MV810 820G1 (SP2) Series AC Drive for Solar Pumps User Manual

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Foreword

Thank you for choosing Megmeet MV810 820 (SP2) Series AC Drive for Solar Pumps.

As a new-generation high-performance integrated vector control platform, the MV810 820 (SP2) series adopts an advanced drive solution that integrates synchronous motor drive with asynchronous motor drive, as well as the torque control with the speed control, generating industry-leading drive performance that satisfies multiple application requirements from our demanding clients. Meanwhile, MV810 820 (SP2) features sound anti-trip control and strong adaptability to unfavourable working conditions, including bad power mains, high temperature, excessive humidity, and dusty environments, tremendously elevating the reliability and robustness of the product.

Built upon the demonstrated excellence of the control algorithms at the core of Megmeet's successful MV800 drive series, MV810 820 (SP2) delivers dedicated photovoltaic pumping system control functionality that is specially developed upon comprehensive researches on outdoor solar-panel-powered pumping application, providing functions of MPPT, low sunlight intensity hibernation, high sunlight intensity wake-up, high water level hibernation, and underload pre-alarm. Power supply switchover to the mains is available upon requirements from clients to ensure normal pump operation during night time.

MV810 820 (SP2) integrates exceptional electromagnetic compatibility and optimized PWM control in its overall design, leading to minimized electromagnetic interference and reduced noise level that meet the environmental protection requirements of various application scenarios.

This manual mainly consists of the installation, wiring, parameter setting, fault diagnosis, trouble shooting, daily maintenance, and related matters of the product. Please read this manual carefully and thoroughly before installing and using the drive so as to release the drive's full potential. Keep the manual properly and give it to the actual user when necessary.

Unboxing inspection

When unboxing the product, please make sure to check the following:

- whether there is any damage;
- whether the rated values on the nameplate are the same with the requirements of the order.

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.

We are engaged in the continuous improvement of our drive products. The relevant manuals provided by us are subject to changes without notice.

Safety precautions

DANGER	Indicates that failure to comply with the notice can result in death or severe personal injuries.
WARNING	Indicates that failure to comply with the notice may result in moderate or minor personal injuries, or property damages.

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. Do not place combustible objects in close proximity to the product. Failure to comply will result in a fire.
- Do not install the product in places with explosive gases. Failure to comply will result in explosion.
- The wiring work must be carried out by sufficiently qualified personnel. Otherwise, there is a risk of electric shock.
- Before wiring, make sure that the power supply input is completely cut off. Otherwise, there is a risk of electric shock.
- Make sure to reliably ground the drive. Otherwise, there is a risk of electric shock.
- Properly install the covers of the drive enclosure before power on. Otherwise, there is a risk of electric shock or explosion.
- When powering on a drive product that has been idle/stored for more than 2 years, employ a voltage regulator to gradually turn up the input voltage to the required level. Otherwise, there is a risk of electric shock or explosion.
- Do not touch any terminals with bare hands when the drive is powered on. Otherwise, there is a risk of electric shock.
- Do not operate the drive with wet hands. Otherwise, there is a risk of electric shock.
- Before maintenance, make sure the drive has been powered off for at least 10 minutes, and 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.
- Parts/Components replacement must be carried out by sufficiently qualified personnel. Do not leave any wire residue or foreign metal inside the drive. Failure to comply will result in a fire.
- In case any control board of the drive product is replaced, make sure to reset the parameters properly before restarting the drive. Otherwise, there is a risk of equipment/property damage.
- The bare parts of the terminal lugs in the main circuit must be properly wrapped with insulation tapes. Otherwise, electric shock may occur.

WARNING

- When handling the drive product, protect the operating panel and the covers against any stress to avoid falling off. Failure to comply may result in personal injuries or property 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 capable of water splashing. Otherwise, there is a risk of property damage.
- Do not allow screws, gaskets, metal bars, and the like to fall into the drive. Failure to comply may result in a fire or property damage.
- If the drive is damaged or lack of components, do not install or run the drive. Failure to comply may result in a fire or personal injuries.
- Do not install the product in places with direct sunlight exposure. Otherwise, there is a risk of property damage.
- Do not short the +/DC+ and the -/DC- terminals. Failure to comply may result in a fire or property damage.
- Cable lugs must be firmly connected to the main circuit terminals. Otherwise, there is risk of property damage.
- Do not connect 220 V AC signal input to the control terminals other than RA/RA2, RB/RB2 and RC/RC2. Otherwise, there is a risk of property damage.

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Chapter 1 Product Introduction

1.1 Naming rule

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

MV810 G 1 - 4 T 5.5 (SP2)

For solar pumps

Power rating:
0.4 kW to 400 kW

Product series

Mark	Application
J	Electro-hydraulic servo
G	General
S	Servo positioning
T	Tension control
L	Lifting control
F	Fly-cut

Mark	Product iteration
Number	Customization

Mark	Input voltage phase
SS	Single-phase input, single-phase output
S	Single-phase input, three-phase output
T	Three-phase input, three-phase output

Mark	Input voltage class
2	Single/Three-phase 220 V or DC 150 to 450 V
4	110 kW and below: Three-phase 380 V or DC 250 to 900 V
	132 kW and above: Three-phase 380 V or DC 350 to 900 V

1.2 Product nameplate

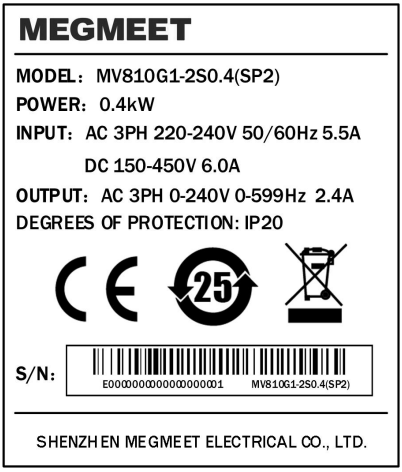


Fig. 1-1 SP2 models of 15 kW and below

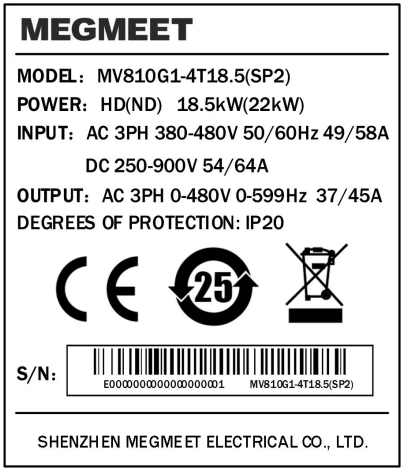


Fig. 1-2 SP2 models of 18.5 kW and above

1.3 Product series and models

Table 1-1 Product series and models

Enclosure	Model	Input AC current (A)		Rated output current (A)		Rated output power (kW)		Fan air volume (m^3/min)
		HD	ND	HD	ND	HD	ND	
Input: 150 V DC to 450 V DC, single-phase 220 V AC (-15% to 10%) Output: single-phase 220 V AC (-15% to 10%)								
B	MV810G1-2SS0.4(SP2)	6.5	-	4.2	-	0.4	-	0.4
	MV810G1-2SS0.75(SP2)	15.0	-	7.5	-	0.75	-	0.48
	MV810G1-2SS1.5(SP2)	19.8	-	9.4	-	1.5	-	
C	MV810G1-2SS2.2(SP2)	35.0	-	17.0	-	2.2	-	0.8
D	MV810G1-2SS4.0(SP2)	50.0	-	25.0	-	4.0	-	1.8
E	MV810G1-2SS5.5(SP2)	65.0	-	32.0	-	5.5	-	4.0
Input: 150 V DC to 450 V DC, single-phase 220 V AC (-15% to 10%) Output: three-phase 220 V AC (-15% to 10%)								
B	MV810G1-2S0.4(SP2)	5.5	-	2.4	-	0.4	-	0.4
	MV810G1-2S0.75(SP2)	8.5	-	4.2	-	0.75	-	0.4
	MV810G1-2S1.5(SP2)	15.0	-	7.5	-	1.5	-	0.48
	MV810G1-2S2.2(SP2)	19.8	-	9.4	-	2.2	-	0.48
C	MV810G1-2S4.0(SP2)	35.0	-	17.0	-	4.0	-	0.8
D	MV810G1-2S5.5(SP2)	50.0	-	25.0	-	5.5	-	1.8
E	MV810G1-2S7.5(SP2)	65.0	-	32.0	-	7.5	-	4.0
Input: 150 V DC to 450 V DC, three-phase 220 V AC (-15% to 10%) Output: three-phase 220 V AC (-15% to 10%)								
B	MV810G1-2T2.2(SP2)	11.0	-	10.0	-	2.2	-	0.48
C	MV810G1-2T4.0(SP2)	20.3	-	17.0	-	4.0	-	0.8
D	MV810G1-2T5.5(SP2)	32.0	-	25.0	-	5.5	-	1.8
	MV810G1-2T7.5(SP2)	41.0	-	32.0	-	7.5	-	1.8
E	MV810G1-2T11(SP2)	47.0	-	45.0	-	11.0	-	4.0
Input: 250 V DC to 900 V DC, single-phase 380 V AC (-15% to 10%) Output: three-phase 380 V AC (-15% to 10%)								
B	MV810G1-4T0.75(SP2)	3.5	-	2.7	-	0.75	-	0.4
	MV810G1-4T1.5(SP2)	5.1	-	4.2	-	1.5	-	
	MV810G1-4T2.2(SP2)	6.8	-	5.6	-	2.2	-	0.48
	MV810G1-4T4.0(SP2)	11.8	-	10.0	-	4.0	-	
C	MV810G1-4T5.5(SP2)	15.5	-	13.0	-	5.5	-	0.8
	MV810G1-4T7.5(SP2)	23.0	-	17.0	-	7.5	-	
D	MV810G1-4T11(SP2)	26.0	-	25.0	-	11.0	-	1.8
	MV810G1-4T15(SP2)	35.0	-	32.0	-	15.0	-	
E	MV810G1-4T18.5(SP2)	49.0	58.0	37.0	45.0	18.5	22.0	4.0
	MV810G1-4T22(SP2)	58.0	62.0	45.0	60.0	22.0	30.0	
F	MV810G1-4T30(SP2)	62.0	76.0	60.0	75.0	30.0	37.0	5.8
	MV810G1-4T37(SP2)	76.0	92.0	75.0	90.0	37.0	45.0	
G	MV810G1-4T45(SP2)	92.0	113.0	90.0	110.0	45.0	55.0	14.42

Enclosure	Model	Input AC current (A)		Rated output current (A)		Rated output power (kW)		Fan air volume (m^3/min)
		HD	ND	HD	ND	HD	ND	
	MV810G1-4T55(SP2)	113.0	157.0	110.0	152.0	55.0	75.0	
	MV810G1-4T75(SP2)	157.0	180.0	152.0	176.0	75.0	90.0	
H	MV820G1-4T90(SP2)	180.0	214.0	176.0	210.0	90.0	110.0	
	MV820G1-4T110(SP2)	214.0	256.0	210.0	253.0	110.0	132.0	
Input: 350 V DC to 900 V DC, single-phase 380 V AC (-15% to 10%) Output: three-phase 380 V AC (-15% to 10%)								
I	MV820G1-4T132(SP2)	256.0	307.0	253.0	304.0	132.0	160.0	
	MV820G1-4T160(SP2)	307.0	330.0	304.0	340.0	160.0	185.0	
J	MV820G1-4T185(SP2)	330.0	368.0	340.0	380.0	185.0	200.0	21.48
	MV820G1-4T200(SP2)	368.0	410.0	380.0	426.0	200.0	220.0	
	MV820G1-4T220(SP2)	410.0	440.0	426.0	465.0	220.0	250.0	
K	MV820G1-4T250(SP2)	442.0	496.0	465.0	520.0	250.0	280.0	27.19
	MV820G1-4T280(SP2)	496.0	563.0	520.0	585.0	280.0	315.0	
L	MV820G1-4T315(SP2)	560.0	625.0	585.0	650.0	315.0	355.0	36.60
	MV820G1-4T355(SP2)	617.0	715.0	650.0	725.0	355.0	400.0	
	MV820G1-4T400(SP2)	687.0	795.0	725.0	810.0	400.0	450.0	

1.4 Technical specifications

Table 1-2 Technical specifications

Power input	Rated voltage (V)	2SS/2S/2T models: single/three-phase 220 V to 240 V; continuous voltage fluctuation ±10%, transient voltage fluctuation -15% to +10% (187 V to 264 V); voltage unbalance rate < 3%, distortion rate compliant with IEC 61800-2; 4T models: three-phase 380 V to 480 V; continuous voltage fluctuation ±10%, transient voltage fluctuation -15% to +10% (323 V to 528 V); voltage unbalance rate < 3%, distortion rate compliant with IEC 61800-2.
	Rated input current (A)	Refer to Table 1-1.
	Rated frequency (Hz)	50/60 Hz; fluctuation range: ±2 Hz.
Power output	Rated output power (kW)	Refer to Table 1-1.
	Rated output current (A)	
	Output voltage (V)	2SS: single-phase output under rated input, 0 to rated input voltage, deviation less than ±3% 2S/2T/4T: three-phase output under rated input, 0 to rated input voltage, deviation less than ±3%.
	Output frequency (Hz)	V/F: 0.00 to 599.00 Hz. Unit: 0.01 Hz. Vector control: 0 to 599.00 Hz.

	Overload capacity	HD: 1 min for 150% rated current; 6 sec for 180% rated current; 1 sec for 200% rated current. ND: 1 min for 110% rated current.
Drive control	Control mode	Vector control without PG, V/F control, MPPT control
	Maximum output frequency	V/F control: 599 Hz. Other control methods: 599 Hz.
	Speed regulation range	1 : 200 (vector control without PG)
	Speed control precision	±0.5% (vector control without PG)
	Speed fluctuation	±0.3% (vector control without PG)
	Torque response	< 20 ms (vector control without PG)
	Torque control	Torque precision ±5% for vector control without PG (above 5 Hz for asynchronous motors, above 10 Hz for synchronous motors).
	Startup torque	0.25 Hz, 150% (vector control without PG)
Function	Key functions	Fast tracking, overtorque/undertorque detection, torque limit, multi-speed reference, multiple acceleration/deceleration time switchover, auto-tuning, S curve acceleration/deceleration, slip compensation, fan speed control, frequency hopping, energy saving operation, PID adjustment, hibernation, power dip ride-through, Modbus, torque control, torque control and speed control switchover, automatic restart, DC braking, dynamic braking, simple PLC, AVR, switchover between 2 sets of motor parameters, and fieldbus; Dedicated functions for photovoltaic pumping system: maximum solar power tracking, low sunlight hibernation, high sunlight wake-up, high water level hibernation, low water level wake-up, dry running protection, low-frequency running protection and so on.
	Basic frequency	0.01 Hz to 599.00 Hz
	Startup frequency	0.00 Hz to 50.00 Hz
	Frequency setting mode	Panel setting, AI1/AI2, terminal pulse HDI, simple PLC, multiple PLC stages, host controller communication, PID control, and fieldbus communication.
	Acceleration/ Deceleration time	0.1 to 6000.0 (unit 0.1 s)
	Dynamic braking capacity	Standard built-in braking unit for the MV810 820 (SP2) series models of 37 kW and below; braking ratio 0.0 to 100.0%.
	DC braking capacity	Startup frequency: 0.00 Hz to 599.00 Hz; braking time: 0.1 s to 50.0 s Braking current: 0% to 100%, based on the nominal rated current of the drive.
	Terminal functions	Refer to the terminal function section for details.
Protection	Refer to the fault protection section for details.	
Others	Installation method	Refer to "3.3 Installation direction and clearance".
	IP rating	IP20
	Cooling method	Air cooling

Environment	Working conditions	Indoors with no direct exposure to sunlight, dust, corrosive gas, combustible gas, oil mist, water vapour/dripping, or salt.
	Altitude	Altitude ≤ 1000 m: normal use. 1000 m < altitude < 3000 m: derated by 1% for every 100 m higher. Maximum altitude: 3000 m.
	Ambient temperature	-10℃ to +50℃; air temperature change < 0.5℃/min (derated use required if the ambient temperature is above 40℃).
	Humidity	5% to 95% RH; non-condensing; no rain, snow, or hail; solar radiation < 700 W/m^2; air pressure from 70 to 106 kPa.
	Vibration	Displacement 1.5 mm when sine vibration is 2 to 9 Hz; 5.9 m/s^2 (0.6 g) for 9 to 200 Hz.
	Storage temperature	-30℃ to +70℃, air temperature change < 1℃/min; maximum 60℃ for long-time storage; 60℃ to 70℃ for short-time storage only.

1.5 Electrical specifications

1.5.1 Electrical specifications for 2SS/2S/2T models

Table 1-3 Electrical specifications for 2SS/2S/2T models

Model	Recommended solar array power (kWp)	Max. input DC current (A)	Output current (A)	Applicable motor (kW)
AC 220 V or DC 450 V				
MV810G1-2SS0.4(SP2)	1.1	9.0	4.2	0.4
MV810G1-2SS0.75(SP2)	2.25	9.0	7.5	0.75
MV810G1-2SS1.5(SP2)	3.3	12.0	9.4	1.5
MV810G1-2SS2.2(SP2)	5.5	18.0	17.0	2.2
MV810G1-2SS4.0(SP2)	8.25	31.5	25.0	4.0
MV810G1-2SS5.5(SP2)	11.0	42.0	32.0	5.5
MV810G1-2S0.4(SP2)	0.6	9.0	2.4	0.4
MV810G1-2S0.75(SP2)	1.1	9.0	4.2	0.75
MV810G1-2S1.5(SP2)	2.25	12.0	7.5	1.5
MV810G1-2S2.2(SP2)	3.3	18.0	9.4	2.2
MV810G1-2S4.0(SP2)	5.55	18.0	16.0	4.0
MV810G1-2S5.5(SP2)	8.3	45.0	25.0	5.5
MV810G1-2S7.5(SP2)	11.3	59.0	32.0	7.5
MV810G1-2T2.2(SP2)	7.5	12.0	10.0	2.2
MV810G1-2T4.0(SP2)	11.7	20.0	17.0	4.0
MV810G1-2T5.5(SP2)	17.3	30.0	25.0	5.5
MV810G1-2T7.5(SP2)	22.0	40.0	32.0	7.5
MV810G1-2T11(SP2)	31.0	48.0	45.0	11.0

Table 1-4 Input/Output specifications for 2SS/2S/2T models

Input	
Solar panel input	
Max. input DC voltage	450 V DC
Recommended Voc voltage range	360 to 430 V DC
Recommended MPPT voltage range	250 to 350 V DC
Startup voltage range	150 to 450 V DC
Input from the mains or backup power generator	
Input voltage AC	2SS/2S/2T models: single/three-phase 220 V to 240 V, continuous voltage fluctuation ±10%, transient voltage fluctuation -15% to +10%.

Output	
Rated output voltage AC	2SS: 1 PH 220 V 2S/2T: 3 PH 220 V
Output frequency range	0 to 599.00 Hz; 0 to 50.00 Hz by default.
Protection	
Built-in protection function	Protective measures against lightning stroke, overcurrent, overvoltage, output phase loss, underload, undervoltage, short circuit, overheat, dry running, etc.

1.5.2 Electrical specifications for 4T models

Table 1-5 Electrical specifications for 4T models

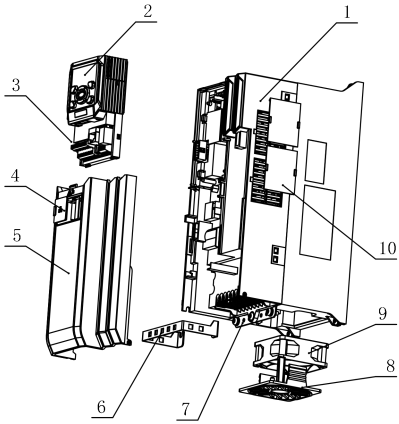
Model	Recommended solar array power (kWp)	Max. input DC current (A)	Output current (A)		Applicable motor (kW)	
			HD	ND	HD	ND
AC 380 V or DC 900 V						
MV810G1-4T0.75(SP2)	1.5	9.0	2.7	-	0.75	-
MV810G1-4T1.5(SP2)	3.0	9.0	4.2	-	1.5	-
MV810G1-4T2.2(SP2)	4.0	12.0	5.6	-	2.2	-
MV810G1-4T4.0(SP2)	6.0	16.0	10.0	-	4.0	-
MV810G1-4T5.5(SP2)	8.9	24.0	13.0	-	5.5	-
MV810G1-4T7.5(SP2)	11.0	30.5	17.0	-	7.5	-
MV810G1-4T11(SP2)	17.0	39.0	25.0	-	11.0	-
MV810G1-4T15(SP2)	21.0	48.0	32.0	-	15.0	-
MV810G1-4T18.5(SP2)	24.0	50.0	37.0	45.0	18.5	22.0
MV810G1-4T22(SP2)	30.0	62.0	45.0	60.0	22.0	30.0
MV810G1-4T30(SP2)	40.0	76.0	60.0	75.0	30.0	37.0
MV810G1-4T37(SP2)	57.0	92.0	75.0	90.0	37.0	45.0
MV810G1-4T45(SP2)	69.0	130.0	90.0	110.0	45.0	55.0
MV810G1-4T55(SP2)	85.0	154.0	110.0	152.0	55.0	75.0
MV810G1-4T75(SP2)	114.0	200.0	152.0	176.0	75.0	90.0
MV820G1-4T90(SP2)	134.0	248.0	176.0	210.0	90.0	110.0
MV820G1-4T110(SP2)	160.0	300.0	210.0	253.0	110.0	132.0
MV820G1-4T132(SP2)	192.0	355.0	253.0	304.0	132.0	160.0
MV820G1-4T160(SP2)	231.0	425.0	304.0	340.0	160.0	185.0
MV820G1-4T185(SP2)	240.0	498.0	340.0	380.0	185.0	200.0
MV820G1-4T200(SP2)	245.0	500.0	380.0	426.0	200.0	220.0
MV820G1-4T220(SP2)	250.0	510.0	426.0	465.0	220.0	250.0
MV820G1-4T250(SP2)	324.0	525.0	465.0	520.0	250.0	280.0
MV820G1-4T280(SP2)	365.0	600.0	520.0	585.0	280.0	315.0

Model	Recommended solar array power (kWp)	Max. input DC current (A)	Output current (A)		Applicable motor (kW)	
			HD	ND	HD	ND
MV820G1-4T315(SP2)	410.0	690.0	585.0	650.0	315.0	355.0
MV820G1-4T355(SP2)	463.0	760.0	650.0	725.0	355.0	400.0
MV820G1-4T400(SP2)	522.0	870.0	725.0	810.0	400.0	450.0

Table 1-6 Input/Output specifications for 4T models

Input	
Solar panel input	
Max. input DC voltage	900 V DC
Recommended Voc voltage range	600 to 750 V DC
Recommended MPPT voltage range	450 to 600 V DC
Startup voltage range	110 kW and below: 250 to 900 V DC
	132 kW and above: 350 to 900 V DC
Input from the mains or backup power generator	
Input voltage AC	4T models: three-phase 380 V to 480 V, continuous voltage fluctuation ±10%, transient voltage fluctuation -15% to +10%.
Output	
Rated output voltage AC	3 PH 380 V
Output frequency range	0 to 599.00 Hz; 0 to 50.00 Hz by default.
Protection	
Built-in protection function	Protective measures against lightning stroke, overcurrent, overvoltage, output phase loss, underload, undervoltage, short circuit, overheat, dry running, etc.

1.6 Parts and components



1: Enclosure 2: Keypad 3: Control board 4: Rubber plug 5: Upper cover 6: Cable fixation bracket 7: Grounding board 8: Fan cover 9: Fan 10: Dust cover(1)

Fig. 1-3 Parts diagram (example based on enclosure C)

WARNING

(1): For 4T4.0, 2S2.2, 4T18.5–22, and 4T30–37, a dust cover and tools (in a bag) are included from the factory. You may choose whether to install the cover based on the actual environment. For environments with heavy dust, powder and the like, the cover shall be installed.

1.7 Appearance and dimensions

There are eleven enclosure types as shown in the following figures. Refer to Table 1-7 for the data of the outline dimensions, installation dimensions, and gross weight. The drawings are for reference only. For actual details, please check the products.

(1) Enclosure B

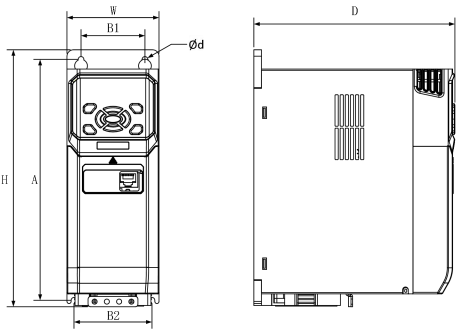


Fig. 1-4 Enclosure B

(2) Enclosure C

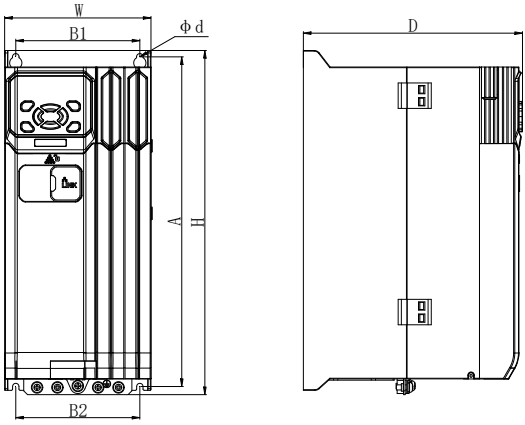


Fig. 1-5 Enclosure C

(3) Enclosure D

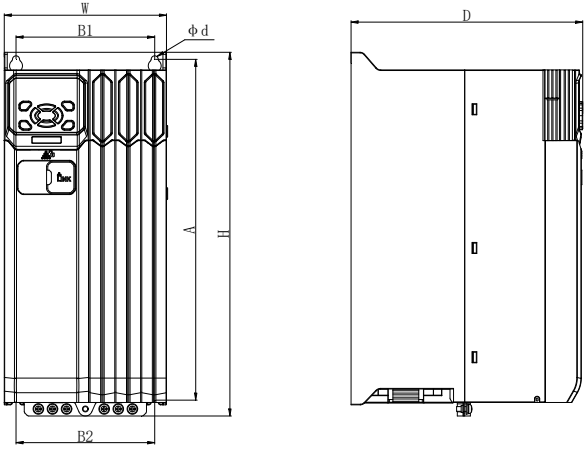


Fig. 1-6 Enclosure D

(4) Enclosure E

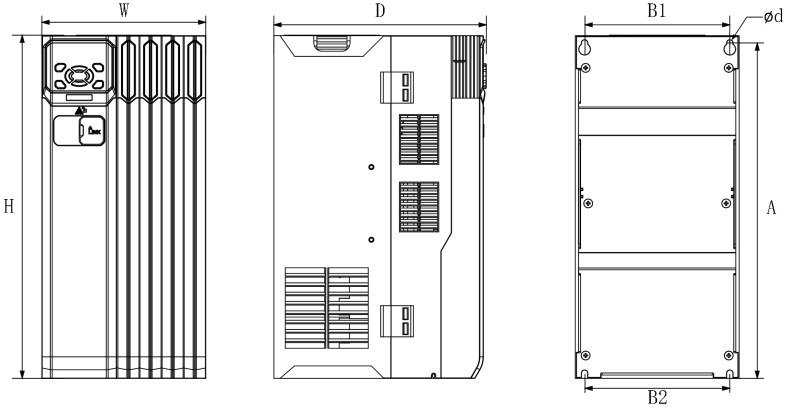


Fig. 1-7 Enclosure E

(5) Enclosure F

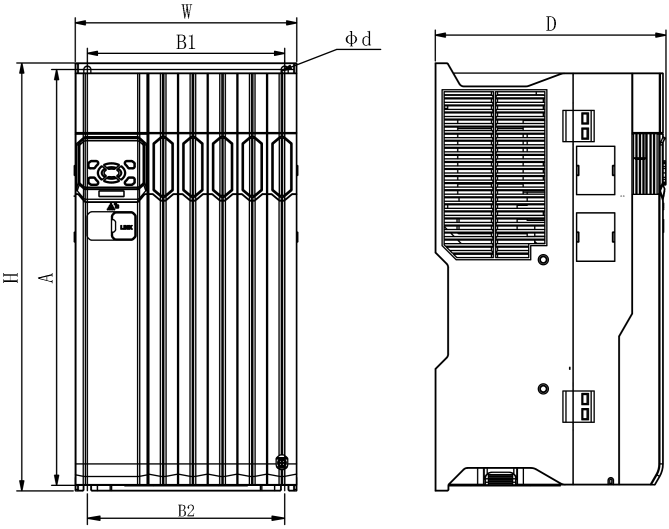


Fig. 1-8 Enclosure F

(6) Enclosure G

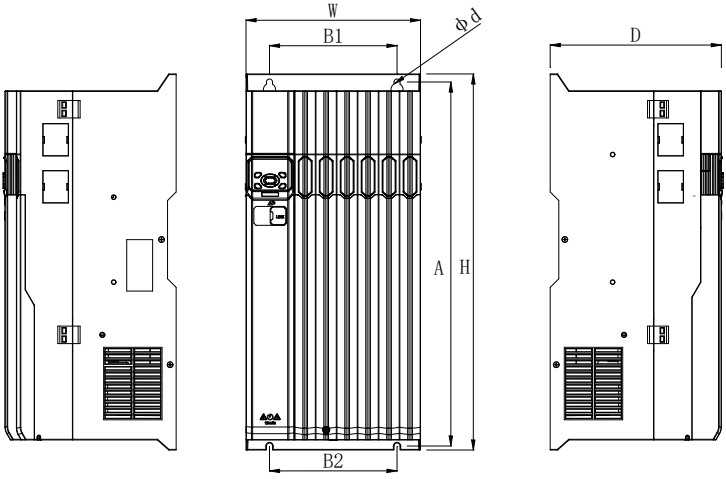


Fig. 1-9 Enclosure G

(7) Enclosure H

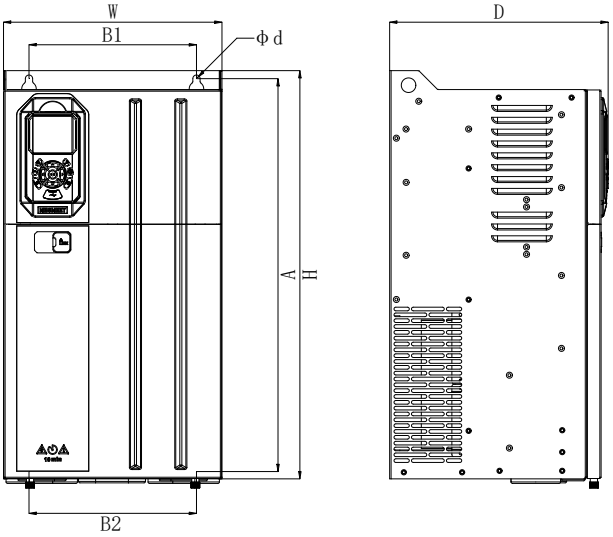


Fig. 1-10 Enclosure H

(8) Enclosure I

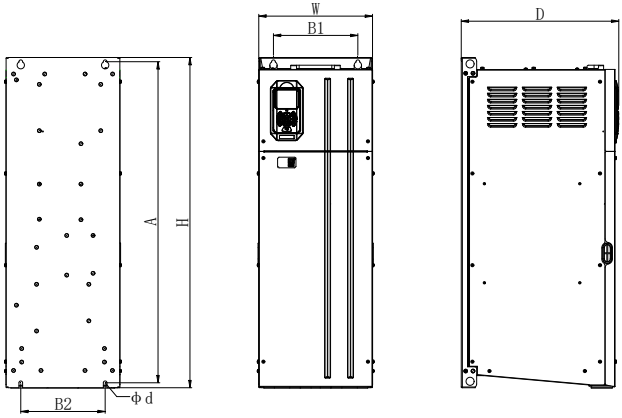


Fig. 1-11 Enclosure I

(9) Enclosure J

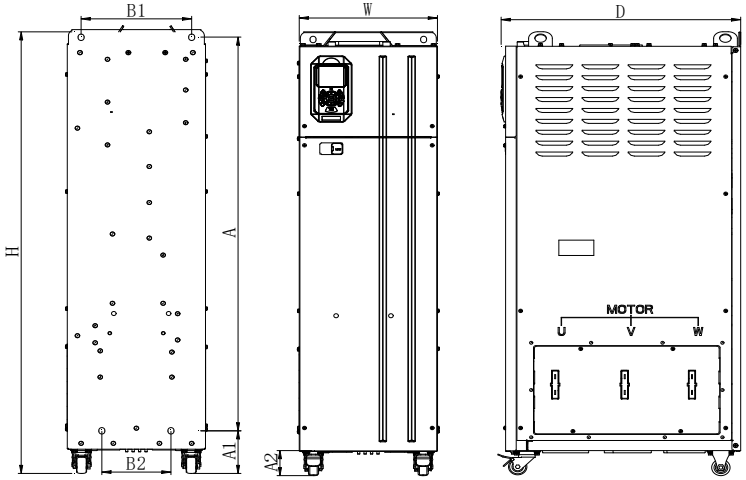


Fig. 1-12 Enclosure J

(10) Enclosure K

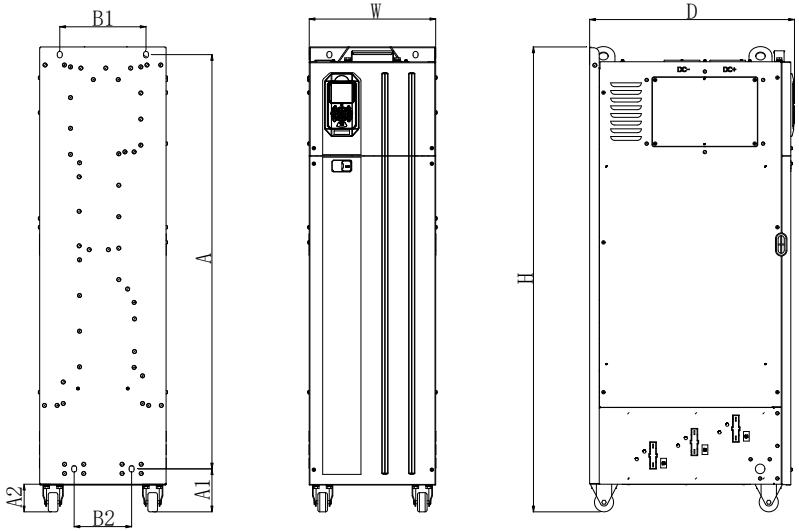


Fig. 1-13 Enclosure K

(11) Enclosure L

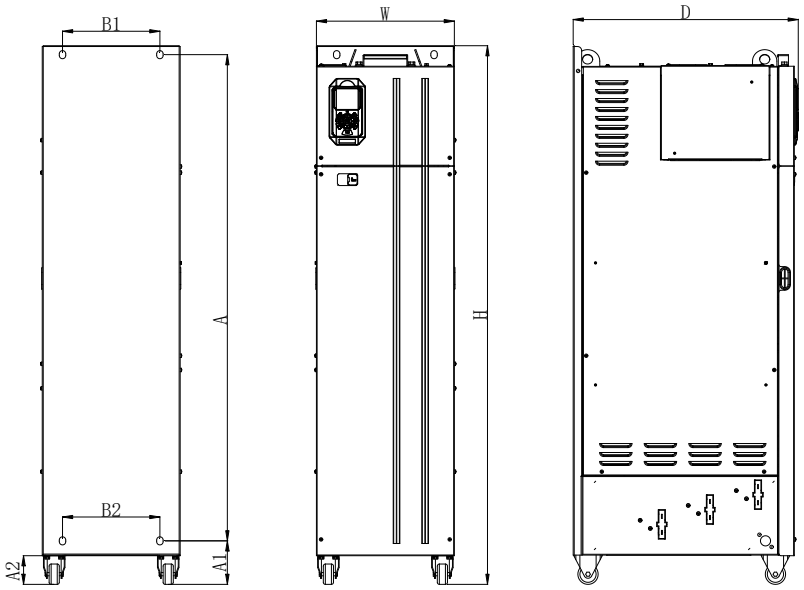


Fig. 1-14 Enclosure L

Table 1-7 Outline dimensions, mounting dimensions, and gross weight

Enclosure	Drive	A (mm)	A1 (mm)	A2 (mm)	B1 (mm)	B2 (mm)	H (mm)	W (mm)	D (mm)	Mounting hole diameter (mm)	Gross weight ±0.5 (kg)
B	MV810G1-2SS0.4(SP2)	187.5	-	-	50	61	200	72	158.3	4.5	1.4
	MV810G1-2SS0.75(SP2)										
	MV810G1-2SS1.5(SP2)										
	MV810G1-2S0.4(SP2)										
	MV810G1-2S0.75(SP2)										
	MV810G1-2S1.5(SP2)										
	MV810G1-2S2.2(SP2)										
	MV810G1-2T2.2(SP2)										
	MV810G1-4T0.75(SP2)										
	MV810G1-4T1.5(SP2)										
	MV810G1-4T2.2(SP2)										
	MV810G1-4T4.0(SP2)										
C	MV810G1-2SS2.2(SP2)	259	-	-	97.5	97.5	270.4	115	172.2	5	2.5
	MV810G1-2S4.0(SP2)										
	MV810G1-2T4.0(SP2)										

Enclosure	Drive	A (mm)	A1 (mm)	A2 (mm)	B1 (mm)	B2 (mm)	H (mm)	W (mm)	D (mm)	Mounting hole diameter (mm)	Gross weight ±0.5 (kg)
	MV810G1-4T5.5(SP2)										
	MV810G1-4T7.5(SP2)										
D	MV810G1-2SS4.0(SP2)	290	-	-	118	118	309.5	138	198.8	6	4.1
	MV810G1-2S5.5(SP2)										
	MV810G1-2T5.5(SP2)										
	MV810G1-2T7.5(SP2)										
	MV810G1-4T11(SP2)										
	MV810G1-4T15(SP2)										
E	MV810G1-2SS5.5(SP2)	318	-	-	140	140	330	158	204.8	6	6
	MV810G1-2S7.5(SP2)										
	MV810G1-2T11(SP2)										
	MV810G1-4T18.5(SP2)										
	MV810G1-4T22(SP2)										
F	MV810G1-4T30(SP2)	412	-	-	196	196	424	220	229	7	13
	MV810G1-4T37(SP2)										
G	MV810G1-4T45(SP2)	542	-	-	190	190	560	260	257.8	9	21.5
	MV810G1-4T55(SP2)										
	MV810G1-4T75(SP2)										
H	MV820G1-4T90(SP2)	539	-	-	230	230	560	300	300	10	37
	MV820G1-4T110(SP2)										
I	MV820G1-4T132(SP2)	875	-	-	230	230	900	310	429	10	95
	MV820G1-4T160(SP2)										
J	MV820G1-4T185(SP2)	974.5	105.5	62	240	150	1099	300	520	13	120
	MV820G1-4T200(SP2)										
	MV820G1-4T220(SP2)										
K	MV820G1-4T250 (SP2)	1080	112	72	225	150	1212	330	535	13	150
	MV820G1-4T280 (SP2)										
L	MV820G1-4T315 (SP2)	1195	107	72	240	240	1324	340	555	16	178
	MV820G1-4T355 (SP2)										
	MV820G1-4T400 (SP2)										

1.8 Operating panel dimensions

(1) Standard operating panel for models of 75 kW and below

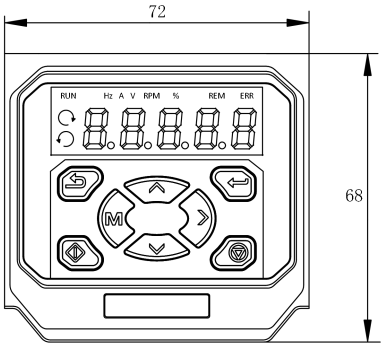


Fig. 1-15 Operating panel appearance and dimensions

(2) Standard operating panel MV820-DP03 for models of 90 kW and above

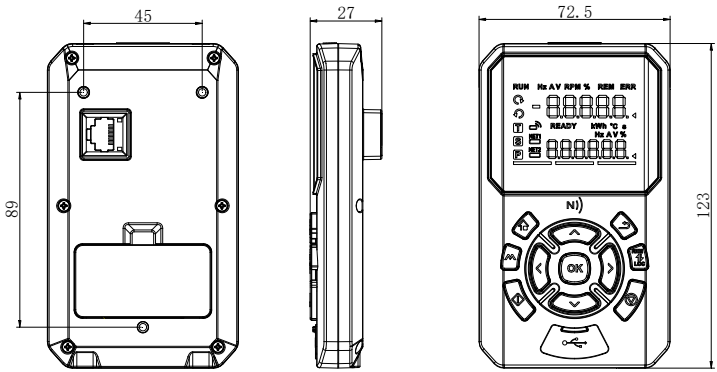


Fig. 1-16 Appearance and dimensions of MV820-DP03 (unit: mm)

WARNING

① Standard configuration includes pluggable LED small or large keyboard depending on power, remote use supported. For options of remote LCD operating panels, refer to description in section 2.7.

② This drive reserves one network port for extension connection.

Chapter 2 Options and Accessories

The options and accessories introduced in this chapter, including the installation brackets, protective kits, remote keypads, and other accessories, are all optional. Users can purchase the items by themselves if needed, or consult the local distributor for the applicable configuration. During installation and use, please follow the corresponding steps to avoid damage to the drive.

2.1 Embedded mounting bracket kit

MV810-EMBB, MV810-EMBC, MV810-EMBD, MV810-EMBE, MV810-EMBF, MV810-EMBG, and MV810-EMBH are bracket kits for embedded drive mounting, respectively corresponding to enclosures of different sizes. They can maintain the air duct, enable independent heat dissipation, and keep the drive interior away from dust, oil mist, and particles. See the following figures (marked in green) for installation instructions.

