AS500 Series High-Performance Vector Inverter Instruction Manual V1.01

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Foreword

Thank you for purchasing AS500 series high performance vector inverter.

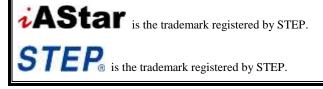
To ensure correct installation and use, please carefully read and understand the contents in the instruction prior to use.

General Statement

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Website: www.stepelectric.com.

Contact address: if you have any doubt or problem during reading the manual, please contact us by the address on the back cover of this document.

About Warranty

Warranty period

Warranty period of the product will be 18 months from the date of leaving factory.

Warranty scope

Fault diagnosis

Principally, the initial fault diagnosis will be executed by the user.

But as required by the user, STEP or its service network may provide the paid service.

At this time, if the fault is caused by STEP according to the result discussed by both parties, then the service is free.

Fault repair

If it needs to repair or replace the product according to the fault appeared, STEP may provide free onsite service. But the following will be paid services:

- Fault is caused by the improper storage, use or design of the user and its customer
- Fault is caused by the change privately made by the user when STEP doesn't understand it;
- Fault caused by the application of the product beyond its specification;
- Fault caused by the natural disaster or fire;
- Fault caused by any other reason other than STEP's responsibility.

Beyond the guarantee responsibility

Any inconvenience brought to the user and its customer or damage to the product not from STEP due to the fault of STEP product will be not within the guarantee scope of STEP.

STEP won't undertake any responsibility for the associated loss.

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Chapter 1 Safety Notice

This section covers the safety notice and matters needing attention during use of AS500 inverter, including sign description, usage, arrival confirmation, transportation and storage, installation, wiring safety notice, commissioning/operation, fault overhaul and product disposal treatment etc. relating to safety. To ensure personal safety and lengthen the service life of equipment and its connecting device, please be sure to read the following safety rules and warnings as well as all warning marks attached to the equipment before installation and commissioning. Please carefully read this information.

1.1 Safety-related Sign

All safety related contents in this manual are marked following labels. All contents attached with these safety signs are important and must be followed strictly.



Indicates a hazardous situation, if a mistake operation could result in death or serious injury.



Indicates a hazardous situation, if a mistake operation could result in minor or severe injury and equipment trouble.



Need to be followed and pay greater attention.

In addition, even if **Notice** matters, according to the specific situation, sometimes also can lead to major accidents.



1.2 Safety Notes

1.2.1 Usage

Danger

This series inverter is used to control the operation of three-phase motor at variable speed, other than single-phase motor or other purposes, otherwise inverter fault or fire may be caused.

This series inverter can't be simply applied on the occasions directly related to personal safety, such as medical device.

This series inverter is produced under the strict quality management system. If any serious accident or loss may be caused by its fault, safety measures such as redundancy or bypass shall be provided.

1.2.2 Arrival Inspection

∧ Notice

The product delivered must be in perfect condition and completely consistent with the information on the order form. If the product is damaged or inconsistent with the information on the order form, please contact your local distributor or agent or manufacturer.

If the equipment delivered has any damage or missing part, it shall not be installed or put into operation, otherwise it may cause accident.

1.2.3 Transportation and Storage

∧ Notice

Avoid violent vibration or impact during transportation.

If any equipment damage is found, it must be informed to the transport company.

Equipment transportation and storage must satisfy the specified ambient conditions.

If the device is stored for more than 1 year, then the capacitor must be recharged.

1.2.4 Installation



Be careful of fire or electric shock.

Don't install the equipment in the flammable and combustible areas or those with water or corrosive danger.

Notice

Please hold the product bottom during handling and installation, to avoid crush or break the inverter.

Don't install the equipment in the areas which are easily affected by continuous vibration, shock or electromagnetic interference.

The inverter must be installed on the flame retardant object such as metal, and keep away from the flammable material or heat.

Be careful of fire! To ensure no foreign matters (sawdust, scrap iron, dust or paper scrap) inside the inverter or on its radiator.

A certain space must be provided between inverter and inverter, inverter and inner wall of another equipment/electrical cabinet. (Refer to Installation Location and Spacing for the details).

Horizontal installation is prohibited.

1.2.5 Electrical Wiring



Wiring must be executed by the qualified electrical engineering staff, otherwise electric shock or inverter damage may be caused.

Power supply must be disconnected prior to wiring, otherwise electric shock or fire may be caused.

Ground terminal PE must be reliably grounded, otherwise the inverter casing may be electrified.

Don't touch the main loop terminal, which shall not contact the casing, otherwise it may cause electric shock.

Turn on the power supply when the run signal is connected, then the motor will run automatically, then please confirm the power supply is connected after the run signal is disconnected. Otherwise personal injury may be caused.

For 3-wire system sequential control, wiring can be executed for the control loop after parameters of multifunctional input terminals are set, otherwise personal injury may be caused due to motor rotation.

1.2.6 Test Run

Notice

Be sure not to connect the power input cable to motor terminals U/T1, V/T2 and W/T3, nor motor cable to the power supply input terminals R/L1, S/L2 and T/L3.

Power line and signal line must be laid in different troughs, with minimum space 30cm between them. The cable connected can't touch any rotating mechanical part.

Capacitor or LC/RC noise filter with phase advance isn't permitted to connect to the output end of the inverter, otherwise internal components of the inverter may be damaged.

Wiring cable of the main loop terminal shall be provided with crimp terminals with insulating bush.

Selection of input and output cable of the inverter, choose the cable with proper section according to inverter power.

If the cable length between inverter and motor exceeds 100m or running with several motors, it suggests use output reactor, to avoid overcurrent due to too large capacitance distributed, so as to produce inverter fault.

Be sure not to use the load other than 3-phase AC motor.

Please ensure to take off the load when executing rotating self-learning. The motor will run and stop repeatedly before the self-learning is completed, therefore don't touch it, otherwise personal injury may be caused.

�Danger

Please ensure to turn on the power supply after the front outer cover has been installed. Don't remove the outer cover when the power supply is turned on, otherwise electric shock may be caused.

Please prepare the emergency stop switch additionally (stop button is effective only when function setting is executed).

Please ensure reset alarm after run signal is switched off, otherwise personal injury may be caused.

Notice

Be sure to have motor no-load commissioning first, and then motor load commissioning. Don't touch the radiator, motor or other high temperature part when the equipment is running or within a period of time after the equipment is disconnected, to avoid scald.

Don't start or stop the inverter by means of connecting or disconnecting the power supply repeatedly, otherwise it will damage the equipment/system.

Prior to running, please ensure that the motor and machine are within the permissible range of application, otherwise equipment damage may be caused.

When it is used with the lifting equipment, mechanical brake device will be provided at the same time.

Don't change the inverter parameters at will, most of the factory set parameters of the inverter are able to satisfy the running requirement, only to set some necessary ones. Random modification may cause mechanical damage.

1.2.7 Maintenance and Inspection



There are HV terminals in the inverter, don't touch them randomly, otherwise electric shock may be caused.

Be sure to install the protective cover when the equipment is electrified. In addition, when remove the protective cover, be sure to disconnect the circuit breaker for wiring, otherwise electric shock may be caused.

After power supply of the main loop is cut off, please wait for 10 min at least, then execute maintenance and inspection only after the charge indicator of the outer cover went off, otherwise electric shock may be caused due to the residual voltage on the capacitor.

Except for the appointed staff, don't execute maintenance, inspection or replacement operation by others. Prior to these operations, please take off the metal ornaments (watch, ring, etc). During operation, please use the tools treated with insulation, otherwise electric shock may be cause.

Notice

Don't touch the circuit board because there is CMOS large scale integrated circuit, to avoid damage to the board.

1.2.8 Disposal Treatment



Explosion may be caused when electrolytic capacitor of the main loop and that on the printed board is burning. Poisonous gas may be produced when plastic parts are burning. Disposal of the equipment must be based on the laws and regulations on processing the industrial electronic waste of the related environmental protection department.

1.2.9 Accord with Low Voltage Directive

Danger

Our products meet the standard of EN61800-5-1:2007, thus they are in accord with "Low Voltage Directive 2006/95/EC".

Make sure that the whole system meets EC requirement if this inverter is integrated in the whole electrical system as a component.

Please note:

- ①To ensure that machine is grounded, and the ground terminal block is grounded separately
- ②Prohibit to ground inverter at Δ , and use IT power
- 3 To ensure that the cabinet is grounded if inverter is installed in it

The protection level of this inverter is class 1. And please use it under the conditions as overvoltage Catalogue III. 3, and pollution Degree II.

1.2.10 Others

∧ Notice

Don't place the inverter in the environment containing halogen (F, Cl, Br and I) under any circumstances of transportation or setting, otherwise inverter damage or parts burning may be caused.

1.3 Matters Needing Attention

1.3.1 Motor Insulation Inspection

The motor shall be executed with insulation inspection when it is used for the first time, reused after long time storage or regular inspection, to avoid inverter damage due to insulation failure of motor winding. During insulation inspection, be sure to separate the motor wiring from the inverter, 500V megameter is recommended. Insulation resistance measured shall be below 5 $M\Omega$.

1.3.2 Thermal Protection of the Motor

If the chosen motor doesn't match with the rated capacity of AS500 series inverter, especially rated power of the inverter is greater than that of the motor, please adjust the related motor protection parameters of AS500 or install a thermal relay in front of the motor, to protect the motor.

1.3.3 Heating and Noise of the Motor

The output voltage of the inverter is PWM wave, with a certain harmonic, therefore temperature rise, noise and vibration of the motor are slighted increased comparing to power frequency running.

When the ordinary motor runs at a low speed for a long time driven by the inverter, its cooling effect becomes poor, and its temperature will rise. If it needs to run at a low speed and constant torque for a long time, variable frequency motor must be chosen or forced air cooling shall be adopted.

1.3.4 Notices for Input and Output

The output of AS500 is PWM wave, if capacitor to improve power factor or voltage dependent resistor for lightning protection is installed on the output side, instant overcurrent or damage will be caused to the inverter. Don't use it.

Schematic diagram shows that output side of inverter can not connect capacitor. See Fig. 1.3.

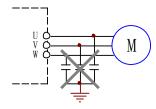


Fig. 1.3 Capacitor cannot be connected to the output of inverter

If a contractor is provided between the power supply and input end of the inverter, then it is prohibited to control start or stop of the inverter with this contactor.

If the switching elements such as contactor are provided between the output end and the motor, it shall ensure the inverter to have making-breaking operation without any output. The contactor won't be closed when the inverter is outputting, otherwise module damage is easily produced.

Start and stop of the inverter can be controlled by the terminal. Direct and frequent start and stop

with the use of switching elements such as contactor on the input side of the inverter will be prohibited, otherwise equipment damage may be caused.

1.3.5 Use Beyond the Rated Voltage Value

If AS500 series inverter is used when the external voltage isn't within the permissible operating voltage scope specified in this manual, damage to the inverter components may be caused. If necessary, please use the related boosting or dropping device to have voltage change processing.

1.3.6 Lightning Surge Protection

This series inverter is provided with lightning surge protective device, with certain self-protection ability to the inductive thunder. The customer shall provide protection in front of the inverter at the places with frequent lightning.

1.3.7 Leakage Protection

High speed switch will work when the inverter is running, leading to high frequency leakage current, which will cause malfunction of the leakage protection circuit sometimes. When the above problem occurs, a leakage protector shall be correctly installed, besides carrier frequency reduction or lead shortening.

The followings must be noted during installation of the leakage protection circuit:

- Leakage protector must be set on the input side of the inverter, it is suitable to put it behind the air switch (non-fuse circuit breaker).
- Leakage protector shall adopt that not sensitive to higher harmonic or that dedicated to the inverter (sensitivity: 30mA above). If the ordinary leakage protector is applied, whose sensitivity shall be better than 200mA and actuation time shall be above 0.1s.

1.3.8 Use of Decreasing

When the ambient temperature exceeds 40° C, the inverter shall be decreased by 2% for temperature rise of every 1° C. And external forced cooling must be added.

In the areas where the altitude is greater than 1000m, cooling effect of the inverter will become poor due to thin air, the inverter shall be decreased by 1% for altitude rise of every 100m, the maximum altitude is 3000m;

When the carrier frequency set exceeds the factor setting, the inverter shall be decreased by 10% for frequency increase of every 1 kHz;

Please refer to our company for the details of decreasing.

1.3.9 Adaptive Motor

AC asynchronous motor and permanent magnet synchronous motor are suitable for the inverter, please be sure to choose the inverter according to motor nameplate.

Built-in default motor parameters of the inverter are asynchronous motor ones, but necessary motor parameter identification or default value modification shall be made according to the actual situation, to meet the actual value, otherwise operation effect and protective performance may be affected.

If short circuit appears inside the cable or the motor, the inverter will send an alarm or even be damaged, therefore insulation short circuit testing shall be made for the motor and cable initially installed, as well as during the daily maintenance. Please note that the inverter and the part to be tested must be disconnected completely during testing.

Chapter 2 Product Overview

AS500 series is 400V (380V~460V) and 200V (220V~240V) current vector control high performance vector inverter, and applies to 3-phase AC asynchronous motor and permanent magnet synchronous motor with motor capacity 1.1~355kW. AS500 series inverter with factory default set provides the ideal solution for many simple motor control applications, it is also can be applied to more advanced motor control operation after the related parameters are set.

2.1 Nameplate Description

The nameplate is attached to the side of the inverter, with the model, specification, batch No. and manufacturing code, etc on it.

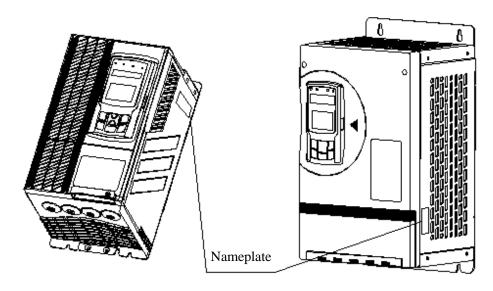


Fig. 2-1 Inverter Nameplate (example)

2.1.1 Description of Inverter Nameplate

Inverter nameplate, see Fig.2-2. Nameplate records the model, specification and lot number.

Model:
Motor Power:
Input:
Output:
Machine No.:
Serial No.:

MODEL: ASSOO 4T00XX
POWER: XXKW
INPUT: AC3PH 380~460V 50/60Hz XXA
OUTPUT: AC3PH 0~380V/460V 0~120Hz XXA
No.:
SER. No.:

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Fig. 2-2 The description of the inverter nameplate

2.1.2 Product (order No.) Description

In the column "inverter model" on the nameplate, specification, voltage grade, motor type and maximum power of the inverter are expressed in letters and numbers.

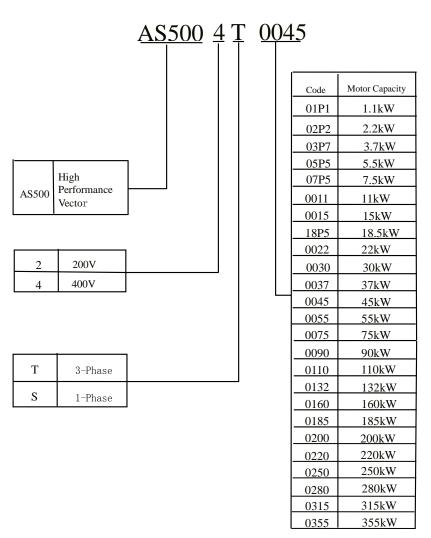


Fig. 2-3 Description of inverter model

2.1.3 Description of Product Specification

In the column "inverter specification" on the nameplate, voltage level and rated current value of the inverter are expressed in letters and numbers.

Table 2.1 Inverter Specification Series

Dodad		Stable operation 40℃, heavy load				
Rated input	Dimensions	Inverter model	Rated input	Rated output	Adaptative motor	Overload 150%
•		AS500	current (A)	current (A)	(kW)	(1min)
200, 2407/	1	2T01P1	7	6	1.1	9
200~240V	1	2T02P2	13	12	2.2	18

		2T03P7	19	18	3.7	27
		4T01P1	3.7	3.5	1.1	5.3
		4T02P2	6.6	6.2	2.2	9.3
		4T03P7	9.5	9	3.7	13.5
		4T05P5	13.7	13	5.5	19.5
	2	4T07P5	20	19	7.5	28.5
	2	4T0011	29	27	11	40.5
		4T0015	35	34	15	51
	3	4T18P5	43	41	18.5	61.5
		4T0022	50	48	22	72
	4	4T0030	66	65	30	97.5
	4	4T0037	82	80	37	120
		4T0045	106	96	45	144
	5	4T0055	138	128	55	192
		4T0075	170	160	75	240
	6	4T0090	205	195	90	292.5
	Ü	4T0110	250	240	110	360
380~460V		4T0132	280	270	132	405
		4T0160	312	302	160	453
	7	4T0185	380	370	185	555
		4T0200	400	390	200	585
		4T0220	436	426	220	639
		4T0250	490	480	250	720
		4T0280	530	520	280	780
	8	4T0315	610	600	315	900
		4T0355	660	650	355	975

Notes: 1. The maximum power of adaptative motor is the rated power of 4-pole 50Hz standard motor. During the actual application, nameplate of the motor must be examined, to ensure the inverter selected is match with the motor.

2. The above is the rated current under default carrier frequency, <=15kW, carrier frequency 6k; <30kW, carrier frequency 5k, <=55kW, carrier frequency 4k; <=75kW, carrier frequency 3k; >75kW, carrier frequency 2k.

2.2 Technical Indicator and Specification of Inverter

	Input voltage	380V ~ 460V (-15% ~ +10%), 3-phase power supply
	Input frequency	45 ~ 65Hz
	Permissible voltage	Voltage unhalence 20/
Power	variation	Voltage unbalance<3%
input	G 41 :	Built-in DC reactor for 30kW and above, with current harmonic <40% (full load)
	Current harmonic	Externally installed DC reactor for 30kW and below (optional)
	T	3-phase AC380V ~ 460V, inpout voltage <ac300v, protection<="" td="" under-voltage=""></ac300v,>
	Transient voltage sag	15ms later.

	Voltage	0VAC ~ input voltage
	Outside for some	V/F control: 0.00 ~ 300.00Hz
Power	Output frequency	Vector control: 0.00 ~ 120.00Hz
	Overload grade	Stable operation under 40°C, heavy load 150%, 1min
output	Efficiency (full load)	≥0.94
	Output frequency	$\pm 0.01\%$ (digital command- $10 \sim +45$ °C)
	precision	$\pm 0.1\%$ (analog command 25 ± 10 °C)

	Optoelectronic isolated	7 optoelectronic isolated inputs, 24V, either high or low level is effective, which					
	input	is settable. Input functions can be defined.					
	Open collector output	2 open collector outputs, output functions can be defined					
Digital		2 relay outputs with normally open contact, contact capacity: inductive,					
I/O		1.5A/250VAC, output functions can be defined.					
	Relay output	2 relay outputs with normally open and close double contact, contact capacity:					
		resistive, 4.5A/250VAC or 4.5A/30VDC; inductive: 0.4A/250VAC or					
		0.4A/30VDC; output functions can be defined.					

Analog	Analog input	2 analog inputs, precision 0.1%: Voltage: -10V ~ +10VDC or current: 0~20mA optional signal
I/O	Analog output	2 analog outputs, precision 0.1%: Voltage: -10V ~ +10VDC or current: 0~20mA optional signal

	PG power	5V, 12V, 300mA						
Encoder	PG signal	Open collector, push-pull, differential, SIN/COS increment type, Endat absolute value type and Resolver type						
input	PG frequency	Quadrature open collector output, frequency dividing factor 2/4/8/16/32/64/128						
	dividing output	is settable (optional)						

			Open loop v	ector control	Closed loop vector				
	Control mode	V/F control	Asynchron	Synchroniz	Asynchron	Synchroniz			
			y-zation	-ation	y-zation	-ation			
	Starting torque	2.50Hz 150%	0.5Hz	5% Speed	0.00Hz	0.00Hz			
	Starting torque	2.30HZ 130%	150%	100%	150%	200%			
	Speed regulation range	1:50	50 1:200 1:1000						
	Speed stabilizing	± 2%	± 0	2%	+ 0	02%			
	precision	± 270	<u> </u>	.270	<u> </u>	0270			
	Torque precision	±5% (closed loop	control)						
	Carrier frequency	1.1~8kHz; autom	atically adjust	the carrier freq	uency according	ng to load			
	Carrier frequency	characteristic							
	Frequency set resolution	0.01Hz (digital command)							
		±0.06Hz/120Hz (analog command 11 bit + unsigned)							
Control	Run command channel	Operation panel reference, control terminal reference and communication							
characteri		reference							
stics	Frequency reference	Operation panel reference, digital/analog reference, communication							
	channel	reference and functional function reference							
	Torque lifting	Automatic and manual torque lifting							
	V/F curve	The user defines V/F curve, linear V/F curve and 3 reduced torque							
	,,,, dai,,	characteristic curves.							
	Automatic voltage	Automatically regulate the duty cycle of output PWM signal according to							
	regulation	fluctuation of bus voltage, so as to relieve the influence of the voltage							
	8	fluctuation of grid on the output voltage fluctuation.							
	Continuous operation	Realize continuous operation by controlling the bus voltage during							
	under transient outage	instantaneous power failure.							
		Built-in braking ı	unit for 22kW a	and below, with	braking resist	or externally			
	Dynamic braking capacity	(optional)							
		Externally install	ed braking unit	for 22kW and	above (option	al)			
	DC braking capacity	Braking current: 0.0 ~ 120.0% rated current							

	Parameter copy	The standard operation panel could upload, download the parameters, and indicate copy progress.					
Ci-1	Process PID	Closed loop control for quantity of process.					
Special functions	Torque control	Realize torque/speed control by terminal switching, multi-torque given way					
Tunctions	function						
	Zero servo function	Lock the zero-speed position, accurately positioning and position control					
	Common DC bus	Realize the common DC bus power supply for several inverters					

	Blocked rotor
Motor	Motor overload
protection	Motor overheat (PTC)
	Speed limitation

Torque limitation

	Output current amplitude limiting						
	Torque limitation						
	Inverter overload						
	IGBT I²t overload						
	Input power undervoltage/overvoltage						
	DC bus undervoltage/overvoltage						
Inverter	IGBT overheat						
protection	Radiator overheat						
	Power failure						
	Abnormal +10V power output						
	Analog input signal loss (speed reference value loss)						
	Abnormal communication						
	Connecting failure for encoder						
	Self-tuning failure						

		Vertically installed inside the electrical control cubicle with good ventilation.					
	Place of service	Horizontal or other installation is not permitted. Cooling medium is air. It is					
	Flace of service	installed in the environment free from direct sunshine, dust, corrosive gas,					
		combustible gas, oily mist, steam and dripping water.					
	Ambient temperature	-10 ~ +40 °C					
Ambient	Temperature derating	>40°C, the rated output current decreases by 2% if the temperature increases					
	use	every 1°C (maximum 50°C)					
	Altitude	<1000m					
conditions	Altitude derating use	>1000m, the rated output current decreases by 1% if the altitude increases					
conditions	Aititude derating use	every 100m (maximum 3000m)					
	Ambient humidity	5 ~ 95%, without condensation					
	Vibration	2≤f<9Hz 3.5mm; 9≤f<200Hz, 10 m/s2; 200≤f<500Hz, 15 m/s2					
	(transportation)						
	Vibration	2≤f<9 0.3mm; 9≤f<200Hz, 1m/s2					
	(installation)	251 \ 9 0.5111111, 951 \ 200112, 1111/82					
	Storage temperature	-40 ~ +70 °C					
	Protection degree	IP20					

	Туре	Movable				
	Length	1m (it can be customized, maximum 5m)				
C1	Connection	RJ45				
Control	Text display	4 lines				
panel	LED display	4-bit				
	Visual LED indicator	4				
	Key	9				

	Cooling mode	Forced air cooling
Others	Installation way	Inside the cubicle
	Certification	CE

2.3 Installation Simensions of the Inverter

2.3.1 Product Appearance and Name of each Part

Refer to Figures 2-4, 2-5 and 2-6 for appearance of the inverter and name of each part.

