Preface

First of all, we'd like to extend out sincere thanks for purchasing SD500 series spindle servo drive from Veichi Electric!

SD500 series spindle servo drive is designed with high performance closed-loop vector control, featuring wide speed range, fast response, accurate positioning, etc. Its various functions and external extension interfaces, with the upper CNC system, are enough for spindle orientation, C-axis, rigid tapping, indexing and positioning. The SD500 series spindle servo drive can be widely used in machining center, CNC machine tool, CNC milling machine, tilting lathe and flying shear, chasing cut, etc., becoming the preferred drive product for various machine tool power axis.

This user manual of SD500 spindle servo drive provides product safety information, mechanical and electrical installation instructions, basic commissioning, troubleshooting and daily maintenance-related matters. To ensure correct installation and operation of the SD500 spindle servo drive and full use of its superior performance, please read this in detail before installing it. If there are any doubts about functions and performance, please consult our technical support staff for assistance.

Due to the continuous improvement of servo products, the information provided here is subject to change without notice.

Catalog

Chapter 1 General

1.1 Safety Precautions

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

Warning signs and meanings

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

Dangerous	**Danger:** major safety accidents or death may be caused due to wrong operation.
Caution	**Note:** minor injuries may be caused due to wrong operation.

Table 1-1

Operation qualifications

This product must be operated by trained professionals. Moreover, the operator must be trained with professional skills, installation methods, wiring, operation and maintenance of the equipment, and proper solutions to various emergencies that may arise during running.

Security guidance

The warning signs are presented to prevent injury to the operator and damage to this product and associated systems; please read this manual carefully before use and follow the safety rules and warning signs strictly.

- Proper transportation, storage, installation, and careful operation and maintenance are essential to the safe operation of the spindle drive. During transportation and storage, the spindle drive must be protected from shock and vibration, and must be stored in a dry place free of corrosive gases, conductive dust, and ambient temperature lower than 60°C.
- This product carries a hazardous voltage and it controls a potentially hazardous motion mechanism. Failure to comply with the regulations of this manual may result in personal injury or death and damage to this product and associated systems.
- Do not perform wiring work while the power is on, as there is a risk of death by electric shock. Before wiring, inspection, maintenance, etc., cut off the power to all associated equipment and make sure the DC voltage of the main circuit has dropped to a safe level and wait for 5 minutes.
- The power cable, motor cable and control cable must be connected tightly, the grounding terminals must be grounded effectively, and the grounding resistance is lower than 10Ω.
- Human static electricity can seriously damage internal sensitive devices. Before performing related operations, please observe the measures and methods specified in the electrostatic preventive measures (ESD), otherwise the spindle drive may be damaged.
- Since the spindle drive output voltage is in a pulse waveform, be sure to remove or move it to the output side if there is a capacitor or varistor against lightning installed on the spindle drive's input side.
- Do not install switching devices such as circuit breakers and contactors on the output side of the spindle drive (if a switching device must be connected on the output side, the output current of the spindle drive must be 0 when the switch is operated).
- Failure at any point in the control equipment may result in production stoppage and major accidents. Therefore, please take the

necessary external protection measures or backup devices.

- This product should be used only for the purposes specified by the manufacturer, and must not be used in special areas such as emergency, rescue, marine, medical, aviation, nuclear facilities, etc. without permission.
- Maintenance of this product should only be performed by Veichi or professionals authorized by Veichi. Unauthorized modifications and use of parts that are not approved by Veichi may result in product failure. During maintenance, any defective device must be replaced timely.
- Veichi are not responsible for any injury or damage to equipment on customers' side or secondary customers if these operating instructions are not complied with.

1.2 Pre-use

When receive the ordered products, please check the outer packaging to see if it is damaged, then open the outer packaging and confirm that the spindle drive has no seeable damage, scratches or dirt (damage caused on the product during transportation does not belong to the scope of our "three packages"). If you receive a product with shipping damage, please contact us or the shipping company immediately. And at last, please confirm that the spindle drive model you received is the same as what you ordered.

1.2.1 Spindle Servo Drive Model and Nameplate Description

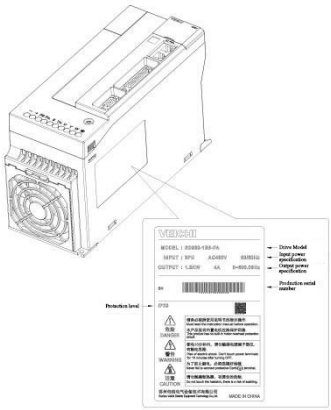


Figure 2-1

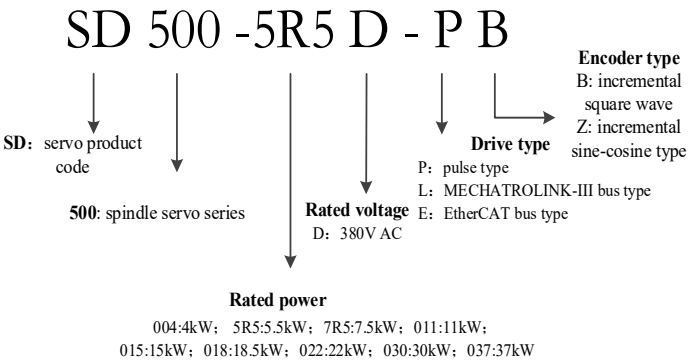


Figure 1-3

Rated output current of spindle servo drive

Input voltage	380V		
Model	Rated input current (A)	Rated output current (A)	Motor power(kw)
SD500-004D-*	12.0	10.0	4.0
SD500-5R5D-*	14.6	13.0	5.5
SD500-7R5D-*	21.5	17.0	7.5
SD500-011D-*	27.0	25.0	11.0
SD500-015D-*	35.2	32.0	15.0
SD500-018D-*	45.3	38.0	18.0
SD500-022D-*	50.0	45.0	22.0
SD500-030D-*	67.7	60.0	30.0
SD500-037D-*	83.4	75.0	37.0

Table 1-2

1.2.2 Motor Naming Rules

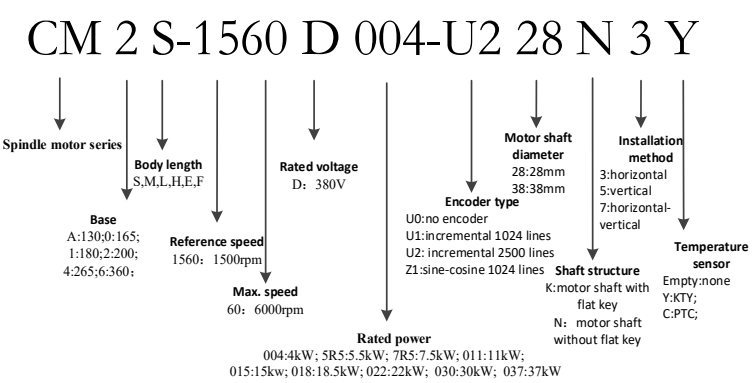


Figure 1-3

1.3 Technical Specification

Item		Description
Power input	Voltage & frequency	Three-phase:380V~440V, 50/60Hz
	Allowable fluctuation	Voltage imbalance rate:<3%; frequency: ±5%; distortion rate in accordance with IEC61800-2
	Closing surge current	Lower than rated current
	Power factor	≥0.94 (with DC reactor)
	Spindle drive efficiency	≥96%
Output	Output voltage	Output under rated conditions: three-phase 380 to 440V, error less than 5%
	Output speed range	4-pole motor 0~18000rpm; 0~600Hz
Main control performance	Motor control mode	Sine wave PWM modulation, fully closed-loop vector control
	Speed control range	1:1000
	Steady-state speed accuracy	≤0.05% rated synchronous speed
	Starting torque	200% rated torque at 0Hz
	Torque response	＜10ms
	Speed control accuracy	±0.2%
	Position control accuracy	±1pulse
	Overload capacity	200% rated current for 20S
Input/output interface	Digital input	7-way optocoupler isolated input, input method NPN or PNP optional
	Digital output	2-way optocoupler isolated output
	Analog input	2-way: -10V to +10V, 0 to 10V, 0 to 20mA selectable
	Analog output	1-way:0~10V、0~20mA Optional
	Relay output	2-way: two sets of normally open and normally closed contacts
	Encoder input interface	2-way: motor encoder 1 way; spindle encoder 1 way
	Encoder output interface	1-way: crossover output
	Pulse input interface	1-way: orthogonal pulse/direction + pulse/CW+CCW
	Bus interface	None

Spindle function	Speed control	Range: 0~12000RPM;
	Directional control	±1 pulse accuracy; set 8 positions with terminals
	Rigid tapping	Connectable to a variety of imported and domestic systems with 2% tapping error
	Encoder self-learning	Dual encoders automatically learn directions without wiring adjustments
	One-touch zero setting	One touch to set any position as zero point
	Arbitrary crossover output	1 to 32767 arbitrary crossover output selection
	Others	C-axis control, thread cutting, electronic gear, borehole, zero- speed lock
Protection		Protection against overvoltage, undervoltage, current limit, overcurrent, overload, overheat, overvoltage stall, input and output phase loss, and stall, data protection, electronic thermal relay
Environment	Installation site	Altitude below 1,000 metres, if use above 1,000 metres requires a derating of 1% for every 100 metres of elevation; No condensation, icing, rain, snow, hail, etc., solar radiation below 700W/m2, air pressure 70 to 106kPa
	Temperature & humidity	-10~+50 °C, if derate above 40 °C, max. of 60 °C (no-load running) 5%~95%RH (no condensation)
	Vibration	When 9~200Hz，5.9m/s2(0.6g)
	Storage temperature	-30~+60°C
	Installation method	Wall-mounted, vertical -mounted
	Protection level	IP20
	Cooling method	Forced air cooling

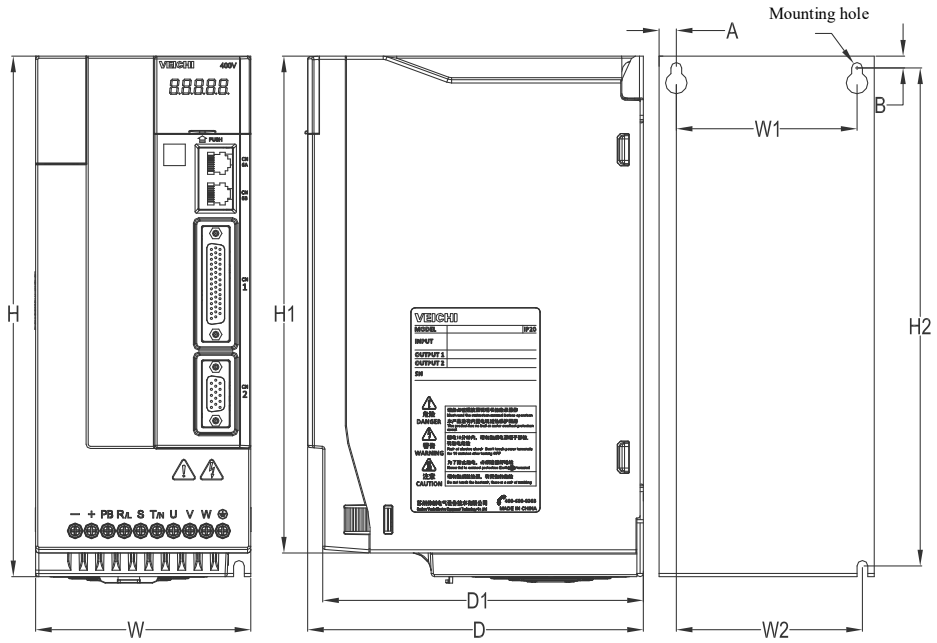
Table 1-3

Chapter 2 Mechanical and Electrical Installation

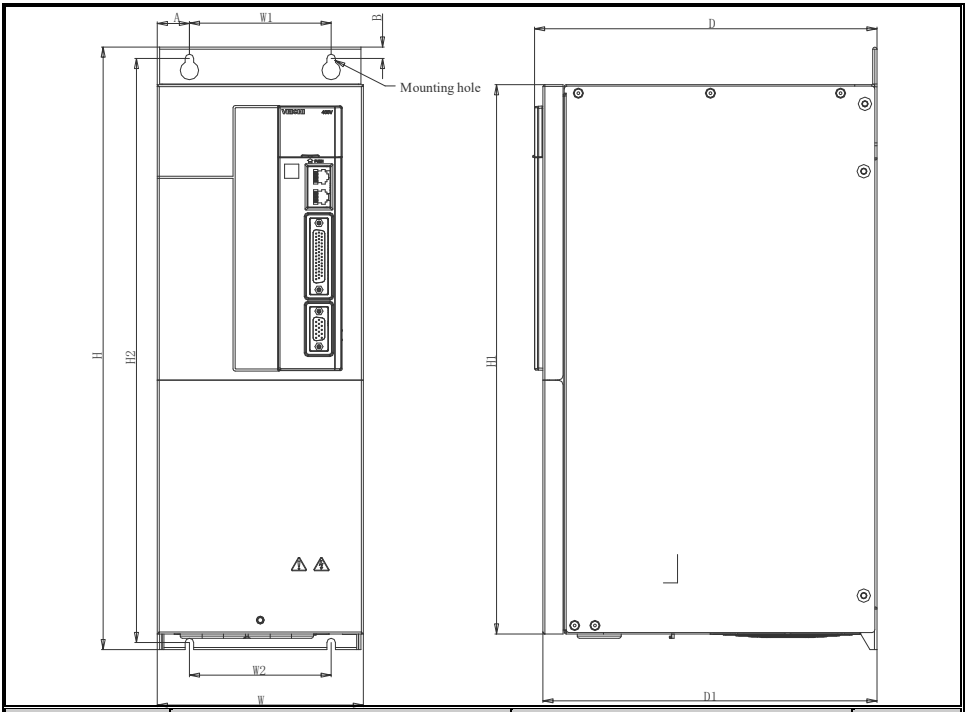
To ensure safety during use of the product and to give play to the maximum performance of the spindle drive, please use the product in strict accordance with the environmental, wiring, and ventilation requirements described in this chapter.

2.1 Mechanical Installation

2.1.1 Spindle Drive External Dimensions



Drive model	External dimensions(mm)					Mounting Dimension(mm)					Mounting aperture
	W	H	H1	D	D1	W1	W2	H2	A	B	
SD500-004D-*	100	242	231	156	149	84	86.5	231.5	8	5.5	3-M4
SD500-5R5D-*											
SD500-7R5D-*	116	320	307.5	176	169	98	100	307.5	9	6	3-M5
SD500-011D-*											



Inverter model	External dimensions(mm)					Mounting dimension(mm)					Mounting aperture
	W	H	H1	D	D1	W1	W2	H2	A	B	
SD500 -015D-*	145	424.5	387	242	236	100	100	411.5	23	8	4-M5
SD500-018D-*											
SD500-022D-*											
SD500-030D-*	185	471	433	242	236	140	140	457	22	8.75	4-M6
SD500-037D-*											

Figure 2-1

2.1.2 Installation Environment and Precautions

a) Environment temperature: the surrounding environment temperature has a great impact on the lifespan of the spindle servo drive, so it must not exceed the allowable temperature range (-10°C~50°C), and when the environment temperature exceeds 40°C, the external forced heat dissipation and the drive must be derated to use.

b) Humidity should be below 95% and no condensation of water droplets at the site. Avoid applications with direct sunlight, oil, dust or metal dust.

c) Thin air above 1000m will lead to poor heat dissipation, so please derate to use it. Derate by 1% for every 100m of elevation.

d) The spindle drive needs to be mounted on a flame-retardant surface to ensure enough space for heat dissipation. The mounting surface needs reliably bear the weight of the spindle servo drive, otherwise there is a possibility of personnel injury or equipment damage if it falls.

e) When the spindle drive is installed near a vibration source, please install vibration isolators on the mounting surface of the servo unit to prevent vibration from being transmitted to the servo unit.

f) Install the spindle servo drive away from sources of electromagnetic interference.

2.1.3 Spindle Drive Installation Space Requirements

Heat generated from SD500 spindle servo drive is distributed in a bottom-up way, the spindle servo drive must be installed in the following vertical way (see Figure 2-1), and other components in the cabinet should be taken consideration to ensure that the SD500 spindle drive has enough space for heat dissipation. Multiple spindle servo drives are usually installed side by side, and the installation space requirements are shown in the figure below as well. In cases where the drives are mounted above or below, it is highly recommended to install thermal deflectors between the drives.

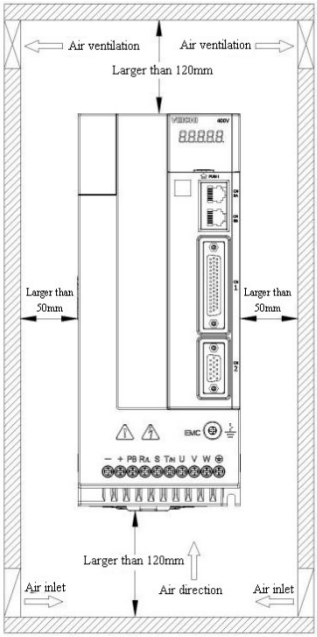


Figure 2-2

2.2 Electrical Installation

2.2.1 Peripheral Electrical Components and Connections

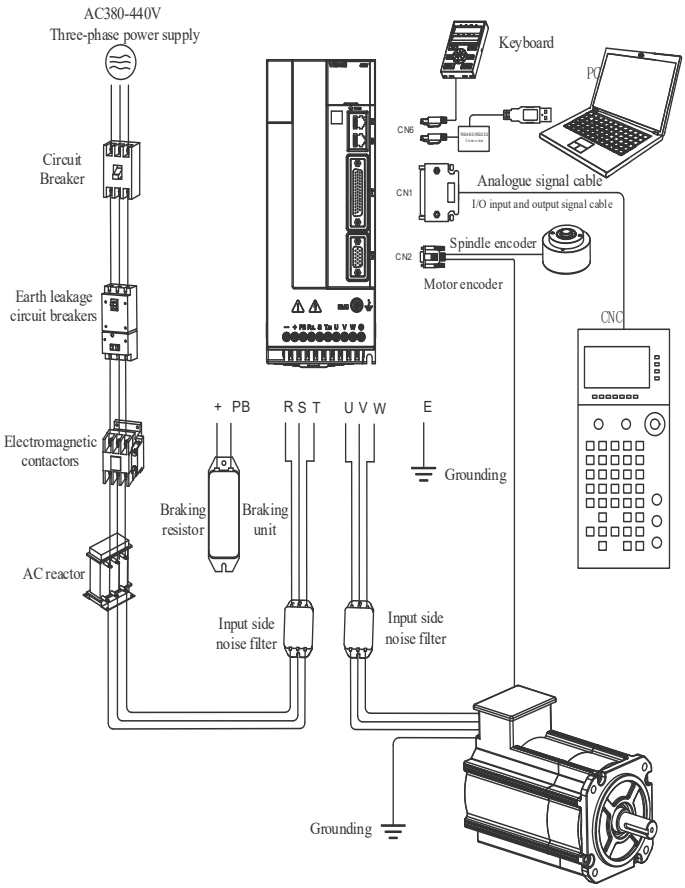


Figure 2-3

Note: When only one encoder is configured in the system, the spindle encoder signal terminal is invalid. The encoder signal must be connected to the motor encoder signal terminal.

2.2.2 Description of Use of External Electrical Components

Accessory	Mounting position	Function description
Air circuit breaker	Front end of input circuit	It contacts and breaks the circuit and acts promptly to protect the downstream equipment in case of short circuit or serious overload. Rated current of air switch can be selected according to 150% of the rated current of the drive.

Electromagnetic contactor	Between the air switch and the spindle servo drive	Drive power-up control. Selected according to 150% of the drive's rated current.
AC reactor	Spindle servo drive input side	Improve the power factor of the input side and the efficiency and thermal stability of the whole spindle drive; Effectively eliminate the influence of input-side high harmonics on the spindle drive and reduce external conduction and radiation interference. Selected according to 100% of the rated current of the drive.
Braking resistor	Models with 37kW and below	For models with 37kW or lower, please use the optional braking resistor, and refer to the braking resistor matching table; The motor consumes regenerative energy through the braking resistor during decelerating.

Table 2-1

● select braking resistor

When the spindle drive with large inertia decelerates with load or for emergency, the motor is running under the discharge state, the load energy through the inverter bridge to the spindle drive DC link, causing the spindle drive bus voltage to rise until it exceeds a certain limit, and then the drive will report an overvoltage fault, to prevent which, those external braking components need to be installed. The following table shows the typical reference values of external braking resistor specifications:

Spindle drive model	**Min. allowable braking resistance**	**Braking resistor power**
SD500-004D-*	50Ω	1.0kW
SD500-5R5D-*	50Ω	1.0kW
SD500-7R5D-*	45Ω	1.5kW
SD500-011D-*	35Ω	2.0kW
SD500-015D-*	30Ω	3.0kW
SD500-018D-*	30Ω	3.0kW
SD500-022D-*	25Ω	4.0kW
SD500-030D-*	18Ω	6.0kW
SD500-037D-*	18Ω	7.0kW

Table 2-2

The table is a typical reference data, the braking resistor needs to be determined according to the power generated by the motor in the actual application system (but the braking resistance value cannot be lower than the limit in the table above), and the system inertia, deceleration time, the energy of the bit energy load, etc. are related. The greater the inertia of the system, the shorter the deceleration time required, and the more frequent the braking, the greater the power and the smaller the resistance value of the braking resistor needs to be. Users can choose different resistor resistance and power according to the actual situations, please consult our technical support for detailed calculation.

2.2.3 Main Circuit Terminal Description

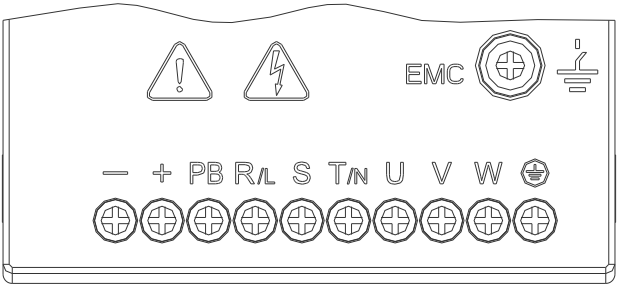


Figure 2-4

Terminal mark	Terminal name	Function description
R、S、T	Three-phase AC power input terminal, 380 ~ 440V, 50/60Hz	AC input three-phase power connection point
(+)、(-)	DC bus positive/negative terminals	Common DC bus input point or external brake unit
(+)、PB	Brake resistor connection terminal	Reserved terminal for external braking resistor
U、V、W	Spindle servo driver output terminal	Three-phase AC output connected to the motor
PE	Ground terminal	Power and motor ground terminal

Table 2-3

● Recommended cable size for main circuit connection:

Servo spindle drive model	Recommended cable size(mm2)		Terminal screw specification	Recommended tightening torque (N.m)
	R/S/T U/V/W	PE		
SD500-004D-*	4.0	4.0	M4	1.2~1.5
SD500-5R5D-*	6.0	6.0	M4	1.2~1.5
SD500-7R5D-*	6.0	6.0	M5	2~2.5
SD500-011D-*	10.0	10.0	M5	2~2.5
SD500-015D-*	10.0	10.0	M6	4~6
SD500-018D-*	16.0	16.0	M6	4~6
SD500-022D-*	16.0	16.0	M6	4~6
SD500-030D-*	25.0	25.0	M8	8~10

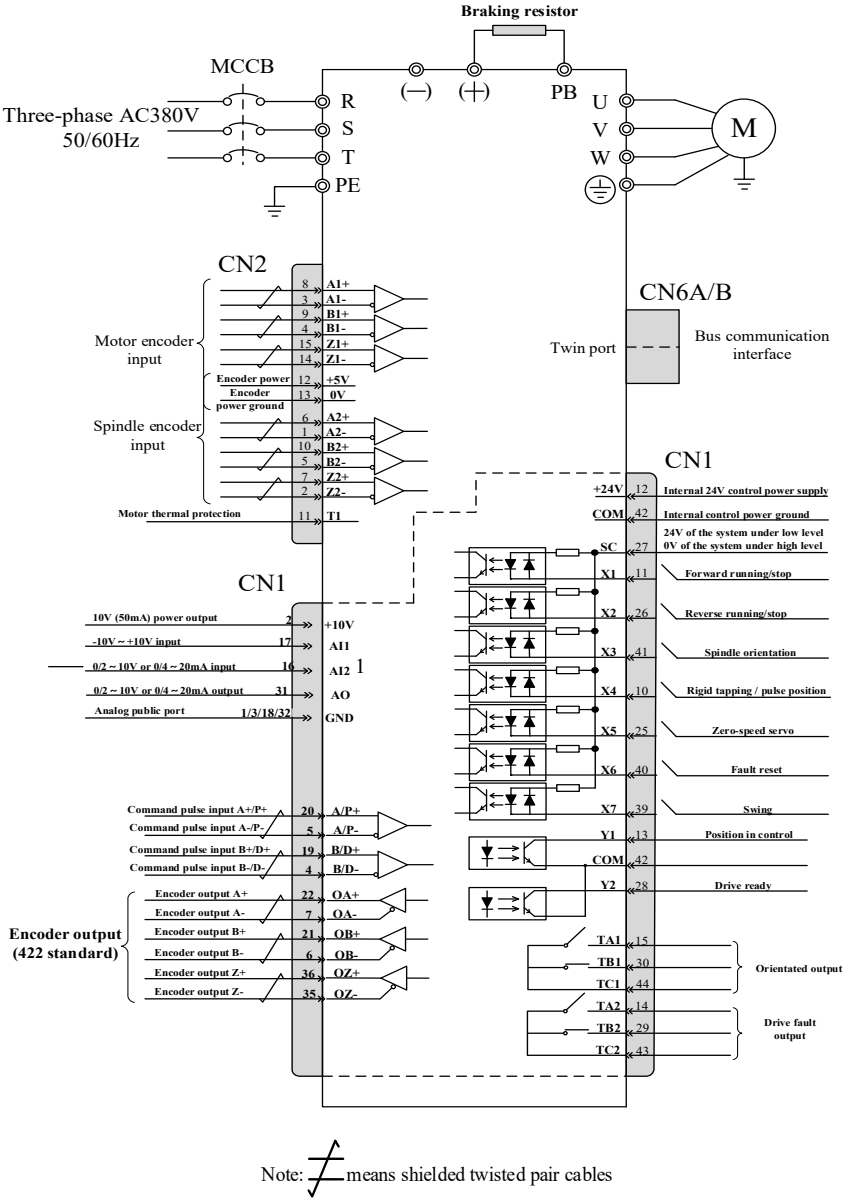
SD500-037D-*	25.0	25.0	M8	8~10

Table 2-4

Main circuit notes:

- The input side wiring of the spindle servo drive has no phase sequence requirement, and attention should be paid to the electrical specifications of the power input.
- External power wiring specifications and installation methods need to comply with local regulations and relevant IEC standards
- The braking resistor is selected with reference to the recommended value and the wiring distance is shorter than 5m.
- The output side of the spindle servo drive must not be connected to capacitors or surge absorbers, otherwise it will cause frequent protection or even damage to the spindle servo drive。
- Separate the motor cable, input power cable and control cable alignment.
- Please use ground wires of the diameter specifications in the technical standards for electrical equipment, and it should be as closer as possible to the ground point, ground resistance at 4Ω or below. Do not share the ground wires with the welding machines or power equipment.

