VC60 Series
Online Soft Starter
User Manual Book

Chapter 1 Product Information
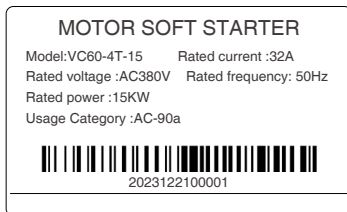
1.1 Unpacking and Inspection

Each soft starter undergoes strict inspection and performance testing before leaving the factory. After receiving the product and unpacking it, please carefully follow the steps below to check it. If you find any problems, please contact the supplier in time.

Check the product model: Check the specification label on the product chassis to make sure that the goods match the ordered product
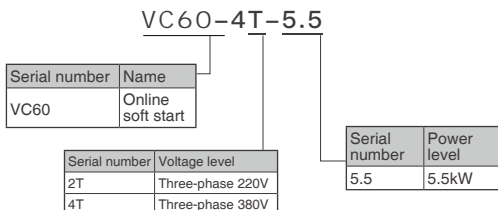
Check whether the product is damaged during transportation, such as: cracking, deformation of the outer cover, falling off of internal parts, abnormal noise, etc.

Check other items: In addition to the product itself, each soft starter box is also equipped with an operating manual and a product inspection certificate.

1.2 Nameplate

MOTOR SOFT STARTER

Model:VC60-4T-15   Rated current :32A
Rated voltage :AC380V   Rated frequency: 50Hz
Rated power :15KW
Usage Category :AC-90a

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1.3 Model

VC60–4T–5.5

Serial number	Name
VC60	Online soft start

Serial number	Voltage level
2T	Three-phase 220V
4T	Three-phase 380V

Serial number	Power level
5.5	5.5kW

Chapter 2 Safety Statement

This symbol is used in this manual to remind readers to pay close attention to special precautions regarding the installation and operation of the equipment.

Warning statements cannot cover every possible cause of equipment damage, but they can highlight common causes of damage. Installers must read and understand all instructions in this manual before installing, operating or maintaining the equipment, must follow good electrical installation practices (including wearing appropriate personal protective equipment), and must seek advice in advance if the equipment is operated in a manner different from that described in this manual.

Notice

The soft starter is not user repairable. The soft starter may only be repaired by authorized repair personnel. Unauthorized tampering with the soft starter will void the product warranty.

2.1 Risk of electric shock

Voltage is present in the following locations and could cause severe electric shock, which could be fatal:

● AC power lines and connections

● Output wires and connections

● Many parts of the starter and external optional equipment

Before opening the starter cover or performing any maintenance work, the AC power supply must be isolated from the starter with an approved isolation device.

WARNING - HAZARD OF ELECTRIC SHOCK

The busbars and heat sink must be considered live whenever supply voltage is connected, including when the starter is tripped or awaiting a command.

SHORT CIRCUIT

Protect against short circuits. The soft starter should be fully tested for operation after a severe overload or short circuit by an authorized service agent.

GROUNDING AND BRANCH CIRCUIT PROTECTION

The user or installer must provide proper grounding and branch circuit protection as required by local electrical safety codes.

For safety reasons

● The stop function of the soft starter does not isolate the dangerous voltage at the starter output. Before touching the electrical connections, the soft starter must be disconnected with an approved electrical isolation device.

● The soft starter protection function is only applicable to motor protection. The user must ensure the safety of the machine operator.

● In some installation situations, the accidental start of the machine may endanger the safety of the machine operator and may damage the machine. In such cases, it is recommended that you install disconnect switches and circuit breakers (such as power contactors) that can be controlled by external safety systems (such as emergency stop and fault detection period) to the soft starter power supply.

● The soft starter has a built-in protection mechanism, and the starter trips in the event of a fault, stopping the motor. Voltage fluctuations, power outages and motor jams can also cause the motor to trip.

● After eliminating the cause of the stop, the motor may restart, which may endanger the safety of some machines or equipment. In this case, appropriate configuration must be made to prevent the motor from restarting after an unexpected stop.

● Soft starters are carefully designed components that can be integrated into the electrical system; the system designer/user must ensure that the electrical system is safe and meets the requirements of the corresponding local safety standards.

Our company assumes no liability for any damage resulting from failure to comply with the above recommendations.

2.2 Selection considerations

Devices with electrical parts cannot be disposed of as household waste.

Electrical and electronic waste must be collected separately according to current local laws.

The soft starter must provide a force greater than the load resistance torque to complete the start. For ordinary loads such as water pumps and fans, it is recommended to configure a soft starter with the same or higher gear specifications. For heavy loads such as ball mills, 6-stage fans, crushers, etc., it is recommended to configure a soft starter with higher gear specifications or two gear specifications.

Our company is constantly improving its products and reserves the right to modify or change product specifications at any time without prior notice.

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Our company strives to ensure that the information (including pictures) in this manual is accurate, but does not assume any responsibility for errors, omissions or inconsistencies with the finished product.

Chapter 3 Introduction

This soft starter is an advanced digital soft start solution for motors ranging from 5.5kW to 750kW. It provides a complete set of motor and system protection functions to ensure reliable performance even in the harshest installation environments.

3.1 Features List

Selectable soft start curve ● Voltage ramp start ● Voltage ramp + jump start ● Current limit start	**Customizable protection** ● Input phase loss ● Output phase loss ● Soft start overheating ● Phase sequence reverse connection ● Running overload ● Start overcurrent ● Running overcurrent ● Overvoltage ● Undervoltage ● Underload
Selectable soft stop curve ● Free stop ● Soft stop	
Extended input and output options ● Remote control input ● Relay output ● Analog output ● Switching input and output ● RS485 communication ● Motor temperature detection	**Models to meet all connection needs** ● 11A-1350A (rated) ● 220VAC-380VAC ● Star connection 1.5
Easy-to-read display shows comprehensive feedback ● Removable operation panel ● Built-in Chinese + English + Russian display	

Chapter 4 Conditions of Use and Installation Requirements

The motor soft starter should comply with the following usage conditions and installation method requirements; otherwise, the performance will not be guaranteed, and in severe cases it may even shorten the life of the motor soft starter or even cause it to be damaged.

4.1 Conditions of Use:

○ Power supply: City power, self-provided power station, diesel generator set three-phase AC 220V, 380V, 30Hz to 70Hz, the power capacity must meet the soft start requirements for the motor.

○ Applicable motor: squirrel cage three-phase asynchronous motor, the motor rated power should match the rated power of the online intelligent motor soft start.

○ Starting frequency: No requirement, the specific number depends on the load.

○ Cooling method: forced air cooling.

○ Protection level: IP20.