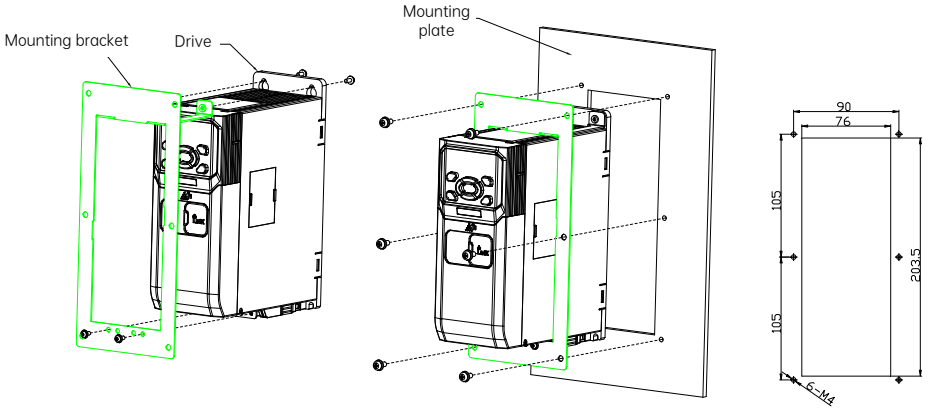


Fig. 2-2 MV810-EMBB (for enclosure B)

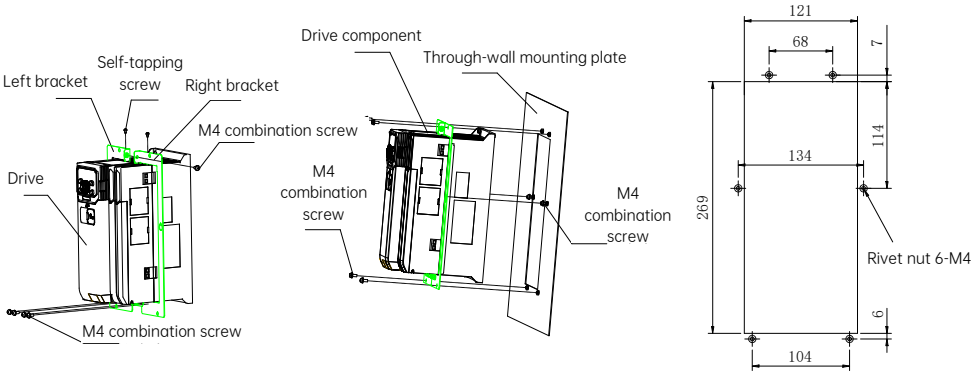


Fig. 2-3 MV810-EMBC (for enclosure C)

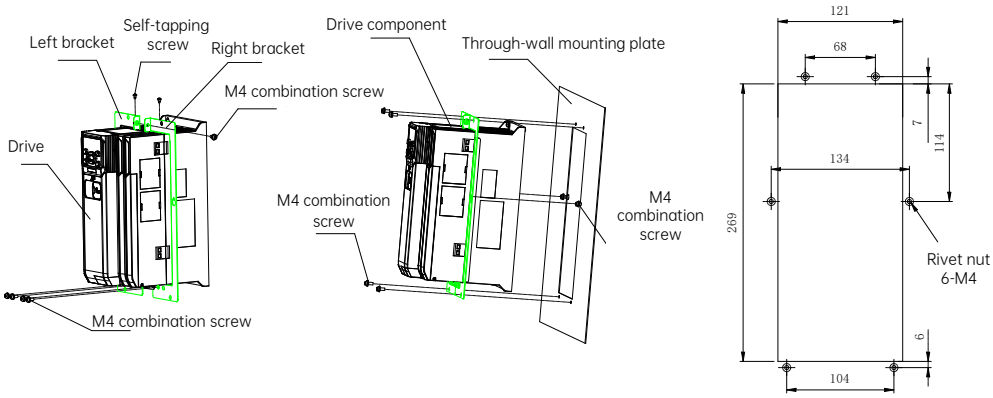


Fig. 2-4 MV810-EMBD (for enclosure D)

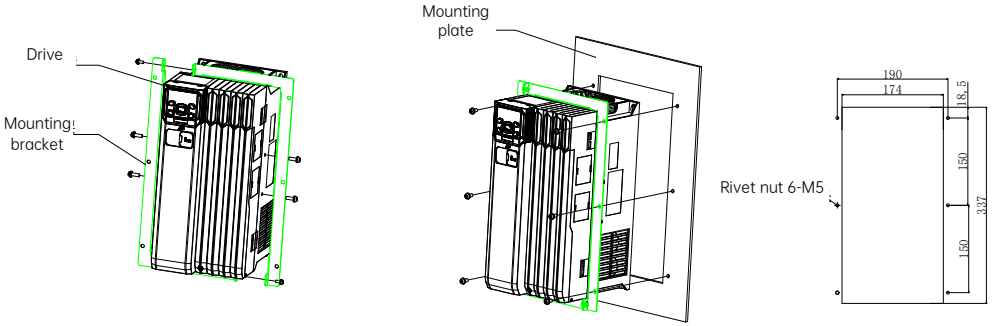


Fig. 2-5 MV810-EMBE (for enclosure E)

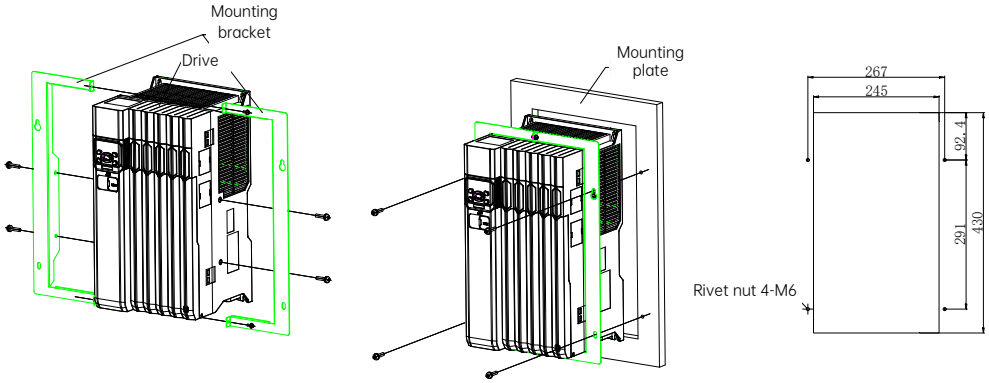


Fig. 2-6 MV810-EMBF (for enclosure F)

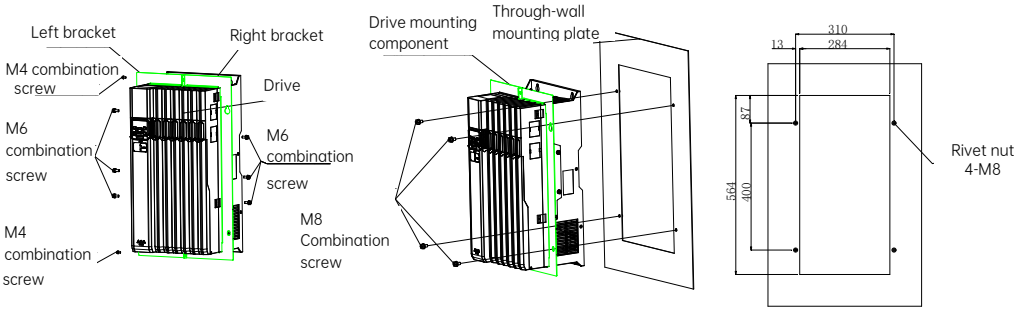


Fig. 2-7 MV810-EMBG (for enclosure G)

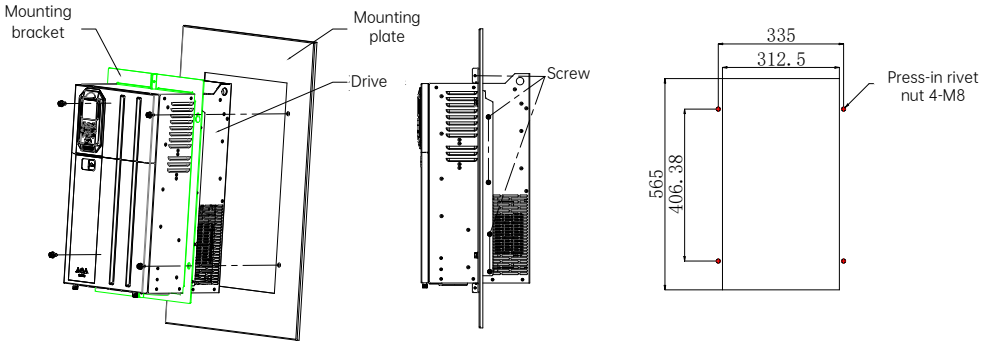


Fig. 2-8 MV810-EMBH (for enclosure H)

2.2 Reinforced metal base plate

MV810-METB, MV810-METC and MV810-METD are reinforced metal base plates respectively corresponding to enclosure B, C, and D. They are used to improve the stability and reliability of installation in harsh environments where there is a risk of corroding the plastic parts or accelerating their aging process, such as places with high temperatures or oil mist. Countersunk head screws are provided in the accessory package for use in installation. See the following figure (marked in green).

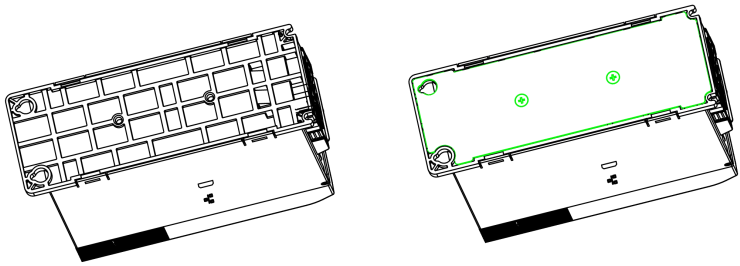


Fig. 2-9 Reinforced metal base plate

2.3 Cable fixation bracket

MV810-FIXB, MV810-FIXC and MV810-FIXD are cable fixation brackets respectively corresponding to enclosure B, C, and D. The bracket is used to fix and support the input and output cables in order to protect the terminals from excessive stress and external impact, and also serves for stable grounding of the cable shield. It can be fixed to the screws on the grounding plate (marked in green), as shown in the following figure.

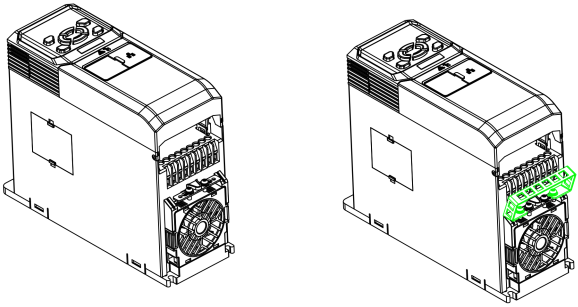


Fig. 2-10 Cable fixation bracket

2.4 Guide rail bracket

MV-DIN3563 (for enclosure B only) is a bracket for guide rail installation, with a mounting hole distance of 63 mm, applicable for the standard DIN 35 mm guide rail. Fix it to the bottom of the drive, and then fix the drive to a guide rail. The M4*25 countersunk head screws included in the accessory package are used for installation. See the following figure (marked in green).

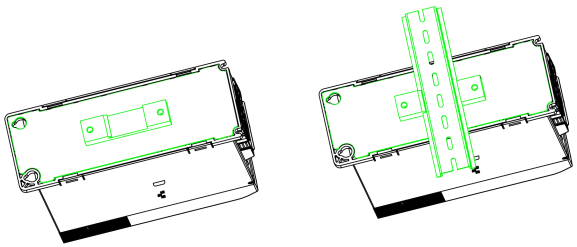


Fig. 2-11 Guide rail bracket

2.5 Keypad/Operating panel mounting base

The keypad mounting base for the whole series drives includes two types: the small-size and the large-size, used respectively for the small-size keypad and the large-size keypad installation.

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 figures:

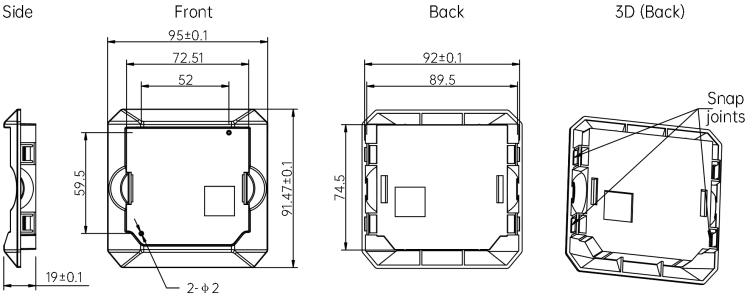


Fig. 2-12 Keypad mounting base (unit: mm)

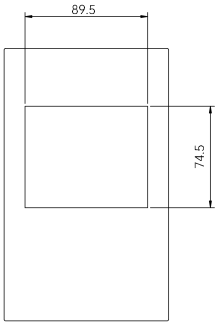


Fig. 2-13 Mounting dimensions of the operating panel mounting base (unit: mm)

Model of large keypad mounting base: MV820-JPT03. If the user employs shielded Ethernet cables that cannot pass through the large keyboard base with fixed Ethernet port slots, this alternative large keypad base without fixed slots can be selected, as shown in the following figures:

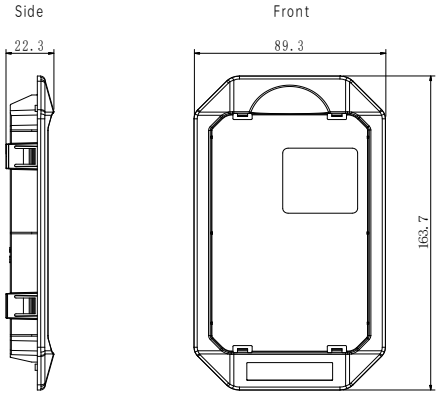


Fig. 2-14 Large keypad mounting base (unit: mm)

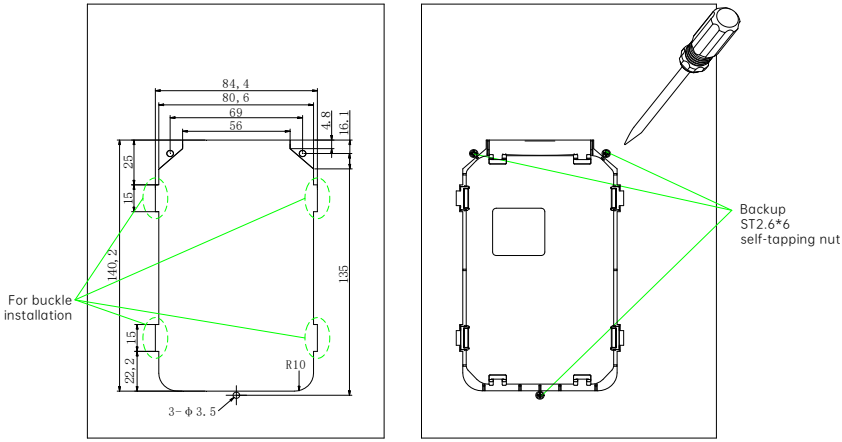


Fig. 2-15 Mounting hole dimensions for large operating panel base (unit: mm)

2.6 Remote LED keypad/operating panel

The remote LED operating panel for the drive series includes two types: the small-size LED panel (with shuttle button) and the large-size LED panel.

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.

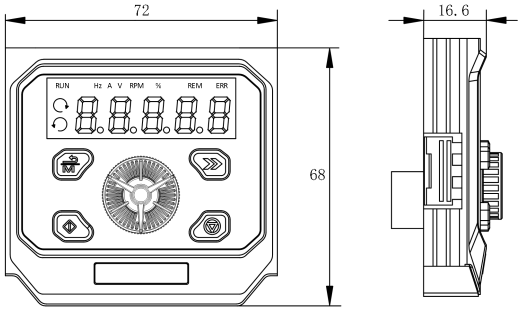


Fig. 2-16 Remote small LED keypad/Operating panel

The remote small LED keypad/operating panel can be fixed to the cabinet door/plate through a mounting base (see 2.5 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):

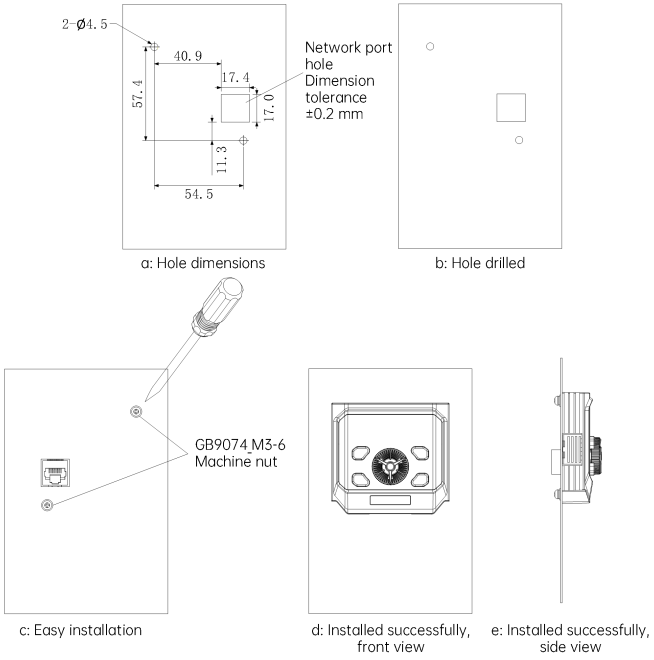


Fig. 2-17 Easy installation of remote small LED keypad/Operating panel

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).

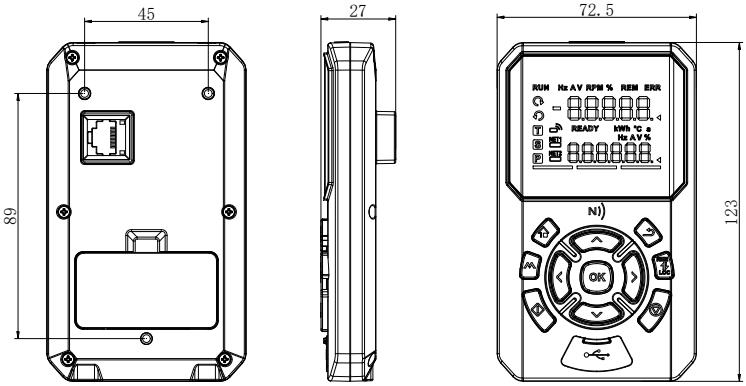
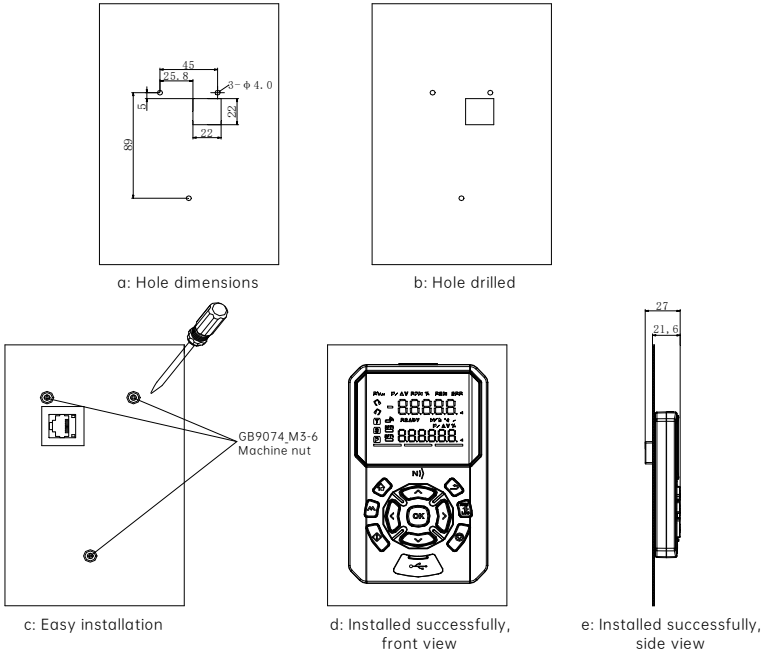


Fig. 2-18 Remote large LED keypad/Operating panel (unit: mm)

The remote large LED keypad/operating panel can be fixed to the cabinet door/plate through a mounting base (see 2.5 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):



a: Hole dimensions

b: Hole drilled

c: Easy installation

d: Installed successfully, front view

e: Installed successfully, side view

Fig. 2-19 Easy installation of remote large LED keypad/Operating panel

2.7 Remote LCD keypad/operating panel

This large-size remote LCD operating panel is detachable, and supports expansion. The model number is MV820-DP02. It supports display language selection between Chinese and English, and provides more functions, including parameter copying (for details, refer to the description of P00.07)

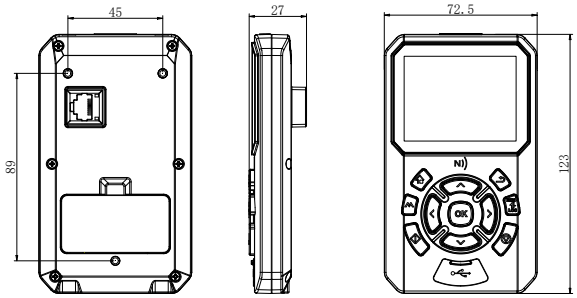


Fig. 2-20 Large-size remote LCD keypad/operating panel (unit: mm)

The large-size remote LCD keypad/operating panel can be fixed to the cabinet door/plate via a mounting base (see 2.5 for details), or via the three diagonal internal thread holes provided on the back of the large-size remote LCD keypad/operating panel, as shown in the following figure. Hole dimension unit: mm.

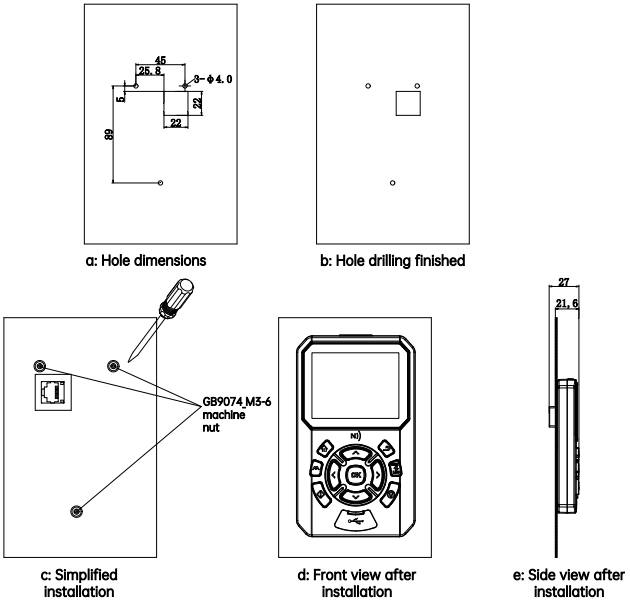
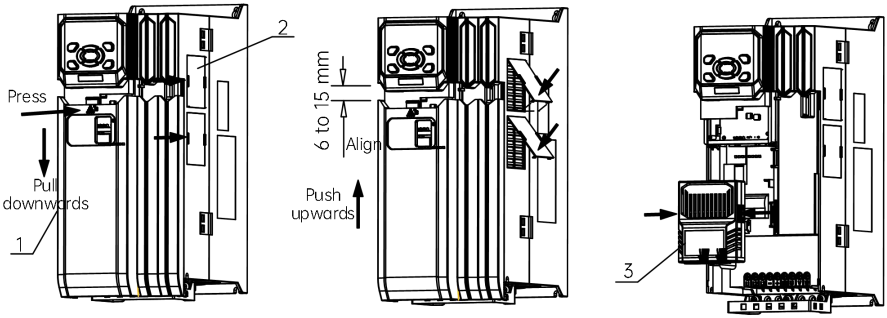


Fig. 2-21 Easy installation for the large-size remote LCD keypad/operating panel (unit: mm)

Chapter 3 Drive Installation

3.1 Assembly/Disassembly of drive components



1: Cover 2: Dust-proof plate 3: Expansion box

Fig. 3-1 Assembly/Disassembly of components (example based on enclosure C)

(1) Assembly/Disassembly of the cover

Disassembly: Press the granulated part of the cover inwards with proper force, pull the cover downwards till the snap-fit joints connecting the cover and the drive are separated, then remove the cover.

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

(2) Assembly/Disassembly of the dust-proof plate

Disassembly: Use a straight screwdriver or a fingernail to pry open the dust-proof plate.

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

(3) Assembly/Disassembly of the expansion box

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

Assembly: Hold the expansion box with the spring snap pressed down slightly, align the box with the installation position, and release the finger to buckle the spring snap in place.

3.2 Installation environment

Check the following items when selecting the installation place:

- Ambient temperature: -10℃ to 50℃; derated use is required if it is within 40℃ to 50℃;
- Ambient humidity: 5% to 95%RH; non-condensing;
- Vibration in the installation place shall be less than 5.9 m/s^2 (0.6 g);
- Do not install the product in a place with direct sunlight exposure;
- 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 or explosive gases.

If there should be any special requirements for installation, please consult Megmeet prior to installation.

3.3 Installation direction and clearance

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

The clearances are shown in the figures below.

3.3.1 Enclosures B/C/D/E/F/G/H/I

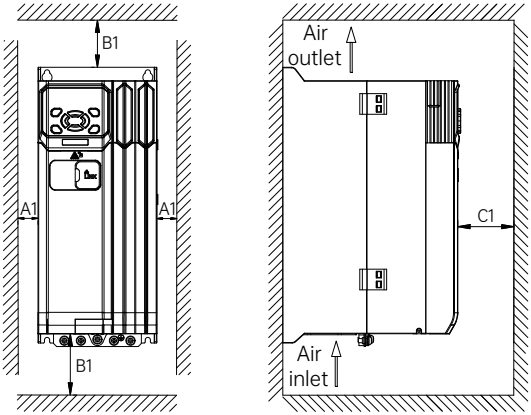


Fig. 3-2 Clearances for enclosures B to I

Table 3-1 Clearance requirements

Enclosure	Clearance requirements (unit: mm)		
B/C/D	A1≥10	B1≥100	C1≥40
E	A1≥10	B1≥200	C1≥40
F	A1≥50	B1≥200	C1≥40
G/H/I	A1≥50	B1≥300	C1≥40

3.3.2 Enclosures J/K/L

(1) Wall-mounted installation

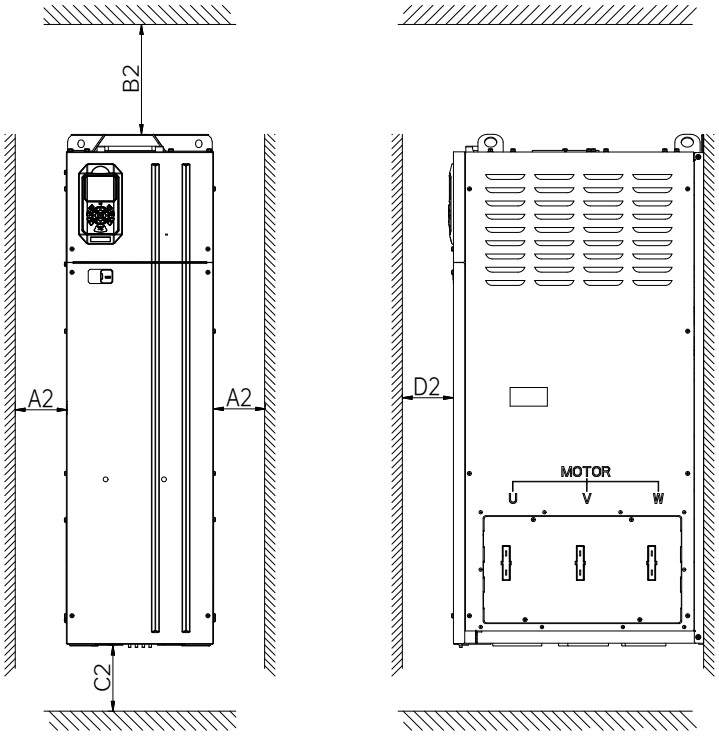


Fig. 3-3 Wall-mounted installation

Table 3-2 Clearance requirements for wall-mounted installation

Enclosure	Clearance requirements (unit: mm)			
J/K/L	A2≥20	B2≥300	C2≥150	D2≥20

(2) Base-mounted installation

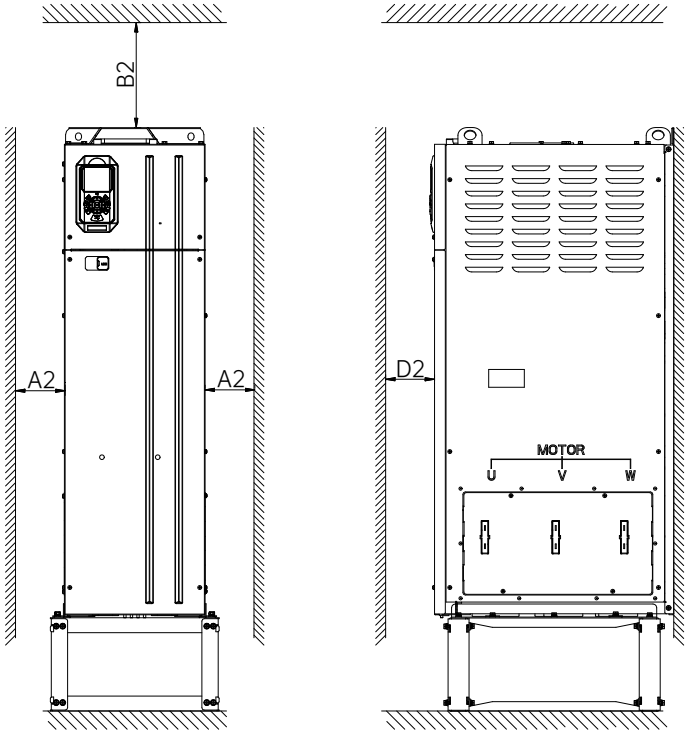


Fig. 3-4 Base-mounted installation

Table 3-3 Base dimensions

Enclosure	Base dimensions (unit: mm)
J	362*455*200
K	330*510*180
L	340*540*180

In addition to the screw installation, MV810 (SP2) also supports guide rail installation for its enclosure B model (a guide rail bracket is required as indicated in section 2.4). See Fig. 3-5 below.

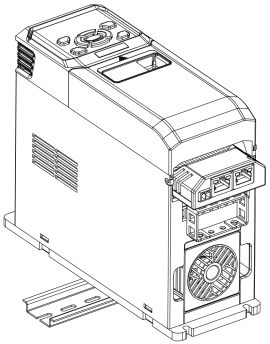


Fig. 3-5 Installation using a guide rail

If two or more drives are installed close to each other in a vertical line, for better heat dissipation, it is recommended to use a baffle plate to redirect the air flow, minimizing the impact imposed on the upper drive air inlet by the lower drive air outlet, as shown in Fig. 3-6.

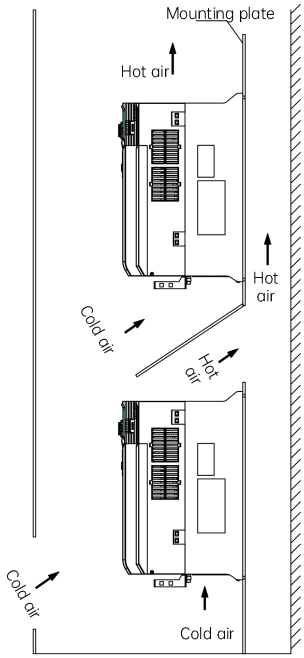


Fig. 3-6 Installation of two or more drives

Chapter 4 Drive Wiring

This chapter provides the instructions for wiring, connection, and related precautions/warnings for safe operations.

DANGER

- Before opening the drive cover, make sure to completely cut off the power supply and wait for at least 10 minutes.
- Before wiring, make sure that the indicator (5-digit LED) on the drive panel is completely off, and the voltage between the positive and negative terminals of the main circuit is below 36 V DC.
- Only professionals who are sufficiently trained and qualified are allowed to wire the drive product.
- When connecting the emergency stop circuit or the safety circuit, check the wiring carefully before and after the operation.
- Check the voltage class of the drive before power-on. Otherwise, personal injuries and property 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 before leaving the factory. Please do not perform the withstand voltage test again.
- If it is needed to connect an external braking resistor, refer to the first chapter.
- Do not connect the power supply cable to U, V and W.
- The grounding cable generally comprises a copper wire with a diameter no less than 3.5 mm, and the grounding resistance shall be less than 10 Ω.
- Leakage current exists inside the drive product, the value of which is determined by actual use. To ensure safety, the drive and the motor must be grounded. A residual current device (RCD) is required. It is recommended to use the B type of RCD with a leakage current limit of 300 mA.
- To facilitate the input overcurrent protection and the power-off maintenance, it is required to use an air switch or a fuse cutout in the connection between the drive and the power supply.

The electrical diagram in Fig. 4-1 below is for the drive trial use.

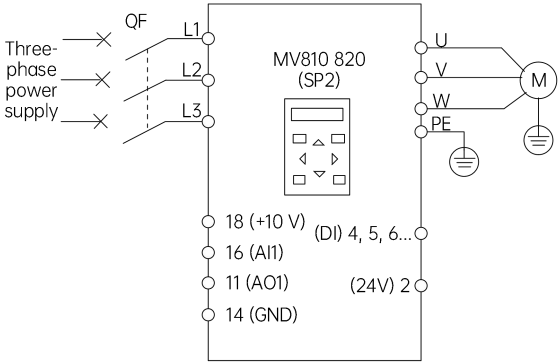


Fig. 4-1 Simplified wiring of the main circuit (for three-phase models)

Recommended cables for the drive using Euroblock are shown in the following table:

Table 4-1 Recommended cables

Type	Cable	Image	Type	Cable	Image
Main circuit cable	Power cable (pipe-type terminal connector)		Control circuit cable	Signal cable (pipe-type terminal connector)	
	Grounding cable (OT terminal connector)			Ethernet cable	

Recommended pipe-type terminal diameters of the drive using Euroblock are shown in the following table:

Table 4-2 Recommended pipe-type terminal diameter

Product model	Main circuit (mm^2)		Control circuit (mm^2)	Recommended pipe-type terminal diameter Φ (mm)		
	Input cable	Output cable	Control terminal cable	Input cable	Output cable	Control terminal cable
2SS series						
MV810G1-2SS0.4(SP2)	1.5	1.5	0.5	2.0	2.0	1.3
MV810G1-2SS0.75(SP2)	2.5	2.5	0.5	2.6	2.6	1.3
MV810G1-2SS1.5(SP2)	4.0	4.0	0.5	3.2	3.2	1.3
MV810G1-2SS2.2(SP2)	6.0	6.0	0.5	3.9	3.9	1.3
MV810G1-2SS4.0(SP2)	10.0	10.0	0.5	5.0	5.0	1.3
2S series						
MV810G1-2S0.4(SP2)	1.0	1.0	0.5	1.7	1.8	1.3
MV810G1-2S0.75(SP2)	1.5	1.5	0.5	2.0	2.0	1.3
MV810G1-2S1.5(SP2)	2.5	2.5	0.5	2.6	2.6	1.3
MV810G1-2S2.2(SP2)	4	4	0.5	3.2	3.2	1.3
MV810G1-2S4.0(SP2)	6	6	0.5	3.9	3.9	1.3
MV810G1-2S5.5(SP2)	10.0	10.0	0.5	5.0	5.0	1.3
2T series						
MV810G1-2T2.2(SP2)	2.5	2.5	0.5	2.6	2.6	1.3
MV810G1-2T4.0(SP2)	6	6	0.5	3.9	3.9	1.3
MV810G1-2T5.5(SP2)	6	6	0.5	3.9	3.9	1.3
MV810G1-2T7.5(SP2)	6	6	0.5	3.9	3.9	1.3
4T series						
MV810G1-4T0.75(SP2)	1	1	0.5	1.8	1.8	1.3
MV810G1-4T1.5(SP2)	1.5	1.5	0.5	2.0	2.0	1.3
MV810G1-4T2.2(SP2)	1.5	1.5	0.5	2.0	2.0	1.3
MV810G1-4T4.0(SP2)	2.5	2.5	0.5	2.6	2.6	1.3
MV810G1-4T5.5(SP2)	4	4	0.5	3.2	3.2	1.3
MV810G1-4T7.5(SP2)	6	6	0.5	3.9	3.9	1.3
MV810G1-4T11(SP2)	6	6	0.5	3.9	3.9	1.3
MV810G1-4T15(SP2)	6	6	0.5	3.9	3.9	1.3
Note: Values in the table are only for recommendation.						

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

Table 4-3 Recommended fastening screw torque

Enclosure	Product model	Main circuit terminals			Control circuit terminal
		L1, L2, L3, N	U, V, W, ⏚	+, -, BR	1 to 18
2SS series					
B	MV810G1-2SS0.4(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
	MV810G1-2SS0.75(SP2)				
	MV810G1-2SS1.5(SP2)				
C	MV810G1-2SS2.2(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
D	MV810G1-2SS4.0(SP2)	1.5 N·m	1.5 N·m	1.5 N·m	0.2 N·m
E	MV810G1-2SS5.5(SP2)	2.8 N·m	2.8 N·m	2.8 N·m	0.2 N·m
2S series					
B	MV810G1-2S0.4(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
	MV810G1-2S0.75(SP2)				
	MV810G1-2S1.5(SP2)				
	MV810G1-2S2.2(SP2)				
C	MV810G1-2S4.0(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
D	MV810G1-2S5.5(SP2)	1.5 N·m	1.5 N·m	1.5 N·m	0.2 N·m
E	MV810G1-2S7.5(SP2)	2.8 N·m	2.8 N·m	2.8 N·m	0.2 N·m
2T series					
B	MV810G1-2T2.2(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
C	MV810G1-2T4.0(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
D	MV810G1-2T5.5(SP2)	1.5 N·m	1.5 N·m	1.5 N·m	0.2 N·m
	MV810G1-2T7.5(SP2)				
E	MV810G1-2T11(SP2)	2.8 N·m	2.8 N·m	2.8 N·m	0.2 N·m
4T series					
B	MV810G1-4T0.75(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
	MV810G1-4T1.5(SP2)				
	MV810G1-4T2.2(SP2)				
	MV810G1-4T4.0(SP2)				
C	MV810G1-4T5.5(SP2)	0.5 N·m	0.5 N·m	0.5 N·m	0.2 N·m
	MV810G1-4T7.5(SP2)				
D	MV810G1-4T11(SP2)	1.5 N·m	1.5 N·m	1.5 N·m	0.2 N·m
	MV810G1-4T15(SP2)				
E	MV810G1-4T18.5(SP2)	2.8 N·m	2.8 N·m	2.8 N·m	0.2 N·m
	MV810G1-4T22(SP2)				
F	MV810G1-4T30(SP2)	3.5 N·m	3.5 N·m	3.5 N·m	0.2 N·m
	MV810G1-4T37(SP2)				
G	MV810G1-4T45(SP2)	4.5 N·m	4.5 N·m	4.5 N·m	0.2 N·m

Enclosure	Product model	Main circuit terminals			Control circuit terminal
		L1, L2, L3, N	U, V, W, ⏚	+, -, BR	1 to 18
	MV810G1-4T55(SP2)				
	MV810G1-4T75(SP2)				
H	MV820G1-4T90(SP2)	20 N·m	20 N·m	20 N·m	0.5 N·m
	MV820G1-4T110(SP2)				
I	MV820G1-4T132(SP2)	20 N·m	20 N·m	20 N·m	0.5 N·m
	MV820G1-4T160(SP2)				
J	MV820G1-4T185(SP2)	35 N·m	35 N·m	35 N·m	0.5 N·m
	MV820G1-4T200(SP2)				
	MV820G1-4T220(SP2)				
K	MV820G1-4T250(SP2)	35 N·m	35 N·m	35 N·m	0.5 N·m
	MV820G1-4T280(SP2)				
L	MV820G1-4T315(SP2)	100 N·m	100 N·m	100 N·m	0.5 N·m
	MV820G1-4T355(SP2)				
	MV820G1-4T400(SP2)				

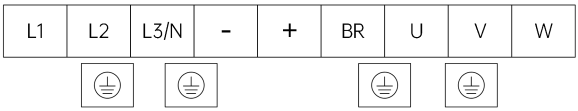
4.1 Main circuit terminal description and wiring

4.1.1 Main circuit input/output terminal types

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

(1) Terminal type 1

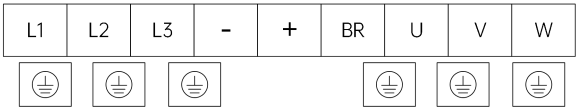
Enclosure B



Terminal name	Function
L1, L2, L3/N	Three-phase AC 380 V or three-phase AC 220 V input terminals
L1, L3/N	2SS/2S models: single-phase 220 V AC input terminals
+, BR	Terminals for external braking resistor connection
+, -	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal, screws used to fix the cable fixation bracket

(2) Terminal type 2

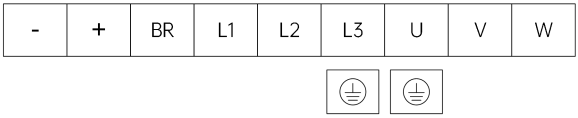
Enclosure C; Enclosure D



Terminal name	Function
L1, L2, L3	Three-phase 380 V AC, or three-phase 220 V AC input terminals
+, BR	Terminals for external braking resistor connection
+, -	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal, screws used to fix the cable fixation bracket

(3) Terminal type 3

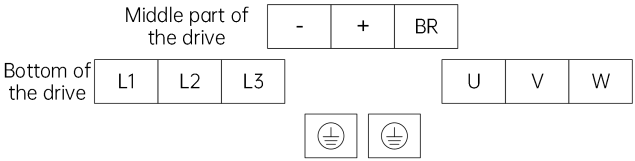
Enclosure E



Terminal name	Function
L1, L2, L3	Three-phase 380 V AC input terminals
+, BR	Terminals for external braking resistor connection
+, -	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal, screws used to fix the cable fixation bracket

(4) Terminal type 4

Enclosure F

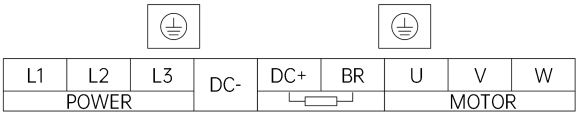


Terminal name	Function
L1、L2、L3	Three-phase 380 V AC, or three-phase 220 V AC input terminals
+, BR	Terminals for external braking resistor connection

Terminal name	Function
+, -	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal, screws used to fix the cable fixation bracket

(5) Terminal type 5

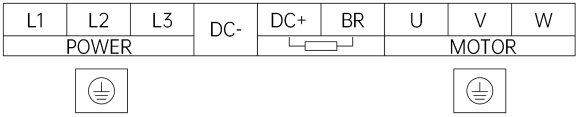
Enclosure G



Terminal name	Function
L1, L2, L3	Three-phase 380 V AC input terminals
DC+, BR	Terminals for external braking resistor connection
DC+, DC-	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal

(6) Terminal type 6

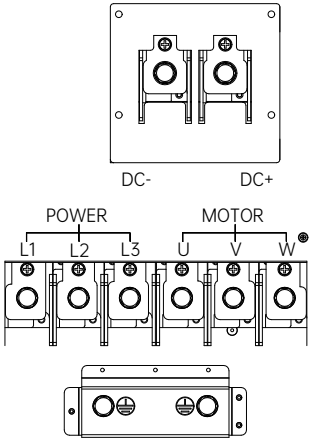
Enclosure H



Terminal name	Function
L1, L2, L3	Three-phase 380 V AC input terminals
DC+, BR	Terminals for external braking resistor connection
DC+, DC-	DC bus terminals
U, V, W	Three-phase AC output terminals
⏚	PE connection terminal

(7) Terminal type 7

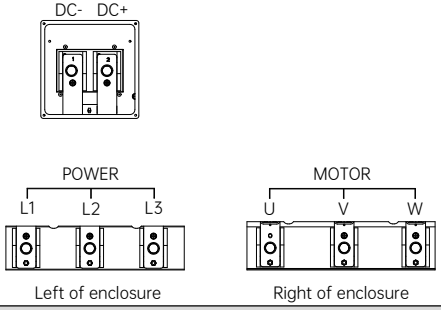
Enclosure I



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

(8) Terminal type 8

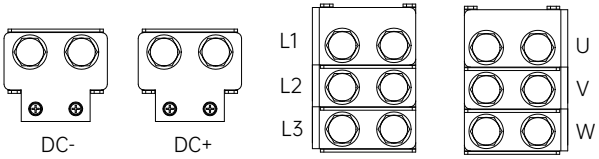
Enclosure J



Terminal name	Function
L1, L2, L3	Three-phase 380 V AC input terminals
DC+, DC-	DC bus terminals
U, V, W	Three-phase AC output terminals

(9) Terminal type 9

Enclosure K; Enclosure L



Left side Front side

Terminal name	Function description
L1, L2, L3	Three-phase 380 VAC input terminals
U, V, W	Motor wiring terminals
DC+, DC-	DC bus terminals

WARNING

(1) In applications of common DC bus, the positive and negative poles of the DC input should be connected to +/DC+ and -/DC- terminals respectively, which would enable the power-on buffering function for the internal DC bus capacitor of the drive.

(2) Connect the cable fixation bracket to the grounding plate via two PE terminals.

4.1.2 Electrical connection between drive and options

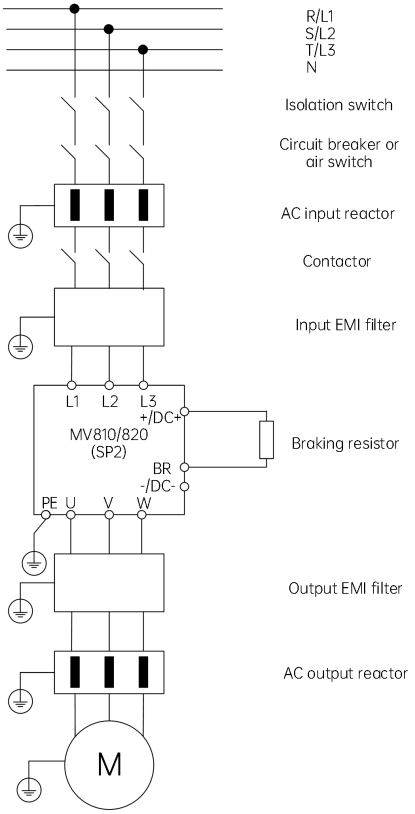


Fig. 4-2 Electrical connection between the drive and options (example based on three-phase models)

(1) A current breaking device, such as an isolation switch, shall be applied between the mains and the drive to ensure safety during maintenance.

(2) When using this drive product in North America, a time-delay fuse shall be applied before the drive (rated fuse current shall be 225% of the maximum full-load output current) to limit the extent of influence in case of a downstream device fault. Refer to the Table 4-4 for fuse selection.

(3) During wiring, refer to Table 4-4 for the cross section requirements of main circuit and control circuit. Note that the cable value for the main circuit are for a single cable while "x2" indicates two same cables in parallel.

Table 4-4 Recommended fuse capacity and cross section of the insulated copper-core wire

Product model	Input line protection	Main circuit (mm^2)		Control circuit (mm^2)
	Fuse (A)	Input cable	Output cable	Control terminal cable
2SS series				
MV810G1-2SS0.4(SP2)	15	1.5	1.5	0.5
MV810G1-2SS0.75(SP2)	20	2.5	2.5	0.5
MV810G1-2SS1.5(SP2)	30	4	4	0.5
MV810G1-2SS2.2(SP2)	80	6	6	0.5
MV810G1-2SS4.0(SP2)	100	10	10	0.5
MV810G1-2SS5.5(SP2)	100	10	10	0.5
2S series				
MV810G1-2S0.4(SP2)	10	1.0	1.0	0.5
MV810G1-2S0.75(SP2)	15	1.5	1.5	0.5
MV810G1-2S1.5(SP2)	20	2.5	2.5	0.5
MV810G1-2S2.2(SP2)	30	4	4	0.5
MV810G1-2S4.0(SP2)	80	6	6	0.5
MV810G1-2S5.5(SP2)	100	10	10	0.5
MV810G1-2S7.5(SP2)	150	16	16	0.5
2T series				
MV810G1-2T2.2(SP2)	30	2.5	2.5	0.5
MV810G1-2T4.0(SP2)	40	6	6	0.5
MV810G1-2T5.5(SP2)	40	6	6	0.5
MV810G1-2T7.5(SP2)	70	6	6	0.5
MV810G1-2T11(SP2)	125	16	16	0.5
4T series				
MV810G1-4T0.75(SP2)	10	1	1	0.5
MV810G1-4T1.5(SP2)	10	1.5	1.5	0.5
MV810G1-4T2.2(SP2)	15	1.5	1.5	0.5
MV810G1-4T4.0(SP2)	30	2.5	2.5	0.5
MV810G1-4T5.5(SP2)	40	4	4	0.5
MV810G1-4T7.5(SP2)	60	6	6	0.5
MV810G1-4T11(SP2)	70	6	6	0.5
MV810G1-4T15(SP2)	70	6	6	0.5
MV810G1-4T18.5(SP2)	100	10	10	0.5
MV810G1-4T22(SP2)	125	16	16	0.5
MV810G1-4T30(SP2)	125	25	25	0.5
MV810G1-4T37(SP2)	150	25	25	0.5
MV810G1-4T45(SP2)	200	35	35	0.5
MV810G1-4T55(SP2)	250	35	35	0.5

Product model	Input line protection	Main circuit (mm^2)		Control circuit (mm^2)
	Fuse (A)	Input cable	Output cable	Control terminal cable
MV810G1-4T75(SP2)	275	70	70	0.5
MV820G1-4T90(SP2)	325	70	70	1.0
MV820G1-4T110(SP2)	400	95	95	1.0
MV820G1-4T132(SP2)	500	150	150	1.0
MV820G1-4T160(SP2)	600	185	185	1.0
MV820G1-4T185(SP2)	800	240	240	1.0
MV820G1-4T200(SP2)	800	150x2	150x2	1.0
MV820G1-4T220(SP2)	800	150x2	150x2	1.0
MV820G1-4T250(SP2)	800	150x2	150x2	1.0
MV820G1-4T280(SP2)	800	150x2	150x2	1.0
MV820G1-4T315(SP2)	1400	185x2	185x2	1.0
MV820G1-4T355(SP2)	1400	185x2	185x2	1.0
MV820G1-4T400(SP2)	1400	240x2	240x2	1.0
Note: Values in the table are only for recommendation.				

