AS620 Series Hoist-Used Inverter

Release status: standard

Revision: V1.00

Foreword

AS620 series Hoist-used inverter is a new inverter developed according to Hoist carrying characteristics. It adopts 32-bit motor-specific microprocessor and state-of-the-art power module, while supporting voltage vector V/F, it makes Hoist running stably, comfortably and efficiently in combination with characteristics of potential energy load.

General

This operating instruction gives a comprehensive and systematic description of installation, operation, setting of functional parameters, maintenance and troubleshooting for AS620 series Hoist-used inverter. This manual can also be used as reference for designing Hoist control system with specific frequency converter for AS620 series Hoist, as well as materials on system installation, commissioning and maintenance.

To ensure correct installation, please read this operating instruction carefully before use of the frequency converter.

Audience

User

Lift control designer

Engineering maintenance staff

Technical support staff of user side

Innovative characteristics

a) New PWM dead-time compensation technology, reducing motor noise and loss effectively.

b) Dynamic PWM carrier modulation technology, reducing motor noise effectively.

c) If motor parameters are set accurately, asynchronous motor can adjust by itself without encoder either. If it can not learn accurate motor on site, it is also possible to make frequency converter get accurate motor parameter automatically with simple self-learn mode of static motor instead of complex working such as car lifting.

d) Hardware uses the 6th generation of new module, which could withstand the high temperature of 175℃, and with low switch loss.

Simple and quick Hoist commissioning way

On completion of inverter wiring, convenience of Hoist commissioning is critical. To complete inverter commissioning, operator always takes a lot of time and efforts to set up a large number of parameters and perform complex operation. Because the inverter is used specially for Hoist, it is vary simple and quick to drive Hoist commissioning, only 3 steps are required.

1. Parameter setting

a) Reset all parameter to ex-factory setting with operating device;

b) Set parameters of motor according to motor name plate.

2. Adjustment of operating direction

It is possible to check encoder wiring and motor operating direction by operating device, if any error is found, parameters can be adjusted simply.

3. Start Torque adjustment

Adjust the start torque compare parameter when full load.

Content description

Supplement and modification may be made to the content of this operating instruction, please visit our company website regularly to update. Website: www.stepelectric.com.

Signs and notices related to safety

This operating instruction uses following signs to hint safety-related content. Description and content noted with safety sign is very important, please observe them strictly.

In case of use by mistake, caused hazard may lead to human injury or even death.

In case of use by mistake, caused hazard may lead to minor or major human injury and equipment damage.

Important: user must observe important notices.

CATALOG

Chapter 1 Notice for inverter use

User familiar with this inverter can read Appendix C "Quick Operating Guide of Hoist Control" directly.

This chapter mainly introduces general information, including voltage level of inverter, adaptive motor capacity, and how to carry out OOBA etc. In addition, it also details notices during inverter installation, wiring, operation, maintenance and reject, facilitating safe inverter operation and extending inverter service life. Please read this chapter carefully.

1.1 Voltage level and adaptive motor capacity

Voltage level of AS620 series inverter is 400V, supporting the asynchronous and synchronous motors. Currently the adaptive motor capacity is 1.1～75kW. For conFig-uration beyond this range, please contact our engineering center.

1.2 OOBA

Notice
◎ **Do not install inverter with damaged or missing parts.** Or it may cause fire and human injury hazards.

When unpacking, please confirm carefully that there is damage during transportation, and that type and specification in the name plate is consistent with order requirement. If not consistent or any part is missing, contact factory or supplier as early as possible.

1.3 Description of inverter type

For description of inverter type, see Fig- 1.1.

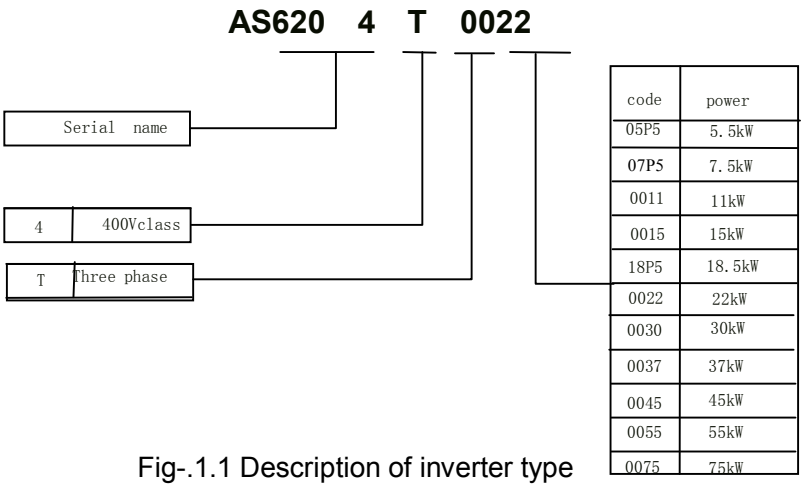


Fig-.1.1 Description of inverter type

1.4 Description of inverter name plate

For inverter name plate, see Fig-. 1.2. Name plate of inverter records inverter type, specification and batch No. etc.

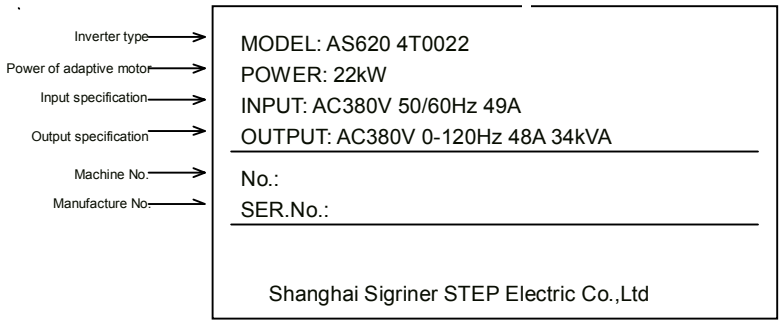


Fig-.1.2 Description of inverter name plate

1.5 Safety notice

Danger

◎ **Please install the device on non-flammable materials such as metal.**

Or it may cause fire hazard.

◎ **Do not install the device in the environment containing explosive gas.**

Or it may cause explosion hazard.

◎ **Do not place flammable materials nearby.**

Or it may cause fire hazard.

Caution

◎ **When carrying, please support the base of body.**

Or if inverter body falls, it may cause hazard of human injury and inverter damage.

◎ **When installing, bearing capacity of the platform should be considered.**

Or if inverter body falls, it may cause hazard of human injury and inverter damage.

◎ **Please do not install the device in the environment with pipe splashing drops.**

Or it may cause hazard of inverter damage.

◎ **Do not fall foreign matters such as screw, gaskets and metal bar into inverter.**

Or it may cause hazard of fire or inverter damage.

Danger

◎ **Before wiring, confirm that input power supply is disconnected totally.** Or it may cause electric shock.

◎ **Wiring task must be carried out by professional engineer.** Or it may cause electric shock.

◎ **Protective grounding terminal E of inverter must be grounded reliably.** Or it may cause electric shock.

◎ **Do not confuse input terminal for main loop of inverter with output terminal.** Or it may damage inverter or cause explosion.

◎ **Do not short terminal** ○+○+○+○+⊕**1/**○+○+○+○+⊕**2 to** ○-○-○-○-⊖**.** Or it may cause fire and explosion hazard.

◎ **Cover plate must be covered properly before power on.** Or it may cause electric shock or explosion.

◎ **Do not operate inverter if your hands are wet.** Or it may cause electric shock.

◎ **When connecting safety loop of emergency stop, please check its wiring carefully after operation.** Or it may cause hazard.

Danger

◎ **For inverter with storage period over 2 years, power should be supplied slowly by voltage regulator during power on.** Or it may cause electric shock or explosion.

◎ **When inverter is running, do not mis-operate.** Or it may cause HV electric shock.

◎ **Within a period after power off, dangerous high voltage still exists inside the inverter, therefore, do not open the cover plate or touch terminal.** Or it may cause HV electric shock.

◎ **Only qualified professional staff having training can maintain the inverter.** Or it may cause inverter damage or electric shock.

◎ **Before maintenance staff works, all metal articles such as watch and ring must be taken off. During working, operator must use clothes and tools conforming to insulation requirement.**

Or it may cause electric shock or explosion.

1.6 Notice in use

When using **AS620** series inverter, following things should be noticed.

1.6.1 Selection of braking resistor

Hoist is potential-energy loading and four-quadrant running, braking power status exists. Therefore, it should consider selection of braking component, or overvoltage may occur, resulting in tripping. **AS620** series inverters are all equipped with built-in braking unit, only braking resistor must be prepared externally. For specification of external braking resistor of inverter, see Table 1.1.

Table 1.1 ConFiguration table of braking resistor for AS620 series Hoist-used inverters

Converter type AS620	Adaptive motor（kW）	Minimum value（Ω）	Maximum value（Ω）	Recommended value（Ω）	Recommended resistor total power（W）
					Asynchronous
4T05P5	5.5	56	100	70	1600
4T07P5	7.5	56	72	64	2000
4T0011	11	34	48	40	3200
4T0015	15	34	41	36	4000
4T18P5	18.5	17	31	24	5000
4T0022	22	17	27	20	6400
4T0030	30	11	20	15	8000
4T0037	37	8	16	12	10000
4T0045	45	5	10	9	15000
4T0055	55	5	8	8	18000
4T0075	75	5	6	6	25000

1.6.2 Absorber is prohibited at output side

Because inverter output is pulse wave, if capacitor for power factor improvement or anti-lightning VDR etc. is installed at output side, all of them may cause inverter tripping or part damage. This must be considered during line design. In case of old Hoist reconstruction, capacitor or VDR connected originally at output side must be removed.

Do not connect capacitor to output side of inverter, for the schematic, see Fig-. 1.3.

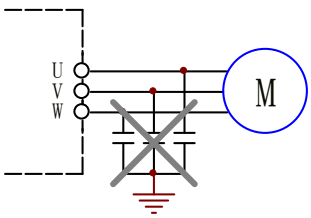


Fig-.1.3 Schematic of not connect capacitor to output side of inverter

1.6.3 Service voltage of inverter

AS620 series inverter only suits to work within its rated voltage range, if voltage is different from its rated voltage, voltage regulator is required for transformation.

1.6.4 2-phase input is not proper

It is not proper to change 3-phase input into 2-phase input, or fault may occur.

1.6.5 User control of output contactor

When output contactor is controlled with user application, to ensure output contactor opens and closes without current, it will be better to close contactor before transmitting running order to inverter, disconnect contactor following a period after Hoist stops signal output.

1.6.6 Altitude and de-rating use

In the area with altitude over 1000m, thin air will cause radiation effect of inverter poor, in this case, it is necessary to use inverter by de-rating. In case of de-rating use for inverter, relation curve between its rated current and altitude, see Fig-. 1.4.

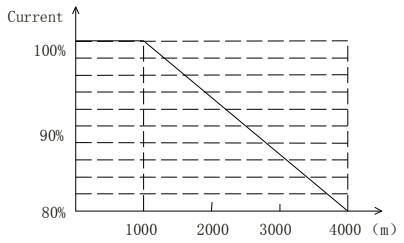


Fig-.1.4 Relation diagram between rated output current and altitude of inverter

1.6.7 Ambient temperature and de-rating use

Normal operating temperature of this inverter is -10～+45℃, when it exceeds 45℃, 10% should be derated for each 5℃ higher, and it can be up to 60℃.

1.6.8 Synchronous star delay

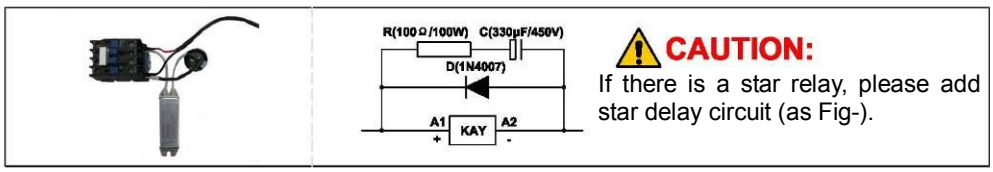


Fig- 1.5 Hint sign of star delay circuit

1.7 Reject notice

When rejecting inverter, it should be treated as industrial rubbish.

1.7.1 Capacitor treatment

Electrolytic capacitors in main loop and on printed board may explode when they are buried. Therefore, it is prohibited to burn capacitor.

1.7.2 Treatment of plastic piece

There are many plastic pieces on the inverter, plastic piece burning will produce poisonous gas. Therefore it is prohibited to burn poisonous gas.

Chapter 2 Type and specification

This chapter provides type, specification and installation dimension of **AS620** series inverter.

2.1 Inverter type

For type of **AS620** series inverter, see Table 2.1.

Table 2.1 Type of **AS620** series inverter

Inverter type **AS620**-	Rated capacity（kVA）	Rated output current（A）	Adaptive motor（kW）
4T05P5	9	13	5.5
4T07P5	13	18	7.5
4T0011	19	27	11
4T0015	24	34	15
4T18P5	29	41	18.5
4T0022	34	48	22
4T0030	45	65	30
4T0037	55	80	37
4T0045	68	97	45
4T0055	89	128	55
4T0075	115	165	75

*Rated capacity is calculated at the voltage of 400V

2.2 Technical index and specification of inverter

For technical index and specification of **AS620** series inverter, see Table 2.2.

Table 2.2 Technical index and specification of **AS620** series inverter

		4T05P5	4T07P5	4T0011	4T0015	4T0018	4T0022	4T0030	4T0037	4T0045	4T0055	4T0075
Maximum applicable motor capacity （kW）		5.5	7.5	11	15	18.5	22	30	37	45	55	75
Rated output	Rated capacity （kVA）	8.5	14	18	24	29	34	50	61	74	98	130
	Rated current （A）	13	18	27	34	41	48	65	80	97	128	165
	Maximum output voltage （V）	400V: 3-phase 380/400/415/440/460V(corresponding input voltage)										
Input power supply	Phase number, voltage, frequency	3-phase 380/400/415/440/460V 50/60Hz										
	Allowable voltage variation	-15%～+10%										
	Allowable frequency variation	-5%～+5%										
	Reduced bearing capacity of instantaneous voltage	AC300V above, continuous running When de-rating from rated input status to below AC300V, perform undervoltage protection after 15ms continuous running										

Controlling characteristics	Controlling way	voltage vector, V/F
	Starting moment	1150% 2.5Hz
	Speed controlling range	1:50
	Precision of speed control	±2.0% , ±0.5% (with slip frequency compared)
	Frequency controlling range	0～120Hz
	Frequency setting resolution	0.01Hz (digital command), ±0.06Hz/120Hz (analog command 11bit + no symbol)
	Output frequency resolution (calculation resolution)	0.01Hz
	Overloading capacity	150%, 1min
	Braking moment	150%(connecting external braking resistor), built-in braking unit
	Time of ACC/DEC	0.01～600s
	Carrier frequency	2～8kHz
	Speed setting	Digital setting: panel setting
	Methods of inputting operating commands	Panel , Digital input, commnication
	Reference frequency selector	Panel, Digital input, commnication
	Torque boost	Auto torque boost, Manual torque boost0.1%~30.0%
	V/F curve	4 modes: 1 V/F curve mode set by user and 3 kinds of torque-derating modes (2.0 order, 1.7 order, and 1.2 order)
	Auto voltage regulation(AVR)	When source voltage changes, the modulation rate can be adjusted automatically, so that the output voltage is unchanged.
	Non-stop operation upon powerfailure	Uninterrupted operation can be realized by controlling the bus voltage when power failure occurs.
	Brake Unit	Built-in, connect brake resistance outside
	DC injection braking	DC injection braking current :： 0.0～120.0％
	Optoelectronic isolated input	8-way. Input function can be defined
	Open collector output	4-way. Output function can be defined
	Programmable relay output	2-way. NO, NC dual-contact, contact capacity: resistor type, 5A 250VAC or 5A 30VDC; Output function can be defined
	RS485 communication interface	1-way
	RS232 communication interface	1-way, used for operating device or PC

Protective function	Motor overloading protection	Protective curve of motor through parameter setting
	Inverter overloading	When < 3Hz, 160%, 5s; when > 3Hz, 185%, 10s
	Short protection	In case of overcurrent caused by short of any 2 phases at output side, protect the inverter
	Input open-phase protection during running	During running, in case of input open-phase, cut off output to protect the inverter
	Output open-phase protection during running	During running, in case of output open-phase, cut off output to protect the inverter
	Overvoltage threshold	Bus voltage 410V (200V series) , 810V (400V series)
	Undervoltage threshold	Bus voltage 180V (200V series) 、380V (400V series)
	Instantaneous power outrage compensation	Protection above 15ms
	Radiator fan overheating	Protect by thermo-sensitive resistor
	Stall out prevention	Stall out protection that speed offset is greater than 30% of rated speed during running
	Braking unit protection	Check that braking unit is abnormal automatically, protect
	Module protection	Overcurrent, short, overheating protection
	Current sensor protection	Self-check at power on
	Speed reverse protection	Inspect with encoder
	I^2t protection	Inspect with 3-phase inspection
	Input overvoltage protection	400V grade is greater than 725V, 200V grade is greater than 360V, inspect after stop
	Output grounding protection	Any phase is shorted to ground during running, cut off output to protect inverter
	Output unbalance protection	Unbalance of output 3-phase current is detected during running, cut off output to protect inverter
	Short protection for braking resistor	Inspect at braking
	EEPROM trouble	Self-check at power on
Display	LCD in English	Various levels of menus

Environment	Ambient temperature	-10～+45℃
	Humidity	Below 95%RH (without condensate)
	Storage temperature	-20～+60℃ (short-time temperature during transportation)
	Location	Indoor (no corrosive gas or dust)
	Altitude	Below 1000m
Structure	IP	IP20
	Cooling way	Forced air cooling
Installation manner		Inside the cabinet

2.3 Installation dimension and quality of inverter

For installation dimension and quality of inverter, see Fig-. 2.1 and 2.3.

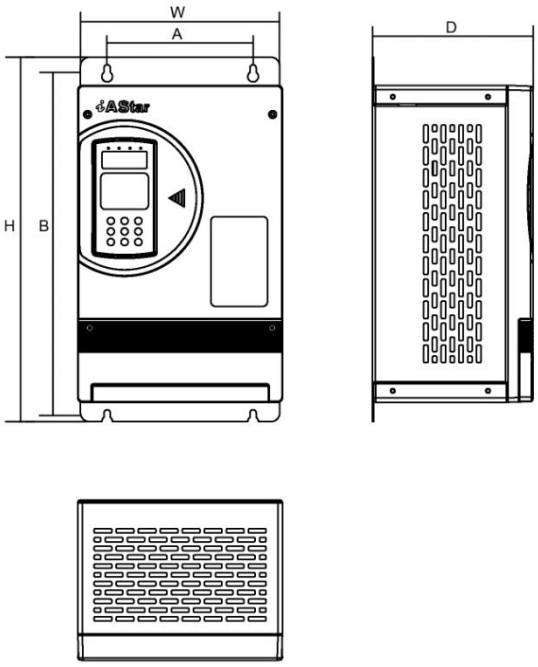


Fig-. 2.1 Installation dimension and quality of inverter

Table 2.3 **Installation dimension and mass of AS620 series inverter**

Inverter type **AS620-**	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation diameter Φ(mm)	Installation	Tightening torque (Nm)			Mass (kg)	Inverter type **AS620-**
								Bolt	Nut	Washer		
1	4T05P5	100	288.5	300	160	166	5.0	4M4	4M4	4Φ4	2.5	4.5
2	4T07P5	165.5	357	379	222	182	7.0	4M6	4M6	4Φ6	3	8
	4T0011											
3	4T0015	165.5	392	414	232	182						10.3
	4T18P5											
	4T0022											
4	4T0030	200	518	540	332	247	9.0	4M8	4M8	4Φ8	9	23
	4T0037											31
5	4T0045	200	587	610	330	310						42
	4T0055											
6	4T0075	320	718	750	430	350	13.0	4M12	4M12	4Φ12	18	60

2.4 Dimension of operating device

For dimension of inverter's operating device, see Fig-. 2.2.

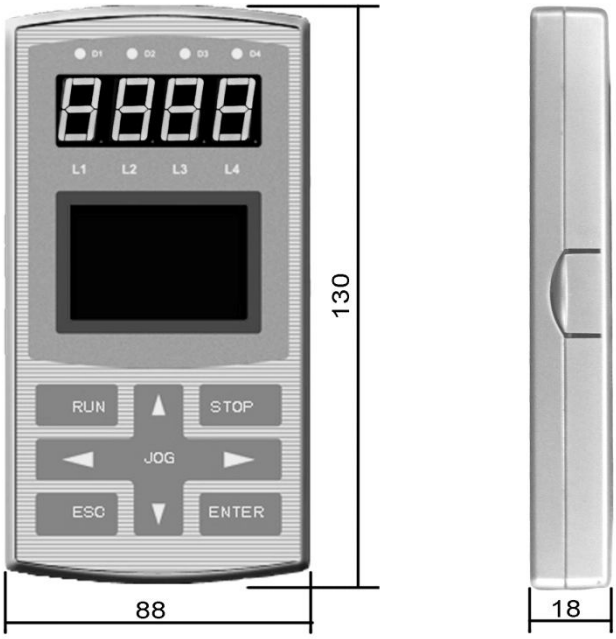


Fig-. 2.2 Dimension of inverter's operating device

Chapter 3 Inverter installation

This chapter describes installation requirements of inverter, notices, removal and installation of inverter panel etc.

3.1Installation location of inverter

Danger

◎ **Please install the device on non-flammable materials such as metal.**

Or it may cause fire hazard.

◎ **No flammable material nearby**

Or it may cause fire hazard.

◎ **Do not install the device in the environment containing explosive gas.**

Or it may cause explosion hazard.

◎ **Enclosure installed with the device should conform to EN50178 standard.**

Caution

◎ **During transport, do not lift operating panel or cover plate**

Or it may cause hazard of inverter falling or damage.

◎ **When installing, bearing capacity of the platform should be considered.**

Or it may cause hazard of inverter falling or damage.

◎ **It is prohibited to install the machine where drop may splash.**

Or it may cause hazard of inverter damage.

◎ **Do not fall foreign matters such as screw, gasket and metal bar into inverter.**

Or it may damage inverter or cause explosion.

◎ **If inverter is damaged or with missing part, do not install or operate it.**

Or it may cause hazard of inverter damage.

◎ **Do not install the machine in direct sunlight location**

Or it may cause inverter overheating or accident.

Installation location of inverter must meet following conditions.

a) Clean location without oil mist, dust, or floating matters should not invade into closed cabinet.

b) Location where metal powder, oil or water will not enter into inverter interior.

c) Location without flammable materials such as wood.

d) Location without radioactive substances.

e) Location without harmful gas or liquid.

f) Location with little vibration.

g) Location with less salt.

h) Location without direct sunlight.

i) Location where temperature is not easy to rise.

When installing in closed enclosure, please install cooling fan and cooling air conditioner, temperature should be below 40℃.

3.2 Installation direction and spacing requirement of inverter

To not reduce cooling effect of inverter, it should be installed at well-ventilated location. Generally, it is installed vertically. For spacing requirement for installation, see Fig-. 3.1.

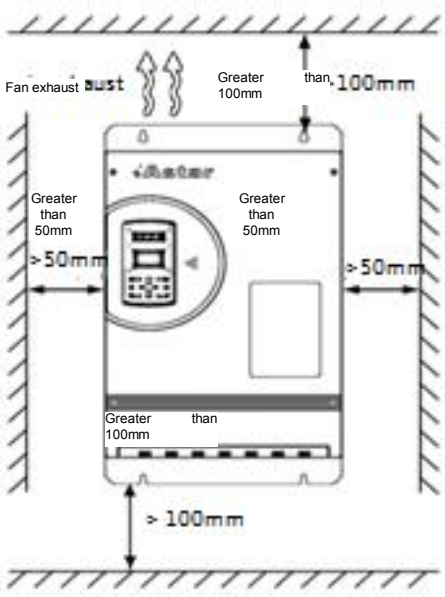


Fig-. 3.1 Schematic of spacing of inverter installation

3.3 Inverter installation

Order of inverter installation is as follow:

1) Confirm 4 installing holes on the inverter, install 2 screws at upper first according to Fig-. 2.1 – Installation dimension and quality of inverter, notice: do not tighten and leave blank of a few mm;

2) Hang 2 pear-shaped mounting holes at the upper of inverter to installed screw;

3) Install 2 screws at the upper and the lower, and tighten all 4 screws.

