MV810J Electro-hydraulic Servo Drive
User Manual

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BOM Code

Shenzhen Megmeet Electrical Co. Ltd. provides professional technical support for our customers. You can contact the local branch office or customer service center, or directly contact the company headquarters.

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Foreword

Thank you for purchasing the MV810J electro-hydraulic servo drive manufactured by Shenzhen Megmeet Electrical Co. Ltd.

MV810J series is designed for hydraulic equipment such as injection molding machines, die-casting machines, hydraulic presses, and hydraulic stations. This product adopts high-performance vector control, featuring energy-saving, precision, efficiency, and durability. Relying upon advanced vector control, MV810J optimizes the motion characteristics during the hydraulic drive process, such as enhancing pressure response, improving the precision of pressure control and system stability, and expanding various process requirements. Additionally, it integrates functions such as software background monitoring, communication buses, and multi-pump combination control.

This manual provides users with information on installation, wiring, parameter setting, fault diagnosis and solutions, daily maintenance, and related precautions. To ensure the correct installation and use of the MV810J servo drive and to enable it to perform optimally, please read this user manual in detail before installation and keep it properly for the machine's user.

We are engaged in the continuous improvement of drives. The relevant manuals provided by us are subject to change without notice. If there are revisions, please consult the agent or download the latest version from the official Megmeet website (https://www.megmeet.com).

Unboxing inspection

When you unbox the product, remember to check the following:

- whether there is any damage on the servo drive;
- whether the product certificate and the user manual (if any) are included in the package, and whether the rated values on the nameplates of the servo drive are the same as what you ordered,;

Our company has implemented strict inspection on the product's manufacturing and packaging. If there is still any error, please contact us or the local distributor.

Safety precautions

Indicates that failure to comply with the notice can result in death or severe personal injuries.

Indicates that failure to comply with the notice may result in moderate or minor personal injuries or equipment damage.

DANGER

- Install the product on incombustible materials such as metal. Failure to comply will result in a fire.
- Do not install the product near combustible objects. Failure to comply will result in a fire.
- Do not install the product in places with explosive gases.
- The wiring work must be done by professional personnel. Otherwise, there will be an electric shock.
- Before wiring, check that the input power supply is cut off. Otherwise, there will be an electric shock.
- Properly connect the grounding terminal of the drive. Otherwise, there will be an electric shock.
- Properly close the cover before power-on. Otherwise, electric shock or explosion may occur.
- When powering on a drive that has been stored for 2 years, use a voltage regulator to increase voltage gradually. Otherwise, electric shock or explosion may occur.
- To avoid electric shock, do not touch terminals when the drive is powered on.
- To avoid electric shock, do not operate the drive with wet hands.
- Before conducting maintenance, ensure that the power is cut off for 10 minutes, and check that the charging indicator is completely off or the voltage of bus negative/positive is below 36 V. Failure to comply will result in an electric shock.
- Only professional personnel are qualified to replace the components. Do not leave any wire or metal parts inside the drive. Failure to comply will result in a fire.
- After changing the control board, you need to properly set the parameters before running. Otherwise, there will be equipment damage.
- The bare parts of the terminal lugs in the main circuit must be wrapped with insulation tape. Otherwise, electric shock may occur.

WARNING

- When carrying the drive, protect the operating panel and the cover against any stress. Failure to comply will result in personal injuries or equipment damage.

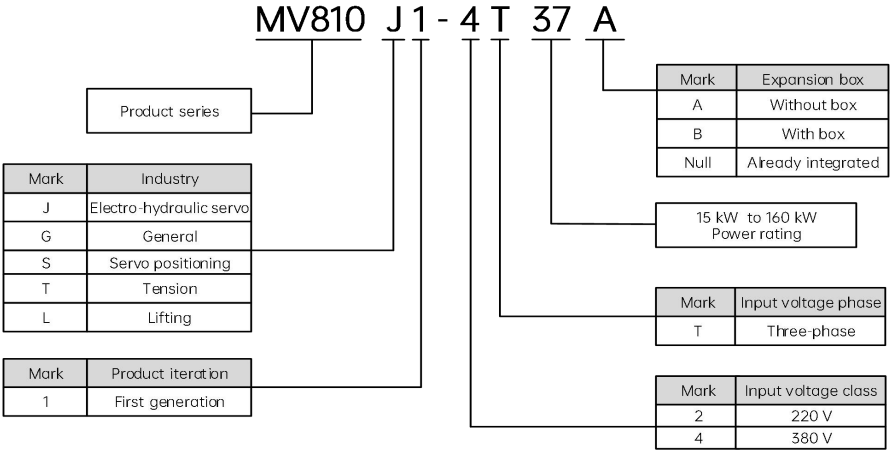
- Install the product on the place that can bear the weight. Failure to comply will result in personal injuries or equipment damage.
- Do not install the drive near water pipes or other places with water splash. Otherwise, there will be equipment damage.
- Take care not to drop screws, gaskets, metal bars and the like into the drive. Otherwise, fire and equipment damage may occur.
- If the drive is damaged or lack of components, do not run the drive. Failure to comply will result in a fire or personal injuries.
- Do not install the product in the place exposed to direct sunlight. Otherwise, there will be equipment damage.
- Do not short terminal + and (-). Otherwise, fire and equipment damage may occur.
- Cable lugs must be firmly connected to main circuit terminals. Otherwise, there will be equipment damage.
- Do not connect 220 VAC input to control terminals other than RA, RB and RC. Otherwise, there will be equipment damage.

Contents

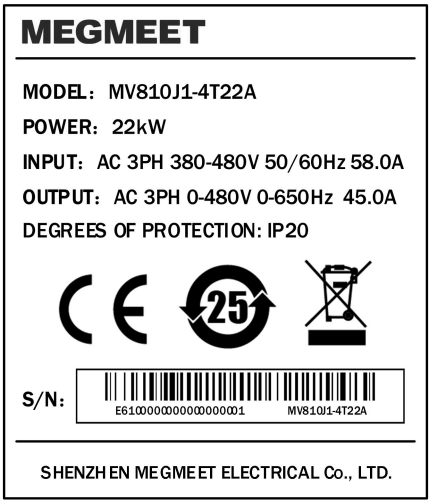
Chapter 1 MV810J Introduction

1.1 Product naming rule

The drive model on the nameplate indicates the product series, voltage class, power rating, product version and so on.



1.2 Product nameplate



WARNING

For 4T15 to 75 models, the expansion box is an option; for 4T90 to 160 models, there is no need to use an expansion box as the large control board has already integrated all function of the box.

1.3 Product model

Tabel 1-1 Product models

Enclosure	Product model	Rated capacity (kVA)	Rated input current (A)	Rated output current (A)	Rated output power (kW)	Fan's air volume (m^3/min)
E	MV810J1-4T15*	21.0	35.0	32.0	15.0	4.0
	MV810J1-4T18.5*	24.0	49.0	37.0	18.5	
	MV810J1-4T22*	30.0	58.0	45.0	22.0	
F	MV810J1-4T30*	39.0	62.0	60.0	30.0	5.8
	MV810J1-4T37*	49.0	76.0	75.0	37.0	
G	MV810J1-4T45*	59.0	92.0	90.0	45.0	7.21
	MV810J1-4T55*	72.0	113.0	110.0	55.0	
	MV810J1-4T75*	100.0	157.0	152.0	75.0	
H	MV810J1-4T90	115.0	180.0	176.0	90.0	7.5
	MV810J1-4T110	138.0	214.0	210.0	110.0	
I	MV810J1-4T132	166.0	256.0	253.0	132.0	9.5
	MV810J1-4T160	200.0	307.0	304.0	160.0	

1.4 Technical specifications

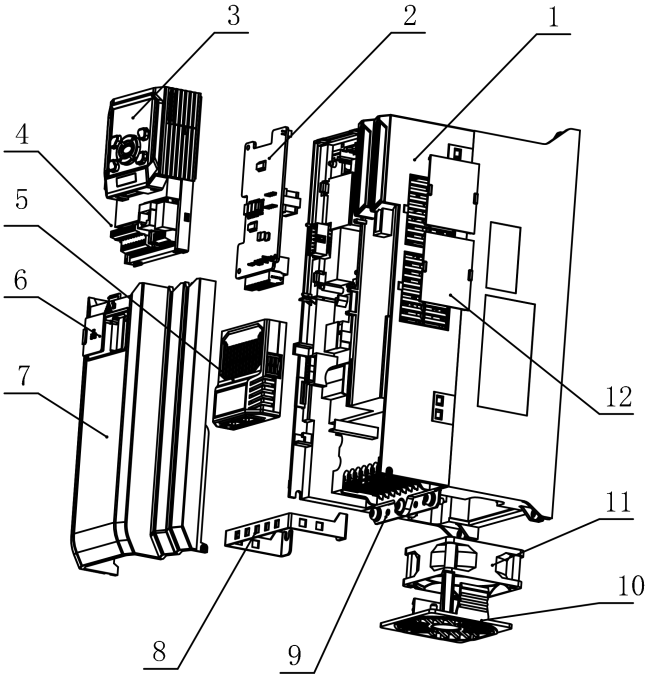
Tabel 1-2 Technical specifications

Basic specifications	Power input	Rated voltage (V)	Three-phase: 380 V to 480 V; continuous fluctuation of voltage: ±10%, transient fluctuation of voltage: -15% to +10% (that is, 323 V to 528 V); voltage unbalance rate: <3%, and the distortion rate compliant with IEC 61800-2
		Rated input current (A)	Please refer to Table 1-1
		Rated frequency (Hz)	50 Hz / 60 Hz, fluctuation range ±5%
	Power output	Standard applicable motor (kW)	Please refer to Table 1-1
		Rated capacity (kVA)	

		Rated current (A)	
		Output voltage (V)	Three-phase output under rated input conditions, 0 to rated input voltage, deviation less than ±3%
		Output frequency (Hz)	Vector control: 0 to 650 Hz, unit: 0.01 Hz
		Overload capacity	1 min for 150% rated current, 6 s for 180% rated current, and 1 s for 200% rated current
	Environment	Operating site	Indoors without direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapour, drip or salt
		Altitude	Derating not required below 1000 m; derated by 1% for every increase of 100 m if above 1000 m.
		Ambient temperature	-10°C to 45°C; derating required above 45°C with proper ventilation; maximum temperature 55°C (still able to run at 80% light load).
		Humidity	5% to 95% RH, non-condensing
		Vibration	Sine vibration: 2 to 9 Hz, displacement 1.5 mm; 9 to 200 Hz, 5.9 m/s^2 (0.6 g)
		Storage temperature	-30℃ to +70℃, and air temperature change < 1℃/min. Maximum 60℃ for long-time storage, and 60℃ to 70℃ only for short-time storage.
	Protection degree		IP20
	Cooling method		Forced cooling
	Digital signal	DI1 to DI5	5 multi-function input terminals. For details, refer to 3.2.2 control IO description.
		DO1 to DO2	2 open-collector output terminals. For details, refer to 3.2.2 control IO description.
	Analog signal	AI1 to AI4	Analog input with 12-bit precision
		AO1 to AO2	2 multi-function analog output terminals. For details, refer to 3.2.2 control IO description.
	Relay output	RA/RB/RC	1 group of normally open and normally closed contacts; the input overvoltage level of the relay output terminals is overvoltage level II. For details, refer to 3.2.2 control IO description.
	Power supply	Output	+13 V and +24 V reference power are provided for external load. Permissible maximum output current 10 mA for 13 V, and 200 mA for 24 V.
	Communication	CAN	Communication with peripheral devices, along with functions such as online parameter setting, drive control, command setting, parameter upload and download, etc.
		RS485	
		USB	

	LED display panel and keypad	10 LED indicators, 5-digit LED display, and 8 function keys, used for command setting, parameter display, parameter hold setting and other functions
Control mode and performance	Control mode	Speed control and hydraulic process control
	Pressure control input	Pressure control reference input: can be set to analog input or CAN communication Speed reference input: CAN communication or RS485 communication
	Multi-pump control	Can control multiple pumps, with three working modes (single-master multi-slave compound flow, single-master multi-slave distributed/convergent flow, as well as multi-master multi-slave convergent flow)
	Pressure control accuracy	±1 bar (screw pump)
	Flow control accuracy	±0.5% FS
	Pressure control step response	⩽ 100 ms, flow setting > 70% (screw pump)
	Flow control step response	⩽ 50 ms, feedback pressure less than 10 bar
	Speed reference input	CAN or RS485 communication
	Speed control accuracy	±0.5%
	Torque response time	⩽ 2 ms
Protection	Hardware fault	Overcurrent, DC overvoltage, DC undervoltage, braking resistor damage, encoder damage, module overtemperature, pressure sensor fault, DEV deviation, braking overload, etc.
	Alarm record	Can store 3 alarm records and the bus voltage, current, frequency and operation state upon the latest fault time

1.5 Product components



1: Enclosure 2: PG card 3: Keypad 4: Control board 5: Expansion box 6: Rubber plug

7: Upper cover 8: Wire fixation bracket 9: Grounding board 10: Fan cover 11: Fan 12: Dustproof plate

Fig. 1-1 Product components

1.6 Product dimensions

There are five types of outline dimensions as shown below. The specific outline dimensions, mounting dimensions and gross weight are shown in Table 1-3.

(1) Enclosure E: 4T15/18.5/22

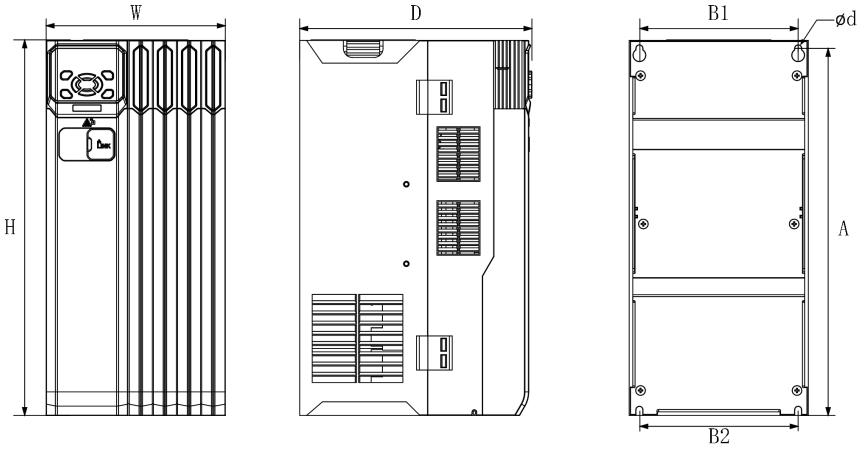


Fig. 1-2 Enclosure E

(2) Enclosure F: 4T30/37

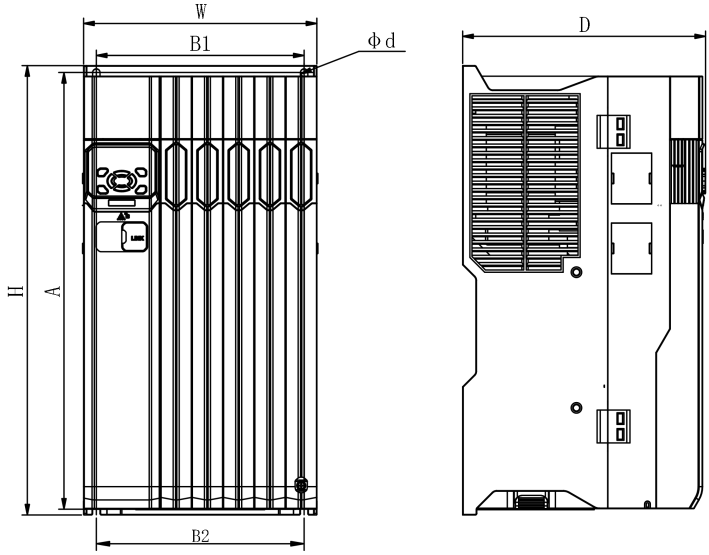


Fig. 1-3 Enclosure F

(3) Enclosure G: 4T45/55/75

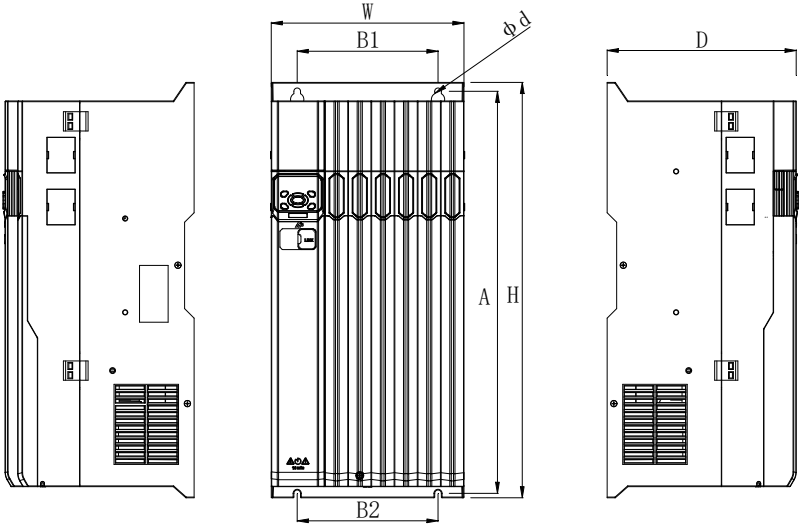


Fig. 1-4 Enclosure G

(4) Enclosure H: 4T90/110

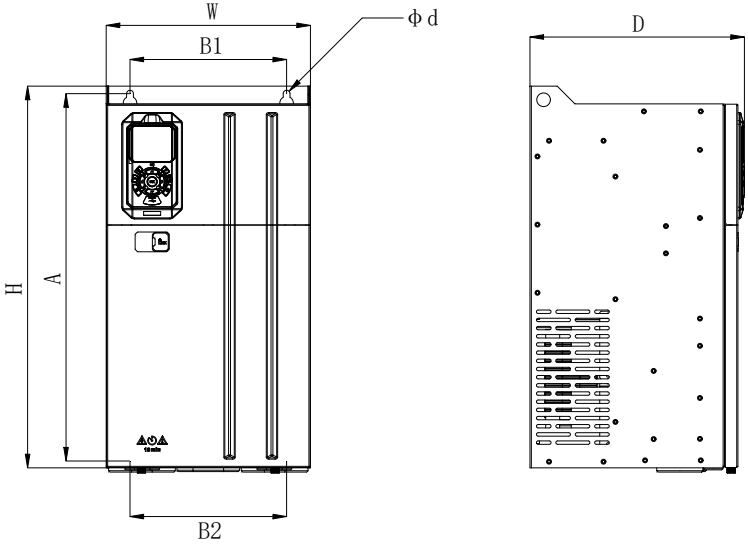


Fig. 1-5 Enclosure H

(5) Enclosure I: 4T132/160

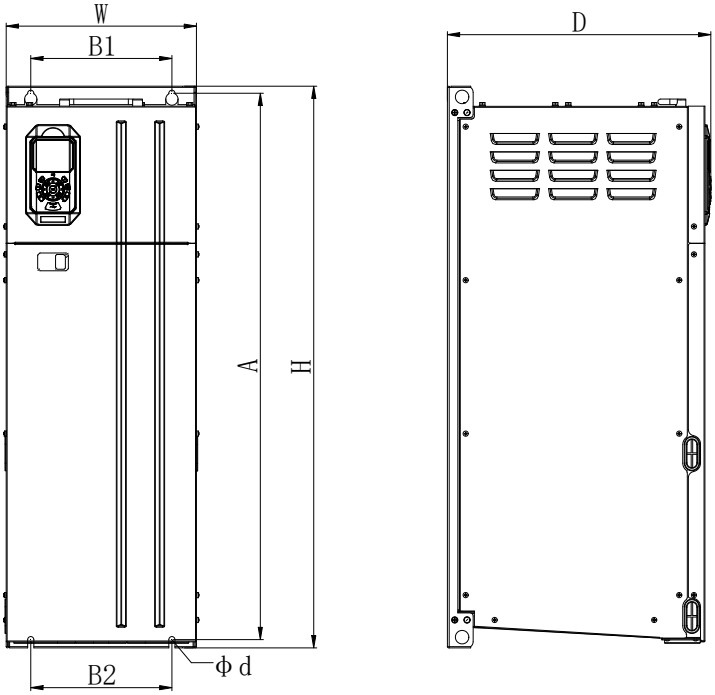


Fig. 1-6 Enclosure I

Tabel 1-3 Outline, mounting dimensions and gross weight

Enclosure	Drive model	A (mm)	B1 (mm)	B2 (mm)	H (mm)	W (mm)	D (mm)	Mounting hole diameter (mm)	Gross weight ±0.5 (kg)
E	MV810J1-4T15*	318	140	140	330	158	204.8	6	6.5
	MV810J1-4T18.5*								
	MV810J1-4T22*								
F	MV810J1-4T30*	412	196	196	424	220	229	7	15
	MV810J1-4T37*								
G	MV810J1-4T45*	542	190	190	560	260	255	9	21.5
	MV810J1-4T55*								
	MV810J1-4T75*								
H	MV810J1-4T90	539	230	230	560	300	300	10	30
	MV810J1-4T110								
I	MV810J1-4T132	875	230	230	900	310	429	10	100
	MV810J1-4T160								

1.7 Operating panel dimensions

(1) MV810-DP01 panel for 4T75 and below

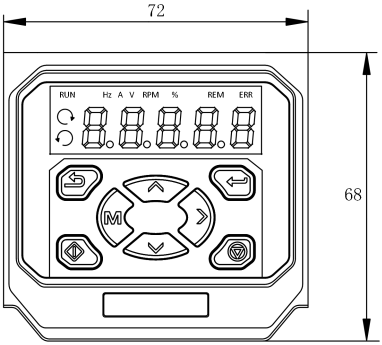


Fig. 1-7 MV810-DP01 appearance and mounting dimensions (unit: mm)

(2) MV820-DP03 panel for 4T90 and above

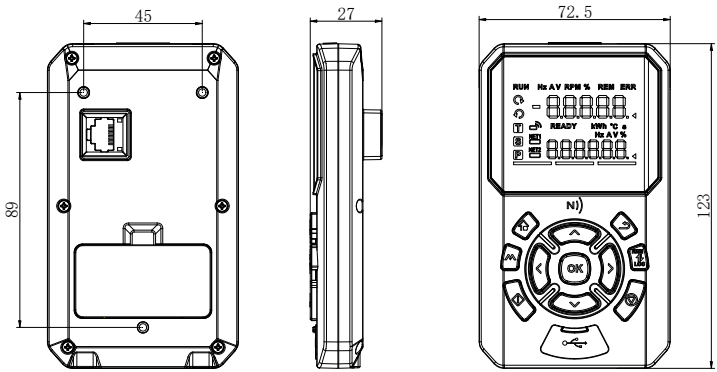


Fig. 1-8 MV820-DP03 appearance and mounting dimensions (unit: mm)

WARNING

(1) The MV810J series comes standard with either a non-removable small LED keypad or a removable large LED keypad (capable for external use), depending on the power rating. Additionally, an optional small remote keypad or remote LCD keypad is available. For details, please refer to sections 1.9 and 1.10.

(2) An Ethernet port is reserved on the drive for external keypad.

1.8 Keypad/Operating panel mounting base

MV810J contains both small and large keypad mounting bases, respectively for small keypads and large keypads, as shown below:

Model of small keypad mounting base: MV820-JPT01, used to install a remote small keypad/operating panel to the cabinet door, as shown in the following figure:

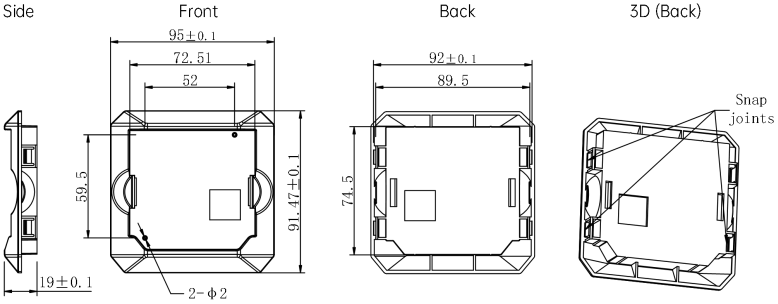


Fig. 1-9 Small keypad mounting base (unit: mm)

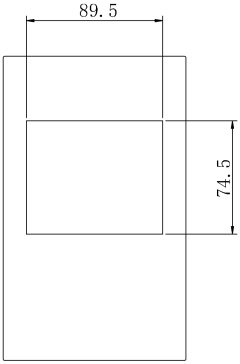


Fig. 1-10 Mounting hole dimensions for operating panel fixed base (unit: mm)

Model of large keypad mounting base: MV820-JPT02, used to install a remote large keypad/operating panel to the cabinet door, as shown in the following figure:

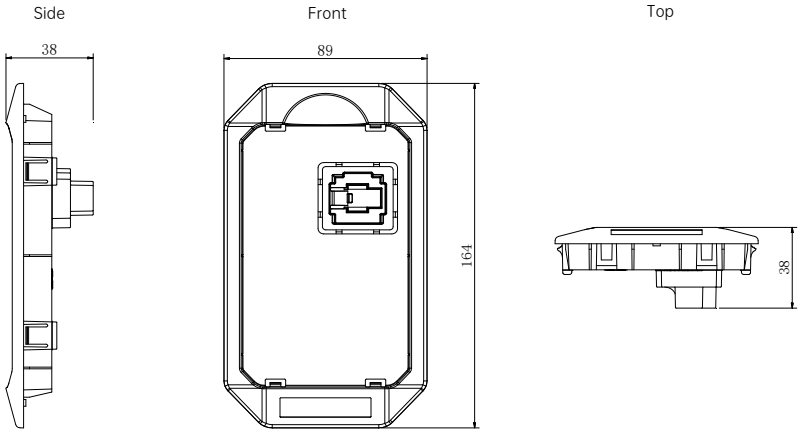


Fig. 1-11 Large keypad mounting base (unit: mm)

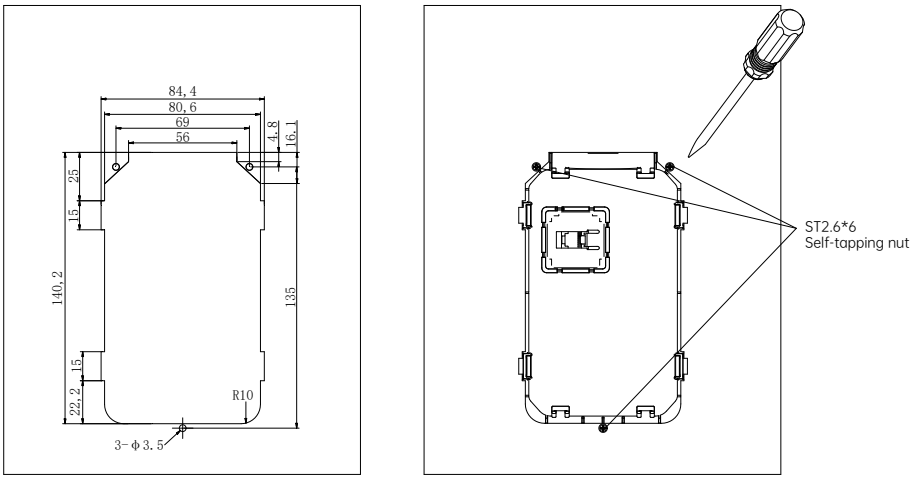


Fig. 1-12 Mounting hole dimensions for large operating panel fixed base (unit: mm)

1.9 Remote LED keypad/operating panel (with shuttle)

Remote LED operating panels of MV810J can be divided into the small LED panel (with shuttle) and the large LED panel. Both two panels can be used remotely for the MV810J series.

MV820-DP01, remote small LED operating panel, removable, supporting external use, with the shuttle button, parameter copy function (refer to P00.07) and IP23 protection.

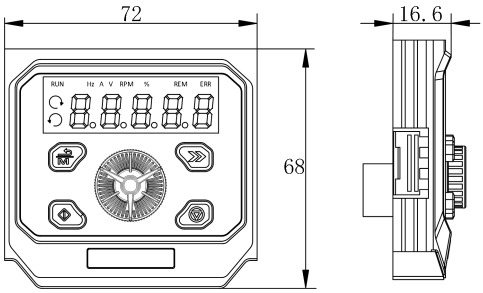


Fig. 1-13 Remote small LED keypad/operating panel

The remote small LED keypad/operating panel can be fixed to the cabinet door/plate through a mounting base (see 1.8 for details); or easily through the two diagonal internal thread holes provided on the back of the remote small LED keypad/operating panel, as shown in the following figure. Hole dimensions (unit: mm):

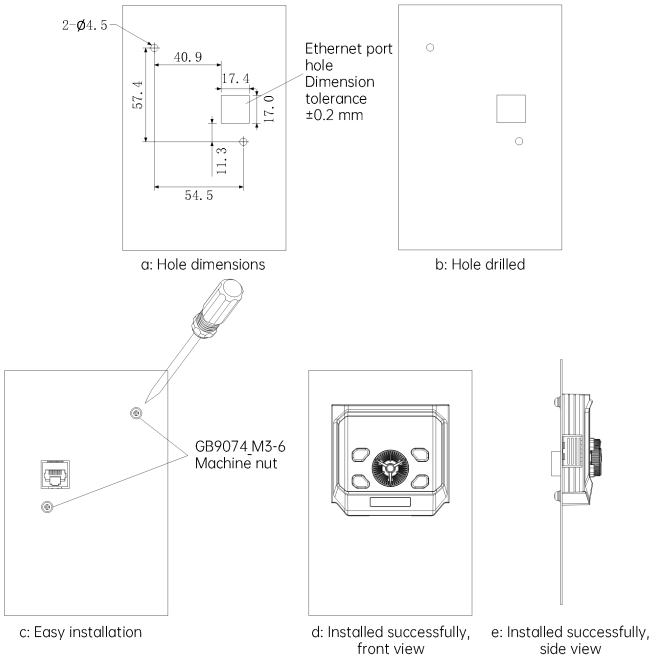


Fig. 1-14 Easy installation of remote small LED keypad/operating panel

MV820-DP03, remote large LED operating panel, removable, supporting external use, with dual-row LED display, abundant functions along with parameter copy (refer to P00.07).

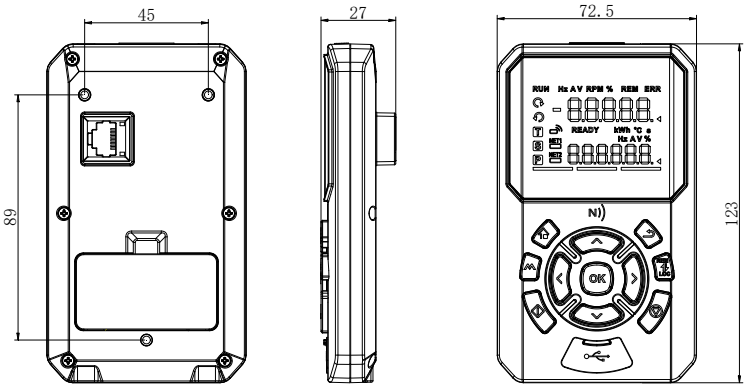


Fig. 1-15 Remote large LED keypad/operating panel (unit: mm)

The remote large LED keypad/operating panel can be fixed to the cabinet door/plate through a mounting base (see 1.8 for details); or easily through the three internal thread holes provided on the back of the remote large LED keypad/operating panel, as shown in the following figure. Hole dimensions (unit: mm):

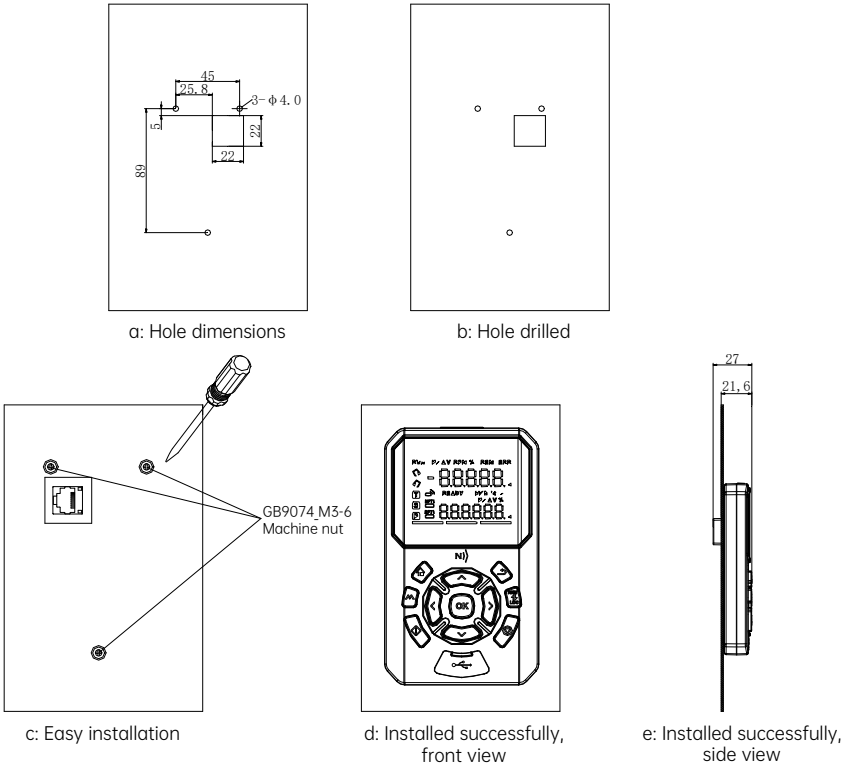


Fig. 1-16 Easy installation of remote large LED keypad/operating panel

1.10 Remote LCD keypad/operating panel (in development)

MV810J remote LCD panel, IP23 protection.

Fig. 1-17 Remote LCD operating panel

Chapter 2 Drive Installation

2.1 Installation environment

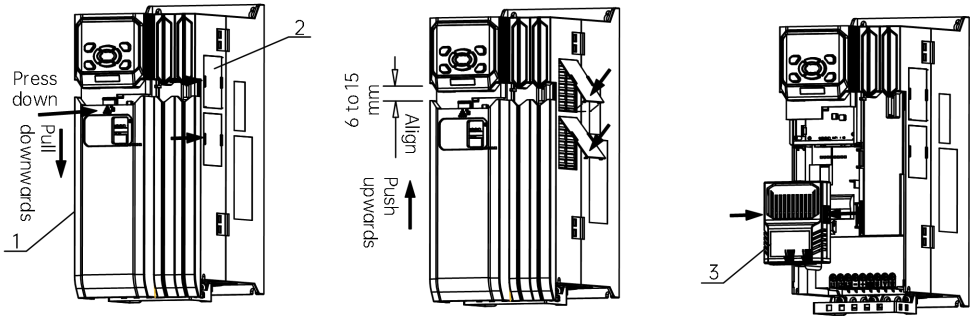
To choose the installation place, follow the below instructions:

WARNING

- Ambient temperature: -10℃ to 45℃, derating required or additional cooling required if the ambient temperature is over 45℃;
- Ambient humidity below 95%, non-condensing;
- Install the product in a place with the vibration less than 5.9 m/s^2 (0.6 g);
- Do not install the product in a place with direct sunlight;
- Do not install the product in a place with dust or metal powder;
- It is strictly forbidden to install the product in a place with corrosive and explosive gases.

If you have any special installation requirements, consult us before installation.

2.2 Assembly/Disassembly of drive components



1: Cover 2: Dustproof plate 3: Expansion box

Fig. 2-1 Assembly and disassembly of drive components (taking enclosure E as an example)

(1) Assembly/Disassembly of the cover

Disassembly: Press down the granulated part of the cover slightly inwards, then pull it downwards until the snap-fit joints of the cover are separated from the drive to remove the cover.

Assembly: Align the cover with the chassis, with the upper end 6-15 mm away from the operating panel, the lower cover in contact with the chassis, then push the cover upwards to buckle the snap-fit joints into the chassis.

(2) Assembly/Disassembly of the dustproof plate

Disassembly: Insert your fingernail or a flat screwdriver to the groove of the dustproof plate, and pry the dustproof plate.

Assembly: Buckle the snap-fit joints of the dustproof plate into the ventilation hole, and press down.

(3) Assembly/Disassembly of the expansion box

Disassembly: Press down the spring snap at the middle of the expansion box to remove the expansion box.

Assembly: Hold the expansion box, slightly press the spring snap, adjust its location, and release your hands, then the spring snap is buckled successfully.

2.3 Installation direction and gap

It is recommended to install the product vertically for better ventilation.

The specific gap distance is shown in Fig. 2-2.

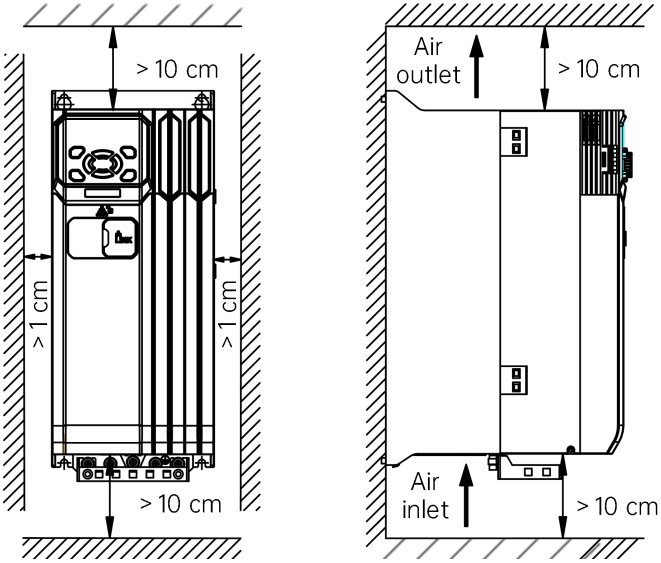


Fig. 2-2 Gap distance for vertical installation

If two or more drives are installed closely up and down, for better heat dissipation, it is recommended to use a baffle plate to redirect the flow, preventing the lower drive from affecting the upper drive, as shown in Fig. 2-3.

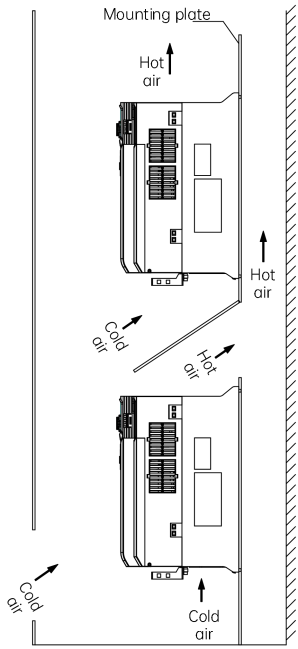


Fig. 2-3 Installation of over two drives

Chapter 3 Drive Wiring

This chapter explains the wiring and related precautions.

DANGER

- Ensure that the drive's power supply is completely cut off and wait for at least 10 minutes before you open the cover of the drive.
- Ensure that the panel indicator (5-digit LED) of the drive is off and the voltage between + and − of the main circuit is below 36 VDC before you start to wire.
- The internal wiring of the drive can only be conducted by trained and qualified professionals.
- When connecting the emergency stop circuit or the safe circuit, check the wiring carefully before and after operation.
- Check the voltage class of the drive before power-on. Otherwise, personal injuries and equipment damage may occur.

WARNING

- Before use, check carefully whether the rated input voltage of drive is consistent with the voltage of the AC power supply.
- The drive has passed the withstand voltage test in the factory, so do not perform the withstand voltage test again.
- If you need to connect an external braking resistor or braking unit, see the Appendix 1.
- Do not connect the power cord to U, V and W.
- The grounding cable is generally a copper wire with the diameter more than 3.5 mm and the ground resistance less than 10 Ω.
- There is current leakage in the drive. The specific value of leakage is determined by the actual condition. To ensure safety, the drive and the motor must be grounded. A residual current device (RCD) is strongly required. It is recommended to choose the B model of RCD with the leakage current limit of 300 mA.
- To provide input overcurrent protection and power-off maintenance, the drive needs to be connected to the power supply through an air switch or a fuse cutout.

You can use the following diagram in Fig. 3-1 during trial operation.

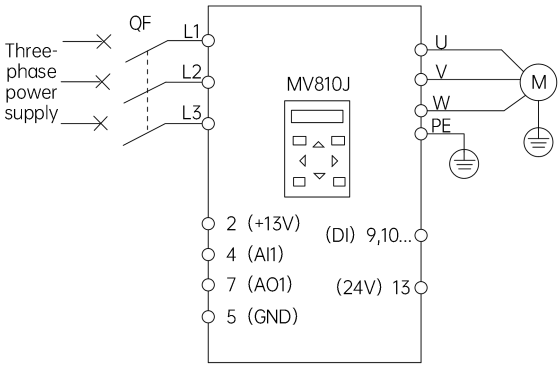


Fig. 3-1 Simple wiring of the main circuit

Recommended fastening screw torque values for wiring are shown in the following table:

Table 3-1 Recommended fastening screw torque

Enclosure	MV810J models	Main circuit terminals			Control circuit terminals
		L1, L2, L3, N	U, V, W, ⏚	+/DC+, -/DC-, BR	
E	MV810J1-4T15*	2.8 N·m	2.8 N·m	2.8 N·m	0.2 N·m
	MV810J1-4T18.5*				
	MV810J1-4T22*				
F	MV810J1-4T30*	3.5 N·m	3.5 N·m	3.5 N·m	0.2 N·m
	MV810J1-4T37*				
G	MV810J1-4T45*	4.5 N·m	4.5 N·m	4.5 N·m	0.2 N·m
	MV810J1-4T55*				
	MV810J1-4T75*				
H	MV810J1-4T90	20 N·m	20 N·m	20 N·m	0.5 N·m
	MV810J1-4T110				
I	MV810J1-4T132	20 N·m	20 N·m	20 N·m	0.5 N·m
	MV810J1-4T160				

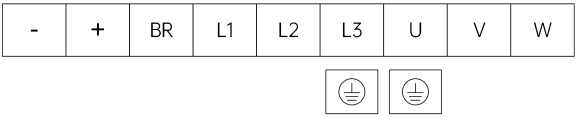
3.1 Main circuit terminal wiring and description

3.1.1 Main circuit input and output terminal types

The main circuit terminals can be divided into five types depending on the enclosure models and drive models.

(1) Terminal type 1

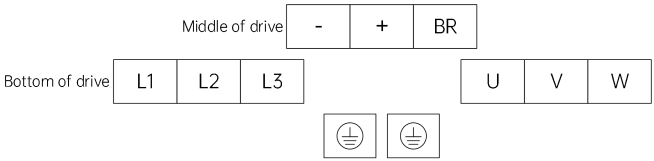
Enclosure type: Enclosure E (applicable power: 4T15/18.5/22)



Terminal name	Function description
L1, L2, L3	Three-phase 380 VAC input terminals
+, BR	Used to connect the external braking resistor
+, -	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal

(2) Terminal type 2

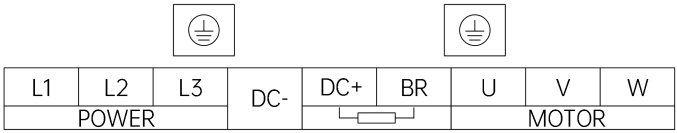
Enclosure type: Enclosure F (applicable power: 4T30/37)



Terminal name	Function description
L1, L2, L3	Three-phase 380 VAC input terminals
+, BR	Used to connect the external braking resistor
+, -	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal

(3) Terminal type 3

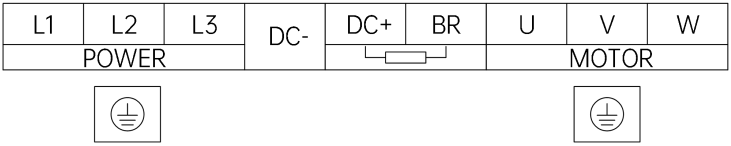
Enclosure type: Enclosure G (applicable power: 4T45/55/75)



Terminal name	Function description
L1, L2, L3	Three-phase 380 VAC input terminals
DC+, BR	Used to connect the external braking resistor
DC+, DC-	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal

(4) Terminal type 4

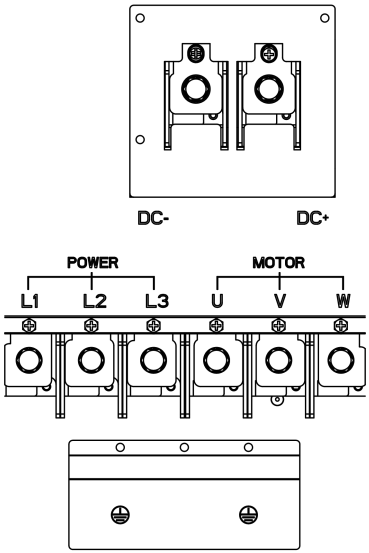
Enclosure type: Enclosure H (applicable power: 4T90/110)



Terminal name	Function description
L1, L2, L3	Three-phase 380 VAC input terminals
DC+, BR	Used to connect the external braking resistor
DC+, DC-	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal

(5) Terminal type 5

Enclosure type: Enclosure I (applicable power: 4T132/160)



Terminal name	Function description
L1, L2, L3	Three-phase 380 VAC input terminals
DC+, DC-	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal

WARNING

(1) Connect the input power cables to the drive power input terminals L1, L2, and L3 respectively. Connect the grounding conductor of the input power cable to any grounding screw (PE) of the drive, and tighten the screw to an appropriate torque to ensure a reliable connection.

(2) Connect the motor's three-phase input cables to the drive output terminals U, V, and W respectively, and tighten the screws to an appropriate torque to ensure a reliable connection. Connect the motor's grounding terminal to any grounding screw (PE) of the drive. Connect the motor's resolver signals and temperature sensor terminals to the corresponding pins of the drive's encoder port CN4 (DB15), and tighten the screws to an appropriate torque to ensure a reliable connection.

(3) Connect the two terminals of the braking resistor to the drive terminals +/DC+ and BR, and tighten the screws to an appropriate torque to ensure a reliable connection.

3.1.2 Standard operation wiring

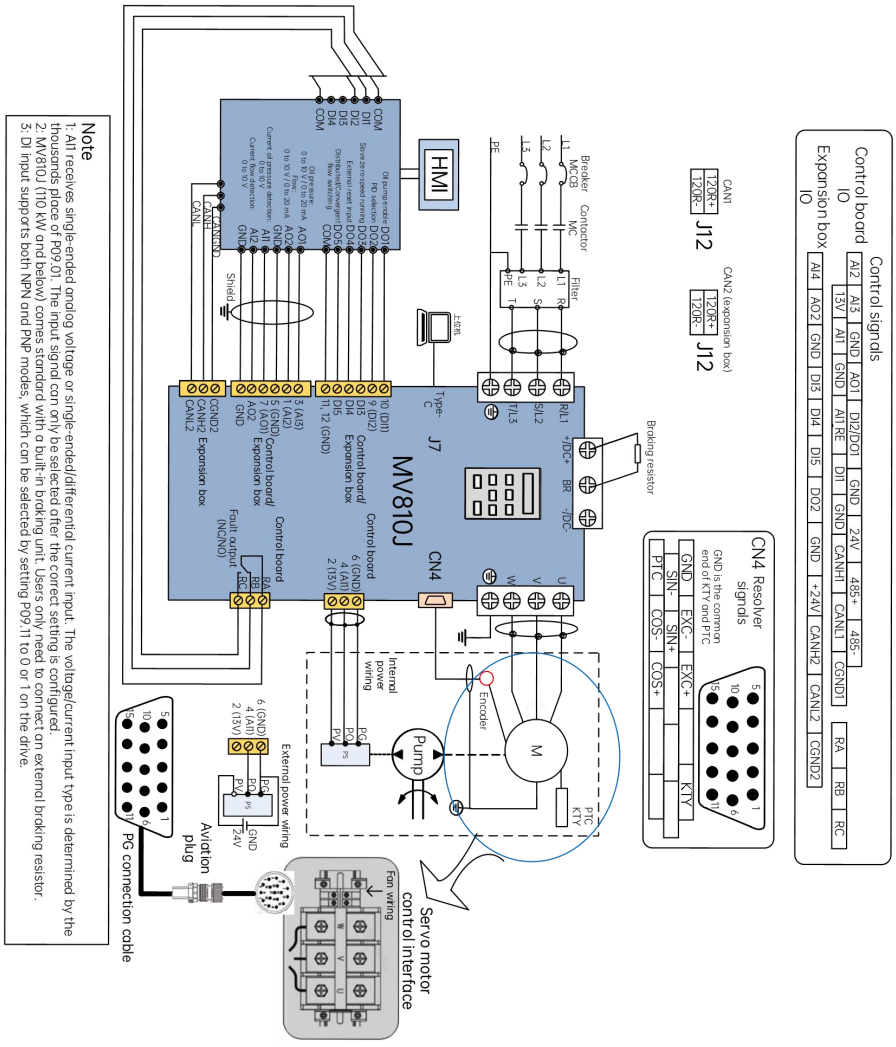


Fig. 3-2 Main circuit and control circuit wiring (small control board + expansion box)

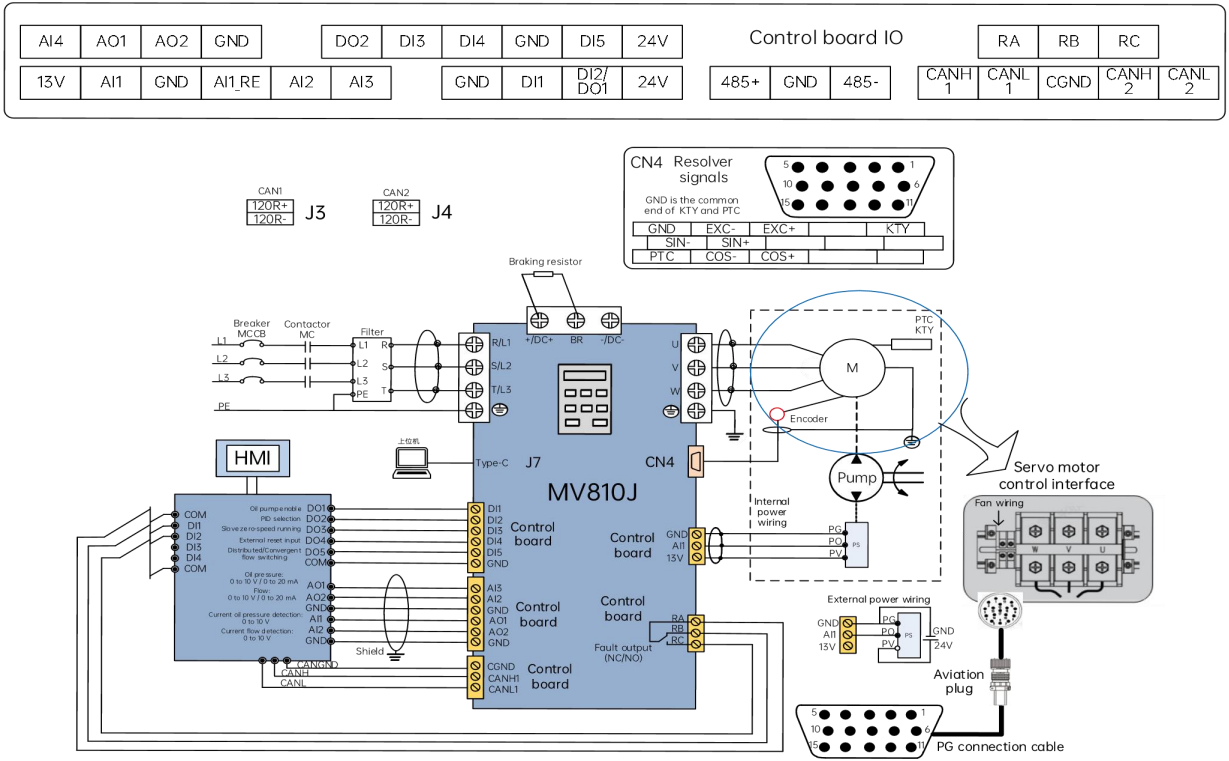


Fig. 3-3 Main circuit and control circuit wiring (large control board)

Note
1: AI1 receives single-ended analog voltage or single-ended/differential current input. The voltage/current input type is determined by the thousands place of P09.01. The input signal can only be selected after the correct setting is configured.
2: MV810J (110 kW and below) comes standard with a built-in braking unit. Users only need to connect an external braking resistor.
3: DI input supports both NPN and PNP modes, which can be selected by setting P09.11 to 0 or 1 on the drive.

