AS500 Universal Vector Inverter with high performance

Product Instruction

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Content

Chapter 1 Safety instructions

This chapter describes the safety instructions and precautions required for the application of **AS500** inverters, including the general information, safety information, application, confirmation for arrival of goods, transport and storage, installation, safety instruction for wiring, debugging/operation, troubleshooting, discarding disposal, etc. To ensure personal safety and extend the service life of equipments and their connecting devices, be sure to read the following safety regulations and warnings, and all warning signs attached to equipments prior to installing and debugging the inverter. Please read this information carefully.

1.1 Safety information

The following symbols with texts are used in this manual for safety-related contents. Please comply with these regulations as they are very important.

 **DANGER**	Indicate precautions that, if not heeded, could possibly result in fire, serious personal injury or even death.
 **CAUTION**	Indicate precautions that, if not heeded, could possibly result in relatively serious or minor injury, damage to the product, or faulty operation.
 **IMPORTANT**	Indicate important information that should be memorized.

In addition, even for  CAUTION matters, a major accident may be caused sometimes according to specific circumstances.

1.2 Safety precautions

1.2.1 Application

DANGER

This series of inverter is used to control the variable speed operation of three phase motor, but not used for single phase motor or other applications; or else, inverter fault or fire may be caused.

This series of inverter can not be simply used in the applications directly related to the human safety, such as the medical equipment.

This series of inverter is produced under strict quality management system. If the inverter failure may cause severe accident or loss, safety measures, such as redundancy or bypass, shall be taken.

1.2.2 Examination for arrival of goods

CAUTION

The delivered goods must not be damaged and shall be in conformity with information on the purchase order. If the goods are found to be damaged or do not conform to the purchase order, please contact your local dealer or agent.

If the inverter is found to be damaged or lack of parts, the inverter cannot be installed or put into operation. Otherwise, accident may be caused.

1.2.3 Transport and storage

CAUTION

During transport, avoid acute vibration and strike.

If the inverter is found to be damaged, inform the transportation company immediately.

The transport and storage of inverter must comply with the specific environmental conditions.

If the inverter has been stored for more than 1 year, it is necessary to recharge the capacitor.

1.2.4 Installation

DANGER

Be care to fire or electric shock!

Do no install the inverter in the areas where inflammable, explosive, or corrosive substances or water exist.

CAUTION

When handling and installing the product, please hold the product bottom. Do not hold the enclosure only. Otherwise, your feet may be injured and the inverter may be damaged because of dropping.

Do not install the inverter in the areas where are easy to suffer continuous vibration, impact or electromagnetic interference.

The inverter shall be mounted on the fire retardant surface, such as metal, and kept far away from heat source.

Take caution to fire! Keep sundries away from the inside of the inverter and its radiator (e.g., chips, iron filings, dust, scrip, etc.).

A certain gap shall be reserved among the inverters, or between the inverter and another equipment / inner wall of cabinet (Specific requirements for gap refer to “Installation orientation and space”).

Do not install the inverter horizontally.

1.2.5 Wiring

DANGER

The wiring must be conducted by qualified electricians. Otherwise, there will be risk of electric shock or inverter damage.

Before wiring, confirm that the power supply is disconnected. Otherwise, there will be risk of electric shock or fire.

The grounding terminal PE must be reliably grounded, otherwise, the inverter enclosure may become live.

Please do not touch the main circuit terminal. The wires of the inverter main circuit terminals must not contact the enclosure. Otherwise, there will be risk of electric shock.

If the power supply is switched on while the running signal is energized, the motor will start running automatically. So to make sure the running mode is OFF before connecting the power supply, otherwise, there will be risk of personal injury.

If the 3-wire sequential control is set, begin the wiring of control loop after setting the parameters of multifunctional input terminals. Otherwise, there will be risk of personal injury by motor rotation.

1.2.6 Test run

CAUTION

Never connect the power input cable to the motor terminals U/T1, V/T2, and W/T3, and do not connect the motor cable to the power input terminals R/L1, S/L2, and T/L3.

The power line and signal line must be laid in the different grooves, apart 10 cm at least. The connected cables may not contact with the rotating mechanical parts.

It is forbidden to connect the output terminal of the inverter to the capacitor or LC/RC noise filter with phase lead, otherwise, the internal components of the inverter may be damaged.

The wires of the main circuit terminals shall adopt lugs with insulating sleeves.

For input and output cable of the inverter, please select the cable with proper section according to the power of the inverter.

When the length of the cable between the inverter and the motor is more than 30m or several motors work simultaneously, it is suggested to use output reactor to avoid the inverter failure caused by the over current of the distribution capacitor.

Please do not use other loads except for three phase AC motor.

At the time of self-tuning learning, please confirm the load removal. Before end of self learning, repeat start and stop of motor, so please do not touch the motor. Otherwise, personal injury may be caused.

DANGER

Power supply can only be connected after the front cover is installed. It is forbidden to remove the cover in power-on condition; otherwise, there will be risk of electric shock.

Provide emergency stop switch additionally (stop buttons only with function settings are valid).

The alarm signal can only be reset after the running signal has been cut off. Otherwise, personal injury may be caused.

CAUTION

Debug the no-load motor firstly, then the load motor.

While the equipment is running or after the power is turned off within a certain period, do not touch the inverter radiator, motor or other high temperature components, or you will be burnt.

Do not switch off and on the inverter time after time, or else the equipment / system may be damaged.

Before operation, please confirm if the motor or machinery is in the allowable use range, otherwise, the equipment may be damaged.

When it is used on lifting equipment, a mechanical brake shall also be equipped.

Please do not change the inverter parameter randomly. Most of the factory set parameters of the inverter can meet the operating requirement, and the user only needs to set some necessary parameters. Any random change of the parameter may cause the damage of the mechanical equipment.

1.2.7 Maintenance and inspection

DANGER

Terminals of the inverter are under high voltage; they are very dangerous. Therefore, please do not touch them, or there will be risk of electric shock.

Under power-on circumstance, take care to mount the protecting cover. In addition, when dismounting the cover, be sure to cut off the circuit breaker. Or else, there will be risk of electric shock.

Wait for at least 10 minutes after power off of main circuit or confirm that the charging indicator is off before maintenance and inspection to prevent the harm caused by the residual voltage of the capacitor to persons.

With exception of the specified personnel, never others may repair, inspect or change components. [Prior to working, please remove the metal accouterment (watch, ring, etc.)]. During the operation, please use the insulated tools. Or otherwise, there will be risk of electric shock.

CAUTION

The circuit boards have large scale CMOS IC. Please do not touch the board to avoid the circuit board damage caused by electro static.

1.2.8 Discarding disposal

DANGER

Explosion may occur during burning of the electrolytic capacitor on the main circuit or PCB. The burning of plastic parts on the inverter will generate poisonous gases. Therefore, the discarding disposal of this equipment must be executed in accordance with laws and regulations on treatment of industrial electronic waste enacted by related environmental protection organizations.

1.2.9 Others

CAUTION
During transport or under any specific condition, the inverter may not be placed in a halogen (fluorine, chlorine, bromine, iodine) environment. Otherwise, the inverter may be damaged or its components will be burned out.

1.3 Precautions

1.3.1 Motor insulation inspection

When the motor is used for the first time, or reused after storing for a long time, or in a regular inspection, the user must inspect the insulation of the motor to prevent the poor insulation of the windings of motor from damaging the inverter. The motor connection must be divided from the inverter during the insulation inspection. It is recommended to use a 500 V Mega-Ohm-Meter and the insulation resistance shall not be less than 5 MΩ.

1.3.2 Thermal protection of motor

If the rated capacity of the motor selected is not matching that of the AS500 series inverter, especially when the rated power of the inverter is greater than that of the motor, make sure to adjust the parameters for motor protection inside the AS500 inverter or to install a thermal relay to the motor to guarantee the protection to the motor.

1.3.3 Motor heat and noise

Since the output voltage of the inverter is PWM wave with some harmonic, the temperature rise, noise and vibration may increase compared with the inverter running at power frequency.

When a conventional motor driven by an inverter is in prolonged low speed operation, the motor temperature will rise because the heat dissipation effect of the

motor becomes poorer. If a prolonged constant-torque low-speed operation is required, a variable frequency motor must be selected, or forced air cooling be provided.

1.3.4 Caution to input and output

Because the AS500 inverter outputs PWM wave, the capacitor used for improving power factor and piezoresistance used for lightening-proof should not be installed at the output side of the inverter. Otherwise the inverter may have transient over-current and may be damaged.

No permission for capacitor connection at the output side of the inverter refers to Figure 1-1.

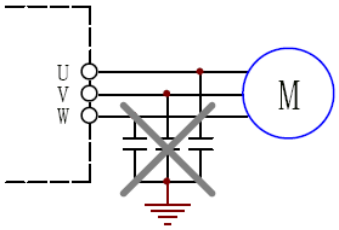


Figure 1-1 Schematic diagram for non-permission for capacitor connection at the output side of the inverter

If a contactor is required to be installed between the inverter input terminal and the power supply, it is prohibited to start or stop the inverter with the contactor.

If switches like contactors are connected between the output terminal and the motor, make sure to start and stop the inverter when the inverter has no output, it is prohibited to pick up the contactor when the inverter is outputting, otherwise the modules in the inverter may be damaged.

Terminals are recommended for the startup / shutdown of the inverter. The user is absolutely not permitted to directly shut down or start up the inverter via such switches as contactor on the input terminal of the inverter; otherwise, damages to equipment may be caused.

1.3.5 Usage out of the Range of Rated Voltage

The AS500 series inverter shall not be used out of the specified range of operating voltage. Otherwise, the internal components of the inverter may be damaged. If needed, please use corresponding voltage regulation device to change the voltage.

1.3.6 Lightning Strike Protection

There are lightning over current protection devices inside the inverter, which has certain self-protection capacity for sensing the lightning. The user should install other lightning protection device at the front end of the inverter where lightning strike occurs frequently.

1.3.7 Leakage protection

Quick startup or shutdown during inverter operation necessarily induces high-frequency leakage currents, which may sometimes cause misoperation of the leakage protection circuit. In the event of the aforesaid problems, reduce the carrier frequency and the length of the lead-in wire appropriately; besides, the leakage protector must be correctly installed.

Keep the following points in mind when installing a leakage protector:

■ It is more proper to install the protector at the input terminal of the inverter and behind the air circuit breaker (not a fuse circuit breaker).

■ The selected leakage protector must be insensitive to higher harmonics (sensitivity: Above 30 mA) or specially suited for inverter applications. If a common leakage protector is selected, it must have the sensitivity above 200 mA and the action time above 0.1 s.

1.3.8 Derating

When the ambient temperature exceeds 40 ℃, the inverter must be derated by 1% for every increment of one degree Celsius. Also, forced external heat dissipation must be provided.

At 1,000 m above sea level, the thinner air will deteriorate the heat dissipation effect

of the inverter. Therefore, the inverter must be derated by 1% for every increment of 100 m.

When the set carrier frequency exceeds the factory settings, the inverter must be derated by 10% for every increment of 1 kHz.

For derating, please contact our company for detailed technical support.

1.3.9 About applicable motor

The inverter is applicable to asynchronous squirrel-cage motor and permanent magnet synchronous motor. Please be sure to select the applicable inverter according to the Nameplate of the motor.

The inverter has already been configured with default parameters which are applicable to asynchronous squirrel-cage motor. To perform the motor parameter identification according to the actual conditions will promote the operation effect.

The short circuit of cable or motor interior may cause the inverter alarm or to be damaged. Therefore, perform insulation short test for the initially installed motor and cables, and also make such test during the routine maintenance. Please make sure that the inverter be cut from the testing parts when the test is undergoing.

Chapter 2 Product overview

AS500 series consist of class 400 V (380 V to 460 V) and class 200 V (220 V to 240 V) universal inverters for current vector control, which apply to three phase AC asynchronous squirrel-cage motor and permanent magnet synchronous motor with 1.1 to 75 kW capacity. AS500 series inverters with default settings provide an ideal solution for most simple motor control application. Moreover, by setting related parameters, AS500 may be applied to advanced operation by motor control.

2.1 Nameplate information

The nameplate is attached to the side of the inverter. The nameplate includes information such as model, specifications, lot number, serial number, and so on.

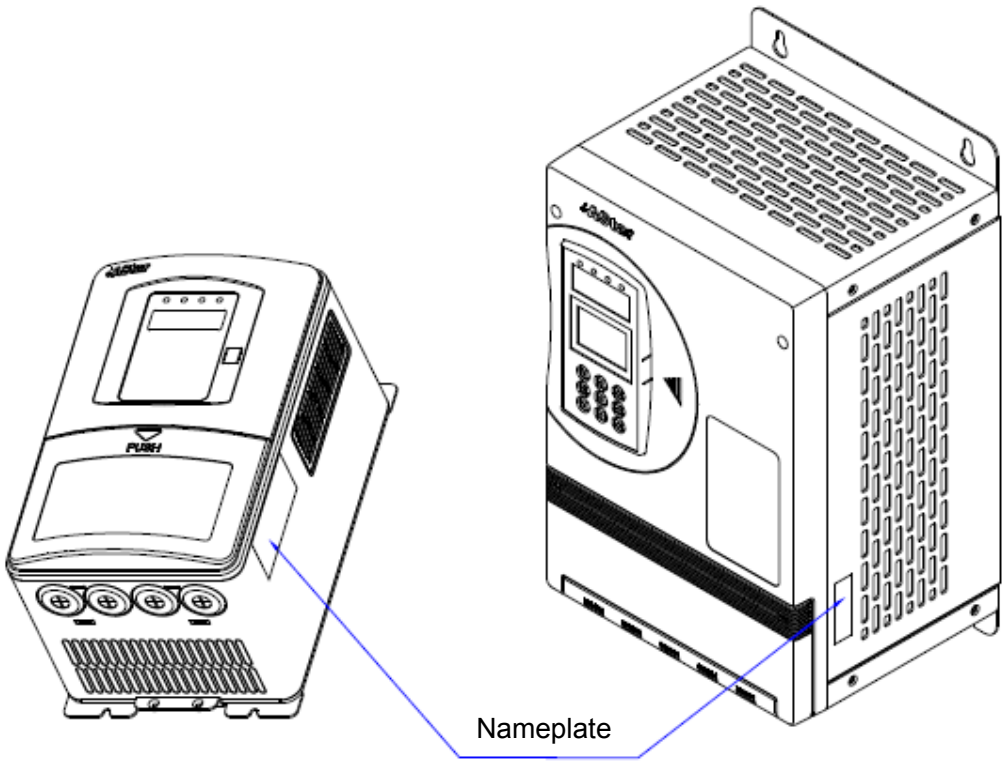


Figure 2-1 Inverter nameplate (example)

2.1.1 Inverter Nameplate Information

The Inverter nameplate is shown in Figure 2-2.

The nameplate includes information such as model, specifications, lot number and

so on.

Model →	MODEL: AS500 4T 0022
Applicable motor power →	POWER: 22kW
Input specifications →	INPUT: 3PH AC 380 – 460 V 50/60 Hz 52 A
Output specifications →	OUTPUT: 34 kVA 0 – 460 V 0-120 Hz 48 A
Number →	No.:
Serial number →	SER. No.:
	Shanghai Sigriner STEP Electric Co., Ltd

Figure 2-2 Nameplate information

2.1.2 Product (order number) information

In “Inverter model” on the nameplate, inverter specification, voltage class, type and maximum capacity of applicable motor are indicated with figures and letters.

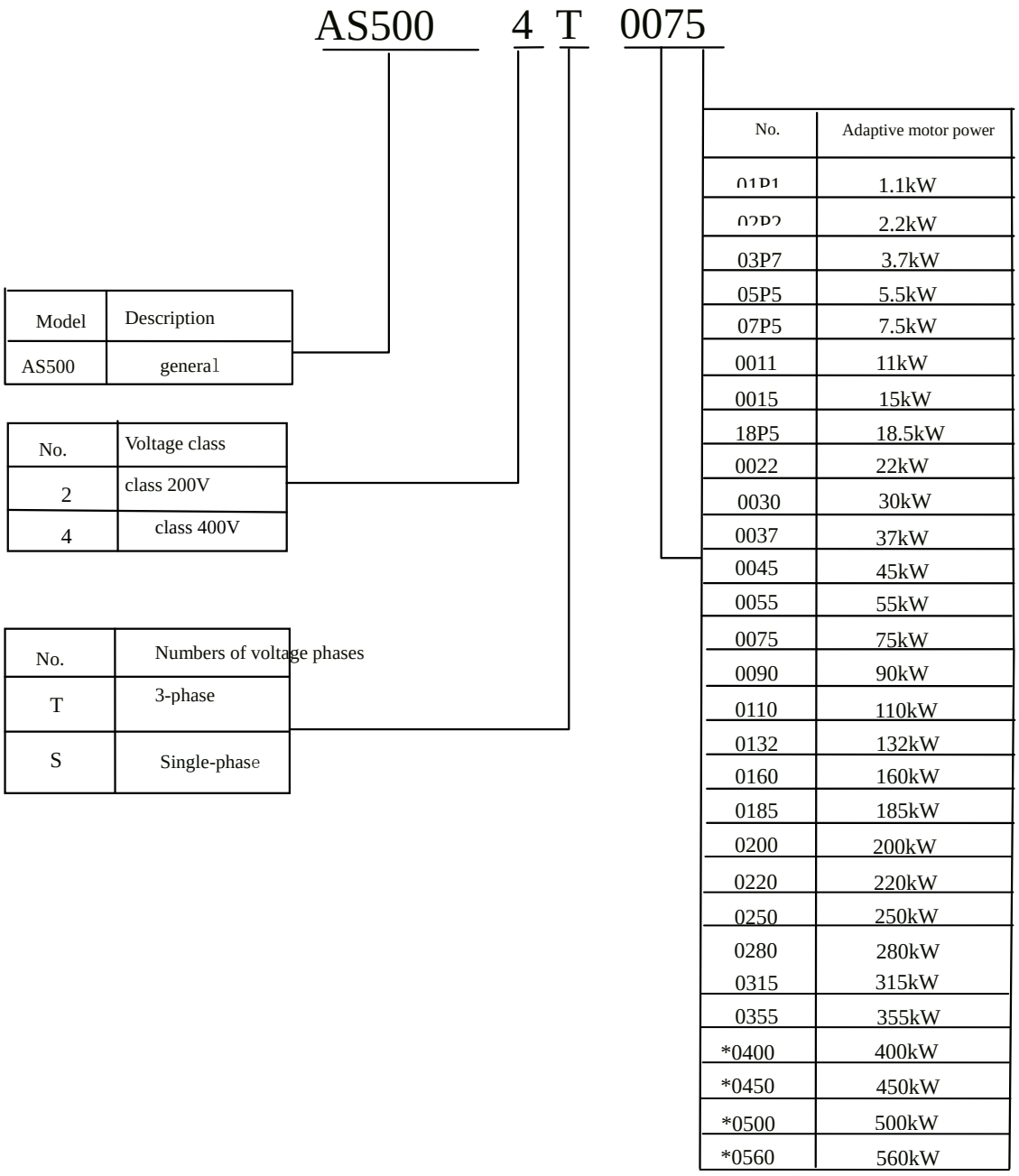


Figure 2-3 Inverter model specifications

2.1.3 Product specifications

In “Inverter specifications” on the nameplate, voltage level and rated value of the inverter are indicated with figures and letters.

Table 2.1 Inverter specifications

Rated input	Dimensions	Heavy load stable operation at 40 ℃			
		Inverter model AS500	Rated output current (A)	Applicable motor (kW)	Overload by 150% (1 min)
200 ~ 240 V	1	2T01P1	6	1.1	9
		2T02P2	12	2.2	18
		2T03P7	18	3.7	27
380~460V		4T01P1	3.5	1.1	5.3
		4T02P2	6.2	2.2	9.3
		4T03P7	9	3.7	13.5
		4T05P5	13	5.5	19.5
	2	4T07P5	19	7.5	28.5
		4T0011	27	11	40.5
	3	4T0015	34	15	51
		4T18P5	41	18.5	61.5
		4T0022	48	22	72
	4	4T0030	65	30	97.5
		4T0037	80	37	120
	5	4T0045	96	45	146
		4T0055	128	55	192
		4T0075	160	75	240
	6	4T0090	195	90	292.5
		4T0110	240	110	360
	7	4T0132	270	132	405
		4T0160	302	160	453
		4T0185	352	185	528
		4T0200	390	200	585
		4T0220	426	220	639
	8	4T0250	480	250	720
		4T0280	520	280	780
		4T0315	600	315	900
		4T0355	650	355	975
	9	*4T0400	740	400	1110
		*4T0450	820	450	1230
		*4T0500	920	500	1380
		*4T0560	1030	560	1545

Note: for rated power of four-pole standard AC motor (1500 r/min) or higher, please contact STEP company.

It is necessary to check the motor nameplate so that the selected inverter matches with the motor.

2.2 Inverter technical index and specification

Power input	Input power	380 V ~ 460 V (- 15% ~ + 10%), three-phase power supply 220 ~ 240 V, three-phase power supply optional
	Input frequency	45 ~ 65 Hz
	Permissible voltage fluctuation	Voltage unbalance factor < 3%
	Instantaneous voltage sag	For three-phase AC 380 V ~ 460 V power supply, if the input voltage is less than AC 300 V, undervoltage protection enables after 15 ms.

Power output	Motor output voltage	0 VAC ~ 100% of input voltage, 3-phase power supply
	Output frequency	V/F control: 0.00 ~ 300.00 Hz
		Vector control: 0.00 ~ 120.00 Hz
	Overload class	150% for zero speed, 160% for < 3 Hz, 5 seconds, 185% for > 3 Hz, 10 seconds
	Efficiency (full load)	≥80% for 7.5 kW and below; ≥85% for 45 kW and below; ≥90% for 55 kW and above
	Output frequency precision	±0.01% (digital instruction -10 ~ +45 ℃), ±0.1% (analog instruction 25 ± 10 ℃)

Digital input and output	Opto-isalated input	8-way, 24 V high/low effective level setting, definable input function
	Pulse frequency input	2-way, maximum input frequency: 50 kHz
	Open collector output	2-way, definable output function
	Relay output	4-way, NO, NC double contact, contact rating: resistance, 5 A 250 VAC or 5 A 30 VDC; definable output function
	Pulse frequency output	1-way, 0 ~ 50 kHz open collector pulse square wave signal output, programmable

Analog input and output	Analog voltage input	2-way, -10 ~ 10 VDC or 0 ~ +10 VDC, precision 0.1%
	Analog current input	1-way, 0 ~ 20 mA, precision 0.1%
	Analog voltage output	2-way, -10 ~ +10 VDC, precision 0.1%
	Potentiometer voltage	+10 VDC power supplied for setting speed of potentiometer (25 mA maximum)

Encoder input	PG card power supply	5 V, 12 V, 300 mA
	PG card signal	Open collector, Push-Pull, differential, SIN/COS, Endat absolute
	PG card frequency division output	OA and OB orthogonal, frequency division coefficient 1～128

Control characteristics	Control method	V/F control	Open-loop vector control	Closed-loop vector control
	Startup torque	0.50 Hz 120%	0.2 Hz 150%	0.00 Hz 150%
	Speed range	1:100	1:200	1:1000
	Speed precision	±0.5%	±0.2%	±0.02%
	Torque precision	±0.5% (closed-loop control)		
	Carrier frequency	2 ~ 12 k(Hz); adjust the carrier frequency automatically according to the load characteristics		
	Frequency setting	0.01 Hz (digital instruction)		
	Resolution	±0.06 Hz / 120 Hz (analog instruction 11 bit + unsigned)		
	Run command channel	Operation panel given, control terminal given, communication given		
	Frequency given channel	Operation panel given, digital / analog given, communication given, function given		
	Torque boost	Automatic torque boost; manual torque boost		
	V/F curve	User-defined V/F curve, linear V/F curve and 5 kinds of torque drop curve		
	Automatic voltage regulation (AVR)	Automatically regulate the duty cycle of output PWM signal based on fluctuation of bus voltage to reduce influence on output voltage fluctuation by mains voltage fluctuation		
	Instantaneous stop treatment	When instantaneous power-off, realize uninterrupted operation by control of bus voltage		
	Dynamic braking capacity	Built-in braking unit for 75 kW and below, use external braking resistor		
	DC braking capacity	Braking current: 0.0 ~ 150% of rated current		

Feature function	Parameter copy	Realize the parameter upload and download by the standard operation panel, and show the copy progress; for the uploaded parameters, inhibition of upload overwrite may be selected.
	Process PID	For closed-loop control of process
	Torque control function	Torque / speed control may be switched by terminals, with several torque given manner
	Zero servo and position control function	Zero speed position locking, accurate positioning, position control
	Common DC bus	Power supply by a common DC bus for several inverters

Motor protection	Rotor blocked
	Motor overload
	Motor overheat (PTC)
	Speed limit
	Torque limit
Inverter protection	Output current amplitude limit
	Torque limit
	Inverter overload

	IGBT'S overload
	Input power undervoltage / overvoltage
	DC bus undervoltage / overvoltage
	IGBT overheat
	Radiator overheat
	Power failure
	Abnormal +10 V power output
	Loss of analog input signal (loss of speed reference)
	Abnormal communication
	Encoder connection fault
	Self-tuning failure

Environmental conditions	Location	Vertically installed in a well-ventilated electric control cabinet, not permitted for horizontal or other installation; cooling medium is air; in an environment away from direct sunshine, without corrosive gas, inflammable gas, oil mist, steam, drip
	Ambient temp.	-10 ~ + 40 ℃
	Temp. derating	> 40 ℃, rated output current reduces by 1% for every 1 ℃ increase, 50 ℃ maximum
	Altitude	1000 m
	Altitude derating	> 1000 m, rated output current reduces by 1% for every 100 m increase (3000 m maximum)
	Ambient humidity	5 ~ 95%, condensation not allowed
	Vibration	3.5 m/s^2, 2 ~ 9 Hz; 10 m/s^2, 9 ~ 120 Hz
	Storage temp.	-40 ~ + 70 ℃
	Degree of protection	IP00, IP20

Control panel	**Type 1**	**Movable**
	Length	1 m (customized length)
	Interface	RJ45
	Text display	4 lines
	LED display	4 digits
	Visible LED indicator	4
	Keys	9
	Type 2	**Integrated display**
	LED display	5 digits
	Keys	8

Other	Cooling method	Forced air cooling
	Installation method	In cabinet
	Certification	CE

2.3 Installation dimension of inverter

2.3.1 Appearance and components of inverter

Appearance and components of the inverter are shown in Figure 2-4.

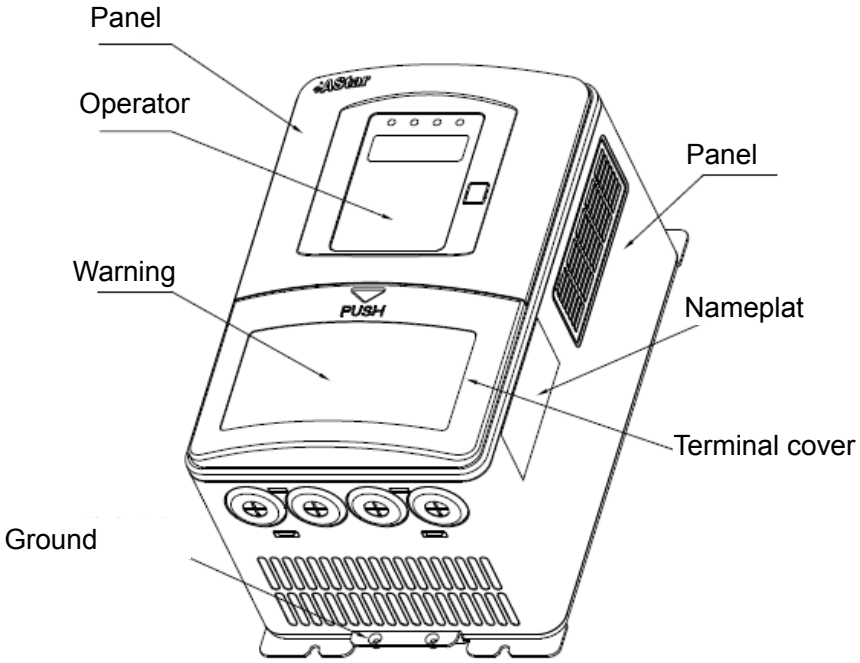


Figure 2-4 For AS500 4T05P5 and below power

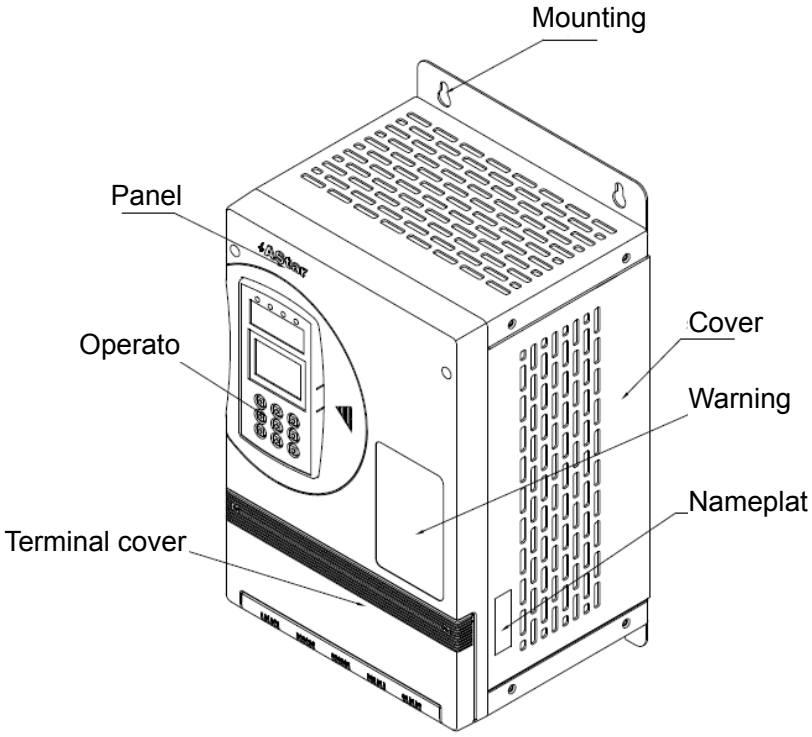


Figure 2-5 For AS500 4T07P5 and above power

2.3.2 External dimensions and installation dimensions of inverter

2.3.2.1 Dimensions for specification 1

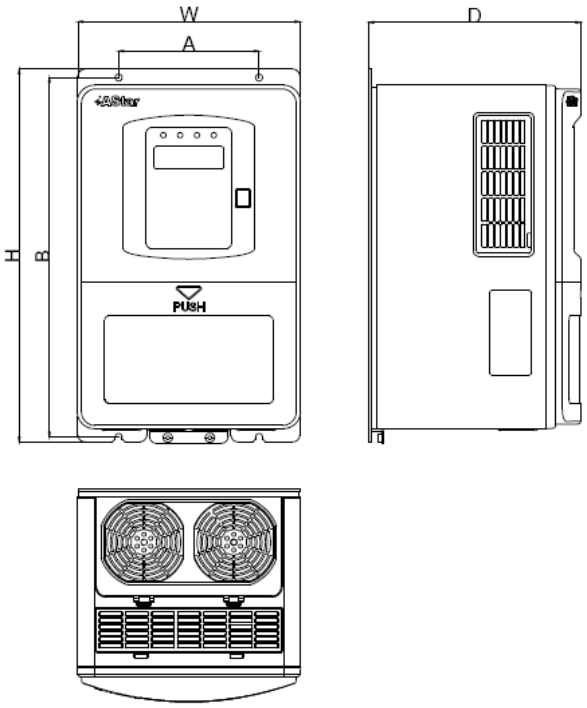


Figure 2-6 Installation dimensions of AS500 4T05P5 / 2T07P5 and below inverters

Specifications	Model AS500	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation aperture Φ(mm)	Installation			Fastening torque (Nm)	Weight (kg)
								Bolt	Nut	Washer		
1	2T01P1 2T02P2 2T03P7 2T05P5 2T07P5 4T02P2 4T03P7 4T05P5	100	288.5	300	160	166	5.0	4M4	4M4	4Φ4	2.5	4.5

2.3.2.2 Dimensions for specifications 2 ~ 7

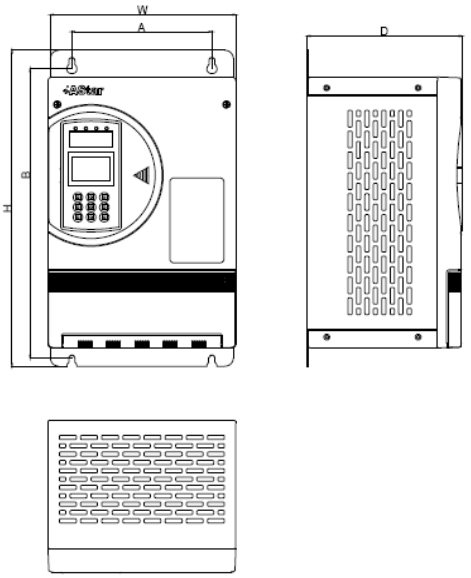


Figure 2-7 Installation dimensions of AS500 4T07P5 and above inverters

Specifications	Model AS500	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation aperture Φ(mm)	Installation			Fastening torque (Nm)	Weight (kg)
								Bolt	Nut	Washer		
2	4T07P5 4T0011	165.5	357	379	222	182	7.0	4M6	4M6	4Φ6	3	8
3	4T0015 4T18P5 4T0022	165.5	392	414	232	182						10.3
4	4T0030 4T0037	200	518	540	332	247	9.0	4M8	4M8	4Φ8	9	23 31
5	4T0045 4T0055	200	587	610	330	310						42
6	4T0075 4T0090 4T0110	320	718 768	750 800	430	350	13.0	4M12	4M12	4Φ12	18	60 81 90
7	4T0132 4T0160 4T0185 4T0200 4T0220	374	844	880	500	350						107 120 130 135 135
8	4T0250 4T0280 4T0315 4T0355	500	997	1030	630	370	14.0	4M12	4M12	4Φ12	18	147 147 147

2.3.3 Dimensions of inverter operator

Dimensions of inverter operator are shown in Figure 2-8.

Figure 2-8 Dimensions of inverter operator

2.4 Options of braking unit and braking resistor

When the motor runs in braking condition, a negative torque will appear. Therefore, the option of braking components shall be considered in order to avoid trips caused by over-current and overvoltage fault. AS500 series inverter has built-in braking unit when it is below 30kW and only needs an external braking resistor. Table 2-2 shows the optioned braking resistor specifications for the inverter below 30kW. For external braking unit and braking resistor options of inverters of 400 V or more, please contact with the company.

Table 2-2 Braking resistors for class 200 V and 400 V inverters

Model AS500	Applicable motor (kW)	Minimum (Ω)	Maximum (Ω)	Recommended (Ω)	Recommended total power (W)	
					Synchronou	Asynchrono
2T01P1	1.1	35	110	100	600	400
2T02P2	2.2	13	58	50	1000	600
2T03P7	3.7	13	39	30	1600	1000

4T02P2	2.2	56	210	100	1000	1000
4T03P7	3.7	56	144	80	1600	1200
4T05P5	5.5	56	100	70	2000	1600
4T07P5	7.5	56	72	64	3200	2000
4T0011	11	34	48	40	4000	3200
4T0015	15	34	41	36	5000	4000
4T18P5	18.5	17	31	24	6400	5000
4T0022	22	17	27	20	8000	6400

AS500 series inverter of 30kW or more has external braking unit. The recommended optional braking unit and braking resistor as well as specifications and numbers of the automatic resistor vary with the braking time ratio in a braking cycle.

When the braking time accounts for 10% of a braking cycle, configuration of external braking unit and braking resistor is shown in Table 2-2.

Table 2-2 configuration table 1 for braking unit and braking resistor of 400 V inverter

Inverter model AS500	Inverter capacity (kW)	Braking unit		Braking resistor（10% usage）	
		specification	No.	Equivalent specification of braking resistor	No.
4T0030	30	DBU-4030	1	6000W 20Ω	1
4T0037	37	DBU-4045	1	9600W 16Ω	1
4T0045	45	DBU -4045	1	9600W 13.6Ω	1
4T0055	55	DBU -4030	2	6000W 20Ω	2
4T0075	75	DBU -4045	2	9600W 13.6Ω	2
4T0090	90	DBU -4045	2	9600W 13.6Ω	2
4T0110	110	DBU -4030	3	9600W 20Ω	3
4T0132	132	DBU -4045	3	9600W 13.6Ω	3
4T0160	160	DBU -4220	1	40KW 3.4Ω	1
4T0185	185	DBU -4220	1	40KW4.5Ω	1
4T0200	200	DBU -4220	1	60KW 3.2Ω	1
4T0220	220	DBU -4220	1	60KW 3.2Ω	1
4T0250	250	DBU -4220	2	40KW4.5Ω	2
4T0280	280	DBU -4220	2	40KW4.5Ω	2
4T0315	315	DBU -4220	2	40KW4.5Ω	2
4T0355	355	DBU -4220	2	40KW4.5Ω	2

When the braking time accounts for 20% of a braking cycle, configuration of external braking unit and braking resistor is shown in Table 2-3.

Table 2-3 Configuration table 2 for braking unit and braking resistor of 400V inverter

Inverter model AS500	Inverter capacity (kW)	Braking unit		Braking resistor（20% usage）	
		specification	No.	Equivalent specification of braking resistor	No.
4T0030	30	DBU -4045	1	12.5KW 17Ω	1
4T0037	37	DBU -4045	1	20KW 15Ω	1
4T0045	45	DBU -4030	2	10KW 24Ω	2
4T0055	55	DBU -4045	2	12.5KW 18Ω	2
4T0075	75	DBU -4045	2	12.5KW 18Ω	2
4T0090	90	DBU -4045	3	12.5KW 18Ω	3
4T0110	110	DBU -4045	3	20KW 15Ω	3
4T0132	132	DBU -4220	1	80KW 3.2Ω	1
4T0160	160	DBU -4220	1	80KW 3.2Ω	1
4T0185	185	DBU -4220	2	60KW 4.7Ω	2
4T0200	200	DBU -4220	2	60KW 4.7Ω	2
4T0220	220	DBU -4220	2	60KW 4.7Ω	2
4T0250	250	DBU -4220	2	60KW 4.7Ω	2
4T0280	280	DBU -4220	2	80KW 3.5Ω	2
4T0315	315	DBU -4220	2	80KW 3.5Ω	2
4T0355	355	DBU -4220	2	80KW 3.5Ω	2

When the braking time accounts for 40% of a braking cycle, configuration of external braking unit and braking resistor is shown in Table 2-4.

Table 2-4 Configuration table 3 for braking unit and braking resistor of 400V inverter

Inverter model AS500	Inverter capacity (kW)	Braking unit		Braking resistor（40% usage）	
		specification	No.	Equivalent specification of braking resistor	No.
4T0030	30	DBU -4030	2	10KW 27Ω	2
4T0037	37	DBU -4045	2	12.5KW 22Ω	2
4T0045	45	DBU -4045	2	12.5KW 18Ω	2
4T0055	55	DBU -4045	3	12.5KW 22Ω	3
4T0075	75	DBU -4045	4	12.5KW 22Ω	4
4T0090	90	DBU -4045	4	12.5KW 22Ω	4
4T0110	110	DBU -4220	1	70KW 3.7Ω	1
4T0132	132	DBU -4220	1	50KW 5Ω	1
4T0160	160	DBU -4220	2	50KW 5Ω	2
4T0185	185	DBU -4220	2	60KW 4.7Ω	2
4T0200	200	DBU -4220	2	60KW 4.7Ω	2

Inverter model AS500	Inverter capacity (kW)	Braking unit		Braking resistor（40% usage）	
		specification	No.	Equivalent specification of braking resistor	No.
4T0220	220	DBU -4220	2	70KW 3.7Ω	2
4T0250	250	DBU -4220	2	70KW 3.7Ω	2
4T0280	280	DBU -4220	3	60KW 4.1Ω	3
4T0315	315	DBU -4220	3	60KW 4.1Ω	3
4T0355	355	DBU -4220	3	60KW 4.1Ω	3

Chapter 3 Inverter installation

3.1 Installation steps

Step 1: delivery of inverter

■ Inspect and confirm the conformity of serial number on the label with that on the purchase order

■ Remove the package of **AS500**, and check whether damages are caused or not during the transport

Step 2: Inspection of line voltage

■ Inspect and confirm that the line voltage is applicable to the voltage and frequency ranges of the inverter

Step 3: Installation of inverter

■ Install the inverter according to instructions

■ Install any internal and external components used

Step 4: Wiring of inverter

■ Connect the motor, and ensure a uniform voltage

■ Connect the control circuit

■ Connect the speed setting

■ Connect the communication cables

■ Connect the encoder cables

■ Connect power supply after power cut-off

3.2 Mechanical installation

3.2.1 Installation environment

3.2.1.1 Humidity and temperature

The ambient operating temperature is -10 ~ + 40 ℃, if exceeding 40 ℃, derating is required, maximum not exceeding 50 ℃. If the ambient temperature is greater than 40 ℃, it shall be derated by 1% for every increment of 1 ℃. The relative humidity of air is ≤ 95%, without condensation.