Important

Fastener must be equipped with anti-vibration part such as spring washer;

4 inverter screws must be tightened.

For inverter installation order, see Fig-. 3.2.

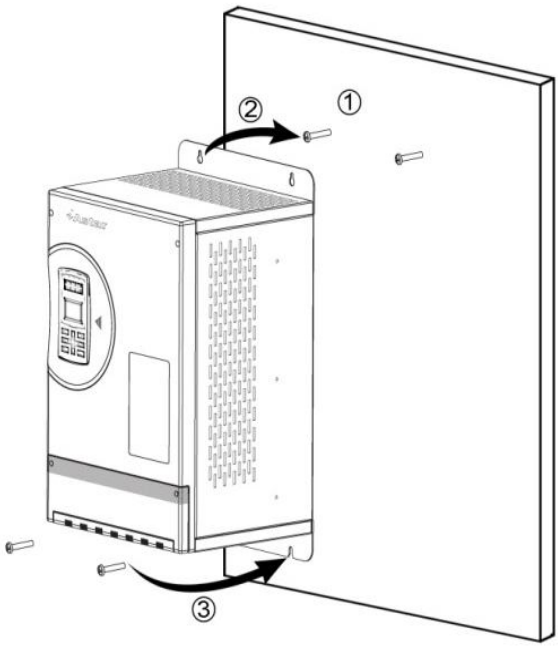


Fig-. 3.2 Diagram of inverter installation order

3.4 Assembly and disassembly of inverter housing parts

3.4.1 Inverter outline and part name

For inverter outline and part name, see Fig-. 3.3.

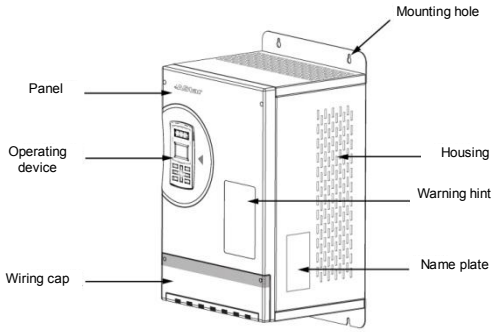


Fig-. 3. 3 Inverter outline and part name

3.4.2 Assembly and disassembly of operating device

Take off operating device

1) Press latch springs at both sides of operating device at the same time so that they disengage from the panel, then take off operating device.

2) There is a connecting line at back of operating device, its plug should be pull off from operating device. Note: do not apply force on connecting line when pulling, or it may damage the line.

For assembly and disassembly of operating device, see Fig-. 3.4.

Fig-.3.4 Assembly and disassembly of operating device

Install operating device

Insert connecting line plug into the socket at back of operating device, then embed a latch spring at one side of operating device into side groove of panel, then press the operating device to panel until a “crack” is heard, latch springs at both sides will be embedded into the panel.

3.4.3 Opening and closing of wiring cap

When connecting line to main loop or removing the panel, wiring cap is required to be opened.

Open wiring cap

1) Loose 2 screws on wiring cap;

2) Open the wiring cap downwards.

For opening operation of wiring cap, see Fig-. 3.5

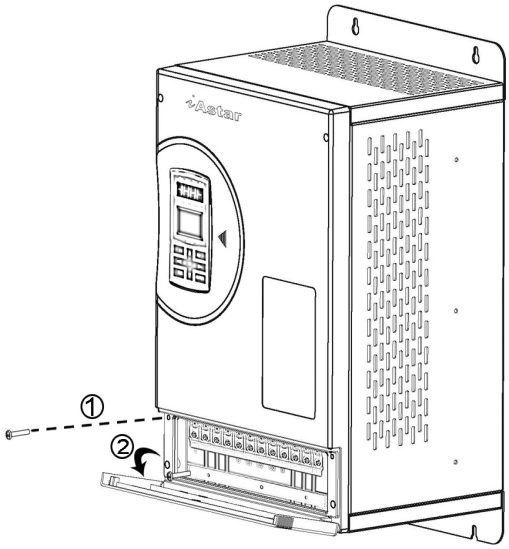


Fig-. 3.5 Opening wiring cap

Close wiring cap

Operate in a reserve order of wiring cap opening, close the wiring cap and tighten 2 “fastening” screws on wiring cap.

3.4.4 Assembly and disassembly of front panel

When controlling loop wiring, it requires removing front panel. To facilitate wiring of main loop, it also allows front panel removal.

Remove front panel

Remove front panel as following steps.

① Take off operating device. See Chapter 3 “Assembly and disassembly of operating device”.

② Open wiring cap. See Chapter 3 “3.5 Opening and closing of wiring cap”.

③ Loose 2 screws at the upper of panel and 2 screws in wiring cap, then take off the panel.

For removal of front panel, see Fig-. 3.6.

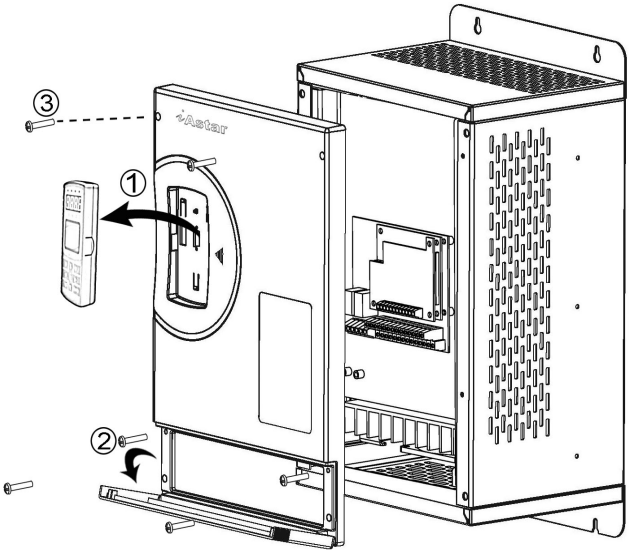


Fig-. 3.6 Removal of front panel

Install front panel

Install front panel in a reserve order of removal.

Chapter 4 Inverter wiring

This chapter details connection of inverter to peripheral equipment, overview of inverter terminal wiring, wiring of main loop terminal, wiring of control loop terminal and wiring of PG card terminal.

Danger

◎ **Before wiring, confirm that input power supply is disconnected completely.**

Or it may cause electric shock.

◎ **Wiring task must be carried out by professional engineer.**

Or it may cause electric shock.

◎ **Grounding terminal E must be grounded reliably.**

Or it may cause electric shock.

◎ **Do not touch terminal by hand directly, and outgoing line of inverter should not contact with outer cover.**

Or it may cause electric shock.

◎ **Do not connect power supply to output terminal U, V and W.**

Or it may cause hazard of inverter damage.

◎ **Do not short terminal** ○+○+⊕**1/**○+○+⊕**2 to** ○−○−⊖**.**

Or it may cause explosion hazard.

Caution

◎ **Please confirm that voltage of power supply to main loop is consistent with rated voltage of inverter.**

Or it may cause fire and human injury hazards.

◎ **Please connect braking resistor correctly as wiring diagram.**

Or it may cause fire hazard.

◎ **Connection must be secure between main loop terminal and conductor or between conductor and its crimp type terminal.**

Or it may cause hazard of inverter damage.

4.1 Connection of inverter to peripheral equipments

4.1.1 Connection diagram of inverter to peripheral equipments

For connection diagram of inverter to peripheral equipments, see Fig-. 4.1.

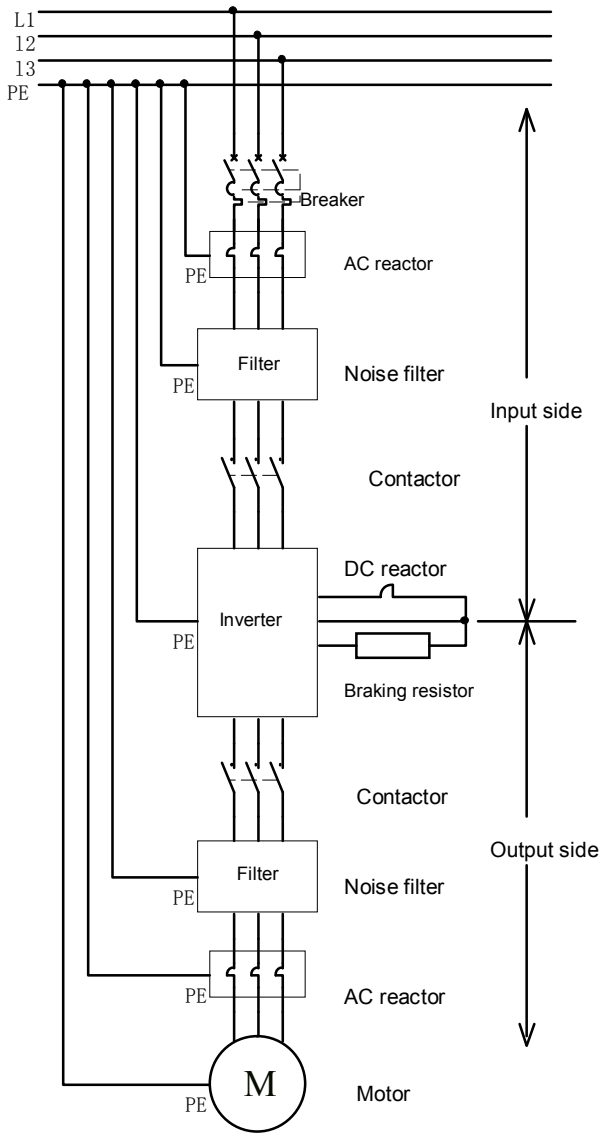


Fig-. 4.1 Connection diagram of inverter to peripheral equipments

Note: The diagram adopts 3-phase power supply input for illustration.

4.1.2 Connection of inverter to peripheral equipments

4.1.2.1 Input power connection

Danger

Do not run inverter beyond rated voltage range of incoming line. Over-voltage may cause permanent damage to inverter.

Technical requirements of input power are as follow.

Technical requirements of input power connection (main circuit)	
Input voltage	Voltage is 380/400/415/440/460V AC 3-phase, -15%～+10%
Short current (IEC60909 standard)	If incoming cable of inverter has proper fuse protection, maximum allowable short current is 100 kA within 1s.
Frequency	50/60 ± 5% Hz
Cable temperature	Allow working at 90℃ for long term

Input protection

Input protection includes breaker, fuse and emergency equipment etc.

Breaker

Inverter does not contain breaker. Therefore, breaker must be installed between AC input power supply and inverter. This breaker must ensure that:

◎ Model should conform to safety regulation in actual application, including but not limited to national and local electric regulation.

◎ During inverter installation and maintenance, beaker must remain at closed position and locked.

Breaker is not allowed to control motoring start and stop. Buttons on operating device or command from I/O terminal should be used to control motor.

Breaker capacity should be selected as 1.5～2 times of rated inverter current.

Time characteristics of breaker should consider that of inverter overheating protection fully (150% of rated output current in 1 minute).

Fuse

Final user must provide loop protection, and this protection model should be conform to national and local electric regulation. Table below gives recommended fuse type used to provide short protection for incoming power of inverter.

AS620-	Input current (A)	Main fuse		
		IEC gG (A)	UL grade T (A)	Bussmann type
4T07P5	19	20	20	CT20
4T0011	28	35	30	FE35
4T0015	35	35	40	FE40
4T18P5	42	45	50	FE45
4T0022	49	50	50	FE50

Emergency equipment

Overall design and installation of equipment must include emergency equipment and other necessary safety equipments. Controlling motor with buttons on inverter operating device or command from I/O terminal can not ensure:

◎ Emergency motor stop

Separate inverter from dangerous voltage.

4.1.2.2 Input power cable/connection

Input cable can be connected in any one of following ways:

◎ 4-core cable (3-phase and grounding protection line)

◎ 4-core insulated conductor is installed in conduit.

Select proper power cable according to local safety regulation, input voltage grade and loading current of inverter. Conductor must be smaller than the maximum limit defined for terminal dimension (see Chapter 4 “4.5.4 Specification of main loop connecting conductor”).Table below lists cable type of copper-core cable under different loading current. Types recommended are only suitable for situations listed in upper part. It is not recommended to use aluminum-core cable.

IEC	NEC
Based on: ◎ EN 60204-1 and IEC 60364-5-2/2001 standard ◎ PVC insulation ◎ Ambient temp. 30 °C ◎ Surface temp. 70 °C ◎ Symmetrical cable shielded with copper net ◎ Cable aligned in the same cable tray should not exceed 9 pieces	Based on: ◎ For copper-core cable, see NEC table 310-16 ◎ Cable insulation 90 °C ◎ Ambient temp. 40 °C ◎ Carrying lines in the same cable groove, cable pitch or of buried cable should not exceed 3 pieces ◎ Copper-core cable shielded with copper net

Max. loading current (A)	Copper-core cable (mm^2)	Max. loading current (A)	Type of copper-core cable (AWG/kcmil)
14	3x1.5	22.8	14
20	3x2.5	27.3	12
27	3x4	36.4	10
34	3x6	50.1	8
47	3x10	68.3	6
62	3x16	86.5	4
79	3x25	100	3
98	3x35	118	2
119	3x50	137	1
153	3x70	155	1/0
186	3x95	178	2/0

4.1.2.3 Grounding connection of input power cable

To ensure human safety, correct operation and reduction of electromagnetic radiation, inverter and motor must be grounded at mounting location.

◎ Conductor diameter must meet requirements in safety regulation.

◎ Shield of power cable must be connected to PE terminal of inverter to meet safety rules.

◎ Only when specification of power cable shield meets requirements in safety regulation, this shield can be used as grounding line of the equipment.

When installing more than one inverter, do not connect inverter terminals in series.

4.1.2.4 Output power cable/connection

Motor connection

Never connect incoming power supply to inverter output end: U, V and W. Connecting incoming power supply to output end will lead to permanent damage to inverter unit.

Do not connect motor with rated voltage less than half of rated input voltage of inverter to the inverter.

Before performing dielectric strength test or insulation resistance test on motor or motor cable, it is a must to disconnect inverter from motor cable. Do not perform those tests mentioned above on inverter.

Technical requirements of motor connection

Technical requirements of output power (motor)	
Output voltage	0 ～ input voltage, symmetric 3-phase voltage
Current	See Chapter 2 “2.2 Technical index and specification of inverter”
Switch frequency	Can be defined: 2 ～ 11 kHz
Rated cable temp.	Allow working at 90℃ for long term
Relation between length of motor cable and switch frequency	See Chapter 4 “4.4.4 Relation between line length and carrier frequency”

Grounding and wiring

Motor cable shielding

Motor cable is required to be shielded with wire conduit, armored cable or shielded cable.

1) Wire conduit

① Each end of wire conduit is required to install a bridge connection with grounded conductor.

② Wire conduit is fixed on housing.

③ Lay motor cable with a single wire conduit line (and input power cable and controlling cable should also be laid dividedly).

④ Each inverter uses a single wire conduit line.

2) Armored cable

① Each end of wire conduit is required to install a bridge connection with grounded conductor.

② 6 pieces of conductors should be used (3 for power supply line and 3 for grounding line), MC continuous wave aluminous armored cable with symmetrical grounding line.

③ Armored motor cable and input power cable use a common cable tray, but armored motor cable can not share the same cable tray with controlling cable.

3) Shielded cable

It is recommended that user should use cable with symmetrically-structured PE conductor meeting CE or C-Tick standard.

Grounding

See **Grounding connection of input power cable** above.

4.1.2.5 AC reactor at input side

AC reactor can be equipped at input side to improve power factor of input-side power supply and reduce high-order harmonic current.

4.1.2.6 Interference filter at input side

Interference filter can be equipped at input side to suppress high-frequency noise interference of power line of inverter to power supply.

4.1.2.7 Contactor at input side

To protect power supply and prevent trouble from extending, control power supply to inverter by means of opening and closing the contactor at input side.

Please do not use this contactor to control motor start and stop.

4.1.2.8 Contactor at output side

To meet the requirement that current should not pass through motor at motor stop defined in GB7588-2003 “National Hoist Safety Standard”, a contactor should be installed at output side.

4.1.2.9 Interference filter at output side

Special output-side interference filter can be equipped to suppress interference noise and drain current of conductor produced at output side of inverter.

4.1.2.10 AC reactor at output side

Output-side AC reactor can be equipped to suppress radio interference from inverter.

If the connecting line is too long between inverter and motor (>20m), output-side AC reactor can prevent inverter overcurrent due to distributed capacitance of conductor.

4.1.2.11 DC reactor

DC reactor can be equipped to improve power factor.

4.2 Wiring of inverter terminal

For internal view of inverter, see Fig-. 4.2.

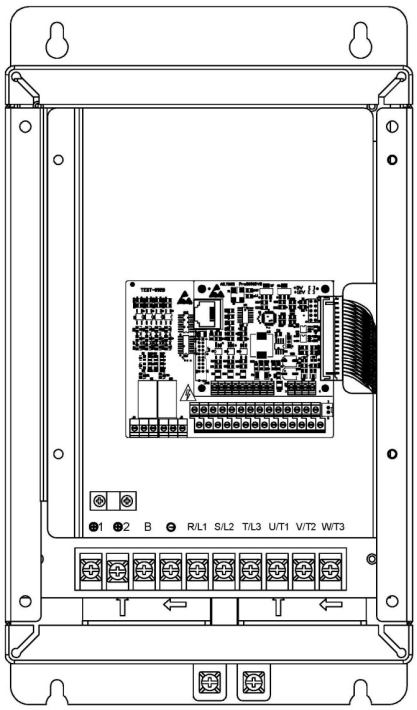


Fig-. 4.2 Internal view of inverter

Note: Except that position and arrangement of power input/output terminals are different slightly, inverter terminals of various power levels are all the same. In the Fig-, 11KW is used for illustration.

4.2.1 Wiring diagram of inverter terminal

For wiring diagram of inverter terminal, see Fig-. 4.3.

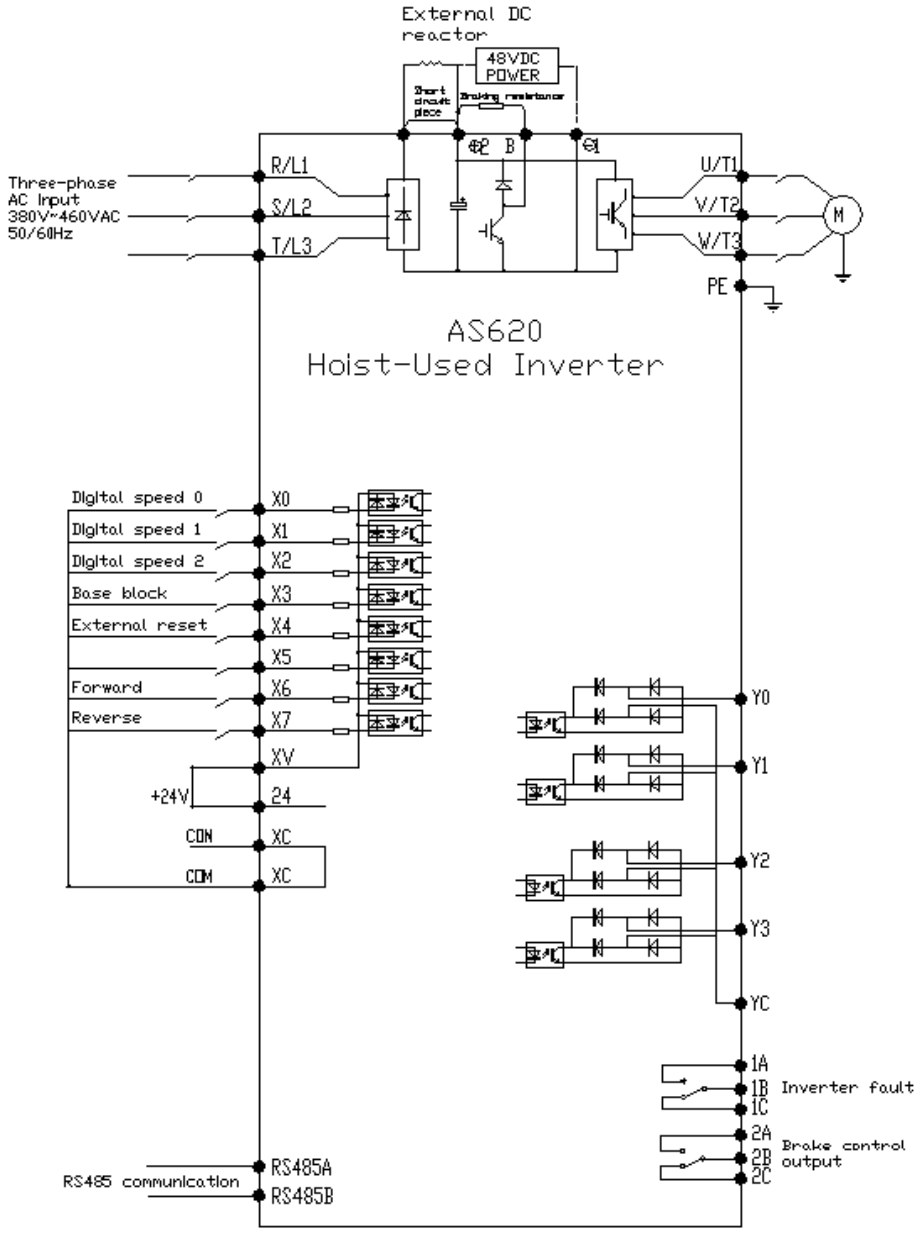


Fig-. 4.3 Wiring diagram of inverter terminals

4.2.2 Wiring Precautions

IMPORTANT

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

b) Chech 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 stripped bare wire at terminal end contact with other terminals?

c) Although **AS620** series Hoist-used inverter is equipped with a braking unit, an external braking resistor is still necessary. The braking resistor shal 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 220 V shall be connected between Terminals RO and TO, 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 grounding resistor shall have its impedance below 10 Ω.

g) The grounding calbe 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.

i) "◯" in the Fig- stands for terminals of the main circuit, and "⊙" for terminals of the control circuit.

4.3 Wiring Main Circuit Terminals

4.3.1 Alignment of main circuit terminals

⊕1	⊕2	B	⊖	R/L1	S/L2	T/L3	U/T1	V/T2	W/T3

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 Functionis of main circuit terminals

Terminal symbol	Function
⊕1	To connect DC reactor, shorting for ex works
⊕2	
⊕2	External braking resisitor 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 motor
V/T2	
W/T3	

4.3.3 Wire sizes of main circuit

600V plastic copper 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

Model: **AS620**-	Permissible cable size (mm^2)	Recommended cable size (mm^2)	Tightening torque (N.m)
2S01P1	2～6	2.5	1.5
2S02P2	2～6	4	1.5
2S03P7	2～6	4	1.5
4T02P2	2～6	4	1.5
4T03P7	2～6	4	1.5
4T05P5	2～6	4	1.5
4T07P5	4～8	6	2.5
4T0011	4～8	6	2.5
4T0015	4～8	6	2.5
4T18P5	8～16	16	4.0
4T0022	8～16	16	4.0
4T0030	14～25	25	9
4T0037	35～100	35	9
4T0045	35～100	50	9.0
4T0055	60～100	60	18.0
4T0075	80～125	80	18.0

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

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 drop（V）= $\sqrt{3}$ * line resistance（Ω）* current（A）

4.3.4 Main Circuit ConFig-urations

The main circuit conFig-urations are shown in Fig- 4.4.