2.2.4 Pulse-type Control Circuit Wiring



Note: ≠ means shielded twisted pair cables

Figure 2-5

● Control signal function description

Category	Terminal mark	Terminal name	Definition of terminal functions
Power supply	+5V-DGND	External +5V power supply	Encoder power supply with terminals, encoder power supply maximum output current: 300mA
	+10V-GND	External +10V power supply	Provide +10V power supply, maximum output current: 50 mA. Generally used as the power supply for external potentiometer, potentiometer resistance range: 1KΩ～5KΩ
	+24V-COM	External +24V power supply	External +24V power supply, generally used as power supply for digital input/output terminals and external sensor Maximum output current: 100 mA
Analog	AI1-GND	Voltage-type analog input	1. Input range: AI1: -10V~+10V; AI2:0~10V/0~20mA, default by voltage-type input, setting by function code P05.42. 2. Input impedance: voltage-type input impedance 20kΩ, current type input impedance 500Ω.
	AI2-GND	Voltage or current-type analog input	
	AO-GND	Voltage or current-type analog output	Output range: voltage 0~+10V or current 0~20mA, default by voltage-type output, setting by function code P06.00.
Digital Input	X1、X2 X3、X4 X5、X6 X7、SC	Switching input, high-speed input	1.Input impedance: 4.4 KΩ 2. Voltage range at level input: 10 ~ 30V 3. Bidirectional input terminal for both NPN and PNP connection. 4. X7 can be used as a high-speed pulse input channel with a maximum input frequency of 100 kHz in addition to the features of X1 to X6. 5. 5. All of them are programmable digital input terminals. terminal function setting via the function code.
	A+/A- B+/B- Z+/Z-	Spindle incremental encoder input	Only for RS-485 standard differential signal transmitter signal
	PULS+/PULS- SIGN+/SIGN-	Position command signal	Only for RS-485 standard differential signal transmitter signal
Digital output	Y1+/COM Y2+/COM	Switching output 1, 2	Optocoupler isolation, open collector output 1.Output voltage range: DC 0V~30V 2.Output current range: DC 0mA~50mA
	TA1/TB1/TC1 TA2/TB2/TC2	Relay output 1, 2	TA1-TC1/ TA2-TC2: normally open; TB1-TC1/ TB2-TC2: normally closed; Contact capacity: 30VDC/1A
	OA+/OA- OB+/OB- OZ+/OZ-	Encoder crossover output	Differential output, the receiver needs to use RS-485 standard differential signal receiver

Table 2-5

2.2.5 Wiring Terminal Pin Definition

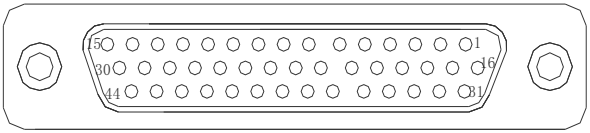


Figure 2-6

● CN1 multi-function control terminal pin definition:

CN1 multi-functional terminal interface					
Pin No.	**Signal name**	**Function**	**Pin No.**	**Signal name**	**Function**
1	AGND	Analog GND	23	-	-
2	10V+	Internal 10V,100mA	24	-	-
3	AGND	Analog GND	25	X5	Multi-function contact input 5
4	SIGN-	Command direction-	26	X2	Multi-function contact input 2
5	PULS-	Pulse command-	27	SC	I/O public terminal+
6	OB-	Crossover output OB-	28	Y2+	Open collector output 2+
7	OA-	Crossover output OA-	29	TB2	Relay B2
8	-	-	30	TB1	Relay B1
9	-	-	31	AO1	0~10V, 0~20mA optional
10	X4	Multi-function contact input 4	32	AGND	Analog GND
11	X1	Multi-function contact input 1	33	DGND	Digital GND
12	24V+	Internal 24V,100mA	34	DGND	Digital GND
13	Y1+	Open collector output 1+	35	OZ-	Crossover output OZ-
14	TA2	Relay A2	36	OZ+	Crossover output OZ+
15	TA1	Relay A1	37	-	-
16	AI2	0~10V, 0~20mA optional	38	-	-
17	AI1	-10V~+10V	39	X7	Multi-function contact input 7
18	AGND	Analog GND	40	X6	Multi-function contact input 6
19	SIGN+	Command direction +	41	X3	Multi-function contact input 3
20	PULS+	Pulse command +	42	COM	Internal +24V power to ground
21	OB+	Crossover output OB+	43	TC2	Relay C2
22	OA+	Crossover output OA+	44	TC1	Relay C1

Table 2-6

● CN2 multi-function control terminal pin definition:

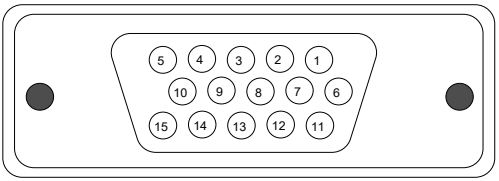


Figure 2-7

CN2 encoder interface					
Pin No.	**Signal name**	**Function**	**Pin No.**	**Signal name**	**Function**
1	U-	Spindle encoder signal A-	8	A+	Motor encoder signal A+

2	W-	Spindle encoder signal Z-	9	B+	Motor encoder signal B+
3	A-	Motor encoder signal A-	10	V+	Spindle encoder signal B+
4	B-	Motor encoder signal B-	11	T1	Motor overheating
5	V-	Spindle encoder signal B-	12	5V	Motor encoder power supply
6	U+	Spindle encoder signal A+	13	0V	Motor encoder power supply
7	W+	Spindle encoder signal Z+	14	Z-	Motor encoder signal Z-
Housing	Shielded	-	15	Z+	Motor encoder signal Z+

Table 2-7

Note: If the system is equipped with only one encoder, the spindle encoder signal terminal is invalid, and the encoder signal must be connected to the motor encoder signal terminal.

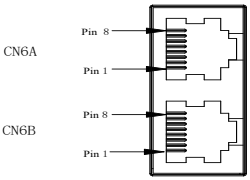


Figure 2- 8

● CN6 network terminal pin definition:

CN6A/CN6B interface definition					
Pin No.	**Signal name**	**Function**	**Pin No.**	**Signal name**	**Function**
1	GND	Signal ground	6	-	-
2	-	-	7	485-	485 data-
3	GND	Signal ground	8	485+	485 data +
4	+5V	External keyboard power supply	Housing	Shielded	Shielded
5	+5V				

Table 2-8

2.2.6 Control Circuit Wiring Instructions

◆ AI analog input circuit:

SD500 spindle servo provides two analog input interfaces AI1 (-10~+10V) and AI2 (0~+10V or 0~20mA). Since the weak analog signals are susceptible to external interference, the wiring control cables should be sufficiently far away from the main circuit and strong power cables (including power cables, motor cables, relays, contactor connection cables, etc.) for more than 30cm and avoid parallel placement. The connection cable is strongly recommended to use twisted shielded pair cables, and the cable shielding layer should be reliably connected to the drive terminal housing, and the wiring distance should be as short as possible. In some cases where the analog signal is subject to serious interference, a ferrite magnet ring can be added near the driver end. The following diagram shows the analog input terminal wiring diagram:

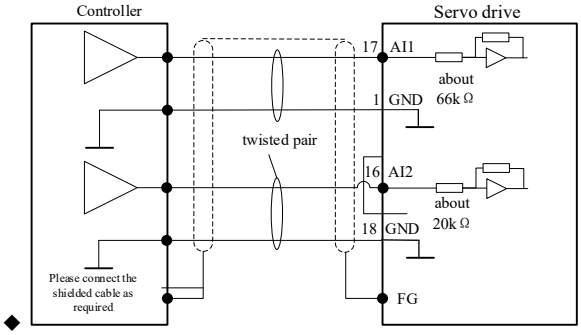


Figure 2-9

◆ Digital input terminal wiring:

The digital input terminals X1 to X7 support either drain or source wiring. The following is an example of X1, and interface circuit for X1 to X7 are all the same. The following is an example of wiring through a relay or transistor circuit (drain or source wiring). When using a relay connection, select a relay for microcurrent. If there is no such a relay for microcurrent, it may cause poor contact.

a) Drain-type wiring

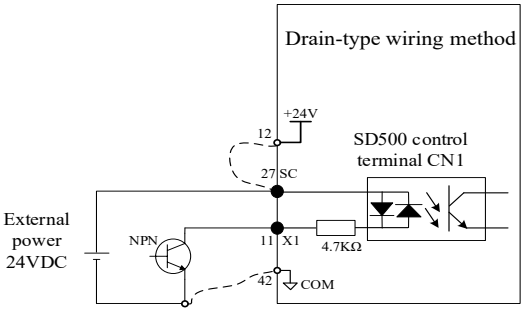


Figure 2-9

b) Source-type wiring

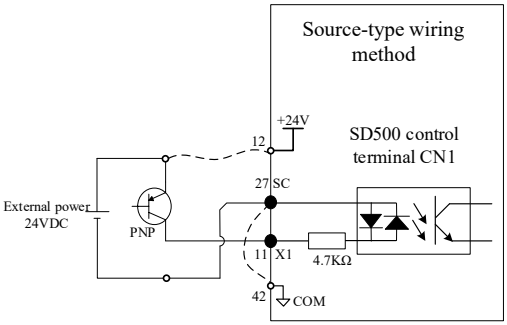


Figure 2-10

c) Relay-type wiring

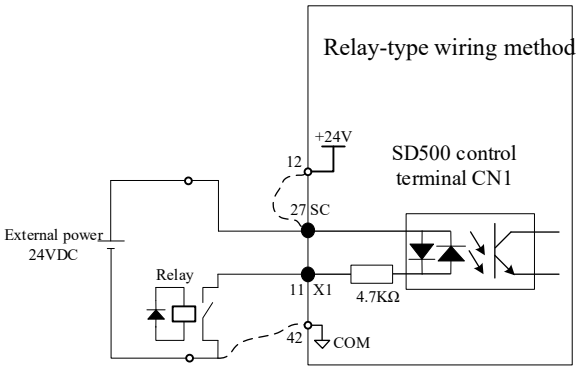


Figure 2-11

Notes:

- The above examples are all powered by external power supply. If you use the internal power supply of the drive, please connect according to the dotted cable shown in the figure.
- The external power supply (DC24V) must have a capacity of 50mA or more.
- Mixing of NPN and PNP input methods is not supported.

◆ Digital output terminal wiring

Take Y1 as an example, Y1/Y2 circuit interface circuits are the same.

The following diagram shows wiring of the upper receiver device of an optocoupler and a relay respectively:

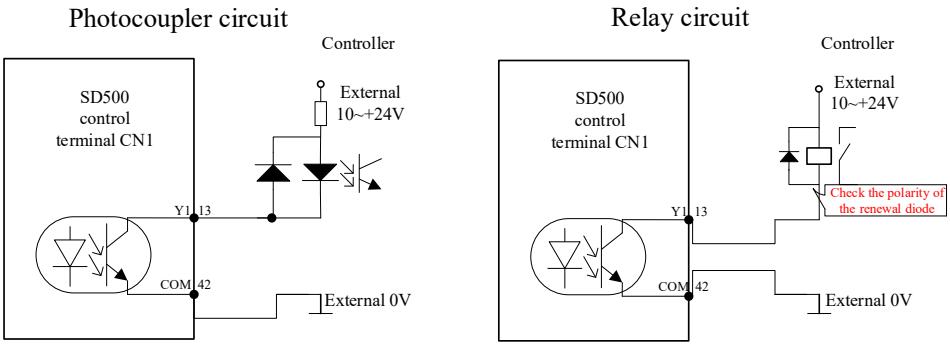


Figure 2-12

Notes:

- When the digital output terminal needs to drive the relay, absorber diodes should be added on both ends of the relay coils, and the diode

polarity should be installed correctly, otherwise it will cause damage to the equipment.

- The maximum allowable voltage is DC 30V and maximum allowable current is DC20mA for open collector output circuit.

2.2.7 Noise and High Harmonic Countermeasures

Here explains the countermeasures against noise and high harmonics.

This servo unit has a built-in microprocessor. Therefore, it may be subject to noise interference from its peripheral devices. To prevent mutual noise interference between the servo unit and its peripheral devices, take the following countermeasures to prevent noise interference as necessary.

- Be sure to locate the input command device and noise filter as close as possible to the servo unit.
- Be sure to connect surge suppressors to the coils of relays, solenoids, and solenoid contactors.
- Do not use the same bushing for the main circuit cable and the input/output signals/encoder cable, and do not tie them together. When wiring, keep the main circuit cable and the input/output signal cable/encoder cable away apart above 30 cm.
- Do not use the same power source with a welding machine or EDM machine, etc. Even if the power supply is not the same, connect a noise filter to the input side of the main circuit power cable and control power cable when there is a high frequency generator nearby.

Chapter 3 Keyboard Layout and Operating Instructions

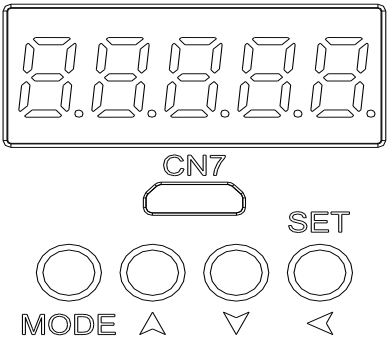


Figure 3-1

Integrated keyboard	Function
Menu MODE	During standby or running, enter the menu to see functions; During parameter modification, press the key to exit; During standby or running, press and hold the key (1 second) to enter the status interface directly.
Confirm /Move SET	Confirm function: press the key after modifying the value to confirm it. Move function: long press the key to move the function digit, long press without releasing activate cyclic move.
Up/Down	Value modification: up key increases the value; down key decreases the value; Fault reset: press the up and down keys simultaneously to enable fault reset

Table 3-1

● Basic parameter group setting

The following is an example of setting F1.22 [acceleration time] = 10.00s to illustrate the basic operation of the LED operator.

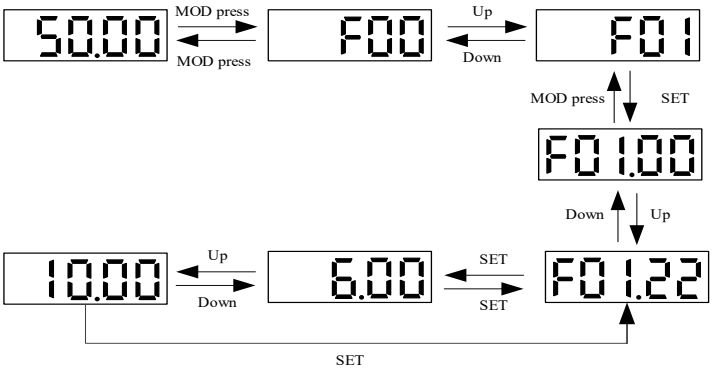


Figure 3-2

Note: Use the keyboard move key to quickly select the tens, hundreds and thousands bits of the modified parameter values.

● Check monitoring status

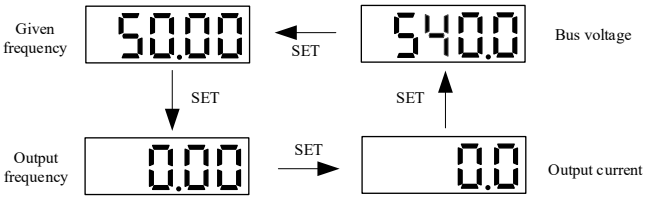


Figure 3-3

Note: When using the external keyboard, use the left move button to cycle through the first row of monitoring parameters, and use the right move button to cycle through the second row of monitoring parameters.

● Check monitoring parameters

The following is an example of checking C02.05 [PLC running phase] to illustrate the basic LED operator.

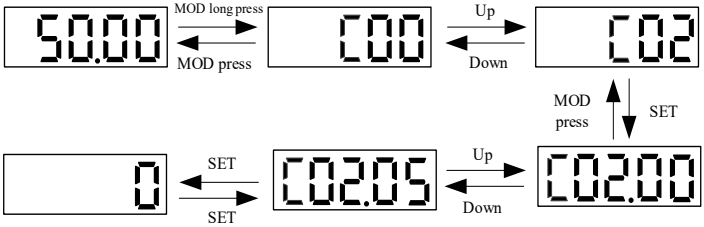


Figure 3-4

● Motor Self-learning

To deliver the best control performance, self-learning of motor running system parameters under vector control need self-learning. Please refer to the following figure for the self-learning process. Please select rotary self-learning for the first time, and make sure the motor is in no-load or light-load state during the self-learning process.

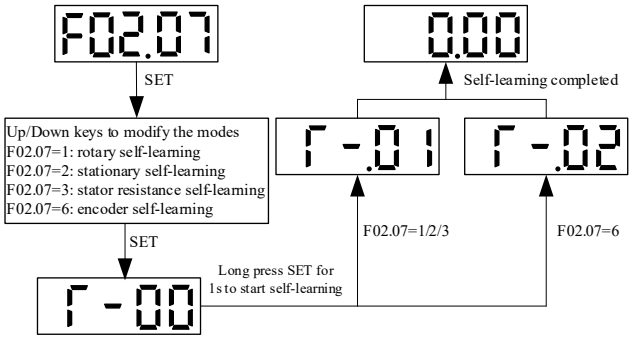


Figure 3-5

Chapter 4 Parameter Table

4.1 Parameter Mark Description

◆Marks and terms indicating control modes

Mark	Content
V/F	Valid parameters in V/F control mode for asynchronous motors
SVC	Valid parameters under open-loop vector control of asynchronous motors
FVC	Valid parameters under closed-loop vector control of asynchronous motors
PMVF	Valid parameters in V/F control mode for synchronous motors
PMSVC	Valid parameters in open-loop vector control mode for synchronous motors
PMFVC	Valid parameters in closed-loop vector control mode for synchronous motors

Table 4-1

Note: The control mode marks not shaded indicate that the parameters are not valid in that control mode.

◆Marks and terms indicating control modes

Mark	Content
RUN	Parameters that can be modified during running
STOP	Parameters that cannot be modified during running
READ	The parameter can only be read, not modified (LED shows 5 "--" when modified)

Table 4-2

4.2 Parameter List

◆Parameters types of this product

Parameter	Designation	Parameter	Designation
F00.0x	Environment settings	F06.2x-F06.3x	Digital, relay output
F01.0x	Basic command	F06.4x	Frequency detection
F01.1x	Frequency command	F06.5x	Monitor parameter comparator output
F01.2x-F01.3x	Acceleration/deceleration time	F06.6x	Virtual input/output terminal
F01.4x	PWM control	F07.0x	Start control
F02.0x	Motor basic parameters and self-learning selection	F07.1x	Stop control
F02.1x	Advanced parameters of asynchronous motors	F07.2x	DC braking and speed tracking
F02.2x	Advanced parameters of synchronous motors	F07.3x	Jogging
F02.3x-F02.4x	Encoder parameter	F07.4x	Start/stop frequency holding and hopping
F02.5x-F02.60	Motor application parameter	F10.0x	Current protection
F02.6x-F02.7x	Sine-cosine encoder parameter	F10.1x	Voltage protection
F03.0x	Speed loop	F10.2x	Auxiliary protection
F03.1x	Current loop and torque limit	F10.3x	Load protection

F03.2x	Torque optimization control	F10.4x	Stall protection
F03.3x	Magnetic flux optimization	F10.5x	Failure recovery protection
F03.4x-F03.5x	Torque control	F11.0x	Key operation
F03.7x	Position compensation	F11.1x	Cyclic monitoring of status screens
F03.8x	Extension control	F11.2x	Monitoring parameter control
F05.0x	Digital input terminal	F12.0x	MODBUS slave parameter
F05.1x	Curve X1-X5 detection delay	F12.1x	MODBUS master parameter
F05.2x	Digital input terminal action selection	F12.6x	M3 bus communication
F05.3x	PUL terminal	F15.xx	Position control parameter
F05.4x	Analog AI type processing	F24.xx	Spindle-specific parameter
F05.5x	Analog AI liner processing	C00.0x	Basic monitoring
F05.6x	AI curve 1 processing	C01.0x	Fault monitoring
F05.7x	AI curve 2 processing	C02.0x	Application parameter monitoring
F05.8x	AI as digital input terminal	C04.xx	Spindle feedback monitoring
F06.0x	AO analog output	C05.xx	Position control monitoring

Table 4-3

4.3 Group F00: Environmental Applications

◆Group F00.0x: Environment setting

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F00.00 (0x0000)	Parameter access level	**V/F SVC FVC PMVF PMSVC PMFVC** Set the parameter access level according to the restriction level. 0: Standard parameters (Fxx.yy) 1: Common parameters (F00.00,Pxx.yy) 2: Monitored parameters (F00.00,Cxx.yy) 3: Changed parameters (F00.00,Hxx.yy)	0 (0~3)	RUN
F00.03 (0x0003)	Initialization	**V/F SVC FVC PMVF PMSVC PMFVC** Set the spindle drive initialization method. 0: No initialization 11:Select the parameters according to the usage (motor parameters are not included) 22: All parameters initialized 33: Clear fault records	0 (0~33)	STOP

F00.04 (0x0004)	Keyboard parameter copy	**V/F SVC FVC PMVF PMSVC PMFVC** 0: No function 11: Upload parameters to keyboard 22: Download parameters to spindle drive	0 (0~9999)	STOP
F00.05 (0x0005)	User password	**V/F SVC FVC PMVF PMSVC PMFVC** Used to set the user password.	0 (0~65355)	STOP
F00.06 (0x0006)	LCD keyboard language selection	**V/F SVC FVC PMVF PMSVC PMFVC** Select the language to be displayed on the LCD operator. 0: Chinese; 1: English;	0 (0~1)	RUN

Table 4-4

4.4 Group F01: Basic Settings

◆ Group F01.0x: Basic instructions

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F01.00 (0x0100)	Motor 1 control method	**V/F SVC FVC PMVF PMSVC PMFVC** Control mode of the motor 0: AM-VF; asynchronous motor V/F control 1: AM-SVC; asynchronous motor open-loop vector control 2: AM-FVC; asynchronous motor closed-loop vector control 10: PM-VF; synchronous motor V/F control 11: PM-SVC; synchronous motor open-loop vector control 12: PM-FVC; synchronous motor closed-loop vector control	2 (0~12)	STOP
F01.01 (0x0101)	Command running channel	**V/F SVC FVC PMVF PMSVC PMFVC** Channels used to select the spindle drive to receive start/stop commands and the running direction 0: Keypad control 1: Terminal control 2: RS485 communication control 3:M3 Bus communication	1 (0~3)	RUN