3.2 Control circuit terminal wiring and description

3.2.1 Control circuit terminal layout

(1) Small control board diagram (4T15 to 4T75)

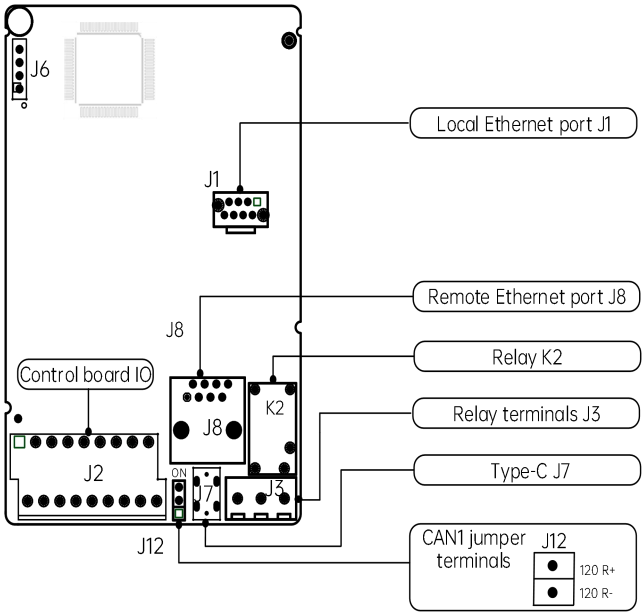


Fig. 3-4 Small control board diagram

(2) Large control board diagram (4T90 to 4T160)

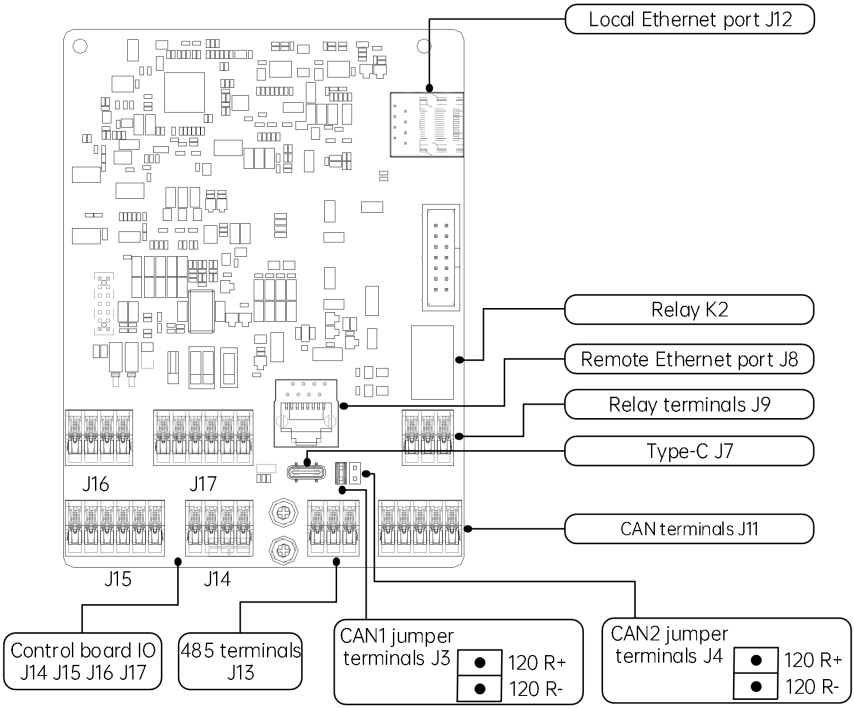


Fig. 3-5 Large control board diagram

(3) Expansion box diagram

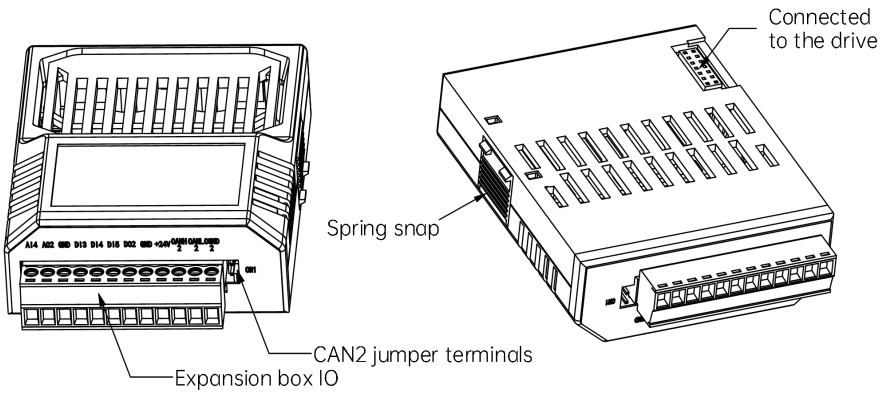


Fig. 3-6 Expansion box diagram

(4) PG card diagram

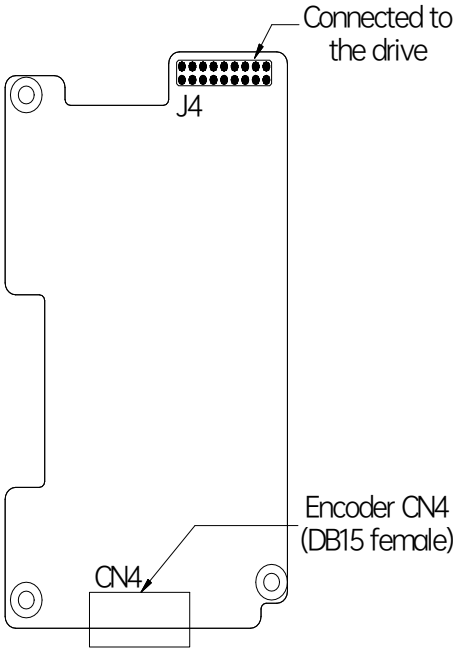
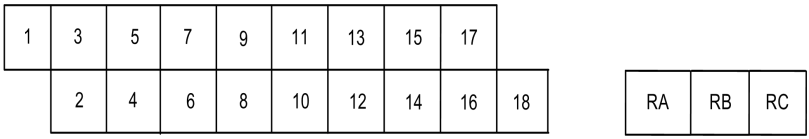


Fig. 3-7 PG card diagram

3.2.2 Control IO description

(1) Small control board layout (4T15 to 4T75)



(2) Large control board layout (4T90 to 4T160)

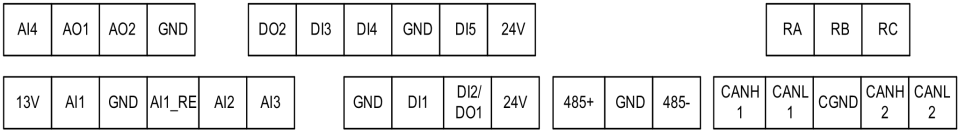


Fig. 3-8 Control board terminal layout

(3) Expansion box layout

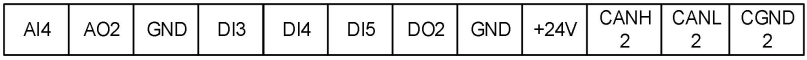


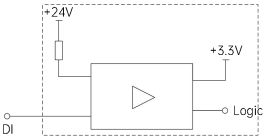
Fig. 3-9 Expansion box terminal layout

WARNING

For 4T15 to 75 models, the expansion box is an option; for 4T90 to 160 models, there is no need to use an expansion box as the large control board has already integrated all function of the box.

Table 3-2 Control terminal functions

Board/Box	Type	Mark	Name	Function	Specifications
Control board	Power supply	2/13V	+13V power supply	+13V reference power output	Permissible maximum output current 10 mA
		5, 6, 11, 12/ GND	13V power ground	Reference ground for analog signals and +13V power supply	
Control board	Analog input	4/AI1	Analog voltage single-ended input AI1 or analog current single-ended / differential input AI1	Receives analog voltage single-ended or current single-ended / differential input. Use P09.01 to select voltage or current analog input. (Reference ground: GND)	Voltage input range: -10 V to 10 V (input impedance: 22 kΩ), resolution: 1/4000 Current input range: 0 mA to 20 mA (input impedance: 10 Ω), resolution: 1/4000
		8/AI1_RE	Differential input current return terminal	For analog current differential input, it serves as the current return terminal. For analog current single-ended input, it shall be connected to GND.	Current input range: 0 mA to 20 mA (input impedance: 10 Ω), resolution: 1/4000; supports differential input.
		1/AI2	Analog voltage single-ended input AI2	Receives analog voltage single-ended input. (Reference ground: GND)	Voltage input range: -10 V to 10 V (input impedance: 22 kΩ), resolution: 1/4000
		3/AI3	Analog voltage single-ended input AI3		
Control board / Expansion box		AI4	Analog voltage single-ended input AI4		
	Analog output	7/AO1	Analog output 1	(Reference ground: GND)	Voltage output range: 0 to 10 V
		AO2	Analog output 2		
	Communication	15/RS485+	RS485 interface	485 differential signal positive end (reference ground: GND)	Standard RS485 communication interface Use twisted-pair or shielded cables.

<table>
<tr><th>Board/Box</th><th>Type</th><th>Mark</th><th>Name</th><th>Function</th><th>Specifications</th></tr>
<tr><td rowspan="6"></td><td rowspan="6"></td><td>17/RS485-</td><td></td><td>485 differential signal negative end (reference ground: GND)</td><td></td></tr>
<tr><td>14/CANH1</td><td rowspan="3">Local CAN</td><td rowspan="3">The J12 jumper (small control board) or J3 jumper (large control board) selects whether to connect the termination resistor, used for multi-pump control.</td><td rowspan="3">Use twisted-pair or shielded cables.</td></tr>
<tr><td>16/CANL1</td></tr>
<tr><td>18/CGND1 (small control board) CGND (large control board)</td></tr>
<tr><td>CANH2</td><td rowspan="3">Expanded CAN</td><td rowspan="3">The J4 jumper (large control board) or J12 jumper (expansion box) selects whether to connect the termination resistor, used for interfacing with external molding machine computers.</td><td rowspan="3">Use twisted-pair or shielded cables.</td></tr>
<tr><td>CANL2</td></tr>
<tr><td>CGND2 (expansion box) CGND (large control board)</td></tr>
<tr><td rowspan="2">Control board</td><td rowspan="5">Multi-function input</td><td>10/DI1</td><td>Multi-function input 1</td><td>Refer to P09.03 to P09.07.</td><td rowspan="5">Multiple input functions are available. Basic diagram is shown below:
 

Example:
<table>
<tr><td>P09.00</td><td>Multi-function input 1</td></tr>
<tr><td>0x00</td><td>DI2</td></tr>
<tr><td>0x10</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>9/DI2/DO1</td><td>Multi-function input 2</td><td>It can be defined as DI2 or DO1 through P09.00.</td></tr>
<tr><td rowspan="3">Expansion box</td><td>DI3</td><td>Multi-function input 3</td><td rowspan="3">Refer to P09.03 to P09.07.</td></tr>
<tr><td>DI4</td><td>Multi-function input 4</td></tr>
<tr><td>DI5</td><td>Multi-function input 5</td></tr>
<tr><td>Control board</td><td rowspan="2">Multi-function output</td><td>9/DI2/DO1</td><td rowspan="2">Open-collector output</td><td>Multiple DO functions can be selected. (Common end: GND)</td><td>Optocoupler isolation output
Maximum working voltage: 30 V
Maximum output current: 50 mA</td></tr>
<tr><td>Expansion box</td><td>DO2</td></tr>
</table>

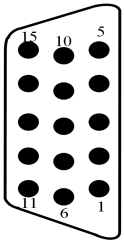
Board/Box	Type	Mark	Name	Function	Specifications
Control board	Power supply	+24	+ 24V power supply	+ 24V power supply output	Maximum output current: 200 mA
Expansion box					Maximum output current: 100 mA
Control board / Expansion box	Common end	GND	Common end for + 24V and +13V power supply	1 common terminal, used with other terminals	
Control board	Relay output	RA	Relay output	Multiple relay output functions can be selected through P09.20.	TA-TB: NC, TA-TC: NO Contact capacity: AC 250 V / 2 A (COS Φ = 1) AC 250 V / 1 A (COS Φ = 0.4) DC 30 V / 1 A The input overvoltage level for the relay output terminals is overvoltage level II.
		RB			
		RC			

WARNING

It is recommended to use cables of 0.5 mm^2 or larger for control circuit terminal connection.

3.2.3 Encoder interface

The encoder interface for the MV810J drive is located on a separate encoder card, labeled as CN4:

Interface	Type	Pin	Definition	Function	Layout
CN4	Resolver terminals	1	KTY	KTY input	
		3	EXC+	Resolver excitation positive	
		4	EXC-	Resolver excitation negative	
		5	GND	Motor temperature detection ground	
		9	SIN+	Resolver feedback SIN positive	
		10	SIN-	Resolver feedback SIN negative	
		13	COS+	Resolver feedback COS positive	
		14	COS-	Resolver feedback COS negative	
		15	PTC	PTC input	

Chapter 4 Quick Operation Guide for Drive

4.1 Operating panel

4.1.1 Introduction

Through the operation panel, you can perform functions such as setting and modifying servo drive parameters, monitoring operating status, and controlling operation.

MV810J has two kinds of operating panels. One is the small operating panel/keypad, MV810-DP01, as the standard configuration for drives of 75 kW and below; the other is the large operating panel/keypad with more functions, MV820-DP03, as the standard configuration for drives of 90 kW and above, which can also be used as option of other models (see 1.8 and 1.9 for mounting dimensions). The small operating panel is shown below:

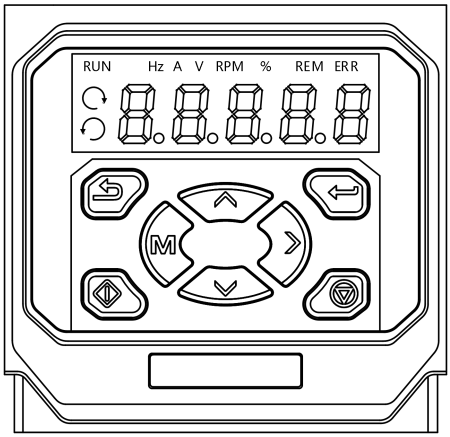


Fig. 4-1 Small operating panel

4.1.1.1 Indicator description of small operating panel

Table 4-1 Indicator description of small operating panel

Indicator		Name	Description	Color
Unit indicator	Hz	Frequency indicator	Flashing: The current parameter is the running frequency On: The current parameter is the frequency reference	Yellow
	A	Current indicator	On: The current parameter is the current	Yellow
	V	Voltage indicator	On: The current parameter is the voltage	Yellow
	RPM	Speed indicator	On: The current parameter is the speed	Yellow
	%	Percent indicator	On: The current parameter is the percent	Yellow

Indicator		Name	Description	Color
Status indicator		Forward running indicator	On: During stop, there is a forward running command for the drive During running, the drive is running forward Flashing: The drive is switching from FWD to REV	Green
		Reverse running indicator	On: During stop, there is a reverse running command for the drive During running, the drive is running reversely Flashing: The drive is switching from REV to FWD	Green
	ERR	Alarm indicator	On: The drive enters the alarm status	Red
	RUN	Running indicator	On: Running Flashing: Stopping Off: Stopped	Green
	REM	Operation command channel indicator	Off: Local Flashing: Communication On: Terminal	Yellow

4.1.1.2 Key description of small operating panel

Table 4-2 Key functions of small operating panel

Key	Name	Function
	Return key	To exit the programming state
	Program/Confirm key	To enter the menu or confirm the data
	Increase key	To increase the data or function code
	Decrease key	To decrease the data or function code
	Shift key	To select the data bit for change in the editing state, or switch the display of status parameters.
	Multi-function key	The multi-function description is shown in Table 4-5
	Run key	Press this key in the operating panel mode, then the drive starts to run
	Stop/Reset key	Stop or fault reset

The large operating panel is shown below:

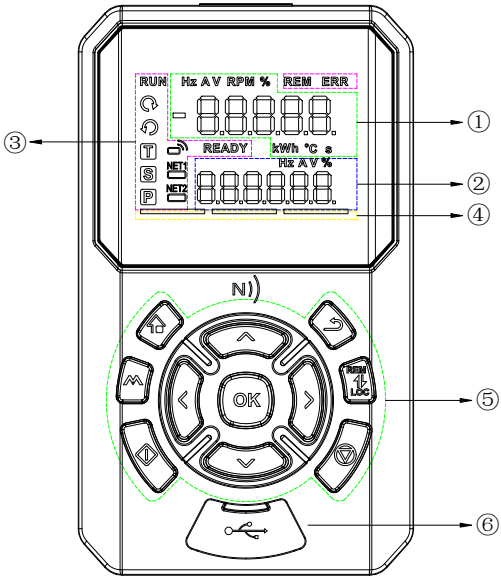


Fig. 4-2 Large operating panel

4.1.1.3 Interface description of large operating panel

No.	Name	Description
①	Main display area	Function parameters, parameter unit, positive or negative
②	Auxiliary display area	Monitored parameter display and unit
③	State indication area	Power state, run/stop, FWD/REV, local/remote control, fault state, speed/torque mode, and communication status
④	Menu mode area	Displays the current menu mode, such as quick menu, full menu, and changed memory menu modes
⑤	Key area	Function/data code input of drive
⑥	USB-Type C	Connected to the PC host controller

4.1.1.4 Indicator description of large operating panel

Table 4-3 Indicator description of large operating panel

Indicator		Name	Description	Color
Unit indicator	Hz	Frequency indicator	Flashing: The current parameter is the running frequency On: The current parameter is the frequency reference	Yellow

Indicator		Name	Description	Color
	A	Current indicator	On: The current parameter is the current	Yellow
	V	Voltage indicator	On: The current parameter is the voltage	Yellow
	r/min	Speed indicator	On: The current parameter is the speed	Yellow
	%	Percent indicator	On: The current parameter is the percent	Yellow
	℃	Temperature indicator	On: The current parameter is the degree centigrade	
	s	Time indicator	On: The current parameter is seconds	
	kWh	Power indicator	On: The current parameter is electric quantity	
Status indicator		Forward running indicator	On: During stop, there is a forward running command for the drive During running, the drive is running forward Flashing: The drive is switching from FWD to REV	Green
		Reverse running indicator	On: During stop, there is a reverse running command for the drive During running, the drive is running reversely Flashing: The drive is switching from REV to FWD	Green
	ERR	Alarm indicator	On: The drive enters the alarm status	Red
	RUN	Running indicator	On: Running Flashing: Stopping Off: Stopped	Green
	REM	Operation command channel indicator	Off: Local Flashing: Communication On: Terminal	Yellow
	T	Torque control mode indicator	On: The drive is now in the torque control mode	
	S	Speed control mode indicator	On: The drive is now in the speed control mode	
	P	Reserved		
		Wireless communication indicator	Flashing: Waiting for connection; On: Connection is successful; Off: Function is disabled	
	NET1	Communication indicator 1	Reserved	Reserved
	NET2	Communication	Reserved	Reserved

Indicator		Name	Description	Color
		indicator 2		
	REDY	Standby state indicator	On: In the standby state	White
	▬▬▬	Menu mode indicator	On: Current menu mode (quick menu, full menu and changed memory menu modes from left to right)	
	▬	Negative sign indicator	On: The current data is negative; Off: The current data is positive	
	◂	Main and auxiliary display area indicator	On: Indicates the current display area (main/auxiliary) that is being operated	
	N))	NFC indicator	Flashing: Normal data communication Off: No data communication	

4.1.1.5 Key description of large operating panel

Table 4-4 Key functions of large operating panel

Key	Name	Function
	Return key	To exit the programming state
	Right shift key	To select the data bit for change or switch the displayed parameter; switch the monitored variables or move the cursor in the right direction
	Left shift key	To select the data bit for change or switch the displayed parameter; switch the monitored variables or move the cursor in the left direction
	RUN key	Press this key in the operating panel mode, then the drive starts to run
	Stop/Reset key	Stop or fault reset
	Up Key	Increase of data or function code
	Down key	Decrease of data or function code
	Confirm key	To enter the next level menu, and confirm parameters
	Menu switchover key	Short press it to switch the menu modes, including quick menu, full menu and changed memory menu modes, same as P00.00. Long press it to switch between the main display area and the auxiliary display area

Key	Name	Function
	Multi-function key	Functions specified by P00.04, such as JOG, FWD and REV switchover
	Operation command channel switchover key	To switch the operation command channels among local, terminal and communication.

Table 4-5 Usage of multi-function key

Multi-function key (M)	Function	Function description
0	No function	The M key is disabled.
1	Forward JOG	The M key is used as a forward JOG key, effective in three command channels. Press and hold the key, then the drive will run in the forward JOG mode. Release the key, then the JOG stops.
2	Reverse JOG	The M key is used as a reverse JOG key, effective in three command channels. Press and hold the key, then the drive will run in the reverse JOG mode. Release the key, then the JOG stops.
3	FWD and REV switchover	The M key is used as the key for FWD and REV switchover, only available in the operating panel command channel, effective during both running and stop.
4	Command channel switchover 1	The M key is used as the key for operation command channel switchover, only effective during stop. The channel is cyclically switched from local, terminal to remote.

4.1.1.6 Status display of operating panel

The display status of the MV810J operating panel includes stop status parameter display, run status parameter display, function code parameter editing status display and fault status display. The small operating panel is taken as the example here, which is operated similarly to the large operating panel.

(1) Stop parameter display status

When the drive is in stop, the operating panel displays the stop status parameters, as shown in Fig. 4-3a. The unit indicator indicates the unit of parameters.

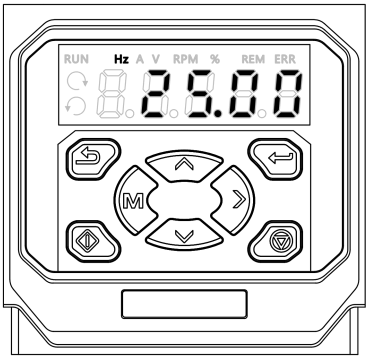
When you choose the verification menu, only the function codes whose parameter values are different from factory settings will be displayed. You can press the "∨" and "∧" keys to browse all such function codes, and check which parameters have been changed.

You can press the "  " key to view different stop status parameters cyclically (defined by the function code P16.03).

(2) Run parameter display status

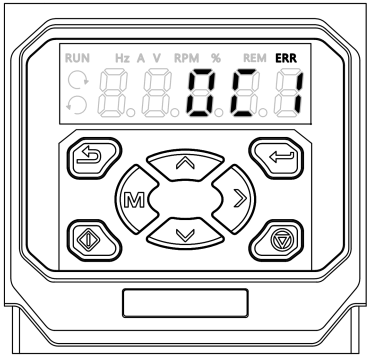
When the drive receives the valid operation command, it will start to run. The operating panel will display the running status parameters, and the RUN indicator becomes on. The on/off of forward running or reverse running indicator depends on the current running direction. As shown in Fig. 4-3b, the unit indicator indicates the unit of parameters.

You can press the "" key to view different running status parameters cyclically (defined by the function codes P16.00 and P16.01).



a: Stop status display

b: Run status display



c: Fault status display

Fig. 4-3 Stop, run and fault display

(3) Fault display status

When the drive detects a fault signal, it will immediately enter the fault display status and display the fault code, as shown in Fig. 4-3c.

You can press the "" key to view stop parameters and fault codes cyclically. Through the "" key, the control terminal or the communication command, you can reset the fault. If the fault still exists, the fault code will not disappear.

You can also choose the stop mode or choose to keep the drive running during certain fault through P97.15 to P97.19.

(4) Function code editing status

In the stop, run or fault alarm status, press the "" key, then you can enter the editing status (if any user password is required, refer to the description of P00.01). The editing status is displayed in three-level menu: function code group or

function code → function code parameter → function code parameter value, and you can press the "  " key to enter the parameter value display status. In the parameter value display status, you can press the "" key to save the parameter, or press the "  " key to exit.

4.1.2 Identification of LED display symbols

The LED display symbols correspond to the following figures/letters:

LED display	Meaning	LED display	Meaning	LED display	Meaning	LED display	Meaning
	0		A		I		S
	1		b		J		T
	2		C		L		t
	3		c		N		U
	4		d		n		V
	5		E		O		y
	6		F		o		-
	7		G		P		.
	8		H		q		
	9		h		r		

LED panel display example:

LED panel display	Unit indicator	Displayed data/code	Meaning of data/code
	Steady on	Flashing	Frequency reference
	Flashing	Steady on	Output frequency
	Steady on	Flashing	Bus voltage
	Steady on	Steady on	Bus voltage
	Steady on	Steady on	Overcurrent during acceleration

WARNING

When the drive is in the stop or standby state, the panel value is flashing; and when the drive is in the running or fault state, the panel value is steady on. To customize parameters displayed during running or stop, refer to "6.16 P16: Keypad display setting parameters".

4.1.3 Basic operations

In the below example, the stop display parameter is the set frequency and its factory setting is 50.00 Hz. The black part in the figure indicates the current editing status.

4.1.3.1 Password setting

To protect the parameters, the drive offers the password protection function. It requires a user to input the correct password before entering the function code editing status. For the manufacturer's parameter setting zone and AI/AO correction group, you need to input the correct manufacturer password.

WARNING

Do not change the manufacturer's set parameters. Improper parameter setting may cause abnormal operation or even damage to the drive.

Function code P00.01 can be used to set the user password.

Assuming that the valid user password is "1368", the drive is currently locked and no operation can be performed. You can unlock the drive by entering the user password through the following steps.

(1) Press the "PRG" key in the locked status, and then the LED will enter the password verification status 00000;

(2) Change 00000 to 01368;

(3) Press the "ENTER" key to confirm and pass the password verification, then the LED displays P00.

The above steps are shown in Fig. 4-4:

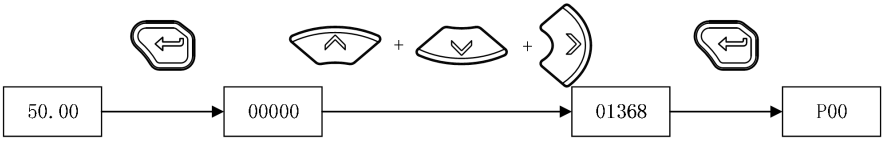


Fig. 4-4 Unlock the drive with a user password

You can conduct various operations on the drive after passing the password verification.

WARNING

If there is no key-pressing operation in 30 s after the correct user password is entered, the password protection will be triggered again to lock the drive.

4.1.3.2 Restore to factory settings

To restore the parameter values to factory settings, set P00.05 to 2.

(1) In the stop parameter display status, press the "ENTER" key to enter the first level menu P00;

(2) Press the "ENTER" key to enter the second level menu P00.00;

(3) Press the "UP" key to change P00.00 to P00.05;

(4) Press the "ENTER" key to enter the third level menu;

(5) Press the "∧" key to change 0 to 2;

(6) Press the "↵" key to confirm the change and return to the second level menu. The change is successful.

The above steps are shown in Fig. 4-5:

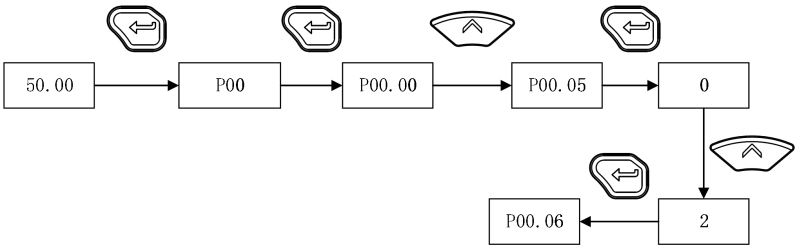


Fig. 4-5 Restore to factory settings

4.1.3.3 Set frequency

For example, set P02.09=25.00 Hz.

Example: Change the function code P02.09 from 50.00 Hz to 25.00 Hz.

(1) In the stop parameter display status, press the "↵" key to enter the first level menu P00;

(2) Press the "∧" key twice to enter the first level menu P02;

(3) Press the "↵" key to enter the second level menu P02.00;

(4) Press the "∧" key for 9 times to enter the second level menu P02.09;

(5) Press the "↵" key to enter the third level menu 50.00;

(6) Press the "≫" key to choose the thousands place and the hundreds place;

(7) Press the "∨" key to change 50.00 to 25.00;

(8) Press the "↵" key to confirm the change and return to the second level menu. The change is successful.

(9) Press the "⎋" key twice to return to the main menu displaying 25.00.

The above steps are shown in Fig. 4-6:

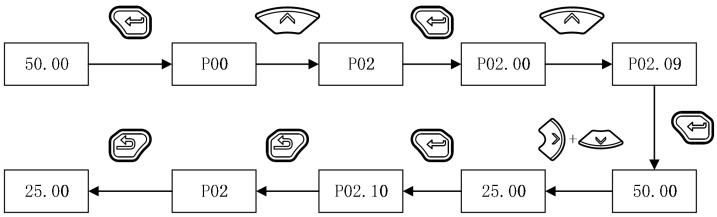


Fig. 4-6 Configure the set frequency

4.1.3.4 Monitoring status parameter display

Through the function codes P16.00, P16.01 and P16.02, you can choose the drive parameters to be displayed on the operating panel during running, such as set frequency, output frequency, bus voltage DI, DO, AI and so on (for details, refer to Group P16). Then, you can view the chosen parameters through the "" key on the operating panel.

Fig. 4-7 shows the parameter display switchover during running with P16.00=0xFF, P16.01=0xF and P16.02=4.

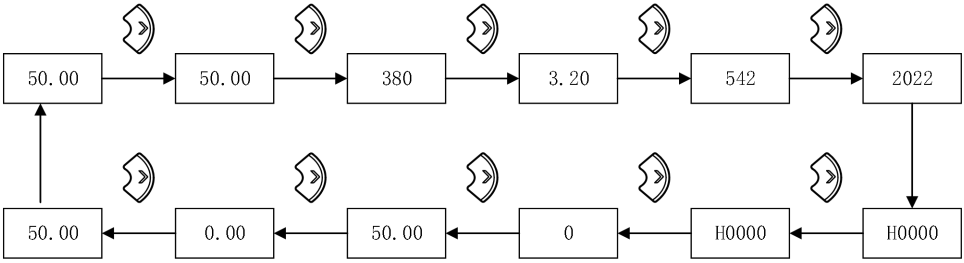


Fig. 4-7 Monitoring status parameter display

4.1.3.5 Switching status parameter display

Through the function codes P16.03 and P16.04, you can choose the drive parameters to be displayed on the operating panel during stop, such as set frequency, bus voltage DI, DO, AI and so on (for details, refer to Group P16). Then, you can view the chosen parameters through the "" key on the operating panel.

Fig. 4-8 shows the parameter display switchover during stop, with P16.03=0xFF.

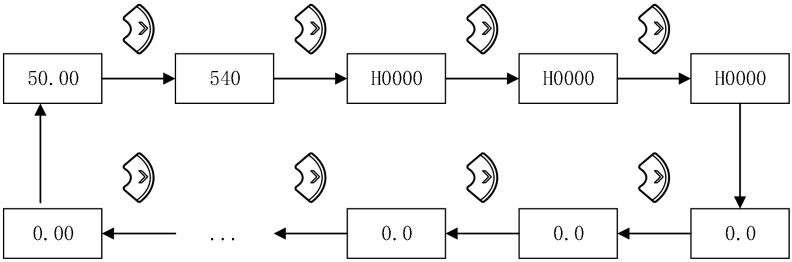


Fig. 4-8 Switching status parameter display

4.2 Quick start

4.2.1 Inspection before power-on

Conduct wiring properly according to the technical requirements mentioned in Chapter 3 Drive Wiring.

4.2.2 Initial power-on operation

When the drive passes the wiring and power supply inspection, turn on the air switch of the AC power supply at the drive input side to supply power for the drive. The operating panel will first display "- - - - -", and the contactor will be normally engaged. When the characters displayed in the digital tube change into the set frequency, the drive initialization is completed.

The initial power-on process is shown in Fig. 4-9:

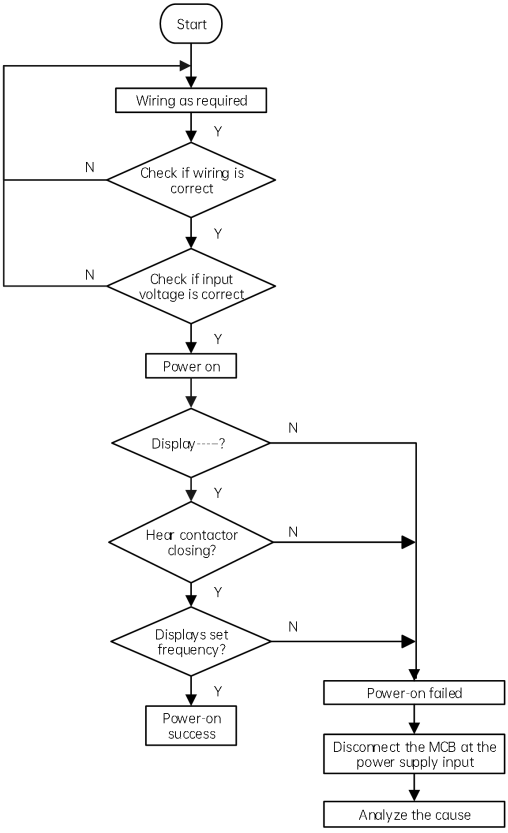


Fig. 4-9 Initial power-on process of drive

4.2.3 No-load commissioning

1. Check the drive wiring and power on after confirming it is correct.

2. Set the control mode to PG closed-loop vector by setting P02.00=3.

3. Configure the PG parameters correctly, including encoder lines and type (P04.00, P04.01).

4. After correctly setting the motor parameters (P03 group), perform motor auto-tuning (P03.27).

5. During motor auto-tuning, the motor will rotate to a certain position and then run at low speed. If the current is low and the operation is stable, the tuning is successful. If the motor keeps running or triggers a tuning fault alarm, the parameter settings are incorrect.

6. If there is an issue with the encoder, first confirm that P04.00 (Encoder PPR) is set correctly.

7. Gradually increase the frequency from 0 to the rated frequency and observe whether the motor runs smoothly or vibrates near 0 Hz. If such issues occur, adjust P05.15 and P05.16.

Note:

For parameter auto-tuning, refer to the section 7.5.

Chapter 5 Parameter List

5.1 Explanation of terms related to function codes

Table field	Explanation
Function code number	Represents the number of the function code, such as P00.00
Function code name	Represents the name of the function code, explaining its function
Value range	Represents the maximum value and minimum value of function codes
Unit	V: voltage; A: current; ℃: temperature; Ω: resistance; mH: inductance; r: revolutions; rpm: rotating speed; %: percentage; bps: baud rate; Hz, kHz: frequency; ms.s, min, h.kh: time; kW: power; /: no unit. Reference unit: The value of the input reference processed by the electronic gear ratio. Encoder unit: The smallest resolvable value input from the host device to the servo drive.
Default value	Represents the factory settings of function codes
Change	○: means the function code can be changed during running; ×: means the function code can be changed during stop; *: means the function code can be read only and can not be changed.
Related mode	Effective control mode for certain function code P: Reserved; S: Speed control; T: Torque control

5.2 Function codes of basic menu

Function code	Name	Description	Value range	Default value	Change
P00: System management parameters					
P00.00	Menu mode selection	0: Quick menu mode Only quick commissioning related parameters are displayed. 1: Full menu mode All function parameters are displayed. 2: Changed memory menu mode Only parameters that are different from factory settings are displayed.	0 to 2	1	○
P00.01	User password	0: No password Others: Password protection	0 to 65535	0	○
P00.02	Reserved				
P00.03	Parameter protection setting	0: All data can be changed. 1: Only main frequency reference digital setting P02.09 and this	0 to 2	0	○

Function code	Name	Description	Value range	Default value	Change
		function code can be changed. 2: Only this function code can be changed.			
P00.04	Selection of key functions	Ones place: Reserved Tens place: Function selection of the STOP key 0: The STOP key is valid only in the panel control channel. 1: The STOP key is valid in all control channels. Hundreds place: Function selection of multi-function M key 0: No function 1: FWD JOG 2: REV JOG 3: FWD and REV switchover 4: Command channel switchover (cyclic) Thousands place: Reserved	0 to 0x0410	0	○
P00.05	Parameter initialization	0: Parameters rewritable 1: Clear fault records 2: Restore to factory settings 3: Restore some parameters to factory settings (motor parameters not restored)	0 to 3	0	×
P00.06	Power board upgrading command	0: Disabled 1: Enabled	0 to 1	0	×
P00.07	Parameter copy	0: No operation 1: Drive's parameters uploaded to the keypad 2: Keypad's parameters downloaded to the drive (all) 3: Keypad's parameters downloaded to the drive (excluding motor parameters) 4: Keypad's parameters downloaded to the drive (only motor parameters)	0 to 4	0	×
P01: Status display parameters					
P01.00	Main frequency	Refers to P02.05	0 to 8	0	*

Function code	Name	Description	Value range	Default value	Change
	channel				
P01.01	Main frequency reference	Displays the main frequency reference.	0.00 to P02.10	0	*
P01.02	Auxiliary frequency reference	Displays the auxiliary frequency reference.	0.00 to P02.10	0	*
P01.03	Frequency reference	Displays the frequency reference after frequency source calculation.	0.00 to P02.10	0	*
P01.04	Ramp frequency reference	Displays the ramp frequency reference.	0.00 to P02.10	0	*
P01.05	Output frequency	Displays the actual output frequency.	0.00 to P02.10	0	*
P01.06	Output voltage	Displays the output voltage.	0 to 65535 V	0	*
P01.07	Output current	Displays the output current.	0.0 to 6553.5 A	0	*
P01.08	Torque current	Displays the drive's current torque current as a percentage of the motor's rated current.	-300.0 to 300.0%	0	*
P01.09	Exciting current	Displays the drive's current exciting current as a percentage of the motor's rated current.	-300.0 to 300.0%	0	*
P01.10	Keypad version No.	0.00 to 2.55	0.00 to 2.55	0	*
P01.11	Motor power	Displays the drive's output power as a percentage of the motor's rated power.	-300.0 to 300.0%	0	*
P01.12	Estimated frequency of motor	Estimated rotor frequency under the open-loop vector conditions	0.00 to P02.10	0	*
P01.13	Measured frequency of motor	Displays the actual output frequency of the motor.	-P02.10 to P02.10	0	*
P01.14	Accumulated power consumption H of the drive	0 to 65535 kWh	0 to 65535 kWh	0	*
P01.15	Accumulated power consumption L of the drive	0 to 3600 After accumulation of 3600 times, 1 kWh is additionally added to P01.14	0 to 3600	0	*
P01.16	Bus voltage	Displays the bus voltage.	0.0 to 6553.5 V	0	*
P01.17	Operation status of the drive	Bit0: 0: Stop; 1: Run Bit1: 0: FWD: 1: REV Bit2: Zero speed running Bit3: Accelerating Bit4: Decelerating	0 to 0xFFFF	0	*

Function code	Name	Description	Value range	Default value	Change
		Bit5: Running at constant speed Bit6: Pre-excitating Bit7: Tuning Bit8: Overcurrent limiting Bit9: Bus overvoltage limiting Bit10: Torque limiting Bit11: Speed reached (speed mode)/ Speed limited (torque mode) Bit12: Drive in fault Bit13: Speed control Bit14: Torque control Bit15: Reserved			
P01.18	DI1 to DI4 state	0: Invalid 1: Valid	0 to 0x1111	0	*
P01.19	DI5 state	0: Invalid 1: Valid	0 to 0x1	0	*
P01.20	DO state	0: Invalid 1: Valid	0 to 0x1011	0	*
P01.21	AI1 input voltage	Displays the AI1 input voltage.	-10.00 to 10.00 V	0	*
P01.22	AI2 input voltage	Displays the AI2 input voltage.	-10.00 to 10.00 V	0	*
P01.23	AI1 input current	Displays the AI1 input current.	0.00 to 20.00 mA	0	*
P01.24	AI3 input voltage	Displays the AI3 input voltage.	-10.00 to 10.00 V	0	*
P01.25	AI4 input voltage	Displays the AI4 input voltage.	-10.00 to 10.00 V	0	*
P01.26	Reserved				
P01.27	Reserved				
P01.28	Reserved				
P01.29	Pressure reference	0.0 to 400.0	0.0 to 400.0	0	*
P01.30	Pressure feedback	0.0 to 400.0	0.0 to 400.0	0	*
P01.31	PID deviation	-100.0% to 100.0%	-100.0% to 100.0%	0	*
P01.32	PID output	-100.0% to 100.0%	-100.0% to 100.0%	0	*
P01.33	PID proportional output	-100.0% to 100.0%	-100.0% to 100.0%	0	*
P01.34	PID integral output	-100.0% to 100.0%	-100.0% to 100.0%	0	*
P01.35	PID derivative output	-100.0% to 100.0%	-100.0% to 100.0%	0	*
P01.36	Current AD of AI1	0 to 4095	0 to 4095	0	*
P01.37	Current AD of AI2	0 to 4095	0 to 4095	0	*
P01.38	Current AD of motor temperature	0 to 4095	0 to 4095	0	*
P01.39	Motor temperature	-40 to 200℃	-40 to 200℃	0	*

Function code	Name	Description	Value range	Default value	Change
P01.40	Encoder count value	0 to 65535	0 to 65535	0	*
P01.41	Speed loop output	-300.0% to 300.0%	-300.0% to 300.0%	0	*
P01.42	Torque reference	Displays the drive's current torque reference as a percentage of the motor's rated current.	-300.0% to 300.0%	0	*
P01.43	Rotation speed of motor	Displays the rotation speed of the motor.	0 to 65535 rpm	0	*
P01.44	Line speed	Displays the line speed of the motor.	0 to 65535 m/min	0	*
P01.45	Output power	Displays the output power of the drive.	0.0 to 6553.5 kW	0	*
P01.46	Inverter bridge temperature	-40.0 to 150.0℃	-40.0 to 150.0℃	0	*
P01.47	Accumulated running duration of the drive (min)	0 to 65535 min	0 to 65535 min	0	*
P01.48	Accumulated running duration of the drive (h)	0 to 65535 h	0 to 65535 h	0	*
P01.49	Current running duration of the drive (min)	0 to 65535 min	0 to 65535 min	0	*
P01.50	Accumulated running duration of the fan	0 to 65535 h	0 to 65535 h	0	*
P01.51	Reserved				
P01.52	Reserved				
P01.53	Reserved				
P01.54	Reserved				
P01.55	Reserved				
P01.56	Reserved				
P01.57	User-defined frequency display	0.00 to P02.10 (the keypad does not display unit)	0.00 to P02.10	0	*
P02: Basic function parameters					
P02.00	Control mode selection	0: SVC1 1: SVC2 (only for asynchronous motors) 2: V/F control (only for asynchronous motors) 3: FVC	0 to 3	2	×
P02.01	Motor selection	0: Motor 1	0 to 1	0	×

Function code	Name	Description	Value range	Default value	Change
		1: Motor 2			
P02.02	Operation command channel selection	0: Keypad control 1: Terminal control 2: Communication control	0 to 2	0	×
P02.03	Communication command channel selection	0: Modbus 1 and 2: Reserved 3: CANopen	0 to 3	0	×
P02.04	Running direction	0: Same direction 1: Opposite direction	0 to 1	0	○
P02.05	Main frequency source selection	0: Digital setting P02.09 1: AI1 2: AI2 3: Reserved 4: Reserved 5: Reserved 6: PID control 7: Modbus 8: CAN communication	0 to 8	0	×
P02.06	Auxiliary frequency source selection	0: Digital setting P02.09 1: AI1 2: AI2 3: Reserved 4: Reserved 5: Reserved 6: PID control 7: Modbus 8: CAN communication	0 to 8	4	×
P02.07	Auxiliary frequency reference range	0: Maximum output frequency 1: Main frequency reference	0 to 1	0	×
P02.08	Frequency reference source calculation	0: Main frequency 1: Auxiliary frequency 2: Main + Auxiliary 3: Main - Auxiliary 4: Max (main reference, auxiliary reference) 5: Min (main reference, auxiliary reference)	0 to 5	0	×
P02.09	Frequency digital setting	0.00 Hz to P02.11	0.00 Hz to P02.11	50.00 Hz	○

Function code	Name	Description	Value range	Default value	Change
P02.10	Maximum output frequency	P02.11 to 599.00 Hz Note: The maximum frequency is at least 50.00 Hz	P02.11 to 599.00 Hz	50.00 Hz	×
P02.11	Upper limit frequency	P02.12 to P02.10	P02.12 to P02.10	50.00 Hz	×
P02.12	Lower limit frequency	0.00 Hz to P02.11	0.00 Hz to P02.11	0.00 Hz	×
P02.13	Acceleration time 1	0.0 to 6000.0 s Note: after being restored to default values, the system will do auto matching based on the actual model (applicable for acceleration/deceleration time 1, 2, 3 and 4) 5.5 kW and below: 10 s 5.5 to 30 kW (included): 20 s Above 30 kW: 40 s	0.0 to 6000.0 s	Model dependent	○
P02.14	Deceleration time 1	0.0 to 6000.0 s	0.0 to 6000.0 s	Model dependent	○
P02.15	Reserved				
P02.16	Carrier frequency	2.0 to 12.0 kHz	2.0 to 12.0 kHz	4.0 kHz	○
P02.17	User-customized parameter	0: No function 1: Customer 1	0 to 1	0	×
P03: Motor 1 parameters					
P03.00	Motor type selection	0: Asynchronous motor 1: Synchronous motor	0 to 1	0	×
P03.01	Asynchronous motor rated power	0.1 to 3000.0 kW	0.1 to 3000.0 kW	Model dependent	×
P03.02	Asynchronous motor rated voltage	0 to 1200 V	0 to 1200 V	Model dependent	×
P03.03	Asynchronous motor rated current	0.8 to 6000.0 A	0.8 to 6000.0 A	Model dependent	×
P03.04	Asynchronous motor rated frequency	0.01 Hz to P02.10	0.01 Hz to P02.10	50.00 Hz	×
P03.05	Asynchronous motor rated speed	1 to 36000 rpm	1 to 36000 rpm	Model dependent	×
P03.06	Asynchronous motor stator resistance	0.001 to 65.535 Ω	0.001 to 65.535 Ω	Model dependent	×
P03.07	Asynchronous motor rotor resistance	0.001 to 65.535 Ω	0.001 to 65.535 Ω	Model dependent	×
P03.08	Asynchronous motor	0.01 mH to 655.35 mH (drive power	Model dependent	Model	×

Function code	Name	Description	Value range	Default value	Change
	leakage inductance	≤ 55 kW) 0.001 mH to 65.535 mH (drive power > 55 kW)		dependent	
P03.09	Asynchronous motor mutual inductance	0.1 mH to 6553.5 mH (drive power ≤ 55 kW) 0.01 mH to 655.35 mH (drive power > 55 kW)	Model dependent	Model dependent	×
P03.10	Asynchronous motor no-load current	0.1 to 6553.5 A	0.1 to 6553.5A	Model dependent	×
P03.11	Asynchronous motor iron core magnetic saturation coefficient 1	0.0 to 100.0%	0.0 to 100.0%	80.0%	×
P03.12	Asynchronous motor iron core magnetic saturation coefficient 2	0.0 to 100.0%	0.0 to 100.0%	68.0%	×
P03.13	Asynchronous motor iron core magnetic saturation coefficient 3	0.0 to 100.0%	0.0 to 100.0%	57.0%	×
P03.14	Asynchronous motor iron core magnetic saturation coefficient 4	0.0 to 100.0%	0.0 to 100.0%	40.0%	×
P03.15	Synchronous motor rated power	0.1 to 3000.0 kW	0.1 to 3000.0 kW	Model dependent	×
P03.16	Synchronous motor rated voltage	0 to 1200 V	0 to 1200 V	Model dependent	×
P03.17	Synchronous motor rated current	0.8 to 6553.5 A	0.8 to 6553.5 A	Model dependent	×
P03.18	Synchronous motor rated frequency	0.01 Hz to P02.10	0.01 Hz to P02.10	Model dependent	×
P03.19	Number of synchronous motor pole pairs	1 to 128	1 to 128	2	×
P03.20	Synchronous motor stator resistance	0.001 to 65.535 Ω (drive power ≤ 55 kW) 0.0001 to 6.5535 Ω (drive power >	Model dependent	Model dependent	×