○ Environmental conditions: below 2000 meters above sea level, ambient temperature between -10℃ ~+40℃ , relative humidity below 95%RH, no condensation, no flammable, explosive, corrosive gas, no conductive dust, good indoor ventilation, vibration less than 0.5G. Above 2000 meters above sea level, derating is required.

● Our company can provide users with products for use under special conditions, such as explosion-proof, low-temperature, and high-voltage online intelligent motor soft starters. The conditions of use will be explained separately.

4.2 Appearance and installation dimensions:

Voltage Level	Rated current	Rated power	Display Mode	Parameters Number	Protection Type	Input and output terminals	Overload capacity
220V	20~2390A	5.5~630KW	LCD display	115	18	20	Adjustable
380V	13~1350A	5.5~750KW					
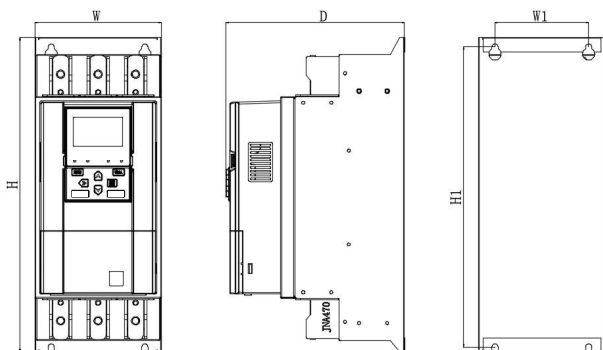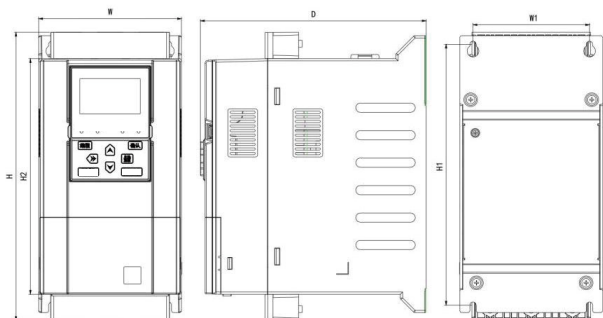
Power Range	Dimensions (mm)				Installation Dimensions (mm)		Mounting holes (mm)	Shape
	W	H	H2	D	W1	H1		
5.5~55kW	125	252	206	197.5	102	228	5	Figure 1
75kW	135	335	/	190	100	320	6	Figure 2
90~110kW	190	360	/	223	140	345		

Chapter 5 Online Intelligent Motor Soft Start External Terminal Description

Soft starter terminal wiring diagram:
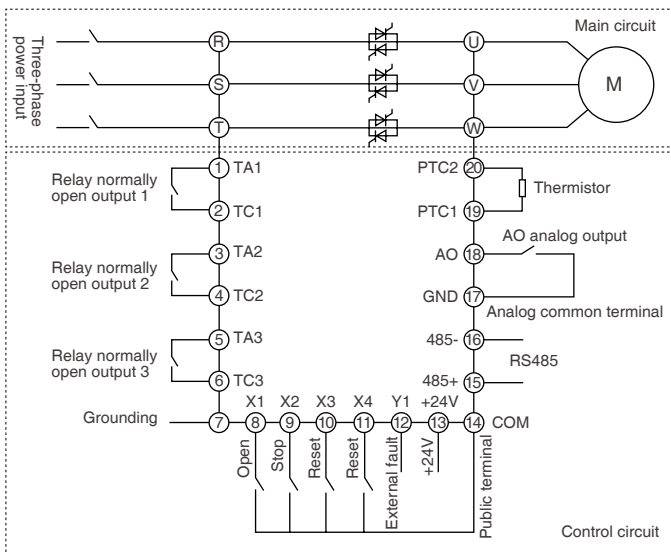
Soft starter secondary terminal sequence diagram:
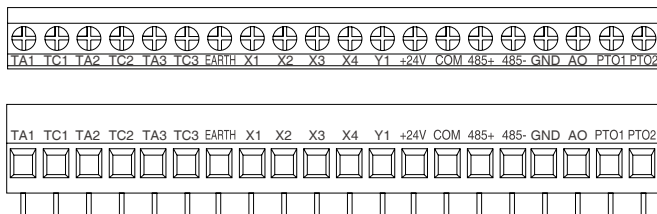
Terminal start and stop instructions:

RUN/STOP Terminal control mode	
0: Two-wire 1	X1Close to start; X1 open to stop;
1: Two-wire 2	X1 and X2 are both closed to start; X1 and X2 are disconnected to stop;
2: Normally closed three-wire	When X2 is closed, X1 is closed once to start; when X2 is opened once, it stops;
3: Normally open three-wire	X1 closes once to start; X2 closes once to stop;
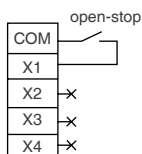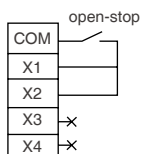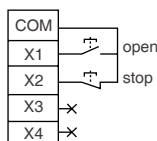
Two-wire 1   Two-wire 2   Normally closed
three-wire   Normally open
three-wire
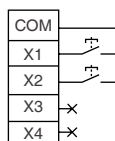
Terminal Type		Terminal No.	Terminal name	illustrate
Main circuit		R, S, T	Power Input	Connect to three-phase AC power supply
		U, V, W	Motor output	Connect to three-phase asynchronous motor
Control loop	Communication	485-	485 communication negative terminal	≥100mm
		485+	485 communication positive terminal	≥100mm

端子类型		端子号	端子名称	说明
Control loop	Programmable digital inputs	+24V	24V auxiliary power supply	The maximum current it can provide is 100mA
		X1	start up	Short-circuit with common terminal (com) to start soft start
		X2	STOP	Disconnecting from the common terminal (com) can stop the soft start
		X3	Reset	Short circuit with common terminal (COM) Soft start reset
		X4	External fault	Short-circuit with common terminal (com) Soft start fault shutdown
		Com	Public terminal	With 24V
	Analog Output	AO	4-20mA Output positive	4-20mA output
		GND	4-20mA Output	
	Programming relay	TA1	Programmable relay 1	Programmable relay output, you can choose from the following functions: 0: Idle 1: Soft starter ready to run 2: Soft starter running 3: Soft starter inching running
		TC1		
		TA2	Programmable relay 2	
		TC2		
		TA3	Programmable relay 3	
		TC3		
	Programmable digital output	Y1	Switching output	4: External fault shutdown 5: Soft starter fault 6: Start completed 7: Soft stop process output 8: Bypass action 9: Overcurrent warning signal output
	Temperature Detection	PTC-1	Temperature detection	Connect thermistor to detect machine temperature
		PTC-2		

Chapter 6 Motor Connection

The soft starter uses the star connection method (also called the three-wire connection method) to connect the motor.

