.

Note: This parameter setting is only valid after re-power up and only valid for once.

FF.14	Four-quadrant start/stop logic	0: basic logic 1: interlocking 2: completely independent	Default: 0

In four-quadrant mode, the rectification and inversion start/stop support the following three modes:

0: basic logic

1: interlocking

2: completely independent

Description:

0: basic logic: the rectification side and the inversion side use the same command setting. When starting, the rectification side starts first, and then the inversion side; when stopping, the inversion side stops first, and then the rectification;

1: interlocking: The rectification side and the inversion side are controlled by different commands to start and stop. The inversion side cannot be started when the rectification side is not started. In rectification process, the inversion can be started and stopped separately. And the inversion has to be shut down before rectification shutdown.

2: completely independent: The rectification side and the inversion side are controlled by different commands to start and stop. They are completely independent of each other.

Note: Via the DB9 communication wiring, the rectification side and the inverter side can interact with each other at the three-level, and the operation command given source of the rectification side should be selected as 2: communication setting.

FF.15	Motor overtemperature point	0.0℃~200.0℃	Default: 120.0℃

The motor temperature display needs to be used with an IO expansion card. When FF.15 is set to 0, overheating faults are not handled.

FF.17	Rectification-side control enabling 1	Ones-bit: locking output switch enabling 0: invalid 1: on	Default: 0001

It is used for three-level four-quadrant one-button start/stop, and there's an A.080 warning for the rectification when the inversion reports a fault.

FF.18	Three-level four-quadrant inversion start delay	0.0s~6000.0s	Default: 0

Three-level four-quadrant one-button start/stop logic is valid.

FF.19	Output contactor disconnection filter time	0.000s~1.000s	Default: 0.200

It is the output contactor disconnection judgment time. When the disconnection duration is greater than this value, it will report a fault.

FF.22	Special function	Ones-bit: undervoltage warning code enabling 0: not enabled 1: enabled Tens-bit: reset enabling at undervoltage 0: not enabled 1: enabled	Default: 0.200

Version Change Log

Date	Modified version	Change content
2025.12	※ First version issued	V1.0
2026.10	Modify the output frequency	V1.1

VEICHI

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Version: V1.1

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