Where the field installation environment is bad, it is suggested that the inverter radiator is mounted outside the cabinet.

3.2.1.2 Altitude

If the inverter is installed below 1,000 m of altitude, it may run in rated power; when exceeding 1,000 m, the inverter needs derating. The specific derating extent is shown in following figure.

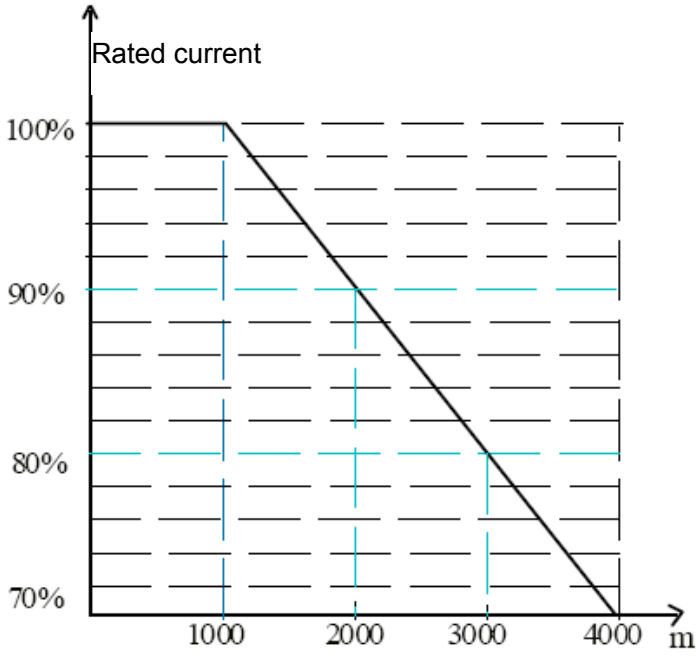


Figure 3-1 Relation between rated output current of inverter and altitude

3.2.1.3 Other environmental requirements

■ Install the inverter in a location free from excessive vibration and impact, with maximum amplitude of vibration not greater than 5.8 m/s2 (0.6 g).

■ Do not install the inverter in a location where the electromagnetic radiation source exists.

■ Do not install the inverter in a location where the harmful gases and liquids,

corrosive, inflammable and explosive gases exist.

■ Install the inverter with low content of salt.

■ Do not install the inverter in a location suffering direct sunshine.

■ Do not install the inverter on the inflammable substance, such as timber, etc.

■ During installation, never make the drilling residual drop into the inside of the inverter.

3.2.2 Installation orientation and space requirement

DANGER
According to the installation method selected, the inverter must be vertically installed: - In an electric cabinet; or in an electric cabinet, but the radiator must be outside The inverter can not be installed horizontally in the electric cabinet!

3.2.2.1 Installation orientation

Install the inverter in a location with adequate ventilation in order not to reduce the cooling effect. The inverter is typically installed vertically.

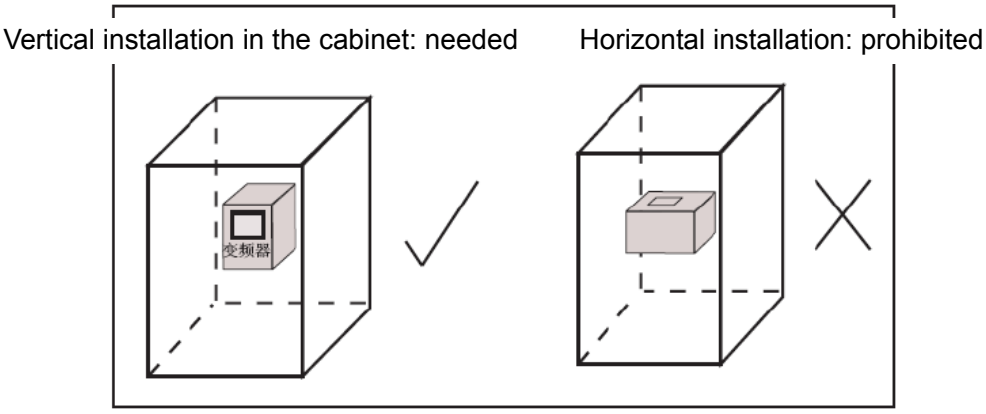


Figure 3-2 Installation orientation

When the user installs the inverter vertically, an included angle between the inverter and the level surface may be 87° to 90°. Details are as shown in Figure 3-3:

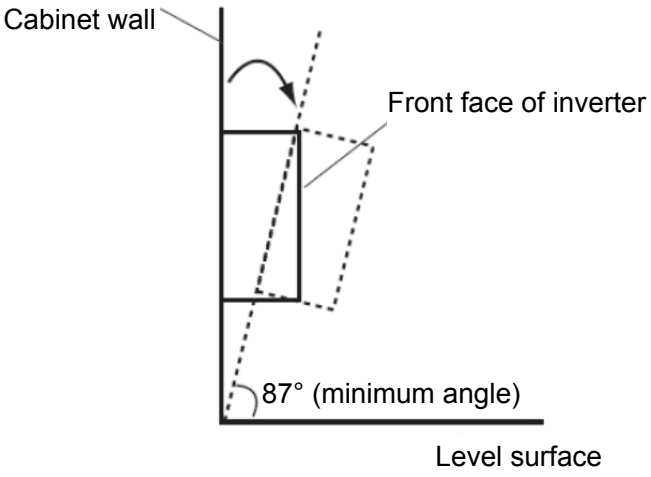


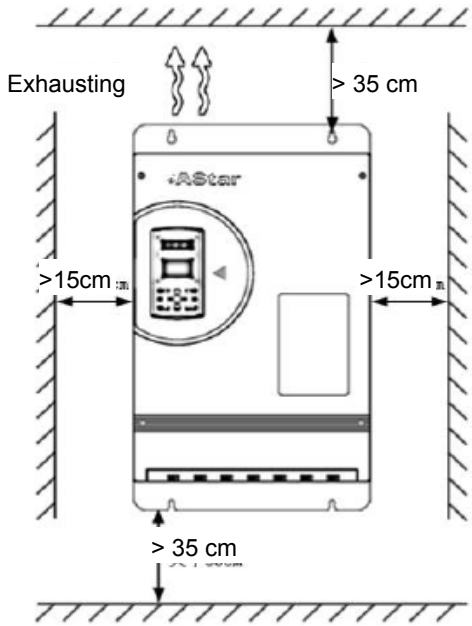
Figure 3-3 Permissible included angle for installation

3.2.2.2 Space for installation

Several inverters may be installed together side by side or in stack. The gap among the inverters or between the inverter and the electric cabinet wall is as follows:

Requirement for space for installation of the inverter 37 kW and below refers to Figure 3-4.

Requirement for space for installation of the inverter 45 kW and above refers to Figure 3-5.



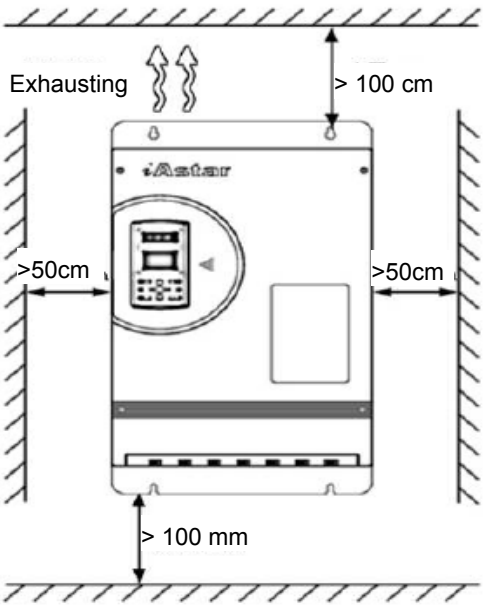


Figure 3-4 Space for installation of the inverter Figure 3-5 Space for installation of the inverter

3.2.3 Installation procedure of inverter

Install the inverter in the electric cabinet directly according to the procedure shown in following figure:

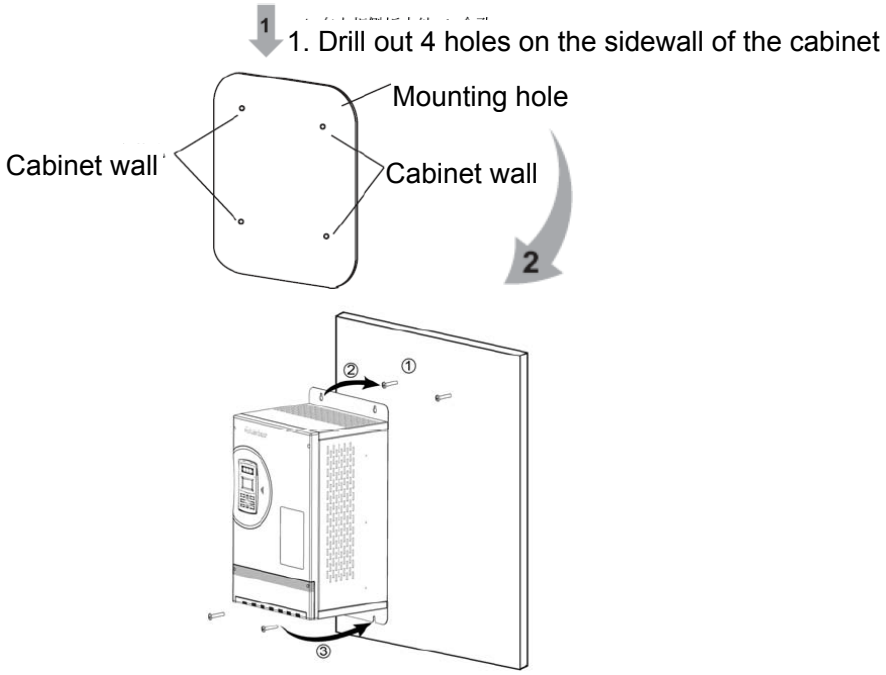


Figure 3-6 Installation order of inverter

IMPORTANT

The fastener shall be equipped with an anti-vibration mechanism, such as a spring washer; make sure all the four screws are fastened.

3.3 Removal and installation of the operation panel and covers

3.3.1 Removal and installation of the operator

3.3.1.1 Operator removal

① Push down the locks at both sides of the operator at the same time to release it from the panel and then take it off.

② Pull out the plug from the back of the operator. Note: do not pull the connecting line in order not to damage it.

Figure 3-7 Operator removal

3.3.1.2 Operator installation

Push the plug into the socket on the back of the operator. Then place the lock on one side of the operator into the groove at one side of the panel. Press the operator against the panel till a click is heard, which means that the two side locks are all in the panel.

3.3.2 Opening and Closing of the Terminal Cover

The terminal cover shall be opened during wiring of the main circuit and before removal of the front panel.

3.3.2.1 Opening the terminal cover

1) Loosen the two screws on the terminal cover;

2) Pull down the terminal cover.

The opening of the terminal cover is shown in Figure 3-8.

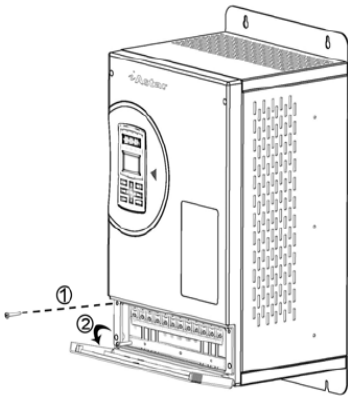


Figure 3-8 Opening the terminal cover

3.3.2.2 Closing the terminal cover

Close the terminal cover in the reversed sequence of opening. Fasten the two anti-dropping screws on the cover.

3.3.3 Removal and installation of the front panel

The front panel shall be removed during wiring of the control circuit. It may also be removed to facilitate the wiring of the main circuit.

3.3.3.1 Removal of the front panel

The following steps shall be done:

①Remove the operator. See 3.3.1 Removal and installation of the operator in Chapter 3.

②Open the terminal cover. See 3.3 Opening and closing of the terminal cover in Chapter 3.

③Loosen the two screws on the upper side of the panel and the two screws inside the terminal cover. And now the panel may be removed.

The removal of the front panel is shown in Figure 3-9:

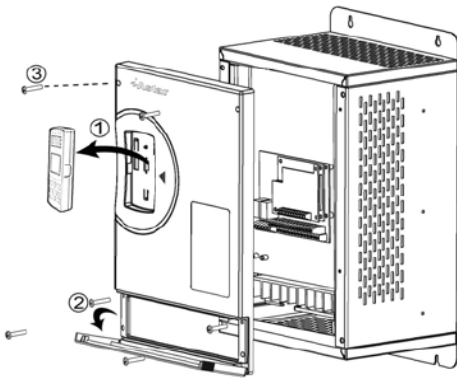


Figure 3-9 Front panel removal

3.3.3.2 Installation of the front panel

Install the front panel in the reversed sequence of the removal.

Chapter 4 Inverter wiring

This chapter describes the wiring of peripheral devices, terminals, main circuit terminal connections, control circuit terminals and PG card terminals.

DANGER

◎ **Always turn off the input power supply before wiring the terminals.**

Or electric shock may occur.

◎ **Wiring shall be performed by an authorized person qualified in electrical work.**

Or electric shock may occur.

◎ **Be sure to ground the earth terminal PE.**

Or electric shock may occur.

◎ **Never touch the terminals directly with your hands or allow the output lines to come into contact with the inverter case.**

Or electric shock may occur.

◎ **Never connect the power supply to output terminal U/T1, V/T2 or WT3.**

Or the inverter may be damaged.

◎ **Never connect terminal ⊕1/⊕2 to terminal ⊖.**

Or explosion may occur.

DANGER

◎ **Make sure the voltage of the AC main circuit power supply is consistent with the rated voltage of the inverter.**

Or fire and injury may occur.

◎ **Connect the braking resistor correctly according to the diagram.**

Or fire may occur.

◎ **Main circuit terminals and cable or cable terminals must be connected firmly.**

Or the inverter may be damaged.

4.1 Connections to peripheral devices

4.1.1 Connection diagram to peripheral devices

The connection diagram to peripheral devices is shown in Figure 4-1.

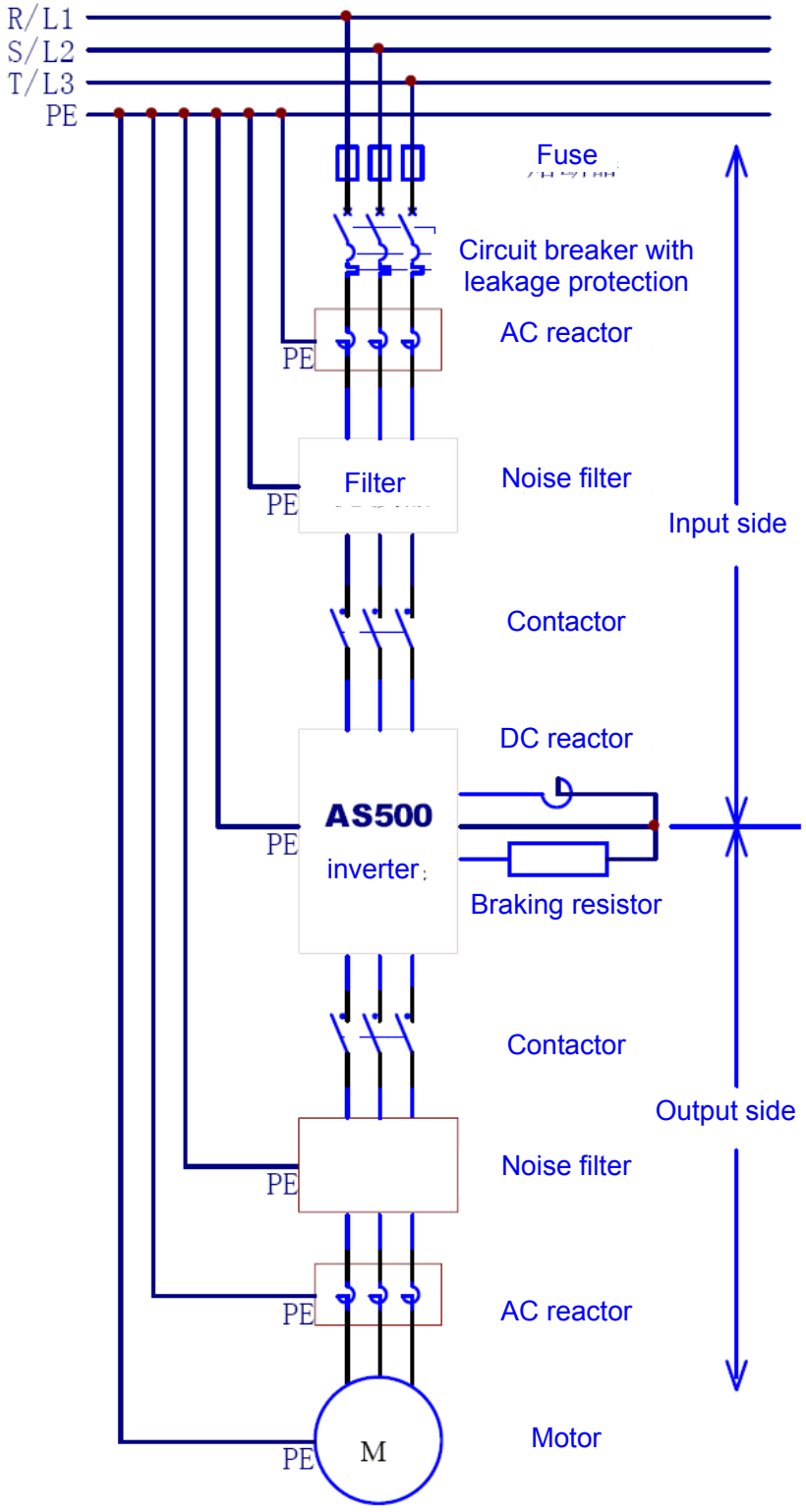


Figure 4-1 Connection diagram of the inverter and peripheral devices

Note: this diagram is based on a 3-phase power supply.

4.1.2 Wiring with peripheral devices in main circuit

4.1.2.1 Input power connection

DANGER

The inverter may not be operated beyond its rated input line voltage. Over-voltage may lead to permanent damage to the inverter.

Table 4.1 Specifications of input power

Specifications of input power (main circuit)	
Input voltage	380 ~ 460 V, AC, three phase, -15% ~ +10%
Short current (IEC 60909)	100kA maximum permissible short current within 1s, if the incoming cable of the inverter has a proper fuse
Frequency	45 ~ 65 Hz
Unbalance	Max.: ± 3% of the rated input line voltage
Cable temp.	Min. rated value: 90 ℃

4.1.2.2 Input protection

Input protection makes use of breaker, fuse and emergency stop.

Breaker

The inverter itself does not have a breaker. Therefore, a breaker shall be set between the AC input power supply and the inverter. This breaker shall ensure that:

◆ It conform to relevant safety regulations, including (but not limited to) national and regional electrical regulations.

◆ It shall be locked in the tripped position during installation and maintenance of the inverter.

◆ The breaker can not be used for emergency stop. This shall be controlled through the operator buttons or commands of I/O terminals.

◆ The breaker shall have a capacity of 1.5 to 2 times of the rated current of the

inverter.

◆ The breaker's time characteristics shall be determined in accordance with the inverter's over-heating protection (at 150% of the rated output current for 1 min.).

Fuse

The end user must provide circuit protection device, and the selection of the device shall be in conformity with the national and local electrical codes. Table 4-2 provides the recommended fuse model which can be used to provide short circuit protection for input power part of the inverter.

Table 4-2 Table of recommended fuse model

AS500	Input current (A)	Main fuse		
		IEC 269 gG (A)	UL Class T (A)	Bussmann model
4T02P2	6.2	10	10	CT10
4T03P7	9	10	10	CT10
4T05P5	13	16	15	CT16
4T07P5	19	20	20	CT20
4T0011	27	35	30	FE35
4T0015	34	35	40	FE40
4T18P5	41	45	50	FE45
4T0022	48	50	50	FE50
4T0030	65	71	71	FE71
4T0037	81	80	80	FE80
4T0045	96	100	100	FE100
4T0055	128	160	160	FEE160
4T0075	160	200	200	FEE200
4T0090	195	400	400	FWH-400A
4T00110	240	400	400	FWH-400A
4T0132	270	400	400	FWH-400A
4T0160	302	600	600	FWH-700A
4T0185	352	800	800	FWH-800A
4T0220	426	800	800	FWH-800A
4T0280	520	800	800	FWH-1000A
4T0315	600	800	800	FWH-1000A
4T0355	650	1000	1000	FWH-1200A
4T0400	740	1000	1000	FWH-1200A

Emergency stop

The design and installation of the equipment shall have an emergency stop and other necessary safety devices. Control through the operator buttons or commands

of I/O terminals may not be sufficient to realize:

- Emergency stop of the motor, and
- Separation of the inverter from dangerous voltages.

4.1.2.3 Input power cable/connection

The input cable may be any of the following:

- 4-core cables (3-phase and grounding), with no need of shield.
- 4-core insulated conductors in conduit

Under any circumstance, the conductor shall be smaller than the maximum dimension of the terminal. If the motor cable is excessively long or its cross sectional area is too large, it shall be derated. The cable for the inverter shall have a specified area (see table). The greater the cross sectional area of the cable, the greater the earth capacitance, the greater the leakage current to ground, therefore, when the cable with greater cross sectional area is used, output current shall be reduced by 5% for every increment of area. The table below lists the copper cable types under different current loads. Only the cables listed in the upper part are recommended. Aluminum cables are not recommended.

IEC	NEC
Based on: ◎ EN 60204-1 and IEC 60364-5-2/2001 ◎ PVC insulated ◎ 30 °C ambient temp. ◎ 70 °C surface temp. ◎ Symmetrical cables with copper shield ◎ No more than 9 cables aligned in one cable tray.	Based on: ◎ For copper cables, see NEC Table 310-16 ◎ 90 °C, insulated ◎ 40 °C ambient temp. ◎ No more than 3 cables in one cable duct, groove, or for current-carrying buried cables. ◎ Copper cables with copper shield

Max. load current (A)	Copper cable (mm^2)	Max. load current	Copper cable (mm^2)
3.5	3 × 1	128	3×50
6.2	3 × 1.5	160	3×70
9	3 × 1.5	195	3×95
13	3 × 1.5	210	3×95
19	3 ×2.5	240	3×120
27	3 ×4	302	3×185
34	3 ×6	352	3×240
41	3 ×10	390	3×95×2P
48	3 ×10	426	3×95×2P
65	3 ×6	480	3×150×2P
80	3 ×25	520	3×150×2P
96	3 ×35	650	3×95×4P

The inverter and the motor shall be grounded in order to ensure personnel safety, correct operation and to reduce radiation.

◆ The conductor diameter shall conform to relevant safety regulations.

◆ According to relevant safety regulations, the shield of power cables shall be connected to terminal PE of the inverter.

◆ Only when the specifications of the power cable shield conforms to relevant safety regulations, it can be used as the earthing conductor.

◆ If several inverters are to be connected, do not connect their terminals in series.

4.1.2.4 Output power cable/connection

Specifications of motor connection

Specifications of output power (motor)	
Output voltage	0 ~ input voltage, symmetrical 3-phase
Current	See 2.2 Inverter technical index and specification
Switching frequency	Set from 2 ~ 11 kHz
Rated temp. of cable	Min. 90 °C
Relationship between motor cable length and switching frequency	See 4.3.6.4 Relationship between wire length and carrier frequency

■ Grounding and wiring

Motor cable shielding: Conduit, armoring cable or shielded cable shall be used for motor cable shielding.

Shielded / armoring cable: use high-frequency low-impedance shielded cable, e.g.,

braided copper, aluminum or iron wire mesh

■ Conduit

◆ Both ends of the conduit shall be equipped with a bridge with grounding conductor.

◆ The conduit shall be fixed on the housing.

◆ A separate conduit shall be used for the motor cable (and at the same time separate the routing of input power cable and control cable).

◆ A separate conduit routing shall be provided for each inverter.

■ Armoring cable

◆ Both ends of the conduit shall be equipped with a bridge with grounding conductor.

◆ Use 6-conductor (3 power lines and 3 earthing lines) cables with MC continuous corrugated aluminum armor and symmetrical earthing lines.

◆ One cable tray may be shared by the armoring motor cable and the input power cable, but not with the control cable.

■ Shielded cable

◆ It is recommended to use cables with symmetrical PE conductors as per CE or C-Tick.

■ Grounding

◆ Refer to above-said Grounding of input power cable.

4.1.2.5 AC reactor on the input side

In order to prevent the rectifier elements damaging from heavy current into power circuit at the time of peak pulse input, an AC reactor should be installed on the input side, which may simultaneously improve the power factor at the input side and reduce the higher harmonic current. To effectively protect the inverter, it is

suggested that a 110 kW (included) and above input reactor is mounted for class 380 V inverter, a 45 kW (included) and above input reactor for class 220 V inverter. For options of AC reactor on the input side, refer to Table 4-5.

Table 4-5 Options table for AC reactor on the input side

Inverter model	Power (kW)	Recommended model（Eagtop）	Current (A)	inductance (mH)	decrease
4T01P1	1.1	ACL-0005-EISC-E3M8B	5	2.800	1%
4T02P2	2.2	ACL-0007-EISC-E2M5B	7	2.000	1%
4T03P7	3.7	ACL-0010-EISC-E1M5B	10	1.400	1%
4T05P5	5.5	ACL-0015-EISH-E1M0B	15	0.930	1%
4T07P5	7.5	ACL-0020-EISH-EM75B	20	0.700	1%
4T0011	11	ACL-0030-EISH-EM60B	30	0.470	1%
4T0015	15	ACL-0040-EISH-EM42B	40	0.350	1%
4T18P5	18.5	ACL-0050-EISH-EM35B	50	0.280	1%
4T0022	22	ACL-0060-EISH-EM28B	60	0.240	1%
4T0030	30	ACL-0080-EISC-EM19B	80	0.170	1%
4T0037	37	ACL-0090-EISC-EM19B	90	0.160	1%
4T0045	45	ACL-0120-EISH-EM13B	120	0.120	1%
4T0055	55	ACL-0150-EISH-EM11B	150	0.095	1%
4T0075	75	ACL-0200-EISH-E80UB	200	0.070	1%
4T0090	90	ACL-0200-EISH-E80UB	200	0.070	1%
4T0110	110	ACL-0250-EISH-E65UB	250	0.056	1%
4T0132	132	ACL-0290-EISH-E50UB	290	0.048	1%
4T0160	160	ACL-0330-EISH-E50UB	330	0.042	1%
4T0185	185	ACL-0390-EISH-E44UB	390	0.036	1%
4T0200	200	ACL-0490-EISH-E35UB	490	0.028	1%
4T0220	220	ACL-0490-EISH-E35UB	490	0.028	1%
4T0250	250	ACL-0530-EISH-E35UB	530	0.026	1%
4T0280	280	ACL-0600-EISH-E25UB	600	0.023	1%
4T0315	315	ACL-0600-EISH-E25UB	600	0.023	1%
4T0355	355	ACL-0800-EISH-E25UB	800	0.017	1%

4.1.2.6 Noise filter on the input side

An optional noise filter may be used specifically on the input side to restrain noise transmitted between the power line and the inverter. While the inverter operates, the peripheral electronic devices may be disturbed by main leads; however, the use of the filter may reduce this interference.

For options of filter on the input side of 380V inverter, refer to Table 4-6.

Table 4-6 Options table for filter on the input side

Inverter model	Power (kW)	Recommended model（Eagtop）	Current (A)
4T01P1	1.1	NFI-005	5
4T02P2	2.2	NFI-010	10
4T03P7	3.7	NFI-010	10
4T05P5	5.5	NFI-020	20
4T07P5	7.5	NFI-020	20
4T0011	11	NFI-036	36
4T0015	15	NFI-036	36
4T18P5	18.5	NFI-050	50
4T0022	22	NFI-050	50
4T0030	30	NFI-065	65
4T0037	37	NFI-080	80
4T0045	45	NFI-100	100
4T0055	55	NFI-150	150
4T0075	75	NFI-150	150
4T0090	90	NFI-200	200
4T0110	110	NFI-250	250
4T0132	132	NFI-250	250
4T0160	160	NFI-300	300
4T0185	185	NFI-300	300
4T0200	200	NFI-400	400
4T0220	220	NFI-600	600
4T0250	250	NFI-600	600
4T0280	280	NFI-600	600
4T0315	315	NFI-900	900
4T0355	355	NFI-900	900

For correct setup illustrations of the noise filter on the power side, see Figure 4-2.

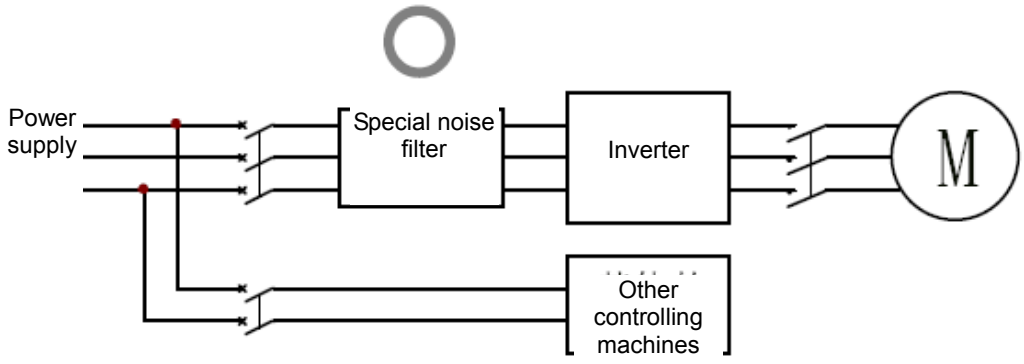


Figure 4-2 Proper layout of noise filter on the power side

Incorrect layout of noise filter on the power side is exampled in Figure 4-3 and Figure 4-4.

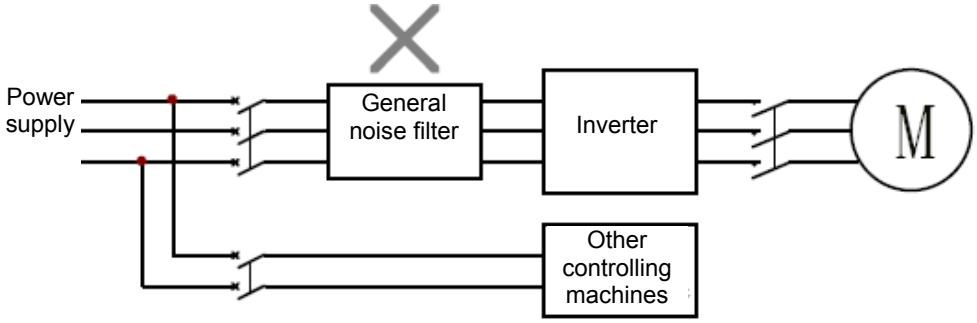


Figure 4-3 Example 1 for incorrect layout of noise filter on the power side

Figure 4-3 Anticipated effect may not be realized if a general noise filter is installed on the power side, which shall be avoided.

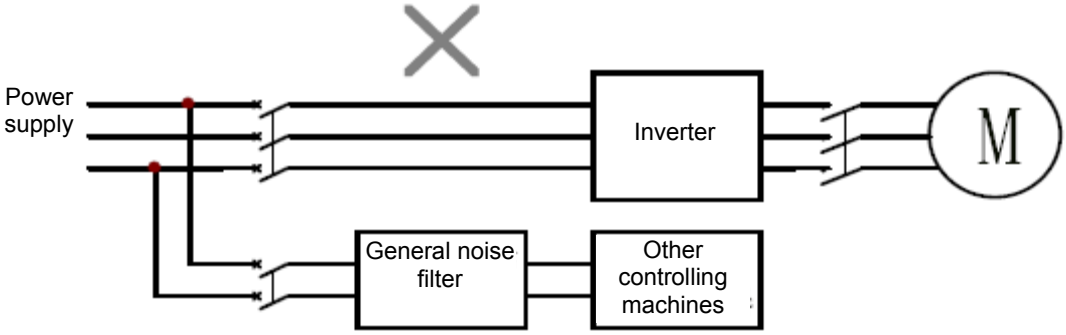


Figure 4-4 Example 2 for incorrect layout of noise filter on the power side

Figure 4-4 Anticipated effect may not be realized if a noise filter is installed on the receiving side, which shall be avoided.

Caution: in case of installing the input noise filter, wiring to input power end of the inverter from the filter shall be as short as possible. The filter enclosure shall be connected to the cabinet by large area so as to reduce 1 g return impedance of noise current.

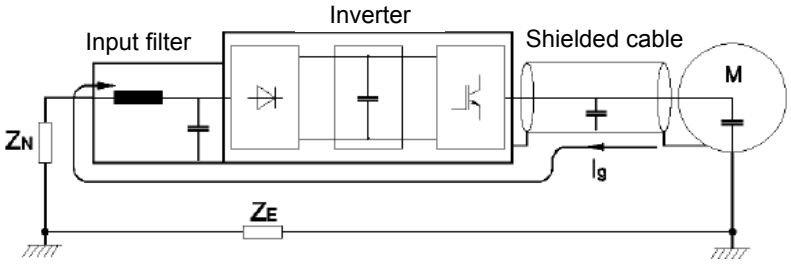


Figure 4-5 Schematic for noise current of noise filter

4.1.2.8 Contactor on the input/output side

The switch on or off of major loop power may be controlled by installing an electromagnetic contactor on the input side to protect the power supply and prevent spreading of faults, and to cut off the input power of the inverter while a system

failure occurs.

Do not use this contactor to control the start and stop of motors.

4.1.2.9 Noise filter on the output side

A noise filter may be used on the output side to reduce the radio noise caused by the cable between the inverter and the motor and to decrease the leakage current on the cable.

For options of output filter of class380V, refer to Table 4-7.

Table 4-7 Output filter

Inverter model	Power (kW)	Recommended model（Eagtop）	Current (A)
4T01P1	1.1	OSF-005	5
4T02P2	2.2	OSF-007	7
4T03P7	3.7	OSF-010	10
4T05P5	5.5	OSF-015	15
4T07P5	7.5	OSF-030	30
4T0011	11	OSF-030	30
4T0015	15	OSF-040	40
4T18P5	18.5	OSF-050	50
4T0022	22	OSF-060	60
4T0030	30	OSF-080	80
4T0037	37	OSF-090	90
4T0045	45	OSF-120	120
4T0055	55	OSF-150	150
4T0075	75	OSF-200	200
4T0090	90	OSF-250	250
4T0110	110	OSF-250	250
4T0132	132	OSF-330	330
4T0160	160	OSF-330	330
4T0185	185	OSF-330	330
4T0200	200	OSF-490	490
4T0220	220	OSF-490	490
4T0250	250	OSF-660	660
4T0280	280	OSF-660	660
4T0315	315	OSF-660	660
4T0355	355	OSF-660	660

4.1.2.10 AC reactor on the output side

An optional AC reactor may be used on the output side to restrain the radio interference.

Where the cable between the inverter and the motor is long (> 30 m) or several motors run together, because of the parasitic capacitance effect to ground by long cable, the leakage current becomes too heavy, and the inverter may suffers from frequent overcurrent protection, and the destruction of insulation of the motor shall be avoided, so an output reactor shall be increased.

For options of AC reactor, refer to Table 4-8.

Table 4-8 Recommended options table for AC reactor

Inverter model	Power (kW)	Recommended model （Eagtop）	Current (A)	inductance (mH)	decrease
4T01P1	1.1	OCL-0005-EISC-E1M4	5	1.400	1%
4T02P2	2.2	OCL-0007-EISC-E1M0	7	1.000	1%
4T03P7	3.7	OCL-0010-EISC-EM70	10	0.700	1%
4T05P5	5.5	OCL-0015-EISC-EM47	15	0.470	1%
4T07P5	7.5	OCL-0020-EISC-EM35	20	0.350	1%
4T0011	11	OCL-0030-EISC-EM23	30	0.230	1%
4T0015	15	OCL-0040-EISC-EM18	40	0.180	1%
4T18P5	18.5	OCL-0050-EISC-EM14	50	0.140	1%
4T0022	22	OCL-0060-EISC-EM12	60	0.120	1%
4T0030	30	OCL-0080-EISC-E87U	80	0.087	1%
4T0037	37	OCL-0090-EISC-E78U	90	0.078	1%
4T0045	45	OCL-0120-EISC-E58U	120	0.058	1%
4T0055	55	OCL-0150-EISH-E47U	150	0.047	1%
4T0075	75	OCL-0200-EISH-E35U	200	0.035	1%
4T0090	90	OCL-0200-EISH-E35U	200	0.035	1%
4T0110	110	OCL-0250-EISH-E28U	250	0.028	1%
4T0132	132	OCL-0290-EISH-E24U	290	0.024	1%
4T0160	160	OCL-0330-EISH-E21U	330	0.021	1%
4T0185	185	OCL-0390-EISH-E18U	390	0.018	1%
4T0200	200	OCL-0490-EISH-E14U	490	0.014	1%
4T0220	220	OCL-0490-EISH-E14U	490	0.014	1%
4T0250	250	OCL-0490-EISH-E13U	530	0.013	1%
4T0280	280	OCL-0600-EISH-E12U	600	0.012	1%
4T0315	315	OCL-0600-EISH-E12U	600	0.012	1%
4T0355	355	OCL-0800-EISH-E8U7	800	0.009	1%

4.1.2.11 DC reactor

For 30 kW ~ 75 kW (380 V) series of AS500 inverters, a built-in DC reactor (optional) may be provided. The DC reactor may improve the power factor, avoid the rectifier bridge damage by heavy input current of the inverter due to connection of a transformer with large capacity, and prevent the rectifying circuit damaging from harmonic caused by abrupt change of mains voltage or phase-controlled load.

For options of external DC reactor of AS500 series inverters below 30kW (class 380V), refer to Table 4-9.

Table 4-9 Recommened options table for DC reactor

Inverter model	Power (kW)	Recommended model（Eagtop）	Current (A)	inductance (mH)
4T01P1	1.1	DCL-0006-EIDC-E11M	6A	11mH
4T02P2	2.2	DCL-0006-EIDC-E11M	6A	11mH
4T03P7	3.7	DCL-0012-EIDC-E6M3	12A	6.3mH
4T05P5	5.5	DCL-0023-EIDH-E3M6	23A	3.6mH
4T07P5	7.5	DCL-0023-EIDH-E3M6	23A	3.6mH
4T0011	11	DCL-0033-EIDH-E2M0	33A	2.0mH
4T0015	15	DCL-0033-EIDH-E2M0	33A	2.0mH
4T18P5	18.5	DCL-0040-EIDH-E1M3	40A	1.3mH
4T0022	22	DCL-0050-EIDH-E1M1	50A	1.08mH

4.2 Inverter terminal wiring

Figure 4-6 shows the interior of the inverter.