Function code	Name	Description	Value range	Default value	Change
		55 kW)			
P03.21	Synchronous motor d-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power > 55 kW)	Model dependent	Model dependent	×
P03.22	Synchronous motor q-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power > 55 kW)	Model dependent	Model dependent	×
P03.23	Synchronous motor back EMF	0.0 to 6553.5 V	0.0 to 6553.5 V	Model dependent	×
P03.24	Reserved				
P03.25	Reserved				
P03.26	Reserved				
P03.27	Motor auto-tuning	0: No operation 1: Part parameter auto-tuning in the static status 2: Full parameter auto-tuning in the rotating status 3: Full parameter auto-tuning in the static status	0 to 3	0	×
P03.28	Motor overload protection factor	0.0 to 300.0%	0.0 to 300.0%	100.0%	×
P03.29	Motor overload protection enable	0: Disabled 1: Enabled	0 to 1	1	×
P04: Motor 1 encoder parameters					
P04.00	Encoder PPR	1 to 65535	1 to 65535	1024	×
P04.01	Encoder type	2: Resolver		2	×
P04.02	Reserved				
P04.03	Reserved				
P04.04	PG card voltage class selection	0: 5 V 1: 12 V	0 to 1	0	×
P04.05	Reserved				
P04.06	Reserved				
P04.07	Initial installation angle of motor 1 encoder	0.0 to 360.0	0.0 to 360.0	0.1	×
P04.08 to	Reserved				*

Function code	Name	Description	Value range	Default value	Change
P04.22					
P04.23	Synchronous open-loop Q-axis correction coefficient	0 to 100	0 to 100	40	○
P04.24	Synchronous open-loop D-axis correction coefficient	0 to 100	0 to 100	30	○
P04.25	Synchronous open-loop speed filter coefficient	0 to 1000	0 to 1000	100	○
P04.26	Synchronous open-loop D-axis injection current	0% to 100%	0 to 100	10	○
P04.27	Synchronous open-loop low-frequency carrier frequency	1.0 to 6.0	1.0 to 6.0	4.0	○
P04.28	Speed tracking Kp adjustment	10 to 1000	10 to 1000	10	○
P04.29	Speed tracking Ki adjustment	10 to 1000	10 to 1000	10	○
P04.30	Speed tracking target current	30% to 200%	30% to 200%	100%	○
P05: Motor 1 vector control parameters					
P05.00	Speed loop proportional gain 1	1 to 100	1 to 100	10	○
P05.01	Speed loop integral time 1	0.01 to 10.00 s	0.01 to 10.00 s	0.50 s	○
P05.02	Switchover frequency 1	0.00 Hz to P02.11	0.00 Hz to P02.11	5.00 Hz	○
P05.03	Speed loop proportional gain 2	1 to 100	1 to 100	10	○
P05.04	Speed loop integral time 2	0.01 to 10.00 s	0.01 to 10.00 s	1.00 s	○
P05.05	Switchover frequency 2	0.00 Hz to P02.11	0.00 Hz to P02.11	10.00 Hz	○
P05.06	Slip compensation coefficient	50 to 200%	50 to 200%	100%	○
P05.07	Speed loop filter time	0.00 to 20.00 s	0.00 to 20.00 s	0.02 s	○

Function code	Name	Description	Value range	Default value	Change
	constant				
P05.08	Vector control overexcitation gain	50 to 200%	50 to 200%	100%	○
P05.09	Drive torque upper limit source	0: Digital setting (P05.10) 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P05.10	Drive torque upper limit digital setting	0.0 to 300.0%	0.0 to 300.0%	150.0%	○
P05.11	Braking torque upper limit source	0: Digital setting (P05.12) 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P05.12	Braking torque upper limit digital setting	0.0 to 300.0%	0.0 to 300.0%	150.0%	○
P05.13	Excitation regulation Kp	0 to 60000	0 to 60000	2000	○
P05.14	Excitation regulation Ki	0 to 60000	0 to 60000	1300	○
P05.15	Torque regulation Kp	0 to 60000	0 to 60000	2000	○
P05.16	Torque regulation Ki	0 to 60000	0 to 60000	1300	○
P05.17	Integral separation	0: Disabled 1: Enabled	0 to 1	0	○
P05.18	Synchronous motor field weakening coefficient	0 to 100	0 to 100	5	○
P05.19	Maximum field weakening current	0.0 to 120.0%	0.0 to 120.0%	100.0%	○
P05.20	Field weakening auto-tuning coefficient	0.0 to 120.0%	0.0 to 120.0%	100.0%	○
P05.21	Field weakening integral multiple	0.000 to 1.200	0.000 to 1.200	0	○
P06: Motor 1 torque control parameters					
P06.00	Torque control	0: Disabled	0 to 1	0	○

Function code	Name	Description	Value range	Default value	Change
	enable	1: Enabled			
P06.01	Torque reference channel	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P06.02	Torque digital setting	-300.0 to 300.0% (rated current of the motor)	-300.0 to 300.0%	0.0%	○
P06.03	Torque reference acceleration/ deceleration time	0.0 to 6000.0 s	0.0 to 6000.0 s	6.0 s	○
P06.04	FWD speed limit channel	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P06.05	FWD speed limit digital setting	0.00 Hz to P02.11	0.00 Hz to P02.11	0.00 Hz	○
P06.06	REV speed limit channel	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P06.07	REV speed limit digital setting	0.00 Hz to P02.11	0.00 Hz to P02.11	0.00 Hz	○
P06.08	Inductance auto-tuning current	0 to 100	0 to 100	80	○
P06.09	Pole position auto-tuning current	0 to 150	0 to 150	120	○
P06.10	Reserved				
P06.11	Reserved				
P07: Motor 1 V/F control parameters					
P07.00	V/F curve	0: Straight-line V/F 1: Multi-point V/F 2: Square V/F 3: Reserved	0 to 5	0	×

Function code	Name	Description	Value range	Default value	Change
		4: V/F complete separation 5: V/F half separation			
P07.01	Torque boost	0.0 to 50.0	0.0 to 50.0	Model dependent	○
P07.02	Cut-off frequency of torque boost	0.00 Hz to P02.11	0.00 Hz to P02.11	50.00 Hz	×
P07.03	Multi-point V/F frequency 1	0.00 Hz to P07.05	0.00 Hz to P07.05	0.00 Hz	×
P07.04	Multi-point V/F voltage 1	0 V to P07.06	0 V to P07.06	0V	×
P07.05	Multi-point V/F frequency 2	P07.03 to P07.07	P07.03 to P07.07	0.00 Hz	×
P07.06	Multi-point V/F voltage 2	P07.04 to P07.08	P07.04 to P07.08	0V	×
P07.07	Multi-point V/F frequency 3	P07.05 to 599.00 Hz	P07.05 to 599.00 Hz	0.00 Hz	×
P07.08	Multi-point V/F voltage 3	P07.06 to 380 V	P07.06 to 380 V	0 V	×
P07.09	Torque compensation coefficient	0 to 300	0 to 300	150	○
P07.10	V/F overexcitation gain	0 to 200	0 to 200	80	×
P07.11	Oscillation suppression gain	0 to 100	0 to 100	40	○
P07.12	Oscillation suppression gain mode	0 to 2	0 to 2	0	×
P07.13	Voltage source for V/F separation	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Reserved 5: Reserved 6: Reserved 7: PID 8: Modbus 9: Reserved	0 to 9	0	○
P07.14	Digital setting of	0 to 1000 V	0 to 1000 V	0 V	○

Function code	Name	Description	Value range	Default value	Change
	voltage source for V/F separation				
P07.15	Voltage rise time of V/F separation	0.0 to 6000.0 s	0.0 to 6000.0 s	5.0 s	○
P07.16	Voltage fall time of V/F separation	0.0 to 6000.0 s	0.0 to 6000.0 s	5.0 s	○
P07.17	Stop mode for V/F separation	0: Frequency and voltage decline to 0 independently 1: Frequency declines after voltage declines to 0	0 to 1	0	○
P07.18	Reserved				
P07.19	Reserved				
P08: Startup/Stop control parameters					
P08.00	Startup mode	0: Startup from the startup frequency 1: Startup after speed tracking 2: Startup after DC braking	0 to 2	0	×
P08.01	Startup delay time	The device responds to the operation commands after the delay time. During the delay, the device is in standby.	0.0 to 600.0 s	0.0	×
P08.02	Startup frequency	0.00 to 50.00 Hz	0.00 to 50.00 Hz	0.00	×
P08.03	Startup frequency hold time	0.0 to 50.0 s	0.0 to 50.0 s	0.0	×
P08.04	Braking current at startup	0.0 to 100.0%	0.0 to 100.0%	0.0%	×
P08.05	Braking time at startup	0.00 (disabled) 0.00 to 50.00 s	0.00 to 50.00 s	0.00	×
P08.06	Stop mode	0: Decelerate to stop 1: Coast to stop 2: Emergency stop	0 to 2	0	○
P08.07	Stop frequency	0.00 to 3.00 Hz	0.00 to 3.00 Hz	0.50	×
P08.08	Stop frequency hold time	0.0 to 600.0 s	0.0 to 600.0 s	0.0	○
P08.09	Stop frequency detection mode	0: Speed reference (for V/F control, only this mode is available) 1: Speed detection value	0 to 1	0	×
P08.10	Stop frequency detection time	After the P08.08 delay, stop frequency detection starts. During	0.00 to 100.00 s	0.50	×

Function code	Name	Description	Value range	Default value	Change
		the time defined by P08.10, if P08.09=0, the drive will immediately stop when the ramp reference frequency is equal to or lower than P08.07; if P08.09=1, the drive will stop only when the actual frequency is equal to or lower than P08.07. If no stop frequency is detected after P08.10, the drive will directly stop.			
P08.11	Start frequency of braking at stop	0.00 to P02.10 (maximum frequency)	0.00 to P02.10 (maximum frequency)	0.00	○
P08.12	Braking delay at stop	0.00 to 30.00 s	0.00 to 30.00 s	0.00	○
P08.13	DC braking current at stop	0.0 to 150.0%	0.0 to 150.0%	0.0%	○
P08.14	DC braking time at stop	0: Disable DC braking at stop 6553.5: Always keep DC braking at stop	0.0 to 6553.5 s	0.0	○
P08.15	Speed tracking mode	0: From the stop frequency 1: From the maximum frequency Note: only for asynchronous motors	0 to 1	0	×
P08.16	Speed of speed tracking	The larger the parameter is, the faster the tracking speed will be. However, too large parameter may cause the tracking unreliable.	1 to 100	20	○
P08.17	Speed tracking current	Ensure the maximum current during speed tracking is within the range. Too small current may cause bad speed tracking.	10 to 200%	Model dependent	×
P08.18	Output upon vector 0 Hz	0: Enable voltage output 1: No voltage output 2: Output according to the DC braking current at stop 3: Zero servo running	0 to 3	0	○
P08.19	Running mode when below frequency lower limit	0: Running at frequency lower limit 1: Decelerate to stop 2: Hibernation When the frequency reference is below the frequency lower limit, the drive coasts to stop; and when the	0 to 2	0	×

Function code	Name	Description	Value range	Default value	Change
		frequency reference is once above the frequency lower limit and running duration exceeds the time set by P08.20, the drive automatically resumes operation.			
P08.20	Recovery delay from hibernation	0.0 to 3600.0 s	0.0 to 3600.0 s	0.0	○
P08.21 to P08.24	Reserved				
P08.25	Restart selection upon power failure	0: Disabled 1: Enabled	0 to 1	0	○
P08.26	Waiting time for restart upon power failure	0.0 to 3600.0 s	0.0 to 3600.0 s	1.0	○
P08.27	Reverse running inhibition	0: Disabled 1: Enabled	0 to 1	0	○
P08.28	FWD/REV switchover deadzone time	0.0 to 3600.0 s	0.0 to 3600.0 s	0.0	○
P08.29	FWD/REV switchover mode	0: Switchover after the zero frequency 1: Switchover after the startup frequency 2: Switchover after the delay subsequent to the stop frequency	0 to 2	0	×
P08.30	Reserved				
P08.31	Dynamic braking usage ratio	0 to 100%	0 to 100%	100%	○
P08.32	Braking startup voltage	500 to 800 V	500 to 800V	680 V	○
P08.33	Deceleration time for emergency stop	0.0 to 60.0 s	0.0 to 60.0 s	2.0	○
P08.34	Terminal running protection	0: Enable protection 1: Disable protection It decides, after a power-on or fault reset, whether the terminals need to be enabled again before drive operation. Note: If you disable protection, the	0 to 1	0	×

Function code	Name	Description	Value range	Default value	Change
		terminal command will be immediately responded after fault reset.			
P08.35	Reserved				
P09: Terminal input parameters					
P09.00	Function selection of terminal 9	Ones: Reserved Tens: 0: Terminal 9 as DI2 1: Terminal 9 as DO1 Hundreds: Reserved Thousands: Reserved	0 to 0x11	0	○
P09.01	DO1 polarity selection	Ones: 0: DO1 as 0 V output 1: DO1 as 24 V output Tens: Reserved Hundreds: Reserved Thousands: Reserved	0 to 0x01	0	○
P09.02	Function selection of terminal 4	Ones: 0: Terminal 4 as AI1 voltage input 1: Terminal 4 as AI1 current input Tens: Reserved Hundreds: Reserved Thousands: Reserved	0 to 0x01	0	○
P09.03	DI1 function selection	0: No function 1: Forward RUN 2: Reverse RUN 3: Forward jog 4: Reverse jog 5: Three-wire control 6: Reserved 7: Reserved 8: Reserved 9: Reserved 10: Acceleration/Deceleration time terminal 1 11: Acceleration/Deceleration time terminal 2 12: Frequency up/down setting clear (Terminal)	0 to 72	1	○
P09.04	DI2 function selection		0 to 72	22	○
P09.05	DI3 function selection		0 to 72	0	○
P09.06	DI4 function selection		0 to 72	0	○
P09.07	DI5 function selection		0 to 72	0	○
P09.08	Reserved		0 to 72	0	○
P09.09	Reserved		0 to 72	0	○
P09.10	Reserved		0 to 72	0	○

Function code	Name	Description	Value range	Default value	Change
		13: Frequency up/down setting clear (Terminal+Keypad) 14: Frequency increase command (UP) 15: Frequency decrease command (DN) 16: External fault NO input 17: External fault NC input 18: Switched from pressure mode to speed mode 19: Master/Slave pump mode switchover 20: Frequency reference source switchover from A to B 21: Frequency reference source switchover from combination to A 22: External reset (RESET) input 23: Coast to stop input (FRS) 24: Acceleration/Deceleration inhibition 25: DC braking input at stop 26: Reserved 27: Frequency reference source switchover from combination to B 28: Reserved 29: Reserved 30: Reserved 31: Reserved 32: Reserved 33: Reserved 34: Main reference frequency source selection 1 35: Main reference frequency source selection 2 36: Main reference frequency source selection 3 37: Reserved 38: Command channel switched to keypad 39: Command channel switched to			

Function code	Name	Description	Value range	Default value	Change
		terminal 40: Command channel switched to communication 41: Reserved 42: REV inhibition 43: Drive running inhibition 44: External stop command (it is valid for all control modes, and the device will be stopped according to the current stop mode) 45: Auxiliary reference frequency clear 46: Reserved 47: Speed control and torque control switchover terminal 48: Torque direction switchover terminal in torque control 49: Reserved 50: Reserved 51: Reserved 52: Reserved 53: Reserved 54: Reserved 55: Motor 1 and 2 switchover terminal 56: Safety terminal input (reserved) 57 to 59: Reserved 60: Emergency stop 61: Reserved 62: Reserved 63: Reserved 64: Reserved 65: Power consumption clear 66: Power consumption hold 67: Reserved 68: Reserved 69: Switched to V/F control 70: Switched to FVC control 71: Reserved 72: Reserved			

Function code	Name	Description	Value range	Default value	Change
P09.11	Terminal open-circuit voltage	0: Digital terminal open-circuit voltage 0 V 1: Digital terminal open-circuit voltage 24 V Note: The DI terminal is low level active by default. To make it high level active, you need to set P02.02 to 0 first, then set P09.11 to 0. In addition, the polarity of corresponding terminal should also be reversed by P09.12 and P09.13 (terminal jogging is not controlled by P02.02, so you need to disable the jogging function before changing P09.11).	0 to 1	1	○
P09.12	DI1 to DI4 active mode	Ones: 0: DI1 positive logic active 1: DI1 negative logic active Tens: 0: DI2 positive logic active 1: DI2 negative logic active Hundreds: 0: DI3 positive logic active 1: DI3 negative logic active Thousands: 0: DI4 positive logic active 1: DI4 negative logic active	0 to 0×1111	0	○
P09.13	DI5 active mode	Ones: 0: DI5 positive logic active 1: DI5 negative logic active Tens: Reserved Hundreds: Reserved Thousands: Reserved	0 to 0×01	0	○
P09.14	Reserved		0 to 3	0	○
P09.15	DI filter time	Used to set the filter time for DI terminal sampling. It is recommended to increase the parameter when there is strong interference to avoid misoperation.	0.000 to 1.000	0.010 s	○
P09.16	VDI active state	Bit0: VDI1	0 to 0x1F	0	×

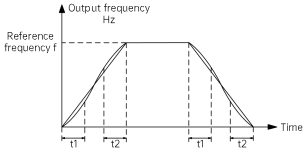
Function code	Name	Description	Value range	Default value	Change
		Bit1: VDI2 Bit2: VDI3 Bit3: VDI4 Bit4: VDI5			
P09.17	DI1 switch-on delay time	Used to set the delay time for level jump upon switch-on/off of digital input terminals. Value range: 0.0 to 600.0 s	0.0 to 600.0	0.0 s	○
P09.18	DI1 switch-off delay time		0.0 to 600.0	0.0 s	○
P09.19	DI2 switch-on delay time		0.0 to 600.0	0.0 s	○
P09.20	DI2 switch-off delay time		0.0 to 600.0	0.0 s	○
P09.21	DI3 switch-on delay time		0.0 to 600.0	0.0 s	○
P09.22	DI3 switch-off delay time		0.0 to 600.0	0.0 s	○
P09.23	DI4 switch-on delay time		0.0 to 600.0	0.0 s	○
P09.24	DI4 switch-off delay time		0.0 to 600.0	0.0 s	○
P09.25	AI1 lower limit	-10.00 V to P09.27	-10.00 V to P09.27	0.00 V	○
P09.26	Percentage corresponding to AI1 lower limit	-100.0% to 100.0%	-100.0% to 100.0%	0.0%	○
P09.27	AI1 upper limit	P09.25 to 10.00 V	P09.25 to 10.00 V	10.00 V	○
P09.28	Percentage corresponding to AI1 upper limit	-100.0% to 100.0%	-100.0% to 100.0%	100.0%	○
P09.29	AI1 filter time	0.000 to 10.000 s	0.000 to 10.000 s	0.030 s	○
P09.30	AI2 lower limit	-10.00 V to P09.32	-10.00 V to P09.32	0.00 V	○
P09.31	Percentage corresponding to AI2 lower limit	-100.0 to 100.0%	-100.0 to 100.0%	0.0%	○
P09.32	AI2 upper limit	P09.30 to 10.00 V	P09.30 to 10.00 V	10.00 V	○
P09.33	Percentage corresponding to AI2 upper limit	-100.0 to 100.0%	-100.0 to 100.0%	100.0%	○
P09.34	AI2 filter time	0.000 to 10.000 s	0.000 to 10.000 s	0.030 s	○
P09.35	AI3 lower limit	-10.00 V to P09.37	-10.00 V to P09.37	0.00 V	○

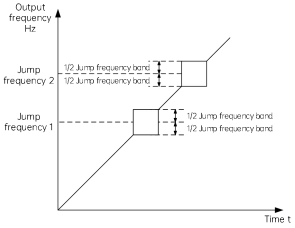
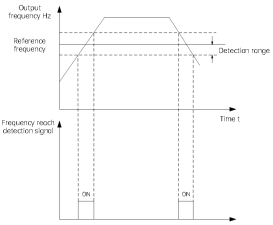
Function code	Name	Description	Value range	Default value	Change
P09.36	Percentage corresponding to AI3 lower limit	-100.0 to 100.0%	-100.0 to 100.0%	0.0%	○
P09.37	AI3 upper limit	P09.35 to 10.00 V	P09.35 to 10.00 V	10.00 V	○
P09.38	Percentage corresponding to AI3 upper limit	-100.0 to 100.0%	-100.0 to 100.0%	100.0%	○
P09.39	AI3 filter time	0.000 to 10.000 s	0.000 to 10.000 s	0.030 s	○
P09.40	AI4 lower limit	-10.00 V to P09.42	-10.00 V to P09.42	0.00 V	○
P09.41	Percentage corresponding to AI4 lower limit	-100.0 to 100.0%	-100.0 to 100.0%	0.0%	○
P09.42	AI4 upper limit	P09.40 to 10.00 V	P09.40 to 10.00 V	10.00 V	○
P09.43	Percentage corresponding to AI4 upper limit	-100.0 to 100.0%	-100.0 to 100.0%	100.0%	○
P10: Terminal output parameters					
P10.00	DO1 function selection	0: Disabled 1: Drive in running 2: Forward running 3: Reverse running 4: Frequency reach signal (FAR) 5: Frequency-level detection signal (FDT1) 6: Frequency-level detection signal (FDT2) 7: Overload detection signal (OL) (reserved) 8: Lockout for undervoltage (LU) 9: External fault stop (EXT) 10: Frequency upper limit (FHL) 11: Frequency lower limit (FLL) 12: Zero-speed running 13: Reserved 14: Reserved 15: Current running duration reach 16: Accumulated running duration reach 17: Drive ready to run (RDY)	0 to 47	1	○
P10.01	DO2 function selection		0 to 47	4	○
P10.02	Reserved				
P10.03	Relay RO1 output selection		0 to 47	18	○

Function code	Name	Description	Value range	Default value	Change
		18: Drive fault 19: Host device on/off signal 20: Motor overheat 21: Torque limiting Valid when torque command is limited by the torque limit value 1 or 2. 22: Motor overload warning 23 to 25: Reserved 26: Reserved 27: Reserved 28: Reserved 29: Reserved 30: Reserved 31: Reserved 32 to 37: Reserved 38: Motor 1 and 2 indication terminal 39: Reserved 40 to 45: Reserved 46: Reserved 47: Reserved			
P10.04	Output terminal polarity selection	Ones: 0: DO1 positive logic active 1: DO1 negative logic active Tens: 0: DO2 positive logic active 1: DO2 negative logic active Hundreds: Reserved Thousands: 0: RO1 positive logic active 1: RO1 negative logic active	0 to 0x1011	0	○
P10.05	DO1 switch-on delay time	Used to set the delay time for level jump upon switch-on/off of output terminals. Value range: 0.0 to 600.0 s	0.0 to 600.0	0.0 s	○
P10.06	DO1 switch-off delay time		0.0 to 600.0	0.0 s	○
P10.07	DO2 switch-on delay time		0.0 to 600.0	0.0 s	○
P10.08	DO2 switch-off delay time		0.0 to 600.0	0.0 s	○
P10.09	Reserved		0.0 to 600.0	0.0 s	○

Function code	Name	Description	Value range	Default value	Change
P10.10	Reserved		0.0 to 600.0	0.0 s	○
P10.11	RO1 switch-on delay time		0.0 to 600.0	0.0 s	○
P10.12	RO1 switch-off delay time		0.0 to 600.0	0.0 s	○
P10.13	AO1 function	0: Output frequency (0 to maximum frequency)	0 to 28	0	○
P10.14	AO2 function		0 to 28	0	○
P10.15	Reserved	1: Frequency reference (0 to maximum frequency) 2: Frequency reference (after acceleration/deceleration) (0 to maximum frequency) 3: Motor speed (0 to maximum speed) 4: Output current (0 to 2*Iei) 5: Output current (0 to 2*Iem) 6: Torque current (0 to 3*Iem) 7: Reserved 8: Output voltage (0 to 1.2*Ve) 9: Bus voltage (0 to 800 V) 10: AI1 after correction 11: AI2 after correction 12: Reserved 13: Output power (0 to 2*Pe) 14: Host device percentage (0 to 100.0%) 15: Torque limit value 1 (0.0 to 300.0%) 16: Torque limit value 2 (0.0 to 300.0%) 17 to 25: Reserved 26: Reserved 27: Reserved 28: Exciting current (0.0 to 100.0%)	0 to 28	0	○
P10.16	AO1 output lower limit	0.00% to P10.18	0.00% to P10.18	0.00%	○
P10.17	Voltage corresponding to AO1 output lower limit	0.00 to 10.00 V	0.00 to 10.00	0.00 V	○
P10.18	AO1 output upper	P10.16 to 100.00%	P10.16 to 100.00%	100.00%	○

Function code	Name	Description	Value range	Default value	Change
	limit				
P10.19	Voltage corresponding to AO1 output upper limit	0.00 to 10.00 V	0.00 to 10.00	10.00 V	○
P10.20	AO1 output filter	0.000 to 10.000 s	0.000 to 10.000	0.005 s	○
P10.21	Reserved				
P10.22	Reserved				
P10.23	Reserved				
P10.24	Reserved				
P10.25	Reserved				
P10.26	Reserved				
P10.27	Reserved				
P10.28	Reserved				
P10.29	Reserved				
P10.30	Reserved				
P11: Auxiliary function parameters					
P11.00	Acceleration/ Deceleration mode	0: Straight-line acceleration/deceleration 1: S-curve acceleration/deceleration	0 to 1	0	○
P11.01	Acceleration time 2	0.0 to 6000.0 s	0.0 to 6000.0 s	Model dependent	○
P11.02	Deceleration time 2	0.0 to 6000.0 s	0.0 to 6000.0 s	Model dependent	○
P11.03	Acceleration time 3	0.0 to 6000.0 s	0.0 to 6000.0 s	Model dependent	○
P11.04	Deceleration time 3	0.0 to 6000.0 s	0.0 to 6000.0 s	Model dependent	○
P11.05	Acceleration time 4	0.0 to 6000.0 s	0.0 to 6000.0 s	Model dependent	○
P11.06	Deceleration time 4	0.0 to 6000.0 s	0.0 to 6000.0 s	Model dependent	○
P11.07	Time proportion of S-curve start segment	In the below figure, t1 is defined by P11.07, in which the output frequency slope gradually increases according to the curve; t2 is defined by P11.08, in which the output frequency slope gradually decreases according to the curve; and the segment between t1 and t2 is	0.0 to 100.0%	10.0%	○
P11.08	Time proportion of S-curve end segment		0.0 to 100.0%	10.0%	○

Function code	Name	Description	Value range	Default value	Change
		straight-line acceleration/deceleration. They are relative to the current acceleration/deceleration time.  Note: P11.07+P11.08 ≤ 100.0%			
P11.09	Switchover frequency of acceleration/ deceleration time 1 and 2	0.00 Hz to P02.10	0.00 Hz to P02.10	0.00 Hz	○
P11.10	Jog operation frequency	0.00 Hz to P02.10	0.00 Hz to P02.10	5.00 Hz	○
P11.11	Jog acceleration time	0.0 to 6000.0 s	0.0 to 6000.0 s	6.0 s	○
P11.12	Jog deceleration time	0.0 to 6000.0 s	0.0 to 6000.0 s	6.0 s	○
P11.13	Reserved				
P11.14	Number of decimal places for line speed	0 to 2	0 to 2	2	○
P11.15	Number of decimal places for acceleration/ deceleration time	1 to 2	1 to 2	1	○
P11.16	Terminal UP/DOWN speed	0.01 to 50.00 Hz/s	0.01 to 50.00 Hz/s	0.50 Hz/s	○
P11.17	Keypad frequency setting selection	Ones: Whether UP/DOWN terminal frequency adjustment is valid 0: Invalid 1: Valid Tens: Whether to retain the keypad UP/DOWN set frequency upon a power failure (keypad + terminal) 0: Does not retain 1: Retain Hundreds: Whether to retain the keypad UP/DOWN set frequency	0 to 0x111	0x111	○

Function code	Name	Description	Value range	Default value	Change
		upon a stop 0: Does not retain 1: Retain			
P11.18	Jump frequency 1	If the frequency reference is within the jump frequency, the drive will output according to the jump frequency boundary actually to avoid the mechanical resonance. If the jump frequency is set to 0, the function is disabled. 	0.00 Hz to P02.10	0.00 Hz	○
P11.19	Jump frequency 1 band		0.00 Hz to P02.10	0.00 Hz	○
P11.20	Jump frequency 2		0.00 Hz to P02.10	0.00 Hz	○
P11.21	Jump frequency 2 band		0.00 Hz to P02.10	0.00 Hz	○
P11.22	Reserved				
P11.23	Reserved				
P11.24	Reserved				
P11.25	Reserved				
P11.26	Frequency reach (FAR) detection range	 When the running frequency of the drive is within the set frequency± percentage range against maximum frequency (set by P11.26), the multi-function DO terminal outputs an ON signal.	0.0 to 100.0%	0.0%	○
P11.27	FDT1 frequency detection value	When the running frequency is higher than P11.27 or P11.29, the multi-function DO terminal outputs an ON signal; when the running frequency is lower than the P11.28 or	0.00 Hz to P02.11	0.00 Hz	○
P11.28	FDT1 frequency detection hysteresis		0.0 to 100.0%	0.0%	○
P11.29	FDT2 frequency		0.00 Hz to P02.11	0.00 Hz	○

Function code	Name	Description	Value range	Default value	Change
	detection value	P11.30 percentage range of the frequency detection value, the DO terminal cancels the ON signal.			
P11.30	FDT2 frequency detection hysteresis		0.0 to 100.0%	0.0%	○
P11.31	Auto start temperature of fan	40.0 to 80.0℃	40.0 to 80.0℃	55.0℃	○
P11.32	Zero speed threshold (reserved)				
P11.33	Reserved				
P11.34	Reserved				
P11.35	Reserved				
P11.36	Reserved				
P11.37	Reserved				
P11.38	Running duration setting	0 to 65535 min	0 to 65535 min	0 min	○
P11.39	Accumulated running duration reach	0 to 65535 h	0 to 65535 h	0 h	○
P11.40	Wakeup frequency	When the frequency reference is higher than P11.40, the drive starts directly after the delay defined by P11.41.	P11.42 to P02.10	0.00 Hz	○
P11.41	Wakeup delay	0.0 to 6553.5 s	0.0 to 6553.5 s	0.0 s	○
P11.42	Hibernation frequency	When the frequency reference is lower than P11.42, the drive decelerates to stop and enters the hibernation state after the delay defined by P11.43.	0.00 Hz to P02.10	0.00 Hz	○
P11.43	Hibernation delay	0.0 to 6553.5 s	0.0 to 6553.5 s	0.0 s	○
P11.44	Cooling fan control	0: Auto running (based on the inverter temperature) 1: Always running after power-on 2: Controlled by start/stop commands (On during operation, Off during stop)	0 to 2	2	×
P12: Control optimization parameters					
P12.00	Reserved				
P12.01	Reserved				
P12.02	Deadzone compensation mode	0: No compensation 1: Compensation mode 1	0 to 1	1	○
P12.03	Random PWM depth	0: Disabled	0 to 10	0	○

Function code	Name	Description	Value range	Default value	Change
		1 to 10: Random PWM depth			
P12.04	Reserved				
P12.05	Voltage overmodulation coefficient	100 to 110	100 to 110	105	×
P12.06	Reserved				
P12.07	SVPWM mode	0 to 1	0 to 1	0	×
P12.08 to P12.10	Reserved				
P13: Multi-speed and simple PLC parameters (reserved)					
P14: Pressure control parameters					
P14.00	Pressure control mode	0: Non-pressure control mode 1: Internal CAN oil pressure mode (multi-pump mode) 2: Pressure control mode AI1 gives the pressure feedback reference; AI2 gives the flow reference; AI3 gives the pressure reference. 3: External CAN oil pressure mode (computer of injection molding machine) During pressure control by the servo drive, CAN gives the pressure and flow references, and AI1 gives the pressure feedback reference.	0 to 3	0	×
P14.01	Pressure reference rise time	0 to 6000 ms	0 to 6000 ms	120	○
P14.02	Pressure control proportional gain Kp1	0.000 to 15.000	0.000 to 15.000	2.1	○
P14.03	Pressure control integral gain Ki1	0.000 to 10.000	0.000 to 10.000	0.5	○
P14.04	Pressure control derivative gain Kd1	0.000 to 10.000	0.000 to 10.000	0.000	○
P14.05	Pressure control proportional gain Kp2	0.000 to 10.000	0.000 to 10.000	3.5	○
P14.06	Pressure control integral gain Ki2	0.000 to 10.000	0.000 to 10.000	0.5	○

Function code	Name	Description	Value range	Default value	Change
P14.07	Pressure control derivative gain Kd2	0.000 to 10.000	0.000 to 10.000	0.000	○
P14.08	Flow reference rise time	0.0 to 500.0 ms	0.0 to 500.0 ms	100	○
P14.09	Flow reference drop time	0.0 to 500.0 ms	0.0 to 500.0 ms	100.0	○
P14.10	Reverse speed limit for pressure relief	-100.0% to 20.0% Note: The maximum output frequency is 100%	-100.0% to 20.0% Note: The maximum output frequency is 100%	-10.0%	○
P14.11	Reserved				
P14.12	Pressure overshoot suppression function	0 to 3	0 to 3	2	×
P14.13	Pressure overshoot suppression detection level	0.0 to 100.0	0.0 to 100.0	0.5	×
P14.14	Pressure overshoot suppression coefficient	0 to 100	0 to 100	80	×
P14.15	Flow control threshold	0.0 to 100.0	0.0 to 100.0	0.5	○
P14.16	Pressure relief delay	1 to 9999	1 to 9999	50	×
P14.17 to P14.20	Reserved				
P14.21	Pressure control proportional gain Kp3	0.000 to 10.000	0.000 to 10.000	1	○
P14.22	Pressure control integral gain Ki3	0.000 to 10.000	0.000 to 10.000	0.2	○
P14.23	Pressure control derivative gain Kd3	0.000 to 10.000	0.000 to 10.000	0.000	○
P14.24	Pressure reference drop time	0 to 6000 ms	0 to 6000 ms	200	○
P14.25	Pressure overshoot suppression detection level 2	0.0 to 500.0	0.0 to 500.0	35.5	○
P14.26	Pressure overshoot suppression coefficient 2	0 to 100	0 to 100	5	○
P14.27	Reserved				

Function code	Name	Description	Value range	Default value	Change
P15: Communication parameters					
P15.00	Communication format	Ones: 0: Modbus protocol 1: Expansion card to 485 protocol Tens: 0: 1-8-2-N format 1: 1-8-1-E format 2: 1-8-1-O format 3: 1-8-1-N format	0 to 0x31	0x30	○
P15.01	Baud rate	0: 4800 BPS 1: 9600 BPS 2: 19200 BPS 3: 38400 BPS 4: 57600 BPS 5: 115200 BPS 6: 125000 BPS	0 to 6	1	○
P15.02	Local address	0 to 247, 0 is the broadcast address	0 to 247	1	○
P15.03	Communication timeout detection time	0.0 to 60.0 s The function code is disabled when set to 0.0. When the function code is set to a non-zero value, if the interval between the current communication and next communication exceeds the timeout detection time, the system will report "485 communication error" (CE).	0.0 to 60.0 s	0.0 s	○
P15.04	Response delay of the drive	0 to 200 ms	0 to 200 ms	5 ms	○
P15.05	Communication action	Ones: 0: Response to write operation 1: No response to write operation Tens: 485 mapping function 0: Disable 1: Enable Note: Only control parameters starting with 0x64 can decide whether there is a response for the write operation. For writing of	0 to 0x11	0	○

Function code	Name	Description	Value range	Default value	Change
		function codes, it is sure to have response.			
P15.06	Reserved function 2 for user	0 to 65535	0 to 65535	0	○
P16: Keypad display setting parameters					
P16.00	LED display parameter selection 1 during running	0: No display; 1: Display Used to set whether a parameter displays on the zero level of the keypad menu during running. The related bits are listed below: 0: Main frequency channel 1: Main frequency reference 2: Auxiliary frequency reference 3: Frequency reference 4: Ramp frequency reference 5: Output frequency 6: Output voltage 7: Output current 8: Torque current 9: Exciting current 10: Reserved 11: Motor power 12: Estimated motor frequency 13: Actual motor frequency 14: HIWORD of the drive's accumulated power consumption 15: LOWORD of the drive's accumulated power consumption	0 to 0xFFFF	0xF0	○
P16.01	LED display parameter selection 2 during running	0: No display; 1: Display Used to set whether a parameter displays on the zero level of the keypad menu during running. The related bits are listed below: 0: Bus voltage 1: Drive running status 2: DI1 to DI4 state 3: DI5 state 4: DO state 5: AI1 voltage 6: AI2 voltage	0 to 0xFFFF	0x1	○

Function code	Name	Description	Value range	Default value	Change
		7: AI1 current 8: AI2 current 9: AO1 voltage 10: Reserved 11: Reserved 12: Reserved 13: Process PID reference 14: Process PID feedback 15: Process PID deviation			
P16.02	LED default parameter display during running	Used to set the default parameter number displayed on the zero level of the keypad menu during running after power-on. 0-31 represent the 32 parameters listed in P16.00 and P16.01. Note: When you press the shift key, the function code displays the switched parameter number, only RAM modified and not saved to EEPROM.	0 to 31	4	○
P16.03	LED parameter display selection at stop	Binary setting: 0: No display; 1: Display Used to set whether a parameter is displayed on the zero level of the keypad menu at stop. Bit0 to bit15 correspond to 16 parameters listed in P16.04. Note: If all is set to 0, the reference frequency will be displayed.	0 to 0xFFFF	0x3	○
P16.04	LED default parameter display at stop	Used to set the default parameter number displayed on the zero level of the keypad menu at stop after power-on. 0: Frequency reference 1: Bus voltage 2: DI input status 1 3: DI input status 2 4: DO output status 5: AI1 input voltage 6: AI2 input voltage	0 to 15	0	○

Function code	Name	Description	Value range	Default value	Change
		7: AO1 output percentage 8: Reserved 9: Reserved 10: Reserved 11: Reserved 12: Reserved 13: Line speed 14: PID reference 15: Torque reference Note: When you press the shift key, the function code only displays the switched parameter number, only RAM modified and not saved to EEPROM.			
P16.05	Line speed display coefficient	0.1 to 999.9% P01.44=line speed×P16.05	0.1 to 999.9%	100.0%	○
P16.06	Rotation speed display coefficient	0.1 to 999.9% Mechanical rotation speed=60× displayed running frequency× P16.06/number of motor pole pairs	0.1 to 999.9%	100.0%	○
P16.07	Frequency display coefficient	0.0 to 100.0% P01.57=P01.05*Frequency display coefficient	0.0 to 100.0%	100.0%	○
P17: Master-slave control parameters (reserved)					
P18: Commissioning parameter group 1					
P18.00	Control data 1 address	0 to 0xFFFF	0 to 0xFFFF	0x1000	○
P18.01	Control data 1 value	0 to 65535	0 to 65535	0	*
P18.02	Control data 2 address	0 to 0xFFFF	0 to 0xFFFF	0x1002	○
P18.03	Control data 2 value	0 to 65535	0 to 65535	0	*
P18.04	Control data 3 address	0 to 0xFFFF	0 to 0xFFFF	0x1004	○
P18.05	Control data 3 value	0 to 65535	0 to 65535	0	*
P18.06	Control data 4 address	0 to 0xFFFF	0 to 0xFFFF	0x1006	○
P18.07	Control data 4 value	0 to 65535	0 to 65535	0	*
P18.08	Function data 1 address	0 to 0xFFFF	0 to 0xFFFF	0x1000	○

Function code	Name	Description	Value range	Default value	Change
P18.09	Function data 1 value	0 to 65535	0 to 65535	0	*
P18.10	Function data 2 address	0 to 0xFFFF	0 to 0xFFFF	0x1002	○
P18.11	Function data 2 value	0 to 65535	0 to 65535	0	*
P18.12	Function data 3 address	0 to 0xFFFF	0 to 0xFFFF	0x1004	○
P18.13	Function data 3 value	0 to 65535	0 to 65535	0	*
P18.14	Function data 4 address	0 to 0xFFFF	0 to 0xFFFF	0x1006	○
P18.15	Function data 4 value	0 to 65535	0 to 65535	0	*
P20: Motor 2 parameters					
P20.00	Motor type selection	0: Asynchronous motor 1: Synchronous motor	0 to 1	0	×
P20.01	Asynchronous motor rated power	0.1 to 3000.0 kW	0.1 to 3000.0 kW	Model dependent	×
P20.02	Asynchronous motor rated voltage	0 to 1200 V	0 to 1200 V	Model dependent	×
P20.03	Asynchronous motor rated current	0.8 to 6000.0 A	0.8 to 6000.0 A	Model dependent	×
P20.04	Asynchronous motor rated frequency	0.01 Hz to P02.10	0.01 Hz to P02.10	50.00 Hz	×
P20.05	Asynchronous motor rated speed	1 to 36000 rpm	1 to 36000 rpm	Model dependent	×
P20.06	Asynchronous motor stator resistance	0.001 to 65.535 Ω	0.001 to 65.535 Ω	Model dependent	×
P20.07	Asynchronous motor rotor resistance	0.001 to 65.535 Ω	0.001 to 65.535 Ω	Model dependent	×
P20.08	Asynchronous motor leakage inductance	0.01 mH to 655.35 mH (drive power ≤ 55 kW) 0.001 mH to 65.535 mH (drive power > 55 kW)	Model dependent	Model dependent	×
P20.09	Asynchronous motor mutual inductance	0.1 mH to 6553.5 mH (drive power ≤ 55 kW) 0.01 mH to 655.35 mH (drive power > 55 kW)	Model dependent	Model dependent	×
P20.10	Asynchronous motor	0.1 to 6553.5 A	0.1 to 6553.5A	Model	×

Function code	Name	Description	Value range	Default value	Change
	no-load current			dependent	
P20.11	Asynchronous motor iron core magnetic saturation coefficient 1	0.0 to 100.0%	0.0 to 100.0%	80.0%	×
P20.12	Asynchronous motor iron core magnetic saturation coefficient 2	0.0 to 100.0%	0.0 to 100.0%	68.0%	×
P20.13	Asynchronous motor iron core magnetic saturation coefficient 3	0.0 to 100.0%	0.0 to 100.0%	57.0%	×
P20.14	Asynchronous motor iron core magnetic saturation coefficient 4	0.0 to 100.0%	0.0 to 100.0%	40.0%	×
P20.15	Synchronous motor rated power	0.1 to 3000.0 kW	0.1 to 3000.0 kW	Model dependent	×
P20.16	Synchronous motor rated voltage	0 to 1200 V	0 to 1200 V	Model dependent	×
P20.17	Synchronous motor rated current	0.8 to 6553.5 A	0.8 to 6553.5 A	Model dependent	×
P20.18	Synchronous motor rated frequency	0.01 Hz to P02.10	0.01 Hz to P02.10	Model dependent	×
P20.19	Number of synchronous motor pole pairs	1 to 128	1 to 128	2	×
P20.20	Synchronous motor stator resistance	0.001 to 65.535 Ω (drive power ≤ 55 kW) 0.0001 to 6.5535 Ω (drive power > 55 kW)	Model dependent	Model dependent	×
P20.21	Synchronous motor d-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power > 55 kW)	Model dependent	Model dependent	×
P20.22	Synchronous motor q-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power >	Model dependent	Model dependent	×

Function code	Name	Description	Value range	Default value	Change
		55 kW)			
P20.23	Synchronous motor back EMF	0.0 to 6553.5 V/krpm	0.0 to 6553.5 V/krpm	Model dependent	×
P20.24	Reserved				
P20.25	Reserved				
P20.26	Reserved				
P20.27	Motor auto-tuning	0: No operation 1: Part parameter auto-tuning in the static status 2: Full parameter auto-tuning in the rotating status	0 to 2	0	×
P20.28	Motor overload protection factor	0.0 to 300.0%	0.0 to 300.0%	100.0%	×
P20.29	Reserved				
P21: Motor 2 encoder parameters					
P21.00	Encoder PPR	1 to 65535	1 to 65535	1024	×
P21.01	Encoder type	2: Resolver	2	2	×
P21.02	Reserved				
P21.03	Detection time for speed feedback PG disconnection	0.1 to 10.0 s 0.0 s for no detection	0.0 to 10.0	0.0 s	○
P21.04	PG card voltage class selection	0: 5 V 1: 12 V	0 to 1	0	×
P21.05	Reserved				
P21.06	Reserved				
P21.07	Initial installation angle of motor 2 encoder	0.0 to 360.0	0.0 to 360.0	0.1	×
P21.08 to P21.30	Reserved				
P22: Motor 2 vector control parameters					
P22.00	Speed loop proportional gain 1	1 to 100	1 to 100	30	○
P22.01	Speed loop integral time 1	0.01 to 10.00 s	0.01 to 10.00 s	0.50 s	○
P22.02	Switchover frequency 1	0.00 Hz to P02.11	0.00 Hz to P02.11	0.00 Hz	○
P22.03	Speed loop proportional gain 2	1 to 100	1 to 100	20	○

Function code	Name	Description	Value range	Default value	Change
P22.04	Speed loop integral time 2	0.01 to 10.00 s	0.01 to 10.00 s	1.00 s	○
P22.05	Switchover frequency 2	0.00 Hz to P02.11	0.00 Hz to P02.11	10.00 Hz	○
P22.06	Slip compensation coefficient	50 to 200%	50 to 200%	100%	○
P22.07	Speed loop filter time constant	0.00 to 20.00 s	0.00 to 20.00 s	0.50 s	○
P22.08	Vector control overexcitation gain	50 to 200%	50 to 200%	100%	○
P22.09	Drive torque upper limit source	0: Digital setting (P22.10) 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved 6: MIN (AI1, AI2) 7: MAX (AI1, AI2)	0 to 7	0	○
P22.10	Drive torque upper limit digital setting	0.0 to 300.0%	0.0 to 300.0%	180.0%	○
P22.11	Braking torque upper limit source	0: Digital setting (P22.12) 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved 6: MIN (AI1, AI2) 7: MAX (AI1, AI2)	0 to 7	0	○
P22.12	Braking torque upper limit digital setting	0.0 to 300.0%	0.0 to 300.0%	180.0%	○
P22.13	Excitation regulation Kp	0 to 60000	0 to 60000	2000	○
P22.14	Excitation regulation Ki	0 to 60000	0 to 60000	1300	○
P22.15	Torque regulation Kp	0 to 60000	0 to 60000	2000	○
P22.16	Torque regulation Ki	0 to 60000	0 to 60000	1300	○
P22.17	Synchronous motor field weakening mode	0: Disabled 1: Enabled	0 to 1	0	○

Function code	Name	Description	Value range	Default value	Change
P22.18	Synchronous motor field weakening coefficient	50 to 110	50 to 110	105	○
P22.19	Maximum field weakening current	0.0 to 120.0%	0.0 to 120.0%	100.0%	○
P22.20	Field weakening auto-tuning coefficient	0.0 to 120.0%	0.0 to 120.0%	100.0%	○
P22.21	Field weakening integral multiple	0.000 to 1.200	0.000 to 1.200	1.000	○
P23: Motor 2 torque control parameters					
P23.00	Torque control enable	0: Disabled 1: Enabled	0 to 1	0	○
P23.01	Torque reference channel	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P23.02	Torque digital setting	-300.0 to 300.0%	-300.0 to 300.0%	0.0%	○
P23.03	Torque reference acceleration/ deceleration time	0.0 to 6000.0 s	0.0 to 6000.0 s	6.0 s	○
P23.04	FWD speed limit channel	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P23.05	FWD speed limit digital setting	0.00 Hz to P02.11	0.00 Hz to P02.11	0.00 Hz	○
P23.06	REV speed limit channel	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Modbus 5: Reserved	0 to 5	0	○
P23.07	REV speed limit digital setting	0.00 Hz to P02.11	0.00 Hz to P02.11	0.00 Hz	○

Function code	Name	Description	Value range	Default value	Change
P23.08 to P23.11	Reserved				
P24: Motor 2 V/F control parameters					
P24.00	V/F curve	0: Straight-line V/F 1: Multi-point V/F 2: Square V/F 3: Reserved 4: V/F complete separation 5: V/F half separation	0 to 5	0	×
P24.01	Torque boost	0.0 to 50.0	0.0 to 50.0	0.0	○
P24.02	Cut-off frequency of torque boost	0.00 Hz to P02.11	0.00 Hz to P02.11	10.00 Hz	×
P24.03	Multi-point V/F frequency 1	0.00 Hz to P24.05	0.00 Hz to P24.05	0.00 Hz	×
P24.04	Multi-point V/F voltage 1	0 V to P24.06	0 V to P24.06	0V	×
P24.05	Multi-point V/F frequency 2	P24.03 to P24.07	P24.03 to P24.07	0.00 Hz	×
P24.06	Multi-point V/F voltage 2	P24.04 to P24.08	P24.04 to P24.08	0 V	×
P24.07	Multi-point V/F frequency 3	P24.05 to 599.00 Hz	P24.05 to 599.00 Hz	0.00 Hz	×
P24.08	Multi-point V/F voltage 3	P24.06 to 380 V	P24.06 to 380 V	0 V	×
P24.09	Slip compensation coefficient	0.0 to 100.0	0.0 to 100.0	0.0	○
P24.10	V/F overexcitation gain	0.0 to 100.0	0.0 to 100.0	0.0	○
P24.11	Oscillation suppression gain	0 to 100	0 to 100	10	○
P24.12	Oscillation suppression gain mode	0 to 2	0 to 2	0	×
P24.13	Voltage source for V/F separation	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: Reserved 5: Reserved	0 to 9	0	○