F01.02 (0x0102)	Frequency giving source channel A	**V/F SVC FVC PMVF PMSVC PMFVC** source channel A selection to give frequency for spindle drive 0: Keyboard number entering 1: Keyboard analog potentiometer 2: Voltage analog AI1 3: Current/voltage analog AI2 4: Reserved 5: Terminal pulse PUL 6:RS485 communication 7: Terminal UP/DW control 8: PID control 9: Program control (PLC) 10: Positioning pulse terminal 11: Multi-speed	10 (0~11)	RUN
F01.03 (0x0103)	Frequency giving source channel A gain	**V/F SVC FVC PMVF PMSVC PMFVC** Gain of the frequency giving source channel A	100.0 (0.0~500.0%)	STOP
F01.04 (0x0104)	Frequency giving source channel B	**V/F SVC FVC PMVF PMSVC PMFVC** Source channel B selection to give frequency for spindle drive, the same as [F01.02]	2 (0~11)	RUN
F01.05 (0x0105)	Frequency giving source channel B gain	**V/F SVC FVC PMVF PMSVC PMFVC** Gain of the frequency giving source channel B	100.0 (0.0~500.0%)	STOP
F01.06 (0x0106)	Reference frequency of source channel B	**V/F SVC FVC PMVF PMSVC PMFVC** The reference source for the frequency giving channel B is selected by this parameter. 0: Maximum output frequency as the reference source 1: Channel A frequency set as the reference source	0 (0~1)	RUN
F01.07 (0x0107) STOP	Selection of frequency giving source	**V/F SVC FVC PMVF PMSVC PMFVC** Used to select the combination of channel A and channel B to set frequency for spindle drive. 0: Channel A 1: Channel B 2: Channel A+ Channel B	0 (0~5)	RUN

		3: Channel A - Channel B 4: Channel A, channel B both maximum value 5: Channel A, channel B both minimum value		
F01.08 (0x0108)	Frequency giving via bundled commands	**V/F SVC FVC PMVF PMSVC PMFVC** When this parameter is valid, it is used to set the frequency source channel for each bundled command. Ones-bit: Keyboard to bundle commands; Tens-bit: Terminal to bundle commands; Hundreds-bit: Communication to bundle commands; Thousands-bit: Card to bundle commands; 0: No bundle 1: Keyboard number entering to give frequency; 2: Keyboard analog potentiometer to give frequency; 3: Voltage analog AI1 to give frequency; 4: Current/voltage analog AI2 to give frequency; 5: Reserved; 6: Terminal pulse PUL to give frequency; 7: Communication to give frequency; 8: Terminal UP/DW control; 9: PID control to give frequency; A: Program control to give frequency; B: Reserved; C: Multi-Speed feeding;	0000 (0000~DDDD)	RUN
F01.09 (0x0109)	Frequency giving from keyboard number entering	**V/F SVC FVC PMVF PMSVC PMFVC** Set and modify frequency via keyboard number entering.	50Hz (0.00~ upper limit)	RUN

Table 4-5

◆ **Group F01.1x: Frequency command**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F01.10 (0x010A)	Max frequency	**V/F SVC FVC PMVF PMSVC PMFVC** The maximum frequency that can be set for the spindle drive.	150.00Hz (upper limit frequency	STOP

			~600.00Hz)	
F01.11 (0x010B)	Upper limit frequency source selection	**V/F SVC FVC PMVF PMSVC PMFVC** Select the source of the upper limit frequency for the spindle drive. 0: Via keyboard number entering; 1: Via keypad analog potentiometer; 2: Via current/voltage analog AI1; 3: Via current/voltage analog AI2; 4: Reserved; 5: Via terminal pulse PUL; 6: Via RS485 communication 7: Selection card;	0 (0~7)	RUN
F01.12 (0x010C)	Upper limit frequency setting via keyboard number	**V/F SVC FVC PMVF PMSVC PMFVC** The upper limit frequency giving channel when F01.11 is set to 0.	150.00Hz (0.00~ Max. frequency set via numbers)	RUN
F01.13 (0x010D)	Lower limit frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set the lower limit for the given frequency.	0.00Hz (0.00~ Max. frequency set via numbers)	RUN
F01.14 (0x010E)	Frequency command resolution	**V/F SVC FVC PMV/F PMSVC PMFVC** Set the resolution of the frequency command. 0:0.01Hz 1:0.1Hz	0 (0~3)	STOP

Table 4-6

◆ **Group F01.2x-F01.3x: Acceleration/deceleration time**

Parameter code	Designation	Content	Default (Setting range)	Adjustable properties
F01.20 (0x0114)	Acceleration/deceleration time reference	**V/F SVC FVC PMVF PMSVC PMFVC** Set the reference frequency to calculate the acceleration/deceleration time. 0: Maximum frequency as reference 1: Fixed frequency 50Hz as reference 2: Frequency set as reference	0 (0~2)	STOP

F01.21 (0x0115)	Acceleration time unit	**V/F SVC FVC PMVF PMSVC PMFVC** Set unit of acceleration time. 0:1S 1:0.1S 2:0.01S	2 (0~2)	STOP
F01.22 (0x0116)	Acceleration time 1	**V/F SVC FVC PMVF PMSVC PMFVC** The time it takes to accelerate the output frequency from 0.00Hz to the time reference frequency. 1~65000s (F01.21 = 0) 0.1~6500.0s (F01.21 = 1) 0.01~650.00s (F01.21 = 2)	Set by models(0.01~650.00s)	RUN
F01.23 (0x0117)	Deceleration time1	**V/F SVC FVC PMVF PMSVC PMFVC** The time it takes for the output frequency to decelerate from the time reference frequency to 0.00Hz.	Set by models(0.01~650.00s)	RUN
F01.30 (0x011E)	S-curve acceleration/deceleration selection	**V/F SVC FVC PMVF PMSVC PMFVC** Whether S curve acceleration / deceleration setting is valid 0: Invalid; 1: Valid	0 (0~1)	STOP
F01.31 (0x011F)	Accelerate time to start S-curve	**V/F SVC FVC PMVF PMSVC PMFVC** Set the acceleration time to start S-curve.	0.20s (0.00~10.00)	STOP
F01.32 (0x0120)	Accelerate time to end S-curve	**V/F SVC FVC PMVF PMSVC PMFVC** Set the acceleration time to end S-curve.	0.20s (0.00~10.00)	STOP
F01.33 (0x0121)	Decelerate time to start S-curve	**V/F SVC FVC PMVF PMSVC PMFVC** Set the deceleration time to start S-curve.	0.20s (0.00~10.00)	STOP
F01.34 (0x0122)	Decelerate time to end S-curve	**V/F SVC FVC PMVF PMSVC PMFVC** Set the deceleration time to end S-curve.	0.20s (0.00~10.00)	STOP
F01.35 (0x0123)	Switching frequency between acceleration time 1 and time 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the switching frequency of acceleration time 1 and acceleration time 2.	0.00Hz (0.00~ Max. frequency set via numbers)	RUN

Table 4-7

◆ Group F01.4x: PWM control

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F01.40 (0x0128)	Carrier frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Used to set the switching frequency of the spindle drive IGBT.	Set by models (1.0~16.0kHz)	RUN

F01.41 (0x0129)	PWM control mode	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Carrier is related to temperature or not; 0: Irrelated 1: Related Tens-bit: Carrier is related to output frequency or not; 0: Irrelated 1: Related Hundreds-bit: Random PWM enabling 0: Off 1: On Thousands-bit: PWM method 0: Only three-phase modulation; 1: Automatically switching between two- and three-phase	1101 (0000~1111)	RUN
F01.43 (0x012B)	Dead-time compensation gain	**V/F SVC FVC PMVF PMSVC PMFVC** Gain of dead-time compensation	Set by models(0~512)	RUN

Table 4-8

4.5 Group F02: Motor 1 Parameter

◆ Group F02.0x: Basic motor parameters and self-learning selection

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F02.00 (0x0200)	Motor type	**V/F SVC FVC PMVF PMSVC PMFVC** Set the type of motor 0: Asynchronous motor (AM) 1: Permanent magnet synchronous motor (PM)	0 (0~1)	READ
F02.01 (0x0201)	Motor pole No.	**V/F SVC FVC PMVF PMSVC PMFVC** Set the number of motor poles.	4 (2~98)	STOP
F02.02 (0x0202)	Motor rated power	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated power of the motor.	Set by models (0.1~1000.0kW)	STOP
F02.03 (0x0203)	Motor rated frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated frequency of the motor.	Set by models (0.01~最大频率)	STOP
F02.04 (0x0204)	Motor rated speed	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated speed of the motor.	Set by models (0~65000rpm)	STOP
F02.05	Motor rated voltage	**V/F SVC FVC PMVF PMSVC PMFVC**	Set by models	STOP

(0x0205)		Set the rated voltage of the motor.	(0~1500V)	
F02.06 (0x0206)	Motor rated current	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated current of the motor.	Set by models (0.1~3000.0A)	STOP
F02.07 (0x0207)	Motor parameter self-tuning selection	**V/F SVC FVC PMVF PMSVC PMFVC** The value of [F02.07] will be set to "0" automatically after the parameter self-tuning is completed. 0: No operation 1: Static + rotary self-learning 2: Static self-learning 3: Stator resistance self-learning 6: Rotary self-learning 7: Inertia self-learning	0 (0~7)	STOP

Table 4-9

◆ **Group F02.1x: Advanced parameters of asynchronous motors**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F02.10 (0x020A)	No-load current	**V/F SVC FVC PMVF PMSVC PMFVC** Set the no-load current of the asynchronous motor.	Set by models (0.1~3000.0A)	STOP
F02.11 (0x020B)	Stator resistance	**V/F SVC FVC PMVF PMSVC PMFVC** Sets the stator resistance value of the asynchronous motor.	Set by models (0.01mΩ~60000mΩ)	STOP
F02.12 (0x020C)	Rotor resistance	**V/F SVC FVC PMVF PMSVC PMFVC** Sets the rotor resistance value of the asynchronous motor.	Set by models (0.01mΩ~60000mΩ)	STOP
F02.13 (0x020D)	Stator leakage inductance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the stator leakage inductance of the asynchronous motor.	Set by models (0.01mH~65535mH)	STOP
F02.14 (0x020E)	Stator inductance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the stator inductance of the asynchronous motor.	Set by models (0.01mH~65535mH)	STOP
F02.15 (0x020F)	Per-unit stator resistance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the stator resistance per unit value.	Set by models (0.01~50.00%)	READ
F02.16 (0x0210)	Per-unit rotor resistance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rotor resistance per unit value.	Set by models (0.01~50.00%)	READ
F02.17 (0x0211)	Per-unit stator leakage inductance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the stator leakage inductance per unit value.	Set by models (0.01~50.00%)	READ
F02.18	Per-unit stator	**V/F SVC FVC PMVF PMSVC PMFVC**	Set by models	READ

(0x0212)	inductance	Set the stator inductance per unit value.	(0.1~999.0%)	

Table 4-10

◆ **Group F02.2x: Advanced parameters of synchronous motors**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F02.20 (0x0214)	Synchronous motor sstator resistance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the stator resistance of the synchronous motor.	Set by models (0.01mΩ~60000mΩ)	STOP
F02.21 (0x0215)	Synchronous motor D-axis inductance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the d-axis inductance of the synchronous motor.	Set by models (0.001mH~6553.5mH)	STOP
F02.22 (0x0216)	Synchronous motor Q-axis inductance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the q-axis inductance of the synchronous motor.	Set by models (0.001mH~6553.5mH)	STOP
F02.23 (0x0217)	Synchronous motor counter-electromotive force	**V/F SVC FVC PMVF PMSVC PMFVC** Set the counter-electromotive force of the synchronous motor. It is only recognized during rotary self-tuning.	Set by models (0~1500V)	STOP
F02.24 (0x0218)	Synchronous motor encoder angle	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder mounting angle of synchronous motor..	Set by models (0.0°~360.0°)	RUN
F02.25 (0x0219)	Synchronous motor per-unit stator resistance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the stator resistance per unit value of synchronous motor.	Set by models (Monitor value)	READ
F02.26 (0x021A)	Synchronous motor per-unit d-axis inductance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the per-unit d-axis inductance of synchronous motor.	Set by models (Monitor value)	READ
F02.27 (0x021B)	Synchronous motor per-unit q-axis inductance	**V/F SVC FVC PMVF PMSVC PMFVC** Set the per-unit q-axis inductance of synchronous motor.	Set by models (Monitor value)	READ
F02.28 (0x021C)	Pulse width factor	**V/F SVC FVC PMVF PMSVC PMFVC** Sets the pulse width factor of the synchronous motor.	Set by models (00.00~99.99)	STOP

Table 4-11

◆ **Group F02.3x-F02.4x: Encoder parameters**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F02.30 (0x021E)	Speed feedback encoder type	V/F SVC FVC PMVF PMSVC PMFVC 0: Standard ABZ encoder	0 (0~4)	STOP

		4: Sine-cosine encoder		
F02.31 (0x021F)	Encoder direction	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Same direction 1: Opposite direction	0 (0~1)	STOP
F02.32 (0x0220)	ABZ encoder Z-pulse detection selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Off 1: On (positive pulse) 2: On (negative pulse)	1 (0~1)	STOP
F02.33 (0x0221)	ABZ encoder cable No.	**V/F SVC FVC PMVF PMSVC PMFVC** Set the number of ABZ encoder cables.	2500 (1~10000)	STOP
F02.35 (0x0223)	Encoder ratio numerator	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder ratio numerator.	1 (1~32767)	RUN
F02.36 (0x0224)	Encoder ratio denominator	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder ratio denominator.	1 (1~32767)	RUN
F02.37 (0x0225)	Encoder speed filter time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder speed filter time.	0.0ms (0.0~ 100.0ms)	RUN
F02.38 (0x0226)	Encoder disconnection detection time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder disconnection detection time.	0.500s (0.100~60.000s)	RUN
F02.39 (0x0227)	Encoder crossover output ratio	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder crossover output ratio.	1 (1~32767)	RUN
F02.40 (0x0228)	Encoder installation position	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Single encoder for motor;1: Single encoder for spindle;2: Dual encoders	0 (0~1)	STOP
F02.41 (0x0229)	Positioning encoder direction selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Same direction 1: Opposite direction	0 (0~1)	STOP
F02.42 (0x022A)	Encoder Z-pulse detection selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Off 1: On (positive pulse) 2: On (negative pulse)	1 (0~2)	STOP
F02.43 (0x022B)	Positioning encoder cable No.	**V/F SVC FVC PMVF PMSVC PMFVC** Set the number of ABZ encoder cables.	1024 (1~10000)	STOP
F02.44 (0x022C)	Positioning encoder speed filter time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the positioning encoder speed filter time.	1.0ms (0.0~ 100.0ms)	RUN
F02.45 (0x022D)	Crossover output selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Crossover output encoder selection	0x0010 (0x0000~0x1111)	STOP

		0: Motor encoder 1: Spindle encoder Tens-bit: Crossover output direction 0: Forward 1: Reverse		
F02.46 (0x022E)	Z-pulse disconnection detection turns	**V/F SVC FVC PMVF PMSVC PMFVC** Set the number of Z-pulse disconnection detection turns When dual encoder (F2.40=2), if the motor frequency > 60Hz, E.PG11,Z pulse loss fault will not be reported. If this value is set to 5, the full frequency band will not block E.PG11.	4 (1~32767)	RUN
F02.47 (0x022F)	Z-pulse error threshold	**V/F SVC FVC PMVF PMSVC PMFVC** Set the difference threshold value between the actual AB pulses and the set ones between the two Z pulses, if the threshold value is exceeded for certain times, report PG02 warning; 0: Threshold value = F2.33 encoder cable number/32, report PG02 warning after the number of times reaches 7; (default) F2.33 encoder cable number/32: threshold value = set value, report PG02 warning after the number of times reaches 4 times; 101: Block the PG02 and PG07 (second encoder) warning. Other non-zero numbers: threshold = set value, report PG02 after the number of times reaches 13;	0 (0~65535)	RUN
F02.49 (0x0231)	PG speed detection selection	V/F SVC FVC PMVF PMSVC PMFVC Ones-bit: S peed detection stage in non-FVC mode 0: Off 1: On Thousands-bit: Filter of C00.29 PG feedback frequency 0: On 1: Off	0x0000 (0x0000~0xFFFF)	RUN

Table 4-12

◆ Group F02.5x-F02.60: Motor application parameters

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties

F02.50 (0x0232)	Stator resistance learning selection	**V/F SVC FVC** PMVF **PMSVC PMFVC** 0: Invalid 1: Learn only but no update ＞1: Learn and update	0 (0~3)	STOP
F02.51 (0x0233)	Stator resistance learning factor 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set stator resistance starting learning factor 1.	0 (0~1000)	RUN
F02.52 (0x0234)	Stator resistance learning factor 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set stator resistance starting learning factor 2.	0 (0~1000)	RUN
F02.53 (0x0235)	Stator resistance learning factor 3	**V/F SVC FVC PMVF PMSVC PMFVC** Set stator resistance starting learning factor 3.	0 (0~1000)	RUN
F02.60 (0x023C)	Magnetic polarity search of synchronous motor	**V/F SVC FVC PMVF PMSVC PMFV** Ones-bit: Closed-loop vector 0: Off 1: On 2: On, start at each power-on Tens-bit: Open-loop vector 0: Off 1: On 2: On, start at each power-on	0x0010 (0x0000~0x0022)	STOP

Table 4-13

◆ Group F02.6x-F02.7x: Sine and cosine encoder parameters

F02.68 (0x0245)	Sin-cos encoder subdivision No.	**V/F SVC FVC PMVF PMSVC PMFVC** The number of subdivisions of a sine wave period for a sin-cos signal	10 (0 ~12)	STOP
F02.69 (0x0246)	SIN signal bias correction	**V/F SVC FVC PMVF PMSVC PMFVC** SIN signal bias calibration acquired via self-learning, manual fine-tuning available.	4096 (0~10000)	RUN
F02.70 (0x0247)	COS signal bias correction	**V/F SVC FVC PMVF PMSVC PMFVC** COS signal bias calibration acquired via self-learning, manual fine-tuning available.	4096 (0~10000)	RUN
F02.71 (0x0248)	SIN COS amplitude rectification	**V/F SVC FVC PMVF PMSVC PMFVC** Amplitude proportionality between SIN and COS signals obtained by self-learning, manual fine-tuning available.	1024 (1 ~10000)	RUN

F02.72 (0x0249)	SIN COS min. threshold	**V/F SVC FVC PMVF PMSVC PMFVC** The minimum threshold for the sum of squares of SIN COS signal, report the E.PG13 fault below the threshold	2000 (1 ~10000)	RUN
F02.73 (0x024A)	Sine/cosine crossover output cable No.	**V/F SVC FVC PMVF PMSVC PMFVC** The number of encoder cables for crossover output.	1024 (0 ~10000)	STOP

Table 4-14

4.6 Group F03: Vector Control

◆ Group F03.0x: Speed loop

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F03.00 (0x0300)	ASR speed rigidity grade	**V/F SVC FVC PMVF PMSVC PMFVC** Rigidity level setting, the higher the level, the better the speed rigidity.	32 (0~64)	RUN
F03.01 (0x0301)	ASR speed rigidity mode	**V/F SVC FVC PMVF PMSVC PMFVC** ASR speed rigidity mode.	0x0000 (0x0000~0xffff)	RUN
F03.02 (0x0302)	ASR (speed loop) proportional gain1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) proportional gain 1.	20.00 (0.01~100.00)	RUN
F03.03 (0x0303)	ASR (speed loop) integral time 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) integral time 1.	0.100s (0.000~6.000s)	RUN
F03.04 (0x0304)	ASR filter time1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR filter time 1.	0.0ms (0.0~100.0ms)	RUN
F03.05 (0x0305)	ASR switching frequency1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR switching frequency 1.	10.00Hz (0~ Max. frequency)	RUN
F03.06 (0x0306)	ASR (speed loop) proportional gain2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) proportional gain 2.	10.00 (0.01~100.00)	RUN
F03.07 (0x0307)	ASR (speed loop) integral time 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) integral time 2.	0.050s (0.000~6.000s)	RUN
F03.08 (0x0308)	ASR filter time 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR filter time 2.	0.0ms (0.0~100.0ms)	RUN
F03.09 (0x0309)	ASR switching frequency 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR switching frequency 2.	5.00Hz (0~最大频率)	RUN

Table 4-15

◆ Group F03.1x: Current loop and torque limit

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F03.10 (0x030A)	Current loop D-axis proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set the current loop D-axis proportional gain.	1.00 (0.001~4.000)	RUN
F03.11 (0x030B)	Current loop D-axis integral gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set the current loop D-axis integral gain.	1.00 (0.001~4.000)	RUN
F03.12 (0x030C)	Current loop Q-axis proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set the current loop Q-axis proportional gain.	1.00 (0.001~4.000)	RUN
F03.13 (0x030D)	Current loop Q-axis integral gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set the current loop Q-axis integral gain.	1.00 (0.001~4.000)	RUN
F03.15 (0x030E)	Torque limit of electric state	**V/F SVC FVC PMVF PMSVC PMFVC** Set the torque limit of the electric state.	250.0% (0.0~400.0%)	RUN
F03.16 (0x030F)	Torque limit of power generation state	**V/F SVC FVC PMVF PMSVC PMFVC** Set the torque limit for power generation state.	350.0% (0.0~400.0%)	RUN
F03.17 (0x0312)	Regenerative torque limit value at low speed	**V/F SVC FVC PMVF PMSVC PMFVC** Set the regenerative torque limit value at low speed.	0.0% (0.0~400.0%)	RUN
F03.18 (0x0313)	Torque limiting frequency amplitude at low speed	**V/F SVC FVC PMVF PMSVC PMFVC** Set the frequency amplitude limited by torque at low speed.	6.00s (0.00~30.00s)	RUN

Table 4-16

◆ Group F03.2x: Torque optimization control

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F03.20 (0x0314)	Low frequency pull-in current for synchronous motor	**V/F SVC FVC PMVF PMSVC PMFVC** When PM motor open loop control is effective, the higher the pull-in current the higher the torque output.	20.0% (0.0~50.0%)	RUN
F03.21 (0x0315)	High frequency pull-in current for synchronous motor	**V/F SVC FVC PMVF PMSVC PMFVC** When the PM motor open-loop control is effective, the higher the pull-in current, the higher the torque output.	10.0% (0.0~50.0%)	RUN
F03.22 (0x0316)	Pull-in current frequency for	**V/F SVC FVC PMVF PMSVC PMFVC** The set value is 100.0% of F01.10 [Maximum frequency].	10.0% (0.0~100.0%)	RUN

	synchronous motor			
F03.23 (0x0317)	Differential compensation for asynchronous motor	**V/F SVC FVC PMVF PMSVC PMFVC** Set the differential compensation for asynchronous motor.	100.0% (0.0~250.0%)	RUN
F03.24 (0x0318)	Initial value of starting torque	**V/F SVC FVC PMVF PMSVC PMFVC** Set the initial value of starting torque.	0.0% (0.0~250.0%)	RUN

Table 4-17

◆ **Group F03.3x: Flux optimization**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F03.30 (0x031E)	Weak magnetic feedforward coefficient	**V/F SVC FVC PMVF PMSVC PMFVC** Set the weak magnetic feedforward coefficient.	10.0% (0.0~200.0%)	RUN
F03.31 (0x031F)	Weak magnetic control gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set the weak magnetic control gain.	100.0% (0.0~500.0%)	RUN
F03.32 (0x0320)	Upper limit of weak magnetic current	**V/F SVC FVC PMVF PMSVC PMFVC** Set the upper limit of weak magnetic current.	60.0% (0.0~250.0%)	STOP
F03.33 (0x0321)	Weak magnetic voltage coefficient	**V/F SVC FVC PMVF PMSVC PMFVC** Set the weak magnetic voltage coefficient.	97.0% (0.0~120.0%)	STOP
F03.34 (0x0322)	Output power limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the output power limit.	250.0% (0.0~400.0%)	RUN
F03.35 (0x0323)	Overexcitation braking gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set the overexcitation braking gain.	100.0% (0.0~500.0%)	RUN
F03.36 (0x0324)	Over-excitation braking limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the overexcitation braking limit.	100.0% (0.0~250.0%)	RUN
F03.37 (0x0325)	Energy-saving running	**V/F SVC FVC PMVF PMSVC PMFVC** 0:Off ; 1:On	0 (0~1)	RUN
F03.38 (0x0326)	Lower excitation limit for energy-saving running	**V/F SVC FVC PMVF PMSVC PMFVC** Set lower excitation limit for energy-saving running.	50.0% (0.0~80.0%)	RUN
F03.39 (0x0327)	Energy-saving running filter factor	**V/F SVC FVC PMVF PMSVC PMFVC** Set filter factor for energy-saving running.	0.010s (0.000~6.000s)	RUN