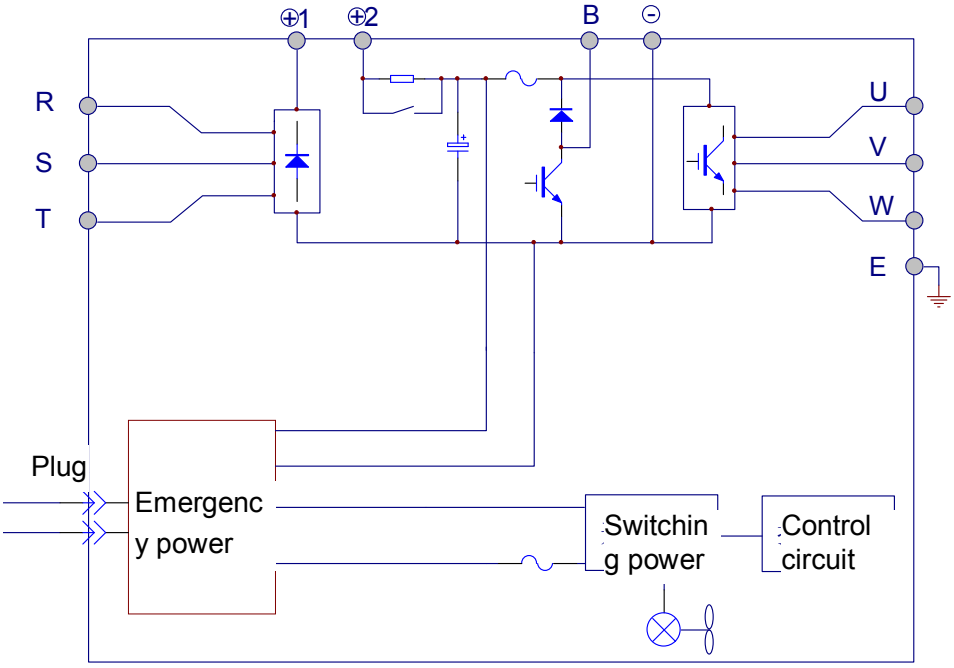


Fig- 4.4 Main circuit conFig-urations

4.3.5 Illustration of Main Circuit Wiring

4.3.5.1 Grounding Terminal (E)/(PE)

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

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

c) 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.

d) 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.

e) It is recommended not to loop the grounding wire when more than one Inverter is to be grounded

in order to avoid grounding loop.

The method to ground more than one Inverter is shown in Fig- 4.5.

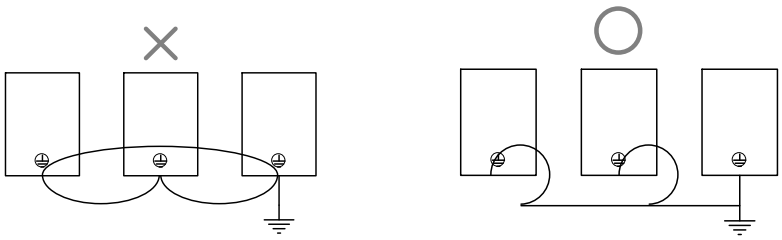


Fig- 4.5 Grounding method of more than one Inverter

4.3.5.2 +48V DC Bus Terminal Block

a) At power grid failure, storage batteries connected to Terminals R and S may be used to supply a direct low-voltage power to the Inverter to enable the Hoist to run at a low speed leveling at the nearest floor.

b) The connection of UPS and storage battery is shown in Fig- 4.6.

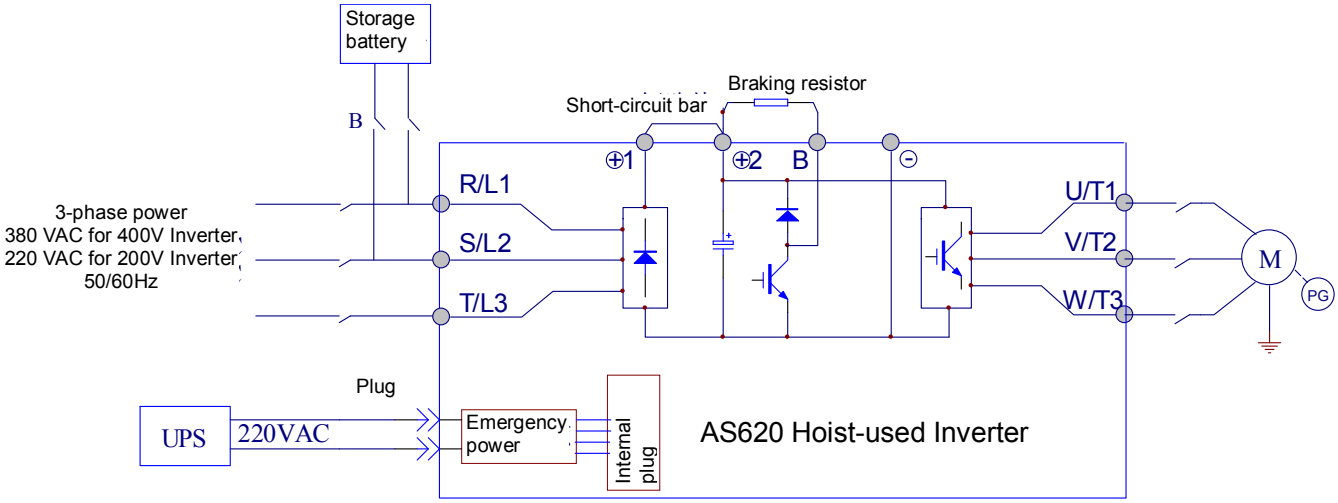


Fig- 4.6 Emergency power and storage battery connection

4.3.5.3 Power Supply Input Terminals for the Main Circuit (R/L1, S/L2, T/L3)

a) 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.

b) 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.

Special caution: pleas use only noise filters specifically for inverters.

Fig- 4.7 shows the correct setting of a noise filter on the power supply side.

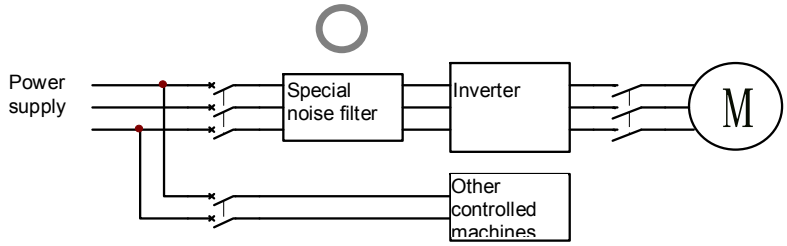


Fig- 4.7 Noise filter on the power supply side

Examples of incorrect settings of noise filter on the power supply side are given in Fig- 4.8 and Fig- 4.9.

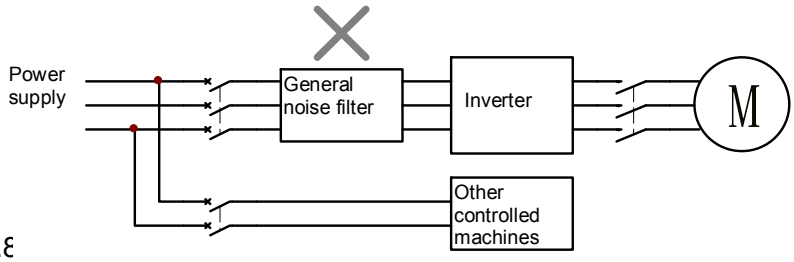


Fig- 4.8 ide

In Fig- 4.8, the general noise filter on the power supply side may not satisfy expected requirements and thus shall be avoided.

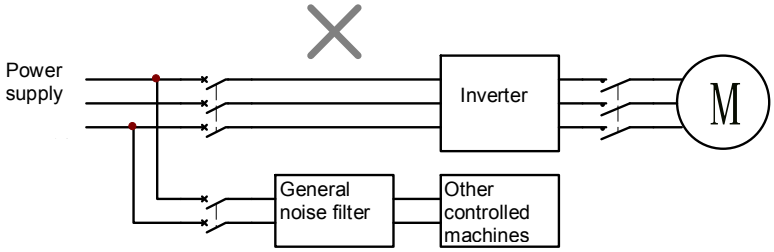


Fig- 4.9 Example 2 of incorrect noise filter setting on the power supply side

In Fig- 4.9, the general noise filter on the power supply side may not satisfy expected requirements and thus shall be avoided.

4.3.5.5 External DC Reactor Terminals (⊕1, ⊕2)

a) An external 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.

b) 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 Fig- 4.10.

Short-circuit bar

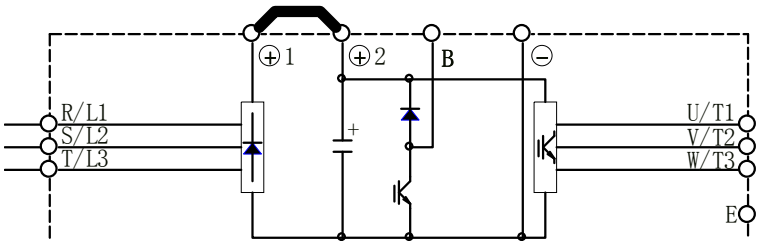


Fig- 4.10 Wiring diagram of short-circuit bar

The wiring of the DC reactor is shown in Fig- 4.11.

External DC reactor

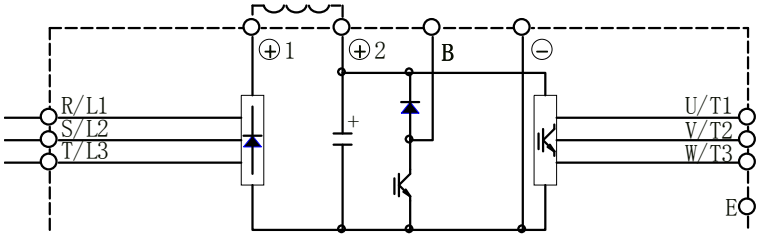


Fig- 4.11 Wiring of the external DC reactor

4.3.5.6 Connecting the External Braking Resistor Terminals (⊕2, B)

a) Since each **AS620** Inverter is equipped with a built-in braking unit, an external braking resistor is required to absorb the energy released during braking. The types of braking resistors are listed in Table 1.6.1 Braking Resistors ConFig-uration Table for 400V Inverters in Chapter I.

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

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

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

The wiring of external braking resistor is shown in Fig- 4.12.

External braking resistor

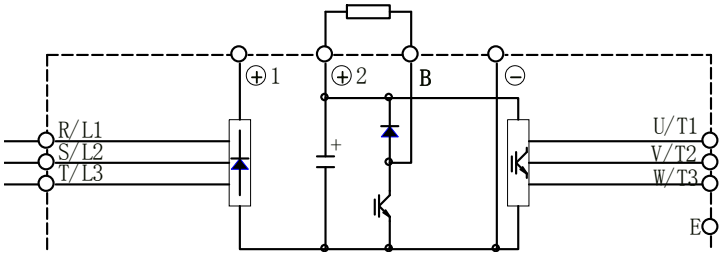


Fig- 4.12 External braking resistor wiring

4.3.5.7 Inverter Output Terminals (U/T1, V/T2, W/T3)

a) Connect Inverter output Terminals U/T1, V/T2, W/T3 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.

b) Never connect the power supply to the Inverter output Terminals U/T1, V/T2 and W/T3.

c) The output terminals may never be grounded or shorted.

d) Never connect a capacitor and/or a surge filter on the Inverter output side, since the Inverter may be thus over-heated or damaged due to its higher harmonics.

Fig- 4.13 shows that capacitor shall never be connected on the output side of the Inverter.

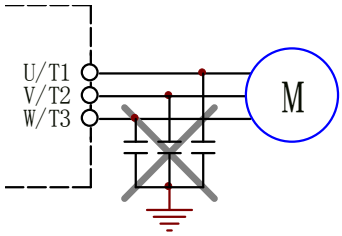


Fig- 4.13 Never connect capacitor on the output side of the Inverter

4.4 Countermeasures against Noise

4.4.1 Install a Special Noise Filter on the Output Side

A special nose filter may be installed on the Inverter output side to restrain the noise from this side. The connection is shown in Fig- 4.14.

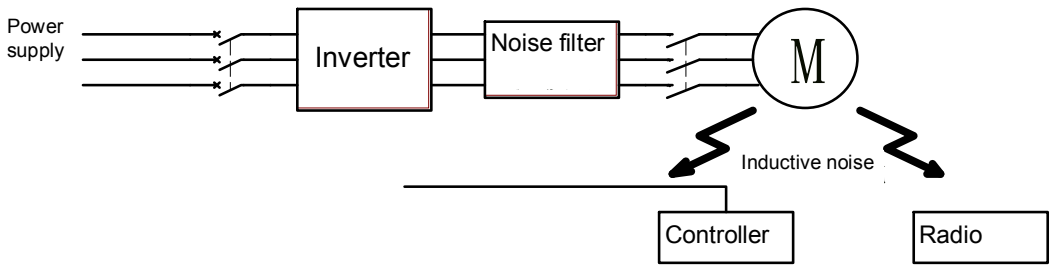


Fig- 4.14 Connection of noise filter on the output side of the Inverter

4.4.2 Main circuit wiring

The main circuit and the control circuit shall be separately wired in order to improve the resistance to inductive noises from the output side. Cables of the main circuit may be routed through a grounded metal pipe at least 10 cm from the signal line. The wiring of the main circuit is shown in Fig- 4.15.

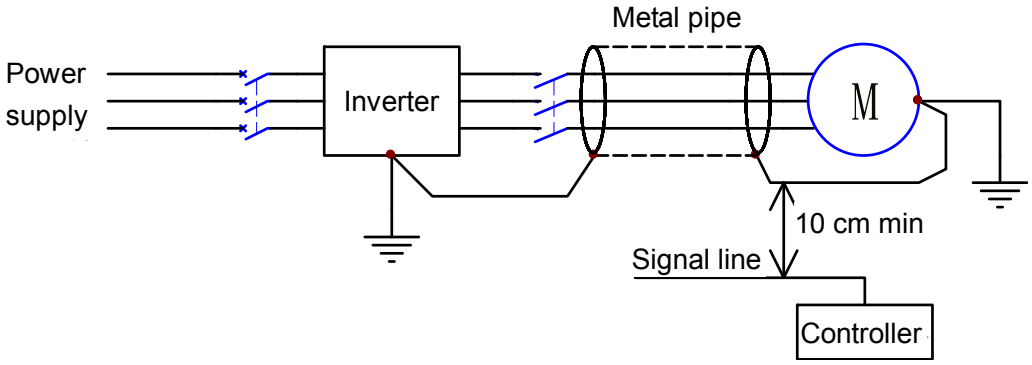


Fig- 4.15 Main circuit wiring

4.4.3 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 Fig- 4.16.

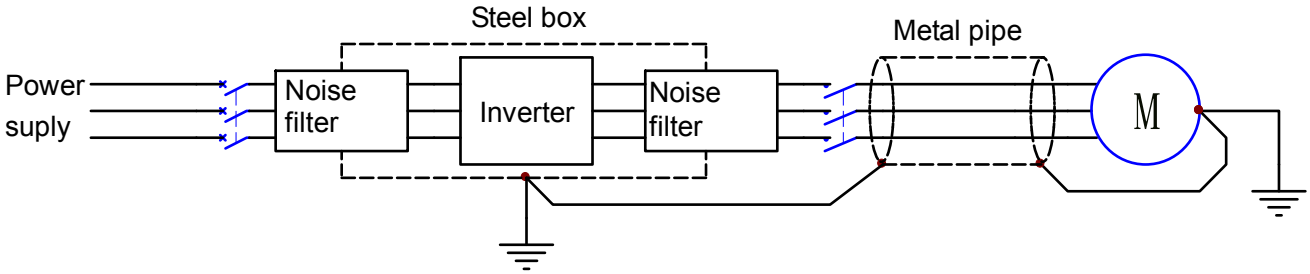


Fig-ur 4.16 Better countermeasures against noise

4.4.4 Relationship between Cable Length and Carrier Frequency

If the cable linking the Inverter and the motor is too long, the high order harmonic 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 motors. Therefore, the cable between the Inverter and the motor shall be not longer than 100 m. Otherwise, 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	Over 100m
Carrier frequency	Below 11kHz	Below 8kHz	Below 5kHz

4.5 Wiring the Control Circuit Terminals

4.5.1 Control Circuit Terminals

Terminals of the control circuit are shown in Fig- 4.17.

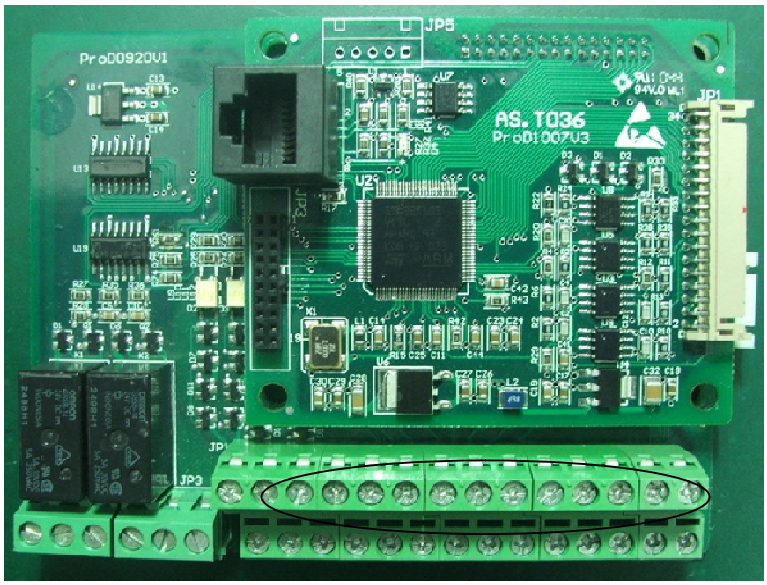


Fig- 4.17 Control circuit terminals

Note: the PG card in the above Fig- is an ABZ incremental PG card.

4.5.2 Terminal Symbols of Control Circuit

The terminal symbols of the control circuit are shown in Fig- 4.18.

					Y1	Y3	YC	24	XV	X1	X3	X5	X7
1A	1B	1C	2A	2B	2C	Y0	Y2	XC	XC	X0	X2	X4	X6

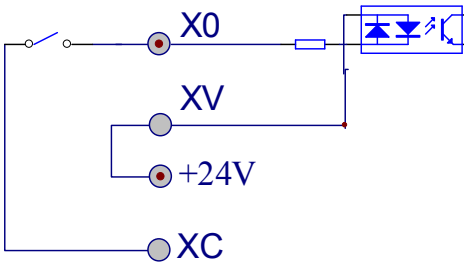
SC	0V	0V	A0	A1	
A+	B-	M0	M1	V+	V-

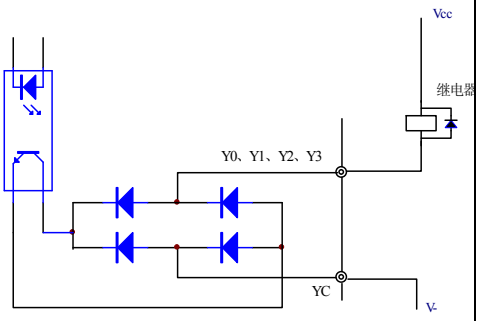
Fig- 4.18 Terminal symbols of control circuit

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

<table>
<tr><th>Name</th><th>Terminal</th><th>Signal</th><th>Remarks</th></tr>
<tr><td rowspan="12">Digital data input terminal</td><td>X0</td><td>Multifunction input 1 (function code P05.00)</td><td rowspan="12">Contact input, input signal is effective when contact is shut off. Function is chosen based on the parameter of function code P05.00~P05.07.
switch data input circuit specification is as follows：
<table><tr><td>inner power</td><td>+24VDC</td></tr><tr><td>Max load current</td><td>20mA</td></tr></table>  </td></tr>
<tr><td>X1</td><td>Multifunction input 2 (function code P05.01)</td></tr>
<tr><td>X2</td><td>Multifunction input 3 (function code P05.02)</td></tr>
<tr><td>X3</td><td>Multifunction input 4 (function code P05.03)</td></tr>
<tr><td>X4</td><td>Multifunction input 5 (function code P05.04)</td></tr>
<tr><td>X5</td><td>Multifunction input 6 (function code P05.05)</td></tr>
<tr><td>X6</td><td>Multifunction input 7 (function code P05.06)</td></tr>
<tr><td>X7</td><td>Multifunction input 8 (function code P05.07)</td></tr>
<tr><td>24</td><td>inner+24VDC power output</td></tr>
<tr><td>XV</td><td>input signal common port 24V</td></tr>
<tr><td>XC</td><td>input signal common port 0V</td></tr>
<tr><td rowspan="5">Analog input Terminal</td><td>A0</td><td>multi-function analog input 1</td><td>External analog voltage input signal,input voltage level：-10～+10V，can be used for analog speed given signal input.</td></tr>
<tr><td>A1</td><td>multi-function analog input 2</td><td>External analog voltage input signal,input voltage level:：-10～+10V.</td></tr>
<tr><td>V＋</td><td>+10V power output</td><td>+10VDC power output port used for analog input,max current 50mA permitted</td></tr>
<tr><td>V－</td><td>-10V power output</td><td>-10VDC power output port used for analog input,max current 50mA permitted</td></tr>
<tr><td>0V</td><td>analog input signal reference GND</td><td>analog input signal reference GND</td></tr>
</table>

<table>
<tr><td rowspan="2">Relay output Terminal</td><td>1A
1B
1C</td><td>programmable relay output
(function code:P05.09)
1A-1B：normally open contact
1B-1C：normally closed contact</td><td>Programmable relay output function can be chosen by parameter of function P05
A pair of switching contact, contact's specification is as follows：<table><tr><td>item</td><td>instruction</td></tr><tr><td>rated volume</td><td>5A/250VAC
5A/30VDC</td></tr><tr><td>switch frequency:120 times/min</td><td>fault rate P level 10mA/5V</td></tr><tr><td>Action time</td><td>below 10ms</td></tr></table></td></tr>
<tr><td>2A
2B
2C</td><td>programmable relay output(function code :P05.10)
2A-2B：normally open contact 2B-2C：normally closed contact</td></tr>
<tr><td rowspan="5">transistor open-collector output terminal</td><td>Y0</td><td>Programmable open-collector output 1
(function code P05.11)</td><td rowspan="5">Programmable open-collector output function can be chosen by parameter of function code P05
 
Drive capability： no more than DC30V，50mA</td></tr>
<tr><td>Y1</td><td>Programmable open-collector output 2
(function code P05.12)</td></tr>
<tr><td>Y2</td><td>Programmable open-collector output 3
(function code P05.13)</td></tr>
<tr><td>Y3</td><td>Programmable open-collector output 4
(function code P05.14)</td></tr>
<tr><td>YC</td><td>Programmable open-collector output common port</td></tr>
<tr><td rowspan="3">analog output terminal</td><td>M0</td><td>programmable analog output 1</td><td rowspan="2"></td></tr>
<tr><td>M1</td><td>programmable analog output 2</td></tr>
<tr><td>0V</td><td>analog output signal reference GND</td><td>analog output signal reference GND</td></tr>
<tr><td rowspan="3">485 Communication terminal</td><td>A+</td><td>485 communication signal+</td><td rowspan="2">485 communication signal terminal</td></tr>
<tr><td>B-</td><td>485communication signal -</td></tr>
<tr><td>SC</td><td>signal GND</td><td>485communication signal GND</td></tr>
</table>

Note: a short circuit must be for 24V and XV

4.5.4 Cable Specifications of Control Circuit Wiring

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

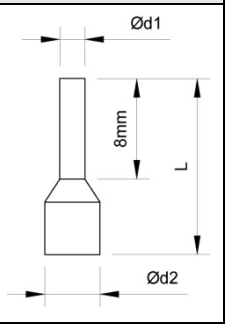
Table 4.6 Cable specifications and tightening torque

Model	Permissible cable, mm^2	Recommended cable, mm^2	Tightening torque (N.m)
AS620	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, mm^2(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 Analog Input Terminals

The Inverter is equipped with two analog voltage input ports. The acceptable range of analog voltage signal is -10V～+10V. A0 is defaulted and defined as signal input for a speed reference; A1 as signal input for starting preload. If A0 and A1 are used for the same signal type, a conflict will occur at the time of use.

The calbe connecting the analog signal and the inverter shall be as short as possible (no longer than 30m), and shielded conductors shall be used. The shield shall be grounded through 0V terminal on the analog input. Fig- 4.18 shows the grounding of the analog signal shielded conductor.