Function code	Name	Description	Value range	Default value	Change
		6: Reserved 7: PID 8: Reserved 9: Reserved			
P24.14	Digital setting of voltage source for V/F separation	0 to 1000 V	0 to 1000 V	0 V	○
P24.15	Voltage rise time of V/F separation	0.0 to 6000.0 s	0.0 to 6000.0 s	5.0 s	○
P24.16	Voltage fall time of V/F separation	0.0 to 6000.0 s	0.0 to 6000.0 s	5.0 s	○
P24.17	Stop mode for V/F separation	0: Frequency and voltage decline to 0 independently 1: Frequency declines after voltage declines to 0	0 to 1	0	○
P24.18	Reserved				
P24.19	Reserved				
P26: Hydraulic servo parameters					
P26.00	Reserved				
P26.01	Pressure sensor range	0.0 to 600.0 kg/cm^2	0.0 to 600.0 kg/cm^2	250.0	×
P26.02	Output signal mode of pressure sensor	0: 1 to 5 V output 1: 4 to 20 mA output (reserved) 2: 1 to 10V 3: 0 to 10V Set according to pressure sensor specifications	0 to 3	3	×
P26.03	Maximum system pressure	0.0 to 250.0 Maximum system pressure required: The system pressure output corresponding to a 10 VDC command voltage represents the maximum system pressure.	0.0 to 250.0 kg/cm^2	175.0	×
P26.04	Reserved				
P26.05	Maximum speed	0 to 6000 rpm	0 to 6000 rpm	2000	×
P26.06	Base pressure	Minimum system pressure as a percentage against the pressure sensor range (P26.01)	0.0 to 100.0%	1.0%	○
P26.07	Base flow	Minimum system flow as a	0.0 to 100.0%	1.0%	○

Function code	Name	Description	Value range	Default value	Change
		percentage against the maximum speed (P26.05)			
P26.08	Base pressure and flow enable	Enable base pressure and base flow.	0 to 1	0	○
P26.09	Pressure sensor fault detection selection	Ones place: Pressure sensor fault detection selection 0: Keep running, with no alarm 1: Keep running and display "AL.FbL" (feedback lost) or "AL.Fbo" (feedback exceeding limit) 2: Coast to stop and display "FbL" (feedback lost) or "Fbo" (feedback exceeding limit) Tens place: Unloading pressure reverse speed limit fault detection selection 0: Keep running, with no alarm 1: Keep running and display "AL.PIL" 2: Coast to stop and display "PIL" Note: As long as the pressure sensor feedback fault occurs, the corresponding "feedback loss" or "feedback exceeding limit" function output terminal will have output.	0 to 0x22	0x00	×
P26.10	Pressure sensor feedback lost detection value	Pressure sensor feedback lost detection value setting	0.0 to 100.0%	3.0%	○
P26.11	Pressure sensor feedback lost detection time	Pressure sensor feedback lost detection time setting	0.0s to 25.0 s	0.2 s	○
P26.12	Pressure sensor feedback exceeding limit detection level	Pressure sensor feedback exceeding limit detection level setting	0.0 to 100.0%	80.0%	○
P26.13	Pressure sensor feedback exceeding limit detection time	Pressure sensor feedback exceeding limit detection time setting	0.0 s to 25.0 s	1.0 s	○
P26.14	Pressure sensor fault detection current lower limit	Pressure sensor fault detection current lower limit setting	20.0% to 300.0%	100.0%	○
P26.15	Pressure sensor fault	Pressure sensor fault detection	20.0 to 100.0%	50.0%	○

Function code	Name	Description	Value range	Default value	Change
	detection current upper limit	current upper limit setting			
P26.16	Maximum speed for pressure control state output	Maximum speed setting for pressure control state output	0.0 to 100.0%	20.0%	○
P26.17	Minimum pressure setting for pressure control state output	Minimum pressure setting for pressure control state output	0.0 to 100.0%	30.0%	○
P26.18	Pressure control state output delay time	Pressure control state output delay time setting	0.001 to 10.000 s	0.800	○
P26.19	Upper torque limit for switchover from pressure mode to speed mode	Upper torque limit for switchover from pressure mode to speed mode	50.0 to 250.0%	150%	○
P26.20 to P26.24	Reserved				
P26.25	AI1 dead zone	AI1 dead zone setting	-10 to 10 V	0	○
P26.26	AI2 dead zone	AI2 dead zone setting	-10 to 10 V	0	○
P26.27	AI3 dead zone	AI3 dead zone setting	-10 to 10 V	0	○
P26.28	AI4 dead zone	AI4 dead zone setting	-10 to 10 V	0	○
P26.29	AI zero offset correction	AI zero offset correction	0 to 65535	0	○
P31: Multi-pressure parameters					
P31.00	Reserved				
P31.01	Pressure difference for pressure relief valve output	0 to 100.0 bar	0 to 100.0 bar	60.0	○
P31.02	Reserved				
P31.03	Delay time for pressure flow	Delay time for pressure flow	0 to 1000 ms	0	○
P31.04	Reserved				
P31.05	AO filter coefficient	AO filter coefficient	0 to 10	2	○
P31.06	Frequency feedback filter coefficient	Frequency feedback filter coefficient	0 to 1000	5	○
P31.07	Internal pressure 1	0 to 175.0 bar (internal pressure 1)	0 to 175.0	0	○
P31.08	Internal flow 1	0 to 100.0%	0 to 100.0%	0	○
P31.09	Internal pressure 2	0 to 175.0 bar (internal pressure 2)	0 to 175.0	0	○

Function code	Name	Description	Value range	Default value	Change
P31.10	Internal flow 2	0 to 100.0%	0 to 100.0%	0	○
P31.11	Internal pressure 3	0 to 175.0 bar (internal pressure 3)	0 to 175.0	0	○
P31.12	Internal flow 3	0 to 100.0%	0 to 100.0%	0	○
P31.13	Internal pressure 4	0 to 175.0 bar (internal pressure 4)	0 to 175.0	0	○
P31.14	Internal flow 4	0 to 100.0%	0 to 100.0%	0	○
P31.15	Start mode of pressure compensation	0 to 2	0 to 2	0	○
P31.16	Pressure compensation mode	0 to 2	0 to 2	0	○
P31.17	Compensation offset	0 to 1024	0 to 1024	0	○
P31.18	Pressure compensation value	0 to 30.0	0 to 30.0	0	○
P31.19	Delay time before auto-tuning start	0.000s to 60.000 s	0.000s to 60.000 s	0	○
P31.20	Oil pump gears	0 to 100	0 to 100	12	○
P31.21 to P31.28	Reserved				○
P31.29	Business timing (h)	0 to 24	0 to 24	0	○
P31.30	Business timing (day)	0 to 6500	0 to 6500	0	○
P31.31 to P31.39	Reserved				○
P32: CANopen communication parameters					
P32.00	Internal/External CAN selection	0: Internal CAN 1: External CAN	0 to 1	0	×
P32.01	External CAN baud rate selection	0: 125 K 1: 250 K 2: 500 K 3: 1 M	0 to 3	1	×
P32.02	External CAN address	0 to 247	0 to 247	1	×
P32.03	External CAN disconnection detection time	0.0 to 1000.0 s	0.0 to 1000.0 s	0 s	×
P32.04 to P32.06	Reserved				
P32.07	Internal CAN baud rate selection	0: 125 K 1: 250 K	0 to 3	3	×

Function code	Name	Description	Value range	Default value	Change
		2: 500 K 3: 1 M			
P32.08	Internal CAN address	0 to 127	0 to 127	0	×
P32.09	Internal CAN disconnection detection time	0.1 to 10.0	0.1 to 10.0	0.5	○
P32.10	Flow type	0: Single pump 1: Single-master multi-slave compound 2: Single-master multiple-slave convergent/distributed flow 3: Multi-master multi-slave convergent flow	0 to 3	0	×
P32.11	Single master selection	0: Invalid 1: Valid	0 to 1	0	×
P32.12	Unit number	0 to 5	0 to 5	0	×
P32.13	Master/Slave switchover of node	0: Slave pump mode 1: Master pump mode	0 to 1	0	×
P32.14	Pump displacement	0 to 300	0 to 300	40	×
P32.15	Flow cut-in threshold	0 to 100%	0 to 100%	40%	×
P32.16	Flow cut-in hysteresis	0 to 100%	0 to 100%	2%	×
P32.17 to P32.39	Reserved				
P88: AIAO correction (manufacturer's parameters)					
P97: Fault and protection parameters					
P97.00	Fault enable	Ones: 0: Pulse-by-pulse current limit disabled 1: Pulse-by-pulse current limit enabled Tens: 0: Fan fault disabled 1: Fan fault enabled Hundreds: 0: Overload prewarning disabled 1: Overload prewarning enabled Thousands: 0: Braking overcurrent disabled 1: Braking overcurrent enabled	0 to 0x1111	0x1001	×

Function code	Name	Description	Value range	Default value	Change
P97.01	Stall suppression enable	Ones: 0: Overvoltage stall suppression disabled 1: Overvoltage stall suppression enabled Tens: 0: Undervoltage stall suppression disabled 1: Undervoltage stall suppression enabled Hundreds: 0: Overcurrent stall suppression disabled 1: Overcurrent stall suppression enabled	0 to 0x111	0x101	×
P97.02	Current limit level	20 to 200%	20 to 200%	150%	×
P97.03	Current limit adjustment coefficient	Range: 0 to 100	0 to 100	20	×
P97.04	Overvoltage stall suppression action voltage	600 to 750 V	600 to 750 V	720 V	○
P97.05	Voltage regulator proportional coefficient upon overvoltage stall	Defines the proportional coefficient of the bus voltage regulator upon overvoltage stall.	0 to 1000	10	○
P97.06	Reserved				
P97.07	Speed regulator proportional coefficient upon overvoltage stall	Defines the proportional coefficient of the rotation speed regulator upon overvoltage stall.	0 to 1000	60	○
P97.08	Reserved				
P97.09	Voltage regulator proportional coefficient upon undervoltage stall	Defines the proportional coefficient of the bus voltage regulator upon undervoltage stall.	0 to 1000	40	○
P97.10	Voltage regulator integral coefficient upon undervoltage stall	Defines the integral coefficient of the bus voltage regulator upon undervoltage stall.	0 to 1000	20	○

Function code	Name	Description	Value range	Default value	Change
P97.11	Undervoltage stall suppression action voltage	When the bus voltage is lower than this value, the undervoltage stall suppression will be triggered to lower the frequency and raise the voltage.	400 to 460 V	460 V	×
P97.12	Undervoltage stall recovery judgment time	When the bus voltage is greater than P97.13, the drive stops lowering frequency after the delay time defined here.	0.0 to 100.0 s	2.0 s	×
P97.13	Undervoltage stall suppression pause voltage	When the bus voltage is greater than this value, the drive no longer lowers frequency.	460 to 500 V	485 V	×
P97.14	Phase loss protection enable	Ones: 0: Input phase loss protection disabled 1: Input phase loss protection enabled Tens: 0: Output phase loss protection disabled during running 1: Output phase loss protection enabled during running Hundreds: 0: Short-to-ground detection upon power-on disabled 1: Short-to-ground detection upon power-on enabled Thousands: 0: Output phase loss protection before running disabled 1: Output phase loss protection before running enabled	0 to 0x1111	0x1100	○
P97.15	Fault protection and alarm property 1	0: Coast to stop 1: Decelerate to stop 2: Keep running Ones: Input phase loss (reserved) Tens: Output phase loss (reserved) Hundreds: Reserved Thousands: Reserved	0 to 0	0	○
P97.16	Fault protection and	0: Coast to stop	0 to 0x2002	0	○

Function code	Name	Description	Value range	Default value	Change
	alarm property 2	1: Decelerate to stop 2: Keep running Ones: EEPROM read/write fault Tens: Reserved Hundreds: Reserved Thousands: 485 communication error			
P97.17	Fault protection and alarm property 3	0: Coast to stop 1: Decelerate to stop 2: Keep running Ones: Fan locked-rotor Tens: Motor overload Hundreds: Motor overheat Thousands: Reserved	0 to 0x222	0x0002	○
P97.18	Fault protection and alarm property 4	0: Coast to stop 1: Decelerate to stop 2: Keep running Ones: Reserved Tens: 24 V power supply overload Hundreds: Reserved Thousands: Reserved	0 to 0x20	0	○
P97.19 to P97.24	Reserved				
P97.25	Motor overheat protection threshold	0 to 200℃	0 to 200℃	120℃	○
P97.26	Motor temperature sensor type	0: No temperature sensor 1: PT1000 2: KTY84-130	0 to 2	0	○
P97.27	Detection value of excessive speed deviation	0.0 to 50.0%	0.0 to 50.0%	0.0%	○
P97.28	Detection time of excessive speed deviation	When it is set to 0.0 s, speed deviation protection is disabled.	0.0 to 10.0 s	1.0 s	○
P97.29	Auto reset attempts	When there are faults, the drive starts to reset according to the interval defined by P97.31. After the auto reset attempts are reached, you can only reset through the manual reset commands. If there are	0 to 100	0	○

Function code	Name	Description	Value range	Default value	Change
		manual reset commands during auto reset, the auto reset count will be cleared. When the drive is running normally without faults for 600 s, the fault reset count will be cleared. 0 means the auto reset function is disabled.			
P97.30	Relay action during auto reset	0: Disabled 1: Enabled	0 to 1	0	○
P97.31	Auto reset interval	2.0 to 600.0 s	2.0 to 600.0 s	5.0 s	○
P97.32	Current fault type	0: No fault 1: Overcurrent during acceleration (OC1) 2: Overcurrent during deceleration (OC2) 3: Overcurrent during operation at constant speed (OC3) 4: Overvoltage during acceleration (OV1) 5: Overvoltage during deceleration (OV2) 6: Overvoltage during operation at constant speed (OV3) 7: Undervoltage fault (Uv) 8: Input phase loss (SPI) 9: Output phase loss (SPO) 10: Power module protection (drv) 11: Inverter overheat (OH1) 12: Rectifier bridge overheat (OH2) 13: AC drive overload (OL1) 14: Motor overload (OL2) 15: External fault (EF) 16: EEPROM read/write fault (EEP) 17: 485 communication error (CE) 18: Reserved 19: Current detection error (ItE) 20: CANopen communication timeout (E-CAN) 21: PID feedback loss (FbL)	0 to 61	0	*
P97.33	Latest fault type		0 to 61	0	*
P97.34	Second latest fault type		0 to 61	0	*

Function code	Name	Description	Value range	Default value	Change
		22: Reserved 23: Braking resistor overcurrent (brOC) 24: Auto-tuning fault (tUN) 25 to 32: Reserved 33: Short-to-ground fault (GdF) 34: Speed deviation fault (dEv) 35 to 38: Reserved 39: Motor overheat (OH3) 40: Reserved 41: 24 V power supply overload (24OL) 42 to 45: Reserved 46: Board-level communication error (bCE) 47: Reserved 48: BootLoader failure (bLt) 49: Power board software version mismatching (vEr) 50: Parameter upload and download timeout (UPdnE) 51: AI1 current input overcurrent (AIOC) 52: Reserved 53: Fan locked-rotor (FAn) 54: Reserved 55: IO option 24 V overload (IO-OL) 56: Hardware input phase loss (HSPI) 57: Reserved 58: Sensor loss (PLoSS) 59: Sensor too high (PoH) 60: Reserved 61: Reserved			
P97.35	Bus voltage upon the current fault	0.0 to 6553.5 V	0.0 to 6553.5 V	0.0 V	*
P97.36	Actual current upon the current fault	0.0 to 999.9 A	0.0 to 999.9 A	0.0 A	*
P97.37	Running frequency upon the current fault	0.00 to 655.35 Hz	0.00 to 655.35 Hz	0.00 Hz	*

Function code	Name	Description	Value range	Default value	Change
P97.38	Drive status upon the current fault	0 to 0xFFFF	0 to 0xFFFF	0	*
P97.39	Inverter bridge temperature upon the current fault	-40.0 to 150.0℃	-40.0 to 150.0℃	0.0℃	*
P97.40	Reserved				
P97.41	Input terminal state upon the current fault	0 to 0xFF	0 to 0xFF	0	*
P97.42	Output terminal state upon the current fault	0 to 0xF	0 to 0xF	0	*
P97.43	Running duration upon the current fault	0.0 to 6553.5 s	0.0 to 6553.5 s	0.0 s	*
P97.44	Bus voltage upon the latest fault	0.0 to 6553.5 V	0.0 to 6553.5 V	0.0 V	*
P97.45	Actual current upon the latest fault	0.0 to 999.9 A	0.0 to 999.9 A	0.0 A	*
P97.46	Running frequency upon the latest fault	0.00 to 655.35 Hz	0.00 to 655.35 Hz	0.00 Hz	*
P97.47	Drive status upon the latest fault	0 to 0xFFFF	0 to 0xFFFF	0	*
P97.48	Inverter bridge temperature upon the latest fault	0.0 to 150.0℃	0.0 to 150.0℃	0.0℃	*
P97.49	Reserved				
P97.50	Input terminal state upon the latest fault	0 to 0xFF	0 to 0xFF	0	*
P97.51	Output terminal state upon the latest fault	0 to 0xF	0 to 0xF	0	*
P97.52	Running duration upon the latest fault	0.0 to 6553.5 s	0.0 to 6553.5 s	0.0 s	*
P97.53	Bus voltage upon the second latest fault	0.0 to 6553.5 V	0.0 to 6553.5 V	0.0 V	*
P97.54	Actual current upon the second latest fault	0.0 to 999.9 A	0.0 to 999.9 A	0.0 A	*
P97.55	Running frequency	0.00 to 655.35 Hz	0.00 to 655.35 Hz	0.00 Hz	*

Function code	Name	Description	Value range	Default value	Change
	upon the second latest fault				
P97.56	Drive status upon the second latest fault	0 to 0xFFFF	0 to 0xFFFF	0	*
P97.57	Inverter bridge temperature upon the second latest fault	0.0 to 150.0℃	0.0 to 150.0℃	0.0℃	*
P97.58	Reserved				
P97.59	Input terminal state upon the second latest fault	0 to 0xFF	0 to 0xFF	0	*
P97.60	Output terminal state upon the second latest fault	0 to 0xF	0 to 0xF	0	*
P97.61	Running duration upon the second latest fault	0.0 to 6553.5 s	0.0 to 6553.5 s	0.0 s	*
P98: Servo drive parameters					
P98.00	Serial No.	0 to 1000	0 to 1000	0	*
P98.01	Software version No.	0.00 to 99.99	0.00 to 99.99	0.00	*
P98.02	Performance software current version No.	0.00 to 99.99	0.00 to 99.99	0.00	*
P98.03	Performance software burning version No.	0.00 to 99.99	0.00 to 99.99	0.00	*
P98.04	Rated capacity	Output power, 0 to 999.9 kW (automatically set according to the model)	0 to 999.9 kW	Model dependent	*
P98.05	Rate voltage	0 to 999 V (automatically set according to the model)	0 to 999 V	Model dependent	*
P98.06	Rated current	0 to 999.9A (automatically set according to the model)	0 to 999.9 A	Model dependent	*
P98.07	Manufacturer's bar code 1	0 to 0xFFFF	0 to 0xFFFF	0	*
P98.08	Manufacturer's bar	0 to 0xFFFF	0 to 0xFFFF	0	*

Function code	Name	Description	Value range	Default value	Change
	code 2				
P98.09	Manufacturer's bar code 3	0 to 0xFFFF	0 to 0xFFFF	0	*
P98.10	Manufacturer's bar code 4	0 to 0xFFFF	0 to 0xFFFF	0	*
P98.11	Manufacturer's bar code 5	0 to 0xFFFF	0 to 0xFFFF	0	*
P98.12	Manufacturer's bar code 6	0 to 0xFFFF	0 to 0xFFFF	0	*

Chapter 6 Parameter Description

6.1 P00: System management parameters

P00.00	Menu mode selection	0 to 2	1

0: Quick menu mode

Only quick commissioning related parameters are displayed. These parameters can be changed to quickly start or stop the drive.

1: Full menu mode

All function parameters are displayed (excluding some associated hidden function codes).

2: Changed memory menu mode

Only parameters that are different from factory settings are displayed (excluding P00.03).

P00.01	User password	0 to 65535	0

The user password is used to prohibit the unauthorized person from viewing and modifying the function parameters.

To set the password:

Input a four-digit number as your user password and then press the "⏎" key to confirm. After that, you need to re-enter this function code to input the same number and press the "⏎" key to confirm within 10 s.

To change the password:

Press the "⏎" key to enter the password verification status and input the original four-digit password to enter the parameter editing status. Select P00.01, set the new password, and press the confirm key.

To clear the password:

Press the "⏎" key to enter the password verification status and input the original four-digit password to enter the parameter editing status. Select P00.01, clear the password, and press the confirm key.

⚠ WARNING

Keep the user password properly. There is no user password by default.

P00.03	Parameter protection setting	0 to 2	0

This function code determines the protection level of drive parameters, including:

0: All data can be changed.

1: Only main frequency reference digital setting P02.09 and this function code can be changed.

2: Only this function code can be changed.

If you want to change other function parameters, set this function code to 0. After such function parameters are changed, you can set this function code to the protection level you want.

P00.04	Selection of key functions	0 to 0x0410	0

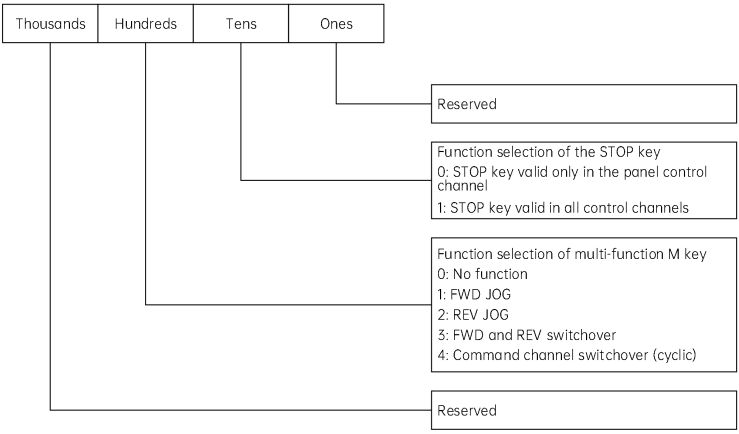


Fig. 6-1 Selection of key functions

Ones place: Reserved

Tens place: Function selection of the STOP/RESET key

Table 6-1 Keypad working mode

Tens place	Function	Description
0	Invalid when not in the panel control mode	The STOP key is valid only in the operating panel control channel.
1	Stop according to the defined mode when not in the panel control mode	The STOP key is valid in the panel, terminal and serial port operation command channels. Press this button, and the drive will stop according to the stop mode defined by P08.06.

WARNING

When the STOP/RESET key is used as the fault reset key "RESET", it is valid only in the local keypad operation command channel. When you press the "RUN" and "STOP" keys at the same time, the drive will coast to stop.

Hundreds place: Function selection of the M key

When it is set to 0, the M key is disabled.

When it is set to 1, the M key is used as FWD JOG.

When it is set to 2, the M key is used as REV JOG.

When it is set to 3, the M key is used as the direction switchover FWD/REV. In the operating panel operation command channel, you can switch the direction of output frequency online.

When it is set to 4, the M key is used as the command channel switchover key, only valid during stop. The sequence of operation command channel switchover:

Operating panel command channel (REM off) → Terminal command channel (REM on) → Serial port command channel (REM flashing) → Operating panel command channel (REM off).

WARNING

The operation command channel takes effect immediately once you use the M key for switchover.

Thousands place: Reserved

P00.05	Parameter initialization	0 to 3	0

0: Parameters rewritable

When it is set to 0, all parameters can be changed.

1: Clear fault records

When it is set to 1, fault records related to P97.32–P97.61 will be cleared.

2: Restore to factory settings

When it is set to 2, all parameters before P97.32 (excluding P00.01 user password, P01 drive status display parameters and P03&P20 motor parameters) will be restored to factory settings.

3: Restore some parameters to factory settings (motor parameters not restored)

When it is set to 3, part of parameters will be restored to factory settings, excluding motor parameters.

P00.06	Power board upgrading command	0 to 1	0

0: Disabled

Disallowed to upgrade the power board.

1: Enabled

Allowed to upgrade the power board.

P00.07	Parameter copy	0 to 4	0

0: No operation

1: Drive's parameters uploaded to the keypad

2: Keypad's parameters downloaded to the drive (all)

3: Keypad's parameters downloaded to the drive (excluding motor parameters)

4: Keypad's parameters downloaded to the drive (only motor parameters)

6.2 P01: Status display parameters

The P01 group is used to monitor some status parameters of the drive and motor, and display frequency reference channel, frequency reference, PID reference, PID feedback, PID error and so on.

P01.00	Main frequency channel	0 to 8	0

Monitors the channel of the main frequency under the common running mode. It displays 0 under a non-common running mode.

P01.01	Main frequency reference	0.00 to P02.10	0

Monitors the main frequency setpoint value under the common running mode. It displays 0 under a non-common running mode.

P01.02	Auxiliary frequency reference	0.00 to P02.10	0

Monitors the auxiliary frequency setpoint value under the common running mode. It displays 0 under a non-common running mode or without auxiliary reference.

P01.03	Frequency reference	0.00 to P02.10	0

Monitors the final frequency after the combination of main frequency and auxiliary frequency. A positive value means forward running, and a negative value means reverse running.

P01.04	Ramp frequency reference	0.00 to P02.10	0

Displays the current ramp frequency reference of the drive.

P01.05	Output frequency	0.00 to P02.10	0

Displays the current actual output frequency of the drive.

P01.06	Output voltage	0 to 65535 V	0

Displays the current output voltage of the drive.

P01.07	Output current	0.0 to 6553.5 A	0

Displays the current output current of the drive.

P01.08	Torque current	-300.0 to 300.0%	0

Monitors the drive's current torque current as a percentage of the motor's rated current.

P01.09	Exciting current	-300.0 to 300.0%	0

Monitors the drive's current exciting current as a percentage of the motor's rated current.

P01.10	Keypad version No.	0.00 to 2.55	0

P01.11	Motor power	-300.0 to 300.0%	0

Displays the drive's output power as a percentage of the motor's rated power.

P01.12	Estimated frequency of motor	0.00 to P02.10	0

Displays the estimated rotor frequency under the open-loop vector conditions.

P01.13	Measured frequency of motor	-P02.10 to P02.10	0

Displays the actual output frequency of the motor.

P01.14	Accumulated power consumption H of the drive	0 to 65535 kWh	0

Displays the accumulated power consumption of the drive.

P01.15	Accumulated power consumption L of the drive	0 to 3600	0

Displays the accumulated power consumption of the drive. After accumulation of 3600 times, 1 kWh is additionally added to P01.14.

P01.16	Bus voltage	0.0 to 6553.5 V	0

Displays the current bus voltage of the drive.

P01.17	Operation status of the drive	0 to 0xFFFF	0

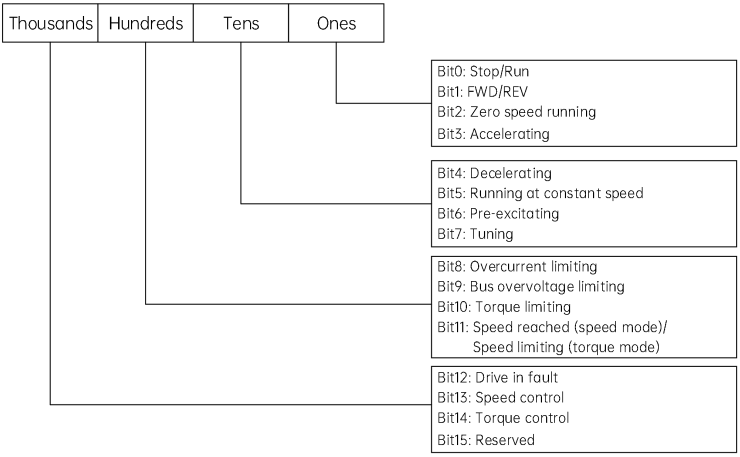


Fig. 6-2 Operation status of the drive

LED ones place Bit0: STOP/RUN

When the drive is at stop, bit0 is 0, otherwise, it is 1.

LED ones place Bit1: FWD/REV

When the drive is in FWD, bit0 is 0, otherwise, it is 1.

For other bits, if the condition is met, they will be 1.

P01.18	DI1 to DI4 state	0 to 0x1111	0

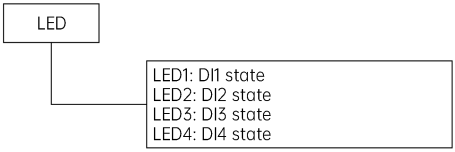


Fig. 6-3 DI terminal state

Displays the on/off state of DI1 to DI4. "0" means the terminal is off, and "1" means the terminal is on.

P01.19	DI5 state	0 to 0x1	0

Fig. 6-4 DI terminal state

Displays the on/off state of DI5. "0" means the terminal is off, and "1" means the terminal is on.

P01.20	DO state	0 to 0x1011	0

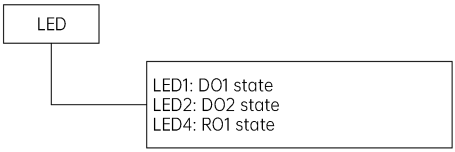


Fig. 6-5 DO terminal state

The function code P01.20 can display the state of the output terminals DO1, DO2, and RO1. When there is signal output, the corresponding LED place will be set as 1. For example, if there is signal output only on DO1, LED1 will display 1, and P01.20 will display 0001. If there is signal output only on RO1, P01.20 will display 1000.

P01.21	AI1 input voltage	-10.00 to 10.00 V	0
P01.22	AI2 input voltage	-10.00 to 10.00 V	0

P01.21 and P01.22 display the AI input voltage before adjustment.

P01.23	AI1 input current	0.00 to 20.00 mA	0

Displays the AI1 input current.

P01.24	AI3 input voltage	-10.00 to 10.00 V	0

Displays the AI3 input voltage.

P01.25	AI4 input voltage	-10.00 to 10.00 V	0

Displays the AI4 input voltage.

P01.26	Reserved		
P01.27	Reserved		
P01.28	Reserved		

P01.29	Pressure reference	0.0 to 400.0	0
P01.30	Pressure feedback	0.0 to 400.0	0
P01.31	PID deviation	-100.0% to 100.0%	0
P01.32	PID output	-100.0% to 100.0%	0

P01.29–P01.32 display the percentage of the process closed-loop reference, feedback, deviation and output in Group P14 related to the full range.

P01.33	PID proportional output	-100.0% to 100.0%	0
P01.34	PID integral output	-100.0% to 100.0%	0
P01.35	PID derivative output	-100.0% to 100.0%	0
P01.36	Current AD of AI1	0 to 4095	0
P01.37	Current AD of AI2	0 to 4095	0

P01.33–P01.35 display the proportional, integral and derivation output (percentage) of the PID controller.

P01.36 and P01.37 display the current AD values of AI1 and AI2, used for verification.

P01.38	Current AD of motor temperature	0 to 4095	0

Displays the current AD value of motor temperature.

P01.39	Motor temperature	-40℃ to 200℃	0

The motor temperature means the actually measured motor temperature. Temperature display range: -40℃ to 200℃; precision: ±5%

P01.40	Encoder count value	0 to 65535	0

P01.41	Speed loop output	-300.0% to 300.0%	0

Displays the output (percentage) of the speed loop controller.

P01.42	Torque reference	-300.0% to 300.0%	0

Displays the drive's torque reference as a percentage of the motor's rated current.

P01.43	Rotation speed of motor	0 to 65535 rpm	0
P01.44	Line speed	0 to 65535/min	0
P01.45	Output power	0.0 to 6553.5 kW	0

Display the current rotation speed, line speed and output power of the motor.

P01.46	Inverter bridge temperature	-40.0 to 150.0℃	0

Displays the current temperature of the inverter bridge inside the drive.

P01.47	Accumulated running duration of the drive (min)	0 to 65535 min	0
P01.48	Accumulated running duration of the drive (h)	0 to 65535 h	0
P01.49	Current running duration of the drive (min)	0 to 65535 min	0
P01.50	Accumulated running duration of the fan	0 to 65535 h	0

Display the accumulated running duration, current running duration of the drive and the accumulated running duration of the fan.

P01.51	Reserved		
P01.52	Reserved		
P01.53	Reserved		
P01.54	Reserved		
P01.55	Reserved		

P01.57	User-defined frequency display	0.00 to P02.10	0

6.3 P02: Basic function parameters

P02.00	Control mode selection	0 to 3	2

0: SVC1

1: SVC2 (only for asynchronous motors)

2: V/F control (only for asynchronous motors)

3: FVC

P02.01	Motor selection	0 to 1	0

0: Motor 1

1: Motor 2

Motor 1 and motor 2 parameters correspond to Group P03 and Group P20 separately. Configure parameters according to actual conditions.

P02.02	Operation command channel selection	0 to 2	0

MV810J has three operation command channels.

0: Operating panel

Use RUN, STOP and the M key (set to JOG function) for control.

1: Terminal

Use external control terminals (FWD, REV, FWD JOG, REV JOG) for control.

2: Communication

Used the serial ports, bus expansion cards and other communication methods for control.

WARNING

During running, it is not allowed to switch the operation command channel by changing this function code, using external terminals or the M key.

P02.03	Communication command channel selection	0 to 3	0

When P02.02=2, the following communication channels are available:

0: Modbus

1 and 2: Reserved

3: CANopen

P02.04	Running direction	0 to 1	0

This function is valid for the operating panel and serial port channels, and invalid for the terminal channel.

0: Same direction

1: Opposite direction

P02.05	Main frequency source selection	0 to 8	0

0: Digital setting P02.09

When the drive is powered on, set the value of P02.09 as the current frequency reference.

When the drive is running or at stop, you can use the "∧" and "∧" keys on the keypad to change such frequency.

1: AI1 reference

2: AI2 reference

AI1 and AI2 are two independent physical channels for analog reference.

AI is the analog signal input channel. When AI is set to voltage signal input, its voltage input range is: AI1: -10 to 10 V, AI2: -10 to 10 V; when AI is set to current signal input, the current input range is 0 to 20 mA. AI1 supports single-ended input, and AI2 supports both single-ended input and differential input.

For the adjusted analog input signals (-10 V to 0 V to +10 V), it is specified as below:

0 V to +10 V, forward, corresponding frequency defined in the Group P09.

0 V to -10 V, reverse, corresponding frequency defined in the Group P09.

3: Reserved

4: Reserved

5: Reserved

6: PID control

The frequency is determined by the calculation of process closed-loop PID.

7: Modbus

8: CANopen

The flow reference for a slave pump is given by CAN communication.

P02.09	Frequency digital setting	0.00 Hz to P02.11	50.00 Hz

When the main frequency reference channel is digital setting (P02.05=0), this parameter is the initial frequency setpoint of the drive's main frequency reference.

P02.10	Maximum output frequency	P02.11 to 599.00 Hz	50.00 Hz

P02.11	Upper limit frequency	P02.12 to P02.10	50.00 Hz
P02.12	Lower limit frequency	0.00 Hz to P02.11	0.00 Hz

The maximum output frequency is the highest frequency allowed by the drive, such as Fmax in the below figure;

The upper limit frequency is the highest frequency allowed in operation set by the user, such as FH in the below figure;

The lower limit frequency is the lowest frequency allowed in operation set by the user, such as FL in the below figure;

Fb in the below figure is the basic operating frequency, defined as the minimum corresponding output frequency when the drive outputs the highest voltage in the V/F mode.

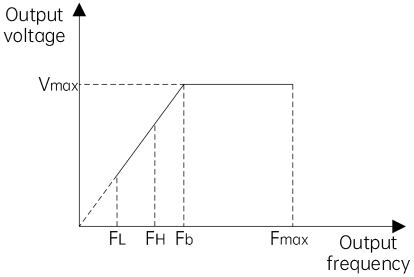


Fig. 6-6 Frequency limit parameter definition

WARNING

(1) The maximum output frequency, upper limit frequency and lower limit frequency should be carefully set according to the actual nameplate parameters of the controlled motor and the needs of the operating conditions.

(2) The limit range of the upper and lower frequency has no effect on the JOG operation, but it will affect the auto-tuning of the motor (parameter identification).

(3) In addition to the upper limit frequency and lower limit frequency, the output frequency of the drive during operation is also limited by the startup frequency, start frequency of DC braking at stop, jump frequency and other parameters.

(4) The above figure shows the relationship between the maximum output frequency, upper limit frequency, and lower limit frequency. Note the value ranges during setting.

(5) The upper and lower frequency limits are used to limit the actual output frequency to the motor. If the frequency reference is higher than the upper limit frequency, the device will run at the upper limit frequency; if the frequency reference is lower than the lower limit frequency, the device will run at the lower limit frequency; and if the frequency reference is lower than the startup frequency, the device will run at zero frequency.

P02.13	Acceleration time 1	0 to 6000.0 s	Model dependent
P02.14	Deceleration time 1	0 to 6000.0 s	Model dependent

The acceleration time refers to the time required for the drive to accelerate from zero frequency to the maximum output frequency (P02.10). The deceleration time refers to the time required for the drive to decelerate from the maximum output frequency (P02.10) to zero frequency.

P02.16	Carrier frequency	2.0 to 12.0 kHz	4.0 kHz

Table 6-2 PWM carrier frequency for servo output

Servo power	Carrier frequency by default
15 to 55 kW	4 kHz
75 to 160 kW	2 kHz

6.4 P03: Motor 1 parameters

P03.00	Motor type selection	0 to 1	0

0: Asynchronous motor

1: Synchronous motor

P03.01	Asynchronous motor rated power	0.1 to 3000.0 kW	Model dependent
P03.02	Asynchronous motor rated voltage	0 to 1200 V	Model dependent
P03.03	Asynchronous motor rated current	0.8 to 6000.0 A	Model dependent
P03.04	Asynchronous motor rated frequency	0.01 Hz to P02.10	50.00 Hz
P03.05	Asynchronous motor rated speed	1 to 36000 rpm	Model dependent

The controlled motor 1 is an asynchronous motor here.

To enter the motor 1 parameter group, you need to set P02.01 to 0 and P03.00 to 0. To ensure the control performance, set the values of P03.01–P03.05 correctly according to the nameplate parameters of the motor.

WARNING

The power rating of the motor and the drive should be matched. Generally, the motor's power can only be lower than the drive by two levels or higher than the drive by one level. Otherwise, the control performance will be affected.

P03.06	Asynchronous motor stator resistance	0.001 to 65.535 Ω	Model dependent
P03.07	Asynchronous motor rotor resistance	0.001 to 65.535 Ω	Model dependent
P03.08	Asynchronous motor leakage inductance	0.01 mH to 655.35 mH (drive power ≤ 55 kW) 0.001 mH to 65.535 mH (drive power > 55 kW)	Model dependent
P03.09	Asynchronous motor mutual inductance	0.1 mH to 6553.5 mH (drive power ≤ 55 kW) 0.01 mH to 655.35 mH (drive power > 55 kW)	Model dependent

P03.10	Asynchronous motor no-load current	0.1 to 6553.5 A	Model dependent

When P03.00 is set to 0 (motor 1 is asynchronous), the above motor parameters are illustrated in the following figure.

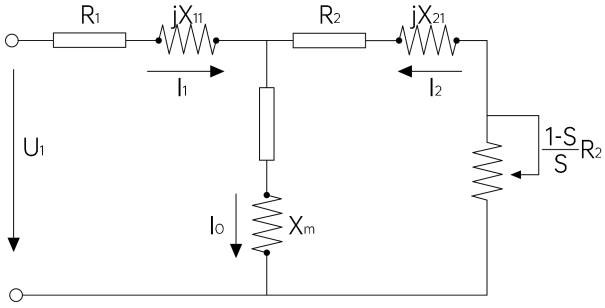


Fig. 6-7 Equivalent circuit diagram for asynchronous motor in steady state

In the above figure, R_1, X_{11}, R_2, X_{21}, X_m, and I_o indicate stator resistance, stator leakage inductance, rotor resistance, rotor leakage inductance, mutual inductance, and no-load current respectively. The function code P03.08 is the sum of stator leakage inductance and rotor leakage inductance.

If the parameters of the asynchronous motor are already known, write the actual value to P03.06–P03.09 accordingly. P03.10 is the no-load current of the asynchronous motor where the user can directly input the no-load current value.

If the motor parameters are auto tuned, the set values of P03.06–P03.10 will be updated after the auto-tuning.

After the motor power P03.01 is changed, the drive will set the P03.02–P03.10 to the default parameters corresponding to the motor power.

P03.11	Asynchronous motor iron core magnetic saturation coefficient 1	0 to 100.0%	80.0%
P03.12	Asynchronous motor iron core magnetic saturation coefficient 2	0 to 100.0%	68.0%
P03.13	Asynchronous motor iron core magnetic saturation coefficient 3	0 to 100.0%	57.0%
P03.14	Asynchronous motor iron core magnetic saturation coefficient 4	0 to 100.0%	40.0%

Specify the asynchronous motor iron core magnetic saturation coefficient 1 to 4.

P03.15	Synchronous motor rated power	0.1 to 3000.0 kW	Model dependent
P03.16	Synchronous motor rated voltage	0 to 1200 V	Model dependent
P03.17	Synchronous motor rated current	0.8 to 6553.5 A	Model dependent
P03.18	Synchronous motor rated frequency	0.01 Hz to P02.10	Model dependent

The controlled motor 1 is a synchronous motor here.

To enter the motor 1 parameter group, you need to set P02.01 to 0 and P03.00 to 1. To ensure the control performance, set the values of P03.15–P03.18 correctly according to the nameplate parameters of the motor.

P03.19	Number of synchronous motor pole pairs	1 to 128	2

Used to set the number of synchronous motor pole pairs.

P03.20	Synchronous motor stator resistance	0.001 to 65.535 Ω (drive power ≤ 55kW) 0.0001 to 6.5535 Ω (drive power > 55 kW)	Model dependent
P03.21	Synchronous motor d-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power > 55 kW)	Model dependent
P03.22	Synchronous motor q-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power > 55 kW)	Model dependent
P03.23	Synchronous motor back EMF	0.0 to 6553.5 V	Model dependent

Specify the control parameters of a synchronous motor, which can be identified by auto-tuning, or manually input by the search of related motor parameters.

P03.27	Motor auto-tuning	0 to 3	0

Provides the motor auto-tuning function in the static or rotating status, as shown below:

0: No operation

1: Part parameter auto-tuning in the static status

2: Full parameter auto-tuning in the rotating status

3: Full parameter auto-tuning in the static status

P03.28	Motor overload protection factor	0.0 to 300.0%	100.0%
P03.29	Motor overload protection enable	0 to 1	1

0: Disabled

1: Enabled

In order to implement effective overload protection for different types of load motors, it is necessary to adjust the permissible maximum output current of the drive, as shown in the following figure.

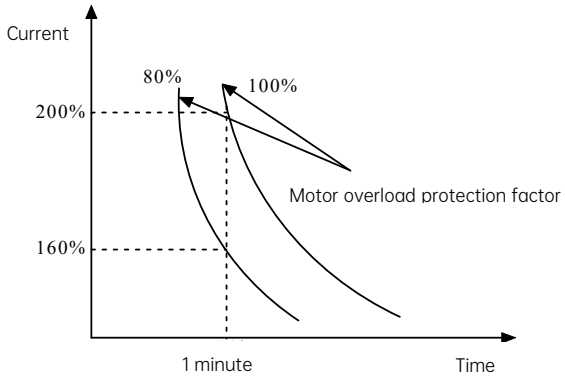


Fig. 6-8 Setting of motor overload protection factor

The adjustment value differs according to the user's needs. Under the same conditions, if the fast protection is required when the motor is overloaded, you need to set P03.28 to a small value; otherwise, set it to a big value.

WARNING

If the rated current of the load motor does not match the rated current of the drive, you can set P03.28 to realize overload protection of the motor.

6.5 P04: Motor 1 encoder parameters

P04.00	Encoder PPR	1 to 65535	1024

Used to set the encoder PPR of motor 1.

Local encoder parameter, set according to the pulses per revolution (PPR) of the selected pulse encoder (PG).

WARNING

Set this parameter correctly, especially when a speed sensor is running; otherwise, the motor may fail to run.

P04.01	Encoder type	2	2

Used to set the encode type of motor 1. Only resolver is supported currently.

2: Resolver

P04.07	Initial installation angle of motor 1 encoder	0.0 to 360.0	0.1

P04.23	Synchronous open-loop Q-axis correction coefficient	0 to 100	40

P04.24	Synchronous open-loop D-axis correction coefficient	0 to 100	30
P04.25	Synchronous open-loop speed filter coefficient	0 to 1000	100
P04.26	Synchronous open-loop D-axis injection current	0% to 100%	10
P04.27	Synchronous open-loop low-frequency carrier frequency	1.0 to 6.0	4.0
P04.28	Speed tracking Kp adjustment	10 to 1000	10
P04.29	Speed tracking Ki adjustment	10 to 1000	10
P04.30	Speed tracking target current	30% to 200%	100%

6.6 P05: Motor 1 vector control parameters

P05.00	Speed loop proportional gain 1	1 to 100	10
P05.01	Speed loop integral time 1	0.01 to 10.00 s	0.50 s
P05.02	Switchover frequency 1	0.00 Hz to P02.11	5.00 Hz
P05.03	Speed loop proportional gain 2	1 to 100	10
P05.04	Speed loop integral time 2	0.01 to 10.00 s	1.00 s
P05.05	Switchover frequency 2	0.00 Hz to P02.11	10.00 Hz

Used to adjust the proportional gain and integral time for the speed loop. Function codes P05.00 to P05.05 are valid in the vector control mode and serve as PI parameters of motor 1 at high speed and low speed.

P05.00 and P05.01 are the PI parameters of the speed loop when the running frequency is lower than the ASR switchover frequency 1 (P05.02), and P05.03 and P05.04 are the PI parameters of the speed loop when the running frequency is higher than the ASR switchover frequency 2 (P05.05). When it is between the switchover frequency 1 and switchover frequency 2, the two sets of PI parameters are linearly switched.

Increasing the proportional gain P can accelerate the dynamic response of the system. However, if P is too large, the system is prone to oscillation. Reducing the integral time I can speed up the dynamic response of the system. However, if I is too small, the system has large overshoots and oscillates easily. Usually, the proportional gain P is adjusted first to increase P as much as possible without oscillating the system. Then the integral time I is adjusted so that the system has both fast response and small overshoots.

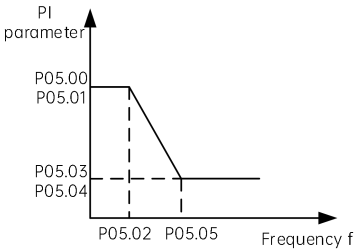


Fig. 6-9 PI parameter

WARNING

If the PI parameter is not well selected, the system may produce overvoltage failure (if there is no external braking resistor or braking unit) after a fast start to high speed, which is due to the energy feedback produced in the regenerative braking state of system during drop after the speed overshoot. This can be avoided by adjusting the PI parameter.

In the vector control mode, you can set the proportional gain P and integral time I of the speed regulator to change the speed response features of vector control.

(1) The composition of speed regulator (ASR)

As shown in the following figure, K_P is the proportional gain P and T_i is the integral time I.

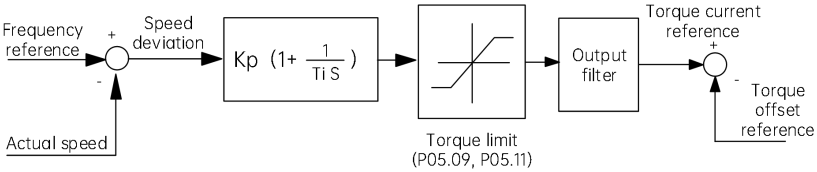


Fig. 6-10 Simplified diagram of ASR

When the integral time is set to 0 (P05.01=0, P05.04=0), there is no integral effect, and the speed loop is a simple proportional regulator.

(2) Setting of the proportional gain P and integral time I of the speed regulator (ASR)

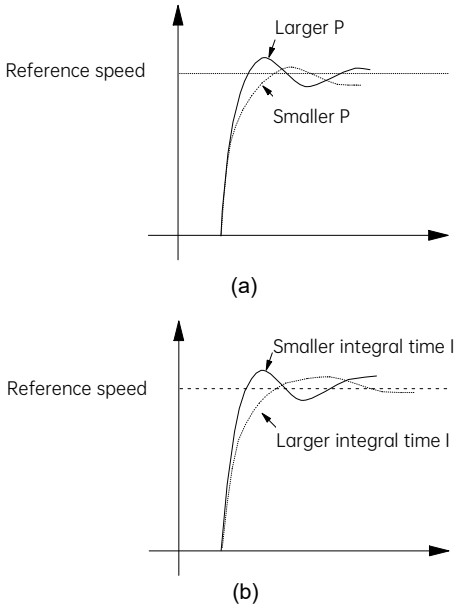


Fig. 6-11 Relations between the step response and PI parameters

Increasing the proportional gain P can accelerate the dynamic response of the system. However, if P is too large, the system is prone to oscillation.

Reducing the integral time I can speed up the dynamic response of the system. However, if I is too small, the system has large overshoots and oscillates easily, as shown in the above figure.

Usually, the proportional gain P is adjusted first to increase P as much as possible without oscillating the system. Then the integral time I is adjusted so that the system has both fast response and small overshoots. The following figure shows the speed step response curve when P and I are well selected (the speed response curve can be observed with the analog output terminal AO1, referring to the Group P10 parameters).

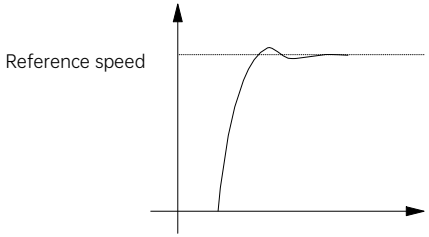


Fig. 6-12 Step response with good dynamic response

WARNING

If the PI parameter is not well selected, the system may produce overvoltage failure (if there is no external braking resistor or braking unit) after a fast start to high speed, which is due to the energy feedback produced in the regenerative braking state of system during drop after the speed overshoot. This can be avoided by adjusting the PI parameter.