Table 4-18

◆ **Group F03.4x - F03.5x: Torque control**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F03.40 (0x0328)	Torque control selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Speed control to limit the torque 1: Torque control to limit speed	0 (0~1)	RUN
F03.41 (0x0329)	Torque command giving	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Channel A Tens-bit: Channel B 0: Set via Keyboard number entering 1: Reserved 2: Set via current/voltage analog AI1 3: Set via current/voltage analog AI2 4: Reserved 5: PUL 6: Set via RS485 communication Hundreds-bit: Method 0: A 1: B 2: A+B 3: A-B 4: MIN (A, B) 5:MAX (A, B)	0x0000 (0x0000~0x0577)	RUN
F03.42 (0x032A)	Torque setting via keyboard numbers	**V/F SVC FVC PMVF PMSVC PMFVC** Set to give the torque command.	0.0% (0.0~100.0%)	RUN
F03.43 (0x032B)	Torque input lower limit value	**V/F SVC FVC PMVF PMSVC PMFVC** Set the lower limit of torque input.	0.00% (0.0~100.00%)	RUN
F03.44 (0x032C)	Lower limit setting	**V/F SVC FVC PMVF PMSVC PMFVC** Set the corresponding value of the lower limit.	0.0% (-200.0~200.0%)	RUN
F03.45 (0x032D)	Torque input upper limit value	**V/F SVC FVC PMVF PMSVC PMFVC** Set the upper limit of torque input.	100.0% (0.0~100.0%)	RUN
F03.46 (0x032E)	Upper limit setting	**V/F SVC FVC PMVF PMSVC PMFVC** Set the upper limit value.	100.0% (-200.0~200.0%)	RUN

F03.47 (0x032F)	Torque filter time	**V/F SVC FVC PMVF PMSVC PMFVC** Set frequency amplitude limited by torque at low speed.	0.100s (0.000~6.000s)	RUN
F03.52 (0x0334)	Upper limit of output torque	**V/F SVC FVC PMVF PMSVC PMFVC** Set the upper limit of output torque.	150.0% (0.0~200.0%)	RUN
F03.53 (0x0335)	Lower limit of output torque	**V/F SVC FVC PMVF PMSVC PMFVC** Set the lower limit of output torque.	0.0% (0.0~200.0%)	RUN
F03.54 (0x0336)	Torque controlling forward speed limit selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0:Set via function code F03.56; 1: Reserved; 2:AI1×F03.56; 3:AI2×F03.56; 4: Reserved; 5: PUL×F03.56; 6: Given value via RS485 communication × F03.56; 7:Reserved;	0 (0~7)	RUN
F03.55 (0x0337)	Torque controlling reverse speed limit selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Set via function code F03.57; 1: Reserved; 2:AI1×F03.57; 3:AI2×F03.57; 4: Reserved; 5:PUL×F03.57; 6: Given value via RS485 communication×F03.57 7: Reserved;	0 (0~7)	RUN
F03.56 (0x0338)	Torque controlling max. speed limit for forward rotation	**V/F SVC FVC PMVF PMSVC PMFVC** Set the maximum speed limit for torque controlling forward rotation.	100.0% (0.0~100.0%)	RUN
F03.57 (0x0339)	Torque controlling max. speed limit for reverse rotation	**V/F SVC FVC PMVF PMSVC PMFVC** Set the maximum speed limit for torque controlling reverse rotation.	100.0% (0.0~100.0%)	RUN

Table 4-19

◆ Group F03.7x: Position compensation

Parameter code	Designation	Content	Default	Adjustable

(Address)			(Setting range)	properties
F03.70 (0x0346)	Position compensation control	**V/F SVC FVC PMVF PMSVC PMFVC** Position-compensated control under speed control, which can achieve zero servo or improve system rigidity.	0 (0~5)	RUN
F03.71 (0x0347)	Compensation gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set compensation gain.	1.0% (0.0~250.0%)	RUN
F03.72 (0x0348)	Compensation limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the compensation limit value.	0.0% (0.0~100.0%)	STOP
F03.73 (0x0349)	Compensation range	**V/F SVC FVC PMVF PMSVC PMFVC** Set the valid compensation range.	10.0% (0.0~100.0%)	STOP

Table 4-20

◆ Group F03.8x: Extension control

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F03.80 (0x0350)	MTPA gain of synchronous motor	**V/F SVC FVC PMVF PMSVC PMFVC** Set the MTPA gain of the synchronous motor.	100.0% (0.0~400.0%)	RUN
F03.81 (0x0351)	MTPA filter time of synchronous motor	**V/F SVC FVC PMVF PMSVC PMFV** Set the filter time of the synchronous motor MTPA.	1.0ms (0.0~100.0ms)	RUN

Table 4-21

4.7 Group F05: Input Terminal

◆ Group F05.0x: Digital input terminal function

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.00 (0x0500)	Terminal X1 function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See the function of terminal X for details.	1 (0~85)	STOP
F05.01 (0x0501)	Terminal X2 function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See the function of terminal X for details.	2 (0~85)	STOP
F05.02 (0x0502)	Terminal X3 function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See the function of terminal X for details.	80 (0~85)	STOP
F05.03 (0x0503)	Terminal X4 function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See the function of terminal X for details.	61 (0~85)	STOP
F05.04 (0x0504)	Terminal X5 function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See the function of terminal X for details.	64 (0~85)	STOP
F05.05	Terminal X6 function	**V/F SVC FVC PMVF PMSVC PMFVC**	8	STOP

(0x0505)	selection	See the function of terminal X for details.	(0~85)	
F05.06 (0x0506)	Terminal X7 function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See the function of terminal X for details.	7 (0~85)	STOP

Table 4-22

◆ **Group F05.1x: Curve X1-X5 detection delay**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.10 (0x050A)	X1 validity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X1 from the invalid state to the valid state.	0.010 (0.000~6.000s)	RUN
F05.11 (0x050B)	X1 invalidity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X1 from the valid state to the invalid state.	0.010 (0.000~6.000s)	RUN
F05.12 (0x050C)	X2 validity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X2 from the invalid state to the valid state.	0.010 (0.000~6.000s)	RUN
F05.13 (0x050D)	X2 invalidity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X2 from the valid state to the invalid state.	0.010 (0.000~6.000s)	RUN
F05.14 (0x050E)	X3 validity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X3 from the invalid state to the valid state.	0.010 (0.000~6.000s)	RUN
F05.15 (0x050F)	X3 invalidity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X3 from the valid state to the invalid state.	0.010 (0.000~6.000s)	RUN
F05.16 (0x0510)	X4 validity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X4 from the invalid state to the valid state.	0.010 (0.000~6.000s)	RUN
F05.17 (0x0511)	X4 invalidity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X4 from the valid state to the invalid state.	0.010 (0.000~6.000s)	RUN
F05.18 (0x0512)	X5 validity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output	0.010 (0.000~6.000s)	RUN

		terminal X5 from the invalid state to the valid state.		
F05.19 (0x0513)	X5 invalidity detection delay	**V/F SVC FVC PMVF PMSVC PMFVC** The delay time corresponding to the transition of output terminal X5 from the valid state to the invalid state.	0.010 (0.000~6.000s)	RUN

Table 4-23

◆ **Group F05.2x: Digital input terminal function selection**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.20 (0x0514)	Terminal control running mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0: two-wire mode 1; 1: two-wire mode 2 2: three-wire mode 1; 3: three-wire mode 2 Note: see Appendix II for the terminal wiring methods.	0 (0~3)	STOP
F05.22 (0x0516)	X1~X4 terminal characteristics selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: valid when closed; 1: valid when open Ones-bit: X1 terminal Tens-bit: X2 terminal Hundreds-bit: X3 terminal Thousands-bit: X4 terminal	0000 (0000~1111)	RUN
F05.23 (0x0517)	X5~X7 terminal characteristics selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: valid when closed; 1: valid when open Ones-bit: X5 terminal Tens-bit: X6 terminal Hundreds-bit: X7 terminal	0000 (0000~0111)	RUN
F05.25 (0x0519)	Terminal UP/DW control selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: power-down frequency storage 1: no power-down frequency storage 2: frequency adjustable during running, records all cleared at stop	0 (0~2)	STOP
F05.26 (0x051A)	Terminal UP/DW for the increase /decrease rate of frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set terminal UP/DW to control the increase or decrease rate of frequency.	0.50Hz/s (0.01~50.00Hz/s)	RUN
F05.27	Terminal controlling	**V/F SVC FVC PMVF PMSVC PMFVC**	1.00s	RUN

(0x051B)	deceleration time of emergency stop	Set the terminal to control deceleration time of emergency stop.	(0.01~650.00s)	

Table 4-24

◆ **F05.3x group: PUL terminal**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.31 (0x051F)	PUL input min. frequency	**V/F SVC FVC PMVF PMSVC PMFVC** The minimum frequency accepted by PUL, frequency signals below will be processed by the spindle drive as the minimum frequency. 0.00~50.000kHz	0.00kHz (0.00~500.00kHz)	RUN
F05.32 (0x0520)	PUL input min. frequency percent	**V/F SVC FVC PMVF PMSVC PMFVC** Percentage of the set PUL input min. frequency.	0.00% (0.00~100.00%)	RUN
F05.33 (0x0521)	PUL input max. frequency	**V/F SVC FVC PMVF PMSVC PMFVC** The maximum frequency accepted by PUL, frequency signals above will be processed by the spindle drive as the maximum frequency. 0.00~50.000kHz	50.00kHz (0.00~500.00kHz)	RUN
F05.34 (0x0522)	PUL input max. frequency percent	**V/F SVC FVC PMVF PMSVC PMFVC** Percentage of the set PUL input max. frequency	100.00% (0.00~100.00%)	RUN
F05.35 (0x0523)	PUL filter time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the filter for the input pulse signal to eliminate interfering signals.	0.100s (0.000~9.000s)	RUN
F05.36 (0x0524)	PUL cut-off frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Frequencies lower than this parameter are no longer recognized by the spindle drive. It is processed as 0Hz.	0.010kHz (0.000~1.000kHz)	RUN

Table 4-25

◆ **Group F05.4x: Analog AI processing**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.42 (0x052A)	AI2 input signal type	**V/F SVC FVC PMVF PMSVC PMFVC** 0: voltage 0~10.00V； 1: current 0~20.00mA	0 (0~1)	RUN
F05.43 (0x052B)	Analog input curve selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Straight cable(default)	0x0000 (0x0000~0x0022)	RUN

		1: Curve 1 2: Curve2 Ones-bit: AI1 Tens-bit: AI2 Hundreds-bit: Reserved Thousands-bit: Reserved		

Table 4-26

◆ **Group F05.5x: Analog AI liner processing**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.50 (0x0532)	AI1 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Define the signal received at the AI1 terminal, and voltage signals below this value are processed as the lower limit.	-100.0% (-100.0~100.0%)	RUN
F05.51 (0x0533)	Percent of AI1 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the percent of AI1 lower limit value.	-100.0% (-100.0~100.0%)	RUN
F05.52 (0x0534)	AI1 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Define the signal received by the AI1 terminal, and voltage signals above this value are processed as the upper limit.	100.0% (-100.0~100.0%)	RUN
F05.53 (0x0535)	Percent of AI1 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the percent of AI1 upper limit value.	100.00% (0.00~100.00%)	RUN
F05.54 (0x0536)	AI1 filter time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the filter for the analog signal to eliminate interfering signals.	0.010s (0.000~6.000s)	RUN
F05.55 (0x0537)	AI2 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Define the signal received by the AI2 terminal, and any voltage signal below this value is processed as the lower limit.	0.0% (0.0~100.0%)	RUN
F05.56 (0x0538)	Percent of AI2 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the percent of AI2 lower limit.	0.00% (-100.00~100.00%)	RUN
F05.57 (0x0539)	AI2 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Define the signal received by the AI2 terminal, and voltage signals above this value are processed as upper limit values.	100.0% (0.0~100.0%)	RUN
F05.58 (0x053A)	Percent of AI2 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the percent of AI2 upper limit.	100.00% (-100.00~100.00%)	RUN

F05.59 (0x053B)	AI2 filtering time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the filter for the analog signal to eliminate interfering signals.	0.010s (0.000~6.000s)	RUN

Table 4-27

◆ **Group F05.6x:AI curve 1 processing**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.60 (0x053C)	Curve 1 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the lower limit of curve 1.	0.0% (0.0~100.0%)	RUN
F05.61 (0x053D)	Percent of curve 1 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set percent of curve 1 lower limit.	0.0% (0.0~100.0%)	RUN
F05.62 (0x053E)	Curve 1 inflection point 1 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set curve 1 inflection point 1 input voltage.	30.0% (0.0~100.0%)	RUN
F05.63 (0x053F)	Percent of curve 1 inflection point 1 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set percent of curve 1 inflection point 1 input voltage.	30.00% (0.0~100.0%)	RUN
F05.64 (0x0540)	Curve 1 inflection point 2 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set curve 1 inflection point 2 input voltage.	60.0% (0.0~100.0%)	RUN
F05.65 (0x0541)	Percent of curve 1 inflection point 2 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set the percent of curve 1 inflection point 2 input voltage.	70.00% (0.0~100.0%)	RUN
F05.66 (0x0542)	Curve 1 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the upper limit of curve 1.	100.00% (0.0~100.0%)	RUN
F05.67 (0x0543)	Percent of curve 1 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Percent of curve 1 upper limit	100.0% (0.0~100.0%)	RUN

Table 4-28

◆ **Group F05.7x:AI curve 2 processing**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.70 (0x0546)	Curve 2 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the lower limit value of curve 2.	0.0% (0.0~100.0%)	RUN
F05.71 (0x0547)	Percent of curve 2 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set percent of curve 2 lower limit.	0.0% (0.0~100.0%)	RUN

F05.72 (0x0548)	Curve 2 inflection point 1 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set curve 2 inflection point 1 input voltage.	30.0% (0.0~100.0%)	RUN
F05.73 (0x0549)	Percent of curve 2 inflection point 1 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set percent of curve 2 inflection point 1 input voltage.	30.00% (0.00~100.00%)	RUN
F05.74 (0x054A)	Curve 2 inflection point 2 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set curve 2 inflection point 2 input voltage.	60.0% (0.0~100.0%)	RUN
F05.75 (0x054B)	Percent of curve 2 inflection point 2 input voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set percent of curve 2 inflection point 2 input voltage.	70.00% (0.0~100.0%)	RUN
F05.76 (0x054C)	Curve 2 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set curve 2 upper limit.	100.00% (0.0~100.0%)	RUN
F05.77 (0x054D)	Percent of curve 2 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set percent of curve 2 upper limit	100.0% (0.0~100.0%)	RUN

Table 4-29

◆ Group F05.8x:AI as digital input terminal

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F05.80 (0x0550)	AI as digital input terminal characteristics selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Valid at low level 1: Valid at high level Ones-bit:AI1 Tens-bit:AI2	0000 (0000~1111)	RUN
F05.81 (0x0551)	AI terminal function selection (as X terminal)	**V/F SVC FVC PMVF PMSVC PMFVC** See X terminal functions.	0 (0~63)	STOP
F05.82 (0x0552)	AI high level setting	**V/F SVC FVC PMVF PMSVC PMFVC** An input higher than the set value here is a high-level input.	70.00% (0.0~100.0%)	RUN
F05.83 (0x0553)	AI low level setting	**V/F SVC FVC PMVF PMSVC PMFVC** An input lower than the set value here is a low-level input.	30.00% (0.0~100.0%)	RUN

Table 4-30

4.8 Group F06: Output Terminal

◆ Group F06.0x:AO analog output

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F06.00 (0x0600)	AO output method selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0:0~10V 1:4.00~20.00mA 2:0.00~20.00mA	0 (0~2)	RUN
F06.01 (0x0601)	AO output volume selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Given frequency 1: Output frequency 2: Output current 3: Input voltage 4: Output voltage 5: Mechanical speed 6: Given torque 7: Output torque 8: Given PID 9: PID feedback 10: Output power 11: Bus voltage 12: AI1 input value 13: AI2 input value 14: Reserved 15: PUL input value 16: Module temperature1 17: Module temperature2 18: 485 communication given 19: Virtual vY1 features	0 (0~19)	RUN
F06.02 (0x0602)	AO output gain	**V/F SVC FVC PMVF PMSVC PMFVC** Adjust the value of the terminal output analog.	100.0% (0.0~200.0%)	RUN
F06.03 (0x0603)	AO output bias	**V/F SVC FVC PMVF PMSVC PMFVC** Set the A0 output bias for adjusting the zero point of the terminal output.	0.0% (-10.0~10.0%)	RUN
F06.04 (0x0604)	AO output filter	**V/F SVC FVC PMVF PMSVC PMFVC** Set the filter for analog signals to eliminate interfering signals.	0.01s (0.0~6.00s)	RUN

Table 4-31

◆ **Group F06.2x-F06.3x: Digital, relay outputs**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F06.20 (0x0614)	Output terminal polarity selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0:Positive； 1: Negative Ones-bit: Y terminal Tens-bit: Relay output terminal 1	0000 (0000~1111)	RUN
F06.21 (0x0615)	Output terminal Y1	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal Y functions.	42 (0~43)	RUN
F06.22 (0x0616)	Relay 1 output (TA-TB-TC)	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal Y functions.	41 (0~43)	RUN
F06.23 (0x0617)	Output terminal Y2	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal Y functions.	8 (0~43)	RUN
F06.24 (0x0618)	Relay 2 output (TA-TB-TC)	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal Y functions.	4 (0~43)	RUN
F06.25 (0x0619)	Y1 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the Y1 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.26 (0x061A)	Relay 1 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the relay 1 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.27 (0x061B)	Y2 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the Y2 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.28 (0x061C)	Relay 2 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the relay 2 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.29 (0x061D)	Y1 output OFF delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the Y2 output OFF delay time.	0.010s (0.000~60.000s)	RUN
F06.30 (0x061E)	Relay 1 output OFF delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the relay 1 output OFF delay time.	0.010s (0.000~60.000s)	RUN
F06.31 (0x061F)	Y2 output OFF delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the Y2 output OFF delay time.	0.010s (0.000~60.000s)	RUN
F06.32 (0x0620)	Relay 2 output OFF delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the relay 2 output OFF delay time.	0.010s (0.000~60.000s)	RUN

Table 4-32

◆ **Group F06.4x: Frequency detection**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F06.40 (0x0628)	Frequency detection value1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the frequency detection value 1.	2.00Hz (0.00~ Max. frequency)	RUN
F06.41 (0x0629)	Frequency detection amplitude 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the frequency detection amplitude 1.	1.00Hz (0.00~ Max. frequency)	RUN
F06.42 (0x062A)	Frequency detection value 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the frequency detection value 2.	2.00Hz (0.00~ Max. frequency)	RUN
F06.43 (0x062B)	Frequency detection amplitude 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the frequency detection amplitude 2.	1.00Hz (0.00~ Max. frequency)	RUN
F06.44 (0x062C)	Detection amplitude for a given frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set the detection amplitude for a given frequency.	2.00Hz (0.00~ Max. frequency)	RUN

Table 4-33

◆ **Group F06.5x: Comparator output of monitoring parameters**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F06.50 (0x0632)	Comparator 1 monitoring selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-and tens- bit: set value 00~63 for yy in the monitoring parameter number Cxx.yy. Hundreds- and thousands-bit: Set value 00~07 for xx in monitoring parameter number Cxx.yy.	0001 (0000~0763)	RUN
F06.51 (0x0633)	Comparator 1 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the comparator 1 upper limit.	3000 (0~65535)	RUN
F06.52 (0x0634)	Comparator 1 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the comparator 1 lower limit.	0 (0~65535)	RUN
F06.53 (0x0635)	Comparator 1 bias	**V/F SVC FVC PMVF PMSVC PMFVC** Set the comparator 1 bias value.	0 (0~1000)	RUN
F06.54	Action selection	**V/F SVC FVC PMVF PMSVC PMFVC**	0	RUN

(0x0636)	when sending CP1	0: Continue running (digital terminal output only) 1: Report a warning and free stop 2: Report a warning and continue running 3: Forced stop	(0~3)	
F06.55 (0x0637)	Comparator 2 monitoring selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-and tens- bit: set value 00~63 for yy in the monitoring parameter number Cxx.yy. Hundreds- and thousands-bit: Set value 00~07 for xx in monitoring parameter number Cxx.yy.	0002 (0000~0763)	RUN
F06.56 (0x0638)	Comparator 2 upper limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the comparator 2 upper limit value.	30 (0~65535)	RUN
F06.57 (0x0639)	Comparator 2 lower limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the comparator 2 lower limit value.	0 (0~65535)	RUN
F06.58 (0x063A)	Comparator 2 bias	**V/F SVC FVC PMVF PMSVC PMFVC** Set the comparator 2 bias value.	0 (0~1000)	RUN
F06.59 (0x063B)	Action selection when sending CP2	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Continue running (digital terminal output only) 1: Report a warning and free stop 2: Report a warning and continue running 3: Forced stop	0 (0~3)	RUN

Table 4-25

◆ **Group F06.6x: Virtual input/output terminals**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F06.60 (0x063C)	Virtual vX1 terminal function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal X functions.	0 (0~63)	RUN
F06.61 (0x063D) RUN	Virtual vX2 terminal function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal X functions.	0 (0~63)	RUN
F06.62 (0x063E)	Virtual vX3 terminal function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal X functions.	0 (0~63)	RUN
F06.63 (0x063F)	Virtual vX4 terminal function selection	**V/F SVC FVC PMVF PMSVC PMFVC** See terminal X functions.	0 (0~63)	RUN

F06.64 (0x0640)	vX terminal valid status source	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Internal link with virtual vYn 1: Link with physical terminal Xn 2: Set via the function code Ones-bit: Virtual vX1 Tens-bit: Virtual vX2 Hundreds-bit: Virtual vX3 Thousands-bit: Virtual vX4	0000 (0000~2222)	RUN
F06.65 (0x0641)	Set virtual vX terminal to valid status via function code	**V/F SVC FVC PMVF PMSVC PMFVC** 0: invalid; 1: valid Ones-bit: VirtualvX1 Tens-bit: VirtualvX2 Hundreds-bit: Virtual vX3 Thousands-bit: Virtual vX4	0000 (0000~1111)	RUN
F06.66 (0x0642)	Virtual vY1 output selection	**V/F SVC FVC PMVF PMSVC PMFVC** See Y terminal functions.	0 (0~31)	RUN
F06.67 (0x0643)	Virtual vY2 output selection	**V/F SVC FVC PMVF PMSVC PMFVC** See Y terminal functions.	0 (0~31)	RUN
F06.68 (0x0644)	Virtual vY3 output selection	**V/F SVC FVC PMVF PMSVC PMFVC** See Y terminal functions.	0 (0~31)	RUN
F06.69 (0x0645)	Virtual vY4 output selection	**V/F SVC FVC PMVF PMSVC PMFVC** See Y terminal functions.	0 (0~31)	RUN
F06.70 (0x0646)	vY1 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set vY1 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.71 (0x0647)	vY2 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set vY2 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.72 (0x0648)	vY3 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set vY3 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.73 (0x0649)	vY4 output ON delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set vY4 output ON delay time.	0.010s (0.000~60.000s)	RUN
F06.74 (0x064A)	vY1 output OFF delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set vY1 output OFF delay time.	0.010s (0.000~60.000s)	RUN
F06.75	vY2 output OFF delay	**V/F SVC FVC PMVF PMSVC PMFVC**	0.010s	RUN

(0x064B)	time	Set vY2 output OFF delay time.	(0.000~60.000s)	
F06.76 (0x064C)	vY3 output OFF delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set vY3 output OFF delay time.	0.010s (0.000~60.000s)	RUN
F06.77 (0x064D)	vY4 output OFF delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set vY4 output OFF delay time.	0.010s (0.000~60.000s)	RUN

Table 4-26

4.9 Group F07: Running Control

◆ Group F07.0x: Starting control

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F07.00 (0x0700)	Starting running mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Start from the starting frequency 1: DC braking first and then start from starting frequency 2: Start after speed tracking and direction judgment	0 (0~2)	STOP
F07.01 (0x0701)	Starting pre-excitation time	**V/F SVC FVC PMVF PMSVC PMFV** Only under vector control (without PG) on asynchronous motors	0.00s (0.00~60.00s)	STOP
F07.02 (0x0702)	Starting frequency	**V/F SVC FVC PMVF PMSVC PMFVC** When the given frequency is lower than this value, it does not start and is in standby mode.	0.50Hz (0.00~ Upper limit frequency via number setting)	STOP
F07.03 (0x0703)	Starting protection selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: off; 1:on Ones-bit: Terminal starting protection on in case of abnormal exit Tens-bit: Jogging terminal starting protection on in case of abnormal exit Hundreds-bit: Terminal starting protection on when command channel is switched to terminal Thousands-bit: Reserved Note: When the free stop, emergency stop and forced stop commands are valid, the terminal starting protection is turned on by default, and the A.RUNx warning is reported	0111 (0000~1111)	STOP

		during protection.		
F07.05 (0x0705)	Rotary direction selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Running direction reversed or not 0: direction unchanged; 1: direction reversed Tens-bit: Running direction prohibited or not 0: allow forward and reverse commands; 1: allow only forward commands; 2: allow only reverse commands; Hundreds-bit: Frequency control command direction or not 0: frequency control is invalid;1: frequency control is valid Thousands-bit: Reserved	0100 (0000~1111)	STOP
F07.06 (0x0706)	Restart action after power down selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: invalid; 1: valid.	0 (0~1)	STOP
F07.07 (0x0707)	Restart waiting time after power down	**V/F SVC FVC PMVF PMSVC PMFVC** Set restart waiting time after power failure.	0.50s (0.00~60.00s)	STOP