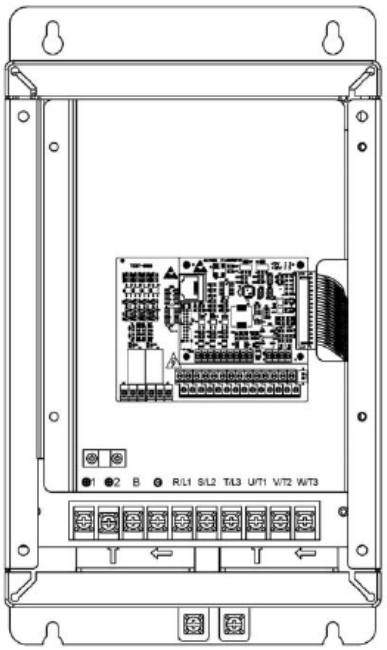


Figure 4-6 Inverter interior

Note: the terminals at all power levels are the same except for the position and alignment of power I/O terminals. The figure above shows the 11 kW type.

4.2.1 Wiring diagram for inverter terminals

For wiring diagram of models applicable to external DC reactor and built-in braking unit, refer to Figure 4-7.

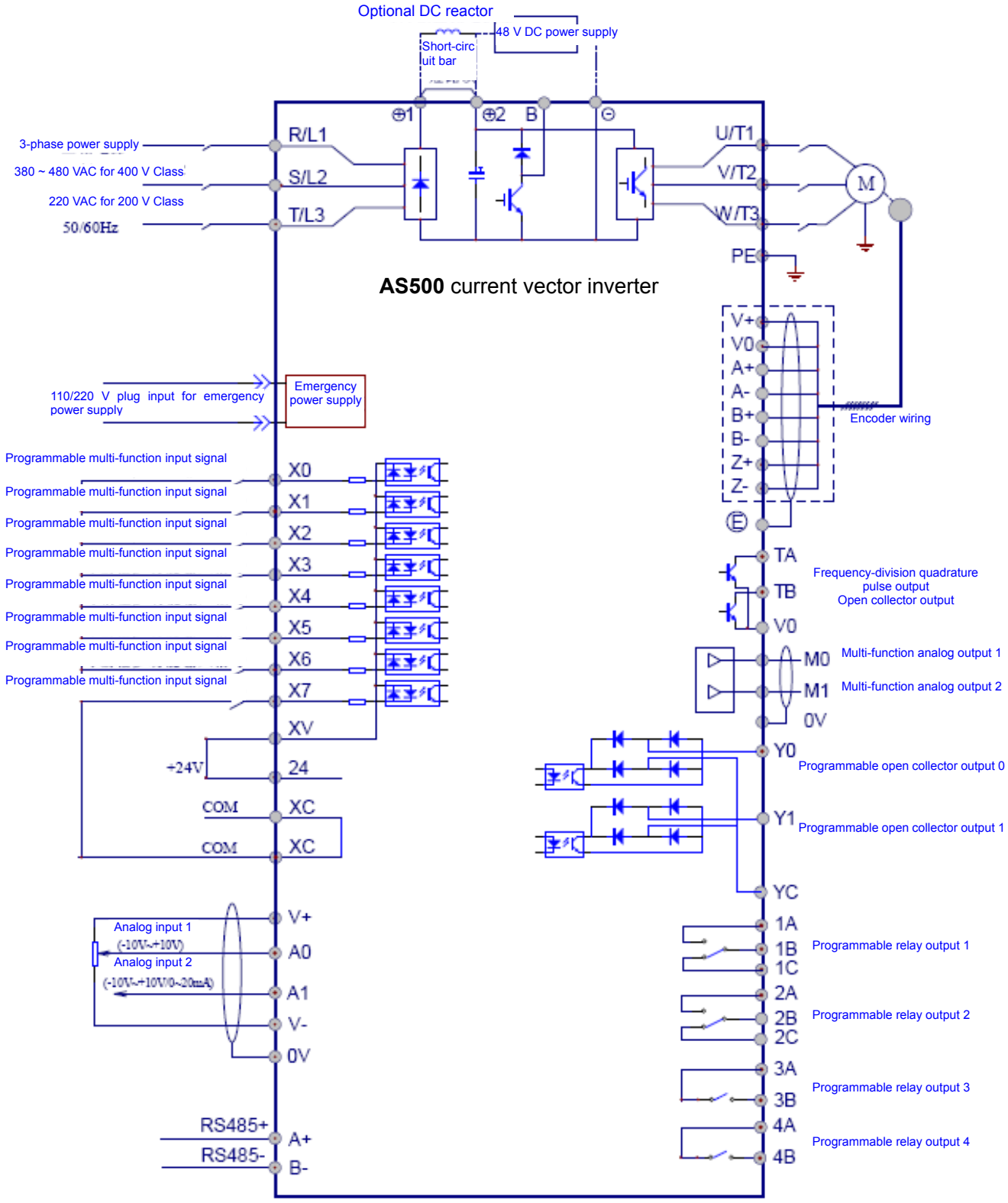


Figure 4-7 Schematic diagram 1 for terminals wiring of universal inverter (below 30kW)

Note: the above figure is based on 3-phase power supply, which is 380 ~ 460 V for the 400 V class and 200 ~ 240 V for the 200 V class. (Any two phases can be connected for single-phase inverter)

For wiring diagram of models applicable to built-in DC reactor and external braking unit, refer to Figure 4-8.

Programmable multi-functional input signal

Programmable multi-functional input signal

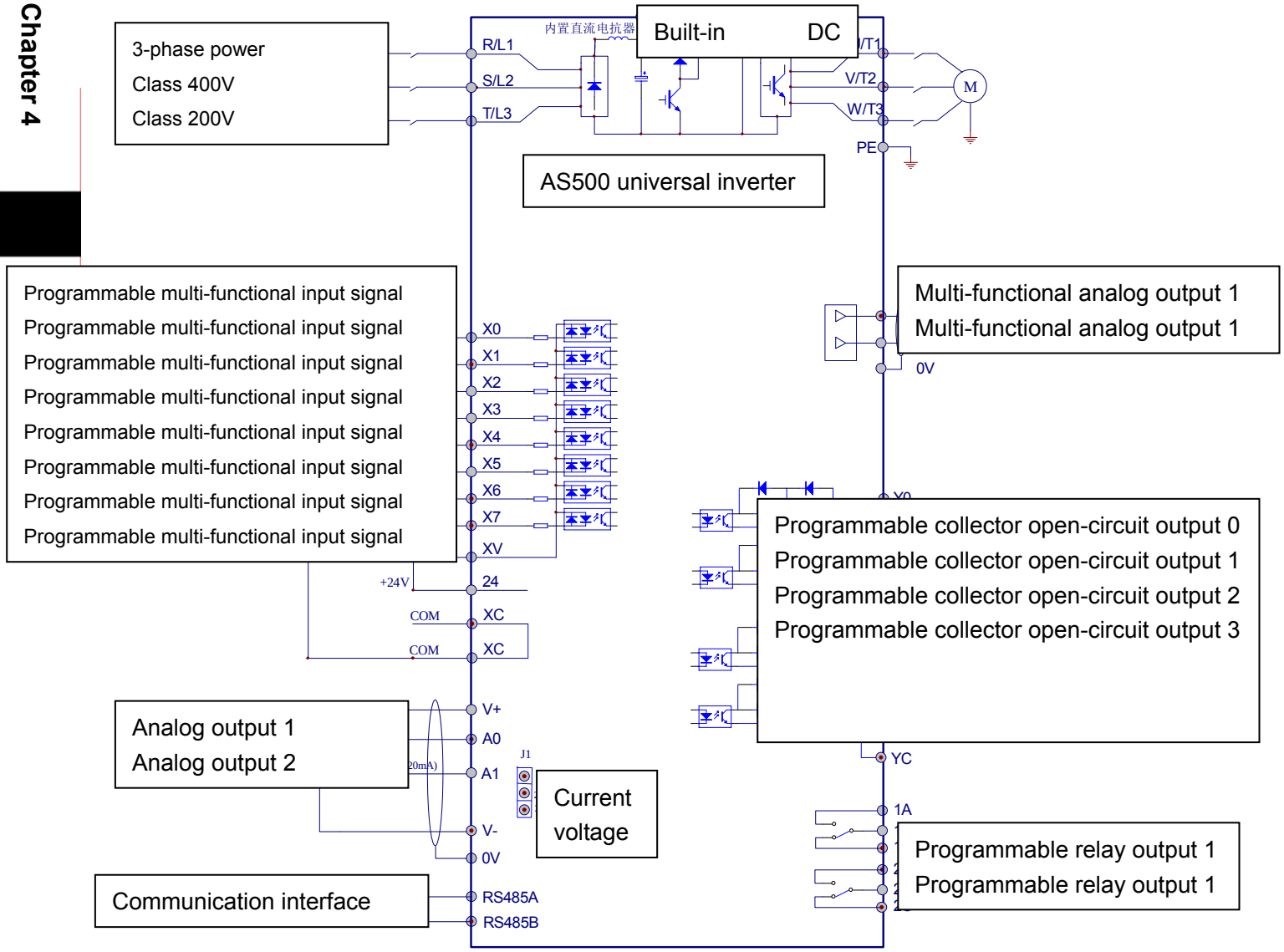


Figure 4-8 Schematic diagram 2 for inverter terminals wiring (30kW or more)

Tips:

1. A0 / A1 can input analog voltage signal, A1 can input analog current signal (J1 jumper settings), and A0 and A1 input simultaneously.
2. The inverter of this specification is without braking unit or external braking unit terminals.

4.2.2 Wiring precautions

IMPORTANT

a) The connection shall conform to relevant electrical engineering standards.

b) Check the wiring and its reliability after wiring. The following items shall be checked:

Is all wiring correct?

Have any wire clippings or screws been left inside the Inverter?

Is any screw loosened?

Does any bare wire at terminal end contact with other terminals?

c) Although **AS500** is equipped with a braking unit, an external braking resistor is still necessary. The braking resistor shall be installed between Terminal B and Terminal ⊕2, and not anywhere else, or the resistor and the Inverter may be damaged.

d) The DC reactor shall be connected between Terminals ⊕1 and ⊕2, and the short-circuit bar between them shall be removed.

e) When bus low-voltage running is needed, an emergency power of 200 V shall be connected between Terminals R0 and T0, and a DC 48V shall be put between Terminals R and S. These may be saved if no bus-voltage running is required.

f) It is recommended that the grounding wire PE of the Inverter be connected to a special grounding terminal and the ground resistor shall have its resistance below 10 Ω.

g) The grounding cable shall be as short as possible.

h) When there is need for wiring changes after powering on, the power shall be cut off first. Since it takes some time for the main circuit charge capacitor to discharge, subsequent procedures may be taken only after the charging indicator

extinguishes and the DC voltage across the capacitor is measured through a DC voltmeter to be below 24 VDC safety level.

4.3 Wiring main circuit terminals

4.3.1 Alignment of main circuit terminals

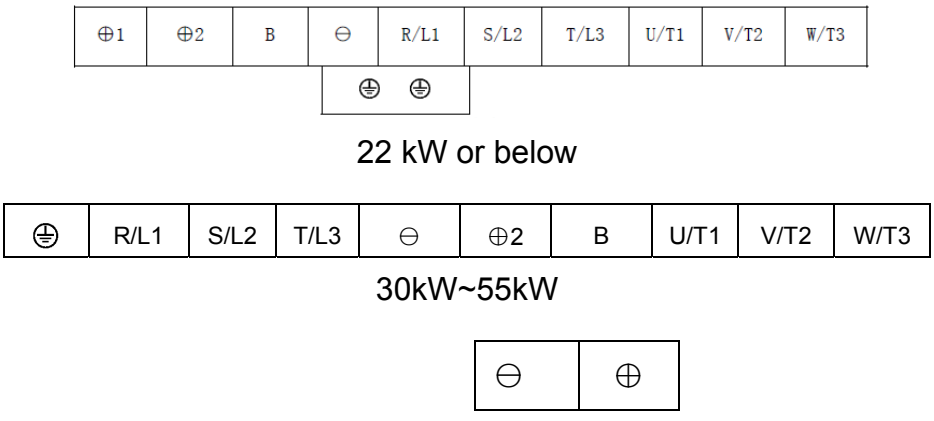


Figure 4-9 Main circuit terminals diagram

4.3.2 Symbols and Functions of Main Circuit Terminals

The functions of main circuit terminals are listed in Table 4.1.

Table 4.1 Functions of main circuit terminals

Terminal symbol	Function
⊕1	To connect DC reactor, shorting for ex works
⊕2	
⊕2	External braking resistor connection
B	
⊖	Negative output of DC bus
R/L1	AC power for the main circuit, to 3-phase input
S/L2	
T/L3	
U/T1	Inverter output, to 3-phase synchronous/asynchronous machine
V/T2	
W/T3	

4.3.3 Wire sizes of main circuit

600V plastic cooper conductors or other insulated conductors for power supply may be used. Cable specifications and tightening torques are listed in Table 4.2.

Table 4.2 Cable specifications and tightening torques for 200V Inverters

Model: AS500	Permissible cable size（mm^2）	Recommended cable size（mm^2）	Tightening torque（N.m）
2T01P1	1.5～2.5	3X2.5	2.5
2T02P2	4～8	3X6	2.5
2T03P7	6～10	3X8	2.5
4T01P1	1.5～2.5	3X2.5	1.5
4T02P2	1.5～2.5	3X2.5	1.5
4T03P7	2.5～4	3X4	2.5
4T05P5	4～8	3X6	2.5
4T07P5	4～8	3X6	2.5
4T0011	4～8	3X6	2.5
4T0015	8～16	3X16	4.0
4T18P5	8～16	3X16	4.0
4T0022	25～35	3X25	6.0
4T0030	35～50	3X35	9.0
4T0037	50～70	3X50	9.0
4T0045	70～95	3X70	14.0
4T0055	95	3X95	14.0
4T0075	85～115	3x95	20
4T0090	85～115	3x95	20
4T00110	95～135	3x120	36
4T0132	165～205	3x185	36
4T0160	205～265	3x240	36
4T0185	85～115(x2P)	3x95x2P	36
4T0220	125～175(x2P)	3x150x2P	36
4T0280	125～175(x2P)	3x150x2P	36
4T0315	85～115(x4P)	3x95x4P	36
4T0355	85～115(x4P)	3x95x4P	36
4T0400	85～115(x4P)	3x95x4P	36

IMPORTANT

The wire sizes are determined at an ambient temperature of 50 ℃ and a permissible temperature of 75℃.

The main circuit of Inverter adopts open terminal connection, for which round crimp

terminals shall be used. The selection of round crimp terminals may be found in Table 4.3.

Table 4.3 Round crimp terminals

Cross section （mm^2）	Screw	Terminal
0.5	M3.5	1.25/3.5
	M4	1.25/4
0.75	M3.5	1.25/3.5
	M4	1.25/4
1.25	M3.5	1.25/3.5
	M4	1.25/4
2	M3.5	2/3.5
	M4	2/4
	M5	2/5
	M6	2/6
	M8	2/8
3.5/5.5	M4	5.5/4
	M5	5.5/5
	M6	5.5/6
	M8	5.5/8
8	M5	8/5
	M6	8/6
	M8	8/8
14	M6	14/6
	M8	14/8
22	M6	22/6
	M8	22/8
30/38	M8	38/8
50/60	M8	60/8
	M10	60/10
80	M10	80/10
100		100/10
120	M12	120/12
185	M12	185/12
240	M12	240/12
300	M12	300/12
380	M12	380/12

IMPORTANT

Sufficient attention shall be paid to the voltage drop along the line to determine

cable cross section. Typically, the voltage shall be maintained below 2% of the rated value. If the drop is too heavy, a larger cross section shall be used. The voltage drop may be calculated as follows:

Line-to-line voltage loss (V) = $\sqrt{3}$ * line resistance (Ω) * current (A)

4.3.4 Illustration of main circuit wiring

4.3.4.1 Power supply

The inverter must be grounded for protection. In view of high leakage current (exceeding 3.5 mA), in order to comply with relevant current regulations, at least 1 piece of 10 mm2 earthing conductor or 2 pieces of earthing conductors having the same cross sectional area with power lead shall be used.

4.3.4.2 Ground Terminal (E)/ (PE)

■ It is recommended to connect the ground terminal to a specialized grounding electrode. Reliable connection shall be ensured. The grounding resistance shall be lower than 10 Ω.

■ The grounding conductor may not be shared with welding machines or other power devices.

■ Always use a grounding conductor that complies with the technical standards on the electrical equipment and minimize the length of the wire. Long distance between the grounding conductor and the grounding electrode may lead to leakage current of the Inverter which causes instability in grounding terminal potential.

■ Multi-strand copper lines over 3.5 mm^2 shall be used for the grounding wire. It is recommended to use specific green-yellow grounding wires.

■ It is recommended not to loop the grounding wire when more than one inverter is to be grounded in order to avoid grounding loop.

■ For the method to ground inverters more than one, see Figure 4-10.

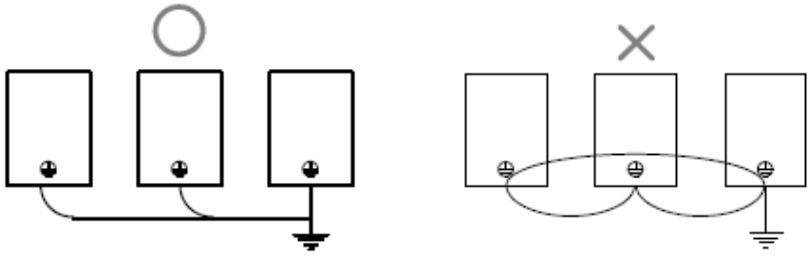


Figure 4-10 Grounding method of more than one inverter

CAUTION

Improper wiring:

If the input line voltage is applied to (U/T1, V/T2, W/T3), the inverter will be damaged.

Prior to power-on of the inverter, check the power connection.

If replacing with another inverter, please confirm all connections to the inverter complying with the wiring instructions in this manual.

If not in accordance with this manual, death or serious injury will be caused.

4.3.4.3 +48 V DC power terminals (⊕ 2, ⊖)

◆ At power grid failure, storage batteries connected to Terminals ⊕ 2 and ⊖ may be used to supply a direct low-voltage power to the inverter to enable low speed running of the motor and protect the machinery from impact.

4.3.4.4 Power supply input terminals for the main circuit (R/L1, S/L2, T/L3)

◆ A 3-phase AC power supply may be connected through a breaker to any one of Terminals R/L1, S/L2, and T/L3. The phase sequence of the input power supply is irrelevant to the sequence of R/L1, S/L2, and T/L3.

◆ A noise filter may be installed on the power supply side in order to reduce transmission and radiation interferences of the Inverter caused to the input power supply. The noise filter may reduce the electromagnetic interference both from the power line to the inverter and vice versa.

CAUTION: please use only noise filters specifically for inverters.

4.3.4.5 DC reactor terminals (⊕1, ⊕2)

◆ A DC reactor may be added to improve the power factor. Remove the short-circuit bar between Terminals ⊕1 and ⊕2 pre-wired at the factory when connecting a DC reactor to the inverter.

◆ If no DC reactor is used, please do not remove the short-circuit bar, or the inverter will not work normally.

The wiring of the short-circuit bar is shown in Figure 4-11.

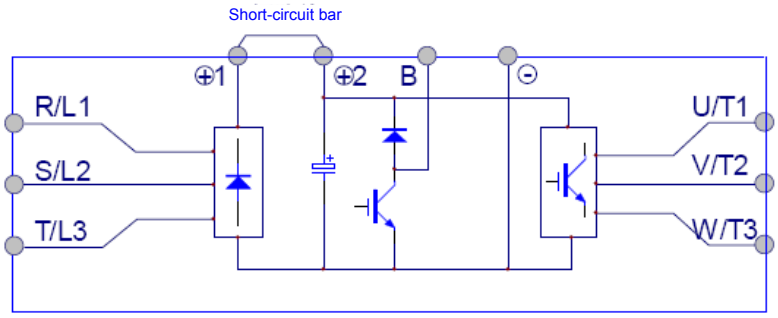


Figure 4-11 Wiring diagram of short-circuit bar

The wiring of the DC reactor is shown in Figure 4-12.

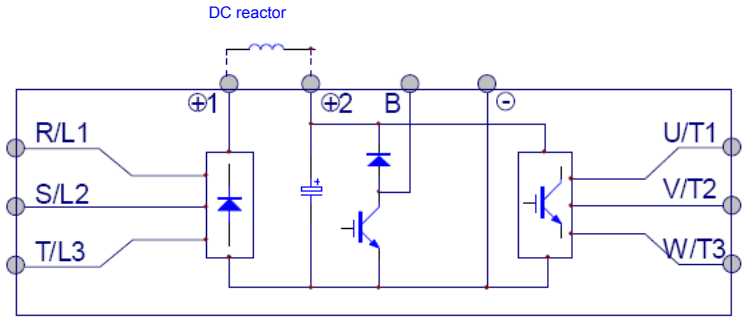


Figure 4-12 Wiring of the DC reactor

4.3.4.6Connecting the Braking Resistor Terminals (⊕2, B)

◆ Since each **AS500** is equipped with a built-in braking unit, an additional braking resistor is required to absorb the energy released during braking. The types of braking resistors are listed in Table 1.9 Braking resistors for 200 V inverters and Table 1.10 Braking resistors for 400 V inverters in Chapter 1.

◆ The braking resistor is put between Terminals ⊕2 and B.

CAUTION

Inverters of 30kW have two ⊕2 terminals, one on the top and the other on the bottom. It is recommended to connect the braking resistor between the ⊕2 terminal on the bottom and Terminal B.

◆ Sufficient attention shall be paid to heat dissipation and ventilation in order to maintain good performance of the braking resistor.

◆ The wire connecting the braking resistor may not be longer than 5 m.

The wiring of additional braking resistor is shown in Figure 4-13.

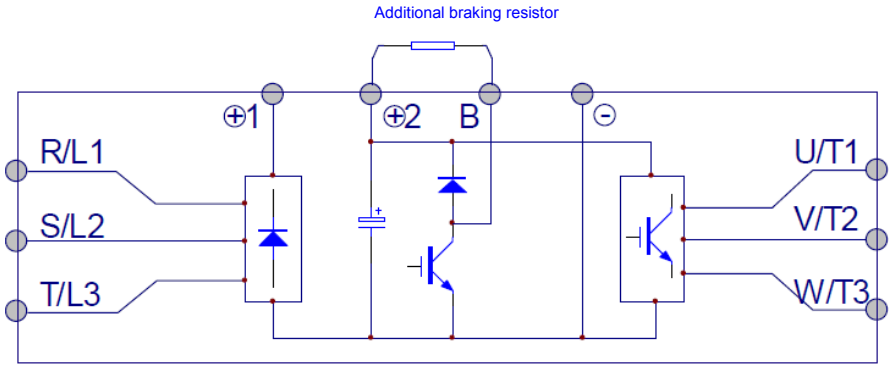


Figure 4-13 Braking resistor wiring

4.3.4.7 External braking unit terminals (⊕2, ⊖)

If an external braking unit is required, Terminals (+) and (-) of the braking unit respond to the inverter terminals (⊕2, ⊖) respectively, and a braking resistor is connected to BR1 and BR2 of the braking unit.

The length of wire connecting the inverter terminals (⊕2, ⊖) and Terminals (+) and (-) of the braking unit shall be less than 5 m, and the length for that connecting BR1 and BR2 of the braking unit and the braking resistor shall be less than 10 m.

CAUTION

CAUTION: polarity of (+) and (-) terminals may not be reversed; Terminals (+) and (-) may not be connected to the braking resistor directly, or else the inverter may be damaged or a fire will be caused.

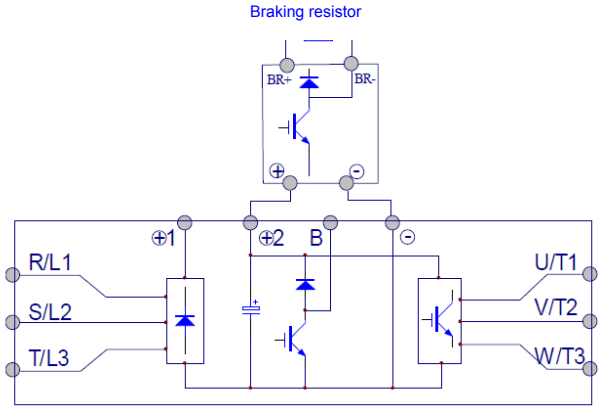


Figure 4-14 External braking unit

4.3.4.8 Connection of power feedback unit

RG series of energy power unit may feed the power generated by the motor in generative braking state back to the grid. RG series of energy power unit uses IGBT as the rectifying feedback, the allocation of harmonic distortion of feedback network is less than 5% of fundamental wave, and there is little pollution to the network, as compared with 3-phase inverse parallel bridge type rectifying unit.

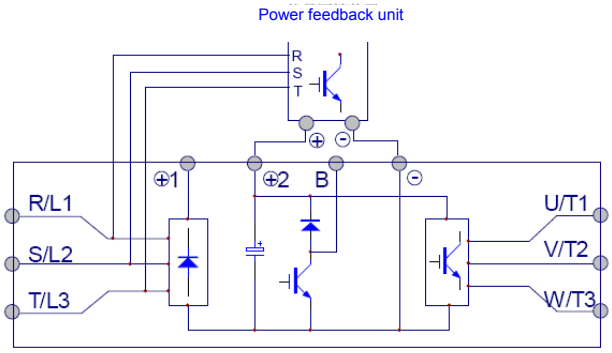


Figure 4-15 External power feedback unit

4.3.4.9 Inverter Output Terminals (U, V, W)

◆ Connect inverter output Terminals U/, V, W to motor lead wires U, V and W respectively. Chang any two of the output terminals of the Inverter or the motor when the motor is not in the desired rotation direction.

◆ Never connect the power supply to the inverter output Terminals U,V and W.

◆ The output terminals may never be grounded or shorted.

◆ Never connect a capacitor and/or an LC/RC noise filter on the Inverter output

side, since the inverter may be thus over-heated or damaged due to its higher harmonics.

Figure 4-16 shows that capacitor shall never be connected on the output side of the inverter.

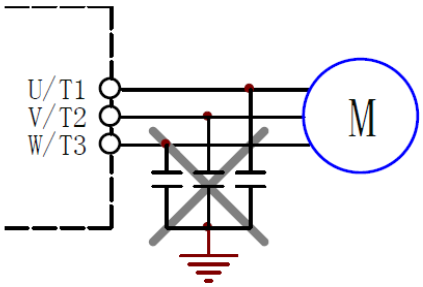


Figure 4-16 Never connect capacitor on the output side of the inverter

4.4 Countermeasures against noise

4.4.1 Install a specialized noise filter on the output side

A specialized nose filter may be installed on the Inverter output side to restrain the noise from this side. The connection is shown in Figure 4-18.

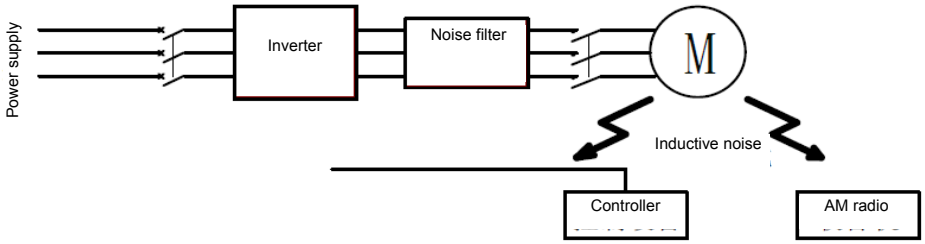


Figure 4-18 Connection of noise filter on the output side of the inverter

4.4.2 Connection of surge suppressor on the output side

When an inductive load (electromagnetic contactor, relay, magnetic valve, etc.) is connected to the inverter, please take care to provide a surge suppressor on the coil of this loading equipment, as shown in Figure 4-18.

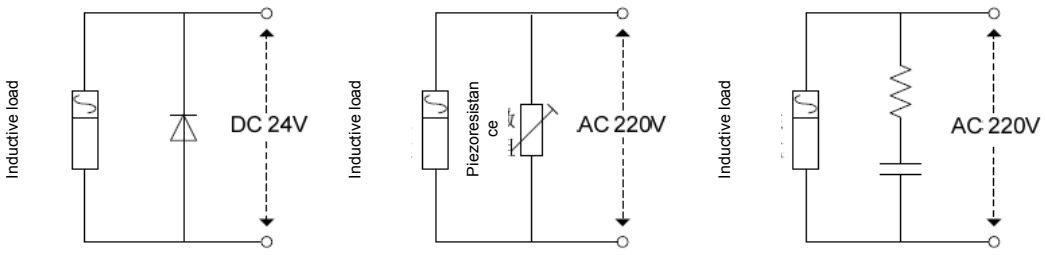


Figure 4-18 Application of surge suppressor for inductive load

4.4.3 Main circuit wiring

To suppress the radiated interference from the output side of the inverter and reinforce the anti-interference ability, the distance between them should be as large as possible, particularly, when the cable is laid in parallel and the extended distance is great relatively. While the signal cable has to cross the power cable, they should be perpendicular mutually. Main circuit wiring is shown in Figures 4-19 and 4-20

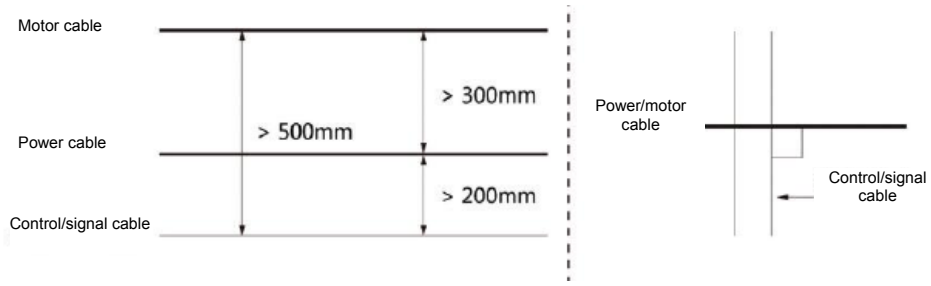


Figure 4-19 Layout 1 of main circuit wiring

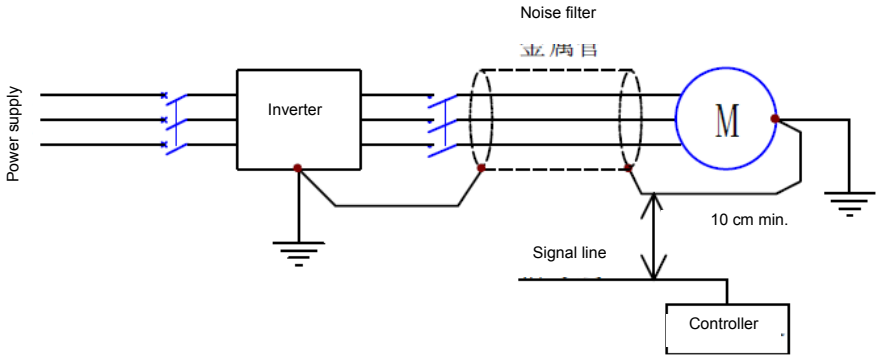


Figure 4-20 Layout 2 of main circuit wiring

In general, the control cable must be shielded, and the wire mesh for shielding must be connected to the metal case of the inverter by means of the cable grips at both ends, as shown in Figure 4-22.

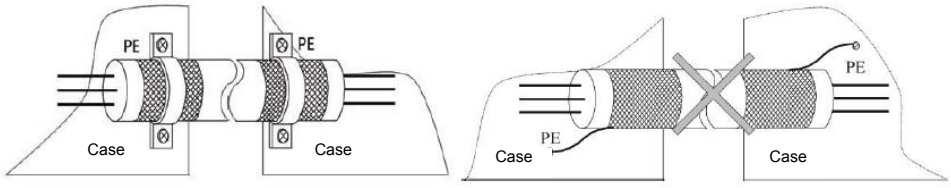
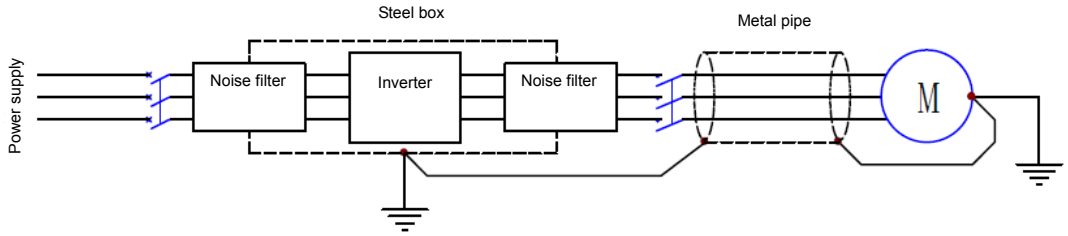


Figure 4-22 Comparison of grounding methods

4.4.4 Better countermeasures against noise

To reduce noises more effectively, a noise filter shall be installed on both the input and the output side of the Inverter and the Inverter shall be enclosed in a steel box,

as shown in Figure 4-23.



Figur 4-23 Better countermeasures against noise

4.4.5 Relationship between cable length and carrier frequency

If the cable linking the inverter and the motor is too long, the high-frequency leakage current may increase due to distributed capacitance, which may trigger over-current protection of the inverter output and thus causes negative impacts on surrounding equipment and electrical machines. Therefore, the cable between the inverter and the motor shall be no longer than 100 m. Please adjust carrier frequency PO2.14 and select a noise filter and reactor for the output side according to the following table.

Cable length	50m and shorter	100m and shorter	Over100m
Carrier frequency	Below 11 kHz	Below 8 kHz	Below 5 kHz

4.5 Wiring the control circuit terminals

4.5.1 Control circuit terminals

For terminals layout of the control circuit, see terminals picture of the control circuit in Figure 4-23.

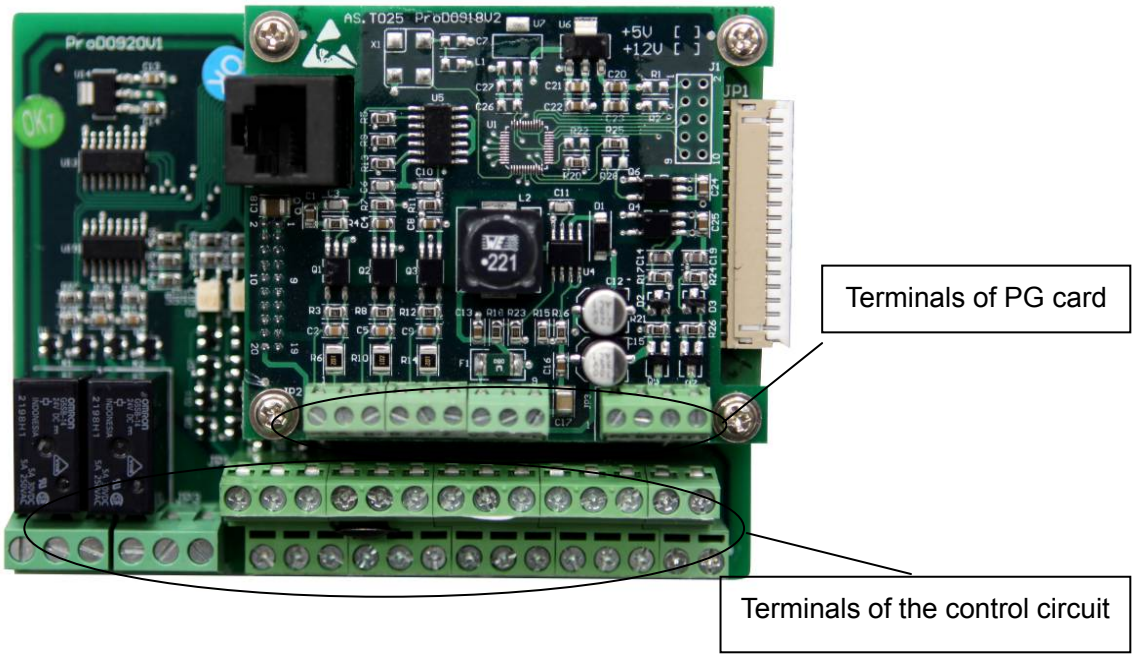


Figure 4-23 Terminals picture of the control circuit

4.5.2 Terminal symbols of the control circuit

For the terminal symbols of the control circuit, see Figure 4-24.

2A	2B	2C	4A	4B	Y1	YC	24	XV	X1	X3	X5	X7	SC	0V	0V	A0	A1
1A	1B	1C	3A	3B	Y0	XC	XC	X0	X2	X4	X6	A+	B-	M0	M1	V+	V-

Figure 4-24 Terminal symbols of the control circuit

4.5.3 Control circuit terminal functions

The functions of the control circuit terminals are shown in Table 4.5.

Table 4.5 Control circuit terminal functions

Name	Terminal	Signal	Remarks
Digital input terminals	X0	Multi-function input 1 (function code: P30.00)	Effective when it is closed. The function of each terminal is selected by parameters of P30 code set. Circuit configuration of digital input is shown as follows: Internal power supply: +24 VDC Max. load current: 20 mA
	X1	Multi-function input 2 (function code: P30.01)	
	X2	Multi-function input 3 (function code: P30.02)	
	X3	Multi-function input 4 (function code: P30.03)	
	X4	Multi-function input 5 (function	

		code: P30.04)	Details of wiring method refers to 4.5.5.1
	X5	Multi-function input 6 (function code: P30.05)	
	X6	Multi-function input 7 (function code: P30.06)	
	X7	Multi-function input 8 (function code:P05.07)	
	24	Internal +24VDC power output	
	XV	Input common end	
	XC	Input common end 0V	
Analog input terminals	A0	Multi-function analog input 1 (function code: P32.01)	Voltage input, ranging from – 10 to +10 V/0 to +10 V, for the input signal of given analog speed.
	A1	Multi-function analog input 2 (function code: P32.07 (voltage), P32.13(current))	External analog voltage input, ranging from – 10 to +10 V/0 to +10 V/0 to 20 mA, for analog input signal Jumper J1 sets 1, 2 for current input, 2,3 for voltage input
	V＋	+10V power ouput	+10 VDC power output terminal for analog input, max. permissible current 50mA
	V－	-10V power ouput	-10 VDC power output terminal for analog input, max. permissible current 50mA
	0V	Reference grounding terminal for analog input	Reference grounding terminal for analog input
Relay output terminals	1A 1B 1C	Programmable relay output: (function code: P31.00) 1A-1B: NO contact (make contact) 1B-1C: NC contact (break contact)	The output functions of the programmable relay may be selected by the function parameter of P06. One pair of switching contacts are configured as follows: Item: Specification Rated capacity: 5A/250VAC 5A/30VDC Switching frequency 120 times/min: Failure rate P level 10mA/5V Response time: Less than 10ms
	2A 2B 2C	Programmable relay output: (function code:P31.01) 2A-2B: NO contact (make contact) 2B-2C: NC contact (break contact)	
	3A/3B 4A/4B	3A/3B, 4A/4B: NO contacts Function code: P31.04, P31.05	
Transistor open collector output terminals	Y0	Programmable open collector output 1 (function code: P31.02)	The functions of the programmable open collector outputs may be selected by the function parameter of P06. Drive capacity: no more than DC30V, 50 mA Details of wiring method refers to 4.5.5.3
	Y1	Programmable open collector output 2 (function code: P31.03)	
	YC	Programmable open collector	

		output common end	
Analog output terminals	M0	Programmable analog output 1 (function code: P33.00)	The functions of the programmable analog outputs may be selected by the function parameters of P33.00 and P33.03. These may be used for the inputs of output monitoring and other devices.
	M1	Programmable analog output 2 (function code: P33.03)	
	0V	Reference grounding terminal for analog outputs	Reference grounding terminal for analog outputs
485 communication terminals	A+	485 communication signal +	For 485 communication signals
	B-	485 communication signal -	
	SC	Signal ground	485 communication signal ground

4.5.4 Cable specifications of control circuit wiring

600V insulated copper cable is used for the control circuit. Cable specifications and tightening torque are listed in Table 4.6.