(4) When the contactor is used for power supply control, do not use it to control the power on/off of the drive.

(5) AC input reactor

If the power grid waveform distortion is severe, or the interaction of high-order harmonics between the drive and the power supply cannot meet the requirements after the drive is configured with a DC reactor, an AC input reactor can be applied additionally. The AC input reactor can also improve the power factor at the input side of the drive.

(6) AC output reactor

When the length of the cable connecting the drive and the motor exceeds 80 m, it is recommended to use stranded cables and install an AC output reactor that serves to suppress the high-frequency oscillation. Such measures can minimize the risks of motor insulation damage, excessive leakage current, and frequent drive protection.

(7) Input EMI filter

An optional EMI filter can be employed to suppress the high-frequency noise interference from the power cable.

(8) Output EMI filter

An optional EMI filter can be employed to suppress the noise interference and the leakage current generated at the output side of the drive.

(9) Safety grounding cable

There is leakage current in the drive. To ensure safety, the drive and the motor must be grounded, and the grounding resistance shall be less than 10 Ω. The grounding cable shall be as short as possible, and its diameter shall comply with the requirements in Table 4-5.

Note:

The values in the table are applicable only when the same metal is used for both types of conductors. If not, the cross sectional area of the protective conductor shall be determined through calculation using the equivalent conductivity coefficient method.

Table 4-5 Cross sectional area of protective conductors

Cross sectional area S (mm^2) of phase conductors	Minimum cross sectional area Sp (mm^2) of protective conductors
S ⩽ 16	S
16 < S ⩽ 35	16
35 < S	S/2

WARNING

The input/output EMI filter shall be installed as close to the drive as possible.

4.2 Control circuit description and wiring

4.2.1 Control circuit terminal layout

(1) Models of 75 kW and below

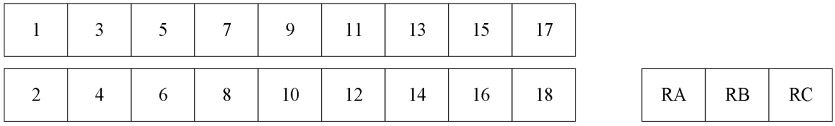


Fig. 4-3 Control circuit terminal layout 1

(2) Models of 90 kW and above

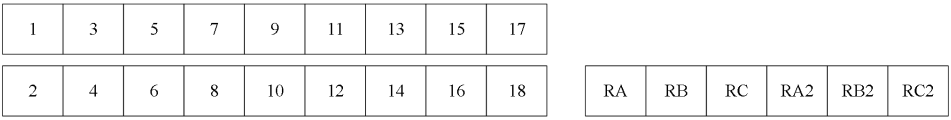


Fig. 4-4 Control circuit terminal layout 2

WARNING

① The standard configuration for models of 75 kW and below includes 3 DOs and 1 relay output (RO1).

② The standard configuration for models of 90 kW and above includes 2 DOs and 2 relay outputs (RO1 and RO2).

4.2.2 Control circuit terminal wiring

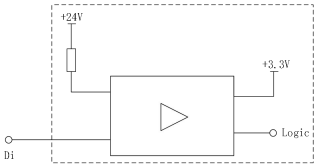
WARNING

It is recommended to employ wires exceeding 0.5 mm^2 for the connection of the control circuit terminals.

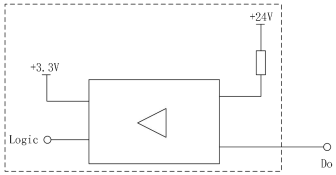
The terminal functions are explained in Table 4-6.

Table 4-6 Interface board terminal function

Type	Mark	Name	Function	Specifications
Communication	1	RS485	485 differential signal positive (reference ground: GND)	Standard RS485 communication interface; Use twisted pair cables or shielded cables.
	3		485 differential signal negative (reference ground: GND)	
Power supply	2/9	+24 V power supply	+24 V reference power output	Maximum allowable output current: 200 mA (the total current with all digital outputs included).
	18	+10 V power supply	+10 V reference power output	Maximum allowable output current: 10 mA.
	14/17	+24 V, +10 V power ground	Reference ground of +24 V and +10 V power supplies	Reference 0 V for digital input/output, analog input/output, and communication signals.
Analog input	16	Analog single-ended input AI1	It receives analog voltage/current single-ended input. Select the input via the setting of function code P09.01 (reference ground: GND).	Input voltage: 0 V to 10 V (input impedance: 100 kΩ). Resolution: 1/4000; Input current: 0 mA to 20 mA (input impedance: 165 Ω). Resolution: 1/4000.
	13	Analog single-ended input AI2 or analog current differential input AI2	It receives analog voltage/current single-ended input, or current differential input. Select the analog voltage/current input via the setting of function code P09.02 (reference ground: GND).	Input voltage: -10 V to 10 V (input impedance: 100 kΩ). Resolution: 1/4000; Input current: 0 mA to 20 mA (input impedance: 10 Ω). Resolution: 1/4000; supporting differential input.
	15	Differential input current return terminal AI2_RE	Used as the current return terminal during analog current differential input. If the analog current input is single-ended, it is	Input current: 0 mA to 20 mA (input impedance: 10 Ω). Resolution: 1/4000; supporting differential input.

<table>
<tr><th>Type</th><th>Mark</th><th>Name</th><th>Function</th><th>Specifications</th></tr>
<tr><td></td><td></td><td></td><td>required to connect this terminal to GND.</td><td></td></tr>
<tr><td>Analog output</td><td>11</td><td>Analog output AO1</td><td>It serves as the analog voltage/current output, with 28 types of outputs allowed. Select the analog voltage/current output via the setting of function code P09.02 (reference ground: GND).</td><td>Output voltage: 0 to 10 V, ±5%
Output current: 0 to 20 mA</td></tr>
<tr><td rowspan="7">Multi-function input terminals</td><td>4</td><td>Multi-function DI1</td><td rowspan="7">Select the terminal function from multi-function DI, HDI, and thermistor signal input via the setting of function codes P09.00 and P09.01 (reference ground: GND). For details, refer to the input functions of P09.03 to P09.10 and the two/three-wire control functions of P09.14.</td><td rowspan="2">For input circuit function selection, refer to the multi-function input/output terminal wiring as shown in the diagram below:


Example:
<table>
<tr><td>P09.00</td><td>Terminal 5</td><td>Terminal 4</td></tr>
<tr><td>0x00</td><td>DI2</td><td>DI1</td></tr>
<tr><td>0x21</td><td>HDO2</td><td>DO1</td></tr>
<tr><td>...</td><td>...</td><td>...</td></tr>
</table></td></tr>
<tr><td>5</td><td>Multi-function DI2</td></tr>
<tr><td>6</td><td>Multi-function DI3</td><td>These two terminals serve respectively as the digital inputs DI3 and DI4 only, and can not be set to other signal input/output functions via the setting of function codes.</td></tr>
<tr><td>8</td><td>Multi-function DI4</td></tr>
<tr><td>7</td><td>Multi-function DI5 or thermistor signal</td><td>This terminal can be used as the digital input DI5 via the setting of the function code P09.01; it can also be used as the thermistor signal input (PT1000 and KTY84-130) via the setting of the function code P97.26.</td></tr>
<tr><td>10</td><td>Multi-function DI6 or HDI</td><td>This terminal can be used as the digital input DI6 or the digital pulse HDI input (pulse range: 0 to 50 kHz) via the setting of function code P09.01.</td></tr>
<tr><td>12</td><td>Multi-function DI7</td><td>This terminal serves as the digital input DI7 only, and can not be set to other signal input/output functions via the setting of</td></tr>
</table>

<table>
<tr><th>Type</th><th>Mark</th><th>Name</th><th>Function</th><th>Specifications</th></tr>
<tr><td rowspan="2"></td><td></td><td></td><td rowspan="2"></td><td>function codes.</td></tr>
<tr><td>16</td><td>Multi-function AI1</td><td>This terminal can be used as the digital input DI8 or the analog input AI1 via the setting of function code P09.01.</td></tr>
<tr><td rowspan="3">Multi-function output terminals</td><td>4</td><td>Open collector output terminal Y1;
DO1 output terminal;
HDO1 pulse output terminal</td><td rowspan="2">Terminals 4 and 5 serve as the general-purpose multi-functional terminals (same as terminals 6, 8, 7, 10, 12, and 16). In addition, these two can also be used as DO/HDO via the setting of function codes (reference ground: GND). For details, refer to the input functions of P09.00 to P09.02.</td><td>For input circuit function selection, refer to the multi-function input/output terminal wiring as shown in the diagram below:


Example:
<table>
<tr><td>P09.00</td><td>Terminal 5</td><td>Terminal 4</td></tr>
<tr><td>0x21</td><td>HDO2</td><td>DO1</td></tr>
<tr><td>0x22</td><td>HDO2</td><td>HDO1</td></tr>
<tr><td>...</td><td>...</td><td>...</td></tr>
</table>
Maximum working voltage: 30 V
Maximum output current: 50 mA</td></tr>
<tr><td>5</td><td>Open collector output terminal Y2;
DO2 output terminal;
HDO2 pulse output terminal</td></tr>
<tr><td>11</td><td>DO3/RO2 output terminal</td><td>This terminal can be used as multi-function DO/AO via the setting of function codes (reference ground: GND).
For details, refer to the functions of P09.02.</td><td>DO3 for models of 75 kW and below.
This terminal can be used as DO3 via the setting of function code P09.02.
Maximum output current: 50 mA

RO2 for models of 90 kW and above</td></tr>
<tr><td rowspan="3">Relay output terminal RO1</td><td>RA</td><td rowspan="3">Relay output</td><td rowspan="3">These terminals can be used as multi-function relay outputs via the setting of function codes. Refer to the output functions of P10.03.</td><td rowspan="3">RA - RB: NC. RA - RC: NO
Contact capacity:
250 V AC / 2 A (COSΦ = 1)
250 V AC / 1 A (COSΦ = 0.4)
30 V DC / 1 A
Refer to the description of P10 for usage instructions. The overvoltage category of the input voltage of the relay output terminal is category II.</td></tr>
<tr><td>RB</td></tr>
<tr><td>RC</td></tr>
<tr><td rowspan="3">Relay output terminal RO2</td><td>RA2</td><td rowspan="3">Relay output</td><td rowspan="3">These terminals can be used as multi-function relay outputs via the setting of function codes.</td><td rowspan="3">RA - RB: NC. RA - RC: NO
Contact capacity:
250 V AC / 2 A (COSΦ = 1)
250 V AC / 1 A (COSΦ = 0.4)</td></tr>
<tr><td>RB2</td></tr>
<tr><td>RC2</td></tr>
</table>

Type	Mark	Name	Function	Specifications
			Refer to the output functions of P10.02.	30 V DC / 1 A Refer to the description of P10 for usage instructions. The overvoltage category of the input voltage of the relay output terminal is category II.

WARNING

(1) Most of the multi-function terminals can be used as input/output of multiple types, including DI, DO, HDI, HDO, AI, AO, and thermocouple input.

(2) The internal circuit of the drive is not illustrated in the multi-function DI/DO wiring diagram, but represented by a symbol (▷) instead.

4.2.2.1 AI terminal wiring

(1) Terminal 16 receives the single-ended input of analog voltage or current. The type of input can be selected from voltage or current via the setting of the thousands place of P09.01. The wiring method is shown in Fig. 4-5.

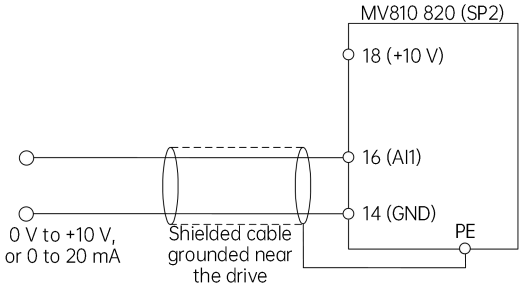


Fig. 4-5 Terminal 16 single-ended input wiring

(2) Terminal 13 receives the analog current differential input, or analog voltage/current single-ended input. The type of input can be selected from voltage or current via the setting of the ones place of P09.02. The wiring method is shown in Fig. 4-6, Fig. 4-7, and Fig. 4-8.

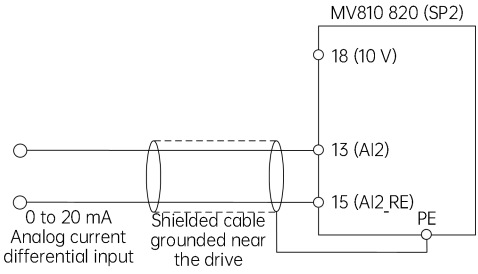


Fig. 4-6 Terminal 13 current differential input wiring

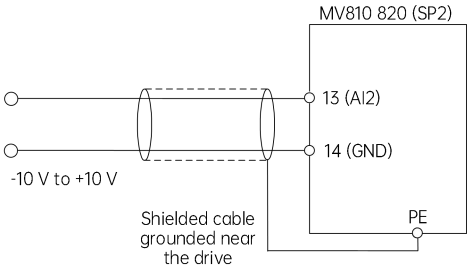


Fig. 4-7 Terminal 13 voltage single-ended input wiring

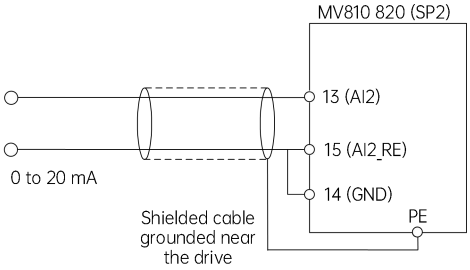


Fig. 4-8 Terminal 13 current single-ended input wiring

4.2.2.2 AO terminal wiring

Analog output terminal AO1 is connected to an external analog meter to indicate multiple physical quantities. The type of output can be selected from analog voltage or current via the setting of P09.02. The terminal wiring method is shown in Fig. 4-9.

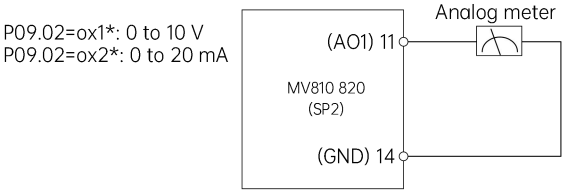


Fig. 4-9 AO terminal wiring

WARNING

(1) For analog input, a filter capacitor or common mode inductor can be installed between the input signal and the GND.

(2) The voltage of the analog input signal shall not exceed 12 V.

(3) The analog input/output signal is vulnerable to external interference. Thus, shielded cables shall be employed and reliably grounded, and the length shall be as short as possible.

(4) The analog output terminal can withstand a voltage up to 12 V.

4.2.2.3 Communication interface wiring

MV810 820 (SP2) provides an RS485 serial communication interface for users. Using the following wiring methods, a control system of single-host-single-slave or single-host-multi-slave can be created. The software of the host (PC or PLC controller) enables multiple control functions performed to the drive in the system, including real-time monitoring, remote control, auto control, and other complicated operations (for example, infinite multi-stage PLC running).

(1) Wiring of the connection between the drive and the host with RS485 interface:

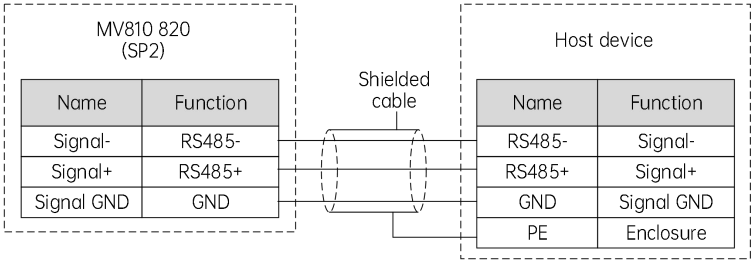


Fig. 4-10 485-RS485 communication wiring

(2) Wiring of the connection between the drive and the host with RS232 interface:

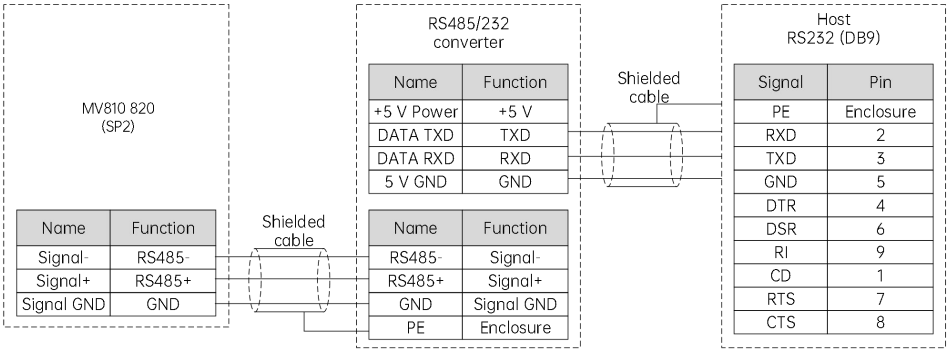


Fig. 4-11 485-(RS485/232)-RS232 communication wiring

(3) Wiring of the multi-drive connection in a single RS485 network:

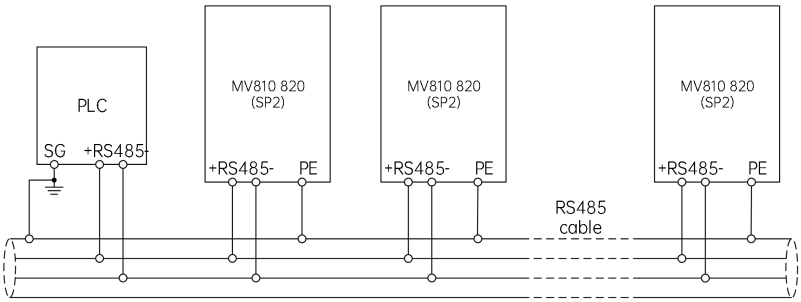


Fig. 4-12 Recommended wiring method for the connection between the PLC and multiple drives (make sure all the drives and motors are reliably grounded)

In case the communication is abnormal when the above recommended wiring method is used, try the following measures:

(1) Provide dedicated power supply for the PLC (or the host device), or isolate its power supply. In case of significant external interference, isolate its communication cables to protect the PLC (or the host device) from being interfered;

(2) Provide dedicated power supply for any RS485/RS232 converter used;

(3) Use magnetic rings on the communication cables;

(4) Reduce the carrier frequency of the drive properly if the on-site conditions permit.

WARNING

(1) An isolated RS485 converter shall be used in places with significant interference.

(2) The RS485 can not withstand a voltage over 30 V.

4.2.2.4 Multi-function input terminal wiring

MV810 820 (SP2) offers multi-function input terminals 4, 5, 6, 7, 8, 10, 12, and 16, which can be set as digital inputs DI1 to DI8 via function codes P09.00 and P09.01. Multiple wiring methods are available via the setting of terminal open-circuit voltage selection P09.11. Typical wiring methods are illustrated below:

(1) P09.11 = 0 (set the digital terminal open-circuit voltage to 0 V)

① Dry contact mode, as shown in Fig. 4-13.

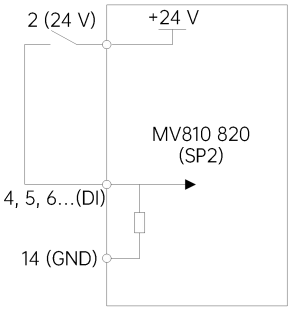


Fig. 4-13 Wiring when using the internal +24 V power supply of the drive

② Wiring when the internal power supply of the drive is used and the external controller adopts the PNP common emitter output, as shown in Fig. 4-14.

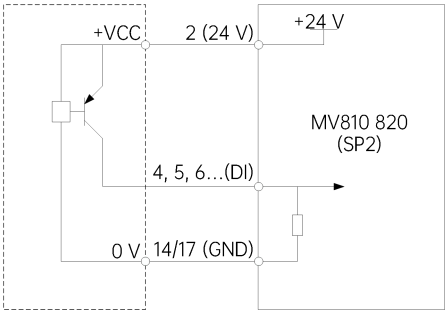


Fig. 4-14 Wiring when using the internal power supply and the PNP type external controller

③ Wiring when the external power supply is used and the external controller adopts the PNP common emitter output, as shown in Fig. 4-15.

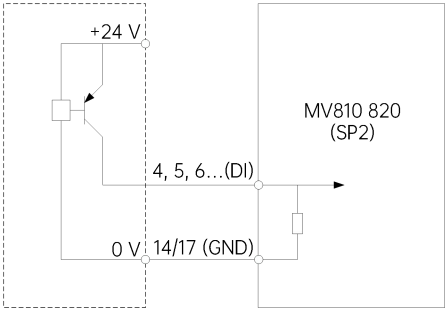


Fig. 4-15 Wiring when using the external power supply and the PNP type external controller

(2) P09.11 = 1 (set the digital terminal open-circuit voltage to 24 V)

① Dry contact mode, as shown in Fig. 4-16.

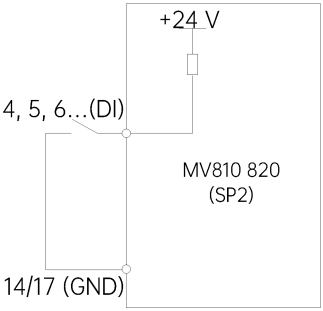


Fig. 4-16 Wiring when using the internal +24 V power supply of the drive

② Wiring when the external controller adopts the NPN common emitter output, as shown in Fig. 4-17.

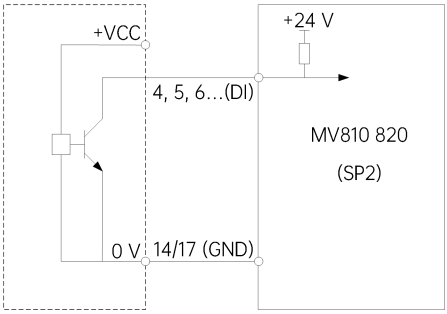


Fig. 4-17 Wiring when using the NPN type external controller

4.2.2.5 Multi-function output terminal wiring

The multi-function output terminals 4 (DO1), 5 (DO2), and 11 (DO3) can use the internal +24 V power supply of the drive (load capacity no more than 200 mA). The wiring method is shown in Fig. 4-18.

WARNING

The inductive load (such as a relay) must be anti-parallel with the fly-wheel diode.

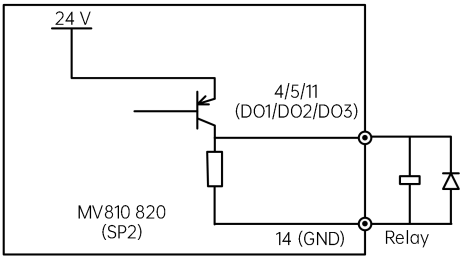


Fig. 4-18 Wiring of the multi-function DO

4.2.2.6 Wiring of the relay outputs RA, RB, and RC

To drive the inductive loads (e.g., electromagnetic relay or contactor), a surge absorption circuit shall be added, such as the RC absorption circuit (whose leakage current shall be less than the holding current of the contactor or relay that it controls), piezoresistor, or fly-wheel diode (it is used in DC electromagnetic circuit; check its polarity carefully during installation). The components of the absorption circuit shall be installed near the two ends of the coil of the relay or contactor.

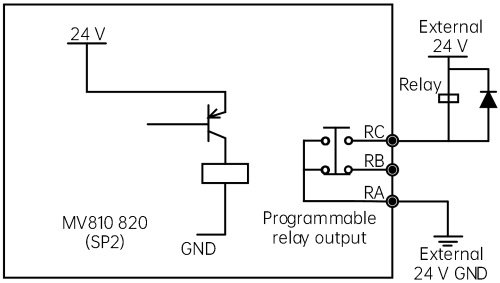


Fig. 4-19 Wiring of the relay outputs RA/RB/RC

WARNING

(1) Do not short the 24 V terminal and the GND terminal. Otherwise, there is a risk of control board damage.

(2) For connection of the control terminals, use multi-core shielded cables or twisted cables (1 mm^2 or above).

(3) When a shielded cable is used, the end of the shield which is closer to the drive shall be connected to the grounding terminal PE of the drive.

(4) The control cables shall be kept at least 20 cm away from the main circuit and high-voltage circuit (including the power cable, motor cable, relay cable, contactor connection cable, etc.). Use perpendicular crossing layout and avoid parallel layout in wiring to reduce interference which may cause misoperation of the drive.

(5) For relays other than 24 V, an appropriate resistor shall be selected according to the relay parameters and connected in series to the relay circuit.

(6) The digital output terminals can not withstand a voltage over 30 V.

4.2.3 Control board layout

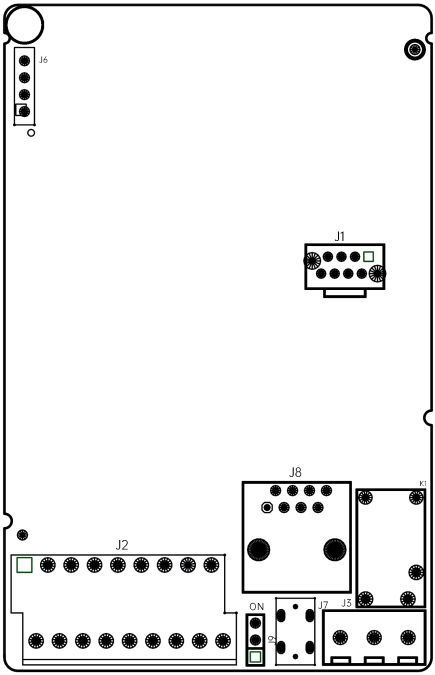


Fig. 4-20 Control board layout of 75 kW and below

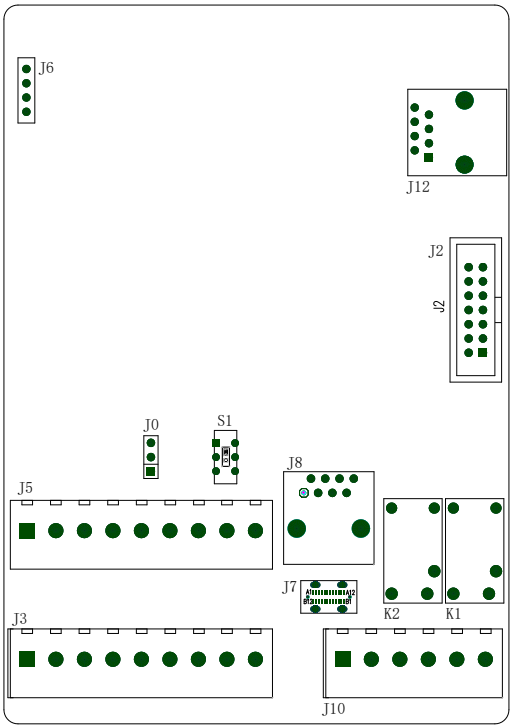


Fig. 4-21 Control board layout of 90 kW and above

4.3 Installation method compliant with EMC requirements

Noise is inevitable during the drive operation, which deviates from the EMC requirements. To reduce the interference of the drive to the environment, detailed installation methods are provided in this section, which complies with the EMC requirements in terms of noise suppression, field wiring, grounding, leakage current, and power filter.

4.3.1 Noise suppression

The noise made by the drive may affect the equipment nearby. The extent of such influence is determined by various factors, including the noise immunity of the drive control system and related devices, the wiring environment, the installation distance, the grounding method, etc.

4.3.1.1 Types of noise

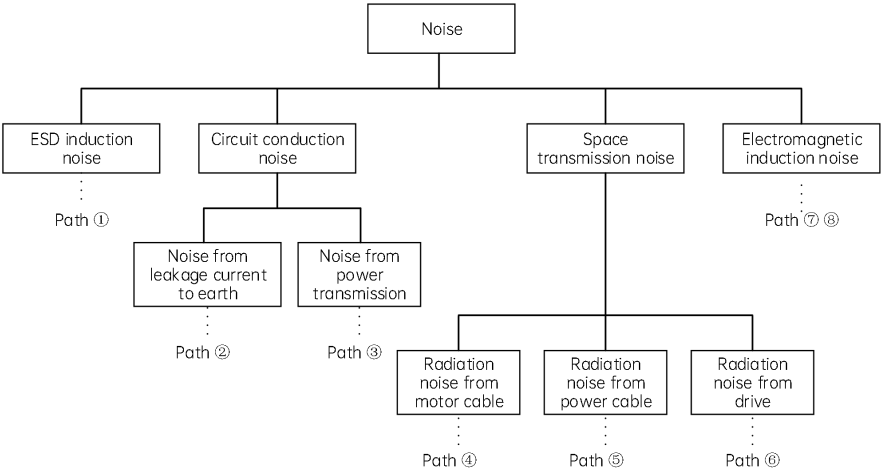


Fig. 4-22 Types of noise

4.3.1.2 Noise transmission path

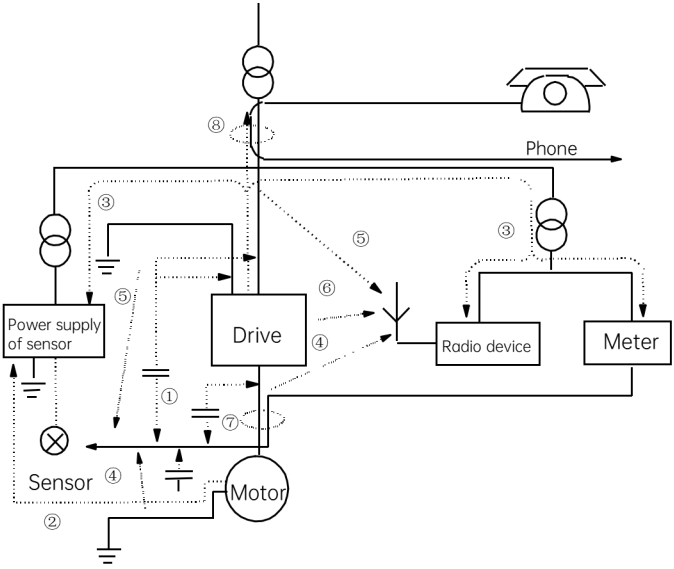


Fig. 4-23 Noise transmission path

4.3.1.3 Basic measures for noise suppression

Table 4-7 Measures for noise suppression

Path	Measure
②	If the external devices form a closed loop due to the drive wiring, the leakage current of the grounding cable may cause misoperation of relevant devices. The misoperation can be reduced if the grounding is removed.
③	When the external devices and the drive share the same power system, the noise generated by the drive will be transmitted along the power cable in a reverse direction, causing misoperation of other devices in the system. Take the following measures: install a noise filter at the input end of the drive, and use an isolation transformer or power filter to isolate the noise for other devices.
④⑤⑥	If the devices (for processing weak signals, such as measuring instruments, radio devices, and sensors) and their signal cables are installed in the same cabinet with the drive and the wiring is very close, misoperation may occur due to noise in the space. Take the following measures: (1) Devices and signal cables vulnerable to noise should be installed away from the drive. The signal cables should be shielded, with the shield layer grounded. Besides, the shielded cable shall be put into a metal tube, and placed away from the drive and its input/output cables. If the signal cable inevitably crosses the power cable, keep them orthogonal. (2) Install a radio noise filter and a linear noise filter (ferrite common mode choke) at the input and output ends of the drive respectively to suppress the radiation noise of the power cable. (3) The motor cable shall be placed in a thick shelter, such as a thick pipe (thickness exceeding 2 mm), or buried into the cement trough. The power cable shall be put into a metal tube, and grounded using a shielded cable (use 4-core cables for the motor cable, with one end grounded at the drive side, and the other end connected to the motor shell)
①⑦⑧	If the signal cables are laid in parallel with the power cables or bundled together with the power cables, electromagnetic induction noise and static induction noise generated will be transmitted along the signal cables to cause misoperation. Thus, such wiring should be avoided. Vulnerable devices shall be kept away from the drive, and vulnerable signal cables shall be kept away from the input/output cables of the drive. Besides, use shielded cables for signal and power cables, and put them into metal tubes to create better isolation. The distance between the metal tubes shall be at least 20 cm.

4.3.2 Field wiring requirements

To avoid interference coupling, the installed control cable, power cable and motor cable shall be kept away from each other, especially when the cables are installed parallel and extend for a long distance. If the signal cable inevitably crosses the power cable, ensure it crosses perpendicularly.

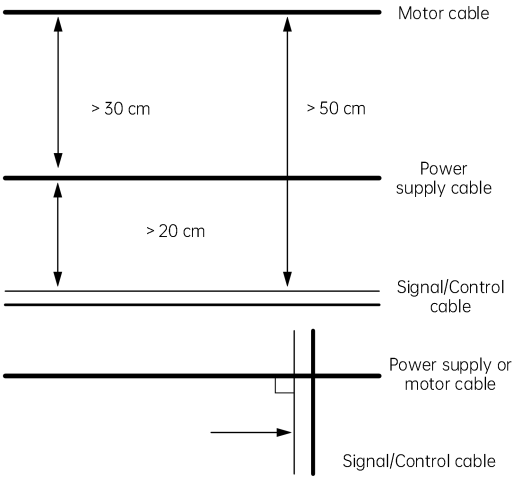


Fig. 4-24 System wiring requirements

If the motor cable is too long or its cross sectional area is too large, derated use is required. The larger the cross sectional area is, the larger the ground capacitance and ground leakage current will be. If the cable with larger cross sectional area is used, the output current shall be reduced by about 5% for each level of increase in area.

Shielded/Armored cables: it is recommended to use high-frequency low-impedance shielded cables, such as woven copper mesh, aluminum mesh, or iron mesh.

Generally, the control cable must be a shielded cable, and the shielded metal mesh must be connected to the metal enclosure of the drive using the cable clamps on both ends.

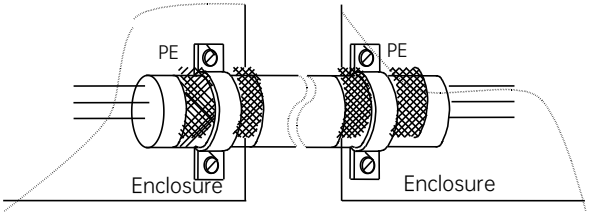


Fig. 4-25 Correct shield grounding

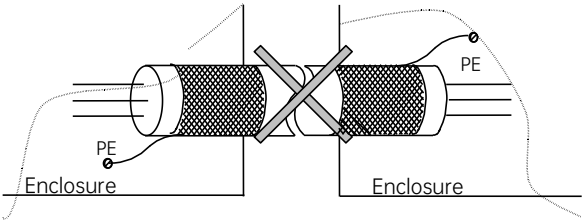


Fig. 4-26 Wrong shield grounding

4.3.3 Grounding

Dedicated grounding pole (optimal)

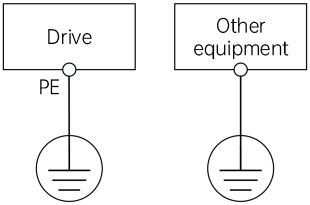


Fig. 4-27 Grounding diagram 1

Shared grounding pole (applicable)

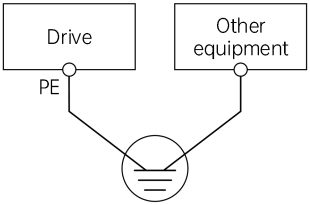


Fig. 4-28 Grounding diagram 2

Shared grounding cable (not recommended)

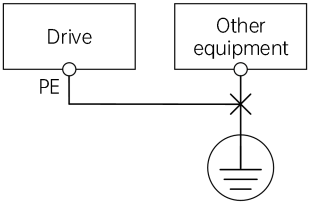


Fig. 4-29 Grounding diagram 3

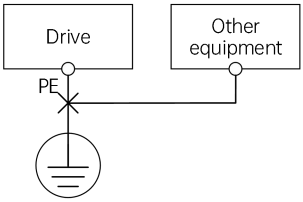


Fig. 4-30 Grounding diagram 4

In addition, pay attention to the following notes:

- To minimize the impedance of different grounding systems, a standard grounding cable of the largest size shall be adopted. The flat cable is preferable to other types, because its high-frequency impedance is smaller than that of the round cable with the same cross sectional area.
- One core of the 4-core motor cable shall be grounded at the drive side at one end, and the other end shall be connected to the motor grounding end. It is much better if the motor and drive use the dedicated grounding pole.
- If the grounding ends of the system are connected together, the leakage current will become a noise source which affects devices in the system. Therefore, the grounding end of the drive should be separate from the grounding ends of audio equipment, sensors, computers, and the like.
- To obtain low high-frequency impedance, the fixing bolt of the equipment can be used as the high-frequency terminal connected to the back plate of the cabinet. Remember to scratch off the insulation paint of the fixing point.
- The grounding cable should be as short as possible (the grounding point shall be as close to the drive as possible).

The grounding cable should be kept away from the I/O cables of noise-sensitive equipment and be as short as possible.

4.3.4 Installation of relay, contactor, and electromagnetic brake

For devices capable of generating high level noises, such as relays, contactors, and electromagnetic brakes, a surge suppressor shall be installed even these devices are installed outside the drive enclosure.

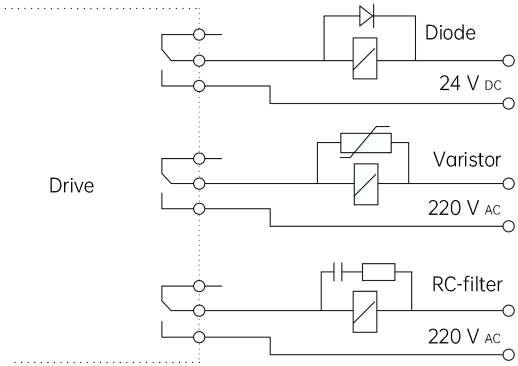


Fig. 4-31 Installation method for relay, contactor, and electromagnetic brake

4.3.5 Leakage current and countermeasures

The leakage current flows through the motor capacitor and the line capacitor at the input/output end of the drive. The magnitude of the leakage current depends on the distributed capacitance and the carrier frequency. There are two types of leakage current: grounding leakage current and line-to-line leakage current.

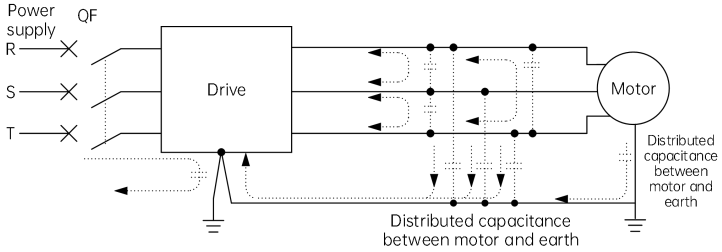


Fig. 4-32 Leakage current path

(1) Grounding leakage current

The leakage current not only flows through the drive system, but also invades other equipment and devices through the grounding cables, causing misoperation of the leakage circuit breaker, relay, and other equipment. If the carrier frequency gets higher, or the motor cable gets longer, the leakage current will be larger.

Countermeasures:

- Reduce the carrier frequency (the motor noise will increase);
- Make the motor cable as short as possible;
- Adopt the leakage circuit breaker dedicated for protection against the leakage current of high surge and high-order harmonics in the drive system and other related systems;
- Prevent the leakage protection by disconnecting the EMC capacitor connection screw, as shown in Fig. 4-33.

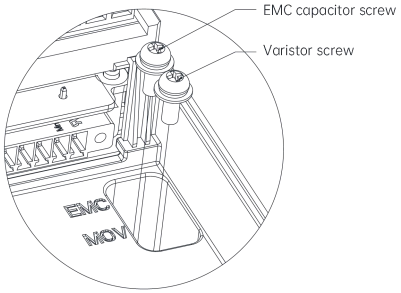


Fig. 4-33 Screws for EMC capacitor and varistor

(2) Line-to-line leakage current

When the leakage current flows through the distributed capacitance between the cables at the output ends of the drive, its high-order harmonics may cause misoperation of the external thermal relay. Larger leakage current may be generated by a drive with smaller power capacity (7.5 kW and below) and longer wiring cables (over 50 m), making misoperation more likely to happen.

Countermeasures:

- Reduce the carrier frequency (the motor noise will increase);
- Install a reactor at the output end.

To reliably protect the motor, it is recommended to use a temperature sensor to monitor the motor temperature, and use the overload protection function (electronic thermal relay) of the drive instead of the external thermal relay.

4.3.6 Drive installation compliant with EMC requirements

Partition principle

In the drive system formed by the drive and motor, the drive, control unit, and sensor are installed in the same cabinet. The noise needs to be suppressed at the main connection points. Therefore, the radio noise filter and input reactor shall be installed in the cabinet. The cabinet shall also meet the EMC requirements.

To physically isolate the noise source and the noise receiver in space in the mechanical/system design stage is the most effective yet expensive measure for interference reduction. In the drive system formed by the drive and motor, the noise source could be the drive, braking unit, or contactor, and the noise receiver could be the automation device, encoder, or sensor.

Divide the mechanical/system layout into different EMC areas based on their distinctions in electrical characteristics. It is recommended to place and install the devices in their corresponding areas as shown in Fig. 4-34.

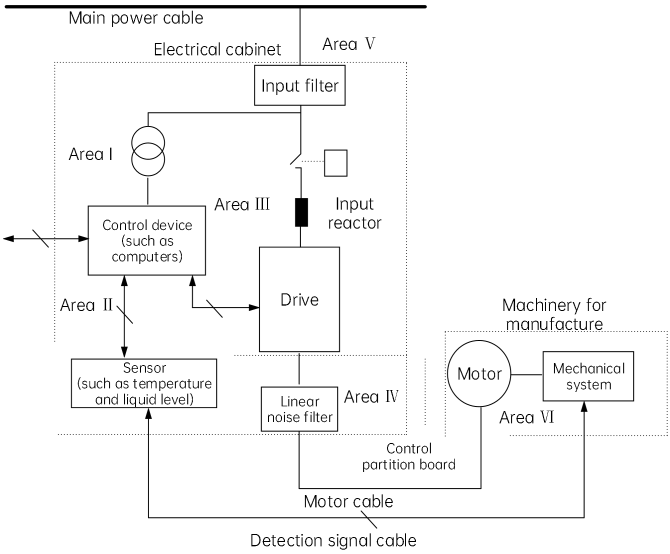


Fig. 4-34 Recommended partition for the EMC installation of the drive

Note:

Area Ⅰ: The control power transformer, control system, sensor, etc.

Area Ⅱ: The interface for the signal and control cables, requiring certain degree of anti-interference capabilities.

Area Ⅲ: The input reactor, drive, braking unit, contactor, and other noise sources.

Area Ⅳ: The output noise filter and its wiring.

Area Ⅴ: The power supply (including the wiring of the radio noise filter).

Area Ⅵ: The motor and its wiring.

- These areas shall be physically isolated from each other for the purpose of electromagnetic decoupling.
- Maintain a minimum spacing of at least 20 mm between areas.
- Each area shall be decoupled via the grounding plate. Cables of different areas shall be placed in separate cable conduits.
- The filters shall be installed at the joints between areas.
- All communication cables (such as RS485) and signal cables extending out from the cabinet shall be shielded.

Electrical installation diagram for the drive

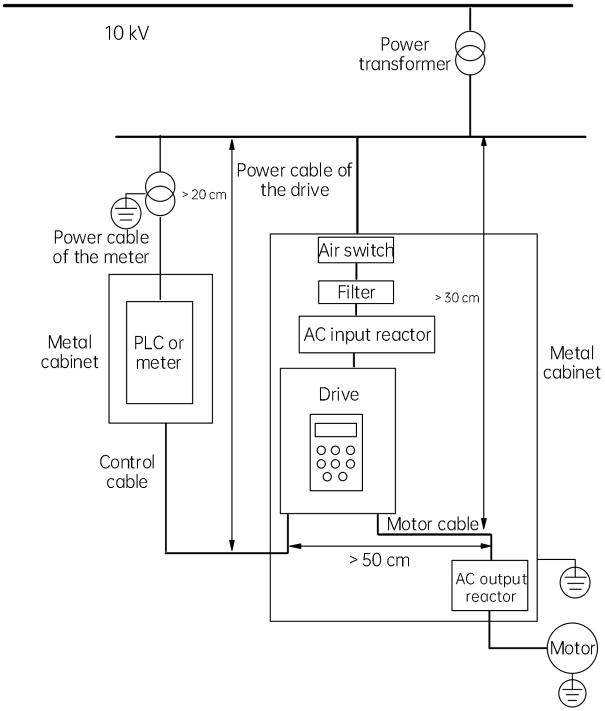


Fig. 4-35 Installation diagram for the drive

The motor cable shall be grounded at the drive side. It is recommended to separately ground the motor and the drive.

The motor cable and control cable should be shielded or armored. The shielding metal mesh shall be connected to both ends of the grounding cable through cable clamps to avoid the twisting of the ends of the metal mesh. Otherwise, the shielding effect will be reduced in the high-frequency conditions.