(3) Adjustment of the PI parameter for the speed regulator (ASR) at high/low speed

If the system requires fast response for both high and low speed with-load running, the ASR switchover frequency (P05.02 and P05.05) can meet the needs. Generally, the proportional gain P can be increased and the integral time I can be decreased relatively to improve the dynamic response when the system is running at low frequency. The speed regulator parameters are adjusted according to the following order in most cases:

① Select the appropriate switchover frequencies P05.02 and P05.05.

② Adjust the proportional gain P05.03 and the integral time P05.04 at high speed to ensure that the system does not oscillate and has good dynamic response.

③ Adjust the proportional gain P05.00 and the integral time P05.01 at low speed to ensure that the system does no oscillate and has good dynamic response at low frequency.

P05.06	Slip compensation coefficient	50 to 200%	100%

Used to set the slip compensation coefficient when the motor 1 is an asynchronous motor.

It is valid only when both P02.01 is set to 0 and P03.00 is set to 0.

P05.07	Speed loop filter time constant	0.00 to 20.00 s	0.02 s

The speed regulator (ASR) output is passed through a delay filter to get the reference torque current. P05.07 is used to set the time constant of the speed loop output filter of motor 1. Generally, no modification is required.

P05.08	Vector control overexcitation gain	50 to 200%	100%

Used to set the overexcitation gain of motor 1 under vector control.

P05.09	Drive torque upper limit source	0 to 5	0
P05.10	Drive torque upper limit digital setting	0.0 to 300.0%	150.0%

Used to set the physical channel for the drive torque limit.

0: Digital setting (P05.10)

P05.10 is the drive torque limit.

1: AI1

2: AI2

The maximum AI input voltage/current (10 V / 20 mA) can correspond to 300% of the rated torque reference.

3: Reserved

4: Modbus

The drive torque limit value is set by Modbus.

5: Reserved

P05.11	Braking torque upper limit source	0 to 5	0
P05.12	Braking torque upper limit digital setting	0.0 to 300.0%	150.0%
P05.13	Excitation regulation Kp	0 to 60000	2000
P05.14	Excitation regulation Ki	0 to 60000	1300
P05.15	Torque regulation Kp	0 to 60000	2000
P05.16	Torque regulation Ki	0 to 60000	1300

Used to set the physical channel for the braking torque limit.

0: Digital setting (P05.12)

P05.12 is the braking torque limit.

1: AI1

2: AI2

The maximum AI input voltage/current (10 V / 20 mA) can correspond to 300% of the rated torque reference.

3: Reserved

4: Modbus

The drive torque limit value is set by Modbus.

5: Reserved

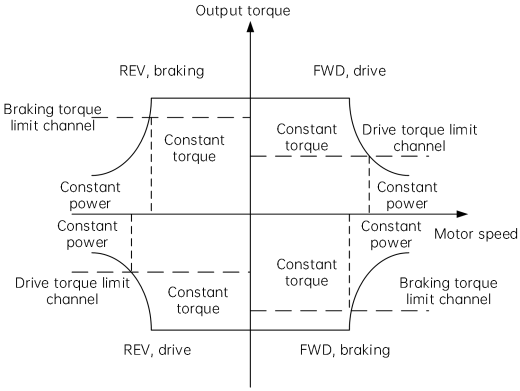


Fig. 6-13 Torque control diagram

WARNING

The torque limit value can only be positive. If the reference is negative, the torque limit will become 0 automatically.

P05.17	Integral separation	0 to 1	0

0: Disabled

1: Enabled

P05.18	Synchronous motor field weakening coefficient	0 to 100	5

P05.19	Maximum field weakening current	0 to 120.0%	100.0%

P05.20	Field weakening auto-tuning coefficient	0.0 to 120.0%	100.0%

P05.21	Field weakening integral multiple	0.000 to 1.200	0

6.7 P06: Motor 1 torque control parameters

P06.00	Torque control enable	0 to 1	0

0: Disabled

1: Enabled

Through this function code, the speed control and torque control can be switched.

0: Speed control mode

In this mode, the motor is controlled by the speed reference, and the internal ASR is effective. The speed control mode shall be used in cooperation with the drive torque limit value and the braking torque limit value.

1: Torque control mode

In this mode, the internal ASR is ineffective, and the torque reference amount can be selected according to the function code P06.01. Under torque control, the motor speed may increase due to the mismatch between the torque reference and the load torque, so you need to set the speed limit properly.

WARNING

Under vector control, the speed control mode and torque control mode can be switched through the terminal. When P06.00 is set to 0 and the terminal function (47) is invalid, the current mode is speed control; if the terminal function is valid, the mode will be switched to torque control. When P06.00 is set to 1 and the terminal function (47) is invalid, the current mode is torque control; if the terminal function is valid, the mode will be switched to speed control. For details, refer to the "No.47 function of terminals: Speed control and torque control switchover terminal" in P09.03–P09.10.

P06.01	Torque reference channel	0 to 5	0

Used to set the physical channel of torque reference in torque control.

0: Digital setting

The torque reference is set by the function code P06.02, and the digital setting range of torque reference is -300% to +300%.

1: AI1

2: AI2

The maximum AI input voltage/current (10 V / 20 mA) corresponds to 300% of the rated torque. For the specific relations between AI input and torque, refer to the description of Group P09. The positive/negative input of AI corresponds to the positive/negative value of torque reference.

3: Reserved

4: Modbus

The host device sets the current torque reference of the drive through the standard RS485 interface built in the drive.

For details about the programming method, operation method and communication protocol, see Modbus communication protocol.

5: Reserved

P06.02	Torque digital setting	-300.0% to 300.0%	0.0%

The digital setting range of the torque reference is -300.0% to +300.0%.

P06.03	Torque reference acceleration/deceleration time	0 to 6000.0 s	6.0 s

Used to set the torque acceleration/deceleration time under torque control. It is invalid under speed control.

Specifies the time the system takes to reach the reference torque from the current torque.

P06.04	FWD speed limit channel	0 to 5	0
P06.05	FWD speed limit digital setting	0.00 Hz to P02.11	0.00 Hz
P06.06	REV speed limit channel	0 to 5	0
P06.07	REV speed limit digital setting	0.00 Hz to P02.11	0.00 Hz

Function codes P06.04 to P06.07 are valid only in the torque control mode.

The speed limits of the motor in torque control are set by function codes P06.04 to P06.07. In the torque control mode, if the motor speed exceeds the speed limit, the internal torque command switches to the speed regulator (ASR) output to control the motor speed.

Function codes P06.04 and P06.06 are used to select the maximum speed limit channel of the motor FWD and REV respectively.

FWD and REV speed limit channels:

0: Digital setting

The FWD and REV limits are set by function codes P06.05 and P06.07.

1: AI1

2: AI2

The AI value is used as the speed limit in torque control. The AI-speed relations are determined by the AI curve in Group P09.

3: Reserved

4: Modbus

The host device sets the current torque reference of the drive through the standard RS485 interface built in the drive.

For details about the programming method, operation method and communication protocol, see Modbus communication protocol.

5: Reserved

The FWD/REV limit value (digital setting) is enabled when P06.04=0 (or P06.06=0), and the 100% setting corresponds to the maximum output frequency of the drive (P02.10).

P06.08	Inductance auto-tuning current	0 to 100	80
P06.09	Pole position auto-tuning current	0 to 150	120

6.8 P07: Motor 1 V/F control parameters

P07.00	V/F curve	0 to 5	0

0: Straight-line V/F

1: Multi-point V/F

2: Square V/F

3: Reserved

4: V/F complete separation

5: V/F half separation

P07.00 to P07.08 determine the different V/F curves of motor 1 under V/F control.

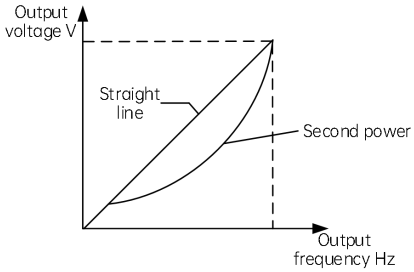


Fig. 6-14 V/F curve

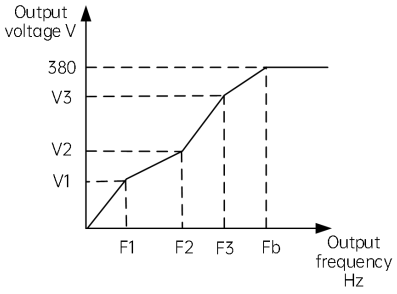


Fig. 6-15 Multi-point V/F curve

P07.00=1: User-defined curve, applicable to segmented constant torque loads, as shown in Fig. 6-14.

In Fig. 6-15, F1 < F2 < F3 < Fb, Fb is the basic operating frequency, which is generally the rated frequency of the motor.

V1 ≤ V2 ≤ V3 ≤ 380.

P07.01	Torque boost	0.0 to 50.0	Model dependent
P07.02	Cut-off frequency of torque boost	0.00 Hz to P02.11	50.00 Hz

For torque compensation at low frequency, the output voltage needs to be boosted. P07.01 is relative to the maximum output voltage. When set to 0, it indicates automatic torque boost; when set to a non-zero value, it indicates manual torque boost, as shown in Fig. 6-16.

P07.02 defines the cut-off frequency for manual torque boost, which is fz shown in Fig. 6-16. This cut-off frequency is applicable to any V/F curve selected by P07.00.

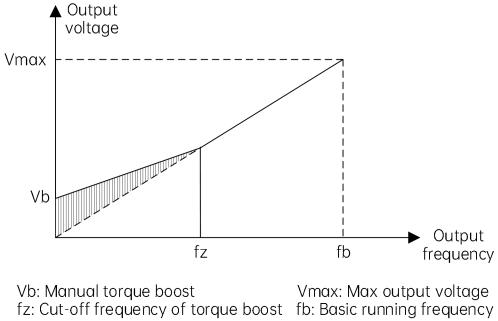


Fig. 6-16 Torque boost (boosted amount is the shaded area)

WARNING

(1) Improper setting of this parameter can lead to motor overheat or overcurrent protection.

(2) fz is defined in the function code P07.02.

(3) When driving the synchronous motor, it is recommended to use manual torque boost, and adjust the V/F curve according to the motor parameters and working conditions.

(4) The maximum output voltage Vmax corresponds to the rated voltage of the motor, so it is necessary to set the rated voltage of the motor correctly.

P07.03	Multi-point V/F frequency 1	0.00 Hz to P07.05	0.00 Hz
P07.04	Multi-point V/F voltage 1	0 V to P07.06	0 V
P07.05	Multi-point V/F frequency 2	P07.03 to P07.07	0.00 Hz
P07.06	Multi-point V/F voltage 2	P07.04 to P07.08	0 V
P07.07	Multi-point V/F frequency 3	P07.05 to 599.00 Hz	0.00 Hz

P07.08	Multi-point V/F voltage 3	P07.06 to 380 V	0.0 V

P07.09	Torque compensation coefficient	0 to 300	150
P07.10	V/F overexcitation gain	0 to 200	80
P07.11	Oscillation suppression gain	0 to 100	40

P07.12	Oscillation suppression gain mode	0 to 2	0

P07.13	Voltage source for V/F separation	0 to 9	0

0: Digital setting

1: AI1

2: AI2

3: Reserved

4: Reserved

5: Reserved

6: Reserved

7: PID

8: Modbus

9: Reserved

P07.14	Digital setting of voltage source for V/F separation	0 to 1000 V	0 V
P07.15	Voltage rise time of V/F separation	0 to 6000.0 s	5.0 s
P07.16	Voltage fall time of V/F separation	0 to 6000.0 s	5.0 s

P07.17	Stop mode for V/F separation	0 to 1	0

0: Frequency and voltage decline to 0 independently

1: Frequency declines after voltage declines to 0

6.9 P08: Startup/Stop control parameters

P08.00	Startup mode	0 to 2	0

The drive provides different startup modes according to various applications.

0: Startup from the startup frequency

The drive starts from the startup frequency P08.02, and accelerates to the frequency reference after the startup frequency hold time P08.03. If the motor is still rotating when the drive starts, the motor will be automatically braked to a low speed before the acceleration.

1: Startup after speed tracking

The drive identifies the speed of the rotating motor and starts directly from the identified frequency. The current and voltage in the starting process are smooth and without impact.

2: Startup after DC braking

DC excitation and DC braking are performed. The DC injection amount and time are set by P08.04 and P08.05. After the DC braking time is reached, the drive starts from the startup frequency P08.02, and accelerates to the frequency reference after the startup frequency hold time P08.03.

P08.01	Startup delay time	0.0 to 600.0 s	0.0 s

Specifies the delay time after which the drive starts to run when receiving an operation command.

P08.02	Startup frequency	0.0 to 50.00 Hz	0.00 Hz
P08.03	Startup frequency hold time	0.0 to 50.0 s	0.0 s

The drive starts from the startup frequency P08.02, and accelerates to the frequency reference after the startup frequency hold time P08.03.

For heavy load startup application, setting a proper startup frequency hold time will facilitate the startup.

P08.04	Braking current at startup	0.0 to 100.0%	0.0%
P08.05	Braking time at startup	0.00 to 50.00	0.00 s

P08.04 sets the magnitude of the DC braking current at startup, which is a percentage relative to the drive's rated current.

P08.05 sets the action time for DC braking at startup.

P08.06	Stop mode	0 to 2	0

The drive provides different stop modes according to various applications.

0: Decelerate to stop

Decelerate to stop according to the set deceleration time.

1: Coast to stop

The drive cuts off the output, and the motor coasts to stop.

2: Emergency stop

Decelerate to stop according to the set deceleration time, and when the frequency is lower than the start frequency of braking at stop P08.11, the DC braking current P08.13 will be injected after the braking delay at stop P08.12. The DC braking time at stop is set by P08.14.

P08.07	Stop frequency	0.00 to 3.00 Hz	0.50 Hz

Specifies the frequency used to detect whether the stop action is completed.

P08.08	Stop frequency hold time	0.0 to 600.0 s	0.0 s

Specifies the hold time for detecting the frequency upon which the stop action is completed.

P08.09	Stop frequency detection mode	0 to 1	0

0: Speed reference

In V/F control, only this mode is available.

1: Speed detection value

P08.10	Stop frequency detection time	0.00 to 100.00 s	0.50 s

After the P08.08 delay, stop frequency detection starts. During the time defined by P08.10, if P08.09=0, the drive will immediately stop when the ramp reference frequency is equal to or lower than P08.07; if P08.09=1, the drive will stop only when the actual frequency is equal to or lower than P08.07. If no stop frequency is detected after P08.10, the drive will directly stop.

P08.11	Start frequency of braking at stop	0.00 to P02.10 (max. frequency)	0.00
P08.12	Braking delay at stop	0.00 to 30.00	0.00 s
P08.13	DC braking current at stop	0.0 to 150.0%	0.0%
P08.14	DC braking time at stop	0.0 to 6553.5 s	0.0 s

P08.11 sets the starting frequency at which the DC braking current begins to be injected during the stop process.

P08.12 braking delay at stop: specifies the time interval from the moment when the operating frequency reaches the start frequency of braking (P08.11) to the moment when the DC braking current beings to be injected during the decelerating to stop process.

P08.13 sets the magnitude of the DC braking current at stop, which is a percentage relative to the drive's rated current.

P08.14 sets the action time of DC braking at stop.

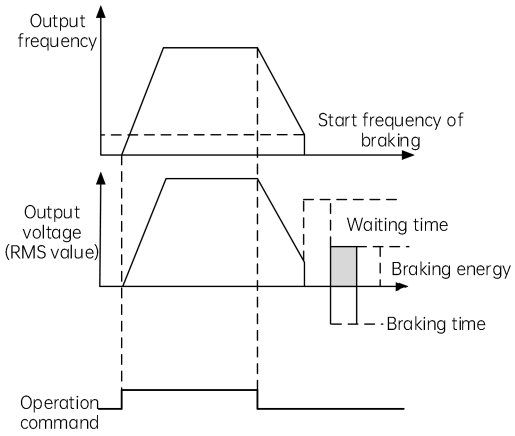


Fig. 6-17 Diagram for "decelerate to stop + DC braking"

P08.15	Speed tracking mode	0 to 1	0

0: From the stop frequency

1: From the maximum frequency

WARNING

Only available for asynchronous motors.

P08.16	Speed of speed tracking	1 to 100	20

The larger the parameter is, the faster the tracking speed will be. However, too large parameter may cause the tracking unreliable.

P08.17	Speed tracking current	10 to 200%	Model dependent

Ensure the maximum current during speed tracking is within the range. Too small current may cause bad speed tracking.

P08.18	Output upon vector 0 Hz	0 to 3	0

0: Enable voltage output

1: No voltage output

2: Output according to the DC braking current at stop

3: Zero servo running

P08.19	Running mode when below frequency lower limit	0 to 2	0

0: Running at frequency lower limit

1: Decelerate to stop

2: Hibernation

When the frequency reference is below the frequency lower limit, the drive coasts to stop; and when the frequency reference is once above the frequency lower limit and running duration exceeds the time set by P08.20, the drive automatically resumes operation.

P08.20	Recovery delay from hibernation	0.0 to 3600.0	0.0 s

P08.25	Restart selection upon power failure	0 to 1	0
P08.26	Waiting time for restart upon power failure	0 to 3600	1.0 s

The functions can decide whether the drive can restart automatically after a power failure, and the waiting time before such auto restart.

P08.25=0: When you power on the drive after a power failure, the drive is forbidden to restart.

P08.25=1: When you power on the drive after a power failure, the drive will restart automatically after the waiting time defined by P08.26.

WARNING

(1) If there is a stop command, the stop shall prevail.

(2) When the restart upon power failure function is effective, if the drive is powered on again while not being completely powered down (the drive LED displays -LU-), the drive will act as though it is powered on again after being completely powered down (the LED on the operating panel is completed extinguished), that is, the drive will restart according to the startup mode defined by P08.00.

P08.27	Reverse running inhibition	0 to 1	0

0: Disabled

1: Enabled

P08.28	FWD/REV switchover deadzone time	0.0 to 3600.0	0.0 s

For some production equipment, reverse running may cause equipment damage. This function can inhibit the drive from running reversely.

The FWD/REV switchover deadzone time specifies the waiting transition time at the output of zero frequency, when the drive switches from forward running to reverse running (or from reverse running to forward running), as t1 shown in the following figure.

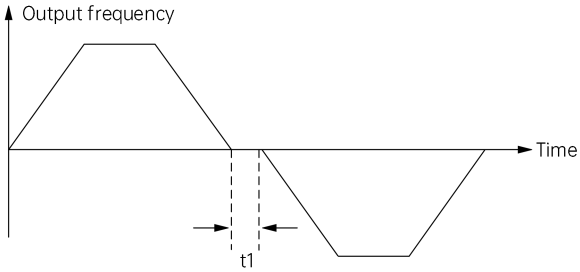


Fig. 6-18 FWD/REV switchover deadzone time

P08.29	FWD/REV switchover mode	0 to 2	0

0: Switchover after the zero frequency

1: Switchover after the startup frequency

2: Switchover after the delay subsequent to the stop frequency

P08.31	Dynamic braking usage ratio	0 to 100%	100%
P08.32	Braking startup voltage	500 to 800 V	680 V

The usage ratio of dynamic braking P08.31 and braking startup voltage P08.32 can only be applied to the drive with a built-in braking unit.

P08.32 can be set to select the action voltage of the braking unit. A proper action voltage can achieve fast dynamic braking stop.

P08.33	Deceleration time for emergency stop	0.0 to 60.0	2.0 s

When the input of the emergency stop terminal (No.60 terminal function) is effective, the drive begins to decelerate to stop. The deceleration time is determined by P08.33. When the time is set to 0 s, the drive can be stopped with the shortest deceleration time.

P08.34	Terminal running protection	0 to 0x11	0x10

0: Enable protection

1: Disable protection

It decides, after a power-on or fault reset, whether the terminals need to be enabled again before drive operation.

Note: If you disable protection, the terminal command will be immediately responded after fault reset.

6.10 P09: Terminal input parameters

P09.00	Function selection of terminal 9	0 to 0x11	0

Ones: Reserved

Tens:

0: Terminal 9 as DI2

1: Terminal 9 as DO1

Hundreds: Reserved

Thousands: Reserved

P09.01	DO1 polarity selection	0 to 0x01	0

Ones:

0: DO1 as 0 V output

1: DO1 as 24 V output

Tens: Reserved

Hundreds: Reserved

Thousands: Reserved

P09.02	Function selection of terminal 4	0 to 0x01	0

Ones:

0: Terminal 4 as AI1 voltage input

1: Terminal 4 as AI1 current input

Tens: Reserved

Hundreds: Reserved

Thousands: Reserved

P09.03	DI1 function selection	0 to 72	1
P09.04	DI2 function selection	0 to 72	22
P09.05	DI3 function selection	0 to 72	0
P09.06	DI4 function selection	0 to 72	0
P09.07	DI5 function selection	0 to 72	0

Table 6-3 Table of digital input terminal functions

Item	Function	Item	Function
0	No function	1	Forward RUN
2	Reverse RUN	3	Forward jog
4	Reverse jog	5	Three-wire control
6	Reserved	7	Reserved
8	Reserved	9	Reserved
10	Acceleration/Deceleration time terminal 1	11	Acceleration/Deceleration time terminal 2
12	Frequency up/down setting clear (Terminal)	13	Frequency up/down setting clear (Terminal+Keypad)
14	Frequency increase command (UP)	15	Frequency decrease command (DN)
16	External fault NO input	17	External fault NC input

Item	Function	Item	Function
18	Switched from pressure mode to speed mode	19	Master/Slave pump mode switchover
20	Frequency reference source switchover from A to B	21	Frequency reference source switchover from combination to A
22	External reset (RESET) input	23	Coast to stop input (FRS)
24	Acceleration/Deceleration inhibition	25	DC braking input at stop
26	Reserved	27	Frequency reference source switchover from combination to B
28	Reserved	29	Reserved
30	Reserved	31	Reserved
32	Reserved	33	Reserved
34	Main reference frequency source selection 1	35	Main reference frequency source selection 2
36	Main reference frequency source selection 3	37	Reserved
38	Command channel switched to keypad	39	Command channel switched to terminal
40	Command channel switched to communication	41	Reserved
42	REV inhibition	43	Drive running inhibition
44	External stop command (it is valid for all control modes, and the device will be stopped according to the current stop mode)	45	Auxiliary reference frequency clear
46	Reserved	47	Speed control and torque control switchover terminal
48	Torque direction switchover terminal in torque control	49	Reserved
50	Reserved	51	Reserved
52	Reserved	53	Reserved
54	Reserved	55	Motor 1 and 2 switchover terminal
56	Safety terminal input (reserved)	57	Reserved
58	Reserved	59	Reserved
60	Emergency stop	61	Reserved
62	Reserved	63	Reserved
64	Reserved	65	Power consumption clear
66	Power consumption hold	67	Reserved
68	Reserved	69	Switched to V/F control
70	Switched to FVC control	71, 72	Reserved

WARNING

The settings of multi-function input terminals are mutually exclusive (excluding the No.0 function)

0: No function

1: Terminal forward running input

2: Terminal reverse running input

3: Terminal forward jog input

4: Terminal reverse jog input

The above 1 to 4 functions are effective only when the operation command channel P02.02 is set to 1; The running commands and jog commands are mutually exclusive, that is, the jog command will not be responded during the running state, and the running command will not be responded during the jog state.

5: Three-wire control

This parameter is valid only when the operation command channel P02.02 is set to 1.

6: Reserved

7: Reserved

8: Reserved

9: Reserved

10: Acceleration/Deceleration time terminal 1

11: Acceleration/Deceleration time terminal 2

When you only control one motor (motor 1 or motor 2), the ON/OFF combination of acceleration/deceleration time terminals 1 and 2 enables 1 to 4 selections of acceleration/deceleration.

Table 6-4 Expression of acceleration/deceleration time selection

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

If the drive needs to perform time-share control of two motors (a terminal's function is selected as No.55 for motor 1 and motor 2 switchover and the terminal is active), the acceleration/deceleration time 1 and 2 belong to motor 1, and the acceleration/deceleration time 3 and 4 belong to motor 2. The acceleration/deceleration time terminal 1 controls the switchover between the two groups of acceleration/deceleration time of motor 1 (acceleration/deceleration time 1, 2), while the acceleration/deceleration time terminal 2 controls the switchover between the two groups of acceleration/deceleration time of motor 2 (acceleration/deceleration time 3, 4).

12: Frequency up/down setting clear (Terminal)

13: Frequency up/down setting clear (Terminal+Keypad)

14: Frequency increase command (UP)

15: Frequency decrease command (DN)

The frequency is increased or decreased by the control terminal for remote control instead of the operating panel. It is valid when P02.05=0 in common running or when P02.06=0 (as auxiliary frequency). The increase and decrease rate is set by P11.16.

16: External fault NO input

17: External fault NC input

The terminal can input the fault signal of an external device, which is convenient for the drive to monitor the fault of the external device. After receiving the fault signal of the external device, the drive displays "EF". The fault signal can adopt two input modes: normally open and normally closed.

18: Switched from pressure mode to speed mode

19: Master/Slave pump mode switchover

20: Frequency reference source switchover from A to B

Switchover between the main frequency reference and the auxiliary frequency reference (P02.08 is set to 0 or 1)

21: Frequency reference source switchover from combination to A

Switchover from the combined frequency channel to the main frequency reference (P02.08 is set to 2–5)

22: External reset (RESET) input

Defines the reset signal of the external terminal input to achieve fault reset, only valid in the terminal control mode.

23: Coast to stop input (FRS)

When the drive is in the running state, if the terminal function is enabled, the drive immediately coasts to stop.

24: Acceleration/Deceleration inhibition

If the function terminal is enabled, the running frequency remains unchanged unless there is a stop command.

25: DC braking input at stop

After the drive receives a stop command, when the running frequency is lower than the start frequency of braking at stop P08.11, the drive starts DC braking. The braking current is set by P08.13. The braking time is the longer one of this terminal's function hold time and P08.14 (DC braking time at stop).

26: Reserved

27: Frequency reference source switchover from combination to B

Switchover from the combined frequency channel to the auxiliary frequency reference (P02.08 is set to 2–5)

28: Reserved

29: Reserved

30: Reserved

31: Reserved

32: Reserved

33: Reserved

34: Main reference frequency source selection 1

35: Main reference frequency source selection 2

36: Main reference frequency source selection 3

Through the ON/OFF combination of selection terminals 1, 2, 3, the frequency reference channels can be switched as shown in the following table. For the switching function via terminals and P02.09, the later comer is effective.

Table 6-5 Expression of frequency reference channel selection

Main frequency reference channel selection terminal 3	Main frequency reference channel selection terminal 2	Main frequency reference channel selection terminal 1	Main frequency reference channel
OFF	OFF	OFF	P02.09
OFF	OFF	ON	AI1
OFF	ON	OFF	AI2
OFF	ON	ON	Reserved
ON	OFF	OFF	Reserved
ON	OFF	ON	Reserved
ON	ON	OFF	PID
ON	ON	ON	Modbus

37: Reserved

38: Command channel switched to keypad

When the function terminal is enabled, the operation command channel will be switched to the keypad. When the function terminal is disabled, the operation command channel will be restored.

39: Command channel switched to terminal

When the function terminal is enabled, the operation command channel will be switched to the terminal. When the function terminal is disabled, the operation command channel will be restored.

40: Command channel switched to communication

When the function terminal is enabled, the operation command channel will be switched to communication. The specific communication method is set by P02.03. When the function terminal is disabled, the operation command channel will be restored.

41: Direct DC braking

42: REV inhibition

If the terminal is enabled during the reverse running, the drive will coast to stop. If this terminal is enabled before the the reverse running, the drive will enter the zero frequency running state. The forward running will not be affected.

43: Reserved

44: External stop command

When the drive is running, if the terminal function is enabled, the drive will stop according to the current stop mode, valid for all control modes.

45: Auxiliary reference frequency clear

It is only valid for the digital auxiliary frequency (P02.06=0, 7). When the function terminal is enabled, the auxiliary frequency reference will be cleared, and the frequency reference will be determined by the main frequency reference.

46: Reserved

47: Speed control and torque control switchover terminal

This function shall be used with the speed/torque control function code P06.00. In vector control, the speed control mode and torque control mode can be switched through the terminal. When P06.00 is set to 0 and the terminal function is disabled, the current mode is speed control; and when the terminal function is enabled, the current mode is torque control. When P06.00 is set to 1 and the terminal function is disabled, the current mode is torque control; and when the terminal function is enabled, the current mode is speed control.

48: Torque direction switchover terminal in torque control

In torque control, if the terminal function is enabled, the torque direction of the torque reference can be changed.

49: Reserved

50: Reserved

51: Reserved

52: Reserved

53: Reserved

54: Reserved

55: Motor 1 and 2 switchover terminal

When the terminal function is enabled, the two motors can be switched. The drive performs time-share control on two motors and uses this terminal function to switch between the two motors. The acceleration/deceleration time of motor 1 can be set by the acceleration/deceleration time 1 and acceleration/deceleration time 2, and the acceleration/deceleration time of motor 2 can be set by the acceleration/deceleration time 3 and acceleration/deceleration time 4.

56: Safety terminal input (reserved)

57 to 59: Reserved

60: Emergency stop

When this terminal function is enabled, the drive will stop as soon as possible according to the deceleration time determined by the load torque.

61: Reserved

62: Reserved

63: Reserved

64: Reserved

65: Power consumption clear

When this terminal function is enabled, the current count of power consumption will be cleared.

66: Power consumption hold

When this terminal function is enabled, the current count of power consumption will be unchanged.

67: Reserved

68: Reserved

69: Switched to V/F control

When this function is enabled, the drive is forcibly switched to the V/F control mode.

70: Switched to FVC control

When this function is enabled, the drive is forcibly switched to the FVC control mode.

71, 72: Reserved

P09.11	Terminal open-circuit voltage selection	0 to 1	1

0: Digital terminal open-circuit voltage 0 V

1: Digital terminal open-circuit voltage 24 V

P09.12	DI1 to DI4 active mode	0 to 0x1111	0

Ones:

0: DI1 positive logic active

1: DI1 negative logic active

Tens:

0: DI2 positive logic active

1: DI2 negative logic active

Hundreds:

0: DI3 positive logic active

1: DI3 negative logic active

Thousands:

0: DI4 positive logic active

1: DI4 negative logic active

P09.13	DI5 active mode	0 to 0x01	0

Ones:

0: DI5 positive logic active

1: DI5 negative logic active

Tens: Reserved

Hundreds: Reserved

Thousands: Reserved

P09.15	DI filter time	0.000 to 1.000	0.010 s

Used to set the filter time for DI terminal sampling. It is recommended to increase the parameter when there is strong interference to avoid misoperation.

P09.16	VDI active state	0 to 0x1F	0

0: Disabled

1: Enabled

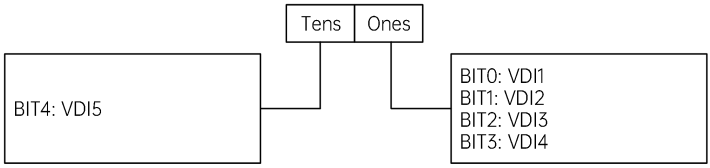


Fig. 6-19 VDI active state

P09.17	DI1 switch-on delay time	0.0 to 600.0	0.0 s
P09.18	DI1 switch-off delay time	0.0 to 600.0	0.0 s
P09.19	DI2 switch-on delay time	0.0 to 600.0	0.0 s
P09.20	DI2 switch-off delay time	0.0 to 600.0	0.0 s
P09.21	DI3 switch-on delay time	0.0 to 600.0	0.0 s
P09.22	DI3 switch-off delay time	0.0 to 600.0	0.0 s
P09.23	DI4 switch-on delay time	0.0 to 600.0	0.0 s
P09.24	DI4 switch-off delay time	0.0 to 600.0	0.0 s

Used to set the delay time for level jump upon switch-on/off of digital input terminals.

P09.25	AI1 lower limit	-10.00 V to P09.27	0.00 V
P09.26	Percentage corresponding to AI1 lower limit	-100.0% to 100.0%	0.0%
P09.27	AI1 upper limit	P09.25 to 10.00 V	10.00 V
P09.28	Percentage corresponding to AI1 upper limit	-100.0% to 100.0%	100.0%
P09.29	AI1 filter time	0.000 to 10.000 s	0.030 s
P09.30	AI2 lower limit	-10.00 V to P09.32	0.00 V
P09.31	Percentage corresponding to AI2 lower limit	-100.0 to 100.0%	0.0%
P09.32	AI2 upper limit	P09.30 to 10.00 V	10.00 V
P09.33	Percentage corresponding to AI2 upper limit	-100.0 to 100.0%	100.0%
P09.34	AI2 filter time	0.000 to 10.000 s	0.030 s
P09.35	AI3 lower limit	-10.00 V to P09.37	0.00 V
P09.36	Percentage corresponding to AI3 lower limit	-100.0 to 100.0%	0.0%
P09.37	AI3 upper limit	P09.35 to 10.00 V	10.00 V
P09.38	Percentage corresponding to AI3 upper limit	-100.0 to 100.0%	100.0%

P09.39	AI3 filter time	0.000 to 10.000 s	0.030 s
P09.40	AI4 lower limit	-10.00 V to P09.42	0.00 V
P09.41	Percentage corresponding to AI4 lower limit	-100.0 to 100.0%	0.0%
P09.42	AI4 upper limit	P09.40 to 10.00 V	10.00 V
P09.43	Percentage corresponding to AI4 upper limit	-100.0 to 100.0%	100.0%

6.11 P10: Terminal output parameters

P10.00	DO1 function selection	0 to 47	1
P10.01	DO2 function selection	0 to 47	4
P10.02	Reserved		
P10.03	Relay RO1 output selection	0 to 47	18

The function of DO terminals are defined in the following table:

Table 6-6 Table of digital output terminal functions

Item	Function	Item	Function
0	Disabled	1	Drive in running
2	Forward running	3	Reverse running
4	Frequency reach signal (FAR)	5	Frequency-level detection signal (FDT1)
6	Frequency-level detection signal (FDT2)	7	Overload detection signal (OL) (reserved)
8	Lockout for undervoltage (LU)	9	External fault stop (EXT)
10	Frequency upper limit (FHL)	11	Frequency lower limit (FLL)
12	Zero-speed running	13	Reserved
14	Reserved	15	Current running duration reach
16	Accumulated running duration reach	17	Drive ready to run (RDY)
18	Drive fault	19	Host device on/off signal
20	Motor overheat	21	Torque limited (valid when torque command is limited by the torque limit value 1 or 2.)
22	Motor overload warning	23 to 25	Reserved
26	Reserved	27	Reserved
28	Reserved	29	Reserved
30	Reserved	31	Reserved
32 to 37	Reserved	38	Motor 1 and 2 indication terminal
39	Reserved	40 to 45	Reserved
46	Reserved	47	Reserved

0: Disabled

1: Drive in running

When the drive is running, the indication signal is output.

2: Forward running

3: Reverse running

The corresponding indication signal is output according to the drive's actual running direction.

4: Frequency reach signal (FAR)

Refer to the function description of P11.26.

5: Frequency-level detection signal (FDT1)

6: Frequency-level detection signal (FDT2)

Refer to the function description of P11.27 to P11.30.

7: Overload detection signal (OL)

Reserved.

8: Lockout for undervoltage (LU)

When the DC bus voltage is lower than the undervoltage detection level, the relevant indication signal will be output, and the LED displays "-Uv-"

9: External fault stop (EXT)

When the drive has external fault tripping alarm (EF), the relevant indication signal will be output.

10: Frequency upper limit (FHL)

When frequency reference ≥ frequency upper limit and the running frequency reaches the frequency upper limit, the relevant indication signal will be output.

11: Frequency lower limit (FLL)

When frequency reference ≤ frequency lower limit and the running frequency reaches the frequency lower limit, the relevant indication signal will be output.

12: Zero-speed running

When the drive is running at zero speed, the relevant indication signal is output. To make it clear, in the V/F mode, the indication signal is output when the output frequency is 0; and in a non-V/F mode, the indication signal is output when the feedback frequency is lower than the corresponding frequency of P11.32.

13: Reserved

14: Reserved

15: Current running duration reach

When the current running duration (see P11.38) of the drive is reached, the relevant indication signal will be output.

16: Accumulated running duration reach

When the accumulated running duration (see P11.39) of the drive is reached, the relevant indication signal will be output.

17: Drive ready to run (RDY)

If the signal output is enabled, it means that the drive does not have any fault, and the bus voltage is normal. If the drive running inhibition terminal is disabled, the drive can receive the startup command.

18: Drive fault

When the drive has any fault, the relevant indication signal will be output.

19: Host device on/ff signal

The output signals of DO1, DO2, and RO1 are directly controlled by the serial port. The output is also affected by P10.04 (output terminal polarity selection).

20: Motor overheat

The signal is output when the motor overheats. For the specific conditions and settings, refer to P97.25 and P97.26.

21: Torque limiting

When the torque command is limited by the electric or braking torque limit value, the relevant indication signal will be output.

22: Motor overload warning

23 to 25: Reserved

26: Reserved

27: Reserved

28: Reserved

29: Reserved

30: Reserved

31: Reserved

32 to 37: Reserved

38: Motor 1 and 2 indication terminal

The output signal indicates the currently selected motor.

39: Reserved

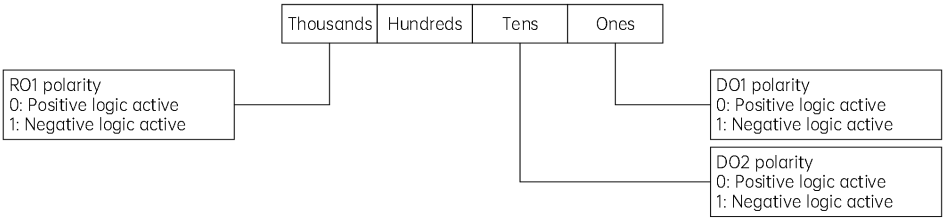
40 to 45: Reserved

46: Reserved

47: Reserved

P10.04	Output terminal polarity selection	0 to 0x1011	0

Used to set the polarity of digital output terminals, as shown below:



P10.05	DO1 switch-on delay time	0.0 to 600.0 s	0.0 s
P10.06	DO1 switch-off delay time	0.0 to 600.0 s	0.0 s
P10.07	DO2 switch-on delay time	0.0 to 600.0 s	0.0 s
P10.08	DO2 switch-off delay time	0.0 to 600.0 s	0.0 s
P10.09	Reserved		
P10.10	Reserved		
P10.11	RO1 switch-on delay time	0.0 to 600.0 s	0.0 s
P10.12	RO1 switch-off delay time	0.0 to 600.0 s	0.0 s

Used to set the delay time for level jump upon switch-on/off of output terminals.

P10.13	AO1 function	0 to 28	0
P10.14	AO2 function	0 to 28	0
P10.15	Reserved		

Table 6-7 Multi-function DO definition

Item	Function	Value range
0	Output frequency	0 to maximum frequency
1	Frequency reference	0 to maximum frequency
2	Frequency reference (after acceleration/deceleration)	0 to maximum frequency
3	Motor speed	0 to maximum speed
4	Output current	0 to 2*Iei
5	Output current	0 to 2*Iem
6	Torque current	0 to 3*Iem
7	Reserved	
8	Output voltage	0 to 1.2* Ve
9	Bus voltage	0 to 800 V
10	AI1 after correction	
11	AI2 after correction	
12	Reserved	
13	Output power	0 to 2*Pe

Item	Function	Value range
14	Host device percentage	0 to 100.0%
15	Torque limit value 1	0.0 to 300.0%
16	Torque limit value 2	0.0 to 300.0%
17 to 25	Reserved	
26	Reserved	
27	Reserved	
28	Exciting current	0.0 to 100.0%

P10.16	AO1 output lower limit	0.00% to P10.18	0.00%
P10.17	Voltage corresponding to AO1 output lower limit	0.00 to 10.00	0.00 V
P10.18	AO1 output upper limit	P10.16 to 100.00%	100.00%
P10.19	Voltage corresponding to AO1 output upper limit	0.00 to 10.00	10.00 V
P10.20	AO1 output filter	0.000 to 10.000	0.005 s
P10.21	Reserved		
P10.22	Reserved		
P10.23	Reserved		
P10.24	Reserved		
P10.25	Reserved		
P10.26	Reserved		
P10.27	Reserved		
P10.28	Reserved		
P10.29	Reserved		
P10.30	Reserved		

Specify the AO1 output filter and the curve settings.

6.12 P11: Auxiliary function parameters

P11.00	Acceleration/Deceleration mode	0 to 1	0

0: Straight-line acceleration/deceleration

The output frequency is decreased or increased according to the constant slope, as shown in the following figure.

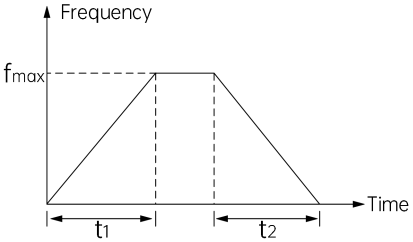


Fig. 6-20 Straight-line acceleration/deceleration

1: S-curve acceleration/deceleration

The output frequency is decreased or increased according to the S curve, as shown in the following figure.

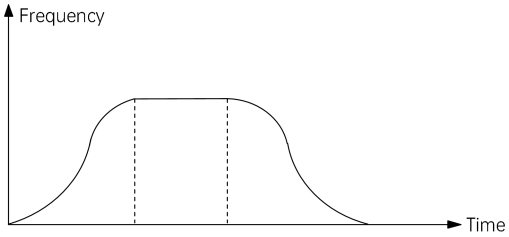


Fig. 6-21 S-curve acceleration/deceleration

The speed values are set to be an S curve at the beginning of the acceleration and reach of speed, and the beginning of the deceleration and reach of speed. In this way, the acceleration and deceleration can be smooth with less impact. The S curve acceleration/deceleration mode is applicable to the start and stop of load carry and transmission, such as elevators and conveyors.

P11.01	Acceleration time 2	0.0 to 6000.0 s	Model dependent
P11.02	Deceleration time 2	0.0 to 6000.0 s	Model dependent
P11.03	Acceleration time 3	0.0 to 6000.0 s	Model dependent
P11.04	Deceleration time 3	0.0 to 6000.0 s	Model dependent
P11.05	Acceleration time 4	0.0 to 6000.0 s	Model dependent
P11.06	Deceleration time 4	0.0 to 6000.0 s	Model dependent

The acceleration time means the time required for the drive to accelerate from 0 Hz to the maximum output frequency (P02.10), as t_1 shown in Fig. 6-22. The deceleration time means the time required for the drive to decelerate from the maximum output frequency (P02.10) to 0 Hz, as t_2 shown in Fig. 6-22.

The drive series defines four kinds of acceleration/deceleration time, which can be selected through the different combinations of control terminals during operation, referring to the acceleration/deceleration time terminal function in P09.03 to P09.10.

P11.07	Time proportion of S-curve start segment	0.0 to 100.0%	10.0%

P11.08	Time proportion of S-curve end segment	0.0 to 100.0%	10.0%

In Fig. 6-22, t_1 is the parameter set by P11.07, in which the slope of output frequency gradually increases; t_2 is the parameter set by P11.08, in which the slope of output frequency gradually decreases; and the segment between t_1 and t_2 is the straight-line acceleration/deceleration. They are relative to the current acceleration/deceleration time.

The sum of P11.07 and P11.08 must not exceed 100.0%.

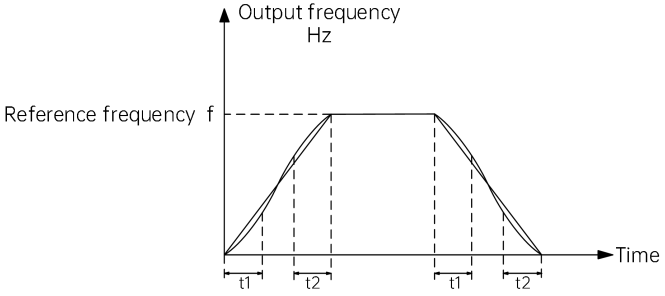


Fig. 6-22 Time proportion of S-curve start and end

P11.09	Switchover frequency of acceleration/deceleration time 1 and 2	0.00 Hz to P02.10	0.00 Hz

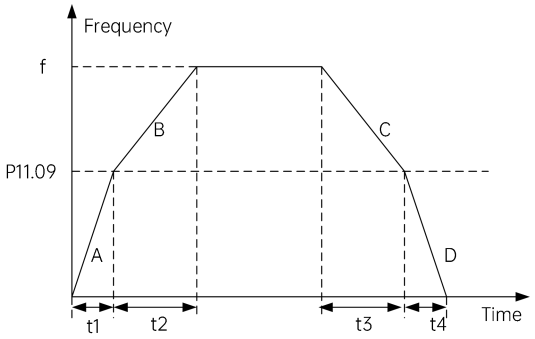


Fig. 6-23 Switchover of acceleration/deceleration time 1, 2

As shown in Fig. 6-23, for the motor 1 acceleration, it will run at the acceleration time 1 first as the A curve and the acceleration time is $t_1 = \frac{P11.09 \times P02.13}{P02.10}$. When the output frequency increases to the switching point P11.09, the acceleration time will switch from P02.13 to P11.01 as the B curve and the acceleration time is $t_2 = \frac{(f - P11.09) \times P11.01}{P02.10}$.

For the deceleration, it will run at the deceleration time 2 first as the C curve, and the deceleration time is

When the output frequency decreases to a frequency lower than P11.09, the deceleration time will switch from 2 to 1 as the D curve and the deceleration time is $t_3 = \frac{(f - P11.09) \times P02.14}{P02.10}$.

$t_4 = \frac{P11.09 \times P11.02}{P02.10}$.

P11.10	Jog operation frequency	0.00 Hz to P02.10	5.00 Hz
P11.11	Jog acceleration time	0.0 to 6000.0 s	6.0 s
P11.12	Jog deceleration time	0.0 to 6000.0 s	6.0 s

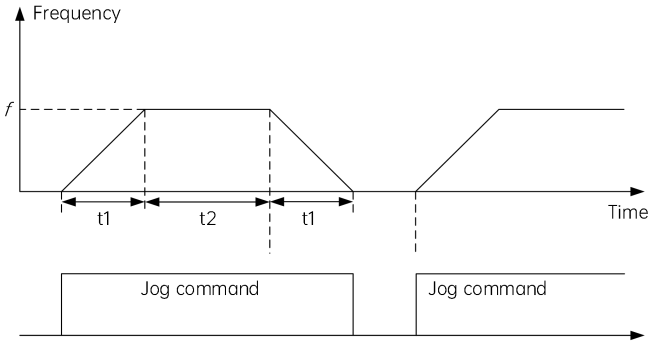


Fig. 6-24 Description of jog operation

As shown in Fig. 7-30, t_1 is the jog acceleration time (P11.11) and jog deceleration time (P11.12) of actual running; t_2 is the jog time and f is the jog operation frequency (P11.10).

The jog acceleration and deceleration time t_1 of actual running is determined by the following equation:

$$t_1 = \frac{P11.11 \times P11.10}{P02.10}$$

The drive does not need to wait for a while to stop during the jog deceleration. It can receive the jog command and accelerate immediately.

WARNING

(1) The jog operation starts and stops according to the start mode 0 and stop mode 0. The unit for the acceleration/deceleration time is fixed to second.

(2) All of the operating panel, terminals and serial port can perform the jog control.

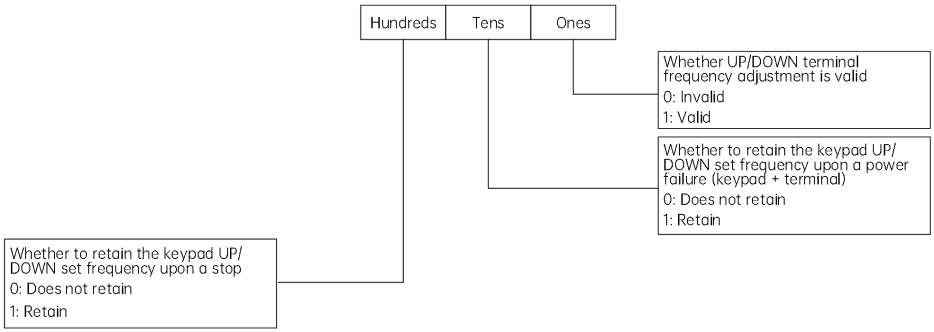
P11.14	Number of decimal places for line speed	0 to 2	2
P11.15	Number of decimal places for acceleration/deceleration time	1 to 2	1

Used to set the decimal places (precision) of frequency, line speed and acceleration/deceleration time.

P11.16	Terminal UP/DOWN speed	0.01 to 50.00 Hz/s	0.50 Hz/s

Used to set the UP/DOWN speed of the terminal.

P11.17	Keypad frequency setting selection	0 to 0x111	0x111



P11.18	Jump frequency 1	0.00 Hz to P02.10	0.00 Hz
P11.19	Jump frequency 1 band	0.00 Hz to P02.10	0.00 Hz
P11.20	Jump frequency 2	0.00 Hz to P02.10	0.00 Hz
P11.21	Jump frequency 2 band	0.00 Hz to P02.10	0.00 Hz

If the frequency reference is within the jump frequency, the drive will output according to the jump frequency boundary actually to avoid mechanical resonance.

If the jump frequency is set to 0, the function is disabled.

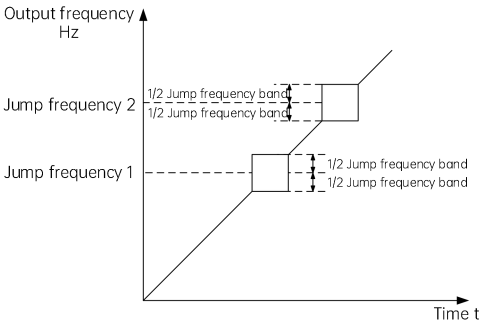


Fig. 6-25 Jump frequency

P11.22	Reserved		
P11.23	Reserved		
P11.24	Reserved		
P11.25	Reserved		

P11.26	Frequency reach (FAR) detection range	0.0 to 100.0%	0.0%

When the running frequency of the drive is within the P11.26 percentage range of maximum frequency, the multi-function DO terminal outputs an ON signal as shown in the following figure.