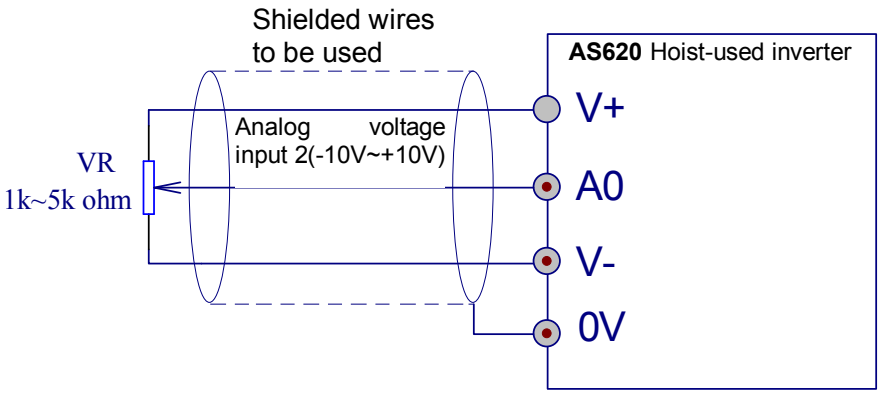


Fig- 4.18 Analog input signal shielded wire wiring

In Fig- 4.18, the analog voltage signal is provided by the Inverter, ranging from -10V to +10V. 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. Fig- 4.19 shows its wiring.

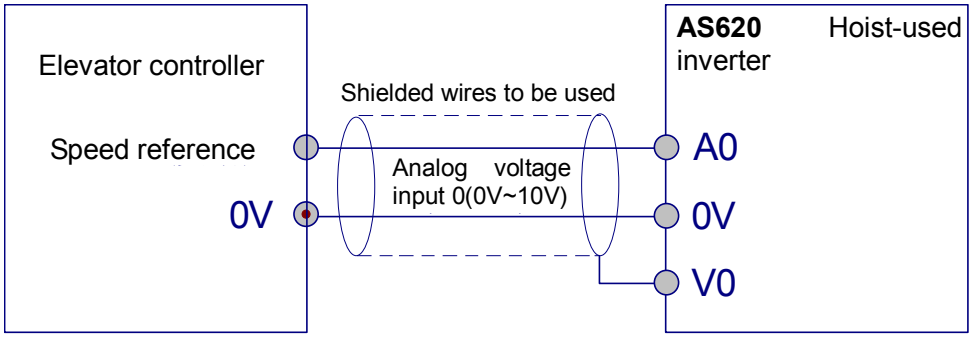


Fig- 4.19 AIO wiring

When analog signal inputs are used, parameters PO7.00 to P07.11 may be used to set gain, offset, filtering time and other parameters for each input, so as to make full use of the analog ports. See 6.2.8 for more details.

4.5.5.2 Digital Input Terminals

To define the input function,each multifunction switch data input terminal can be set via parameter of function code P5.00~P5.07. the setting Fig-s of P5.00～P5.07 is in the range of 0～31, each Fig- means respectively that the corresponding input point has function as follows

00：no function（means that the corresponding input point is not used）;

1： select acceleration or deceleration 0

2： select acceleration or deceleration 1

03： multisegment speed port 0 signal input ；

04： multisegment speed port 1 signal input;

05： multisegment speed port 2 signal input;

07： positive rotate（rise）;

08： negative rotate（decline）;

09： Three wire system control selection

13： fault reset signal input;

14： external fault reset signal input

18： base closing off signal normally open output;

29: stop emergently

30： backward pull mode rise

31： backward pull mode decline

32： brake inspection

Note：if add 1 before function definition, it means input signal is normally closed input, e.g.:function definition is set to “107” means that upward signal input exist when input signal is disconnected, no upward signal input exist when input signal is connected.

4.5.5.3 Digital Output Terminals

Switch data output terminal is divided into two parts :relay contactor output terminal and open collector output terminal, each switch data output ‘s function can be defined via the setting value of P06’s parameter. The setting data scope is 0~31, each value means respectively that the corresponding input point has function as follows :

0： no action（means that the corresponding input point is not used）;

01： power on self test is normal;

02： converter fault output;

03： converter running signal(RUN);

04： frequency arriving output:

06： converter zero speed running;

07： bus voltage normal output

16： brake/drive status

29： Anti-adhesion inspection output:

30： lift mode brake output;

31: brake output after start

Note: if 1 is added before the function definition, the output signal is NC output. For example, the function definition is set as 103, which indicates if the Inverter operates, output is disconnected; if the Inverter stops, the output singal is connected.

Note: “connected” here means pick-up of NO contact and release of NC contact of relays, and low level of outputs of open collectors. On the same basis, “disconnected” means release of NO contact and pick-up of NC contact of relays, and high resistance of open collectors.

Digital outputs consist of relay contact outputs and open collector outputs. The former is realized through idle contacs, including two pairs of switching contacts.

There are four channels for open collector outputs. The circuit is shown in Fig- 4.20.

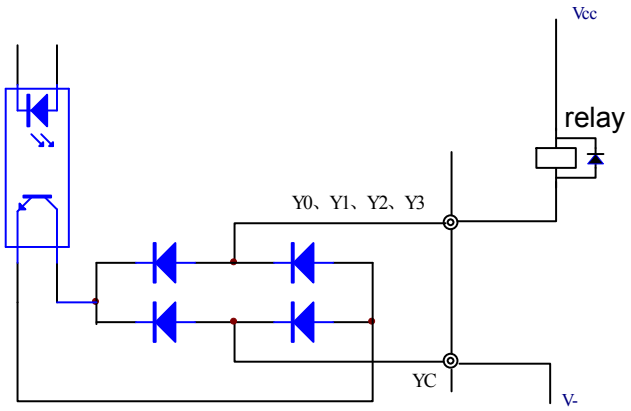


Fig- 4.20 Circuit of open collector ouputs

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

Chapter 5 Digital Operator

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 Function of Digital Operator Components

The components of the digital operator and their functions are shown in Fig- 5.1.

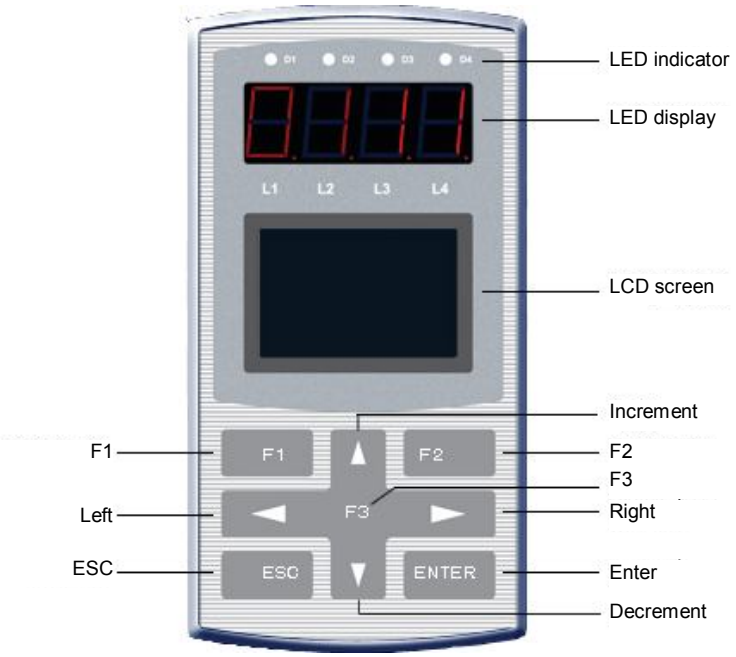


Fig- 5.1 Components and their functions of the digital operator

5.1.1 LED Indicator

At the top of the front cover there are four LED indicators showing the four status of the Hoist, namely D1 (RUN), D2 (UP/DOWN), D3 (LOC/REMOTE) and D4 (FAULT). The functions of these indicators are shown in Table 5.1.

Table 5.1 Hoist status indicated by the four indicators

Hoist status	D1 (RUN)	D2 (UP/DOWN)	D3（LOC/REMOTE）	D4 (FAULT)
UP	ON	ON	OFF	OFF
DOWN	ON	OFF	OFF	OFF
FAULT/WARNING	OFF	Not related	Not related	Flashing
Panel operation	ON	ON/OFF	ON	OFF

5.1.2 LED Digital Tube

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

5.1.3 LCD Display

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

5.1.4 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 【Parameter setting】mode.
v	Decrement	To select the next function code under 【Function Select】mode; To decrease the value of the selected parameter under 【Parameter setting】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.

5.2 Operation

5.2.1 Display after Power on

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

5.2.2【Monitoring State】

On "Monitoring State" interface, press ^ and v keys or < and > keys to switch the interfaces in monitoring state. Under "Monitoring State", 10 real time data for Hoist 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	Designation	Explanation	Setting Range	Unit	Factory Setting	Remarks
Vref	Speed reference	Display the speed reference instructions of the motor	×	rpm	×	
Vfbk	Feedback speed	Display the feedback speed of the motor	×	rpm	×	
Vdev	Speed deviaiton	Display the deviation of feedback speed from speed reference	×	rpm	×	
Irms	Output current	Display the output current	×	A	×	
Torq	Output torque	Display the output torque	×	%	×	
Tzero	Zero-servo torque	Display the zero-servo torque at starting	×	%	×	
Udc	DC bus voltage	Display the DC voltage of the main circuit in the Inverter	×	V	×	
Uout	Output voltage	Display the output voltage of the Inverter	×	V	×	
AI0	A0 input voltage	Display the Inverter analog voltage input 0 (A0)	×	V	×	
AI1	A1 input voltage	Display the Inverter analog voltage input 1 (A1)	×	V	×	
AI2	A2 input current	Display the Inverter analog current input 2 (A2)	×	mA	×	
DI	Input X0-X7 status	Display the input status of terminals X0-X7, in “XXXXXXXX”, where “X” = 0, indicating no input, while “X” = 1, indicating input.	×	×	×	
DO	Output Y0-Y3 and K1, K2 status	Display the input status of terminals Y0-Y3 and K1, K2, in “XXXXXXXX”, where “X” = 0, indicating no output, while “X” = 1, indicating output.	×	×	×	

5.2.3【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 Hoist running, of which panel operation speed Vref and Hoist running direction Vdir may be modified, and other 4 data can be displayed but not be modified.

Table 5.4 Comparision of panel control data

Display	Designation	Explanation	Setting Range	Unit	Factory Setting	Remarks
Vref	Panel operation speed	Set the speed reference of Inverter at panel operation	0.00～50.00	Hz	5.00	
Vfbk	Feedback speed	Display the feedback speed of the motor	×	Hz	×	
Irms	Output current	Display the output current	×	A	×	
Vdir	Hoist running direction	Set Hoist UP or DOWN	0～1	×	1	
Udc	DC bus voltage	Display the DC voltage of the main circuit in the Inverter	×	V	×	
Uout	Output voltage	Display the output voltage of the Inverter	×	V	×	

5.2.4 Operation Mode

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

* 1：parameter setting

2：motor tuning

3：fault detect

4：parameter processing

5.2.4.1【Parameter Setting】

Modify parameters under【Parameter Setting】 mode. The setting 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 v .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 v ,and press ENTER to confirm modification. If ENTER is not pressed, the modification is invalid.

Press ESC to return to the previous menu.

5.2.4.2【Motor Tuning】

Under 【Motor Tuning】 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-tuning 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.

5.2.4.3【Fault Inspection】

Under 【Fault Inspection】, view the recent 8 faults and the voltage, current, speed reference, and feedback speed status recorded while the fault occurs. On main state interface, press ENTER to shown ER0=X, press ∧ or ∨ to change from ER0 to ER7, of which ER0 represents the serial number of latest 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), speed reference (Vref), and feedback speed (Vfbk) for the current fault are shown, and press ENTER again to retun to fault code display mode. Press ESC to return to the previous menu.

5.2.4.4 【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 ∨ to select corresponding operation mode, and press ENTER to confirm. Parameter processing selection parameters have 4 modes, defined as follows:

1: paramter upload to operator

2: parameter download to Inverter

7: Reset parameter

8: Reset fault

Press ESC to return to the previous menu.

5.3 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 serial number	Fault display	Fault serial number	Fault scan display
1	module overcurrent protection	2	ADC fault
3	radiator overheating	4	brake unit fault
5	converter no output	6	output over torque
8	bus overvoltage protection	9	bus undervoltage
10	output phase lack	11	motor low speed overcurrent
13	current is detected when stop	16	motor phase sequence fault
21	abc over current	22	brake inspection fault
23	input overvoltage	27	output overcurrent
29	input phase lack	31	motor high speed overcurrent
32	grounding protection	33	capacitor aging
34	external fault	35	output imbalance
36	parameter setting fault	37	current sensor fault
38	brake resistance short circuit	39	current Instantaneous value too large
38	brake resistor short circuit	39	current Instantaneous value too large
42	IGBT short circuit	44	charge relay fault(less than 30KW)
45	brake fault		

Chapter 6. Fast debug instruction

6.1 Forward/backward （Diff）torque starting lift mode

------For elevator used

6.1.1 Basic parameter settings

function code	function code name	setting value	notes
P01.00	command channel selection	1： forward/backward torque starting command	
P04.00	motor rated power	set according to motor nameplate	
P04.01	motor rated current		
P04.02	motor rated frequency		
P04.03	motor rated voltage		
P06.02	acceleration time Ta0	set according to Operating condition	*1
P06.03	deceleration time Td0		*2
P07.00	digital multi-segment speed f0		
P07.01	digital multi-segment speed f1		
P07.02	digital multi-segment speed f2		
P07.03	digital multi-segment speed f3		
P05.09	Output KO function		One of these is used for Brake Control
P05.10	Output K1 function		

Note 1：the shorter acceleration time is, the bigger starting current will be , it can't start or overcurrent protection will be acted if acceleration time is too short;

Note 2：the shorter deceleration time is , the shorter stopping distance will be, overvoltage protection will be acted if deceleration time is too short;

6.1.2 Debug parameter setting

function code	function code name	setting value	notes
P02.00	starting mode selection	3：positive/negative starting frequency start	as shown in time sequence Fig- 6.1 and Fig-6.2
P02.01	start holding frequency	equal or slightly larger than motor rated Slip frequency	positive rotation rise time sequence Fig- is shown in Fig- 6.1
P02.02	start frequency holding period	More than motor brake mechanical action time*3	
P02.03	negative rotation start holding frequedcy	equal or slightly larger than motor rated Slip frequency	negative rotation fall, time sequence Fig- is shown in Fig- 6.2
P02.04	negative rotation start holding period	More than motor brake mechanical action time*3	
P02.07	stop holding frequency	Equal or slightly larger than motor's rated slip frequency	time sequence Fig- is shown in Fig- 6.1 and Fig- 6.2
P02.08	stop frequency holding period	More than motor brake mechanical action time*3	
P02.13	rising brake release current	100.0%~150.0%	
P02.14	falling brake release current	50.0~120.%	
P02.17	Brake close delay time	0~100ms	Time sequence Fig- is shown in Fig-6.1 and Fig- 6.2
P08.06	rising torque compensation data	*5	
P08.07	falling torque compensation data	*6	
P08.08	falling stop torque compensation	*7	
P08.09	V/F compensation maximum frequency	*8	

Note 3: normally setting value is above 100ms;

Note 5: increase torque compensation value gradually to ensure current within the range of motor's rated current times 1.5 to converter's rated current times 1.8 when it causes sliding car or can't start.

Note 6,Note 7: start current during falling period is lower than start current during rising period, decrease compensation value under the condition that no sliding car occurs.

Note 8: compensation maximum frequency is within 20%~50% of motor's rated frequency, increase frequency if it is too low after start；

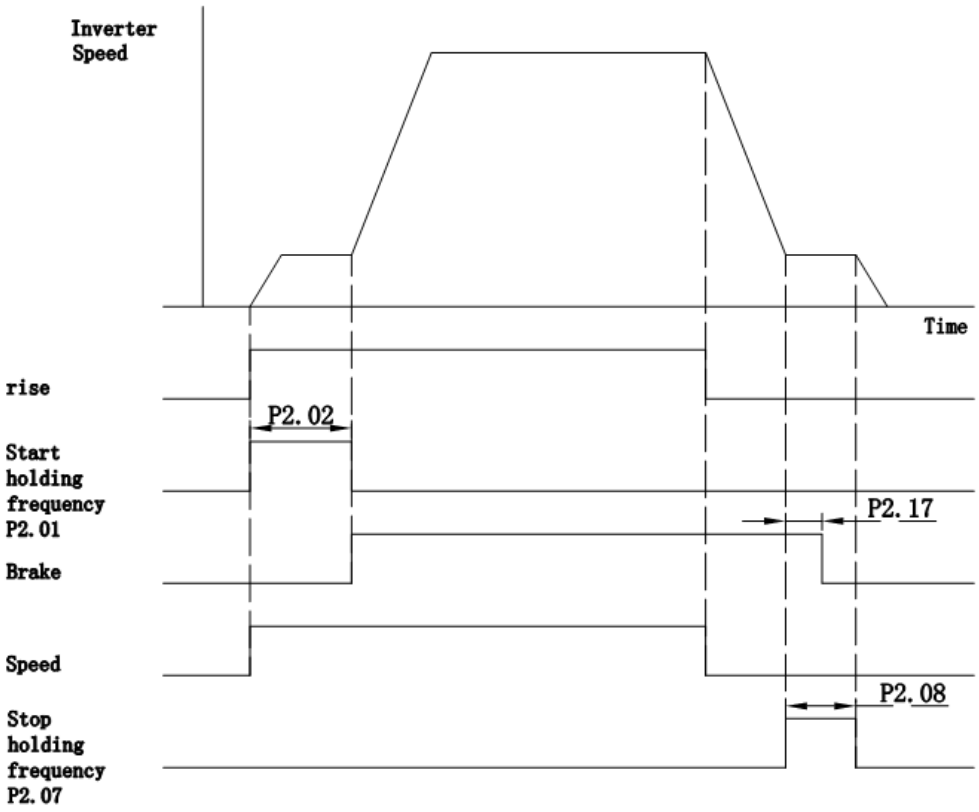


Fig--6.1positive/nergative torque start rising

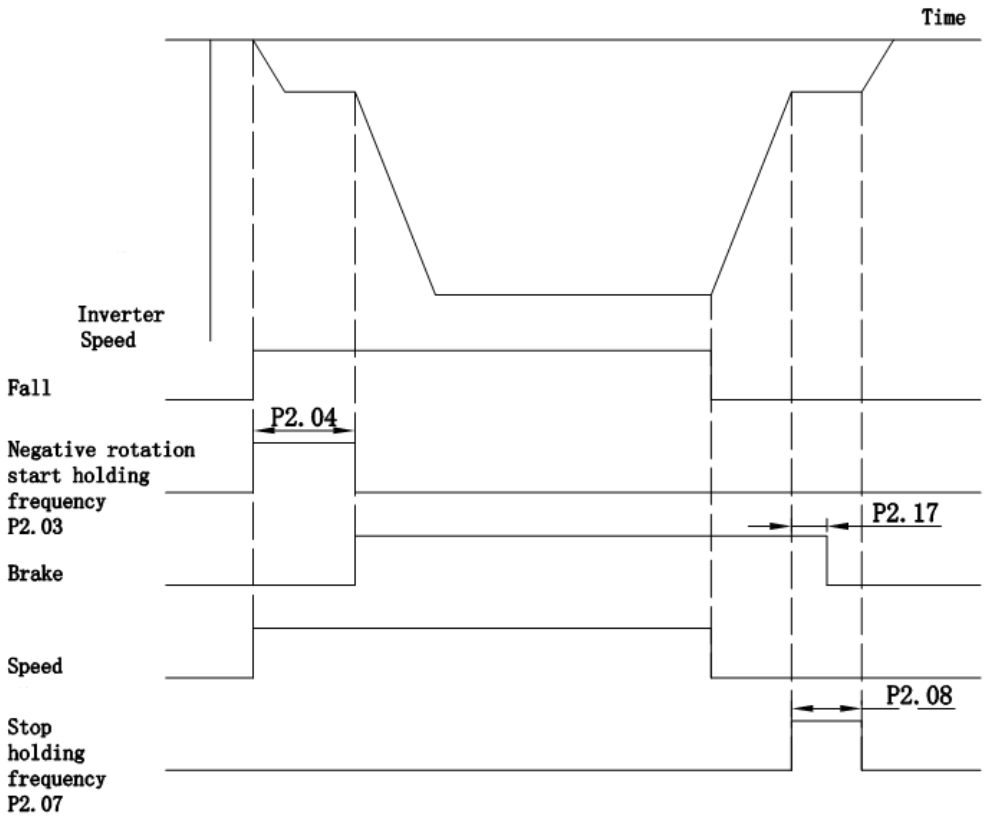


Fig- 6.2 positive/nergative torque start falling

6.1.3 Limit and protection parameter

Function code	Function code name	Setting value	Notes
P06.01	basic frequency	Equal motor's rated frequency	
P08.00	frequency upper limit	Equal motor's rated power without flux-weakening requirement	
P08.01	frequency lower limit	Setting based on requirement	
P08.02	maximum frequency	Equal motor's rated power without Flux-weakening requirement	
P08.04	Accelerate overcurrent threshold	No more than 180%	*9

Note 9: when it can't start, increase the value, setting value should be no more than 180%;

6.2 Fixed torque start lift mode

6.2.1Bbasic parameter setting

Function code	function code name	Setting value	notes
P01.00	command channel selection	3： fixed torque start command	As shown in time sequence Fig- 6.1 and 6.2
P04.00	motor rated power	setting based on motor's nameplate	
P04.01	motor rated current		
P04.02	motor rated frequency		
P04.03	motor rated voltage		
P06.02	acceleration time Ta0	setting based on operating condition	*1
P06.03	deceleration time Td0		*2
P06.04	acceleration time Ta1		*3
P06.05	deceleration time Td1		
P07.00	digital multi-segment speed f0		
P07.01	digital multi-segment speed f1		
P07.02	digital multi-segment speed f2		
P07.03	digital multi-segment speed f3		

Note1: the shorter acceleration time is ,the larger start current will be, it can't start or overcurrent protection will be acted if acceleration time is too short；

Note 2: the shorter deceleration time is ,the shorter stopping distance will be, overvoltage protection will be acted if the deceleration time is too short.

Note 3: normally 50% of acceleration/deceleration time 0

6.2.2 Debug parameter setting

Function code	Function code name	Setting value	Notes
P02.00	Start mode selection	0：normally start	
P02.01	Start holding frequency	0	this mode is set 0
P02.02	Start frequency holding period	0	
P02.07	Stop holding frequency	equal or slightly larger than motor's rated slip frequency	
P02.08	Stopping frequency holding period	more than motor 's brake mechanical action time	
P02.09	Brake release frequency	Equal or slightly larger than motor's rated slip frequency	
P02.10	Brake frequency	Slightly larger than stop holding frequency	
P02.11	Slope switch frequency	Slightly larger than brake release frequency	
P02.12	Backward pull frequency during falling	Normally equal slope switch frequency	
P02.13	Rising brake release current	100.0%~150.0%	
P02.14	Falling brake release current	50.0~120.%	
P02.15	Backward pull holding period	Normally more than 300ms	Time sequence Fig- is shown in Fig- 6.4
P02.16	Brake release frequency holding period	Normally more than 100ms	Time sequence Fig- is shown in Fig- 6.3
P02.17	Brake close delay time	0~100ms	Time sequence Fig- is shown in Fig- 6.1 and Fig- 6.2
P08.06	Rising torque compensation value	*5	
P08.07	Falling torque compensation value	*6	
P08.08	Falling stop torque compensation value	*7	
P08.09	V/F compensation maximum frequency	*8	

Note 5： increase torque compensation value gradually to ensure current within the range of motor's rated current times 1.5 to converter's rated current times 1.8 when it causes sliding car or can't start.

Note 6,Note 7: start current during falling period is lower than start current during rising period, decrease compensation value under the condition that no sliding car occurs.