Table 4-27

◆ **Group F07.1x: Stop control**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F07.10 (0x070A)	Stop mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0: deceleration stop; 1: free stop	0 (0~1)	RUN
F07.11 (0x070B)	Stop detection frequency	**V/F SVC FVC PMVF PMSVC PMFVC** When the output frequency of the spindle drive is lower than this value, it enters the stop state when the speed is reduced.	0.50Hz (0.00~ Upper limit frequency via number setting)	RUN
F07.12 (0x070C)	Stop-and-start limit time	**V/F SVC FVC PMVF PMSVC PMFVC** Waiting time to start again after a shutdown.	0.00s (0.00~60.00s)	STOP
F07.15 (0x070F)	Action selection below lower limit frequency	**V/F SVC FVC PMVF PMSVC PMFVC** 0: Run according to frequency command 1: Free stop and pause 2: Run at the lower frequency limit 3: Zero-speed running	0 (0~3)	RUN
F07.16	Zero-speed torque	**V/F SVC FVC PMVF PMSVC PMFVC**	60.0%	RUN

(0x0710)	holding factor	Set zero-speed torque current, 100.0% corresponds to spindle drive's rated current.	(0.0~150.0%)	
F07.17 (0x0711)	Zero-speed torque holding time	**V/F SVC FVC PMVF PMSVC PMFVC** Set zero-speed torque holding time.	0s (0.0~6000.0s)	RUN
F07.18 (0x0712)	Forward/reverse dead time	**V/F SVC FVC PMVF PMSVC PMFVC** Zero frequency holding time at forward / reverse switching.	0.0s (0.0~120.0s)	STOP

Table 4-28

◆ **Group F07.2x: DC braking and speed tracking**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F07.20 (0x0714)	Pre-start braking current	**V/F SVC FVC PMVF PMSVC PMFVC** Set pre-start braking current.	60.0% (0.0~150.0%)	STOP
F07.21 (0x0715)	Pre-start braking time	**V/F SVC FVC PMVF PMSVC PMFVC** Set pre-start braking time.	0.0s (0.0~60.0s)	STOP
F07.22 (0x0716)	DC braking starting frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set DC braking starting frequency.	1.00Hz (0.00~50.00Hz)	STOP
F07.23 (0x0717)	DC braking current	**V/F SVC FVC PMVF PMSVC PMFVC** Base on spindle drive‘s rated current, internally limited to motor rated current.	60.0% (0.0~150.0%)	STOP
F07.24 (0x0718)	DC braking time during shutdown	**V/F SVC FVC PMVF PMSVC PMFVC** Set DC braking time during shutdown.	0.0s (0.0~60.0s)	STOP
F07.25 (0x0719)	Speed tracking mode	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Search method 0:search from the maximum frequency； 1: search from the stop frequency Tens-bit: Reverse the search 0:off； 1: on Hundreds-bit: Search source 0: software search； 1: hardware search Thousands-bit: Reserved	00 (00~11)	STOP
F07.26 (0x071A)	Rotational speed tracking speed	**V/F SVC FVC PMVF PMSVC PMFVC** Set the speed of RPM tracking.	0.5s (0.0~60.0s)	STOP
F07.27	Stop delay due to	**V/F SVC FVC PMVF PMSVC PMFVC**	1.00s	STOP

(0x071B)	speed tracking	Set stop time delay of speed tracking.	(0.0~60.0s)	
F07.28 (0x071C)	Speed tracking current	**V/F SVC FVC PMVF PMSVC PMFVC** Set speed tracking current.	120.0% (0.0~400.0%)	STOP

Table 4-29

◆ Group F07.3x: Jogging

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F07.30 (0x071E)	Jogging frequency setting	**V/F SVC FVC PMVF PMSVC PMFVC** Set jogging running frequency.	5.00Hz (0.00~ Max. frequency)	RUN
F07.31 (0x071F)	Jogging acceleration time	**V/F SVC FVC PMVF PMSVC PMFVC** Set jogging acceleration time.	10.0s (0.0~650.0s)	RUN
F07.32 (0x0720)	Jogging deceleration time	**V/F SVC FVC PMVF PMSVC PMFVC** Set jogging deceleration time.	10.0s (0.0~650.0s)	RUN
F07.33 (0x0721)	Jogging S-curve selection	**V/F SVC FVC PMVF PMSVC PMFVC** Set jogging S-curve selection. 0: invalid；1: valid	0 (0~1)	RUN
F07.34 (0x0722)	Jogging stop mode selection	**V/F SVC FVC PMVF PMSVC PMFVC** Set the jogging stop mode 0: set mode via F7.10; 1: deceleration stop only	0 (0~1)	STOP

Table 4-30

◆ Group F07.4x: Start/Stop frequency holding and hopping frequency

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F07.40 (0x0728)	Holding frequency at start-up	**V/F SVC FVC PMVF PMSVC PMFVC** Holding frequency at start-up is larger than the starting frequency and smaller than the upper frequency via number setting	0.50Hz (0.00~ Upper limit frequency via number setting)	STOP
F07.41 (0x0729)	Holding frequency time at start-up	**V/F SVC FVC PMVF PMSVC PMFVC** The setting value should be larger than the starting frequency, and if it is not, it starts with the starting frequency.	0.0s (0.0~60.0s)	STOP
F07.42 (0x072A)	Holding frequency during shutdown	**V/F SVC FVC PMVF PMSVC PMFVC** Set the holding frequency during shutdown.	0.50Hz (0.00~ Upper limit	STOP

			frequency via number setting)	
F07.43 (0x072B)	Holding frequency time during shutdown	**V/F SVC FVC PMVF PMSVC PMFVC** Set holding frequency time during shutdown.	0.0s (0.0~60.0s)	STOP
F07.44 (0x072C)	Hopping frequency 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set hopping frequency 1.	0.00Hz (0.00~ Max. frequency)	RUN
F07.45 (0x072D)	Hopping frequency 1 amplitude	**V/F SVC FVC PMVF PMSVC PMFVC** Set hopping frequency 1 amplitude.	0.00Hz (0.00~ Max. frequency)	RUN
F07.46 (0x072E)	Hopping frequency 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set hopping frequency 2.	0.00Hz (0.00~ Max. frequency)	RUN
F07.47 (0x072F)	Hopping frequency 2 amplitude	**V/F SVC FVC PMVF PMSVC PMFVC** Set hopping frequency 2 amplitude.	0.00Hz (0.00~ Max. frequency)	RUN

Table 4-31

4.10 Group F10: Protection Parameters

◆ Group F10.0x: Current protection

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F10.00 (0x0A00)	Overcurrent suppression	**V/F SVC FVC PMVF PMSVC PMFVC** Automatically limits the output current below the set overcurrent suppression point to prevent excessive current from triggering an overcurrent fault. 0: suppression is always valid; 1: acceleration/deceleration is valid, constant speed is not valid.	0 (0~1)	RUN
F10.01 (0x0A01)	Overcurrent suppression point	**V/F SVC FVC PMVF PMSVC PMFVC** Set the load current limit level, 100% corresponding to the rated motor current.	185.0% (0.0~300.0%)	RUN
F10.02 (0x0A02)	Overcurrent suppression gain	**V/F SVC FVC PMVF PMSVC PMFVC** Sets the response effect of overcurrent suppression.	100.0% (0.0~500.0%)	RUN
F10.03	Current protection	**V/F SVC FVC PMVF PMSVC PMFVC**	0001	STOP

(0x0A03)	setting 1	Sets whether the current-related protection function is on Ones-bit: Wave-by-wave current limiting (CBC) 0: off 1: on Tens-bit: OC protection interference suppression 0: normal 1: primary interference suppression 2: secondary interference suppression Hundreds-bit: SC protection interference suppression 0: normal 1: primary interference suppression 2: secondary interference suppression Thousands-bit: Reserved	(0000~0221)	
F10.04 (0x0A04)	Current protection setting 2	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: three-phase current and protection selection 0: off; 1:on	0001 (0000~0001)	STOP

Table 4-32

◆ Group F10.1x: Voltage protection

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F10.10 (0x0A0A)	Busbar overvoltage hardware protection	**V/F SVC FVC PMVF PMSVC PMFVC** Set whether the busbar overvoltage hardware protection function is on 0: off ; 1:on	0 (0~1)	STOP
F10.11 (0x0A0B)	Busbar overvoltage suppression	**V/F SVC FVC PMVF PMSVC PMFVC** When the bus voltage is greater than the overvoltage suppression point, acceleration / deceleration will be slowed down or stopped to prevent over-voltage faults from being reported. Ones-bit: Overpressure suppression function 0: off 1: on only during deceleration 2: on during both acceleration / deceleration	0012 (0000~0012)	STOP

		Tens-bit: Overexcitation function 0:off; 1: on		
F10.12 (0x0A0C)	Busbar overvoltage suppression	**V/F SVC FVC PMVF PMSVC PMFVC** Set bus voltage value for triggering the overvoltage suppression function.	750V (0~820V)	STOP
F10.13 (0x0A0D)	Busbar overvoltage suppression gain	**V/F SVC FVC PMVF PMSVC PMFVC** Setting the response effect of overvoltage suppression.	100.0% (0.0~500.0%)	RUN
F10.14 (0x0A0E)	Energy consumption brake	**V/F SVC FVC PMVF PMSVC PMFVC** Set whether the energy brake function is on or off 0: off 1: on, but the overvoltage suppression function is off 2: on, while the overvoltage suppression function is on	2 (0~2)	RUN
F10.15 (0x0A0F)	Energy consumption brake voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set the energy consumption brake working voltage, when the bus voltage is greater than this value, the energy consumption brake starts to work.	740V (0~820V)	RUN
F10.16 (0x0A10)	Bus undervoltage suppression function	**V/F SVC FVC PMVF PMSVC PMFVC** When the bus voltage is lower than the undervoltage suppression point, the running frequency is automatically adjusted to suppress the bus voltage reduction and prevent the undervoltage fault from being reported 0:off; 1: on	0 (0~1)	STOP
F10.17 (0x0A11)	Busbar undervoltage suppression point	**V/F SVC FVC PMVF PMSVC PMFVC** Set bus voltage value for triggering the undervoltage suppression function.	430V (0~820V)	STOP
F10.18 (0x0A12)	Bus undervoltage suppression gain	**V/F SVC FVC PMVF PMSVC PMFVC** Setting the response effect of undervoltage suppression.	100.0% (0.0~500.0%)	RUN
F10.19 (0x0A13)	Busbar undervoltage protection point	**V/F SVC FVC PMVF PMSVC PMFVC** The set lower limit voltage allowed for bus voltage, below which the spindle drive reports an undervoltage fault	350V (0~820V)	STOP

Table 4-33

◆ Group F10.2x: Auxiliary protection

Parameter code	Designation	Content	Default	Adjustable

(Address)			(Setting range)	properties
F10.20 (0x0A14)	Input / output phase loss protection selection	**V/F SVC FVC PMVF PMSVC PMFVC** Set whether the input / output phase loss protection function is on. Ones-bit: Output phase loss protection function 0:off; 1: on Tens-bit: Input phase loss protection function 0: off 1: on, input phase loss warning A.ILF is detected, continue running 2: on, input phase loss warning A.ILF is detected, free stop	021 (000~121)	STOP
F10.21 (0x0A15)	Input phase loss threshold	**V/F SVC FVC PMVF PMSVC PMFVC** Voltage detection percentage of the set input phase loss detection, 100% corresponding to the rated bus voltage.	10% (0~30.0%)	STOP
F10.22 (0x0A16)	Ground short circuit protection selection	**V/F SVC FVC PMVF PMSVC PMFVC** Whether the spindle drive output and the spindle drive cooling fan ground short circuit protection are on. Ones-bit: Output short circuit protection to ground 0: off 1: on Tens-bit: Cooling fan short circuit protection to ground 0: off 1: on	11 (00~12)	STOP
F10.23 (0x0A17)	Fan ON/OFF control selection	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle drive cooling fan running modes. 0: fan runs after spindle drive is powered on 1: fan is related to temperature after shutdown, and fan runs with the drive. 2: Fan stops after the set F10.24 time after shutdown, and running is related to temperature.	1 (0~2)	RUN
F10.24 (0x0A18)	Fan delay time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the time from when the run command is released to when the cooling fan stops running.	30.00s (0~600.00)	STOP

F10.25 (0x0A19)	Spindle drive overheating oH1 warning detection level	**V/F SVC FVC PMVF PMSVC PMFVC** Set the temperature value for spindle drive overheating warning, report the overheating warning when it's greater than the value.	80.0°C (0~100.0)	RUN

Table 4-34

◆ **Group F10.3x: Load protection**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F10.30 (0x0A1E)	Motor overload protection curve factor	**V/F SVC FVC PMVF PMSVC PMFVC** Set the factor of overload protection for the load motor, increasing this value will increase the overload capacity of the motor.	100.0% (0~250.0%)	STOP
F10.31 (0x0A1F)	Selection of spindle drive overload characteristics at low speeds	**V/F SVC FVC PMVF PMSVC PMFVC** Set whether the spindle drive overload protection function is effective at low speed (below 5Hz) 0: invalid 1: valid	0 (0~1)	STOP
F10.32 (0x0A20)	Load warning detection setting	**V/F SVC FVC PMVF PMSVC PMFVC** Set the spindle drive load warning detection method and the according warning method LED ones-bit: Detection selection (protection 1) 0: no detection; 1: overload detection; 2: overload detection at constant speed only; 3: underload detection 4: underload detection at constant speed only; 5: overload detection (position control valid) 6: underload detection (position control valid) LED tens-bit: Warning selection 0: report the warning and continue running 1: protections on and free stop LED hundreds-bit: detection selection (protection 2) 0: no detection;	0000 (0000~1414)	STOP

		1: overload detection; 2: overload detection at constant speed only; 3: underload detection 4: underload detection at constant speed only; 5: overload detection (position control valid) 6: underload detection (position control valid) LED thousands-bit: Warning selection 0: report the warning and continue running 1: protections on and free stop		
F10.33 (0x0A21)	Load warning detection level 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the detection value 1 of load warning. For VF control, it is 100% of the rated motor current. For vector control, it is 100% the rated output torque of the motor.	130.0% (0~200.0%)	STOP
F10.34 (0x0A22)	Load warning detection time 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the duration of the detection of load warning 1, the load is greater than the load warning detection level after the duration of the time, report the load detection warning 1.	5.0s (0~60.0)	STOP
F10.35 (0x0A23)	Load warning detection level 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the detection value 2 of load warning. For VF control, it is 100% of the rated motor current. For vector control, it is 100% the rated output torque of the motor.	130.0% (0~200.0%)	STOP
F10.36 (0x0A24)	Load warning detection time 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the duration of the detection of load warning 2, the load is greater than the load warning detection level after the duration of the time, report the load detection warning 2.	5.0s (0~60.0)	STOP

Table 4-35

◆ Group F10.4x: Stall protection

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F10.40 (0x0A28)	Excessive speed deviation protection	**V/F SVC FVC PMVF PMSVC PMFVC** Set the selection of early warning detection method and	00 (00~12)	STOP

		warning method when the deviation between the given speed and the feedback speed of the motor is too large. Ones-bit: detection selection 0: no detection 1: detection on at constant speed only 2: detection on all the time Tens-bit: Warning selection 0: free stop and report fault 1: report the warning and continue running		
F10.41 (0x0A29)	Excessive speed deviation detection threshold	**V/F SVC FVC PMVF PMSVC PMFVC** Set the detection value for excessive speed deviation, which is 100% of F01.10 [maximum frequency].	10.0% (0~60.0%)	STOP
F10.42 (0x0A2A)	Excessive speed deviation detection time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the detection time for detecting excessive speed deviation. If the deviation between the given speed and the feedback speed is greater than F10.41 and lasts for this time, the excessive speed deviation warning is reported.	2s (0~60)	STOP
F10.43 (0x0A2B)	Stall protection	**V/F SVC FVC PMVF PMSVC PMFVC** Setting the selection of detection method and warning method when the motor is running at high speed. Ones-bit: Detection selection 0: no detection 1: detection on at constant speed only 2: detection on all the time Tens-bit: Warning selection 0: free stop and report fault 1: report the warning and continue running	00 (00~12)	STOP
F10.44 (0x0A2C)	Stall detection threshold	**V/F SVC FVC PMVF PMSVC PMFVC** Set the stall warning detection value, which is 100% corresponding to F01.10 [maximum frequency]	110.0% (0~150.0%)	STOP
F10.45 (0x0A2D)	Stall detection time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the duration of the stall detection, when the feedback speed is greater than F10.44 and continues for this time, the	0.01s (0~2)	STOP

		stall detection warning is reported.		

Table 4-36

◆ **Group F10.5x: Fault recovery protection**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F10.50 (0x0A32)	Fault self-recovery times	**V/F SVC FVC PMVF PMSVC PMFVC** Set the allowable times of fault self-recovery to be performed. Note: 0 means to turn off the fault self-recovery function, otherwise it means this function is on.	0 (0~10)	STOP
F10.51 (0x0A33)	Fault self-recovery interval time	**V/F SVC FVC PMVF PMSVC PMFVC** Set the waiting time between a spindle drive failure and a reset.	1.0s (0~100.0)	STOP
F10.52 (0x0A34)	Number of recovered faults	**V/F SVC FVC PMVF PMSVC PMFVC** Indicate the number of fault self-recovery times that have been performed; read-only.	0	READ

Table 4-37

4.11 Group F11: Operator Parameters

◆**Group F11.0x: Key operation**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F11.00 (0x0B00)	Key lock selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: no lock 1: keyboard lock of function parameter modification 2: function parameters and non-start/stop key lock 3: function parameters and key full-lock	0 (0~3)	RUN
F11.01 (0x0B01)	Key lock password	**V/F SVC FVC PMVF PMSVC PMFVC** Set key lock password.	0 (0~65535)	RUN
F11.04 (0x0B04)	Up/down function selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Up / down modification selection 0: invalid 1: used to adjust F01.09 frequency given via keyboard 2: used to adjust F13.01 PID given via keyboard 3: Keyboard up / down to modify the parameter number	0011 (0000~0213)	STOP

		Tens-bit: Power-down storage 0: power-down frequency storage off 1: power-down frequency storage on Hundreds-bit: Restrictions 0: adjustable during stop 1: adjustable only during running, stored during stop 2: adjustable during running, cleared during stop		
F11.05 (0x0B05)	Up / down for quick change of parameter code	**V/F SVC FVC PMVF PMSVC PMFVC** Ones- and tens-bit: set 00~99 to yy in the function code Fxx.yy. Hundreds- and thousands-bit: set 00~15 to xx in the function code Fxx.yy.	0109 (0000~1563)	RUN

Table 4-38

◆ **Group F11.1x: Cycle monitoring on the status interface**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F11.11 (0x0B0B)	Cyclic display parameter 1 on the 1st cable	**V/F SVC FVC PMVF PMSVC PMFVC** Ones- and tens-bit: set 00~63to yy in the function code Cxx.yy.	0000 (0000~0763)	RUN
F11.12 (0x0B0C)	Cyclic display parameter 2 on the 1st cable	**V/F SVC FVC PMVF PMSVC PMFVC** Ones- and tens-bit: set 00~63to yy in the function code Cxx.yy.	0001 (0000~0763)	RUN
F11.13 (0x0B0D)	Cyclic display parameter 3 on the 1st cable	**V/F SVC FVC PMVF PMSVC PMFVC** Ones- and tens-bit: set 00~63to yy in the function code Cxx.yy.	0002 (0000~0763)	RUN
F11.14 (0x0B0E)	Cyclic display parameter 4 on the 1st cable	**V/F SVC FVC PMVF PMSVC PMFVC** Ones- and tens-bit: set 00~63to yy in the function code Cxx.yy.	0011 (0000~0763)	RUN

Table 4-39

◆ **Group F11.2x: Monitoring parameter control**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F11.20 (0x0B14)	Keyboard display settings	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Output frequency display selection	0002 (0000~111f)	RUN

		0: target frequency 1: running frequency 2: target frequency, filter depth increases with this value Tens-bit: Reserved 0: invalid 1: active power by removing stator resistance loss Hundreds-bit: Power with scale 0: power with percentage (%) 1: power with kilowatt (KW) Thousands-bit: Reserved		
F11.21 (0x0B15)	Speed factor	**V/F SVC FVC PMVF PMSVC PMFVC** Adjust the display of C00.06 RPM.	100.0% (0.0~500.0%)	RUN
F11.22 (0x0B16)	Power factor	**V/F SVC FVC PMVF PMSVC PMFVC** Adjust the display of C00.10 output power.	100.0% (0.0~500.0%)	RUN
F11.23 (0x0B17)	Monitoring parameter group display	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Reserved 0: invalid; 1: valid Tens-bit: C05 display selection 0: automatic switching according to the control modes 1: VF mode related parameters 2: VC mode related parameters Hundreds-bit: C00.40~C00.63 display selection 0: no display; 1:display Thousands-bit: Communication fault code switching 0: non-enabling; 1: enable;	0000 (0000~FFFF)	RUN
F11.24 (0x0B18)	Monitoring parameter filter	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Output current with filtering 0~F: The larger the value, the deeper the filtering	0x0000 (0x0000~0x 000F)	RUN
F11.25 (0x0B19)	Display during motor self-learning	**V/F SVC FVC PMVF PMSVC PMFVC** Set the display when the motor is self-learning 0: display self-learning process status; 1: self-learning process status is not displayed	0 (0~1)	STOP

F11.27 (0x0B1B)	Fault display selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: set whether to display the faults when the they are self-recovered 0: no display 1: display	0x0001 (0x0000~0x0001)	RUN

Table 4-40

4.12 Group F12: Communication Parameters

◆Group F12.0x: MODBUS slave parameters

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F12.00 (0x0C00)	Master/Slave selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: slave, 1: master	0 (0~1)	STOP
F12.01 (0x0C01)	Modbus communication address	**V/F SVC FVC PMVF PMSVC PMFVC** Different values are set for different slaves.	1 (1~247)	STOP
F12.02 (0x0C02)	Communication baud rate	**V/F SVC FVC PMVF PMSVC PMFVC** 0:1200 bps 1:2400 bps 2:4800 bps 3:9600 bps 4:19200 bps 5:38400 bps 6:57600 bps	3 (0~6)	STOP
F12.03 (0x0C03)	Modbus data format	**V/F SVC FVC PMVF PMSVC PMFVC** 0:(N, 8, 1) No checksum. 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.	0 (0~5)	STOP

		Data bits: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		
F12.04 (0x0C04)	Modbus transmission response processing	**V/F SVC FVC PMVF PMSVC PMFVC** 0: write operation with response 1: write operation without response	0 (0~1)	RUN
F12.05 (0x0C05)	Modbus communication response delay	**V/F SVC FVC PMVF PMSVC PMFVC** Set Modbus communication response delay.	0ms (0~500ms)	RUN
F12.06 (0x0C06)	Modbus communication failure timeout time	**V/F SVC FVC PMVF PMSVC PMFVC** Set Modbus communication failure timeout time	1.0s (0.1~100s)	RUN
F12.07 (0x0C07)	Communication disconnection processing	**V/F SVC FVC PMVF PMSVC PMFVC** 0: no timeout fault detection 1: fault detected and free stop 2: report warning and continue running 3: forced stop	0 (0~3)	RUN
F12.08 (0x0C08)	Receive data (address 0x3000) zero offset	**V/F SVC FVC PMVF PMSVC PMFVC** Offset correction for address 0x3000 communication data.	0.00 (-100.00-100.00)	RUN
F12.09 (0x0C09)	Receive data (address 0x3000) gain	**V/F SVC FVC PMVF PMSVC PMFVC** Liner correction of the address 0x3000 communication data.	100.0% (0.0~500.0%)	RUN

Table 4-41

◆ **Group F12.1x: MODBUS master parameters**

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F12.10 (0x0C0A)	Master sending cyclic parameter selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-, tens-, hundreds-, and thousands-bit: 0: invalid	0031 (0000~CCCC)	RUN

		1: master running command 2: master given frequency 3: master output frequency 4: master upper limit frequency 5: master given torque 6: master output torque 7: reserved 8: reserved 9: master given PID A: master PID feedback B: reserved C: active current component		
F12.11 (0x0C0B)	Customized address to give frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set the customized address to give frequency.	0000 (0000~FFFF)	RUN
F12.12 (0x0C0C)	Customized address to send command	**V/F SVC FVC PMVF PMSVC PMFVC** Customized address to send command.	0000 (0000~FFFF)	RUN
F12.13 (0x0C0D)	Forward running command value	**V/F SVC FVC PMVF PMSVC PMFVC** Set the command to the forward running value.	0001 (0000~FFFF)	RUN
F12.14 (0x0C0E)	Reverse running command value	**V/F SVC FVC PMVF PMSVC PMFVC** Set the command to the reverse running value.	0002 (0000~FFFF)	RUN
F12.15 (0x0C0F)	Stop command value	**V/F SVC FVC PMVF PMSVC PMFVC** Set the command to the stop value.	0005 (0000~FFFF)	RUN
F12.16 (0x0C10)	Reset command value	**V/F SVC FVC PMVF PMSVC PMFVC** Set the command to the reset value.	0007 (0000~FFFF)	RUN