Ensure good conductivity among the mounting plate, mounting screws and the drive's metal enclosure. The tooth-type paint scratching gasket and conductive mounting plate shall be used.

If the number of the sensitive devices on the installation site is limited, it is feasible to only install a separate power filter at the device side, which may reduce the cost.

4.3.7 Operating instructions for power filter

A power filter shall be used for the device either capable of generating strong interference or sensitive to external interference. The power line filter is a two-way low-pass filter, which allows the passage of DC or 50 Hz power line frequency current while rejecting the passage of the current with high-frequency electromagnetic interference.

Role of the power line filter

It enables the device to meet the EMC requirements on conducted emission and conducted susceptibility, and also serves to suppress the radiated emission of the device.

It is able to prevent the electromagnetic interference generated by the device from entering the power line, and the interference generated by the power line from entering the device.

Common mistakes during the installation of the power line filter

(1) Excessively long input cable of the power supply

The filter shall be installed close to the power cable inlet of the cabinet. The in-cabinet part of the filter power input cable shall be as short as possible.

(2) The input and output cables of the power line filter are too close to each other

If the input and output cables of the filter are too close to each other, the high-frequency interference signal will be directly coupled through the input and output cables, and bypass the filter, making the power line filter ineffective.

(3) Poor filter grounding

The filter enclosure must be reliably connected to the metal enclosure. There is usually a dedicated grounding terminal on the filter enclosure. However, it is insufficient to suppress the high-frequency interference signal if only a single-cable connection between the filter and the enclosure is employed, because the impedance of long cables (not the resistance of the resistor) is excessively large at high frequency, making the bypass ineffective. The correct installation method is to directly install the filter enclosure against the conducting surface of the metal enclosure of the device, with the insulating paint removed.

4.3.8 Radiated emission of the drive

Radiated emission is inevitable during the operation of the drive. It has little impact on equipment outside the metal cabinet because the drive is usually installed inside the cabinet. Thus, the main source of radiated emission is the external connection cables. Conduct proper wiring according to the requirements in this section to effectively suppress the radiated emission of the cables.

If the drive and other control devices are installed in the same cabinet, isolate each area and conduct proper wiring, shielding and line crossing based on the partition principles mentioned above.

4.4 MV810 820 (SP2) solar pump drive commissioning

To quickly ready the MV810 820 (SP2) solar pump drive for operation, instructions on the external wiring and the commissioning steps of the drive are provided in this section.

4.4.1 Wiring diagram when powered by PV panel

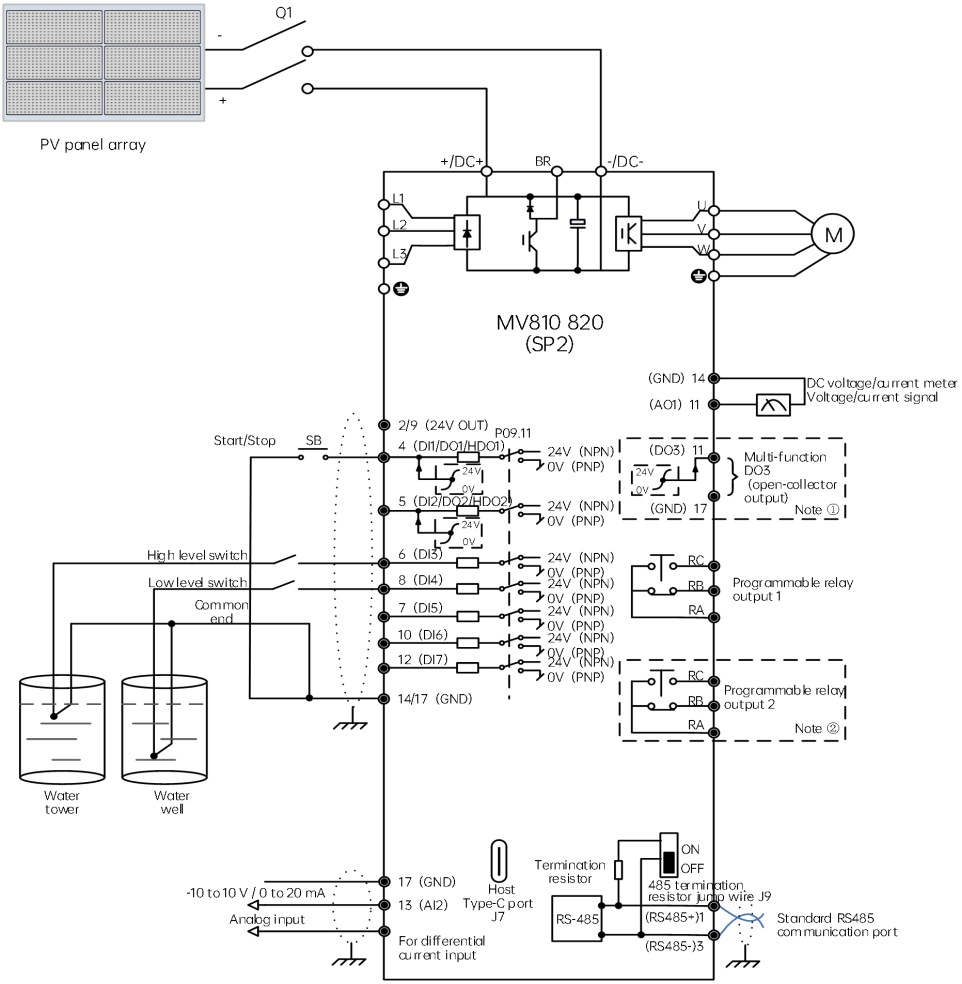


Fig. 4-36 Basic wiring diagram 1

WARNING

(1) The GND terminal of the drive shall be connected to the 0 V of an external device.

(2) AI1 and AI2 can be set to the input voltage/current signal via the function codes P09.01 and P09.02.

(3) AO1 can be set to the output voltage/current signal via the function code P09.02.

(4) In the above figure, "○" indicates a main circuit terminal, and "◉" indicates a control circuit terminal.

(5) For instructions on control circuit terminals, please refer to the section 4.2.

(6) The above wiring diagram is based on the three-phase model. The actual wiring depends on the specific model.

(7) Note 1 in the above figure: models of 75 kW and below have three DO outputs and one RO output (RO1) as the standard configuration.

(8) Note 2 in the above figure: models of 90 kW and above have two DO outputs and two RO outputs (RO1 and RO2) as the standard configuration.

4.4.2 Commissioning steps when powered by PV panel

(1) Check the power specification and the wiring of the drive. Make sure no error exists, then close Q1.

(2) Properly set the motor parameters.

Set the parameters P03.00 to P03.05 properly according to the motor nameplate.

(3) Test the water flow rate

Press the start button to start the operation. In conditions of normal sunlight intensity, if the running frequency or the water flow rate is too low, it indicates that the wiring of the pump may have been reversed. Exchange any two phases of the wiring to solve the problem.

(4) Adjust the water flow rate

Properly modify the PI parameters (P14.05 and P14.06) if a certain flow rate is required by the user. A higher value of the parameter indicates a faster adjustment of the flow rate, which may lead to greater fluctuation in the running frequency; a lower value of the parameter indicates a slower adjustment of the flow rate, which may lower the fluctuation of the running frequency.

(5) Set the pre-alarm function

Set the pre-alarm function if the user requires functions including low sunlight intensity pre-alarm, full water pre-alarm, underload pre-alarm, delay pre-alarm, reset delay pre-alarm, and the like. For water level control functions, modify the parameters P30.15 to P30.21; for underload functions, modify the parameters P30.34 to P30.37; for low sunlight intensity detection, modify the parameters P30.23 to P30.24. The user can also use the default settings.

(6) Commissioning is completed

If the pump discharge is normal, set P97.29=5 (Automatic fault reset count) if needed.

4.4.3 Wiring diagram when powered by the mains/generator and PV DC

WARNING

(1) When both PV panels and AC power are input simultaneously, anti-reverse diodes must be added to the photovoltaic panel and the input end at least, otherwise the drive and the PV panels may be damaged.

(2) It is recommended to add an external AC contactor, with the contactor coil controlled by the relay on the drive's control board.

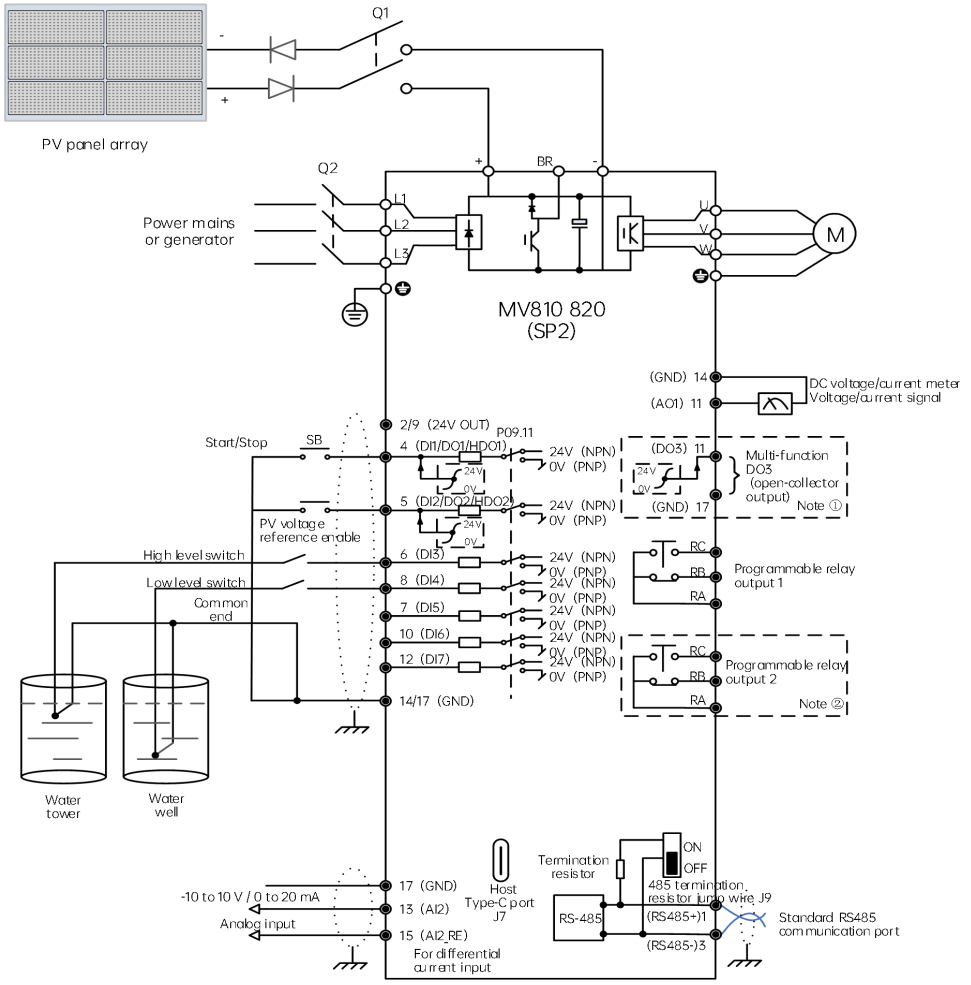


Fig. 4-37 Basic wiring diagram 2

WARNING

(1) The GND terminal of the drive shall be connected to the 0 V of an external device.

(2) AI1 and AI2 can be set to the input voltage/current signal via the function codes P09.01 and P09.02.

(3) AO1 can be set to the output voltage/current signal via the function code P09.02.

(4) In the above figure, "○" indicates a main circuit terminal, and "◉" indicates a control circuit terminal.

(5) For instructions on control circuit terminals, please refer to the section 4.2.

(6) The above wiring diagram is based on the three-phase model. The actual wiring depends on the specific model.

(7) Note 1 in the above figure: models of 75 kW and below have three DO outputs and one RO output (RO1) as the standard configuration.

(8) Note 2 in the above figure: models of 90 kW and above have two DO outputs and two RO outputs (RO1 and RO2) as the standard configuration.

4.4.4 Commissioning steps when powered by the mains/generator and PV DC

(1) Check that the connection is correct according to the power supply of the inverter based on the system wiring diagram shown in Fig. 4-37.

(2) Close Q2 first, then close Q1 to avoid inrush current when the PV panel voltage is low.

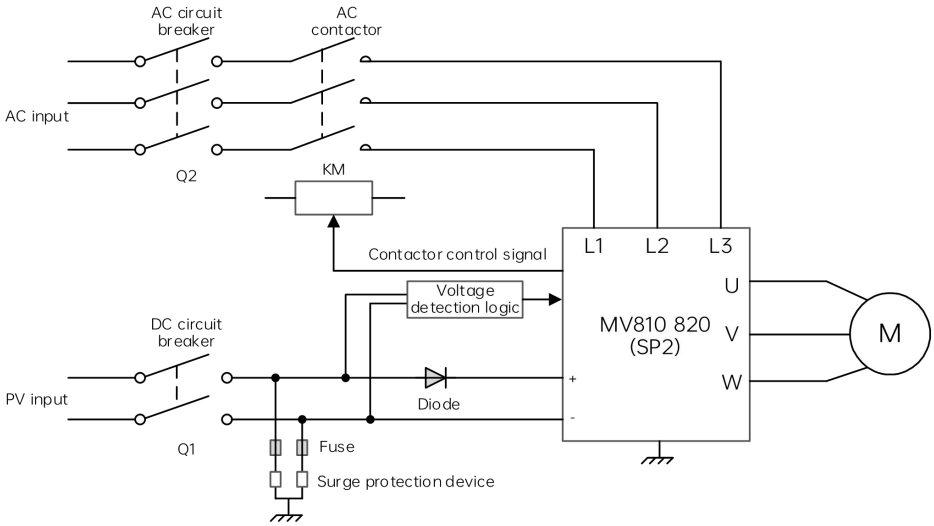


Fig. 4-38

(3) Option 1: Set P30.00=1 to run the AC drive in CVT mode. Set the voltage reference value in P30.14, ensuring it is lower than the DC bus voltage during operation. The greater the difference, the faster the water output. Generally, it is recommended to keep it 20 V below the lower limit of bus voltage fluctuation.

Option 2: Alternatively, you can set P09.04=59, then close terminal DI2 to enable fixed-frequency (P02.09) running mode.

(4) To switch to PV-only power supply, simply open Q2, close Q1, disconnect terminal DI2, and set P30.00=2.

WARNING

When no diode protection is installed at the DC bus input, do not close both the PV panel switch Q1 and the mains input switch Q2 simultaneously, as this may damage the drive and the PV panel.

Chapter 5 Quick Operation Guide

5.1 Operating panel

5.1.1 Introduction

The MV810 820 (SP2) series drive offers two types of operating panels. One is the small-size keypad/operating panel, serving as the standard configuration for the models of 75 kW and below. The other is the large-size keypad/operating panel (MV820-DP03) with richer functions which serves as the standard configuration for the models of 90 kW and above, and it also functions as the option for other models (Refer to the section 2.6 for details in installation dimensions).

The small-size operating panel is as shown below.

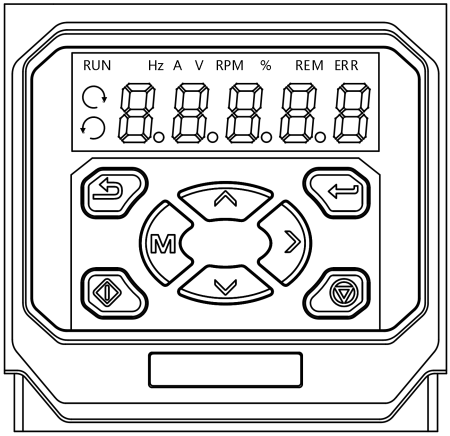


Fig. 5-1 Small-size operating panel

5.1.1.1 Small-size operating panel LED description

Table 5-1 Small-size operating panel LED description

LED		Name	Description	Color
Unit	Hz	Frequency indicator	Flashing: The value on display is the running frequency; On: The value on display is the frequency reference;	Yellow
	A	Current indicator	On: The value on display is the current;	Yellow
	V	Voltage indicator	On: The value on display is the voltage;	Yellow
	RPM	RPM indicator	On: The value on display is the revolutions per minute;	Yellow
	%	Percentage indicator	On: The value on display is the percentage;	Yellow
Status	↻	FWD running indicator	Off: The drive is in standby or reverse running	Green

LED		Name	Description	Color
			On: The drive is running forward Flashing: The drive is switching from FWD to REV	
	↻	REV running indicator	Off: The drive is in standby or forward running On: The drive is running reversely Flashing: The drive is switching from REV to FWD	Green
	ERR	Alarm indicator	On: The drive is in the alarm state;	Red
	RUN	Running indicator	On: Running; Flashing: Stopping; Off: Stopped;	Green
	REM	Operation command channel indicator	Off: Local; Flashing: Communication; On: Terminal.	Yellow

5.1.1.2 Description of the small-size operating panel buttons

Table 5-2 Description of the small-size operating panel buttons

Button	Name	Function
	Return	To exit the programming state;
	Programming/ Confirm	To enter the menu or confirm the data;
	Increase	To increase the data or function code;
	Decrease	To decrease the data or function code;
	Shift	To select the data bit for change in the editing state, or switch the parameters of status display in other states.
	Multi-function	Refer to Table 5-5 for instructions on the multi-function button;
	RUN	In the operating panel mode, press this button to start the running of the drive;
	Stop/Reset	To stop or fault reset.

The large-size operating panel is as shown below.

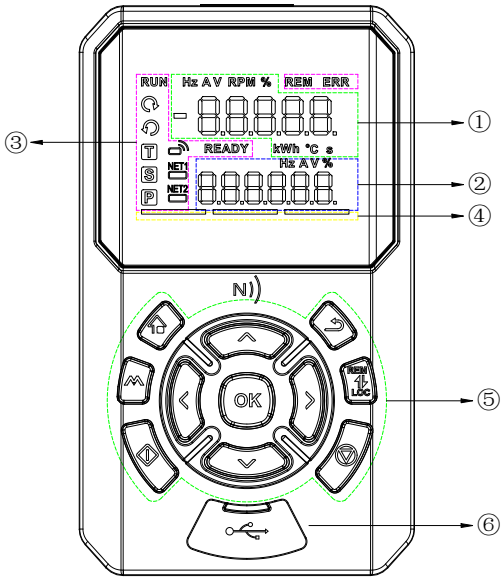


Fig. 5-2 Multi-function button usage

5.1.1.3 Interface description of the large-size operating panel

Number	Name	Description
①	Main display zone	It displays the drive function code parameters, the unit of the parameter values, and the positive/negative property of the values.
②	Auxiliary display zone	It displays the drive monitoring parameter values and their units.
③	Status indication	It indicates whether the drive is powered on normally, and the status of RUN/STOP, FWD/REV, local/remote control, fault/alarm, speed/torque/position, communication, and the wireless NFC.
④	Indication of menu mode	It indicates the present menu mode, including the shortcut menu, the basic menu, the modification record menu, etc.
⑤	Buttons	It serves as the drive function code/data input.
⑥	USB-Type C	Connected to the PC end for manufacturer firmware upgrade (to be used only when the drive is not powered on)

5.1.1.4 Large-size operating panel LED description

Table 5-3 Large-size operating panel LED description

LED		Name	Description	Color
Unit	Hz	Frequency indicator	Flashing: The value on display is the running	White

LED		Name	Description	Color
			frequency; On: The value on display is the frequency reference;	
	A	Current indicator	On: The value on display is the current;	White
	V	Voltage indicator	On: The value on display is the voltage;	White
	RPM	RPM indicator	On: The value on display is the revolutions per minute;	White
	%	Percentage indicator	On: The value on display is the percentage;	White
	℃	Temperature indicator	On: The value on display is the temperature in degree centigrade;	White
	s	Time indicator	On: The value on display is the reading of second;	White
	kWh	Power indicator	On: The value on display is the power (electrical energy);	White
Status		FWD running indicator	Off: The drive is in standby or reverse running On: The drive is running forward Flashing: The drive is switching from FWD to REV	Green
		REV running indicator	Off: The drive is in standby or forward running On: The drive is running reversely Flashing: The drive is switching from REV to FWD	Green
	ERR	Alarm indicator	On: The drive is in the alarm state;	Red
	RUN	Running indicator	On: Running; Flashing: Stopping; Off: Stopped;	Green
	REM	Operation command channel indicator	Off: Local; Flashing: Communication; On: Terminal.	White
	T	Torque control mode indicator	On: The drive is in the torque control mode;	White
	S	Speed control mode indicator	On: The drive is in the speed control mode;	White
	P	Position control mode indicator	On: The drive is in the position control mode;	White
		Wireless communication indicator	Flashing: Waiting to be connected; On: Connected; Off: Function not enabled;	White
	NET1	Communication indicator 1	Reserved	

LED		Name	Description	Color
	NET2	Communication indicator 2	Reserved	
	REDY	Standby state indicator	Steady on: The drive is in the stop state;	White
	▬▬▬	Menu mode indicator	On: The present menu modes are the shortcut menu, the complete menu, and the modification record menu from left to right in sequence;	White
	▬	Negative symbol indicator	On: The present value on display is negative; Off: The present value on display is positive;	White
	◂	Main/Auxiliary display zone indicator	On: The display zone currently in operation (main/auxiliary)	White

5.1.1.5 Description of the large-size operating panel buttons

Table 5-4 Description of the large-size operating panel buttons

Button	Name	Function
	Return	To exit the programming state;
	Right shift	To select the data bit for change in the editing state, or switch the parameters of status display in other states; To right shift for monitoring variable switchover; to move the cursor to the right;
	Left shift	To select the data bit for change in the editing state, or switch the parameters of status display in other states; To left shift for monitoring variable switchover; to move the cursor to the left;
	RUN	In the operating panel mode, press this button to start the running of the drive;
	Stop/Reset	To stop or fault reset;
	Up	To increase the data or function code;
	Down	To decrease the data or function code;
	Confirm	To enter the menu of the next level; to confirm the parameter setting;
	Menu switchover	Short press for menu mode switchover, including the quick commissioning menu, the complete menu, and the modification record menu, which is consistent with the setting of the function code P00.00; Long press for the switchover between the main display zone and

Button	Name	Function
		the auxiliary display zone;
	Multi-function button	To select the function via the setting of P00.04, such as JOG, FWD/REV switchover, etc.;
	Operation command channel switchover	To select the command channel among local, terminal, and communication.

Table 5-5 Instructions on the multi-function button

Multi-function button (M)	Function	Description
0	No function	The M button is disabled.
1	FWD jog	The M button is used as a forward jog button, effective with all three command channels. Press and hold the button to enter and stay in the forward jog running mode. Release the button, and the jogging stops.
2	REV jog	The M button is used as a reverse jog button, effective with all three command channels. Press and hold the button to enter and stay in the reverse jog running mode. Release the button, and the jogging stops.
3	FWD and REV switchover	The M button is used as the button for FWD and REV switchover, only available with the operating panel command channel, effective during both running and stop.
4	Command channel switchover 1	The M button is used as the button for operation command channel switchover, only effective during stop. The channel is cyclically switched from local, terminal to remote.

5.1.1.6 Operating panel display in each state

The MV810 820 (SP2) operating panel provides display in different states, including the parameter display in the stop state, parameter display in the running state, display in the function code editing state, and display in the fault state. This part takes the small operating panel as the example. The operations of large operating panel are similar, which are detailed in "MV820-DP03 Smart Keypad User Manual".

(1) Parameter display in the stop state

When the drive is in the stop state, the operating panel displays the stop-state parameters, as shown in Fig. 5-3a. The unit LED indicates the unit of the parameter value.

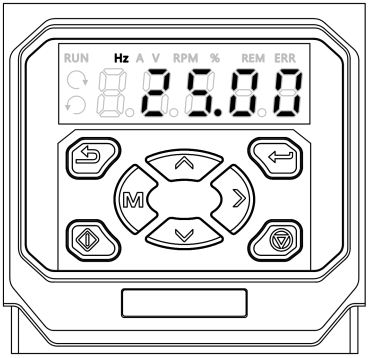
When the verification menu is enabled, only the function codes of which the parameter values are different from the factory default settings will be displayed. Press the "" and "" buttons to browse all such function codes, which would help the user learn which parameters have been changed.

Press the "" button to view different stop-state parameters cyclically (defined by the function code P16.03).

(2) Parameter display in the running state

When the drive receives a valid running command, it will start running accordingly. The operating panel will display the running-state parameters, and the RUN indicator will be on. The on/off status of the forward running and reverse running LED depends on the current running direction. As shown in Fig. 5-3b, the unit LED indicates the unit of parameter value..

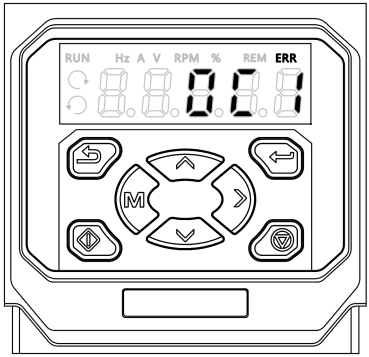
Press the "" button to view different running-state parameters cyclically (defined by the function codes P16.00 and P16.01).



a: Parameter display in the stop state



b: Parameter display in the running state



c: Display in the fault state

Fig. 5-3 Display in the stop, running, and fault state

(3) Display in the fault state

When the drive detects a fault signal, it will immediately enter the fault-state display, and display the fault code, as shown in Fig. 5-3c.

Press the "" button to view the stop-state parameters and the fault codes. Perform the fault reset operations via the "" button, the control terminal, or the communication command. The fault code will be displayed as long as the fault exists.

Choose to keep running or select a stop mode for the corresponding fault via the setting of P97.15 to P97.19 (fault protection property setting).

(4) Display in the function code editing state

In the stop, running, or fault state, press the "" button to enter the editing state (if any user password is required, refer to the description of P00.01). The editing state is displayed in a three-level menu: function code group or function code → function code parameter → function code parameter value. Press the "" button to enter the parameter value display. In the parameter value display, press the "" button to save the parameter setting, or press the "" button to exit.

5.1.2 Reading of the LED display

The LED display and the corresponding letter/number are shown below:

Display	Meaning	Display	Meaning	Display	Meaning	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		

Examples of LED display:

LED display	Unit LED	Data/Code display	Meaning
	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 fault during acceleration

WARNING

When the drive is in the stop or standby state, the LED data on the display is flashing; when the drive is in the running or fault state, the LED data on the display is steady on. To choose the parameters to be displayed/modified in the standby/running state, refer to the description of the parameters in Group P16 in section 7.1.11.

5.1.3 Example of basic operations

In the following example, the parameter on display in the stop state is the frequency reference with a default value of 50.00 Hz. The data in bold font in the Fig.s is in the editing state.

This section is explained based on the small operating panel. The operations of large operating panel are similar, which are detailed in "MV820-DP03 Smart Keypad User Manual".

5.1.3.1 Password setting

To protect the parameters, this drive offers the password protection function. If a user password has been set, the user must input the correct password before entering the function code editing state. To enter the manufacturer parameter groups and the AI/AO correction groups, a manufacturer password is further required.

WARNING

Do not modify or try to modify the manufacturer parameters. Improper settings of such parameters may result in malfunction of or 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. The user can unlock the drive by entering the user password following the steps below.

(1) Press the "" button in the drive lockup state, and the LED display will enter the password verification state 00000;

(2) Change 00000 to 01368;

(3) Press the "" button to confirm the change, and the password will be verified, with the LED displaying P00.

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

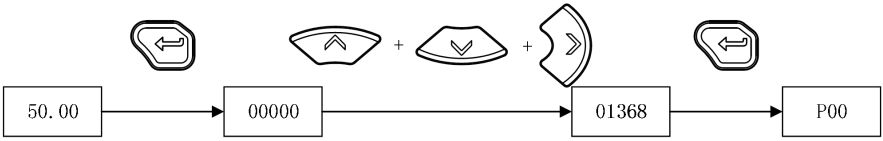


Fig. 5-4 Unlock the drive with a user password

Operations on the drive are available once the password is verified.

WARNING

The password protection will be enabled and the drive will be locked again in case of 30 seconds of no button action after entering the correct user password.

5.1.3.2 Restore to the factory settings

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

(1) When the parameter display is in the stop state, press the "⏎" button to enter the level one menu P00;

(2) Press the "⏎" button to enter the level two menu P00.00;

(3) Press the "∧" button to change P00.00 to P00.05;

(4) Press the "⏎" button to enter the level three menu;

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

(6) Press the "⏎" button to confirm the change and return to the level two menu. The change is then completed.

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

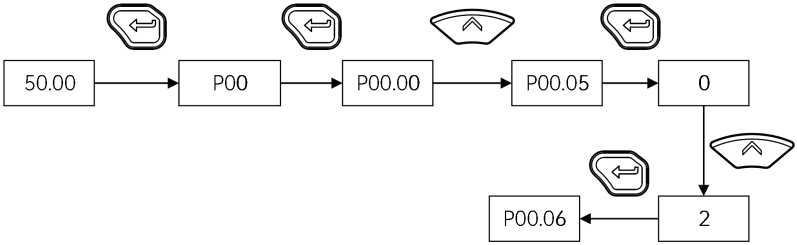


Fig. 5-5 Restore to the factory settings

5.1.3.3 Set the frequency reference

The following example shows the method of setting P02.09 = 25.00 Hz.

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

(1) When the parameter display is in the stop state, press the "⏎" button to enter the level one menu P00;

(2) Double press the "∧" button to enter the level one menu P02;

(3) Press the "⏎" button to enter the level two menu P02.00

(4) Press the "∧" button for nine times to enter the level two menu P02.09;

(5) Press the "⏎" button to enter the level three menu 50.00;

(6) Press the "≫" button to select the thousands place or the hundreds place;

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

(8) Press the "⏎" button to confirm the change and return to the level two menu. The change is then completed;

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

The above steps are shown in Fig. 5-6 below:

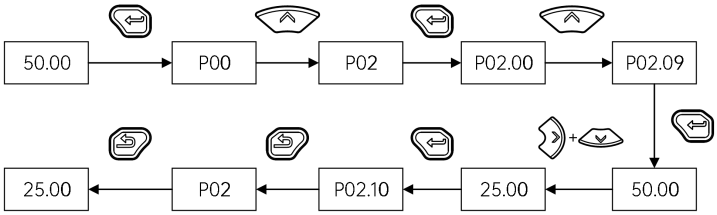


Fig. 5-6 Set the frequency reference

5.1.3.4 Display of parameters for running status monitoring

Select the parameters to be displayed on the operating panel in the running state using the function codes P16.00, P16.01, and P16.02. These parameters include frequency reference, output frequency, bus voltage DI, DO, and AI, etc.; refer to the descriptions of parameters in Group P16 for details. When the setting is completed, it is available to view the selected parameters in sequence by pressing the "" button on the operating panel.

Fig. 5-7 demonstrates the example of parameter display switchover in the running state with the setting of P16.00=0xF0, P16.01=0xF, and P16.02 = 4.

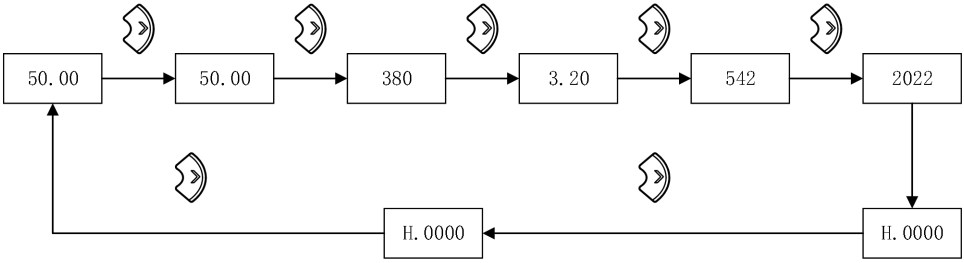


Fig. 5-7 Example of parameter display for running status monitoring

5.1.3.5 Switchover of parameters on display

Select the parameters to be displayed on the operating panel in the stop state using the function codes P16.03 and P16.04. These parameters include frequency reference, bus voltage DI, DO, and AI, etc.; refer to the descriptions of parameters in Group P16 for details. When the setting is completed, it is available to view the selected parameters in sequence by pressing the "" button on the operating panel.

Fig. 5-8 demonstrates the example of parameter display switchover in the stop state with the setting of P16.03=0xFF.

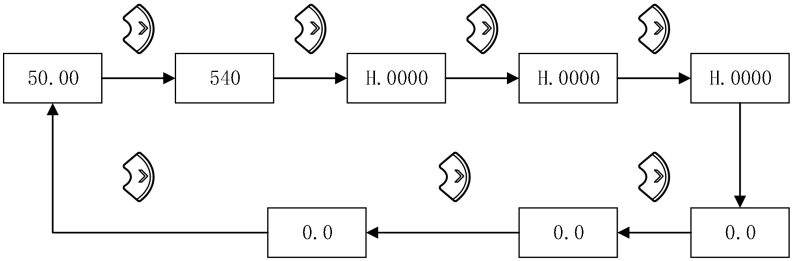


Fig. 5-8 Example of parameter display switchover

5.2 Operation mode

In the following chapters, terms related to the control, operation and status of the drive will be frequently mentioned. Please read this section carefully, which would help to understand and use the functions.

5.2.1 Operation command channel

The drive operation command channel refers to the physical channel for the drive to receive the operation command: start, stop, jog, and so on. There are four operation command channels:

(1) Operating panel: To control via the "", "", and "" buttons (multi-function button is available only when the JOG function is enabled);

(2) Control terminals: To control via the multi-function terminals (4, 5, 6, 8, 7, 10, 12, and 16) (set to digital input FWD or REV) and the terminals of two-wire GND or three-wire DIi as determined by P09.14;

(3) Serial port: To control the start and stop via the communication interface;

(4) Field bus: To control the start and stop via the field bus (such as PROFINET).

The command channel can be selected via the function code P02.02, the multi-function button "" on the operating panel, or the function of multi-function input terminal selection (select functions 38, 39, and 40 for P09.03 to P09.10).

WARNING

Before switching the channels, make sure to perform necessary commissioning. Otherwise, there is risk of equipment damage and personal injuries.

5.2.2 Operation state

The operation state of MV810 820 (SP2) includes the stop state, the running state, and the motor parameter auto-tuning state.

(1) Stop state: When the drive is powered on and initialized, if there is no operation command input or a stop command is executed during running, the drive will enter the stop state;

(2) Running state: The drive enters the running state once receiving a running command;

(3) Motor parameter auto-tuning state: Set P03.27 to 1 or 2, after which there will be a running command, and the drive enters the motor parameter identification state. When the parameter identification is completed, the drive will enter the stop state.

5.2.3 Control mode and operation mode

Control mode

There are two control modes for MV810 820 (SP2), which are set by P02.00.

(1) Vector control without PG: It refers to the vector control without a speed sensor. In this mode, although no PG is installed, the drive can perform desirable torque and speed control, achieving high torque on low frequencies and high precision at constant speed. The mode is usually used in scenarios requiring high robustness which the V/F control mode can not satisfy.

(2) V/F control: it is used in ordinary scenarios requiring moderate performance, for example, using a single drive to control multiple motors.

5.2.4 Frequency channel

Frequency channel in the speed control mode

There are five running modes for MV810 820 (SP2) in the speed control mode, including jog running, process closed-loop running, PLC running, multi-speed running, and common running. The running mode is selected via the setting of P02.05. The priority is shown in Fig. 5-9.

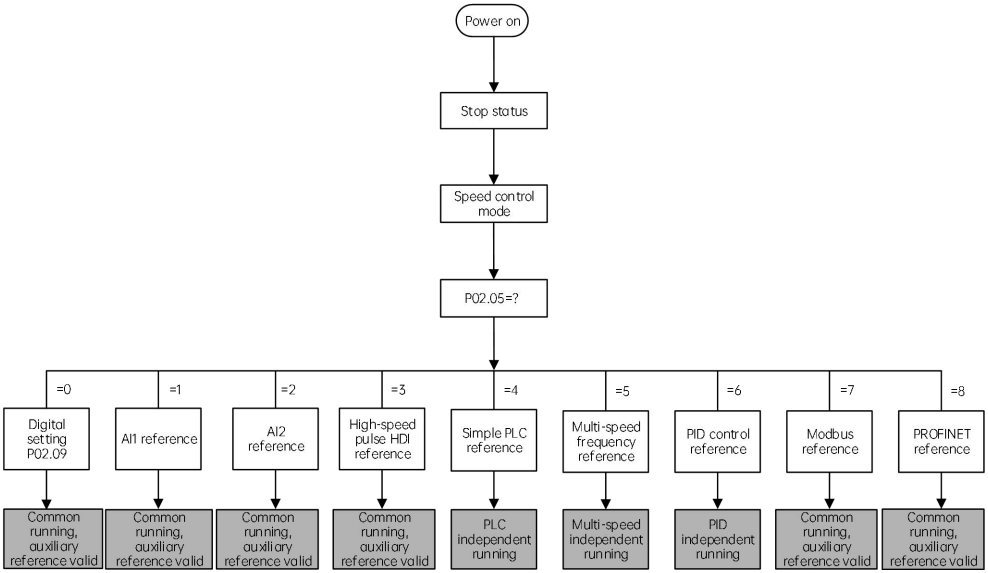


Fig. 5-9 Running mode selection in the speed control mode

The five running modes indicate five basic frequency sources. The common running frequency source can be processed with auxiliary frequency superposition and frequency adjustment, while each of "Jog running", "PLC running", "multi-speed running" and "process closed-loop running" serves as an independent running channel of the main frequency, among which "PLC running" has various frequency source reference channels. For details, refer to the function codes for "PLC running" frequency reference selection. The running modes are described below:

① Jog running: When the drive receives a jog running command in the stop state, it will run according to the jog frequency (refer to function codes P11.10 to P11.12);

② Process closed-loop running: When the process closed-loop function is enabled (P02.05=6), the drive will adopt the process closed-loop running mode which performs closed-loop adjustment according to the reference and feedback (refer to Group P14). Via the multi-function terminal (function 29), the process closed-loop running mode can be disabled. If there is a running command, the drive will run at 0 Hz;

③ PLC running: When the PLC function is enabled (P02.05=4), the drive will adopt the PLC running mode, and run in a preset mode (refer to the description of groups P13.00 to P13.36);

④ Multi-speed running: When the multi-speed function is enabled (P02.05=5), the drive can perform multi-speed running with multi-frequency 1 to 15 (P13.01 to P13.16), via the on/off settings of the multi-function terminals (functions 6,

7, 8, and 9). Note: the multi-frequency setting value is the percentage of maximum frequency, and if it is negative, the drive will run reversely.

WARNING

For the specific frequency reference channels of each running mode in the speed control mode, refer to Chapter 7.

5.3 Initial power-on

5.3.1 Inspection before power-on

Properly wire the drive according to the technical requirements indicated in Chapter 4.

5.3.2 Operation of initial power-on

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 power the drive. The operating panel will first display "- - - - -", and the contactor will be normally engaged. When the LED display changes into the value of the set frequency, it indicates that the drive initialization is completed.

The initial power-on process is shown in Fig. 5-10:

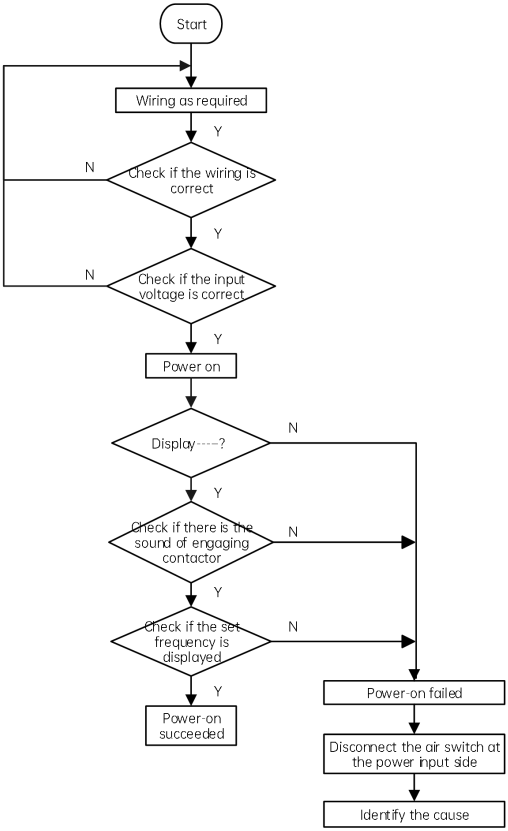


Fig. 5-10 Initial power-on process

Chapter 6 Parameter List

6.1 Description of table headers

Item	Explanation		
Function code	Indicates the designation of a function code, such as P00.00;		
Name	Indicates the full name of the function code, which explains its main function;		
Default	Indicates the default value by the factory setting of the function code;		
Range	Indicates the maximum and the minimum values of the function code;		
Unit	V: Voltage	A: Current	℃: Temperature
	Ω: Resistance	mH: Inductance	%: Percentage
	rpm: Rotating speed	bps: Baud rate	Hz, kHz: Frequency
	ms, s, min, h, kh: Time	kW: Power	/: No unit
Modify	○: Indicates that the function code can be modified in the running state; ×: Indicates that the function code can be modified in the stop state; *: Indicates that the function code is read-only and can not be modified;		
Selection	Indicates the parameter setting list of the function code;		
User setting	Indicates the parameter setting by the user.		