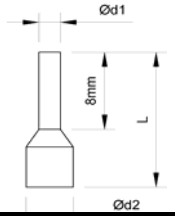
Table 4.6 Cable specifications and tightening torque

Model	Permissible cable, mm^2	Recommended cable, mm^2	Tightening torque (N.m)
AS500	0.75～1	0.75	1.5

The size of the conductor is determined at an ambient temperature of 50 ℃ and a permissible temperature of 75 ℃.

It is recommended that bar-like terminals be used for the control circuit. The specifications of bar-like terminals are listed in Table 4.7.

Table 4.7 Bar-like terminals

Conductor cross section, mm2(AWG)	d1（mm）	d2（mm）	L（mm）	Illustration
0.25（24）	0.8	2	12.5	
0.5（20）	1.1	2.5	14	
0.75（18）	1.3	2.8	14	
1.5（16）	1.8	3.4	14	
2（14）	2.3	4.2	14	

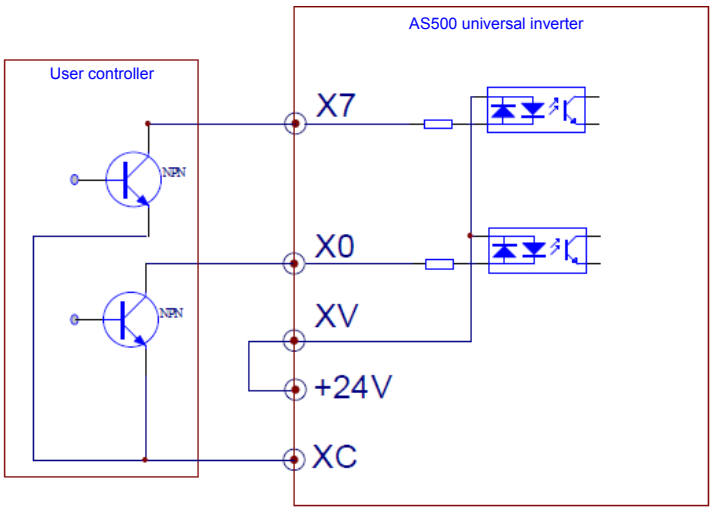
4.5.5 Control circuit terminal wiring

4.5.5.1 Digital input terminals

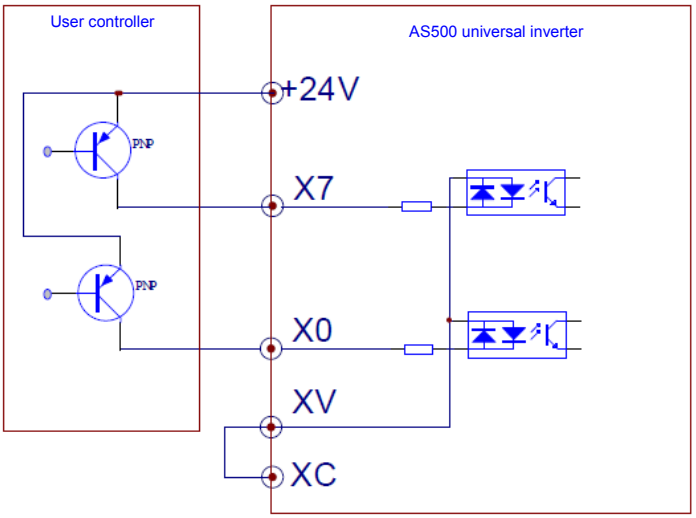
The function codes of P30 group may be used to define the input function of each multi-function digital input terminal. The value of P30.00 to P30.07 ranges from 0 to 31, seeing parameters P30 group for details.

Specific wiring method:

■ For inverter internal +24 V, NPN type source current wiring applies to external controller.

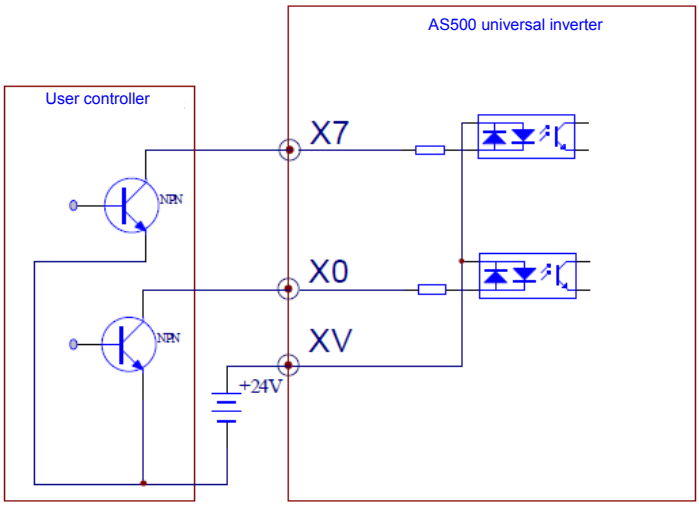


■ For inverter internal +24 V, PNP type sink current wiring applies to external controller.



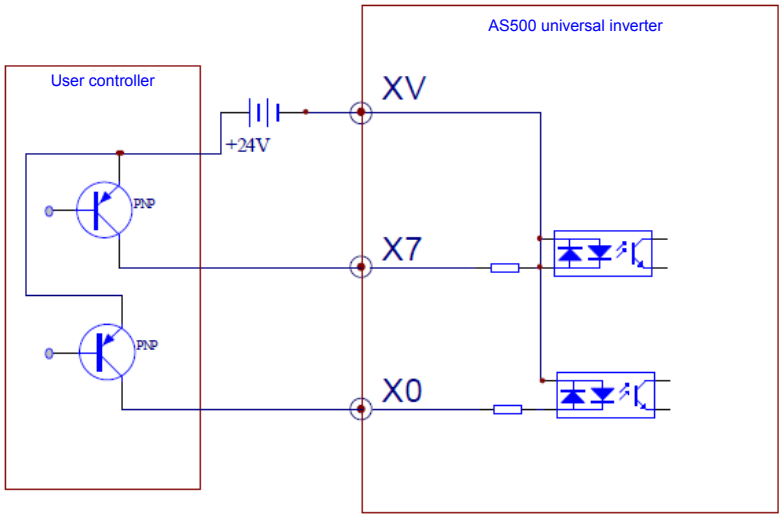
Note: take care to remove the short-circuit bar between +24 V and XV terminals, and connect the bar between XC and XV terminals.

■ For wiring by external power source, NPN type source current wiring applies to external controller.



Note: take care to remove the short-circuit bar between +24 V and XV terminals.

■ For external power source use, PNP type sink current wiring applies to external controller.



Note: take care to remove the short-circuit bar between +24 V and XV terminals.

4.5.5.2 Analog input terminals

The Inverter is equipped with two analog inputs, of which A0 is used for analog voltage signals and A1 for optional analog voltage/current signals, selected by jumper JP1. The signal range of A0 and A1 is -10 ~ +10V, that of A1 is 0 ~ 20mA.

While the analog input signal is used, select the gain, offset, filtering time, etc. of signal corresponding to each input by means P32 ~ P32.11 parameters setting, so that the analog input may be used all the better. Details refer to 7.6.3.

The cable connecting the analog signal and the inverter shall be as short as possible (no longer than 30 m), and shielded conductors shall be used. The shield shall be grounded through 0V terminal on the analog input.

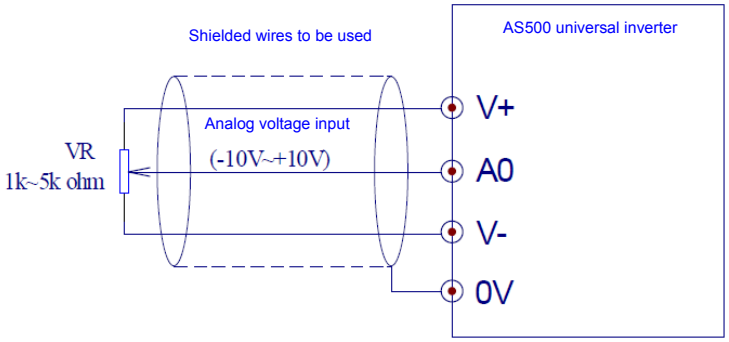


Figure 4-25 Shielded analog input wiring

In Figure 4-26, the analog voltage signal is provided by the Inverter, ranging from -10 V to +10 V. In most applications, the voltage signals for analog inputs are provided by a controller sending analog signals, and most of the voltage signals range from 0V to 10V. Figure 4-27 shows its wiring. In case of current signal, Figure 4-28 shows its wiring.

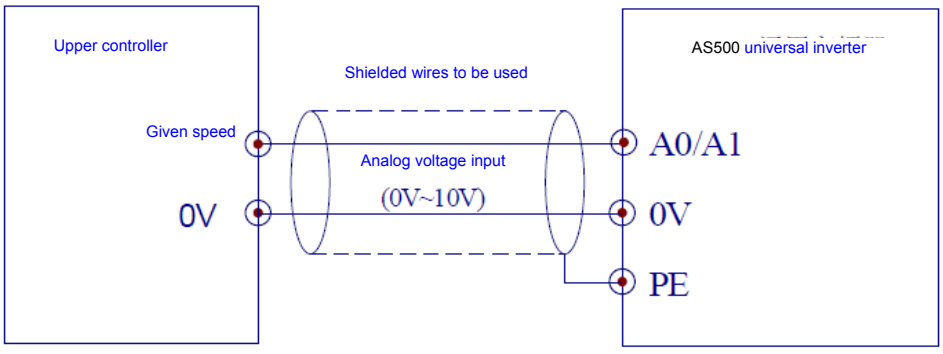


Figure 4-26 A0/A1 analog voltage signal wiring

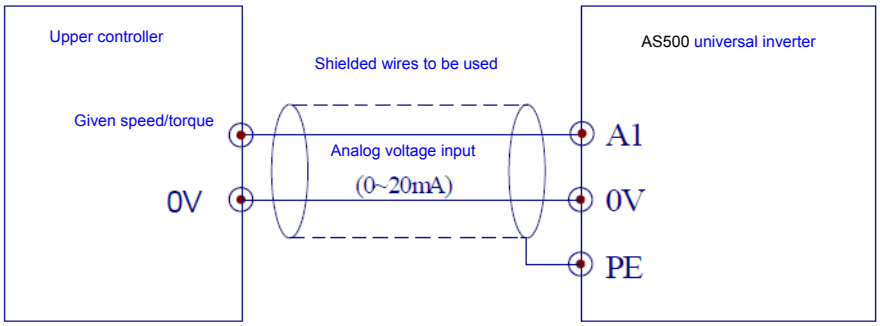


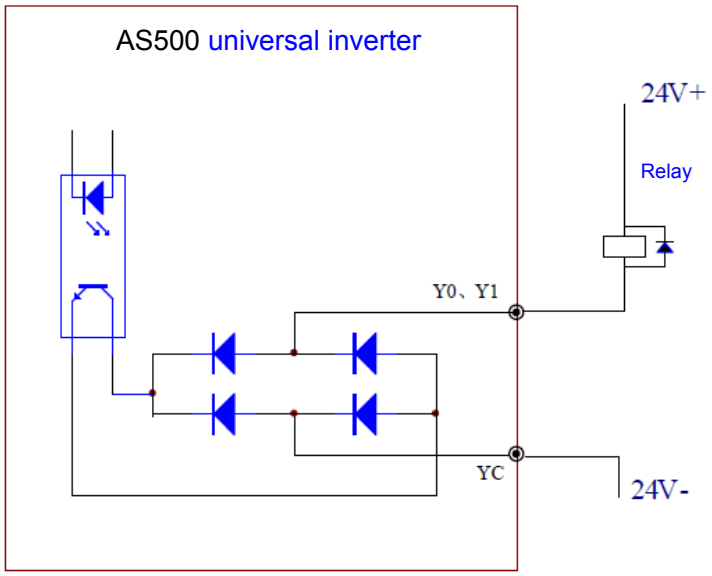
Figure 4-27 A1 analog current signal wiring

4.5.5.3 Digital output terminals

Digital output terminals include relay contact terminals and open collector terminals. The parameters of P06 may be used to set the functions of each digital output terminal. The setting data area is 0 to 31, and details for each value refer to parameters P31 group.

Note: Open collector outputs adopt external power supplies. Polarization shall be noticed when the power is connected. The power supply may not exceed +30 VDC, 50mA, or the output circuit may be damaged.

■ Wiring method to multi-function open collector output terminals of the inverter using external +24 V power



Note: when this wiring method is used, if Y0 or Y1 terminal is damaged, please confirm the correctness of polarity of external diode.

4.5.5.4 Multi-function analog output terminals

Parameters of P33.00 and P33.03 are used to define the functions of multi-function analog output terminals. The value of P33.00 and P33.03 ranges from 0 to 64, each standing for a special output function (P33.00 parameters corresponding to M0 outputs, and P33.03 corresponding to M1 outputs):

0： No definition

1： current of phase U

2： current of phase V

3： current of phase W

6： given speed regulator

7： feedback of speed regulator

13：output of speed regulator

14：given current regulator IQ

15：given current regulator ID

30：output of current regulator IQ

32：DC bus voltage

44：speed deviation

See 7.6.4 I (Analog Output) Parameters for more information.

4.5.6 Other precautions for wiring

Keep the control circuit away from the main circuit power line, or interference may cause wrong actions.

4.6 Wiring PG Cards

There are two types of PG cards to adapt to different encoder types, as shown in

the following table.

PG card	Applicable motor	Type	Input signal	Remarks
ABZ increment	Synchronous/asynchronous	AS.T025	Open collector signals, Push-Pull signals	S.T025 （12V） AS.T041 （5V）
SIN/COS	Synchronous	AS.T024	SIN/COS differential signals	

4.6.1 ABZ Increment PG Card

ABZ increment PG card (AS.T025) is able to receive two types of encoder output signals, and thus may be equipped with encoders with open collector signals or Push-Pull signals.

4.6.1.1 Terminal alignment of ABZ increment PG card

The terminal alignment of ABZ increment PG card is shown in Figure 4-28

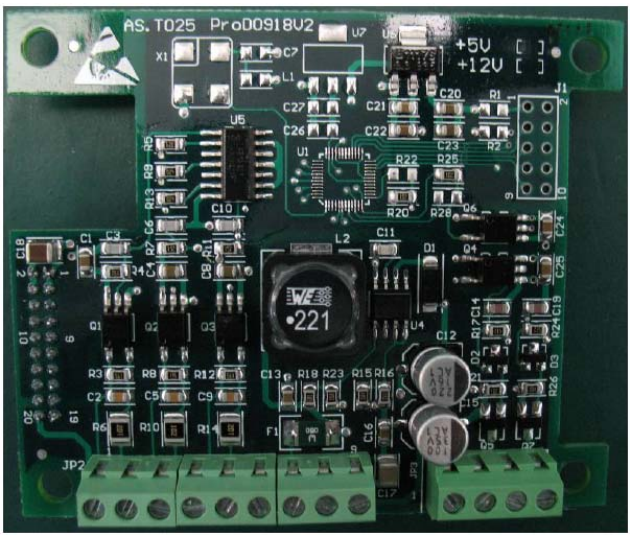


Figure 4-28 Terminal alignment of ABZ increment PG card

4.6.1.2 Terminal yymbols of ABZ increment PG card

The terminal symbols of ABZ increment PG card are shown as follows:

JP3 frequency division output terminals:

FA	V0	FB	V0

JP2 input terminals:

A+	A−	B+	B−	Z+	Z−	V+	V−	PE

4.6.1.3 Terminal functions of ABZ increment PG card

The terminal functions of the ABZ increment PG Card are listed in Table 4.8.

Table 4.8 Terminal functions of ABZ increment PG card

Name	Pin number	Symbol	Function	Specification
Frequency division output	JP3.1	FA	Frequency division output phase-A	Open collector outputs of triodes (max. output frequency: 100 kHz)
	JP3.2	0V	24V GND	
	JP3.3	FB	Frequency division output phase-B	
	JP3.4	0V	24V GND	
Encoder input	JP2.1	A+	Phase-A signal + of encoder	Open collector/Push-Pull, max. input frequency 100 kHz
	JP2.2	A-	Phase-A signal - of encoder	
	JP2.3	B+	Phase-B signal + of encoder	
	JP2.4	B-	Phase-B signal - of encoder	
	JP2.5	Z+	Phase-Z signal + of encoder	
	JP2.6	Z-	Phase-Z signal - of encoder	
	JP2.7	V＋	Anode of encoder power	Voltage 12 VDC, max. output current 500 mA
	JP2.8	V-	Cathode of encoder power	
	JP2.9	PE	Shielded ground	Grounding through shielded wires

4.6.1.4 Wiring between input terminals of ABZ increment PG card and encoder output signals

The ABZ increment PG card may receive two types of encoder output signals, namely, open collector signals and Push-Pull signals.

Wiring with the open collector signals of the encoder is shown in Figure 4-29.

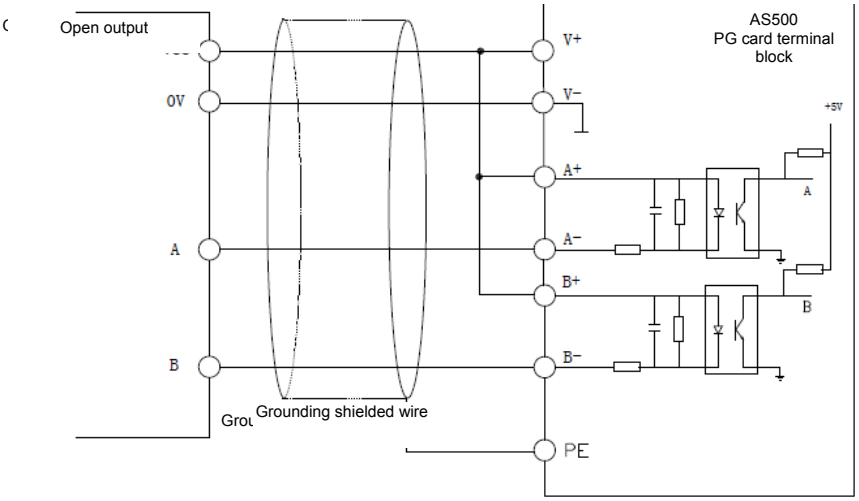


Figure 4-29 Wiring with the open collector signals of the encoder

Wiring with the Push-Pull signals of the encoder is shown in Figure 4-30.

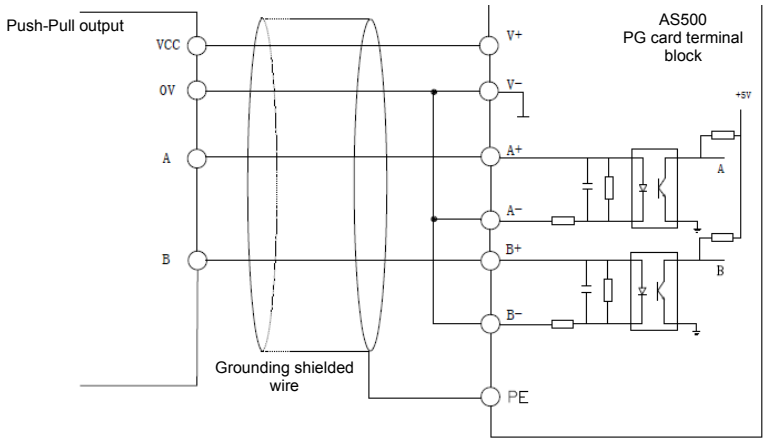


Figure 4-30 Wiring with the Push-Pull signals of the encoder

4.6.2 SIN/COS PG card

The SIN/COS PG card (AS.T007) may receive SIN/COS differential signals from the encoder, and thus may be equipped with encoders with SIN/COS differential signals.

4.6.2.1 Terminal alignment of SIN/COS PG card

The terminal alignment of the SIN/COS PG card is shown in Figure 4-31.

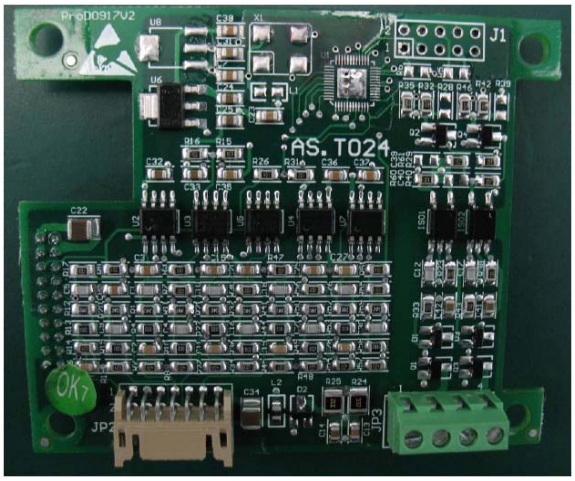


Figure 4-31 Terminal alignment of SIN/COS PG card (AS.T024)

4.6.2.2 Terminal symbols of SIN/COS PG card

The terminal symbols of the SIN/COS PG card (AS.T024) are shown as follows:

Symbols of JP3 terminal

FA	VO	FB	VO

Symbols of JP2 terminal (14-pin socket)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
NC	NC	R-	R+	B-	B+	A-	A+	NC	NC	NC	NC	0V	V+

4.6.2.3 Terminal functions of SIN/COS PG card

The terminal functions of the SIN/COS PG card are listed in Table 4-19.

Table 4-19 Terminal Functions of SIN/COS PG Card

Name	Symbol	Function	Specification
Open collector output	FA	Frequency division signal output phase-A	Open collector outputs of triodes (max. output frequency: 100 kHz)
	0V	24V GND	
	FB	Frequency division signal output phase-B	
	0V	24V GND	
Encoder input	A+,A-	Phase-A of encoder	Differential signal, max. input frequency 100 kHz
	B+,B-	Phase-B of encoder	
	R+,R-	Phase-Z of encoder	
	V+	+5V	
	0V	+5V 的 GND	

4.6.2.4 Wiring between input terminals of SIN/COS PG card and encoder outputs

SIN/COS PG card may receive SIN/COS differential output signals from encoders.

The wiring with the encoder is shown in Figure 4-32.

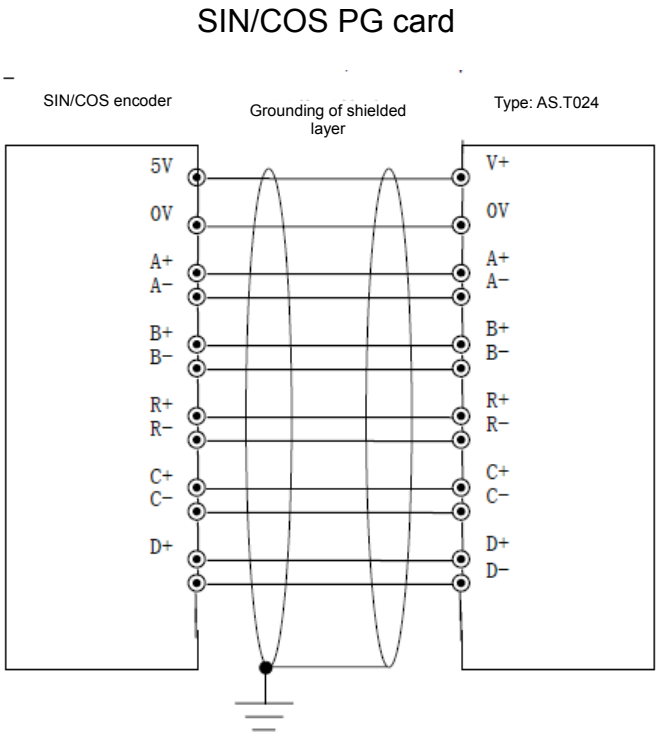


Figure 4-32 Wiring with SIN/COS differential signals of the encoder

4.6.3 PG card terminal wiring precaution

IMPORTANT

Keep encoder signal wiring away from the main circuit and other power lines. Never lay wires closely in parallel. Shielded wires shall be used for encoder wiring, with the shielded layer clipping with the earthing casing PE.

Chapter 5 Debugging and test run

Terms related to control, operation and status of the inverter will be specified in the following section time after time. Prior to operation of this product, please read this chapter with care so as to play the functions described in the following chapters.

DANGER

After the installation of the inverter case enclosure has been confirmed, switch on the input power. After power-on, never dismantle the inverter case enclosure, or else there will be risk of electric shock.

If the inverter is provided with restart function after power-off, please do not close to the rotary mechanical equipment, which may prevent personal injury caused by the inverter starting the mechanical equipment in case of power-on.

If a dynamic braking resistor is provided, please do not touch the resistor, or else there will be risk of electric shock and burn.

Prior to starting the inverter and mechanical equipment, please be sure to confirm the permissible range of application for the motor and mechanical equipment, or else there will be risk of injury.

CAUTION

During operation of the inverter, please do not check measuring signal, or else there will be risk of damaging equipment.

Please do not change the parameter setting of the inverter randomly, or else the appropriate running effect may not be reached, and there will be risk of damaging driving device.

Prior to switching the run command channels of the inverter, please be sure to carry out switching debugging, or else there will be risk of damaging equipment and personal injury.

5.1 Run command setting

The digital operator is the basic tool of inverter operation for observing the status and fault codes of the inverter and setting and viewing the parameters. This chapter describes basic operations of the operator in detail.

5.1.1 Inverter run command channel

It specifies the physical channels for command receiving, startup, stop, etc. of the inverter. Run command channels have three kinds:

Operating panel: make control by RUN, STOP, LOC/REM keys on operating panel;

Control terminal: make control by control terminals X0 ~ X7 (digital), A0 ~ A1 (analog);

Communication port: make startup and stop control by control terminals A+, B- (RS485) through the upper machine.

Selection of run channels may be set by function code P10.01.

Caution: Prior to switching the run channels, please be sure to carry out switching debugging, or else there will be risk of damaging equipment and personal injury!

5.1.2 Inverter frequency setting channel

Under common running mode, **AS500** has four kinds of physical channels for frequency setting, including:

Setting by ▲, ▼ keys on operating panel;

Setting by terminal speed;

Setting by serial port;

Setting by analog voltage, current

5.1.3 Working state of inverter

Working state of **AS500** inverter includes shutdown and running. Shutdown state: after power-on initialization, if not run command is entered, or after a shutdown

command is executed, the inverter enters into shutdown state immediately.

Running state: the inverter enters into running state after receiving a run command.

5.1.4 Run modes of inverter

AS500 inverter has four kinds of run modes, sequenced by priority as follows:

Closed-loop run > Multi-speed run > Common run

Closed-loop run: closed-loop selection function becomes valid (P51.00 = 1), and the inverter will operate in closed-loop mode; namely, PID adjustment is performed according to setting and feedback (see P51 function codes).

Multi-speed run: in virtue of open/close of multi-function terminals (#3, 4, 5 functions), select multi-stage frequency 1 ~ 7 (P41.00 ~ P41.07) for multi-speed run. Note: three terminals may not be all in “OFF” state; otherwise, it becomes common run.

Common run: simple open-loop run mode.

5.2 Operation guide

The digital operator is the basic tool of inverter operation for observing the status and fault codes of the inverter and setting and viewing the parameters. This chapter describes basic operations of the operator in detail.

User may realize by operating panel:

- Motor status monitoring
- Motor self-tuning
- Motor running control (startup/stop, speed, clockwise rotation / anticlockwise rotation, etc.)
- Fault or alarm viewing and response
- Parameter setting and modification
- Switching between local and remote modes

Two kinds of operators are provided for **AS500** inverters, ≤5.5 kW (for ≤7.5 kW fan or water pump) operator by integrated display, ≥7.5 kW (for ≥11 kW fan or water pump) LCD operator.

5.2.1 Function of digital operator components

The components of the digital operator and their functions are shown in Figure 5-1.

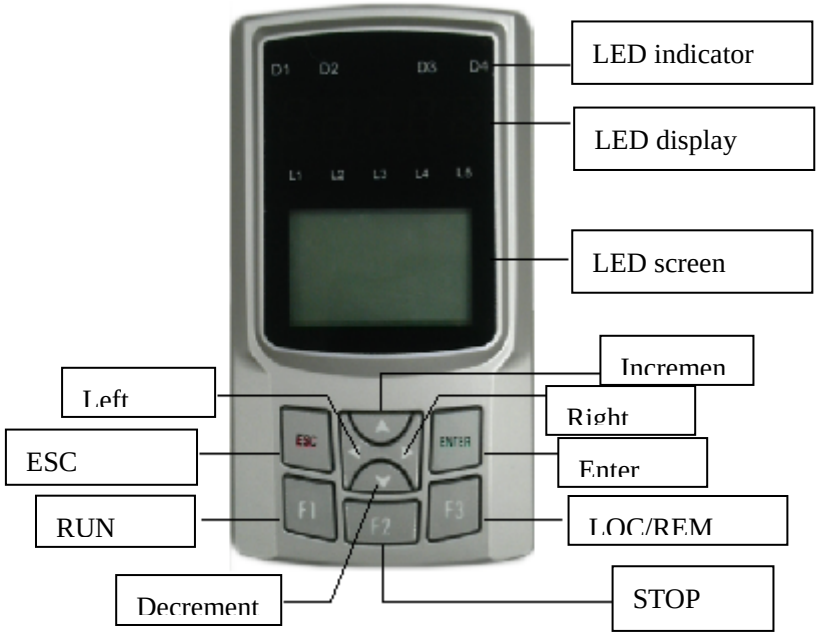


Figure 5-1 Components and their functions of the digital operator

5.2.2 LED indicator

At the top of the front panel there are four LED indicators showing the four statues of the motor, namely D1 (RUN), D2 (REVERSE/BACKWORD), D3 (LOC/REMOTE) and D4 (FAULT). The functions of these indicators are shown in Table 5.1.

Table 5.1 Motor status indicated by the four indicators

Motor status	D1 (RUN)	D2 (REVERSE/BACKWORD)	D3（LOC/REMOTE）	D4 (FAULT)
REVERSE	ON	ON	OFF	OFF
BACKWORD	ON	OFF	OFF	OFF
FAULT/WARNING	OFF	Not related	Not related	Flashing
Panel operation	ON	ON/OFF	ON	OFF

5.2.3 LED digital tube

Below the LED indicators there are 4 LED digital tubes showing real-time running frequency of the motor. The displayed contents may be selected by parameters.

5.2.4 LCD display

At the middle of the operator there is an LCD display for setting inverter parameters, showing motor running parameters and viewing inverter codes.

5.2.5 Keyboard

The functions of the nine keys at the bottom of the operator are shown in Table 5.2.

Table 5.2 Key functions

Key	Name	Function
>	Right	To select the next function group under 【Function Select】mode; To move the cursor to the right bit under 【Parameter setting】mode.
<	Left	To select the previous function group under 【Function Select】mode; To move the cursor to the left bit under 【Parameter setting】mode.
^	Increment	To select the previous function code under 【Function Select】mode; To increase the value of the selected parameter under 【Function Select】mode.
v	Decrement	To select the next function code under 【Function Select】mode; To decrease the value of the selected parameter under 【Function Select】mode.
ENTER	Enter	Enter the Function Select interface under 【Monitoring State】; Enter the selected function interface under 【Function Select】.
ESC	ESC	To go back to 【Monitoring State】 from 【Function Select】 mode; To go back to 【Function Select】 from each function operation interface.
F1	F1	To darken the display under 【Monitoring State】 mode. To be RUN function under LOCAL state.
F2	F2	To brighten the display under 【Monitoring State】 mode. To be STOP function under LOCAL state.
F3	F3	To switch between operator (LOCAL) run mode and control circuit terminal (REMOTE) run mode.

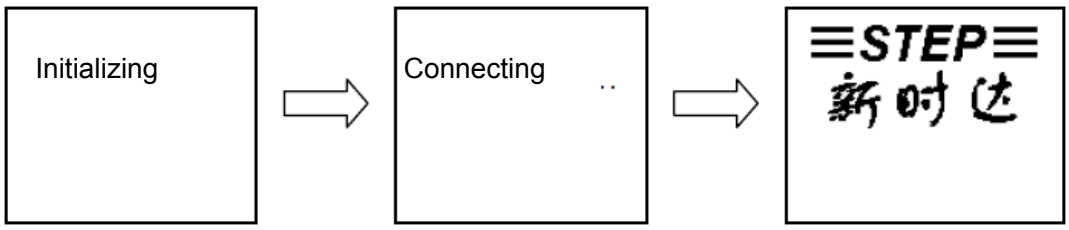
5.3 Operation of LCD operator

The digital operator provides three operation modes, namely, 【Monitoring State】, 【Function Select】and 【Parameter Modification】. The menu may be shown in Chinese or English. The factory setting is Chinese. Choose 0 for the parameter of “Language selection” to switch to English menu.

5.3.1 Power on and initialization

The initialization may take several seconds with an【Init Menu】shown on the LCD after power on.

【Init Menu】:



Note: In the process of initialization, the operator will check the communication link with main board, and it will show “Connecting” menu until a successful connection is completed.

5.3.2 Display after Power on

“Monitoring State” is displayed 5 seconds later after power on. The given speed (Vref), feedback speed (Vfbk) and current state (Irms) recorded currently are displayed on this interface by default.

5.3.3 【Monitoring State】

On “Monitoring State” interface, press  and  keys or  and  keys to switch the interfaces in monitoring state. Under “Monitoring State”, 10 real time data for motor running are displayed by default. These data can be displayed only but not be modified.

Table 5.3 Comparison of default running state data

Display	Name	Explanation	Range	Unit	Default value	Remarks
Vref	Given speed	Speed setting values instruction	×	rpm	×	
Vfbk	Feedback speed	Monitor of motor feedback speed	×	rpm	×	
Vdev	Speed deviation	Deviation of feedback speed from ref. speed	×	rpm	×	
Irms	Output current	Monitor of output current	×	A	×	
Torq	Output torque	Monitor of output torque	×	%	×	
Tzero	Zero-torque	Monitor of zero-torque at starting	×	%	×	
Udc	DC bus voltage	Monitor of the DC voltage of the main circuit in the Inverter	×	V	×	
Uout	Output voltage	Monitor of output voltage of the Inverter	×	V	×	
A0	A0 input voltage	Monitor of the Inverter analog voltage input 0 (A0)	×	V	×	
A1	A1 input voltage	Monitor of the Inverter analog voltage input 1 (A1)	×	V	×	
A2	A2 input current	Monitor of the Inverter analog current input 2 (A2)	×	mA	×	
DI	Input X0-X7 status	Monitor of input status of terminals X0-X7, in “XXXXXXXX”, where “X” = 0, indicating no input, while “X” = 1, indicating input.	×	×	×	
D0	Output Y0 - Y5 status	Monitor of input status of terminals Y0 – Y4, in “XXXXXX”, where “X” = 0, indicating no output, while “X” = 1, indicating output.	×	×	×	

5.3.4 【Panel Control】

On the “Monitoring State” interface, press F3 to switch between “Monitoring State” and “Panel control”, and the LED indicator D3 on the operator becomes on

under “Panel Control” mode; then, press F1, control the Inverter to enter RUN state, and the LED indicator D1 on the operator becomes on; press F2, control the Inverter to enter STOP state, and the LED indicator D1 on the operator becomes off. On the “Panel Control” interface, press ∧ and ∨ to switch the monitored items, and there are 2 parameters controlling running and 4 real time data displaying motor running, of which panel operation speed Vref and motor running direction Vdir may be modified, and other 4 data can be displayed but not be modified.

Table 5.4 Comparison of panel control data

Display	Name	Explanation	Range	Unit	Default value	Remarks
Vref	Panel operation speed	Set the given speed of Inverter at panel operation	0.00 ~ 50.00	Hz	5.00	
Vfbk	Feedback speed	Monitor of motor feedback speed	×	Hz	×	
Irms	Output current	Monitor of output current	×	A	×	
Vdir	Motor running direction	Set motor REVERSE or BACKWARD	0 ~ 1	×	1	
Udc	DC bus voltage	Monitor of the DC voltage of the main circuit in the Inverter	×	V	×	
Uout	Output voltage	Monitor of output voltage of the Inverter	×	V	×	

5.3.5 Operation mode

The digital operator has four operation modes, namely 【Parameter Setting】, 【Motor Setting】, 【Fault Inspection】 and 【Parameter Processing】. In any monitoring state, press ENTER to enter the following “Function Select” interfaces.

* 1：Parameter setting

2：Motor setting

3：Fault detect

4：Parameter processing

5.3.5.1【Parameter Setting】

Modify parameters under【Parameter Setting】 mode. The retting range of parameters refers to Chapter 6.

Under 【Parameter Setting】 mode, select parameter group by pressing < or >, and select parameter code of each group by pressing ∧ or ∨. After the parameter is selected, press ENTER, and a cursor indicating modification presents at the place of parameter to be modified. Increase or decrease the parameter value by pressing ∧ or ∨, and press ENTER to confirm modification. If ENTER is not pressed, the modification is invalid.

Press ESC to return to the previous menu.

5.3.5.2【Motor Setting】

1：Parameter setting

* 2：Motor setting

3：Fault detect

4：Parameter processing

Under 【Motor Setting】 mode, self learn the parameters of motor (asynchronous) and encoder phase angle (synchronous motor) manually, and select the corresponding self-learning mode by modifying X value in ATun = X. Press ENTER, and a cursor indicating modification presents at the place of parameter to be

modified; press ^ or v to select self-learning item, and press ENTER to confirm. Self-setting selection parameters have 6 modes, defined as follows:

0： Normal running mode

1： Encoder static self-learning

2： Encoder dynamic self-learning

3： End of encoder self-leaning

4： Motor static self-learning

5： Motor dynamic self-learning

6： Motor static advanced learning

Press ESC to return to the previous menu.

5.3.5.3 【Fault Detect】

1：Parameter setting

2：Motor setting

* 3：Fault detect

4：Parameter processing

Under 【Fault Detect】, view the recent 8 faults and the voltage, current, given speed, and feedback speed status recorded while the fault occurs. On main state interface, press ENTER to shown ER0=X, press ^ or v to change from ER0 to ER7, of which ER0 represents the serial number of lately fault, and ER7 for the farthest one, X for fault code of current number; at the same time, the meaning of fault code will be shown below in Chinese. Under fault code display mode, press ENTER again, the recorded DC bus voltage (Udc), output current (Irms), given speed (Vref), and feedback speed (Vfbk) for the current fault are shown, and press ENTER again to return to fault code display mode. Press ESC to return to the

previous menu.

5.3.5.4【Parameter Processing】

1：Parameter setting

2：Motor setting

3：Fault detect

* 4：Parameter processing

Under【Parameter Processing】mode, upload, download, initialize the parameters, and eliminate all faults. Select the relevant operation mode by modifying X value in Init = X. Press ENTER, and a cursor indicating modification presents at the place of parameter to be modified (X place); press ^ or v to select corresponding operation mode, and press ENTER to confirm. Parameter processing selection parameters have 4 modes, defined as follows:

1：Parameter upload to operator

2：Parameter download to inverter

7：Reset parameter

8：Reset fault

Press ESC to return to the previous menu.

5.4 Integrated display operator

Low-power AS500 inverters (≤ 5.5 kW) has an integrated display terminal with a digital tube having 7 segments and 5 digits. The graphic display terminal described in previous pages may be connected to these inverters as an option.

5.4.1 Function of each display terminal

5.4.2 Key functions

The functions of the 8 keys at the bottom of the operator are shown in Table 5.2.

Table 5.2 Key functions

Key	Name	Function
>	Right	Under the stop and run display interfaces, select the displayed parameter circularly; for parameter modification, select the modified bit of parameter.
^	Increment	Return to previous menu or parameter, or increase the displayed value
v	Decrement	Go to next menu or parameter, or decrease the displayed value
ENT	Enters	Enter the menu or parameter, or store the displayed parameter or value
ESC	ESC	Exit the menu or parameter, or abandon the show value and return to the preceding value in internal memory
RUN	RUN	For operation by keyboard
STOP	STOP	Under keyboard mode, for stop of running
LOC/REM	Local switching	To switch between operator (LOCAL) run mode and control circuit terminal (REMOTE) run mode.