Reference diagram for online soft starter connection:
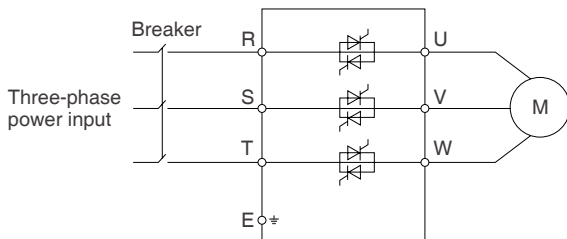
Chapter 7 Operation Panel

Key	Name	Function
PRG	Programming Key	Enter the parameter menu
»	Shift key	Shift key when modifying parameters.
▲	Increment key	Data and parameter codes increment.
▼	Decrement key	Data and parameter codes are decremented.
Run	Run Key	In keyboard operation mode, it is used to run operations.
STOP/RESET	Stop/Reset Key	In the running state, press this key to stop the operation; in the fault state, it can be used to reset the operation.
ENTER	ENTER key	1. Enter the next submenu.
		2. Set the parameters to confirm.
LOCAL / REMOTE	Panel control keys	Turn keyboard control on or off.

Starter Status LED

Name	Lights on	Flash
Run	The light is always on when the machine is in operation, otherwise it is off	
point		Flashes when in warning or fault condition, otherwise turns off
local	The light is always on when the machine is in local control state, otherwise it is off	
remote	The light is always on when the machine is in remote control mode, otherwise it is off	

The local LED light only works for keyboard control mode. The light is on when the panel can be started or stopped, and the light is off when the panel cannot be started or stopped.

Chapter 8 Selection of Water Pump Matching Functions

Selection of Water Pump Matching Functions	
0: None	Control start and stop according to the RUN/STOP terminal control mode;
1: Float	X1 closing enables operation, X2 closing starts, and X2 opening stops;
2: Electric contact pressure gauge	X1 is closed to enable operation, X2 is closed to start, and X3 is closed to stop;
3: Water supply level relay	X1 is closed to enable operation, X2 and X3 are both disconnected to start, and X2 and X3 are both closed to stop;
4: Drain level relay	X1 is closed to enable operation, X2 and X3 are closed to start, and X2 and X3 are open to stop;

Float

Electric contact pressure gauge

Water supply level relay

Drain level relay
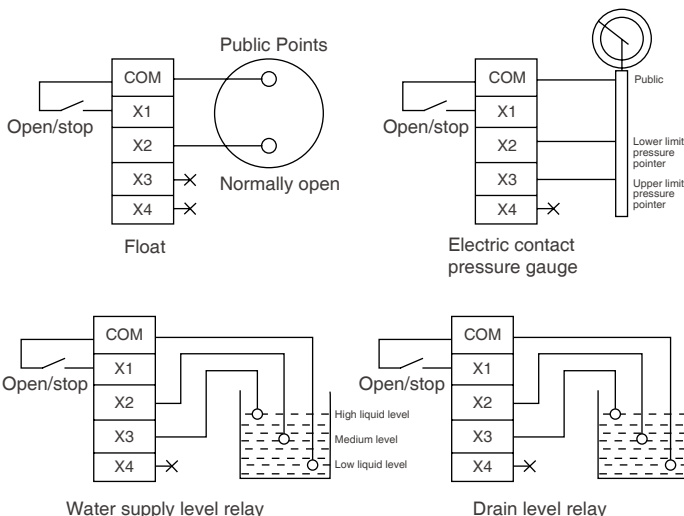
Chapter 9 Basic Parameters

Soft starter parameter description

" ○ " : Parameters that can be modified in any state
" × " : Parameters that cannot be modified in the running state
" ◆ " : Actual detection parameters, cannot be modified
" ◇ " : Manufacturer parameters, limited to manufacturer modification, users are prohibited from modifying

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F0 basic function group						
F0.00	Reserve	——	——	——	——	×
F0.01	Motor starting method selection	0: Voltage ramp 1: Voltage ramp+kick start 2: Current-limit	0 ~ 2	1	0	×
F0.02	Motor stopping method selection	0: Coast to stop 1: Soft stop	0 ~ 1	1	0	×
F0.03	Start command source selection	0: Disable Start-Stop 1: Panel command channel 2: Terminal command channel 3: Communication command channel 4: Panel +Terminal command channel 5: Panel +Communication command channel 6: Terminal +Communication command channel 7: Panel +Terminal +Communication command channel	0 ~ 7	1	4	○
F0.04	Voltage ramp start time	The reference time for smooth motor start-up during voltage ramp mode initiation under standard load;this time is not the mechanical time constant.	0.1 ~ 999.9s	0.1s	15.0s	○