6.2 Function code list of the basic menu

Function code	Name	Description	Range	Default	Modify
P00: System management parameters					
P00.00	Menu mode selection	0: Quick commissioning menu mode Only parameters related to the quick running of the drive are displayed. 1: Full menu mode All function parameters are displayed. 2: Modification memory menu mode Only parameters different from the 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: Modification available for all data; 1: Modification available for this function code and P02.09 (main frequency reference digital setting) only; 2: Modification available for this function code only.	0 to 2	0	○

Function code	Name	Description	Range	Default	Modify
P00.04	Button function selection	Ones place: Reserved Tens place: Selection of the STOP button enable 0: Enabled in the panel control channel only 1: Enabled in all control channels Hundreds place: Function selection of the Multi-function button M 0: No function 1: FWD JOG 2: REV JOG 3: FWD/REV switchover 4: Command channel switchover (cyclic) Thousands place: Reserved	0 to 0x0410	0	○
P00.05	Parameter initialization	0: All parameters can be modified 1: Clear fault records 2: Restore to factory settings 3: Restore partial parameters to factory settings (motor parameters not restored)	0 to 3	0	×
P00.06	Power board upgrading command	0: Disabled 1: Enabled	0, 1	0	×
P00.07	Parameter copy	0: No action 1: Upload parameters from the drive to the keypad 2: Download parameters from the keypad to the drive (complete) 3: Download parameters from the keypad to the drive (motor parameters not included) 4: Download parameters from the keypad to the drive (motor parameters only)	0 to 4	0	×
P01: Status display parameters					
P01.00	Main frequency channel	Refer to P02.05	0 to 8	0	*
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	*

Function code	Name	Description	Range	Default	Modify
P01.04	Ramp frequency reference	Displays the present ramp frequency reference	0.00 to P02.10	0	*
P01.05	Output frequency	Displays the present output frequency	0.00 to P02.10	0	*
P01.06	Output voltage	Displays the present output voltage	0 to 65535 V	0	*
P01.07	Output current	Displays the present output current	0.0 to 6553.5 A	0	*
P01.08	Torque current	It monitors the present torque current of the drive, indicated as a percentage of the rated current of the motor.	-300.0 to 300.0%	0	*
P01.09	Exciting current	It monitors the present exciting current of the drive, indicated as a percentage of the rated current of the motor.	-300.0 to 300.0%	0	*
P01.10	Keypad version number	0.00 to 2.55	0.00 to 2.55	0	*
P01.11	Output power	It displays the present output power of the drive.	0.0 to 6553.5 kW	0	*
P01.12	Estimated motor frequency	Estimated rotor frequency in open-loop vector conditions	0.00 to P02.10	0	*
P01.13	Actual motor frequency	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 Another 1 kWh is added to the value of P01.14 when the number of the accumulation times reaches 3600.	0 to 3600	0	*
P01.16	Bus voltage	Displays the present bus voltage	0.0 to 6553.5 V	0	*
P01.17	Operation state of the drive	Bit0: 0: Stop 1: Run Bit1: 0: FWD 1: REV Bit2: Zero speed running Bit3: Accelerating Bit4: Decelerating Bit5: Running at constant speed Bit6: Pre-excitating Bit7: Tuning Bit8: Overcurrent limited Bit9: Bus overvoltage limited	0 to 0xFFFF	0	*

Function code	Name	Description	Range	Default	Modify
		Bit10: Torque limited 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 status	0: Disabled 1: Enabled	0 to 0x1111	0	*
P01.19	DI5 to DI8 status	0: Disabled 1: Enabled	0 to 0x1111	0	*
P01.20	DO status	0: Disabled 1: Enabled	0 to 0x1111	0	*
P01.21	AI1 input voltage	Displays the AI1 input voltage.	0.00 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	AI2 input current	Displays the AI2 input current.	0.00 to 20.00 mA	0	*
P01.25	AO1 output	0.00 to 100.00%	0.00 to 100.00%	0	*
P01.26	HDI input frequency	Display the HDI input frequency	0.000 to 50.000 kHz	0	*
P01.27	HDO1 frequency	Display the HDO1 frequency	0.000 to 50.000 kHz	0	*
P01.28	HDO2 frequency	Displays the HDO2 frequency	0.000 to 50.000 kHz	0	*
P01.29	PID reference	-100.0% to 100.0%	-100.0% to 100.0%	0	*
P01.30	PID feedback	-100.0% to 100.0%	-100.0% to 100.0%	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	*

Function code	Name	Description	Range	Default	Modify
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	*
P01.40	Encoder count	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	It displays the present torque reference of the drive, indicated as a percentage of the rated current of the motor.	-300.0% to 300.0%	0	*
P01.43	Rotation speed of motor	Displays the present rotation speed of the motor.	0 to 65535 rpm	0	*
P01.44	Line speed	Displays the present line speed of the motor	0 to 65535 m/min	0	*
P01.45	Output power	Displays the present 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 time of the drive (min)	0 to 59 min	0 to 59 min	0	*
P01.48	Accumulated running time of the drive (hour)	0 to 65535 h	0 to 65535 h	0	*
P01.49	Current running time of the drive (min)	0 to 65535 min	0 to 65535 min	0	*
P01.50	Accumulated running time of the fan	0 to 65535 h	0 to 65535 h	0	*
P01.51	Photovoltaic bus voltage	Current bus voltage value	0.0 to 6553.5	0	*
P01.52	Photovoltaic voltage setting	Bus voltage value set by MPPT	0.0 to 6553.5	0	*
P01.53	Photovoltaic calculated power	Power estimation	0.0 to 6553.5	0	*
P01.54	Photovoltaic MPPT status	Ones: 0: MPPT waiting 1: MPPT initializing 2: MPPT searching Ten thousands: AC/DC switching status	0 to 65535	0	*
P01.55	Photovoltaic hibernation status	Ones: AC grid connection status Tens: Load shedding status Hundreds: Weak-light/low-frequency protection status	0 to 65535	0	*

Function code	Name	Description	Range	Default	Modify
		Thousands: Full water protection status Ten thousands: Empty water protection status			
P01.56	Rectifier bridge temperature	-40.0 to 200.0℃	-40 to 200.0℃	0	*
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: Vector control 1 without PG 1: Vector control 2 without PG (only for asynchronous motors) 2: VF control (only for asynchronous motors) 3: Closed-loop vector control	0 to 3	2	×
P02.01	Motor selection	0: Motor 1 1: Motor 2	0, 1	0	×
P02.02	Operation command channel selection	0: Panel control 1: Terminal control 2: Communication control 3: Auto running	0 to 3	0	×
P02.03	Communication command channel selection	0: Modbus communication channel / Modbus TCP communication channel 1 to 2: Reserved 3: EtherCAT channel / PROFINET channel / CANopen channel / Ethernet IP channel	0 to 3	0	×
P02.04	Running direction	0: Same direction 1: Opposite direction	0, 1	0	○
P02.05	Main frequency source selection	0: Digital setting P02.09 1: AI1 setting 2: AI2 setting 3: High-speed pulse HDI reference 4: Simple PLC programming reference 5: Multi-speed running reference 6: PID control 7: Modbus/Modbus TCP setting 8: EtherCAT/PROFINET/CANopen/ Ethernet IP setting	0 to 8	6	×
P02.06	Auxiliary frequency source selection	0: Digital setting P02.09 1: AI1 setting 2: AI2 setting	0 to 8	4	×

Function code	Name	Description	Range	Default	Modify
		3: High-speed pulse HDI reference 4: Simple PLC programming reference 5: Multi-speed running reference 6: PID control 7: Modbus/Modbus TCP setting 8: EtherCAT/PROFINET/CANopen/ Ethernet IP setting			
P02.07	Auxiliary frequency reference range selection	0: Maximum output frequency 1: Main frequency reference	0, 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	○
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 the default settings, 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	G/P model	0: G model 1: P model	0, 1	0	○
P02.16	Carrier frequency	2.0 to 12.0 kHz	2.0 to 12.0 kHz	Model dependent	○

Function code	Name	Description	Range	Default	Modify
P02.17	Customized parameter	0: No function 1: Customer 1	0, 1	0	×
P03: Motor 1 parameters					
P03.00	Motor type selection	0: Asynchronous motor 1: Synchronous motor	0, 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 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	×
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 6553.5 A	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	0.0 to 100.0%	0.0 to 100.0%	40.0%	×

Function code	Name	Description	Range	Default	Modify
	saturation coefficient 4				
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 > 55 kW)	Model dependent	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	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	Single-phase motor winding coefficient	0 to 20	0 to 20	1.3	×
P03.25	Single-phase motor connection method	1 to 6	1 to 6	1	×
P03.26	Single-phase motor operation mode	0 to 3	0 to 3	0	×
P03.27	Motor auto-tuning	0: No action 1: Partial parameter auto-tuning in the static state 2: Full parameter auto-tuning in the rotating state 3: Full parameter auto-tuning in the static state	0 to 3	0	×
P03.28	Motor overload protection factor	0.0 to 300.0%	0.0 to 300.0%	100.0%	×

Function code	Name	Description	Range	Default	Modify
P03.29	Motor overload protection enable	0: Disabled 1: Enabled	0, 1	1	×
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 constant	0.00 to 20.00 s	0.00 to 20.00 s	0.02 s	○
P05.08	Vector control over-excitation 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: HDI setting 4: Modbus\Modbus TCP reference 5: EtherCAT/PROFINET/CANopen/ Ethernet IP reference	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: HDI setting 4: Modbus\Modbus TCP reference 5: EtherCAT/PROFINET/CANopen/ Ethernet IP reference	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	○

Function code	Name	Description	Range	Default	Modify
P05.16	Torque regulation Ki	0 to 60000	0 to 60000	1300	○
P05.17	Integral separation	0: Disabled 1: Enabled	0, 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	○
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 4: V/F complete separation 5: V/F half separation	0 to 5	0	×
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	0 V	×
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	0 V	×
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 over-excitation gain	0 to 200	0 to 200	80	×
P07.11	Oscillation suppression gain	0 to 100	0 to 100	40	○
P07.12	Oscillation suppression	0 to 2	0 to 2	0	×

Function code	Name	Description	Range	Default	Modify
	gain mode				
P07.13	Voltage source for V/F separation	0: Digital setting 1: AI1 2: AI2 3: Reserved 4: HDI setting 5: Multi-reference 6: Simple PLC 7: PID reference 8: Modbus/Modbus TCP reference 9: EtherCAT/PROFINET/CANopen/ Ethernet IP reference	0 to 9	0	○
P07.14	Digital setting of voltage source for V/F separation	0 to 1000 V	0 to 1000 V	0 V	○
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, 1	0	○
P07.18	VF Slip compensation gain	0.0 to 100.0	0.0 to 100.0	0.0	○
P07.19	Reserved				
P08: Start/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 (no action) 0.00 to 50.00 s	0.00 to 50.00 s	0.0	×

Function code	Name	Description	Range	Default	Modify
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, 1	0	×
P08.10	Stop frequency detection time	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 frequency reference 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.	0.00 to 100.00 s	0.50	×
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 120.0%	0.0 to 120.0%	50.0%	○
P08.14	DC braking time at stop	0: Disable DC braking at stop	0.0 to 100.0 s	0.0	O
P08.15	Speed tracking mode	0: From the stop frequency 1: From the maximum frequency Note: Only for asynchronous motors.	0, 1	0	×
P08.16	Speed of speed tracking	The larger the parameter is, the faster the tracking speed will be. However, an excessively large parameter value may cause the tracking unreliable.	1 to 100	20	○
P08.17	Current of speed tracking	Ensure the maximum current during speed tracking is within the range. An excessively small current may cause the speed tracking unreliable.	10 to 200%	Model dependent	×
P08.18	Output upon vector 0 Hz	0: Enable voltage output 1: No voltage output	0 to 3	0	○

Function code	Name	Description	Range	Default	Modify
		2: Output according to the DC braking current at stop 3: Zero-servo running			
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; when the frequency reference is above the frequency lower limit again and the running time exceeds the time set by P08.20, the drive automatically resumes operation.	0 to 2	0	×
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, 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 prohibit	0: Disabled 1: Enabled	0, 1	0	○
P08.28	FWD/REV switchover dead-zone 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	350 to 900 V	350 to 900 V	900 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 selection	Ones place: 0: Enable protection 1: Disable protection It decides, when the terminal command is valid after power-on, whether the	0 to 0x11	0x10	×

Function code	Name	Description	Range	Default	Modify
		terminals need to be enabled again before drive operation. Tens place: 0: No protection after fault reset and coast to stop 1: Protection after fault reset and coast to stop When running protection is disabled, this setting determines whether re-enabling is required after a fault reset or coast stop. Note: If protection is disabled, the terminal command will be immediately responded after fault reset, after stop in the coast to stop mode, or when the terminal command is valid after power-on.			
P08.35	Reserved				
P09: Terminal input parameters					
P09.00	Function selection of terminals 4, 5, 6, 8	Ones place: 0: Terminal 4 as DI1 1: Terminal 4 as DO1 2: Terminal 4 as HDO1 Tens place: 0: Terminal 5 as DI2 1: Terminal 5 as DO2 2: Terminal 5 as HDO2 Hundreds place: Reserved Thousands place: Reserved Note: Terminal 6 can only be set as DI3; terminal 8 can only be set as DI4.	0 to 0x22	0x10	○
P09.01	Function selection of terminals 7, 10, 12, 16	Ones place: 0: Terminal 7 as DI5 1: Terminal 7 as thermistor signal input Tens place: 0: Terminal 10 as DI6 1: Terminal 10 as HDI Hundreds place: Reserved Thousands place: 0: Terminal 16 as DI8	0 to 0x2011	0x10	○

Function code	Name	Description	Range	Default	Modify
		1: Terminal 16 as AI1 voltage input 2: Terminal 16 as AI1 current input Note: Terminal 12 can only be set as DI7.			
P09.02	Function selection of terminals 13, 11	Ones place: 0: Terminal 13 as AI2 voltage input 1: Terminal 13 as AI2 current input Tens place: 0: Terminal 11 as DO3/RO2 1: Terminal 11 as AO1 voltage output 2: Terminal 11 as AO1 current output Hundreds place: Reserved Thousands place: Reserved	0 to 0x21	0x10	○
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: Multi-reference terminal 1 7: Multi-reference terminal 2 8: Multi-reference terminal 3 9: Multi-reference terminal 4 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 18: Full water signal 19: Empty water signal 20: Frequency reference source switchover from A to B 21: Frequency reference source switchover from combination to A	0 to 72	1	○
P09.04	DI2 function selection		0 to 72	0	○
P09.05	DI3 function selection		0 to 72	18	○
P09.06	DI4 function selection		0 to 72	19	○
P09.07	DI5 function selection		0 to 72	0	○
P09.08	DI6 function selection		0 to 72	0	○
P09.09	DI7 function selection		0 to 72	0	○
P09.10	DI8 function selection		0 to 72	0	○

Function code	Name	Description	Range	Default	Modify
		22: External reset (RESET) input 23: Coast to stop input (FRS) 24: Acceleration/Deceleration prohibit 25: DC braking input at stop 26: Simple PLC pause command 27: Frequency reference source switchover from combination to B 28: PLC stop memory clear 29: PID pause 30: PID clear 31: PID integral hold 32: Enter the 0 Hz running 33: PID regulating feature switchover 34: Main reference frequency source selection 1 35: Main reference frequency source selection 2 36: Main reference frequency source selection 3 37: Main reference frequency source selection 4 38: Command channel switched to keypad 39: Command channel switched to terminal 40: Command channel switched to communication 41: Direct DC braking running 42: REV prohibit 43: Reserved 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 frequency reference clear 46: Pulse input clear 47: Reserved 48: Reserved 49: Position selection 1 50: Position selection 2 51: Position selection 3			

Function code	Name	Description	Range	Default	Modify
		52: Enable the positioning cyclic mode of the digital position 53: Spindle homing 54: Speed/Position mode switchover 55: Motor 1 and 2 switchover terminal 56: Safety terminal input (reserved) 57: PG card meter count clear 58: Reserved 59: Power line frequency input switchover of PV terminal 60: Emergency stop 61: Wobble pause 62: Wobble reset 63: Counter reset 64: Counter trigger 65: Power consumption clear 66: Power consumption hold 67: Length counter input 68: Length reset 69: Switched to V/F control 70: Switched to FVC control 71: Reserved 72: Reserved			
P09.11	Terminal active mode selection	0: High level active outside terminal 1: Low level active outside terminal	0 to 1	1	×
P09.12	DI1 to DI4 active mode selection	Ones place: 0: DI1 positive logic active 1: DI1 negative logic active Tens place: 0: DI2 positive logic active 1: DI2 negative logic active Hundreds place: 0: DI3 positive logic active 1: DI3 negative logic active Thousands place: 0: DI4 positive logic active 1: DI4 negative logic active	0 to 0×1111	0	○
P09.13	DI5 to DI8 active mode selection	Ones place: 0: DI5 positive logic active 1: DI5 negative logic active Tens place:	0 to 0×1111	0	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Range</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>0: DI6 positive logic active
1: DI6 negative logic active
Hundreds place:
0: DI7 positive logic active
1: DI7 negative logic active
Thousands place:
0: DI8 positive logic active
1: DI8 negative logic active</td><td></td><td></td><td></td></tr>
<tr><td>P09.14</td><td>FWD/REV operation mode</td><td>0: Two-wire mode 1
The combination of FWD and REV generates the running commands and directions.<table><tr><td>FWD</td><td>REV</td><td>Command</td></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>0</td><td>1</td><td>Reverse</td></tr><tr><td>1</td><td>0</td><td>Forward</td></tr><tr><td>1</td><td>1</td><td>Stop</td></tr></table>1: Two-wire mode 2
FWD is the source of running commands, and REV controls the running directions.<table><tr><td>FWD</td><td>REV</td><td>Command</td></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>0</td><td>1</td><td>Stop</td></tr><tr><td>1</td><td>0</td><td>Forward</td></tr><tr><td>1</td><td>1</td><td>Reverse</td></tr></table>2: Three-wire mode 1
Three-wire operation control terminal EN is the enabling terminal, and the rising edges of FWD and REV are the source of the running commands and directions.<table><tr><td>EN</td><td>FWD</td><td>REV</td><td>Command</td></tr><tr><td rowspan="4">1</td><td rowspan="2">0→1</td><td>0</td><td rowspan="2">Forward</td></tr><tr><td>1</td></tr><tr><td rowspan="2">0</td><td rowspan="2">0→1</td><td rowspan="2">Reverse</td></tr><tr><td>1</td></tr><tr><td>0</td><td></td><td></td><td>Stop</td></tr></table>3: Three-wire mode 2
Three-wire operation control terminal EN is the enabling terminal, the rising edge</td><td>0 to 3</td><td>0</td><td>○</td></tr>
</table>

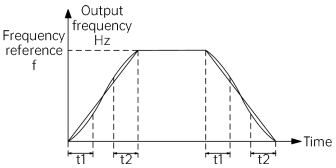
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Range</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>of FWD is the source of running commands, and REV controls the running directions.
<table>
<tr><th>EN</th><th>FWD</th><th>REV</th><th>Command</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">0→1</td><td>0</td><td>Forward</td></tr>
<tr><td>1</td><td>Reverse</td></tr>
<tr><td rowspan="2">0</td><td></td><td></td><td rowspan="2">Stop</td></tr>
<tr><td></td><td></td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td>P09.15</td><td>DI filter time</td><td>Used to set the filter time for DI terminal sampling. It is recommended to increase the parameter value when there is obvious interference for the purpose of misoperation prevention.</td><td>0.000 to 1.000</td><td>0.010 s</td><td>○</td></tr>
<tr><td>P09.16</td><td>VDI active state</td><td>Bit0: VDI1
Bit1: VDI2
Bit2: VDI3
Bit3: VDI4
Bit4: VDI5
Bit5: VDI6
Bit6: VDI7
Bit7: VDI8</td><td>0 to 0xFF</td><td>0</td><td>×</td></tr>
<tr><td>P09.17</td><td>DI1 switch-on delay time</td><td rowspan="8">Used to set the delay time for level jump upon switch-on/off of digital input terminals
Range: 0.0 to 600.0 s</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.18</td><td>DI1 switch-off delay time</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.19</td><td>DI2 switch-on delay time</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.20</td><td>DI2 switch-off delay time</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.21</td><td>DI3 switch-on delay time</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.22</td><td>DI3 switch-off delay time</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.23</td><td>DI4 switch-on delay time</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.24</td><td>DI4 switch-off delay time</td><td>0.0 to 600.0</td><td>0.0 s</td><td>○</td></tr>
<tr><td>P09.25</td><td>AI1 lower limit</td><td>0.00 V to P09.27</td><td>0.00 to P09.27</td><td>0.00 V</td><td>○</td></tr>
<tr><td>P09.26</td><td>Percentage corresponding to AI1</td><td>-1000.0% to 100.0%</td><td>-1000.0% to 100.0%</td><td>0.0%</td><td>○</td></tr>
</table>

Function code	Name	Description	Range	Default	Modify
	lower limit				
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	-1000.0% to 100.0%	-1000.0% 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	-10.00 V	○
P09.31	Percentage corresponding to AI2 lower limit	-100.0 to 100.0%	-100.0 to 100.0%	-100.0%	○
P09.32	AI2 middle value 1	P09.30 to P09.34	P09.30 to P09.34	0.00 V	○
P09.33	Percentage corresponding to AI2 middle value 1	-100.0 to 100.0%	-100.0 to 100.0%	0.0%	○
P09.34	AI2 middle value 2	P09.32 to P09.36	P09.32 to P09.36	0.00 V	○
P09.35	Percentage corresponding to AI2 middle value 2	-100.0 to 100.0%	-100.0 to 100.0%	0.0%	○
P09.36	AI2 upper limit	P09.34 to 10.00 V	P09.34 to 10.00 V	10.00 V	○
P09.37	Percentage corresponding to AI2 upper limit	-100.0 to 100.0%	-100.0 to 100.0%	100.0%	○
P09.38	AI2 filter time	0.000 to 10.000 s	0.000 to 10.000 s	0.030 s	○
P09.39	HDI frequency lower limit	0.000 kHz to P09.41	0.000 kHz to P09.41	0.000 kHz	○
P09.40	Percentage corresponding to HDI frequency lower limit	-1000.0% to 100.0%	-1000.0% to 100.0%	0.0%	○
P09.41	HDI frequency upper limit	P09.39 to 50.000 kHz	P09.39 to 50.000 kHz	50.000 kHz	○
P09.42	Percentage corresponding to HDI frequency upper limit	-1000.0% to 100.0%	-1000.0% to 100.0%	100.0%	○
P09.43	HDI filter time	0.000 to 10.000 s	0.000 to 10.000 s	0.030 s	○
P10: Terminal output parameters					
P10.00	DO1 function selection	0: Disabled	0 to 47	0	○
P10.01	DO2 function selection	1: AC drive in running	0 to 47	1	○

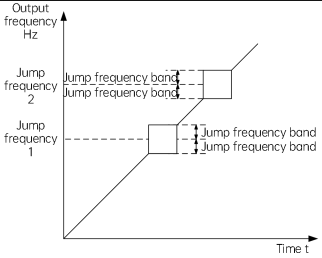
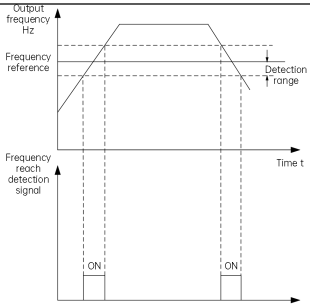
Function code	Name	Description	Range	Default	Modify
P10.02	DO3 function selection / RO2 output selection	2: Forward running 3: Reverse running	0 to 47	0	○
P10.03	RO1 output selection	4: Frequency reach signal (FAR) 5: Frequency-level detection signal (FDT1) 6: Frequency-level detection signal (FDT2) 7: Overload detection signal (OL) 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: Simple PLC stage completion 14: Simple PLC cycle completion 15: Current running time reach 16: Accumulated running time reach 17: AC drive ready to run (RDY) 18: AC drive fault 19: Host device On/Off signal 20: Motor overheat 21: Torque limited (valid when the torque command is limited by the torque limit value 1 or 2) 22: Motor overload pre-alarm signal 23 to 25: Reserved 26: Reference count value reach 27: Designated count value reach 28: Length reach 29: Positioning finished 30: Zero point positioning finished 31: Index position finished 32: PV power AC/DC switchover state 33 to 37: Reserved 38: Motor 1 and 2 indication terminal 39: Bus card switch signal 40 to 45: Reserved 46: PID feedback loss 47: Reserved	0 to 47	18	○
P10.04	Output terminal polarity selection	Ones place: 0: DO1 positive logic active	0 to 0x1111	0	○

Function code	Name	Description	Range	Default	Modify
		1: DO1 negative logic active Tens place: 0: DO2 positive logic active 1: DO2 negative logic active Hundreds place: 0: DO3/RO2 positive logic active 1: DO3/RO2 negative logic active Thousands place: 0: RO1 positive logic active 1: RO1 negative logic active			
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	DO3 switch-on delay time / relay output RO2 switch-on delay time		0.0 to 600.0	0.0 s	○
P10.10	DO3 switch-off delay time / relay output RO2 switch-off delay time		0.0 to 600.0	0.0 s	○
P10.11	Relay RO1 switch-on delay time		0.0 to 600.0	0.0 s	○
P10.12	Relay RO1 switch-off delay time		0.0 to 600.0	0.0 s	○
P10.13	AO1 function selection	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	0 to 28	0	○
P10.14	HDO1 function selection		0 to 28	0	○
P10.15	HDO2 function selection		0 to 28	0	○

Function code	Name	Description	Range	Default	Modify
		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: Bus card percentage (0 to 100.0%) 27: High-speed pulse HDIA input value 28: Exciting current (0.0 to 100.0%)			
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 limit	P10.16 to 100.00%	P10.16 to 100.00%	100.00%	○
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	HDO1 output lower limit	0.00% to P10.23	0.00% to P10.23	0.00%	○
P10.22	Frequency corresponding to HDO1 output lower limit	0.00 to 50.00 kHz	0.00 to 50.00	0.00 kHz	○
P10.23	HDO1 output upper limit	P10.21 to 100.00%	P10.21 to 100.00%	100.00%	○
P10.24	Frequency corresponding to HDO1 output upper limit	0.00 to 50.00 kHz	0.00 to 50.00	50.00 kHz	○
P10.25	HDO1 output filter time	0.000 to 10.000 s	0.000 to 10.000	0.005 s	○
P10.26	HDO2 output lower limit	0.00% to P10.28	0.00% to P10.28	0.00%	○
P10.27	Frequency corresponding to HDO2 output lower limit	0.00 to 50.00 kHz	0.00 to 50.00	0.00 kHz	○
P10.28	HDO2 output upper limit	P10.26 to 100.00%	P10.26 to 100.00%	100.00%	○
P10.29	Frequency	0.00 to 50.00 kHz	0.00 to 50.00	50.00	○

Function code	Name	Description	Range	Default	Modify
	corresponding to HDO2 output upper limit			kHz	
P10.30	HDO2 output filter time	0.000 to 10.000 s	0.000 to 10.000	0.005 s	○
P11: Auxiliary function parameters					
P11.00	Acceleration/ Deceleration mode	0: Straight-line acceleration/deceleration 1: S-curve acceleration/deceleration	0, 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 following 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; the segment between t1 and t2 is straight-line acceleration/deceleration. They are relative to the current acceleration/deceleration time.  Note: P11.07 + P11.08 ⩽ 100.0%	0.0 to 100.0%	10.0%	○
P11.08	Time proportion of S-curve end segment		0.0 to 100.0%	10.0%	○
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 running frequency	0.00 Hz to P02.10	0.00 Hz to	5.00 Hz	○

Function code	Name	Description	Range	Default	Modify
			P02.10		
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, 2	1, 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 place: Whether the frequency adjustment via the UP/DOWN terminal is valid; 0: Invalid 1: Valid Tens place: Whether to retain the frequency reference (keypad + terminal) set via the keypad UP/DOWN buttons when a power failure occurs; 0: Does not retain 1: Retain Hundreds place: Whether to retain the frequency reference set via the keypad UP/DOWN buttons upon a stop; 0: Does not retain 1: Retain Thousands place: Whether to retain the frequency reference set via the UP/DOWN terminal upon a stop; 0: Does not retain 1: Retain	0 to 0x1111	0x1111	○
P11.18	Jump frequency 1	If the frequency reference is within the jump frequency band, the actual output will be at the jump frequency boundary to avoid the mechanical resonance of the load. 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	○

Function code	Name	Description	Range	Default	Modify
					
P11.22	Wobble amplitude	0.0 to 100.0% (frequency reference percentage)	0.0 to 100.0%	0.0%	○
P11.23	Wobble step	0.0 to 100.0% (wobble amplitude percentage)	0.0 to 100.0%	0.0%	○
P11.24	Wobble rise time	0.0 to 6000.0 s	0.0 to 6000.0 s	6.0 s	○
P11.25	Wobble fall time	0.0 to 6000.0 s	0.0 to 6000.0 s	6.0 s	○
P11.26	Frequency reach (FAR) detection range	 When the running frequency of the drive is within the value range of the frequency reference ± the maximum frequency (multiplied by the P11.26 set percentage), the multi-function DO terminal outputs an ON signal.	0.0 to 100.0%	5.0%	○
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 P11.30 percentage of the frequency detection value, the DO terminal cancels the ON signal.	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%	○
P11.31	Temperature for automatic fan start	5.0 to 80.0℃	5.0 to 80.0℃	40.0℃	○
P11.32	Reserved				

Function code	Name	Description	Range	Default	Modify
P11.33	Length reference	0 to 60000 m	0 to 60000 m	0 m	○
P11.34	Actual length	0 to 60000 m	0 to 60000 m	0 m	○
P11.35	Number of pulses per meter	0 to 60000	0 to 60000	1000	○
P11.36	Reference count value	0 to 60000	0 to 60000	0	○
P11.37	Designated count value	0 to 60000	0 to 60000	0	○
P11.38	Running time setting	0 to 65535 min	0 to 65535 min	0 min	○
P11.39	Accumulated running time reach	0 to 65535 h	0 to 65535 h	0 h	○
P11.40	Wake-up frequency	When the frequency reference is higher than P11.40, the drive wakes up and starts running after the delay defined by P11.41.	P11.42 to P02.10	0.00 Hz	○
P11.41	Wake-up delay time	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 time	0.0 to 6553.5 s	0.0 to 6553.5 s	0.0 s	○
P11.44	Fan control	0: Auto running (based on the inverter temperature) 1: Continuous running after power-on 2: Controlled by start/stop commands (running upon start, off upon stop)	0 to 2	2	×
P14: Process PID parameters					
P14.00	PID reference source	0: P14.02 digital setting 1: AI1 2: AI2 3: Reserved 4: HDI 5: Modbus/Modbus TCP reference 6: EtherCAT/PROFINET/CANopen/ Ethernet IP reference	0 to 6	0	○
P14.01	PID feedback source	0: AI1 1: AI2 2: Reserved 3: HDI 4: Modbus/Modbus TCP reference 5: EtherCAT/PROFINET/CANopen/ Ethernet IP reference	0 to 9	0	○

Function code	Name	Description	Range	Default	Modify
		6: AI1 + AI2 7: AI1 - AI2 8: MIN (AI1, AI2) 9: MAX (AI1, AI2)			
P14.02	PID digital setting value	-100.0% to 100.0%	-100.0% to 100.0%	0.0%	○
P14.03	Acceleration/ Deceleration time of PID reference	0.0 to 3600.0 s	0.0 to 3600.0 s	0.0 s	○
P14.04	PID regulating feature selection	0: Positive action 1: Negative action	0, 1	0	○
P14.05	Proportional gain Kp1	0.0 to 1000.0	0.0 to 1000.0	35.0	○
P14.06	Integral time Ti1	0.01 to 10.00 s	0.01 to 10.00 s	1.00 s	○
P14.07	Derivative time Td1	0.000 to 10.000 s	0.000 to 10.000 s	0.000 s	○
P14.08	Derivative limit	0.00 to 100.00%	0.00 to 100.00%	0.10%	○
P14.09	Sampling cycle	0.01 to 10.00 s	0.01 to 10.00 s	0.01 s	○
P14.10	Deviation limit	0.0 to 100.0% (relative to the maximum span)	0.0 to 100.0%	0.0%	○
P14.11	PID parameter low-frequency switchover point	When the ramp frequency reference is lower than the low-frequency switchover point, the PID parameters include P14.05 to P14.07; when it is higher than the high-frequency switchover point, the PID parameters include P14.13 to P14.15; when it is between the low-frequency and high-frequency switchover points, the PID parameter is the linear interpolation of these two parameter groups.	0.00 Hz to P14.12	5.00 Hz	○
P14.12	PID parameter high-frequency switchover point	P14.11 to P02.10	P14.11 to P02.10	10.00 Hz	○
P14.13	Proportional gain Kp2	0.0 to 1000.0	0.0 to 1000.0	35.0	○
P14.14	Integral time Ti2	0.01 to 10.00 s	0.01 to 10.00 s	1.00 s	○
P14.15	Derivative time Td2	0.000 to 10.000 s	0.000 to 10.000 s	0.000 s	○
P14.16	PID upper limit digital setting	P14.17 to 100.0%	P14.17 to 100.0%	100.0%	○
P14.17	PID lower limit digital setting	-100.0% to P14.16	-100.0% to P14.16	0.0%	○

Function code	Name	Description	Range	Default	Modify
P14.18	Output filter time	0.00 to 60.00 s	0.00 to 60.00 s	0.00 s	○
P14.19	PID output property	Ones place: 0: Integral separation disabled 1: Integral separation enabled Tens place: 0: When the PID output is a negative value, the limit is 0; 1: When the PID output is a negative value, the output is negative. Hundreds place: 0: The integral regulation continues after the frequency reaches the upper/lower limit; 1: The integral regulation stops after the frequency reaches the upper/lower limit.	0x000 to 0x111	0x100	○
P14.20	PID preset value	0.0 to 100.0%	0.0 to 100.0%	0.0%	○
P14.21	PID preset value hold time	0.00 to 650.00 s	0.00 to 650.00 s	0.0 s	○
P14.22	PID feedback loss detection threshold	0.0 to 100.0% 0.0%: Disabled	0.0 to 100.0%	0.0%	○
P14.23	PID feedback loss detection time	0.0 to 20.0 s	0.0 to 20.0 s	1.0 s	○
P14.24	PID calculation mode	0: Calculation disabled at stop 1: Calculation enabled at stop	0, 1	0	○
P14.25	PID upper/lower limit unit selection	0: Percentage 1: Hz Note: When Hz is chosen, P14.26 and P14.27 are the upper and lower PID limits. When Hz is chosen, the maximum frequency P02.10 cannot exceed 327.67 Hz.	0, 1	0	×
P14.26	PID frequency upper limit	0 to P02.10	0 to P02.10	50.00 Hz	○
P14.27	Reserved				
P15: Communication parameters					
P15.00	Communication format	Ones place: 0: Modbus protocol 1: Expansion card to 485 protocol Tens place: 0: 1-8-2-N format	0 to 0x31	0x30	○

Function code	Name	Description	Range	Default	Modify
		1: 1-8-1-E format 2: 1-8-1-O format 3: 1-8-1-N format			
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	5	○
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 a "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 place: 0: Response to the write operation 1: No response to the write operation Tens place: 485 mapping function; 0: Prohibit 1: Enable Note: Only control parameters starting with 0x64 are provided with the choices whether there is a response or not to the write operation. For function codes of writing, only the choice with response is available.	0 to 0x11	0	○
P15.06	Reserved function 2 for user	0 to 65535	0 to 65535	0	○
P16: Keypad display setting parameters					
P16.00	Parameter selection 1 for LED display in the	0: No display; 1: Display Used to determine whether a parameter	0 to 0xFFFF	0x4F0	○

Function code	Name	Description	Range	Default	Modify
	running state	is displayed or not on the zero level keypad menu in the running state. The corresponding bits of each parameter 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: Motor speed 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			
P16.01	Parameter selection 2 for LED display in the running state	0: No display; 1: Display Used to determine whether a parameter is displayed or not on the zero level keypad menu in the running state. The corresponding bits of each parameter are listed below: 0: Bus voltage 1: Drive in the running state 2: DI1 to DI4 status 3: DI5 to DI8 status 4: DO status 5: AI1 voltage 6: AI2 voltage 7: AI1 current 8: AI2 current 9: AO1 voltage 10: HDI frequency 11: HDO1 frequency 12: HDO2 frequency	0 to 0xFFFF	0x1	○

Function code	Name	Description	Range	Default	Modify
		13: Process PID reference 14: Process PID feedback 15: Process PID deviation			
P16.02	Default selection of parameters for LED display in the running state	Used to determine the default selection of parameters (displayed as the serial number of each parameter) to be displayed on the zero level keypad menu in the running state after power-on. Each of the values 0 to 31 corresponds respectively to the 32 parameters listed in P16.00 and P16.01. Note: Press the shift button on the keypad, and the function code will display the serial number of the switched parameter. Such operation only modifies RAM, and does not save to EEPROM.	0 to 31	4	○
P16.03	Parameter selection for LED display in the stop state	Binary setting: 0: No display; 1: Display Used to determine whether a parameter is displayed or not on the zero level keypad menu in the stop state. Bit0 to bit15 correspond respectively to the 16 parameters listed in P16.04. Note: When all parameters are set to 0, the frequency reference will be displayed.	0 to 0xFFFF	0x3	○
P16.04	Default selection of parameters for LED display in the stop state	Used to determine the default selection of parameters (displayed as the serial number of each parameter) to be displayed on the zero level keypad menu in the stop state after power-on. 0: Frequency reference 1: Bus voltage 2: DI status 1 3: DI status 2 4: DO status 5: AI1 input voltage 6: AI2 input voltage 7: AO1 output percentage 8: HDI frequency reference	0 to 15	0	○

Function code	Name	Description	Range	Default	Modify
		9: HDO1 output 10: HDO2 output 11: Length 12: Simple PLC current step 13: Line speed 14: PID reference 15: Torque reference Note: Press the shift button on the keypad, and the function code will display the serial number of the switched parameter. Such operation only modifies RAM, and does not save 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%	○
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	○
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	0 to 0xFFFF	0 to 0xFFFF	0x1006	○

Function code	Name	Description	Range	Default	Modify
	address				
P18.15	Function data 4 value	0 to 65535	0 to 65535	0	*
P26: Commissioning parameter group 2					
P26.00	Commissioning parameter 1	0 to 65535	0 to 65535	5	○
P26.01	Commissioning parameter 2	0 to 65535	0 to 65535	1	○
P26.02	Commissioning parameter 3	0 to 65535	0 to 65535	10	○
P26.03	Commissioning parameter 4	0 to 65535	0 to 65535	70	○
P26.04	Commissioning parameter 5	0 to 65535	0 to 65535	300	○
P26.05	Commissioning parameter 6	0 to 65535	0 to 65535	0	○
P26.06	Commissioning parameter 7	0 to 65535	0 to 65535	0	○
P26.07	Commissioning parameter 8	0 to 65535	0 to 65535	0	○
P26.08	Commissioning parameter 9	0 to 65535	0 to 65535	0	○
P26.09	Commissioning parameter 10	0 to 65535	0 to 65535	0	○
P26.10	Commissioning parameter 11	0 to 65535	0 to 65535	0	○
P26.11	Commissioning parameter 12	0 to 65535	0 to 65535	0	○
P26.12	Commissioning parameter 13	0 to 65535	0 to 65535	0	○
P26.13	Commissioning parameter 14	0 to 65535	0 to 65535	0	○
P26.14	Commissioning parameter 15	0 to 65535	0 to 65535	0	○
P26.15	Commissioning parameter 16	0 to 65535	0 to 65535	0	○
P26.16	Commissioning parameter 17	0 to 65535	0 to 65535	0	○
P26.17	Commissioning parameter 18	0 to 65535	0 to 65535	0	○
P26.18	Commissioning	0 to 65535	0 to 65535	0	○

Function code	Name	Description	Range	Default	Modify
	parameter 19				
P26.19	Commissioning parameter 20	0 to 65535	0 to 65535	0	○
P26.20	Commissioning parameter 21	0 to 65535	0 to 65535	0	○
P26.21	Commissioning parameter 22	0 to 65535	0 to 65535	0	○
P26.22	Commissioning parameter 23	0 to 65535	0 to 65535	0	○
P26.23	Commissioning parameter 24	0 to 65535	0 to 65535	0	○
P26.24	Commissioning parameter 25	0 to 65535	0 to 65535	0	○
P26.25	Commissioning parameter 26	0 to 65535	0 to 65535	0	○
P26.26	Commissioning parameter 27	0 to 65535	0 to 65535	0	○
P26.27	Commissioning parameter 28	0 to 65535	0 to 65535	0	○
P26.28	Commissioning parameter 29	0 to 65535	0 to 65535	0	○
P26.29	Commissioning parameter 30	0 to 65535	0 to 65535	0	○
P30: Solar pump control parameters					
P30.00	CVT/MPPT mode	0: Stop solar function 1: CVT 2: MPPT	0 to 2	2	×
P30.01	Initial voltage in MPPT mode (percentage)	0 to 100.0	0 to 100.0	83.0	×
P30.02	Power filter time	0 to 10.00	0 to 10.00	0	×
P30.03	Bus filter time	0 to 10.00	0 to 10.00	0	×
P30.04	Minimum bus voltage allowed for running	0 to 600.0	0 to 600.0	Model dependent	×
P30.05	MPPT step size for upward search	0 to 200.0	0 to 200.0	2.0	×
P30.06	MPPT step size for downward search	0 to 200.0	0 to 200.0	2.0	×
P30.07	Steady-state judgment count	0 to 100	0 to 100	10	○
P30.08	Fluctuation percentage	0 to 100	0 to 100	2	○

Function code	Name	Description	Range	Default	Modify
	for steady-state exit				
P30.09	Weak-light delay start count	0 to 65535	0 to 65535	5	○
P30.10	Prolonged time for weak-light wake-up	0 to 6553.5	0 to 6553.5	600.0	○
P30.11	MPPT power detection refresh time	0 to 65535	0 to 65535	3	○
P30.12	Actual perturbation interval	0 to 6553.5	0 to 6553.5	1.0	○
P30.13	MPPT algorithms	0, 1	0, 1	1	×
P30.14	Vmpp keypad setting	0 to 600.0	0 to 600.0	500	×
P30.15	Water-level control selection	0: Control through digital input 1: AI1 (water-level signal input through AI1) 2: AI2 (water-level signal input through AI2)	0, 1, 2	0	×
P30.16	Full-water level threshold	0 to 100.0	0 to 100.0	25.0	×
P30.17	Empty-water level threshold	0 to 100.0	0 to 100.0	75.0	×
P30.18	Full-water level delay	0 to 10000	0 to 10000	5	×
P30.19	Full-water level wake-up delay	0 to 10000	0 to 10000	20	×
P30.20	Empty-water level delay	0 to 10000	0 to 10000	5	×
P30.21	Empty-water level wake-up delay	0 to 10000	0 to 10000	20	×
P30.22	Minimum running frequency	0 to P02.11	0 to P02.11	20.00	×
P30.23	Weak-light delay	0 to 3600.0	0 to 3600.0	20.0	×
P30.24	Weak-light wake-up delay	0 to 3600.0	0 to 3600.0	30.0	×
P30.25	PV input and power line frequency input selection	0: Automatic switchover of modes 1: Power line frequency input mode 2: PV input mode	0, 1, and 2	2	×
P30.26	Reserved				
P30.27	Threshold for switching to PV input	P30.30 to 800.0	P30.30 to 800.0	Model dependent	×
P30.28	Rated pump flow	0 to 6553.5	0 to 6553.5	0	×
P30.29	Rated pump lift	0 to 6553.5	0 to 6553.5	0	×

Function code	Name	Description	Range	Default	Modify
P30.30	PV undervoltage point setting	0 to 400.0	0 to 400.0	Model dependent	×
P30.31	Actual pump flow	0 to 6553.5	0 to 6553.5	0	*
P30.32	Actual pump lift	0 to 6553.5	0 to 6553.5	0	*
P30.33	Total pump flow	0 to 65535	0 to 65535	0	*
P30.34	Current at pump underload pre-alarm	0 to 100.0	0 to 100.0	0	×
P30.35	Frequency threshold at underload	0 to 200.00	0 to 200.00	0.5	×
P30.36	Underload pre-alarm delay time	0 to 6553.5	0 to 6553.5	60.0	×
P30.37	Reset time at underload	0 to 6553.5	0 to 6553.5	60.0	×
P30.38	PV reference voltage	0 to 600.0	0 to 600.0	0	*
P30.39	PV actual voltage	0 to 600.0	0 to 600.0	0	*
P97: Fault and protection parameters					
P97.00	Fault enable	Ones place: 0: Pulse-by-pulse current limit protection disabled 1: Pulse-by-pulse current limit protection enabled Tens place: 0: Hardware input phase loss detection fault disabled (for models of 18.5 kW and above only) 1: Hardware input phase loss detection fault enabled (for models of 18.5 kW and above only) Hundreds place: 0: Overload pre-alarm disabled 1: Overload pre-alarm enabled Thousands place: 0: Braking overcurrent disabled 1: Braking overcurrent enabled	0 to 0x1111	0x0011	×
P97.01	Stall protection enable	Ones place: 0: Overvoltage stall protection disabled 1: Overvoltage stall protection enabled Tens place: 0: Undervoltage stall protection disabled 1: Undervoltage stall protection enabled 2: Undervoltage stop	0 to 0x1121	0x1110	×

Function code	Name	Description	Range	Default	Modify
		Hundreds place: 0: Overcurrent stall protection disabled 1: Overcurrent stall protection enabled Thousands place: 0: Pulse by pulse current limit fault disabled 1: Pulse by pulse current limit fault enabled			
P97.02	Current limit level	60 to 200%	60 to 200%	150%	×
P97.03	Current limit adjustment coefficient	Range: 0 to 100	0 to 100	20	×
P97.04	Overvoltage stall protection action voltage	200 to 900 V	200 to 900 V	850 V	×
P97.05	Voltage regulator proportional coefficient for overvoltage stall protection	Used to define the proportional coefficient of the bus voltage regulator upon overvoltage stall.	0 to 1000	10	○
P97.06	Reserved				
P97.07	Speed regulator proportional coefficient for overvoltage stall protection	Used to define the proportional coefficient of the rotation speed regulator upon overvoltage stall.	0 to 1000	60	○
P97.08	Reserved				
P97.09	Voltage regulator proportional coefficient for undervoltage stall protection	Used to define the proportional coefficient of the bus voltage regulator upon undervoltage stall.	0 to 1000	40	○
P97.10	Voltage regulator integral coefficient for undervoltage stall protection	Used to define the integral coefficient of the bus voltage regulator upon undervoltage stall. Range: 0 to 1000	0 to 1000	20	○
P97.11	Undervoltage stall protection action voltage	When the bus voltage is lower than this value, the undervoltage stall protection will be triggered to lower the frequency and raise the voltage.	400 to 460 V	460	×
P97.12	Undervoltage stall recovery judgment time	When the bus voltage is greater than P97.13, the drive stops lowering the frequency after the delay time defined by P97.12.	0.0 to 100.0 s	2.0 s	×

Function code	Name	Description	Range	Default	Modify
P97.13	Undervoltage stall protection pause voltage	When the bus voltage is greater than this value, the drive stops lowering the frequency.	460 to 500 V	Model dependent	×
P97.14	Phase loss protection enable	Ones place: 0: Input phase loss protection disabled 1: Input phase loss protection enabled Tens place: 0: Output phase loss protection disabled in the running state 1: Output phase loss protection enabled in the running state Hundreds place: 0: Short-to-ground detection upon power-on disabled 1: Short-to-ground detection upon power-on enabled Thousands place: 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 place: Input phase loss (reserved) Tens place: Output phase loss (reserved) Hundreds place: Reserved Thousands place: Reserved	0 to 0	0	○
P97.16	Fault protection and alarm property 2	0: Coast to stop 1: Decelerate to stop 2: Keep running Ones place: EEPROM read/write fault Tens place: Reserved Hundreds place: Reserved Thousands place: 485 communication fault	0 to 0x2002	0	○
P97.17	Fault protection and alarm property 3	0: Coast to stop 1: Decelerate to stop 2: Keep running Ones place: Fan locked-rotor Tens place: Motor overload	0 to 0x222	0x0002	○

Function code	Name	Description	Range	Default	Modify
		Hundreds place: Motor overheat Thousands place: Reserved			
P97.18	Fault protection and alarm property 4	0: Coast to stop 1: Decelerate to stop 2: Keep running Ones place: Reserved Tens place: 24 V power supply overload Hundreds place: Reserved Thousands place: Reserved	0 to 0x20	0	○
P97.19	STO fault automatic reset enable	0: Disable 1: Enable	0 to 1	1	○
P97.20	Reserved				
P97.21	Reserved				
P97.22	U phase fault	0 to 0x1111	0 to 0x1111	0	*
P97.23	V phase fault	0 to 0x1111	0 to 0x1111	0	*
P97.24	W phase fault	0 to 0x1111	0 to 0x1111	0	*
P97.25	Motor overheat protection threshold	0 to 200℃	0 to 200℃	120℃	○
P97.26	Motor temperature sensor type	Ones place: 0: No temperature sensor 1: PT1000 2: KTY84-130 3: PT100 Tens place: 0: Motor temperature channel PT100_1 1: Motor temperature channel PT100_2	0x00 to 0x13	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	Automatic fault reset count	When there are faults, the drive starts to reset after the time interval defined by P97.31. After the automatic fault reset count is reached, the reset can be started by the manual reset command only. If there is any manual reset command during the automatic reset, the automatic reset count will be	0 to 100	5	○

Function code	Name	Description	Range	Default	Modify
		cleared. When the drive is running normally without faults for 600 s, the fault reset count will be cleared. The value of 0 indicates that the automatic fault reset function is disabled.			
P97.30	Fault relay action selection during automatic reset	0: Disabled 1: Enabled	0, 1	0	○
P97.31	Automatic fault reset interval	2.0 to 600.0 s	2.0 to 600.0 s	60.0 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: Reserved 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: Reserved 21: PID feedback loss (FbL) 22: Reserved 23: Braking resistor overcurrent (brOC) 24: Auto-tuning fault (tUN) 25: Reserved 26: Reserved	0 to 65	0	*
P97.33	Last fault type		0 to 65	0	*
P97.34	Second last fault type		0 to 65	0	*

Function code	Name	Description	Range	Default	Modify
		27: Reserved 28: Modbus TCP communication timeout (E-TCP) 29: STO1 fault (STO1) 30: STO2 fault (STO2) 31 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/download timeout (UPdnE) 51: AI1 current input overcurrent (AIOC) 52: Reserved 53: Fan locked-rotor (FAn) 54: Pre-overload (POL1) 55: I/O option 24 V overload (IO-OL) 56: Hardware input phase loss (HSPI) 57: DI zero-point positioning failure (POFL) 58: Sensor loss (PLoSS) 59: Sensor over-high (PoH) 60: Underload (PPL) 61: Burst (PPb) 62: IGBT hardware fault 63: CBC fault 64: Fan undervoltage fault (Fuv) 65: Buffer relay engage failure (CtF)			
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	*

Function code	Name	Description	Range	Default	Modify
P97.37	Running frequency upon the current fault	0.00 to 655.35 Hz	0.00 to 655.35 Hz	0.00 Hz	*
P97.38	AC drive operation state 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 status upon the current fault	0 to 0xFF	0 to 0xFF	0	*
P97.42	Output terminal status upon the current fault	0 to 0xF	0 to 0xF	0	*
P97.43	Running time upon the current fault	0.0 to 6553.5 min	0.0 to 6553.5 min	0.0 min	*
P97.44	Bus voltage upon the last fault	0.0 to 6553.5 V	0.0 to 6553.5 V	0.0 V	*
P97.45	Actual current upon the last fault	0.0 to 999.9 A	0.0 to 999.9 A	0.0 A	*
P97.46	Running frequency upon the last fault	0.00 to 655.35 Hz	0.00 to 655.35 Hz	0.00 Hz	*
P97.47	AC drive operation state upon the last fault	0 to 0xFFFF	0 to 0xFFFF	0	*
P97.48	Inverter bridge temperature upon the last fault	0.0 to 150.0℃	0.0 to 150.0℃	0.0℃	*
P97.49	Reserved				
P97.50	Input terminal status upon the last fault	0 to 0xFF	0 to 0xFF	0	*
P97.51	Output terminal status upon the last fault	0 to 0xF	0 to 0xF	0	*
P97.52	Running time upon the last fault	0.0 to 6553.5 min	0.0 to 6553.5 min	0.0 min	*
P97.53	Bus voltage upon the second last fault	0.0 to 6553.5 V	0.0 to 6553.5 V	0.0 V	*
P97.54	Actual current upon the second last fault	0.0 to 999.9 A	0.0 to 999.9 A	0.0 A	*
P97.55	Running frequency upon the second last fault	0.00 to 655.35 Hz	0.00 to 655.35 Hz	0.00 Hz	*

Function code	Name	Description	Range	Default	Modify
P97.56	AC drive operation state upon the second last fault	0 to 0xFFFF	0 to 0xFFFF	0	*
P97.57	Inverter bridge temperature upon the second last fault	0.0 to 150.0℃	0.0 to 150.0℃	0.0℃	*
P97.58	Reserved				
P97.59	Input terminal status upon the second last fault	0 to 0xFF	0 to 0xFF	0	*
P97.60	Output terminal status upon the second last fault	0 to 0xF	0 to 0xF	0	*
P97.61	Running time upon the second last fault	0.0 to 6553.5 min	0.0 to 6553.5 min	0.0 min	*
P98: Drive parameters					
P98.00	Serial number	0 to 1000	0 to 1000	0	*
P98.01	Software version number	0.00 to 99.99	0.00 to 99.99	0.00	*
P98.02	Performance software current version number	0.00 to 99.99	0.00 to 99.99	0.00	*
P98.03	Performance software burning version number	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 based on the model)	0 to 999.9 kW	Model dependent	*
P98.05	Rated voltage	0 to 999 V (automatically set based on the model)	0 to 999 V	Model dependent	*
P98.06	Rated current	0 to 999.9 A (automatically set based on 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 code 2	0 to 0xFFFF	0 to 0xFFFF	0	*
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	0 to 0xFFFF	0 to 0xFFFF	0	*

Function code	Name	Description	Range	Default	Modify
	code 6				

Chapter 7 Parameter Description

The parameter is described in the following format:

Function code	Function name	Value range	Default value

7.1 General parameters for solar pump control

7.1.1 P00: System management parameters

P00.00	Menu mode selection	0 to 2	1

0: Quick commissioning menu mode

Only parameters related to the quick commissioning are displayed. The user can initiate a quick drive start via the modification of these parameters.