5.4.3 Description of indicators

Indicator name	Description
RUN/STOP	Indicator for running status OFF indicates stop of the inverter; ON indicates running of the inverter.
FWD/REV	FORWARD/REVERSE indicator: OFF indicates FWD status; ON indicates REV status.
LOC/REM	Indicator for control mode: OFF indicates keyboard control; FLASHING indicates terminal control; ON indicates remote communication control.
ALM	Indicator for overload pre-alarm: OFF indicates being normal status of the inverter; FLASHING indicates overload pre-alarm; ON indicates failure status of the inverter.

5.4.4 LED display

Relevant relation between LED displaying symbols and characters/figures is as follows:

LED display	Meaning of characters	LED display	Meaning of characters	LED display	Meaning of characters	LED display	Meaning of characters
	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.
	8		H		q		.
	9		h		r		

5.5 Operation of integrated display terminal

5.5.1 Initial power-on

Wiring operations must be conducted as per the technical requirements of 4.1 Connections to peripheral devices in this manual.

Check and confirm the wiring and power supply. Then close the air circuit-breaker

for the AC power supply on the input side of the inverter. “U.0.0.0.0.” will be displayed on the control panel of the inverter. If the contactor in the inverter is normally picked up and the characters displayed by the LED digital tube change to the set frequency, it indicates that the inverter has been successfully initialized. If any abnormality occurs in the aforesaid power-on process, please open the air circuit-breaker on the output side, find out the cause and rectify the fault.

5.5.2 Guide to quick debugging

This part prescribes the common but necessary debugging steps for speed control of the AS500 series inverter in general mode on the basis of the factory settings.

5.5.2.1 Setting of common parameter in each control mode

1. Selection of control mode: select control mode according to application and demand, referring to P10.00 “Control mode of motor” for details;

2. Selection of running command channel: refer to P10.02 “Selection of given running command” for details;

3. Selection of given frequency channel and given setting frequency: refer to P10.03 “Method to setting of frequency and speed” for details;

4. Correctly set P70.02 “Max frequency”, P70.00 “Upper frequency limit” and P70.01 “Lower frequency Limit”;

5. Direction of motor rotation: To confirm the phase sequence of the motor wiring and configure P20.09 “Phase sequence of the motor” and P71.05 “Reverse rotation prohibited” as required by the mechanical load;

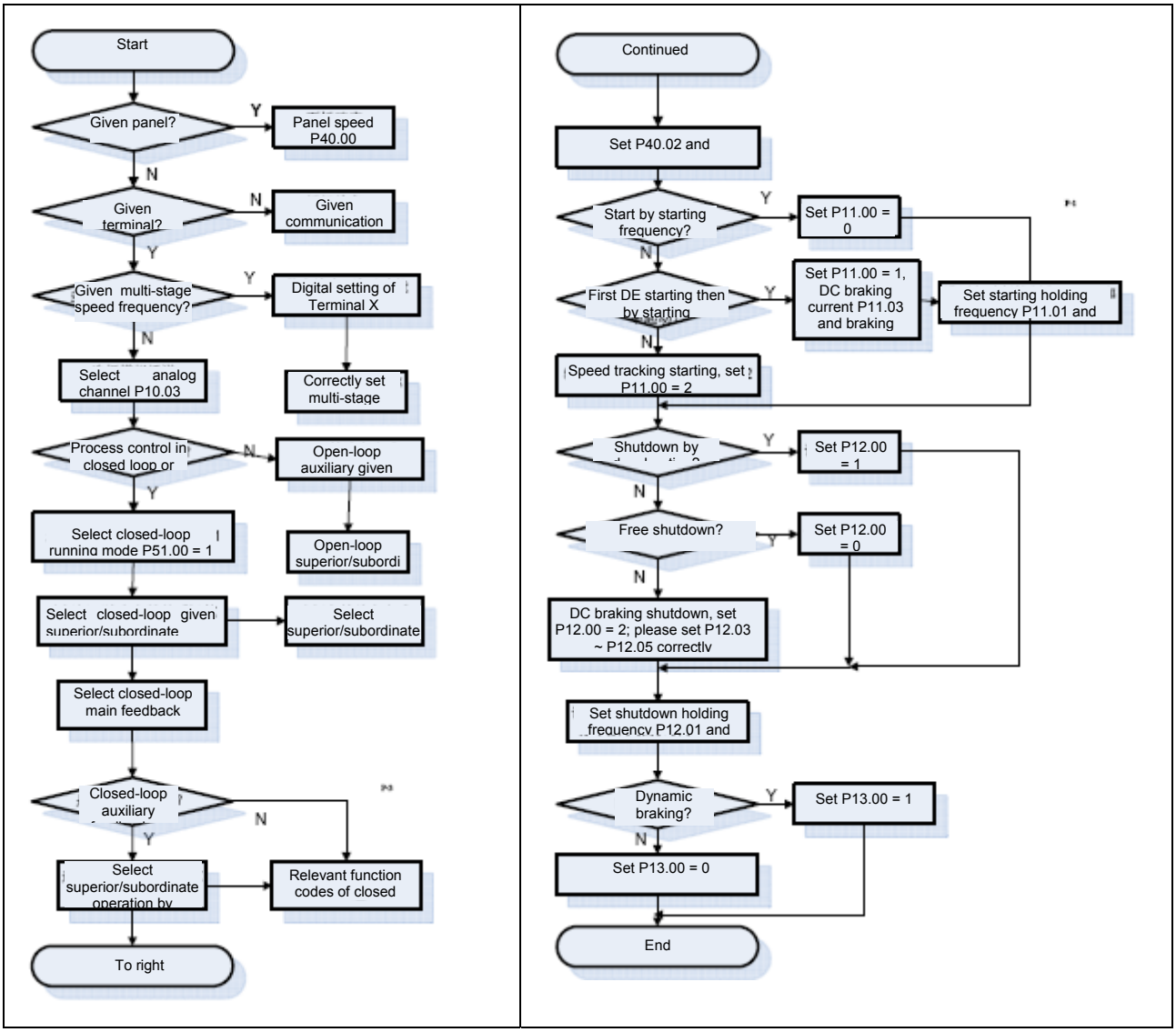
6. Acceleration/deceleration time: set P10.09 “Acceleration time” and P10.10 “Deceleration time” as long as possible to meet requirements. If the time is too short, a great torque will be generated and damage the load, or cause an overcurrent;

7. Startup/shutdown mode: refer to P11.00 “Startup mode” and P12.00 “Shutdown mode” for details;

8. Parameters on motor nameplate: set P20.00 ~ P20.06 rated power, number of poles, rated current, rated frequency, rated rotation speed, rated voltage;

9. Motor overload protection: refer to P21.01 “Motor overload protection mode”, P21.02 “Motor sensor overload protection threshold”, P21.03 “Motor overload protection time”, P70.04 “Output torque limitation” for details.

5.5.2.2 Quick debugging for V/F control

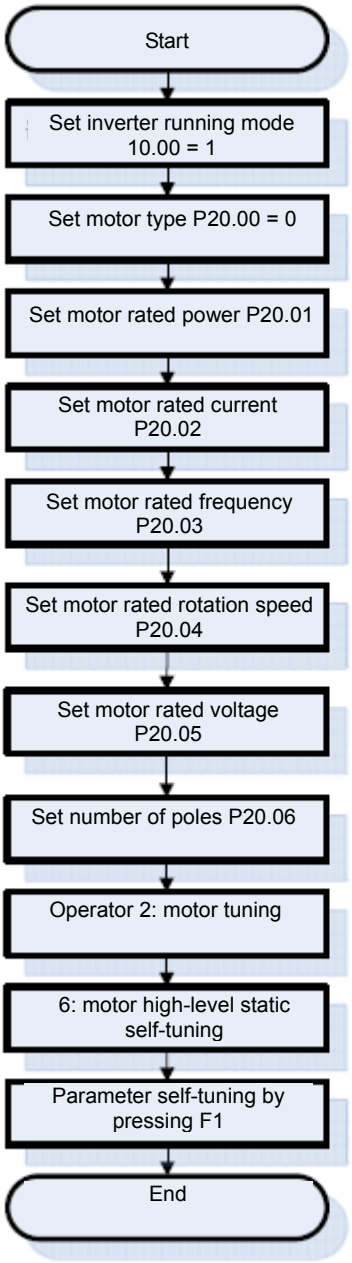


5.5.2.3 Quick debugging for vector control

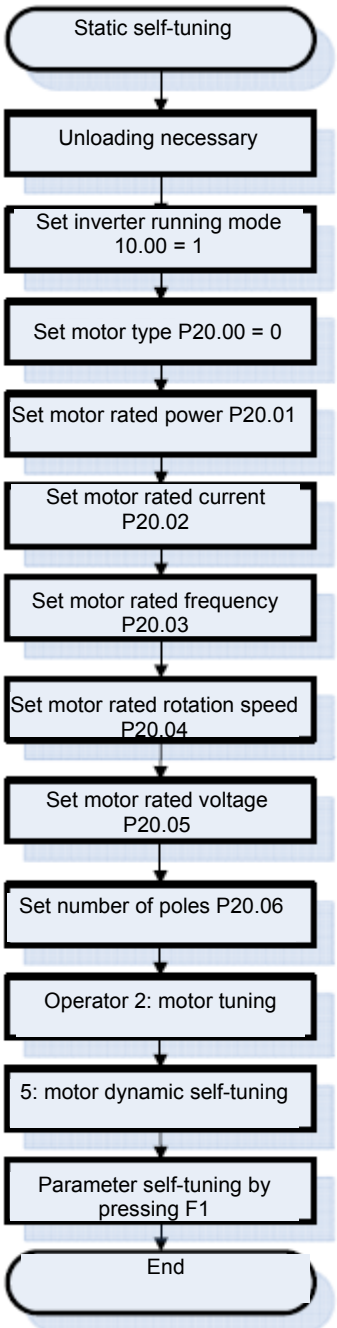
Method to quick debugging for vector control is described in following section with sensorless vector control without as an example. If “vector control with PG” is used, it is required to set encoder parameters according to instruction to encoder parameter P22 in this manual.

1. P20.10 “Motor no-load current coefficient”: adjust magnetic density, and make current of the motor in vector control low-speed (not weak magnetic area) no-load running close to motor no-load current;

2. Motor parameter self-tuning: for vector control, a motor no-load rotation self-tuning is required. If this does not apply, a static self-tuning for motor may be carried out as follows.



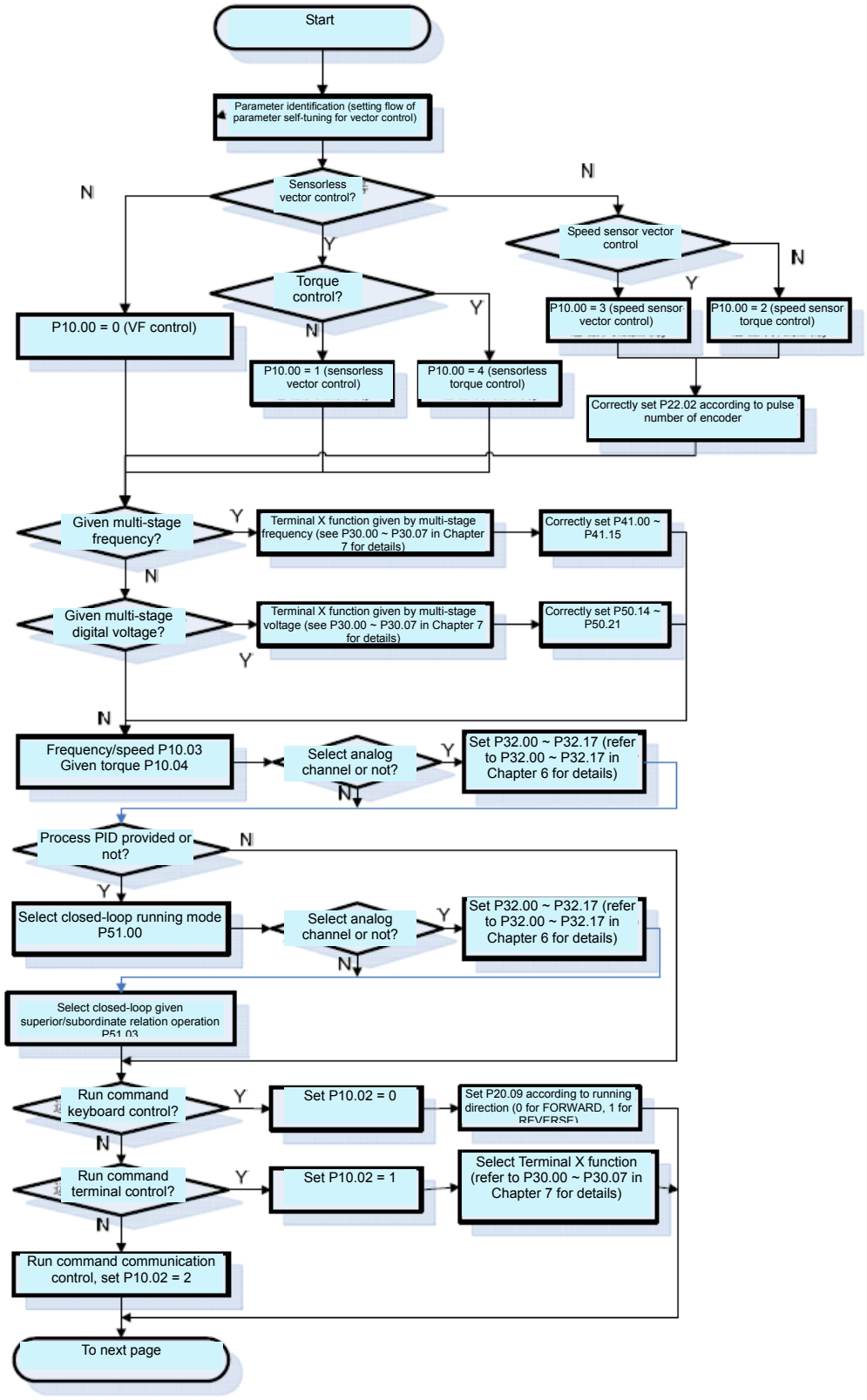
Static self-tuning

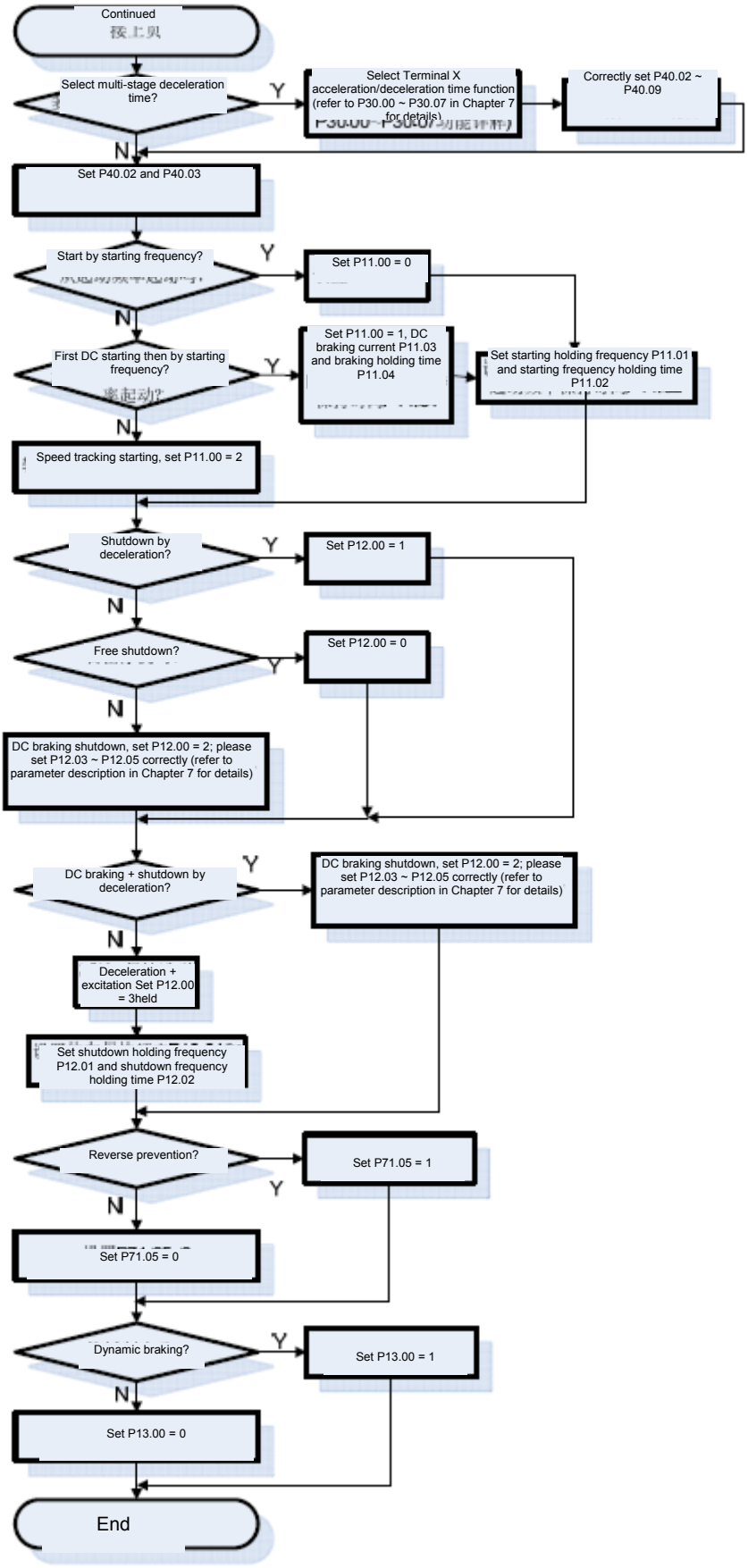


Dynamic self-tuning

3. Flow of vector control. Attention! During the vector control, a self-tuning is necessary.

4. While performing vector control, P10.07 “Fundamental frequency” should have the same setting with P20.03 “Motor rated frequency”.

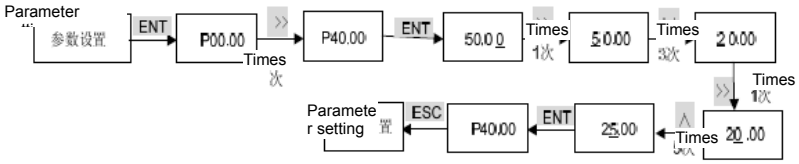



Continued
Select multi-stage deceleration time?
Y
Select Terminal X acceleration/deceleration time function (refer to P30.00 ~ P30.07 in Chapter 7 for details)
Correctly set P40.02 ~ P40.09
N
Set P40.02 and P40.03
Start by starting frequency?
Y
Set P11.00 = 0
N
First DC starting then by starting frequency?
Y
Set P11.00 = 1, DC braking current P11.03 and braking holding time P11.04
Set starting holding frequency P11.01 and starting frequency holding time P11.02
N
Speed tracking starting, set P11.00 = 2
Shutdown by deceleration?
Y
Set P12.00 = 1
N
Free shutdown?
Y
Set P12.00 = 0
N
DC braking shutdown, set P12.00 = 2; please set P12.03 ~ P12.05 correctly (refer to parameter description in Chapter 7 for details)
DC braking + shutdown by deceleration?
Y
DC braking shutdown, set P12.00 = 2; please set P12.03 ~ P12.05 correctly (refer to parameter description in Chapter 7 for details)
N
Deceleration + excitation Set P12.00 = 3held
Set shutdown holding frequency P12.01 and shutdown frequency holding time P12.02
Reverse prevention?
Y
Set P71.05 = 1
N
Set P71.05 = 0
Dynamic braking?
Y
Set P13.00 = 1
N
Set P13.00 = 0
End

5.6 Example for operation

The displayed shutdown parameter is setting parameter, 50.00 Hz for factory setting. Underlined figures in the following indicate the current editing bit.

Set the given frequency, for example, P40.00 = 25.00 Hz



5.7 Fault indication

When a fault occurs to the inverter, the fault indicator D4 flashes on the top of operator. LED digital tubes show the current fault code. Fault codes and types are listed in Table 5.5.

Table 5.5 Fault codes and names

Fault code	Fault indication	Fault code	Fault indication
1	Module overcurrent protection	2	ADC fault
3	Radiator superheated	4	Brake unit fault
5	Fuse blown fault	6	Output torque overload
7	Speed deviation	8	Bus overvoltage protection
9	Bus undervoltage	10	Output phase loss
11	Motor low speed overcurrent	12	Encoder fault
13	Current detected during elevator stopping	14	Reversed speed direction detected during running
15	Speed detected during elevator stopping	16	Wrong motor phase
17	Fwd overspeed	18	Rev overspeed
19	Wrong phase sequence of UVW encoder	20	Encoder communication fault
21	Abc overcurrent	22	Brake detection trouble
23	Input overvoltage	24	UVW encoder disconnected
25	Standby	26	Encoder not self-learning
27	Output overcurrent	28	Sincos encoder fault
29	Input phase loss	30	Overspeed protection
31	Motor high speed overcurrent	32	Ground protection
33	Capacitor aging	34	External fault
35	Output unbalance	36	Wrong parameter setting
37	Current sensor fault	38	Braking resistor short circuit
39	Instantaneous current too large	40	Inverter overload
41	Abnormal power-off during operation	42	Motor overheat (PTC)
43	Internal fault	44	Self-tuning failure
45	Interference protection	46	Terminal exclusiveness checkout
47	EEPOM abnormity	48	Abnormal communication
49	Abnormal expansion card connection		

Chapter 6 Chapter Six Function Parameter Tables

6.1 Function code parameter table explanation

Short list field	Explanation
Function code	Represent the code for functions, such as P00.00
Function code	The name of function code used to explain the code
Ex work value	Settings after the ex work setting of the function code is resumed(refer to P00.01
Setting scope	The minimum value to the maximum value the function code allows
Unit	V：voltage；A：current；℃：centigrade；Ω：Ohm； mH：millihenry; rpm：rotary speed; %：percent ； bps：baud rate；Hz/kHz：frequency；ms、s、min、h、kh：time；kW：power；/：no unit and etc.
Attribute	○：the function code can be modified during operation;×：the function code can only be modified at the time of shutdown; *：the function code is a read only parameter and can't be modified.
Function code	Function code parameter setting list
Custom	For users to record parameters

6.2 Function code parameter short list

6.2.1 P0X Group user parameters

P00 Group password parameters							
function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P00.00	Password for log on	0	0～65535	/	×	0：no password；others：password for log on	
P00.01	Password for modification	0	0～65535	/	×	00：no password；others：password protection;	
P00.02	Backup password	0	0～65535	/	×	Back up	
P01 group parameters used by customers							
P02 Group Special function parameters							

6.2.2 P1X Group Control parameters

6.2.2.1 P10 Group Basic control parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P10.00	Control mode selection	0	0～4	/	×	0：voltage vector V/f control 1:speed sensorless vector control 2:speed sensor torque control 3:speed sensor vector control 4：back up	
P10.01	Operation mode selection	0	0～3	/	×	0：two-wire system1；1：two wire system 2；2：three wire 1； 3：three wire 2；	
P10.02	Operation command reference selection	0	0～2	/	×	0：panel 1：terminal 2：communication	
P10.03	frequency /speed reference selection	0	0～13	/	○	0:panel digital frequency setting 1:digial multi-speed given target speed 2:analog multi-speed given target speed 3:analog 0 given target speed 4:analog 0 given current speed	

						5:analog 1given target speed	
						6:analog 1given current speed	
						7:communication given current speed	
						8:Function given target speed	
						9: back up	
						10: back up	
						11:DI given target speed	
						12:communication given target speed	
						13:CAN given current speed	
P10.04	Torque reference selection	0	0～4	/	○	0: Panel given torque	
						1:analog 0 given target torque	
						2:analog 1 given target torque	
						3:communication given torque	
						4:function given target torque	
P10.05	compensation torque reference selection	0	0～5	/	○	0:compensationless torque	
						1:digital compensation torque	

						2:analog 0 given compensation torque	
						3:analog 1given compensation torque	
						4:communication given compensation torque	
						5:automatic compensation torque	

6.2.2.2 P11 Group startup parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P11.00	Startup modes	0	0～2	/	×	0:normal startup 1: Start up after DC braking 2: Speed track startup	
P11.01	Startup holding frequency	0.00	0.00～60.00	Hz	×		
P11.02	Startup frequency holding time	0.0	0.0～3600.0	s	×		
P11.03	Startup DC injection current	30.0	0.0～120.0	%	×		
P11.04	Startup DC injection time	5.0	0.0～99.9	s	×		
P11.05	Excitation time	0.3	0.0～99.9	s	×		
P11.06	Zero-servo time	0.8	0.0～99.9	s	×		
P11.07	Contracting brake operating time	0.20	0.00～99.99	Hz	×		

6.2.2.3 P12 Group shutdown parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P12.00	Shutdown modes	0	0～3	/	×	0:inertia shutdown 1:Slow down 2:slow down+DC brake 3:slow down+holding excitation	
P12.01	Shutdown holding frequency	0	0.00～300.00	Hz	×	0.00～300.00	
P12.02	Shutdown frequency holding time	0	0.0～99.9	s	×	0.1～99.9	
P12.03	DC brake initial frequency	0	0.00～300.00	Hz	×	0.00～300.00Hz	
P12.04	Shutdown DC braking current	0	0.0～120.0	%	×	0.0～120.0	
P12.05	Shutdown DC braking time	0	0～99.9	s	×	0～99.9	
P12.06	Shutdown excitation holding time	0	0～99.9	s	×		

6.2.2.4 P13 Group Braking function parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P13.00	dynamic braking selection	0	0～1	/	○	0： select dynamic braking 1： refuse dynamic braking	
P13.01	Braking turn-on voltage	660	620～750	V	○	620～750	
P13.02	Braking unit service time	60.0	0.0～300.0	s	○	0.0～300.0	

6.2.2.5 P14 group V/F control parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P14.00	V/F curve setting	0	0～4	/	×	0：standard V/F straight line 1 ： 1.2 order power curve； 2 ： 1.5 order power curve 3：2 order power curve 4：customize	
P14.01	V/F voltage setting V0	76.0	0.0～380.0	V	×	0.0～380.0	
P14.02	V/F frequency setting F0	10.00	0.00～300.00	Hz	×	F0<F1	
P14.03	V/F voltage setting V1	152.0	0.0～380.0	V	×	0.0～380.0	
P14.04	V/F frequency setting F1	20.00	0.00～300.00	Hz	×	F1<F2	
P14.05	V/F voltage setting V2	228.0	0.0～380.0	V	×	0.0～380.0	
P14.06	V/F frequency setting F2	30.00	0.00～300.00	Hz	×	F2<F3	
P14.07	V/F voltage setting V3	304.0	0.0～380.0	V	×	0.0～380.0	
P14.08	V/F frequency setting F3	40.00	0.00～300.00	Hz	×	F3<F4	
P14.09	V/F voltage setting V4	380.0	0.0～380.0	V	×	0.0～380.0	
P14.10	V/F frequency setting F4	50.00	0.00 ～ 300.00	Hz	×	F4<frequency upper limit PXXX	

6.2.3 P2X Group motor parameters

6.2.3.1 P20 Basic motor parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P20.00	Type of motors	0	0～1	/		0:asynchronous；1：synchronous	
P20.01	motor rated power	注 1	0.4～999.9	kW	×	Set according to the nameplate of motors	
P20.02	motor rated current	注 1	0.1～999.9	A	×	set according to the nameplate of motors	
P20.03	motor rated frequency	50.00	0.00～300.00	Hz	×	set according to the nameplate of motors	
P20.04	motor rated rotary speed	1460	0～30000	rpm	×	set according to the nameplate of motors	
P20.05	motor rated voltage	380	0～480	V	×	set according to the nameplate of motors	
P20.06	Number of poles for motors	4	2～128	/	×	Motor pole pairs=series /2	
P20.07	motor rated slip frequency	1.30	0.10～655.35	Hz	×	set according to the nameplate of motors	
P20.08	The maximum slip frequency of motor	2.60	0.10～655.35	Hz	×	Normally two times of the ratings	
P20.09	Motor phase	1	0～1	/	×	0 ： negative	

	sequence					sequence phase；1 ： positive sequence phase	
P20.10	Motor no load current coefficient	32.00	0.00～60.00	%	×		
P20.11	motor rated torque	0.1	0.1～6553.5	Nm	×	motor rated torque	
P20.12	Maximum power coefficient of motors	200	100～300	%	×		

Note 1：different inverter power corresponds to different ex work setting.

6.2.3.2 P21 advanced motor parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P21.00	Motor setting	0	0～6	/	×	0 ： normal operation	The parameter can't be modified directly and refer to option 2 in the main menu for details
						1：coder static self learning	
						2 ： coder modification self learning	
						3 ： code self learning ending	
						4：motor static self learning	
						5：motor dynamic self learning	
						6 ： motor static advanced self	

						learning 7：coder dynamic self learning	
P21.01	motor stator resistance		0.000 ～ 65.000	Ω	×	0.000～65.000Ω	
P21.02	Motor rotor resistance		0.000 ～ 65.000	Ω	×	0.000～65.000Ω	
P21.03	Motor stator inductance		0.0000 ～ 6.0000	H	×		
P21.04	Motor rotor inductance		0.0000 ～ 6.0000	H	×		
P21.05	Mutual inductance		0.0000 ～ 6.0000	H	×		

6.2.3.3 P22 auxiliary motor parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P22.00	Moment of inertia	1	0～	kgm^2	×	Moment of inertia	
P22.01	Type of coders	0	0～3	/	×	0:increment type ;1:SinCos; 2:EnDat; 3:Rezav	
P22.02	The number of coder pulse	1024	500～16000	/	×	The number of coder pulse	
P22.03	Coder frequency division coefficient	0	0～7	/	×	Coder frequency division coefficient	
P22.04	Coder position angle	0.0	0.0～360.0	rad	*	Coder position angle	
P22.05	Coder feedback speed filtration time constant	0	0～30	ms	×	Coder feedback speed filtration time constant	
P22.06	Coder direction	1	0～1	/	×	0：negative phase sequence,1：positive phase sequence	
P22.07	SinCos coder division coefficient	11	7,9,11	/	×	7—128;9-512;11-2048	

6.2.3.4 P23 Motor protection parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P23.00	Motor overheat protection selection	0	0～1	/	×	0：No overheat protection 1：No overheat protection	
P23.01	Inverter protection threshold	5.00	0.00～10.00	V	×	0.00～10.00V	
P23.02	Motor overload protection time	60.0	0.5～300.0	s	×		
P23.03	Motor low speed overcurrent	150.00	0.00～	%	○	20% rated speed and below	
P23.04	Motor low speed overcurrent time	60.0	0.1～	s	○		
P23.05	Motor high speed overcurrent	120.00	0.00～	%	○	20% rated speed and above	
P23.06	Motor high speed overcurrent time	30.0	0.1～	s	○		

6.2.4 P3X Group digital parameters

6.2.4.1 P30 digital input parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P30.00	X0 terminal input function selection	0	0～31	/	×	Refer to chapter seven for parameter details	
P30.01	X1 terminal input function selection	0	0～31	/	×		
P30.02	X2 terminal input function selection	0	0～31	/	×		
P30.03	X3 terminal input function selection	0	0～31	/	×		
P30.04	X4 terminal input function selection	0	0～31	/	×		
P30.05	X5 terminal input function selection	0	0～31	/	×		
P30.06	X6 terminal input function selection	0	0～31	/	×		
P30.07	X7 terminal input function selection	0	0～31	/	×		
P30.08	X0～X7 input filtration time	0.001	0.000～1.000	s	×	0.000～1.000s	
P30.09	Back up						
P30.10	Back up						

6.2.4.2 P31 digital output parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P31.00	Relay K1 output function definition	0	0～31	/	×	Refer to F31 group multiple function output terminal definition table in chapter seven	
P31.01	Relay K2 output function definition	0	0～31	/	×		
P31.02	Y0 terminal output function selection	0	0～31	/	×		
P31.03	Y1 terminal output function selection	0	0～31	/	×		
P31.04	Y2 terminal output function definition	0	0～31	/	×		
P31.05	Y3 terminal output function definition	0	0～31	/	×		
P31.06	Relay K1 terminal action delay	0	0.0～60.0	s	×		
P31.07	relay K1 terminal reset delay	0	0.0～60.0	s	×		
P31.08	relay K2 terminal action delay	0	0.0～60.0	s	×		
P31.09	relay K2 terminal reset delay	0	0.0～60.0	s	×		
P31.10	Y0 terminal action delay	0	0.0～60.0	s	×		
P31.11	Y0 terminal reset delay	0	0.0～60.0	s	×		
P31.12	Y1 terminal action delay	0	0.0～60.0	s	×		
P31.13	Y1terminal reset delay	0	0.0～60.0	s	×		
P31.14	Y2 terminal action delay	0	0.0～60.0	s	×		
P31.15	Y2terminal reset delay	0	0.0～60.0	s	×		
P31.16	Y3 terminal action delay	0	0.0～60.0	s	×		

P31.17	Y3 terminal reset delay	0	0.0～60.0	s	×		
P31.18	backup						
P31.19	backup						
P31.20	Non-zero current detection width	2.0	0.0～50.0	%	○		
P31.21	Frequency consistency detection width	1.00	0.0～300.00	Hz	○		
P31.22	Any frequency detection	1.00	0.00～300.00	Hz	○	For Frequency detection function	
P31.23	Any frequency detection width	0.20	0.00～300.00	Hz	○	For Frequency detection function	

6.2.4.3 P32 analog input parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P32.00	A0input type	1	0～1	/	×	0：0～10V 1：-10V～10V	
P32.01	A0 input function selection	0	0～4	/	×	0：no function 1：target speed signal 2：current speed signal 3：torque signal 4：compensation torque signal	
P32.02	A0 offset	10.000	0.000～20.000	V	×	0.000～20.000	
P32.03	A0 gain	100.0	0.1～1000.0	%	×		

P32.04	A0filteration time	10	0～30	ms	×		
P32.05	A0 chopping	10.000	0.000～10.000	V	×		
P32.06	A1input type	0	0～1	/	×	The same as A0	
P32.07	A1 input function selection	0	0～4	/	×	The same as A0	
P32.08	A1 offset	10.000	0.000～20.000	V	×		
P32.09	A1 gain	100.0	0.1～1000.0	%	×		
P32.10	A1 filtration time	10	0～30	ms	×		
P32.11	A1 chopping	10.000	0.000～10.000	V	×		

6.2.4.4 P33 analog output parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P33.00	M0 output function selection	0	0～44	/	×	Please refer to chapter 7 for details of parameters	
P33.01	M0 offset	15.000	0.000～20.000	V	×	0.000～20.000	
P33.02	M0 gain	100.0	0.1～6000.0	%	×		
P33.03	M1 output function selection	0	0～44	/	×	Please refer to chapter 7 for details of parameters	
P33.04	M1offset	15.000	0.000～20.000	V	×		
P33.05	M1 gain	100.0	0.1～6000.0	%	×		

6.2.5 P4X Group speed control parameters

6.2.5.1 P40 basic speed parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P40.00	Panel speed	5.00	0.0～100.00	Hz	○		
P40.01	Basic frequency	50.00	0.0～100.00	Hz	○		
P40.02	acceleration time0	5.00	0.1～360.00	s	○	15kW and below: 0.1～360.00s	
P40.03	deceleration time0	5.00	0.1～360.00	s	○	18.5k and above: 0.0～360.00s	
P40.04	acceleration time1	5.00	0.1～360.00	s	×		
P40.05	deceleration time 1	5.00	0.1～360.00	s	×		
P40.06	acceleration time2	5.00	0.1～360.00	s	×		
P40.07	deceleration time 2	5.00	0.1～360.00	s	×		
P40.08	acceleration time3	5.00	0.1～360.00	s	×		
P40.09	deceleration time 3	5.00	0.1～360.00	s	×		
P40.10	acceleration fillet Ts0	1.30	0.00～10.00	s	○	Acceleration start	
P40.11	acceleration fillet Ts1	1.30	0.00～10.00	s	○	Acceleration end	
P40.12	Deceleration fillet Ts2	1.30	0.00～10.00	s	○	Deceleration start	
P40.13	Deceleration fillet Ts3	1.30	0.00～10.00	s	○	Deceleration end	

6.2.5.2 P41 digital multi-speed parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P41.00	digital multi-speed reference 0	0.00	0.00～300.00	Hz	○		
P41.01	digital multi-speed reference 1	5.00	0.00～300.00	Hz	○		
P41.02	digital multi-speed reference 2	8.00	0.00～300.00	Hz	○		
P41.03	digital multi-speed reference 3	10.00	0.00～300.00	Hz	○		
P41.04	digital multi-speed reference 4	15.00	0.00～300.00	Hz	○		
P41.05	digital multi-speed reference 5	18.00	0.00～300.00	Hz	○		
P41.06	digital multi-speed reference 6	20.00	0.00～300.00	Hz	○		
P41.07	digital multi-speed reference 7	25.00	0.00～300.00	Hz	○		
P41.08	digital multi-speed reference 8	28.00	0.00～300.00	Hz	○		
P41.09	digital multi-speed reference 9	30.00	0.00～300.00	Hz	○		
P41.10	digital multi-speed reference	35.00	0.00～300.00	Hz	○		
P41.11	digital multi-speed reference	38.00	0.00～300.00	Hz	○		
P41.12	digital multi-speed reference	40.00	0.00～300.00	Hz	○		
P41.13	digital multi-speed reference	45.00	0.00～300.00	Hz	○		
P41.14	digital multi-speed reference	48.00	0.00～300.00	Hz	○		
P41.15	digital multi-speed reference	50.00	0.00～300.00	Hz	○		

6.2.6 P5X group process control parameters

6.2.6.1 P50 group process open loop parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P50.00	open-loop auxiliary reference selections	0	0～3	/	×	0：N/A； 1：A0； 2：A1； 3：backup	
P50.01	Open-loop reference main/auxiliary relationship operation	0	0～5	/	×	0：main＋auxiliary 1：main－auxiliary 2：auxiliary－（50%×Imax） 3：main＋auxiliary－（50%×Imax） 4：take the maximum value 5：take the minimum value	Imax is the maximum value of the input signal
P50.02	Process open loop and close loop composite running relationship operation	0	0～1	/	×	0：open loop frequency reference +frequency after close loop PID adjustment 1：open loop frequency reference - frequency after close loop PID adjustment	