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F0.05	Start voltage	For voltage ramp start mode, the higher the initial voltage setting,the greater the initial starting torque.	20.0%~ 80.0%Ue	0.1%	30.0%	×
F0.06	Starting current limit multiple	During current limiting start, the starting current is limited to a multiple of the motor's rated current.	100%~ 500% ie	1%	300%	×
F0.07	Kick voltage	When the kickstart function is selected, the soft starter	50.0%~ 90.0%Ue	0.1%	70.0%	×
F0.08	Kick start time	instantaneously outputs the kickstart voltage upon start initiation. This voltage is maintained for the duration of the kickstart time, after which the output voltage follows the programmed voltage ramp profile.	0~ 2000ms	1ms	500 ms	×
F0.09	Soft stop time	Deceleration time when soft stop mode is enabled.	0.1~ 999.9s	0.1s	1.0s	○
F0.10	Start interval time	After a start failure occurs, this delay time must elapse before the equipment can be restarted.	0.1~ 999.9s	0.1s	60.0s	○
F0.11	Extended start time	When the starting process exceeds this time limit without successful motor start, a start timeout fault is tripped. Setting it to 0 disables this function.	0.1 ~ 999.9s	0.1s	60.0s	○
F0.12	Reserve	——	——	——	——	×
F0.13	user password	"0 ~ 9999 Note 1:0 means no password protection; Note 2:After succussful password setting,wait 3 minutes for it to take effect;"	0~9999	1	0	○
F1 Auxiliary running parameters						
F1.00	Reserve	——	——	——	——	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F1.01	Reserve	——	——	——	——	×
F1.02	Reserve	——	——	——	——	×
F1.04	Input power frequency	0: 50Hz 1: 60Hz 2: Self-adaption	0~2	1	2	×
F1.05	Current resolution	0: NO decimal point 1: One decimal point	0~1	1	Model setting	×
F2 Motor functional parameters						
F2.00	Motor rated voltage	Rated voltage of Motor	380V: 0~500V 220: 0~250V	1V	380 220	◆
F2.01	Motor rated current	Rated current of Motor	0.1~ 2000.0A	0.1A	Model setting	×
F2.02	Reserve	——	——	——	——	×
F2.03	Reserve	——	——	——	——	×
F2.04	Reserve	——	——	——	——	×
F2.05	Reserve	——	——	——	——	×
F3 External control application parameters						
F3.00	AO output lower limit	Lower Scaling Limit Percentage for Analog Output	0.0%~100.0%	0.1%	20.0%	○
F3.01	AO output upper limit	Upper Scaling Limit Percentage for Analog Output	0.0%~100.0%	0.1%	100.0%	○
F3.02	AO output upper limit corresponding value	Physical Value at Analog Output Upper Limit: Rated Current × [F3.02]	50%~500% ie	1%	200%	○
F3.03	Input terminal X1 function	0: Idle 1: Start control 2: Stop control 3: Reserved 4: Fault reset signal input 5: Extern fault normally open input 6: Prohibit start stop command 7: Pump signal 1 8: Pump signal 2	0 ~ 8	1	1	×
F3.04	Input terminal X2 function		0 ~ 8	1	2	×
F3.05	Input terminal X3 function		0 ~ 8	1	4	×
F3.06	Input terminal X4 function		0 ~ 8	1	5	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F3.07	X1 closing delay	When terminal X1 is closed to COM and the programmed delay elapses, the system executes the corresponding action.	0.0~255.0s	0.1s	0.0s	×
F3.08	X1 opening delay	When terminal X1 is opened from COM and the configured delay expires, the system releases the assigned function.	0.0~255.0s	0.1s	0.0s	×
F3.09	X2 closing delay	When terminal X2 is closed to COM and the programmed delay elapses, the system executes the corresponding action.	0.0~255.0s	0.1s	0.0s	×
F3.10	X2 opening delay	When terminal X2 is opened from COM and the configured delay expires, the system releases the assigned function.	0.0~255.0s	0.1s	0.0s	×
F3.11	X3 closing delay	When terminal X3 is closed to COM and the programmed delay elapses, the system executes the corresponding action.	0.0~255.0s	0.1s	0.0s	×
F3.12	X3 opening delay	When terminal X3 is opened from COM and the configured delay expires, the system releases the assigned function.	0.0~255.0s	0.1s	0.0s	×
F3.13	X4 closing delay	When terminal X4 is closed to COM and the programmed delay elapses, the system executes the corresponding action.	0.0~255.0s	0.1s	0.0s	×
F3.14	X4 opening delay	When terminal X4 is opened from COM and the configured delay expires, the system releases the assigned function.	0.0~255.0s	0.1s	0.0s	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F3.15	Input terminal pulse trigger mode setting(X1~X4)	Bit0：X1 Trigger Mode Bit1：X2 Trigger Mode Bit2：X3 Trigger Mode Bit3：X4 Trigger Mode Bit4 ~ 7：Reserve 0：Level triggering method 1：Pulse triggering method	0 ~ 0x0FH	1	0	○
F3.16	Input terminal valid logic setting (X1~X4)	Bit0：X1 Logic Configuration Bit1：X2 Logic Configuration Bit2：X3 Logic Configuration Bit3：X4 Logic Configuration Bit4~7：Reserve 0：Positive logic 1：Inverse logic	0 ~ 0x0FH	1	0	○
F3.17	Input terminal filter coefficient	1：2 millisecond scanning time unit	0 ~ 9999	1	4	○
F3.18	RUN/STOP terminal control mode	"0：Two line control mode 1 1：Two line control mode 2 2：Normally closed three wire control 3：Normally open three wire control	0 ~ 3	1	0	×
F3.19	Power- on terminal function detection selection	0：The terminal start command is invalid when powered on 1：The terminal start command is valid when powered on	0 ~ 1	1	0	×
F3.20	Y output setting	0：Idle 1：The soft starter is ready for operation	0 ~ 8	1	0	○
F3.21	Programmable R1 output setting	2：The soft starter is running 3：The soft	0 ~ 8	1	8	○
F3.22	Programmable R2 output setting	starter is jogging 4：External fault machine halt 5：Soft starter	0 ~ 8	1	5	○
F3.23	Programmable R3 output setting	malfunction 6：Start completed 7：Soft stop process output	0 ~ 8	1	0	○