Note 8: compensation maximum frequency is within 20%~50% of motor's rated frequency, increase frequency if it is too low after start;

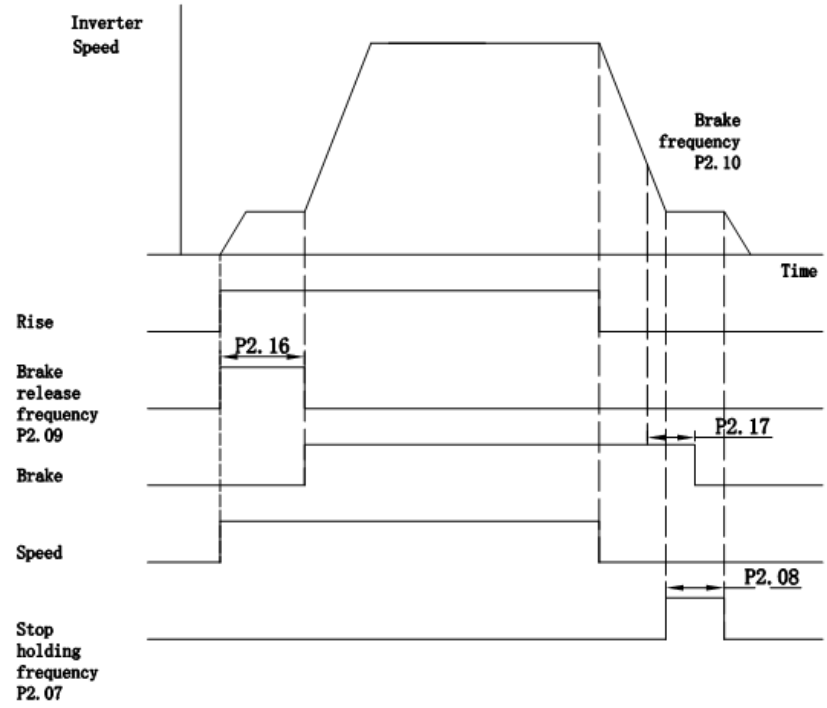


Fig- 6.3 fixed torque start rise

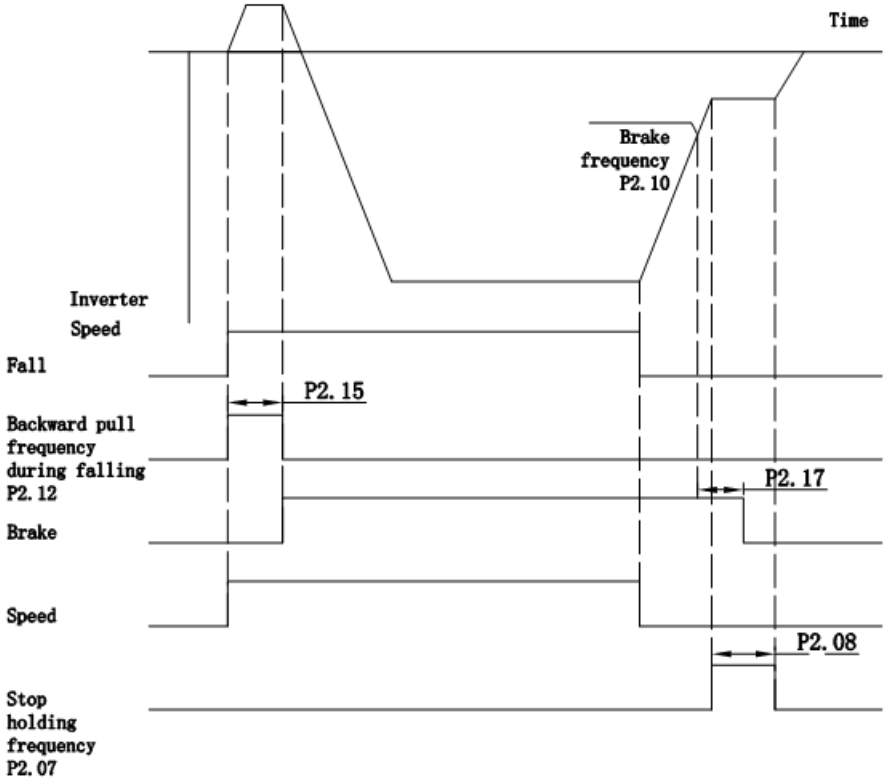


Fig- 6.4 fixed torque start fall

6.2.3 limit and protection parameter

Function code	Function code name	Setting value	Notes
P06.01	basic frequency	Equal motor's rated frequency	
P08.00	frequency upper limit	Equal motor's rated power without flux-weakening requirement	
P08.01	frequency lower limit	Setting based on requirement	
P08.02	maximum frequency	Equal motor's rated power without flux-weakening requirement	
P08.04	Accelerate the overcurrent threshold	No more than 180%	*9

Note 9: when it can't start, increase the value, setting value should be no more than 180%;

Chapter 7 function parameter list

This chapter introduces all functions and relevant information of the special converter in detail, as a reference.

7.1 Parameter group area division

Function code area	Function code instruction	Function code range
P00 group	code parameter group	P00.00～P00.02
P01 group	basic control command group	P01.00～P01.02
P02 group	start/stop parameter group	P02.00～P02.19
P03 group	V/F parameter group	P03.00～P03.10
P04 group	motor parameter group	P04.00～P04.06
P05 group	digital data input/out parameter group	P05.00～P05.20
P06 group	basic speed parameter group	P06.00～P06.10
P07group	digital multi-segment parameter group	P07.00～P07.07
P08 group	limit and protection parameter group	P08.00～P08.16
P09 group	product identifying parameter group	P09.00～P09.01

7.2 Function code parameter simple table

P00 group code parameter							
Function code	Function code name	Default value	Setting range	Unit	Property	Option instruction	Note
P00.00	login password	0	0～65535	/	△	0：no password；others：login password；	
P00.01	modify password	0	0～65535	/	○	0：no password；others：password protection；	
P00.02	standby	0	0～65535	/	○	standby	
P00.03	Language Selection	0	0～1	/	○	0: Chinese 1: English	

P01group basic control command							
function code	Function code name	Default value	Setting range	unit	property	Option instruction	note
P01.00	Command channel selection	1	0～3	/	○	0：running command given by panel 1：positive/negative (Diff) torque start command 2：command given by communication 3： fixed torque start command	
P01.01	Speed channel selection	1	0～1	/	○	0：speed given by panel 1：given by digital multi-segment speed	
P01.02	Lift special function	4	0~5	/	○	Bit0 setting to 1, brake control Bit2 setting to 1, lift special function	

P02 group start/stop parameter							
Function code	Function code name	Default value	Setting range	Unit	○	Option instruction	Notes
P02.00	Start mode selection	3	0～3	/	○	0： normal start 3：positive/negative starting frequency start	
P02.01	Start holding frequency	2.00	0.00～6.00	Hz	○	0.00～6.00	
P02.02	Start frequency holding period	0.1	0.0～3600.0	s	○	0.0～3600.0	

P02.03	start holding frequency when falling	0.50	0.00～60.00	Hz	○	0.00～60.00	
P02.04	start holding time when falling	0.1	0.00～3600.00	s	○	0.0～3600.0	
P02.05	Excitation time	0.0	0.0～99.9	s	○	0.0～99.9	
P02.06	Deceleration stop mode	1	0～3	/	○	0： inertia stop 1： deceleration stop 3:deceleration+holding excitation	
P02.07	Stop holding frequency	0.50	0.00～300.00	Hz	○	0.00～300.00	
P02.08	Stop frequency holding period	0.0	0.0～99.9	s	○	0.1～99.9	
P02.09	Brake release frequency	1.50	0.00～300.00	Hz	○	0.00～300.00Hz	
P02.10	Brake frequency	1.00	0.00～300.00	Hz	○	0.00～300.00Hz	
P02.11	Slope switch frequency	2.00	0.00～300.00	Hz	○	0.00～300.00Hz	
P02.12	backward pull frequency during falling period	2.00	0.00～300.00	Hz	○	0.00～300.00Hz	
P02.13	rise brake release current	20.0	0.0～200.0	%	○	0.0～200.0	
P02.14	Fall brake release current	20.0	0.0～200.0	%	○	0.0～200.0	
P02.15	Backward pull holding period	1.00	0.00～7.00	s	○	0.00～7.00	

P02.16	Brake release frequency holding period	0.30	0.00～655.35	s	○	0.00～655.35	
P02.17	Brake close delay period	0.00	0.00～655.35	s	○	0.00～655.35	
P2.18	Anti-adhesion start delay	0.0	0.0～5.0	s	○	0.0～5.0	
P2.19	Anti-adhesion stop delay	0.0	0.0～5.0	s	○	0.0～5.0	
P03 group V/F control parameter							
Function code	Function code name	Default value	Setting range	Unit	Property	Option instruction	Notes
P03.00	V/F curve setting	0	0～4	/	○	0：line 1： power of 1.2 2： power of 1.5 3： power of 2 4：user-defined	
P03.01	V/F curve Vol0	76	0～380	V	○	0～380	
P03.02	V/F curve Freq0	10.00	0.00～300.00	Hz	○	F0<F1	
P03.03	V/F curve Vol1	152	0.0～380.0	V	○	0～380	
P03.04	V/F curve Freq1	20.00	0.00～300.00	Hz	○	F1<F2	
P03.05	V/F curve Vol2	228	0.0～380.0	V	○	0～380	
P03.06	V/F curve Freq2	30.00	0.00～300.00	Hz	○	F2<F3	
P03.07	V/F curve Vol3	304	0.0～380.0	V	○	0～380	
P03.08	V/F curve Freq3	40.00	0.00～300.00	Hz	○	F3<F4	
P03.09	V/F curve Vol4	380	0.0～380.0	V	○	0～380	
P03.10	V/F curve Freq4	50.00	0.00～	Hz	○	F4< frequency	

Function code	Function code name	Default value	Setting range	unit	Property	Option instruction	
P04.00	Motor rated power		0.40～999.90	kW	○	Setting based on motor nameplate	
P04.01	Motor rated current		0.1～999.9	A	○	Setting based on motor nameplate	
P04.02	Motor rated frequency	50.00	0.00～300.00	Hz	○	Setting based on motor nameplate	
P04.03	Motor rated voltage	380	0～480	V	○	Setting based on motor nameplate	
P04.04	Motor rated slip frequency	1.40	0.10～655.35	Hz	○	Setting based on motor nameplate	
P04.05	Rising no load current quotiety	30.00 %	0.00～60.00	%	○		
P04.06	Falling no load current quotiety	28.00 %	0.00～60.00	%	○		

P05 group digital input output parameter

Function code	Function code name	Default value	Setting range	unit	property	Option instruction	notes
P05.00	Input Dio function	3	0～50	/	○	00：no function 01：acceleration/deceleration selection 0 02：acceleration/deceleration selection 1 03：multi-segment port0	
P05.01	Input Di1 function	4	0～50	/	○		
P05.02	Input Di2 function	5	0～50	/	○		
P05.03	Input Di3 function	118	0～50	/	○		

P05.04	Input Di4 function	13	0～50	/	○	signal input; 04：multi-segment port1 signal input 05：multi-segment speed port2 signal input ; 07：positive rotation(rising); 08：negative rotation(falling)； 09：three-phase system control selection; 13：fault reset signal input ; 14：external fault signal input 18：base block signal normally open input； 29:emergency stop 30：backward-pull mode rise 31：backward-pull mode fall 32：brake inspection	
P05.05	Input Di5 function	0	0～50	/	○		
P05.06	Input Di6 function	7	0～50	/	○		
P05.07	Input Di7 function	8	0～50	/	○		
P05.08	Input terminal filter frequence	4	0～10	/	○	0～10	
P05.09	Output KO function	2	0～31	/	○	0： no action 01：power on self test is normal	
P05.10	Output K1 function	31	0～31	/	○		
P05.11	Output YO function	0	0～31	/	○		

P05.12	Output Y1 function	0	0～31	/	○	02：converter fault output 03：converter running 04：frequency arrive output： 06：converter 0 speed running； 07：bus voltage normally output 16：brake/drive status 29：anti-adhesion inspection output: 30：lift mode brake output； 31:brake output after start	
P5.13	Output Y2 function	0	0～31	/	○		
P5.14	Output Y3 function	0	0～31	/	○		

P06 group speed parameter

Function code	Function code name	Default value	Setting range	unit	property	Option instruction	notes
P06.00	Panel speed	50.00	0.00～100.00	Hz	○	0.00～100.00	
P06.01	Basic frequency	50.00	0.00～100.00	Hz	○	0.00～100.00	
P06.02	Acceleration time Ta0	6.00	0.10～360.00	s	○	0.10～360.00	
P06.03	Deceleration time Td0	2.00	0.10～360.00	s	○	0.10～360.00	
P06.04	Acceleration time Ta1	3.00	0.10～360.00	s	○	0.10～360.00	

P06.05	Deceleration time Td1	2.00	0.10～360.00	s	○	0.10～360.00	
P06.06	Acceleration round angle Ts0	0.20	0.00～10.00	s	○	Acceleration start	
P06.07	Acceleration round angle Ts1	0.20	0.00～10.00	s	○	Acceleration over	
P06.08	Deceleration round angle Ts2	0.20	0.00～10.00	s	○	Deceleration start	
P06.09	Deceleration round angle Ts3	0.20	0.00～10.00	s	○	Deceleration over	
P06.10	Urgency deceleration time	1.00	0.00～10.00	s	○	0.00～10.00	
P07group multi-segment speed parameter							
Function code	Function code name	Default value	Setting range	unit	property	Option instruction	notes
P07.00	Digital multi-segment speed f0	0.00	0.00～300.00	Hz	○	set frequency according to the parameter given by multi-segment combination table (table 7.1 shows corresponding relationship of multi-segment speed input combination and given speed)	
P07.01	Digital multi-segment speed f1	0.00	0.00～300.00	Hz	○		
P07.02	Digital multi-segment speed f2	0.00	0.00～300.00	Hz	○		
P07.03	Digital multi-segment speed f3	0.00	0.00～300.00	Hz	○		
P07.04	Digital	0.00	0.00～	Hz	○		

	multi-segment speed f4		300.00				
P07.05	Digital multi-segment speed f5	0.00	0.00～300.00	Hz	○		
P07.06	Digital multi-segment speed f6	0.00	0.00～300.00	Hz	○		
P07.07	Digital multi-segment speed f7	0.00	0.00～300.00	Hz	○		
P08 group limit and protection parameter							
Function code	Function code name	Default value	Setting range	unit	property	Option instruction	notes
P08.00	Frequency upper limit	50.00	0.01～maximum frequency	Hz	○		
P08.01	Frequency lower limit	0.00	0.01～frequency upper limit	Hz	○		
P08.02	Maximum frequency	50.00	0.01～300.00	Hz	○		
P08.03	Maximum output voltage	380	0～480	V	○		
P08.04	Acceleration overcurrent threshold value	150	0～200	%	○		
P08.05	Deceleration	750	0～800	V	○		

	overvoltage threshold value						
P08.06	torque compensation value when rising	3.0	0.0～30.0	%	○		
P08.07	stop torque compensation value When falling	2.0	0.0～30.0	%	○		
P08.08	torque compensation when falling	2.0	0.0～50.0	Hz	○		
P08.09	V/F compensation maximum frequency	10.00	1.10～ 10.00	Hz	○		
P08.10	PWM carrier wave frequency	4.000	2.000～ 10.000	KHz	○		
P08.11	No PWM inspection delay	500	0～2000	ms	○		
P08.12	Damping suppression upper limit	0.0	0～20.0	%	○		
P08.13	Damping suppression lower limit	0.0	0～20.0	%	○		
P08.14	start compensation frequency when falling	0.00	0.00～ 20.00	Hz	○		
P08.15	dead zone compensation value	100	0～65535	%	○		

	when rising						
P08.16	dead zone compensation when falling	100	0～65535	%	○		
P09 group product identifying parameter							
Function code	Function code name	Default value	Setting range	unit	property	Option instruction	notes
P09.00	Converter rated power		0.0～999.9	kW	×		
P09.01	Converter software version	620.01		/	×	Converter software version	

○：readable/writable, and can be initialized

△：readable/writable, and can't be initialized

×：only writable

7.3 Function code parameter detailed solution

P00 group:basic function parameter

P00.00	Login password	0～65535（0）

This function is used to prevent irrelevant person from inquiring and modifying the parameters to protect the safety of converter parameters.

00000：no code protection, all the parameters could be inquired ,as to converter, no password is set upon delivery.

Once user password is set effective and re-enter the parameter setting status, all the parameters can't be changed via panel unless entering the right password,can only be viewed. Password of the parameters always displays 00000.

Note：the default setting value of AS620 serial converter is no user password (p00.00=0),so no login password is needed when first use.

P00.01	modify password	0～65535（0）

set password：

Enter 5-digit Fig- as user password, press ENT key to confirm, and reset it .

modify password：

press ENT key to enter password indentification status, display 0.0.0.0.,enter parameter editing status after entering the right password. Select P00.01(P00.01 parameters display 00000), enter new password and press ENT key to confirm, reset P00.01 the same password, new password has been set successfully after displaying “password is modified successfully” .

cancel password：

press ENT key to enter password verification status, display 0.0.0.0.0,enter parameters editing status after inputting correct password. view that P00.01 is 00000 , press ENT key to confirm. Reset P00.01=00000,password is removed successfully after displaying “password has been removed successfully”.

P00.03	Language selection	0～1（0）

Choose the display language you want：

0: Chinese 1:English

P01group basic control parameters

P01.00	Command channel selection	0～3（1）

can select three different converter running command given mode.

0：operation panel running instruction given mode: act operations such as converter run, stop, rise/fall and so on via key F1(RUN), F2(STOP), F3(LOC/REM) on operation panel.

1：terminal lift command: act operations such as converter run, stop, rise/fall and so on via defining multi-function terminal X0~X7 . shown in instruction P05.00~P05.07.

2：master run command given mode: act operations such as converter run, stop, positive/negative rotation and so on via communication mode.

3:reverse drawing command given mode: in view of the condition that brake all the time during falling , drive all the time during rising, and as to lift without counterpoise, can use this mode.

P01.01	Speed channel selection	0～1（1）

this function applies to the given frequency under V/f control.

0：digital frequency given by panel, set frequency given via P06.00

1：digital data multi-segment given target speed

digital data multi-segment speed terminal 0~2 is effective, then frequency is confirmed by this terminal combination(shown in table 7.1), frequency setting is shown in P07.00~P07.07

P01.02	Lift special function	0～5（4）

when bit0=1(namely P01.02=1），brake inspection point is involved in control and protection, can only enter acceleration status after brake inspection point acts ,otherwise keep in start frequency.

bit2=1（namely P01.02=4），to invoid bus voltage falling, converter outputs normal frequency when bus voltage is normal, to invoid fault , converter will decrease output frequency according to percentage of bus voltage falling when bus voltage is too low .

Note：if you want to achieve P01.02 parameter's two functions, please do bit0+bit2, namely P01.02=1+4=5

P02 group： start/ stop control parameters

P02.00	start mode selection	0～3（3）

can use different start modes according to different occasions,

0：normal start.

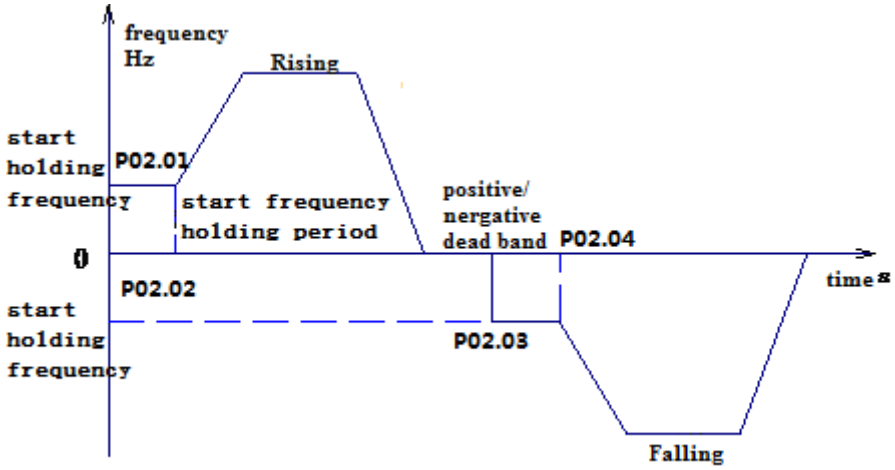


Fig- 7-1 start frequency start mode diagram

3：positive/negative（diff） start frequency start

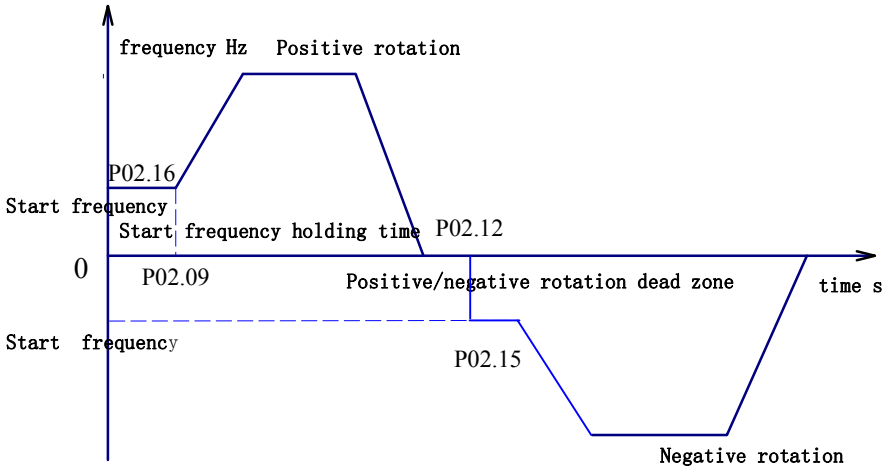


Fig- 7-2 positive/negative start frequency start mode diagram

P02.01	Start holding frequency (Hz)	0.00～60.00 Hz（2.00）
P02.02	Start frequency holding time (s)	0.00～3600.00（0.10）
P02.03	Falling start holding frequency (Hz)	0.00～60.00 Hz（0.50）
P02.04	Falling start frequency holding time	0.00～3600.00（0.10）

start frequency means the initial frequency when converter start , as fs shown in Fig- below; start frequency holding time ts means the holding running time under start frequency during converter's start process. As shown in Fig- 7-1

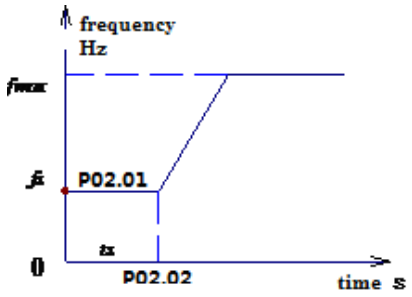


Fig- 7-3 start frequency and start time diagram

When P02.00=0 start normally，P02.01 and P02.02 work，rising and falling use a common group of start frequency and holding time.

When P02.00=3 start with positive/negative start frequency , P02.01~P02.04 work，rising and falling use different start frequency and holding time.

Note : As to heavy load start occasion, set the start frequency holding time properly, Being good for start .

P02.05	Excitation time(s)	0.0～99.9（0.0）

Excitation time is the time for establishing the magnetic flux before motor start, in order to achieve the purpose of rapid response when motor start, when instruction run, enter pre-excitation status according to time set by this function code,after magnetic flux is established, enter normal speed running status again. Setting this function code “0” means no pre-excitation process.

Note : motor maybe rotate when pre-excitation is acted, here cooperate with mechanical brake please.