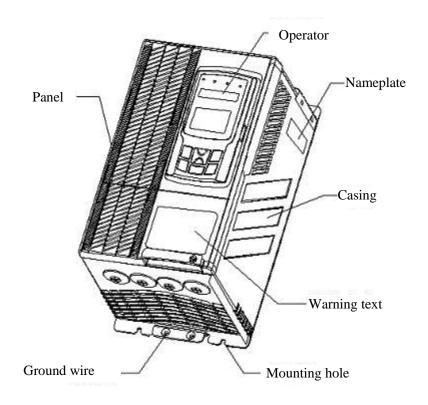


Fig. 2-4 AS500 4T05P5 and below

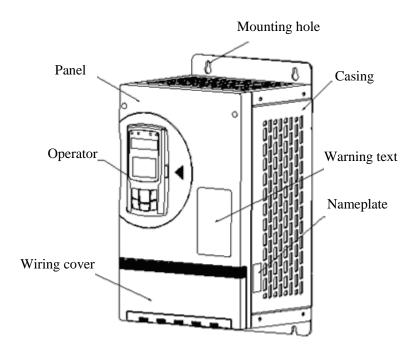


Fig. 2-5 AS500 4T07P5~4T0022 power level

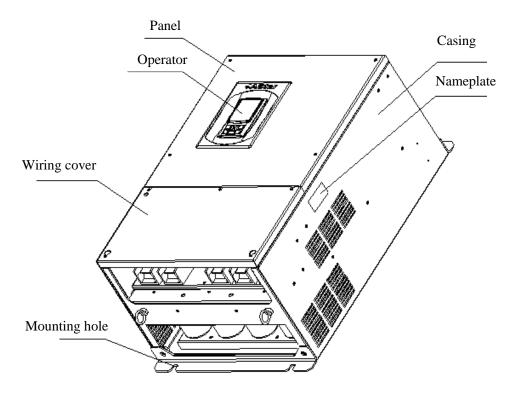


Fig. 2-6 AS500 4T0030~4T0355 power level

2.3.2 Product Boundary Dimension and Mounting Dimension

2.3.2.1 A1 Specification and Dimension

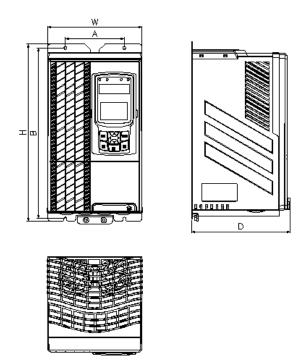


Fig. 2-7 A1 specification and installation dimensions

	Model	A	В	H (mm)	W (mm)	D (mm)	Installing	Installation			Tightening	Weight
Specifications	AS500	(mm)	(mm)				Diameter Φ(mm)	Bolt	Nut	Washer	torque (Nm)	(kg)
	2T01P1											
	2T02P2		100 288.5	300	160	162	5.0	4M4	4M4	4Φ4	1.1	4.5
	2T03P7											
A1	4T01P1	100										
	4T02P2											
	4T03P7											
	4T05P5											

2.3.2.2 A2~A9 Specification and Dimension

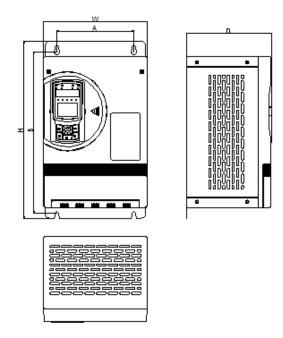


Fig. 2-8 A2~A3 specification and installation dimensions

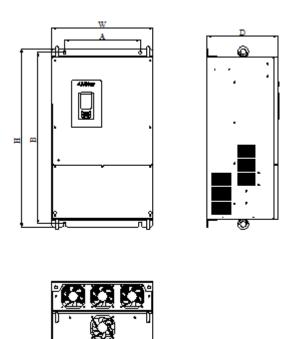


Fig. 2-9 A4~A9 specification and installation dimensions

Specifi	Model	A		Н	W (mm)	D (mm)	Installing		Installation	l	Tightening torque (Nm)	Weight (kg)					
cations	AS500	(mm)		(mm)			Diameter Φ(mm)	Bolt	Nut	Washer							
A2	4T07P5	165.5	165.5	165.5	165.5	165.5	165.5	257	270	222	102	7.0	1).16	1).16	4.5.6	2.5	0
	4T0011	165.5	357	379	222	182	7.0	4M6	4M6	4Ф6	3.5	8					

	4T0015												
A3	4T18P5	165.5	392	414	232	182						10.3	
	4T0022												
A4	4T0030	200	512	530	330	288	9.0	4M8	4M8		9	29.5	
A4	4T0037	200	312	330	330					4Ф8		29.3	
A5	4T0045	200	585	610	330	310				4Φ8		38	
A3	4T0055	200	363	010	330	310							
A6	4T0075		718	750	430	350						79.5	
A7	4T0090	320	768	800								81	
A/	4T0110		/08									01	
	4T0132	374 8						13.0	4M12	4M12	4Ф12	29	
	4T0160												106.5
A8	4T0185		844	880	500	352							
	4T0200											112.5	
	4T0220												
	4T0250	- 500 997										4.50	
A9	4T0280		500	007	1020	620	270	110	0.412	0.012	4.5.12		168
	4T0315		997	97 1030	630	370	14.0	4M12	4M12	4Ф12	29	169	
	4T0355										170		

2.3.3 Operator Dimension

Fig. 2-10 show the dimensions of the operator



Fig. 2-10 The dimension of the inverter Operator

2.4 Selection of Braking Unit and Braking Resistor

Negative torque maybe appear when the motor is running under braking. Therefore braking component will be considered for the inverter, otherwise overcurrent or overvoltage will occur, leading to tripping. AS500 series inverter with 22kW and below is provided with built-in braking unit, only braking resistor externally provided; while 22kW and above is the externally installed braking unit, it is recommended to choose the optional braking unit and braking resistor, whose specification and quantity will be different based on the different ratio occupied by braking time within a braking period.

When braking time occupied within a braking period is 10%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-2.

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

Inverter	Innertance it (IW)	Braking	unit	Braking resistor (Utilization rate 10%)	
model AS500	Inverter capacity (kW)	Specification	Qty. (pcs)	Specification of equivalent braking resistor	Qty. (pcs)
2T01P1	1.1			300W 100Ω	1
2T02P2	2.2			400W 50Ω	1
2T03P7	3.7			600W 30Ω	1
4T01P1	1.1			260W 600Ω	1
4T02P2	2.2			260W 250Ω	1
4T03P7	3.7	Built-	·	390W 150Ω	1
4T05P5	5.5	Built-	in	520W 100Ω	1
4T07P5	7.5			780W 75Ω	1
4T0011	11			1040W 50Ω	1
4T0015	15			1560W 40Ω	1
4T18P5	18.5			4800W 32Ω	1
4T0022	22			4800W 27.2Ω	1
4T0030	30	BKU-4030	1	6000W 20Ω	1
4T0037	37	BKU-4045	1	9600W 16Ω	1
4T0045	45	BKU-4045	1	9600W 13.6Ω	1
4T0055	55	BKU-4030	2	6000W 20Ω	2
4T0075	75	BKU-4045 2 BKU-4110 1		9600W 13.6Ω	2
4T0090	90			18kW 6.7Ω	1
4T0110	110	BKU-4110	1	25kW 5Ω	1
4T0132	132	BKU-4220	1	40kW 3.4Ω	1
4T0160	160	BKU-4220	1	40kW 3.4Ω	1
4T0185	185	BKU-4220	1	40kW 3.4Ω	1

4T0200	200	BKU-4220	1	48kW 3Ω	1
4T0220	220	BKU-4220	1	48kW 3Ω	1
4T0250	250	BKU-4110	2	25kW 5Ω	2
4T0280	280	BKU-4220	2	40kW 3.4Ω	2
4T0315	315	BKU-4220	2	40kW 3.4Ω	2
4T0355	355	BKU-4220	2	40kW 3.4Ω	2

When braking time occupied within a braking period is 20%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-3.

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

Inverter	Investor conscitu (LW)	Braking	unit	Braking resistor (Utilization rate 20%)		
model AS500	Inverter capacity (kW)	Specification Qty. (pcs)		Specification of equivalent	Qty.	
				braking resistor	(pcs)	
2T01P1	1.1			300W 100Ω	1	
2T02P2	2.2			400W 50Ω	1	
2T03P7	3.7			600W 30Ω	1	
4T01P1	1.1			520W 500Ω	1	
4T02P2	2.2	Built-in		520W 230Ω	1	
4T03P7	3.7			780W 140Ω	1	
4T05P5	5.5			1040W 90Ω	1	
4T07P5	7.5			1560W 70Ω	1	
4T0011	11			2kW 47Ω	1	
4T0015	15			3kW 34Ω	1	
4T18P5	18.5			9600W 28Ω	1	
4T0022	22			9600W 24Ω	1	
4T0030	30	BKU-4045 1		12.5kW 17Ω	1	
4T0037	37	BKU-4045	1	20kW 15Ω	1	
4T0045	45	BKU-4030	2	10kW 24Ω	2	
4T0055	55	BKU-4045	2	12.5kW 18Ω	2	
4T0075	75	BKU-4110	1	36kW 6.7Ω	1	
4T0090	90	BKU-4045	3	12.5kW 18Ω	3	
4T0110	110	BKU-4045 3 BKU-4220 1		12.5kW 16Ω	3	
4T0132	132			80kW 3.5Ω	1	
4T0160	160	BKU-4220 1		80kW 3.2Ω	1	
4T0185	185	BKU-4110	2	50kW 5Ω	2	
4T0200	200	BKU-4110	2	50kW 5Ω	2	
4T0220	220	BKU-4110	2	50kW 5Ω	2	
4T0250	250	BKU-4220	2	60kW 4.7Ω	2	

4T0280	280	BKU-4220	2	80kW 3.5Ω	2
4T0315	315	BKU-4220	2	80kW 3.5Ω	2
4T0355	355	BKU-4220	2	80kW 3.5Ω	2

When braking time occupied within a braking period is 40%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-4.

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

Inverter	Inverter capacity (kW)	Braking	unit	Braking resistor (Utilization rate 40%)		
model AS500		Specification	Qty. (pcs)	Specification of equivalent	Qty.	
115000		Specification	QtJ. (pcs)	braking resistor	(pcs)	
2T01P1	1.1			300W 100Ω	1	
2T02P2	2.2			400W 50Ω	1	
2T03P7	3.7			600W 30Ω	1	
4T01P1	1.1			800W 350Ω	1	
4T02P2	2.2			1.3kW 180Ω	1	
4T03P7	3.7	D:14	:	2.2kW 110Ω	1	
4T05P5	5.5	Built-in		3.3kW 75Ω	1	
4T07P5	7.5			4.5kW 55Ω	1	
4T0011	11			6.6kW 37Ω	1	
4T0015	15			9kW 27Ω	1	
4T18P5	18.5			11kW 22Ω	1	
4T0022	22			13kW 18Ω	1	
4T0030	30	BKU-4045 1		20kW 13.5Ω	1	
4T0037	37	BKU-4030 2		12.5kW 22Ω	2	
4T0045	45	BKU-4045	2	12.5kW 18Ω	2	
4T0055	55	BKU-4045	2	20kW 15Ω	2	
4T0075	75	BKU-4110	1	60kW 5Ω	1	
4T0090	90	BKU-4110	1	60kW 5Ω	1	
4T0110	110	BKU-4220	1	70kW 3.7Ω	1	
4T0132	132	BKU-4220	1	70kW 3.7Ω	1	
4T0160	160	BKU-4220	1	90kW 3Ω	1	
4T0185	185	BKU-4220	2	60kW 5Ω	2	
4T0200	200	BKU-4220 2		60kW 5Ω	2	
4T0220	220	BKU-4220	2	70kW 3.7Ω	2	
4T0250	250	BKU-4220	2	70kW 3.7Ω	2	
4T0280	280	BKU-4220	2	90kW 3Ω	2	
4T0315	315	BKU-4220	2	90kW 3Ω	2	
4T0355	355	BKU-4220	2	90kW 3Ω	2	

Chapter 3 Installation of the Inverter

3.1 Installation Steps

Step 1: delivery of the inverter

- Examine and confirm the catalog number on the label is the same as that on the order form
- Remove the packing of AS500 inverter and examine it for any damage during transportation

Step 2: examine the line voltage

■ Examine and confirm that the line voltage is matched with voltage and frequency range of the inverter

Step 3: install the inverter

- Install the inverter as described in this document
- Install any internal and external option

Step 4: wiring of the inverter

- Connect the motor and ensure the voltage is consistent with the inverter
- Connect the control line
- Connect the speed reference
- Connect the communication cable
- Connect the encoder cable
- Connect the power line after power is turned off

3.2 Mechanical Installation

3.2.1 Installation Environment of the Product

3.2.1.1 Temperature and Humidity

Operating ambient temperature is $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$. Derating when the ambient temperature exceeds 40°C (maximum 50°C). For the ambient temperature greater than 40°C , derating by 2% for every increase of 1°C . Relative humidity of the air is $\leq 95\%$, without condensation.

For the occasions with poor environment on site, it is recommended to enhance the cooling of the inverter.

3.2.1.2 Altitude

In altitude below 1000m area, the inverter can operating under rated power. Derating when the installation altitude over 1000m area (maximum 3000m). Fig 3-1 shows the relationship between descendent rated output current and the altitude.

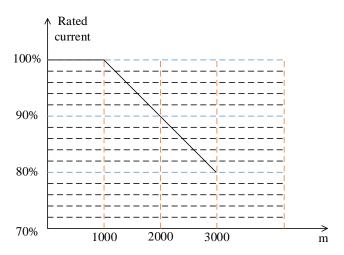


Fig 3-1 Diagram of rated output current vs. altitude

3.2.1.3 Other Environmental Requirements

- Avoid installation in the places with violent vibration or shock, the maximum vibration acceleration not greater than 5.8m/s2 (0.6g).
- Don't install it in the places with electromagnetic radiation point.
- Avoid installation in the places with oil mist, metal dust and more dust.
- Avoid installation in the places with poisonous and harmful gas, liquid, corrosive gas, flammable and explosive gas.
- Avoid installation in the places containing more salt content.
- Be sure not to install it in the place with direct sunshine.
- Be sure not to install it on the flammable object such as wood.
- Be sure not to drop any boring residue inside the inverter during installation.

3.2.2 Installation Position and Space Requirement



According to the installation method chosen, the inverter must be vertically installed:

-- inside the electrical cabinet

Horizontal installation in the electrical cabinet will be prohibited.

3.2.2.1 Installation Orientation

In order not to reduce the cooling effect of the inverter, it shall be installed in the place with good ventilation, with vertical installation direction.

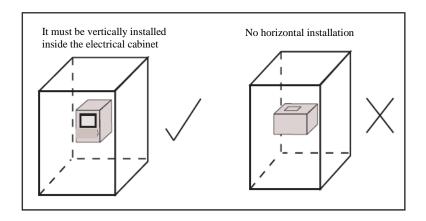


Figure 3-2 Installation orientation

When the user vertically installs the inverter, the included angle between it and the horizontal plane will be 87° to 90°. The details are shown as Figure 3-3:

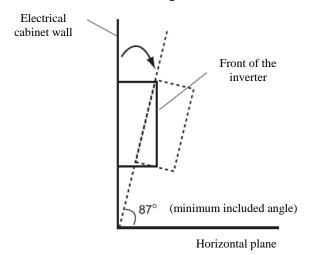


Figure 3-3 Permissible installation included angle

3.2.2.2 Installation Space

Several inverters may be installed side by side or up and down, space among inverters as well as that between the inverter and the electrical cabinet wall shall be:

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

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

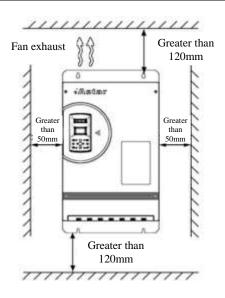


Figure 3-4 Installation space schematic of the inverter (37kW and below)

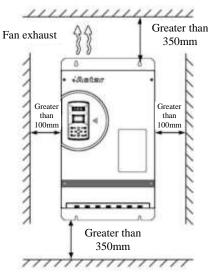


Figure 3-5 Installation space schematic of the inverter (45kW and above)

3.2.3 Inverter Installation

Refer to Fig. 3-5 for the installation procedures:

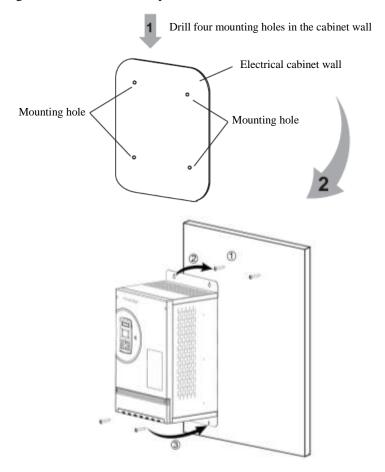


Figure 3-5 Installation procedures

Important

Fasteners must have anti-vibration parts such as spring washer.

All four mounting screws must be securely tightened.

3.3 Installation and Disassembling of the Operator and Panel

3.3.1 Connect/Disconnect the Operator

3.3.1.1 Disconnect the Operator

- ① Press latch springs at both sides of operator simultaneously to unhook the operator from the front panel, and then the operator can be removed from inverter.
- ② A cable at the back of operator connecting to inverter needs to be unplugged. Note, do not pull directly on the cable, it may damage the connection.

Connect and disconnect operator, see Fig. 3-6



Figure 3-6 Disconnect operator

3.3.1.2 Connect Operator

Plug the cable into the socket at the back of operator first, then slide one side of latch into the groove of front panel, press operator against the panel until a "Click" sound heard. Both latches are locked properly.

3.3.2 Open/Close Wiring Cap

3.3.2.1 Open Wiring Cap

- ① Loose two screws on wiring cap;
- ② Open wiring cap downward.

Open wiring cap, see Fig. 3-7.



Figure 3-7 Open wiring cap

3.3.2.2 Close Wiring Cap

Operate open wiring cap procedure reversely to close it, tighten two thumb screws.

3.3.3 Install and Disassemble Front Panel

Front panel needs to be dismounted when controlling loop is wired. For the convenience to wire the main loop the front panel may also be removed.

3.3.3.1 Disassemble Front Panel

Procedures of disassembling front panel:

- ① Remove operator. Refer to chapter 3, 3.1 Connect/Disconnect the operator;
- ② Open wiring cap. Refer to chapter 3, 3.2 Open/Close wiring cab;
- ③ Loose two screws at top of the front panel and two screws inside wiring cap compartment, and then the front panel can be removed.

The Operation to remove the front panel, see Fig. 3-8.

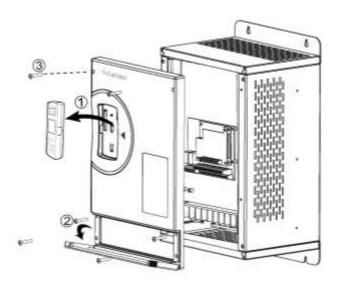


Figure 3-8 Disassemble front panel

3.3.3.2 Install Front Panel

Install front panel in a reversed order of disassembling the front panel.

Chapter 4 Wiring of the Inverter

This chapter introduces the wire connection in details in inverter and its peripheral equipment, inverter terminal blocks, main circuit looping, controlling circuit looping and PG card.

Danger

O Ensure to have power supply fully disconnected before wiring.

Or it may cause electric shock.

Only the certified electrician can handle wiring task.

Or it may cause electric shock.

© Ensure the protect grounding terminal PE to be grounded reliably.

Or it may cause electric shock.

O Don't touch terminal block by hand directly, don't connect the output cable to the inverter encloser.

Or it may cause electric shock.

O Don't connect power supply to output terminal U, V, W.

Or it may damage inverter.

O Do not short connect the terminal $\oplus 1 / \oplus 2$ to \ominus .

Or it may have a risk of explosion hazard.

∧ Notice

© Ensure the consistency between the voltage of power supply in AC main circuit and rated voltage.

Or it may cause human injury and fire hazard.

O Connect braking resistor correctly referring to wiring diagram.

Or it may cause fire hazard.

 \odot Secure fastenedly connect the main circuit to the wiring cables or to the wire crimping terminal.

Or it may damage inverter.

4.1 Connect Inverter to Peripherals

4.1.1 Connection Diagram between Inverter and Peripherals

Connection diagram between the inverter and its peripheral equipments. See Fig. 4.1.

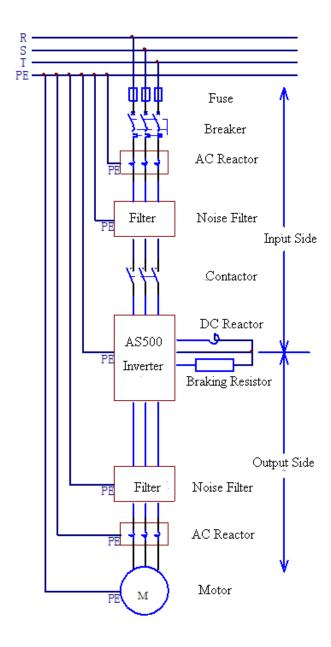


Fig. 4.1 The connection between the inverter and its peripheral equipment

Note: Sample drawing shows a 3-phase input power supply.

4.1.2 Connect Inverter to Peripherals

4.1.2.1 Input Power Connection



Overvoltage may damage inverter permanently.

Table 4.1 The technical requirements for the input power

The connection technical requirements for power input (Main circuit)		
Input Voltage	380~460V AC 3 phase, -15% ~+10%	
Short Current	If incoming cable is properly protected by fuse, the max permissible short current in 1	
(IEC60909 Standard)	second is 100kA	
Frequency	45~65 Hz	
Unbalance	Its maximum is $\pm 3\%$ of rated input line voltage.	
Cable Temperature	It's permissible that the inverter works at 90°C for a long-term period.	

4.1.2.2 Input Protection

Input protection includes breaker, fuse and emergency stop.

Breaker

Inverter doesn't carry breaker by itself. Therefore breaker must be installed between AC input power supply and the inverter. Ensure the following notice of the breaker:

- Type selection must conform with the applied safety regulation, including (but not limited to) national and local electric regulation.
- During installation and maintenance to the inverter, breaker must ensure to stay at open position and be locked.
- Breaker doesn't allow to control to start or stop the motor. Motor is controlled by operator keypad or I/O terminal command.
- Capacity of selected breaker should be 1.5~2 times of rated inverter current.
- Breaker time response character should correspond with the inverter overheat protection character (over 150% of rated output current for more than 1minute).

Fuse cutout

Terminal user must provide loop protection device, which is consistent with the national and local electric laws and regulations. The table 4-2 introduces recommended fuse cutout types, it provides short protection for inverter incoming cable.

Table 4.2 The recommended fuse cutout types

Inverter Type	Input Current	Main Fuse Cutout	UL Grade T	
AS500	(A)	IEC269gG(A)	(A)	Туре
4T01P1	3.7	10	10	CT10
4T02P2	6.6	10	10	CT10
4T03P7	9.5	16	15	CT16
4T05P5	13.7	20	20	CT20
4T07P5	20	35	40	FE40
4T0011	29	45	50	FE45
4T0015	35	50	50	FE50
4T18P5	43	70	70	FE70
4T0022	50	70	70	FE70
4T0030	66	100	100	FE100
4T0037	82	100	100	FE100
4T0045	106	160	160	FEE160
4T0055	138	200	200	FEE200
4T0075	170	400	400	FWH-400A
4T0090	205	400	400	FWH-400A
4T0110	250	400	400	FWH-400A
4T0132	280	700	700	FWH-700A
4T0160	312	800	800	FWH-800A
4T0185	380	800	800	FWH-800A
4T0200	400	1000	1000	FWH-1000A
4T0220	436	1000	1000	FWH-1000A
4T0250	490	1200	1200	FWH-1200A
4T0280	530	1200	1200	FWH-1200A
4T0315	610	1200	1200	FWH-1200A
4T0355	660	1200	1200	FWH-1200A

Emergency stop

General design and installation must include emergency stop device and other necessary safety equipment. To control motor by operator keypad operation, or I/O commend can't guarantee:

- Emergency motor stop;
- Separate inverter from hazardous voltage.

4.1.2.3 Input Power Cable/Connection

Input cable can be any one of followings:

- 4 core cable (3 phase and ground protection) without shield;
- 4 core insulated cable installed in conduit.

In any circumstances, the size of the conducting wire must smaller than the defined maximum limit value. When motor cable is too long or motor cable cross-section is too large, inverter should be

derated and use cable based on the standard of cable cross-section (see Table 4.3). The larger the cross-section of the cable is, the bigger the capacity to the ground is, the lager the leak current to the ground is. When choose cable with lager cross-section, output current should be reduced. One level added of the cross-section of cable, 5% of the current reduced. Table 4.3 lists types of copper cables under different load currents. Recommended types are only suitable when the situation meets the top part of the table. Aluminum cable is not recommended.

Table 4.3 Relevant standards of IEC and NEC requirements for input power cables

IEC	NEC
Based on:	Based on:
EN 60204-1 and IEC 60364-5-2/2001 standard;	For copper cable , see NEC Table 310-16;
PVC Insulation;	Cable insulation at 90 °C;
Ambient temperature at 30 °C;	Ambient temperature at 40 °C;
Surface temperature at 70 °C;	No more than 3 current-carrying cables in the same
Copper net shielded symmetrical cable;	trunking, the cable trench, or the buried cables.
No more than 9 cables laid side by side in a same cable	Copper net shielded copper core cable
tray compartment.	

Max Carry Current	Copper cable	Max Carry Current	Copper cable
(A)	(mm ²)	(A)	(mm ²)
3.5	1	128	50
6.2	1.5	160	70
9	1.5	195	95
13	1.5	210	95
19	2.5	240	120
27	4	302	185
34	6	352	240
41	10	390	95×2P
48	10	426	95×2P
65	16	480	150×2P
80	25	520	150×2P
96	35	650	95×4P

To ensure human safety, correct operation and to reduce electromagnetic radiation, inverter and motor must be grounded at their installed place.

- The diameter of conductor must meet the requirements of the safety laws and regulations.
- The shielding layer of power cable must be connected to PE terminal of inverter to meet the safety guideline.

- Only when the specifications of the power cable shielding layer meet safety requirements can the shielding layer of power cable be used as ground connection.
- Don't connect terminal blocks in series when multi inverters installed.

4.1.2.4 Output Power Cable/Connection

Table 4.4 Output power (Motor connection technical specification)

Technical specification for output power (motor)			
Output Voltage	0 ~input voltage, symmetric 3-phase		
Current	see Chapter 2, "2.2 Technical Indexes and Specifications of the Inverter"		
Switch frequency	Allow to set: 1.1~8kHz		
Rated cable temperature	Allow long term working at 90 °C		
Length of motor cable vs. switch	See Chapter 4, "4.4.5 Relationship between Length of Wire and Carrier		
frequency	Frequency"		

Grounding and wiring

Motor cable shielding: Motor cable requires to be shielded by wire conduit, armored cable or shielded cable. Armored cable or shielded cable: high frequency low impedance shielded cable should be adopted, such as braided copper wire mesh, aluminium wire mesh or wire mesh.