1: Full menu mode

All parameters are displayed (excluding the hidden function codes correlated to other function codes).

2: Modification memory menu mode

Only parameters whose values are different from the default settings are displayed; P00.03 is excluded.

P00.01	User password	0 to 65535	0

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

To set the password:

Enter this function code, input a four-digit number as your user password and then press the "" key to confirm.

To change the password:

Press the "" button to enter the password verification state. Input the previous four-digit password to enter the parameter editing state. Select P00.01, set a new password, and press the confirm button.

To clear the password:

Press the "" the button to enter the password verification state. Input the previous four-digit password to enter the parameter editing state. Select P00.01, clear the previous password, and press the confirm button.



Keep the user password safe. 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: Modification available for all data;

1: Modification available for this function code and P02.09 (main frequency reference digital setting) only;

2: Modification available for this function code only.

If it is needed to change other parameters, set this function code to 0. After the parameters are changed, set this function code to the protection level needed.

P00.04	Button function selection	0 to 0x0410	0

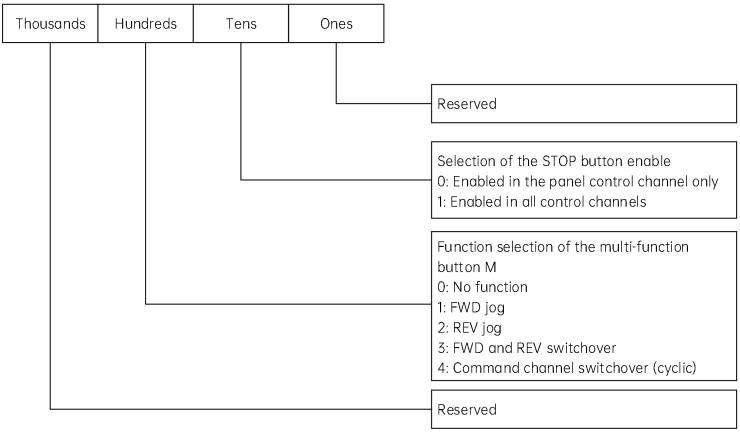


Fig. 7-1 Selection of button functions

Ones place: Reserved

Tens place: STOP/RESET function selection

Table 7-1 Keypad working mode

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

WARNING

When the STOP/RESET button is used as the fault reset button RESET, it is valid only in the local operating panel control channel. When pressing the RUN and STOP buttons at the same time, the drive will coast to stop.

Hundreds place: Function selection of the M button

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

When it is set to 1, the M button is used as FWD jog.

When it is set to 2, the M button is used as REV jog.

When it is set to 3, the M button is used as the FWD/REV direction switchover. In the operating panel control channel, the user can switch the direction of output frequency online.

When it is set to 4, the M button is used as the command channel switchover, only valid in the stop state. 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).



The operation command channel takes effect immediately once selected via the M button cyclic switchover.

Thousands place: Reserved

P00.05	Parameter initialization	0 to 3	0

0: All parameters can be modified

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 to P97.61 will be cleared.

2: Restore to factory settings

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

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

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

P00.06	Power board upgrading command	0, 1	0

0: Disabled

Power board upgrading is prohibited.

1: Enabled

Power board upgrading is allowed.

P00.07	Parameter copy	0 to 4	0

0: No action

1: Upload parameters from the drive to the keypad

2: Download parameters from the keypad to the drive (complete)

3: Download parameters from the keypad to the drive (motor parameters not included)

4: Download parameters from the keypad to the drive (motor parameters only)

7.1.2 P01: Status display parameters

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

P01.00	Main frequency channel	0 to 8	0

It monitors the main frequency channel in the common running mode. 0 is displayed in a non-common mode.

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

It monitors the main frequency reference in the common running mode. 0 is displayed in a non-common mode.

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

It monitors the auxiliary frequency reference in the common running mode. 0 is displayed in a non-common mode or when there is no auxiliary reference.

P01.03	Frequency reference	0.00 to P02.10	0

It monitors the final frequency based on the combination of the main frequency and the auxiliary frequency. A positive value indicates forwarding running, and a negative value indicates reverse running.

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

It displays the present ramp frequency reference of the drive.

P01.05	Output frequency	0.00 to P02.10	0

It monitors the present output frequency of the drive.

P01.06	Output voltage	0 to 65535 V	0

It monitors the present output voltage of the drive.

P01.07	Output current	0.0 to 6553.5 A	0

It monitors the present output current of the drive.

P01.08	Torque current	-300.0 to 300.0%	0

It monitors the present torque current of the drive, indicated as a percentage of the rated current of the motor.

P01.09	Exciting current	-300.0 to 300.0%	0

It monitors the present exciting current of the drive, indicated as a percentage of the rated current of the motor.

P01.10	Keypad version number	0.00 to 2.55	0

P01.11	Output power	0.0 to 6553.5 kW	0

It displays the present output power of the drive.

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

It displays the estimated motor rotor frequency under the condition of open-loop vector.

P01.13	Actual motor frequency	-P02.10 to P02.10	0

It displays the actual output frequency of the motor.

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

It displays the accumulated power consumption of the drive.

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

It displays the accumulated power consumption of the drive. Another 1 kWh is added to the value of P01.14 when the times of accumulation reaches 3600.

P01.16	Bus voltage	0.0 to 6553.5 V	0

It displays the present bus voltage of the drive.

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

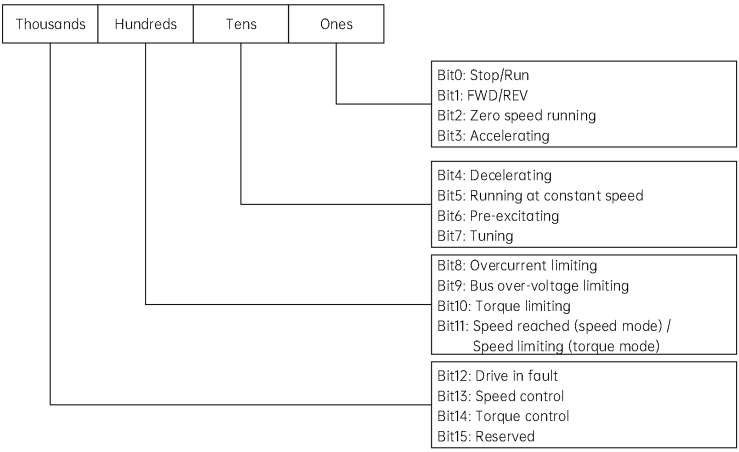


Fig. 7-2 Operation state of the drive

LED ones place Bit0: Stop/Run

When the drive is in the stop state, Bit0 is 0; otherwise, it is 1.

LED ones place Bit1: FWD/REV

When the drive is the in the FWD running state, Bit0 is 0; otherwise, it is 1.

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

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

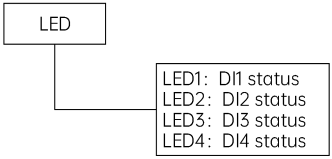


Fig. 7-3 DI terminal status

It displays the status of the four terminals (DI1 to DI4); the value of 0 indicates that the terminal is off, and the value of 1 indicates that the terminal is on.

P01.19	DI5 to DI8 status	0 to 0x1111	0

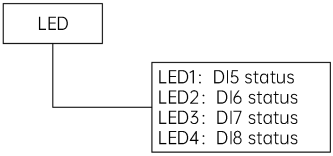


Fig. 7-4 DI terminal status

It displays the status of the four terminals (DI5 to DI8); the value of 0 indicates that the terminal is off, and the value of 1 indicates that the terminal is on.

P01.20	DO status	0 to 0x1111	0

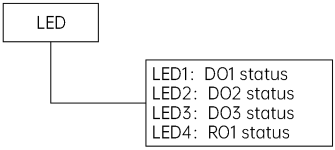


Fig. 7-5 DO terminal state

It displays the output status of the terminals DO1, DO2, DO3/RO2, and relay RO1. When there is a signal output, the bit of the corresponding LED will be set to 1. For example, if there is a signal output on DO1 only, LED1 will display 1, and the value of P01.20 will be displayed as 0001. If there is a signal output on RO1 only, the displayed value of P01.20 will be 1000.

P01.21	AI1 input voltage	0.00 to 10.00 V	0
P01.22	AI2 input voltage	-10.00 to 10.00 V	0

P01.21 and P01.22 are used to display the AI voltage before adjustment.

P01.23	AI1 input current	0.00 to 20.00 mA	0

It displays the AI1 input current.

P01.24	AI2 input current	0.00 to 20.00 mA	0

It displays the AI2 input current.

P01.25	AO1 output	0.00 to 100.00%	0

It displays the AO1 output (percentage).

P01.26	HDI input frequency	0.000 to 50.000 kHz	0

It displays the HDI input frequency.

P01.27	HDO1 frequency	0.000 to 50.000 kHz	0
P01.28	HDO2 frequency	0.000 to 50.000 kHz	0

They respectively display the output frequency of HDO1 and HDO2.

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

Function codes (P01.29 to P01.32) are used to display the reference, feedback, deviation, and output of the process closed-loop control in Group P14, each indicated as a percentage of 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

Function codes (P01.33 to P01.35) are used to display the proportional, integral, and derivation outputs (percentage) of the PID controller.

Function codes P01.36 and P01.37 are used to display the present AD values of AI1 and AI2 for use in the verification.

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

It displays the present AD value of the motor temperature.

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

The motor temperature indicates the temperature value actually measured. The range for display: -40℃ to 200℃. Margin of error: ±5%.

P01.40	Encoder count	0 to 65535	0

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

It displays the output (percentage) of the speed-loop controller.

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

It displays the present torque reference of the drive, indicated as a percentage of the rated current of the motor.

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

It displays the present rotation speed, line speed, and the output power of the motor.

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

It displays the present temperature of the inverter bridge inside the drive.

P01.47	Accumulated running time of the drive (min)	0 to 59 min	0
P01.48	Accumulated running time of the drive (hour)	0 to 65535 h	0
P01.49	Current running time of the drive (min)	0 to 65535 min	0
P01.50	Accumulated running time of the fan	0 to 65535 h	0

The above function codes respectively display the accumulated drive running time , the current drive running time, and the accumulated running time of the fan.

P01.51	Photovoltaic bus voltage	0.0 to 6553.5	0

It displays the current bus voltage value.

P01.52	Photovoltaic voltage setting	0.0 to 6553.5	0

It displays the bus voltage value set by MPPT.

P01.53	Photovoltaic calculated power	0.0 to 6553.5	0

It displays the estimated power.

P01.54	Photovoltaic MPPT status	0 to 65535	0

Ones:

0: MPPT waiting

1: MPPT initializing

2: MPPT searching

Ten thousands: AC/DC switching status

P01.55	Photovoltaic hibernation status	0 to 65535	0

Ones: AC grid connection status

Tens: Load shedding status

Hundreds: Weak-light/low-frequency protection status

Thousands: Full water protection status

Ten thousands: Empty water protection status

P01.56	Rectifier bridge temperature	-40.0 to 200.0℃	0℃

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

7.1.3 P02: Basic function parameters

P02.00	Control mode selection	0 to 3	2

0: Vector control 1 without PG

1: Vector control 2 without PG (only for asynchronous motors)

2: VF control (only for asynchronous motors)

3: Closed-loop vector control

P02.01	Motor selection	0, 1	0

0: Motor 1

1: Motor 2

The parameters of motor 1 and motor 2 correspond respectively to the parameters of Group P03 and Group P20. Please set the corresponding motor parameters based on the actual motor.

P02.02	Operation command channel selection	0 to 3	0

MV810 820 (SP2) has three operation command channels:

0: Operating panel control

Control via the RUN, STOP, and M (set as the JOG function) buttons on the operating panel.

1: Terminal control

Control via the external control terminals (FWD, REV, FWD JOG, and REV JOG).

2: Communication control

Control via the communication methods of the drive (serial port, bus expansion card, etc.).

3: Auto running

WARNING

In the running state, it is not allowed to change the operation command channel by modifying this function code, using external terminals, or the multi-function M button.

P02.03	Communication command channel selection	0 to 3	0

When P02.02 is set to 2, the following communication channels are available:

0: Modbus channel / Modbus TCP channel

1 to 2: Reserved

3: EtherCAT channel / PROFINET channel / CANopen channel / Ethernet IP channel

WARNING

A corresponding option must be installed before using the communication channels of Modbus TCP/EtherCAT/PROFINET/CANopen.

P02.04	Running direction	0, 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	6

0: Digital setting P02.09

The value of P02.09 will be used as the present frequency reference of the drive once the drive is powered on.

The present frequency reference of the drive can be changed via the ∧ and ∨ buttons on the operating panel when the drive is in the running/stop state.

1: AI1 setting

2: AI2 setting

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: 0 to 10 V

AI2: -10 to 10 V

When AI is set to current signal input, the current input range for both AI1 and AI2 is 0 to 20 mA. AI1 supports singled-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 Group P09.

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

3: High-speed pulse HDI reference

The terminal pulse frequency is used as the source of the main frequency, and it can only be input via terminal T6. For details, refer to Group P09.

4: Simple PLC programming reference

The simple PLC program is used as the source of the main frequency. The present frequency reference, running time, and cycle method of the drive are determined by Group P13.

5: Multi-speed running reference

In this mode, multi-speed terminals are combined to form various multi-speed references. For details, refer to the terminal functions.

6: PID control

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

7: Modbus/Modbus TCP setting

The frequency is set via the Modbus serial port or the Modbus TCP expansion bus frequency-setting command.

8: EtherCAT/PROFINET/CANopen/Ethernet IP setting

The frequency is set by the bus expansion card.

P02.06	Auxiliary frequency source selection	0 to 8	4

0: Digital setting P02.09

Digital setting P02.09 is used as the source of auxiliary frequency.

1: AI1 setting

2: AI2 setting

AI1 and AI2 are used as the source of auxiliary frequency.

3: High-speed pulse HDI reference

The auxiliary frequency is determined by the terminal pulse frequency, and it can only be input by the terminal 10. For details, refer to Group P09.

4: Simple PLC programming reference

The simple PLC program is used as the source of auxiliary frequency.

5: Multi-speed running reference

The multi-speed reference is used as the source of auxiliary frequency.

6: PID control

The process PID is used as the source of auxiliary frequency.

7: Modbus/Modbus TCP setting

The frequency is set via the Modbus serial port or the Modbus TCP expansion bus frequency-setting command.

8: EtherCAT/PROFINET/CANopen/Ethernet IP setting

The frequency is set by the bus expansion card.

WARNING

(1) When choosing 1, 2, or 3 as the auxiliary frequency source, the polarity of the auxiliary frequency output is determined by either the analog/pulse value itself or the function code P02.04, which is selected via the setting of Group P09.

(2) The source channels for the main frequency and the auxiliary frequency are mutually exclusive.

P02.07	Auxiliary frequency reference range selection	0, 1	0

0: Maximum output frequency

1: Main frequency reference

P02.08	Frequency reference source calculation	0 to 5	0

0: Main frequency

Only the main frequency reference is used as the frequency reference.

1: Auxiliary frequency

Only the auxiliary frequency reference is used as the frequency reference.

2: Main + Auxiliary

The sum of the main frequency reference and the auxiliary frequency reference is used as the frequency reference.

When the polarity of the combined frequency is opposite to that of the main frequency reference, the frequency reference is 0.

3: Main - Auxiliary

The main frequency reference minus the auxiliary frequency reference is used as the frequency reference.

When the polarity of the combined frequency is opposite to that of the main frequency reference, the frequency reference is 0.

4: MAX (main reference, auxiliary reference)

Select the maximum absolute value between the main reference and the auxiliary reference as the frequency reference.

When the polarity of the auxiliary frequency reference is opposite to that of the main frequency reference, the main frequency reference is the frequency reference.

5: MIN (main reference, auxiliary reference)

Select the minimum absolute value between the main reference and the auxiliary reference as the frequency reference.

When the polarity of the auxiliary frequency reference is opposite to that of the main frequency reference, the frequency reference is 0.

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, 5), this parameter indicates the initial frequency value 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 output allowed by the drive, such as Fmax in Fig. 7-6;

The upper limit frequency is the highest frequency allowed in operation, which is set by the user, such as FH in Fig. 7-6;

The lower limit frequency is the lowest frequency allowed in operation, which is set by the user, such as FL in Fig. 7-6;

Fb in Fig. 7-6 is the basic operating frequency, defined as the minimum corresponding output frequency when the drive outputs the highest voltage in the V/F mode.

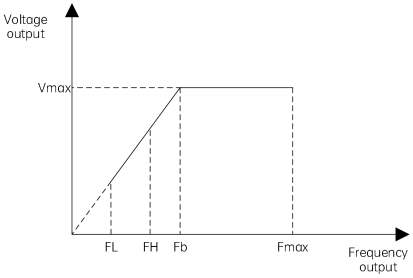


Fig. 7-6 Frequency limit parameter definition

WARNING

(1) The maximum output frequency, upper limit frequency and lower limit frequency should be carefully set according to the nameplate parameters of the actual motor and the requirements 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 and lower limit frequency, the output frequency of the drive during operation is also affected by the startup frequency, start frequency of DC braking at stop, skip frequency, and other parameters.

(4) Fig. 7-6 shows the relationship between the maximum output frequency, upper limit frequency, and lower limit frequency. Note the order of values during setting.

(5) The upper and lower frequency limits are used to limit the actual frequency output 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; 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.

P02.15	G/P model	0, 1	0

0: G model

1: P model

P02.16	Carrier frequency	2.0 to 12.0 kHz	Model dependent

Table 7-2 Carrier frequency for PWM output of the drive

Drive power	Default carrier frequency

Drive power	Default carrier frequency
0.4 to 15 kW	4 kHz

WARNING

(1) The carrier frequency affects the noise level of the motor during operation, and it is usually set to a value between 3 to 5 kHz. For occasions requiring silent operation, it can be set to a value between 6 to 8 kHz.

(2) When the carrier frequency is above the factory setting value, the drive needs to be derated by 5% for every increase of 1 kHz.

(3) Under vector control, the carrier frequency should not be lower than 2 kHz (under vector control, the carrier frequency can be set between 2 to 16 kHz, applicable for all control modes.)

P02.17	Customized parameter	0, 1	0

7.1.4 P03: Motor 1 parameters

P03.00	Motor type selection	0, 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 above parameters apply to the situation where the motor 1 is an asynchronous motor.

To enter the motor 1 parameter group, it is required to set both P02.01 and P03.00 to 0. To ensure the control performance, make sure to set the values of P03.01 to P03.05 properly according to the nameplate parameters of the motor

WARNING

The power ratings of the motor and the drive should be matched. Generally, the motor's power can only be lower than that of the drive by two levels or higher than that of 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 Fig. 7-7.

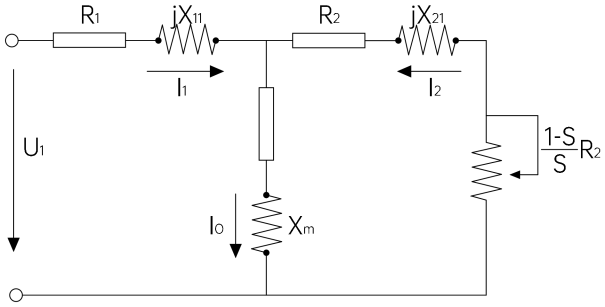


Fig. 7-7 Equivalent circuit diagram for asynchronous motor in steady state

In Fig. 7-7, R1, X11, R2, X21, Xm, and Io indicate respectively the stator resistance, stator leakage inductance, rotor resistance, rotor leakage inductance, mutual inductance, and no-load current. The value of the function code P03.08 is the sum of the stator leakage inductance and the rotor leakage inductance.

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

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

After the motor power P03.01 is changed, the drive will set the parameters of P03.02 to P03.10 to the default values 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%

The above four parameters refer to the four asynchronous motor iron core magnetic saturation coefficients respectively.

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 above parameters apply to the situation where the motor 1 is a synchronous motor.

To enter the motor 1 parameter group, it is required to set both P02.01 and P03.00 to 1. To ensure the control performance, set the values of P03.15 to P03.18 properly according to the nameplate parameters of the motor.

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

It sets the number of pole pairs for the synchronous motor.

P03.20	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
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

The above parameters refer to the control parameters of the synchronous motor, which can be identified via auto-tuning, or manually input according to the search result of related motor parameters.

P03.24	Single-phase motor winding coefficient	0 to 20	1.3
P03.25	Single-phase motor connection method	1 to 6	1
P03.26	Single-phase motor operation mode	0 to 3	0

P03.27	Motor auto-tuning	0 to 3	0

It provides the motor auto-tuning function in the static/rotating state. The result differs in different state, as shown below:

0: No action;

1: Partial parameter auto-tuning in the static state;

2: Full parameter auto-tuning in the rotating state;

3: Full parameter auto-tuning in the static state.

P03.28	Motor overload protection factor	0.0 to 300.0%	100.0%
P03.29	Motor overload protection enable	0, 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 maximum permissible output current of the drive, as shown in Fig. 7-8.

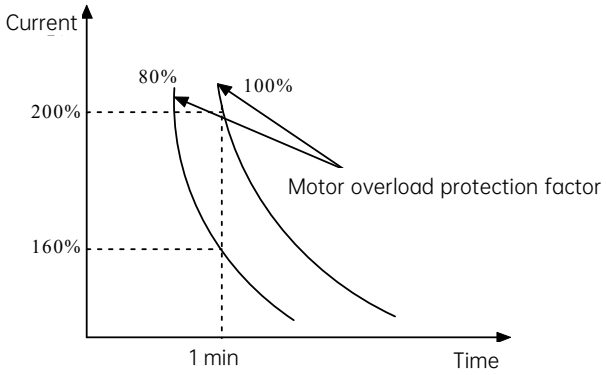


Fig. 7-8 Setting of the motor overload protection factor

The adjustment value differs according to the user's needs. Under the same conditions, if the motor overload protection is required to be faster, set P03.28 to a smaller value; otherwise, set it to a larger value.

WARNING

If the rated current of the load motor does not match the rated current of the drive, modify P03.28 to realize the overload protection for the motor.

7.1.5 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

It is 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 the PI parameters of motor 1 at high/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). 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 will have larger overshoots and oscillate 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.

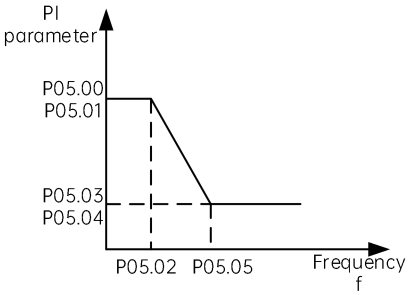


Fig. 7-9 PI parameter

WARNING

If the PI value is not properly selected, an overvoltage failure may occur (if there is no external braking resistor or braking unit) when the system accelerates to a high speed after a quick start, which is caused by the energy feedback resulted from the regenerative braking state of the system during the drop process subsequent to the speed overshoot. Adjust the PI parameter to eliminate the risk of such failures.

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

(1) Composition of speed regulator (ASR)

Kp refers to the proportional gain P, and Ti refers to the integral time I, as shown in Fig. 7-10.

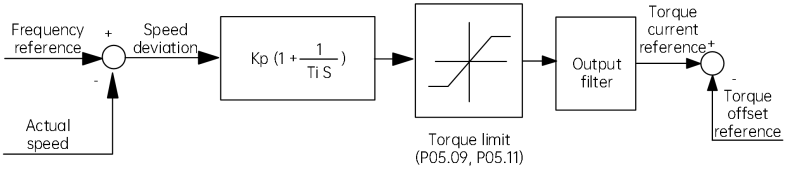


Fig. 7-10 Simplified diagram of ASR

When the integral time is set to 0 (P05.01 = 0, P05.04 = 0), the integral function is ineffective. Meanwhile, the speed loop serves as a proportional regulator only.

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

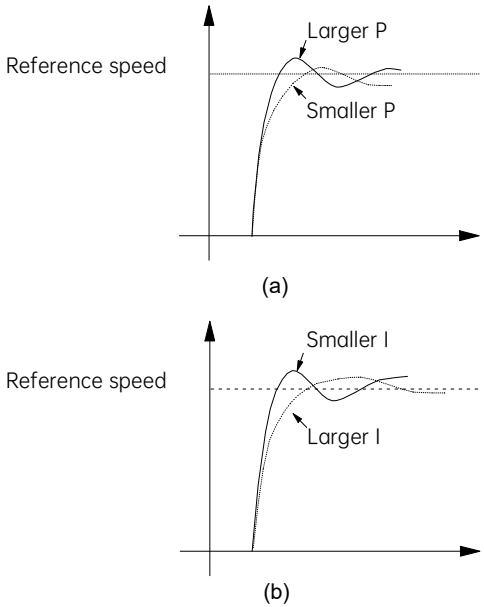


Fig. 7-11 Relations between the step response and PI parameters

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 will have larger overshoots and oscillate easily, as shown in Fig. 7-11.

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. 7-12 shows the speed step response curve when P and I are well selected (the speed response curve can be observed via the analog output terminal AO1; refer to the parameters in Group P10).

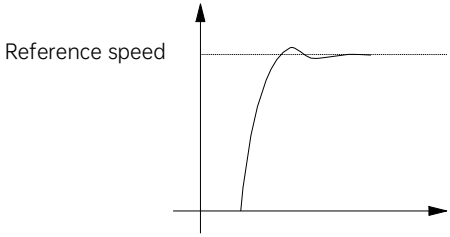


Fig. 7-12 Step response with good dynamic response

WARNING

If the PI value is not properly selected, an overvoltage failure may occur (if there is no external braking resistor or braking unit) when the system accelerates to a high speed after a quick start, which is caused by the energy feedback resulted from the regenerative braking state of the system during the drop process subsequent to the speed overshoot. Adjust the PI parameter to eliminate the risk of such failures.

(3) PI adjustment for the speed regulator (ASR) at high/low speed

If the system requires fast response for both high-speed and low-speed on-load running, set the ASR switchover frequency (P05.02 and P05.05). 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 a low frequency. In most cases, the speed regulator parameters can be adjusted according to the following order:

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 not oscillate and has good dynamic response at low frequency.

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

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

It is valid only when 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 goes through a delay filter and the torque current reference is produced. 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 over-excitation gain	50 to 200%	100%

It is used to set the over-excitation gain of motor 1 in 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%

It is used to set the physical channel for the drive torque limit.

0: Digital setting (P05.10)

P05.10 defines the value of the drive torque limit.

1: AI1

2: AI2

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

3: HDI

The maximum pulse input frequency (50 kHz) of the terminal corresponds to 300% of the rated torque reference. For the corresponding relations between the pulse input and output, refer to the description of Group P09.

4: Modbus\Modbus TCP reference

The drive torque limit value is set via Modbus\Modbus TCP communication.

5: EtherCAT/PROFINET/CANopen/Ethernet IP reference

The drive torque limit value is set via EtherCAT/PROFINET/CANopen/Ethernet IP communication.

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

It is used to set the physical channel for the braking torque limit.

0: Digital setting (P05.12)

P05.12 defines the value of the braking torque limit.

1: AI1

2: AI2

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

3: HDI

The maximum pulse input frequency (50 kHz) of the terminal corresponds to 300% of the rated torque reference. For the corresponding relations between the pulse input and output, refer to the description of Group P09.

4: Modbus\Modbus TCP reference

The drive torque limit value is set via Modbus\Modbus TCP communication.

5: EtherCAT/PROFINET/CANopen/Ethernet IP reference

The drive torque limit value is set via EtherCAT/PROFINET/CANopen/Ethernet IP communication

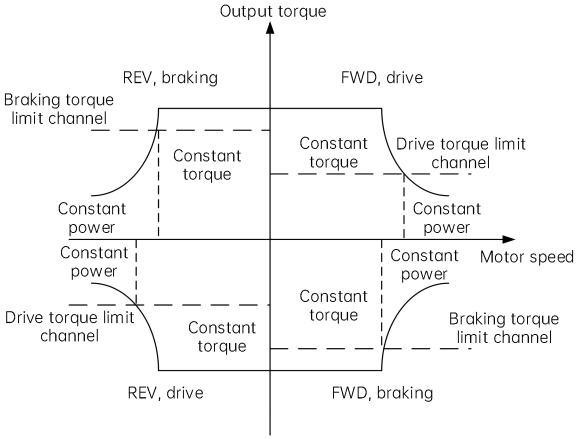


Fig. 7-13 Torque control diagram

WARNING

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

P05.17	Integral separation	0, 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

7.1.6 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

Function codes (P07.00 to P07.08) define the different V/F curves of motor 1 under V/F control.

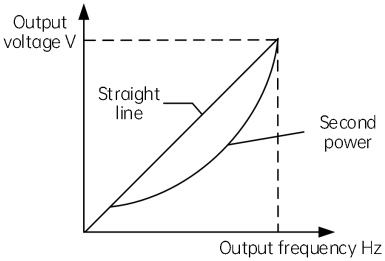


Fig. 7-14 V/F curve

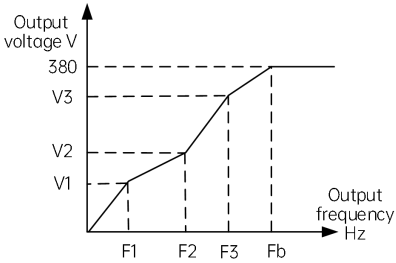


Fig. 7-15 Multi-point V/F curve

When P07.00 is set to 1, the curve is user-defined and applicable for segmented constant-torque loads, as shown in Fig. 7-14.

In Fig. 7-15, 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. 7-16.

P07.02 defines the cut-off frequency for manual torque boost, shown as fz in Fig. 7-16. This cut-off frequency is applicable to any V/F curve selected by P07.00.

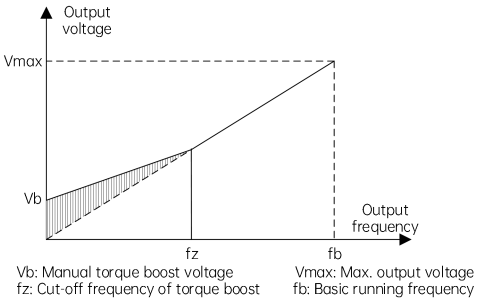


Fig. 7-16 Torque boost (the amount of boost is indicated as the shaded area)

WARNING

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

(2) Refer to the function code P07.02 for the definition of fz.

(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 properly set the rated voltage of the motor according to the actual motor selected.

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 V

P07.09	Torque compensation coefficient	0 to 300	150
P07.10	V/F over-excitation 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: HDI

5: Multi-reference

6: Simple PLC

7: PID

8: Modbus/Modbus TCP reference

9: EtherCAT/PROFINET/CANopen/Ethernet IP reference

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.

P07.18	VF Slip compensation gain	0.0 to 100.0	0.0

7.1.7 P08: Start/Stop control parameters

P08.00	Startup mode	0 to 2	0

The drive provides different startup modes for 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 first. 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

It is used to define 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 according to the set acceleration time after the startup frequency hold time P08.03.

WARNING

For heavy-load startup applications, a properly-set 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 s	0.0 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 for various applications.

0: Decelerate to stop

The motor decelerates 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

The motor decelerates to stop according to the set deceleration time, and when the frequency is lower than the start frequency of DC 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

It defines 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

It defines the hold time of the frequency which is used to detect whether the stop action is completed.

P08.09	Stop frequency detection mode	0, 1	0

0: Speed reference

For 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 hold time P08.08, the 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 (maximum 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 120.0%	50.0%
P08.14	DC braking time at stop	0.0 to 100.0 s	0.0 s

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

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

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 the DC braking at stop.

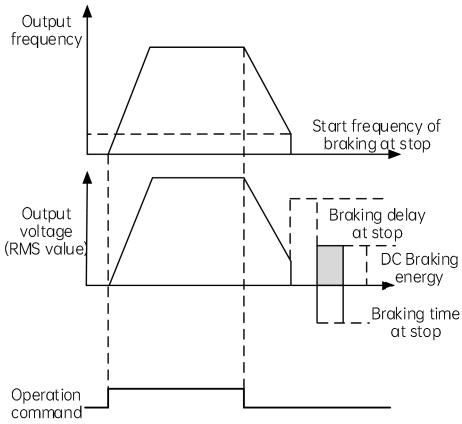


Fig. 7-17 Decelerate to stop + DC braking

P08.15	Speed tracking mode	0, 1	0

0: From the stop frequency

1: From the maximum frequency

WARNING

Only for asynchronous motors.

P08.16	Speed of speed tracking	1 to 100	20

A larger value of the parameter indicates a faster tracking speed. However, an excessively large value may impact the reliability of the tracking.

P08.17	Current of speed tracking	10 to 200%	Model dependent

Make sure that the maximum current during speed tracking is within the range. An excessively small value may impact the effect of the 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 changes to be 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 s

P08.25	Restart selection upon power failure	0, 1	0
P08.26	Waiting time for restart upon power failure	0.0 to 3600.0 s	1.0 s

The above function codes determine whether the drive automatically restarts upon power-on after a power failure, and the waiting time before such automatic restart.

When P08.25 is set to 0, there is no automatic restart upon power-on after a power failure.

When P08.25 is set to 1, the drive will restart automatically after the waiting time set by P08.26 if the drive is powered on again after a power failure.

WARNING

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

(2) When the function of restart upon power failure is effective, if the drive is powered on again while not being completely powered off (the drive LED displays -LU-), the drive will act in the same manner used in the situation where the drive is powered on after being completely powered off (the LED on the operating panel is completely turned off); that is, the drive will restart according to the startup mode defined by P08.00.

P08.27	Reverse running prohibit	0, 1	0

0: Disabled

1: Enabled

P08.28	FWD/REV switchover dead-zone time	0.0 to 3600.0 s	0.0 s

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

The FWD/REV switchover dead-zone time defines the transition waiting time during zero-frequency output which occurs when the drive switches from forward running to reverse running (or from reverse running to forward running), as t1 shown in Fig. 7-18.

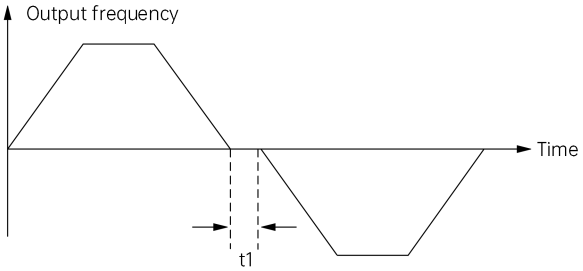


Fig. 7-18 FWD/REV switchover dead-zone time

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	350 to 900 V	900 V

The function codes P08.31 and P08.32 are effective only for the drives with built-in braking units.

P08.32 can 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 s	2.0 s

When the input of the emergency stop terminal (terminal function 60) 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 in the shortest deceleration time allowed by the system.

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

0: Enable protection

1: Disable protection

This function code determines whether the terminals need to be enabled again for the purpose of the drive operation resumption in special situations, such as upon powering-on or after a fault reset.

Tens place:

0: No protection after fault reset and coast to stop

1: Protection after fault reset and coast to stop

This function code determines whether it is required to enable again for running after fault reset and coast to stop when there is no protection for running.

WARNING

If protection is disabled, the terminal command will be immediately responded after fault reset, after stop in the coast to stop mode, or when the terminal command is valid after power-on.

7.1.8 P09: Terminal input parameters

P09.00	Function selection of terminals 4, 5, 6, 8	0 to 0x22	0x10

Ones place:

0: Terminal 4 as DI1

1: Terminal 4 as DO1

2: Terminal 4 as HDO1

Tens place:

0: Terminal 5 as DI2

1: Terminal 5 as DO2

2: Terminal 5 as HDO2

Hundreds place: Reserved

Thousands place: Reserved

WARNING

Terminal 6 can only be set as DI3; terminal 8 can only be set as DI4.

P09.01	Function selection of terminals 7, 10, 12, 16	0 to 0x2011	0x10

Ones place:

0: Terminal 7 as DI5

1: Terminal 7 as thermistor signal input

Tens place:

0: Terminal 10 as DI6

1: Terminal 10 as HDI

Hundreds place: Reserved

Thousands place:

0: Terminal 16 as DI8

1: Terminal 16 as AI1 voltage input

2: Terminal 16 as AI1 current input

P09.02	Function selection of terminals 13, 11	0 to 0x21	0x10

Ones place:

0: Terminal 13 as AI2 voltage input

1: Terminal 13 as AI2 current input

Tens place:

0: Terminal 11 as DO3/RO2

1: Terminal 11 as AO1 voltage output

2: Terminal 11 as AO1 current output

Hundreds place: Reserved

Thousands place: Reserved

P09.03	DI1 function selection	0 to 72	1
P09.04	DI2 function selection	0 to 72	0
P09.05	DI3 function selection	0 to 72	18
P09.06	DI4 function selection	0 to 72	19
P09.07	DI5 function selection	0 to 72	0
P09.08	DI6 function selection	0 to 72	0
P09.09	DI7 function selection	0 to 72	0
P09.10	DI8 function selection	0 to 72	0

Table 7-3 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	Multi-reference terminal 1	7	Multi-reference terminal 2
8	Multi-reference terminal 3	9	Multi-reference terminal 4
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
18	Full water signal	19	Empty water signal
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 prohibit	25	DC braking input at stop
26	Simple PLC pause command	27	Frequency reference source switchover from combination to B
28	PLC stop memory clear	29	PID pause
30	PID clear	31	PID integral hold
32	Enter the 0 Hz running	33	PID regulating feature switchover
34	Main reference frequency source selection 1	35	Main reference frequency source selection 2
36	Main reference frequency source selection 3	37	Main reference frequency source selection 4

Item	Function	Item	Function
38	Command channel switched to keypad	39	Command channel switched to terminal
40	Command channel switched to communication	41	Direct DC braking running
42	REV prohibit	43	Reserved
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 frequency reference clear
46	Pulse input clear	47	Reserved
48	Reserved	49	Position selection 1
50	Position selection 2	51	Position selection 3
52	Enable the positioning cyclic mode of the digital position	53	Spindle homing
54	Speed/Position mode switchover	55	Motor 1 and 2 switchover terminal
56	Safety terminal input (reserved)	57	PG card meter count clear
58	Reserved	59	Power line frequency input switchover of PV terminal
60	Emergency stop	61	Wobble pause
62	Wobble reset	63	Counter reset
64	Counter trigger	65	Power consumption clear
66	Power consumption hold	67	Length counter input
68	Length reset	69	Switched to V/F control
70	Switched to FVC control	71, 72	Reserved



The settings of the multi-function input terminals are mutually exclusive (excluding the function 0).

0: No function

1: Forward run: Terminal forward running input

2: Reverse run: Terminal reverse running input

3: Forward jog: Terminal forward jogging input

4: Reverse jog: Terminal reverse jogging 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 jogging commands are mutually exclusive, which means the jog command will not be responded during the running state and the running command will not be responded during the jogging state.

5: Three-wire control

This parameter is valid only when the operation command channel P02.02 is set to 1. See P09.14 for the usage method.

6: Multi-reference terminal 1

7: Multi-reference terminal 2

8: Multi-reference terminal 3

9: Multi-reference terminal 4

The parameters are valid when P02.05 is set to 5.

By the ON/OFF combination of these function terminals, an operation curve with up to 15 segments of speed can be defined.

Table 7-4 Multi-speed reference combination table

K4	K3	K2	K1	Frequency setting
OFF	OFF	OFF	OFF	Multi-speed 0
OFF	OFF	OFF	ON	Multi-speed 1
OFF	OFF	ON	OFF	Multi-speed 2
OFF	OFF	ON	ON	Multi-speed 3
OFF	ON	OFF	OFF	Multi-speed 4
OFF	ON	OFF	ON	Multi-speed 5
OFF	ON	ON	OFF	Multi-speed 6
OFF	ON	ON	ON	Multi-speed 7
ON	OFF	OFF	OFF	Multi-speed 8
ON	OFF	OFF	ON	Multi-speed 9
ON	OFF	ON	OFF	Multi-speed 10
ON	OFF	ON	ON	Multi-speed 11
ON	ON	OFF	OFF	Multi-speed 12
ON	ON	OFF	ON	Multi-speed 13
ON	ON	ON	OFF	Multi-speed 14
ON	ON	ON	ON	Multi-speed 15

10: Acceleration/Deceleration time terminal 1

11: Acceleration/Deceleration time terminal 2

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

Table 7-5 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-based control of two motors (terminal function 55 of motor 1 and motor 2 switchover is selected, and this terminal is valid), the acceleration/deceleration time 1 and 2 correspond to motor 1, and the acceleration/deceleration time 3 and 4 correspond 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 and

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 and 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)

Instead of the operating panel, the frequency is increased or decreased by the control terminal for remote control . It is valid when P02.05 is set to 0 in the normal running state or when P02.06 is set to 0 (as auxiliary frequency). The increase/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 adopts two input modes: NO and NC.

18: Full water signal

19: Empty water signal

20: Frequency reference source switchover from A to B

This function enables the 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

This function enables the switchover from the combined frequency reference channel to the main frequency reference (P02.08 is set to a value from 2 to 5).