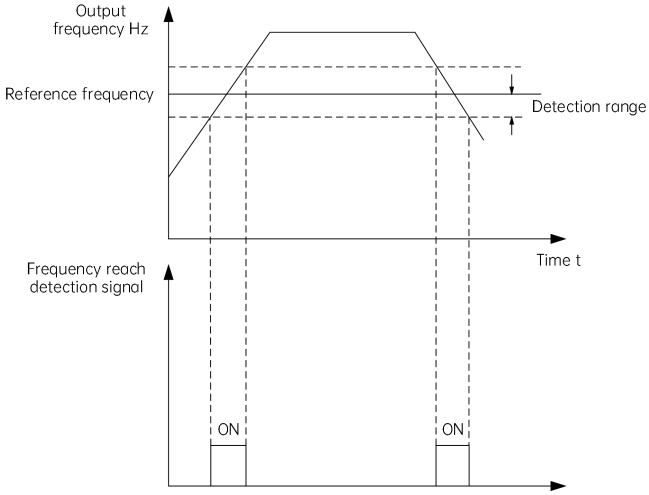


Fig. 6-26 Frequency reach (FAR) detection range

P11.27	FDT1 frequency detection value	0.00 Hz to P02.11	0.00 Hz
P11.28	FDT1 frequency detection hysteresis	0.0 to 100.0%	0.0%
P11.29	FDT2 frequency detection value	0.00 Hz to P02.11	0.00 Hz
P11.30	FDT2 frequency detection hysteresis	0.0 to 100.0%	0.0%

When the output frequency exceeds P11.27 (FDT1 frequency detection value), the relevant signal will be output until the output frequency drops below a certain percentage P11.28 (FDT1 frequency detection hysteresis) of the FDT1 detection value. The function of FDT2 is similar, with the corresponding parameters P11.29 (FDT2 frequency detection value) and P11.30 (FDT2 frequency detection hysteresis), as shown in the following figure.

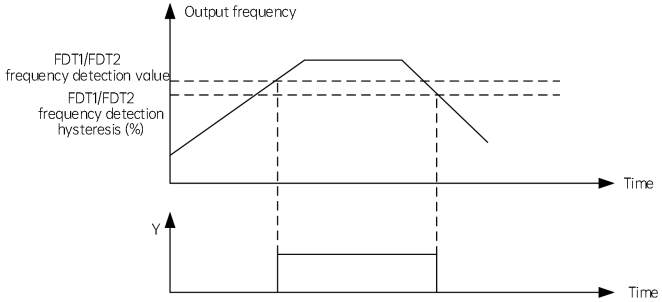


Fig. 6-27 Frequency level detection

P11.31	Auto start temperature of fan	40.0 to 80.0℃	55.0℃
P11.33	Reserved		
P11.34	Reserved		
P11.35	Reserved		
P11.36	Reserved		
P11.37	Reserved		
P11.38	Running duration setting	0 to 65535 min	0 min
P11.39	Accumulated running duration reach	0 to 65535 h	0 h

P11.40	Wakeup frequency	P11.42 to P02.10	0.00 Hz

When the frequency reference is higher than P11.40, the drive starts directly after the delay defined by P11.41.

P11.41	Wakeup delay	0.0 to 6553.5 s	0.0 s
P11.42	Hibernation frequency	0.00 Hz to P02.10	0.00 Hz

When the frequency reference is lower than P11.42, the drive decelerates to stop and enters the hibernation state after the delay defined by P11.43.

P11.43	Hibernation delay	0.0 to 6553.5 s	0.0 s

When the frequency reference is lower than P11.42, the drive coasts to stop after the delay defined by P11.43 and enters the hibernation state. When the frequency reference is higher than P11.40, the drive resumes operation after the time defined by P11.41.

P11.44	Cooling fan control	0 to 2	2

0: Auto running (based on the inverter temperature)

The drive automatically starts the internal temperature detection program during operation, and decides the running and stop of the fan according to the temperature condition of the module.

1: Always running after power on

The fan is always running after the drive is powered on.

2: Controlled by start/stop commands (On during operation, Off during stop)

The fan is running when the drive is in operation, and is stopped after the drive is at stop.

6.13 P12: Control optimization parameters

P12.02	Deadzone compensation mode	0 to 1	1

0: No compensation

1: Compensation mode 1

P12.03	Random PWM depth	0 to 10	0

0: Disabled

1 to 10: Random PWM depth

P12.05	Voltage overmodulation coefficient	100 to 110	105
P12.07	SVPWM mode	0 to 1	0

6.14 P14: Pressure control parameters

P14.00	Pressure control mode	0 to 3	0

0: Non-pressure control mode

1: Internal CAN oil pressure mode (multi-pump mode)

2: Pressure control mode

AI1 gives the pressure feedback reference;

AI2 gives the flow reference;

AI3 gives the pressure reference.

3: External CAN oil pressure mode (computer of injection molding machine)

During pressure control by the servo drive, CANopen gives the pressure and flow references, and AI1 gives the pressure feedback reference.

P14.01	Pressure reference rise time	0 to 6000 ms	120

The acceleration/deceleration function for pressure reference provides a soft-start capability to gradually increase or decrease the target value according to the set acceleration/deceleration time.

This set time refers to the duration required for the pressure reference to rise from 0.0% to 100.0% of the target value.

P14.02	Pressure control proportional gain Kp1	0.000 to 15.000	2.100

First PID group proportional gain for pressure control.

A larger setting value results in faster response, but excessive values may cause oscillation.

Steady-state deviation cannot be eliminated by using proportional gain control alone.

P14.03	Pressure control integral gain Ki1	0.000 to 10.000	0.500

First PID group integral gain for pressure control.

A larger setting value results in faster response, but excessive values may cause oscillation.

Integral gain control can eliminate steady-state deviation.

P14.04	Pressure control derivative gain Kd1	0.000 to 10.000	0.000

Kd is used to improve the system's response performance, but setting it too high may cause oscillation.

P14.05	Pressure control proportional gain Kp2	0.000 to 10.000	3.500
P14.06	Pressure control integral gain Ki2	0.000 to 10.000	0.500
P14.07	Pressure control derivative gain Kd2	0.000 to 10.000	0.000

Note:

(1) In hydraulic servo control, the priority is to achieve control over the servo motor response, followed by system pressure and flow response control. Therefore, servo motor response tuning should be performed first, before adjusting system response control. For servo motor control tuning, the focus is on speed loop and current loop parameter adjustments.

(2) A higher setting value for proportional gain (Kp), integral gain (Ki), and derivative gain (Kd) results in a faster response. However, an excessively fast response may cause servo motor vibration and unstable machine operation. Conversely, lower settings for Kp, Ki, and Kd lead to a slower response, which may result in unstable pressure control and overshoot.

P14.10	Reverse speed limit for pressure relief	-100.0% to 20.0%	-10.0%

The maximum reverse speed during pressure relief, corresponding to the percentage setting of the maximum speed, is used to set the motor's maximum reverse operating speed.

A larger setting value results in faster pressure relief, but excessive values may cause oil pump reversal noise.

A smaller setting value results in slower pressure relief.

P14.11	Reserved		

P14.12	Pressure overshoot suppression function	0 to 3	2
P14.13	Pressure overshoot suppression detection level	0.0 to 100.0	0.5
P14.14	Pressure overshoot suppression coefficient	0 to 100	80

P14.15	Flow control threshold	0.0 to 100.0	0.5

P14.16	Pressure relief delay	1 to 9999	50

P14.17 to P14.20	Reserved		

P14.21	Pressure control proportional gain Kp3	0.000 to 10.000	1.000

Third PID group proportional gain for pressure control.

A larger setting value results in faster response, but excessive values may cause oscillation.

Steady-state deviation cannot be eliminated by using proportional gain control alone.

P14.22	Pressure control integral gain Ki3	0.000 to 10.000	0.2

Third PID group integral gain for pressure control.

A larger setting value results in faster response, but excessive values may cause oscillation.

Integral gain control can eliminate steady-state deviation.

P14.23	Pressure control derivative gain Kd3	0.000 to 10.000	0.000

Kd is used to improve the system's response performance, but setting it too high may cause oscillation.

P14.24	Pressure reference drop time	0 to 6000 ms	200

The set time refers to the duration required for the pressure reference to decrease from 100.0% to 0.0%.

P14.25	Pressure overshoot suppression detection level 2	0.0 to 500.0	35.5
P14.26	Pressure overshoot suppression coefficient 2	0 to 100	5

6.15 P15: Communication parameters

P15.00	Communication format	0 to 0x31	0x30

Ones:

0: Modbus protocol

1: Expansion card to 485 protocol

Tens:

0: 1-8-2-N format, RTU

1: 1-8-1-E format, RTU

2: 1-8-1-O format, RTU

3: 1-8-1-N format, RTU

P15.01	Baud rate	0 to 6	1

0: 4800 BPS

1: 9600 BPS

2: 19200 BPS

3: 38400 BPS

4: 57600 BPS

5: 115200 BPS

6: 125000 BPS

P15.02	Local address	0 to 247	1

Used to identify the address of the drive.

Note: 0 is the broadcast address. When set to the broadcast address, the drive can only receive and execute the broadcast command of the host device, but can not respond to the host device.

P15.03	Communication timeout detection time	0.0 to 60.0	0.0 s

If the serial port communication signal disappears for a period exceeding the value of this function code, the drive is considered having a communication error.

When the value is set to 0, the drive will not detect the serial port communication signal.

P15.04	Response delay of the drive	0 to 200	5 ms

Refers to the delay time required from the drive's receiving and executing the host command to returning the response frame to the host. For the RTU mode, the response delay shall not be less than the transmission time of 3.5 characters.

P15.05	Communication action	0 to 0x11	0

Ones:

0: Response to write operation

1: No response to write operation

Tens: 485 mapping function

0: Disable

1: Enable

Note: Only control parameters starting with 0x64 can decide whether there is a response for the write operation. For writing of function codes, it is sure to have response.

P15.06	Reserved function 2 for user	0 to 65535	0

Reserved function

6.16 P16: Keypad display setting parameters

P16.00	LED display parameter selection 1 during running	0 to 0xFFFF	0xF0

P16.00 and P16.01 define the parameters allowed to be displayed on the LED during drive running, binary setting shown in the following figures.

When a bit is set to 0, the corresponding parameter will not display;

When a bit is set to 1, the corresponding parameter will display.

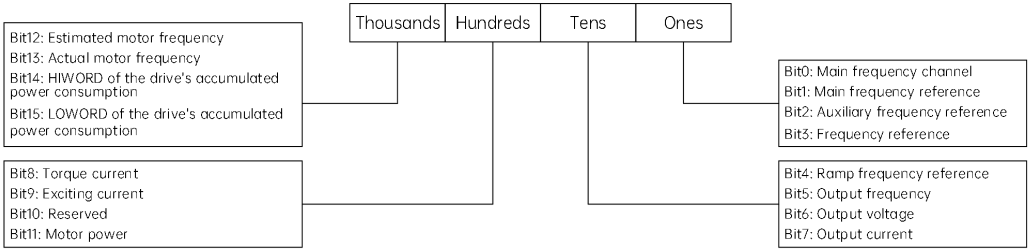


Fig. 6-28 LED display parameter 1 during running

P16.01	LED display parameter selection 2 during running	0 to 0xFFFF	0x1

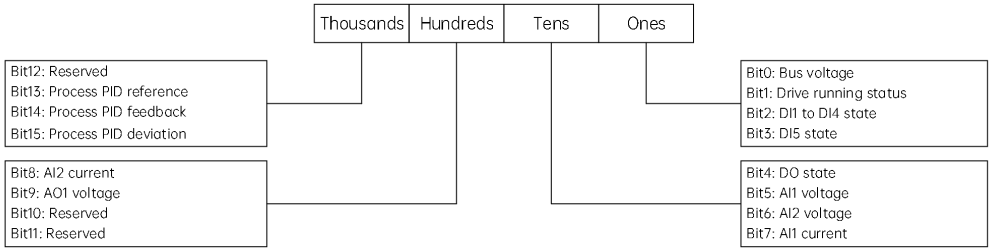


Fig. 6-29 LED display parameter 2 during running

P16.02	LED default parameter display during running	0 to 31	4

Used to set the default parameter number displayed on the zero level of the keypad menu during running after power-on. 0 to 31 represent the 32 parameters listed in P16.00 and P16.01.

WARNING

When you press the "" key, the function code displays the switched parameter number, only RAM modified and not save to EEPROM.

P16.03	LED parameter display selection at stop	0 to 0xFFFF	0x3

0: No display

1: Display

Used to set whether a parameter is displayed on the zero level of the keypad menu at stop. Bit0 to bit15 correspond to 16 parameters listed in P16.04.

Note: If all is set to 0, the reference frequency will be displayed.

P16.04	LED default parameter display at stop	0 to 15	0

Used to set the default parameter number displayed on the zero level of the keypad menu at stop after power-on.

0: Frequency reference

1: Bus voltage

2: DI input status 1

3: DI input status 2

4: DO output status

5: AI1 input voltage

6: AI2 input voltage

7: AO1 output percentage

8: Reserved

9: Reserved

10: Reserved

11: Reserved

12: Reserved

13: Line speed

14: PID reference

15: Torque reference

WARNING

When you press the "" key, the function code displays the switched parameter number, only RAM modified and not save to EEPROM.

P16.05	Line speed display coefficient	0.1 to 999.9%	100.0%

This function code is used to correct the line speed display error, and has no influence on the actual speed.

$$\text{P01.44} = \text{Line speed} \times \text{P16.05}$$

P16.06	Rotation speed display coefficient	0.1 to 999.9%	100.0%

This function code is used to correct the rotation speed display error, and has no influence on the actual speed.

Mechanical rotation speed = 60 × displayed running frequency × P16.06 / number of motor pole pairs

P16.07	Frequency display coefficient	0.0 to 100.0%	100.0%

P01.57=P01.05*Frequency display coefficient

6.17 P20: Motor 2 parameters

P20.00	Motor type selection	0 to 1	0

0: Asynchronous motor

1: Synchronous motor

P20.01	Asynchronous motor rated power	0.1 to 3000.0 kW	Model dependent
P20.02	Asynchronous motor rated voltage	0 to 1200 V	Model dependent
P20.03	Asynchronous motor rated current	0.8 to 6000.0 A	Model dependent
P20.04	Asynchronous motor rated frequency	0.01 Hz to P02.10	50.00 Hz
P20.05	Asynchronous motor rated speed	1 to 36000 rpm	Model dependent
P20.06	Asynchronous motor stator resistance	0.001 to 65.535 Ω	Model dependent
P20.07	Asynchronous motor rotor resistance	0.001 to 65.535 Ω	Model dependent
P20.08	Asynchronous motor leakage inductance	0.01 mH to 655.35 mH (drive power ≤ 55 kW) 0.001 mH to 65.535 mH (drive power > 55 kW)	Model dependent
P20.09	Asynchronous motor mutual inductance	0.1 mH to 6553.5 mH (drive power ≤ 55 kW) 0.01 mH to 655.35 mH (drive power > 55 kW)	Model dependent
P20.10	Asynchronous motor no-load current	0.1 to 6553.5 A	Model dependent
P20.11	Asynchronous motor iron core magnetic saturation coefficient 1	0.0 to 100.0%	80.0%
P20.12	Asynchronous motor iron core magnetic saturation coefficient 2	0.0 to 100.0%	68.0%
P20.13	Asynchronous motor iron core magnetic saturation coefficient 3	0.0 to 100.0%	57.0%
P20.14	Asynchronous motor iron core magnetic saturation coefficient 4	0.0 to 100.0%	40.0%
P20.15	Synchronous motor rated power	0.1 to 3000.0 kW	Model dependent

P20.16	Synchronous motor rated voltage	0 to 1200 V	Model dependent
P20.17	Synchronous motor rated current	0.8 to 6553.5 A	Model dependent
P20.18	Synchronous motor rated frequency	0.01 Hz to P02.10	Model dependent
P20.19	Number of synchronous motor pole pairs	1 to 128	2
P20.20	Synchronous motor stator resistance	0.001 to 65.535 Ω (drive power ≤ 55 kW) 0.0001 to 6.5535 Ω (drive power > 55 kW)	Model dependent
P20.21	Synchronous motor d-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power > 55 kW)	Model dependent
P20.22	Synchronous motor q-axis inductance	0.01 to 655.35 mH (drive power ≤ 55 kW) 0.001 to 65.535 mH (drive power > 55 kW)	Model dependent
P20.23	Synchronous motor back EMF	0.0 to 6553.5 V/krpm	Model dependent
P20.27	Motor auto-tuning	0 to 2	0
P20.28	Motor overload protection factor	0.0 to 300.0%	100.0%

For the parameter description, refer to "6.4 P03: Motor 1 parameters".

6.18 P21: Motor 2 encoder parameters

P21.00	Encoder PPR	1 to 65535	1024
P21.01	Encoder type	2	2

2: Resolver

P21.03	Detection time for speed feedback PG disconnection	0.0 to 10.0 s	0.0 s

Used to set the detection time for PG disconnection. If it is set to 0.0, no detection will be done.

P21.04	PG card voltage class selection	0 to 1	0

0: 5 V

1: 12 V

P21.05 to P21.06	Reserved		

P21.07	Initial installation angle of motor 2 encoder	0.0 to 360.0	0.1

P21.08 to P21.30	Reserved		

The group's parameter description is the same as "6.5 P04: Motor 1 encoder parameters".

6.19 P22: Motor 2 vector control parameters

P22.00	Speed loop proportional gain 1	1 to 100	30
P22.01	Speed loop integral time 1	0.01 to 10.00	0.50 s
P22.02	Switchover frequency 1	0.00 Hz to P02.11	0.00 Hz
P22.03	Speed loop proportional gain 2	1 to 100	20
P22.04	Speed loop integral time 2	0.01 to 10.00	1.00 s
P22.05	Switchover frequency 2	0.00 Hz to P02.11	10.00 Hz
P22.06	Slip compensation coefficient	50 to 200%	100%
P22.07	Speed loop filter time constant	0.00 to 20.00	0.50 s
P22.08	Vector control overexcitation gain	50 to 200%	100%
P22.09	Drive torque upper limit source	0 to 7	0
P22.10	Drive torque upper limit digital setting	0.0 to 300.0%	180.0%
P22.11	Braking torque upper limit source	0 to 7	0
P22.12	Braking torque upper limit digital setting	0.0 to 300.0%	180.0%
P22.13	Excitation regulation Kp	0 to 60000	2000
P22.14	Excitation regulation Ki	0 to 60000	1300
P22.15	Torque regulation Kp	0 to 60000	2000
P22.16	Torque regulation Ki	0 to 60000	1300
P22.17	Synchronous motor field weakening mode	0 to 1	0
P22.18	Synchronous motor field weakening coefficient	50 to 110	105
P22.19	Maximum field weakening current	0.0 to 120.0%	100.0%
P22.20	Field weakening auto-tuning coefficient	0.0 to 120.0%	100.0%

P22.21	Field weakening integral multiple	0.000 to 1.200	1.000

For the parameter description, refer to "6.6 P05 Motor 1 vector control parameters".

6.20 P23: Motor 2 torque control parameters

P23.00	Torque control enable	0 to 1	0

0: Disabled

1: Enabled

P23.01	Torque reference channel	0 to 5	0

0: Digital setting

1: AI1

2: AI2

3: Reserved

4: Modbus

5: Reserved

P23.02	Torque digital setting	-300.0% to 300.0%	0.0%

The digital setting range of torque reference is -300.0% to 300.0%.

P23.03	Torque reference acceleration/deceleration time	0.0 to 6000.0	6.0 s

Used to set the torque acceleration/deceleration time under torque control. It is invalid under speed control.

Specifies the time the system takes to reach the reference torque from the current torque.

P23.04	FWD speed limit channel	0 to 5	0
P23.05	FWD speed limit digital setting	0.00 Hz to P02.11	0.00 Hz
P23.06	REV speed limit channel	0 to 5	0
P23.07	REV speed limit digital setting	0.00 Hz to P02.11	0.00 Hz

FWD and REV speed limit channels:

0: Digital setting

1: AI1

2: AI2

3: Reserved

4: Modbus

5: Reserved

P23.08 to P23.11	Reserved		

For the parameter description, refer to "6.7 P06: Motor 1 torque control parameters".

6.21 P24: Motor 2 V/F control parameters

P24.00	V/F curve	0 to 5	0

0: Straight-line V/F

1: Multi-point V/F

2: Square V/F

3: Reserved

4: V/F complete separation

5: V/F half separation

P24.01	Torque boost	0.0 to 50.0	0.0
P24.02	Cut-off frequency of torque boost	0.00 Hz to P02.11	10.00 Hz

P24.03	Multi-point V/F frequency 1	0.00 Hz to P24.05	0.00 Hz
P24.04	Multi-point V/F voltage 1	0 V to P24.06	0 V
P24.05	Multi-point V/F frequency 2	P24.03 to P24.07	0.00 Hz
P24.06	Multi-point V/F voltage 2	P24.04 to P24.08	0 V
P24.07	Multi-point V/F frequency 3	P24.05 to 599.00	0.00 Hz
P24.08	Multi-point V/F voltage 3	P24.06 to 380	0 V
P24.09	Slip compensation coefficient	0.0 to 100.0	0.0
P24.10	V/F overexcitation gain	0.0 to 100.0	0.0
P24.11	Oscillation suppression gain	0 to 100	10
P24.12	Oscillation suppression gain mode	0 to 2	0
P24.13	Voltage source for V/F separation	0 to 9	0

0: Digital setting

1: AI1

2: AI2

3: Reserved

4: Reserved

5: Reserved

6: Reserved

7: PID

8: Reserved

9: Reserved

P24.14	Digital setting of voltage source for V/F separation	0 to 1000	0 V
P24.15	Voltage rise time of V/F separation	0.0 to 6000.0	5.0 s
P24.16	Voltage fall time of V/F separation	0.0 to 6000.0	5.0 s
P24.17	Stop mode for V/F separation	0 to 1	0

0: Frequency and voltage decline to 0 independently

1: Frequency declines after voltage declines to 0

P24.18	Reserved		
P24.19	Reserved		

For the parameter description, refer to "6.8 P07: Motor 1 V/F control parameters".

6.22 P26: Hydraulic servo parameters

P26.01	Pressure sensor range	0.0 to 600.0	250.0

Set according to pressure sensor specifications.

P26.02	Output signal mode of pressure sensor	0 to 3	3

0: 1 to 5 V output

1: 4 to 20 mA output (reserved)

2: 1 to 10V

3: 0 to 10V

Set according to pressure sensor specifications

P26.03	Maximum system pressure	0.0 to 250.0	175.0

Maximum system pressure required: The system pressure output corresponding to a 10 VDC command voltage represents the maximum system pressure.

P26.05	Maximum speed	0 to 6000	2000

It defines the maximum motor speed taking account of the system output flow. The value should be set below 140% of the motor's rated speed (P03.05). This value must always be lower than the motor's maximum speed.

P26.06	Base pressure	0.0 to 100.0 %	1.0
P26.07	Base flow	0.0 to 100.0 %	1.0

Enable base pressure/base flow (P26.08) by setting it to 1, then the device needs to run under pressure for a period before this function activates.

P26.06 sets the system's minimum operating pressure as a percentage of the pressure sensor range (P26.01).

P26.07 sets the system's minimum operating flow as a percentage of the maximum speed (P26.05).

P26.09	Pressure sensor fault detection selection	0 to 0x22	0x00

Ones place: Pressure sensor fault detection selection

0: Keep running, with no alarm

1: Keep running and display "AL.FbL" (feedback lost) or "AL.Fbo" (feedback exceeding limit)

2: Coast to stop and display "FbL" (feedback lost) or "Fbo" (feedback exceeding limit)

Tens place: Unloading pressure reverse speed limit fault detection selection

0: Keep running, with no alarm

1: Keep running and display "AL.PIL"

2: Coast to stop and display "PIL"

Note: As long as the pressure sensor feedback fault occurs, the corresponding "feedback loss" or "feedback exceeding limit" function output terminal will have output.

P26.10	Pressure sensor feedback lost detection value	0.0 to 100.0%	3.0%
P26.11	Pressure sensor feedback lost detection time	0.0s to 25.0 s	0.2 s
P26.12	Pressure sensor feedback exceeding limit detection level	0.0 to 100.0%	80.0%
P26.13	Pressure sensor feedback exceeding limit detection time	0.0s to 25.0 s	1.0 s
P26.14	Pressure sensor fault detection current lower limit	20.0% to 300.0%	100.0%
P26.15	Pressure sensor fault detection current upper limit	20.0 to 100.0%	50.0%
P26.16	Maximum speed for pressure control state output	0.0 to 100.0%	20.0%
P26.17	Minimum pressure setting for pressure control state output	0.0 to 100.0%	30.0%
P26.18	Pressure control state output delay time	0.001 to 10.000 s	0.800
P26.19	Upper torque limit for switchover from pressure mode to speed mode	50.0 to 250.0%	150%

P26.25	AI1 dead zone	-10 to 10 V	0
P26.26	AI2 dead zone	-10 to 10 V	0
P26.27	AI3 dead zone	-10 to 10 V	0
P26.28	AI4 dead zone	-10 to 10 V	0
P26.29	AI zero offset correction	0 to 65535	0

6.23 P31: Multi-pressure parameters

P31.01	Pressure difference for pressure relief valve output	0 to 100.0 bar	60.0

P31.03	Delay time for pressure flow	0 to 1000 ms	0

P31.05	AO filter coefficient	0 to 10	2

P31.06	Frequency feedback filter coefficient	0 to 1000	5

P31.07	Internal pressure 1	0 to 175.0	0
P31.08	Internal flow 1	0 to 100.0%	0
P31.09	Internal pressure 2	0 to 175.0	0
P31.10	Internal flow 2	0 to 100.0%	0
P31.11	Internal pressure 3	0 to 175.0	0
P31.12	Internal flow 3	0 to 100.0%	0
P31.13	Internal pressure 4	0 to 175.0	0
P31.14	Internal flow 4	0 to 100.0%	0

P31.15	Start mode of pressure compensation	0 to 2	0
P31.16	Pressure compensation mode	0 to 2	0
P31.17	Compensation offset	0 to 1024	0
P31.18	Pressure compensation value	0 to 30.0	0
P31.19	Delay time before auto-tuning start	0.000 s to 60.000 s	0

P31.20	Oil pump gears	0 to 100	12

Used to set the current number of oil pump gears.

P31.29	Business timing (h)	0 to 24	0
P31.30	Business timing (day)	0 to 6500	0

6.24 P32: CANopen communication parameters

P32.00	Internal/External CAN selection	0 to 1	0

0: Internal CAN

1: External CAN

P32.01	External CAN baud rate selection	0 to 3	1

External CAN baud rate selection:

0: 125 K

1: 250 K

2: 500 K

3: 1 M

P32.02	External CAN address	0 to 247	1

Master and slave addresses must be different.

P32.03	External CAN disconnection detection time	0.1 to 1000.0	0.0

Used to set the detection time for external CAN bus disconnection. If the drive does not receive data within the set time, a fault will be triggered.

P32.07	Internal CAN baud rate selection	0 to 3	3

Internal CAN baud rate selection:

0: 125 K

1: 250 K

2: 500 K

3: 1 M

P32.08	Internal CAN address	0 to 127	0

Master and slave addresses must be different.

P32.09	Internal CAN disconnection detection time	0.1 to 10.0	0.5

Used to set the detection time for internal CAN bus disconnection. If the drive does not receive data within the set time, a fault will be triggered.

P32.10	Flow type	0 to 3	0

0: Single pump

1: Single-master multi-slave compound

2: Single-master multiple-slave convergent/distributed flow

3: Multi-master multi-slave convergent flow

P32.11	Single master selection	0 to 1	0

When the parameter is set to 1, this drive serves as the absolute master in the entire network. Only one absolute master is allowed in the whole network.

P32.12	Unit number	0 to 5	0

It defines the unit to which each control node belongs.

P32.13	Master/Slave switchover of node	0 to 1	0

Used for master/slave switching of nodes in the multi-master multi-slave convergent mode.

P32.14	Pump displacement	0 to 300	40

It defines the oil pump displacement per revolution.

P32.15	Flow cut-in threshold	0.0 to 100.0%	40

In a hydraulic system with multiple pumps, when the system flow exceeds the current pump's flow cut-in threshold, additional pumps are activated to participate in the operation.

P32.16	Flow cut-in hysteresis	0.0 to 100.0%	2

In a hydraulic system with multiple pumps, the parameter is used to prevent repeated pump start/stop misoperation when the flow is near the critical threshold.

6.25 P97: Fault and protection parameters

P97.00	Fault enable	0 to 0x1111	0x1001

Ones:

0: Pulse-by-pulse current limit disabled

1: Pulse-by-pulse current limit enabled

Tens:

0: Fan fault disabled

1: Fan fault enabled

Hundreds:

0: Overload prewarning disabled

1: Overload prewarning enabled

Thousands:

0: Braking overcurrent disabled

1: Braking overcurrent enabled

P97.01	Stall suppression enable	0 to 0x111	0x101

Ones:

0: Overvoltage stall suppression disabled

1: Overvoltage stall suppression enabled

Tens:

0: Undervoltage stall suppression disabled

1: Undervoltage stall suppression enabled

Hundreds:

0: Overcurrent stall suppression disabled

1: Overcurrent stall suppression enabled

P97.02	Current limit level	20 to 200%	150%
P97.03	Current limit adjustment coefficient	0 to 100	20

The current limit function controls load current in real time within the limit set by P97.02 to avoid tripping caused by current overshoot. This function is especially useful for scenarios with large inertia or drastic change.

The current limit level (P97.02) defines the current threshold for the auto current limiting. Its setting range is a percentage relative to the drive's rated current.

The current limit adjustment coefficient (P97.03) defines the adjustment rate of the output frequency upon the auto current limiting.

If the frequency decrease rate (P97.03) upon the current limiting is too small, it is difficult to get out of the current limiting state, causing overload fault. If the frequency decrease rate is too large, the adjustment will be overly intensified, with the drive always in the power generation state, causing overload protection.

The current limiting action may cause change to the output frequency. Thus, it is not recommended to use the function in sites requiring stable output frequency at constant speed.

The low setting of auto current limiting function may affect the drive's overload capacity.

P97.04	Overvoltage stall suppression action voltage	600 to 750 V	720 V

During the deceleration operation of the drive, due to the influence of load inertia, the actual decrease rate of the motor speed may be lower than the decrease rate of the output frequency. At the time, the motor will return power to the drive, resulting in the increase of the DC bus voltage of the drive. If no measures are taken, there will be overvoltage trip.

The function of overvoltage stall protection detects the bus voltage during the deceleration of the drive and compares it with the stall overvoltage point defined by P97.04. If the stall overvoltage point is exceeded, the output frequency of the drive stops falling. When the bus voltage is lower than the stall overvoltage point, the drive starts to decelerate, as shown in the following figure.

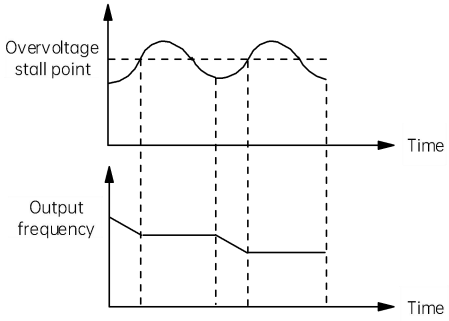


Fig. 6-30 Overvoltage stall

P97.05	Voltage regulator proportional coefficient upon overvoltage stall	0 to 1000	10
P97.07	Speed regulator proportional coefficient upon overvoltage stall	0 to 1000	60

Used to set the proportional coefficients of the voltage regulator and speed regulator upon overvoltage stall.

P97.09	Voltage regulator proportional coefficient upon undervoltage stall	0 to 1000	40
P97.10	Voltage regulator integral coefficient upon undervoltage stall	0 to 1000	20

Used to set the proportional coefficient and integral coefficient of the bus voltage regulator upon undervoltage stall.

P97.11	Undervoltage stall suppression action voltage	400 to 460 V	460 V

During undervoltage stall, when the bus voltage is lower than this value, the undervoltage stall suppression action will be triggered to lower the frequency and raise the voltage.

P97.12	Undervoltage stall recovery judgment time	0 to 100.0 s	2.0 s
P97.13	Undervoltage stall suppression pause voltage	460 to 500 V	485 V

Used to set the voltage point for undervoltage stall suppression pause. When the bus voltage is greater than this value, the drive stops lowering frequency after the delay time set by P97.12.

P97.14	Phase loss protection enable	0 to 0x1111	0x1100

Use to selection functions related to input and output phase loss protection, as shown in the following figure.

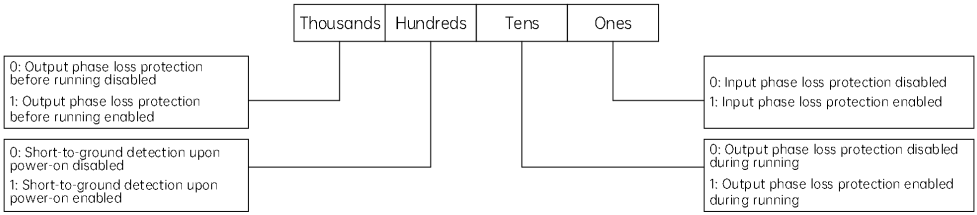


Fig. 6-31 Input and output phase loss protection

P97.15	Fault protection and alarm property 1	0	0

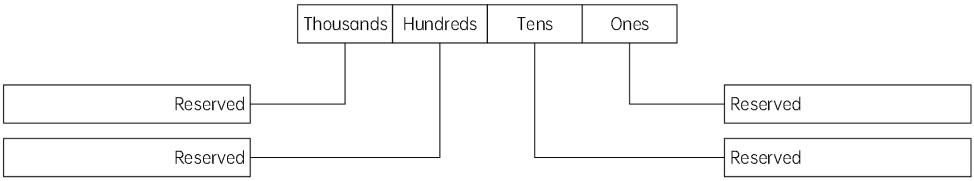


Fig. 6-32 Fault protection and alarm property 1

P97.16	Fault protection and alarm property 2	0 to 0x2002	0

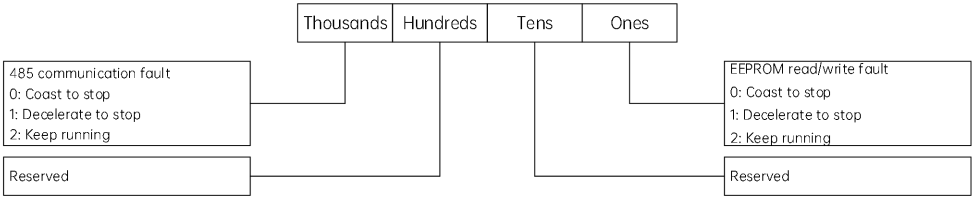


Fig. 6-33 Fault protection and alarm property 2

P97.17	Fault protection and alarm property 3	0 to 0x222	0x0002

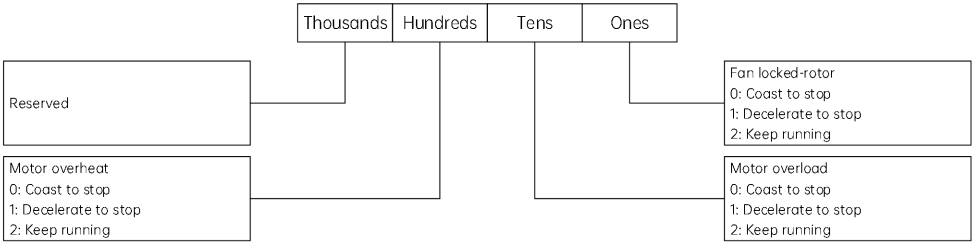


Fig. 6-34 Fault protection and alarm property 3

P97.18	Fault protection and alarm property 4	0 to 0x20	0

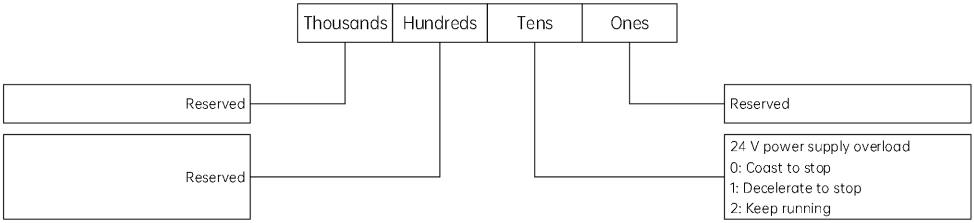


Fig. 6-35 Fault protection and alarm property 4

P97.25	Motor overheat protection threshold	0 to 200℃	120℃

Compare the analog feedback value of the thermal sensor installed in the motor with the preset motor overheat protection threshold P97.25. If the feedback value is greater than the protection threshold value and the duration is longer than 10 s, the drive will report the motor overheat fault (OH3). The customer must clearly know the resistance rule of motor temperature detection in order to correctly set this value.

P97.26	Motor temperature sensor type	0 to 2	0

0: No temperature sensor

1: PT1000

2: KTY84-130

P97.27	Detection value of excessive speed deviation	0.0 to 50.0%	0.0%
P97.28	Detection time of excessive speed deviation	0.0 to 10.0	1.0 s

Used to set the detection method for excessive speed deviation (DEV).

When the speed deviation (difference between the speed reference and the actual motor speed) exceeds the value set by P97.27 and exceeds the time set by P97.28, excessive speed deviation is detected. Set P97.27 with the maximum output frequency being 100%.

When it is set to 0.0 s, speed deviation protection is disabled.

P97.29	Auto reset attempts	0 to 100	0

The auto reset function can automatically reset faults according to the configured attempts and interval during operation. 0 means the auto reset function is disabled.

When there are faults, the drive starts to reset according to the interval defined by P97.31. After the auto reset attempts are reached, you can only reset through the manual reset commands. If there are manual reset commands during auto reset, the auto reset count will be cleared.

When the drive is running normally without faults for 600 s, the fault reset count will be cleared.

WARNING

(1) The inverter module protection (OUT), external device fault (EF), the short circuit to ground fault (GdF) cannot be reset (both automatic and manual ways can not reset); undervoltage (Uv), board-level communication error (bCE)

and power board software version mismatch (vEr) can be automatically reset immediately when the three faults disappear; other faults can be manually reset or automatically reset according to the policies.

(2) During the reset interval, the output is locked and runs at zero frequency, and after the automatic reset is completed, the drive will automatically start after speed tracking.

(3) Use the automatic fault reset function with caution. Otherwise, personal injury and equipment damage may occur.

P97.30	Relay action during auto reset	0 to 1	0

0: Disabled

1: Enabled

P97.31	Auto reset interval	2.0 to 600.0	5.0 s

P97.32	Current fault type	0 to 61	0
P97.33	Latest fault type	0 to 61	0
P97.34	Second latest fault type	0 to 61	0

P97.35	Bus voltage upon the current fault	0.0 to 6553.5	0.0 V
P97.36	Actual current upon the current fault	0.0 to 999.9	0.0 A
P97.37	Running frequency upon the current fault	0.00 to 655.35	0.00 Hz
P97.38	Drive status upon the current fault	0 to 0xFFFF	0
P97.39	Inverter bridge temperature upon the current fault	-40.0 to 150.0	0.0℃
P97.41	Input terminal state upon the current fault	0 to 0xFF	0
P97.42	Output terminal state upon the current fault	0 to 0xF	0
P97.43	Running duration upon the current fault	0.0 to 6553.5	0.0 s
P97.44	Bus voltage upon the latest fault	0.0 to 6553.5	0.0 V
P97.45	Actual current upon the latest fault	0.0 to 999.9	0.0 A
P97.46	Running frequency upon the latest fault	0.00 to 655.35	0.00 Hz
P97.47	Drive status upon the latest fault	0 to 0xFFFF	0
P97.48	Inverter bridge temperature upon the latest fault	0.0 to 150.0	0.0℃
P97.50	Input terminal state upon the latest fault	0 to 0xFF	0
P97.51	Output terminal state upon the latest fault	0 to 0xF	0
P97.52	Running duration upon the latest fault	0.0 to 6553.5	0.0 s

P97.53	Bus voltage upon the second latest fault	0.0 to 6553.5	0.0V
P97.54	Actual current upon the second latest fault	0.0 to 999.9	0.0 A
P97.55	Running frequency upon the second latest fault	0.00 to 655.35	0.00 Hz
P97.56	Drive status upon the second latest fault	0 to 0xFFFF	0
P97.57	Inverter bridge temperature upon the second latest fault	0.0 to 150.0	0.0℃
P97.59	Input terminal state upon the second latest fault	0 to 0xFF	0
P97.60	Output terminal state upon the second latest fault	0 to 0xF	0
P97.61	Running duration upon the second latest fault	0.0 to 6553.5	0.0 s

MV810J records the latest three fault types (P97.32, P97.33, and P97.34), and records the bus voltage (P97.35), output current (P97.36), running frequency (P97.37), and operation state (P97.38) upon the current fault for users to query. For details about the operation status, see P01.17.

6.26 P98: Servo drive parameters

P98.00	Serial No.	0 to 1000	0
P98.01	Software version No.	0.00 to 99.99	0.00
P98.02	Performance software current version No.	0.00 to 99.99	0.00
P98.03	Performance software burning version No.	0.00 to 99.99	0.00
P98.04	Rated capacity	0 to 999.9 kW	Model dependent
P98.05	Rate voltage	0 to 999 V	Model dependent
P98.06	Rated current	0 to 999.9 A	Model dependent

The above are read-only parameters recording basic servo information. The values of P98.04 to P98.06 are set by the manufacturer.

P98.07	Manufacturer's bar code 1	0 to 0xFFFF	0
P98.08	Manufacturer's bar code 2	0 to 0xFFFF	0
P98.09	Manufacturer's bar code 3	0 to 0xFFFF	0
P98.10	Manufacturer's bar code 4	0 to 0xFFFF	0
P98.11	Manufacturer's bar code 5	0 to 0xFFFF	0
P98.12	Manufacturer's bar code 6	0 to 0xFFFF	0

Chapter 7 Pressure Control Commissioning

7.1 Pressure commissioning process

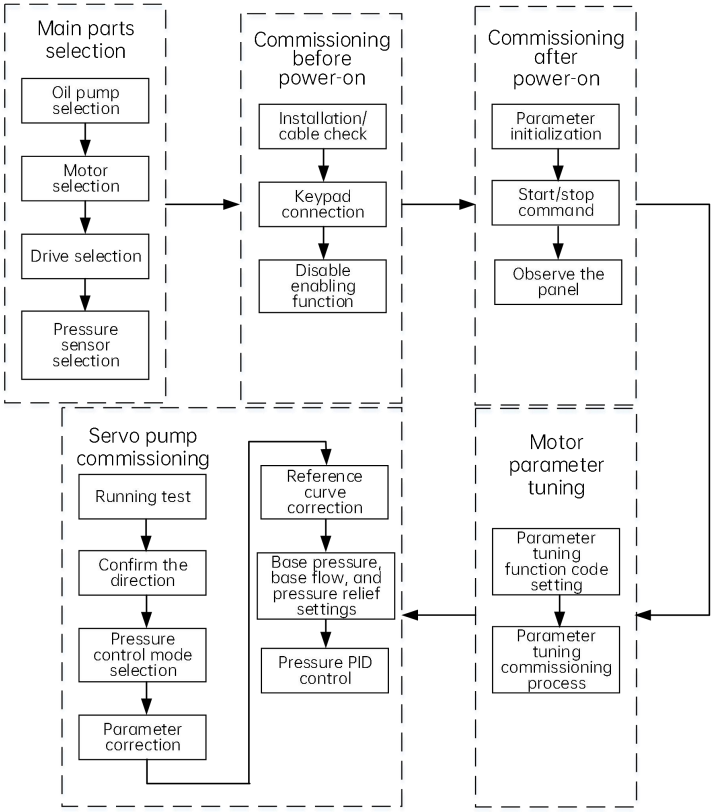


Fig. 7-1 Flow chart for pressure commissioning

7.2 Main parts selection of hydraulic servo

7.2.1 Oil pump selection

The size of the oil pump is determined by its output flow rate Q (L/min), the system pressure P_1 (kgf/cm²), and the maximum motor speed N_{max} (rpm). The oil pump specifications are jointly determined by the servo drive manufacturer and the injection molding machine manufacturer to simplify parameter configuration (using a single preset parameter that contains all necessary settings for the corresponding machine model).

Oil pump pressure selection: The rated pressure of the oil pump should be greater than or equal to the system pressure P_1 (kgf/cm²).

Oil pump displacement selection: Oil pump displacement per revolution (ml/rev) = Q (L/min) × 1000 (ml/L) / N_{max} (rpm).

Oil pump type selection: Please select the oil pump type according to the following instructions.

Table 7-1 Oil pump selection

Pump type	Price	Volumetric efficiency	Pulsation (stability)	Noise	Reliability	Pressure (unipolar)	Speed
Gear pump	Low	Low	Medium	Medium	High	Low	Medium
Plunger pump	Medium	High	Low	High	Low	Medium	Low
Screw pump	High	Medium	High	Low	Medium	High	High

7.2.2 Motor selection

The size of the oil pump can be obtained through 7.2.1. So, the displacement of the oil pump and the pressure that the system needs to bear can also be calculated through the speed and torque of the motor.

(1) Motor rated speed selection:

Motor (PMSM) characteristic curve as shown in Fig. 7-2:

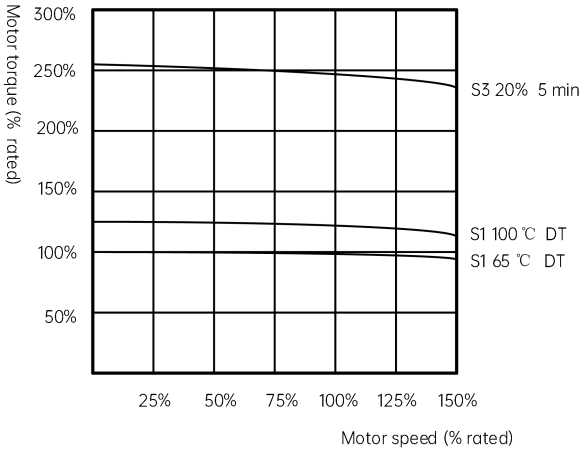


Fig. 7-2 Motor characteristic curve

According to Fig. 7-2, as motor speed increases, the motor torque gradually decreases. When the motor speed exceeds 150% of the rated speed, the servo motor gradually reaches magnetic saturation, causing the motor torque to drop rapidly. Therefore, this speed range cannot be used as the operating speed range for the servo motor. It is

recommended to set the maximum motor speed (N_{max} (rpm)) at 140% of the selected rated speed (N_{max} (rpm) = N (rpm) × 140%).

Note:

For better control effect, please select the maximum speed of the motor as 130% of the rated speed.

(2) Motor rated torque selection:

Maximum output power of the molding machine:

P_{2max} (kW) = P_1 (kgf/cm²) × 0.9807 (kgf/cm²/bar) × Q (L/min) / 600

Maximum output power of the motor (converted at 90% total energy conversion efficiency):

P_{3max} (kW) = P_{2max} (kW) × 90%

Maximum output torque of the motor:

T_{max} (N·m) = P_{3max} (kW) × 9550 / N (rpm)

According to the motor characteristic curve in Fig. 7-2, the overall operating state of the servo motor is between (S1 100°C DT) and (S3 20% 5 min). Since continuous high torque output is required during pressure holding, the torque curve of this servo motor remains in a high torque state. Based on this curve, it is recommended to select a motor type with a maximum torque of 180% of the rated torque.

Motor rated torque:

T (N·m) = T_{max} (N·m) / 180%

Note:

If a double displacement plunger pump or a double gear pump is selected, the torque output of the motor can be reduced by reducing the displacement of the oil pump during the pressure holding process.

If the servo motor is in the working state (S3 20% 5 min), the motor whose maximum torque is 230% of the rated torque can be selected.

7.2.3 Drive selection

Drive capacity selection: After completing the servo motor selection, obtain the motor torque constant Kt (N·m/A) from the servo motor supplier. The holding current for the drive can then be determined by the formula: I (A) = T_{max} (N·m) / Kt (N·m/A). Following the principle that this calculated value must be less than 150% of the servo drive's rated output current, the appropriate servo drive model and corresponding peripheral components can be selected.

Note:

The torque constant value Kt (N·m / A) is related to the servo motor technology, materials and motor rated speed N (rpm).

7.2.4 Pressure sensor selection

After completing the selection of the oil pump, motor, and drive, the required system pressure and displacement can be determined. To establish a closed-loop pressure control system, the pressure sensor specifications must be selected based on the system's required pressure and displacement, and parameters P26.01 and P26.02 should be configured accordingly. Set P26.03 according to the maximum required system pressure. Additionally, configure P26.05 to set the motor's maximum operating speed corresponding to the maximum percentage of the flow reference.

P26.01	Pressure sensor range	0.0 to 600.0 (250)
P26.02	Output signal mode of pressure sensor	0 to 3 (3)
P26.03	Maximum system pressure	0.0 to 250.0 (175)
P26.05	Maximum speed	0 to 6000 (2000)

7.3 Commissioning before power-on

7.3.1 Installation

Before powering on, personnel must thoroughly inspect all terminal connections to ensure all fastening screws are securely tightened to prevent loosening during equipment operation. Simultaneously, check all wire connections for exposed conductors or uneven crimping. If such conditions are found, immediately rectify the wiring to prevent electrical shock hazards. Check the following items before applying power:

Item	Content
Check the power supply voltage	Check that the power supply is AC 380 V to 480 V 50/60 Hz
	Ensure that the power input terminals (L1/L2/L3) are connected reliably
	Check that the servo drive and motor are wired correctly
Check the connection between the output terminals of the servo drive and the motor terminals	Check whether the connection between the servo output terminals (U/V/W) and the motor terminals is firm
Check the connection of the control circuit terminals of the servo drive	Check whether the connection between the control circuit terminals of the servo drive and other controller devices is reliable
Check the shorting status of servo drive control terminals	Check whether the control circuit terminals of the servo drive are all in the OFF state (non-operational state)
Check the load	Check whether the motor is in the no-load state and not connected to the mechanical system

7.3.2 Keypad connection

When the keypad is connected, observe whether there is a problem with the LED display screen. Perform simple operations to check whether the keypad works well.