Table 4-42

◆ **Group F12.6x:M3 bus communication parameters**

F12.61 (0x0C3D)	M3 bus axis No.	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Corresponding CNC axis number 0~F Tens-bit: Reserved	0024 (0000~FFFF)	STOP
F12.62 (0x0C3E)	M3 bus data length	**V/F SVC FVC PMVF PMSVC PMFVC** Corresponding CNC data length 0:16 bytes	2 (0~5)	STOP

		1:32 bytes 2:48 bytes 3:64 bytes		
F12.63 (0x0C3F)	Burning and upper computer connection method	**V/F SVC FVC PMVF PMSVC PMFVC** The communication method during communication with the master computer or burning software. 0: USB 1: UART Select the correct one and then connect them correctly.	1 (0~5)	STOP

Table 4-43

4.13 Group F15: Position Control

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F15.00 (0x0F00)	Position control mode selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0:off; 1:on	0 (0~1)	RUN
F15.01 (0x0F01)	Pulse position giving	**V/F SVC FVC PMVF PMSVC PMFVC** 0: keyboard 1: X7 terminal 2: pulse terminal	2 (0~2)	RUN
F15.02 (0x0F02)	Pulse counting mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0:AB; 1:CW+CCW; 2: pulse + direction; 3: reserved; 4: opposite to AB; 5: opposite to CW+CCW; 6: opposite to pulse + direction; 7: reserved;	4 (0~7)	STOP
F15.03 (0x0F03)	Setting via keyboard numbers	**V/F SVC FVC PMVF PMSVC PMFVC** Set the amount of pulses via keyboard.	0 (0~65535)	RUN
F15.04 (0x0F04)	Electronic gear numerator	**V/F SVC FVC PMVF PMSVC PMFVC** Set electronic gear ratio numerator.	1 (1~32767)	STOP
F15.05 (0x0F05)	Electronic gear denominator	**V/F SVC FVC PMVF PMSVC PMFVC** Set electronic gear ratio denominator.	1 (1~32767)	STOP
F15.06 (0x0F06)	Set first order filtering time for	**V/F SVC FVC PMVF PMSVC PMFVC** Used to filter the input position command to make motor	0.0 (0.0~6000.0ms)	STOP

	positions	rotation smoother		
F15.07 (0x0F07)	Set given smoothing filter time for positions	**V/F SVC FVC PMVF PMSVC PMFVC** Used to filter the input position command to make motor rotation smoother.	0.1 (0.0~512.0ms)	STOP
F15.08 (0x0F08)	Speed feedforward gain	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system dynamic running and following performance.	100.0% (0.0%~300.0%)	RUN
F15.09 (0x0F09)	Speed feedforward filter time	**V/F SVC FVC PMVF PMSVC PMFVC** Filter the command pulse signal to increase interference immunity.	1.0 (0.0~100.0ms)	RUN
F15.10 (0x0F0A)	Position controller output limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the output limit value of the position proportional controller.	100.0% (0.0%~100.0%)	RUN
F15.11 (0x0F0B)	Position loop proportional gain 1	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	50.0 (0.0~600.0Hz)	RUN
F15.12 (0x0F0C)	Position loop proportional gain 2	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	30.0 (0.0~600.0Hz)	RUN
F15.13 (0x0F0D)	Gain switching mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0: no switching; 1: terminal switching 2: position error; 3: speed error	0 (0~3)	STOP
F15.14 (0x0F0E)	Switching filter time	**V/F SVC FVC PMVF PMSVC PMFVC** For adjusting the smooth switching position loop gain.	0.030 (0.000~6.000s)	STOP
F15.15 (0x0F0F)	Switching position error	**V/F SVC FVC PMVF PMSVC PMFVC** Set the position error value of switching gain.	10 (1~32767)	RUN
F15.16 (0x0F10)	Switching speed command	**V/F SVC FVC PMVF PMSVC PMFVC** Set the speed value of switching gain.	0.00Hz (0.00~ Max. frequency via keyboard)	RUN
F15.17 (0x0F11)	Positioning completion condition	**V/F SVC FVC PMVF PMSVC PMFVC** 0: the absolute value of position deviation is smaller than the positioning completion range. 1: the absolute value of position deviation is smaller than the positioning completion range and the position command	0 (0~1)	RUN

		is zero.		
F15.18 (0x0F12)	Positioning completion width	**V/F SVC FVC PMVF PMSVC PMFVC** Set the positioning completion threshold.	10 (1~32767)	RUN
F15.19 (0x0F13)	Position proximity width	**V/F SVC FVC PMVF PMSVC PMFVC** When the absolute value of position deviation is smaller than the position proximity width, the output terminal "position proximity" outputs a valid signal	100 (1~32767)	RUN
F15.20 (0x0F14)	Zero servo movement error	**V/F SVC FVC PMVF PMSVC PMFVC** Set zero servo movement deviation threshold.	0 (0~1000)	RUN
F15.21 (0x0F15)	Position overrun selection	**V/F SVC FVC PMVF PMSVC PMFVC** 0: position overrun remains undetected; 1: position overrun detection is valid, and send the warning signal. 2: position overrun detection is valid, send the fault signal.	0 (0~2)	RUN
F15.22 (0x0F16)	Position overrun detection frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set frequency threshold for position overrun detection.	110.0% (0.0%~200.0%)	RUN
F15.23 (0x0F17)	Position overrun detection time	**V/F SVC FVC PMVF PMSVC PMFVC** Set position overrun detection time.	10ms (0~6000ms)	STOP
F15.24 (0x0F18)	Servo stop method	**V/F SVC FVC PMVF PMSVC PMFVC** 0: enter the shutdown state after positioning is completed. 1: control mode switching to speed control mode to stop at zero speed	0 (0~1)	STOP
F15.25 (0x0F19)	Position control ASR proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	30.00 (0.01~100.00)	RUN
F15.26 (0x0F1A)	Position control ASR integral time	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	0.050s (0.000~6.000s)	RUN
F15.28 (0x0F1C)	Pulse numerator of transmission ratio	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder pulses as the numerator in the transmission ratio.	1000 (0~65535)	RUN
F15.29 (0x0F1D)	Pulse denominator of transmission ratio	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder pulses as the denominator in the transmission ratio.	1000 (0~65535)	RUN
F15.30	Subdivision feedback	**V/F SVC FVC PMVF PMSVC PMFVC**	0	STOP

(0x0F1E)		0: no subdivision required 1: speed subdivided while position not (sine + cosine + square wave) 2: speed and position subdivided (sine cosine, sine cosine + sine cosine)	(0~2)	
F15.31 (0x0F1F)	Z-pulse width extension	**V/F SVC FVC PMVF PMSVC PMFVC** Hundreds-bit: Spindle encoder Thousands-bit: Motor encoder 0: no movement； 1: Z-pulse extension	1100 (0000~1111)	STOP
F15.32 (0x0F20)	ADRC observer gain β1	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	10000 (0~20000)	RUN
F15.33 (0x0F21)	ADRC observer gain β2	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	100 (0~200)	RUN
F15.34 (0x0F22)	ADRC input factor b	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	32 (1~200)	RUN
F15.35 (0x0F23)	ADRC toggle switch	**V/F SVC FVC PMVF PMSVC PMFVC** Toggle switch between ADRC and PI.	1 (0~1)	STOP
F15.36 (0x0F24)	Torque feedforward gain	**V/F SVC FVC PMVF PMSVC PMFVC** Torque feedforward gain during position control.	0.00 (0.00~100.00)	RUN
F15.41 (0x0F29)	Mechanical brake current limit threshold	**V/F SVC FVC PMVF PMSVC PMFVC** When it is turned on, the current is limited within the error range of the corresponding position.	0 (0~10000)	RUN
F15.46 (0x0F2E)	Low speed measurement method	**V/F SVC FVC PMVF PMSVC PMFVC** Speed measurement method at position control 0: low speed equivalent M method 1: M/T method + T method	0 (0~1)	RUN

Table 4-44

4.14 Group F24: Spindle Control

Parameter code (Address)	Designation	Content	Default (Setting range)	Adjustable properties
F24.00 (0x5800)	Spindle positioning	**V/F SVC FVC PMVF PMSVC PMFVC** 0: disabled; 1: enabled	0 (0~1)	STOP
F24.01 (0x5801)	Orientation positioning zero point	**V/F SVC FVC PMVF PMSVC PMFVC** 0:Z-pulse； 1: proximity switch	0 (0~1)	STOP

F24.02 (0x5802)	Zero update mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0: update only for the first time after power-up 1: update at each zero-edge signal	0 (0~1)	STOP
F24.03 (0x5803)	Orientated mode 2 running mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0:in positioning mode 2, spindle running <1 turn 1: in positioning mode 2, spindle running >1 turn	0 (0~1)	STOP
F24.04 (0x5804)	Orientated running direction	**V/F SVC FVC PMVF PMSVC PMFVC** 0: minimum travel principle 1: forward 2: reverse	0 (0~2)	STOP
F24.05 (0x5805)	Orientation speed	**V/F SVC FVC PMVF PMSVC PMFVC** Set the speed when searching for Z pulses or proximity switches.	5.00 (0.01~100.00Hz)	STOP
F24.06 (0x5806)	Orientated acceleration / deceleration time	**V/F SVC FVC PMVF PMSVC PMFVC** Set acceleration / deceleration time when searching for Z pulse or proximity switch.	3.00s (0.01~100.00s)	STOP
F24.07 (0x5807)	Spindle indexing offset	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing offset value.	0 (0~65535)	STOP
F24.08 (0x5808)	Spindle indexing position 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing position 1.	0 (0~65535)	STOP
F24.09 (0x5809)	Spindle indexing position 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing position 2.	0 (0~65535)	STOP
F24.10 (0x580A)	Spindle indexing position 3	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing position 3.	0 (0~65535)	STOP
F24.11 (0x580B)	Spindle indexing position 4	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing position 4.	0 (0~65535)	STOP
F24.12 (0x580C)	Spindle indexing position 5	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing position 5.	0 (0~65535)	STOP
F24.13 (0x580D)	Spindle indexing position 6	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing position 6.	0 (0~65535)	STOP
F24.14 (0x580E)	Spindle indexing position 7	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing position 7.	0 (0~65535)	STOP
F24.15	Spindle indexing	**V/F SVC FVC PMVF PMSVC PMFVC**	0	STOP

(0x580F)	position 8	Set spindle indexing position 8.	(0~65535)	
F24.16 (0x5810)	Delay time of indexing selection terminal with valid change	**V/F SVC FVC PMVF PMSVC PMFVC** Set delay time of indexing selection terminals when changes are valid.	0.010S (0.000~1.000S)	STOP
F24.20 (0x5814)	Orientated position loop proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set the proportional gain of the orientated position loop.	60.0Hz (0.1~600.0Hz)	RUN
F24.21 (0x5815)	Orientated speed loop proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set orientated speed loop proportional gain.	20.00 (0.01~100.00)	RUN
F24.22 (0x5816)	Orientated speed loop integral time	**V/F SVC FVC PMVF PMSVC PMFVC** Set orientated speed loop integral time.	0.050s (0.000~6.000s)	RUN
F24.23 (0x5817)	Zero-speed orientated position loop proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set zero-speed orientated position loop proportional gain.	40.0Hz (0.1~600.0Hz)	RUN
F24.24 (0x5818)	Zero-speed position loop output limit	**V/F SVC FVC PMVF PMSVC PMFVC** Limit position loop output amplitude at zero speed.	2.5% (0.0~100.0%)	RUN
F024.25 (0x5819)	Proximity switch equivalent number of pulses of one turn	**V/F SVC FVC PMVF PMSVC PMFVC** The number of one-turn pulses of the orientated proximity switch is automatically set during self-learning.	0 (0~65535)	STOP
F024.26 (0x581A)	Effective number of proximity switch rotation after starting	**V/F SVC FVC PMVF PMSVC PMFVC** A value greater than this is considered valid for an orientated position.	2 (0~100)	STOP
F024.27 (0x581B)	Proximity switch orientated positioning effective times after starting	**V/F SVC FVC PMVF PMSVC PMFVC** The first orientated positioning is performed only if it is greater than this value, otherwise it will keep rotating to find the proximity switch point.	3 (0~100)	STOP
F024.28 (0x581C)	Proximity switch captured effective deviation threshold during first power-up	**V/F SVC FVC PMVF PMSVC PMFVC** Judge whether the captured proximity switch latching point is valid according to the first three rotations, if the deviation of the first two comparisons with the corresponding number of pulses per revolution F24.25 is within the setting range of this value, it is considered normal, otherwise the search for the finite proximity switch point will start again.	20 (0~65535)	STOP

F024.29 (0x581D)	2nd gear proximity switches equivalent number of pulses in one turn	**V/F SVC FVC PMVF PMSVC PMFVC** The number of one-turn pulses when the second gear proximity switch is orientated, which is set automatically during self-learning. The second gear works when the Xi terminal is set to 86 and receives a high level, and system will send to the drive that this is the second gear and the drive runs as the second gear parameter F24.29/F24.30, otherwise it runs as the first gear parameter F24.25/F24.07.	0 (0~65535)	STOP
F24.30 (0x581E)	2nd gear spindle indexing offset	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing offset value.	0 (0~65535)	STOP

Table 4-45

4.15 C0x Group: Monitoring Parameters

Group C00: Basic monitoring

Code (address)	Designation	Code (address)	Designation
C00.00 (0x2100)	Given frequency	C00.20 (0x2114)	Analog output AO
C00.01 (0x2101)	Output frequency	C00.21 (0x2115)	Reserved
C00.02(0x2102)	Output current	C00.22 (0x2116)	Counter value
C00.03 (0x2103)	Input voltage	C00.23 (0x2117)	This power-up running time
C00.04 (0x2104)	Output voltage	C00.24 (0x2118)	Cumulative running time
C00.05 (0x2105)	Mechanical speed	C00.25 (0x2119)	Spindle drive power level
C00.06 (0x2106)	Given torque	C00.26 (0x211A)	Spindle drive rated voltage
C00.07 (0x2107)	Output torque	C00.27 (0x211B)	Spindle drive rated current
C00.08 (0x2108)	Given PID	C00.28 (0x211C)	Software version
C00.09 (0x2109)	PID feedback	C00.29 (0x211D)	PG feedback frequency
C00.10 (0x210A)	Output power	C00.30 (0x211E)	Timer
C00.11 (0x210B)	Bus voltage	C00.31 (0x211F)	PID output value
C00.12 (0x210C)	Module temperature 1	C00.32 (0x2120)	Spindle drive software sub-version
C00.13 (0x210D)	Module temperature 2	C00.33(0x2121)	Encoder feedback angle
C00.14 (0x210E)	Input terminal X ON state (Note)	C00.34 (0x2122)	Z pulse cumulative error
C00.15 (0x210F)	Input terminal Y ON state (Note)	C00.35 (0x2123)	Z-pulse counting
C00.16(0x2110)	Analog AI1 input value	C00.36 (0x2124)	Fault warning code
C00.17 (0x2111)	Analog AI2 input value	C00.37 (0x2125)	Cumulative electricity consumption (low)

C00.18 (0x2112)	Keyboard potentiometer input value	C00.38 (0x2126)	Cumulative electricity consumption (high)
C00.19 (0x2113)	Pulse signal PUL input value	C00.39 (0x2127)	Impedance angle

Table 4-46

Note: For example, when terminals X1 and X2 are ON, C00.14 is displayed as  , When the terminal Y and the relay are ON, C00.15 is displayed as  .

Group C01: Fault monitoring

Code (address)	Designation	Code (address)	Designation
C01.00 (0x2200)	Fault type diagnosis information	C01.12 (0x220C)	Previous 1 fault running frequency
C01.01 (0x2201)	Troubleshooting information	C01.13 (0x220D)	Previous 1 fault output voltage
C01.02 (0x2202)	Fault running frequency	C01.14 (0x220E)	Previous 1 fault output current
C01.03 (0x2203)	Fault output voltage	C01.15 (0x220F)	Previous 1 fault bus voltage
C01.04 (0x2204)	Fault output current	C01.16 (0x2210)	Previous 1 fault module temperature
C01.05 (0x2205)	Fault bus voltage	C01.17 (0x2211)	Previous 1 spindle drive fault status
C01.06 (0x2206)	Fault module temperature	C01.18 (0x2212)	Previous 1 fault input terminal status
C01.07 (0x2207)	Spindle drive fault status	C01.19 (0x2213)	Previous 1 fault output terminal status
C01.08 (0x2208)	Fault input terminal status	C01.20 (0x2214)	Previous 2 fault types
C01.09 (0x2209)	Fault output terminal status	C01.21 (0x2215)	Previous 2 troubleshooting information
C01.10 (0x220A)	Previous 1 fault type	C01.22 (0x2216)	Previous 3 fault types
C01.11 (0x220B)	Previous 1 troubleshooting information	C01.23 (0x2217)	Previous 3 troubleshooting information

Table 4-47

Group C02: Application monitoring

Code (address)	Designation	Code (address)	Designation
C02.08 (0x2308)	Forward / reverse command	C02.15 (0x230F)	Inverter overload timing factor
C02.09 (0x2309)	Jogging command	C02.16(0x2310) (0x2310)	Motor overload timing factor
C02.10 (0x230A)	AI1 with curve adjustment	C02.18(0x2312) (0x2310)	Real-time carrier frequency
C02.11 (0x230B)	AI2 with curve adjustment	C02.19 (0x2313)	Wave-by-wave current limiting times

Table 4-48

Group C04: Spindle feedback monitoring

Code (address)	Designation	Code (address)	Designation
C04.00 (0x2500)	Spindle position (pulse)	C04.25 (0x2519)	Spindle encoder pulse counting
C04.01 (0x2501)	Spindle position (angle)	C04.26 (0x251A)	Spindle encoder one-turn position
C04.02 (0x2502)	Spindle zero counting	C04.27 (0x251B)	Spindle encoder Z pulse detection No.
C04.03 (0x2503)	Spindle external zero counting	C04.28 (0x251C)	Spindle encoder Z pulse cumulative error
C04.04 (0x2504)	Spindle external zero position	C04.29 (0x251D)	Spindle encoder frequency (PU)
C04.15	Position error		

Table 4-49

Group C05: Position control monitoring

Code (address)	Designation	Code (address)	Designation
C05.20 (0x2614)	Pulse command counting	C05.25 (0x2619)	Motor encoder pulse counting
C05.21 (0x2615)	Pulse counting increment	C05.26 (0x261A)	Motor encoder one-turn position
C05.22 (0x2616)	Pulse counting frequency	C05.27 (0x261B)	Motor encoder Z-pulse detection times
C05.23 (0x2617)	X7 pulse counting	C05.28 (0x261C)	Motor encoder Z pulse cumulative error
C05.24 (0x2618)	X7 pulse counting frequency	C05.29 (0x261D)	Motor encoder frequency (PU)

Table 4-50

4.16 Terminal input / Output Function Selection

X	Function explanation	X	Function explanation	X	Function explanation
0	No function	29	PID feedback switching 3	58	Run output blocking command
1	Forward running	30	Program running (PLC) pause	59	Reserved
2	Reverse running	31	Program running (PLC) reboot	60	Speed-torque control switching
3	Three-wire running control (Xi)	32	Acceleration/deceleration time setting terminal 1	61	Rigid tapping / pulse position control
4	Forward jogging	33	Acceleration/deceleration time setting terminal 2	62	Reserved
5	Reverse jogging	34	Acceleration/deceleration pause	63	Reserved
6	Free stop	35	Swing frequency input	64	Zero-servo command
7	Emergency stop	36	Swing frequency pause	65	Reserved
8	Fault reset	37	Swing frequency reset	66	Reserved

9	External fault input	38	Keyboard keys and self-test display selection	67	Reserved
10	Frequency up (UP)	39	X4 frequency measurement	68	Reserved
11	Frequency down (DW)	40	Timer triggering terminal	69	Position gain switching
12	Frequency up/down (UP/DW zero clearing)	41	Timer zeroing terminal	70	X7 pulse direction switching
13	Channel A switching to channel B	42	Counter clock input terminal	71	Pulse input disabled
14	Frequency channel combination switching to A	43	Counter zeroing terminal	72	Pulse error zeroing
15	Frequency channel combination switching to B	44	DC brake command	73	Pulse forward running disabled
16	Multi-speed terminal 1	45	Pre-excitation command terminal	74	Pulse reverse running disabled
17	Multi-speed terminal 2	46	Reserved	75	Reserved
18	Multi-speed terminal 3	47	Reserved	76	Reserved
19	Multi-speed terminal 4	48	Command channel switching to keyboard	77	Reserved
20	PID control cancellation	49	Command channel switching to terminal	78	Reserved
21	PID control pause	50	Command channel switching to communication	79	Reserved
22	PID characteristic switching	51	Reserved	80	Spindle orientation enabled
23	PID parameter switching	52	Running disabled	81	Indexing selection 1
24	PID giving switching 1	53	Forward running disabled	82	Indexing selection 2
25	PID giving switching 2	54	Reverse running disabled	83	Indexing selection 3
26	PID giving switching 3	55	Reserved	84	Proximity switch
27	PID feedback switching 1	56	Reserved	85	Swing enabled
28	PID feedback switching 2	57	Reserved		
Y	**Function explanation**	**Y**	**Function explanation**	**Y**	**Function explanation**
0	No output	15	Program running cycle completed	30	Communication address 0x3018 control output
1	Spindle drive running	16	Program running phase completed	31	Spindle drive overheating warning

2	Spindle drive reversing	17	PID feedback over the upper limit	32	Motor overheating warning output
3	Spindle drive forwarding	18	PID feedback below the lower limit	33	Select motor 2
4	Fault trip warning 1 (warning during fault self-recovery)	19	PID feedback sensor disconnected	34	output paused (module blocking)
5	Fault trip warning 2 (no warning during fault self-recovery)	20	Counting meter length reached	35	Torque limiting
6	External fault shutdown	21	Timer time up	36	Running at upper limit speed
7	Spindle drive undervoltage	22	Counters maximum value reached	37	Comparator 1
8	Spindle drive ready for running	23	Counter setpoint reached	38	Comparator 2
9	Output frequency level detection 1 (FDT1)	24	Energy-consumption braking	39	Zero-servo ending
10	Output frequency level detection 2 (FDT2)	25	PG feedback disconnection	40	Positioning completed
11	Given frequency reached	26	Emergency stopping	41	Spindle orientation completed
12	Zero speed running	27	Overload pre-warning output 1	42	Position controlling
13	Upper limit frequency reached	28	Overload pre-warning output 2	43	Position approaching
14	Lower limit frequency reached	29	Spindle drive sending warning		

Table 4-51

4.17 Fault and Warning Code List

Note: The numbers in brackets in the code column are fault codes or warning codes (Dec. means decimal).