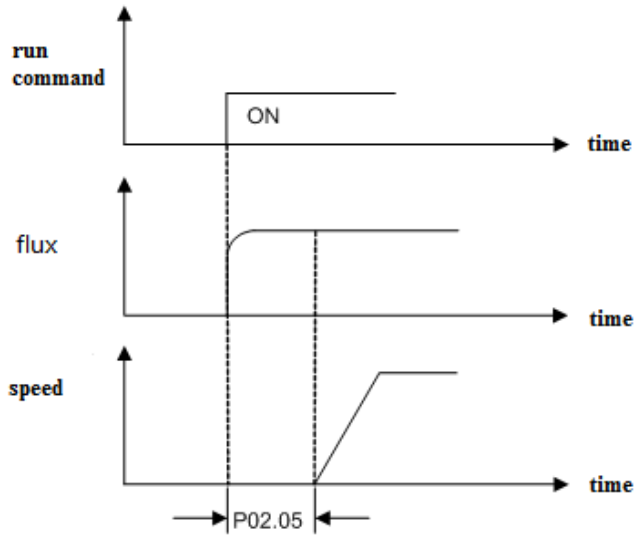


Fig- 7-4 pre-excitation diagram

P02.06	Deceleration stop mode	0～3（1）

use different stop modes according to different occasions

0：converter block output, motor inertial stop freely

1：slow down and stop according to the setting deceleration time

3：slow down and stop according to setting deceleration time, keep excitation on motor after stop, can answer start rapidly when run instruction come.

P02.07	Stop holding frequency (Hz)	0.00～300.00（0.50）
P02.08	Stop frequency holding time (s)	0.1～99.9（0.0）

converter decelerates from normal running speed (frequency) to car stop frequency P02.07 , then last for car stop frequency holding time P02.08 , then decelerate to zero according to the presetting deceleration time , being good for car stop stability.

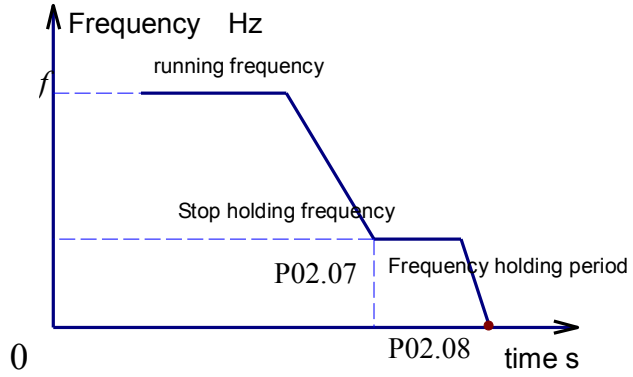


Fig- 7-5 stop holding frequency diagram

P02.09	Brake release frequency（Hz）	0.00～300.00（1.50）

P01.00=3 in reverse drawing lift mode , start frequency during rising period.

P02.10	Brake frequency（Hz）	0.00～300.00（1.00）

Brake after lift decelerates to brake frequency for a period of P02.17

P02.11	Slope switch frequency（Hz）	0.00～300.00（2.00）

run under acceleration/deceleration time set by P06.04 and P06.05 when converter run below frequency set by P02.11. run under acceleration/deceleration time set by P06.02 and P06.03 when converter run above frequency set by P02.11 .

P02.12	Reverse drawing frequency during falling（Hz）	0.00～300.00（2.00）

P01.00=3 in reverse drawing lift mode，reverse drawing frequency during falling period.

P02.15	reverse drawing holding time（S）	0.00～7.00（1.00）

P01.00=3 in reverse drawing lift mode , reverse drawing frequency holding time during falling period.

P02.16	Brake release frequency holding time（S）	0.00～65535（0.30）

P01.00=3 in reverse drawing lift mode，brake release frequency holding time during rising period.

P02.09~P02.12，P02.15,P02.16 are effective only when running command given mode selects “ fixed torque start command (P01.00=3)” , and set P02.01~P02.04 to “0”, time sequency Fig- is shown in Fig- 6.2 , “fixed torque start command mode” in Fig- 6.3 and 6.4 .

P02.13	Rising brake release current（%）	0.00～100.00%（20%）

conditions of brake releasing after converter run during rising period.

P02.14	Falling brake release current（%）	0.00～100.00%（20%）

conditions of brake releasing after converter run during falling period .

P02.17	Brake closing delay period（S）	0.00～65535（0.00）

shown in P02.10 parameter instruction

P02.18	Anti-adhesion start delay（S）	0.0～5.0（0.0）

output speed after receiving direction signal and delaying for a period of P2.18, this parameter is used to ensure that protection relay’s signal act reliablely.

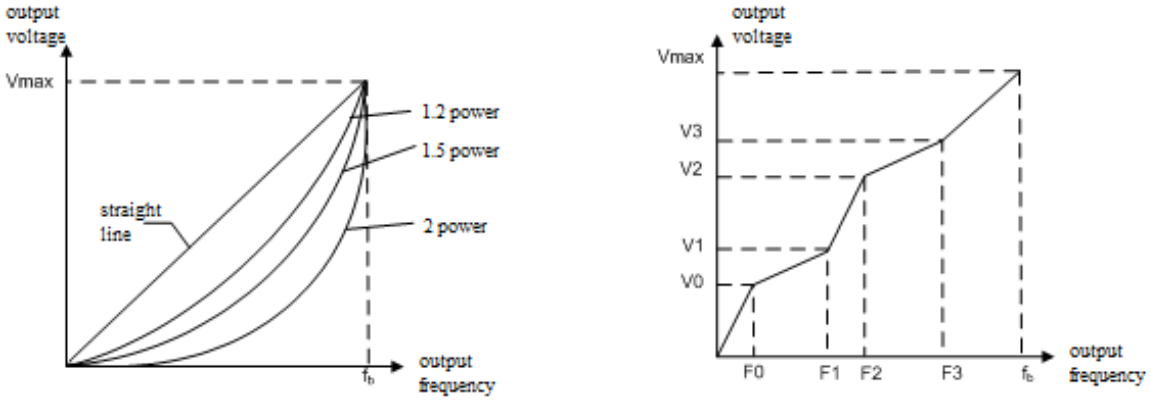
P02.19	Anti-adhesion stop delay（S）	0.0～5.0（0.0）

disconnect anti-adhesion relay after brake is closed and delaying for a period of P02.19.

P03 group V/F control parameter

P03.00	V/F curve given	0～4（0）
P03.01	V/F voltage value V0(V)	0.0～380.0（76.0）
P03.02	V/Ffrequency value F0(Hz)	0.00～300.00（10.00）
P03.03	V/Fvoltage value V1(V)	0.0～380.0（152.0）
P03.04	V/Ffrequency valueF1(Hz)	0.00～300.00（20.00）
P03.05	V/Fvoltage value V2(V)	0.0～380.0（228.0）
P03.06	V/Ffrequency value F2(Hz)	0.00～300.00（30.00）
P03.07	V/Fvoltage value V3(V)	0.0～380.0（304.0）
P03.08	V/Ffrequency value F3(Hz)	0.00～300.00（40.00）
P03.09	V/Fvoltage value V4(V)	0.0～380.0（380.0）
P03.10	V/Ffrequency value F4(Hz)	0.00～300.00（50.00）

confirm different V/Fcurves under vector control 1 run mode.



V/F curve **multi-segment V/F curve**

Fig- 7-6 V/F curve diagram

P03.00＝0 apply to constant torque load situation, as the line in this Figure.

P03.00＝4 user defined curve, apply to subsection constant torque load, shown in Fig-.

In Fig- 7-6： F0<F1<F2<F3<F4≤fb fb is basic running frequency P06.01. V0≤V1≤V2≤V3<V4≤Vmax V0、V1、V2、V3、V4 are the actual output voltage (V1= (Vmax/ fb)*F1 default Vmax=380V，fb=50Hz）corresponding to maximum output voltage, rated frequency .

P04 group：motor parameter group

P04.00	Rated power (KW)	0.4～999.9
P04.01	Motor rated current (A)	0.1～999.9
P04.02	Motor rated frequency (Hz)	0～300(50)
P04.03	Motor rated voltage (V)	0～480(380)
P04.04	Motor rated slip frequency (Hz)	0.1～6553.5(1.4)

Motor rated slip frequency = 120*motor rated frequency/motor rated rotation speed

P04.05	Rising no load current modulus (%)	0～60.00(30.00)
P04.06	falling no load current modulus (%)	0～60.00(28.00)

P04.00～P04.04 is used to set motor parameters driven by converter, set parameters correctly according to motor's nameplate before using.

Note: converter's power class should match with motor.No-load current's modulus affect motor's excitation current, pause occurs after start, can increase no-load current modulus.

P05 group：digital input output parameters

P05.00	X0 terminal input function selection	0～31(3)
P05.01	X1 terminal input function selection	0～31(4)
P05.02	X2 terminal input function selection	0～31(5)
P05.03	X3 terminal input function selection	
P05.04	X4 terminal input function selection	0～31(118)
P05.05	X5 terminal input function selection	0～31(0)
P05.06	X6 terminal input function selection	0～31(7)
P05.07	X7 terminal input function selection	0～31(8)

 function input terminal definition table：

Number	Function definition
0	No function
1	Acceleration/deceleration selection 0
2	Acceleration/deceleration selection 1
3	Digital segment speed 0
4	Digital segment speed 1
5	Digital segment speed 2
7	Positive rotation(rise)
8	Negative rotation(fall)
9	Three wire system control selection
13	External reset terminal
14	External fault terminal
18	base block
29	Emergency deceleration stop
30	Rise(backward pull mode)
31	Fall(backward pull mode)
32	Brake inspection

0： no function

1：acceleration/ deceleration selection 0

2:：acceleration/ deceleration selection 1

3：digital segment speed 0

4：digital segment speed 1

5：digital segment speed 2

Using method is shown in P07.00~P07.07 instruction

7：positive rotation(rise)

8：negative rotation (fall)

9：three wire system control selection

13：external reset terminal

achieve fault reset of external terminal

14：external fault terminal

This terminal's function is : give converter a fault signal via external input to make the converter stop running.

18：base block

Converter output is forbidden when this function terminal is effective.

29：emergency stop

Converter will slow down and stop according to the urgent deceleration time set by P06.10 when this function terminal is effective.

30：rise

set to rise only when P01.00=3 lift is under running mode.

31：fall

set to fall only when P01.00=3 lift is under running mode

32：brake inspection

Enter brake inspection point after brake output.

Note：this input terminal signal turns effective when disconnected after adding 100 to the function code above . e.g.: terminal function is set 118, then it means this base is blocked when this terminal input is ineffective.

P05.08	Input terminal filter times	0～10（4）

increase this parameter properly when input port is disturbed

P05.09	Relay KO output function selection	0～31(2)
P05.10	Relay K1 output function selection	0～31(31)
P05.11	Output Y0 function	0～31(0)
P05.12	Output Y1 function	0～31(0)
P05.13	Output Y2 function	0～31（0)
P05.14	Output Y3 function	0～31（0)

Y0～Y3 open-collector、K1～K2 relay output can be defined “multi-function output” function definition table of multi-function switch data output：

Function setting	Meanings
0	No function
1	Power on self test normal
2	Converter fault output
3	Converter running signal(RUN)
4	frequency arrive output
6	Converter 0 speed running
7	Bus voltage normal output
16	Brake/drive status
29	Anti-adhesion relay output
30	Crane brake output
31	Lift brake output

Instruction 1：

0：no function

1or 101：converter running preparation ready (RDY)

1：converter self test is normal and no fault, corresponding output point is connected, otherwise disconnected.

101：converter self test is normal and no fault, corresponding output point is connected, otherwise disconnected.

2 or 102：converter fault.

2：corresponding output point is connected when converter under stop status due to fault,otherwise disconnected.

102：corresponding output point is disconnected when converter under stop status due to fault,otherwise connected.

3 or 103：converter running signal(RUN)

3：corresponding output point is connected when converter run normally after answering running command,otherwise disconnected.

103：corresponding output point is disconnected when converter run normally after answering running command,otherwise connected.

4 or 104：frequency arrive output.

6 or 106：converter zero speed running.

6：corresponding output point is connected when output power is zero during running process ,otherwise disconnected.

7 or 107：DC bus voltage is no less than 85% of the rated value.

7：corresponding output point is connected when bus voltage of converter is no less than 85% of the rated value, otherwise disconnected.

107：corresponding output point is disconnected when bus voltage of converter is no less than 85% of the rated value, otherwise connected.

16：brake and drive status identification 0：drive；1：brake

116：brake and drive status identification 0：brake ； 1：drive

29 or 129：anti-adhesion relay output.

29：corresponding anti-adhesion relay is connected after receiving direction signal, otherwise

disconnected.

129：corresponding anti-adhesion relay is disconnected after receiving direction signal, otherwise connected.

30 or 130：brake output upon lift mode （P01.00=3）.

30：corresponding output point is connected when converter brake signal output under lift mode , otherwise disconnected.

130：corresponding output point is disconnected when converter brake signal output under lift mode , otherwise connected.

31 or 131：brake output after start under normal mode (P01.00=1)

31：corresponding output point is connected when converter's brake signal output under normal mode. Otherwise disconnected ;

131：corresponding output point is disconnected when converter's brake signal output under normal mode. Otherwise connected ;

Note: above-mentioned "connect" means: to relay output, normally open contact(1A and 1B,2A and 2B) connect, normally closed contact (1B and 1C,2B and 2C) disconnect; to open collector output, means output point is low electrical level status, the same, above-mentioned "disconnect" means: to relay output, normally open contact(1A and 1B,2A and 2B) disconnect, normally closed contact (1B and 1C,2B and 2C) connect; to open collector output, means output point is high resistance status.

P06 group: speed parameter

P06.00	Panel speed	0.0～100.0（50.0）

initial speed given by panel, Vref value also could be changed via panel operation mode.

P06.01	Basic running frequency	0.0～100.0（50.0）

basic running frequency means the corresponding minimum frequency when converter export maximum voltage. Corresponding to motor's rated frequency when use standard AC motor. Shown in motor nameplate.

P06.02	Acceleration time0(s)	0.1～3600.0（6.0）
P06.03	Deceleration time 0(s)	0.1～3600.0（2.0）

this function can set the speed during the process of accelerating to constant speed or decelerating from constant speed to stop.

Acceleration time 0: time P06.02 spent in the process that converter's output frequency rise from zero to maximum value.

Deceleration time 0: time P06.02 spent in the process that converter's output frequency fall from maximum value to zero.

P06.04	Acceleration time1(s)	0.1～3600.0(3.0)
P06.05	Deceleration time1(s)	0.1～3600.0(2.0)

when set to lift mode (P01.00=3) , run according to the acceleration/ deceleration time set by P06.04 and P06.05 when converter run below the frequency set by P02.11, run according to the acceleration/ deceleration time set by P06.02 and P06.03 when converter run above the frequency set by P02.11.

P06.06	Acceleration round angle 0(s)	0.1～10.0（0.2）
P06.07	Acceleration round angle 1(s)	0.1～10.0（0.2）
P06.08	deceleration round angle 0(s)	0.1～10.0（0.2）
P06.09	deceleration round angle 1(s)	0.1～10.0（0.2）

Acceleration /deceleration round angle: accessorial arc segment time P06.06~P06.09 for improving the initial and final segment's smoothness during acceleration, deceleration process. arc curve time applies to conveyor belt for transporting fragile items or the occasion that needs smooth speed-adjusting .

P06.06～P06.09 is S curve(speed curve) parameter of motor running when setting switch data multi-segment speed is confirmed. They appoint acceleration time(P06.02), deceleration time(P06.03), acceleration angle time(P06.06 and P06.07), deceleration angle time(P06.08 and P06.09)，these parameters affect S curve's property directly, also directly relate to motor's running efficiency and riding comfortability. Above mentioned parameters's detailed position in motor running S speed curve is shown in Fig- 7-7.

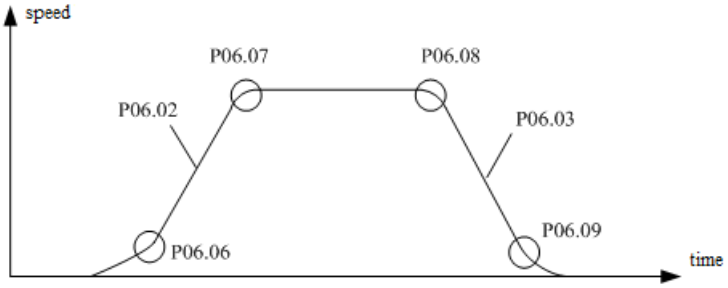


Fig-7-7 S curve bv's position during motor running

P06.10	Rapid deceleration time (s)	0.1～3600.0（1.0）

converter will slow down and stop according to the rapid deceleration time set by P06.10 when the terminal set to rapid deceleration function is effective .

P07group : digital multi-segment speed parameter

P07.00	Multi-segment digital frequency given 0(HZ)	0.01～300.00(0.00)
P07.01	Multi-segment digital frequency given 1(HZ)	0.01～300.00(0.00)
P07.02	Multi-segment digital frequency given 2(HZ)	0.01～300.00(0.00)
P07.03	Multi-segment digital frequency given 3(HZ)	
P07.04	Multi-segment digital frequency given 4(HZ)	0.01～300.00(0.00)
P07.05	Multi-segment digital frequency given 5(HZ)	0.01～300.00(0.00)
P07.06	Multi-segment digital frequency given 6(HZ)	0.01～300.00(0.00)
P07.07	Multi-segment digital frequency given 7(HZ)	0.01～300.00(0.00)

could give as digital frequency, select different multi-segment frequency to give according to different terminal's status via defining multi-functional X terminal (digital data multi-segment 0~3). ON means terminal is effective, OFF means terminal is ineffective.

P07.00～P07.07 define speed instruction values of given speed 0 to given speed 7 respectively, composed to Eight states via Three input point's binary system code from 0～2 given by switch data multi-segment speed , these Eight states are corresponding to above mentioned seven given speed instructions as P07.00 to P07.07 and 0 given speed (when combination code is 0),the corresponding relationship of multi-segment speed input port signal and given speed instruction is shown in table 7.1 as follows.

Table 7.1 the corresponding relationship of multi-segment speed input port combination and given speed

Multi-segment speed combination code	Multi-segment speed given 2	Multi-segment speed given 1	Multi-segment speed given 0	given frequency
0	0	0	0	Given speed 0
1	0	0	1	Given speed 1
2	0	1	0	Given speed 2
3	0	1	1	Given speed 3
4	1	0	0	Given speed 4
5	1	0	1	Given speed 5
6	1	1	0	Given speed 6
7	1	1	1	Given speed 7

in above mentioned table , status “0” means this input port has no input signal, status “1” means this input port has input signal. Give an example as follows to illuminate more about the above mentioned table: if speed given “0” has input signal , speed given “1” has input signal , speed given “2 ”has no input signal ,then binary system code is “011”=3, corresponding given speed is given speed 3, its given speed value is appointed by P07.03 parameter .

P08.00	Frequency upper limit（Hz）	0.01～ (50.00)
P08.01	Frequency lower limit（Hz）	0.01～Frequency upper limit (0.00)

frequency upper limit fH and frequency lower limit fL are the highest frequency and lowest frequency of motor running set via production process requirement during using process.

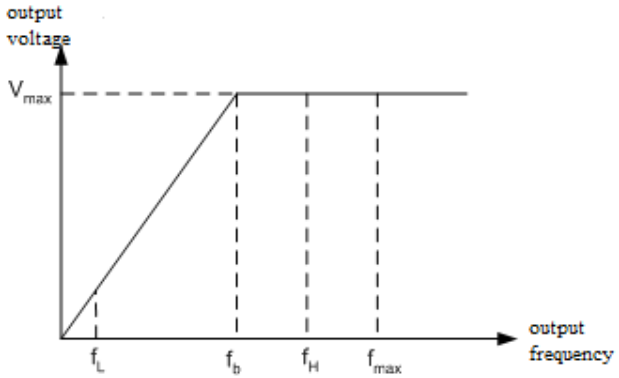


Fig- 7-8 frequency upper/lower limit diagram

P08.02	Maximum output frequency（Hz）	0.01～300.00(50.00)

 maximum output frequency f_{max} is the highest target output frequency permitted by converter.

P08.03	Maximum output voltage（V）	0～480(380)

 maximum output voltage Vmax means the output voltage when converter run with basic running frequency , corresponding to motor's rated voltage value upon using standard AC motor, shown in motor nameplate.

P08.04	Converter acceleration overcurrent (%)	0.01～ (150.00)
P08.05	Converter deceleration overvoltage (V)	0～750(700.00)

 P08.04～P08.05 set threshold value to converter's overcurrent , generally speaking , converter's output current may be more than overcurrent protection point when setting speed and motor load change rapidly, result in overcurrent fault .current restriction function means that converter keep the rapidly changed output current less than action protection value. Consequently reduce overcurrent fault effectively to ensure system's continuous and reliable operation . converter enter current limited status upon current exeed a certain value (P08.04); ensure stable load capability and no overcurrent fault via current restriction , exit current restriction status automatically and renew normal work when load is lightened , this function applies to situation that speed or load change rapidly especially.

P08.06	Rising torque compensation value	0.0～100.0（3.0）

 set converter V/F to control torque compensation of low frequency running positive rotation.

P08.07	Falling torque compensation value	0.0～100.0（2.0）

 set converter V/F to control torque compensation of low frequency running negative rotation.

P08.08	Falling stop torque compensation (HZ)	0.0～50.0（2.0）

 set torque compensation frequency upon converter fall and stop.

P08.09	V/Fcompensation maximum frequency(HZ)	0.0～100.0（10.0）

P08.09 set to provide maximum frequency of compensation torque under V/F control

effect of torque compensation function : incease output voltage when converter run under low-frequency,V/F control mode to offset stator's voltage to generate enough torque, so that motor can run normally.

Note: increase range of torque should be set properly based on load's situation, if increase excessively , it will generate larger current impact during start process.

P08.10	Carrier wave frequency(KHz)	2.0～10.0(4.0)
P08.11	No carrier wave inspection delay(ms)	0.0～2000(500)

carrier wave frequency adjustment:increase carrier wave's frequency to make sound become lighter when variable frequency motor's sound is excessively large, but increasing carrier wave's frequency will also increase converter's loss.

P08.12	Restrain oscilation upper limit（%）	0～10.0(0)
P08.13	estrain oscilation lower limit（%）	0～10.0(0)

if motor produce oscillation when rise or fall , increase the upper limit of Restricted oscillation under drive status, increase the lowerlimit of Restricted oscillation under brake status .

P08.14	Falling start compensation frequency（Hz）	0～5.00(0.00)

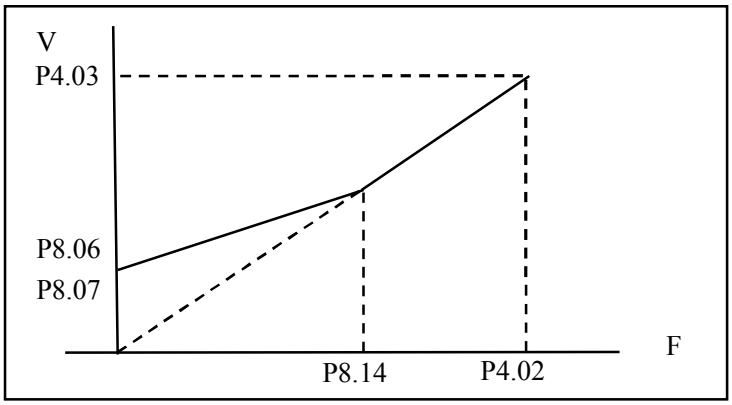


Fig- 7-9 falling start compensation frequency diagram

frequency point at which rising torque compensation value or falling torque compensation value work.

P08.15	Rising dead zone compensation value (%)	0～200(100)
P08.16	falling dead zone compensation value (%)	0～200(100)

if motor produce oscillation during rising or falling process, decrease dead zone compensation value.

P09 group product identification parameter

P09.00	Converter rated power (kw)	0.0～999.9
P09.01	Control panel software version	manufacturer

P09 group display mainly the converter's power and parameter of software vertion, generally speaking, set by manufacturer

Chapter 8 Fault Check

This chapter addresses the detailed fault, fault code, content, reason and countermeasures during the operation of inverter, and gives the analysis process for all fault phenomena during Hoist commissioning and operation.

◎ **Maintenance operation can be done 10 minutes after input power is off, when the charging indicator is off completely or DC bus voltage is below 24VDC.**

Or else there will a danger of electric shock.

◎ **Never retrofit inverter by yourself.**

Or else there will be a danger of electric shock and/or personnel injury.

◎ **Only the qualified electrical mechanics are allowed to perform the maintenance. It is prohibited to leave the stub or metal inside the inverter.**

Or else, there may be a danger of fire hazard.