6.2.6.2 P51 process close loop parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P51.00	Close loop operation control selection	0	0～1	/	×	0：invalid close loop operation control 1：effective close loop operation control	
P51.01	Close loop control main reference selection	0	0～6	/	×	0：digital voltage reference 1：A0 2：A1 3 ： backup 4：DI([l;se) 5：Multi-stage voltage	
P51.02	close loop control auxiliary reference selections	0	0～5	/	×	0：N/A 1：A0 2：A1 3：backup 4：DI(pulse) 5：multi-stage voltage	
P51.03	close loop control reference main/auxiliary operation	0	0～5	/	×	0：main+auxiliary 1：main-auxiliary 2：auxiliary —（50%×Imax） 3：main+auxiliary—（50%×Imax） 4：take the	Imax is the maximum value of input signal

						maximum value 5：take the minimum value	
P51.04	close loop control main feedback selection	1	0～5	/	×	0：N/A 1：A0 2：A1 3：backup 4：DI(pulse)； 5：multi-stage voltage reference	
P51.05	close loop control auxiliary feedback selection	0	0～5	/	×	0：N/A 1：A0 2：A1 3：backup 4：DI(pulse) 5：multi-stage voltage reference	
P51.06	close loop control feedback main/auxiliary operation	0	0～5	/	×	0：main+auxiliary 1：main-auxiliary 2：auxiliary－（50%×Imax） 3：main+auxiliary－（50%×Imax） 4：take the maximum value 5：take the minimum value	Imax is the maximum value of input signal
P51.07	close loop control digital voltage	0.00	0.00～10.00	V	○		

	reference						
P51.08	The number of single-phase pulses in each turn of rotation	1024	1～9999	/	×		
P51.09	proportional gain Kp	1.000	0.000～10.000	/	○		
P51.10	integral gain Ki	0.500	0.000～10.000	/	○		
P51.11	Differential gain Kd	1.000	0.000～10.000	/	○		
P51.12	Sampling cycle	0.100	0.001～30.000	s	○		
P51.13	Integral method selection	0	0～1	/	○	0：when the frequency reaches the upper limit, stop integral adjustment 1：when the frequency reaches the upper and lower limits, continue adjusting the integral	
P51.14	analog multi-speed f0	0.00	0.00～10.00	V	×		
P51.15	analog multi-speed f1	0.00	0.00～10.00	V	×		
P51.16	analog multi-speed	0.00	0.00～10.00	V	×		

	f2						
P51.17	analog multi-speed f3	0.00	0.00～10.00	V	×		
P51.18	analog multi-speed f4	0.00	0.00～10.00	V	×		
P51.19	analog multi-speed f5	0.00	0.00～10.00	V	×		
P51.20	analog multi-speed f6	0.00	0.00～10.00	V	×		
P51.21	analog multi-speed f7	0.00	0.00～10.00	V	×		
P51.22	Integral action upper limit	0.0	0.0～	%	×		
P51.23	close loop output reverse selection	0	0～1	0	×	0：invalid 1：effective	
P51.24	Close loop input upper limit	50.0	0.0～	%	×		
P51.25	Close loop input lower limit	1.0	0.0～20.0	%	○		
P51.26	Close loop output upper limit	200.0	0.0～	%	×		
P51.27	Close loop output lower limit	5.0	0.0～	%	×		
P51.28	Suspend selection	0	0～ 1	/	×	0:N 1:Y	
P51.29	Suspend limits	0.0	0.0～ 100.0	%	×	P51.29=1 有效	
P51.30	Suspend the delay	0	0～ 65535	S	×	P51.29=1	

						effective	
P51.31	Suspend offset	0.0	0.0～ 100.0	%	×	P51.29=1 effective	
P51.32	Given deceleration time	5.0	0.0～3600.0	s	×		
P51.33	Close-loop output filtration time	0.01	0.01～50.00	s	×		
P51.34	The minimum reference	0.0	0.0～100.0	%	×	the value is the percent of the maximum input value (10V or 22mA)	
P51.35	The feedback in answer to the minimum reference	0.2	0.0～100.0	%	×	the value is the percent of the maximum input value (10V or 22mA)	
P51.36	The maximum reference	100.0	0.0～100.0	%	×	the value is the percent of the maximum input value (10V or 22mA)	
P51.37	The feedback in answer to the maximum reference	100.0	0.0～100.0	%	×	the value is the percent of the maximum input value (10V or 22mA)	
P51.38	Preset frequency	22.0	0～ maximum frequency	Hz	×		

P51.39	Preset frequency holding time	1	0～60	s	×		
P51.40	Offset neg	0	0～1	/	×	0：no neg 1：offset neg	

6.2.7 P6X group Vector control parameters

6.2.7.1 P60 group speed loop control parameters

function code	function code name	ex work setting	settingscope	unit	attribute	option explanation	customize
P60.00	speed loop P0	100.00	0.00～655.35	/	○	zero servo section	
P60.01	speed loop I0	120.00	0.00～655.35	/	○		
P60.02	speed loop D0	0.50	0.00～655.35	/	○		
P60.03	speed loop P1	70.00	0.00～655.35	/	○	Low speed section	
P60.04	speed loop I1	30.00	0.00～655.35	/	○		
P60.05	speed loop D1	0.50	0.00～655.35	/	○		
P60.06	speed loop P2	120.00	0.00～655.35	/	○	intermediate speed section	
P60.07	speed loop I2	25.00	0.00～655.35	/	○		
P60.08	speed loop D2	0.20	0.00～655.35	/	○		
P60.09	speed loop P3	140.00	0.00～655.35	/	○	High speed section	
P60.10	speed loop I3	5.00	0.00～655.35	/	○		
P60.11	speed loop D3	0.10	0.00～655.35	/	○		
P60.12	Switching frequency 0	1.0	0.0～100.0	%	○		
P60.13	Switching frequency 1	50.0	0.0～100.0	%	○		

6.2.7.2 Group P61 Current control parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P61.00	current ring Kp	1.40	0.01～9.99	/	○		
P61.01	current ring Ki	1.00	0.01～9.99	/	○		
P61.02	current ring Kd	0.00	0.00～9.99	/	○		
P61.03	current ring bandwidth	400.0	0.01～1000.0	Hz	○		
P61.04	Magnetic flux linkage bandwidth	0.8	0.01～1000.0	Hz	○		
P61.05	current ring selection	0	0～10	/	○		
P61.06	backup				○		
P61.07	backup				○		

6.2.7.3 Group PP62 Torque control parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P62.00	digital torque reference	0.0	0.1～100.0	%	○		
P62.01	Torque direction	0	0or not 0	/	○		
P62.02	Torque increase time	1.00	0.01～655.35 s	s	○		
P62.03	Torque decrease time	1.00	0.01～655.35 s	s	○		

6.2.7.4 P63 torque compensation parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P63.00	Compensation torque direction	0	0 or not 0	/	○		
P63.01	Compensation gain	100.0	0.0～200.0	%	○		
P63.02	Compensation offset	0.0	0.0～100.0	%	○		
P63.03	Light load switch compensation	0.0	0.0～99.9	%	○	For elevators only	
P63.04	Heavy load switch compensation	0.0	0.0～99.9	%	○	For elevators only	

6.2.8 P7X group incremental control parameters

6.2.8.1 P70 limitation and protection parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P70.00	Frequency upper limit	55.00	0.01～maximum frequency	Hz	○	0.01～maximum frequency	
P70.01	frequency upper limit	0.00	0.01～frequency upper limit	Hz	○	0.01～frequency upper limit	
P70.02	maximum output frequency	55.00	0.01～300.00	Hz	○	0.01～300.00	
P70.03	maximum output voltage	380	0～480	V	○		
P70.04	Output torque limitation	150.00	0.00～200.00	%	○		
P70.05	Acceleration over current threshold of inverters	180.00	0.00～200.00	%	○		
P70.06	deceleration overvoltage threshold of inverters	750	0～800	V	○		
P70.07	Overspeed protection coefficient	120.00	0.00～	%	○	Beyond the speed rating	
P70.08	Special function selection	16	0～65535	/			

6.2.8.2 P71 control optimization parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P71.00	frequency hopping speed 1	0.00	0.01～100.00	Hz	○		
P71.01	frequency hopping speed 2	0.00	0.01～100.00	Hz	○		
P71.02	frequency hopping speed 3	0.00	0.01～100.00	Hz	○		
P71.03	Frequency hopping width	0.00	0.01～100.00	Hz	○		
P71.04	Inertia compensation coefficient	0.00	0.01～100.00	%	○	×	
P71.05	Reversal prohibition	0	0～1	/	○	0：N 1：Y	
P71.06	Interval between forward and reversal rotation	2.0	0.1～6553.5	S	○		
P71.07	PWM modulation modes	0	0～2	/	○	0：5 段式; 1：7 段式；2：<40%rpm 7 段，>40% 5 段	
P71.08	V/F optimization function selection	0	0～63	/	○	0：N/A 1 ： auto torque increase 2：oscillation suppression	

						4 ： slip compensation 8 ： stator resistance compensation 16 ： dead zone compensation 32 ： busbar voltage compensation （ position selection function）	
P71.09	V/F torque compensation	0.0	0.0～30.0	%	○	Manual torque increase，P71.08=0	
P71.10	V/F compensation maximum frequency	10.00	0.00～50.00	Hz	○		
P71.11	dead zone compensation mode	0	0～2	/	○	0:compensate 1; based on the degree of angle 1:compensat	

						e 1 or 0.5 based on the degree of angle; 2: compensate based on current	
P71.12	Current down slop time	0.00	0.01～655.35	S	○		
P71.13	backup						
P71.14	Carrier frequency	6.000	1.100～10.000	KHz	○		
P71.15	Random PWM width	0.001	0.001～1.000	KHz	○		
P71.16	Regulator mode	1	0～3	/	×		
P71.17	Contactor making delay	0.8	0.0～	S	○		
P71.18	Switching off delay	0.4	0.0～	S	○		
P71.19	Contactor shutdown delay	1.0	0.0～	S	○		
P71.20	Braking delay	0.1	0.0～	S	○		
P71.21	Output shutdown delay	0.3	0.001～	s	○		
P71.22	Zero-speed threshold	0.2	0.0～10.0	Hz	○		
P71.23	Dead zone compensation size	100	0～100	%	○		
P71.24	Zero-servo compensation	0	0～100	%	○		
P71.25	Energize to calibrate	0	0～1	/	×	0：NO	

	automatically or not?					1：each time of energization, auto calibration will be made on the angle of coders.	
P71.26	Calibration current gain coefficient	150	100～300	%	×		
P71.27	Zero servo current ring gain coefficient	100	50～200	%	×		

6.2.9 P8X group communication parameters

6.2.9.1 P80 group communication selection parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P80.00	Communication mode selection	0	0～1	\	○	0： Modbus； 1：Profibus；	

6.2.9.2 P81 group Modbus communication parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P81.00	Communication baud rate	4	0～7	bps	○	0：1200 bps 1：2400 bps 2： 4800 bps 3： 9600 bps 4：19200 bps 5：38400 bps 6：57600 bps 7：76800 bps	
P81.01	data format	0	0～2	/	○	0：1−8−1 format, free of test 1：1−8−1 format, even 2：1−8−1 format, odd	
P81.02	transfer mode selection	1	0～1	/	○	0：ASC;1：RTU	
P81.03	Master/slave mode	0	0～2	/	○	0 ： slave mode of operator jack and slave mode of terminal wiring 1 ： master mode of operator jack and slave mode of terminal wiring 2 ： slave mode of operator jack and master mode of terminal wiring	
P81.04	Address of local machine	1	1～247	/	○	1 ～ 247 ， 0 is the broadcasting address	

P81.05	Communication status word 1			/	○	Refer to communication appendix A	
P81.06	communication status word 2			/	○	Refer to communication appendix A	
P81.07	communication address format selection			/	○		

6.2.9.3 P82 Group Profibus communication parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P82.00	communication baud rate	6	4～9	bps	○	4：187.5k 5：500k 6：1M 7：3M 8：6M 9：12M	
P82.01	data format	0	0～5	/	○	0：not PPO format 1：PPO1 2：PPO2 3：PPO3 4：PPO4 5：PPO5	
P82.02	Address of the local computer	0	0～255	/	○	0～255	
P82.03	Communication status word 1			/	○	Refer to communication appendix B	
P82.04	communication status word 2			/	○	Refer to communication appendix B	

6.2.10 P9X Group fault and display parameters

6.2.10.1 P90 Group language selection parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P90.00	Operator language selection	0	0～1	/	○	0：Chinese 1：English	backup

6.2.10.1 P91 group LCD display data

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P91.00	U01 display data	24	0～31	/	○	Refer to chapter 7 for explanation	
P91.01	U02 display data	1	0～31	/	○		
P91.02	U03 display data	25	0～31	/	○		
P91.03	U04 display data	4	0～31	/	○		
P91.04	U05 display data	6	0～31	/	○		
P91.05	U06 display data	16	0～31	/	○		
P91.06	U07 display data	7	0～31	/	○		
P91.07	U08 display data	5	0～31	/	○		

6.2.10.2 P92 Group LED display parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P92.00	LED display data	1	0～31	/	1	Refer to chapter 7 for explanation	

6.2.10.3 P93 group operation record parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P93.00	Total energization time of Local machine	0	0.000～65.535	kh	*		
P93.01	Total running time of local machine	0	0.000～65.535	kh	*		
P93.02	The maximum record of radiator temperature	0	0.0～100.0	℃	*		

6.2.10.4 P94 Group Fault processing parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P94.00	Inverter minor fault processing methods	1	0～1	/	*	0： don't output fault relay 1： output fault relay	
P94.01	Inverter fault auto reset duration	10.0	0.0～180	S	*	Inverter fault auto reset duration	
P94.02	Inverter fault auto reset times	3	1～100	/	*	Inverter fault auto reset times	30 minutes
P94.03	Radiator overheat time	0.5	0.0～180	S	×	No. 3 fault	Rectification
P94.04	Overspeed protection time	1.00	0.00～180	S	×	No. 30 fault	
P94.05	Input phase failure voltage threshold	35	0～150	V	×	No.29 fault	

P94.06	Braking resistance short-circuit times	10	0～100	/	×	NO. 4 fault	
P94.07	SinCos coder wire breakage confirmed times	2	0～100	/			
P94.08	Output phase failure confirmed duration	2.000	0.000～180.00	S			
P94.09	Relay failure confirmed voltage	65	0～150	V			
P94.10	CD error phase judgment threshold	300	300～1000	/			
P94.11	ABZ protection threshold	20	20～100	%			

6.2.10.5 P95 Group Product identification parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P95.00	Inverter hardware version	0		/	*	Inverter hardware version	
P95.01	Control panel software version	Manufacturer		/	*	Inverter software version	

6.2.10.6 P96 Group inverter product parameters

function code	function code name	ex work setting	setting scope	unit	attribute	option explanation	customize
P96.00	inverter rated power		0.0～999.9	kW	×		
P96.01	inverter rated current		0.0～999.9	A	×		
P96.02	inverter maximum current		0.0～999.9	A	×		
P96.03	inverter rated voltage	380	0～480	V	×	0～480	
P96.04	Inverter power coefficient	16	0～99	%	*		
P96.05	Inverter sensor current	0	0～9999	A	*	0～9999	
P96.06	Inverter module rated current		0～9999	A	*	0～9999	
P96.07	Built-in braking unit current		0～9999	A	*	0～9999	
P96.08	Three-phase current balance coefficient	1.000	0.000～99.999	%	*	0.0～0.99	

6.3 Parameter record sheet of users

function	Setting	function	Setting	Function	Setting

Chapter 7 Parameter description

7.1 About the main menu

7.1.1 Parameter setting

After entering, parameter from Group P0X to Group P9X would be displayed. If the logging password is correct, it can be modified. For specific meaning, see below

Field	Explanation
Function code number	Means the number of function code, such as P00.00
Name of function code	Name of function code, explaining its function
Option of function code	Parameter setting list
Setting range	Minimum to maximum value that is allowed for setting the function code
Unit	V: voltage; A: current; ℃: degree; Ω: ohm; mH: millihenry; rpm: =revolutions per minute; %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc.
Exworks value	Setting value after function code is restored with exworks value operation (P00.04)
Attribute	○: this function code can be modified during running; ×: this function code can be modified only during shutdown; *: this function code is read-only parameter, and cannot be modified.
User setting	For the users to record parameter

7.1.2 Motor learning

This option performs motor self-learning. For the different motors that connects to the inverter for the first time, recommend self-learning

For known motor nameplate parameter and others, please write to the corresponding parameter directly; if the motor internal parameter is unknown,

please execute parameter self-tuning. Press ENT, determine self-learning plan; usually 6 is recommended:

0: normal running

1: encoder static self-learning

Usually angle learning of the synchro motor on the encoder shall be started first.

2: encoder dynamic self-learning

For the sin/cos encoder, this function is required for learning the center point.

3: simple motor self-learning

1-3 is for self-learning of synchro motor

4: rotating motor self-learning

If the motor is relieved from the load, choose rotating self-learning 4; otherwise it can only choose static self-learning. When the parameter self-learning is started, ensure the motor is under static condition. In case of overcurrent, overvoltage fault during self-learning, extend the acceleration, deceleration time P40.02, P40.03 properly.

5: Static motor self-learning

In case the inverter does not match with motor power, please choose static self-learning. After learning, change the no-load current P20.10 into about 30% of motor rated current P20.02 manually. The small the motor power is, the larger this value would be

6: Advanced motor static self-learning

Normally, the advanced static self-learning is recommended for connecting to new motor to check the motor parameter automatically.

During self-tuning process, the data is displayed as 9-8-7-6-5-4-3-2-1-0 on the panel, and then, parameter condition returns to 0 (normal running) automatically

7.1.3 Fault check

Press ENT key, go to fault list. According to time reverse order, it can display eight faults. When a certain fault is detected, press ENT key to display the bus voltage, output current, running frequency, etc. at the time of occurrence.

There are totally 49 fault codes. For corresponding fault types, see below.

Fault number	Fault display	Fault number	Fault display
1	Module overcurrent protection	2	ADC fault
3	Heatsink Overheat	4	Brake unit fault
5	Fuse blown fault	6	Output overtorque
7	Speed deviation	8	Bus overvoltage protection
9	Bus undervoltage	10	Output phase-lack
11	Motor low-speed overcurrent	12	Encoder fault
13	Current found when stopped	14	Speed reversing during running
15	Speed found when stopped	16	Wrong phase sequence
17	Overspeed with the same direction	18	Reversing overspeed
19	UVW encode phase sequence fault	20	Encoder communication fault
21	Abc overcurrent	22	Brake check fault
23	Input overvoltage	24	UVW encoder disconnection
25	Backup	26	Encoder unlearned
27	Output overcurrent	28	Sincos encoder fault
29	Input phase lacking	30	Overspeed protection
31	Motor high-speed overcurrent	32	Earthing protection
33	Capacitance aging	34	External fault
35	Output unbalanced	36	Parameter setting error
37	Current sensor fault	38	Brake resistance short-circuit
39	Current instant value too large	40	Inverter overload
41	Unusual power down during running	42	Motor overheat (PTC)
43	Internal fault	44	Self-tuning fault
45	Interference protection	46	Terminal exclusive check
47	EEPOM unusual	48	Unusual communication
49	Unusual connection of extension card		

7.1.4 Parameter processing

Press ENT key to enter. This function is used for setting the parameter change authority and initialization level.

0: all parameter is allowed for change.

1: all parameter is not allowed for change.

2: restore P0X area parameter as exworks set value.

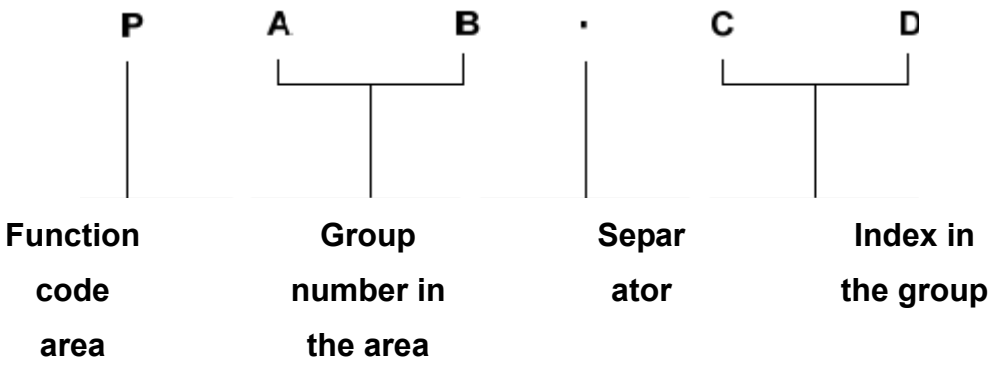
3: restore all non-P0X area parameter (function code display invisible area self-defined by the user) to exworks setting value.

4: restore all user parameter to exworks setting value.

Note: after the parameter is initialized, the password set by the user would be reset. Press ESC key, return to main menu.

7.2 Parameter group classification and format

7.2.1 Parameter group format



7.2.2 Parameter group area division

Function code area	Group number	Description	Range
P0X user parameter	P00	Password parameter group	P00.00～P00.02
P1X control parameter	P10	Basic control parameter group	P10.00～P10.05
	P11	Start parameter group	P11.00～P11.07
	P12	Shutdown parameter group	P12.00～P12.05
	P13	Brake function parameter group	P13.00～P13.02
	P14	V/F parameter group	P14.00～P14.10
P2X motor parameter	P20	Basic motor parameter group	P20.00～P20.11
	P21	Advanced motor parameter group	P21.00～P21.05
	P22	Motor auxiliary parameter group	P22.00～P22.07
	P23	Motor protection parameter group	P23.00～P23.06
P3X terminal control parameter	P30	Digital quantity input parameter group	P30.00～P30.10
	P31	Digital quantity output parameter group	P31.00～P31.17
	P32	Analog quantity input parameter group	P32.00～P32.20
	P33	Analog quantity output parameter group	P33.00～P33.05
P4X speed parameter	P40	Basic speed parameter group	P40.00～P40.13

	P32	Digital quantity multispeed parameter group	P41.00～P41.15
P5X process control parameter	P50	Process open-loop parameter group	P50.00～P50.02
	P51	Process close-loop parameter group	P51.00～P51.38
P6X vector control parameter	P60	Speed loop control parameter group	P60.00～P60.13
	P61	Current loop control parameter group	P61.00～P61.07
	P62	Torque control parameter group	P62.00～P62.03
	P63	Compensation torque control parameter group	P63.00～P63.04
P7X enhance control parameter	P70	Limit and protection parameter group	P70.00～P70.08
	P71	Control optimization parameter group	P71.00～P71.22
P8X communication parameter	P80	Communication function select group	P80.00
	P81	Modbus communication group	P81.00～P81.06
	P82	Profibus DP communication group	P82.00～P82.04
P9X display parameter	P90	Language select group	P90.00
	P91	LCD display group	P91.00～P91.07
	P92	LED display group	P92.00
	P93	Run record parameter group	P93.00～P93.02
	P94	Fault process parameter group	P94.00～P94.06
	P95	Inverter product identification parameter group	P95.00～P95.01
	P96	Inverter product parameter	P96.00～P96.08

7.3 Group P0X: user parameter group

7.3.1 Group P00: basic function parameter

P00.00	Log on password	0～65535 (0)

This function is used for preventing irrelevant personnel from inquiry and modification of parameter and protecting inverter parameter safety.

00000: Without password protection, all parameter can be inquired, and inverter has no password for exworks.

After the user password takes effect and enters parameter setting condition again, unless correct password is entered, all parameter can not be changed through operation panel, and only for read. Password is always displayed 00000.

Note: Exworks setting of Series As500 inverter is user password-free (P00.00=0); no password is required for the first time.

P00.01	Modify password	0～65535 (0)

Set the password:

Input five numbers for user password, and confirm it by pressing ENT. And repeat again.

Modify the password:

Press ENT to enter password verification condition, displayed as 0.0.0.0.. Enter parameter edit condition after inputing correct password, and select P00.01 (P00.00 parameter shown as 00000). Input new password and confirm it by pressing ENT. Then repeat P00.01 with the same password. After "OK" is displayed, new password is successfully set.

Cancel the password:

Press ENT to enter password verification condition, displayed as 0.0.0.0.0. Enter parameter edit condition after inputing correct password, and see P00.01 as 00000, and then press ENT to confirm. Set P00.01＝00000 repeatedly, and password is cleared after "Clr" is displayed.

P00.02	Backup password	0～65535 (0)

When the user forgets the password that has been set, the manufacturer can modify the parameter through entering correct backup password, including new password.

7.3.2 Group P01～09: User function parameter (abbreviated):

7.4 Group P1X: control parameter group

7.4.1 Group P10 Basic control parameter

P10.00	Control mode select	0～4 (0)

This function is used for setting control running mode of the inverter. O stands for V/f control, 1, 3 for vector speed control 1; 2, 4 for vector torque control.

0: voltage vector V/f control: for most of applications. Adjust the frequency and

voltage as proportional, and keep the control speed under magnetic flux condition, without the encoder.

When V/F control is selected, please set up Group P14 V/F control parameter reasonably to reach good control effects.

1: speed-free sensor vector control: for universal variable speed driven condition with high requirements on speed control accuracy and large torque. Analog quantity of feedback of analog quantity process close-loop can stands for physical quantity, such as temperature, pressure, humidity.

When vector control is selected, perform motor parameter self-tuning, and set the motor nameplate parameter to P20.xx~P20.xx correctly. Start the motor parameter self-tuning to obtain correct parameter, and meanwhile set up Group PX vector control parameter reasonably to perform excellent control effect of the vector.

2: Speed sensor torque control: similar to 3, with speed encoder, higher control accuracy, and better speed protection.

3: speed sensor vector control: pulse encoder is required to realize the speed and torque performance with higher accuracy than the speed feedback vector control 2 without encoder.

4: backup.

P10.01	Running mode select	0～3 (0)

P10.01 is used under terminal run command given mode, with X0 (corotation), X1 (reverse rotation) terminal control inverter start/stop.

0: two-wire type 1:

K2 K1	Run command
0 0	Stop
1 0	Reverse rotation
0 1	Corotation
1 1	Stop

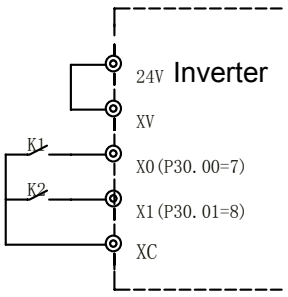


Figure 7-1 Two-wire running mode 1

1: two-wire type 1;

K2 K1	Run command
0 0	Stop
1 0	Stop
0 1	Corotation
1 1	Reverse rotation

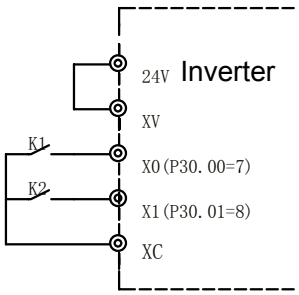


Figure 7-2 Two-wire running mode 2

2: three-wire type1;

Xi (i=2～7) terminal set up "9: three-wire type run control" function.

When K3 is closed, X0 (corotation), X1 (reverse rotation) control is valid; when K3 is disconnected, X0, X1 control is not valid, and the inverter stops;

When X0 terminal rises, it means corotation; when X1 terminal rises, it means reverse rotation.

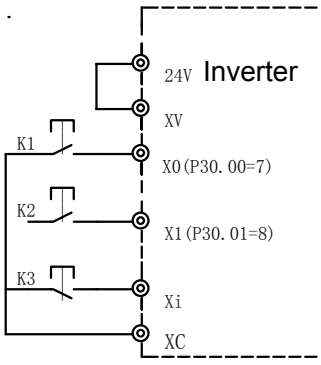


Figure 7-3 Three wire running mode 1

3: three-wire type 2;

K2	Run direction selection
0	Corotation
1	Reverse rotation

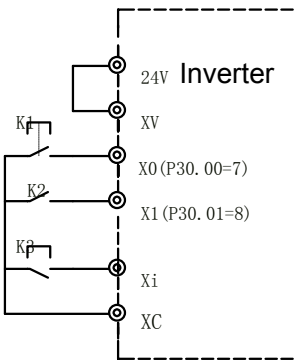


Figure 7-4 Three wire running mode 2

Xi (i=2～7) terminal set up "9: three-wire type run control" function.

When K3 is closed, X0, X1 control is valid; when K3 is disconnected, X0, X1 control is not valid, and the inverter stops;

When X0 terminal rises, it means run command; when X1 terminal is disconnected, it means corotation; when X1 terminal is closed, it means reverse rotation.

P10.02	Run command set mode	0～2 (0)

Operation panel run command set mode: perform run, stop, corotation/reverse rotation of the inverter via the key F1(RUN), F2(STOP), F3(LOC/REM) on the operation panel.

1: Terminal run command set mode: perform run, stop, corotation/reverse rotation of the inverter through definition of multifunction terminal X0～X7; see P30.00～P30.07.

2: Communication set mode: perform run, stop, corotation/reverse rotation of the inverter through communication; see appendix Modbus communication protocol.

P10.03	Frequency/speed set mode	0～11 (0)

This function is used for frequency set under V/f control, sensor-free vector control, sensor vector control; for selection of control mode, see Group P10.00 function code.

0: panel digital frequency set; set up the frequency set through P40.00

1: multi-section set target speed with digital quantity

Digital quantity multispeed terminal 0-3 valid, with the frequency to be determined by this terminal combination; see P41.00～P41.15

2: Multispeed set target speed of analog quantity

Multi-section digital voltage terminal 1-3 valid, with the frequency to be determined by this terminal combination; see P51.14～P51.21

3: target speed set with A0 analog quantity

4: current speed set with A0 analog quantity

5: target speed set with A1 analog quantity

6: current speed set with A1 analog quantity

7: communication set current speed

8: function set target speed

9: backup

10 : backup

A0, A1 (A1 terminal, jumper J1 set as 2, 3), input specification: 0～10V or -10～10V,

Corresponding relation between analog quantity and set frequency is determined by Group P32

11: DI set target speed

12: communication set target speed

13: CAN set current speed

P10.04	Torque set mode	0～5 (0)

Under torque control mode, its set depends on the following channels

0: panel set

Panel digital torque set

1: A0 analog quantity set

2: A1 analog quantity set

When torque set mode is set as analog quantity input, match it correctly while setting up the definition of function parameter of analog port, such as when P10.04 is set as 1, P32.01 must be 2; also, when P10.04 is set as 1, P32.07 must be 3

3: communication set torque

Set the target torque through communication port; for communication mode, see Group P80

4: function set target torque

For some specific industry, set the torque by design of different functions accordingly

P10.05	Compensation torque set mode	0～5 (0)

Compensation torque selection modes are:

0: no compensation torque

1: digital quantity compensation torque

2: analog quantity 0 for compensation torque

3: analog quantity 1 for compensation torque

4: communication set compensation torque

5: auto moment compensation

Auto moment compensation is mainly for crane industry. And this function memorizes torque during zero-speed stop, then release the brake with memorized torque before releasing the torque. Only for closed-loop control temporarily.

7.4.2 Group P11: start control parameter

P11.00	Start mode	0～2 (0)

Take different start modes according to application conditions.

0: Started from start frequency P11.01, after holding time of start frequency P11.02, accelerate to set frequency. If the motor is still rotating when the inverter is started, start acceleration after braking the motor to low speed automatically.

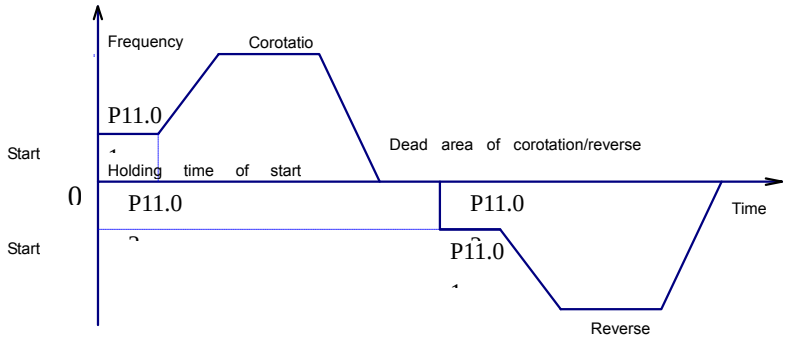


Figure 7-5 Start mode diagram of start frequency

1: Fill in direct current for DC excitation and DC band type brake on the motor. Amount and time of DC filled is set by P11.03 and P11.04. After DC filling time is reached, run it from start frequency P11.01, then after holding time of start frequency P11.02, accelerate to set frequency.

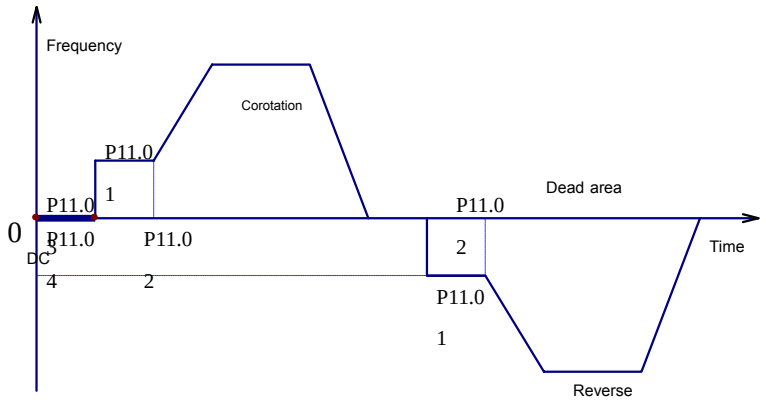


Figure 7-6 Start mode diagram of DC brake

2: Speed tracking start

The inverter makes speed identification on the rotating motor, and track start directly according to identified frequency; during start, current and voltage is smooth without shock.

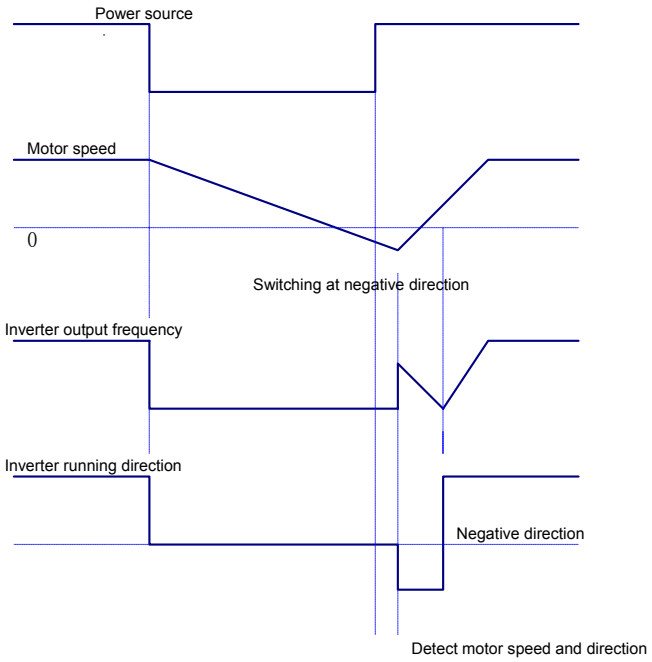


Figure 7-6 Start mode diagram of speed track

P11.01	Start holding frequency (Hz)	0.00～60.00 Hz (0.00)
P11.02	Start frequency holding time (s)	0.00～3600.00 (0.00)

Start frequency refers to initial frequency while the inverter is started, as shown f_s in the figure; holding time of start frequency t_s refers to running time under start frequency during start, as shown in the figure.

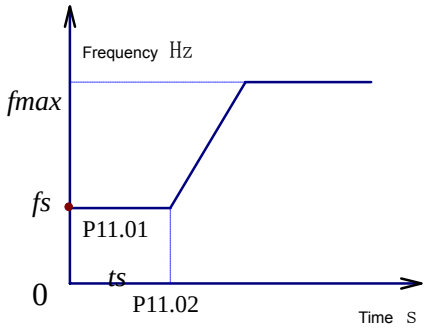


Figure 7-7 Start frequency and start time diagram

Run it from start frequency P11.01, then after holding time of start frequency P11.02, accelerate according to the set acceleration time.

Note: for heavy load start, set up the holding time of start frequency properly, which is better for start.with encoder speed feedback vector control, exworks value of start frequency is 0.00Hz, and others as 0.05Hz

P11.03	Start DC injection current (%)	0.00～120.00 (30.00)
P11.04	Start DC injection time (s)	0.0～99.0 (5.0)

P11.03, P11.04 is valid only when start run mode is under "DC braking before start (P11.00=1)", as below.

Start DC braking current (P11.03) is set relative to the percentage of inverter rated current. If the set DC braking current is larger than 120% of motor rated current, then injected current is 120% of motor rated current. Heavy load: 0.0～120.0%; light load: 0.0～90.0%

Start DC braking time (P11.04) is injected action time. When P11.04=0, there is no DC braking.

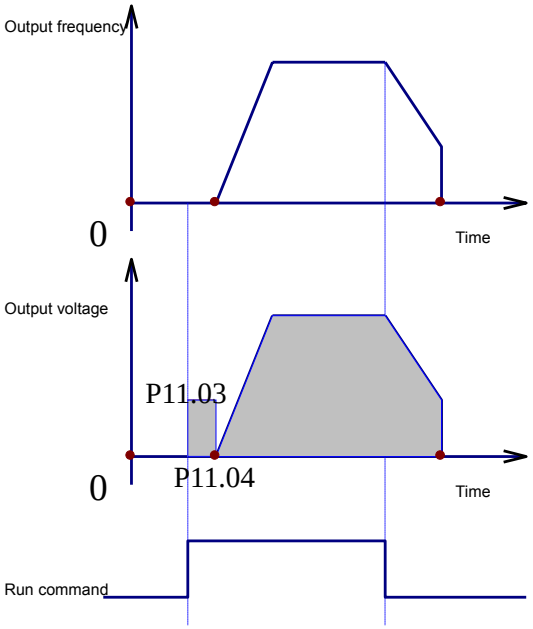


Figure 7-8 DC braking diagram

P11.05	Excitation time (s)	0.0～99.9 (0.3)

Excitation time is that required by establishing the magnetic flux in advance before the motor is started and also for reaching quick response. When there is run command, enter pre-excitation condition according to the time set by this function code. After the magnetic flux is established, enter normal acceleration run. 0 set by this function code means there is no pre-excitation process.

Note: the motor might be rotated during pre-excitation; at this point, please use together with mechanical braking.

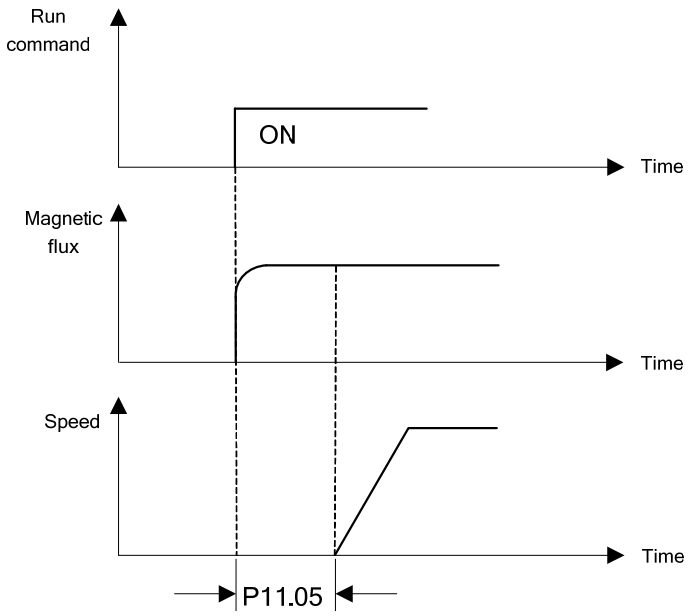


Figure 7-9 Pre-excitation diagram

P11.06	Zero-servo time (s)	0.0～99.9 (0.8)
P11.07	Band type brake action time (s)	0.0～99.9 (0.35)

Band type brake action time is the time required from switching off command to complete opening of the external rake. After opening, enter zero servo time, i.e. Holding time of zero speed.

7.4.3 Group P12: stop control parameter

P12.00	Stop mode	0～3 (0)

Take different stop modes according to different applications.

0: inverter blocked output, motor with free stop

1: stop by deceleration according to the set deceleration time

2: stop by deceleration according to the set DC braking; when the frequency is lower than DC braking start frequency P12.03, inject DC braking current P12.04, with the DC braking time to be determined by P12.05

3: stop by deceleration according to the set deceleration time; after stop, keep the excitation on the motor, and when the run command comes, it can quickly response to start.

P12.01	Stop holding frequency (Hz)	0.00～300.00 (0.00)
P12.02	Holding time of stop frequency (s)	0.1～99.9 (0.0)

The inverter decelerates to stop frequency P12.01 from normal running speed, and after holding time of stop frequency P12.02, decelerate to zero according to the set deceleration time, which is better for stability.

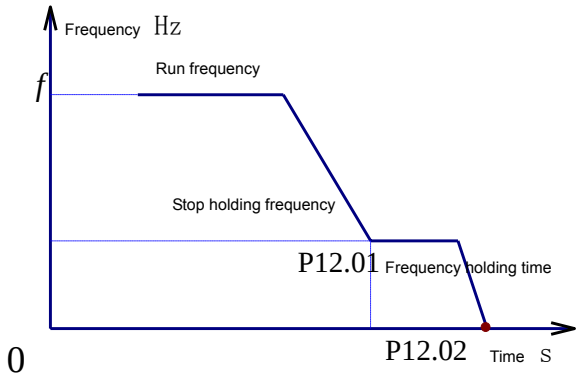


Figure 7-10 Stop holding frequency diagram

P12.03	DC braking start frequency (Hz)	0.00～300.00 (0.00)
P12.04	Stop DC braking current (%)	0.00～120.00 (0.00)
P12.05	Stop DC braking time (s)	0.0～99.9 (0.5)

P12.03~P12.05 is valid only when stop mode is "Deceleration + DC braking (P12.00=2)".