7.3.3 Disable enabling function

To ensure system safety during commissioning, before connecting three-phase AC power, the system's enabling function must be disabled. Without connecting the keypad, there are two methods to disable the enabling function:

Method 1: Disconnect the enabling button for drive terminal input.

Method 2: If the injection molding machine computer has a system enabling function and its enabling output is connected to the drive's enabling terminal, the system enabling output must be disabled in this case.

7.4 Commissioning after power-on

7.4.1 Parameter initialization

Restore the settings of the servo drive to factory settings. After initialization, P00.05 will automatically return to zero.

P00.05	Parameter initialization	Default value	0
		0	Parameters rewritable
		1	Clear fault records
		2	Restore to factory settings
		3	Restore some parameters to factory settings (motor parameters not restored)

0: Parameters rewritable

When it is set to 0, all parameters can be changed.

1: Clear fault records

When it is set to 1, fault records related to P97.32–P97.61 will be cleared.

2: Restore to factory settings

When it is set to 2, all parameters before P97.32 (excluding P00.01 user password, P01 drive status display parameters and P03&P20 motor parameters) will be restored to factory settings.

3: Restore some parameters to factory settings (motor parameters not restored)

When it is set to 3, part of parameters will be restored to factory settings, excluding motor parameters.

Note:

Parameter initialization settings can be performed for new models, while for old models such step can be skipped. If the old model needs to be initialized, it needs to be carried out while retaining the original parameters, which can effectively reduce the risk of equipment damage and personal injuries.

7.4.2 Start and stop commands

P02.02	Operation command channel selection	Default value	0
		0	Operating panel
		1	Terminal
		2	Communication

0: Operating panel

Use RUN, STOP and the M key (set to JOG function) for control.

1: Terminal

Use external control terminals (FWD, REV, FWD JOG, REV JOG) for control.

2: Communication

Used the serial ports, bus expansion cards and other communication methods for control.

7.4.3 Observe panel display

After power is turned on, the panel in the normal state is displayed as follows:

State	Display	Description
Normal	50.00	Displays the default motor frequency 50.00 Hz
Fault	oXX	Displays the fault type

7.5 Motor parameter auto-tuning

Customers can utilize the drive's motor auto-tuning function to obtain motor parameters. There are three auto-tuning modes: static auto-tuning, dynamic auto-tuning, and full-parameter auto-tuning.

7.5.1 Auto-tuning comparison

Static auto-tuning: This method slightly rotates the motor and can perform auto-tuning under light load. After completion, it identifies resistance, inductance, and initial motor angle. The motor can operate normally after this auto-tuning.

Dynamic auto-tuning: This method rotates the motor to a certain speed and identifies back EMF. It is not suitable for heavy loads, so the motor must be unloaded or the relief valve opened during auto-tuning. It is only used for back EMF identification, and static auto-tuning is required afterward for normal operation.

Full-parameter auto-tuning: This method rotates the motor to a certain speed and identifies resistance, inductance, back EMF, and initial motor angle. It is not suitable for heavy loads, so the motor must be unloaded or the relief valve opened during auto-tuning. The motor can operate normally after this auto-tuning.

7.5.2 Auto-tuning related function code settings

P03.15	Synchronous motor rated power	0.1 to 3000.0 kW
P03.16	Synchronous motor rated voltage	0 to 1200 V
P03.17	Synchronous motor rated current	0.8 to 6553.5 A
P03.18	Synchronous motor rated frequency	0.01 Hz to P02.10
P03.19	Number of synchronous motor pole pairs	1 to 128
P03.27	Motor auto-tuning	0: No operation 1: Static auto-tuning 2: Dynamic auto-tuning 3: Full-parameter auto-tuning

7.5.3 Auto-tuning flowchart

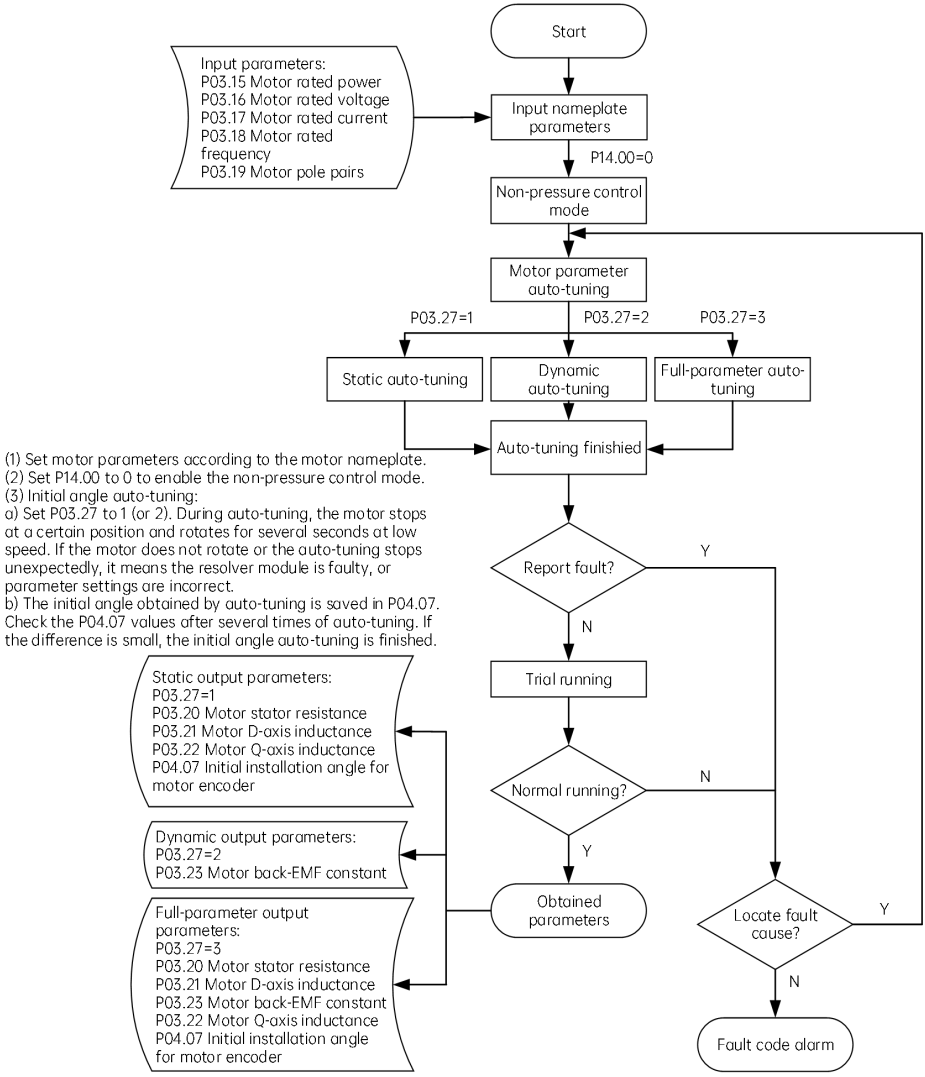


Fig. 7-3 Motor parameter auto-tuning flowchart

7.6 Hydraulic servo commissioning

7.6.1 Running test

After completing motor auto-tuning, power off the drive and then restart it. After restarting, run the motor and ensure smooth operation during startup. The frequency displayed on the keypad should fluctuate slightly around the set value during stable operation, and the motor current under no-load conditions should be less than 10% of the rated current, indicating normal motor operation.

When running the motor at various speed ranges, observe its performance and adjust the drive's speed loop parameters and current loop PI parameters as needed to ensure stable operation at both high and low speeds. If oscillation or low-frequency noise occurs during operation, appropriately reduce the stiffness (P05.00) and current loop parameters (P05.13–P05.16).

Note:

Before pressure commissioning, you need to perform trial running on the motor referring to section 4.2.3.

7.6.2 Running direction check

Make the drive run at 2 Hz low speed (P02.09=2.00). Observe the oil pressure buildup direction. If the pressure gauge shows no pressure or the motor current is too small, the pressure buildup direction is incorrect. Set P02.04 to 1 to reverse the motor running direction, or swap any two phase wires (U/V/W) of the motor. After adjusting the direction, repeat the motor parameter auto-tuning steps in section 7.5 by setting P03.27 to 1 or 3. When the pressure gauge shows pressure or the motor generates sufficient current after adjustment, it means the motor is running in the correct pressure buildup direction.

7.6.3 Pressure control mode selection

P14.00	Pressure control mode	Default value	0
		0	Non-pressure control mode
		1	Internal CAN oil pressure mode (multi-pump mode)
		2	Pressure control mode
		3	External CAN oil pressure mode (computer of injection molding machine)

0: Non-pressure control mode

1: Internal CAN oil pressure mode (multi-pump mode)

2: Pressure control mode

AI1 gives the pressure feedback reference;

AI2 gives the flow reference;

AI3 gives the pressure reference.

3: External CAN oil pressure mode (computer of injection molding machine)

During pressure control by the servo drive, CANopen gives the pressure and flow references, and AI1 gives the pressure feedback reference.

7.6.4 Parameter correction

7.6.4.1 AI upper and lower limits correction

Using AI1 upper and lower limits as an example: With peripheral signals properly connected, power on the drive (without enabling it). Have the system computer send minimum and maximum pressure signals to the drive respectively. Observe the values in P01.21, then set the two recorded values into P09.25 and P09.27. Other AI channels follow similar correction procedures, only differing in monitored parameters and function codes. Refer to descriptions for P01.22–P01.25 and P09.30–P09.43.

7.6.4.2 AI zero offset automatic correction

Set P26.29 to "1" for AI zero offset auto-correction. The drive will perform an automatic zero offset correction for all 3 analog channels and store the detected zero offset values in the parameter group P88.

7.6.5 Base pressure, base flow, pressure relief settings

7.6.5.1 Base pressure, base flow settings

In pressure-related systems, internal leakage in oil pumps is unavoidable. When the system provides no flow or pressure commands, hydraulic oil may flow back to the tank, allowing air to enter the oil circuit. This can cause noise and unstable operation during system running.

To prevent this, technicians must preset the drive with base pressure and base flow. In standby, adjust P26.06 (Base pressure) and P26.07 (Base flow) according to the displayed P01.29 (Pressure reference) that should be changed based on needs.

P26.06 sets the system's minimum operating pressure as a percentage of the pressure sensor range (P26.01).

P26.07 sets the system's minimum operating flow as a percentage of the maximum speed (P26.05).

P26.06	Base pressure	0.0% to 100%
P26.07	Base flow	0.0% to P26.05

7.6.5.2 Pressure relief settings

The maximum reverse speed during pressure relief, corresponding to the percentage setting of the maximum speed, is used to set the motor's maximum reverse operating speed.

P14.10	Reverse speed limit for pressure relief	-100% to 20%

A larger setting value results in faster pressure relief, but excessive values may cause oil pump reversal noise.

A smaller setting value results in slower pressure relief.

7.6.6 Pressure PID Control

Proportional gain (Kp), integral gain (Ki), and derivative gain (Kd) settings with larger values result in faster response, but excessively fast response may cause servo motor vibration and unstable molding machine operation. Conversely, smaller settings for Kp, Ki, and Kd result in slower response, and excessively slow response may lead to unstable pressure control and overshoot.

P14.02	Pressure control proportional gain Kp1	0.000 to 15.000
P14.03	Pressure control integral gain Ki1	0.000 to 10.000
P14.04	Pressure control derivative gain Kd1	0.000 to 10.000

Chapter 8 Multi-Pump Control Schemes

Due to the limitations of oil pump displacement and motor power, a single-pump system can no longer meet the flow requirements for large-tonnage pressure control in most cases. To better address issues such as insufficient flow, low production efficiency, and prolonged user process cycles, multiple single-pump systems can be connected in parallel. This allows the entire hydraulic system to form two or more networked configurations, enabling distributed/convergent flow control and thereby achieving a high-flow pressure control system. In practical field conditions, parallel pump configurations can be divided into three schemes: single-master multi-slave compound distribution, single-master multi-slave distributed/convergent flow, and multi-master multi-slave convergent flow.

8.1 Single-master multi-slave compound distribution

The single-master multi-slave compound distribution structure is shown in Fig. 8-1. The wiring method for the compound distribution scheme is illustrated in Fig. 8-2. When configured as compound distribution, the master drive is responsible for receiving pressure references, flow references, operation enable signals, and pressure sensor signals of oil let from the system's computer, and then performs pressure and system flow control.

The master drive in the network can select analog interfaces AI1, AI2, and AI3 or external CAN interfaces CANH2, CANL2, and CGND2 via function code P14.00. When P14.00 is set to 2, the analog interfaces are connected to the pressure sensor and the system computer's flow and pressure reference terminals to receive pressure feedback, flow and pressure reference signals. When P14.00 is set to 3, the external CAN interfaces are connected to the computer system to receive flow and pressure reference signals from the system computer. The slave drives are interconnected via internal CAN interfaces CANH1, CANL1, and CGND1 to enable internal signal exchange. The following formula can be used to calculate the flow that each drive can handle independently, referred to as the maximum private flow:

Maximum single pump flow (L/min) = Maximum speed (P26.05) × Pump displacement per revolution (P32.14) / 1000 (L/ml)

Maximum private flow (L/min) = Maximum single pump flow (L/min) × Flow cut-in threshold ratio (%)

System maximum flow (L/min) = Maximum flow of pump 1 (L/min) + Maximum flow of pump 2 (L/min) + ... + Maximum flow of pump N (L/min)

System reference total flow (L/min) = System maximum flow (L/min) × System flow reference percentage (%)

When the total flow reference from the system computer is less than the master drive's maximum private flow, the master drive will handle the entire system flow demand. When the total flow reference exceeds the master drive's maximum private flow, the master drive will provide its own maximum private flow, then distribute the remaining flow demand to slave drive 1. If the remaining flow demand is less than slave drive 1's maximum private flow, slave drive 1 will handle the remaining demand. If the remaining flow demand exceeds slave drive 1's maximum private flow, slave drive 1 will provide its own maximum private flow and distribute the remaining demand to other slave drives. This process continues until the remaining flow is fully absorbed by the remaining slave drives. However, if the last slave drive's

maximum private flow is still insufficient to cover the remaining demand (meaning the sum of all drives' maximum private flows cannot meet the system flow requirement), all drives will proportionally share the system flow demand.

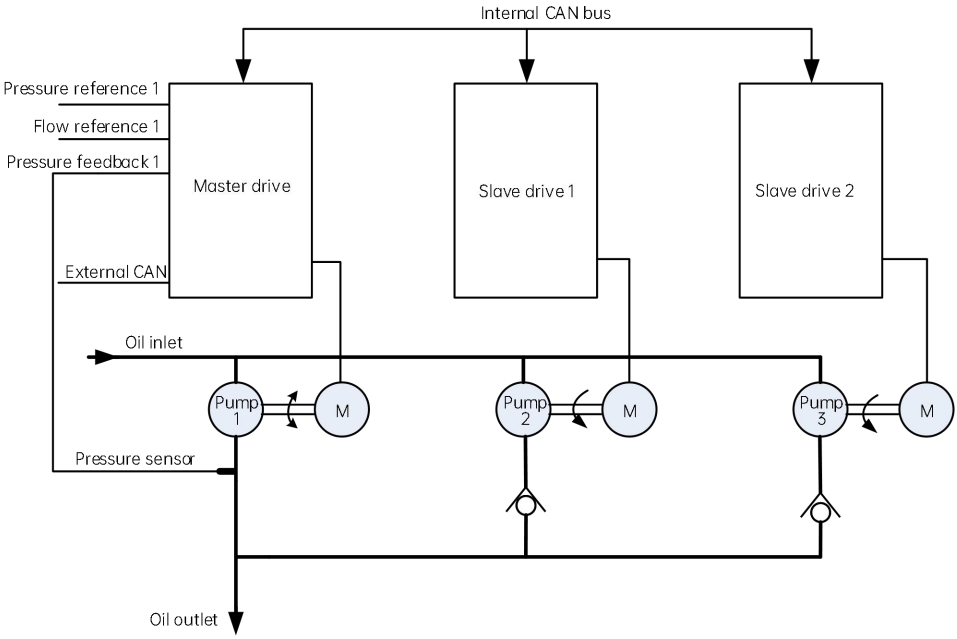


Fig. 8-1 Single-master multi-slave compound distribution structure diagram

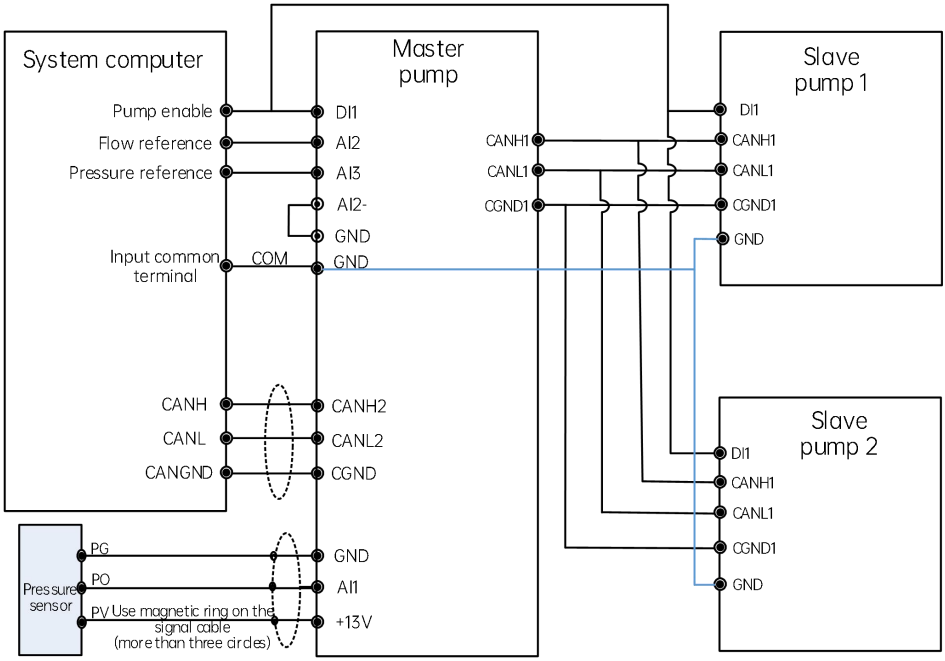


Fig. 8-2 Single-master multi-slave compound control terminal wiring diagram

Compound distribution example:

The compound distribution structure is shown in Fig. 8-1. The entire compound distribution hydraulic network consists of three hydraulic systems: master drive 1, slave drive 2, and slave drive 3. Master drive 1 will calculate the flow it can handle internally and allocate any excess flow to slave drive 2 within the system. If slave drive 2 still cannot fully absorb the assigned flow, the remaining excess will be distributed to slave drive 3. If drive 3 is also unable to handle the remaining flow, the system will command all three drives to proportionally share the total flow demand.

As configured in Table 8-1, if the computer system sets the flow reference percentage to 20%, the system flow reference is calculated as 48 L based on the function code settings and the formulas above. The maximum private flow for each of the three drives is 32 L. Since master drive 1 cannot fully handle the system-assigned 48 L flow, it will allocate the excess 16 L to slave drive 2. Given that slave drive 2 has a maximum private flow of 48 L, it can completely absorb the 16 L excess. As a result, no flow needs to be assigned to slave drive 3.

Table 7-1 Example of function code settings for compound distribution

Function code	Master drive 1	Slave drive 2	Slave drive 3
P14.00 (Pressure control mode)	2 (AI) or 3 (CAN communication)	1	1
P26.05 (Maximum speed)	2000	2000	2000

Function code	Master drive 1	Slave drive 2	Slave drive 3
P32.07 (Internal CAN baud rate selection)	3	3	3
P32.08 (Internal CAN address)	0	1	2
P32.09 (Internal CAN disconnection detection time)	0.5	0.5	0.5
P32.10 (Flow type)	1	1	1
P32.11 (Single master selection)	1	0	0
P32.12 (Unit number)	0	0	0
P32.13 (Master/Slave switchover of node)	0	0	0
P32.14 (Pump displacement)	40	40	40
P32.15 (Flow cut-in threshold)	40%	40%	40%
P32.16 (Flow cut-in hysteresis)	2%	2%	2%

8.2 Single-master multi-slave pump distributed/convergent flow

The single-master multi-slave pump distributed/convergent flow control has two control modes: distributed flow and convergent flow modes. The control structure is shown in Fig. 8-3, and the wiring method is shown in Fig. 8-4. This control network achieves the switching between distributed flow and convergent flow control modes by adding a distributed/convergent switching input function DI2 terminal (No. 21 function) to each slave drive. When the DI2 terminal is valid, it is in the distributed flow control mode, where each drive operates as an independent single-loop hydraulic system to complete flow and pressure control. When the DI2 terminal is invalid, it is in the convergent flow control mode, where the master drive receives the pressure and flow references from the computer system, and the slave drives follow the received flow reference from the master drive for operation through the internal CAN connection between the drives.

The master drive in the network can select between analog interfaces AI1, AI2, and AI3 or external CAN interfaces CANH2, CANL2, and CGND2 via function code P14.00. When P14.00 is set to 2, the analog interfaces are connected to the pressure sensor and the flow/pressure reference terminals of the system computer to receive pressure feedback, flow reference, and pressure reference signals. When P14.00 is set to 3, the external CAN interfaces are connected to the

computer system to receive flow and pressure reference signals from the system computer. The slave drives are interconnected through internal CAN interfaces CANH1, CANL1, and CGND1 to enable internal signal communication.

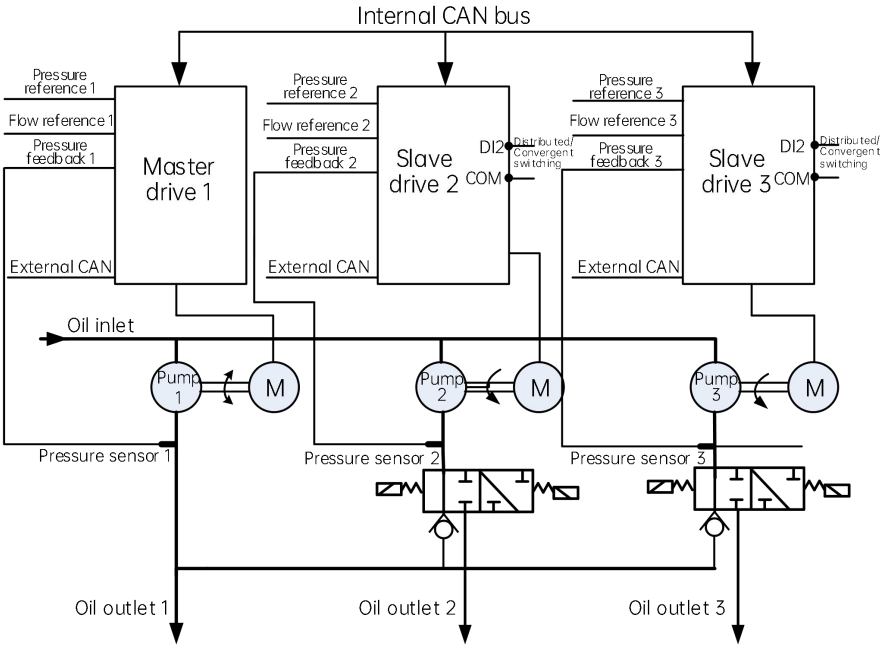


Fig. 8-3 Single-master multi-slave pump distributed/convergent flow structure diagram

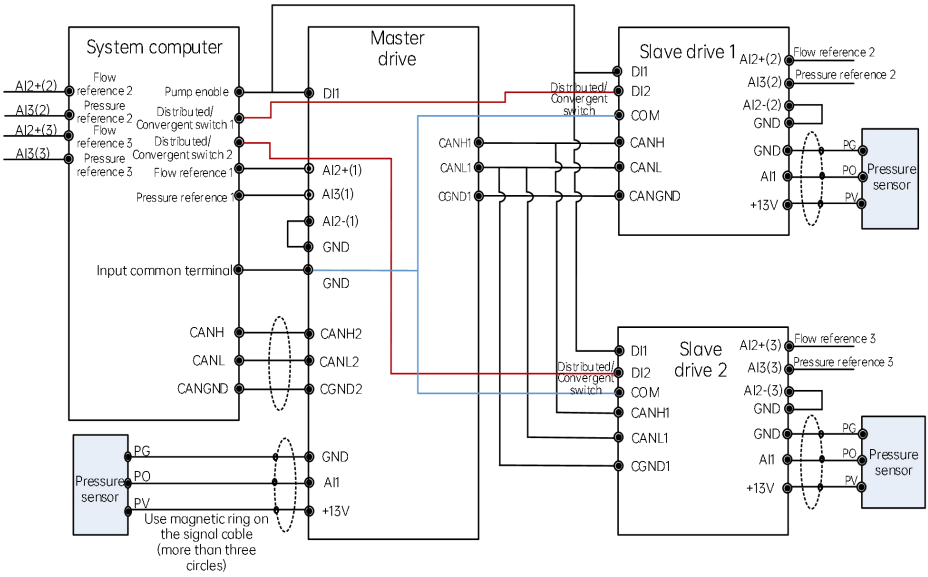


Fig. 8-4 Single-master multi-slave pump distributed/convergent control terminal wiring diagram

Single-master multi-slave pump distributed/convergent flow example:

The single-master multi-slave distributed/convergent flow structure diagram is shown in Fig. 8-3. The entire single-master multi-slave distributed/convergent hydraulic network consists of three hydraulic systems: master drive 1, slave drive 2, and slave drive 3. The settings are configured as shown in Table 8-2. When the DI2 terminal is invalid, it is in the convergent flow mode. After the computer system sets the flow rate, the slave drives follow the flow received by the master drive. When the DI2 terminal is valid, it is in the distributed flow mode, where each drive functions as an independent hydraulic circuit to complete flow and pressure control separately.

Table 7-2 Example of function code settings for single-master multi-slave distributed/convergent flow

Function code	Master drive 1	Slave drive 2	Slave drive 3
P14.00 (Pressure control mode)	2 (AI) or 3 (CAN communication)	1	1
P26.05 (Maximum speed)	2000	2000	2000
P32.07 (Internal CAN baud rate selection)	3	3	3
P32.08 (Internal CAN address)	0	1	2

Function code	Master drive 1	Slave drive 2	Slave drive 3
P32.09 (Internal CAN disconnection detection time)	0.5	0.5	0.5
P32.10 (Flow type)	2	2	2
P32.11 (Single master selection)	1	0	0
P32.12 (Unit number)	Invalid	Invalid	Invalid
P32.13 (Master/Slave switchover of node)	Invalid	Invalid	Invalid
P32.14 (Pump displacement)	Invalid	Invalid	Invalid
P32.15 (Flow cut-in threshold)	Invalid	Invalid	Invalid
P32.16 (Flow cut-in hysteresis)	Invalid	Invalid	Invalid

Note:

When DI2 is invalid, the system is in the convergent flow state, and the pressure reference, flow reference and pressure feedback signals received from slave drives are invalid.

8.3 Multi-master multi-slave pump convergent flow

The multi-master multi-slave pump convergent flow structure is shown in Fig. 8-5. The wiring method is shown in Fig. 8-6. This system consists of one master unit and two slave units. Each unit can be composed of one or more drives, with each drive defined as a node. Every unit must have one control node, while follower nodes may be multiple or none. The control node in each unit is responsible for receiving pressure references, flow references, operation enable signals from the system computer, and pressure sensor signals from the oil outlet, and performs pressure and total system flow control.

The control unit within the unit can select between analog interfaces AI1, AI2, and AI3 or external CAN interfaces CANH2, CANL2, and CGND2 via function code P14.00. When P14.00 is set to 2, the analog interfaces are connected to the pressure sensor and the flow/pressure reference terminals of the system computer to receive pressure feedback, flow references, and pressure reference signals. When P14.00 is set to 3, the external CAN interfaces are connected to the computer system to receive flow and pressure reference signals from the system computer. All nodes within each unit are interconnected through internal CAN interfaces CANH1, CANL1, and CGND1 to enable internal signal communication.

Multi-master Multi-slave convergent flow example:

The multi-master multi-slave convergent flow structure diagram is shown in Fig. 8-5. The entire multi-master multi-slave convergent flow hydraulic network consists of 5 hydraulic systems: master drive 1, slave drive 2, slave/master drive 3, slave drive 4, and slave/master drive 5. Master drive 1 and slave drive 2 form master unit 1, with slave drive 2 following master drive 1. Slave/master drive 3 and slave drive 4 form slave unit 2, with slave drive 4 following slave/master drive 3. Slave/master drive 5 forms slave unit 3. Since this unit contains only one drive, it operates solely under independent pressure closed-loop control.

This control system achieves slave-to-master switching by adding a slave/master switching input function DI4 terminal (No. 56 function) to the slave control nodes in each slave unit, and enables slave pumps to follow a second master through another DI4 terminal (No. 56 function) for secondary master following input function. When DI4 is invalid, master drive 1 is defined as the control unit, other drives are defined as follower units, and follower units run at the same speed as master drive 1. When all DI4 terminals are valid, master drive 1, slave/master drive 3 and slave/master drive 5 are defined as control nodes, while slave drive 2 and slave drive 4 are defined as follower nodes.

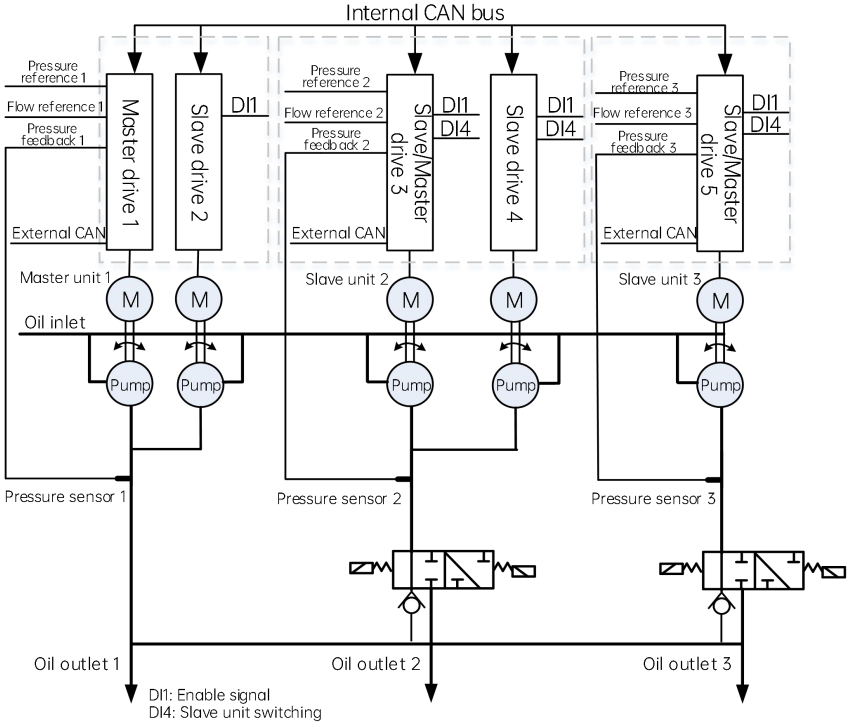
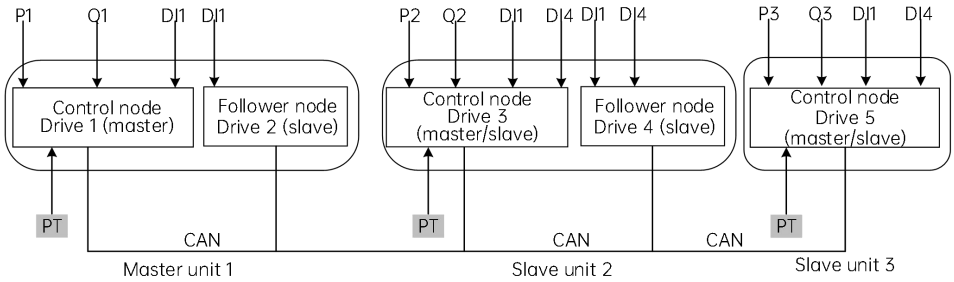


Fig. 8-5 Multi-master multi-slave pump convergent flow structure diagram



PT: Pressure sensor P1 to 3: Pressure reference Q1 to 3: Flow reference DI1: Enable signal
DI4: Slave unit switching

Fig. 8-6 Multi-master multi-slave pump convergent flow terminal wiring diagram

Table 7-3 Example for function code settings of multi-master multi-slave convergent flow

Function code	Master drive 1	Slave drive 2	Master/Slave drive 3	Slave drive 4	Master/Slave drive 5
P14.00 (Pressure control mode)	2 (AI) or 3 (CAN communication)	1	1	1	1
P26.05 (Maximum speed)	2000	2000	2000	2000	2000
P32.07 (Internal CAN baud rate selection)	3	3	3	3	3
P32.08 (Internal CAN address)	0	1	2	3	4
P32.09 (Internal CAN disconnection detection time)	0.5	0.5	0.5	0.5	0.5
P32.10 (Flow type)	3	3	3	3	3
P32.11 (Single master selection)	1	0	0	0	0
P32.12 (Unit number)	0	0	1	1	2
P32.13 (Master/Slave switchover of node)	0	0	1	0	1
P32.14 (Pump displacement)	Invalid	Invalid	Invalid	Invalid	Invalid

Function code	Master drive 1	Slave drive 2	Master/Slave drive 3	Slave drive 4	Master/Slave drive 5
P32.15 (Flow cut-in threshold)	Invalid	Invalid	Invalid	Invalid	Invalid
P32.16 (Flow cut-in hysteresis)	Invalid	Invalid	Invalid	Invalid	Invalid

The drive control board or control board with control box has two sets of CAN terminals: internal CAN terminals CANH1 and CANL1, and external CAN terminals CANH2 and CANL2. The internal CAN terminals are used for internal signal transmission in multi-pump control. All CANH1 and CANL1 signal terminals on the drive control boards are connected together, and the ground terminal CGND1 is connected through the shield layer. The internal CAN termination resistors for drive 1 and drive N need to be connected (via J12/J3 jumper). The external CAN terminals are used to connect to the injection molding machine computer or other operation controllers. The drive's CANH2, CANL2, and CGND2 are connected to the injection molding machine computer's CANH, CANL, and CANGND. The external CAN termination resistor must also be connected (via control board J4 / expansion box J12 jumper). Fig. 8-7 shows the CAN bus wiring diagram.

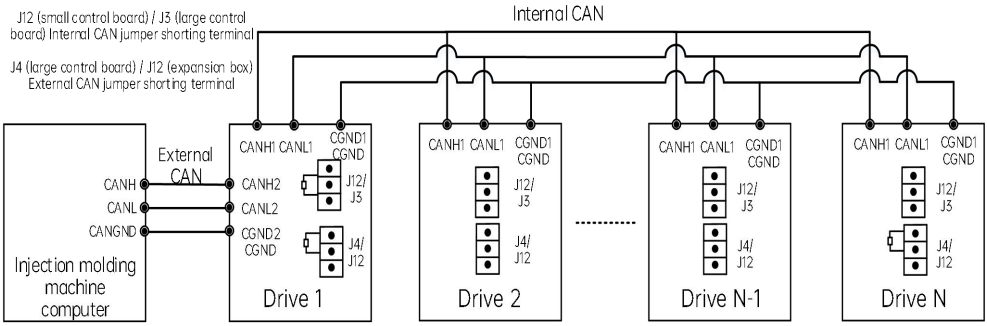


Fig. 8-7 CAN bus wiring diagram

Note:

When connecting the CAN bus, please use twisted pair shielded cables for connection, which can effectively reduce the interference of external signals.

Chapter 9 Troubleshooting

9.1 List of fault codes

All possible fault types are summarized in Table 9-1. Before seeking for service, users can perform self-check according to this table and record the fault symptoms in details. This will help a lot when you contact the sales personnel for technical support.

Table 9-1 Fault types and solutions

Fault code	Fault type	Possible fault cause	Solution
OC1	Acceleration overcurrent of the drive	The acceleration time is too short.	Prolong the acceleration time.
		The motor parameters are incorrect.	Perform auto-tuning of motor parameters.
		When instantaneous stop happens, the rotating motor is restarted.	Set the startup mode P08.00 to startup after speed tracking.
		Encoder fault occurs when PG is running.	Check the encoder and its wiring.
		The drive power is too low.	Use a drive with higher power.
		Low grid voltage	Check the input power supply.
OC2	Deceleration overcurrent of the drive	The deceleration time is too short.	Prolong the deceleration time.
		There is potential energy load or the load inertial torque is large.	Add additional appropriate dynamic braking components.
		Encoder fault occurs when PG is running.	Check the encoder and its wiring.
		The drive power is too low.	Use a drive with higher power.
OC3	Constant speed overcurrent of the drive	The acceleration/deceleration time is too short.	Prolong the acceleration/deceleration time appropriately.
		Sudden load change or abnormal load	Check the load.
		Low grid voltage	Check the input power supply.
		Encoder fault occurs when PG is running.	Check the encoder and its wiring.
		The drive power is low.	Use a drive with higher power.
OV1	Acceleration overvoltage of the drive	Abnormal input voltage	Check the input power supply.
		The acceleration time is too short.	Prolong the acceleration time appropriately.
		When instantaneous stop happens, the rotating motor is restarted.	Set the startup mode P08.00 to startup after speed tracking.

Fault code	Fault type	Possible fault cause	Solution
OV2	Deceleration overvoltage of the drive	The deceleration time is too short (compared with the regenerative energy).	Prolong the deceleration time.
		There is potential energy load or the load inertial torque is large.	Select appropriate dynamic braking components.
OV3	Constant speed overvoltage of the drive	In vector control, the ASR parameters are not set properly.	Refer to the ASR parameter setting of Group P05.
		The acceleration/deceleration time is too short.	Prolong the acceleration/deceleration time appropriately.
		Abnormal input voltage	Check the input power supply.
		Abnormal fluctuation of input voltage	Install an input reactor.
		Large load inertia	Adopt dynamic braking components.
SPI	Input phase loss	There is phase loss in input R, S, T.	Check the installation wiring. Check the input voltage.
SPO	Output phase loss	There is phase loss in output U, V, W.	Check the output wiring. Check the motor and the cables.
Uv	Undervoltage	The bus voltage of the drive is too low (lower than 350 VDC).	Check the input power voltage. Check the bus voltage of the drive. Seek for technical support.
drv	Power module protection	There is interphase short circuit or grounding short circuit in three phases output.	Rewire and check the motor insulation.
		Instantaneous overcurrent of the drive	Refer to the overcurrent solutions.
		The duct is blocked or the fan is damaged.	Unblock the duct or replace the fan.
		The ambient temperature is too high.	Lower the ambient temperature.
		Wires or plug-in units of the control board are loose.	Check them and rewire.
		Abnormal current waveform caused by output loss or other reasons	Check the wiring.
		The auxiliary power supply is damaged, and the drive voltage is insufficient.	Seek for technical support.
		Inverter module shoot-through	Seek for technical support.

Fault code	Fault type	Possible fault cause	Solution
		Abnormal control board	Seek for technical support.
		Braking pipe damaged	Seek for technical support.
OH1	Inverter module heatsink overheat	The ambient temperature is too high.	Lower the ambient temperature.
		The duct is blocked.	Clean the duct.
		The fan is damaged.	Replace the fan.
		The inverter module is abnormal.	Seek for technical support.
OH2	Rectifier heatsink overheat	The ambient temperature is too high.	Lower the temperature.
		The duct is blocked.	Clean the duct.
		The fan is damaged.	Replace the fan.
OL1	Drive overload	The motor parameters are incorrect.	Perform auto-tuning of motor parameters.
		The load is too large.	Use a drive with higher power.
		The DC braking amount is too large.	Reduce the DC braking current and prolong the braking time.
		When instantaneous stop happens, the rotating motor is restarted.	Set the startup mode P08.00 to startup after speed tracking.
		The acceleration time is too short.	Prolong the acceleration time.
		The grid voltage is too low.	Check the grid voltage.
		The drive power is low.	Use a drive with higher power.
OL2	Motor overload	The motor overload protection factor setting is incorrect.	Set the overload protection factor of the motor correctly.
		The motor is blocked or the sudden change of load is too large.	Check the load.
		The universal motor runs at low speed for a long time with high load	For long-time low-speed running, a specialized motor should be used.
		The grid voltage is too low.	Check the grid voltage.
		The motor power is low.	Use a motor with higher power.
EF	External device fault	External fault emergency stop terminal is enabled.	After the external fault is revoked, release the external fault terminal.
EEP	EEPROM read/write fault	The read/write error of the control parameters occurs.	Reset by pressing the STOP/RESET key, and seek for technical support.
CE	Abnormal remote serial	The baud rate is set improperly.	Set the baud rate properly

Fault code	Fault type	Possible fault cause	Solution
	port communication	Serial port communication error	Reset by pressing the STOP/RESET key, and seek for technical support.
		The fault alarm parameters are set improperly.	Modify the P15.03 setting.
		The host device does not work.	Check if the host device is working and if the wiring is correct.
ItE	Current detection circuit abnormal	Wires or plug-in units of the control board are loose.	Check them and rewire.
		The auxiliary power supply is damaged.	Seek for technical support.
		The Hall device is damaged.	Seek for technical support.
		The amplifying circuit is abnormal.	Seek for technical support.
FbL	Closed-loop feedback loss	Feedback wire breakage	Rewiring.
		The reference of closed-loop feedback is too low.	Increase the feedback reference.
brOC	Overcurrent of the braking resistor	The braking resistor is not well matched	Use the braking resistor of a higher level.
CoP	Parameter copy error of operating panel	Operating panel parameters are incomplete or the operating panel version does not match the main control board version.	Refresh the operating panel data and version, and set P00.07 to 1 to upload parameters, then set P00.07 to 2 or 3 to download parameters.
		Operating panel EEPROM damaged	Seek for technical support
tUN	Auto-tuning fault	The nameplate parameters of the motor are incorrect.	Set the parameters properly according to the motor nameplate.
		When reverse running is inhibited, reverse rotation auto-tuning is performed.	Cancel the reverse running inhibition.
		Auto-tuning timeout	Check the motor wiring.
			Check the P02.11 (upper limit frequency) and see whether the P02.12 set value is lower than the rated frequency.
PG1	PG fault	Encoder disconnected	Check encoder cables and PG card connection.

Fault code	Fault type	Possible fault cause	Solution
OVS	Overspeed	The motor speed exceeds the limit.	Check whether P02.10 is within a reasonable range.
		There is potential energy load or abrupt load inertial torque.	Select appropriate dynamic braking components.
		Incorrect motor auto-tuning	Correct parameters and do auto-tuning again.
24v	Control board 24 V short circuit	P24 is short circuited with GND	Check the wiring between P24 and GND.
		Circuit damaged	Change the board by seeking for technical support.
24OL	24 V power supply overload	Incorrect terminal wiring of the control board, or large overload	Control 24 V output, the total current of digital output less than 200 mA.
bCE	Board level communication error	Incorrect connection of board detection signals	Seek for technical support.
bLt	BootLoader failure		Seek for technical support.
VEr	Power board software version not matching	The software version to be burned is not consistent with the current software version number.	Set P00.06=1 to upgrade software.
UPdnE	Parameter upload/download timeout	Parameter upload/download timeout	Check the wiring and seek for technical support.
AIOC	Overcurrent of AI1 current input	Check whether the AI1 input current is normal.	Seek for technical support.
FAn	Fan blocked	Check whether the fan is blocked by foreign matters.	Clean the motor fan.
IO-OL	IO option 24 V overload	Check whether the external wiring of IO option is correct, and whether 24 V load is too large.	The total output of 24 V shall be lower than 200 mA.
GdF	Short circuit to ground fault	One of the phases (most likely the phase U) is grounding short circuited.	Check the grounding short circuit of the three phases output and troubleshoot it.
dEv	Excessive speed deviation (DEV) fault	The ASR parameters are improper.	Modify the Group P05 function codes.
		The speed deviation detection value is too small.	Modify the speed deviation detection setting.
		Heavy load fluctuation	Eliminate the load vibration.

Fault code	Fault type	Possible fault cause	Solution
Fbo	PID feedback exceeding limit	The PID feedback exceeds the limit.	Check whether the input voltage of feedback value is correct. If correct, seek for technical support.
OH3	Motor overheat	The ambient temperature is too high.	Lower the ambient temperature.
		The motor duct is blocked.	Clean the motor duct.
		The motor fan is damaged.	Replace the motor fan.
		The motor runs at low frequency for a long time with high load	Add a large fan for the motor to dissipate heat.
048	Master CAN communication interrupted	The CAN communication cables are disconnected between the host device and the drive.	1. Check whether communication cables are well connected. 2. Check whether the shield layer is properly connected, and whether the cables are too long. 3. Check whether CANH2 and CANL2 are reversed.
		Strong interference (RX error)	
		Host device fault	Check the host device fault
049	Slave CAN communication interrupted	The communication cables are disconnected between the master pump and the slave pump.	1. Check whether communication cables are well connected. 2. Check whether the shield layer is properly connected, and whether the cables are too long. 3. Check whether CANH1 and CANL1 are reversed.
		Strong interference (RX error)	
		Master pump fault	Check the master pump fault.
050	Master and slave not matched	Incorrect settings of P32 group parameters	Set appropriately according to multi-pump contents in this manual.
051	Braking resistor overload	Abnormal input voltage	Check the input power supply.
		The motor is faulty, which requires continuous braking.	Contact the motor manufacturer for technical support.
052	Main circuit running undervoltage	Abnormal input voltage	Check the input power supply.

Fault code	Fault type	Possible fault cause	Solution
053	Business mode timeout	An alarm is triggered when the set business mode duration is reached.	Contact after-sales service or the supplier to reset the password.

9.2 List of operation exceptions

Table 9-2 Operation exceptions and solutions

Symptom	Condition	Possible cause	Solution
The operating panel has no response.	Some keys or all keys have no response.	The operating panel lock function is now active.	To unlock, press and hold the "⏎" key, then press the "∨" key three times, whether in the stop or running parameter display state.
			Power off the drive completely and power on again.
		The wires of the operating panel have poor contact.	Check the wiring and perform hot plug again.
		The keys of the operating panel are damaged.	Replace the operating panel or seek for technical support.
The function code can not be modified.	Can not be modified during running.	The function code itself cannot be modified during running.	Modify the function code at stop.
	Some function codes can not be modified.	The function code P00.03 is set to 1 or 2.	Set P00.03 to 0
		The function code is the actual detected value.	The actual parameters can not be modified by users.
	No response when pressing the "⏎" key	Panel lock activated or other reasons	Refer to the solutions of "The operating panel has no response".
	Cannot enter the editing state when pressing the "⏎" key, and the function code displays 0000	A user password is set.	Enter the correct user password.
			Seek for technical support.
The drive stops	No stop command is	Fault alarm occurs.	Locate the fault causes

Symptom	Condition	Possible cause	Solution
unexpectedly during operation.	received, but the drive stops automatically and the drive run indicator is off.		and reset the fault.
		Power supply interruption	Check the power supply.
		Operation command channel switchover	Check the function codes related to the operation command channels.
		Too large speed deviation	Modify the speed deviation detection value.
		The positive/negative logic of the control terminals changes.	Check if the P09.12 settings meet the requirements.
	No stop command is received, but the motor stops automatically and the drive run indicator is on (running at zero frequency).	Automatic fault reset	Check the fault auto reset setting and find out the cause.
		External interruption	Check the external interruption setting and find out the cause.
		The frequency reference is 0.	Check the frequency reference.
		The startup frequency is higher than the frequency reference.	Check the startup frequency.
		Jump frequency is set improperly.	Check the Jump frequency setting.
		"Forward running inhibition" terminal is enabled during forward running.	Check the terminal function setting.
		"Reverse running inhibition" terminal is enabled during reverse running.	Check the terminal function setting.
		Frequency is set to 0.	Check P02.11 and P02.12 settings.
		Transient low-voltage compensation is applied for restart after power failure and the power supply voltage is too low.	Check the restart after power failure function setting and the input voltage.
The drive does not work.	The drive does not work when you press the run key and the run indicator is off.	The coast-to-stop function terminal is enabled.	Check the coast-to-stop terminal.
		The drive running inhibition terminal is enabled.	Check the drive running inhibition terminal.
		The external stop function terminal	Check the external stop

Symptom	Condition	Possible cause	Solution
		is enabled.	function terminal.
		External stop function terminal is active.	Check the external stop function terminal.
		Poor terminal contact	Check the terminal wiring.
		Fault alarm occurs.	Troubleshoot
		The virtual terminal function of the host device is set improperly.	Cancel the virtual terminal function of the host device or set the function properly, or modify the P09.16 setting.
		The positive/negative logic of the input terminal is set improperly.	Check the P09.12 settings.
When the drive is powered on, it reports Uv immediately.	The thyristor or the contactor is disconnected and the drive load is large.	Since the thyristor or the contactor is not closed, when the drive runs with large load, the DC bus voltage of the main circuit will drop, and the drive will display Uv.	Run the drive after the thyristor or the contactor is fully closed, or seek for technical support.

9.3 Fault source analysis

As shown in Fig. 9-1, the hydraulic servo system mainly consists of key components such as a permanent magnet synchronous motor, motor rotor position/speed sensor (resolver), servo drive, oil pump coaxially connected to the servo motor, and pressure sensors for detecting the hydraulic system.