◎ **Never change wiring or connect or disconnect the terminal under energized state.**

Or else there will a danger of electric shock.

8.1 Protection and check functions

When inverter fails to work, the fault indicator LED above digital operator lights up and LED digital tube display the current fault code in real time.

Inverter has 39 fault codes in total. For fault reasons and countermeasures corresponding to the fault code, see Table 8.1 Fault List.

Table 8.1 Fault list

Fault Code	Fault display	Potential reason	solution
1	Module overcurrent protection	DC terminal voltage is excessively high	Check power source of grid, check if big inertia load no energy consumption brake fast stop
		Short circuit phenomenon occurs in periphery	Check whether motor and output connecting wire have been short-circuited, and short-circuit to ground
		lack of phase in output	Check whether motor and output wire is loose.
		encoder fault	Check whether encoder has been damaged or connecting wire is correct
		Hardware is poor contacted or damaged	Ask for maintenance from professional technical personnel
		Converter inner connectors are loose	Ask for maintenance from professional technical personnel
2	ADC fault	current sensor damaged	Replace current sensor
		Current sampling loop has fault	replace control board
3	Radiator overheat	environment temperature is too high	Decrease environment temperature , enhance ventilation and heat dissipating
		wind path is blocked	Clear up wind path dust, batting and other sundries
		Fan abnormal	Check whether fan's power line is well connected, or replace with the same type fan
		Temperature inspection circuit fault	Ask for maintenance from professional technical personnel
4	Brake unit fault	Brake unit damaged	Replace with the corresponding drive module.
		External brake resistor circuit is short-circuited	Check the wiring of brake resistor.
5	Converter has no output	1.converter is bad contact to motor 2.converter hardware	Check whether fuse loop is disconnected ,or connecting point is loose.
6	Output over torque	Input power voltage is too low	check input power
		Motor is blocked or load sudden	Keep motor from being blocked,increase load

Fault Code	Fault display	Potential reason	solution
		change	sudden change
		encoder fault	Check wether encoder has been damaged or wiring is correct
		Lack of phase in output	Check whether motor and output connecting wire is loose
8	（acceleration running） bus overvoltage protection	Input power voltage abnormal	Check input power
		Fast start again during motor's high speed running	Motor restart after stopping
	（deceleration running） bus overvoltage protection	load moment of inertia is too large	Use proper energy consumption brake groupware
		Deceleration time is too short	Extend deceleration time
		Brake resistor's resistance is too large or disconnected	Connect proper brake resistor
	（constant speed running） bus overvoltage protection	Input power is abnormal	Check input power
		Load moment of inertia is too large	Use proper energy consumption brake groupware
		Brake resistor's resistance is too large or disconnected	Connect proper brake resistor
9	Bus lack of voltage	power voltage is lower than equipment minimum operation voltage	Check input power
		instantaneous power off occur	Check input power, when input voltage is normal, restart after resetting
		Input power's voltage change too much	
		Wiring terminal of power is loose	Check input wire
		Inner switch power is abnormal	Ask for maintenance from professional technical personnel
		Large start current load exist in the same power system	Change power system to accord with specification value
10	Output lack of phase	Converter output side is abnormal, bobble or disconnect wire	Check wiring condition of converter's output side according to operation procedure, eliminate

Fault Code	Fault display	Potential reason	solution
		Output terminal is loose	bobble ,disconnection
		Motor power is too small, below 1/20 of converter'maximum adaptive motor capacity	Adjust converter's capacity or motor's capacity
		Unbalanced three-phase output	Check whether motor's wiring is good
			Check whether converter's terminal property of output side is corresponding to the one of DC side
11	Motor low speed overcurrent(acceleration running)	Grid voltage is low	Check input power
		Motor parameter setting is abnormal	Set motor's parameter correctly
		Directly fast start during motor running	Restart after motor stop
	Motor lowspeed overcurrent (decelerationrunning)	Grid voltage is low	Check input power
		Load moment of inertia is too big	Use proper energy consumption brake group
		Motor parameter setting is abnormal	Set motor parameter correctly
		deceleration time is too short	Extend deceleration time
	Motor low speed overcurrent (constant speed running)	Load change suddenly during running	Decrease load's sundden change frequence and range
		Motor parameter setting is abnormal	Set motor's parameter correctly
		Function code setting is abnormal	Confirm that the relevant function code of converter's encoder is set correctly
13	Detect current when stop	Current is not blocked effectively when motor stop	Synchronous motor has slip car phenomenon
			Ask for maintenance from professional technical personnel
15	Detect speed when stop	brake is loose , motor slip	Check brake
		Encoder is disturbed, or encoder is loose	Fix encoder, exclude interference
16	Motor phase sequency fault	motor cable inversed connect	Reverse line or adjust parameter

Fault Code	Fault display	Potential reason	solution
21	abc overcurrent (Three phase instantaneousvalue)	Motor single-phase short circuit to ground	Check motor and output line loop
		Encoder fault	Check whether encoder is damaged or wiring is correct
		Fault occurs in drive board detecting loop .	Replace drive board
22	Brake inspection fault	Output relay has no action	Check relay control loop
		Relay action brake is not open	Check brake power line is loose or disconnected
		Feedback component has not detect signal	Adjust feedback component
23	Input overvoltage	Incoming line voltage is too high	Check whether incoming voltage match with converter
		Switch power voltage inspection loop has fault	Ask for maintenance from professional technical personnel
27	Output overcurrent (effective value)	Run under overload status for too much time , the larger load is , the shorter time will be.	Stop running for a period , if appear after running, check whether load is within the range permitted.
		Motor is blocked	check motor or brake
		Motor winding short circuit	Check motor
		Output short circuit	Inspect wiring or motor.
29	Input lack of phase	Input side voltage abnormal	Inspect grid voltage
		Input voltage lack of phase	
		Input side wiring terminal is loose	Check incoming terminal wiring
31	Motor high speed overcurrent	Grid voltage is low	Check incoming power
		load sudden change during running	Decrease load sundden change frequence and range
		Motor parameter setting is abnormal	Set correct motor parameter

Fault Code	Fault display	Potential reason	solution
		Encoder parameter settingset fault or interface	check encoder loop
32	Earth protection	wiring fault	Correct wrong wiring according to user manual
		motor abnormal	Replace motor , need to act isolation test to ground first
		leakage current between converter output side and ground is too large	Ask for maintenance from professional technical personnel
33	Capacitor aging	Converter capacitor aging	Ask for maintenance from professional technical personnel
34	External fault	input fault signal from outside	Check external fault's reason
35	Output inbalance	Wiring of converter output side is abnormal, incompletely connect or disconnect	Check wiring condition of converter output side according to operation procedure， exclude incompletely connection ,disconnection
		Motor Three phase unbalance	Check motor
36	Parameter setting fault	Parameter setting is incorrect	Modify converter's parameter
37	Current sensor fault	Drive board hardware fault	Ask for maintenance from professional technical personnel
38	Brake resistor short circuit	External brake resistor short circuit	Check brake resistor wiring
39	Current instantaneousvalue is too big	Three phase current instantaneous value overlarge alarm when Ia、Ib、Ic don't run	Ask for maintenance from professional technical personnel
42	IGBT short circuit		
44	Recharge relay fault(less than 30KW)		
45	Brake fault	1. Brake has not release 2. Brake inspection point don't act well	1.check whether brake is released effectively 2. check brake inspection switch

Chapter 9 Service and Maintenance

This chapter introduces the general information about service and maintenance.

 Danger
◎ **Maintenance operation can be done 10 minutes after input power is off, when the charging indicator is off completely or DC bus voltage is below 24VDC.** Or else there will a danger of electric shock. ◎ **Never retrofit inverter by yourself.** Or else there will be a danger of electric shock and/or personnel injury. ◎ **Only the qualified electrical mechanics are allowed to perform the maintenance. It is prohibited to leave the stub or metal inside the inverter.** Or else, there may be a danger of fire hazard.

 Attention
◎ **Never change wiring or connect or disconnect the terminal under energized state.** Or else there will a danger of electric shock.

9.1 Warranty Period

If inverter (main body) has the following condition, our company will provide the maintenance service:

If failure or damage is incurred under the normal operation, the manufacturer will be responsible for the repair and maintenance within the warranty period (since the date of leaving the factory); If the inverter is beyond the warranty period, the appropriate maintenance cost will be charged.

If the fault is caused by the following reasons, some cost will be charged even within the warranty period:

1） Problems caused by usage that fails to observe the instruction or by the unauthorized repair or retrofit.

2） Problems caused by usage beyond the requirements of standard specification.

3） Damage caused by falling or during the transportation process after being sold.

4） Damage caused by earthquake, fire, flood, lightning, abnormal voltage and/or other natural disaster and/or secondary disaster.

9.2 Product inquiry

If it is found that the product is damaged, failed to work or has other problems, please contact the office or customer service department of our company in the terms of the following items.

Inverter model

Serial number of production

Purchasing date

Problems worthy of contact include: Damage state, unclear question and the existing failure, etc.

9.3 Daily Check

Inverter enclosure can not be removed if energized or during operation, perform the external visual check to confirm that the operation state of inverter is normal. Daily check includes the following items:

a) Whether ambient environment conforms to the standard specification or not;

b) Whether the operation performance conforms to the standard specification or not;

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

d) Whether the cooling fan installed in inverter operates normally or not;

e) Whether there is overheat phenomenon or not.

9.4 Regular check

When performing regular check, stop the operation firstly, then cut off the power supply, finally remove the enclosure. At this time, the charged capacitor in main circuit still contains the charging voltage, and the capacitor needs some time to discharge the electric energy completely. So please wait until the charge indicator off, then use the universal meter to confirm that the DC bus voltage is lower than safety value (below DC 24V) or not, then the check can be carried out.

If you contact the terminal immediately after the power supply is cut off, there may be a danger of electric shock.

For regular items, see Table 9.1.

Table 9.1 Regular check items

Check parts		Check items	Check methods	Judge standards
Operation environment		1） Confirm the ambient temperature, humidity, vibration and dust, corrosive gas, oil mist and water drop, etc. 2） Confirm whether there is dangerous material around.	1） Visual check, thermometer, hygrometer 2） Visual check	1) Ambient temperature is below 40℃. Other requirements, such as humidity, conforms to the environmental requirements. 2) There is no dangerous material
LCD		1） Whether LCD display is clear or not and backlight is even or not 2） Whether LCD display lacks numeric alphabetic	Visual check	1） Backlight is even 2） Display is normal
Connector assembly Terminal, bolt		1) Whether bolt is loosened or not 2) Whether connector assembly is loosened or not	1) Tighten it 2) Visual check	1) There is no abnormality 2) The installation is secured
Main circuit	Conductor	1） Whether shielded layer has been broken or has discoloration 2） Whether the connection copper bar has deformation or not	Visual check	There is no abnormality
	Electromagnetic contactor, relay	1) Whether there is vibration and noise when working 2) Whether connecting points contact or are attracted	Audio check, visual check	1） Non 2） There is sound of contact pick-up
	Charged capacitor	1) Whether there is liquid leakage, discoloration, crack and enclosure expansion 2) Whether the safety valve goes out or valve body has obvious expansion	Visual check	There is no abnormality
	Heatsink fin	1） Whether there is dust accumulated or not 2） Whether the fan air duct is blocked or attached with foreign substance.	Visual check	There is no abnormality
	Cooling fan	1） Whether there is abnormal noise 2） Whether there is abnormal vibration 3） Whether there is discoloration and/or deformation caused by overheat	1） Perform audio check, visual check, rotate the fan blade manually after cutting the power supply. 2） Visual check 3） Visual check, olfaction check	1） Rotating steadily 2), 3) There is no abnormality

Control circuit	Connection Plug-in unit	Whether the double-row connecting plug-in unit between control board and main circuit has dust accumulated and is attached with foreign substance.	Visual check	There is no abnormality
	Control board	1） Whether the control circuit board has discoloration and odor or not 2） Whether the control circuit board has crack, damage and deformation	3） Visual check, olfaction check 4） Visual check	There is no abnormality

Appendix A Installation Guide to Inverter EMC

This appendix introduces the design and installation guide to inverter EMC for users' reference in the aspects such as noise suppression, wiring requirements, grounding, external equipment surge absorption, leakage current, installation area division and installation precautions, how to use power filters and radiation noise treatment.

A.1 Noise suppression

The working principle of inverters makes them inevitable to produce certain noise whose influence on peripheral equipment is related to factors such as the type of noise, noise transmission path and the design, installation and wiring of the drive system.

A.1.1 Types of noise

The types of noise are shown in the following Fig- A.1.

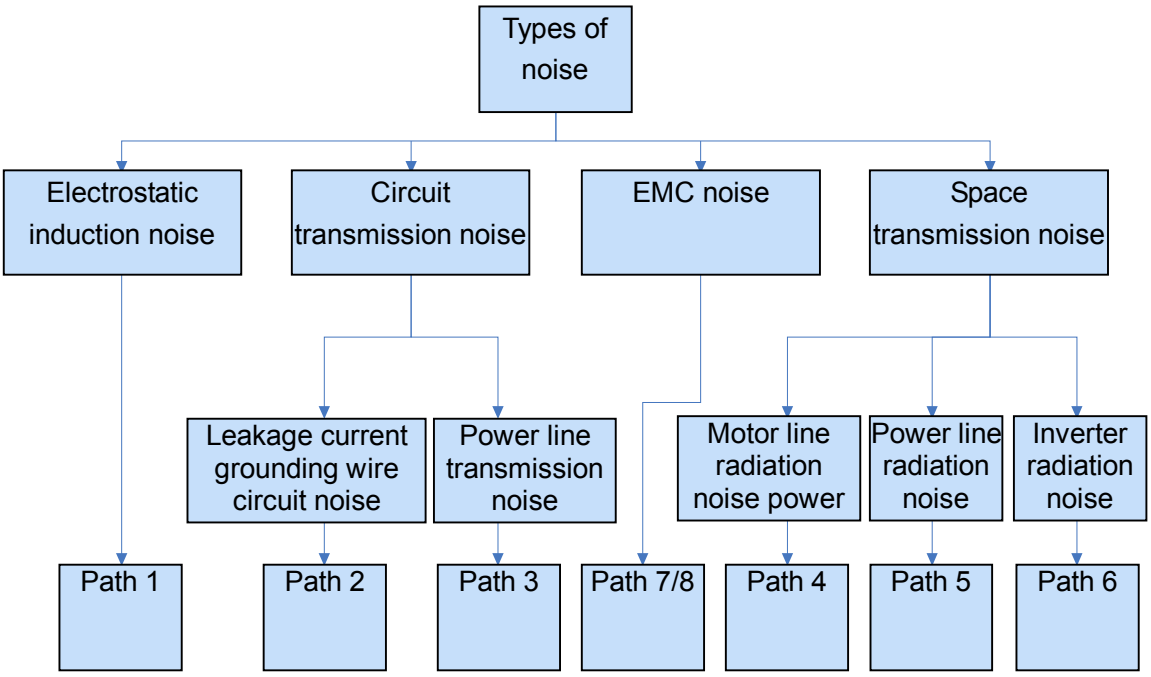


Fig- A.1 Schematic of the types of noise

A.1.2 Noise transmission path

Noise transmission path is as shown in Fig- A.2.

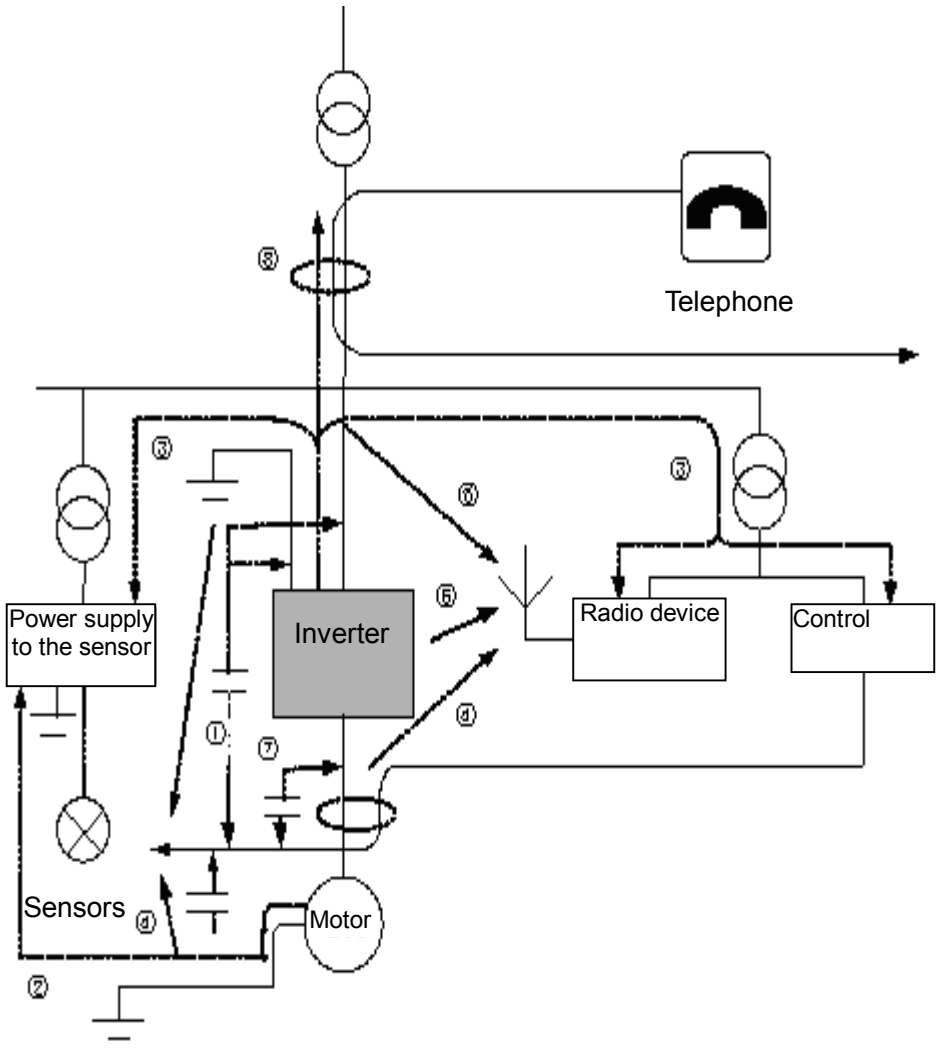


Fig- A.2 Noise transmission schematic

A.1.3 Basic countermeasures for noise suppression

The basic countermeasures for noise suppression are as shown in the attached table A.1.

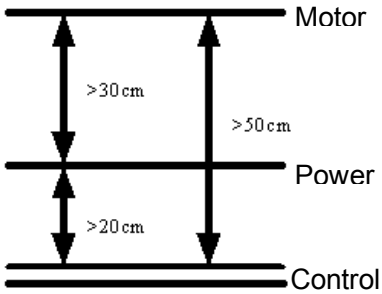
Table A.1 Basic countermeasures for noise suppression

No.	Causes	Countermeasures
① ⑦ ⑧	If the signal line is laid in parallel to the power line or is laid by being bundled up together with the power line, the noise will transmit in the signal line due to EM induction and electrostatic induction, which will result in error action of the peripheral equipment.	1.Signal line shall be prevented from being laid in parallel to the power line or from being bundled together with the power line; 2. Keep the peripheral equipment easy to be affected away from the inverters; 3. Keep the signal line easy to be affected away from the input and output cables of the inverter; 4. The signal line and power line use shielded wire. If they are respectively inserted into metallic tubes, the effect will be better (the metallic tubes shall be spaced at a distance of at least 20cm).
②	When the peripheral equipment forms a closed-loop circuit through wiring the inverter, the grounding wire leakage current of the inverter will lead to error action of the peripheral equipment.	At this time, if the peripheral equipment is not grounded, error action resulting from leakage current can be removed.
③	When the peripheral equipment and the inverter share a power supply system, error action may be produced on other peripheral equipment connected in the system since the noise produced by the inverter transmits along the power line.	Install a noise filter at the input end of the inverter or isolate the noise from other peripheral equipment with an isolation transformer/power filters.
④ ⑤ ⑥	If weak current equipment such as control computers, measuring instruments, radio devices and sensors among the peripheral equipment and their signal lines are installed in the same control cabinet with the inverter and when the wires are laid near to the inverter, error action will be produced due to radiation disturbance.	1. Peripheral equipment easy to be affected and their signal line shall be installed as far as possible away from the inverter. The signal lines shall use shielded cables with the shielded layer grounded and the cable inserted in the metallic tubes and shall be kept away from the inverter and their input and output cables. If the signal lines must go through the input and output cables of the inverter, they should be orthogonal; 2. At the output and input sides of the inverter, respectively install radio noise filters or linear noise filters (ferrite common mode choke) which can suppress the noise radiation of the input and output cables of the inverter; 3. Cables from the inverter to the motor shall be placed in a relatively thick barrier and can be placed in a tube more than 2mm long or be buried in a cement groove. The cables shall be bushed in metallic tubes and be shielded and grounded (the motor cables can use 4-core cables, one of which is grounded at the side of the inverter and connected with the motor shell at the other side.)

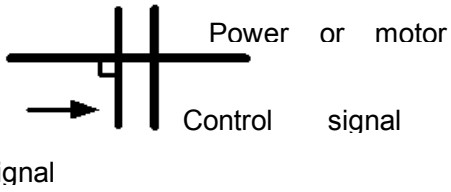
A.2 Wiring requirements

A.2.1 Requirements on cable laying

To avoid mutual coupling of disturbance, the control signal cables shall be laid separately from power cables and motor cables and shall be kept as far way as possible from them on the premise that enough distance can be ensured as shown in Fig- A.3 (a); when the control signal cable must cross the power cable or motor cable, orthogonal cross shall be ensured between them as shown in Fig- A.3 (b).



(a) Parallel laying



(b) Orthogonal cross

A.2.2 Requirement on the cross section of cables

Since the larger the cross section of cables is, the higher the earth capacitance will be and the higher the ground leakage current will also be, the motor cables shall be used with the ratings decreased to ensure the decrease in output current (for one level of increased cross section, the current will reduce by 5%), if the cross section of the motor cables is too high.

A.2.3 Requirement on shielded cables

Shielded armored cables such as woven copper wire net and aluminum wire net with high frequency and low impedance shall be adopted.

A.2.4 Requirements on laying the shielded cables

Generally, control cables shall be shielded cables and the shielded metallic wire net must be connected with the metallic cabinets in a 360° ring-type connecting way via cable clamps as shown in the Fig- A.4. The shielded grounding method shown in Fig- A.5 is incorrect.

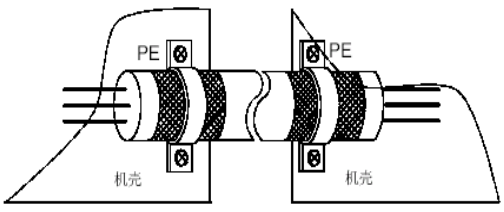


Fig- A.4 Correct shielded grounding method

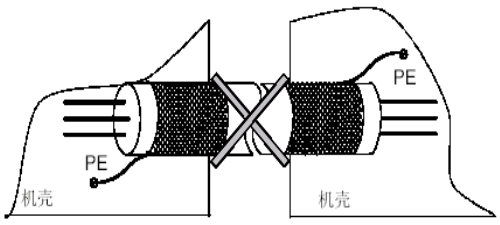


Fig- A.5 Incorrect shielded grounding method

A.3 Grounding

A.3.1 Grounding methods

The grounding methods for the ground electrode are shown in Fig- A.6.