Stop DC braking current (P12.03) is set relative to the percentage of inverter rated current. If the set DC braking current is larger than 120% motor rated current, the injected current is 120% of motor rated current. For heavy load: 0.0～120.0%; for light load: 0.0～90.0%.

Start DC braking time (P12.04) is injected action time; when P12.04=0, there is no DC braking process.

When P12.00=2, P12.03 can be set as braking start frequency for quick braking. P12.03 sets the amount of DC braking current, and this value is relative to the percentage of inverter rated current. Variable torque load: 0.0～90.0%.

P12.04 sets action time of DC braking.

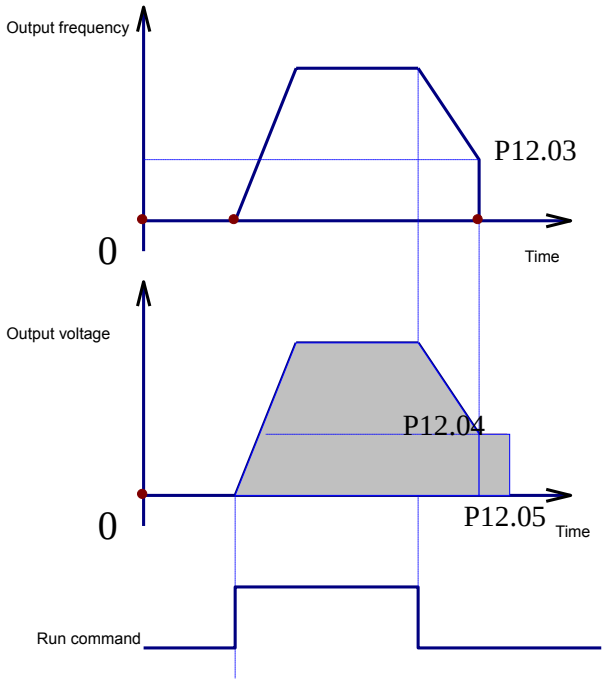


Figure 7-11 Stop DC braking diagram

P12.06	Holding time of stop excitation (s)	0～99.9 (0)

When deceleration + holding excitation is selected for stop mode, and when excitation holding time is larger than value of P12.06, the inverter outputs band type brake signal and stops.

7.4.4 Group P13 Braking function V/F control parameter

P13.00	Energy consumption braking	0～1(0)
P13.01	Braking turnon voltage	620～750(660)
P13.02	Time for braking unit	0.0～300.0(100.0)

P13.00 energy consumption braking selection reflects the inverter can be used with energy consumption braking

0: turn on energy consumption braking function

1: energy consumption braking function not available.

For large moment of inertia, and with quick braking stop, select matching braking unit and braking resistance, and set up braking parameter to realize quick braking stop.

Time for P13.02 braking unit, P13.01 braking turnon voltage is only valid for the inverter with built-in braking unit.

Time for braking unit action can be adjusted, usually as 100s.

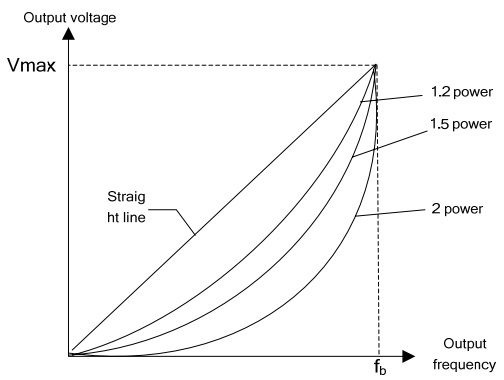
To adjust P13.01, select action voltage of braking unit. Proper action voltage can realize quick energy consumption braking stop.

Note: to use braking unit, please set P13.00 as 1. For selection of type of braking unit parts, refer to 1.9 braking resistance selection.

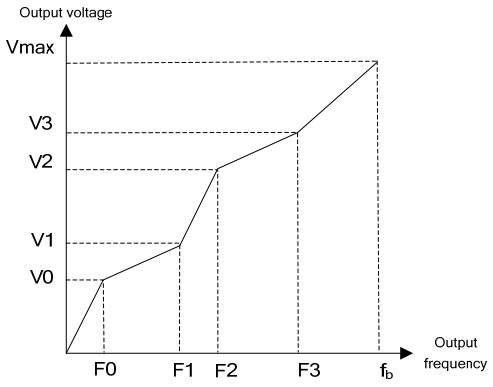
7.4.5 Group P14 V/F control parameter

P14.00	V/F curve set	0～4 (0)
P14.01	V/F voltage value V0(V)	0.0～380.0 (76.0)
P14.02	V/F frequency value F0(Hz)	0.00～300.00 (10.00)
P14.03	V/F voltage value V1(V)	0.0～380.0 (152.0)
P14.04	V/F frequency value F1(Hz)	0.00～300.00 (20.00)
P14.05	V/F voltage value V2(V)	0.0～380.0 (228.0)
P14.06	V/F frequency value F2(Hz)	0.00～300.00 (30.00)
P14.07	V/F voltage value V3(V)	0.0～380.0 (304.0)
P14.08	V/F frequency value F3(Hz)	0.00～300.00 (40.00)
P14.09	V/F voltage value V4(V)	0.0～380.0 (380.0)
P14.10	V/F frequency value F4(Hz)	0.00～300.00 (50.00)

P14.00 parameter confirms different V/F curves under voltage vector V/F control running mode (P10.00=0).



V/F curve



Multi-section V/F curve

Figure 7-12 VF curve diagram

P14.00＝0 is suitable for constant-torque load condition, and what between V and

F is the linear relation with coefficient as 1. For details, see straight line in the figure.

P14.00＝4 with self-defined curve, which is suitable for subsection constant-torque load; see figure.

In 7−12: F0<F1<F2<F3<F4≤fb

Fb is basic running frequency P40.01

V0≤V1≤V2≤V3<V4≤Vmax

V0, V1, V2, V3, V4 is actual output voltage ((V1= (Vmax/ fb) * F1 default Vmax=380V，fb=50Hz) relative to maximum output voltage, rated frequency.

P14.00＝1～3 is suitable for variable torque load of fan, water pump, etc. P14.00 is set as 1-3, respectively corresonding to 1.2 power, 1.5 power, 2 power curve; see Figure 7-12. 2 power curve is for water supply, and 1.2 power, 1.5 power curve is for load of other mediums. Select proper curve according to actual conditions.

7.5 Group P2X: motor parameter group

7.5.1 Group P20: basic motor parameter

P20.00	Motor type	0～1(0)

For motor type, select:

0: asynchronous motor

1: synchronous motor

P20.01	Rated power (Kw)	0.4～999.9( )
P20.02	Motor rated current (A)	0.1～999.9( )
P20.03	Motor rated frequency (Hz)	0～300(50)
P20.04	Motor rated speed (rpm)	0～30000(1500)
P20.05	Motor rated voltage (V)	0～480(380)
P20.06	Motor pole	2～128(4)
P20.07	Motor rated slip frequency (Hz)	0.1～6553.5(0.0)
P20.11	Motor rated torque (Hz)	0.1～6553.5(0.0)

For P20.00 motor type, select:

0: asynchronous motor

1: synchronous motor

P20.01～P20.07 and P20.11 is used for setting the motor parameter driven by the inverter. Before using, set the parameter correctly according to motor nameplate.

P20.06 is used for setting the motor pole, which is set by the nameplate.

If there is no parameter of motor pole on the nameplate, calculate it according to below formula:

Number of poles = (120×f) ÷n.

In which: n for rated speed; f for rated frequency.

For the calculated values, take even-integral number as "number of poles".

Note: inverter power level shall match with the motor.

P20.07 is used for setting of slip frequency.

If there is no slip frequency data on the motor nameplate, P20.07 values can make calculation according to below formula:

Set: rated frequency as f (P20.03), rated speed as n (P20.04), motor poles as p (P20.06), then slip frequency = f— ((n×p) ÷120) .

Foe example: when rated frequency is 50Hz, rated speed is 1430rpm, motor pole is 4, then set value of P20.07 ＝50— ((1430×4) ÷120) ＝2.33Hz.

P20.08	Maximum slip frequency of motor	0.1～6553.5(0.0)
P20.09	Motor phase sequence	0～1(1)
P20.10	Motor zero-load current coefficient	0～100.0(32.00)

P20.08 sets maximum slip frequency of the motor, which is usually 2 times rated slip frequency.

P20.09 sets rotating direction of the motor; 0 for negative phase sequence; 1 for positive phase sequence.

P20.10 sets motor zero-load current coefficient, which is usually about 30%.

P20.11	Motor rated torque	0.1～6553.5(0.1)
P20.12	Motor maximum power coefficient	100～300(200)

P20.12 motor maximum power coefficient is used for limiting maximum torque output allowed currently by the inverter under closed-loop vector control mode. When the current actual output power of the inverter is smaller than the power set by P20.12, maximum torque output allowed by the inverter is limit value of P70.04

output moment; otherwise maximum torque output allowed by the inverter would decrease gradually, with the power maintained no more than P20.12.

Above-mentioned two parameters are not required for setting and adjustment during normal uses.

7.5.2 Group P21: advanced motor parameter

P21.00	Parameter self-tuning	0～6(0)

Select execution method of parameter self-tuning (see start menu):

0: normal running

1: encoder static self-learning

2: encoder correction self-learning

3: encoder self-learning study

4: motor static self-learning

5: motor dynamic self-learning

6: motor static advanced self-learning

7: encoder dynamic self-learning

After self-tuning process is completed, restore as 0 automatically.

Note: If the motor is relieved from the load, choose dynamic self-learning; otherwise it can only choose static self-learning. When the parameter self-learning is started, ensure the motor is under static condition. In case of overcurrent, overvoltage fault during self-learning, extend the acceleration, deceleration time P40.02, P40.03properly.

In case the inverter does not match with motor power, please choose static self-learning. After tuning, change the no-load current coefficient P20.10 into about 40% of motor rated current P20.02 manually.

For known motor parameter, please write to the corresponding parameter directly; if the motor parameter is unknown, please execute parameter self-tuning.

For asynchronous motor, when the inverter needs new cooperation from the motor every time, perform self-learning first to obtain the motor's internal feature parameter; for specific steps, see below:

All wires with the inverter, encoder can be completed correctly;

Inverter is power on, and set the required parameter in Group P20;

Make the contactor connecting the inverter and motor closed (if there is two contactors, then both shall be closed), making them well connected. Ensure band type brake of dragging machine would not be opened;

Select "2 Motor tuning" in the operator main menu, and press "Enter" to enter "Self-learning" menu;

There is display of "ATun＝0" in the "Self-learning" menu, and the data at right of equal mark is changeable. Change 0 to 6, and use the mode of motor static advanced self-learning. Press "Enter" again, the motor starts self-learning;

At this point, the menu is displayed with 9, 8, 7, 6, 5, 4, 3, 2, 1, till 0. When 0 is displayed, it means self-learning is completed. If it displays failed self-learning, please find out reasons and then start self-learning again.

Special note: during actual operations, motor tuning cannot be executed by modification of this parameter (it is read only). Instead, perform motor tuning (or motor parameter self-learning) on the special menu for motor tuning of the operator. Operational methods are as below:

P21.01	Motor stator resistance (Ω)	0.000～65.000(0.0)
P21.02	Motor rotor resistance (Ω)	0.000～65.000(0.0)
P21.03	Motor stator inductance (mH)	0.000～65.000(0.0)
P21.04	Motor rotor inductance (mH)	0.000～65.000(0.0)
P21.05	Mutual inductance (mH)	0.000～65.000(0.0)

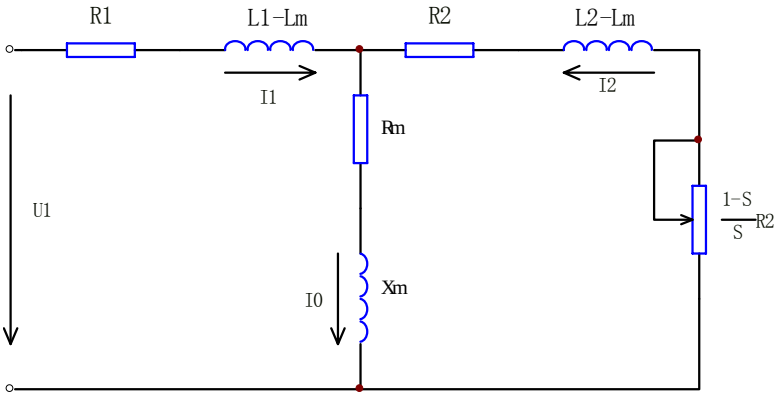


Figure 7-13 Circuit diagram for steady-state equivalence of asynchronous motor

R1, R2, L1, L2, Lm, I0 in the figure stands for stator resistance, stator inductance, rotor resistance, rotor inductance, mutual inductance, excitation current respectively. Excitation current can be figured out through motor rated current, motor power factor, also through rotation self-tuning.

Relation among rated torque current, excitation current and motor rated current:

Rated moment current = power factor × motor rated current

Zero-load excitation current = $\sqrt{1-powerfactor^2} \times motorratedcurrent \times motorefficient$, normally, motor efficient is about 85%

P21.01, P21.02 , P21.03, P21.04 and P21.05 is only valid for asynchronous motor, which is internal feature parameter of the motor, and automatically obtained through self-learning on motors by the inverter.

Through execution of parameter self-tuning, determine key motor parameters that would affect inverter running control. These motor parameters would be saved in the inverter automatically after completion of parameter self-tuning, till parameter input or self-tuning next time.

Parameter self-tuning process is as below:

Input P20.00～P20.11 correctly according to motor nameplate; set up the basic running frequency P40.01, maximum output frequency P70.02 and maximum output voltage P70.03 correctly; set up proper acceleration/deceleration time P40.02, P40.03.

Select execution method for parameter self-tuning (see start menu):

7.5.3 Group P22: motor auxiliary parameter

P22.00	Moment of inertia (kgm^2)	0～(1)

P22.00 set up the moment of inertia of the motor, and initial value is figured out according to mechanical inertia, and can be slightly adjusted during actual running.

P22.01	Encoder type	0～3(0)
P22.02	Encoder pulse number	0～8196(1024)
P22.03	Encoder fractional frequency	0～100(1)

P22.04	Encoder position angle	0.01～(0)
P22.05	Encoder feedback speed filtering	0～30(0)
P22.06	Encoder direction	0～1(1)
P22.07	SinCos encoder subdivision	0～11(11)

Encoder type, pulse number per revolution, fractional frequency coefficient, position angle is read from self-learning, and cannot be set. Filtering time shall be adjusted within the controllable range, and for the encoder, select software, replace P22.06 or hardware wires according to actual conditions.

Parameter P22.04 is phase angle data of the encoder, which is valid for synchronous motor. It is not a set parameter, instead, it is a feature parameter of motor and encoder that is obtained automatically from the inverter's fist running.

For parameter P22.06, select encoder feedback direction, with default value as 1, which is normally not changed. However, in case the encoder connection is wrong, which causes feedback direction contrary to actual direction, it can be adjusted through modification of parameter P22.06.

Parameter P22.07 sets up the subdivision coefficient of the inverter: set up N, with actual value as 2^N power, such as 7, and actually 2^7=128

7.5.4 Group P23: motor protection parameter:

P23.00	Motor overheat protection select	0～1(0)
P23.01	Motor sensor protection threshold	0.00～10.00 (5.00)
P23.02	Motor overload protection time	0.5～300.0(60.0)

P23.01 setting

Units order: protection mode

0: motor current mode;

1: sensor mode ;

2: no action;

Tens place: low speed

0: action (for normal motor);

1: no action (for variable frequency motor);

When units order of P23.01 is set as sensor mode, P23.02 can be set to limit input voltage value, and P23.03 sets overload protection time.

When units order of P23.01 determines whether to execute motor overload protection; for execution of motor overload protection, use current mode or sensor mode?

0: motor current mode: perform overload calculation according to motor current, running frequency and running time, and compare it with overload time allowed by the motor that is determined by P23.02. When the overload time is accumulated and reached, the inverter would report faulty motor overload.

Note: during inverter running and stop, motor overload protection is under calculation; and when the inverter is power off, overload accumulation would be reset.

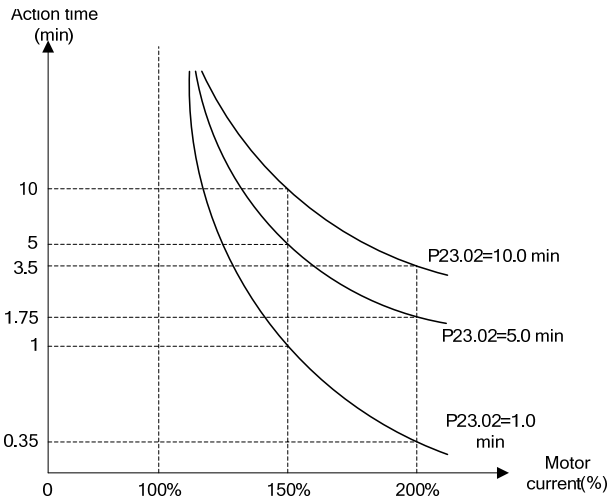


Figure 7-14 Motor overload protection feature curve (constant-torque)

1: sensor mode: compare analog feedback quantity of thermal sensor installed on the motor with preset sensor protection threshold value P23.02; if feedback quantity is larger than this protection threshold value, the inverter would immediately report overheat fault, without inverse time lag feature.

2: when the motor protection does not act, the inverter would not protect the motor overload condition. Please be careful.

Tens order of P23.01:

0: action: as the motor would have poor heat elimination effect during low-speed

running, please reduce the rating based on the motor overload protection time that is determined by P23.02.

1: no action: use some special motors, such as variable frequency motor; select low-speed rating reduction without action. Please be careful.

P23.03	Motor low-speed overcurrent threshold value(%)	0.00～（150.00）
P23.04	Motor low-speed overcurrent time(s)	0.1～ （60.0）
P23.05	Motor high-speed overcurrent threshold	0.00～（120.00）
P23.06	Motor high-speed overcurrent time(s)	0.1～ （30.0）

P23.03～P23.06 sets up threshold value for the motor speed and overcurrent, usually within 10% for overspeed. And overcurrent scale and time is inverse proportion function. When the overcurrent peak is higher, the set time would be shorter.

Set these parameters after proper reduction according to motor report. High-speed and low-speed is within 20%.

7.6 Group P3X: terminal parameter group

7.6.1 Group P30: digital quantity input parameter

P30.00	X0 terminal input function select	0～31(0)
P30.01	X1 terminal input function select	0～31(0)
P30.02	X2 terminal input function select	0～31(0)
P30.03	X3 terminal input function select	0～31(0)
P30.04	X4 terminal input function select	0～31(0)
P30.05	X5 terminal input function select	0～31(0)
P30.06	X6 terminal input function select	0～31(0)
P30.07	X7 terminal input function select	0～31(0)

Function input terminal definition table:

No.	Function definition	No.	Function definition
0	No function	1	Acceleration/deceleration time
2	Acceleration/deceleration time	3	Digital quantity speed 0
4	Digital quantity speed 1	5	Digital quantity speed 2
6	Digital quantity speed 3	7	Corotation (FWD)
8	Reverse rotation (REV)	9	Three-wire run control
10	Analog quantity speed 0	11	Analog quantity speed 1
12	Analog quantity speed 2	13	External reset terminal
14	External fault terminal	15	External self-learning input
16	Emergency power running	17	Weighing compensation input
18	Base electrode block	19	Light load switch input
20	Heavy load switch input	21	Output contactor feedback
22	Brake contactor feedback	23	Brake limit feedback
24	Motor parameter group switch	25	Motor parameter group switch 1
26	Control parameter group	27	Control parameter group switch 1
28	Pulse frequency DI0 input	29	Pulse frequency DI1 input
30~31	Reserve		

0: no function

1: acceleration/deceleration time terminal 1

2: acceleration/deceleration time terminal 2

For methods, see below table.

Acceleration/deceleration time terminal 2	Acceleration/deceleration time terminal 1	Acceleration/deceleration time select
OFF	OFF	Acceleration/deceleration time 0 (P40.02, P40.03)
OFF	ON	Acceleration/deceleration time 1 (P40.04, P40.05)
ON	OFF	Acceleration/deceleration time 2 (P40.06, P40.07)
ON	ON	Acceleration/deceleration time 3 (P40.08, P40.09)

3: digital quantity speed 0

4: digital quantity speed 1

5: digital quantity speed 2

6: digital quantity speed 3

For methods, see P41.00～P41.15 description

7: terminal corotation input (FWD)

8: terminal reverse rotation input (REV)

9: three-wire running control

Only valid for terminal run command set mode (P10.02=1); for methods, see P10.01 description.

10: analog quantity speed 0

11: analog quantity speed 1

12: analog quantity speed 3

For methods, see P51.14～51.21 description.

13: external reset terminal

Realize fault reset of external terminal

14: external fault terminal

This terminal would sent one fault signal to the inverter through external input, and make the inverter stop running.

15: external self-learning input terminal, magnetic pole tuning input

External input signal control self-learning start

16: emergency power running

Instruct the inverter to run under external emergency conditions

17: weighing compensation input

Weighing compensation command input for special application users

18: base electrode block

This function can make the inverter forbid input effectively

19: light load switch input

20: heavy load switch inpt

These are for comparison between actual load weight and counterweight; lower for light load, and larger for heavy load.

21: output contactor feedback

Normally used with output function 17. Control the inverter with output contactor to confirm its closing condition before the inverter outputs current, and meanwhile cut

off the inverter output duly when the contactor jumps aside.

22: brake contactor feedback

Normally used with output function 18. Judge if the output contactor is closed.

23: brake limit feedback

Normally used with output function 18. Judge if the brake is opened real-time

24: motor parameter group switch 0

25: motor parameter group switch 1

For methods, see below table:

Motor parameter	Motor parameter switch	Motor parameter group select
OFF	OFF	Motor parameter group 0
OFF	ON	Motor parameter group 1
ON	OFF	Motor parameter group 2
ON	ON	Motor parameter group 3

26: control parameter group switch 0

27: control parameter group switch 1

For methods, see below table:

Control parameter group switch 1	Control parameter group switch 0	Control parameter group select
OFF	OFF	Control parameter group 0
OFF	ON	Control parameter group 1
ON	OFF	Control parameter group 2
ON	ON	Control parameter group 3

28: pulse frequency DI0 input

29: pulse frequency DI1 input

When pulse frequency DI input is used as set, Xi terminal must select this function.

P30.08	X0～X7 terminal filtering time (s)	0.000～1.000(0.000)

Anti-interference capacity of the terminal can be improved through properly increasing setting of P30.08. The longer the terminal filtering time is, action delay time of the terminal would be longer.

P30.09	Backup	

P30.10	Backup	

Chapter 8 Fault inspection

This chapter describes the fault codes, reasons and countermeasures of the inverter, and provides an analysis to the faults during elevator operation.

DANGER

◎ **Maintenance may be performed only 10 minutes after the input power is cut off, when the charging indicator is off or the bus DC voltage is below 24 V.**

Or electric shock may occur.

◎ **Do not change anything about the inverter by yourself.**

Or electric shock or injury may occur.

◎ **Maintenance shall be performed by authorized personnel qualified in electrical engineering. Do not leave any wire end or metal object in the inverter.**

Or fire may occur.

CAUTION

◎ **Do not change the wiring or remove connectors when the Inverter is powered.**

Or electric shock may occur.

8.1 Protection and inspection

When a fault occurs to the Inverter, the fault LED on the digital operator will be on, and the LED digital tubes show the fault code.

The Inverter provides 49 fault codes. The fault codes and corresponding faults are shown in Table 8.1 Fault List.

Table 8.1 Fault List:

Fault code	Display	Possible causes	Measures
1	Module overcurrent protection	Voltage at DC end too high	Check grid power, and check; check if there is quick stop without energy consumption brake due to large mass load.
		Short-circuit	Check if motor and output connection is short-circuited, or short-circuit to ground
		Output with phase-lack	Check if motor and output connection is loosening
		Encoder fault	Check if the encoder is damaged or connection is correct
		Poor or damaged hardware contact	Have technical personnel maintain
		Internal connector loosening	Have technical personnel maintain
		Circuit part overheating due to cooling fan or cooling system problems	Check cooling fan. Check if the cooling fan power is correct or clogged
		Warning: the inverter must be started after fault is cleared to avoid damages of IGBT.	
2	ADC fault	Current sensor damaged	Replace the current sensor
		Current sampling circuit faulty	Replace control panel
3	Heatsink Overheat	Environment temperature too high	Reduce environment temperature and strengthen ventilation and heat emission. Keep the surrounding temperature lower than 40°or check the inverter capacity according to this performance
		Cooling fan damaged or foreign matter entering cooling system	Check if fan power line is connected, or replace with one with the same model and remove foreign matter
		Cooling fan unusual	Check cooling fan. Check if cooling fan power is correct or clogged.
		Temperature check circuit faulty	Have technical personnel maintain
4	Brake unit fault	Brake unit damaged	Replace with corresponding drive module or control panel
		External brake resistance or lines opened circuit	Replace with resistance or connect the lines
5	Fuse blown	Current too large causing blown fuse	Check if fuse loop is opened circuit, or connection loosening
6	Output over-torque	Input power voltage too low	Check the input power
		Motor with rotor blocked or load severely changed	Prevent motor with rotor blocked and reduce severe change of load
		Encoder fault	Check if the encoder is damaged or connection is correct

Fault code	Display	Possible causes	Measures
		Output with phase-lack	Check if the motor and output connection is loosening
7	Speed deviation	Acceleration time too short	Extend acceleration time
		Load to large	Reduce the load
		Current limit too low	Improve limit value properly within the permissible range
8	Bus overvoltage protection (during acceleration running)	Input power voltage unusual	Check input power
		Quick start again when the motor is under high-speed rotation	Start again after the motor stops rotation
	Bus overvoltage protection (during deceleration running)	Load rotary inertia too large	Use proper energy consumption brake elements
		Deceleration time too short	Extend deceleration time
		Brake resistance value too large or no connection	Connect proper brake resistance
		Input power unusual	Check input power
		Load rotary inertia too large	Use proper energy consumption brake elements
		Brake resistance value too large or no connection	Connect proper brake resistance
9	Bus undervoltage	Power voltage lower than minimum working voltage	Check input power
		Transient power off	Check input power, and restart after reset until input voltage is normal
		Voltage change of input power too large	
		Connection terminal of power loosening	Check input connection
		Internal switch power unusual	Have technical personnel maintain
		Load with large pickup current exists within the same power system	Change power system to make it accordance with specification value
10	Output phase-lack	Connection at inverter output side unusual; missed connection or disconnection	Check connection at output side and remove missed connection, disconnection according to operation regulations
		Output terminal loosening	
		Motor power too small, and below 1/20 of maximum proper motor capacity	Adjust the inverter capacity or motor capacity
		Output three-phase unbalanced	Check if motor connection is complete

Fault code	Display	Possible causes	Measures
			With power breakdown, check features of output side and DC side terminal is consistent
11	Motor low-speed overcurrent (during acceleration running)	Grid voltage low	Check input power
		Motor parameter setting unusual	Set the motor parameter correctly
		Direct and quick startup during motor is rotating	Start again after the motor stops rotation
		Acceleration time too short for load inertia (GD2)	Extend acceleration time
	Motor low-speed overcurrent (during deceleration running)	Grid voltage low	Check input power
		Load rotary inertia too large	Use proper energy consumption brake element
		Motor parameter setting unusual	Set the motor parameter correctly
		Deceleration time too short for load inertia (GD2)	Extend deceleration time
		Load with sudden change during running	Reduce frequency and range for sudden change
		Motor parameter setting unusual	Set the motor parameter correctly
12	Encoder fault	Encoder connection incorrect	Change the encoder connection
		Encoder without signal output	Check the encoder and power supply
		Encoder disconnection	Repair disconnection
		Function code with unusual setting	Check if relevant function code is correctly set
13	Check upon shutdown	Current flow without effective cutoff	synchro motor slipping
			Have technical personnel maintain
14	Speed reversing during running	Speed with negative direction	Check if external load suddenly changes
		Encoder not consistent with motor phase sequence	Change motor or encoder phase sequence
		Motor reversing while started, and current reaches limit current	Current limit too low, or motor not matching
15	Speed checked while shutdown	Band type brake loosening, and motor slips	Check band type brake
		Encoder interfered, or loosening	Tighten the encoder and remove interference
16	Motor phase sequence incorrect	Motor connection reversing	Reverse or adjust the parameter
17	Overspeed at the same direction (within permissible maximum	galloping caused as synchro motor is without magnetism	Check the motor
		Angle self-learning for synchro motor not correct	Start self-learning again
		Encoder parameter setting incorrect	Check the encoder loop

Fault code	Display	Possible causes	Measures
	speed)	or interfered	
		Load at forward direction too large or changes suddenly	Check external causes for sudden change
18	Overspeed at the contrary direction (within permissible maximum speed)	galloping caused as synchro motor is without magnetism	Check the motor
		Angle self-learning for synchro motor not correct	Start self-learning again
		Encoder parameter setting incorrect or interfered	Check the encoder loop
		Load at backward direction too large or changes suddenly	Check external causes for sudden change
19	UVW encoder phase sequence incorrect	Encoder connection faulty or parameter setting incorrect	Check connection or change the parameter
20	Encoder communication fault	Encoder fault	Check encoder connection and start self-learning again
21	abc overcurrent (three-phase transient value)	Motor single phase shorted circuit to ground	Check the motor and output line loop
		Encoder fault	Check if the encoder is damaged or connection is correct
		Check loop of drive panel incorrect	Replace the drive panel
22	Brake check fault	Output relay not functioning	Check the control loop
		Brake not opened while relay is functioning	Check brake power line is loosening
		No signal detected for feedback component	Adjust the feedback component
23	Input overvoltage	Incoming voltage too high	Check if the incoming voltage matches with the inverter
		Switch power voltage loop fault	Have technical personnel maintain
24	UVW encoder disconnection	Encoder connection loop fault	Connection terminal loosening or lines damaged or broken
25	backup		
26	Encoder not learning	Synchro motor not learning from encoder angle	Start encoder self-learning
27	Output overcurrent (valid value)	Running under overload condition too long, with larger the load, shorter the time	Stop running for a while, and if it appears again after running, check if the load is within permissible range

Fault code	Display	Possible causes	Measures
		Motor with rotor blocked	Check the motor or band type brake
		Motor coil short circuit	Check the motor
		Output short circuit	Check the connection or motor
28	Sincos encoder fault	Encoder damaged or lines incorrect	Check the encoder and its lines
29	Input phase-lack	Voltage at input side unusual	Check the grid voltage
		Input voltage phase-lack	
		Connection terminal at input side loosening	Check the connection at input side
30	Overspeed protection (exceeding maximum speed protection limit)	Encoder parameter setting incorrect or interfered	Check the encoder loop
		Load with sudden change	Check the external causes for sudden change
		Overspeed protection parameter setting incorrect	Check the parameter
31	Motor high-speed overcurrent	Grid voltage low	Check the input power
		Load with sudden change during running	Reduce the frequency and range for sudden change
		Motor parameter setting unusual	Set the motor parameter correctly
		Encoder parameter setting incorrect or interfered	Check the encoder loop
32	Earthing protection	Connection incorrect	Correct the connection according to user's guide
		Motor unusual	Change the motor and perform ground insulation test
		Leakage current to ground at output side too large	Have technical personnel maintain
33	Capacitor aging	Inverter capacitor aging	Have technical personnel maintain
34	External fault	Input fault signal outside	Check the external fault causes
35	Output unbalanced	Connection at output side unusual, with missed connection or disconnection	Check connection at output side and remove missed connection, disconnection according to operation regulations
		Motor three-phase unbalanced	Check the motor
36	Parameter setting wrong	Parameter setting incorrect	Change the inverter parameter
37	Current sensor fault	Drive panel hardware fault	Have technical personnel maintain
38	Brake resistance	External brake resistance lines shorted circuit	Check the brake resistance connection

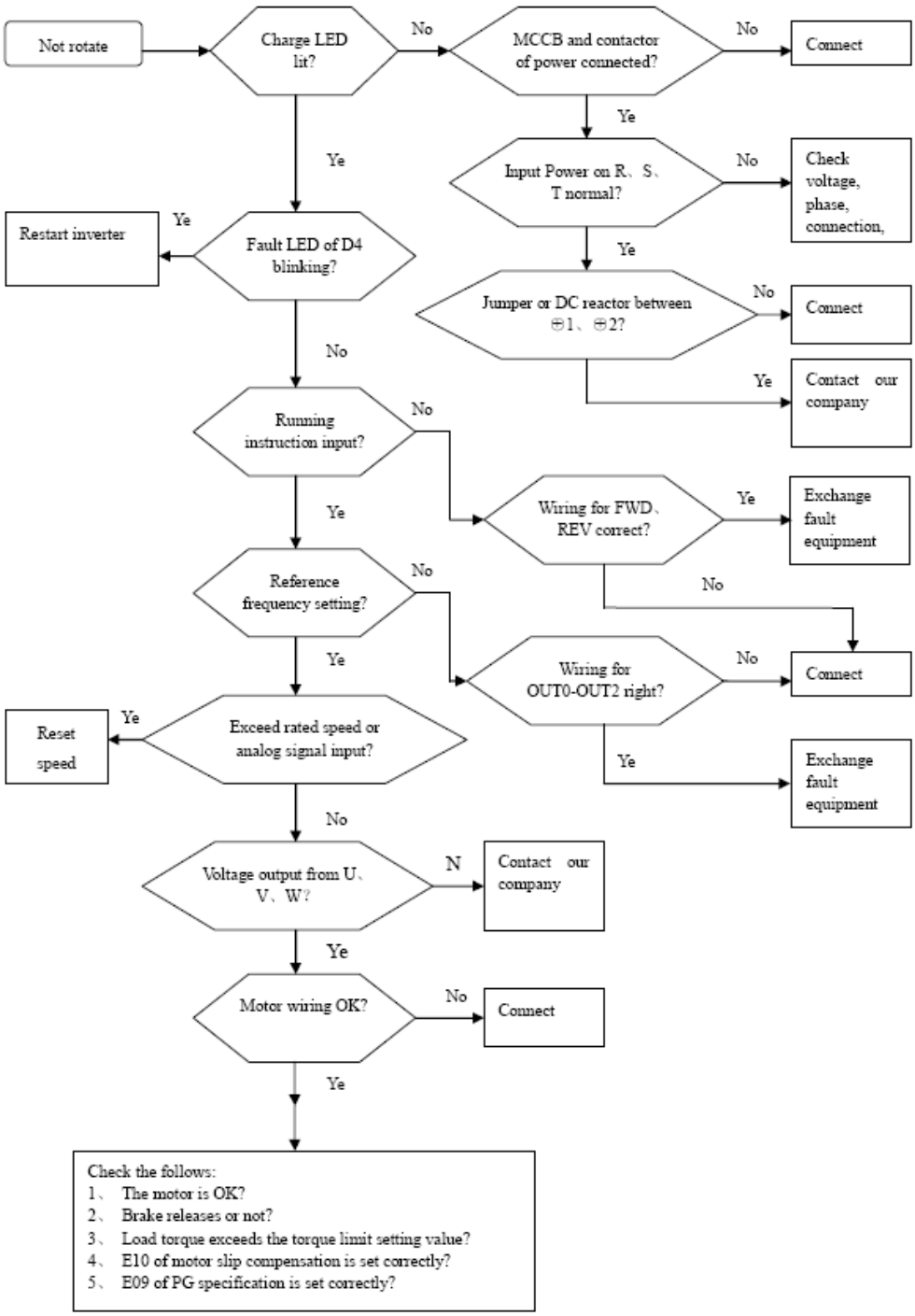
Fault code	Display	Possible causes	Measures
	shorted circuit		
39	Current transient value too large	Give an alarm for too large three-phase current transient value while Ia, Ib, Ic not running	Have technical personnel maintain
		Signal sampling and comparison circuit unusual	Consult with technical service
		Inverter set as main machine	Change the inverter to slave machine

8.2 Workflow of fault diagnosis

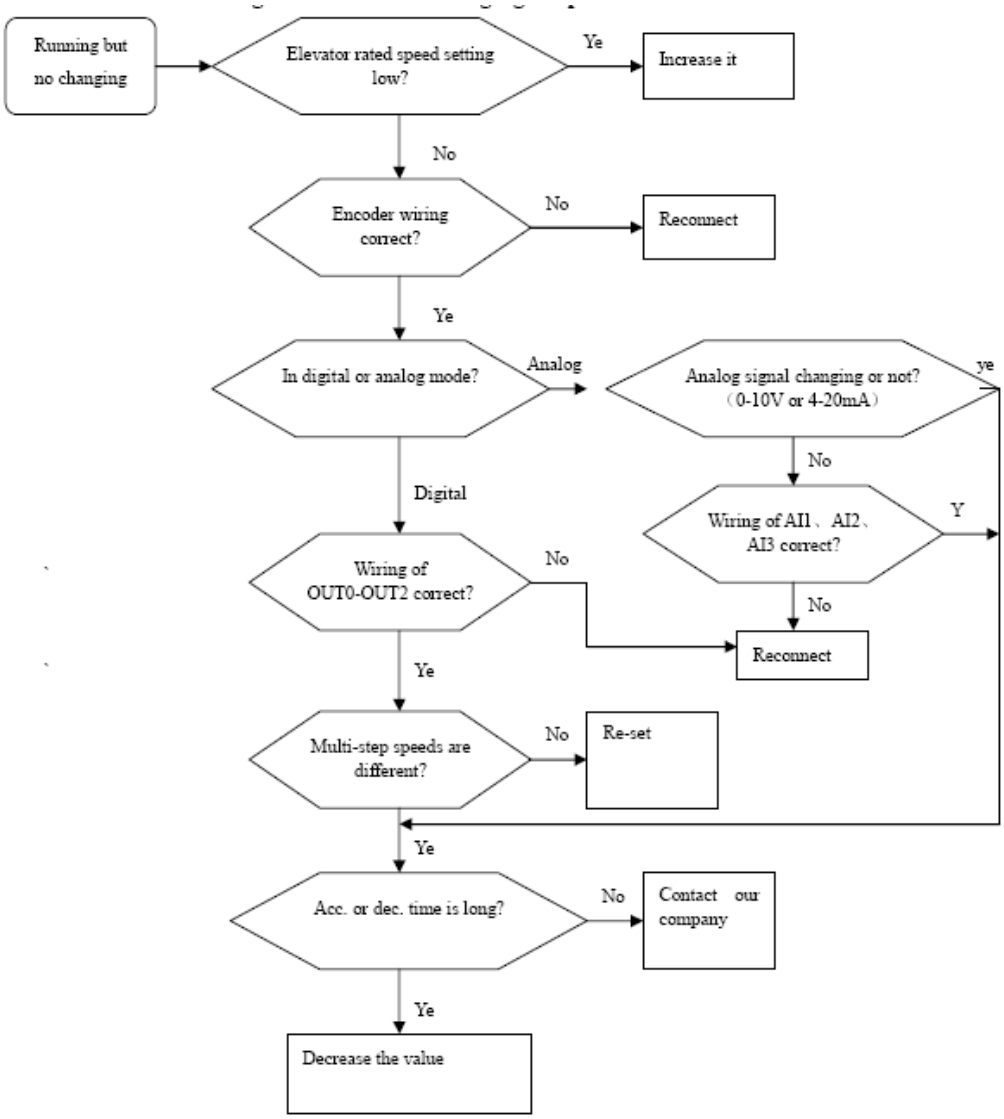
When the system is starting, the inverter or the motor may not operate as required due to causes such as wrong parameter setting or wiring. The following diagnosis flow may be used for fault analysis and treatment in such situations.