Wire conduit

- Each end point of wire conduit must install a grounded bridging.
- Wire conduit needs to be fixed on housing.
- Laying an individual conduit for motor cable only. (separate input power cable and control cable)
- One separated conduit for each inverter

Armored cable

- Each end point of wire conduit must install a grounded bridging;
- To use cable having 6 wires (3 power lines, 3 grounding lines). Type MC continuous corrugated Aluminum armored cable with symmetric grounding lines;
- Metal-clay motor cable can share one cable tray with input power cable. But it can't share with control cable.

Shielded cable

Recommend to use symmetric PE conductor cable certified by CE or C-Tick.

Grounding

Recommended cross-sectional area of grounded wire is in Table 4-13 of Chapter 4.3.4.1.

4.1.2.5 AC Reactor at the Input Side

In order to prevent the large current from flowing into the input power loop and damage the rectifying elements when the peak pulse is input from the grid, AC reactor will be connected at the input side, which also is able to improve power factor of the input side and reduce the higher harmonic current. To effectively protect the inverter, it is recommended to add AC input reactor for 380V inverter 110kW and above (including 110kW).

Selection of AC reactor at the input side refers to Table 4-5.

Table 4-5 The recommended types of input AC resistor

Inverter Type AS500	Power (kW)	Recommended Type	Current (A)	Inductance (mH)	Voltage Drop
4T01P1	1.1	ACR-0005-2M80-0.4SC	5	2.800	2%
4T02P2	2.2	ACR-0007-2M00-0.4SC	7	2.000	2%
4T03P7	3.7	ACR-0010-1M40-0.4SC	10	1.400	2%
4T05P5	5.5	ACR-0015-0M94-0.4SC	15	0.940	2%
4T07P5	7.5	ACR-0020-0M70-0.4SC	20	0.700	2%
4T0011	11	ACR-0030-0M47-0.4SC	30	0.470	2%
4T0015	15	ACR-0040-0M36-0.4SC	40	0.360	2%
4T18P5	18.5	ACR-0050-0M28-0.4SC	50	0.280	2%
4T0022	22	ACR-0060-0M24-0.4SC	60	0.240	2%
4T0030	30	ACR-0080-0M18-0.4SC	80	0.180	2%
4T0037	37	ACR-0090-0M16-0.4SC	90	0.156	2%
4T0045	45	ACR-0120-0M12-0.4SA	120	0.117	2%
4T0055	55	ACR-0150-094U-0.4SA	150	0.094	2%
4T0075	75	ACR-0200-070U-0.4SA	200	0.070	2%
4T0090	90	ACR-0250-056U-0.4SA	250	0.056	2%
4T0110	110	ACR-0250-056U-0.4SA	250	0.056	2%
4T0132	132	ACR-0290-048U-0.4SA	290	0.048	2%
4T0160	160	ACR-0330-042U-0.4SA	330	0.042	2%
4T0185	185	ACR-0390-036U-0.4SA	390	0.036	2%
4T0200	200	ACR-0490-028U-0.4SA	490	0.028	2%
4T0220	220	ACR-0490-028U-0.4SA	490	0.028	2%
4T0250	250	ACR-0600-024U-0.4SA	600	0.024	2%
4T0280	280	ACR-0600-024U-0.4SA	600	0.024	2%
4T0315	315	ACR-0660-022U-0.4SA	660	0.022	2%
4T0355	355	ACR-0800-17U5-0.4SA	800	0.0175	2%

4.1.2.6 Interference Filter at the Input Side

When the inverter is working, other electronic equipment surrounded may be interfered by the power line. Filter is adopted to reduce the interference to the surrounding equipment.

Selection of the filter at the input side of 380V inverter refers to Table 4-6.

Table 4-6 The recommended types of input filter

Inverter Type AS500	Power (kW)	Recommended Type	Current (A)
4T01P1	1.1	RFI4C5	5
4T02P2	2.2	RFI4C10	10
4T03P7	3.7	RFI4C10	10
4T05P5	5.5	RFI4C20	20
4T07P5	7.5	RFI4C20	20
4T0011	11	RFI4C36	36
4T0015	15	RFI4C36	36
4T18P5	18.5	RFI4C50	50
4T0022	22	RFI4C50	50
4T0030	30	RFI4C65	65
4T0037	37	RFI4C80	80
4T0045	45	RFI4C100	100
4T0055	55	RFI4C150	150
4T0075	75	RFI4C150	150
4T0090	90	RFI4C200	200
4T0110	110	RFI4C250	250
4T0132	132	RFI4C250	250
4T0160	160	RFI4C300	300
4T0185	185	RFI4C400	300
4T0200	200	RFI4C400	400
4T0220	220	RFI4C600	600
4T0250	250	RFI4C600	600
4T0280	280	RFI4C600	600
4T0315	315	RFI4C900	900
4T0355	355	RFI4C900	900

Sample diagram for the correct setting of noise filter at power supply side, see Fig. 4.2.

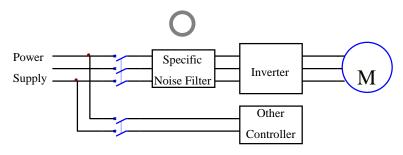


Fig. 4.2 Correct noise filter installation at power supply side

Sample diagram for the incorrect setting of noise filter at power supply side, see Fig. 4.3 and Fig 4.4.

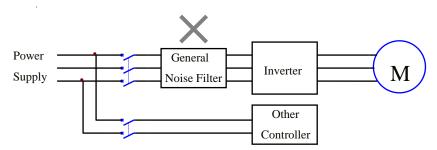


Fig. 4.3 Incorrect noise filter installation at power supply side, example 1

In Fig. 4.3, a general noise filter at power supply side may not meet the required expectation and should be avoided.

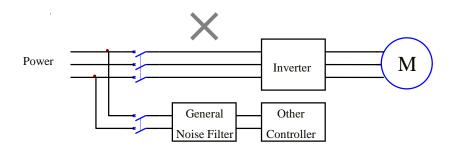


Fig. 4.4 Incorrect noise filter installation at power supply side, example 2

In Fig. 4.4, a general noise filter at receiving side may not meet the required expectation and should be avoided.

Notice: the wire length between filter and inverter should as short as possible when installing noise filter in the input side.

Filter housing and the installation of the cabinet should be large and reliable connections to reduce reflux of impedance noise current lg.

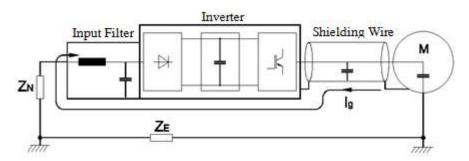


Fig. 4.5 Noise current schematic diagram of noise filter

4.1.2.7 Contactor at the Input/Output Side

In order to protect the power supply and avoid the fault being enlarged, input power of the inverter must be effectively cut off when the system has any fault. Electromagnetic contactor can be

mounted at the input side to control power on and off of the main loop, to ensure safety.

Please don't use the contactor to control start and stop of the motor.

4.1.2.8 Interference Filter at the Output Side

Output noise filter may reduce the radio noise caused by the cable between inverter and motor as well as the leakage current of the conductor.

Selection of 380V output filter refers to Table 4-7.

Table 4-7 Recommended selection table of output filter

Inverter Type AS500	Power (kW)	Recommended Type	Current (A)
4T01P1	1.1	RFO4B5	5
4T02P2	2.2	RFO4B10	10
4T03P7	3.7	RFO4B10	10
4T05P5	5.5	RFO4B20	20
4T07P5	7.5	RFO4B20	20
4T0011	11	RFO4B36	36
4T0015	15	RFO4B36	36
4T18P5	18.5	RFO4B50	50
4T0022	22	RFO4B50	50
4T0030	30	RFO4B65	65
4T0037	37	RFO4B80	80
4T0045	45	RFO4B100	100
4T0055	55	RFO4B150	150
4T0075	75	RFO4B150	150
4T0090	90	RFO4B200	200
4T0110	110	RFO4B250	250
4T0132	132	RFO4B250	300
4T0160	160	RFO4B300	300
4T0185	185	RFO4B400	400
4T0200	200	RFO4B400	400
4T0220	220	RFO4B600	600
4T0250	250	RFO4B600	600
4T0280	280	RFO4B600	600
4T0315	315	RFO4B900	900
4T0355	355	RFO4B900	900

4.1.2.9 AC Reactor at the Output Side

AC reactor at the output side can be chosen to control the radio frequency interference from the inverter.

When the wire between the inverter and the motor is too long (>100m) or there are several motors are running, because leakage current produced by the long cable-ground stray capacitance effect is too large, the inverter is easily subject to overcurrent protection, at the same time, output reactor compensation must be increased to avoid motor insulation damage.

Selection of AC reactor refers to Table 4-8.

Table4-8 Recommended selection table of AC Reactor at the output side

Inverter Type AS500	Power (kW)	Recommended Type	Current (A)	Inductance (mH)	Voltage Droop
4T01P1	1.1	OCR-0005-1M40-0.4SC	5	1.400	1%
4T02P2	2.2	OCR-0007-1M00-0.4SC	7	1.000	1%
4T03P7	3.7	OCR-0010-0M70-0.4SC	10	0.700	1%
4T05P5	5.5	OCR-0015-0M47-0.4SC	15	0.470	1%
4T07P5	7.5	OCR-0020-0M35-0.4SC	20	0.350	1%
4T0011	11	OCR-0030-0M23-0.4SC	30	0.230	1%
4T0015	15	OCR-0040-0M18-0.4SC	40	0.180	1%
4T18P5	18.5	OCR-0050-0M14-0.4SC	50	0.140	1%
4T0022	22	OCR-0060-0M12-0.4SC	60	0.120	1%
4T0030	30	OCR-0080-087U-0.4SC	80	0.087	1%
4T0037	37	OCR-0090-078U-0.4SC	90	0.078	1%
4T0045	45	OCR-0120-058U-0.4SA	120	0.058	1%
4T0055	55	OCR-0150-047U-0.4SA	150	0.047	1%
4T0075	75	OCR-0200-035U-0.4SA	200	0.035	1%
4T0090	90	OCR-0250-028U-0.4SA	250A	0.028	1%
4T0110	110	OCR-0250-028U-0.4SA	250A	0.028	1%
4T0132	132	OCR-0290-024U-0.4SA	290	0.024	1%
4T0160	160	OCR-0330-021U-0.4SA	330	0.021	1%
4T0185	185	OCR-0390-018U-0.4SA	390	0.018	1%
4T0200	200	OCR-0490-014U-0.4SA	490	0.014	1%
4T0220	220	OCR-0490-014U-0.4SA	490	0.014	1%
4T0250	250	OCR-0600-012U-0.4SA	600	0.012	1%
4T0280	280	OCR-0600-012U-0.4SA	600	0.012	1%
4T0315	315	OCR-0660-011U-0.4SA	660	0.011	1%
4T0355	355	OCR-0800-08U7-0.4SA	800	0.0087	1%

4.1.2.10 DC Reactor

AS500 series inverter ≥30kW (400V grade) is provided with built-in DC reactor, which is able to improve the power factor, avoid too large input current of the inverter due to the large capacity transformer connected, leading to damage of the rectifier bridge, as well as avoid the damage caused by harmonic due to voltage leap of the grid or phase control load to the rectifying circuit.

AS500 series inverter below 30kW (400V grade) is provided with externally installed DC reactor. Refer to Table 4-9 for its selection.

Table 4-9 Recommended selection table of DC reactor

Inverter Type AS500	Power (kW)	Recommended Type	Current (A)	Inductance (mH)
4T01P1	1.1	DCR-0010-6M30-0.4DC	10	6.3
4T02P2	2.2	DCR-0010-6M30-0.4DC	10	6.3
4T03P7	3.7	DCR-0010-6M30-0.4DC	10	6.3
4T05P5	5.5	DCR-0015-3M60-0.4DC	15	3.6
4T07P5	7.5	DCR-0020-3M60-0.4DC	20	3.6
4T0011	11	DCR-0030-2M00-0.4DA	30	2
4T0015	15	DCR-0040-2M00-0.4DA	40	2
4T18P5	18.5	DCR-0040-1M30-0.4DA	40	1.3
4T0022	22	DCR-0050-1M08-0.4DA	50	1.08

4.2 Wiring of Inverter Terminals

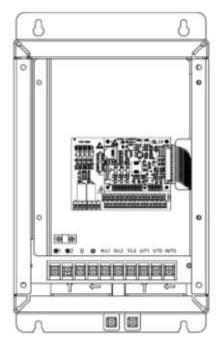


Fig4-6 Internal view of the inverter

Note: terminals of the inverter with different power level are the same in terms of position and arrangement except for those power input/output terminals. We take 11kW inverter as an example in the figure.

4.2.1 Wiring Diagram of the Inverter Terminals

Basic wiring diagram of the inverter with no built-in DC reactor and built-in braking unit is

shown as Figure 4-7.

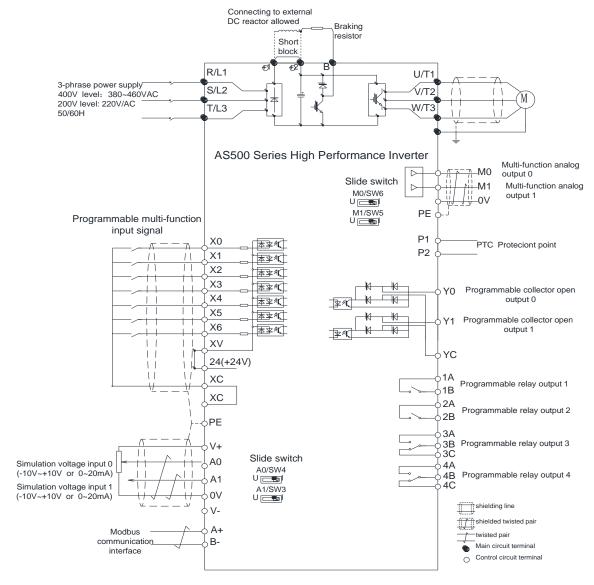


Figure 4-7 Wiring schematic of high performance vector inverter terminals (22kW and below)

Note: input power in the diagram is given taking 3-phase power input as an example, 3-phase 380-600V power input for 400V grade inverter, while 3-phase 200-240V power input for 200V grade inverter (any 2 phases can be connected for single-phase inverter).

Basic wiring diagram of the inverter with built-in DC reactor and no built-in braking unit is shown as Figure 4-8.

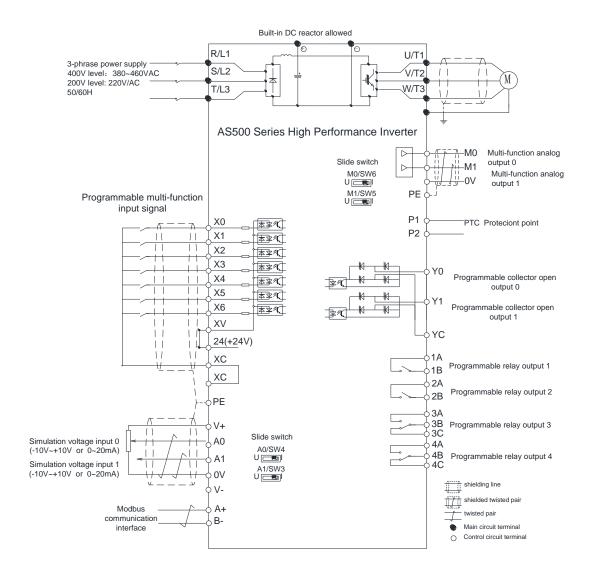


Figure 4-8 Wiring schematic 2 of inverter terminals (22kW and above)

Notes:

- 1. Optional analog voltage and current signals can be input to A0/A1 simultaneously.
- 2. This inverter isn't provided with braking unit, but with the terminals for external connection.

4.2.2 Terminal wiring precaution

Important

- a) Wiring should meet standard of electrician regulation.
- b) Ensure wiring is correctly and reliably after finish of wire connection. Need to check-up:
 - Is wiring correct?

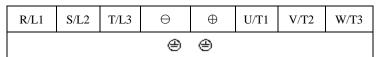
- Is any loose piece, like wire clipping, screw left in the inverter?
- ◆ Any loosing screw?
- ◆ Does the stripped wire of the terminal parts contact to any other terminal?
- c) AS500 series inverter equips (22kW and below) inside braking component. But it needs to connect external braking resistor. Braking resistor should be installed between terminal B and ⊕2. Please don't install them anywhere else, or it may damage braking resistor and inverter. AS500 series inverter equips (greater than 22kW) outside braking component.
- d) AS500 series inverter equips (22kW and below) Select DC reactor is installed between terminal $\oplus 1$ and $\oplus 2$, and short block between those terminals needs to be taken off. AS500 series inverter equips (greater than 22kW) inside DC reactor.
- e) For AS500 series inverter equips (22kW and below), if bus low voltage running function is needed, the emergency 220V power supply needs to be connected at terminals R0 and T0 on extended power board. A 48V DC power supply need to be connected between terminal R and S at the same time. No extra connection needs if there is no bus low voltage running function.
- f) Inverter grounding point PE is recommended to ground to specialized grounding spot. The grounding resistance should be below 10Ω .
- g) Keep the grounding cable as short as possible.
- h) If there is any wire alteration required after power on, disconnect the power supply first. The capacity in main circuit needs a certain time to discharge. To avoid any hazard, charging indicator must be off, and then the DC voltage on charging capacity should be measured by DC voltage meter and is below a safety voltage of 24V before any further work.

4.3 Main Circuit Terminal Wiring

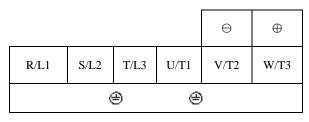
4.3.1 Line-up of Main Circuit Terminals



a) 22kW and below



b) 30kW~55kW



c) 75kW~355kW

Fig. 4.9 The line-up of connection terminals of the main circuit ${\bf r}$

4.3.2 Main Circuit Terminal Label and Function Specification

Function specification for main circuit terminals, see Table 4.10.

Table 4-10 Function specification of main circuit terminals

Terminal Label	Function Specification	
⊕1	May connect external DC reactor. Short connected by factory	
⊕2	default	
⊕2		
В	Connect to external braking resistor	
⊕2/⊕	DC Bus cable positive/negative output terminal. May connect	
Θ	external DC reactor or common DC bus.	
R/L1		
S/L2	Main circuit input AC power supply, connecting 3 phase input	
T/L3		
U/T1		
V/T2	Inverter output, connecting 3 phase sync/async motor	
W/T3		
Φ	Ground terminal, connect the protective ground, when the 400V	
⊜	class ground resistance is not greater than 4Ω	

4.3.3 Main Circuit Wire Specification

600V insulated copper conductor power supply cable is used. Specification of wire and tightening torque, see Table 4.11.

Table 4-11 Wire Specification and Tightening Torque

Model- AS500	Connectable wire specification (mm²)	Recommended wire specification (mm²)	Tightening Torque (N.m)
4T01P1	1.5~2.5	2.5	2.7
4T02P2	1.5~2.5	2.5	2.7
4T03P7	2.5~4	4	2.7

Model-	Connectable wire	Recommended wire	Tightening
AS500	specification (mm ²)	specification (mm ²)	Torque (N.m)
4T05P5	4~8	6	2.7
4T07P5	4~8	6	2.7
4T0011	4~8	6	2.7
4T0015	8~16	16	3
4T18P5	8~16	16	3
4T0022	25~35	25	3
4T0030	35~50	35	6
4T0037	50~70	50	6
4T0045	70~95	70	6
4T0055	95	95	6
4T0075	85~115	95	10
4T0090	85~115	95	10
4T00110	95~135	120	10
4T0132	165~205	185	10
4T0160	205~265	240	10
4T0185	85~115(×2P)	95×2P	10
4T0200	85~115(×2P)	95×2P	10
4T0220	125~175(×2P)	150×2P	10
4T0250	125~175(×2P)	150×2P	10
4T0280	125~175(×2P)	150×2P	17
4T0315	85~115(×4P)	95×4P	17
4T0355	85~115(×4P)	95×4P	17

@Important

The wire specifications are determined under the ambient temperature of 50°C , and the wire allowable temperature of 75°C .

Inverter main circuit uses open terminal block. Round crimp terminal should be used for open terminal block. To select round crimp terminal, see Table 4-12.

Table 4-12 Round crimp terminal

Cross Section Area (mm²)	Terminal Screw	Round crimp terminal
0.5	M3.5	1.25/3.5
0.5	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

Cross Section Area (mm²)	Terminal Screw	Round crimp terminal
	M5	2/5
	M6	2/6
	M8	2/8
	M4	5.5/4
25/55	M5	5.5/5
3.5/5.5	M6	5.5/6
	M8	5.5/8
	M5	8/5
8	M6	8/6
	M8	8/8
1.4	M6	14/6
14	M8	14/8
22	M6	22/6
22	M8	22/8
30/38	M8	38/8
50/60	M8	60/8
50/60	M10	60/10
80	M10	80/10
100	M10	100/10
120	M12	120/12
185	M12	185/12
240	M12	240/12
300	M12	300/12
380	M12	380/12

@ Important

Voltage drop of wire should be fully considered while selecting the wire cross section.

Typically maintains voltage within 2% of rated voltage, the cross section of wire needs to be increased if voltage drop is too heavy. Formula for calculating of voltage drop is:

Line to line voltage drop (V) = $\sqrt{3}$ * Line resistance (Ω) * Current (A)

4.3.4 Detailed Wiring Description for Terminals of the Main Loop

4.3.4.1 Power Supply

The inverter must be connected to the protected ground. Considering the high leakage current (exceeding 3.5mA), protective grounding must be taken for the purpose of observing the related current regulations.

4.3.4.2 Grounding Terminal (PE)

• Grounding terminal is recommended to ground to designated grounding spot, must be

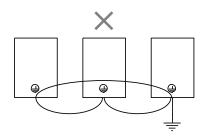
grounded reliably. The grounding resistance should be below 10Ω ;

- Don't share grounding cable with welding machine, or other power devices;
- Grounding cable should comply with the technical standard for electric equipment, and should be as short as possible. The current leakage will cause instability of voltage potential at grounding terminal if the distance between grounding cable and grounding spot is too far;
- Recommend to use specific green-yellow ground cable; see Table. 4-13.

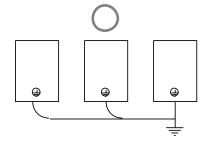
Installation: the cross section of conductor	Minimum cross section of grounding conductor		
S(mm ²)	Smin (mm ²)		
S≤16	S		
16 <s≤35< td=""><td>16</td></s≤35<>	16		

Table 4-13 The cross section of grounding conductor

When multi-inverter are grounded, try to avoid looping the connection. Methods of multi-inverter grounding connection, see Fig. 4.10.



35<S



S/2

Fig. 4.10 Methods of multi-inverter grounding connection

∧ Notice

Incorrect wiring:

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

Examine power connection before the inverter is powered on.

If it needs to replace another inverter, please confirm that all wiring to the inverter conforms to the wiring instruction in this manual.

Nonobservance of the instruction manual will lead to death or serious injury.

4.3.4.3 DC +48V Power Supply Terminal ($\oplus 2$, \ominus)

■ In case of power failure, storage battery may input +48V DC power supply to inverter via terminal $(\oplus \mathbf{2} \ominus)$. It can operate the motor at a low speed and protect the machine from shock.

4.3.4.4 Power Supply Input terminals for Main Circuit (R/L1, S/L2, T/L3)

- Three phase AC power supply cable connects the main circuit terminals R/L1, S/L2, T/L3 via the breaker. The phase sequence of input power doesn't relate to the order of terminals R/L1, S/L2, T/L3. Any terminal can be connected.
- A noise filter can be installed at the power supply side in order to reduce transmission and radiation interference created by inverter. The noise filter can reduce the electromagnetic noise intruded from the power wire. It can also reduce the electromagnetic noise sent from inverter to power cable.



Notice Please use the specialized noise filter for inverter only.

4.3.4.5 External DC Reactor Terminals ($\oplus 1$, $\oplus 2$)

- External DC reactor can be added to improve the power factor of inverter. Terminal ⊕1, ⊕
 2 is short connected by short block by the factory pre-setting. To connect DC reactor, short block needs to be removed first, then proceeds the connection.
- Do not take off the short block if no DC reactor is used, or inverter may work abnormally. Connecting short block, see Fig. 4.11.

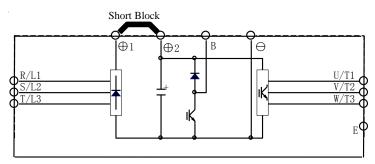


Fig. 4.11 Connection diagram for short block

Connecting external DC reactor, see Fig. 4.12.

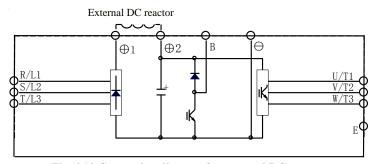


Fig. 4.12 Connection diagram for external DC reactor

4.3.4.6 External Braking Resistor Terminal (⊕2, B)

■ AS500 inverter (≤22kW) is installed a built-in braking unit. External braking resistor is necessary to absorb released energy by motor braking. Table 2-2 400V Inverter Braking

Resistor" lists the specification of braking resistor.

- Braking resistor is installed between terminal $\oplus 2$ and B.
- In order to maintain the breaking resistor working, the heat dissipation characteristic of braking resistor should be fully considered, and it should be well ventilated.
- The cable length of braking resistor connection can't be longer than 5m.

External braking resistor connection, see Fig. 4.13.