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
		8：Bypass Active 9：Overcurrent Pre-alarm signal				
F3.24	Y closing delay	After the Y-terminal function is enabled and the configured delay expires, the Y terminal outputs a logic signal.	0.0~255.0s	0.1s	0.0s	×
F3.25	Y opening delay	After the Y-terminal function is deactivated and the configured delay expires, the Y terminal deactivates its logic signal output.	0.0~255.0s	0.1s	0.0s	×
F3.26	Programmable R1 closing delay	After the R1 relay function is enabled and the configured delay expires, the R1 terminal actuates its contact signal.	0.0~255.0s	0.1s	0.0s	×
F3.27	Programmable R1 opening delay	After the R1 relay function is deactivated and the configured delay expires, the R1 terminal releases its contact signal output.	0.0~255.0s	0.1s	0.0s	×
F3.28	Programmable R2 closing delay	After the R2 relay function is enabled and the configured delay expires, the R2 terminal actuates its contact signal.	0.0~255.0s	0.1s	0.0s	×
F3.29	Programmable R2 opening delay	After the R2 relay function is deactivated and the configured delay expires, the R2 terminal releases its contact signal output.	0.0~255.0s	0.1s	0.0s	×
F3.30	Programmable R3 closing delay	After the R3 relay function is enabled and the configured delay expires, the R3 terminal actuates its contact signal.	0.0~255.0s	0.1s	0.0s	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F3.31	Programmable R3 opening delay	After the R3 relay function is deactivated and the configured delay expires, the R3 terminal releases its contact signal output.	0.0~255.0s	0.1s	0.0s	×
F3.32	Output terminal logic setting	Bit0: Y Logic Assignment Bit1: R1 Logic Assignment Bit2: R2 Logic Assignment Bit3: R3 Logic Assignment Bit4 ~ 7: Reserve 0: Positive logic,outputs high-level signal when terminal function is active 1: Negative logic,outputs high-level signal when terminal function is inactive	0 ~ 0x0FH	1	0	○
F4 Protection function parameters						
F4.00	Operation overload protection level	Select appropriate overload class based on load conditions: higher loads permit higher overload classes; the overload protection curve follows an inverse-time characteristic.	1 ~ 30	1	10	×
F4.01	Operation overload fault response	0: Protective action and coast to stop 1: Alarm and continue running	0 ~ 1	1	0	×
F4.02	Starting overcurrent protection multiple	During soft-start process, if actual output current exceeds the product of [F2.01] Motor Rated Current × [F4.02] Starting Overcurrent Protection Ratio for [F4.03] Starting Overcurrent Protection Delay Time, the soft starter triggers [F4.04] Starting Overcurrent Protection Action.	100%~600%ie	1%	500%	×
F4.03	Starting overcurrent protection delay time		0.1~999.9s	0.1s	20.0s	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F4.04	Starting overcurrent fault response	0：Protective action and coast to stop 1：Alarm and continue running 2：No action	0 ~ 2	1	0	×
F4.05	Running overcurrent protection multiple	After soft start completion, if the actual output current exceeds (motor rated current [F2.01] × running overload protection multiplier [F4.05]) and persists beyond the running overcurrent protection time [F4.06], the soft starter initiates running overcurrent protection action [F4.07].	100%~ 600% ie	1%	200%	×
F4.06	Running overcurrent protection delay time		0.1~ 999.9s	0.1s	30.0s	×
F4.07	Running overcurrent fault response	0：Protective action and coast to stop 1：Alarm and continue running 2：No action	0 ~ 2	1	0	×
F4.08	Overvoltage protection multiple	When the input voltage exceeds the product of soft starter rated voltage × overvoltage protection factor [F4.08], and persists beyond the overvoltage protection delay time [F4.09], the soft starter trips with the overvoltage fault action configured in [F4.10].	100%~ 140% ie	1%	125%	×
F4.09	Overvoltage protection delay time		0.1~ 999.9s	0.1s	5.0s	×
F4.10	Overvoltage fault response	0：Protective action and coast to stop 1：Alarm and continue running 2：No action	0 ~ 2	1	0	×
F4.11	Undervoltage protection multiple	When input voltage drops below rated voltage × under-voltage protection ratio [F4.11] and persists for the under-voltage protection delay time [F4.12], the soft starter initiates the under-voltage fault protection action [F4.13].	50%~ 100% Ue	1%	75%	×
F4.12	Undervoltage protection delay time		0.1~ 999.9s	0.1s	5.0s	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F4.13	Undervoltage fault response	0: Protective action and coast to stop 1: Alarm and continue running 2: No action	0 ~ 2	1	0	×
F4.14	Three-phase unbalance protection coefficient	During operation, if the ratio of minimum phase current to maximum phase current in U/V/W output phases is below the three-phase imbalance coefficient [F4.14] and persists beyond the imbalance protection delay time [F4.15], the three-phase imbalance protection [F4.16] will activate. This function is disabled when the imbalance coefficient is set to 100%.	20% ~ 100%	1%	40%	×
F4.15	Three-phase unbalance protection delay time		0 ~ 1000s	1s	5s	×
F4.16	Three-phase unbalance fault response	0: Protective action and coast to stop 1: Alarm and continue running	0 ~ 1	1	0	×
F4.17	Underload protection multiple	During operation, if the output current falls below (motor rated current [F2.01] × underload protection multiplier [F4.17]), the underload protection action [F4.19] will be triggered after the underload protection delay time [F4.18] elapses.	0 ~ 100%	1%	50%	×
F4.18	Underload protection delay time		0.1~ 999.9s	0.1s	5.0s	×
F4.19	Underload fault response	0: Protective action and coast to stop 1: Alarm and continue running 2: No action	0 ~ 2	1	2	×
F4.20	Input phase loss protection selection	0: Forbidden 1: Valid	0 ~ 2	1	0	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F4.21	Input phase loss protection delay time	Upon detecting the absence of one or more phases, the system triggers input phase-loss protection after the preset delay time	1 ~ 100s	1	1S	○
F4.22	Phase sequence reverse protection selection	"0: Forbidden 1: Valid"	0 ~ 1	1	0	×
F4.23	RS485 communication error protection selection	0: Protective action and coast to stop 1: Alarm and continue running	0 ~ 1	1	0	×
F4.24	Reserve	——	——	——	——	×
F4.25	Module overheat fault response	0: Protective action and coast to stop 1: Alarm and continue running	0 ~ 1	1	0	×
F4.26	Overcurrent Pre-alarm threshold	After startup completion, an overcurrent pre-alarm signal is triggered when the output current exceeds (motor rated current × overcurrent pre-alarm level) for 3 seconds.	20%~ 250%	1%	120%	F4.26
F5 Communication parameters						
F5.00	Local address	0: Broadcast address 1 ~ 247	0 ~ 247	1	1	×
F5.01	Modbus communication configuration	Units digit: Baud rate selection 0: 9600BPS 1: 19200BPS 2: 38400BPS tens digit: data format 0: No parity 1: Even parity 2: Odd parity hundreds digit: reserved thousands digit: reserved	0~ 0×0022	1	0× 0000	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F5.02	Communication timeout detection time	If no valid data signal is received within the time interval defined by this function code, the drive will recognize a communication fault. The inverter will then execute the response action configured in the 'Communication Failure Mode' setting (either trip protection or continue operation). Setting this value to 0.0 disables RS485 communication timeout detection.	0.0~100.0s	0.1s	10.0s	×
F5.03	Local response delay	This function code defines the inter-frame delay between the completion of inverter data frame reception and the transmission of the response frame to the host controller. If the response time is shorter than the system processing time, the system processing time shall prevail.	0~200ms	1ms	5ms	×
F6 Advanced functional parameters						
F6.00	Cooling fan control(Valid only in online mode))	0: Automatic control mode 1: Continuous operation during power-on 2: Temperature-based control	0 ~ 2	1	0	○
F6.01	Number of automatic fault resets	When fault reset count is set to 0, auto-reset is disabled (manual reset only). Setting 10 indicates unlimited reset attempts.	0 ~ 10	1	0	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F6.02	Automatic fault reset interval	Set fault auto-reset interval time;if the system is in running state when fault occurs,it will auto-run after reset	0.5~ 25.0s	0.1s	3.0s	×
F6.03	Power-loss restart	0： Invalid 1： Valid	0 ~ 1	1	0	×
F6.04	Power-loss restart waiting time	When power-off restart is enabled, if a power failure occurs during operation, the system will automatically resume operation after the power-off restart waiting time [F6.04] elapses upon next power-up.	0.0~ 25.0s	0.1s	0.0s	×
F6.05	Reserve	——	——	——	——	×
F6.06	Reserve	——	——	——	——	×
F6.07	Operation restriction password	Note 1: 0 = Password protection disabled Note 2: Password takes effect after 3-minute delay when successfully set"	0~ 65500	1	0	○
F6.08	Operation restriction selection	Operation restriction fault occurs when accumulated running time reaches preset limit after operation restriction function is enabled	0~1	1	0	○
F6.09	Operation restriction duration		0~ 65500 (h)	1h	0h	○
F7 Application-specific function parameters						
F7.00	Reserve	——	——	——	——	×
F7.01	Reserve	——	——	——	——	×
F7.02	Reserve	——	——	——	——	×
F7.03	Reserve	——	——	——	——	×
F7.04	Reserve	——	——	——	——	×
F7.05	Reserve	——	——	——	——	×
F7.06	Reserve	——	——	——	——	×
F7.07	Reserve	——	——	——	——	×