Abnormal operation of the motor:

The motor does not run when the control terminal receives a running command.

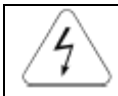


The motor runs without speed variation.


Running but no changing
Elevator rated speed setting low?
Ye
Increase it
No
Encoder wiring correct?
No
Reconnect
Ye
In digital or analog mode?
Analog
Analog signal changing or not? (0-10V or 4-20mA)
ye
No
Digital
Wiring of AI1、AI2、AI3 correct?
Y
Wiring of OUT0-OUT2 correct?
No
No
Reconnect
Ye
Multi-step speeds are different?
No
Re-set
Ye
Acc. or dec. time is long?
No
Contact our company
Ye
Decrease the value

Chapter 9 Servicing and maintenance

This chapter provides the general information on servicing and maintenance.



DANGER

◎ Maintenance shall be performed 10 minutes after the cutoff of the input power supply, with the charging indicator off or the bus DC voltage below 24 V.
Or electric shock may occur.
◎ Do not change anything about the Inverter by yourself.
Or electric shock or injury may occur.
◎ Maintenance shall be performed by authorized personnel qualified in electrical engineering. Do not leave any wire end or metal object in the Inverter.
Or fire may occur.

CAUTION

◎ Do not change the wiring or remove connectors when the inverter is powered.
Or electric shock may occur.

9.1 Guarantee period

We will provide maintenance and repair with the following problems of the inverter:

We will provide maintenance and repair within the guarantee period (dating from the day leaving the factory) for any fault or damage of the inverter in normal application; a certain amount of charge will be required when the guarantee expires.

A certain amount will also be charged for faults due to the following causes within the guarantee period:

1) Repair or modification is performed not according to the user manual or without permission by the user.

2) Applications exceed the specifications.

3) The Inverter falls after the purchase or is damaged during the transportation.

4) Damages are caused by earthquake, fire, flood, lightening strike, abnormal power or other natural disasters or related reasons.

9.2 Product inquiry

Upon any damage, fault or other problems, please contact our offices or service department with the following information:

Inverter type

Production No.

Purchase date

The inquiry may concern damage status, unknown reasons and faults.

9.3 Daily inspection

Since the cover of the Inverter may not be removed when it is powered and running, visual inspection shall be performed to see whether it operates normally. The daily inspection may include the following:

a) Whether the surroundings conform to the specifications;

b) Whether the performance conforms to the specifications;

c) Whether there is abnormal noise, vibration or abnormality;

d) Whether the cooling fan on the inverter works normally;

e) Whether there is overheat.

9.4 Periodic inspection

During periodic inspection, stop the inverter, cut off the power supply, and remove the cover. It takes some time to discharge the storage capacitor on the main circuit. Therefore, wait for the charging indicator to go out and a multimeter shall be used

to check whether the voltage on the DC bus is below the safe level (24VDC). If it is, the inspection may begin.

Immediate contact with the terminals after the power is cut off may lead to an electric shock.

The inspection items are listed in Table 9.1.

Table 9.1 Items of periodic inspection

Item		Details	Method	Criteria
Operation ambient		1) Confirm ambient temperature, humidity, vibration and the existence of dust, corrosive gas, oil fog and water drop. 2) Whether there is dangerous object nearby.	1) Visual, thermometer, hygrometer 2) Visual	1)The ambient temperature shall be lower than 40℃, and the humidity and other items shall conform to the specifications. 2）No dangerous object.
LCD display		1) Whether the LCD display is clear, whether the backlight is even. 2) Whether there is missing digits on the LCD display	Visual	1）Even backlight 2） Normal display
Connecting parts, terminals and bolts		1) Whether any bolt is loosened 2) Whether any connecting part is loosened	1) Fasten 2) Visual	1) No abnormality 2) Secure installation
Main circuit	Conductor	1) Whether the sheath is broken or has a changed color 2) Whether the copper row is distorted	Visual	No abnormality
	Contactor and relay	1) Whether there is vibration 2) Whether the contact is connected	Listening and visual	1) No 2) A clap of connection
	Capacitor	1) Whether there is leakage, color changing, crack or cover expansion 2) Whether the safety valve is out or expand	Visual	No abnormity
	Heat sink	1) Whether there is dust 2) Whether the air duct is	Visual	No abnormity

		blocked or has foreign objects attached on it		
	Cooling fan	1) Whether there is abnormal noise 2) Whether there is abnormal vibration 3) Whether there is color changing or distortion due to overheat	1) Listening, visual, manually rotate the fan after cutting off the power 2) Visual 3) Visual, smell	1) Stable rotation 2) and 3) No abnormality
Control circuit	Insert-piece	Whether there is dust or foreign object on the double-row insert-piece between the control board and the main circuit.	Visual	No abnormity
	Control board	1) Whether there is color changing or order on the control board 2) Whether there is crack, damage or distortion on the circuit board	1) Visual, smell 2) Visual	No abnormity

Appendix A Electromagnetic compatibility

In this appendix, the EMC design and installation precautions are described in terms of noise restraint, wiring requirements, grounding, surge absorption of peripheral equipment, leakage current, installation areas, installation precautions, application of power filter, and treatment of radiation.

A.1 Noise restraint

The inverter will generate noise due to its operation. Its impact on peripheral equipment is determined by noise type, transmission route, design, installation, wiring and grounding of the drive system.

A.1.1 Noise type

Figure A.1 shows noise types.

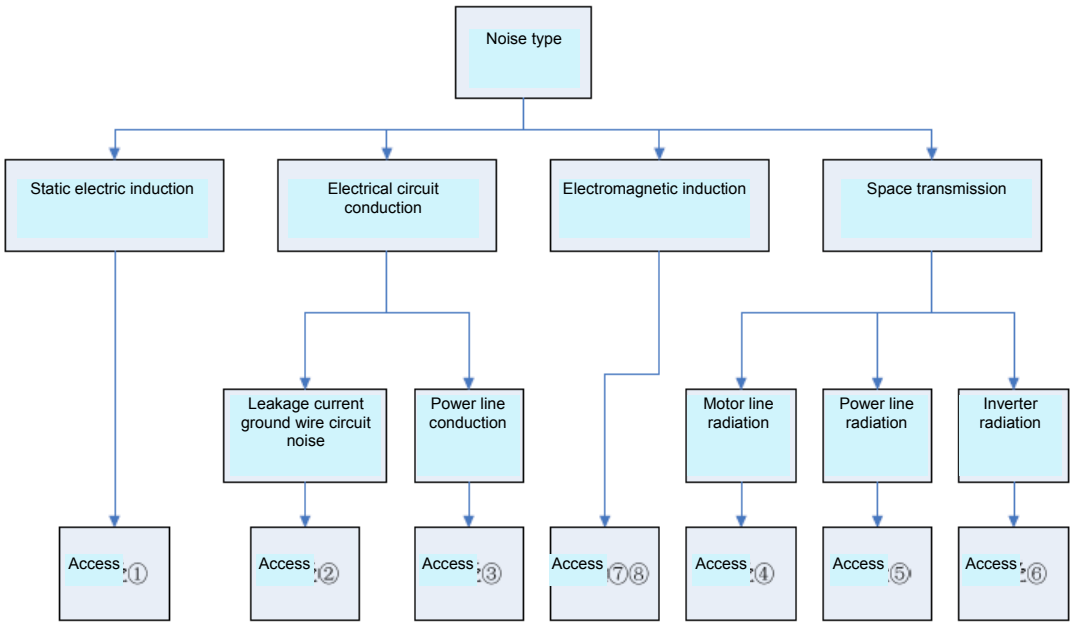


Figure A.1 Noise types

A.1.2 Noise transmission

Figure A.2 shows noise transmission.

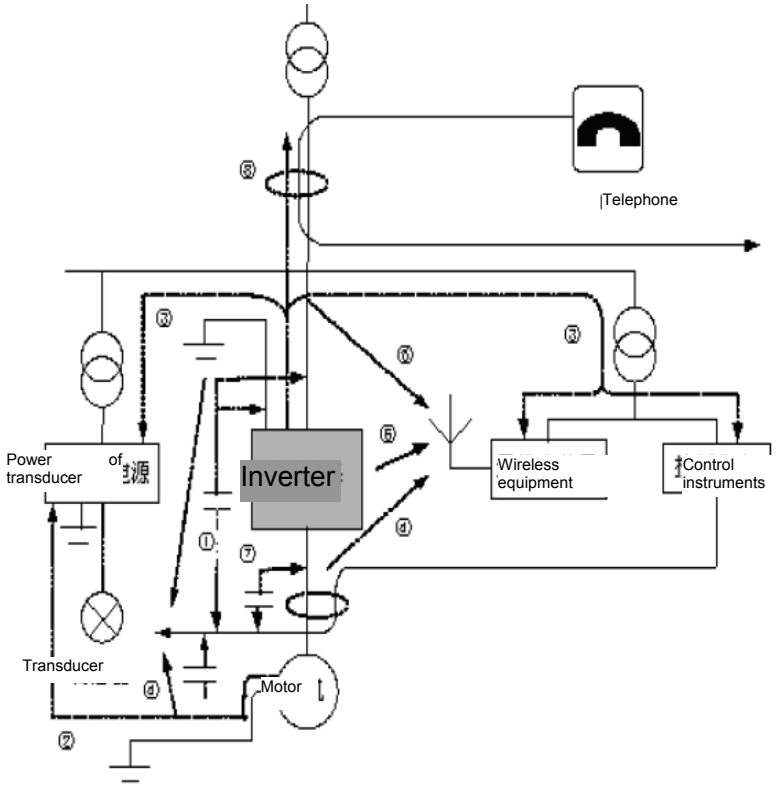


Figure A.2 Noise transmission

A.1.3 Basic Countermeasures for Noise Restraint

The basic measures are listed in Table A.1.

Table A.1 Basic countermeasures for noise restraint

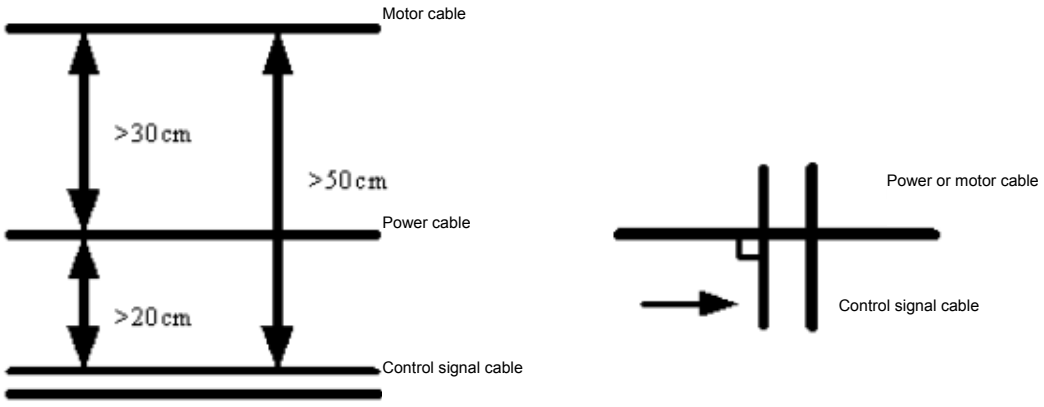
No.	Cause	Countermeasure
① ⑦ ⑧	Peripheral equipment may take wrong actions due to noises transmitted along the signal line caused by electromagnetic induction and electrostatic induction between parallel or bunched signal lines and power lines.	1. Avoid parallel or bunched signal line and power line; 2. Install sensitive equipment away from the Inverter; 3. Keep sensitive signal lines away from the input and output cables of the Inverter; 4. Shielded conductors shall be used for signal and power lines. It will be even better for them to be put in separate metal tubes (with a distance at least 20cm).
②	Peripheral equipment may take wrong actions due to leakage current of the Inverter grounding when the equipment forms a closed loop with the Inverter wiring.	Not grounding the peripheral equipment will eliminate the leakage current.
③	Peripheral equipment may take wrong actions due to the transmission of noises from the inverter along the power line when peripherals and the inverter share the same power supply system.	Install a noise filter on the input side of the Inverter, or separate the peripherals with an insulation transformer/power filter.

④ ⑤ ⑥	Weak peripherals such as control computer, measuring instrument, radio and sensor may take wrong actions when they and their signal lines are installed in the same cabinet with the inverter with the wiring very close to the inverter.	1. Keep sensitive peripherals and their signal lines away from the inverter. Shielded conductors shall be used for signal lines and the shield shall be grounded. Signal cables shall be put in metal tubes and laid away from the inverter and its input and output cables. Keep the signal line and the input or output cable perpendicular when they have to cross. 2. A radio or linear noise filter (ferrite common-mode choking coil) may be installed on the input and the output side of the inverter to restrain the noises from the input and output cables of the inverter. 3. The cable linking the inverter to the motor shall be equipped with a thick shield and may be put in a duct over 2 mm or buried in a cement groove. The cable shall be put in metal tubes and the shield shall be grounded (as for motor cables, 4-core conductors may be used, with one conductor grounded on the inverter side and another connected to the motor cover).

A.2 Wiring Requirements

A.2.1 Cable laying

To avoid interference coupling, the control signal cable, the power cable and the motor cable shall be laid separately, with enough distances and kept as far as possible, as shown in Figure A.3 (a). When the control signal line has to cross the power line or the motor line, they shall be kept perpendicular, as shown in Figure A.3 (b).



(a) Parallel layout (b) Crossing layout

Figure A.1 Wiring requirements

A.2.2 Cable cross-section area

Since bigger cross-section area means higher capacitance and leakage current to the earth, the motor shall be used at a lower power when its cable has a big cross-section area to lower its output current (5% will be lowered with the reduction of one step of the cross-section area).

A.2.3 Shielded cable

Armoring shielded cables with high frequency and low impedance shall be used, such as braided copper net and aluminum net.

A.2.4 Installation of shielded cable

Shielded conductors are usually used for control cable. The metal shield shall be connected to the metal housing with the cable clamps on both ends in a 360° ring, as shown in Figure A.4. Figure A.5 shown a wrong shielding.

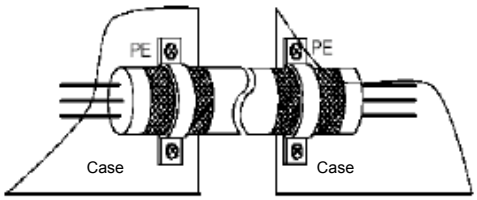


Figure A.4 Correct wiring to PE

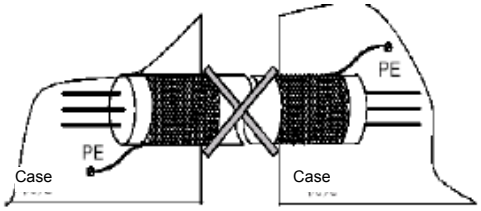


Figure A.3 Incorrect wiring to PE

A.3 Grounding

A.3.1 Grounding method

Figure A.6 shows the grounding method.

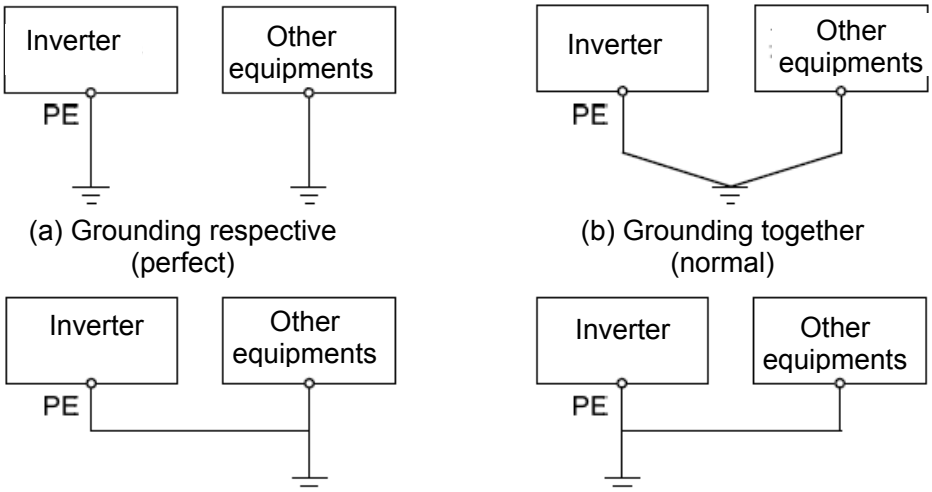


Figure A.6 Grounding

Among the four grounding methods shown above, (a) is the most preferable and is recommended.

A.3.2 Grounding precautions

(1) Cables with standard cross section area shall be used for grounding, to keep the grounding impedance as low as possible. Since the high-frequency impedance of flat cable is lower than that of round cable, flat cable shall be selected given the same cross-section area.

(2) The grounding cable shall be as short as possible, with the grounding point as close to the Inverter as possible.

(3) When 4-core cables are used for the motor, one shall be grounded on the inverter side and the other on the motor side. When both the Inverter and the motor are equipped with specific grounding poles, optimal grounding may be expected.

(4) Noises from the leakage current of grounding may impact the inverter and peripherals in the control system when different parts of the system are grounded together. Therefore, the inverter shall be separately grounded from weak equipment such as computer, sensor or audio in the same control system.

(5) To reduce high-frequency impedance, the fixed bolts may be used as the high-frequency terminal connected with the back panel of the cabinet. The insulation paint on the fixed point shall be removed before installation.

(6) Grounding cables shall be laid away from the I/O wiring of noise sensitive equipment, and kept as short as possible.

A.4 Surge absorber installation

Surge absorbers shall be used for apparatus with heavy noises such as relay, contactor and electromagnetic brake even when they are installed outside the inverter housing, as shown in Figure A.7.

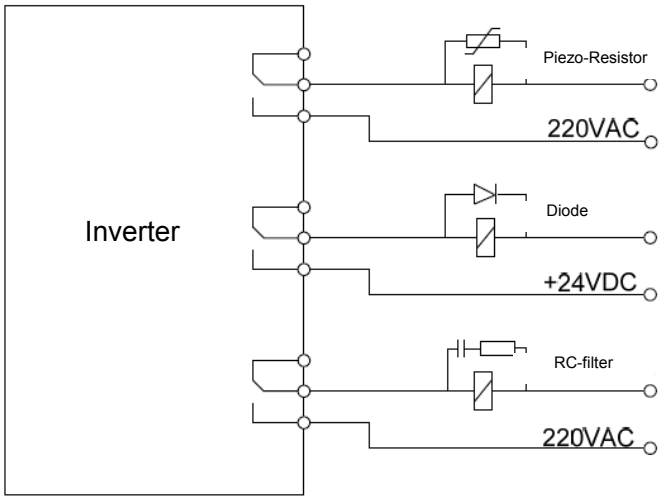


Figure A.7 Application of relay, contactor and electromagnetic brake

A.5 Leakage current and countermeasures

Figure A.8 shows that the leakage current will flow through the line capacitor and motor capacitor on the input and output sides of the Inverter, including the leakage current to earth and the leakage current between lines. The leakage current is determined by the carrier frequency and the capacitance.

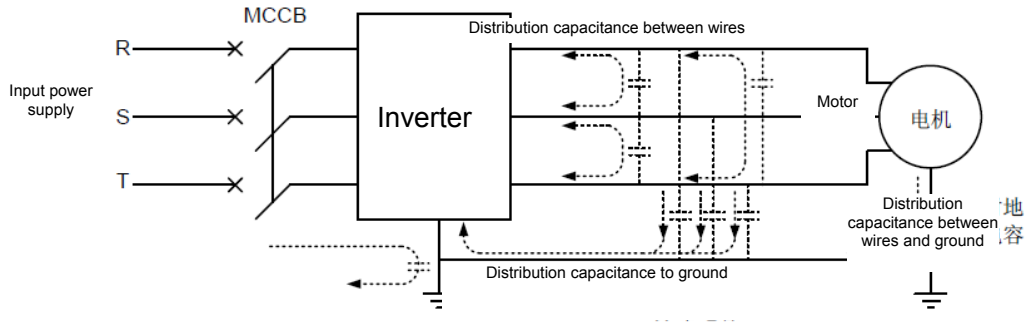


Figure A8 Leakage current path

A.5.1 Leakage current to earth

Leakage current to earth may not only enter the inverter, but also other equipment through the grounding conductor, causing wrong actions of leakage circuit-breaker, relay or other equipment. The leakage current goes higher with higher carrier frequency and longer motor cable.

Countermeasures: lower the carrier frequency; shorten the motor cable as much as possible; use a leakage circuit-breaker specifically designed for high harmonic/surge applications.

A.5.2 Leakage current between lines

External thermal relays may take wrong actions due to the high harmonic of the leakage current cross the distributed capacitors on the output side of the inverter. Especially for inverters with capacity lower than 7.5 kW, higher leakage current with a long conductor (above 50 m) may trigger wrong actions of external thermal relays.

Countermeasures: lower the carrier frequency; install an AC reactor on the output side; use a thermal sensor to directly monitor the motor temperature; use the electronic thermal relay for motor over-load protection of the inverter itself instead of an external relay.

A.6 Restraint of radiation from inverter

The control cabinet containing the inverter is generally made of metal, thus reducing the radiation from the inverter to the instruments and equipment outside the cabinet. The connecting cable is the major radiation source. Since the cables for inverter power supply, motor, control circuit and keyboard shall be led out of the shielded cabinet, special measures shall be taken at the cable entry, or the shielding may be invalidated.

In Figure A.9, the cables in the shielded cabinet function as antenna receiving the radiation inside the cabinet and sending it to the outer space. In Figure A.10, the shield of the cable is connected to the cover at the exit and grounded, thus sending the radiation in the cabinet directly to the ground and avoiding its going out.

In the shielded grounding shown in Figure A.10, the cable shield shall be grounded as close to the exit as possible, or the length between the exit and the grounding point still works as a coupling antenna. The distance between the grounding point and the exit may not exceed 15cm and shall be as short as possible.

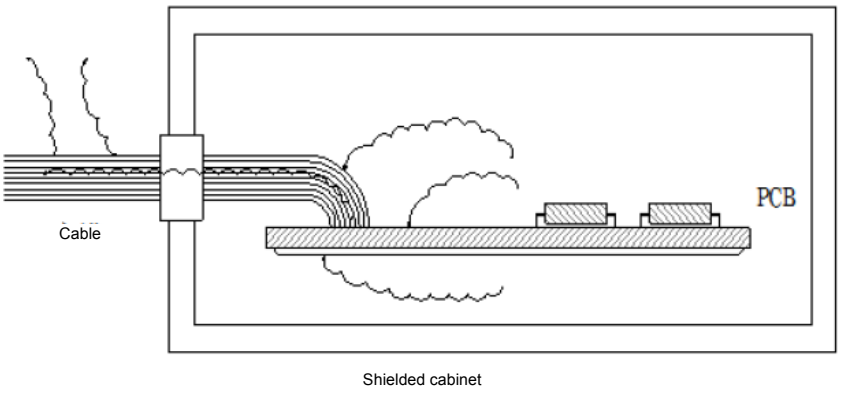


Figure A.9 Radiation from cables going out the shielded cabinet

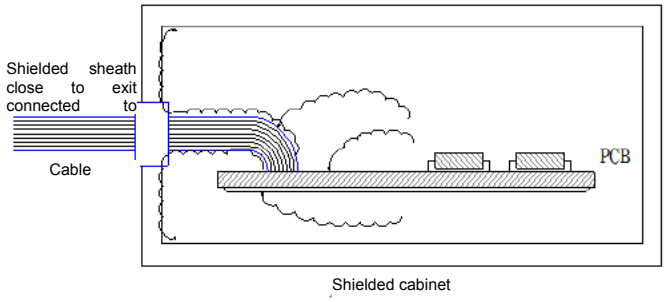


Figure A.10 Radiation restraint by connecting the cable shield with the housing

A.7 Application of filter for power lines

Filters for power lines may be used for equipment generating strong interferences or sensitive to interferences.

A.7.1 Functions

(1) The filter for power lines is a double-direction lowpass, which only allows direct current and 50Hz industry frequency current to go through, and blocks electromagnetic interferences with high frequencies. Therefore, it may prevent the electromagnetic interferences generated by itself from going into the power line, but also vice versa.

(2) With the filter, the equipment easily meets the EMC requirements on transmission and transmission sensitiveness, and at the same time the radiation of the equipment is restrained.

A.7.2 Installation of filter for power lines

(1) In the cabinet, the filter shall be installed as close to the entry of the power line as possible, and the power input line of the filter shall be as short as possible in the cabinet.

(2) If the input line and the output line of the filter are laid too close to each other, high-frequency interferences will bypass the filter, the input and the output lines will directly couple, and the filter will work no longer.

(3) There is normally a specialized grounding terminal on the filter housing. When

the grounding terminal is connected to the housing through a conductor, the filter will not work effectively because of the high impedance of the conductor which reduces the bypassing effect. The correct installation is to put the filter cover on the conductive metal housing surface, with the contacting area as large as possible. The insulation paint shall be removed before the installation to ensure good electrical contacting.

A.8 EMC installation areas

In the drive system consisting of an inverter and a motor, the inverter and peripherals such as control devices and sensors are normally installed in the same cabinet. The interference from the cabinet to the outside may be restrained through measures at the main connecting point, and a radio filter and an AC reactor shall be installed at the cable entry of the cabinet. EMC standards shall also be met within the cabinet.

In the drive system consisting of an inverter and a motor, the inverter, the braking unit and the contactor are all strong noise sources impacting normal function of sensitive peripherals such as automatic devices, encoders and sensors. Peripherals may be installed in different EMC areas according to their electrical characteristics, thus separating noise sources and receivers, which is the most effective way of reducing noises.

The division of EMC areas for inverter installation is shown in Figure A.11.

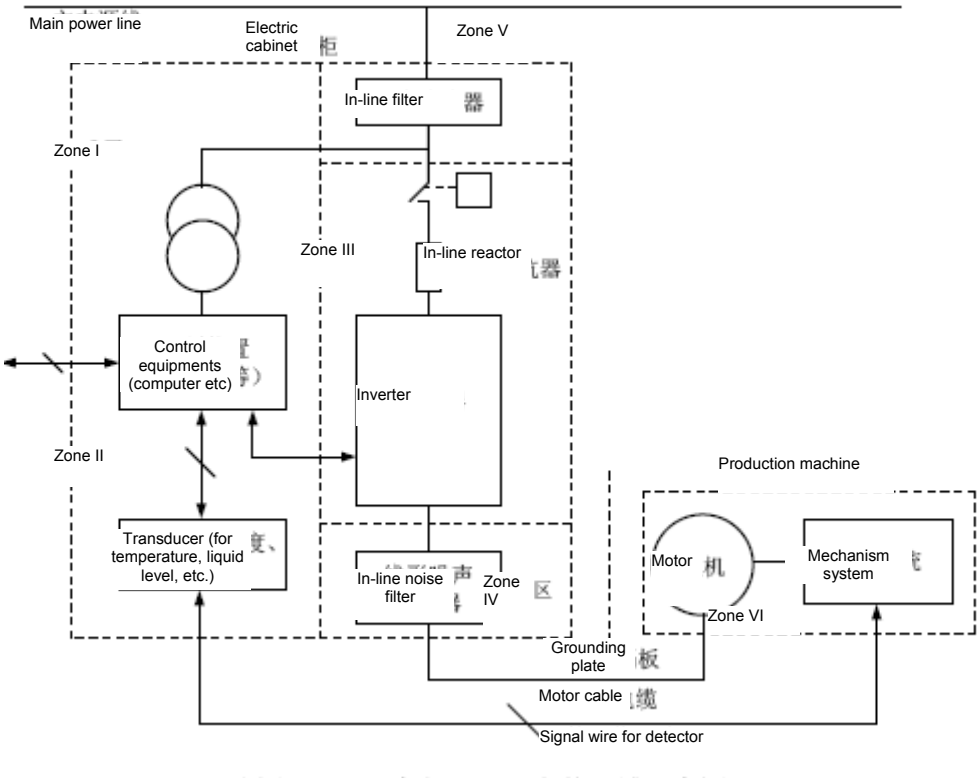


Figure A.11 EMC installation areas for the inverter

Notes on the installation areas:

I: control circuit transformer, control devices, sensors, etc..

II: control signals and interfaces, with a certain degree of interference resistance.

III: in-line reactor, inverter, braking unit, contactor and other major noise sources.

IV: output noise filter and its wiring.

V: power supply (including the wiring for the radio filter).

VI: motor and its cables.

Each zone shall be separated from the others, with a distance no less than 20 cm, in order to decouple. Grounded spacers may be used for decoupling. Cables from different zones shall be put into different conduits. Filters (if necessary) shall be installed at the interfaces of the zones. All bus cables (such as RS485) and signal cables coming from the cabinet shall be shielded.

A.9 Precautions for inverter electric installation

Figure A.12 shows the electric installation of the inverter:

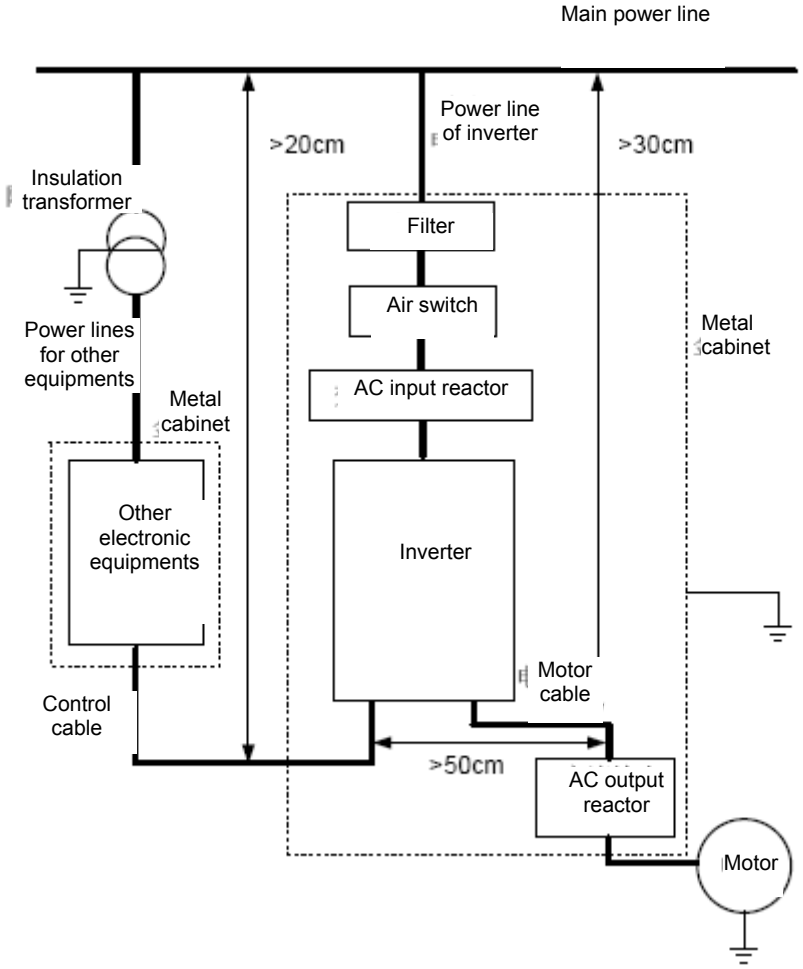


Figure A.12 Electric installation of the inverter

To meet EMC requirements, the following shall be noted during the installation:

(1) The inverter shall be installed in a cabinet, with its bottom and the housing of input filters fixed on the back panel of the cabinet, to ensure good electrical contacting. The distance between the inverter and the filter shall be as short as possible, no more than 15 cm, thus minimizing the high frequency impedance between the two and reducing high-frequency noises.

(2) Install a wide PE terminal at the inlet of the cabinet (with the distance from the exit no longer than 5 cm). The shield of all the incoming and outgoing cables of the cabinet shall be connected to the terminal with a 360° ring to ensure good electrical

contacting.

(3) Shielded cables shall be used for the motor, preferably with a double shield of screw metal belt and metal net. The motor cable shield on the inverter side shall be connected to the back panel with the cable clamps in a 360° ring (as shown in Figure A.4). There shall be two fixing positions: one near the inverter (preferably less than 15 cm), and the other on the grounding terminal. The motor cable shield shall be connected to the grounded metal housing of the motor in a 360° ring when the motor end goes cross the terminal box. If it is too difficult, the shields may be braided and then flattened to connect the grounding terminal, with the width larger than 1/5 of the braid length. The bare cable core and the PE braid shall be as short as possible, preferably smaller than 5 cm.

(4) Shielded cables shall be used for terminal control. The shield shall be connected to the grounding terminal at the entry of the cabinet with metal cable clamps in a 360° ring. It may be connected to the metal housing of the inverter though metal cable clamps. If it is too difficult, the shields may be braided and then flattened to connect the grounding terminal, with the width larger than 1/5 of the braid length. The bare cable core and the PE braid shall be as short as possible, preferably smaller than 15 cm.

(5) The keyboard line may not go outside the shielded cabinet.

(6) Holes on the cabinet shall be as small as possible, no larger than 15 cm.

A.10 EMC Standards for AS500 Inverter

With appropriate input and output filters, AC reactor (types of both may be found in Optional Parts), and wired according to the precautions stated above, the AS500 inverter can meet the following EMC requirements listed in Table A.2.

Table 0.2 EMC performance of AS500 Inverter

Item	Standard	Test specification
Conducted radio frequency	EN12015.1998	0.15 ≤ f < 0.50 *MHz* ,100 dB (*μv*/*m*) Quasipeak value 0.50≤ f < 5.0 *MHz*,86 dB (*μv*/*m*) Quasipeak value 5.0 ≤ f < 30 *MHz* , 90 □ 70 dB(*μv*/*m*) Quasipeak value
Radio frequency	EN12015.1998	30 ≤ f < 230 *MHz* ,40 dB (*μv*/*m*) Quasipeak value 230 ≤ f < 1000 *MHz*,47 dB (*μv*/*m*) Quasipeak value
Electrostatic discharge	EN12016.2004	Criterion B (contact discharge 4000 V, air discharge 8000 V)
Radio frequency radiated field	EN12016.2004	Level 3, Criterion A (3 V/m)
Fast transient bust	EN12016.2004	Level 4, Criterion B (strong voltage ± 2 KV/2.5 kHz)
Surge voltage	EN12016.2004	Criterion B (±1 KV)
Conduction noise	EN12016.2004	Criterion A (3V, 0.15～80 MHz)

Appendix B Inverter accordance standards

European low voltage specifications

Series AS500 inverter production accords with low voltage specifications 73/23/EEC and revision items 98/68/EEC. This inverter also accords with the following standards:

EN61800-5-1: Adjustable speed electrical power drive systems Part 5-1: Safety requirements – Electrical, thermal and energy.

1. European EMC specifications

When you make installation according to suggestions in this manual, Series AS500 inverter product accords with the following EMC standard:

EN12015.1998 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Emission. (22kW inverter)

EN12016.2004 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Immunity. (22kW inverter)

EN61800-3: Adjustable speed electrical power drive systems Part 3 (5.5/7.5kW,11/15kW inverter)

North American safety specifications

Series AS500 inverter product is in accordance with North American safety certification. This inverter accords with the following standards and specifications:

UL508: Industrial Control Equipment

UL508C: Power Conversion Equipment

ISO9001 quality management system

Shanghai Sigriner STEP Electric Co.,Ltd manages their quality management system according to requirements of ISO 9001 standard.

Appendix C Letter of Complaint

Name:	
Tel:	Fax:
Type: □ Sales □ Promotion □ Service □ Quality □ Business □ Product □ Others	
Complaints:	
	Complainant (signature): Unit (stamp): Date:

Appendix D Warranty card

Name:	
Tel:	Fax:
Type: □ Sales □ Promotion □ Service □ Quality □ Business □ Product □ Others	
Complaints:	
	Complainant (signature): Unit (stamp): Date:

Warranty agreement

1. Warranty period of this product is 18 months (based on bar code). Should the product is applied according to the instructions within the warranty period, our company would be responsible for free maintenance in case of faults or damages.

2. Certain maintenance fees would be collected for damages caused due to below reasons within the warranty period:

A. Machine damages caused due to incorrect application or random repairs, changes;

B. Machine damages caused due to fire, flood, abnormal voltage, other natural disasters and secondary disasters;

C. Hardware damages caused due to man-made throwing or transportation after purchasing;

D. Machine damages caused due to noncompliance with user's manual provided by our company;

E. Faults and damages caused due to obstacles other than machines (such as external equipment);

3. In case of faults or damages, please fill in Warranty Card in detail correctly.

4. Maintenance fee would be charged based on Maintenance Price List that is updated by our company.

5. Generally, this warranty card would not be reissued. Please take good care of this card, and show to the maintenance personnel for maintenance.

6. In case of any problems during service, please contact our agent or our company duly.

7. Shanghai Sigriner STEP Electric Co.,Ltd. reserves the right of final interpretation of this agreement.

Shanghai Sigriner STEP Electric Co.,Ltd

(Customer service center) service hotline: 400-820-7921 800-820-7921

Add.: No 1560 Siyi Road, Jiading District, Shanghai

Zip code: **201801**

Tel: **021-69926000**

Fax: **021-69926000**

Website: **www.stepelectric.com**

Appendix E To the Customer

STEP®	To the Customer	Edition: A Revision: 0
		No.:

Dear Customers:

RoHS refers to the Restriction of the use of certain hazardous substances in electrical and electronic equipment, which is executed by EU on July 1, 2006. It specifies: restrictions on six hazardous substances such as lead, mercury, cadmium, hexavalent chrome, PBB and PBDE in the electric, electronic equipments that are newly launched on the market.

Ministry of Information Industry, Development and Reform Commission, Department of Commerce, the General Administration of Customs, State Administration for Industry and Commerce, General Administration of Quality Supervision and State Environmental Protection Administration issued Chinese RoHS directive - Management Methods on Control of Pollution from Electronic Information Products together on February 28, 2006, and launched compulsory execution. Measures on Pollution Prevention from Electronic Waste issued by the State Environmental Protection Administration on February 1, 2008 has executed, which states that the users of electric and electronic products shall provide electronic wastes to or entrust with qualified disposal units (including individual units of industry and commerce that are listed to the List (including temporary list) for diassembling, uses or disposal.

Our company has been in accordance with requirements of Management Methods on Control of Pollution from Electronic Information Products and RoHS directive from type selection and purchasing of electronic parts and components, PCB panel, harness materials, strcutural parts, and has been strict on six hazardous substances such as lead, mercury, cadmium, hexavalent chrome, PBB and PBDE, and welding of PCB parts and components has been executed on the lead-less welding line during production, with lead-less welding process.

Toxic and harmful elements that may be contained by the following products:

Type	Electronic part	Electronic print circuit panel (PCB)	Plate work	Radiator	Plastic part	Conductor
Toxic and harmful elements that may be contained	six hazardous substances such as lead, mercury, cadmium, hexavalent chrome, PBB and PBDE					

1. Analysis on environment effect

Electronic products of our company may generate some heat during using, and may cause micro emission of individual harmful substances, but it would not cause severe effect on the surrounding environment.

After the life cycle of electronic products is finished and after disposal, some heavy metal and chemical and toxic, harmful substances would cause severe pollution on the soil, water resources.

2. Life cycle of electronic products and equipments

Any electronic products and equipments have the service life, and will be damaged and rejected. Even it can be used, it would be wiped out due to upgrade. Electronic products and equipments of our company have the service life no more than 20 years.

3. Rejection and disposal of electronic products.

Improper disposal of rejected electronic products will cause environment pollution. Our company would request the customers to establish recycle system according to relevant specifications, and the products shall not be disposed as general domestic rubbish or industrial wastes. They shall strictly implement Measures on Pollution Prevention from Electronic Waste issued by the State Environmental Protection Administration, and store and use it through environment friendly methods; or entrust qualified units for united disposal. Unqualified individuals or units are not allowed for disassembling, uses or disposal of electronic wastes.

Do not dispose of electronic wastes with domestic rubbishes. Please call the local waste disposing institute or environment protection institute to obtain recommendations of electronic wastes.

Shanghai Sigriner STEP Electric Co., Ltd