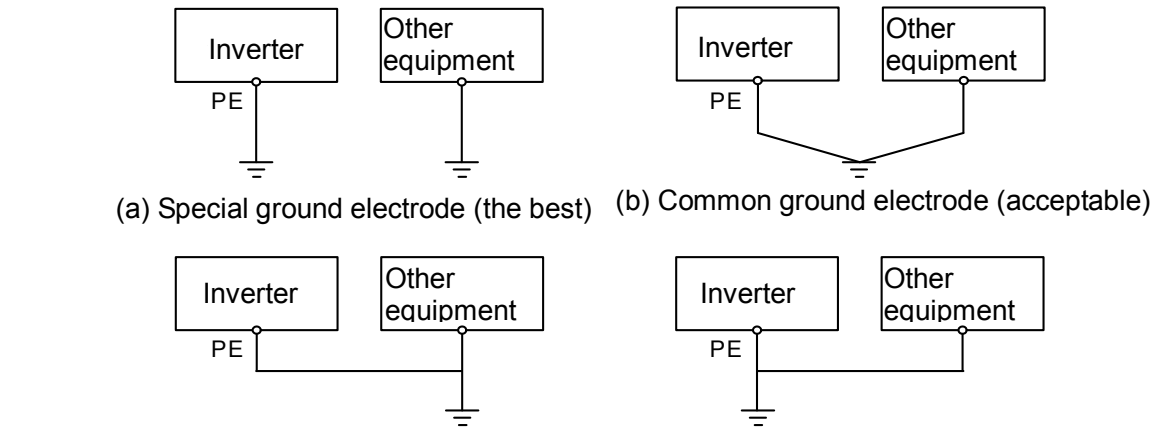


Fig- A.6 Schematic for special ground electrode

Among the above four grounding methods, (a) is the best and the users are suggested using it.

A.3.2 Precautions for ground wiring

(1) Do best to adopt grounding cables with standard cross section to ensure the minimum grounding impedance; since flat cables have smaller high-frequency impedance than round conductors, flat cables will be a better choice if the cross sections are the same.

(2) The grounding cable shall be as short as possible and the grounding point as close as possible to the inverter.

(3) If four-core cables are adopted for motors, then one cable of the four-core cables must be grounded on the side of the inverter and the other side connected to the ground end of the motor. If the motors and inverters have their own special ground electrodes, the optimum grounding effect can be achieved.

(4) When the grounding ends of all the parts in the control system are connected together, the noise source formed due to the ground leakage current will affect other peripheral equipment other than the inverters in the control system. Therefore, in the same control system, the inverters and weak electrical equipment such as computers, sensors or audio equipment shall be grounded separately and can't be connected together.

(5) To acquire rather low high-frequency impedance, the fixing bolts of the equipment can be taken as the high-frequency terminal used to connect the cabinet and the rear panel. Please make sure to remove the insulation paint from the fixing points.

(6) The grounding cables shall be laid far away from the wiring of I/O for noise sensitive equipment and meanwhile the ground wire shall be made as short as possible.

A.4 Surge absorber installation

Devices such as relays, contactors and EM brakes which produce large amount of noise must be equipped with surge absorbers even if they are installed outside the cabinet of the inverters as shown in Fig- A.7.

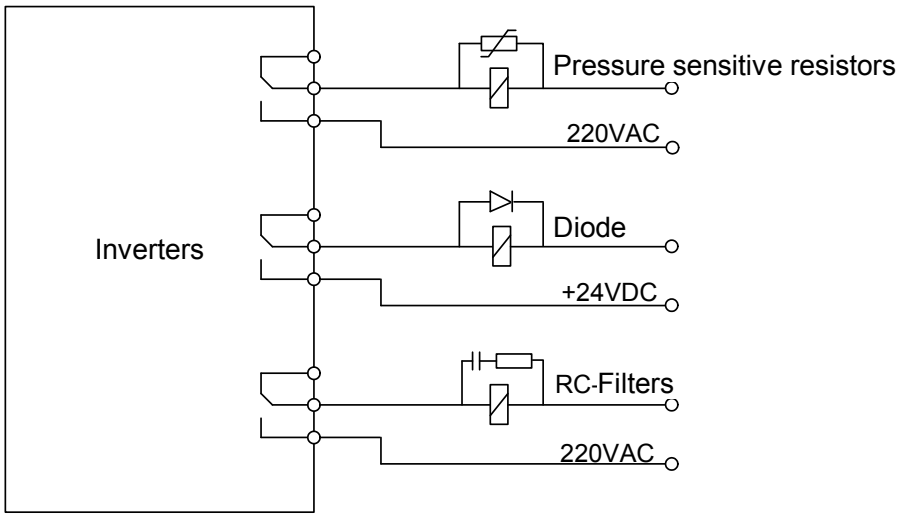


Fig- A.7Operation requirements on relays, contactors and EM brakes

A.5 Leakage current and its countermeasures

The leakage current flows through the line capacitors and motor capacitors at the I/O side of the inverters, including the ground leakage current and the inter-line leakage current as shown in the Fig-A.8. The size of the leakage current depends on the size of the carrier frequency and capacitance.

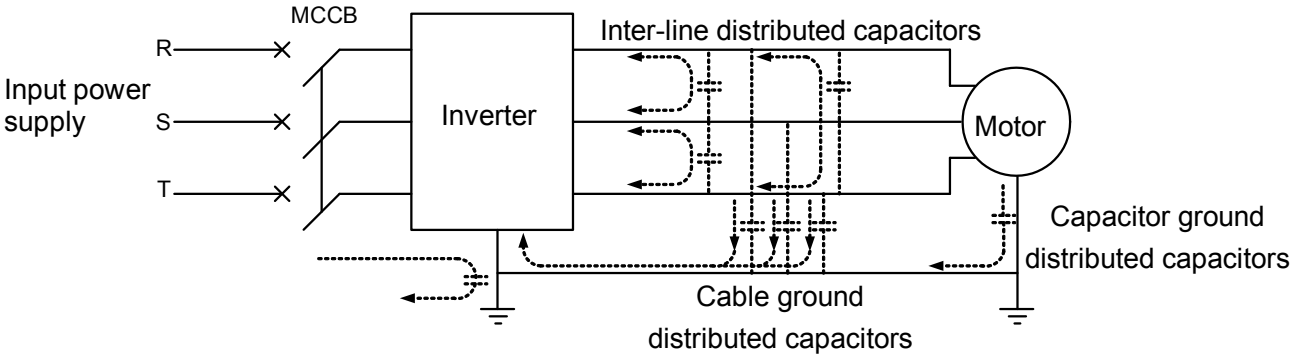


Fig- A.8 Leakage current path

A.5.1 Ground leakage current

The ground leakage current will not only flow into the inverters, but also can flow into other equipment through ground wires. It may lead to the error action of breakers, relays or other equipment leaking current. The higher the carrier frequency of the inverter is, the longer the motor cables and the higher the leakage current shall be.

Suppression measures: reduce the carrier frequency; make the motor cable as short as possible; use leakage breakers designed specially for the leakage of high harmonic/surge.

A.5.2 Inter-line leakage

The high order harmonic of the leakage current flowing through the capacitors distributed among the cables at the output side of the inverters may lead to the error action of external thermal relay. Especially for inverters with a small capacity below 7.5kW, when the wires are very long (above 50m), the increased leakage current is easy to produce the error action of external thermal relays.

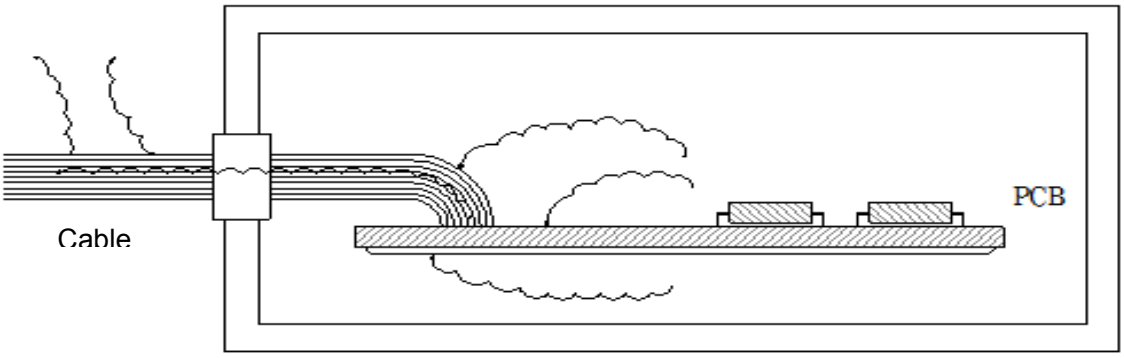
Suppression measures: reduce the carrier frequency; install AC output reactors at the output side; recommend using temperature sensors to monitor the temperature of the motors directly or replace the external thermal relay with the electronic thermal relay with overload protection functions for the motors of the inverters.

A.6 Radiation emission suppression for inverters

Inverters are normally installed in a metallic control cabinet. The instruments and equipment outside the cabinet are subject to very small influence of the inverters' radiation emission and the cables for external connection are the major radiation emission source. Since the power cables, motor cables and control cables of the inverters as well as the keyboard cables all need to be led out of the shielded cabinet, special treatment shall be done at the outgoing locations, or the shield will become invalid.

In Fig- A.9, part of the cables inside the shielded cabinet play the role as antenna which pick up the noise radiation inside the cabinet and then send it to the space outside the cabinet; in Fig- A.10: connect the outlet of the cable shielded layer to the ground of the shielded cabinet case. Thus the noise radiation received by the cables inside the cabinet will flow into the ground directly via the shielded case so as to remove the influence on the environment.

When the shielded layer grounding method shown in Fig- A.10 is adopted, the cable shielded layer shall be connected to the ground of the case as close as possible to the outlet, or the cable from the ground point to the outlet will still play the role of antenna and couple. The noise ground point shall keep a distance at the most 15cm (the smaller the better) from the outlet.



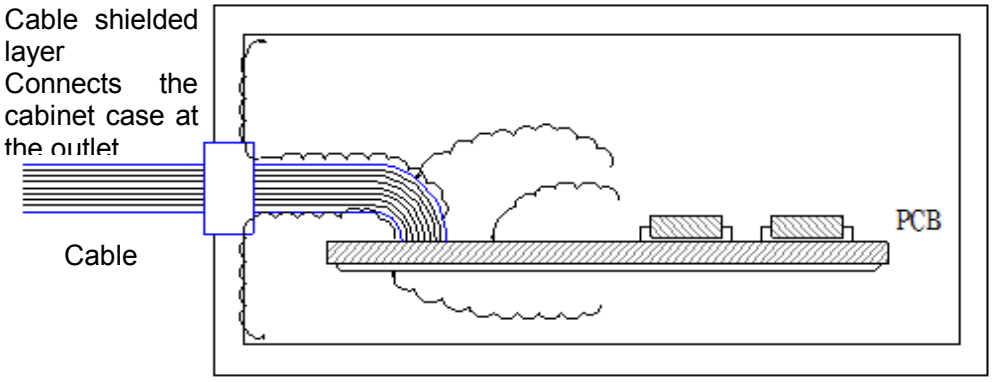


Fig- A.10 Suppression of radiation by connecting the cable shielded layer to the ground of the case

A.7 Users' guide to power line filters

Equipment which can produce strong disturbance and which is sensitive to external disturbance can use power line filters.

A.7.1 Functions of the filters

(1) The power line filters are dual low-pass filters which only allow direct current and current of 50Hz power frequency and refuse EM disturbance current with high frequency. Therefore, they can not only prevent the EM disturbance produced by the equipment itself from entering the power line, but also can restrain the disturbance on the power line from entering the equipment.

(2) Power line filters can make the equipment satisfy the requirements in the conducted emission and conducted susceptibility EMC standards and meanwhile can suppress the radiation disturbance of the equipment.

A.7.2 Precautions on power line filter installation

(1) Inside the cabinet, the installation locations for the filters shall be as close as possible to the inlet end of the power line and the power input line of the filters shall be kept as short as possible inside the control cabinet.

(2) If the input line and output line for the filters are laid too close to each other, high-frequency disturbance will bypass the filters and be coupled directly via the input line and output line of the filters to make the power filters defunct.

(3) Typically there is a dedicated ground terminal on the shell of the filters. However, if a conductor is used to connect the terminal to the case of the cabinet, the filter can't play effective role of bypass and become useless due to the high-frequency impedance of the long conductor. Correct installation method is to apply the shell of the filters on the conductive plane of the metallic case and make the contact surface as large as possible. Make sure to remove the insulation paint at the time of installation and ensure sound electrical contact.

A.8 Division of the installation area for the inverter's EMC

In the drive system made up of inverters and motors, the inverters and peripheral equipment such as the control devices and sensors are normally installed in the same control cabinet. The outside disturbance produced by the control cabinet can be suppressed by taking measures at the main connection, so a radio noise filter and an incoming AC resistor shall be installed at the incoming end of the control cabinet. To meet the EMC requirements, EMC shall also be realized inside the cabinet.

In the drive system made up of inverters and motors, the inverters, braking units and contactors are all strong noise sources which will influence the proper operation the noise sensitive peripheral equipment such as automation devices, encoders and sensors. The peripheral equipment can be installed in different EMC regions respectively according to their electrical characteristics so as to isolate the noise sources and noise receivers in space. This is the most effective measure to reduce disturbance. The

installation area for the inverter's EMC is shown in Fig- A.11.

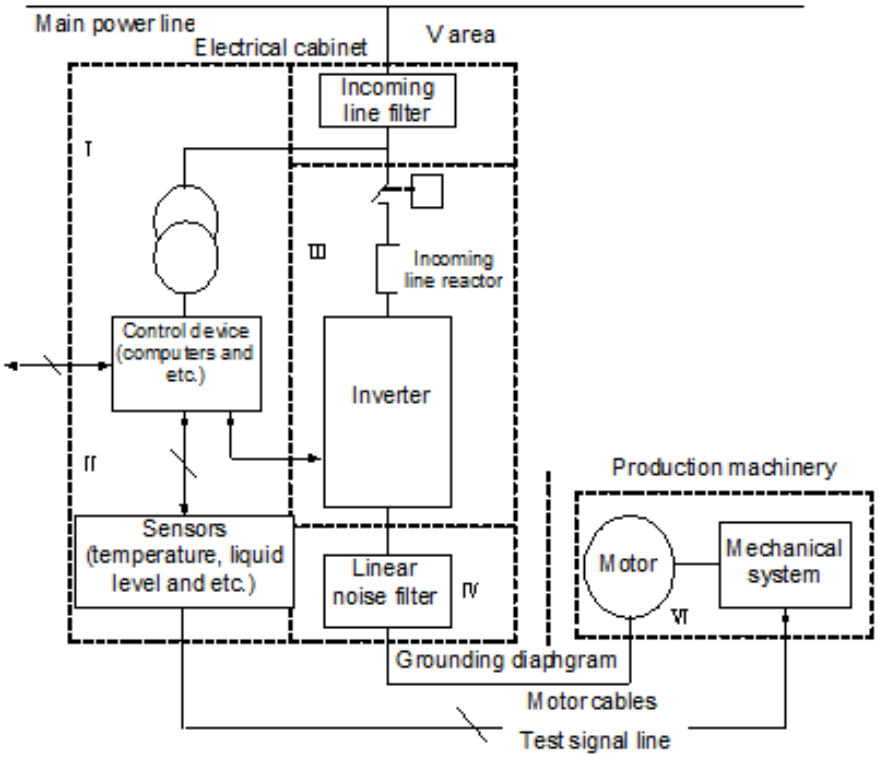


Fig- A.11 Schematic of installation area for the inverter's EMC

The division of the above mentioned installation area is clarified as follows.

Area Ⅰ: Control power transformer, control devices, sensors and etc.

Area Ⅱ: Control signals and their cable interfaces require certain disturbance.

Area Ⅲ: Main noise sources such as incoming line reactors, inverters, braking units and contactors.

Area Ⅳ: Output noise filters and other wiring parts.

Area Ⅴ: Power supply (including radio noise filter wiring part).

Area Ⅵ: Motors and their cables.

The areas shall be separated at a minimum space of 20cm so as to realize EM decoupling. The areas had better decouple via a grounding diaphragm plate. Cables in different areas shall be placed in different cable ducts. When the filters are needed, they shall be installed at the connection of the areas. All the bus cable led out from the cabinet (such as RS485) and the signal cables must be shielded.

A.9 Precautions for electrical installation of inverters

Electrical installation of inverters is shown in Fig- A.12

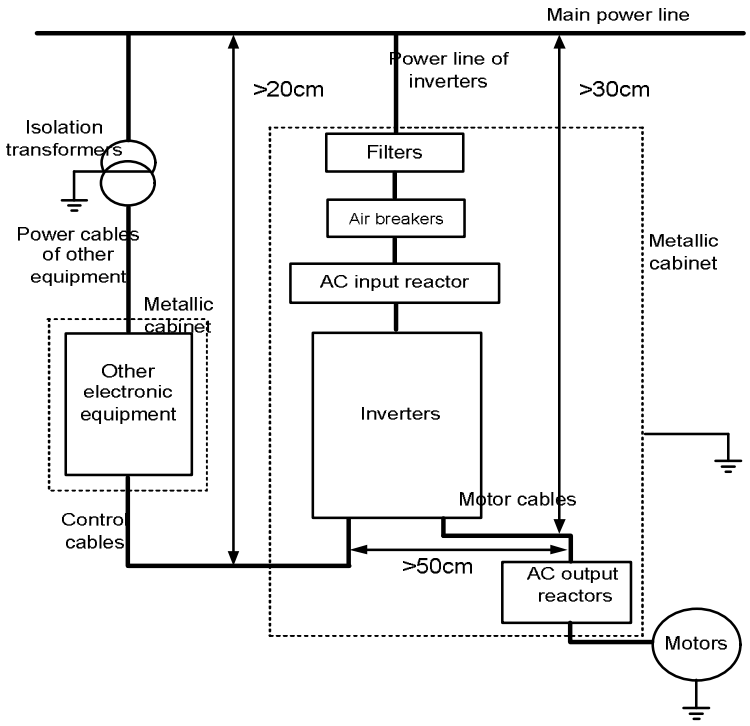


Fig- A.12 Electrical installation schematic of inverters

To satisfy EMC requirements, pay attention to the following during installation:

(1) The inverters shall be installed inside the cabinet and the shells of peripheral equipment such as the baseplate of inverters and the input filters shall be fixed on the backpanel of the control cabinet to ensure sound electrical contact with the backpanel. The distance between the inverters and the filters shall be kept less than 15cm so as to make the high-frequency impedance between the inverters and the input filters to the minimum and reduce high-frequency noise.

(2) A wide grounding block shall be installed at the inlet of the control cabinet (not more than 5cm from the outlet) and the shielded layer of all the cables incoming and outgoing the cabinets shall be fixed on the ground block via a 360° ring connection way to ensure sound electrical contact.

(3) The motor cables must be shielded cables and had better be cables shielded dually with screw metallic tape and metallic wire net. The shielded layer of the motor cables must be fixed on the backpanel of the cabinet with metallic cable clamps via a 360° ring connection way as shown in Fig-A.4). There are two fixing locations: one is as close as possible to the inverter (better to be less than 15cm); the other is on the ground block. The shielded layer of the motor cables shall be connected with the motor's metallic shell via a 360° ring connection way when the motor goes through the motor terminal boxes. If there is any difficulty, the shielded layers can be stranded mutually into a plait which shall be connected to the ground terminal of the motor after it spread flat. The spread width shall be larger than 1/5 of the length of the plait. The cable cores of the motors and its PE flexible plait shall have an outgoing line as short as possible (better to be less than 5cm).

(4) The terminal control cables must be shielded cables. The shielded layer shall be connected to the ground block at the inlet of the cabinet with metallic cable clamps via a 360° ring connection way. At the

inverter end, metallic cable clamps can be used to fix the shielded layer to the shell of the inverters. If there is any difficulty, the shielded layers can be stranded mutually into a wide but short plait which shall be connected to the PE terminal of the inverter after it spread flat. The exposed part of the cable cores and the length of the outgoing PE soft plait shall be kept as short as possible (better to be less than 15cm).

⑸ The keyboard cables can't go out of the shielded cabinet.

⑹ The size of the holes and seams in the shielded cabinet shall be as small as possible (the longest shall not be above 15cm).

A.10 EMC standards to be satisfied by AS620 series Hoist-used inverters

When AS620 series Hoist-used inverters are equipped with proper input/output filters and AC reactors (for type selection, please refer to *accessories selection*) and are wired in reference to the above precautions, they can satisfy the EMC standards as shown in the Table A.2.

Table A.2 EMC performance overview of **AS620** series Hoist-used inverters

Items	Satisfied standards	Levels of the standards
Conduction disturbance emission	EN12015.1998	$0.15 \le f < 0.50MHz, 100dB(\mu v/m)$; quasi-peak value $0.50 \le f < 5.0MHz, 86dB(\mu v/m)$ quasi-peak value $5.0 \le f < 30MHz, 90 \sim 70dB(\mu v/m)$; quasi-peak value
Radiation disturbance emission	EN12015.1998	$30 \le f < 230MHz, 40dB(\mu v/m)$ quasi-peak value $230 \le f < 1000MHz, 47dB(\mu v/m)$ quasi-peak value
Static discharge disturbance immunity	EN12016.2004	Criterion B (contact discharge 4000V, air discharge 8000V)
Radiation EM field disturbance immunity	EN12016.2004	Level 3 Criterion A (3V/m)
Fast transient electrical pulse train disturbance immunity	EN12016.2004	Level 4 Criterion B (strong current end±2KV/2.5kHz)
Surge disturbance immunity	EN12016.2004	Criterion B (±1KV)
Conduction disturbance immunity	EN12016.2004	Criterion A (3V,0.15～80MHz)

A letter of Advice to Clients

Dear clients,

RoHS is the abbreviation for *The restriction of the use of certain hazardous substances in electrical and electronic equipment* which was implemented by EU on July 1st, 2006. It stipulates that in the newly launched electrical and electronic equipment, the following six hazardous substances are restricted: lead, mercury, cadmium, sexivalence chrome, PBB and PBDE.

In our country, *the Electronic Information Products Pollution Control Management Measures* was issued on February 28th, 2006 jointly by the Ministry of Information Industry, State Development and Reform Commission, Ministry of Commerce, General State Administration for Industry and Commerce, Administration of Customs of the P.R.C, General Administration of Quality Supervision, Inspection and Quarantine and State Bureau of Environmental Protection, becoming an RoHS direction of Chinese Version and enforced. On February 1st, 2008, *electronic waste environmental pollution prevention and control management measures* issued by the State Bureau of Environmental Protection of the P.R.C began to be executed, clearly specifying that the users of electronic and electrical products shall provide or entrust the electronic waste to the disassembling and disposing units (including small individual businesses) with corresponding business scope listed in directory (or temporary directory) to disassemble, make use of or dispose.

Our company follows the requirements in *the Electronic Information Products Pollution Control Management Measures* and RoHS directive in the aspects such as purchasing and selecting the types of electronic parts and components, PCB filter plates, wring harness material and structural parts and strictly controls the above-mentioned six hazardous substances. Meanwhile in the production process, PCB parts and components are welded on XinChi lead free welding production line with a lead free welding technology.

Hazardous substances which may be contained in the following assemblies:

Type of assembly	Electronic components	Electronic printed circuit board	Sizing sheet pieces	Radiators	Plastic pieces	conductors
Possible hazardous substances	six hazardous substances: lead, mercury, cadmium, sexivalence chrome, PBB and PBDE					

1) analysis on environmental influence: Our electronic products will produce some heat in use, which may lead too the emission of individual hazardous substance but will not cause serious influence on the surrounding. Once an electronic product is discarded after the expiry of its life, the heavy metallic and chemical hazardous substance in it will severely pollute the soil and water resources.

2) The life cycle of electronic products and equipment. Any electronic product and equipment has a life cycle and can be damaged and discarded. Even if it can still be used, it will be replaced and washed out by new generations of electronic products. Our products and equipment normally have a life cycle not more than 20 years.

3) The treatment of discarded electronic products. If the discarded electronic products can not be treated properly, they will pollute the environment. Our company requires our clients establish a reclaiming system in accordance with related national regulation and not throw away them as ordinary domestic waste. The products shall be stored and used in environment-friendly ways or reclaimed by qualified units by strictly complying with the *electronic waste environmental pollution prevention and control management measures* issued by the State Bureau of Environmental Protection of the P.R.C. Any individual or unit having no such qualification is prohibited conducting the activity of disassembling, making use of and disposing electronic wastes.

Please don't throw away electronic waste together with ordinary domestic waste, but call the local waste disposing agencies or environment protection agencies for suggestion on how to deal with the electronic waste.

Shanghai Sigriner STEP Electric Co., Ltd