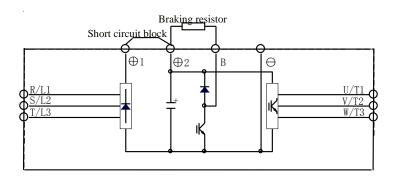


Fig. 4.13 Connection diagram for external braking resistor

4.3.4.7 Terminals of the External Braking Unit(\oplus , \ominus)

- When an outer braking unit is required, its \oplus and \oplus will be corresponding to (\oplus, \ominus) of the inverter one to one, with braking resistor being connected at its terminals BR1 and BR2.
- Length of the wire between (\oplus, \ominus) of the inverter and (\oplus, \ominus) of the braking unit shall be less than 5m, while that of the wiring for BR1 & BR2 of the braking unit and the braking resistor shall be less than 10m.

Notice Polarity of \oplus and \ominus won't be reversed, without braking resistor directly connected, otherwise it may cause inverter damage or fire.

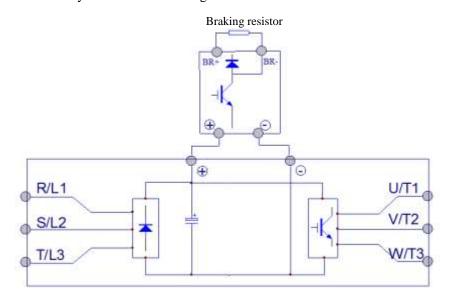


Figure 4-14 Diagram of outer braking unit

4.3.4.8 Connection of Energy Feedback Unit

Our RG series energy feedback unit is able to feedback the electric power generated by the generator under regenerative braking to the grid. RG series energy feedback adopts IGBT as rectified feedback, comparing to the traditional 3-phase antiparallel bridge rectifier unit, its harmonic distortional component is less than 5% fundamental wave, with small pollution to the grid.

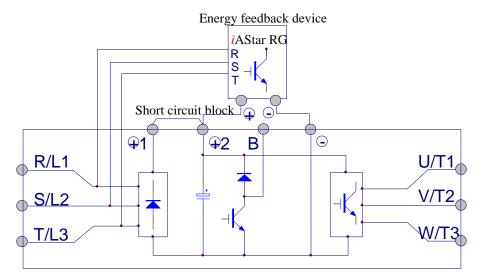


Figure 4-15 Diagram of outer energy feedback device

4.3.4.9 Inverter Output Terminal (U/T1, V/T2, W/T3)

- Inverter output terminal U/T1, V/T2, W/T3 connects motor terminal U, V, W. If motor runs in wrong direction, please switch any two wires at inverter output or motor terminals.
- Never connect power supply input to inverter output U/T1, V/T2, W/T3 directly.
- Never ground, short the output terminals;
- Never install capacitors/surge filter at inverter output side, or it may cause the inverter overheat, or damage due to the output of higher harmonics.
- Never connect capacitor at inverter output side, see Fig. 4.16.

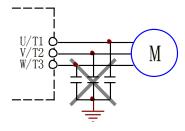


Fig. 4.16 Never connect capacitor at inverter output side

4.4 Anti-interference Measures

4.4.1 Connect Specific Noise Filter at Output

In order to restrain noise at inverter output side, a specific noise filter can be installed. To install a

filter at output side, see Fig. 4.17.

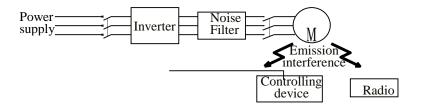


Fig. 4.17 Connection diagram for noise filter at output side

4.4.2 Surge Suppressor at Output Side

When the inverter connects to an inductive load equipment (electromagnetic contactor, relay and solenoid valve etc), please be sure to apply a surge suppressor on its coil, shown as Figure 4-18.

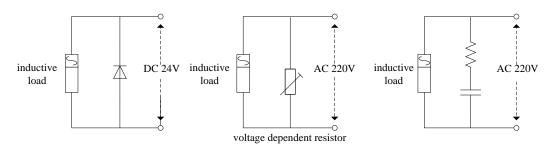


Figure 4-18 Application of surge suppressor in the inductive load

4.4.3 Wiring Arrangement of the Main Loop

In order to control the radiated interference from output side of the inverter and enhance the anti-interference performance, enough distance shall be guaranteed between them and as far as possible, especially when the cable is laid in parallel or extended for a long distance. When the signal cable must pass through the power cable, then it will vertically pass through it. Wiring arrangement schematic of the main loop is shown as Figures 4-19 and 4-20.

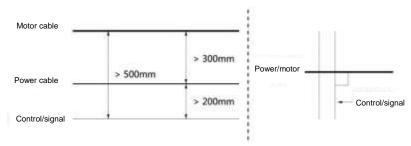


Figure 4-19 Wiring arrangement 1 of the main loop

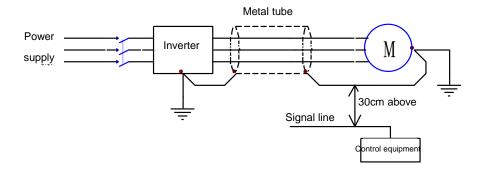


Figure 4-20 Wiring arrangement 2 of the main loop

Generally, control cable must be shielded cable, and shielding wire mesh must be connected to the metal case of inverter through the cable clamps on both sides, shown as Figure 4-21.

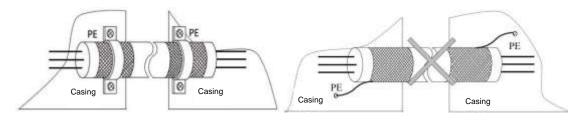


Figure 4-21 Contrast of grounding mode

4.4.4 Proper Method against Interference

To have better anti-interference method, both inverter input and output sides are installed noise filter, and inverter is shielded in enclosed steel cabinet. See Fig. 4-22.

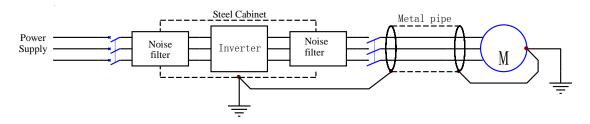


Fig. 4-22 Better anti-interference method

4.4.5 Relationship between Length of Wire and Carrier Frequency

The distributed capacitance on long cable between inverter and motor will increase higher harmonic current leakage. It may trigger output over-current protection, and causes negative impact on peripheral equipment and motor. The length of cable between inverter and motor shall not be longer than 100m. Otherwise output side filter and reactor is needed, and carrier frequency needs to be tuned to P02.14 by referring to following table.

Table 4.14 The cable length between inverter and motor

Wire Distance between inverter and motor	Less than 100m	Over 100m
Carrier frequency	Below 8kHz	Below 5kHz

4.5 Control Circuit Terminal Wiring

4.5.1 Line-up of Control Circuit Terminals

Layout of control circuit terminals, see Fig. 4.23.

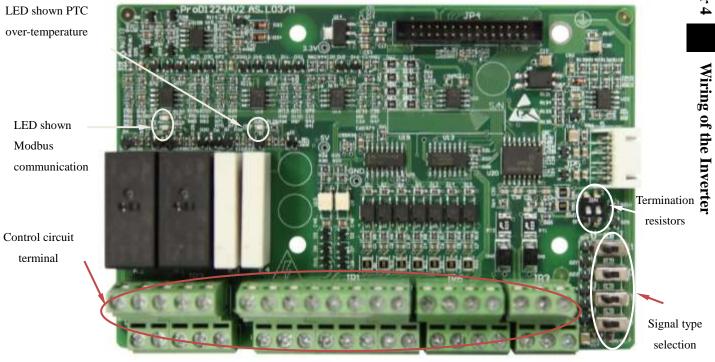


Fig. 4.23 Picture of control circuit terminals

A0/A1 is able to input analog voltage signal ($-10V \sim +10V$) or analog current signal ($0\sim 20$ mA), with its input mode to be determined by the toggle switch of each port.

M0/M1 is able to output analog voltage signal $(-10V\sim+10V)$ or analog current signal $(0\sim20\text{mA})$, with its output mode to be determined by the toggle switch of each port.

When the switch is toggled to U, its corresponding port will be at voltage working mode; while it is toggled to I, its corresponding port will be at current working mode. Toggle switch of I/O voltage/current is arranged as Figure 4-24:



Figure 4-24 Selection detail of signal type

4.5.2 Control Circuit Terminal Label

Labels of control circuit terminal, see Fig. 4.25.

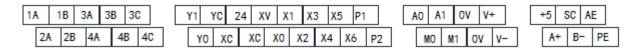


Fig. 4.25 Control circuit terminal label

4.5.3 Functional Description for Terminals of the Control Circuit

Functional description for terminals of the control loop refers to Table 4-15.

Table 4-15 Functional description for terminals of the control circuit

Name	Terminal	Signal		Remarks	1			
	X0	Multi-function input 0(Function code: P30.00)						
	X1	Multi-function input 1(Function code: P30.01)						
	X2	Multi-function input 2(Function code: P30.02)		Input signal valid when connect closed. Function is select by function code P30 group.				
Digital	Х3	Multi-function input 3(Function code: P30.03)	Specification for digital input circuit:			:		
input terminal	X4	Multi-function input 4(Function code: P30.04)		Internal power Max. load current	+24VDC 100mA			
	X5	Multi-function input 5(Function code: P30.05)	·					
	X6	Multi-function input 6(Function code: P30.06)						
	24	Internal +24VDC power output						
	XV	Input common terminal 24V						

	W.C.	T			
	XC	Input common terminal 0V			
	A0	Multi-function analog input 0	External analog voltage/	current input,	
		(Function code: P32.01)	Analog voltage level range: -10+10V or 0~10V		
			Rin=34Ω,		
		Multi-function analog input 1	Analog current level	range: 0~20mA or 4~20mA,	
	A1	(Function code: P32.07)	Rin=120Ω		
Analog input			can be used as input sign	nal for given analog speed	
terminal			Analog input +10VD0	C at power output side, max	
	V+	+10V Power output	allowed current: 20mA		
			Analog input -10VDC	at power output side, max	
	v-	-10V Power input	allowed current: 20mA	1 ,	
	0V	Reference ground for analog input		alog input	
	0 V	Reference ground for analog input	-		
		Programmable relay output	_	lay output function can be	
	1A		selected from function code P31 group		
	1B	(Function code: P31.00)	The contact specification for a pair of switching		
		NO (Normally Open contact)	contacts is as follows:		
			Item	Specification	
		Programmable relay output	Rate capacity	Inductance:1.5A/250VAC	
	2A	(Function code: P31.01)	Switch frequency	Failure rate "P" 10mA/5V	
	2B	NO (Normally Open	120/min	Tandic fate 1 Toma/5 v	
			Response time	Less than 10ms	
		Programmable relay output	Programmable relay or	utput function can be selected	
Relay output		(Function code: P31.02)	from function code P31	group	
terminal	3A	3A-3B: NO (Normally Open	The contact specification	n for a pair of switching contacts	
	3B	contact)	is as follows:		
	3C	3B-3C: NC (Normally Closed	Item	Specification	
		contact)	Tem	Resistive:	
				4.5A 250VAC/30VAC	
		Programmable relay output	Rate capacity	Inductance:	
		(Function code: P31.03)		0.4A 250VAC/30VDC	
	4A	4A-4B: NO (Normally Open	Switch frequency	Failure rate "P" 10mA/5V	
	4B	contact)	120/min Response time	Less than 10ms	
	4C	4B-4C: NC (Normally Closed	Acsponse time	Less than Tollis	
		contact)			

Y0		Programmable open collector				
Transistor		output 1 (Function Code: P31.04)				
open	Y1	Programmable open collector	Programmable open collector output function car			
collector	11	output 2 (Function Code: P31.05)	select by function code P31 .			
terminals	YC	Programmable open collector	Capable drive: less than DC30V, 50mA			80V, 50mA
	10	output common terminal				
	M 0	Programmable analog output 1	Analog voltage	/current	t outpu	ıt:
	IVIO	(Function code: P33.00)	Analog voltage	output	: -10+	10V or 0~10V, RL≥1kΩ,
Analog	M1	Programmable analog output 2	Analog current	output:	0~201	mA or 4~20mA, RL≤500Ω
output I	IVI I	(Function code: P33.03)	It can output to	monito	or or ot	her device input.
	0V	Reference ground of analog	Analog output s	ai amal m	a faman	aa amaaand
	υv	output signal	Analog output s	signai re	ereren	ce ground
High			Model of the m	atched	tempe	rature sensor: PT1000
temperature		PTC functional connection port	High temperatu	re prote	ection	point: 120℃
protection	P1, P2	(Function code P30.07)	Status indicator (green) D35		ON: normal temperature	
terminal					OFF: 1	high temperature protection
		Modbus communication signal +	Signal terminal of Modbus communication			
	A +		Communica	Yellow (TX) D36		ON: IO board is sending
	A+					data to the bus
Modbus						OFF: IO board isn't in sending status
communicati			tion status indicator	Gree	en	ON: IO board is receiving
on terminal	B-	Modbus communication signal-	mulcator	(TX	-	data from the bus
		Woods communication signal		D37	7	OFF: IO board isn't in receiving status
			<u> </u>			-
-	+5	Signal power +5V	Communication	n signal	isolat	ing power 5V, 100mA
5	SC	Signal ground	Modbus commu	unicatio	on sign	al ground
			Shielding layer will be grounded via RC loop in the			
	AE	RC grounding terminal	places with long communication line and serious			
Grounding			interference			
terminal			Direct groundi	ng, sui	itable	for the places with good
I	PE	Direct grounding terminal	grounding condition. Analog and shielding layer of the			
		1	1			

4.5.4 Control Circuit Wire Specification

600V plastic insulated copper conductor cable is used for control circuit. Specification of wire

and tightening torque, see Table 4.15.

Table 4.15 Wire Specification and Tightening Torque

Model	Allowable wire (mm²)	Recommended wire (mm²)	Tightening Torque (N.m)
Whole AS320 series	0.75~1	0.75	1.5

The wire sizes are determined under the ambient temperature of 50° C, wire temperature of 75° C.

Control circuit connection is recommended to use bar shaped terminal. Specification of bar shaped terminal, see Table 4.17.

Table 4.17 Specification – Bar shaped terminal

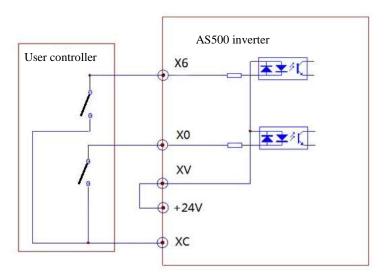
Cross Section area mm ² (AWG)	d1 (mm)	d2 (mm)	L(mm)	Illustration
0.25 (24)	0.8	2	12.5	Ød1
0.5 (20)	1.1	2.5	14	A A
0.75 (18)	1.3	2.8	14	
1.5 (16)	1.8	3.4	14	
2 (14)	2.3	4.2	14	→ 062

4.5.5 Detailed Wiring Description for Terminals of the Control Loop

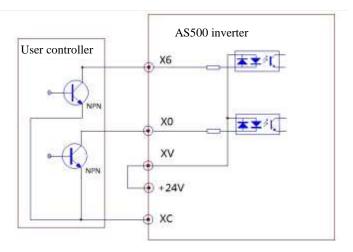
4.5.5.1 Digital Input Terminal

The specific connection mode:

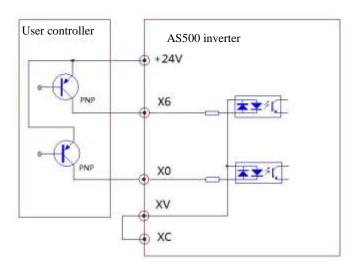
■ Use the internal +24V power supply of the inverter, the outer controller is passive contact connection mode



■ Use the internal +24V power supply of the inverter, the outer controller is NPN sink current connection mode

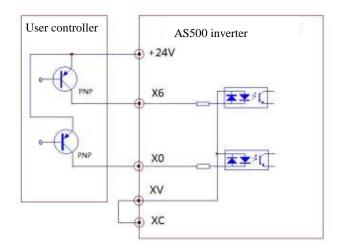


■ Use the internal +24V power supply of the inverter, the outer controller is PNP source current connection mode.



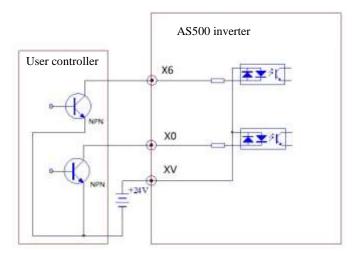
Note: be sure to remove the short circuit lug between terminals +24V and XV, and short connect XC and XV.

■ Use the external power supply connection mode, the outer controller is NPN sink current connection mode.



Note: be sure to remove the short circuit lug between terminals +24V and XV.

Use the external power supply, outer controller is PNP source current connection mode.



Note: Be sure to remove the short circuit lug between terminals +24V and XV.

4.5.5.2 Analog Input Terminal

There are two input ports A0 and A1 for analog signal in this inverter, with signal type of optional voltage/current; voltage signal range $-10V \sim +10V$ and current signal range $0\sim 20$ mA.

When using analog input signals, parameters from P32.00 to P32.11 can be set to select parameters, such as gain, offset, and signal filtering time of each corresponding signal input port, so that analog input port can be use better. Refer to chapter "7.6.3" in detail.

The cable connecting analog signal and inverter should be as short as possible (no longer than 30m) while connecting analog signal, and should use shielded cable. Shielded cable should be grounded and connected to 0V terminal on inverter analog output.

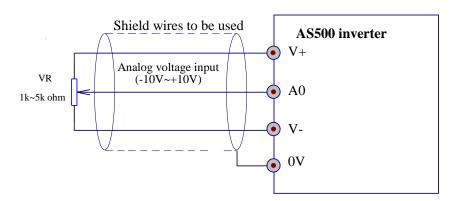


Fig. 4.26 Diagram for analog signal shielded cable connection

In Fig. 4.26, analog voltage signal is supplied by inverter, and its voltage range is $-10V \sim +10V$. In reality, most analog voltage signal is supplied by controller who sends out analog signal. If it is voltage signal, $0\sim10V$ is taken in most cases, the connection diagram, see Fig. 4.27. If it is current signal, $0\sim40V$ is taken in most cases, the connection diagram, see Fig. 4.28.

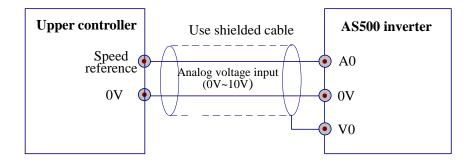


Fig. 4.27 Diagram for AIO cable connection with voltage signal

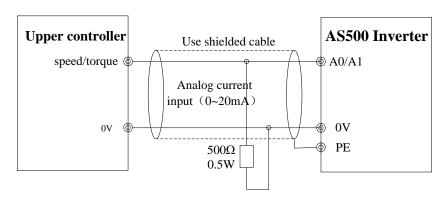


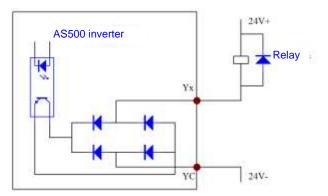
Fig. 4.28 Diagram for AIO cable connection with current signal

4.5.5.3 Digital Output Terminal

Digital output terminal has two parts, relay contact output terminal and open collector output terminal. Each digital output terminal can define input function by setting parameter based on function code P31. The value of code P31 ranges from 0 to 63. Each number refers to Parameter group P31.

Notice: Open collector output USES the external power supply, note the polarity of the power supply for connection to the external power supply. The output of the specifications of the power supply for the maximum voltage + 30 VDC, maximum load current 50 mA, beyond which specification is in danger of damage output circuit.

■ Use the external +24V power supply of the inverter, multifunctional collector open output terminal connection mode



Note: if terminal Y0 or Y1 is damaged when this wiring mode is adopted, be sure to confirm

whether polarity of the outer diode is correct.

4.5.5.4 Multi-function Analog Output Terminal

Multi-function analog output can define input function by setting parameter based on function code P33.00 and P33.03. The value of code ranges from 0 to 16. Each number refers to the following function and the corresponding output (P33.00 refers to M0, P33.03 refers to M1):

- > no definition;
- ➤ 1: output current;
- ➤ 2: output voltage;
- > 3: torque given;
- 4: busbar voltage;
- > 5: output total power;
- ► 6. output active power;
- > 7: speed(unsigned);
- ➤ 8: given speed (signed);
- > 9: feedback of speed regulator(signed);
- ➤ 10: heating rate
- > 11: radiator temperature
- ➤ 12: Analog A0
- ➤ 13: Analog A1
- ➤ 14: Analog A2

See chapter 7, "7.6.4 Analog output function Parameter I" for more information.

4.5.6 Other Remarks for Wiring

Control terminal wiring must keep far away from power cable in main circuit, or wrong action may be triggered due to the electromagnetic interference.

4.6 The Wiring of PG Card Terminals

To adopt different kind encoder, 3 types of PG cards are available. See table 4.18:

Table 4.18 The types of PG card

PG Card Type	ype Motor Type Model Input signal		Remarks	
:	A	AS.T025	Onen cellesten med mell	AS.T024: 12V
incremental ABZ	Async	AS.T041	Open collector, push-pull	AS.T041: 5V
SIN/COS	Sync	AS.T024	SIN/COS differential	
RESOLVER	Sync	AS.L06/E	RESOLVER differential	

4.6.1 PG Card Incremental ABZ

Incremental ABZ 12V PG card (AS.T025) can receive two kinds encoder signal. It can talk to the encoder with open collector signal and push-pull signal.

4.6.1.1 Line-up Terminal for Incremental ABZ PG Card

Terminal line up for incremental ABZ 12V PG card (AT.T025), see Fig. 4.29.



Fig. 4.29 Terminal line up for incremental ABZ PG card

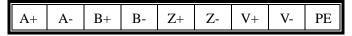
4.6.1.2 Incremental ABZ 12V PG Card Terminal Label

Terminal label for incremental ABZ 12V PG card is as follows:

JP3 divided frequency output terminal:



JP2 input terminal:



4.6.1.3 Incremental ABZ PG Card Terminal Function Specification

Incremental ABZ PG card terminal function specification, see Table 4.19.

Table 4.19 Incremental ABZ PG card terminal function specification

Name	Pin No	Label	Function	Specification		
Divided	JP3.1	FA	Divided frequency output, phase A			
	JP3.2	0V	24V GND	Trieds ones collector (may extruit frequency 100kHz)		
frequency	JP3.3	FB	Divided frequency output, phase B	Triode open collector (max. output frequency 100kHz)		
output	JP3.4	0V	24V GND			
Encoder	JP2.1	A+	Phase A signal +	Open collector/push-puff, max input frequency 100kHz		
input	JP2.2	A-	Phase A signal -	Open conector/push-pun, max input frequency 100kriz		

JP2.3	B+	Phase B signal +	
JP2.4	B-	Phase B signal -	
JP2.5	Z+	Phase Z signal +	
JP2.6	Z-	Phase Z signal -	
JP2.7	v+	Anode of encoder power	Voltage: 12VDC May output gurrent: 500m A
JP2.8	V-	Cathode of encoder power	Voltage: 12VDC, Max output current: 500mA
JP2.9	PE	Shielded ground	Grounding terminal for shielded cable

4.6.1.4 Wire Requirement for Incremental ABZ PG Card input Terminal and Encoder Output

Incremental ABZ PG card can receive two kinds encoder signals: open collector signal and push-pull signal. Encoder wiring by open collector signal, see Fig. 4.30.

Note: PE is the grounding terminal of inverter closer.

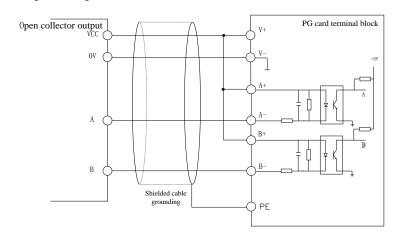


Fig. 4.30 Wiring with encoder open collector signal

Encoder wiring by push-pull signal, see Fig. 4.31.

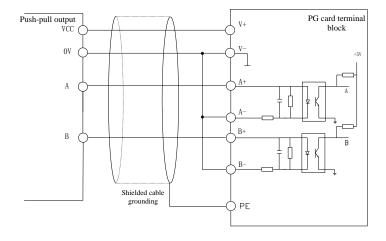


Fig. 4.31 Wiring with encoder push-pull signal

4.6.2 PG card - SIN/COS

SIN/COS PG card (AS.T024) can receive SIN/COS differential signal from encoder. It adopts encoders with SIN/COS differential output signal.

4.6.2.1 Line-up SIN/COS PG Card Terminal

Line-up SIN/COS PG card terminal, see Fig. 4.32.



Fig. 4.32 SIN/COS PG card (AS.T024) terminal line up

4.6.2.2 SIN/COS PG Card Terminal Label

Terminal label for SIN/COS PG card (AS.T024) is as follows:

JP3 terminal label:



JP2 terminal label: (14 pin socket):

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

4.6.2.3 SIN/COS PG Card Terminal Function Specification

SIN/COS PG card (AS.T024) terminal function specification, see Table 4.20.

Table 4.20 SIN/COS PG card terminal function specification

Name	Label	Function	Specification			
0	FA	Divided frequency output, phase A				
Open	0V	24V GND	Triada array allastas (mar for marca 100kHz)			
collector	FB	Divided frequency output, phase B	Triode open collector (max. frequency 100kHz)			
output	0V	24V GND				
Encoder	A+,A-	Phase A signal	Differential sisual may input for guarayy 100kHz			
input	input B+,B- Phase B signa		Differential signal, max input frequency: 100kHz;			

Name	Label	Function	Specification
	R+,R-	Phase Z signal	
	V+	+5V	Maximum of output current is 300mA.
	0V	+5V GND	

4.6.2.4 The Wiring between SIN/COS PG Card and Encoder

SIN/COS PG can receive SIN/COS differential signal from encoder.