22: External reset (RESET) input

This function defines the reset signal input via the external terminal to facilitate the fault reset, valid only 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 prohibit

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 between the function hold time of this terminal and the DC braking time at stop P08.14.

26: Simple PLC pause command

It is used to realize the pause control of the PLC process. When the terminal is enabled, the drive runs at zero frequency, and the PLC runs without time counting. When the terminal is disabled, the drive will start in the speed tracking mode, and continue the PLC operation. For details, see the function description of P13.00 to P13.36.

27: Frequency reference source switchover from combination to B

This function enables the switchover from the combined frequency channel to the auxiliary frequency reference (P02.08 is set to a value from 2 to 5).

28: PLC stop memory clear

If the drive is in the stop state under the PLC running mode, when the terminal is enabled, the PLC running stage, running time, running frequency and other information stored in the PLC upon the drive stop will be cleared. For details, see the function description of P13.00 to P13.36.

29: PID pause

When this function is enabled, the PID output is disabled and the PID is forced by the drive to output with zero frequency.

30: PID clear

31: PID integral hold

When the input terminal is closed, the system mandates the maintenance of the integral value of the PID control. When the input terminal is open, the PID control will restart the integral. For details of this function, see "Fig. 7-36 PID control diagram."

32: Enter the 0 Hz running

33: PID regulating feature switchover

It refers to the integral value of PID control when the input terminal is closed. For details of this function, see "Fig. 7-36 PID control diagram."

34: Main reference frequency source selection 1

35: Main reference frequency source selection 2

36: Main reference frequency source selection 3

37: Main reference frequency source selection 4

The ON/OFF combination of the selection terminals 1, 2, and 3 enables the switchover of the frequency reference channels shown in Table 7-6. Between the switchover via terminals and the setting of P02.09, the later command shall prevail.

Table 7-6 Frequency reference channel selection

Main frequency reference channel selection terminal 4	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	OFF	P02.09
OFF	OFF	OFF	ON	AI1
OFF	OFF	ON	OFF	AI2
OFF	OFF	ON	ON	HDI
OFF	ON	OFF	OFF	Simple PLC
OFF	ON	OFF	ON	Multi-speed reference
OFF	ON	ON	OFF	PID
OFF	ON	ON	ON	Modbus\Modbus TCP

Main frequency reference channel selection terminal 4	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
				setting
ON	OFF	OFF	OFF	EtherCAT/PROFINET/ CANopen/Ethernet IP setting

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 running

42: REV prohibit

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. Operations in the forward running state 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 immediately according to the preset stop mode, valid for all control modes.

45: Auxiliary frequency reference clear

It is valid only 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: Pulse input clear

47: Reserved

48: Reserved

49: Position selection 1

50: Position selection 2

51: Position selection 3

52: Enable the positioning cyclic mode of the digital position

53: Spindle homing

54: Speed/Position mode switchover

55: Motor 1 and 2 switchover terminal

When the terminal function is enabled, the two motors can be switched. The drive performs time-based control of the 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: PG card meter count clear

58: Reserved

59: Power line frequency input switchover of PV terminal

60: Emergency stop

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

61: Wobble pause

In wobble running, when this terminal function is enabled, the wobble output is paused.

62: Wobble reset

When this terminal function is enabled, the current wobble output frequency will be reset.

63: Counter reset

When this terminal function is enabled, the current count of the counter will be reset to 0.

64: Counter trigger

When this terminal function is enabled, the current counter will continue to count.

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 remain unchanged.

67: Length counter input

When this terminal function is enabled, the length count input is valid.

68: Length reset

When this terminal function is enabled, the current length count input will be reset.

69: Switched to V/F control

When this function is enabled, the drive is forced to switch to the V/F control mode.

70: Switched to FVC control

When this function is enabled, the drive is forced to switch to the FVC control mode.

71, 72: Reserved

P09.11	Terminal active mode selection	0 to 1	1

0: High level active outside terminal

1: Low level active outside terminal

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

Ones place:

0: DI1 positive logic active

1: DI1 negative logic active

Tens place:

0: DI2 positive logic active

1: DI2 negative logic active

Hundreds place:

0: DI3 positive logic active

1: DI3 negative logic active

Thousands place:

0: DI4 positive logic active

1: DI4 negative logic active

P09.13	DI5 to DI8 active mode selection	0 to 0x1111	0

Ones place:

0: DI5 positive logic active

1: DI5 negative logic active

Tens place:

0: DI6 positive logic active

1: DI6 negative logic active

Hundreds place:

0: DI7 positive logic active

1: DI7 negative logic active

Thousands place:

0: DI8 positive logic active

1: DI8 negative logic active

P09.14	FWD/REV operation mode	0 to 3	0

This parameter defines four different modes that the external terminals use to control the drive running.

0: Two-wire mode 1

K1	K2	Command
0	0	Stop
0	1	Reverse
1	0	Forward
1	1	Stop

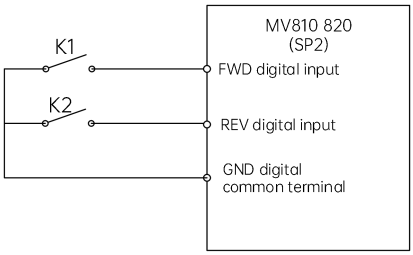


Fig. 7-19 Two-wire mode 1

1: Two-wire mode 2

K1	K2	Command
0	0	Stop
0	1	Stop
1	0	Forward
1	1	Reverse

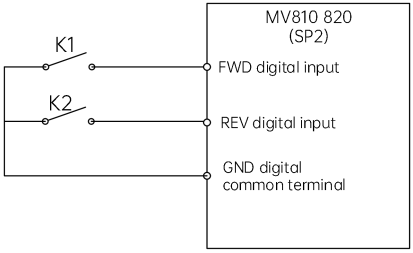


Fig. 7-20 Two-wire mode 2

2: Three-wire mode 1

SB1	SB2	SB3	Command
1	0→1	0	Forward
		1	
	0	0→1	Reverse
	1		
0			Stop

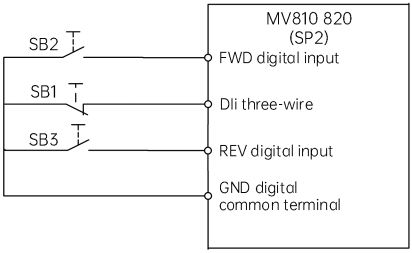


Fig. 7-21 Three-wire mode 1

In the above Fig.:

SB1: Stop button

SB2: FWD button

SB3: REV button

Dli is the multi-function input end of DI1 to DI8, so it is required to set the terminal to function 5 "Three-wire control."

3: Three-wire mode 2

SB1	SB2	SB3	Command
1	0→1	0	Forward
		1	Reverse
0			Stop

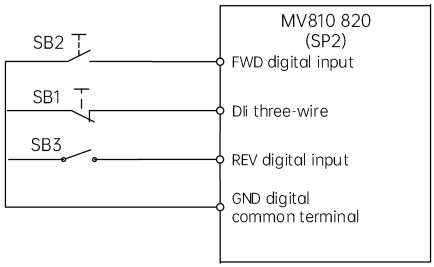


Fig. 7-22 Three-wire mode 2

In the above Fig.:

SB1: Stop button

SB2: Run button

Dli is the multi-function input end of DI1 to DI8, so it is required to set the terminal to function 5 "Three-wire control."

P09.15	DI filter time	0.000 to 1.000	0.010 s

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

P09.16	VDI active state	0 to 0xFF	0

0: Disabled

1: Enabled

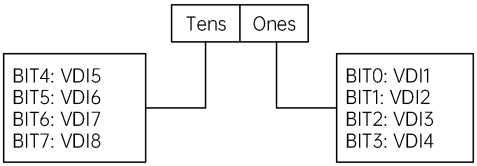


Fig. 7-23 VDI active state

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

The above function codes are used to set the delay time for the level jump upon switch-on and switch-off of the digital input terminals.

P09.25	AI1 lower limit	0.00 V to P09.27	0.00 V
P09.26	Percentage corresponding to AI1 lower limit	-1000.0% to 100.0%	0.0%
P09.27	AI1 upper limit	P09.25 to 10.00	10.00 V
P09.28	Percentage corresponding to AI1 upper limit	-1000.0% to 100.0%	100.0%
P09.29	AI1 filter time	0.000 to 10.000	0.030 s
P09.30	AI2 lower limit	-10.00 V to P09.32	-10.00 V
P09.31	Percentage corresponding to AI2 lower limit	-100.0 to 100.0%	-100.0%
P09.32	AI2 middle value 1	P09.30 to P09.34	0.00 V
P09.33	Percentage corresponding to AI2 middle value 1	-100.0 to 100.0%	0.0%
P09.34	AI2 middle value 2	P09.32 to P09.36	0.00 V
P09.35	Percentage corresponding to AI2 middle value 2	-100.0 to 100.0%	0.0%
P09.36	AI2 upper limit	P09.34 to 10.00	10.00 V
P09.37	Percentage corresponding to AI2 upper limit	-100.0 to 100.0%	100.0%
P09.38	AI2 filter time	0.000 to 10.000 s	0.030 s
P09.39	HDI frequency lower limit	0.000 kHz to P09.41	0.000 kHz
P09.40	Percentage corresponding to HDI frequency lower limit	-1000.0% to 100.0%	0.0%
P09.41	HDI frequency upper limit	P09.39 to 50.000 kHz	50.000 kHz
P09.42	Percentage corresponding to HDI frequency upper limit	-1000.0% to 100.0%	100.0%
P09.43	HDI filter time	0.000 to 10.000 s	0.030 s

AI1, AI2, and HDI pulse input can be used as different reference channels. The analog input channel function can be set by P09.01 and P09.02, and the pulse input function can be set by P09.01 (terminal 10 input function selection). For example, when choosing AI1, AI2, or HDI pulse input as the frequency reference channel, the relation between the frequency reference source and the frequency reference is shown in Fig. 7-24 (example based on AI1 as the main frequency reference channel).

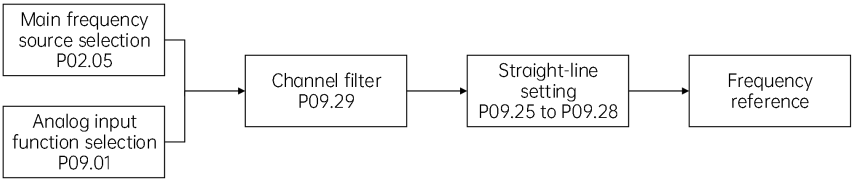


Fig. 7-24 Relation between reference channel input and frequency reference

After the analog signal reference is filtered, the relation between the signal and the frequency reference is in the form of a straight line or a curve. The AI1 frequency reference line is defined by P09.25 to P09.28, the AI2 frequency reference line is defined by P09.30 to P09.37, and the HDI frequency reference line is defined by P09.30 to P09.42. See Fig. 7-25.

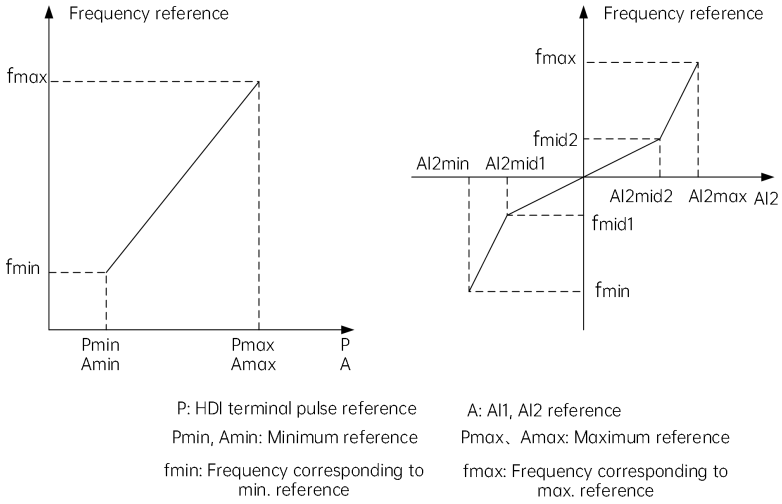


Fig. 7-25 Analog input frequency feature curve

7.1.9 P10: Terminal output parameters

P10.00	DO1 function selection	0 to 47	0
P10.01	DO2 function selection	0 to 47	1
P10.02	DO3 function selection / RO2 output selection	0 to 47	0
P10.03	RO1 output selection	0 to 47	18

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

Table 7-7 Table of digital output terminal functions

Item	Function	Item	Function
0	Disabled	1	AC 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)
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	Simple PLC stage completion
14	Simple PLC cycle completion	15	Current running time reach
16	Accumulated running time reach	17	AC drive ready to run (RDY)
18	AC drive fault	19	Host device On/Off signal
20	Motor overheat	21	Torque limited (valid when the torque command is limited by the torque limit value 1 or 2)
22	Motor overload pre-alarm signal	23 to 25	Reserved
26	Reference count value reach	27	Designated count value reach
28	Length reach	29	Positioning finished
30	Zero point positioning finished	31	Index position finished
32	PV power AC/DC switchover state	33 to 37	Reserved
38	Motor 1 and 2 indication terminal	39	Bus card switch signal
40 to 45	Reserved	46	PID feedback loss
47	Reserved		

0: Disabled

1: AC drive in running

When in the running state, the drive outputs the indication signal of the state.

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)

When the drive's output current exceeds the overload pre-alarm detection level, and its hold time exceeds the overload pre-alarm detection time, the relevant indication signal will be output. It is used for overload pre-alarm in most cases. Refer to the function description of P97.21 to P97.22.

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; 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: Simple PLC stage completion

When the simple PLC completes the current stage, the relevant indication signal will be output.

14: Simple PLC cycle completion

When the simple PLC completes an operation cycle, the relevant indication signal will be output.

15: Current running time reach

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

16: Accumulated running time reach

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

17: AC 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 prohibit terminal is disabled, the drive can receive the startup command.

18: AC drive fault

When a fault occurs in the drive, the relevant indication signal will be output.

19: Host device on/ff signal

The output signals of DO1, DO2, DO3/RO2, 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 limited

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

22: Motor overload pre-alarm signal

23 to 25: Reserved

26: Reference count value reach

The signal is output when the count reference value is reached.

27: Designated count value reach

The signal is output when the designated count value is reached.

28: Length reach

The signal is output when the set length is reached.

29: Positioning finished

30: Zero point positioning finished

31: Index position finished

32: PV power AC/DC switchover state

Indication signal is output when it is in power line frequency state.

33 to 37: Reserved

38: Motor 1 and 2 indication terminal

The output signal indicates the selected motor.

39: Bus card switch signal

The digital terminal signal adopts the virtual reference of the bus card.

40 to 45: Reserved

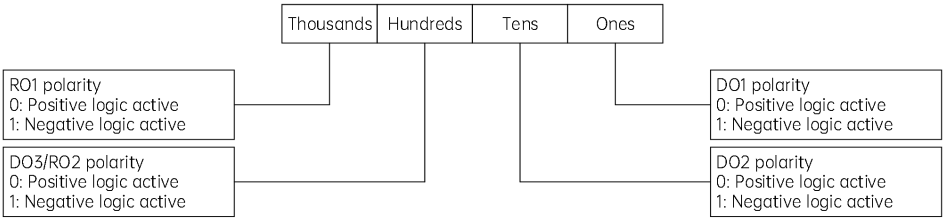
46: PID feedback loss

When the feedback signal is less than the detection value set by P14.22 and its hold time exceeds the time set by P14.23, the PID feedback is considered as "loss."

47: Reserved

P10.04	Output terminal polarity selection	0 to 0x1111	0

It is used to set the polarity of the 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	DO3 switch-on delay time / relay output RO2 switch-on delay time	0.0 to 600.0 s	0.0 s
P10.10	DO3 switch-off delay time / relay output RO2 switch-off delay time	0.0 to 600.0 s	0.0 s
P10.11	Relay RO1 switch-on delay time	0.0 to 600.0 s	0.0 s
P10.12	Relay RO1 switch-off delay time	0.0 to 600.0 s	0.0 s

It is used to set the delay time for the level jump upon switch-on and switch-off of the output terminals.

P10.13	AO1 function selection	0 to 28	0
P10.14	HDO1 function selection	0 to 28	0
P10.15	HDO2 function selection	0 to 28	0

Table 7-8 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
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	Bus card percentage	0 to 100.0%
27	High-speed pulse HDIA input value	
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	HDO1 output lower limit	0.00% to P10.23	0.00%
P10.22	Frequency corresponding to HDO1 output lower limit	0.00 to 50.00	0.00 kHz
P10.23	HDO1 output upper limit	P10.21 to 100.00%	100.00%
P10.24	Frequency corresponding to HDO1 output upper limit	0.00 to 50.00	50.00 kHz
P10.25	HDO1 output filter time	0.000 to 10.000	0.005 s
P10.26	HDO2 output lower limit	0.00% to P10.28	0.00%
P10.27	Frequency corresponding to HDO2 output lower limit	0.00 to 50.00	0.00 kHz
P10.28	HDO2 output upper limit	P10.26 to 100.00%	100.00%
P10.29	Frequency corresponding to HDO2 output upper limit	0.00 to 50.00	50.00 kHz
P10.30	HDO2 output filter time	0.000 to 10.000	0.005 s

The above function codes define the output filter and curve settings of AO1, HDO1, and HDO2.

7.1.10 P11: Auxiliary function parameters

P11.00	Acceleration/Deceleration mode	0, 1	0

0: Straight-line acceleration/deceleration

The output frequency is decreased or increased according to the constant slope, as shown in Fig. 7-26.

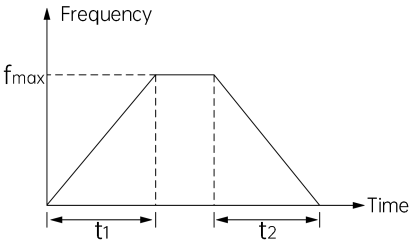


Fig. 7-26 Straight-line acceleration/deceleration

1: S-curve acceleration/deceleration

The output frequency is decreased or increased according to the S curve, as shown in Fig. 7-27.

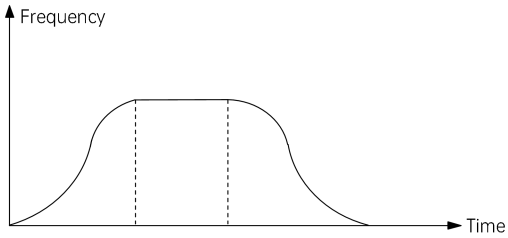


Fig. 7-27 S-curve acceleration/deceleration

Adopt an S curve of speed values between the acceleration start and the reach of speed, as well as between the deceleration start and the reach of speed. In this way, the acceleration and deceleration will be smooth and with less impact. The S curve acceleration/deceleration mode is applicable to the start/stop of load handling, 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 refers to the time required for the drive to accelerate from 0 Hz to the maximum output frequency (P02.10), as t_1 shown in Fig. 7-28. The deceleration time refers to the time required for the drive to decelerate from the maximum output frequency (P02.10) to 0 Hz, as t_2 shown in Fig. 7-28.

The MV810 820 (SP2) series AC drive provides four types of acceleration/deceleration time, which can be selected through the different combinations of control terminals during operation. Refer to the acceleration/deceleration time terminal function in P09.03 to P09.10. They can also be defined as the acceleration/deceleration time for the running frequency switchover for each segment when the drive is running in the simple PLC mode. Refer to the description in Group P13.

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. 7-28, t_1 refers to the parameter value set by P11.07, in which the slope of output frequency gradually increases; t_2 refers to the parameter set by P11.08, in which the slope of output frequency gradually decreases. The segment between t_1 and the subsequent t_2 is the straight-line acceleration/deceleration. They are relative to the current acceleration/deceleration time.

Note:

The sum of the set values of P11.07 and P11.08 shall not exceeds 100.0%.

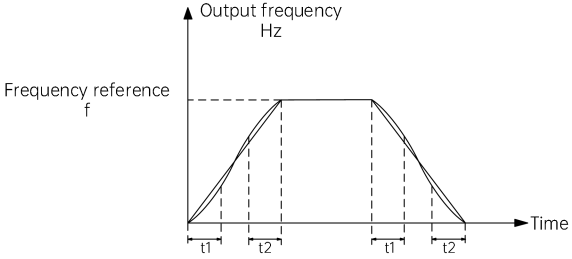


Fig. 7-28 Time proportion of S-curve start and end

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

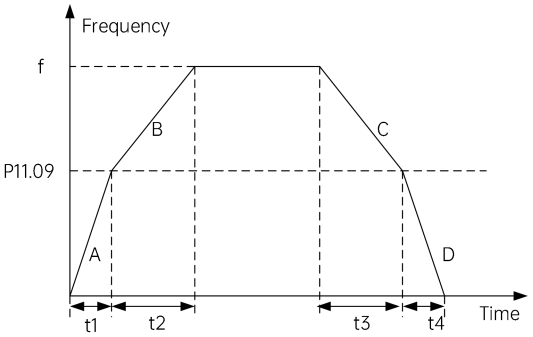


Fig. 7-29 Switchover of acceleration/deceleration time 1 and 2

As shown in Fig. 7-29, to accelerate motor 1, the motor will firstly run according to the acceleration time 1 shown as the A curve, and the acceleration time is defined as $t_1 = \frac{P11.09 \times P02.13}{P02.10}$. When the output frequency reaches to the switching point P11.09, the acceleration time will switch from P02.13 to P11.01 shown as the B curve, and the acceleration time is defined as $t_2 = \frac{(f - P11.09) \times P11.01}{P02.10}$. To decelerate, the motor will firstly run according to the deceleration time 2 shown as the C curve, and the deceleration time is defined as $t_3 = \frac{(f - P11.09) \times P02.14}{P02.10}$. When the output frequency decreases to a value lower than P11.09, the deceleration time will switch from 2 to 1 shown as the D curve, and the deceleration time is defined as $t_4 = \frac{P11.09 \times P11.02}{P02.10}$.

P11.10	Jog running 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

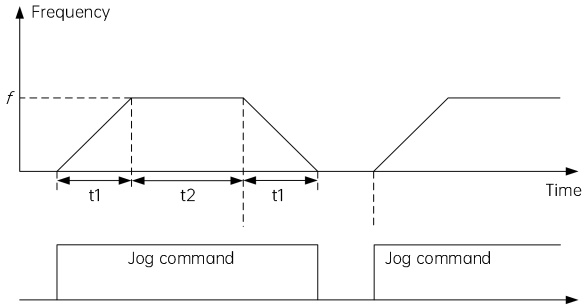


Fig. 7-30 Description of jog operation

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

The jog acceleration/deceleration time t_1 in actual running is determined by the following equation:

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

The drive can receive the jog command and accelerate immediately without the need to wait til stop during the process of the jog deceleration.

WARNING

(1) The jog operation starts according to the start mode 0 and stops according to the 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.

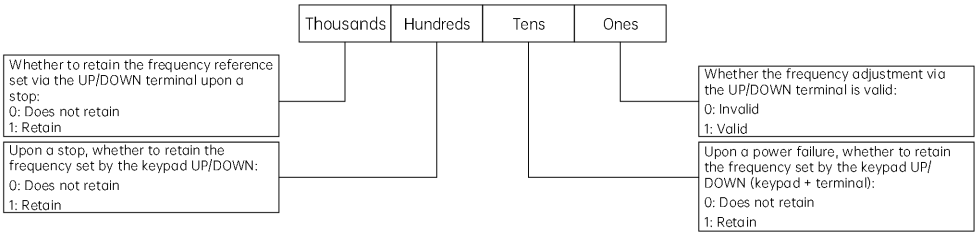
P11.14	Number of decimal places for line speed	0 to 2	2
P11.15	Number of decimal places for acceleration/deceleration time	1 to 2	1

The above function codes are used to set the decimal places (precision) of the frequency, line speed, and acceleration/deceleration time.

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

It is used to set the UP/DOWN speed of the terminal.

P11.17	Keypad frequency setting selection	0 to 0x1111	0x1111



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 range, the drive will output at the jump frequency boundary in actual operation to avoid mechanical resonance. If the jump frequency is set to 0, the function is disabled.

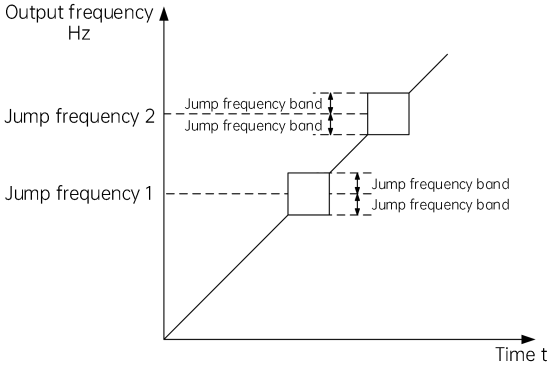


Fig. 7-31

P11.22	Wobble amplitude	0.0 to 100.0%	0.0%
P11.23	Wobble step	0.0 to 100.0%	0.0%
P11.24	Wobble rise time	0.0 to 6000.0 s	6.0 s
P11.25	Wobble fall time	0.0 to 6000.0 s	6.0 s

It is used to set parameters related to wobble running.

P11.26	Frequency reach (FAR) detection range	0.0 to 100.0%	5.0%

When the running frequency of the drive is within the value range of the frequency reference ± the maximum frequency (multiplied by the P11.26 set percentage), the multi-function DO terminal outputs an ON signal.

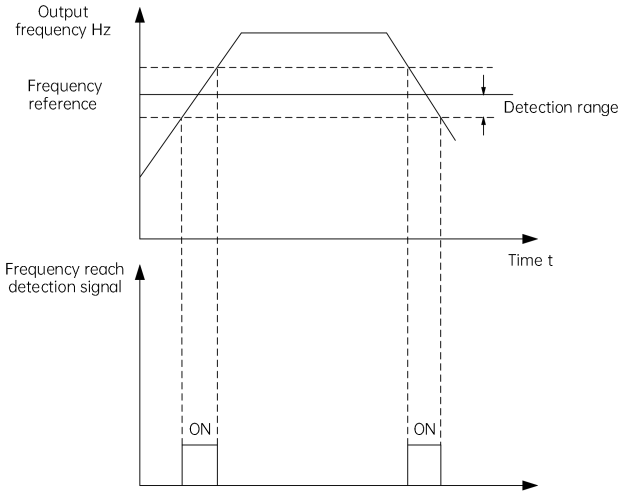


Fig. 7-32 Frequency reach (FAR) detection range

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 indication signal will be output and kept on 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 Fig. 7-33.

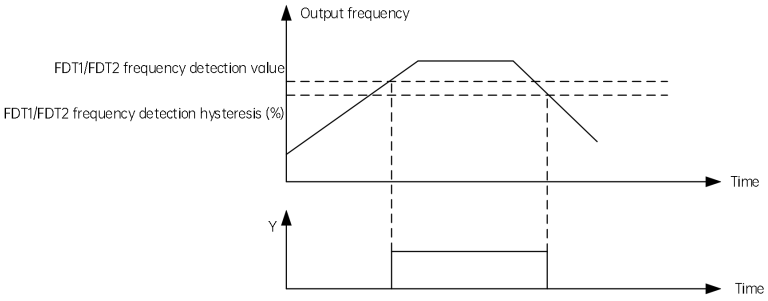


Fig. 7-33 Frequency level detection

P11.31	Temperature for automatic fan start	5.0 to 80.0℃	40.0℃
P11.33	Length reference	0 to 60000 m	0 m
P11.34	Actual length	0 to 60000 m	0 m

P11.35	Number of pulses per meter	0 to 60000	1000
P11.36	Reference count value	0 to 60000	0
P11.37	Designated count value	0 to 60000	0
P11.38	Running time setting	0 to 65535 min	0 min
P11.39	Accumulated running time reach	0 to 65535 h	0 h
P11.40	Wake-up 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	Wake-up delay time	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 time	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 automatically resumes operation after the time defined by P11.41.

P11.44	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 of the module.

1: Continuous running after power-on

The fan keeps running after the drive is powered on.

2: Controlled by start/stop commands (running upon start, off upon stop)

The fan runs when the drive runs, and stops when the drive stops.

7.1.11 P16: Keypad display setting parameters

P16.00	Parameter selection 1 for LED display in the running state	0 to 0xFFFF	0x4F0

P16.00 and P16.01 define the parameters allowed to be displayed on the LED during operation. The binary setting is shown in Fig. 7-34 and Fig. 7-35.

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

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

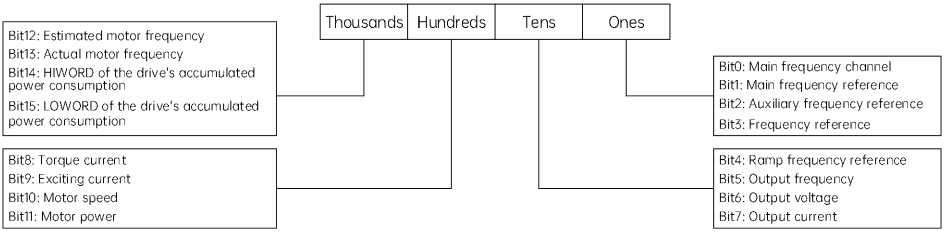


Fig. 7-34 Parameter selection 1 for LED display in the running state

P16.01	Parameter selection 2 for LED display in the running state	0 to 0xFFFF	0x1

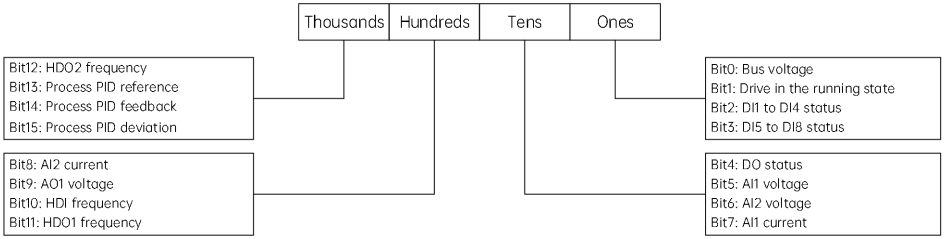


Fig. 7-35 Parameter selection 2 for LED display in the running state

P16.02	Default selection of parameters for LED display in the running state	0 to 31	4

It is used to set the default selection of parameters (displayed as the serial number of each parameter) to be displayed on the zero level keypad menu in the running state after power-on. Each of the values 0 to 31 corresponds respectively to the 32 parameters listed in P16.00 and P16.01.

WARNING

Turn the "" button clockwise, and the switched parameter serial number will be displayed. Such operation only modifies RAM, and does not save to EEPROM.

P16.03	Parameter selection for LED display in the stop state	0 to 0xFFFF	0x3

0: No display

1: Display

Used to determine whether a parameter is displayed or not on the zero level keypad menu in the stop state. Bit0 to bit15 correspond respectively to the 16 parameters listed in P16.04.

Note:

When all parameters are set to 0, the frequency reference will be displayed.

P16.04	Default selection of parameters for LED display in the stop state	0 to 15	0

Used to determine the default selection of parameters (displayed as the serial number of each parameter) to be displayed on the zero level keypad menu in the stop state after power-on.

0: Frequency reference

1: Bus voltage

2: DI status 1

3: DI status 2

4: DO status

5: AI1 input voltage

6: AI2 input voltage

7: AO1 output percentage

8: HDI frequency reference

9: HDO1 output

10: HDO2 output

11: Length

12: Simple PLC current step

13: Line speed

14: PID reference

15: Torque reference

WARNING

Turn the "" button clockwise, and the switched parameter serial number will be displayed. Such operation only modifies RAM, and does 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 scale display error, and has no influence on the actual speed.

$$P01.42 = \text{Line speed} \times P16.05$$

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

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

$$\text{Mechanical rotation speed} = 60 \times \text{Displayed running frequency} \times P16.06 / \text{Number of motor pole pairs}$$

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

P01.57 = P01.05 * Frequency display coefficient

7.1.12 P98: Drive parameters

P98.00	Serial number	0 to 1000	0
P98.01	Software version number	0.00 to 99.99	0.00
P98.02	Performance software current version number	0.00 to 99.99	0.00
P98.03	Performance software burning version number	0.00 to 99.99	0.00
P98.04	Rated capacity	0 to 999.9 kW	Model dependent
P98.05	Rated voltage	0 to 999 V	Model dependent
P98.06	Rated current	0 to 999.9 A	Model dependent

The above parameters record the drive's basic information, and are read-only. 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

7.2 Special parameters for solar pump control

7.2.1 P14: Process PID parameters

The PID closed-loop control adopts the combination of proportional control (P), integral control (I), and derivative control (D) to make the feedback value consistent with the target value.

Proportional control (P)

It defines the adjustment intensity in proportion to the deviation. Solely using P control can not eliminate the steady-state error.

Integral control (I)

It defines the adjustment intensity in proportion to the deviation integral value, which can eliminate the steady-state error but cannot control sharp changes.

Derivative control (D)

It defines the adjustment intensity in proportion to the deviation change rate, which can predict the tendency of deviation, quickly respond to sharp changes, and improve the dynamic performance. However, it is vulnerable to interference, so use D control only when necessary. The PID control diagram is shown in Fig. 7-36.

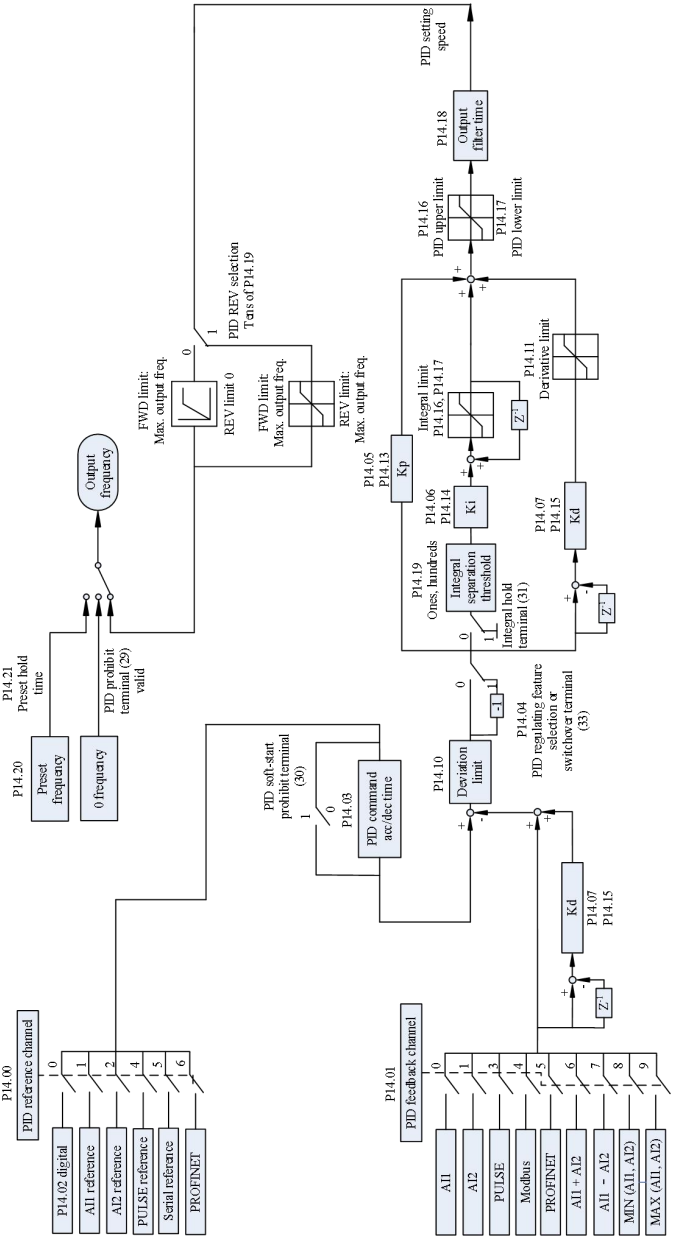


Fig. 7-36 PID control diagram

P14.00	PID reference source	0 to 6	0

0: P14.02 digital setting

1: AI1

2: AI2

3: Reserved

4: HDI

5: Modbus/Modbus TCP reference

6: EtherCAT/PROFINET/CANopen/Ethernet IP reference

P14.01	PID feedback source	0 to 9	0

0: AI1

1: AI2

2: Reserved

3: HDI

4: Modbus/Modbus TCP reference

5: EtherCAT/PROFINET/CANopen/Ethernet IP reference

6: AI1 + AI2

7: AI1 - AI2

8: MIN (AI1, AI2)

9: MAX (AI1, AI2)

P14.02	PID digital setting value	-100.0% to 100.0%	0.0%

It can be set via the operating panel or the serial port.

P14.03	Acceleration/Deceleration time of PID reference	0 to 3600.0	0.0 s

The PID acceleration/deceleration command is the soft start function that increases or decreases the PID target value by the acceleration/deceleration time reference

The set time refers to the required time for increasing from 0.0% reference to 100.0% reference, or the time for decreasing from 100.0% reference to 0.0% reference.

P14.04	PID regulating feature selection	0, 1	0

0: Positive action, selected when the motor speed needs to be increased upon the increased reference;

1: Negative action, selected when the motor speed needs to be decreased upon the increased reference.

P14.05	Proportional gain Kp1	0.0 to 1000.0	35.0

A larger Kp indicates quicker response, but an excessively large Kp may easily cause oscillation. The steady-state error can not be eliminated by using Kp control only.

P14.06	Integral time Ti1	0.01 to 10.00	1.00 s

Ti1 is used to eliminate the steady-state error, so the feedback value would be kept consistent with the target value. An excessively small Ti1 may cause overshoot and oscillation.

P14.07	Derivative time Td1	0.000 to 10.000	0.000 s

Td1 is used to improve the response of the system, but an excessively small value may cause oscillation.

P14.08	Derivative limit	0.00 to 100.00%	0.10%

It is used to limit the output of derivative regulating intensity.

When the PID output is used as the frequency reference, the maximum output frequency is 100%.

P14.09	Sampling cycle	0.01 to 10.00	0.01 s

The sampling cycle is for the sampling of feedback values, which also serves as the PID control cycle. The PID regulator calculates once for each sampling cycle. The longer the sampling cycle is, the slower the response will be.

P14.10	Deviation limit	0.0 to 100.0%	0.0%

When the deviation of the feedback value from the reference value, represented as a percentage of the reference value, falls less than this deviation limit value, the PID will stop adjusting and the output remains unchanged. This function can avoid frequent actions of PID control, as shown in Fig. 7-37.

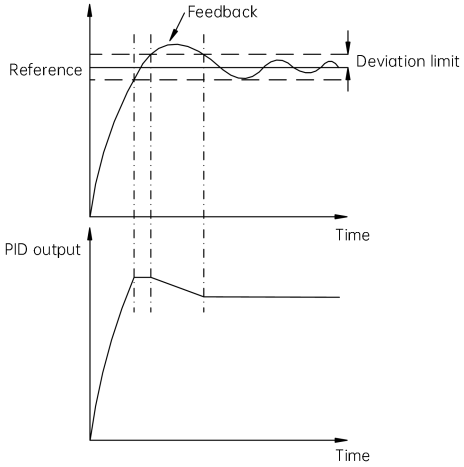


Fig. 7-37 Deviation limit

P14.11	PID parameter low-frequency switchover point	0.00 Hz to P14.12	5.00 Hz

When the ramp frequency reference is lower than the low-frequency switchover point, the PID parameters include P14.05 to P14.07.

When it is higher than the high-frequency switchover point, the PID parameters include P14.13 to P14.15.

When it is between the low-frequency and high-frequency switchover points, the PID parameter is the linear interpolation of the parameters of these two groups.

P14.12	PID parameter high-frequency switchover point	P14.11 to P02.10	10.00 Hz
P14.13	Proportional gain Kp2	0.0 to 1000.0	35.0
P14.14	Integral time Ti2	0.01 to 10.00	1.00 s
P14.15	Derivative time Td2	0.000 to 10.000	0.000 s

The definitions of Kp2, Ti2, and Td2 are the same as Kp1, Ti1, and Td1.

P14.16	PID upper limit digital setting	P14.17 to 100.0%	100.0%
P14.17	PID lower limit digital setting	-100.0% to P14.16	0.0%

The above function codes are used to limit the output of PID.

When the PID output is used as the frequency reference, the maximum output frequency is 100%.

P14.18	Output filter time	0.00 to 60.00	0.00 s

It defines the filter time for the output of the PID regulator. The longer the output filter time is, the slower the response will be.

P14.19	PID output property	0x000 to 0x111	0x100

It is used to set the PID output property, as shown in Fig. 7-38.

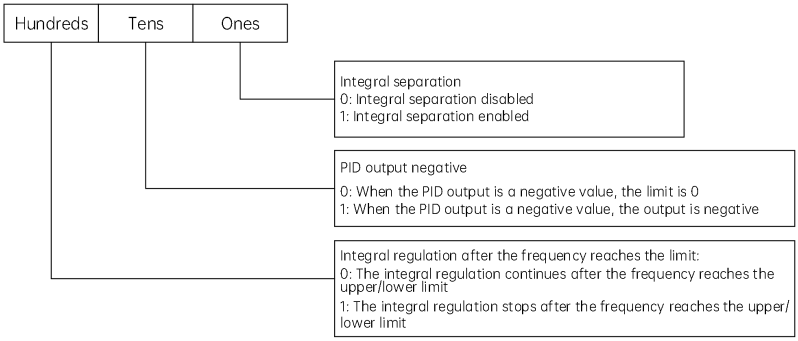


Fig. 7-38 PID output property

P14.20	PID preset value	0.0 to 100.0%	0.0%
P14.21	PID preset value hold time	0.00 to 650.00	0.0 s

Proper PID preset value and preset value hold time enable the closed-loop adjustment to quickly enter a stable stage.

After the PID operation starts, the frequency will firstly accelerate to the PID preset value according to the acceleration time, and then run continuously at this frequency till the time defined by P14.21 is reached before it runs according to the PID adjustment output, as shown in Fig. 7-39.

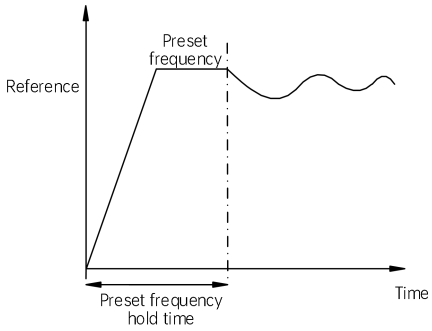


Fig. 7-39 PID preset frequency running

P14.22	PID feedback loss detection threshold	0.0 to 100.0%	0.0%
P14.23	PID feedback loss detection time	0.0 to 20.0	1.0 s

When the feedback signal is smaller than the detection value set by P14.22 and its holding time exceeds the value set by P14.23, the PID feedback is considered as "loss."

P14.24	PID calculation mode	0, 1	0

PID calculation mode selection:

0: Calculation disabled at stop

1: Calculation enabled at stop

P14.25	PID upper/lower limit unit selection	0, 1	0

0: Percentage

1: Hz

Note:

When Hz is chosen, P14.26 and P14.27 are the upper and lower PID limits. When Hz is chosen, the maximum frequency P02.10 cannot exceed 327.67 Hz.

P14.26	PID frequency upper limit	0 to P02.10	50.00 Hz

7.2.2 P15: Communication parameters

P15.00	Communication format	0 to 0x31	0x30

Ones place:

0: Modbus protocol

1: Expansion card to 485 protocol

Tens place:

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

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

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

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

P15.01	Baud rate	0 to 6	5

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

This function code is used to identify the address of the drive.

Note:

The value 0 is the broadcast address. When set to the broadcast address, the drive can only receive and execute the broadcast command from the host device, and 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 time period exceeding the value of this function code, the drive is considered to be in a communication error state.

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

It refers to the delay time between the drive's receiving and executing of the host command and the returning of 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 place:

0: Response to the write operation

1: No response to the write operation

Tens place: 485 mapping function;

0: Prohibit

1: Enable

Note:

Only control parameters starting with 0x64 are provided with the choices whether there is a response or not to the write operation. For function codes of writing, only the choice with response is available.

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

Reserved function.

7.2.3 P30: Solar pump control parameters

P30.00	CVT/MPPT mode	0 to 2	2
P30.01	Initial voltage in MPPT mode (percentage)	0 to 100.0	83.0

0: Stop solar function

1: CVT

2: MPPT

CVT refers to the constant voltage tracking; the voltage reference is a fixed value set by P30.14. The voltage reference value shall be lower than the PV input voltage; otherwise, the system will run at the frequency lower limit.

MPPT refers to the voltage reference for the maximum power point tracking, which changes constantly till the system reaches a stable state. The regulation speed of MPPT can be adjusted via Kp (P14.05 and P14.13) and Ti (P14.06 and P14.14) of PID. Generally, the step size adjusted via the voltage reference does not require further modification.

P30.02	Power filter time	0 to 10.00	0
P30.03	Bus filter time	0 to 10.00	0
P30.04	Minimum bus voltage allowed for running	0 to 600.0	Model dependent
P30.05	MPPT step size for upward search	0 to 200.0	2.0
P30.06	MPPT step size for downward search	0 to 200.0	2.0

P30.07	Steady-state judgment count	0 to 100	10
P30.08	Fluctuation percentage for steady-state exit	0 to 100	2

P30.09	Weak-light delay start count	0 to 65535	5
P30.10	Prolonged time for weak-light wake-up	0 to 6553.5	600.0

If the weak-light events exceed the specified count, the system will extend the restart delay time by P30.10 beyond the default P30.24 setting.