Display (Dec.)	Fault name	Type	Display (Dec.)	Fault name	Type
E.SC1 (1)	System fault in acceleration	Fault	E.TExx (52)	Motor parameter self-learning fault	Fault
E.SC2 (2)	System failure in deceleration	Fault	E.IAE1 (71)	Motor angle learning fault 1	Fault
E.SC3 (3)	System failure at constant speed	Fault	E.IAE2 (72)	Motor angle learning fault 2	Fault
E.SC4 (4)	Shutdown system fault	Fault	E.IAE3 (73)	Motor angle learning fault 3	Fault
E.OC1 (5)	Overcurrent in acceleration	Fault	E.PST1(74)	Synchronizer out-of-step fault 1	Fault

E.OC2 (6)	Overcurrent in deceleration	Fault	E.PST2(75)	Synchronizer out-of-step fault 2	Fault
E.OC3 (7)	Overcurrent at constant speed	Fault	E.PST3(76)	Synchronizer out-of-step fault 3	Fault
E.OU1 (9)	Overvoltage in acceleration	Fault	E.DEF (77)	Excessive speed deviation	Fault
E.OU2 (10)	Overpressure in deceleration	Fault	E.SPD (78)	Stall fault	Fault
E.OU3 (11)	Overvoltage at constant speed	Fault	E.LD1 (79)	Load protection 1	Fault
E.LU (13)	Undervoltage in running	Fault	E.LD2 (80)	Load protection 2	Fault
E.OL1 (14)	Motor overload	Fault	E.CPU (81)	CPU timeout fault	Fault
E.OL2 (15)	Spindle drive overload 1	Fault	E.LOC (85)	Chip locking	Fault
E.OL3 (16)	Spindle drive overload 2	Fault	E.EEP (86)	Parameter storage fault	Fault
E.OL4 (17)	Spindle drive overload 3	Fault	E.BUS5 (95)	CPLD communication error 1	Fault
E.ILF (18)	Input phase loss	Fault	E.BUS6 (96)	CPLD communication error 2	Fault
E.OLF (19)	Three-phase output phase loss	Fault	E.CP1 (97)	Monitor comparison output 1 fault	Fault
E.OLF1(20)	U-phase output phase loss	Fault	E.CP2 (98)	Monitor comparison output 2 fault	Fault
E.OLF2(21)	V-phase output phase loss	Fault	E.DAT (99)	Parameter setting error	Fault
E.OLF3(22)	W-phase output phase loss	Fault	E.POE (100)	Position overrun fault	Fault
E.OH1 (30)	Rectifier module overtemperature	Fault	Warning codes		
E.OH2 (31)	IGBT module overtemperature	Fault	A.LU1 (128)	Shutdown undervoltage	Warning
E.EF(33)	External fault	Fault	A.OU (129)	Shutdown overvoltage	Warning
E.CE(34)	Modbus communication fault	Fault	A.ILF (130)	Input phase loss	Warning
E.HAL1(35)	Large U-phase zero drift	Fault	A.PID (131)	PID feedback disconnection	Warning
E.HAL2(36)	Large V-phase zero drift	Fault	A.EEP (132)	Parameter storage warning	Warning
E.HAL (37)	None-zero sum fault of three phase current	Fault	A.DEF (133)	Excessive speed deviation	Warning
E.HAL3(38)	Large W-phase zero drift	Fault	A.SPD (134)	Stall warning	Warning
E.SGxx (40)	Ground short circuit	Fault	A.GPS1 (135)	GPS locking	Warning
E.FSG (41)	Fan short circuit	Fault	A.GPS2 (136)	GPS disconnection	Warning
E.PID (42)	PID feedback disconnection	Fault	A.CE (137)	External warning	Warning
E.COP (43)	Parameter copy fault	Fault	A.LD1 (138)	Load protection 1	Warning
E.PG1 (44)	PG parameter setting error	Fault	A.LD2 (139)	Load protection 2	Warning
E.PG2 (44)	Encoder Z-pulse fault	Fault	A.OH1 (141)	Module over-temperature warning	Warning
E.PG5 (44)	ABZ encoder disconnection	Fault	A.OH3 (142)	Motor over-temperature warning	Warning
E.PG6 (44)	Spindle encoder disconnection	Fault	A.RUN1 (143)	Run command conflicts	Warning

				-	
E.PG7 (44)	Spindle encoder Z-pulse error fault	Fault	A.POE (156)	Position overrun warning	Warning
E.PG8 (44)	Encoder Z-pulse logic fault	Fault	A.RUN2 (158)	Jogging terminal starting protection	Warning
E.PG9 (44)	Spindle encoder Z-pulse logic fault	Fault	A.RUN3 (159)	Terminal starting protection	Warning
E.PG10(44)	Encoder Z-pulse disconnection	Fault	A.CP1 (146)	Monitor comparison output 1 warning	Warning
E.BRU (50)	Brake unit fault	Fault	A.CP2 (147)	Monitor comparison output 2 warning	Warning

Table 4-52

Chapter 5 Spindle Function Application Guidance

5.1 Motor Self-Learning

Motor self-learning is required before commissioning. Please refer to the control circuit wiring diagram for wiring definitions, and parameters are as follows.

Code (Address)	Designation	Content	Factory value (setting range)	Adjustable properties
F01.00 (0x0100)	Motor 1 control method	**V/F SVC FVC PMVF PMSVC PMFVC** Control mode of motor 0:AM-VF; asynchronous motor V/F control 1:AM-SVC; asynchronous motor open-loop vector control 2:AM-FVC; asynchronous motor closed-loop vector control 10:PM-VF; synchronous motor V/F control 11:PM-SVC; synchronous motor open-loop vector control 12:PM-FVC; synchronous motor closed-loop vector control	2 (0 ~12)	STOP
F02.01 (0x0201)	Motor poles No.	**V/F SVC FVC PMVF PMSVC PMFVC** Set the number of motor poles.	4 (2~98)	STOP
F02.02 (0x0202)	Motor rated power	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated power of the motor.	Set by models (0.1~1000.0kW)	STOP
F02.03 (0x0203)	Motor rated frequency	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated frequency of the motor.	Set by models (0.01~ Max. frequency)	STOP
F02.04 (0x0204)	Motor rated speed	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated speed of the motor.	Set by models (0~65000rpm)	STOP
F02.05 (0x0205)	Motor rated voltage	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated voltage of the motor.	Set by models (0~1500V)	STOP
F02.06 (0x0206)	Motor rated current	**V/F SVC FVC PMVF PMSVC PMFVC** Set the rated current of the motor.	Set by models (0.1~3000.0A)	STOP
F02.30 (0x021E)	Speed feedback encoder type	V/F SVC FVC PMVF PMSVC PMFVC 0: normal ABZ encoder 4: sine-cosine encoder	0 (0~2)	STOP
F02.33 (0x0221)	ABZ encoder cable No.	**V/F SVC FVC PMVF PMSVC PMFVC** Sets the number of ABZ encoder cables.	2500 (1~10000)	STOP
F02.40	Encoder installation	**V/F SVC FVC PMVF PMSVC PMFVC**	0	STOP

(0x0228)	position	V/F SVC FVC PMVF PMSVC PMFVC 0: single motor encoder 1: single spindle encoder 2: dual encoder	(0~2)	
F02.43 (0x022B)	Position encoder cable No.	**V/F SVC FVC PMVF PMSVC PMFVC** Sets the number of ABZ encoder cables.	1024 (1~10000)	STOP
F02.07 (0x0207)	Self-tuning of motor parameters	**V/F SVC FVC PMVF PMSVC PMFVC** The value of [F02.07] will be set to "0" automatically upon completion of the adjustment. 0:no movement 1: stationary + rotary self-learning 2: stationary self-learning 3: stator resistance self-learning 6: Rotary self-learning 7: inertia self-learning	0 (0~7)	STOP

Table 5-1

Set the parameters above, change F02.07 to 1 for rotary self-learning, and then r-00 is displayed, continue to press SET for 1 second until r-01 appears and then here goes the self-learning.

Before self-learning, users need to select the relevant parameters according to the encoder installation positions, choose the encoder installation position by F2.40: single motor encoder, single spindle encoder, double encoder.

5.1.1 Single-motor Encoder Mode (F02.40=0)

When the encoder is built into the motor, the default F2.40=0 parameter is used to set the number of encoder cables and then the self-learning can be performed directly.

If there is any difference between the actual speed and the set speed after the self-learning test run, it can be corrected by fine-tuning the parameter F15.28/F15.29.

5.1.2 Single-spindle Encoder Mode (F2.40=1)

When the encoder is not installed in the motor but in the mechanical spindle, set the number of encoder cables and select F2.40=1 for self-learning.

F02.35 (0x0223)	Encoder ratio numerator	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder ratio numerator.	1 (1~32767)	RUN
F02.36 (0x0224)	Encoder ratio denominator	**V/F SVC FVC PMVF PMSVC PMFVC** Set the encoder ratio denominator.	1 (1~32767)	RUN

Table 5-2

After self-learning, the encoder ratio will be automatically set to F02.35 and F02.36. The gain is weakened to prevent severe vibrations

from occurring in this mode.

5.1.3 Dual Encoder Mode (F2.40=2)

When the motor has a built-in encoder and the mechanical spindle also has an encoder, it is considered as the dual encoder mode, and it is necessary to set the number of two encoder cables and select F2.40=1 for self-learning.

F15.28 (0x0F1C)	Pulse numerator of transmission ratio	**V/F SVC FVC PMVF PMSVC PMFVC** Set pulse numerator of transmission ratio.	1000 (0~65535)	RUN
F15.29 (0x0F1D)	Pulse denominator of transmission ratio	**V/F SVC FVC PMVF PMSVC PMFVC** Set pulse denominator of transmission ratio.	1000 (0~65535)	RUN

Table 5-3

In the dual encoder mode, self-learning will automatically learn the numerators and denominators of pulse number in the F15.28, F15.29 transmission ratio. The actual speed can be manually fine-tuned via F15.28, F15.29 if there is deviation in the speed mode.

5.2 Speed Control

Code (Address)	Designation	Content	Factory value (setting range)	Adjustable properties
F01.02 (0x0102)	Frequency giving source channel A	**V/F SVC FVC PMVF PMSVC PMFVC** Set the frequency giving source A for spindle drive. 0: given by keyboard numbers; 1: given by keyboard analog potentiometer give 2: given by voltage analog AI1 3: given by current/voltage analog AI2 4: reserved 5: given by terminal pulse PUL 6: given by RS485 communication 7: given by terminal UP/DW 8: given by PID 9: given by program control (PLC) 10: given by positioning pulse terminal 11: given by multi-speed	10 (0~11)	RUN
F01.10 (0x010A)	Max. frequency	**V/F SVC FVC PMVF PMSVC PMFVC** The max. frequency that can be set for the spindle drive.	150.00Hz (Upper limit frequency ~600.00Hz)	STOP
F01.12 (0x010C)	Upper limit frequency setting via	**V/F SVC FVC PMVF PMSVC PMFVC** The upper limit frequency given channel when F01.11 is set	150.00Hz (0.00~ Max.	RUN

	keyboard numbers	to 0.	frequency set via numbers)	
F01.22 (0x0116)	Acceleration time 1	**V/F SVC FVC PMVF PMSVC PMFVC** The time it takes to accelerate the output frequency from 0.00Hz to the reference frequency. 1~65000s(F01.21 = 0) 0.1~6500.0s(F01.21 = 1) 0.01~650.00s(F01.21 = 2)	Set by models (0.01~650.00s)	RUN
F01.23 (0x0117)	Deceleration time1	**V/F SVC FVC PMVF PMSVC PMFVC** The time it takes to accelerate the output frequency from 0.00Hz to the reference frequency.	Set by models (0.01~650.00s)	RUN
F03.02 (0x0302)	ASR (speed loop) proportional gain1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) proportional gain 1.	20.00 (0.01~100.00)	RUN
F03.03 (0x0303)	ASR (speed loop) integral time 1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) integral time 1.	0.100s (0.000~6.000s)	RUN
F03.04 (0x0304)	ASR filter time1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR filter time 1.	0.0ms (0.0~100.0ms)	RUN
F03.05 (0x0305)	ASR switching frequency1	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR switching frequency 1.	10.00Hz (0.00~ Max. frequency)	RUN
F03.06 (0x0306)	ASR (speed loop) proportional gain2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) proportional gain 2.	20.00 (0.01~100.00)	RUN
F03.07 (0x0307)	ASR (speed loop) integral time 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set the ASR (speed loop) integral time 2.	0.050s (0.000~6.000s)	RUN
F03.08 (0x0308)	ASR filter time 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set ASR filter time 2.	0.0ms (0.0~100.0ms)	RUN
F03.09 (0x0309)	ASR switching frequency 2	**V/F SVC FVC PMVF PMSVC PMFVC** Set ASR switching frequency 2.	5.00Hz (0.00~ Max. frequency)	RUN
F15.33 (0x0F21)	ADRC observer gain β2	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	100 (0~200)	RUN
F15.34 (0x0F22)	ADRC input factor b	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	32 (1~200)	RUN

F15.35 (0x0F23)	ADRC toggle switch	**V/F SVC FVC PMVF PMSVC PMFVC** Toggle switch between ADRC and PI.	1 (0~1)	STOP
F07.05 (0x0705)	Rotary direction selection	**V/F SVC FVC PMVF PMSVC PMFVC** Ones-bit: Reverse running direction 0: direction unchanged 1: direction reversed Tens-bit: Running direction disabled 0: forward and reverse commands allowed 1: only forward command allowed 2: Only reverse command allowed Hundreds-bit: Frequency control command direction 0: frequency control direction invalid 1: frequency control direction valid Thousands-bit: reserved	0100 (0000~1111)	STOP

Table 5-4

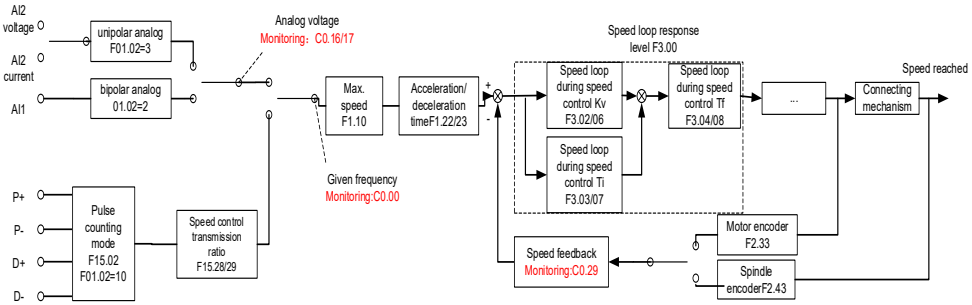


Figure 5-1

5.2.1 Analog Speed Control

The speed command source is given by the analog, and it can be controlled by unipolarity and bipolarity according to the actual needs. The direction cannot be changed by unipolarity, so it needs to switch forward and reverse directions via the X terminal, while the direction can be changed by the polarity of the analog for bipolarity. The maximum value of the analog input (10V/20mA) corresponds to the maximum frequency of the spindle servo drive, and the running direction can be changed by the F07.05.

The wiring pins and parameters involved in the commissioning are as follows.

Analog unipolarity 0~10V/4~20mA wiring: AI2(16), AGND (1/3/18/32).

Analog bipolarity -10V~+10V wiring: AI1(17), AGND (1/3/18/32).

The analog speed control changes F01.02 (frequency giving source channel A) to 3 (AI2) or 2 (AI1) according to unipolar or bipolar wiring, and adjusts F01.10 (maximum frequency) and F01.12 (upper frequency) and F01.22 (acceleration time) and F01.23 (deceleration time)

accordingly.

5.2.2 Pulse Speed Control

The speed command source is given by pulse, and the 5V differential signals given by CNC system are connected to PULS+(20), PULS-(5), SIGN+(19), SIGN-(4) respectively, please note that these four ports only receive 5V differential signals;

The pulse type and direction are changed by F15.02 (pulse counting mode), the related debugging parameters are the same as the speed list above, F01.02 default is 10 (given by pulse).

5.2.3 Speed Control Parameter Adjustment

Parameters related to ASR (speed loop) and PI.

F15.35 toggle switch between ADRC and PI.

F15.35 = 0, speed mode, position mode and orientation all with the PI controller;

F03.02 ASR proportional gain 1 (high speed gain); F03.03 ASR integral time 1 (high speed integration); F03.04 ASR filter time 1; F03.05 ASR switching frequency 1;

F03.06 ASR proportional gain 2 (low speed gain); F03.07 ASR integral time 2 (low speed integration); F03.08 ASR filter time 2; F03.09 ASR switching frequency 2.

The schematic diagram of the speed loop proportional gain and integration time switching is as follows.

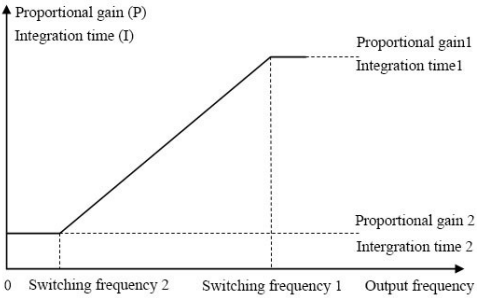


Figure 5-2

Parameters related to ADRC.

F15.35 toggle switch between ADRC and PI control.

When F15.35=1, ADRC is used for speed mode and orientation mode, and PI is used for position mode; when F15.35=2, ADRC is used for speed mode, position mode, and orientation mode all.

After turning on ADRC, it's important to adjust F15.33 ADRC observer gain β2, F15.34 ADRC input factor b but F03.02 and F03.06 are still valid.

F15.33 is equivalent to the integral gain (1/Ti) of PI control. The larger, the more rigid it is, currently the default 100 is considered as high rigidity. When conmection between the encoder and motor is non-rigid, please reduce its gain, otherwise it is easy to vibrate. When F2.40=1, the single spindle mode, it will be automatically set to 30.

F15.34 can be taken as inertia adjustment, and the normal adjustment range is 32~10, the smaller the value, the larger the electronic inertia adjusted at this time. Since the equivalent inertia becomes larger, response without overshoot can be achieved, and anti-interference performance is enhanced. And considering that the equivalent inertia is generated by the electromagnetic torque, so the smaller the F15.34, the greater the inertia, but more vibration is likely to happen.

5.3 Position Control

In the pulse position mode, a high-speed pulse terminal signal can be received, and C-axis functions such as indexing and rigid tapping can be performed when the X4 terminal is valid.

Code (Address)	Designation	Content	Factory value (setting range)	Adjustable properties
F15.00 (0x0F00)	Position control mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0:off; 1: on	0 (0~1)	RUN
F15.01 (0x0F01)	Pulse position giving source	**V/F SVC FVC PMVF PMSVC PMFVC** 0: keyboard; 1: X7 terminal ; 2: pulse terminal	2 (0~2)	RUN
F15.02 (0x0F02)	Pulse counting mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0:AB; 1:CW+CCW; 2: pulse + direction; 3: reserved; 4: reverse AB 5: reverse CW+CCW; 6: reverse pulse + direction; 7: reserved;	4 (0~7)	STOP
F15.03 (0x0F03)	Keyboard number giving	**V/F SVC FVC PMVF PMSVC PMFVC** Set pulses to be given via the keyboard.	0 (0~65535)	RUN
F15.04 (0x0F04)	Electronic gear numerator	**V/F SVC FVC PMVF PMSVC PMFVC** Set electronic gear ratio numerator.	1 (1~32767)	STOP
F15.05 (0x0F05)	Electronic gear denominator	**V/F SVC FVC PMVF PMSVC PMFVC** Set electronic gear ratio denominator.	1 (1~32767)	STOP
F15.06 (0x0F06)	First order filter time for position	**V/F SVC FVC PMVF PMSVC PMFVC** Filter the input position command to make motor rotation smoother.	0.0 (0.0~6000.0ms)	RUN
F15.07	Smooth filter time for	**V/F SVC FVC PMVF PMSVC PMFVC**	0.1	STOP

(0x0F07)	position	Filter the input position command to make motor rotation smoother.	(0.0~512.0ms)	
F15.08 (0x0F08)	Speed feedforward gain	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system dynamic running and following.	0.0% (0.0%~300.0%)	RUN
F15.09 (0x0F09)	Speed feedforward filter time	**V/F SVC FVC PMVF PMSVC PMFVC** Filter the command pulse signal to improve interference immunity.	1.0 (0.0~100.0ms)	RUN
F15.10 (0x0F0A)	Position controller output limit	**V/F SVC FVC PMVF PMSVC PMFVC** Set the output limit value of the position proportional controller.	100.0% (0.0%~100.0%)	RUN
F15.11 (0x0F0B)	Position loop proportional gain 1	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	50.0 (0.0~600.0Hz)	RUN
F15.12 (0x0F0C)	Position loop proportional gain 2	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	30.0 (0.0~600.0Hz)	RUN
F15.25 (0x0F19)	Position controlling ASR proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	30.00 (0.01~100.00)	RUN
F15.26 (0x0F1A)	Position controlling ASR integral time	**V/F SVC FVC PMVF PMSVC PMFVC** For improving system response and rigidity.	0.050s (0.000~6.000s)	RUN
F15.46 (0x0F2E)	Low speed measurement method	**V/F SVC FVC PMVF PMSVC PMFVC** Speed measurement method during position control 0: low speed equivalent M method 1: M/T method + T method estimation	0 (0~1)	RUN

Table 5-5

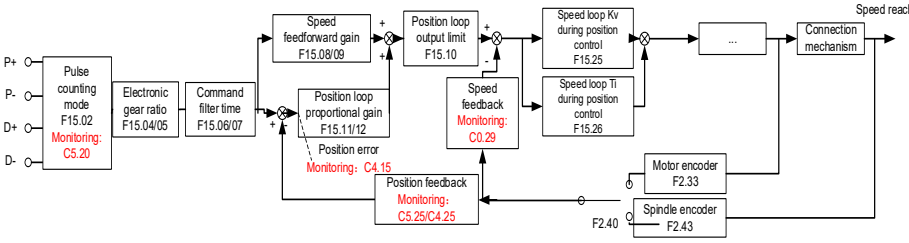


Figure 5-3

To raise rigidity, increase F15.11, F15.25, and decrease F15.26 values, but users need to consider the problems between jitter and sound. If jitter occurs at the arrival position, reduce the gain appropriately. And to further improve the response speed, increase F15.08 speed feedforward

gain.

Common problems during pulse position control

Problem 1: The system is enabled but the motor does not run or does not run properly.

Monitor: C5.20 pulse command counting

Judgement: If there is no change in C5.20, there may be a wiring or soldering error; If there is a change in C05.20: but the value is abnormal and the running is not regular, check whether the pulse counting mode is abnormal.

Problem 2: Exact positions can't be reached.

Monitor: C5.20 pulse command counting, C5.25 motor encoder pulse counting (spindle encoder C4.25), C4.15 position error

Judgement: If C5.20 and C5.25 increments are the same, and C4.15=0, check whether the system ratio and command are set correctly; otherwise, try to increase gain a little.

Problem 3: Analysis of jitter during position control

Monitor: C04.15 position error

High-frequency jitter: loud vibration sound, strong vibration felt by hands if not by naked eyes, generally such vibration is caused by high gain of speed loop.

Conclusion: Reduce the speed loop gain F15.25; and increase F2.37 speed feedback filter (increased to 3~7ms);

Low-frequency jitter: vibration can be observed by the naked eye and frequency is low, which is generally caused by high gain of position loop or the speed measurement method.

Conclusion: Reduce position loop gain F15.11, increase the integral time F15.26 and weaken the response; Adjust F15.46 speed measurement method (0~1 modification)

5.4 Spindle Orientation

Z pulse or proximity switch can be used for the zero point of orientation positioning and orientation is available when X3 terminal is valid.

Set the orientation point: For only one orientation point, check the current value by entering C04.00 and long press the confirmation key for 3 seconds, and exit the current value to confirm the change, and the current value will be stored in F24.07. Check the value of F24.07 after setting is completed.

Code (Address)	Designation	Content	Factory value (setting range)	Adjustable properties
F24.00 (0x5800)	Spindle positioning	**V/F SVC FVC PMVF PMSVC PMFVC** 0: disabled; 1: enabled	0 (0~1)	STOP
F24.01 (0x5801)	Orientation positioning zero point	**V/F SVC FVC PMVF PMSVC PMFVC** 0:Z-pulse; 1: proximity switch	0 (0~1)	STOP
F24.02 (0x5802)	Zero update mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0: update only at the first time after power-up 1: update at each zero-edge delay signal	0 (0~1)	STOP

F24.03 (0x5803)	Orientation mode 2 running mode	**V/F SVC FVC PMVF PMSVC PMFVC** 0: positioning mode 2 running less than 1 turn 1: positioning mode 2 running spindle running more than 1 turn	0 (0~1)	STOP
F24.04 (0x5804)	Orientation running direction	**V/F SVC FVC PMVF PMSVC PMFVC** 0: principle of shortest stroke 1: forward 2: reverse	0 (0~2)	STOP
F24.05 (0x5805)	Orientation speed	**V/F SVC FVC PMVF PMSVC PMFVC** Set the speed when searching for Z pulses or proximity switches.	5.00 (0.01~100.00Hz)	STOP
F24.06 (0x5806)	Orientation acceleration/deceleration time	**V/F SVC FVC PMVF PMSVC PMFVC** Set acceleration / deceleration time when searching for Z pulse or proximity switch.	3.00s (0.01~100.00s)	STOP
F24.07 (0x5807)	Spindle indexing offset	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing offset value	0 (0~65535)	STOP
F24.16 (0x5810)	Delay time of indexing selection terminal with valid change	**V/F SVC FVC PMVF PMSVC PMFVC** Set delay time of indexing selection terminals when changes are valid.	0.010S (0.000~1.000S)	STOP
F24.20 (0x5814)	Orientation position loop proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set orientation position loop proportional gain.	60.0Hz (0.1~600.0Hz)	RUN
F24.21 (0x5815)	Orientation speed loop proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set orientation speed loop proportional gain.	20.00 (0.01~100.00)	RUN
F24.22 (0x5816)	Orientation speed loop integral time	**V/F SVC FVC PMVF PMSVC PMFVC** Set orientation speed loop integral time.	0.050s (0.000~6.000s)	RUN
F24.23 (0x5817)	Zero-speed orientation position loop proportional gain	**V/F SVC FVC PMVF PMSVC PMFVC** Set zero-speed orientation position loop proportional gain.	40.0Hz (0.1~600.0Hz)	RUN
F24.24 (0x5818)	Zero-speed position loop output limit	**V/F SVC FVC PMVF PMSVC PMFVC** Limit position loop output amplitude at zero speed.	2.5% (0.0~100.0%)	RUN
F024.25 (0x5819)	Proximity switch equivalent number of pulses in one	**V/F SVC FVC PMVF PMSVC PMFVC** The number of one-turn pulses of the orientated	0 (0~65535)	STOP

	revolution	proximity switch is automatically set during self-learning.		
F024.26 (0x581A)	Effective number of proximity switch rotation after starting	**V/F SVC FVC PMVF PMSVC PMFVC** A value greater than this is considered valid for an orientated position.	2 (0~100)	STOP
F024.27 (0x581B)	Proximity switch orientated positioning effective times after starting	**V/F SVC FVC PMVF PMSVC PMFVC** The first orientated positioning is performed only if it is greater than this value, otherwise it will keep rotating to find the proximity switch point.	3 (0~100)	STOP
F024.28 (0x581C)	Proximity switch captured effective deviation threshold during first power-up	**V/F SVC FVC PMVF PMSVC PMFVC** Judge whether the captured proximity switch latching point is valid according to the first three rotations, if the deviation of the first two comparisons with the corresponding number of pulses per revolution F24.25 is within the setting range of this value, it is considered normal, otherwise the search for the finite proximity switch point will start again.	20 (0~65535)	STOP
F024.29 (0x581D)	2nd gear proximity switches equivalent number of pulses in one turn	**V/F SVC FVC PMVF PMSVC PMFVC** The number of one-turn pulses when the second gear proximity switch is orientated, which is set automatically during self-learning. The second gear works when the Xi terminal is set to 86 and receives a high level, and system will send to the drive that this is the second gear and the drive runs as the second gear parameter F24.29/F24.30, otherwise it runs as the first gear parameter F24.25/F24.07.	0 (0~65535)	STOP
F24.30 (0x581E)	2nd gear spindle indexing offset	**V/F SVC FVC PMVF PMSVC PMFVC** Set spindle indexing offset value.	0 (0~65535)	STOP

Table 5-6

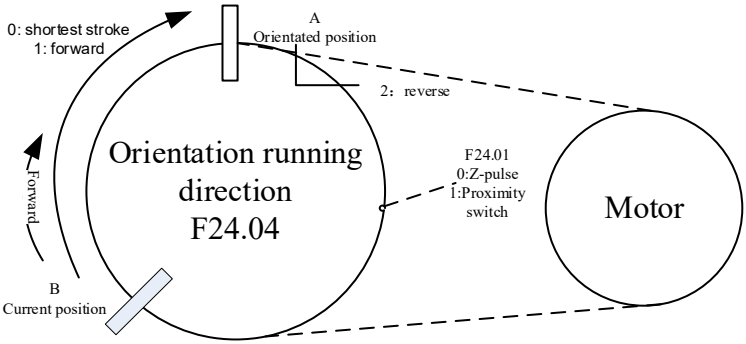


Figure 5-4

Orientation FAQ

Problem 1: The motor is moving too slowly when it is stationary to enable orientation.