Wiring diagram for encoder, see Fig. 4.33.

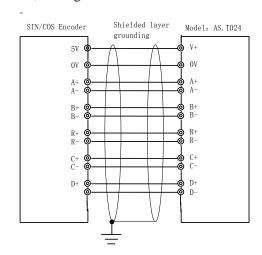
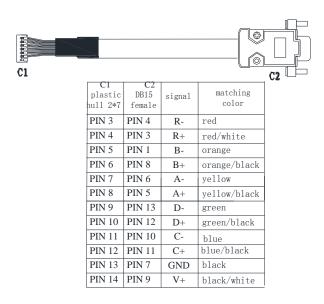


Fig. 4.33 Wiring diagram for encoder with SIN/COS differential signal output

4.6.2.5 SIN/COS PG Card and Encoder Wiring

In order to simplified on-site connection, SIN/COS PG card equips an encoder signal cable with them from factory. It transfers encoder signal to a type D plug with 15 pins. Detail specifications shows as follows.



4.6.3 RESOLVER PG Card

Resolver card (AS.L06/E) can receive differential signals from resolver encoder.

4.6.3.1 Line-up Terminal for Resolver PG Card

Terminal line up for RESOLVER PG card, see Fig. 4.34.



Fig. 4.34 Terminal line up for Resolver PG card

4.6.3.2 Resolver PG Card Terminal Label

Terminal label for Resolver PG card(AS.L06/E) is as follows:

JP3 terminal:

FA	G24	FB	G24	+12
----	-----	----	-----	-----

JP2 terminal (6 pin socket):

1	2	3	4	5	6
OUT+	OUT-	SIN+	SIN-	COS+	COS-

4.6.3.3 Resolver PG Card Terminal Function Specification

Resolver PG card terminal function specification, see Table 4.21.

Table 4.21 Resolver PG card terminal function specification

Name	Label	Function	Specification			
0	FA	Pulse output, phase A	Triode open collector output, pulse volume is			
Open	G24 12V GND					
collector	FB	Pulse output, phase B	proportional to the motor rotation speed, coefficie			
output	G24	12V GND	of 1024 p/r, max output. current 20mA			

	+12V	+12V power output			
	OUT+, OUT-	Drive signal of encoder	The highest support of 20000 mass (2D sain verichle		
Encoder	SIN+,SIN- SIN signal of encoder		The highest support of 20000 rpm (2P spin variable conditions)		
input	COS+,COS-	COS signal of encoder	Conditions)		

Need to configure spin variable connect wire (3m or 5m):

Spin variable connect wire (3m) type: AS.L06/E.42-002 Material No.: H61002079

Spin variable connect wire (5m) type: AS.L06/E.42-003 Material No.: H6100208

The definition of spin variable connect wire is as follows:

Line label	OUT+	OUT-	SIN+	SIN-	COS+	COS-
Color	Red	White	Yellow	Black	Orange	Brown

4.6.4 Precaution for PG Card Terminal Wiring

Important

Encoder signal cable must be separated from main circuit and other power lines. Never running those two cables in parallel in short distance. Shielded cable should be used for encoder, and shielded layer needs to be grounded to the grounding PE of the outer case.

Chapter 5 Commissioning and Test Run

In the following chapters, noun description relating to control, running and status of the inverter will be mentioned many times. Please carefully read the contents in this chapter prior to use of the product, to correctly understand and properly use the functions mentioned in later chapters.

Danger

Close input power only after the inverter casing has been installed. After electrification, don't remove the inverter casing, otherwise it may cause electric shock.

If restart for outage function is set for the inverter, don't close to the rotating mechanical equipment, to avoid personal injury caused by starting the mechanical equipment when the inverter is powered on.

Don't touch the braking resistor when dynamic braking resistor is provided, otherwise it may cause electric shock or burn.

Please be sure to confirm the permissible application scope of the motor and mechanical equipment before the inverter starts the motor and mechanical equipment, otherwise it may cause personal injury.

Notice

Don't examine the measurement signal when the inverter is running, otherwise it may cause equipment damage.

Be sure not to change the parameter setting of the inverter at will, otherwise the proper operation effect can't be met, with damage to the transmission equipment.

Be sure to have switching commissioning firstly before run command channel of the inverter is switched, otherwise it may cause equipment damage and personal injury.

5.1 Run Command Given

As a basic tool for the inverter operation, Operator is used to observe different status and fault code of the inverter, as well as set and view its various parameters. In this chapter, basic operation method of the Operator is described in details.

5.1.1 Run Command Channel of the Inverter

It assigns the inverter to receive run command: physical channel for start, stop and so on. The run command channels are divided into:

Operation panel: control by use of RUN, STOP and LOC/REM keys on it

Control terminal: control by use of control terminals X0~X6 (digital) and A0~A1 (analog)

Communication port: start and stop the control by use of control terminals A+ and B- (Modbus) with upper computer.

Selection of command channel can be set through function code P10.02.

Note: before the command channel is switched, be sure to have switching commissioning firstly, otherwise it may cause equipment damage and personal injury.

5.1.2 Frequency Given Channel of the Inverter

There are 4 frequency given physical channels when AS500 is in normal operation mode:

Operation panel **▲** and **▼** keys given,

Terminal given,

Communication given,

Analog voltage or current given.

5.1.3 Working Status of the Inverter

Working status of AS500 includes stop status and running status.

Stop status: after the inverter is powered on and initialized, if no any run command is input or stop command is executed during running, then it will enter stop status immediately.

Running status: the inverter will enter running status after it receives run command.

5.1.4 Run Mode of the Inverter

Inching run shares the highest priority.

Closed loop run: selection function of the closed loop is effective (P51.00=1). The inverter will choose closed loop run mode, to have PID regulation based on given and feedback quantity (refer to function code in P51 group).

Multi-speed run: select multi-frequency $0 \sim 7$ (P41.00 \sim P41.07) by use of combined open/close the multifunctional terminals (functions 3, 4 and 5) to realize multi-speed run.

Normal run: the simple open loop run mode.

5.2 Operation Guide

As a basic tool for the inverter operation, Operator is used to observe different status and fault code of the inverter, as well as set and view its various parameters. In this chapter, basic operation method of the Operator is described in details.

The user can execute the following through the operation panel:

- Motor status monitoring
- Motor self-tuning
- Motor run control (start/stop, speed, forward/reverse)

- View and answer the fault or alarm
- Set and modify the parameters
- Switching between local mode and remote mode

5.2.1 Function for Individual Parts of the Operator

Refer to the Fig. 5-1 for each parts of operator and its function.

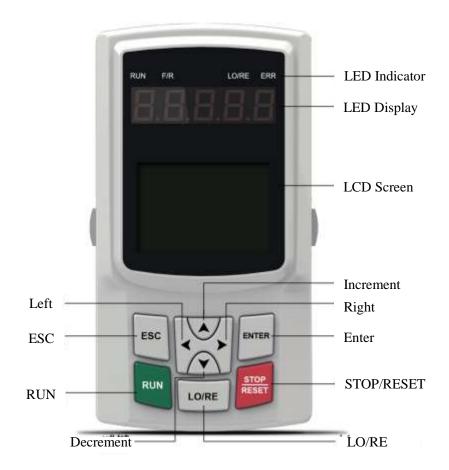


Figure 5-1 Names and functions of each parts of the operator

5.2.2 LED Indicator

The operator have 4 LED indicators, D1 (RUN), D2 (F/R), D3 (LO/RE) and D4 (ERR). These indicators show the motor status. Refer to Table 5.1 for the relationships between indicators and motor status.

Table 5.1 Motor status indication

Status	D1 (RUN)	D2 (F/R)	D3 (LO/RE)	D4 (ERR)
Forward	On	On	Off	Off
Reverse	On	Off	Off	Off
Fault/Warning	Off			Flashing
Panel operation	On	On/off	On	Off

5.2.3 LED Digital Tube

There are 4 LED digital tubes below the indicators and displaying real time motor speed at the default interface. The content of display can be changed by selecting different parameters.

5.2.4 LCD Display

In middle of operator you can find a LCD screen. This is the main screen to display and set the parameter of the inverter, and to view the fault code of the inverter.

5.2.4 Keyboard

There are 9 keys at lower part of the operator. Function of those keys, see Table 5.2

Table 5.2 Key function

Key	Name	Function
>	Right	In [Function Select] mode: To select the next function group;
<u> </u>	Left	In 【Parameter setting】 mode: To move the cursor to the right; In 【Function Select】 mode: To select the previous function group;
	Increment	In 【Parameter setting】 mode: To move the cursor to the left; In 【Function Select】 mode: To select the previous function code; In 【Parameter setting】 mode: To increase the value;
~	Decrement	In 【Function Select】 mode: To select the next function code; In 【Parameter setting】 mode: To decrease the value;
ENTER	Enter	In 【Monitoring】 mode: To enter the function selecting interface; In 【Function Select】 mode: To enter the selected function interface;
ESC	ESC	In 【Function Select】 mode: back to 【Monitoring】 mode; In all operational sites: beck to 【Function Select】 mode.
RUN	RUN	In LOCAL control mode: "RUN" function;
STOP RESET	STOP/RESET	In LOCAL control mode: "STOP" function; In Fault stop status: "RESET" function
LO/RE	LO/RE	Operation mode switch between operator (LOCAL) and control circuit terminal (REMOTE).

5.3 Operation

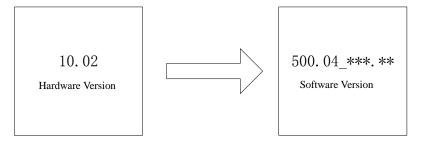
Monitoring status, function selection and parameter setting are provided on the operator. Menu of the operator is displayed in Chinese and English, which is set as Chinese at factory, but it may be switched to English by setting the parameter value in "language selection" of the advanced menu.

5.3.1 Power On and Initialization

When the operator is powered on for the first time, it needs to adjust brightness of the operator LCD via left shift key and right shift key, with the former to reduce brightness, while the latter to increase brightness.

After the operator is powered on, there is several seconds for its initialization. During this process, operator LCD will display [startup picture].

Startup picture is as the following:



Note: the screen enters monitoring status after the software version number is displayed.

Table 5.3 Comparison table of default run status data

5.3.2 Display After Power On

Screen shows "Monitoring" state 5 seconds after power on. The screen default displays the current reference speed (Vref), feedback speed (Vfbk) and current states (Irms).

5.3.3 [Monitor State] In Detail

Monitoring interface can be switched by pressing , or in Monitor State 1. 14 real time data of motor status are displayed in screen by default. These data is for display only but can't be modified.

Table 5.3 Comparison table for default operation data

Display	Name	Explanation	Range	Unit	Factory Default	Remarks
Vobj	Target speed	Display the target speed of the motor	×	rpm	×	
Vref	Given speed	Display the given speed				
Vfbk	Feedback speed	Display feedback speed of the motor	×	rpm	×	
Irms	Output current	Display output current	×	A	×	
Torq	Output torque	Display output torque	×	%	×	
Tzero	Zero servo torque	Display zero servo torque at starting	×	%	×	
Udc	DC Bus voltage	Display DC voltage of inverter main circuit	×	V	×	
Uout	Output voltage	Display inverter output voltage	×	V	×	

A0	A0 input voltage	Display input voltage of inverter analog input 0 (A0)	×	V	×	
AI1	A1 input voltage	Display input voltage of inverter analog input 1 (A1)	×	V	×	
PIDRef	Process closed loop PID given	Display the current PID given value	×	V (def ault)	×	
PIDFbk	Process closed loop PID feedback	Display the current PID feedback value	×	V (def ault)	×	
DI	Input X0-X7 status	Display the input status of terminals X0-X6, as "XXXXXXXX", where "X" = 0, indicating no input, "X" = 1, indicating input	×	×	×	
DO	Output K1-K4 and Y0、Y1 status	Display the output status of terminals K1-K4, Y0, Y1, as "XXXXXX", where "X" = 0, indicating no output, "X" = 1, indicating output	×	×	×	

5.3.4 [Control Panel] In Detail

Press in "Monitoring" interface can switch operation mode between "Monitoring" and "Control Panel". In "Control Panel" mode LED indicator D3 will be on. Press at that time may control inverter into operation state, LED indicator D1 in operator will be on. Inverter enters in stop state by pressing [STOP], LED indicator D1 will be off. Press and in "Control Panel" interface can switch the monitored contents. In this interface there are 2 panel adjustable parameters and 4 real time operation data. Panel adjustable speed (Vref) and motor moving direction (Vdir) can be modified, other 4 data are displayed only but can't be modified.

Table 5.4 Comparison table for control panel data

Display	Name	Explanation	Range	Unit	Factory Default	Remarks
Vref	Panel controlled speed	Set speed reference in panel operation	0.00~50.00	Hz	5.00	
Vfbk	Feedback speed	Display motor feedback speed ×		Hz	×	
Irms	Output current	Display output current ×		A	×	
Vdir	Motor moving direction	Set motor rotating to forward or reverse direction	0~1	×	1	
Udc	DC Bus voltage	Display DC voltage of inverter main circuit	×	V	×	

Uout	Output voltage	Display inverter output voltage	×	V	×	

5.3.5 Operation Mode

Operator has 5 operating modes. They are 【Parameter Setting】, 【Motor Tuning】, 【Fault Check】, 【Parameter Processing】 and 【Modified Parameters】. In any monitoring interface, press

can enter into following "Function Select" interface:

- * 1: Parameter Setting
- 2: Motor Tuning
- 3: Fault Check
- 4: Parameter Processing
- 5: Modified Parameters

5.3.5.1 **[**Parameter Setting]

Parameters are modified in **[** Parameter Setting **]** mode. The setting range of parameter refers to chapter 6.

In 【Parameter Setting】 mode, to select parameter group by pressing or , select parameter code by pressing or . Press to confirm the parameter to be modified. A cursor that indicats the position to be modified is displayed on selected parameter. Press or to move the cursor and change the modified position, press or to increase/decrease the modified value. Then press to confirm the modification, modification is invalid if INTER is not pressed. Press and return to previous menu.

- 1: Parameter Setting
- * 2: Motor Tuning
- 3: Fault Check
- 4: Parameter Processing
- 5: Modified Parameters

In [Motor Tuning] mode, the parameters for motor (asynchronous) and encoder phase angle (sync. Motor) can be retrieved manually by self-learning. Self-learning mode can be selected by

modifying X value in ATun = X. Press enter, a cursor is displayed on the parameter to be modified.

Press or to select self-learning mode. Then press to confirm. There are 7

self-learning modes. They are:

- 0: normal operation
- 1: static encoder self-learning
- 2: encoder modification
- 3: end of encoder self-learning
- 4: static motor self-learning
- 5: inverter optimised self-learning
- 6: static motor advanced learning
- 7: dynamic encoder self-learning

Press and return to previous menu.

5.3.5.3 **【** Fault Check **】**

- 1: Parameter Setting
- 2: Motor Tuning
- * 3: Fault Check
- 4: Parameter Processing
- 5: Modified Parameters
- In 【Fault Check】 mode, records of voltage, current, speed reference, feedback speed and

content for latest 8 faults are displayed. In main interface, press

to display ER0=X, then press

or and display changes from ER0 to ER7. ER0 is the latest fault, ER7 is the earliest one. X stands for the fault code in current fault index. The explanation of this fault is displayed

underneath at the same time. Press on more time in fault code display screen, current DC Bus voltage (Ude), output current (Irms), speed reference (Vref) and feedback speed (Vfbk) are displayed.

Press again and return to fault code display screen. Press and return to previous menu.

5.3.5.4 **[**Parameter Processing]

- 1: Parameter Setting
- 2: Motor Tuning
- 3: Fault Check
- * 4: Parameter Processing
- 5: Modified Parameters
- In [Parameter Processing] mode, parameter can be uploaded, downloaded, initialized, cleared.

To select proper operation mode by modifying X value in Init = X.

Press, a cursor is displayed on the parameter to be modified in position X. press

or to select proper operation mode. Then press to confirm. There are 4 parameter processing modes. They are:

- 1: upload parameter to operator
- 2: download parameter to inverter
- 7: parameter reset
- 8: fault reset

Press and return to previous menu.

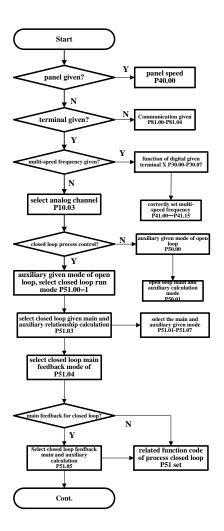
5.3.5.5 [Modified Parameters]

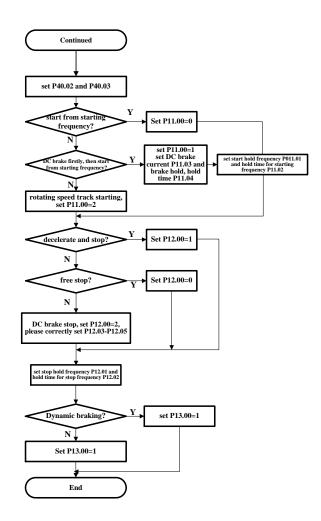
- 1: Parameter Setting
- 2: Motor Tuning
- 3: Fault Check
- 4: Parameter Processing
- * 5: Modified Parameters

In [Modified Parameters] could Inquire and modify the recently modified parameters. Select the parameter code in parameter set via or , then press enter, a cursor indicating modified bit will be shown on the parameter bit to be modified. After that, change the modified bit with or , and plus or minus the value with or . Finally press enter to confirm the modification, otherwise it will be invalid.

Press to return to the previous menu.

5.4 Fast Commissioning for V/F Control

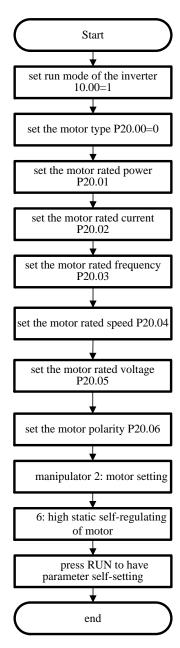




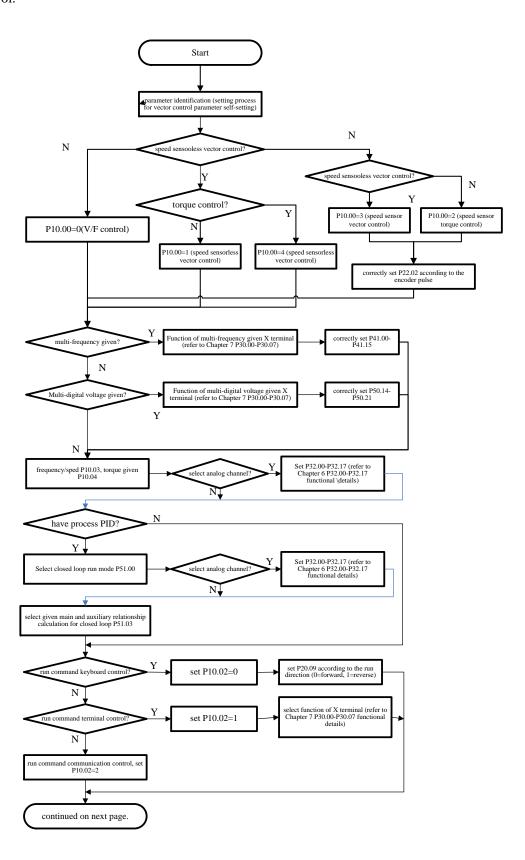
5.5 Fast Commissioning for Vector Control

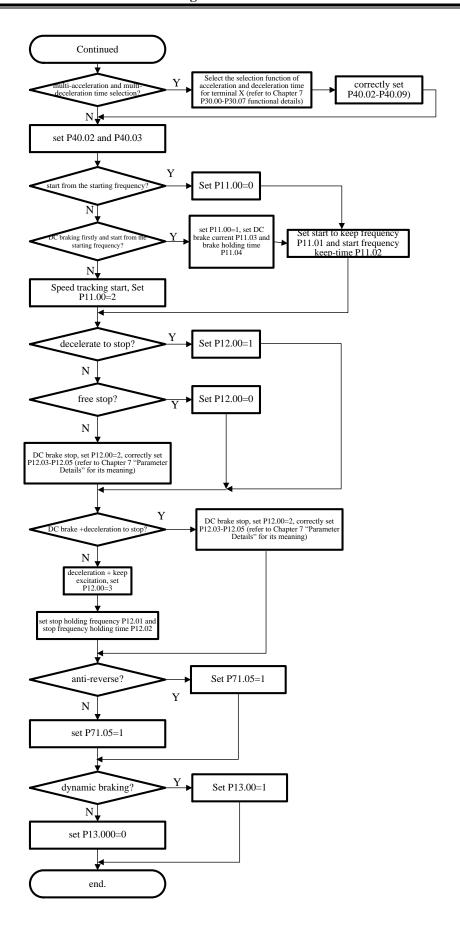
Introduce the fast commissioning method for vector control taking the vector control without PG as an example. IF "Vector Control with PG" is used, it needs to set encoder parameter according to P22 "Encoder Parameter" of this manual.

- 1. P20.10 "motor no-load current coefficient": adjust the magnetic flux intensity, making the current of the motor running at low speed (other than flux-weakening area) in vector control mode is similar to its no-load current.
- 2. Motor parameter self-tuning: static motor parameter self-tuning is required for vector control, the details are:



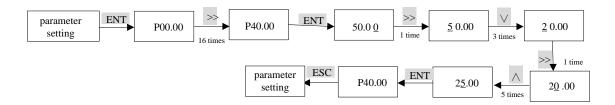
3. Control process for vector control. Please note that self-tuning must be executed during vector control.





5.6 Operation Example

In the following example, stop display parameter is the setting frequency, which is 50.00Hz at factory. Those underlined are the current editing bit. Set the setting frequency, for example, P40.00 = 25.00Hz.



5.7 Fault Display

When inverter has fault, fault indicator D4 on top of operator will blink. LED tube light will display real-time fault code. Table 5.5 lists fault codes and names.