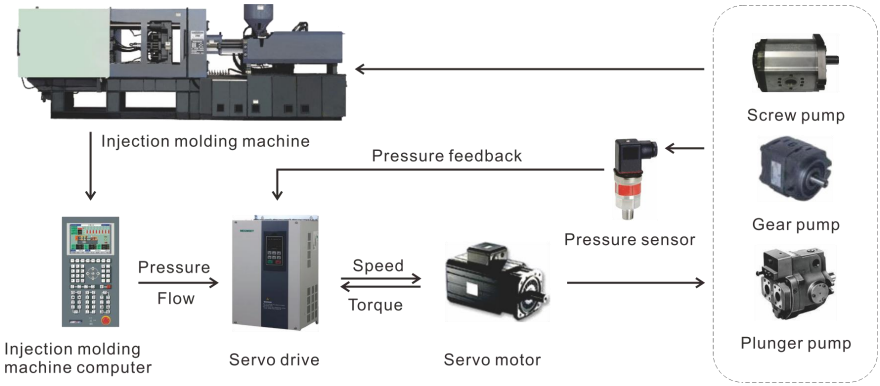


Fig. 9-1 Hydraulic servo system of injection molding machine

In most cases, all components (including connecting cables) appearing in the above diagram could be potential fault sources. Familiarity with fault distribution facilitates systematic and comprehensive fault analysis, enabling rapid and accurate identification of fault sources. Below is the system fault distribution diagram:

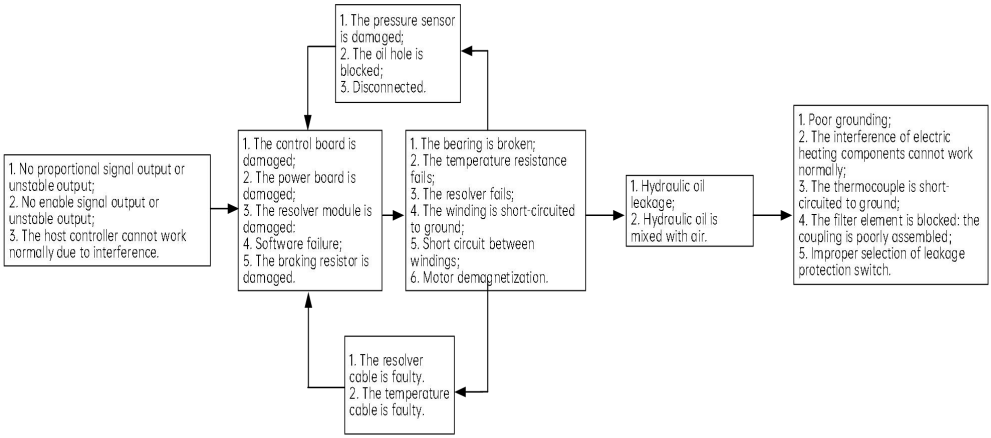
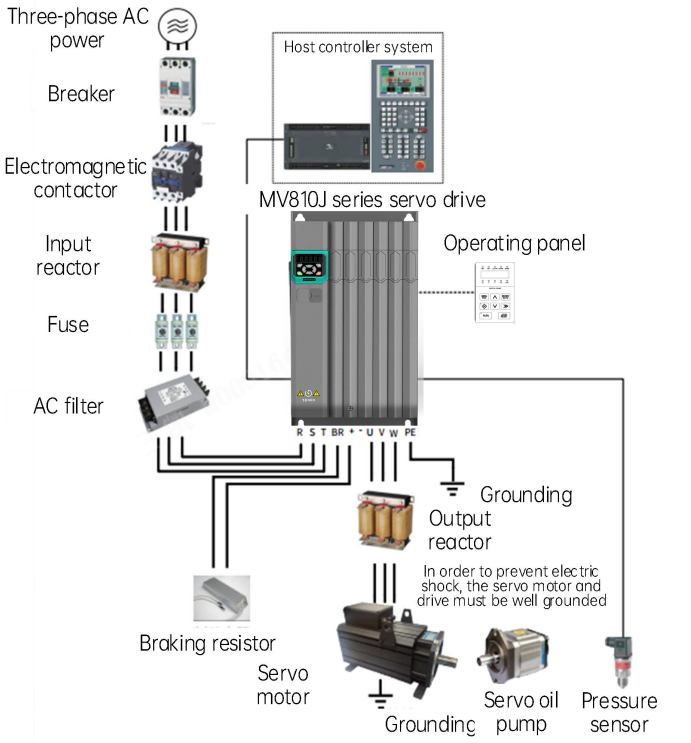


Fig. 9-2 Fault analysis of hydraulic servo system

Appendix A Optional Components

A.1 Peripheral components



Appendix Fig. A-1 Peripheral electrical components diagram

Appendix Table A-1 Use instructions for MV810J peripheral components

Accessory name	Installation position	Description
Breaker	Between power supply and drive input side	Short-circuit breaker: Cut off the power supply when the downstream equipment is overcurrent to prevent accidents.
		Leakage protection circuit breaker: The drive may generate high-frequency leakage current when working. In order to prevent electric shock accidents and induced electric fires, please choose and install a suitable leakage protection circuit breaker according to the site conditions.
(Electromagnetic) Contactor	Between air and drive input side	During the power-on and power-off operation of the drive, frequent power-on and power-off operations (interval time not less than 1 hour) or direct start-up operations through the contactor should be avoided .
Input reactor	Drive input side	Improves the power factor of the input side; Effectively eliminates high-order harmonics on the input side, to prevent other equipment damage due to voltage waveform distortion; and eliminates input current imbalance caused by power supply phase imbalance.
Fuse	Between power supply and drive input side	Prevents accidents due to short circuits, and protects subsequent semiconductor devices.
AC filter	Drive input side	Reduces the external conduction and radiation interference of the drive; reduces the conduction interference from the power supply end to the drive, and improves the anti-interference ability of the drive.
Braking resistor	All models	The motor consumes regenerative energy through the braking resistor during deceleration.
Output reactor (du/dt filter)	Between the drive output side and the current, mounted close to the drive	The output side of the drive generally contains more high-order harmonics. When the distance between the motor and the drive is long, there is a large distributed capacitance in the line. One of the harmonics may resonate in the loop, which has two effects: a) Destroys the insulation performance of the motor, which will damage the motor for a long time. b) Large leakage current is generated, causing frequent protection of the drive. Generally, if the distance between the drive and the motor is more than 100 m, it is recommended to install the output reactor.
Output magnetic ring	Mounted close to the drive at the output side of the drive	The output magnetic ring of the AC reactor is mainly used to reduce the shaft current.

Accessory name	Installation position	Description
Host computer system	Part of the control signal is connected to the drive	The host computer system mainly controls the action of the whole machine, sends various instructions to the drive, and exchanges information with the drive.
Servo motor	Drive output side	Please select the suitable motor according to the recommendation.
Servo oil pump	Connected to the servo motor	Provides flow and pressure to hydraulic systems.
Pressure sensor	Installed on the oil circuit of the oil port, with feedback signals connected to the drive	Provides pressure feedback analog signals of the hydraulic circuit .

A.2 AC input reactor selection

The AC input reactor is primarily used to reduce harmonics in the input current. As an optional external component, it can be installed when the environment requires higher harmonic suppression standards. The recommended manufacturers and models for the input reactor are listed in the table below:

Appendix Table A-2 Recommended models of AC input reactor

Drive model	Reactor model	Rated power (kW)	Rated inductance (mH)
MV810J1-4T15*	MACL-15kW-R	15	0.35
MV810J1-4T18.5*	MACL-18.5kW-R	18.5	0.28
MV810J1-4T22*	MACL-22kW-R	22	0.233
MV810J1-4T30*	MACL-30kW-R	30	0.184
MV810J1-4T37*	MACL-37kW-R	37	0.155
MV810J1-4T45*	MACL-45kW-R	45	0.116
MV810J1-4T55*	MACL-55kW-R	55	0.0935
MV810J1-4T75*	MACL-75kW-R	75	0.074
MV810J1-4T90	MACL-90kW-R	90	0.066
MV810J1-4T110	MACL-110kW-R	110	0.056
MV810J1-4T132	MACL-132kW-R	132	0.0483
MV810J1-4T160	MACL-160kW-R	160	0.0424

A.3 Braking resistor configuration

Appendix Table A-3 Braking resistor configuration

Power (kW)	Braking unit	Recommended braking resistor power (kW)	Recommended braking resistance (Ω)	Minimum braking resistance (Ω)
15	Built-in	3.0	38	22
18.5		4.0	33	24
22		4.5	27	24
30		6.0	20	19.2
37		7.0	16	14.8
45		9.0	13	12.8
55		11.0	10.5	9.6
75		15.0	7.7	6.8
90		18.0	5.1	5.1
110		22.0	4	3.4
132	MDBU-4-132	26.0	3.4	3.4
160	MDBU-4-200	32.0	1.4	1.3

Note:

Functions related to the built-in braking unit:

(1) Braking action voltage and braking ratio can be adjusted by function codes;

(2) Braking resistor short circuit protection;

(3) Heat sink overheat protection;

(4) Braking IGBT module abnormal alarm indication.

WARNING

The connecting cable between the braking resistor and drive should be within 5 meters. If it is longer than 5 m, twisted pair cable shall be adopted. The maximum cable length is 10 m.

Appendix B Use of Megdrive Studio for MV810J

B.1 Megdrive Studio software installation and startup

B.1.1 Hardware requirements

A PC or laptop and a micro-USB cable are required. Connect the micro-USB to the J7 port on the servo drive.

Appendix Fig. B-1　Micro-USB

B.1.2 Install Megdrive Studio software

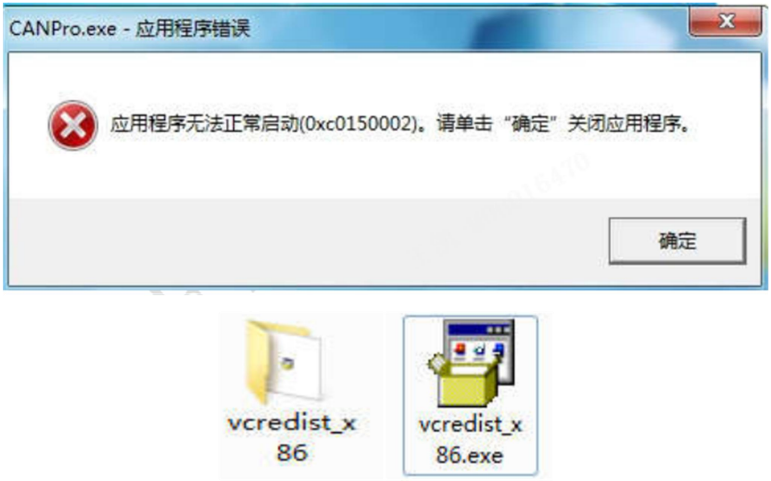
Open the "MDS.smart" host computer installation folder,as shown below:

Appendix Fig. B-2　Install software execution files

The installation steps are as follows:

1. Double-click "setup.exe" to install. During installation, if the computer does not have "Microsoft.NET Framework X" installed, the system will prompt you to download and install it. You must allow this installation to proceed for successful setup.

2. After installation is completed, a shortcut will be created on the desktop. Since some dynamic link libraries in the software depend on the VC2008 library, if this library is not installed on the computer, double-clicking the shortcut will trigger the error message: "The application failed to start (0x0150002)". Download and install the VC2008 library (x86 version), then double-click the shortcut to launch the program.



Appendix Fig. B-3　Installation of software operating environment

3. When the above steps are completed, the software can be used normally.

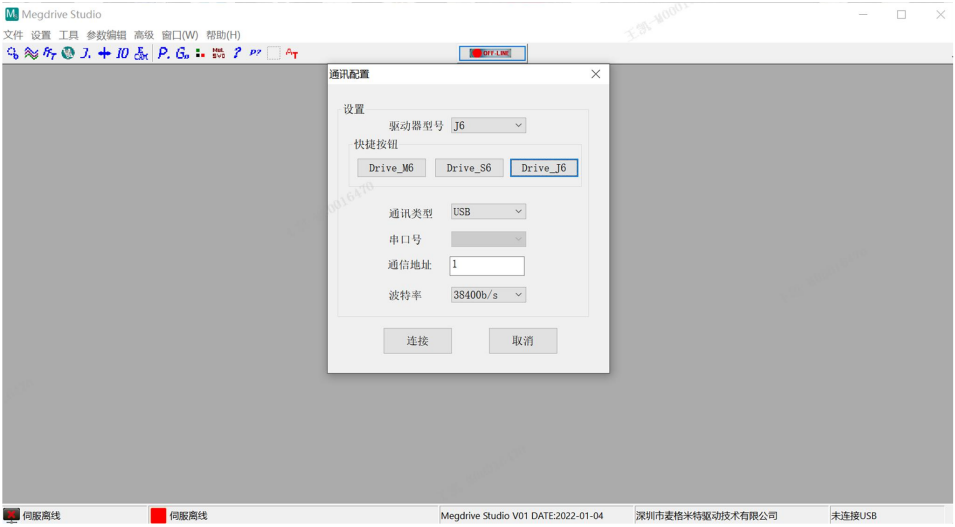
B.1.3 Install driver software

Connect the USB-CAN adapter, find the driver file corresponding to the PC or laptop from the driver folder and install it.

Appendix Fig. B-4　Install the usb-driver file

B.2 Servo parameter setting and software interface setting

After completing the servo drive configuration, open the software Megdrive Studio to enter the interface shown in the following figure. First connect the USB cable to the drive's USB port, then set the drive model, and then select the USB serial port number connected to the drive. The communication address and baud rate can be kept default.



Appendix Fig. B-5　Communication parameter setting

B.3 Function description of Megdrive Studio

B.3.1 Megdrive Studio interface introduction

Megdrive Studio interface consists of menu bar, toolbar and status bar. Various functions in the menu bar and toolbar can be selected, such as: connection settings, oscilloscope, parameter management, and instructions for use.

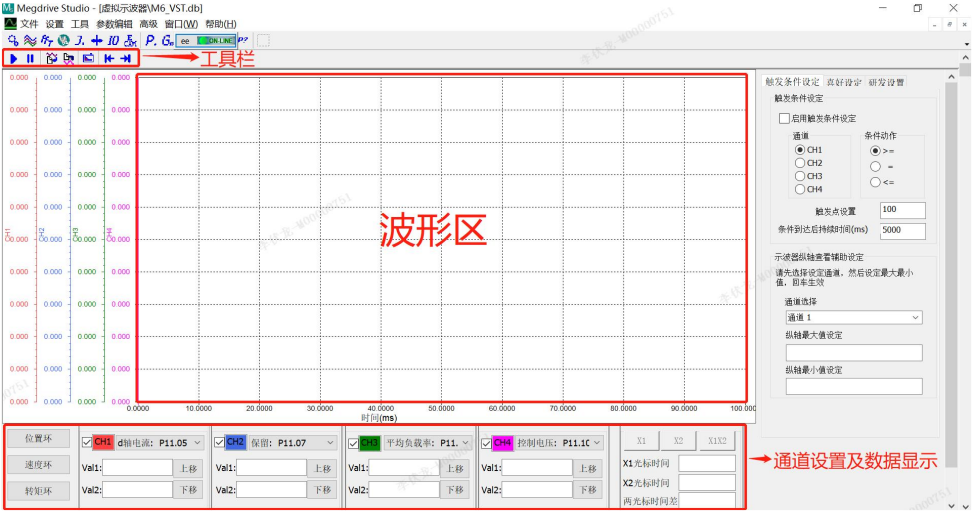
Appendix Fig. B-6　Megdrive Studio interface introduction

Note:

For more understanding, click help ? in the software.

B.3.2 Oscilloscope function introduction

The oscilloscope toolbar is composed of oscilloscope running, oscilloscope pause, saving oscilloscope data, opening oscilloscope data, setting oscilloscope channel, saving waveform picture, moving waveform right and left. Waveform area: displays the real-time waveform of the selected parameter.



Appendix Fig. B-7 Oscilloscope function introduction 1

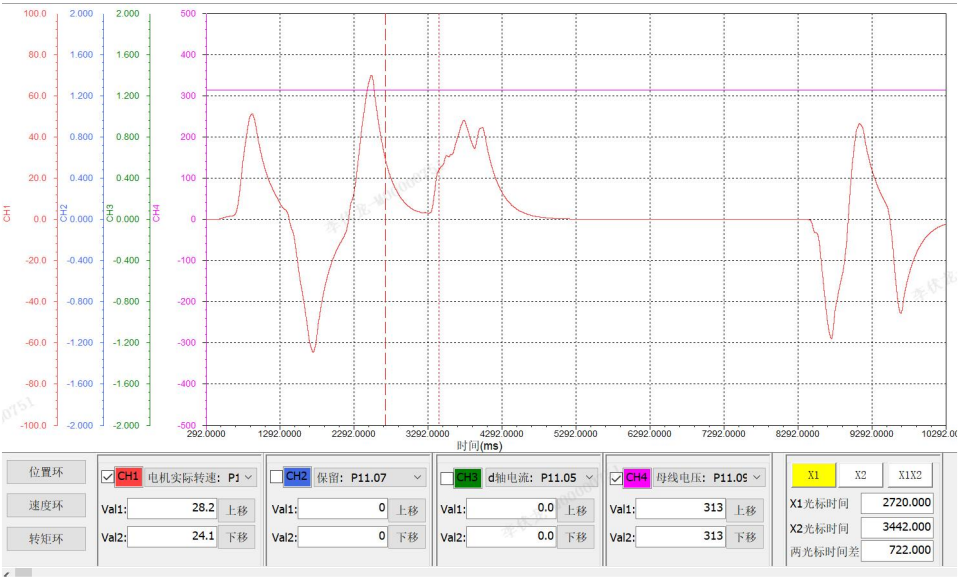
Channel setting and data display (display channel 1 and channel 4 waveform):

Appendix Fig. B-8 Oscilloscope function introduction 2

Check the channel to display the waveform, and uncheck it to not display; for each channel, the waveform can be moved up or down independently;

Cursor: Cursors X1 and X2 can be selected individually or at the same time.

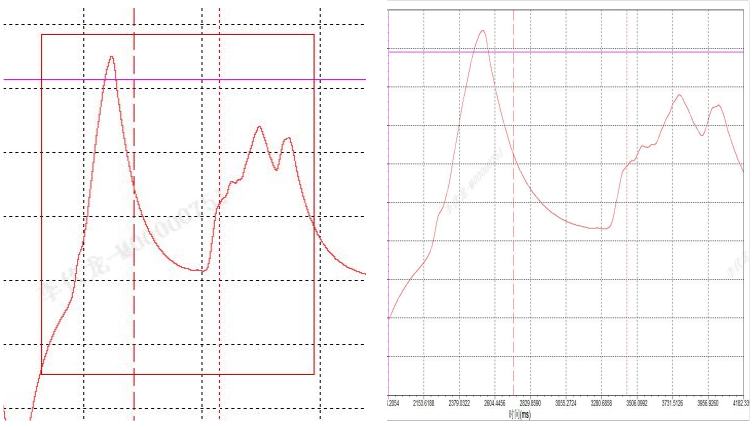
After the cursor is selected, press "CTRL" + "left mouse button" to move the cursor quickly, and the currently selected cursor can be fine-tuned by pressing the left and right arrows (←, →). The cursor displays the current timeline time and the current value at each channel's cursor position.



Appendix Fig. B-9　Oscilloscope function introduction 3

Waveform zoom in: Press and hold the left button, draw a zoom-in rectangle from the upper left to the lower right, and release to complete the zoom in the rectangular area.

Waveform zoom out: Double-click any area to zoom out.



(a) Original graphics　　(b) Zoom in the graphics

Appendix Fig. B-10　Oscilloscope function introduction 4

B.3.3 Parameter editing function introduction

The parameter editing toolbar consists of opening the CSV parameter file, saving the file to CSV, downloading servo parameters and reading from servo parameters. It is recommended that professionals familiar with MV810J use this function which facilitates multi-platform commissioning.

When a model completes commissioning, connect the servo drive to the software, upload the data from the servo drive to the software, and save it as a CSV file. Then, connect other machine models in the same way and import the previously saved CSV file into their platforms. By repeating this process, rapid multi-platform commissioning can be efficiently achieved.

Function: parameter reading and writing, parameter saving and importing

Open the parameter editor interface:

① Click "Parameter Edit" in the menu bar, and then select the "Parameter Editor" option;

② Click the toolbar icon "P. Parameter Editor" to open it. The parameter editor interface is as follows.

Appendix Fig. B-11 Parameter editing function introduction

Directory tree: displays the parameter groups supported by the current servo;

Operating tools: tools for reading and writing parameters;

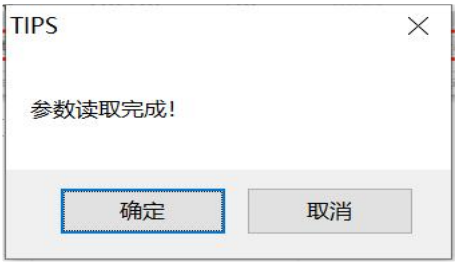
Upload and download parameters:

① Select the parameter group of the directory tree, and select the operation tool as required (take reading the parameters of this group as an example);

② After clicking the selected tool, there will be a progress bar prompt, as shown below (if the number of selected parameters is small, it may not appear);

0	P06.07	1000	0-65535	1000	运行更改
1	P06.08	1000	0-65535	1000	运行更改
2	P06.09				运行更改
3	P06.10				运行更改
4	P06.11	6000.0	0.0-6000.0	6000.0	运行更改
5	P06.12	0	0-3	0	停机更改

③ After parameter reading is completed, the following prompt will appear;



④ Click any group of parameters in the directory tree to refresh the interface (the current value of the parameter is different from the default value, the parameter row will be displayed in gray).

序号	功能码地址	参数	范围	默认值	更改属性	说明
143	P06.00	0	0-5	0	停机更改	主给定源选择
144	P06.01	200.0	-6000.0-6000.0	0.0	运行更改	主给定速度设定
145	P06.02	0	0-4	0	停机更改	辅助速度源选择
146	P06.03	0.0	-6000.0-6000.0	0.0	运行更改	辅助给定速度设定
147	P06.04	0	0-4	0	停机更改	主辅给定运算
148	P06.05	100.0	0.0-6000.0	100.0	运行更改	点动速度
149	P06.06	100.0	0.0-6000.0	100.0	只读	点动运行
150	P06.07	800	0-65535	1000	运行更改	速度指令加速时间1
151	P06.08	900	0-65535	1000	运行更改	速度指令减速时间1
152	P06.09	6000.0	0.0-6000.0	6000.0	运行更改	最大转速阈值
153	P06.10	6000.0	0.0-6000.0	6000.0	运行更改	正向转速阈值
154	P06.11	6000.0	0.0-6000.0	6000.0	运行更改	反向转速阈值
155	P06.12	0	0-3	0	停机更改	电动转矩限制通道
156	P06.13	0	0-3	0	停机更改	制动转矩限制通道

Parameter modification:

① Open the directory tree, select the parameter group, and double-click the parameter to be modified, then the parameter modification interface will pop up (drop-down box or value modification);

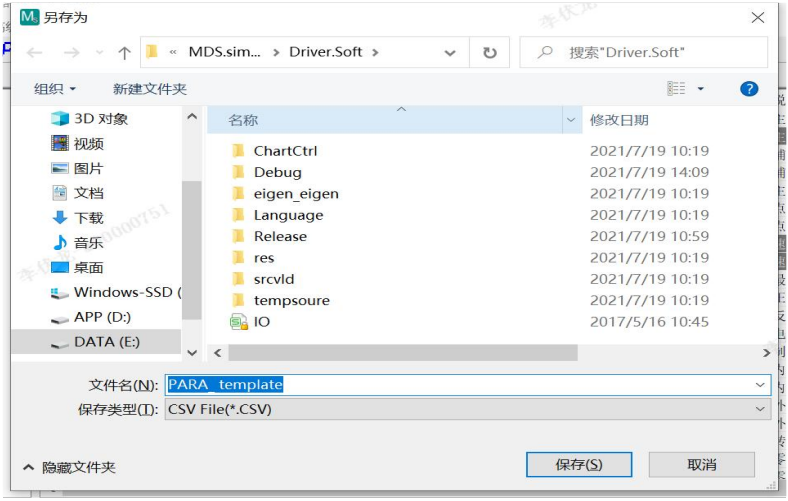
② Modify the parameters as needed, and click "Download".

Parameters save (saved as "csv" file):

① Click the "Save" button;

② In the pop-up save interface, select the file save path and name the file name;

③ Click "Save" to complete the parameter saving.

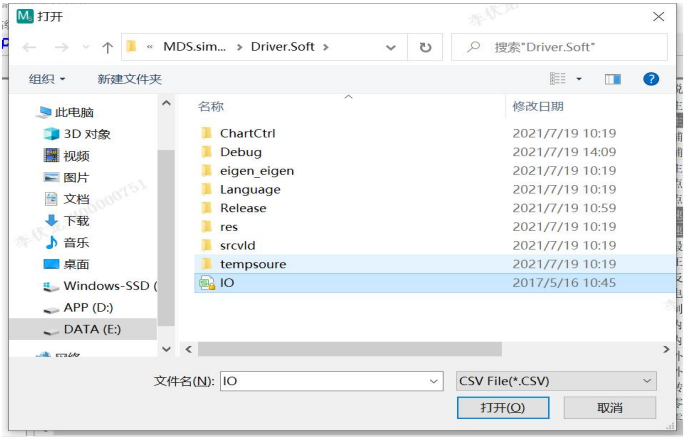


Parameters open (open the “csv” file):

① Click the “Open” button;

② Find the required file in the pop-up open interface and click to open;

③ Click the directory tree to refresh the interface and wait for the subsequent operations.



Note:

When downloading data, make sure that the debugged data is correct and safe. If there is any wrong operation, the consequences will be at your own risk.

Appendix C Modbus Communication Protocol

C.1 Networking mode

There are two networking modes: single master / multiple slave mode, and single master / single slave mode.

C.2 Interface

RS485 interface: asynchronous and half-duplex. Default: 1-8-N-1, 9600 bps, RTU. For the parameter settings, refer to Group P15.

C.3 Communication mode

(1) The communication protocol of the drive is Modbus protocol, which supports common register reading and writing as well as some commands for function code management.

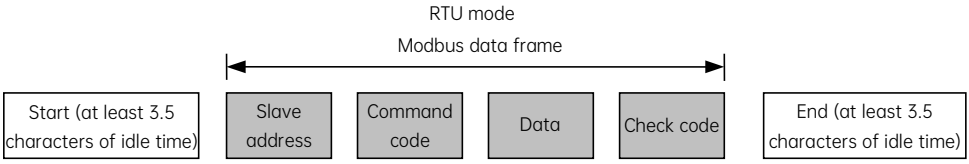
(2) The drive is the slave station, adopting master/slave point-to-point communication. When the master sends the command via a broadcast address, the slave will not response.

(3) In multiple units communication or long-distance communication, parallel connecting the resistance of 100 to 120 ohm with the positive end and negative end of the communication signal line of the master station can enhance the immunity to interference.

(4) MV810J provides the RS485 interface only. If the communication interface of external device is RS232, an RS232/485 conversion device is required.

C.4 Protocol format

Modbus protocol supports RTU. The corresponding format is shown in the following figure.



Appendix Fig. C-1 Modbus protocol format

Modbus adopts the "Big Endian" encoding mode, which sends the high bytes first and then sends the low bytes.

In the RTU mode, the larger value between the function code value and the Modbus internal conventional value shall be selected as the idle time between frames. The minimum idle time value between frames under the Modbus internal convention is as follows: the idle time that the frame header and frame tail pass the bus shall not be less than 3.5 characters to define the frame. The data check adopts CRC-16 for the whole information, and high and low bytes of the

checksum can only be sent after exchange. For the specific CRC check, refer to the CRC example after the protocol description. Note that at least 3.5 characters of the bus idle time shall be kept between frames and there is no need to accumulate the start and end idle time for such bus idle time.

In the example below, the RTU mode is used to read the parameters of the internal register 0101 (P01.01) of No.5 slave.

Request frame:

Slave address	Command code	Data				Check code	
		Register address		Number of bytes read			
0x05	0x03	0x01	0x01	0x00	0x01	0xD5	0xB2

Response frame:

Slave address	Command code	Data			Check code	
		Number of bytes responded	Register content			
0x05	0x03	0x02	0x13	0x88	0x44	0xD2

In the above table, the check code is the CRC check value. For the CRC check computing method, refer to the following text.

The drive can be set with different response delays via the function codes to meet the specific application demands of various master stations. For the RTU mode, the actual time of response delay shall not be less than the interval of 3.5 characters.

C.5 Protocol function

The main function of Modbus is reading/writing parameters. Different command codes control different operation requests. The Modbus protocol supports the operations as shown in the following table:

Command code	Meaning
0x03	Used to read the drive parameters, including function code parameters, control parameters and status parameters.
0x06	Used to change the single 16-bit function code parameter or control parameter of the drive, and parameter value will be saved after power off.
0x07	Used to change the single 16-bit function code parameter or control parameter of the drive, and the parameter value will not be saved after power off.
0x10	Used to change multiple function code parameters or control parameters of the drive, and the parameter values will be saved after power off.

All the function code parameters, control parameters and status parameters of the drive are mapped as the read/write registers of Modbus. The read/write features and ranges of function code parameters are specified in the user manual. The group number of the drive function code is mapped as the high byte of the register address, and the group internal index (the serial number of the parameter in the group) is mapped as the low byte of the register address. The control parameters and status parameters are designed to be virtual function code groups of the drive. The correspondence

between the group numbers of the function codes and the high bytes of the mapped register address are as shown in the following table:

Drive parameter group	High byte of the address mapped	Drive parameter group	High byte of the address mapped
P00	0x00	P18	0x12
P01	0x01	P20	0x14
P02	0x02	P21	0x15
P03	0x03	P22	0x16
P04	0x04	P23	0x17
P05	0x05	P24	0x18
P06	0x06	P26	0x1A
P07	0x07	P31	0x1F
P08	0x08	P32	0x20
P09	0x09	P88	0x58
P10	0x0A	P97	0x61
P11	0x0B	P98	0x62
P12	0x0C	Control parameter group	0x64
P13	0x0D	Status parameter group	0x65
P14	0x0E	.....	.....
P15	0x0F		
P16	0x10		
P17	0x11		

For example, the register address of the function code parameter P03.02 is 0x0302, and the register address of the first control parameter (control word 1) is 0x6400.

As the format of the whole data frame has been explained in the above text, the following text will describe the format and meanings of the "command code" and "data" of Modbus protocol. These two parts constitute the Modbus application layer data unit. The following description to the frame format is based on the RTU mode.

(1) Read the drive parameters and status parameters

The application-layer protocol data unit is shown as below.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x03
Start register address	2	0x0000 to 0xFFFF
Number of registers	2	0x0001 to 0x000A

If the operation is successful, the response format is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x03
Number of bytes read	1	2 x Number of registers

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Content read	2 x Number of registers	Parameter value

If the operation fails, the abnormal response frame will return. The abnormal response frame includes the error code and exception code in which the error code = (command code + 0x80), and the exception code indicates the error cause.

Abnormal response frame format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Error code	1	(command code +0x80)
Exception code	1	

The exception codes and meanings are as follows:

Exception code	Meaning
0x01	Incorrect password
0x02	Invalid command code
0x03	CRC check error
0x04	Invalid address
0x05	Invalid parameter
0x06	Invalid parameter change
0x07	System lock
0x08	Parameter is being saved

(2) Change the single 16-bit function code parameter and control parameter of the drive, and the parameter values will be saved after power off.

When this command is used, the changed parameter value will be saved upon power on after power off.

The application-layer protocol data unit is as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x06
Register address	2	0x0000 to 0xFFFF
Register content	2	0x0000 to 0xFFFF

If the operation is successful, the response format is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x06
Register address	2	0x0000 to 0xFFFF
Register content	2	0x0000 to 0xFFFF

If the operation fails, the abnormal response frame will return, and the format is described as above.

(3) Change the single 16-bit function code parameter and control parameter of the drive, and the parameter values will not be saved after power off.

When this command is used, the changed parameter value will not be saved upon power on after power off.

The application-layer protocol data unit is as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x07
Register address	2	0x0000 to 0xFFFF
Register content	2	0x0000 to 0xFFFF

If the operation is successful, the response format is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x07
Register address	2	0x0000 to 0xFFFF
Register content	2	0x0000 to 0xFFFF

If the operation fails, the abnormal response frame will return, and the format is described as above.

(4) Change multiple function code parameters and control parameters of the drive, and the parameter values will be saved after power off.

The application-layer protocol data unit is as follows:

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x10
Start register address	2	0x0000 to 0xFFFF
Number of registers in operation	2	0x0001 to 0x000A
Number of bytes of register content	1	2 × Number of registers in operation
Register content	2 × Number of registers in operation	

If the operation is successful, the response format is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x10
Start register address	2	0x0000 to 0xFFFF
Number of registers in operation	2	0x0001 to 0x000A
Number of bytes of register content	1	2 × Number of registers in operation
Register content	2 × Number of registers in operation	

This command is used to change the content of the continuous data units from the start register address. If the operation fails, the abnormal response frame will return and its format is described as above.

C.6 Control parameters and status parameters of drive

The control parameters of the drive can realize the start, stop, running frequency setting and other functions. The status parameters allow the inquiring of drive parameters like the running frequency, output current and output torque.

(1) Control parameters

The control parameters of the drive are as shown in the following table:

Register address	Parameter name	Remarks
0x6400	Control word 1	Refer to its bit definition table
0x6401	Main frequency reference	Main frequency reference, ranging from 0.00 Hz to P02.10
0x6402	Main frequency reference percentage	0.0 to 100% of maximum frequency
0x6403	Digital process closed loop (PID) reference	Valid when the process closed-loop function is enabled, -1000 to 1000 corresponding to -100% to 100%
0x6404	PID feedback	Valid when the process closed-loop function is enabled, -1000 to 1000 corresponding to -100% to 100%
0x6405	AO1 setting	Valid when P10.13=14, 0 to 1000 corresponding to 0.0 to 100.0%
0x6406	Pressure reference	0 to P26.03
0x6407	DO terminal state setting	0 to 0xFF Bit0 to bit3 corresponding to DO1, DO2 Valid when P10.00 to P10.03=19
0x6408	Flow reference	0 to 99.99%
0x6409	Virtual terminal control setting	0 to 0xFF Bit0 to bit4 corresponding to virtual terminals DI1 to DI5 Valid when the corresponding bit of P09.16 is set
0x640C	Auxiliary frequency reference	Range: 0.00 Hz to P02.10
0x640D	Torque reference	-3000 to 3000, corresponding to -300.0% to 300.0% In the torque control mode, it is valid when the torque reference channel is the serial port in the torque control mode
0x640E	FWD frequency limit under torque control	Range: 0.00 Hz to P02.11
0x640F	REV frequency limit under torque control	Range: 0.00 Hz to P02.11
0x6410	Drive torque limit under speed control	0 to 3000 corresponding to 0.0 to 300.0%
0x6411	Braking torque limit under speed control	0 to 3000 corresponding to 0.0 to 300.0%
0x6412	Voltage reference for V/F	0 to 1000 V

Register address	Parameter name	Remarks
	separation	
0x6413	Reserved	
0x6414	Control word 2	Refer to its bit definition table

The bit definition of the control word 1 is as shown in the following table:

Bit	Value	Function	Remarks
BIT2 to BIT0	111B	Stop for external fault	Coast to stop and the drive displays external fault
	110B	Stop in mode 1	Coast to stop
	101B	Stop in mode 0	Stop according to the deceleration time set (valid when the jog is disabled)
	100B	Running command	Start the drive (valid when the jog is disabled)
	Others	No command	
BIT3	1	Run reversely	Set the running direction when the running command is valid
	0	Run forward	
BIT4	0	Enable acceleration/deceleration	BIT0 to BIT3, BIT7 to BIT8 of control word 1 are valid only when acceleration/deceleration is allowed
	1	Disable acceleration/deceleration	
BIT5	0	Reserved	
BIT6	0	Reserved	
BIT7	1	Jog forward	When both jog forward and reverse running are enabled, no action will be performed; when both are disabled, the jog will stop.
	0	Jog forward disabled	
BIT8	1	Jog reversely	
	0	Jog reversely disabled	
BIT9	1	Fault reset enabled (valid for all command channels)	The selected bit for the validity of the fault reset of the host device
	0	Fault reset disabled	
BIT15 to BIT10	0	Reserved	

① The control command (control words 1 and 2) of the host device is valid only when "operation command channel selection" is set to "communication control".

② The host device processes the faults and alarms as follows: when the drive fault occurs, for control words 1 and 2, only the fault reset command is valid, and any other commands from the host device are invalid. That is, the host shall reset the fault first before sending other commands.

The bit definition of the control word 2 is shown in the following table.

Bit	Value	Function	Remarks
BIT0	0	Reserved	Reserved
BIT1	1	Drive running inhibited	Bit for enabling/disabling drive running
	0	Drive running allowed	
BIT15 to BIT2	0	Reserved	

(2) Status parameters

Register address	Parameter name	Remarks
0x6500	Status word 1 of drive	Refer to the status word 1 definition table
0x6501	Actual running value of current main reference	Range: 0.00 Hz to P02.11, current running frequency
0x6502	Drive model	Refer to manufacturer's parameters.
0x6503	Drive serial No.	Product series, such as 810
0x6504	Function software version No.	Software version No. of the function board
0x6505	Pressure reference	0 to P26.03
0x6506	Output current	0.0 to 6553.5 A
0x6507	Output voltage	0 to 65535 V
0x6508	Output power	0.0 to 6553.5 kW
0x6509	Rotation speed in running	0 to 65535 rpm
0x650 A	Line speed in running	0 to 65535 m/s
0x650B	Pressure feedback	0 to 250 bar
0x650C	Bus voltage	0.0 to 6553.5 V
0x650D	Reserved	
0x650E	DI terminal state 1	0 to 0x1111 Corresponding to DI1 to DI4
0x650F	DI terminal state 2	0 to 0x0001 Corresponding to DI5
0x6510	Output terminal state	0 to 0x0011 Corresponding to DO1, DO2
0x6511	Reserved	
0x6512	Current fault type	0 to 55
0x6513	Latest fault type	0 to 55
0x6514	Second latest fault type	0 to 55
0x6515	Running frequency reference	Range: 0.00 Hz to P02.11
0x6516	Flow reference	0 to 99.99%

Register address	Parameter name	Remarks
0x6517	PID reference	-100.0% to 100.0%
0x6518	PID feedback	-100.0% to 100.0%
0x6519	AI1	0.00 to 10.00 V
0x651 A	AI2	-10.00 to 10.00 V
0x651B	AI3	0.00 to 10.00 V
0x651C	Acceleration time setting 1	0.0 to 6000.0 s
0x651D	Deceleration time setting 1	0.0 to 6000.0 s
0x651E	Operation command channel	Operation command channel (same as P02.02)
0x651F	Status word 2 of drive	Refer to the status word 2 definition table
0x6520	Main frequency source selection	Refer to P02.05
0x6521	Reserved	
0x6522	Motor and mode selection	0 to 0xFFF Ones: Control mode 0: SVC1 1: FVC 2: V/F Tens: Motor number 0: Motor 1 1: Motor 2 Hundreds: Motor type 0: Asynchronous motor 1: Synchronous motor
0x6523	Bus voltage upon the current fault	0.0 to 6553.5 V
0x6524	Actual current upon the current fault	0.0 to 6553.5 A
0x6525	Running frequency upon the current fault	Range: 0.00 Hz to P02.11
0x6526	AC drive status upon the current fault	Refer to P01.17
0x6527	Reserved	
0x6528	Status word 3 of drive	Refer to the status word 3 definition table

① The status parameters can not be written.

② In the status parameters, the maximum length of "actual running value of current main reference", "current running frequency", "running frequency reference" and "running frequency at the 3rd fault" is 32 bits, and others' length is 16 bits.

The bit definition of the status word 1 of the drive is shown in the following table.

Bit	Value	Function	Remarks
BIT0	1	Serial port control enabled	
	0	Serial port control disabled	
BIT1	1	Drive running	
	0	Drive stop	
BIT2	1	Drive REV running	
	0	Drive FWD running	
BIT3	1	Serial port reference enabled	
	0	Serial port reference disabled	
BIT4	1	Output frequency reaches the main reference	
	0	Output frequency does not reach the main frequency	
BIT5	1	Fault	1 means there is a fault. At the time, you can refer to the bit15 to bit8 to check the current fault type.
	0	No fault	
BIT6	0	Reserved	
BIT7	0	Reserved	
BIT15 to BIT8	0x00 to 0xFF	Fault or alarm codes	0: No fault 1 to 49: Fault exists Refer to P97.32 for the fault type

The bit definition of the status word 2 of the drive is shown in the following table.

Bit	Value	Function	Remarks
BIT0		Reserved	
BIT1	1	Jog running	
	0	Non jog running	
BIT2	1	Simple PLC running	
	0	Non simple PLC running	
BIT3		Reserved	
BIT4	1	Process closed-loop running (PID)	
	0	Non process closed-loop running (PID)	
BIT15 to BIT5		Reserved	

The bit definition of the status word 3 of the drive is shown in the following table.

Bit	Value	Function	Remarks
BIT2 to BIT0		Reserved	

Bit	Value	Function	Remarks
BIT3		Accelerating	
BIT4		Decelerating	
BIT5		Running at constant speed	
BIT6		Pre-exciting	
BIT7		Parameter auto-tuning	
BIT8		Overcurrent limited	
BIT9		DC overvoltage limited	
BIT10		Torque limited	
BIT11		Speed reached (speed mode)/ Speed limited (torque mode)	
BIT12		Drive fault	
BIT13		Speed control	
BIT14		Torque control	
BIT15		Reserved	

C.7 Cautions

1. To read multiple parameters, if any one of the function codes is not read successfully (due to invalid parameter address, parameter being password, etc.), only the error information will return, and no read parameters will return.

2. To write multiple control parameters or function code parameters (0×10), if any one of the parameters is not written successfully (due to invalid parameter address, exceeding parameter range, etc.), the error information will return. Parameters before this parameter will be correctly written and become valid, but subsequent parameters will not be written.

3. The host device's operations on the user password

(1) Protection on reading/writing of function code parameters via the user password and management of function codes (except "reading the address of displayed data" and "displayed data switchover").

(2) If a user password is set (P00.01), the host device can access the function code parameters only after "decryption" (write the correct password to P00.01), and the control parameters and status parameters are not restricted by the user password.

(3) The host device can set a password, but can not cancel the password as the operating keypad. The writing operation of P00.01 is valid only in two cases: one is decryption to the set password and the other is to set a new password when no password is set. In other cases, only password error information will return.

(4) The operations of the host device and the operating keypad are independent. Even if you have done decryption through the operating keypad, the decryption through the host device is still required when you use the host device to visit function code parameters, vice versa.

(5) Password related parameters are forbidden to access in communication, and in this case the invalid parameter address error will return.

(6) When the host device gets the access to the function code after decryption, if there is no communication within 30 s, the access right will be invalid, and the user password needs to be entered again for another access.

(7) When the host device has gotten the access (no user password or already being decrypted), if the user password is set or changed through the keypad, the host device still has the current access with no need to decrypt. When the access right becomes invalid, the host device needs to decrypt again (entering the new password) for access.

C.8 CRC check

To improve the speed, CRC-16 generally adopts the table type. The following is the C language source code for realizing CRC-16. Note that the final results have exchanged high and low bytes, that is, the results are the CRC checksum to send.

```
unsigned short CRC16   (unsigned ch Ar *msg, unsigned ch Ar      /* The function returns the CRC   As   A
length)                                                          unsigned short type */
{
      unsigned ch Ar uchCRCHi = 0xFF ;                           /* high byte of CRC initi Alized */
      unsigned ch Ar uchCRCLo = 0xFF ;                           /* low byte of CRC initi Alized */
      unsigned uIndex ;                                          /* index into CRC lookup t Able */
      while   (length--)                                         /* p Ass through mess Age buffer */
      {
            uIndex = uchCRCLo ^ *msg++ ;                         /* c Alcul Ate the CRC */
            uchCRCLo = uchCRCHi ^   (crc V Alue[uIndex] >>8) ;
            uchCRCHi =crc V Alue[uIndex]&0xff;
       }
       return   (uchCRCHi | uchCRCLo<<8)   ;
}
/* T Able of CRC   V Alues */
const unsigned int   crc V Alue[ ] = {
0x0000,0xC1C0,0x81C1,0x4001,0x01C3,0xC003,0x8002,0x41C2,0x01C6,0xC006,0x8007,0x41C7,
0x0005,0xC1C5,0x81C4,0x4004,0x01CC,0xC00C,0x800D,0x41CD,0x000F,0xC1CF,0x81CE,0x400E,
0x000 A,0xC1C A,0x81CB,0x400B,0x01C9,0xC009,0x8008,0x41C8,0x01D8,0xC018,0x8019,0x41D9,
0x001B,0xC1DB,0x81D A,0x401 A,0x001E,0xC1DE,0x81DF,0x401F,0x01DD,0xC01D,0x801C,0x41DC,
0x0014,0xC1D4,0x81D5,0x4015,0x01D7,0xC017,0x8016,0x41D6,0x01D2,0xC012,0x8013,0x41D3,
0x0011,0xC1D1,0x81D0,0x4010,0x01F0,0xC030,0x8031,0x41F1,0x0033,0xC1F3,0x81F2,0x4032,
0x0036,0xC1F6,0x81F7,0x4037,0x01F5,0xC035,0x8034,0x41F4,0x003C,0xC1FC,0x81FD,0x403D,
0x01FF,0xC03F,0x803E,0x41FE,0x01F A,0xC03 A,0x803B,0x41FB,0x0039,0xC1F9,0x81F8,0x4038,
0x0028,0xC1E8,0x81E9,0x4029,0x01EB,0xC02B,0x802 A,0x41E A,0x01EE,0xC02E,0x802F,0x41EF,
0x002D,0xC1ED,0x81EC,0x402C,0x01E4,0xC024,0x8025,0x41E5,0x0027,0xC1E7,0x81E6,0x4026,
0x0022,0xC1E2,0x81E3,0x4023,0x01E1,0xC021,0x8020,0x41E0,0x01 A0,0xC060,0x8061,0x41 A1,
0x0063,0xC1 A3,0x81 A2,0x4062,0x0066,0xC1 A6,0x81 A7,0x4067,0x01 A5,0xC065,0x8064,0x41 A4,
0x006C,0xC1 AC,0x81 AD,0x406D,0x01 AF,0xC06F,0x806E,0x41 AE,0x01 A A,0xC06 A,0x806B,0x41 AB,
0x0069,0xC1 A9,0x81 A8,0x4068,0x0078,0xC1B8,0x81B9,0x4079,0x01BB,0xC07B,0x807 A,0x41B A,
```

0x01BE,0xC07E,0x807F,0x41BF,0x007D,0xC1BD,0x81BC,0x407C,0x01B4,0xC074,0x8075,0x41B5,
0x0077,0xC1B7,0x81B6,0x4076,0x0072,0xC1B2,0x81B3,0x4073,0x01B1,0xC071,0x8070,0x41B0,
0x0050,0xC190,0x8191,0x4051,0x0193,0xC053,0x8052,0x4192,0x0196,0xC056,0x8057,0x4197,
0x0055,0xC195,0x8194,0x4054,0x019C,0xC05C,0x805D,0x419D,0x005F,0xC19F,0x819E,0x405E,
0x005 A,0xC19 A,0x819B,0x405B,0x0199,0xC059,0x8058,0x4198,0x0188,0xC048,0x8049,0x4189,
0x004B,0xC18B,0x818 A,0x404 A,0x004E,0xC18E,0x818F,0x404F,0x018D,0xC04D,0x804C,0x418C,
0x0044,0xC184,0x8185,0x4045,0x0187,0xC047,0x8046,0x4186,0x0182,0xC042,0x8043,0x4183,
0x0041,0xC181,0x8180,0x4040}

If the CRC checksum of each sent byte is computed online, it will take a lot of time, but it can save the program space occupied by the table. The code for computing CRC online is as follows:

```
unsigned int crc_check  (unsigned ch Ar *d At A,unsigned ch Ar length)
{
        int i;
        unsigned crc_result=0xffff;
        while  (length--)
        {
                crc_result^=*d At A++;
                for  (i=0;i<8;i++)
                {
                        if  (crc_result&0x01)
                        {
                        crc_result=  (crc_result>>1)  ^0x A001;
                        }
                        else
                        {
                                crc_result=crc_result>>1;
                        }
                }
        }
        return   (crc_result=  (  (crc_result&0xff)  <<8)  |  (crc_result>>8)  )  ;
}
```

C.9 Scaling of drive

(1) Scaling of frequency 1:100

To run the drive at 50 Hz, the main reference should be 0x1388 (5000).

(2) Scaling of time 1:10

To set the drive's acceleration time to be 30 s, the function code should be set to 0x012C (300).

(3) Scaling of current 1:10

If the drive's feedback current is 0x012C (300), the present current is 30 A.

(4) The output power is its absolute value.

(5) Scaling of pressure 1:10

To set the pressure reference to 50.0 bar, the parameter should be set to 0x01F4 (500)。

(6) Scaling of flow 1:100

To set the flow reference to 5.00%, the parameter should be set to 0x01F4 (500)。

Output frequency = Maximum frequency (P02.10) * Flow rate setting (0.01%)
Example: 6.66 Hz = 133.3 Hz * 5%

(7) For other parameters, refer to the function parameter descriptions.

Appendix D Warranty and Service

Shenzhen Megmeet Electrical Co., Ltd. manufactures motor drive products strictly according to the ISO9001:2008 standard. In case of any product abnormalities, please contact the distributor or the headquarters. Our company will provide full technical support for you.

1. Warranty period

The product is warranted for 18 months from the purchase date, however, the warranty date shall not exceed 24 months after the manufacturing date on the nameplate.

2. Warranty scope

During the warranty period, any product abnormalities incurred due to our company can be freely repaired or replaced by our company. In case of the following situations, maintenance fees will also be charged even if the product is still in the warranty period.

(1) The damages are caused by fire, flood, strong lightning strike, etc.

(2) The damages are caused by users' unauthorized modifications.

(3) The product is damaged due to drop or in transmission after the purchase.

(4) The product is damaged because the standard requirements are not obeyed in actual use.

(5) The product is damaged because the user does not follow the instructions of the user manual.

3. After-sales service

(1) If there are specific requirements for drive installation and trial operation, or the working status of the drive is not satisfactory (such as unsatisfactory performance and function), please contact the distributor or Shenzhen Megmeet Electrical Co., Ltd.

(2) In case of any abnormality, contact the distributor or Shenzhen Megmeet Electrical Co., Ltd. immediately for help.

(3) During the warranty period, our company will repair any drive abnormality incurred due to the product manufacturing and design free of charge.

(4) If the product is out of the warranty period, our company can provide paid repairing service according to the customers' needs.

(5) The service charge is calculated by actual costs. If there is an agreement, the agreement shall prevail.

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