Treatment: Reduce F24.06 acceleration/deceleration time and increase F24.23/24 value.

Problem 2: The quasi-stop is not stopped accurately

Monitoring: C4.15 position error

Judgment: C4.15=0, then determine whether the system mode is set correctly; rotate the axis and observe C4.00 to determine whether the quasi-stop point is the desired point.

5.5 Common Faults and Problems Explanation

5.5.1 Encoder-related Faults

Self-learning-related fault E. PGxx's detailed diagnosis information is shown in the table below, "xx" is the self-learning fault sub-code, or C01.01=44xx.

Sub-code	Troubleshooting information	Solutions
1	Encoder parameter error	Motor rotation frequency is not consistent with the encoder feedback frequency. The difference between the numerator/denominator of the encoder ratio (F02.35/F02.36) is too large
2	Motor encoder Z-pulse fault	1.Wrong setting of encoder wire number. 2.The encoder has lost pulse or the external encoder pulley is skidding.
5	Motor encoder disconnection fault	Hardware does not detect a clear level signal 1. Encoder fault. 2. Cables are not plugged (F2.38=0 for shielding, not recommended to shield for common use)

6	Spindle encoder disconnection fault	Hardware does not detect a clear level signal 1. Encoder fault. 2. Cables are not plugged (F2.38=0 for shielding, not recommended to shield for common use)
7	Spindle encoder Z-pulse fault	1.Wrong setting of encoder cable number. 2.The encoder has lost pulse or the external encoder pulley is skidding.
8	Motor encoder Z-logic fault	1. Encoder Z signal rewired without self-learning (F02.07=6). 2.Strong electrical interference is serious without grounding and shielded wires. 3.Magnetic ring encoder sensor installation distance is far.
9	Spindle encoder Z-logic fault	1. Encoder Z signal rewired without self-learning (F02.07=6). 2.Strong electrical interference without grounding and shielded wires. 3.Magnetic ring encoder sensor installation distance is too far.
10	Motor encoder Z-pulse loss fault	Z pulse width is too narrow and the rotation speed is too fast, set F2.46 to 0 for shielding.
11	Spindle encoder Z-pulse loss fault	Z pulse width is too narrow and the rotation speed is too fast, set F2.46 to 0 for shielding.
15	Enable before self-learning cause warning	Disable first for self-learning.
16	Excessive load-motor deviation warning	Check whether the spindle encoder signal is abnormal.

Table 5-7

5.5.2 Self-learning Related Faults

Self-learning fault E. TExx's detailed diagnosis information is shown in the table below, "xx" is the self-learning fault sub-code, or C01.01=52xx.

Subcode	Troubleshooting information	Solutions
1	Current saturation, Hall detection problem or excessive output current	1. Check whether there is a phase short circuit among the motor cable, and please connect the motor cables correctly. 2. Rotation by a certain angle may result in too much current during synchronous motor DC learning. Try to learn a few times again. 3.The internal wiring of the inverter is abnormal or damaged, please contact the manufacturer.
2	Excessive current zero bias	1. Check whether there is a problem with the Hall sensor. 2. If the fault is not eliminated after several times of self-learning, please contact

		the manufacturer.
3	Unbalance current	1. Check whether there is output phase loss of motor cables, and please connect the motor cables correctly if any mistakes. 2. Measure the resistance value among the motor cables, please replace the cable if any deviation.
4	Current oscillation	1. Check whether there is a phase short circuit among the motor wires, please connect the motor wires correctly if there any mistake. 2. Check whether the input motor nameplate parameters are correct, please correct them if any errors. 3. Set the acceleration/deceleration time too large to casue current oscillation, appropriately reduce F01.22 [acceleration time 1] and F01.23 [deceleration time 1]. 4. Adjust F04.06 [oscillation suppression gain] according to the parameter description.
5	Static learning current amplitude exceeds the limit	1. Check whether there is a phase short circuit in the motor line, if there is an error, please connect the motor line correctly 2. Check whether the input motor nameplate parameters and the number of encoder cables are correct, please correct the errors. 3. Make sure the rated current of the motor is smaller than the output current limit of the inverter.
6	U phase current overrun during static learning	Check the U-phase motor connection, whether there is a phase-to-phase or ground short circuit, please connect correctly if there is a mistake.
7	V phase current overrun during static learning	Check the V-phase motor connection, whether there is a phase-to-phase or ground short circuit, please connect correctly if there is a mistake.
8	W phase current overrun during static learning	Check the W-phase motor connection, whether there is a phase-to-phase or ground short circuit, please connect correctly if there is a mistake.
9	Continuous current overrun during dynamic learning	1. Check whether there is a phase short circuit among the motor wires, please connect the motor wires correctly if there is a mistake. 2. Check whether the input motor nameplate parameters are correct, please correct if there is a mistake. 3. Make sure that the load carried by the motor does not exceed 50% of the rated load. 4. Increase F01.22 [acceleration time 1] and F01.23 [deceleration time 1]

		appropriately.
10	Voltage saturation	1. Check whether there is an open circuit among the motor connection cables, please connect the motor cables correctly if there is an error. 2. Check whether the input motor nameplate parameters are correct, please correct if there is a mistake. 3. Shorten the motor power cable length (<1000m) or increase the motor power cable diameter.
15	Too high rotor resistance value	1. Check whether the input motor nameplate parameters are correct, please correct the mistakes. 2. Shorten the motor power cable length (<1000m) or increase the motor power cable diameter.
16	Excessive inductance	1. Check whether the input motor nameplate parameters are correct, please correct the mistakes. 2. Shorten the motor power cable length (<1000m) or increase the motor power cable diameter.
40	Self-learning timeout	1. Check whether the input motor nameplate parameters are correct, please correct if there is a mistake. 2. Check whether the difference between inverter power level and motor power level is too large (>3 levels). 3. If the fault is not eliminated after several times of self-learning, please contact the manufacturer.
41	Parameter error	Re-enter the motor nameplate parameters correctly and make sure the rated frequency of the motor is in the range of 10~500Hz.
44	Negative rotor resistance	1. Check whether the input motor nameplate parameters are correct. 2. If the fault is not eliminated after several times of self-learning, please contact the manufacturer.
45	Synchronous motor output voltage exceeds limit	Check whether the input motor nameplate parameters are correct (especially whether the keyboard input rated frequency is larger than the motor nameplate rating).
46	High learning counter potential voltage	Check whether the input motor nameplate parameters are correct (especially whether the keyboard input rated frequency is larger than the motor nameplate rating).
47	Low learning counter potential voltage	1. Check whether the input motor nameplate parameters are correct (especially

		the keyboard input rated frequency is much smaller than the motor nameplate rating). 2. Check whether the motor is demagnetized.
49	Motor parameter error	1. Check whether the input motor nameplate parameters are correct, wrong rated frequency setting will lead to this fault.
50	Wrong direction of motor rotation	1. Check whether the number of encoder cables is set correctly. 2. Check whether the motor load is too large (>30%). 3.Separate the motor from the machine and start the learning again.
52	Z-pulse not detected by synchronous motor	1.Check whether the encoder Z pulse wiring is normal. 2. Check whether the encoder connection cable is poorly wired causing excessive interference. 3.Make sure the encoder output Z pulse normally. 4.Motor pole number setting error.
53	Z pulse deviation of the synchronous motor is too large	1.Check whether the number of encoder cables is set correctly. 2.Check whether the encoder connection cable is poorly wired to cause excessive interference.
61	Limited maximum frequency	The maximum frequency of the inverter set is smaller than the rated frequency of the motor, reset the maximum frequency of the inverter and the upper limit frequency and then learn again.
62	Excessive current deviation between inverter and motor	Check whether the difference between the power level of the inverter and the power level of the motor is too large, please ensure the difference does not exceed 2 power level.
90	Stop command given during self-learning	Fail to complete parameter learning, so please start learning again. Enable signal is given during self-learning.
Others	Multiple faults occur simultaneously during learning	1. Check whether the motor connection is correct. 2. The sub-code fault is still reported after rewiring, please seek technical support from the manufacturer.

Table 5-8

Chapter 6 Inspection, Maintenance and Warranty

6.1 Inspection

Spindle drives consist of semiconductor devices, passive electronics, and motion devices, and all these devices have a service life. Even under normal operating conditions, some of the devices may change their characteristics or fail if their service life is exceeded. To prevent this kind of failure, preventive inspection and maintenance such as daily inspection, periodic inspection, and device replacement must be performed. It is recommended that inspection be performed every 3~4 months after the machine is installed.

● Daily inspection: to avoid damage to the spindle drive and shortened service life, please check the following items daily.

Item	Inspection content	Solution
Power supply	Check whether the supply voltage meets the requirements and whether there is a lack of phase supply.	Solve by nameplate.
Surroundings	Check whether the installation environment meets the requirements.	Identify the source and address it properly.
Cooling system	Check whether there is abnormal heat and discoloration on the spindle drive and motor, and the working condition of cooling fan.	Confirm if there is overload, whether the heat sink of the spindle drive is dirty, or the fan is blocked. Tighten the screws.
Motor	Check whether there is abnormal vibration and abnormal sound of the motor.	Fasten mechanical and electrical connections and lubricate mechanical parts.
Load condition	Check whether the spindle drive output current is higher than the motor or spindle drive rating for a certain period.	Verify that no overload has occurred and that the spindle drive is correctly selected.

Table 6-1

● Periodic inspection: generally, it is appropriate to conduct periodic inspection every 3 to 4 months, but in actual cases, please inspect based on the actual usage and working environment of each machine.

Item	Inspection content	Solution
Overall	Insulation resistance check; environmental check.	Fasten and replace defective parts; clean and improve the working environment.
Electrical connection	● Whether the cables and connections are discolored, or whether the insulation is broken, cracked, discolored, or aged; ● Whether the connection terminal is worn, damaged or loose; ● Grounding check.	● Replace damaged wires; ● Tighten loose terminals and replace damaged terminals; ● Measure the grounding resistance and tighten the corresponding grounding terminals.
Mechanical connection	● Whether there is abnormal vibration and rattling sound, and whether the fixing is loose.	● Fasten, lubricate, and replace defective parts.
Semiconduct	● Whether it is covered with garbage and dust;	● Clean the working environment;

or devices	● Whether there is any obvious change on the appearance.	● Replace damaged parts.
Electrolytic capacitor	● Whether liquid leakage, discoloration, cracking, safety valve exposure, expansion, rupture or leakage.	● Replace damaged parts.
Surroundings	● External equipment appearance and insulation inspection.	● Clean the environment and replace damaged parts.
Printed circuit board	● Whether there is odor, discoloration, serious rust, and whether the connectors are correct and reliable.	● Fasten connections; ● Clean the printed circuit board; ● Replace damaged printed circuit boards;
Cooling system	● Whether the cooling fan is broken or blocked; ● Whether the heat sink is contaminated with garbage and dusty or dirty; ● Whether the air inlet and exhaust port are blocked or contaminated with foreign matter.	● Clean the working environment; ● Replace damaged parts.
Keyboard	● Whether the keyboard is broken and the display is defective.	● Replace damaged parts.
Motor	● Whether the motor has abnormal vibration and abnormal rattling sound.	● Fasten mechanical and electrical connections and lubricate the motor shaft.

Table 6-2

Note: Do not carry out the relevant work while the power is on, otherwise there is a risk of death by electric shock. So, when carrying out the relevant work, please cut off the power and make sure that the DC voltage of the main circuit has dropped to a safe level, and wait for 5 minutes before any movements.

6.2 Maintenance

All equipment and components have a service life. Proper maintenance may extend the life, but not solve the damaged equipment and devices, please replace the devices according to the requirements.

Part name	Life cycle	Part name	Life cycle	Part name	Life cycle
Fan	2~3 years	Electrolytic capacitor	4~5 years	Printed circuit board	8~10 years

Table 6-3

6.3 Product Warranty

1. If the product fails during the warranty period, please refer to the warranty terms on the warranty card for details about the scope.

2. In general, the primary fault diagnosis will be carried out by customers, but the service can be provided by Veichi or Veichi's service network for a fee at your request. If the cause of the failure is on the product itself, the service will be free of charge based on mutual discussion.

3. Exemption from liability. Any inconvenience caused to customers or or secondary customers by the failure of our products and any damage caused to non-our products, whether within the warranty period, shall not fall within the scope of our responsibility.

Appendix

Appendix I: Modbus Communication Protocol

● Communication frame structure

The communication data format is as follows.

One byte includes a start bit, 8 data bits, a parity bit and a stop bit.

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

Table appendix-1

The information of a frame must be transmitted in a continuous data stream. If the interval time before the end of the whole frame transmission is more than 1.5 bytes, the receiving device will clear this incomplete information and incorrectly assume that the subsequent byte is the address field part of the new frame. Similarly, if the interval between the start of a new frame and the previous frame is fewer than 3.5 bytes, the receiving device will consider it as a continuation of the previous frame and, due to the misalignment of the frame, the final CRC checksum value will be incorrect, resulting in a communication error.

● Communication control parameter group address description

Function description	Address definition	Data description			R/W
Communication giving frequency	0x3000 or 0x2000	0~32000 corresponds to 0.00Hz~320.00Hz			W/R
Communication command setting	0x3001 o r0x2001	0x0000: No command 0x0001: Forward running 0x0002: Reverse running 0x0003: Forward jogging 0x0004: Reverse jogging		0x0005: Deceleration stop 0x0006: Free stop 0x0007: Fault reset 0x0008: Running not allowed 0x0009: Running allowed	W/R
Spindle drive status	0x3002 or 0x2002	Bit0	0: Stop	1: Running	R
		Bit1	0: Non-accelerated	1: Accelerating	
		Bit2	0: Non-deceleration	1: Decelerating	
		Bit3	0: Forward	1: Reverse	
		Bit4	0: No fault	1: Spindle drive failure	
		Bit5	0: GPRS unlocked	1: GPRS locked	
		Bit6	0: Pre-warning	1: Spindle drive pre-warning	
Spindle drive fault code	0x3003 or 0x2003	Current fault code of the spindle drive (see fault code table)			R
Communication giving the upper frequency	0x3004 or 0x2004	0~32000 corresponds to 0.00Hz~320.00Hz			W/R
Communication torque setting	0x3005 or 0x2005	0~1000 corresponds to 0.0~100.0%			W/R
Torque controlling forward max frequency	0x3006 or 0x2006	0~1000 corresponds to 0.0~100.0%			W/R
Torque controlling reverse max frequency	0x3007 or 0x2007	0~1000 corresponds to 0.0~100.0%			W/R
Communication giving PID	0x3008 or 0x2008	0~1000 corresponds to 0.0~100.0%			W/R
Communication giving the PID	0x3009 or 0x2009	0~1000 corresponds to 0.0~100.0%			W/R

feedback value			
Fault and warning code reading	0x3010 or 0x2010	0~127 are fault codes and 128 and above are warning codes	R
Output terminal status	0x3018 or 0x2018	External devices are using the spindle drive output terminals. Bit0 – Y1 Bit1 –TA1-TB1-TC1; Bit2 – Y2 BIT3 – TA2-TB2-TC2	R
AO1 output	0x3019 or 0x2019	0-10000 corresponds to output 0-10V，0-20mA	R

Table appendix-2

Note: Additional function code addresses can be found in the "Address" column of the function code summary table.

When using the write command (06H) to write the parameters of F00~F15 group, if the highest bit of the function code's parameter address field is 0, it will only be written to the RAM of the spindle drive and not stored during power down; if the high half-byte of the function code's parameter address field is 1, it will be written to the EEPROM, that is, be stored during power down. For example F00 group:0x00XX(write RAM) 0x10XX(stored in EEPROM).

When using the write command (06H) to write F16~F29 parameter group, if the highest bit of the function code's parameter address field is 5, it is only written to the spindle drive RAM, and is not stored during power down; if the high half-byte of the function code parameter address field is D, it is written to EEPROM, that is, be stored in during power down. For example, F16 group: 0x50XX (write RAM) 0xD0XX (stored in EEPROM).

● Meaning of the error code of the slave response to an abnormal message

Error code	Description	Error code	Description	Error code	Description
1	Wrong command code	3	CRC checksum error	4	Illegal address
5	Illegal data	6	Parameters cannot be changed during running	8	Spindle drive is busy (EEPROM is being stored)
9	Parameter value over limit	10	Reserved parameters cannot be changed	11	Wrong number of bytes for reading parameters

Table appendix-3

Appendix II: Matching Cable Description

1.CN1 multifunctional port cables

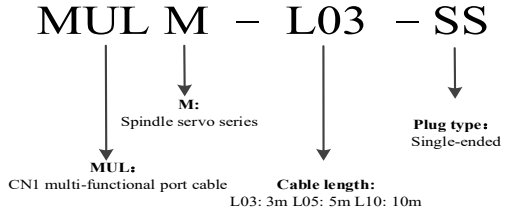


Figure appendix-1

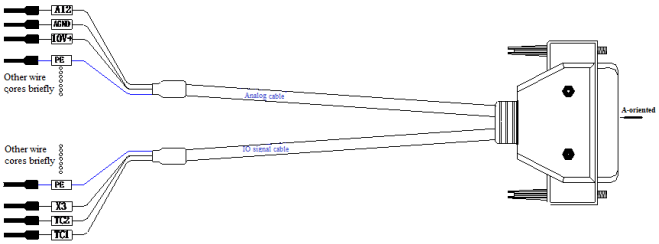


Figure appendix-2

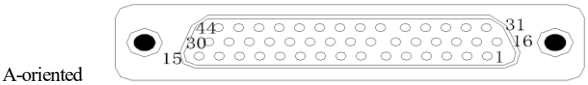


Figure appendix-3

Analog cable				IO signal cable			
Pin	Definition	Function	Remark	Pin	Definition	Function	Remark
16	AI2	0~10V or 0~20mA	2-wire twisted pair	10	X4	Multi-contact input 4	2-wire twisted pair
18	AGND	Analog GND		25	X5	Multi-contact input 5	
4	SIGN-	Command direction-	2-wire twisted pair	11	X1	Multi-contact input 1	2-wire twisted pair
19	SIGN+	Command direction +		26	X2	Multi-contact input 2	
5	PULS-	Pulse command -	2-wire twisted pair	12	24V+	Internal 24V,100mA	2-wire twisted pair
20	PULS+	Pulse command +		42	COM	Internal +24V power grounded	
6	OB-	Crossover output OB-	2-wire twisted pair	14	TA2	Relay A2	2-wire twisted pair
21	OB+	Crossover output OB+		43	TC2	Relay C2	
7	OA-	Crossover output OA-	2-wire twisted pair	15	TA1	Relay A1	2-wire twisted pair
22	OA+	Crossover output OA+		44	TC1	Relay C1	
35	OZ-	Crossover output OZ-	2-wire twisted pair	27	SC	I/O Public port+	2-wire twisted pair
36	OZ+	Crossover output OZ+		39	X7	Multi-contact input 7	

Inner iron case	PE	Shielding layer		28	Y2+	Open collector output 2+	2-wire twisted pair
				13	Y1+	Open collector output 1+	
				40	X6	Multi-contact input 6	2-wire twisted pair
				41	X3	Multi-contact input 3	
				29	TB2	Relay B2	2-wire twisted pair
				30	TB1	Relay B1	
				Inner iron case	PE	Shielding layer	

Table appendix-4

2. Encoder cables

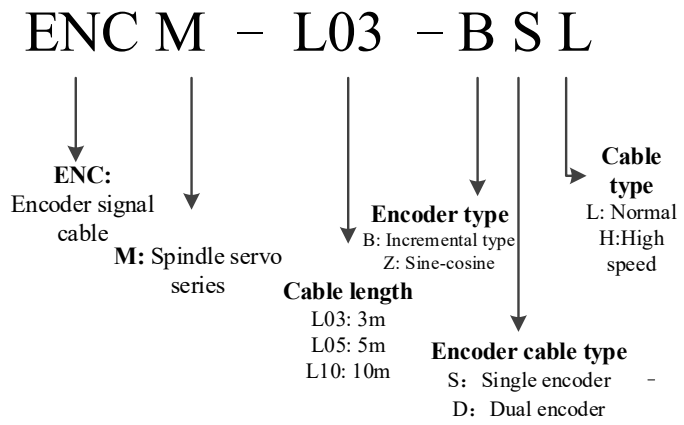


Figure appendix-4

1) Single encoder cable

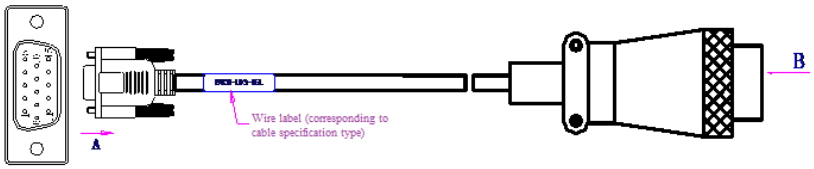


Figure appendix-5

2) Dual encoder cable

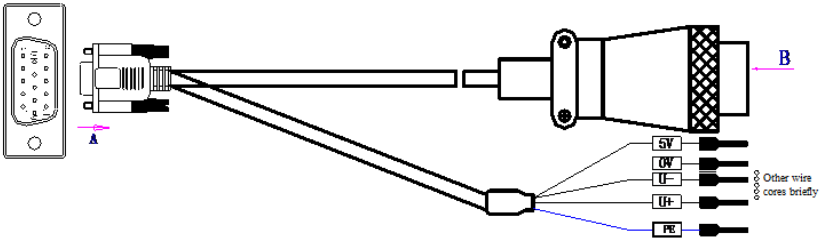
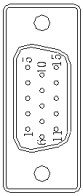


Figure appendix-6



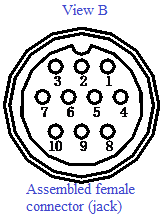


Figure appendix-7 Figure appendix-8

Signal definition	Terminal A Pin No. (DB15)	to	Terminal B Pin No. (Air plug)	Remark
A-	3		4	twisted pair
A+	8		3	
B-	4		6	twisted pair
B+	9		5	
5V	12	⟷	1	twisted pair
0V	13		2	
Z-	14		8	twisted pair
Z+	15		7	
PE（Shielding layer）	Internal metal case		10	
5V	12		tubular pre-insulated terminals	twisted pair
0V	13			
U-	1			twisted pair
U+	6	⟷		
W-	2			twisted pair
W+	7			
V-	5			twisted pair
V+	10			
T1	11			
PE（Shielding layer）	Internal metal case			

Table appendix-5

Note: Single encoder cables are enough for normal cases but please choose the double encoder cables if there is any need.

The view A and B of single and double encoder are the same, the wiring definition of the double encoder has the signal under the PE shielding layer in the above table when compared to the single encoder.