Table 5.5 Table of fault code & name

Fault code	Fault description	Fault code	Fault description
1	Module overcurrent protection	2	ADC fault
3	Heatsink overheat	4	Brake unit fault
5	Fuse break fault	6	Output torque overload
7	Speed deviation	8	DC bus over-voltage protection
9	DC bus under-voltage	10	Output phase loss
11	Motor overcurrent at low speed	12	Encoder fault
13	Current detected while stop	14	Speed reversed direction in running
15	Speed detected while stop	16	Wrong motor phase
17	Overspeed in the same direction	18	Overspeed in the opposite direction
19	Wrong phase sequence of UVW encoder	20	Encoder communication fault
21	abc overcurrent	22	Brake detection trouble
23	Input overvoltage	24	UVW encoder disconnected
25	Spare	26	Encoder haven't self-learned
27	Output overcurrent	28	SIN/COS encoder fault
29	Input phase loss	30	Overspeed protection
31	Motor high speed overcurrent	32	Ground protection
33	Aging capacitor	34	External fault
35	Output unbalance	36	Wrong parameter setting
37	Current sensor fault	38	Braking resistor short circuit
39	Too large instant current	40	Faulty output contactor

Fault code	Fault description	Fault code	Fault description
41	Brake detection fault	42	IGBT short fault
43	Communication fault	44	Abnormal input power
47	Abnormal analog input	48	Disconnected temperature sampling
49	PT detection fault	50	Humidity fault
51	Abnormal running output current	52	PTC high temperature alarm

Chapter 6 Functional Parameter Table

6.1 Introduction to Function Code Parameters Table

Simple table field	Description
Function code symbol	Function code symbol, for example P00.00
Function code name	Name of function code, to explain its roles
Factory default	Function code set value after reset to factory default operation (see P00.01)
Setting range	The minimum and maximum value set permitted by function code
Unit	V: voltage; A: current; $^{\circ}$ C: degree; Ω : ohm,; mH: millihenry rpm: rotating speed %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc
Properties	o: modifiable during running; ×: modifiable only during stop; *: read-only parameter, unchangeable
Function code option	List of function code parameter setting
User setting	Parameter record by the user

6.2 Simple Table of Function Code Parameters

6.2.1 Group P0X User Parameters

Group P00 Password Parameter								
Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description		
P00.00	Login password	0	0~65535	/	×	0: no password; other: login password;		
P00.01	Modify password	0	0~65535	/	×	0: no password; other: password protection;		
P00.02	Spare password	0	0~65535	/	×	Spare		
Group P01 Customer parameter								
Group P02 Special functional parameter								

6.2.2 Group P1X Control Parameters

6.2.2.1 Group P10 Basic Control Parameters

Function		Factory	Setting		Prope			
Code	Function Name	Default	range	Unit	rties	Option description		
						0: voltage vector V/f control		
						1: Vector control 2 without		
						speed sensor		
	Control mode					2: Torque control with speed		
P10.00	selection	0	0~5	/	×	sensor		
						3: Vector control with speed		
						4: Spare		
						_		
						5: Vector control 1 without speed sensor		
	Operating mode					0: 2-wire 1; 1: 2-wire 2; 2:		
P10.01	selection	0	0~3	/	×	3-wire 1; 3: 3-wire 2;		
						0: panel 1: terminal		
P10.02	Run command	0	0~4	/	×	2: communication (Modbus)		
	given mode					3: CAN given		
								4: Profibus_DP given
						0: given ▲ and ▼ for panel frequency		
						1: digital multi-speed given		
						target speed		
						2: spare		
						3: analog 0 given target speed		
						4: analog 0 given current		
						speed		
						5: analog 1 given target speed		
P10.03	Frequency/speed given mode 1	0	0~16	,		6: analog 1 given current		
F10.03	given mode i	U	010	_ ′	×	speed		
						7: communication (Modbus)		
						given current speed		
						8: PID given target speed		
						9: spare		
						10: spare		
						11: spare		
						12: communication (Modbus)		
						given target speed		
						13: CAN given current speed		

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
						14: CAN given target speed
						15: Up/Down given speed
						16: Profibus_DP given speed
						0: panel given torque
						1: analog 0 given target torque
						2: analog 1 given target torque
P10.04	Torque given mode	0	0~6	/	×	3: communication given torque
						4: function given target torque
						5: ModBus given torque
						6: Profibus-DP given torque
			0~6			0: no compensating torque
						1: digital compensating torque
		0		/		2: analog 0 given
	Compensating					compensating torque
D10.05	torque given					3: analog 1 given compensating torque
P10.05	mode				×	4: communication given
						compensating torque
						5: automatic compensating
						torque
						6: Profibus-DP compensating
						torque
						0: internal parameter limit
						1: analog 0 limit
	Speed limit					2: analog 1 limit
P10.06	selection	0	0~5	/	×	3: analog 2 limit
						4: ModBus communication
						limit
						5: automatic limit
P10.07	Frequency/speed given mode 2	0	0~16	/	×	As P10.03

6.2.2.2 Group P11 Starting Parameters

Function		Factory	Setting		Prope	
Code	Function Name	Default	range	Unit	rties	Option description
						0: normal start
P11.00	Starting mode	0	0~2	/	×	1: restart after DC braking
						2: speed track start
P11.01	Start holding frequency	0.00	0.00~30.00	Hz	×	
P11.02	Holding time of starting frequency	0.0	0.0~3600.0	S	×	
P11.03	Starting DC injection current	30.0	0.0~120.0	%	×	
P11.04	Starting DC injection time	5.0	0.0~99.9	S	×	
P11.05	Excitation time	0.0	0.0~99.9	s	×	
P11.06	Zero servo time	0.0	0.0~99.9	S	×	
P11.07	Brake actuation time	0.20	0.00~99.99	S	×	
P11.08	Track delay time	1000	0~65535	ms	×	
P11.09	Track zero voltage time	100	0.0~65535	ms	×	
P11.10	Tracking voltage Kp	0.20	0.00~ 6553.50	/	×	
P11.11	Tracking voltage Ki	0.30	0.00~ 6553.50	/	×	
P11.12	Tracking voltage Kd	0.00	0.00~ 6553.50	/	×	
P11.13	Track exit delay	1000	0~65535	ms	×	
P11.14	Maximum current during track	100.0	0~200.0	%	×	
P11.15	Tracking frequency change gain	10.0	0~100.0	%	×	
P11.16	Maximum voltage during track	0	0~65535	V	×	
P11.17	Initial tracking frequency	50.00	0.00~ 100.00	Hz	×	
P11.18	Maximum current during track	0.0	0~6553.5	A	×	
P11.19	Reverse breaking current	20.0	0.0~100.0	%	×	

6.2.2.3 Group P12 Parking Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
						0: inertia parking
						1: decelerate parking
						2: deceleration + DC
P12.00	Parking mode	0	0~4	/	×	braking
						3: deceleration + holding
						excitation
						4: deceleration+ holding
						torque
P12.01	Parking holding	0.00	0.00~	Hz	×	
112.01	frequency	0.00	300.00	112	,	
P12.02	Parking frequency holding time	0.0	0.0~99.9	s	×	
P12.03	DCbraking initial frequency	2.50	0.00~10.00	Hz	×	
P12.04	Parking DC braking current	50. 0	0.0~100.0	%	×	
P12.05	Parking DC braking time	0.5	0~10.0	S	×	
P12.06	Parking excitation holding time	0	0~65535	S	×	

6.2.2.4 Group P13 Braking Function Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Proper ties	Option description
P13.00	Dynamic braking selection	1	0~1	/	×	0: turn on dynamic braking 1: not turn on dynamic braking Built-in braking unit, default 0
P13.01	Braking turning-on voltage	660	620~750	V	×	
P13.02	Braking unit service time	60.0	0.0~300.0	S	×	

6.2.2.5 Group P14 V/F Control Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P14.00	V/F curve setting	0	0~4	,		0: standard V/F straight line:
F14.00	V/F curve setting	U	0 74	,	×	1: 1.2-power curve

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
						2: 1.5-power curve
						3: second power curve
						4: user defined
P14.01	V/F voltage value V0	76	0.0~460.0	V	×	
P14.02	V/F frequency value F0	10.00	0.00~300.00	Hz	×	F0 <f1< td=""></f1<>
P14.03	V/F voltage value V1	152	0.0~460.0	V	×	
P14.04	V/F frequency value F1	20.00	0.00~300.00	Hz	×	F1 <f2< td=""></f2<>
P14.05	V/F voltage value V2	228	0.0~460.0	V	×	
P14.06	V/F frequency value F2	30.00	0.00~300.00	Hz	×	F2 <f3< td=""></f3<>
P14.07	V/F voltage value V3	304	0.0~460.0	V	×	
P14.08	V/F frequency value F3	40.00	0.00~300.00	Hz	×	F3 <f4< td=""></f4<>
P14.09	V/F voltage value V4	380	0.0~460.0	V	×	
P14.10	V/F frequency value F4	50.00	0.00~300.00	Hz	×	

6.2.3 Group P2X Motor Parameters

6.2.3.1 P20 Basic Motor Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P20.00	Type of motor 1	0	0~1	/		0: asynchronous 1: synchronous
P20.01	Rated power of motor	As per the inverter power	0~655.35	kW	×	Set as per the motor nameplate
P20.02	Rated current of motor 1	As per the inverter current	0.1~ 999.9	A	×	Set as per the motor nameplate

Function		Factory	Setting		Prope	
Code	Function Name	Default	range	Unit	rties	Option description
P20.03	Rated frequency of motor 1	50.00	0.00~ 300.00	Hz	×	Set as per the motor nameplate
P20.04	Rated speed of motor	1460	0~30000	rpm	×	Set as per the motor nameplate
P20.05	Rated voltage of motor 1	380	0~460	V	×	Set as per the motor nameplate
P20.06	Number of poles of motor 1	4	2~128	/	×	Number of pole-pair of motor=poles/2
P20.07	Rated slip frequency of motor 1	1.40	0.10~ 655.35	Hz	×	Set as per the motor nameplate
P20.08	Maximum slip frequency of motor 1	2.80	0.10~ 655.35	Hz	×	
P20.09	Phase sequence of motor 1	1	0~1	/	×	0: negative phase sequence; 1: positive phase sequence
P20.10	No-load current coefficient of motor 1	30.00	0.10~ 60.00	%	×	
P20.11	Motor rated torque	450.0	0.0~ 6553.5	Nm	×	Set as per the motor nameplate
P20.12	Maximum power factor of motor 1	250	50~400	%	×	
P20.13	Maximum power of motor 1	50.00	0.00~ 300.00	Hz	×	
P20.14	Type of motor 2	0	0~1	/		0: asynchronous 1: synchronous
P20.15	Rated power of motor	As per the inverter power	0~655.35	kW	×	Set as per the motor nameplate
P20.16	Rated current of motor 2	As per the inverter current	0.1~ 999.9	A	×	Set as per the motor nameplate
P20.17	Rated frequency of motor 2	50.00	0.00~ 300.00	Hz	×	Set as per the motor nameplate
P20.18	Rated speed of motor	1460	0~30000	rpm	×	Set as per the motor nameplate
P20.19	Rated voltage of motor 2	380	0~460	V	×	Set as per the motor nameplate

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P20.20	Number of poles of motor 2	4	2~128	/	×	Number of pole-pair of motor=poles/2
P20.21	Rated slip frequency of motor 2	1.40	0.10~ 655.35	Hz	×	Set as per the motor nameplate
P20.22	Maximum slip frequency of motor 2	2.80	0.10~ 655.35	Hz	×	
P20.23	Phase sequence of motor 2	1	0~1	/	×	0: negative phase sequence; 1: positive phase sequence
P20.24	No-load current coefficient of motor 2	30.00	0.00~ 60.00	%	×	
P20.25	Maximum power factor of motor 2	450.0	0.0~ 6553.5	%	×	
P20.26	Maximum frequency of motor 2	250	50~400	Hz	×	

Note 1: different inverter power corresponds to different default value.

6.2.3.2 P21 Advanced Motor Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
	Motor tuning					0: normal operation
						1: encoder static self-learning
						2: encoder self-learning correction
D21.00		0 0~7 / ×		3: encoder self-learning end		
P21.00			×	4: motor static self-learning		
						5: motor dynamic self-learning
						6: motor static advanced
						self-learning
						7: motor dynamic self-learning
P21.01	Stator resistance of	0.072	0.000~	Ω	×	
1 21.01	motor 1	0.072	65.000	52	^	
P21.02	Rotor resistance of	0.054	0.000~	Ω		
P21.02	motor 1	0.054	65.000	12	×	
D21 02	Stator inductance	0.0221	0.0000~	Н		
P21.03	of motor 1	0.0221	6.0000	н	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P21.04	Rotor inductance of motor 1	0.0221	0.0000~ 6.0000	Н	×	
P21.05	Mutual inductance of motor 1	0.0210	0.0000~ 6.0000	Н	×	
P21.06	Stator resistance of motor 2	0.072	0.000~ 65.000	Ω	×	
P21.07	Rotor resistance of motor 2	0.054	0.000~ 65.000	Ω	×	
P21.08	Stator inductance of motor 2	0.0221	0.0000~ 6.0000	Н	×	
P21.09	Rotor inductance of motor 2	0.0221	0.0000~ 6.0000	Н	×	
P21.10	Mutual inductance of motor 2	0.0210	0.0000~ 6.0000	Н	×	

6.2.3.3 P22 Auxiliary Motor Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P22.00	Motor rotary inertia	20	0~	kgm^2	×	Rotary inertia
P22.01	Encoder type	0	0~3	/	×	0: incremental; 1: SinCos; 2: EnDat; 3: Rezav
P22.02	Encoder 1 pulses	1024	500~ 16000	ppr	×	Encoder pulses
P22.03	Encoder frequency division coefficient	0	0~7	/	×	Encoder frequency division coefficient
P22.04	Encoder 1 position angle	0.0	0.0~360.0	rad	*	Encoder position angle
P22.05	Encoder feedback speed filter time constant	5	0~1000	ms	×	
P22.06	Encoder 1 direction	1	0~1	/	×	0: negative phase sequence 1: positive phase sequence
P22.07	SinCos encoder subdivision coefficient	11	7,9,11	/	×	7—128; 9-512; 11-2048
P22.08	Poles of Rezav encoder 1	2	2~128	Р	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P22.09	Type of encoder 2	0	0~3	/	×	0: incremental; 1: SinCos; 2: EnDat; 3: Rezav
P22.10	Pulses of encoder 2	1024	500~ 16000	ppr	×	Encoder pulses
P22.11	Encoder 2 position angle	0.0	0.0~360.0	rad	*	Encoder position angle
P22.12	Encoder 2 direction	1	0~1	/	×	0: negative phase sequence, 1: positive phase sequence
P22.13	Poles of Rezav encoder 2	2	2~128	P	×	

6.2.3.4 P23 Motor Protection Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prop ertie s	Option description
P23.00	Motor overheat protection selection	0	0~2	/	×	0: no protection 1: input via analog A0 2: input via analog A1
P23.01	Motor sensor protection threshold value	5.000	0.000~ 10.000	V	×	0.00~10.00V
P23.02	Motor overcurrent protection time	60.0	0.5~300.0	S	×	
P23.03	Motor low speed overcurrent threshold value	150.00	0.00~150.00	%	×	20% rated speed and below
P23.04	Motor low speed overcurrent time	60.0	0.1~120.0	S	×	
P23.05	Motor high speed overcurrent threshold value	120.00	0.00~150.0	%	×	20% rated speed and above
P23.06	Motor high speed overcurrent time	30.0	0.1~60.0	S	×	

6.2.4 Group P3X Digital Parameters

6.2.4.1 P30 Digital Input Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Propert ies	Option description
P30.00	Input function selection of terminal X0	7	0~63	/	×	
P30.01	Input function selection of terminal X1	8	0~63	/	×	
P30.02	Input function selection of terminal X2	0	0~63	/	×	
P30.03	Input function selection of terminal X3	0	0~63	/	×	Refer to Chapter 7 "Parameter Details".
P30.04	Input function selection of terminal X4	0	0~63	/	×	
P30.05	Input function selection of terminal X5	0	0~63	/	×	
P30.06	Input function selection of terminal X6	0	0~63	/	×	
P30.07	Input function selection of terminals P1-P2	1	0~1	/	×	
P30.08	Input filter times of $X0 \sim X6$ and P1-P2	5	0~100	per	×	Default high level, which is reduced with over temperature signal

6.2.4.2 P31 Digital Output Parameters

Function Code	Function Name	Factory Default Setting range		Unit	Propert ies	Option description
P31.00	Output K1 function definition	2	0~63	/	×	
P31.01	Output K2 function definition	25	0~63	/	×	Refer to Chapter 7 "Definition table of
P31.02	Output K3 function definition	0	0~63	/	×	multifunctional output terminals in
P31.03	Output K4 function definition	0	0~63	/	×	group P31
P31.04	Terminal Y0 output function definition	0	0~63	/	×	

Function	Function Name	Factory	Setting range	Unit	Propert	Option description
Code	runction Name	Default	Setting range	Cint	ies	Option description
P31.05	Terminal Y1 output	0	0~63	/	×	
131.03	function definition	· ·	0 03	,	^	
P31.06	Relay K1 terminal	0.0	0.0~60.0	S	×	
	action relay			5		
P31.07	Relay K1 terminal reset	0.0	0.0~60.0	s	×	
	relay					
P31.08	Relay K2 terminal	0.0	0.0~60.0	S	×	
	action relay					
P31.09	Relay K2 terminal reset	0.0	0.0~60.0	s	×	
	relay					
P31.10	Relay K3 terminal	0.0	0.0~60.0	S	×	
	action relay					
P31.11	Relay K3 terminal reset	0.0	0.0~60.0	S	×	
	relay					
P31.12	Relay K4 terminal	0.0	0.0~60.0	s	×	
	action relay					
P31.13	Relay K4 terminal reset	0.0	0.0~60.0	s	×	
	relay Terminal Y0 action					
P31.14		0.0	0.0~60.0	s	×	
D24.45	delay	0.0				
P31.15	Terminal Y0 reset delay	0.0	0.0~60.0	S	×	
P31.16	Terminal Y1 action	0.0	0.0~60.0	s	×	
	delay					
P31.17	Terminal Y1 reset delay	0.0	0.0~60.0	S	×	
D24.20	Non zero current					
P31.20	detection width	4.0	0.0~50.0	%	×	
	Frequency arrive			Н		
P31.21	detection width	1.00	0.0~300.00	z	×	
P31.22	Detection frequency	1.00	0.00~300.00	Н	×	For frequency
	1			Z		detection function
	Detection frequency			Н		For frequency
P31.23	width	0.20	0.00~300.00	z	×	detection function
D21 24	G. 1	2	0.65525			
P31.24	Single run time arrive	2	0~65535	h	×	
P31.25	Accumulated run time	8	0~65535	h	×	
	arrive					

6.2.4.3 P32 Analog Input Parameters

Function	Б. 41. 11	Factory	G 44	T7 1:	Prope	
Code	Function Name	Default	Setting range	Unit	rties	Option description
						0: 0V ~ 10V
						1: -10V ~ 10V
P32.00	A0 input type	1	0~3	/	×	2: 0 ~ 20mA
1 32.00	Ao input type	1	0 3	,	^	3: 4 ~ 20mA
						Note: it depends on I/O
						board type.
						0: no function
						1: target speed signal
						2: current speed signal
P32.01	A0 input function	0	0~6	/	×	3: torque signal
132.01	selection	· ·	0 0	,		4: compensating torque
						signal
						5: speed limit signal
						6: PTC temperature signal
						Voltage type:
P32.02	A0 offset 10.000 0.000~20.000 V	×	0.000 offset-10.000V			
102.02			20.000	•	.,	10.000 offset 0V
						20.000 offset +10V
P32.03	A0 gain	100.0	0.1~1000.0	%	×	Factor of proportionality,
	- 6					typical 100%
						When PTC temperature
P32.04	A0 filtering time	10	0~65535	ms	×	signal is chosen, default
						2000ms
	A0 amplitude					It is set as 20.000mA, if
P32.05	limit	10.000	0.000~10.000	V/mA	×	current type input is
						chosen.
						0: 0V ~ 10V
						1: -10V ~ 10V
P32.06	A1 input type	1	0~3	/	×	2: 0 ~ 20mA
			<u> </u>	,		3: 4 ~ 20mA
						Note: it depends on IO
						board type.
P32.07	A1 input function	0	0~6	/	×	As A0
	selection					
P32.08	A1 offset	10.000	0.000~20.000	V	×	
P32.09	A1 gain	100.0	0.1~1000.0	%	×	
						When PTC temperature
P32.10	A1 filtering time	10	0~65535	ms	×	signal is chosen, default
						2000ms.

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P32.11	A1 amplitude limit	10.000	0.000~10.000	V/mA	×	It is set as 20.000mA, if current type input is chosen.

6.2.4.4 P33 Analog Output Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Proper ties	Option description
P33.00	M0 output	1	0~16	/	×	Refer to chapter 7
	function selection					"Parameter details
P33.01	M0 offset	15.000	0.000~20.000	V	×	
P33.02	M0 gain	100.0	0.1~6000.0	%	×	
P33.03	M1 output	2	016	,		Refer to chapter 7
P33.03	function selection	2	0~16	/	×	"Parameter details
P33.04	M1 offset	15.000	0.000~20.000	V	×	
P33.05	M1 gain	100.0	0.1~6000.0	%	×	
						1: 0~10V
P33.06	MO output type	0	0~4	,		2: -10V~+10V
F33.00	M0 output type	U	0~4	,	×	3: 0∼20mA
						4:4~20mA
				1: 0~10V		
P33.07	M1 output type	0	0~4	,	×	2: -10V~+10V
F33.07				/		3: 0∼20mA
						4:4~20mA

6.2.5 Group P4X Speed Control Parameters

6.2.5.1 P40 Basic Speed Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Proper ties	Option description
P40.00	Panel speed	5.00	0.0~300.00	Hz	×	
P40.01	Basic frequency	50.00	0.0~300.00	Hz	×	
P40.02	Acceleration time	5.00	0.1~360.00	s	×	The greater power, the longer default acceleration time
P40.03	Deceleration time 0	5.00	0.1~360.00	s	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Proper ties	Option description
P40.04	Acceleration time	5.00	0.1~360.00	s	×	
P40.05	Deceleration time	5.00	0.1~360.00	s	×	
P40.06	Acceleration time	5.00	0.1~360.00	s	×	
P40.07	Deceleration time	5.00	0.1~360.00	S	×	
P40.08	Acceleration time	5.00	0.1~360.00	S	×	
P40.09	Deceleration time	5.00	0.1~360.00	S	×	
P40.10	Acceleration circular arc Ts0	0.00	0.00~10.00	S	×	Start to accelerate
P40.11	Acceleration circular arc Ts1	0.00	0.00~10.00	S	×	Stop accelerating
P40.12	Deceleration circular arc Ts2	0.00	0.00~10.00	s	×	Start to decelerate
P40.13	Deceleration circular arc Ts3	0.00	0.00~10.00	s	×	Stop decelerating

6.2.5.2 P41 Digital Multi-speed Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P41.00	Digital multi-speed given 0	0.00	0.00~ 300.00	Hz	×	
P41.01	Digital multi-speed given 1	5.00	0.00~ 300.00	Hz	×	
P41.02	Digital multi-speed given 2	10.00	0.00~ 300.00	Hz	×	
P41.03	Digital multi-speed given 3	20.00	0.00~ 300.00	Hz	×	
P41.04	Digital multi-speed given 4	30.00	0.00~ 300.00	Hz	×	
P41.05	Digital multi-speed given 5	40.00	0.00~ 300.00	Hz	×	
P41.06	Digital multi-speed given 6	50.00	0.00~ 300.00	Hz	×	
P41.07	Digital multi-speed given 7	60.00	0.00~ 300.00	Hz	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P41.08	Digital multi-speed given 8	0.00	0.00~ 300.00	Hz	×	
P41.09	Digital multi-speed given 9	0.00	0.00~ 300.00	Hz	×	
P41.10	Digital multi-speed given 10	0.00	0.00~ 300.00	Hz	×	
P41.11	Digital multi-speed given 11	0.00	0.00~ 300.00	Hz	×	
P41.12	Digital multi-speed given 12	0.00	0.00~ 300.00	Hz	×	
P41.13	Digital multi-speed given 13	0.00	0.00~ 300.00	Hz	×	
P41.14	Digital multi-speed given 14	0.00	0.00~ 300.00	Hz	×	
P41.15	Digital multi-speed given 15	0.00	0.00~ 300.00	Hz	×	
P41.16	Inching frequency given	5.00	0.00~50.00	Hz	×	

6.2.6 Group P5X Process Control Parameters

6.2.6.1 Group P50 Process Open Loop Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P50.00	Open loop auxiliary given mode	0	0~5	/	×	0: no; 1: A0; 2: A1; 3: spare 4: spare 5: PID given target speed
P50.01	Open loop given main and auxiliary relationship calculation	0	0~6	/	×	0: no calculation 1: main+auxiliary 2: main-auxiliary 3: spare 4: spare 5: take the maximum value 6: take the minimum value

6.2.6.2 P51 Process Closed Loop Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P51.00	Closed loop control selection	0	0~1	/	×	0: invalid closed loop run control 1: effective closed loop run

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Function Code	Function Name	Factory Default	Setting	Unit	Prope rties	Option description
Code		Default	range		Tues	control
						Control
						0: internal given
						1: A0 2: A1
	Closed loop control					3: spare 4: spare
P51.01	main given mode	0	0~6	/	×	5: spare
						6: Modbus communication
						given
						0: no
						1: A0
	Cl. 11					2: A1 3: spare
P51.02	Closed loop control auxiliary given mode	2	0~6	/	×	4: spare
	auxiliary given mode					5: spare
						6: Modbus communication
						given
						0: no calculatiojn
						1: main+auxiliary
	Closed loop control					2: main-auxiliary
P51.03	auxiliary given calculation	0	0~6	/	×	3: spare
						4: spare
						5: take the maximum value
						6: take the minimum value
						0: no
						1: A0
	GI II					2: A1
P51.04	Closed loop control	1	0~6	/	×	3: spare
	main feedback mode					4: spare
						5: multi-voltage given6: Modbus communication
						given
						0: no
						1: A0
						2: A1
	Closed loop control					3: spare
P51.05	auxiliary feedback mode	2	0~6	/	×	4: spare
	•					5: spare
						6: Modbus communication
						given
	Cl. 11					0: no calculation
D51.07	Closed loop control feedback main and	0	0-16	,		1: main+auxiliary
P51.06		0	0~6	/	×	2: main-auxiliary
	auxiliary calculation					3: spare

Function		Factory	Setting		Prope	
Code	Function Name	Default	range	Unit	rties	Option description
						4: spare 5: take the maximum value 6: take the minimum value
P51.07	PID internal given value	0.70	0.00~ 10.00		0	The unit depends on P51.08
P51.08	Unit	0	0~3	/	×	Unit 0: V 1: % 2: Mpa 3: degree
P51.09	Proportional gain Kp	0.50	0.00~ 10.00	/	0	
P51.10	Integral gain Ki	0.50	0.00~ 10.00	/	0	
P51.11	Differential gain Kd	0.00	0.00~ 10.00	/	0	
P51.12	Spare	0	×	×	×	
P51.13	Integral mode selection	0	0~1	/	×	Stop integral regulation when the frequency reaches the upper and lower limit Continue integral regulation when the frequency reaches the upper and lower limit
P51.14	Spare	0	×	×	×	
P51.15	Spare	0	×	×	×	
P51.16	Spare	0	×	×	×	
P51.17	Spare	0	×	×	×	
P51.18	Spare	0	×	×	×	
P51.19	Spare	0	×	×	×	
P51.20	Spare	0	×	×	×	
P51.21	Spare	0	×	×	×	
P51.22	Integral action upper limit	100.00	0.00~	%	×	
P51.23	Spare	0	×	×	×	
P51.24	Closed loop input upper limit	50.0	0.00~	%	×	
P51.25	closed loop input lower	0.0	0.0~ 20.0	%	×	
P51.26	Closed loop output upper limit	100.0	0.00~	%	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P51.27	Spare	0	×	×	×	
P51.28	Dormancy selection	0	0~ 1	/	×	0:N 1:Y
P51.29	Dormancy frequency	30.00	0.00~ 50.00	Hz	×	P51.28=1 valid
P51.30	Dormancy delay	10.0	0~ 655.35	S	×	P51.28=1 valid
P51.31	Awake deviation	0.10	0.0~ 100.0	%	×	P51.2=1 valid,
P51.32	Awake delay	10.0	0.0~ 3600.0	S	×	
P51.33	Given acceleration time	0.0	0.0~ 50.0	S	×	
P51.34	Closed loop output filtering time	0.01	0.00~ 50.000	S	×	
P51.35	Given quantity lower limit	0.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.36	Feedback quantity range lower limit	0.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.37	Given quantity upper limit	10.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.38	Feedback quantity range upper limit	10.00	0.00~ 100.00	V	×	The unit depends on P51.08
P51.39	Preset frequency	22.0	0.0~ Max.Fre quency	Hz	×	
P51.40	Preset frequency holding time	0	0~60	S	×	
P51.41	Positive and negative characteristics	0	0~1	/	×	0: positive characteristic 1: negative characteristic