P30.11	MPPT power detection refresh time	0 to 65535	3
P30.12	Actual perturbation interval	0 to 6553.5	1.0
P30.13	MPPT algorithms	0, 1	1
P30.14	Vmpp keypad setting	0 to 600.0	500.0

P30.15	Water-level control selection	0 to 2	0

0: Control through digital input

1: AI1 (water-level signal input through AI1)

2: AI2 (water-level signal input through AI2)

P30.16	Full-water level threshold	0 to 100.0	25.0
P30.17	Empty-water level threshold	0 to 100.0	75.0
P30.18	Full-water level delay	0 to 10000	5
P30.19	Full-water level wake-up delay	0 to 10000	20
P30.20	Empty-water level delay	0 to 10000	5
P30.21	Empty-water level wake-up delay	0 to 10000	20

The above function codes serve as the water-level control parameters. When the water-level control selection (P30.15) is set to 0, the water-level signal is controlled by the digital input. Refer to the DI function 18 and 19 in Group P09 for detailed information. When the full-water signal input via the terminal is valid, the system will report a full-water pre-alarm (A-tF) after the full-water level delay time (P30.18), and enter the hibernation state. During the full-water alarm, the full-water signal is invalid; the system will clear the full-water alarm after the full-water level wake-up delay time (P30.19), and enter the running state again. When the empty-water signal input via the terminal is valid, the system will report an empty-water pre-alarm (A-tL) after the empty-water level delay time (P30.20), and enter the hibernation state. During the empty-water alarm, the empty-water signal is invalid; the system will clear the empty-water alarm after the empty-water level wake-up delay time (P30.21), and enter the running state again.

When the water-level control selection (P30.15) is set to a value of 1 or 2, the water-level signal is controlled by the analog input. If the detected analog signal of the water-level control is less than the full-water level threshold (P30.16) and remains in such state throughout the full-water level delay time (P30.18), the system will report a full-water pre-alarm and enter the hibernation state. If the detected analog signal rises above the full-water level threshold before the full-water level delay time is reached (defined as a non-continuous situation), the delay time count will be cleared automatically; however, the delay time count will restart once the detected analog signal falls below the threshold again. During the full-water alarm, when the detected analog signal exceeds the full-water level threshold (P30.16), the delay time count starts; if such state remains throughout the full-water level wake-up delay time (P30.19), the system will clear the full-water alarm and recover to the normal running state. In a non-continuous situation, the delay time count will be cleared automatically.

P30.22	Minimum running frequency	0 to P02.11	20.00 Hz
P30.23	Weak-light delay	0 to 3600.0	20.0
P30.24	Weak-light wake-up delay	0 to 3600.0	30.0
P30.25	PV input and power line frequency input selection	0 to 2	2

0: Automatic switchover of modes

1: Power line frequency input mode

2: PV input mode

When the output frequency is lower than or equal to the low-frequency protection frequency (P30.22), the delay time count starts. If such state remains throughout the low-frequency protection / weak-light delay period, the system will report a low-frequency running alarm (A-LF) and enters the hibernation state. In a non-continuous situation, the delay time count will be cleared automatically.

WARNING

When the bus voltage falls below the undervoltage point, or when the PV voltage is less than P30.30 V, a weak-light warning (A-Pu) is triggered immediately without delay. After multiple weak light occurrences, the drive will extend the weak-light wake-up time to protect the pump. If the PV input and power line frequency input selection (P30.25) is set to 0, the system will automatically switch to mains input mode after weak light detection.

P30.27	Threshold for switching to PV input	P30.30 to 800.0	600

When the PV input and power line frequency input selection is set to 0, the drive automatically switches between PV input and power line frequency input. When the system operates on photovoltaic power, the MPPT function is active. If the system enters a weak-light condition, it will automatically switch to grid power. When the system operates on grid power, the MPPT function is inactive, and speed adjustment is determined by the frequency reference (P02.09). When powered by the grid, if the bus voltage exceeds P30.27, the drive will disconnect from the grid via a contactor and activate MPPT.

P30.28	Rated pump flow	0 to 6553.5	0
P30.29	Rated pump lift	0 to 6553.5	0

The pump flow under the rated frequency and rated lift is indicated by Q, and the unit is m^3/h.

The pump lift under the rated frequency and rated flow is indicated by H, and the unit is m.

P30.30	PV undervoltage point setting	0 to 400.0	Model dependent
P30.31	Actual pump flow	0 to 6553.5	0
P30.32	Actual pump lift	0 to 6553.5	0
P30.33	Total pump flow	0 to 65535	0

P30.34	Current at pump underload pre-alarm	0 to 100.0	0
P30.35	Frequency threshold at underload	0 to 200.00	0.5
P30.36	Underload pre-alarm delay time	0 to 6553.5	60.0
P30.37	Reset time at underload	0 to 6553.5	60.0

The above function codes serve as the underload protection parameters. When the current at pump underload pre-alarm is set to a non-zero value, the underload detection function of the drive will be enabled, with 100.0% corresponding to the rated current of the motor. When the absolute difference between the target frequency and the ramp frequency remains less than or equal to the frequency threshold at underload (P30.35), the system will report an underload pre-alarm (A-LL) after the underload pre-alarm delay time if the present value of the current remains lower

than the set value of the current at pump underload pre-alarm. In the underload pre-alarm state, the system will restore after the reset time at underload.

P30.38	PV reference voltage	0 to 600.0	0
P30.39	PV actual voltage	0 to 600.0	0

7.2.4 P97: Fault and protection parameters

P97.00	Fault enable	0 to 0x1111	0x0011

Ones place:

0: Pulse-by-pulse current limit protection disabled

1: Pulse-by-pulse current limit protection enabled

Tens place:

0: Hardware input phase loss detection fault disabled (for models of 18.5 kW and above only)

1: Hardware input phase loss detection fault enabled (for models of 18.5 kW and above only)

Hundreds place:

0: Overload pre-alarm disabled

1: Overload pre-alarm enabled

Thousands place:

0: Braking overcurrent disabled

1: Braking overcurrent enabled

P97.01	Stall protection enable	0 to 0x1121	0x1110

Ones place:

0: Overvoltage stall protection disabled

1: Overvoltage stall protection enabled

Tens place:

0: Undervoltage stall protection disabled

1: Undervoltage stall protection enabled

2: Undervoltage stop

Hundreds place:

0: Overcurrent stall protection disabled

1: Overcurrent stall protection enabled

Thousands place:

0: Pulse by pulse current limit fault disabled

1: Pulse by pulse current limit fault enabled

P97.02	Current limit level	60 to 200%	150%
P97.03	Current limit adjustment coefficient	0 to 100	20

The current limit function controls the 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 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 (adjustment coefficient 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 staying in the power generation state for overlong time, leading to overload protection.

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

When the auto current limit function is enabled, the current would be limited to a low level, which may affect the drive's overload capacity.

P97.04	Overvoltage stall protection action voltage	200 to 900 V	850 V

During the drive deceleration, 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 the energy to the drive, resulting in the increase of the DC bus voltage of the drive. If no measures are taken, there will be an overvoltage trip.
The function of overvoltage stall protection detects the bus voltage during the deceleration of the drive, and compares it with the overvoltage stall point defined by P97.04. If the overvoltage stall point is exceeded, the output frequency of the drive stops decreasing. When the detected bus voltage falls lower than the overvoltage stall point, the drive restarts the deceleration, as shown in Fig. 7-40.

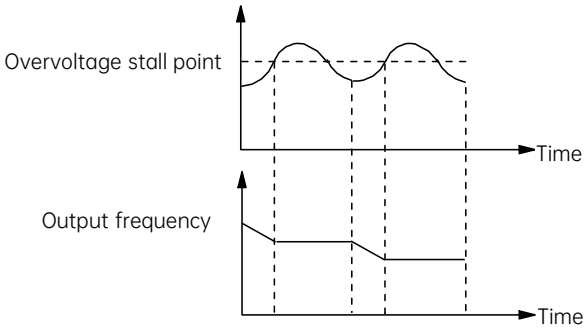


Fig. 7-40 Overvoltage stall

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

It is used to set the proportional coefficients for the bus voltage regulator and the speed regulator upon overvoltage stall.

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

It is used to set the proportional coefficient and integral coefficient for the bus voltage regulator upon undervoltage stall.

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

During undervoltage stall, when the bus voltage is lower than this value, the undervoltage stall protection 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 protection pause voltage	460 to 500 V	Model dependent

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

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

It is used to select the input/output phase loss protection modes, as shown in Fig. 7-41.

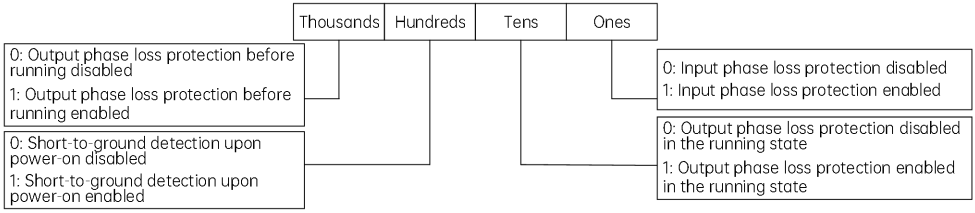


Fig. 7-41 Input/output phase loss protection setting

P97.15	Fault protection and alarm property 1	0	0

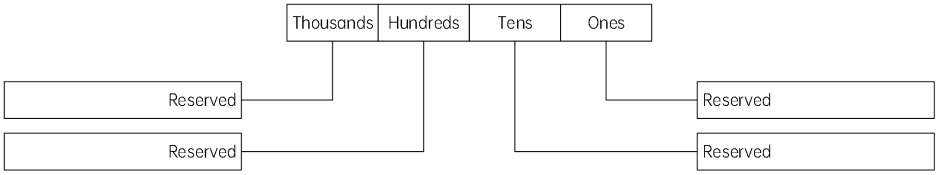


Fig. 7-42 Fault protection and alarm property 1

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

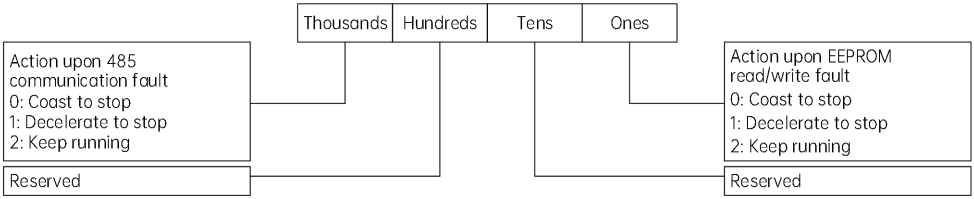


Fig. 7-43 Fault protection and alarm property 2

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

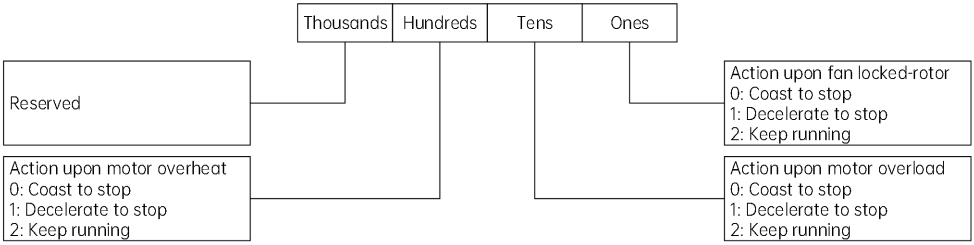


Fig. 7-44 Fault protection and alarm property 3

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

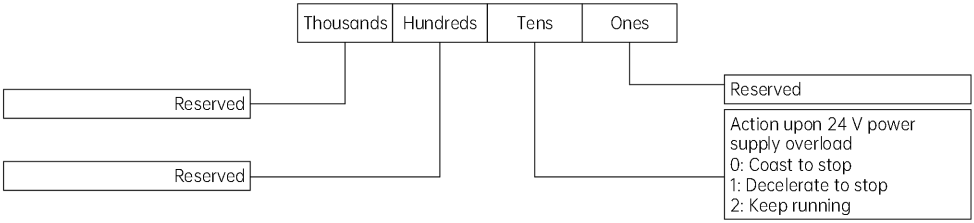


Fig. 7-45 Fault protection and alarm property 4

P97.19	STO fault automatic reset enable	0 to 1	1

P97.22	U phase fault	0 to 0x1111	0
P97.23	V phase fault	0 to 0x1111	0
P97.24	W phase fault	0 to 0x1111	0

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 hold time is

longer than 10 s, the drive will report a motor overheat fault (OH3). The user shall possess a good level of knowledge regarding the rule of the temperature-related resistance change during the motor temperature detection in order to correctly set this value.

P97.26	Motor temperature sensor type	0x00 to 0x13	0

Ones place:

0: No temperature sensor

1: PT1000

2: KTY84-130

3: PT100

Tens place:

0: Motor temperature channel PT100_1

1: Motor temperature channel PT100_2

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

It is 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 the hold time of such state exceeds the time set by P97.28, it is defined as excessive speed deviation. 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	Automatic fault reset count	0 to 100	5

The automatic reset function can automatically reset faults during operation according to the preset number of attempts and the preset time of interval. The value of 0 means the auto reset function is disabled, and the fault protection shall be initiated immediately.

When a fault occurs, the drive starts to reset according to the interval defined by P97.31. After the auto reset attempt number is reached, the user can only reset via 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.

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(1) The inverter module protection (OUT), external device fault (EF), and the short-to-ground fault (GdF) cannot be reset (neither automatic nor manual reset); the undervoltage fault (Uv), board level communication error (bCE), and power board software version mismatch (vEr) can be automatically reset immediately when the fault disappears; other faults can be manually reset or automatically reset according to the requirements;

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

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

P97.30	Fault relay action selection during automatic reset	0, 1	0

0: Disabled

1: Enabled

P97.31	Automatic fault reset interval	2.0 to 600.0	60.0 s

P97.32	Current fault type	0 to 65	0
P97.33	Last fault type	0 to 65	0
P97.34	Second last fault type	0 to 65	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	AC drive operation state 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 status upon the current fault	0 to 0xFF	0
P97.42	Output terminal status upon the current fault	0 to 0xF	0
P97.43	Running time upon the current fault	0.0 to 6553.5 min	0.0 min
P97.44	Bus voltage upon the last fault	0.0 to 6553.5	0.0 V
P97.45	Actual current upon the last fault	0.0 to 999.9	0.0 A
P97.46	Running frequency upon the last fault	0.00 to 655.35	0.00 Hz
P97.47	AC drive operation state upon the last fault	0 to 0xFFFF	0
P97.48	Inverter bridge temperature upon the last fault	0.0 to 150.0	0.0℃
P97.50	Input terminal status upon the last fault	0 to 0xFF	0
P97.51	Output terminal status upon the last fault	0 to 0xF	0
P97.52	Running time upon the last fault	0.0 to 6553.5 min	0.0 min
P97.53	Bus voltage upon the second last fault	0.0 to 6553.5	0.0 V
P97.54	Actual current upon the second last fault	0.0 to 999.9	0.0 A
P97.55	Running frequency upon the second last fault	0.00 to 655.35	0.00 Hz
P97.56	AC drive operation state upon the second last fault	0 to 0xFFFF	0

P97.57	Inverter bridge temperature upon the second last fault	0.0 to 150.0	0.0℃
P97.59	Input terminal status upon the second last fault	0 to 0xFF	0
P97.60	Output terminal status upon the second last fault	0 to 0xF	0
P97.61	Running time upon the second last fault	0.0 to 6553.5 min	0.0 min

MV810 820 (SP2) records the types of the latest three faults (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 fault occurrence, which serve for the reference for users. For details about the operation state, see P01.17.

Chapter 8 Troubleshooting

8.1 Diagnosis and solution of faults on display

All possible fault types of MV810 820 (SP2) are summarized in Table 8-1. Before seeking for assistance, the user can perform the fault diagnosis according to this table and record the fault symptoms in details. This will help when contacting the distributor for technical support.

Table 8-1 Fault types and solutions

Fault code	Fault type	Possible cause	Solution
OC1	Overcurrent during acceleration	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.
		Coded disc fault occurs when PG is running.	Check the coded disc and its wiring.
		The drive power is too low.	Use a drive with higher power.
		The V/F curve is improper.	Adjust the V/F curve and the manual torque boost.
OC2	Overcurrent during deceleration	The deceleration time is too short.	Increase the deceleration time.
		There is potential energy load, or the load inertial torque is too 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	Overcurrent during operation at constant speed	The acceleration/deceleration time is set too short.	Increase 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 too low.	Use a drive with higher power.
OV1	Overvoltage during acceleration	Abnormal input voltage	Check the input power supply.
		The acceleration time is too short.	Increase the acceleration time appropriately.
		When instantaneous stop happens, the rotating motor is restarted.	Set the startup mode P08.00 to startup after speed tracking.
OV2	Overvoltage during deceleration	The deceleration time is too short (compared with the regenerative energy).	Increase the deceleration time.
		There is potential energy load, or the load inertial torque is too large.	Select appropriate dynamic braking components.

Fault code	Fault type	Possible cause	Solution
OV3	Overvoltage during operation at constant speed	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.	Increase 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.
Uv	Undervoltage fault	The bus voltage of the drive is too low (lower than 350 V DC).	Check the input power voltage; Check the bus voltage of the drive; Seek for technical support.
SPI	Input phase loss	There is phase loss in input R, S, or T.	Check the installation wiring; Check the input voltage.
SPO	Output phase loss	There is phase loss in output U, V, or W.	Check the output wiring; Check the motor and the cables.
drv	Power module protection	There is interphase short circuit or short-to-ground circuit in the 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.
		Abnormal control board	Seek for technical support.
		Braking pipe damaged	Seek for technical support.
OH1	Inverter overheat	The ambient temperature is too high.	Lower the ambient temperature.
		The duct is blocked.	Unblock the duct.
		The fan is damaged.	Replace the fan.
		The inverter module is abnormal.	Seek for technical support.
OL1	AC drive overload	The motor parameters are incorrect.	Re-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 increase the braking time.
		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 cause	Solution
		The acceleration time is too short.	Increase the acceleration time.
		The power grid voltage is too low.	Check the power grid voltage.
		The V/F curve is inappropriate.	Adjust the V/F curve and the torque boost.
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 general-purpose motor runs at low speed for a long time with high load.	For long-time low-speed running, a specific motor shall be used.
		The power grid voltage is too low.	Check the power grid voltage.
		The V/F curve is inappropriate.	Set the V/F curve and the torque boost correctly
EF	External fault	The STOP button is used for emergency stop.	Refer to the function description of the STOP button in P00.04.
		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 button, and seek for technical support.
CE	485 communication error	The baud rate is set improperly.	Set the baud rate properly.
		Serial port communication error	Reset by pressing the STOP/RESET button, 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 error	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	PID feedback loss	The parameters for feedback loss are set improperly.	Modify the P14.22 setting.
		Feedback wire breakage	Rewire.
		The reference of closed-loop feedback is too low.	Refer to the P14.01 setting and increase the feedback reference.
brOC	Braking resistor overcurrent	The braking resistor is not well matched.	Use the braking resistor of a higher level.
tUN	Auto-tuning fault	The parameters corresponding to the motor nameplate parameters are not set correctly.	Set the parameters properly according to the motor nameplate.

Fault code	Fault type	Possible cause	Solution
		Reverse rotation auto-tuning is performed when the reverse running is prohibited.	Enable the reverse running.
		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.
E-TCP	Modbus TCP communication timeout	The detection time for options (P40.01) is set too short.	Set P40.01 properly
		Modbus TCP communication is disconnected.	Seek for technical support
PG1	Local PG fault	Encoder signal wire breakage in vector control with PG.	Check the encoder wiring and rewire.
oPt	Option fault	The expansion card is not installed properly.	Reinstall the expansion card.
		The expansion card is damaged.	Seek for technical support.
GdF	Short-to-ground fault	One of the phases (most likely the phase U) is short circuited to ground.	Check the connection of the output three phases to ground, and remove the fault.
dEv	Excessive speed deviation fault	The ASR parameters are improper.	Modify the Group P05 function codes.
		The speed deviation detection value is set too small.	Modify the speed deviation detection setting.
		Significant load fluctuation	Eliminate the load vibration.
Fbo	PID feedback over-limit	The PID feedback value exceeds the limit.	Check whether the input voltage of the feedback is normal. If it is normal, seek for technical support.
OH3	Motor overheat	The ambient temperature is too high.	Lower the ambient temperature.
		The motor duct is blocked.	Unblock the motor duct.
		The motor fan is damaged.	Replace the motor fan.
		The motor runs at low frequency with high load for a long time.	Employ a large external fan to help the cooling of the motor.
24OL	24 V power supply overload	The wiring of the control board terminal may be incorrect, or the load is excessively large.	Control the 24 V output, and the overall current of the digital output shall be less than 200 mA.
bCE	Board-level communication error	Incorrect connection of board detection signals	Seek for technical support.
PnCE	PN bus communication timeout	The identification time for expansion cards is too short.	Set P40.01 properly.
		PN communication disconnected	Seek for technical support.
bLt	BootLoader failure		Seek for technical support.

Fault code	Fault type	Possible cause	Solution
vEr	Power board software version mismatching	The software version to be burned is not consistent with the current software version number.	Set P00.06 to 1 to upgrade software.
UPdnE	Parameter upload/download timeout	Parameter upload/download timeout	Check the wiring. If the wiring is correct, seek for technical support.
AIOC	AI1 current input overcurrent	Check whether the AI1 input current is normal.	Seek for technical support.
FAn	Fan locked-rotor	Check whether the fan is blocked by foreign matters.	Clean the motor fan.
POL1	Pre-overload	Motor parameters are improper or the load is too large.	Adjust relevant parameters; and check whether the load is abnormal.
HSPI	Hardware input phase loss	Phase loss exists for the RST input.	Check the installation wiring.
			Check the input voltage.
HDrv	IGBT hardware fault	IGBT module fault	Change the IGBT module.
		IGBT module desaturation detection circuit fault	Check the IGBT module Vce detection circuit.
CBC	CBC fault	Pulse-by-pulse current limiting too frequent	Refer to overcurrent solution.
Fuv	Fan undervoltage fault	Fan power damaged	Seek for technical support.
CtF	Buffer relay pull-in failure	Relay fault	Seek for technical support.
		Relay control circuit fault	
A-Pu	PV panel undervoltage	Weak sunlight or underconfigured PV panels	Check the PV panel configuration.
A-tF	Full-water pre-alarm	The water tank is full.	If the full-water pre-alarm function is enabled, the system will automatically stop after the preset hold time of the full-water pre-alarm is reached, and does not require any action from the user; otherwise, check whether the terminals are wired correctly.
A-tL	Empty-water pre-alarm	There is no water in the water source.	If the empty-water pre-alarm function is enabled, the system will automatically stop after the preset hold time of the empty-water pre-alarm is reached, and does not require any action from the user; otherwise, check whether the terminals are wired correctly.
A-LF	Low-frequency running alarm	Weak sunlight or cloud shading	The device resumes operation automatically when light becomes strong.

Fault code	Fault type	Possible cause	Solution
A-LL	Underload pre-alarm	There is no water in the water source.	Check the water source.

8.2 Operation exceptions

Table 8-2 Operation exceptions and the corresponding solutions

Symptom	Condition	Possible cause	Solution
The operating panel has no response.	No response from part or all buttons.	Improper connection of the operating panel.	Check the wiring and perform hot plug.
		The buttons of the operating panel are damaged.	Replace the operating panel or seek for technical support.
The function code can not be modified.	The function code does not support modification in the running state.	The function code does not support modification in the running state.	Modify the function code after the drive stops.
	Only some of the 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.	Parameters of actual detected values do not support modification by the user.
	No response when pressing the "" button.	Refer to the possible causes of "The operating panel has no response."	Refer to the solutions of "The operating panel has no response."
	No response after pressing the ENTER button; the function code displays 0000.	A user password is set.	Enter the correct user password.
			Seek for technical support.
The drive stops unexpectedly during operation.	No stop command is received, but the drive stops automatically and the running indicator is off.	Fault alarms occur.	Perform the fault diagnosis, and reset the fault.
		A single cycle of the simple PLC is completed.	Check the PLC parameter setting.
		Power supply interruption	Check the power supply.
		Operation command channel switchover	Check the function codes related to the operation command channels.
		Excessively large speed deviation	Modify the speed deviation detection value.
		The positive/negative logic of the control terminals changes.	Check whether P09.12 and P09.13 are set according to the requirements.
	No stop command is received, but the motor stops	Automatic fault reset	Check the automatic fault reset setting and find out the cause.
		Simple PLC pause	Check the PLC pause function terminal.

Symptom	Condition	Possible cause	Solution
	automatically and the running indicator is on (running at zero frequency).	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.
		The closed-loop output is negative when the reverse running is disabled.	Check the setting of P14.19 and P08.27.
		"FWD prohibit" terminal is enabled during forward running.	Check the terminal function setting.
		"REV prohibit" terminal is enabled during reverse running.	Check the terminal function setting.
		Transient low-voltage compensation is applied for restart after power failure, and the power supply voltage is too low.	Check the input voltage and the setting of the restart after power failure function.
The drive does not work.	The drive does not work when pressing the RUN button, and the running indicator is off.	The coast-to-stop function terminal is enabled.	Check the coast-to-stop terminal.
		The drive running prohibit terminal is enabled.	Check the drive running prohibit terminal.
		The external stop function terminal is enabled.	Check the external stop function terminal.
		Under the three-wire control mode, the three-wire control function terminal is not closed.	Configure and close the three-wire control terminal.
		Fault alarms occur.	Clear the fault.
		The virtual terminal function of the host device is set improperly.	Disable the virtual terminal function, or set the function properly via the host device; the fault can also be cleared by modifying the P09.16 setting.
		The positive and negative logic of the input terminal are not set correctly.	Check the settings of P09.12 and P09.13.
The drive reports Uv immediately upon powering on.	The thyristor or the contactor is disconnected, and the drive is overload.	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.

Chapter 9 Maintenance

Many factors, such as the extremity in ambient temperature, humidity, dust, and vibration, as well as the aging of the internal components, will give rise to the occurrence of potential faults. Therefore, it is necessary to conduct daily/periodical maintenance for this AC drive product.

9.1 Daily inspection

WARNING

As safety precautions, before inspection and maintenance of the drive, please check the following matters. Otherwise, electrical shock may occur:

① The drive's power supply is cut off;

② Confirm that the charging LED indicator is off before opening the drive cover;

③ The voltage between terminals +/DC+ and –/DC- measured by a DC high-voltmeter should be below 36 V.

The drive shall be working in the environments specified in Section 3.2. In addition, there may be some unexpected situations during operation. The users need to carry out daily maintenance according to the following table. The effective ways to prolong the service life of the drive is to maintain a good operating environment, record daily operating data, and locate the causes for potential faults in the early stage.

Table 9-1 Instructions for daily inspection

Item	Instructions			Standard
	Aspect	Cycle	Methods	
Operating environment	1. Temperature and humidity	Any time	1. Thermometer and hygrometer	1. - 10℃ to + 40℃, derated use from 40℃ to 50℃
	2. Dust, water dripping and leakage		2. Visual inspection	2. No water dripping or leakage
	3. Odor		3. Smell	3. No strange smell
AC drive	1. Vibration and heating	Any time	1. Touch on the enclosure	1. The vibration is stable and limited; the temperature of the enclosure is normal; the fan is operating normally.
	2. Noise		2. Listen	2. No abnormal sound
Motor	1. Heating	Any time	1. Touch by hand	1. No abnormal heating
	2. Noise		2. Listen	2. Low and regular noise
Running status	1. Output current	Any time	1. Current meter	1. Within the rated range, and three-phase balanced
	2. Output voltage		2. Voltmeter	2. Within the rated range, and three-phase balanced
	3. Internal temperature		3. Thermometer	3. The difference with the ambient temperature is less than 35℃

9.2 Periodical maintenance

Users are recommended to carry out periodical maintenance for the drive once every 3 or 6 months based on the operating environment.

WARNING

① Only trained professionals are allowed to disassemble the drive, maintain, and replace parts of the device;

② Do not leave any screws, gaskets or other metal objects in the machine. Otherwise, the device may be damaged.

General inspections:

(1) Check if the screws of control terminals are loose. If so, use a screwdriver to fasten them;

(2) Check if the main circuit terminals are poorly connected, and if the connection part of copper bar is overheated;

(3) Check if there is any damage to the power cables and control cables, especially whether there is any wear on the cable sheath;

(4) Check if the insulation tapes around the power cable lugs are stripped;

(5) Clean out the dust on the circuit board and the duct; a vacuum cleaner is recommended;

(6) Before testing the grounding insulating performance of the drive, short all the input and output terminals (L1, L2, L3/N, U, V, W, BR, +/DC+, -/DC-) of the main circuit first. It is strictly forbidden to conduct the grounding test for a single terminal; otherwise, the drive may be damaged. Please use a 500 V megger during the test;

(7) To test the insulating performance of the motor, it is needed to disconnect the input terminals U, V, and W of the motor from the drive, and conduct test independently; otherwise, the drive may be damaged.

WARNING

① The drive has passed the dielectric strength test before delivery. Thus, the user shall not conduct the test again; otherwise, improper test may damage the drive.

② If it is needed to replace the original components, make sure the models and specifications of new components are the same; otherwise, the drive will be damaged.

9.3 Replacement of quick-wear parts

The quick-wear parts of this AC drive product mainly include the fans and the filter electrolytic capacitor, the service life of which depends on the operating environment and the maintenance. The service life of components in general conditions is listed in the table below.

Table 9-2 Service life of components

Component	Service life
Fan	30,000 to 40,000 hours
Electrolytic capacitor	40,000 to 50,000 hours
Relay	About 100,000 times

Users can replace the parts according to the actual running time.

(1) Fan

Possible causes of damage: Wear of the bearing, or aging of the blades.

Inspection standards: Check whether there is any crack on the blades, and whether there is any abnormal vibration or noise at startup.

(2) Electrolytic capacitor

Possible causes of damage: High ambient temperature, increased pulse current caused by rapid changing load, or electrolyte aging.

Inspection standards: Check whether there is liquid leakage, and whether the safety valve is protruded; measure the static capacitance and the insulating resistance.

(3) Relay

Possible causes of damage: Erosion, or frequent actions.

Inspection standards: Check whether the relay can be opened and closed properly.

9.4 Storage

The following points must be followed for the temporary and long-term storage of the drive:

(1) The drive should be stored in the place with good ventilation away from high temperature, humidity, dust and metal powder;

(2) Long-term storage will cause the deterioration of the electrolytic capacitor. The drive should be powered on for a test at least once (for at least 5 hours) within 2 years. To power on the drive, the input voltage should be raised gradually to the rated value via a regulator.

Appendix 1 Modbus Communication Protocol

1. Network

The two networking methods for this AC drive include: single-master-multi-slave, and single-master-single-slave.

2. Interface

RS485 interface: asynchronous and half-duplex. Default: 1-8-N-1, 9600 BPS, RTU. For the parameter setting, refer to Group P15.

3. Communication

(1) The drive adopts the Modbus communication protocol, which supports the common reading/writing of the register, and expands part of the commands to manage the function codes.

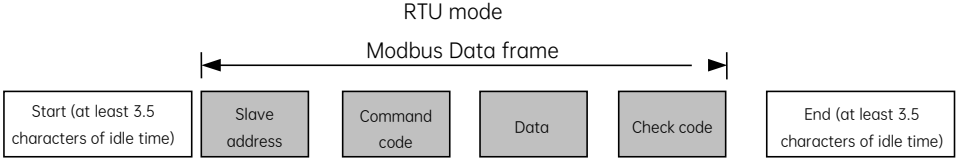
(2) The drive serves as a slave in the network, and communicates with the master in a point-to-point manner. The slave does not respond the master command sent via a broadcast address.

(3) In multi-station or long-distance communication, a resistance unit (ranging from 100 to 120 Ω) in parallel connection with the positive and negative ends of the signal cable of the master station can enhance the immunity to interference.

(4) MV810 820 (SP2) provides one type of RS485 interface only. An additional RS232/RS485 conversion device is required when the external device adopts an RS232 interface.

4. Protocol format

The Modbus protocol supports the RTU mode. The corresponding frame format is shown in Appendix Fig. 1-1.



Appendix Fig. 1-1 Modbus protocol format

Modbus adopts the "Big-Endian" encoding order, which sends the high bytes first and then sends the low bytes.

In 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 in order to define the frame. The data check adopts CRC-16 for the whole information; the high and low bytes of the checksum can only be sent after exchange. For the specific CRC check, refer to the CRC example subsequent to

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.

5. Protocol functions

The main function of Modbus is reading/writing parameters. Different command codes control different operation requests. The Modbus protocol of MV810 820 (SP2) drive supports the operations as shown in the following table:

Command code	Definition
0x03	Used to read the drive parameters, including function code parameters, control parameters and status parameters.
0x06	Used to rewrite one function code parameter or control parameter (16-bit), and the result will be saved at power off.
0x07	Used to rewrite one function code parameter or control parameter (16-bit), and the result will not be saved at power off.
0x10	Used to rewrite multiple function code parameters or control parameters, and the parameter values will be saved at 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 as the 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 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	P20	0x14
P01	0x01	P21	0x15
P02	0x02	P22	0x16
P03	0x03	P23	0x17
P04	0x04	P24	0x18
P05	0x05	P26	0x1A
P06	0x06	P40	0x28
P07	0x07	P41	0x29
P08	0x08	P42	0x2A
P09	0x09	P43	0x2B
P10	0x0A	P50	0x32
P11	0x0B	P88	0x58
P12	0x0C	P97	0x61
P13	0x0D	P98	0x62
P14	0x0E	P99	0x63
P15	0x0F	Control parameter group	0x64
P16	0x10	Status parameter group	0x65
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 the Modbus protocol. These two parts constitute the Modbus application-layer protocol data unit which is mentioned in the text below. The following description of 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/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/Range
Command code	1	0x03
Number of bytes read	1	2 × Number of registers
Content read	2 × Number of registers	Parameter value

If the operation fails, an 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/Range
Error code	1	(Command code + 0x80)
Exception code	1	

The exception codes and meanings are as follows:

Exception code	Definition
0x01	Incorrect password
0x02	Invalid command code
0x03	CRC check error
0x04	Invalid address
0x05	Invalid parameter
0x06	Invalid modification of parameters
0x07	System lock
0x08	Parameter being saved

(2) Rewrite one function code parameter or control parameter (16-bit), and the result will be saved at power off.

When this command is executed, the changed parameter value will be saved at 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/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/Range
Command code	1	0x06
Register address	2	0x0000 to 0xFFFF
Register content	2	0x0000 to 0xFFFF

If the operation fails, an abnormal response frame will return, and the format is described as above.

(3) Rewrite one function code parameter or control parameter (16-bit), and the result will not be saved at power off.

When this command is executed, the changed parameter value will not be saved at 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/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/Range
Command code	1	0x07
Register address	2	0x0000 to 0xFFFF
Register content	2	0x0000 to 0xFFFF

If the operation fails, an abnormal response frame will return, and the format is described as above.

(4) Rewrite multiple function code parameters and control parameters of the drive, and the parameter values will be saved at power off.

The application-layer protocol data unit is as follows:

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value/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/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, an abnormal response frame will return, and its format is described as above.

6. Control parameters and status parameters

The control parameters of the drive manage the start, stop, running frequency setting, and other functions alike. The status parameters allow the inquiring of drive parameters, such as the running frequency, output current, and output torque.

(1) Control parameters

The control parameters of the drive are 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, with the range of -1000 to 1000 corresponding to the range of -100% to 100%.
0x6404	PID feedback	Valid when the process closed-loop function is enabled, with the range of -1000 to 1000 corresponding to the range of -100% to 100%.
0x6405	AO1 setting	Valid when P10.13 = 14, with the range of 0 to 1000 corresponding to the range of 0.0 to 100.0%.
0x6406	Reserved	
0x6407	DO terminal status setting	0 to 0xF Bit0 to Bit3 corresponding to DO1, DO2, DO3/RO2, and RO1 Valid when P10.00 to P10.03 = 19.
0x6408	Reserved	
0x6409	Virtual terminal control setting	0 to 0xFF Bit0 to bit7 corresponding to virtual terminals DI1 to DI8

Register address	Parameter name	Remarks
		Valid when the corresponding bit of P09.16 is set to positive logic active.
0x640C	Auxiliary frequency reference	Range: 0.00 Hz to P02.10.
0x640D	Torque reference	-3000 to 3000 corresponding to -300.0% to 300.0% 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 separation	0 to 1000 V
0x6413	Reserved	
0x6414	Control word 2	Refer to the definition table of control word 2.

The bit definition of control word 1 is 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 set deceleration time (valid when the jog is disabled).
	100B	Running command	Start the drive (valid when the jog is disabled).
	Others	No command	
Bit3	1	REV run	Set the running direction when the running command is valid.
	0	FWD run	
Bit4	0	Enable acceleration/deceleration	Bit0 to Bit3, and 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	FWD jog	No action when the bits of FWD and REV jog are both enabled; the jog stops when both are disabled.
	0	Disable FWD jog	
Bit8	1	REV jog	
	0	Disable REV jog	

Bit	Value	Function	Remarks
Bit9	1	Enable fault reset (valid for all command channels)	The selected bit for the validity of the fault reset of the host device
	0	Disable fault reset	
Bit15 to Bit10	0	Reserved	

WARNING

(1) The control command (control words 1 and 2) of the host device is valid only when the "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 control word 2 is shown in the following table.

Bit	Value	Function	Remarks
Bit0	0	Reserved	Reserved
Bit1	1	Drive running prohibit	Selection bit for enabling/disabling the drive running
	0	Drive running enable	
Bit15 to Bit2	0	Reserved	

(2) Status parameters

Register address	Parameter name	Remarks
0x6500	Status word 1 of the drive	Refer to the status word 1 definition table
0x6501	Actual running value of the current main reference	Range: 0.00 Hz to P02.11, the current running frequency
0x6502	Drive model	Refer to manufacturer's parameters.
0x6503	Drive serial number	Product serial number, such as 810
0x6504	Function software version number	Software version number of the function board
0x6505	Reserved	Reserved
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
0x650A	Line speed in running	0 to 65535 m/s
0x650B	Reserved	
0x650C	Bus voltage	0.0 to 6553.5 V
0x650D	Reserved	
0x650E	DI terminal status 1	0 to 0x1111 Corresponding to DI1 to DI4

Register address	Parameter name	Remarks
0x650F	DI terminal status 2	0 to 0x1111 Corresponding to DI5 to DI8
0x6510	Output terminal status	0 to 0x1111 Corresponding to DO1, DO2, DO3/RO2, and RO1
0x6511	Reserved	
0x6512	Current fault type	0 to 55
0x6513	Last fault type	0 to 55
0x6514	Second last fault type	0 to 55
0x6515	Running frequency reference	Range: 0.00 Hz to P02.11
0x6516	Reserved	
0x6517	PID reference	-100.0% to 100.0%
0x6518	PID feedback	-100.0% to 100.0%
0x6519	AI1	0.00 to 10.00 V
0x651A	AI2	-10.00 to 10.00 V
0x651B	Reserved	
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 place: Control mode 0: SVC1 1: FVC 2: VF Tens place: Motor number 0: Motor 1 1: Motor 2 Hundreds place: 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 state upon the current fault	Refer to P01.17
0x6527	Reserved	

Register address	Parameter name	Remarks
0x6528	Status word 3 of the drive	Refer to the status word 3 definition table

WARNING

(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' maximum length is 16 bits.

The bit definition of 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 stopped	
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	Value 1 indicates the occurrence of a fault. Check the fault type by referring to Bit15 to Bit8 in status word 1.
	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: Indicates a fault. Refer to P97.32 for the fault type.

The bit definition of 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)	

Bit	Value	Function	Remarks
	0	Non-process closed-loop running (PID)	
Bit15 to Bit5		Reserved	

The bit definition of status word 3 of the drive is shown in the following table.

Bit	Value	Function	Remarks
Bit2 to Bit0		Reserved	
Bit3		Accelerating	
Bit4		Decelerating	
Bit5		Running at a 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	

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 parameter values 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, value exceeding parameter range, etc.), the error information will return. Control 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) The user password serves to protect the reading/writing of the function code parameters and the management of the function codes (except "read the address of the 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; only the operating keypad can cancel the password. The writing operation of P00.01 is valid only in two situations: one is decryption of 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 password operations of the host device and the operating keypad are independent. Even if the user has conducted decryption successfully via the operating keypad, the decryption via the host device is still required when using the host device to visit the function code parameters, and vice versa.

(5) Access to the password-related parameters is forbidden with the communication channel, and, in this, case an 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 invalidated, and the user password needs to be entered again for another access.

(7) When the host device has acquired the access right (no user password, or decrypted), if a new user password is set or the user password is changed via the keypad, the host device will retain the present access right, which means there is no need to decrypt again. If the present access right becomes invalid, the host device needs to decrypt again (entering the new password) for new access.

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 in the final result the high and low bytes have already been exchanged, which means the results are the CRC checksum to be sent.

```
unsigned short CRC16 (unsigned char *msg, unsigned char length)    /* The function returns the CRC as a unsigned short type */
{
    unsigned char uchCRCHi = 0xFF ;                                /* high byte of CRC initialized */
    unsigned char uchCRCLo = 0xFF ;                                /* low byte of CRC initialized */
    unsigned uIndex ;                                              /* index into CRC lookup table */
    while (length--)                                               /* pass through message buffer */
    {
        uIndex = uchCRCLo ^ *msg++ ;                               /* calculate the CRC */
        uchCRCLo = uchCRCHi ^ (crcvalue[uIndex] >>8);
        uchCRCHi =crcvalue[uIndex]&0xff;
    }
    return (uchCRCHi | uchCRCLo<<8) ;
}
```

```
/* Table of CRC values */
const unsigned int   crcvalue[ ] = {
0x0000,0xC1C0,0x81C1,0x4001,0x01C3,0xC003,0x8002,0x41C2,0x01C6,0xC006,0x8007,0x41C7,
0x0005,0xC1C5,0x81C4,0x4004,0x01CC,0xC00C,0x800D,0x41CD,0x000F,0xC1CF,0x81CE,0x400E,
0x000A,0xC1CA,0x81CB,0x400B,0x01C9,0xC009,0x8008,0x41C8,0x01D8,0xC018,0x8019,0x41D9,
0x001B,0xC1DB,0x81DA,0x401A,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,0x01FA,0xC03A,0x803B,0x41FB,0x0039,0xC1F9,0x81F8,0x4038,
0x0028,0xC1E8,0x81E9,0x4029,0x01EB,0xC02B,0x802A,0x41EA,0x01EE,0xC02E,0x802F,0x41EF,
0x002D,0xC1ED,0x81EC,0x402C,0x01E4,0xC024,0x8025,0x41E5,0x0027,0xC1E7,0x81E6,0x4026,
0x0022,0xC1E2,0x81E3,0x4023,0x01E1,0xC021,0x8020,0x41E0,0x01A0,0xC060,0x8061,0x41A1,
0x0063,0xC1A3,0x81A2,0x4062,0x0066,0xC1A6,0x81A7,0x4067,0x01A5,0xC065,0x8064,0x41A4,
0x006C,0xC1AC,0x81AD,0x406D,0x01AF,0xC06F,0x806E,0x41AE,0x01AA,0xC06A,0x806B,0x41AB,
0x0069,0xC1A9,0x81A8,0x4068,0x0078,0xC1B8,0x81B9,0x4079,0x01BB,0xC07B,0x807A,0x41BA,
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,
0x005A,0xC19A,0x819B,0x405B,0x0199,0xC059,0x8058,0x4198,0x0188,0xC048,0x8049,0x4189,
0x004B,0xC18B,0x818A,0x404A,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 char *data,unsigned char length)
{
        int i;
        unsigned crc_result=0xffff;
```

```
    while(length--)
    {
        crc_result^=*data++;
        for(i=0;i<8;i++)
        {
            if(crc_result&0x01)
            {
            crc_result=(crc_result>>1)^0xa001;
            }
            else
            {
                crc_result=crc_result>>1;
            }
        }
    }
    return (crc_result=((crc_result&0xff)<<8)|(crc_result>>8));
}
```

9. Scaling of the drive parameters

(1) Scaling of frequency is 1: 100

To run the drive at 50 Hz, the main reference should be 0x1388 (5000).

(2) Scaling of time is 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 is 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) For other parameters, refer to the parameter function descriptions.

Appendix 2 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.

Shenzhen Megmeet Electrical Co., Ltd.

Address: 5th Floor, Block B, Unisplendor Information Harbor, Langshan Road, Nanshan District, Shenzhen, 518057, China

Tel: +86-755-86600500

Fax: +86-755-86600562

Zip code: 518057

Website: https://www.megmeet.com

Parameter Recording Table

Shenzhen Megmeet Electrical Co., Ltd.

Drive Warranty Bill

Customer company:	
Detailed address:	
Zip code:	Contact:
Tel:	Fax:
Machine model:	
Power:	Machine No.:
Contract No.:	Purchase date:
Service unit:	
Contact:	Tel:
Maintenance person:	Tel:
Maintenance date:	
Comment on service: ☐ **Excellent** ☐ **Good** ☐ **Fair** ☐ **Unsatisfactory** Other comment: User's signature: Date:	
Customer Service Center follow-up record: ☐ **Follow-up phone call** ☐ **Follow-up letter** Other: Signature of the technical support engineer: Date:	

Note: This bill becomes invalid if the user can not be visited.

Shenzhen Megmeet Electrical Co., Ltd.

Drive Warranty Bill

Customer company:	
Detailed address:	
Zip code:	Contact:
Tel:	Fax:
Machine model:	
Power:	Machine No.:
Contract No.:	Purchase date:
Service unit:	
Contact:	Tel:
Maintenance person:	Tel:
Maintenance date:	
Comment on service: ☐ **Excellent** ☐ **Good** ☐ **Fair** ☐ **Unsatisfactory** Other comment: User's signature: Date:	
Customer Service Center follow-up record: ☐ **Follow-up phone call** ☐ **Follow-up letter** Other: Signature of the technical support engineer: Date:	

Note: This bill becomes invalid if the user can not be visited.