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F7.08	Reserve	——	——	——	——	×
F7.09	Pump-related function selection	0：Invalid 1：Floating ball 2：Electric Contact Pressure Gauge 3：Water supply level relay 4：Drainage level relay	0 ~ 4	1	0	×
F8 Display and functional management parameters						
F8.00	LCD language selection	0：Chinese 1：English	0 ~ 1	1	0	○
F8.02	Primary display selection during operation	Select monitoring information displayed on main digital tube during operation (This parameter is only valid for digital tube keypads)	0 ~ 25	1	24	○
F8.03	Primary display selection during stop	Select monitoring information displayed on main LED display during standby state (This parameter is only valid for digital display keypads)	0 ~ 2	1	0	×
F8.04	Parameter initialization	0：No-operation 1：All parameters are restored to factory values 2：Clear fault records This function code automatically resets to 0 after operation completion."	0 ~ 1	1	0	○
F8.05	Parameter write protection	0：Allow modification of all parameters 1：All parameters except for this function code are prohibited from being modified; Note：The above restrictions are not valid for F0.13"	0 ~ 25	1	2	○

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
F8.06	Secondary display selection during stop	Select monitored information displayed on sub-display during standby (This parameter applies only to LED keypad)	0 ~ 25	1	2	○
FF Factory parameters						
FF.00	厂家密码	Manufacturer password required to unlock access to subsequent parameters	1~9999	1	****	◇
FF.00	Manufacturer password	Manufacturer password required to unlock access to subsequent parameters	1~9999	1	****	◇
FF.01	Inverter model	380V: 30:5.5KW 31:7.5KW 32:11KW 33:15KW 34:18.5KW 3522KW 36:30KW 37:37KW 38:45KW 39:55KW 40:75KW 41:90KW 42:110KW 43:132KW 44:160KW 45:200KW 46:220KW 47:250KW 48:280KW 49:315KW 50:350KW 51:400KW 52:450KW 53:500KW 54:550KW 55:630KW 56:750KW	30~56	1	Model setting	◇
FF.02	Input voltage correction factor	When the displayed input voltage deviates from the actual measurement, adjust this setting to calibrate the display.	0.01~3.00	0.01	1.00	◇
FF.03	Output current correction factor	When the displayed output current deviates from the actual output current, adjust this parameter to calibrate the display value.	0.01~3.00	0.01	1.00	◇
FF.04	Temperature detection mode selection	0:Type Ⅰ 1:Type Ⅱ	0~1	1	0	◇

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
FF.05	Temperature Protection Threshold Setting	Module overheat protection [F4.25] triggers when detected temperature exceeds this setpoint value	80.0℃ ~95.0℃	0.1℃	85.0℃	◇
FF.06	Reserve	——	——	——	——	◇
FF.07	Reserve	——	——	——	——	◇
FF.08	Special Function Selection	"Units digit:Cumulative operation time clear selection 0: Disabled 1: Enabled Tens digit:Current transformer installation mode 0: Required on U, V, W phases 1: Required on U, V phases 2: Required on U, W phases Hundreds digit:Reserved Thousands digit:Reserved"	0~ 0x21H	1	0	×
d Monitoring parameter group						
d-00	Output Power Factor	0.00 ～ 1.00		0.01	0.00	◆
d-01	Input frequency(Hz)	0.0 ～ 999.9Hz		0.1 Hz	0.0	◆
d-02	Input voltage(V)	0 ～ 999V		1V	0	◆
d-03	Reserve	0 ～ 999V		1V	0	◆
d-04	Output current(A)	0.0 ～ 999.9A		0.1A	0.0	◆
d-05	U phase current(A)	0.0 ～ 999.9A		0.1A	0.0	◆
d-06	V phase current(A)	0.0 ～ 999.9A		0.1A	0.0	◆
d-08	W phase current(A)	0.00 ～ 99999rpm		0.1A	0.0	◆
d-09	Analog output AO(V/mA)	0.00 ～ 10.00V		0.01 V	0.00	◆

Function code	Name	Function definition	Setting range	Minimum increment	Factory default	Change
d-10	Input terminal status(X1-X4)	0 ～ FH		1	0	◆
d-11	Output terminal status(Y1/Y2/R1/R2)	0 ～ FH		1	0	◆
d-12	Motor temperature(℃)	0.0 ～ 200.0℃		0.1℃	0.0	◆
d-13	Module temperature(℃)	0.0 ～ 132.3℃		0.1℃	0.0	◆
d-14	Software upgrade date(Year)	2021 ～ 2050		1	2023	◆
d-15	Software upgrade date(Month,Day)	0 ～ 1231		1	504	◆
d-16	Third fault code	0 ～ 18		1	0	◆
d-17	Second fault code	0 ～ 18		1	0	◆
d-18	Latest fault code	0 ～ 18		1	0	◆
d-19	Output current during the most recent fault(A)	0.0 ～ 6553.5A		0.1A	0.0	◆
d-20	Output voltage during the most recent fault(V)	0 ～ 999V		1V	0	◆
d-21	Modul temperature during the most recent fault(℃)	0.0 ～ 132.3℃		0.1℃	0.0	◆
d-22	Accumulated running time(h)	0 ～ 9999h		1h	0	◆
d-23	Soft starter power specifications	7.5 ～ 999.9KW		0.01 kW	Model setting	◆
d-24	Rated current of soft starter	0 ～ 999.9A		0.1A	Model setting	◆
d-25	Main controller software version	1.00 ～ 99.99		0.01	1.00	◆
d-26	Soft starter status	0 ～ 4		1	0	◆

Chapter 10 Fault codes

10.1 Protection Response

When a protection condition is detected, the soft starter programs the protection condition and it may trip or issue a warning. The soft starter response depends on the protection level.

Some of these protection responses are not user adjustable. These trips are usually caused by external events (such as phase loss) or by internal faults in the soft starter. These trips have no parameters and cannot be set to warning or ignored.

If the soft starter trips, you need to identify and clear the condition that triggered the trip and reset the soft starter before you can restart. To reset the starter, press the (Stop/Reset) button on the keypad or activate the Stop/Reset Remote Input.

10.2 Soft starter fault code table

The following table lists the protection mechanisms of the soft starter and possible tripping reasons. Some settings can be adjusted with the protection level, while other settings are built-in system protection and cannot be set or adjusted.