6.2.7 Group P6X Vector Control Parameters

6.2.7.1 Group P60 Speed Loop Control Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P60.00	Speed loop - zero speed P	0.00	0.00~ 655.35	/	×	Zero servo section
P60.01	Speed loop - zero speed I	0.00	0.00~ 655.35	/	×	
P60.02	Speed loop - zero	0.00	0.00~	/	×	

Function		Factory	Setting		Prope	
Code	Function Name	Default	range	Unit	rties	Option description
	speed D		655.35			
P60.03	Speed loop - low speed P	100.00	0.00~ 655.35	/	×	Low speed section
P60.04	Speed loop - low speed I	5.00	0.00~ 655.35	/	×	
P60.05	Speed loop - low speed D	0.50	0.00~ 655.35	/	×	
P60.06	Speed loop - medium speed P	70.00	0.00~ 655.35	/	×	Medium speed section
P60.07	Speed loop - medium speed I	2.00	0.00~ 655.35	/	×	
P60.08	Speed loop - medium speed D	0.20	0.00~ 655.35	/	×	
P60.09	Speed loop - high speed P	70.00	0.00~ 655.35	/	×	High speed section
P60.10	Speed loop - high speed I	2.00	0.00~ 655.35	/	×	
P60.11	Speed loop - high speed D	0.10	0.00~ 655.35	/	×	
P60.12	Switching frequency 0	10.0	0.00~ 655.35	%	×	
P60.13	Switching frequency	60.0	0.00~ 655.35	%	×	

6.2.7.2 Group P61 Current Control Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P61.00	Current loop Kp	1.40	0.01~ 9.99	/	×	
P61.01	Current loop Ki	1.00	0.01~ 9.99	/	×	
P61.02	Current loop Kd	0.00	0.00~ 9.99	/	×	
P61.03	Current loop bandwidth	400.0	0.1~ 1000.0	Hz	×	
P61.04	Magnetic link bandwidth	0.8	0.01~ 1000.0	Hz	×	
P61.05	Current loop selection	0	0~10	/	×	
P61.06	V/F control current loop Max	1.0	0.0 ~100.0	%	×	

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P61.07	V/F control current loop Min	1.0	0.0 ~100.0	%	×	

6.2.7.3 Group P62 Torque Control Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P62.00	Digital torque given	0.0	0.0~ 100.0	%	×	
P62.01	Torque direction	0	0~1	/	×	
P62.02	Torque increase time	1.00	0.01~ 655.35	S	×	
P62.03	Torque decrease time	1.00	0.01~ 655.35	s	×	

6.2.7.4 P63 Torque Compensating Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P63.00	Compensating torque direction	0	0~1	/	×	
P63.01	Compensation gain	100.0	0.0~ 200.0	%	×	
P63.02	Compensation offset	0.0	0.0~ 100.0	%	×	
P63.03	Light load switch compensation	0.0	0.0~ 99.9	%	×	
P63.04	Heavy load switch compensation	0.0	0.0~ 99.9	%	×	

6.2.8 Group P7X Enhanced Control Parameters

6.2.8.1 P70 Limit and Protection Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P70.00	Frequency upper limit	50.00	0.01∼ Max.Freq uency	Hz	×	0.01~maximum frequency
P70.01	Frequency lower limit	0.00	0.01∼ Freq. upper limit	Hz	×	$0.01 \sim$ frequency upper limit

			a		_	
Function	Function Name	Factory	Setting	Unit	Prope	Option description
Code	Manimum	Default	range		rties	
P70.02	Maximum output frequency	55.00	0.01~ 300.00	Hz	×	0.01~300.00
			300.00			
P70.03	Spare	0	×	×	×	
P70.04	Output torque limit	150	0~200	%	×	
P70.05	Inverter acceleration overcurrent threshold value	160	0~200	%	×	
P70.06	Inverter deceleration overvoltage threshold value	750	0~800	V	×	
P70.07	Overspeed protection coefficient	120.00	0.00~	%	×	
P70.08	Special function selection	16	0~ 65535	/	×	
P70.10	Spare	0	0~2	/	×	0: NC 1:A0 2:A1
P70.11	PT signal channel	10.000	0.000~ 10.000	V	×	
P70.12	PT protection upper threshold value	0.000	0.000~ 10.000	V	×	
P70.13	PT protection lower threshold value	3.0	0.0~ 10.0	S	×	
P70.14	PT protection action delay	0	0~2	/	×	0: NC 1:A0 2:A1
P70.15	HT signal channel	10.000	0.000~ 10.000	V	×	
P70.16	HT protection upper threshold value	0.000	0.000~ 10.000	V	×	
P70.17	HT protection lower threshold value	3.0	0.0~ 10.0	S	×	
P70.18	HT protection action delay	380	0~540	V	×	
P70.19	Bus undervoltage threshold value	0	0~400	%	×	
P70.20	No-load up maximum torque	0	0~400	%	×	
P70.21	No-load down maximum torque	800	0~ 65535	ms	×	
P70.22	PWM detection delay	0	0~3		×	0: run at the lower limit frequency

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
						1: stop
						2: given frequency 0
						3: inertia stop

6.2.8.2 P71 Control Optimization Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P71.00	Frequency hopping speed 1	0.00	0.00~ 100.00	Hz	×	
P71.01	Frequency hopping speed 2	0.00	0.00~ 100.00	Hz	×	
P71.02	Frequency hopping speed 3	0.00	0.00~ 100.00	Hz	×	
P71.03	Frequency hopping width	0.00	0.00~ 100.00	Hz	×	
P71.04	Inertia compensation factor	0.00	0.00~ 100.00	%	×	
P71.05	No reverse	0	0~1	/	×	0: N 1: Y
P71.06	Interval time for forward and reverse	0.0	0.0~ 6553.5	S	×	
P71.07	PWM modulation mode	2	0~2	/	×	0: 5-section; 1: 7-section; 2: <40%rpm 7-section, >40% 5-section
P71.08	Automatic torque lifting	83	0~1000	/	×	0: none 1: automatic torque lifting 2: suppression oscillation 4: slip compensation 8: stator resistance compensation 16: dead-time compensation 32: bus voltage compensation 64: suppression oscillation 2 (bit selection function)
P71.09	V/F torque compensation	0.0	0.0~ 30.0	%	×	Manual torque lifting, P71.08=0
P71.10	V/F compensating maximum frequency	10.0	0.0~ 50.0	Hz	×	
P71.11	Dead-time compensation mode	0	0~2	/	×	0: compensate 100% as per angle;

Function		Factory	Setting		Prope	
Code	Function Name	Default	range	Unit	rties	Option description
3040		201010	1 mage		10100	1: compensate 50% as per
						angle;
						2: compensation as per current
P71.12	Current slow down	0.00	0.01~		.,	
P/1.12	time	0.00	655.35	S	×	
P71.14	Carrier frequency	6.000	1.100~	KHz	×	
1,1.11			8.000	1112		
P71.15	Random PWM	0.000	0.000~	KHz	×	
	width		1.000			
P71.16	Regulator mode	1	0~3	/	×	
P71.17	Contactor turning-on	0.8	0.0~	s	×	
	delay		10.0			
P71.18	Open delay	0.4	0.0~	S	×	
			10.0			
P71.19	Contactor shutoff	1.0	0.0~	S	×	
	delay		10.0 0.0~			
P71.20	Brake delay	0.1	10.0	S	×	
			0.0~			
P71.21	Output shutoff delay	0.3	10.0	S	×	
P21 00	Zero speed threshold	0.20	0.00~	***		
P71.22	value	0.20	10.00	Hz	×	
P71.23	Forward dead-time	100	0~100	%		
F/1.23	compensation	100	0 - 100	70	×	
P71.24	Reverse dead-time	100	0~100	%	×	
-	compensation			, -		
P71.25	Zero servo	0	0~100	%	×	
_	compensation					
P71.28	Zero servo current	100	50~200	%	×	
	loop gain factor					0: underflow updating 1:
	PWM modulation					o: underflow updating 1: overflow/underflow updating
P71.29	selection	0	0~1	/	×	Set as 1 for the switching
						frequency below 4kHz
D=1.65	Speed precision	100 -	0.0~			
P71.33	adjustment	100.0	100.0	%	×	
	Performance					
P71.34	improving	106	0~1000	/	×	
	compensation					
P71.35	System inertia factor	100.0	0.0~	%	×	
	,	-	300.0			

E4'		F4	G-44*	_	D	
Function Code	Function Name	Factory Default	Setting	Unit	Prope rties	Option description
Code	Automotic law speed	Default	range		rues	
P71.36	Automatic low speed	100.0	0.0~	%	×	
	torque lifting		300.0			
771.00	Power failure	400	380~			
P71.39	detection threshold	480	550	V	×	
	value					
P71.40	KEB bus target	500	380∼	V	×	
	voltage		550			
						0: no handling
						1: track start (time limit)
	Power failure					2: track start (time unlimited)
P71.41	handling mode	0	0~4	/	×	3: KEB (with detection
	manual mode					undervoltage)
						4: KEB (no detection
						undervoltage)
P71.42	Maximum outage	3.0	0.0~	S	×	
171.42	compensation time	3.0	60.0		^	
P71.43	KEB shortest action	100	0~2000	ms	×	
171.43	time	100	0 12000	1115	^	
	KEB initial		0.00~			
P71.44	frequency reduction	2.00		~	×	
	quantity		5.00			
					0.00	
D71 45	KEB deceleration	10.00	0.00~		\sim	
P71.45	time	10.00	200.00	S	300.0	
					0	
						0: variable deceleration
						1: automatic deceleration
P71.46	KEB deceleration	0	0~3	/	×	2: constant deceleration
	mode					3: constant deceleration
						(antistall)
D=: :-	KEB acceleration	27.05	0.00~			
P71.47	time	25.00	300.00	S	×	
	KEB proportional		0.00~			
P71.48	Кр	200.00	300.00	/	×	
			0.00~			
P71.49	KEB integral Ki	0.00	300.00	/	×	
			0.00~			
P71.50	KEB differential Kd	0.00	300.00	/	×	
	KEB integral upper		0.0~			
P71.51	limit	100.0	300.00	%	×	
DZ1 50		100.0		0/		
P71.52	KEB integral lower	100.0	0.0~	%	×	

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Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
	limit		300.00			
P71.53	KEB closed loop output upper limit	100.0	0.0~ 300.00	%	×	
P71.54	KEB closed loop output lower limit	100.0	0.0~ 300.00	%	×	
P71.55	KEB voltage deviation upper limit	300.00	0.0~ 500.0	V	×	
P71.56	KEB voltage zero deviation value	0.0	0.0~ 10.0	V	×	
P71.57	Variable carrier frequency threshold value	0.00	0.00~ 50.00	Hz	×	
P71.58	Fan control selection	0	0~4	/	×	
P71.59	Optimization parameter 1	0.0000		/	×	
P71.60	Optimization parameter 2	100.0	1.0~ 300.0	%	×	
P71.61	Optimization parameter 3	100.0	1.0~ 300.0	%	×	
P71.62	UP/DOWN single step length	0.1	0.0~ 10.0	Hz	×	

6.2.9 Group P8X Communication Parameters

6.2.9.1 Group P80 Communication Selection Parameters

Function	Function Name	Factory	Setting	Unit	Prope	Option description
Code	Function Name	Default	range	Cint	rties	Option description
						0: No communication
P80.00	Communication mode selection	0	0~2	\	×	1: Profibus_DP;
P80.00						2: Modbus;
						3:CANbus

6.2.9.2 Group P81 Modbus Communication Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
				bps		0: 1200 bps
	Communication baud rate	3	0~7		×	1: 2400 bps
D01.00						2: 4800 bps
P81.00						3: 9600 bps
						4: 19200 bps
						5: 38400 bps

						6: 57600 bps
						7: 76800 bps
						0: 1-8-1, None
P81.01	Data format	0	0~2	/	×	1: 1-8-1, ODD
						2: 1-8-1, EVEN
P81.02	Transmission mode selection	1	0~1	/	×	0: ASC;1: RTU
P81.04	Local address	1	1~247	/	×	$1\sim$ 247, 0 is broadcast address
P81.05	Communication status word set 1	0		/	×	
P81.06	Communication status word set 2	0		/	×	
	Communication					0: hexadecimal number
P81.07	address format	1		/	×	system;
	selection					1: decimal number system

6.2.9.3 Group P82 Profibus_DP Communication Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P82.00	Local address	0	0~255	/	×	0~255
P82.01	Big endian and little endian mode	0	0~1	/	×	See communication appendix B
P82.02	User-defined status word set 1	16			×	See communication appendix B
P82.03	User-defined status word set 2	13		/	×	See communication appendix B
P82.04	User-defined status word set 3	10		/	×	See communication appendix B
P82.05	User-defined status word set 4	18		/	×	See communication appendix B

6.2.10 Group P9X Fault and Display Parameters

6.2.10.1 Group P90 Language Selection Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P90.00	Operator language selection	0	0~1	/	×	0: Chinese 1: English

6.2.10.2 Group P91 LCD Display Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P91.00	U01 display data	20	0~34	/	×	
P91.01	U02 display data	2	0~34	/	×	
P91.02	U03 display data	3	0~34	/	×	Refer to Chapter 7
P91.03	U04 display data	4	0~34	/	×	
P91.04	U05 display data	6	0~34	/	×	
P91.05	U06 display data	16	0~34	/	×	
P91.06	U07 display data	7	0~34	/	×	Refer to Chapter 7
P91.07	U08 display data	5	0~34	/	×	
P91.08	U01 - U08 monitoring selection	0	0~65535	/	×	

6.2.10.3 Group P92 LED Display Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P92.00	LED display data	2	0~34	/	×	Refer to Chapter 7

6.2.10.4 Group P93 Running Record Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P93.00	Inverter accumulated electrification time	0	0~65535	h	*	
P93.01	Inverter accumulated running time	0	0~65535	h	*	
P93.02	Radiator maximum temperature record	0.0	0.0~100.0	degree	*	
P93.03	Accumulated output power	0.0	0.0~999.9	kWh	*	
P93.04	Inverter output power	0	0~65535	MWh	*	
P93.05	Fan running time	0	0~65535	h	*	

6.2.10.5 Group P94 Troubleshooting Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P94.00	Inverter minor fault processing mode	1	0~3	/	*	0: no fault relay output for minor fault

Function		Fastam	Co44in a	_	Duana	
Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
Couc		Delauit	range		Tucs	1: fault relay output for minor
						fault
						2: fault relay output and
						shutdown for 52#PTC fault,
						and no automatic reset for the
						fault
						3: 1 and 2 are valid.
P94.01	Inverter fault	10.0	0.0~180.0	S	*	Inverter fault automatic reset
1 74.01	automatic reset time	10.0	0.0 100.0			time
P94.02	Inverter fault	0	0~100	/	*	Inverter fault automatic reset
17.102	automatic reset times		0 100	,		times
P94.03	Radiator overheating	0.5	0.0~180.0	S	×	
	time					
P94.04	Overspeed	1.0	0.0~180.0	S	×	
	protection time					
P94.05	Input default phase	65	0~150	V	×	
	voltage threshold					
P94.06	Braking resistor short times	10	0~100	per	×	
	Encoder					
P94.07	disconnection times	2	0~100	per	×	
17.107	confirmed	_	0 100	•		
	Output default phase		0.000~			
P94.08	confirm time	2.000	180.000	S	×	
D04.00	Relay fault confirm	0.0	0 250	* 7		
P94.09	voltage	90	0~350	V	×	
P94.10	CD misphase	300	300~1000	/		
F 94.10	judgement threshold	300	300 - 1000	/	×	
P94.11	ABZ protection	20	20~100	%	×	
171.11	threshold	20	20 100	,,,		
P94.12	IGBT protection	2	0~1000	/	×	
	times	_		,		
P94.13	I2t protection	0	0~3	/	×	
	selection					
P94.14	Analog A0	0.0	0.0~100	%	×	
	disconnection value					
P94.15	Analog A1	0.0	0.0~100	%	×	
	disconnection value					O: no treatment
P94.16	Abnormal analog	0	0~5	/	×	0: no treatment 1: protection shutdown
1 74.10	treatment	U	0 - 3	/	_ ^	2: run at the current speed
						2. run at the current speed

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
						3: run at the maximum amplitude limit 4: run at the minmum amplitude limit 5: run at the set value for multi-speed 15
P94.17	Temperature sampling disconnection treatment	0	0~1	/	×	0: no treatment 1: protection shutdown
P94.18	Communication protection	1	0~1	/	×	0: no treatment 1: protection shutdown
P94.19	Communication disconnection protection time	2.000	0.000~ 65.535	s	×	
P94.20	Grounding protection times	100	1~60000	/	×	

6.2.10.6 Group P95 Product Identification Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Prope rties	Option description
P95.00	Inverter hardware version	450.04		/	*	Inverter hardware version
P95.01	Inverter software version	Factory		/	*	Inverter software version
P95.02	Version number	100. 01		/	*	Version number
P95.03	Profibus_DP Software version	Factory			*	Profibus_DP software version

6.2.10.6 Group P96 Inverter Product Parameters

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P96.00	Inverter rated power	A44: -	0.0~999.9	kW	×	
P96.01	Inverter rated current	Automatic identificatio	0.0~999.9	A	×	
P96.02	Inverter maximum current	n	0.0~999.9	A	×	
P96.03	Inverter rated voltage	380	0~460	V	×	0~480
P96.04	Inverter power factor	Automatic	0~99		*	

Function Code	Function Name	Factory Default	Setting range	Unit	Properties	Option description
P96.05	Inverter sensor current	identificatio n	0~9999	A	*	0~9999
P96.06	Inverter module rated current		0~9999	A	*	0~9999
P96.07	Built-in braking unit current		0~9999	A	*	0~9999
P96.08	3-phase current balance coefficient	1.000	0.000~ 99.999		*	0.0~0.99

6.3 User Parameters Record Sheet

Function	Set value	Function	Set value	Function	Set value

Chapter 7 Parameter Details

7.1 Introduction to the Main Menu

7.1.1 Parameter Setting

Parameters in groups P0X-P9X will be displayed after it enters. When the login password is correct, the modifiable parameters can be modified. Refer to the following for their specific meanings.

Simple table field	Description
Function code symbol	Function code symbol, for example P00.00
Name of function code	Name of function code, to explain its roles
Function code option	List of function code parameter setting
Setting range	The minimum and maximum value set permitted by function code
Unit	V: voltage; A: current; °C: degree; Ω: ohm; mH: millihenry rpm: rotating speed %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc
Factory default	Function code set value after reset to factory default operation (see P00.04)
Properties	o: modifiable during running; ×: modifiable only during stop; *: read-only parameter, unchangeable
User setting	Parameter record by the user

7.1.2 Motor Tuning

This option is motor self-learning. For the different motor firstly connecting to inverter, it is better to have a self-learning.

If the motor nameplate and other parameters are known, please directly write them into the related parameters; if the motor internal parameters are unknown, please execute parameter self-tuning. Press ENTER to determine and select the self-learning scheme.

- 0: normal running mode
- 1: encoder static self-learning
- 2: encoder correction
- 3: encoder self-learning ends
- 4: motor static self-learning
- 5: motor dynamic self-learning
- 6: motor static advanced learning
- 7: encoder dynamic self-learning

7.1.3 Fault Check

Press ENT to enter list of fault, 8 faults will be displayed in reverse time order. If some fault is

found, press ENT to display the bus voltage, output current and running frequency etc when it occurs.

52 fault codes totally, whose corresponding fault type is shown in the following table.

EI4 NI-	F14 3'1	Elevate NI	F14 1'1
Fault No.	Fault display	Fault No.	Fault display
1	Module overcurrent protection	2	ADC fault
3	Radiator overheating	4	Braking unit fault
5	Fuse blown fault	6	Output over-torque
7	Speed variation	8	Bus overvoltage protection
9	Bus undervoltage	10	Output default phase
11	Motor low speed overcurrent	12	Encoder fault
13	Current detected during parking	14	Reverse speed during running
15	Speed detected during parking	16	Motor phase sequence error
17	Forward overspeed	18	Reverse overspeed
19	UVW encoder phase sequence error	20	Encoder communication fault
21	abc overcurrent	22	Brake detection fault
23	Input overvoltage	24	UVW encoder disconnection
25	Spare	26	No self-learning for the encoder
27	Output overcurrent	28	Sincos encoder fault
29	Input default phase	30	Overspeed protection
31	Motor high speed overcurrent	32	Grounding protection
33	Capacitor aging	34	External fault
35	Output unbalance	36	Parameter setting error
37	Current sensor fault	38	Braking resistor short circuit
39	Too large instantaneous current value	40	Output contactor fault
43	Communication fault	44	Abnormal input power
45	I ² t instantaneous value overcurrent	46	I2t effective value overcurrent
47	Abnormal analog input	48	High temperature sampling disconnection
49	PT detection fault	50	Humidity fault
51	Abnormal running output current	52	PTC over-temperature warning

7.1.4 Parameter Processing

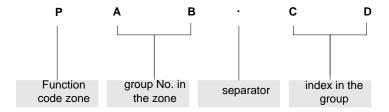
Press ENTER to enter. The function is used for change permission and initialization level of setting parameters.

- 0: Modification for all parameters.
- 1: No modification for all parameters.
- 2: Reset the parameters in group P0X to the factory defaults.
- 3: Reset the parameters other than in group P0X (user-defined function code visible and invisible area) to the factory defaults.
 - 4: Reset all user parameters to the factory defaults.

Note: after parameter initialization, password set by the user resets automatically. Press ESC to return to the main menu interface.

7.2 Classification and Format of Parameter Groups

7.2.1 Format of Parameter Groups



7.2.2 Zoning of Parameter Groups

Function code zone	Group No. in the zone	Description of function code
P0X user parameters	Group P00	Password parameter group
	Group P10	Basic control parameter group
	Group P11	Start parameter group
P1X control parameters	Group P12	Parking parameter group
	Group P13	Braking function parameter
	Group P14	V/F parameter group
	Group P20	Basic motor parameter group
DOW	Group P21	Advanced motor parameter group
P2X motor parameters	Group P22	Motor auxiliary parameter group
	Group P23	Motor protection parameter group
	Group P30	Digital input parameter group
D2V 4 1 4 1	Group P31	Digital output parameter group
P3X terminal control parameters	Group P32	Analog input parameter group
	Group P33	Analog output parameter group
D4V	Group P40	Basic speed parameter group
P4X speed parameters	Group P32	Digital multi-speed parameter group
D5V muscoss control more motors	Group P50	Process open loop parameter group
P5X process control parameters	Group P51	Process closed loop parameter group
	Group P60	Speed loop control parameter group
DCV	Group P61	Current loop control parameter group
P6X vector control parameters	Group P62	Torque control parameter group
	Group P63	Compensation torque control parameter group
D7Vhdtlt	Group P70	Limit and protection parameter group
P7X enhanced control parameters	Group P71	Control optimization parameter group
	Group P80	Communication control selection group
P8X communication parameters	Group P81	Modbus communication group
	Group P82	Profibus DP communication group
DOV Jimles assessed	Group P90	Language selection group
P9X display parameters	Group P91	LCD display group

Group P92	LED display group
Group P93	Running record parameter group
Group P94	Troubleshooting parameter group
Group P95	Inverter product identification parameter group
Group P96	Inverter product parameter

7.3 Group POX User Parameter Groups

7.3.1 Group P00 Basic Function Parameters

Function code	Function name	Setting range	Factory default
P00.00	Login password	0~65535	0

This function is to prevent the irrelevant personnel from inquiring or modifying parameters, so as to protect safety of the inverter parameters.

00000: No password protection. All parameters may be inquired, no password provided for the inverter at factory.

Once the user password set becomes valid, when it enters parameter setting status again, all parameters can't be modified via operation panel unless the correct password is input, which can be viewed only. Parameter password is always shown as 00000.

Note: factory setting of AS500 series inverter isn't provided with user password (P00.00=0), therefore no password is provided for your first login.

Function code	Function name	Setting range	Factory default
P00.01	Modify password	0~65535	0

Set a password:

Input a 5-digit number as user password, then press ENTER to confirm it, and reset it once.

Change password:

Press ENTER to enter password authentification status, 00000 is displayed. Then enter parameter editing status after the correct password is input, select P00.01 (P00.00 parameter is displayed as 00000), input the new password and press ENTER to confirm it. Then reset the same password as P00.01 once again, indicating successfully setting the new password if "successful password setting" is shown.

Cancel password:

Press ENTER to enter password authentification status, 00000 is displayed, and then input the correct user password to enter parameter editing status. View P00.01 to be 00000, press ENTER to confirm, reset P00.01=00000, then the password is cancelled after "password clear" is shown.

Function code	Function name	Setting range	Factory default
P00.02	Spare password	0~65535	0

When the setting password is forgotten, users can input the spare password to modify parameter value, including new password.

7.3.2 Group P01∼09 + User Function Parameter

7.4 Group P1X Control Parameter Groups

7.4.1 Group P10 Basic Control Parameters

Function code	Function name	Setting range	Factory default
P10.00	Control mode selection	0~5	0

The function is to set the control running mode of inverter. Of which, 0 is V/f control, 1, 3 and 5 mean vector speed control; 2 is vector torque control; 4 is spare.