Fault codes	Name	Cause	Corrective action
——	No fault		
E-01	Overcurrent during startup	Excessive load	Reduce load
		Motor stall	Check motor for mechanical blockageCheck motor for mechanical blockage
		Improper parameter setting	Adjust current protection multiplier during start

Fault codes	Name	Cause	Corrective action
E-02	Overcurrent during running	Excessive load	Reduce load
		Motor stall	Check motor for mechanical blockageCheck motor for mechanical blockage
		Improper parameter setting	Adjust current protection multiplier during start
E-03	Overload	Excessive load	Reduce load
		Undersized soft starter	Verify soft starter-motor compatibility
		Improper parameter setting	Adjust overload protection level
E-04	Underload	Sudden motor load loss	Check for abrupt load disconnection
		Improper parameter setting	Adjust underload coefficient or disable function
E-05	Overvoltage	Grid overvoltage	Inspect grid voltage
E-06	Undervoltage	Grid undervoltage	Inspect grid voltage
		Insufficient grid capacity	Check gird power supply capability
E-07	Heatsink OT	Ambient temperature too high	Improve ventilation/cooling
		Fan failure	Replace cooling fan
		Air duct blockage	Clear ventilation path
E-08	Reserve	-	-
E-09	Start timeout	Overload or insufficient power	Verify load&power supply capacity
		Improper parameter setting	Adjust current limit&extended start time
E-10	External device fault	External fault input active	Clear external fault signal & diagnose cause

Fault codes	Name	Cause	Corrective action
E-11	Current detection fault	Thyristor failure(open circuit)	Test thyristor module
		Current sampling circuit fault	Contact manufacturer
E-12	RS485 communication fault	RS485 disconnection/ interference	Check shielded wiring;add filter capacitors
		Communication timeout	Reset system;check host-device configuration
E-13	Input phase loss	Abnormal input power	Verify UVW phase integrity
E-14	Output phase loss	Thyristor failure	Replace thyristor module
		Motor phase loss	Replace thyristor module
		Motor wiring fault	Inspect starter-motor connections
		Incorrect phase imbalance setting	Adjust phase imbalance coefficient
E-15	Phase sequence error	Input phase sequence error	Correct UVW phase sequence
E-16	CPU fault	CPU communication fault	Contact manufacturer
E-17	EEPROM read/write error	EEPROM R/W error	Contact manufacturer
E-18	The running time limit has been reached	Total operating time reached set value	Contact manufacturer
Alarm codes			
0	No alarm		
1	Overcurrent alarm during startup	Refer to fault cause	Refer to troubleshooting procedure
2	Overcurrent alarm during running	Refer to fault cause	Refer to troubleshooting procedure

Fault codes	Name	Cause	Corrective action
3	Overload alarm	Refer to fault cause	Refer to troubleshooting procedure
4	Underload alarm	Refer to fault cause	Refer to troubleshooting procedure
5	Overvoltage alarm	Refer to fault cause	Refer to troubleshooting procedure
6	Undervoltage alarm	Refer to fault cause	Refer to troubleshooting procedure
7	Heatsink over-temperature alarm	Refer to fault cause	Refer to troubleshooting procedure
8	Reserve	Refer to fault cause	Refer to troubleshooting procedure
9	RS485 communication fault	Refer to fault cause	Refer to troubleshooting procedure
10	Output phase loss alarm	Refer to fault cause	Refer to troubleshooting procedure

Chapter 11 Overload Protection Function Description

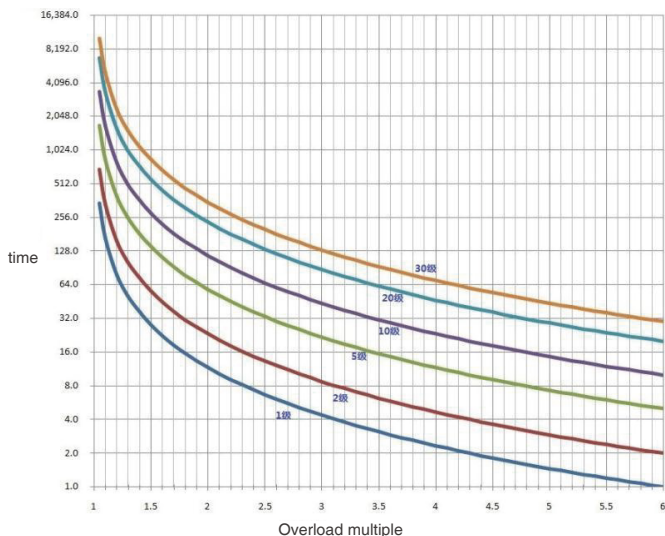**Overload protection**

Overload protection adopts inverse time curve control

Protection time: $t = \dfrac{35 \cdot Tp}{(I/Ip) - 1}$

Where: t represents the action time, Tp represents the protection level, I represents the operating current, and Ip represents the rated current of the motor;

Motor overload protection characteristic curve:

Motor overload protection characteristics

Overload multiple / Overload Level	1.05Ie	1.2Ie	1.5Ie	2Ie	3Ie	4Ie	5Ie	6Ie
1	∝	79.5s	28s	11.7s	4.4s	2.3s	1.5s	1s
2	∝	159s	56s	23.3s	8.8s	4.7s	2.9s	2s
5	∝	398s	140s	58.3s	22s	11.7s	7.3s	5s
10	∝	795.5s	280s	117s	43.8s	23.3s	14.6s	10s
20	∝	1591s	560s	233s	87.5s	46.7s	29.2s	20s
30	∝	2386s	840s	350s	131s	70s	43.8s	30s

∝ Indicates no protection

Chapter 12 485 Communication Protocol

1、RTU mode and format

When the controller communicates on the Modbus bus in RTU mode, each 8-bit byte in the information is divided into two 4-bit hexadecimal characters. The main advantage of this mode is that the density of characters transmitted is higher than that of ASCII mode at the same baud rate. Each message must be transmitted continuously.

(1) Format of each byte in RTU mode

Coding system: 8-bit binary, hexadecimal 0-9, A-F.

Data bits: 1 start bit, 8 data bits (low bit sent first), 1 stop bit, and optional parity bit. (Refer to the RTU data frame sequence diagram)

Error check area: Cyclic redundancy check (CRC).

(2) RTU data frame bit sequence diagram

With parity check

Start	1	2	3	4	5	6	7	8	Par	Stop

No parity check

Start	1	2	3	4	5	6	7	8	Stop

2、Read and write function code description:

Function code	Functional Description
3	Read Register
6	Write Register

3、Register Address

Register Function	Address
Control command input	2000H
Monitoring parameter reading （d-00 ～ d-25）	1000H ～ 0019H
User parameter settings （F0.00 ～ F8.04）	0000H ～ 0804H
Factory parameter settings （FF.00 ～ FF.08）	0F00H ～ 0F08H

4、Communication protocol parameter address description: (R: read-only W: writable)

Functional Description	Address Definition	Data meaning	R/W
Communication control commands	2000H	0012H： Run	W
		0013H： Reserve	
		0022H： Reserve	
		0023H： Reserve	
Communication control commands	2002H	0001H： External fault input	W
		0002H： Fault reset	
Fault reading	2100H	Read soft start fault (see fault code table in Part 7 for details)	R
Soft starter status Read	2101H	Read soft starter status: 0: Stop status 1: Starting 2: Reserved 3: Start completed 4: Fault	R
Monitoring parameter reading	1000H	d-00 Output power factor (two decimal points)	R
	1001H	d-01 Input frequency (Hz) (one decimal point)	R
	1002H	d-02 Input voltage(V)	R
	1003H	d-03 Output voltage(V)	R
	1004H	d-04 Output current (A) (F1.05 determines the number of decimal places)	R
	1005H	d-05 U phase current (A) (F1.05 determines the number of decimal places)	R
	1006H	d-06 V phase current (A) (F1.05 determines the number of decimal places)	R
	1007H	d-07 W phase current (A) (F1.05 determines the number of decimal places)	R
	1008H	d-08 Motor speed (rpm)	R

Functional Description	Address Definition	Data meaning	R/W
Monitoring parameter reading	1009H	d-09 Analog output AO(V) (two decimal points)	R
	100AH	d-10 Input terminal status(X1-X4)	R
	100BH	d-11 Output terminal status(Y1/Y2/R1/R2)	R
	100CH	d-12 Motor temperature (℃) (A decimal point)	R
	100DH	d-13 Module temperature (℃) (A decimal point)	R
	100EH	d-14 Software upgrade date (year)	R
	100FH	d-15 Software upgrade date (month, day)	R
	1010H	d-16 The third fault code (See data sheet)	R
	1011H	d-17 Second fault code (See data sheet)	R
	1012H	d-18 The most recent fault code (See data sheet)	R
	1013H	d-19 Output current at the most recent fault (A) (F1.05 determines the number of decimal places)	R
	1014H	d-20 Output voltage at the last fault (V)	R
	1015H	d-21 Module temperature at the time of the most recent fault (°C) (one decimal point)	R
	1016H	d-22 Cumulative running time (h)	R
	1017H	d-23 Soft starter power specifications (Kw)	R
	1018H	d-24 Soft starter rated current (A) (F1.05 determines the number of decimal places)	R
	1019H	d-25 Main controller software version (two decimal points)	R
	101AH	d-26 Soft starter status (consistent with the data read from address 2101H)	R

5、03 Read function mode:

Query information frame format (send frame)

Address	01H
Function	03H
Starting data address	10H
	01H
Data （2 byte）	00H
	02H
CRC CHK Low	91H
CRC CHK High	0BH

Analysis of this data:
01H is the soft starter address
03H is the read function code
1001H is the starting address
0002H is the number of read addresses, and 1001H and 1002H
910BH is the 16-bit CRC verification code

Response information frame format (return frame)

Address	01H
Function	03H
DataNum*2	04H
Data 1 （2 byte）	01H
	F4H
Data 2 （2 byte）	01H
	7CH
CRC CHK Low	BAH
CRC CHK High	4CH

Analysis of this data:
01H is the soft starter address

03H is the read function code
04H is the product of the read item * 2
01F4H is the data for reading 1001H (input frequency)
017CH is the data for reading 1002H (input voltage)
BA4CH is the 16-bit CRC check code

Name	Frame Format
Read the data of F0.03 and F0.04	Send frame: 01H 03H 0003H 0002H 340BH
	Returns the frame: 01H 03H 04H 0004H 0096H 3B9CH
Read the data of F2.01	Send frame: 01H 03H 0201H 0001H D472H
	Returns the frame: 01H 03H 02H 0384H B8D7H
Read monitoring parameters of 2 items from d-00	Send frame: 01H 03H 1000H 0002H C0CBH
	Returns the frame: 01H 03H 04H 0041H 01F4H AA30H
Read the monitoring parameters of item d-01 1	Send frame: 01H 03H 1001H 0001H D10AH
	Returns the frame: 01H 03H 02H 01F4H B853H

6. 06H write function mode:

Query information frame format (send frame)

Address	01H
Function	06H
Starting data address	20H
	00H
Data（2 byte）	00H
	01H
CRC CHK Low	43H
CRC CHK High	CAH

Analysis of this data:
01H is the soft starter address
06H is the write function code
2000H is the control command address
0001H is the stop command
43CAH is the 16-bit CRC verification code

Response information frame format (return frame)

Address	01H
Function	06H
Starting data address	20H
	00H
Data（2 byte）	00H
	01H
CRC CHK Low	43H
CRC CHK High	CAH

This section of data analysis: If the settings are correct, the same input data is returned.

Name	Frame Format
RUN	Send frame: 01H 06H 2000H 0012H 0207H
	Returns the frame: 01H 06H 2000H 0012H 0207H
STOP	Send frame: 01H 06H 2000H 0001H 43CAH
	Returns the frame: 01H 06H 2000H 0001H 43CAH
Communication to external fault	Send frame: 01H 06H 2002H 0001H E20AH
	Returns the frame: 01H 06H 2002H 0001H E20AH

Name	Frame Format
Reset	Send frame: 01H 06H 2002H 0002H A20BH
	Returns the frame: 01H 06H 2002H 0002H A20BH
Set the parameter of item F6.00 to 1	Send frame: 01H 06H 0600H 0001H 4882H
	Returns the frame: 01H 06H 0600H 0001H 4882H

7、 Inverter fault codel list:

Fault Codes	Keyboard display content	Fault Information
0000H	——	No trouble
0001H	E-01	Overcurrent during startup
0002H	E-02	Overcurrent during operation
0003H	E-03	Overload
0004H	E-04	Underload
0005H	E-05	Overvoltage
0006H	E-06	Undervoltage
0007H	E-07	Radiator overheating
0008H	E-08	Reserve
0009H	E-09	Start timeout
000AH	E-10	External device failure
000BH	E-11	Current detection fault
000CH	E-12	485 Communication failure
000DH	E-13	Input phase loss
000EH	E-14	Output phase loss
000FH	E-15	Phase sequence error
0010H	E-16	CPU Failure
0011H	E-17	EEPROM Read and write errors
0012H	E-18	Running limit time reached

8. Meaning of error code when slave responds to abnormal information:

01H	Illegal function code
02H	Illegal address
03H	Illegal data
04H	Illegal register length
05H	CRC Verification Error
06H	Parameters cannot be modified during operation
07H	Parameters cannot be modified
08H	The host computer control command is invalid
09H	Parameters are password protected
0AH	Wrong password