0: **Voltage vector V/f control:** it applies to most applications, regulating frequency proportional to voltage, keep control speed under flux, without encoder.

Please reasonably set V/F control parameters in group P14 when selecting V/F control, to reach the good control effect.

 Vector control 2 without speed sensor: it applies to the general variable speed drive applications with high speed control precision and greater torque requirement.

When selecting vector control, motor parameter self-tuning will be executed firstly, to correctly set the motor nameplate parameter as P20.xx~P20.xx and obtain the accurate motor parameters by starting motor parameter self-tuning. At the same time, vector control parameters in group P6X will be set reasonably, to realize its best control effect.

- 2: **Vector control with speed sensor:** it is similar to 3, it is provided with speed encoder, with higher control precision and better speed protection.
- 3: **Vector control with speed sensor:** Pulse encoder is required, which is able to realize speed with higher precision than vector control 2 without encoder speed feedback and torque performance
 - 4: Spare.
- 5: **Vector control 1 without speed sensor:** Pulse encoder isn't required, which is able to realize speed with higher precision than open loop VF and torque performance. Performance index is less than vector control 2 without speed sensor, but not sensitive to motor parameters. It applies to the applications where motor parameters can't easily be obtained.

Function code	Function name	Setting range	Factory default
P10.01	Rotation mode selection	0~3	0

P10.01 is used to set a mode to control inverter start and stop by use of terminals X0 (forward) and X1 (reverse) under terminal running command given mode.

0: 2-wire 1;

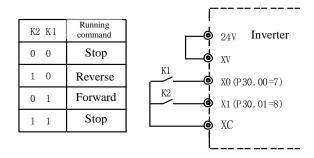


Figure 7-1 2-wire running mode 1

1: 2-wire 2;

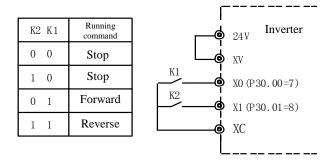


Figure 7-2 2-wire running mode 2

2: 3-wire 1;

Terminal Xi ($i=2 \sim 7$) sets the function "9: 3-wire running control".

When K3 closes, K0 (forward) and K1 (reverse) control are effective; when K3 opens, K0 and K1 control are invalid, and the inverter stops.

Rising edge of terminal X0 indicates forward running command; while that of terminal X1 is reverse running command.

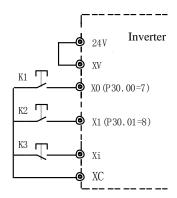


Figure 7-3 3-wire running mode 1

3: 3-wire 2;

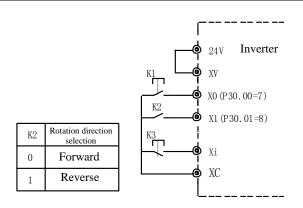


Figure 7-4 3-wire running mode 2

Terminal Xi ($i=2 \sim 7$) sets the function "9: 3-wire running control".

Rising edge of terminal K1 indicates running command; when K2 opens, indicating the forward direction command; when K3 closes, indicating the reverse direction command. When K3 opens, the inverter stops.

Function code	Function name	Setting range	Factory default
P10.02	Running command given mode	0~4	0

There are 3 different inverter running command given modes for selection.

- 0: Operation panel running command given mode: execute the operations such as run, stop and forward/reverse rotation with the buttons RUN (F1), STOP (F2) and LO/RE (F3) on the operation panel.
- 1: Terminal running command given mode: execute the operations such as run, stop and forward/reverse rotation by defining the multifunctional terminals $X0 \sim X7$. Refer to $P30.00 \sim P30.07$.
- 2: Communication given mode: execute the operations such as run, stop and forward/reverse rotation by means of Modbus communication. Refer to the Appendix Modbus Communication Protocol.
 - 3: CAN given: optional, give command by means of CANBus.
 - 4: Profibus_DP given: optional, give command by means of Profibus_DP.

See the related supplementary agreement for communication protocol of 3, 4.

Function code	Function name	Setting range	Factory default
P10.03	Frequency/speed given mode 1	0~16	0

The function applies to frequency given under V/f control, vector control without sensor and vector control with sensor. See the function code in group P10.00 for control mode.

0: Panel digital frequency given, set frequency given with P40.00

Increase or decrease the frequency with \triangle and ∇ during running, at this time, stop will be held, but not power failure.

1: Digital multi-speed given target speed

Digital multi-speed terminals 0-3 are effective, then frequency is determined by this terminal combination, see $P41.00 \sim P41.15$.

- 2: Spare.
- 3: A0 analog target speed given
- 4: A0 analog current speed given
- 5: A1 analog target speed given
- 6: A1 analog current speed given

Give target speed via analog input port, at this time, output frequency is calculated according to acceleration and deceleration time in group P40. Also give current speed, then acceleration and deceleration time in group P40 are invalid.

7: Communication given current speed

Standard configuration, see Modbus protocol.

8: Function given target speed

Macro situation in industrial applications.

- 9: Spare.
- 10: Spare.
- 11: Spare.
- 12: Communication given target speed

Standard configuration, see Modbus protocol.

- 13: CAN given current speed
- 14: CAN given target speed

Optional, give speed command by means of CANBus.

- 15: Up/Down given speed
- 16: Profibus_DP given speed

Optional, give speed command by means of Profibus_DP

Function code	Function name	Setting range	Factory default
P10.04	Torque given mode	0~6	0

Torque given shares the following means under torque control mode:

- 0: panel given Panel digital torque given
- 1: A0 analog given
- 2: A1 analog given

When torque given mode is set as analog input, it must be correctly matched when setting definition analog port function parameters, for example: P10.04 is set as 1, P32.01 must be set as 3. Similarly, P10.04 is set as 1, P32.07 also must be set as 3.

3: Communication given torque: Give target torque via communication port, see group P80 for

communication mode.

- **4: Function given target torque:** In some special industries, given torque will be based on designing the different performance functions as required.
 - **5:** ModBus given torque: Standard configuration, see Modbus protocol.
 - **6: CAN given torque:** Optional, give torque command by means of CANBus.

Function code	Function name	Setting range	Factory default
P10.05	Compensating torque given mode	0~6	0

Set compensating torque for start under closed loop vector mode. Compensating torque selection modes:

- 0: No compensating torque
- 1: Digital compensating torque

Set compensating torque by light full load digital input, see group P63.

- 2: Analog A0 given compensating torque
- 3: Analog A1 given compensating torque

Set compensating torque via analog input port. Compensating torque direction is determined by analog.

4: Communication given compensating torque

Standard configuration, see Modbus protocol

5: Automatic torque compensation

Automatic torque compensation main serves lifting industry, which is to remember torque when zero speed stops, then release the brake until all remembered torque is added. It only applies to closed loop control.

6: Profibus given compensation

Optional, give compensating torque command by means of Profibus.

Function code	Function name	Setting range	Factory default
P10.06	Speed limit selection	0~4	0

Select the different channel to limit speed given and avoid over-speed. It is effective only under torque control mode.

- **0: Internal parameter limit:**Limit by means of the upper and lower limit frequency of P70.00 and P70.01.
 - 1: Analog 0 limit
 - **2: Analog 1 limit:** 10V corresponding to the maximum output frequency of P70.02.
 - 3: Spare.
 - **4: ModBus communication limit:** See Modbus protocol.
 - 5: Automatic limit

Function code	Function name	Setting range	Factory default
P10.07	Frequency/speed given mode 2	0~16	0

Same as P10.03 frequency/speed given mode 1.

7.4.2 Group P11 Start Control Parameter

Function code	Function name	Setting range	Factory default
P11.00	Start mode	0~2	0

Different start modes can be adopted according to different applications.

0: Run from the starting frequency P11.01, then accelerate to the set frequency after starting frequency holding time P11.02.

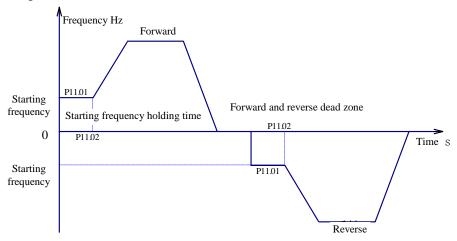


Figure 7-5 Schematic of start mode for starting frequency

1: Firstly inject DC, to have DC excitation and braking for the motor. Injection quantity and time is set by P11.03 and P11.04. After injection time is reached, run from the starting frequency P00.01, then accelerate to the set frequency after starting frequency holding time P11.02.

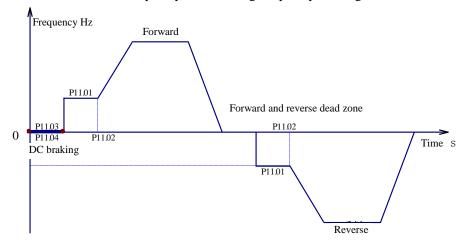


Figure 7-6 Schematic of start mode for DC braking

2: Speed tracking start

The inverter is able to identify the rotating speed of the motor, and execute direct tracking start

from the identified frequency. During starting, current and voltage shall be smooth, free from shock.

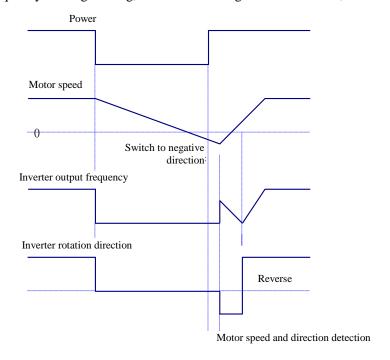


Figure 7-7 Schematic of speed tracking start mode

Function code	Function name	Setting range	Factory default
P11.01	Start holding frequency (Hz)	0.00~30.00	0.00
P11.02	Starting frequency holding time(s)	0.00~3600.00	0.00

Starting frequency is the initial frequency when the inverter starts, shown as fs in the figure. Starting frequency holding time is the time to keep running under starting frequency of the inverter during its starting, shown as the figure. The inverter won't work when frequency command is below the starting holding frequency.

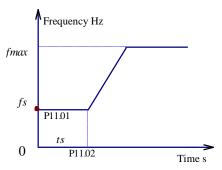


Figure 7-8 Schematic of starting frequency and starting time

The inverter begins to run from starting frequency P11.01, then accelerate at the set acceleration time after starting frequency holding time P11.02.

Note: for the applications with heavy load starting, it is advantageous to properly set starting frequency holding time. Under encoder speed feedback vector control, factory default of the starting frequency is 0.00Hz, while others are set as 0.05Hz.

Function code	Function name	Setting range	Factory default
P11.01	Start DC injection current (%)	0.00~120.00	30.00
P11.02	Start DC injection time (s)	0.0~99.9	5.0

P11.03 and P11.04 are valid only when "DC braking first, then starting mode (P11.00=1)" is chosen in start running mode, shown as the following figure:

Setting of start DC braking current (P11.03) is percentage to the inverter rated current, if the DC braking current set is greater than 120% rated motor current, then the current injected will be 120% motor rated current. Heavy load: $0.0 \sim 120.0\%$; light load: $0.0 \sim 90.0\%$.

Note: it applies to motor open control in lifting industry. Motor open conditions are met only when the current to start forward rotation of the motor is greater than P11.03 current value.

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

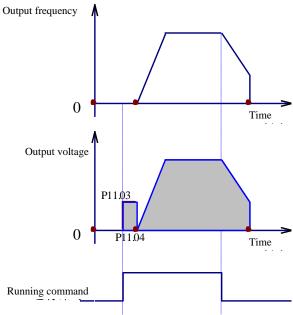


Figure 7-9 DC braking schematic

Function code	Function name	Setting range	Factory default
P11.05	Excitation time (s)	0.0~99.9	0.3

Excitation time means the time to set up the flux in advance before the motor is started, with the purpose of reaching quick response when the motor starts. When there is running command, firstly enter the pre-excitation status according to the time set by this function code. After magnetic flux is set up, enter the normal accelerated operation. If the function code is set as 0, indicating no exciting process required. Excitation time default parameter is set as 0 under VF control, modifiable. Other control defaults are 0.3, modifiable.

Note: the motor may rotate during pre-exciting, at this time, please apply mechanical braking.

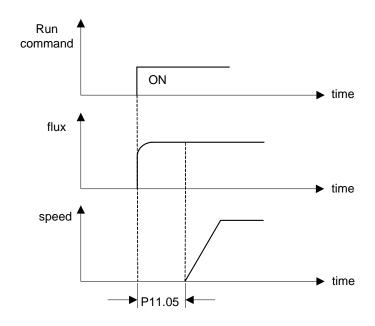


Figure 7-10 Pre-excitation schematic

Function code	Function name	Setting range	Factory default
P11.06	Zero servo time (s)	0.00~99.9	0.0
P11.07	Brake actuation time (s)	0.0~99.99	0.20

Brake actuation time is the time from the outer brake receiving open command to being fully opened. The brake enters zero servo time, namely zero speed holding time.

Function code	Function name	Setting range	Factory default
P11.08	Tracking delay time (ms)	0~65535	1000

The time is used to wait the motor to demagnetize. If overcurrent appears at beginning of tracking, then it will be increased.

Function code	Function name	Setting range	Factory default
P11.09	Track zero voltage time (ms)	0~65535	100

Enter tracking waiting time.

Function code	Function name	Setting range	Factory default
P11.10	Tracking voltage Kp	0~65535	0.20

Kp during tracking. If it is too small, tracking process will be longer, otherwise overcurrent may be caused during tracking.

Function code	Function name	Setting range	Factory default
P11.11	Tracking voltage Ki	0~6553.5	0.30

Ki during tracking. If it is too small, tracking process will be longer, otherwise overcurrent may be caused during tracking.

Function code	Function name	Setting range	Factory default
P11.12	Tracking voltage Kd	0~6553.5	0.00

Kd during tracking. If it is too small, overshoot current won't be controlled obviously during tracking, otherwise, if it is too large, overcurrent may be caused during tracking.

Function code	Function name	Setting range	Factory default
P11.13	Tracking exit delay (ms)	1000~65535	1000

Ensure to exit from tracking process steadily. Its increase is helpful to exit steadily.

Function code	Function name	Setting range	Factory default
P11.14	Maximum current during tracking (%)	0.0~200.0	100.0

Percentage of the motor rated current. When small inverter is used to drive large motor, ensure the maximum current during tracking is less than the inverter rated current. If overcurrent appears during tracking, it should be reduced.

Function code	Function name	Setting range	Factory default
P11.15	Tracking frequency change gain (%	0.0~100.0	10.0

If overvoltage or P60.09 greater than 600V appears during tracking, this value shall be decreased.

Function code	Function name	Setting range	Factory default
P11.16	Maximum voltage during tracking (V)	0~65535	0

This parameter is only for reading, to monitor the maximum bus voltage during tracking.

Function code	Function name	Setting range	Factory default
P11.17	Initial tracking frequency (Hz)	0.00~100.00	50.00

It is set as the maximum running frequency before tracking. If inertia parking speed of the system drops speedily, this value may be decreased properly.

Function code	Function name	Setting range	Factory default
P11.18	Maximum current during tracking (A)	0.0~6553.5	0.0

This parameter is only for reading, to monitor the maximum effective current value during tracking.

Function code	Function name	Setting range	Factory default
P11.19	Reverse opening current (%)	0.00~1000.00	20.00

It applies to the motor open control in lifting industry. Open conditions will be met only when the current to start reverse is greater than P11.19.

7.4.3 Group P12 Parking Control Parameters

Function code	Function name	Setting range	Factory default
P12.00	Parking mode	0~4	0

Different parking modes will be adopted according to different applications.

- 0: inverter output lockout, free parking for the motor
- 1: slow down and stop as the set deceleration time
- 2: slow down and stop as the set DC braking. When the frequency is less than DC braking starting frequency P12.03, inject DC braking current P12.04. DC braking time is determined by P12.05.
- 3: slow down and stop as the set deceleration time. Excitation is kept on the motor after stop, to fast respond to starting when running command is received.

4: Slow down and stop as the set deceleration time. Maintain the current torque at zero speed, then stop after P12.6 lasted.

Function code	Function name	Setting range	Factory default
P12.01	Parking holding frequency (Hz)	0.00~300.00	0.00
P12.02	Parking frequency holding time (s)	0.1~99.9	0.0

The inverter decelerates to parking frequency P12.01 from its normal running speed, then slow down to zero as the set deceleration time after parking frequency holding time P12.02, which is advantageous to stop smoothly.

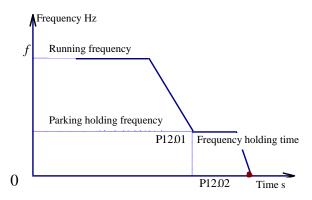


Figure 7-11 Parking holding frequency schematic

Function code	Function name	Setting range	Factory default
P12.03	DC braking starting frequency (Hz)	0.00~10.00	2.50
P12.04	Parking DC braking current (%)	0.00~100.00	50.0
P12.05	Parking DC braking time (s)	0.0~10.0	0.5

P12.03~P12.05 are valid only when stop mode selects "deceleration + DC braking (P12.00=2)".

Setting of parking DC braking current (P12.03) is percentage to the inverter rated current, if DC braking current set exceeds 120% motor rated current, then the injected current will be 120% motor rated current. Heavy load: $0.0 \sim 120.0\%$; light load: $0.0 \sim 90.0\%$.

Start current braking time (P12.04) is the injected actuation time. When P12.04=0, no DC braking process is provided.

When P12.00=2, P12.03 can be set as braking starting frequency, to apply fast braking.

P12.03 sets DC braking current, which is percentage to the inverter rated current.

Variable torque load: 0.0 ~ 90.0%.

P12.04 sets the actuation time for DC braking.

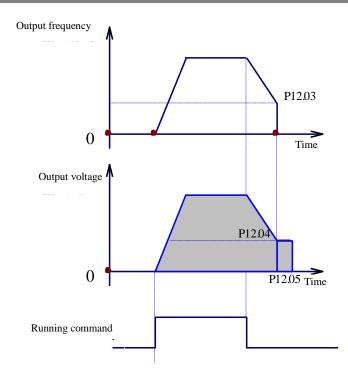


Figure 7-12 Parking DC braking schematic

Function code	Function name	Setting range	Factory default
P12.06	Stop excitation holding time (s)	0~65535	0

Parking mode adopts "deceleration + excitation/torque holding", the inverter stops after excitation/torque holding time is greater than P12.06.

7.4.4 Group P13 Braking Function V/F Control Parameters

Function code	Function name	Setting range	Factory default
P13.00	Dynamic braking selection	0~1	1
P13.01	Braking turning-on voltage	620~750	660
P13.02	Braking unit service time	0.0~300.0	60.0

P13.00 dynamic braking selection reflects whether the inverter applies dynamic braking.

- 0: Open dynamic braking function.
- 1: Dynamic braking function not used.

For the applications with big rotational inertia and fast braking & stop, braking unit and braking resistor matched to them may be selected, also braking parameters will be set to realize fast braking and stop.

P13.02 braking unit service time, P13.01 braking turning-on voltage are valid to the inverter provided with built-in braking unit only.

Braking unit actuation service time can be set, generally 100s.

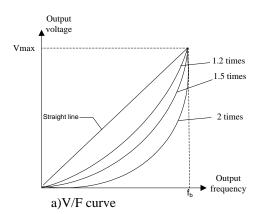
Regulate P13.01 to select the action voltage of braking unit, to realize fast dynamic braking and stop.

Note: set P13.00 as 1 if built-in braking unit is applied, refer to 1.9 "Braking resistor selection" for its components type.

7.4.5 Group P14 V/F control Parameters

Function code	Function name	Setting range	Factory default
P14.00	V/F curve given	0~4	0
P14.01	V/F voltage value V0 (V)	0.0~460.0	76.0
P14.02	V/F frequency value F0 (Hz)	0.00~300.00	10.00
P14.03	V/F voltage value V1 (V)	0.0~460.0	152.0
P14.04	V/F frequency value F1 (Hz)	0.00~300.00	20.00
P14.05	V/F voltage value V2 (V)	0.0~460.0	228.0
P14.06	V/F frequency value F2 (Hz)	0.00~300.00	30.00
P14.07	V/F voltage value V3 (V)	0.0~460.0	304.0
P14.08	V/F frequency value F3 (Hz)	0.00~300.00	40.00
P14.09	V/F voltage value V4(V)	0.0~460.0	380.0
P14.10	V/F frequency value F4 (Hz)	0.00~300.00	50.00

Parameter P14.00 is used to determine the different V/F curves under voltage vector V/F control running mode (P10.00=0).



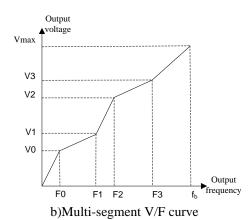


Figure 7-13 VF curve schematic

P14.00=0 applies to the constant torque load, sharing a linear relationship of factor 1 between V and F. Refer to the straight line in figure for details.

P14.00=4 user-defined curve, which applies to the sectional constant torque load, shown as the figure.

In Figure 7-12: F0<F1<F2<F3<F4≤fb, fb is the basic running frequency P40.01.

 $V0 \le V1 \le V2 \le V3 < V4 \le V$ max, V0, V1, V2, V3 and V4 are the actual output voltage relative to the maximum output voltage and rated frequency ($V1 = (Vmax/fb)^*$ F1 default Vmax = 380V, fb = 50Hz).

P14.00= $1\sim3$ applies to the variable torque load in fan and water pump. P14.00 is set as $1\sim3$, corresponding to 1.2-power curve, 1.5-power curve and second power curve respectively, shown as Figure 7-12. Of which, second power curve applies to water supply, while the rest applies to other medium liquid load. Choose the proper curve according to the actual conditions.

7.5 Group P2X Motor Parameter Groups

7.5.1 Group P20 Basic Motor Parameters

Function code	Function name	Setting range	Factory default
P20.00	Motor 1 type	0~1	0
P20.01	Motor 1 rated power (kW)	0.4~400.0	
P20.02	Motor 1 rated current (A)	0.1~999.9	
P20.03	Motor 1 rated frequency (Hz)	0~300	50
P20.04	Motor 1 rated speed (rpm)	0~30000	1460
P20.05	Motor 1 rated voltage (V)	0~460	380
P20.06	Motor 1 poles	2~128	4
P20.07	Motor 1 rated slip frequency (Hz)	0.10~655.35	1.40

P20.00 motor type: 0: asynchronous motor 1: synchronous motor

P20.01 ~ P20.07 and P20.11 are used to set motor parameters driven by the inverter. Correctly set the parameters according to the motor nameplate prior to use.

P20.06 is used to set motor poles based on the nameplate. If no motor poles parameter is provided on the nameplate, you can calculate it according to the following formula:

Poles = $(120 \times f) \div n$.

Where: n is rated speed and f is rated frequency.

For the calculated value, the even integer will be the poles.

Note: the inverter power grade shall be matched with the motor.

P20.07 is used to set the slip frequency.

If no slip frequency data is provided on the motor nameplate, you can calculate P20.07 with the following formula:

Set rated frequency as f (P20.03), rated speed as n (P20.04) and motor poles as p (P20.06),

then: slip frequency=f-((n ×p) \div 120).

For example: rated frequency 50Hz, rated speed 1430rpm and motor poles 4,

Then $P20.07 = 50 - ((1430 \times 4) \div 120) = 2.33 \text{Hz}.$

Function code	Function name	Setting range	Factory default
P20.08	Motor 1 maximum slip frequency (Hz)	0.1~655.35	2.80
P20.09	Motor 1 phase sequence	0~1	1
P20.10	Motor 1 no-load current coefficient (%)	0~60.0	30.00

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

P20.09 sets the motor rotation direction, 0 is negative phase sequence rotation, while 1 is positive phase sequence rotation.

P20.10 sets the motor no-load current coefficient, about 30% typically.

Function code	Function name	Setting range	Factory default
P20.11	Motor 1 rated torque	0.1~6553.5	450.0
P20.12	Motor 1 maximum power factor (%)	100~300	200

P20.12 The maximum motor power factor means the maximum torque to limit the current permissible output of the inverter under closed loop vector control mode. When the current actual output power of the inverter is below the power set in P20.12, the maximum torque permitted to output by the inverter will be P70.04 output torque limit value; otherwise the maximum torque output by the inverter will be reduced gradually, with maintain power not greater than P20.12.

Function code	Function name	Setting range	Factory default
P20.13	Motor 1 maximum frequency (Hz)	0~300	50

P20.01 ~ P20.07 and P20.11 are used to set motor parameters driven by the inverter. Correctly set the parameters according to the motor nameplate prior to use.

Function code	Function name	Setting range	Factory default
P20.14	Motor 2 type	0~1	0
P20.15	Motor 2 rated power (kW)	0.4~400.0	
P20.16	Motor 2 rated current (A)	0.1~999.9	
P20.17	Motor 2 rated frequency (Hz)	0~300	50
P20.18	Motor 2 rated speed (rpm)	0~30000	1460
P20.19	Motor 2 rated voltage (V)	0~460	380
P20.20	Motor 2 poles	2~128	4
P20.21	Motor 2 rated slip frequency (Hz)	0.10~655.35	1.40
P20.22	Motor 2 maximum slip frequency (Hz)	0.10~655.35	2.80
P20.23	Motor 2 phase sequence	0~1	1
P20.24	Motor 2 no-load current coefficient (%)	1.00~60.00	30.00
P20.25	Motor 2 maximum power factor (%)	50~400	250
P20.26	Motor 2 maximum frequency (Hz)	0~300	50

P20.14 ~ P20.26 set motor 2, according to the parameters specification of motor 1.

7.5.2 Group P21 Advanced Motor Parameters

Function code	Function name	Setting range	Factory default
P21.00	Motor turning	0~6	0

P21.00 motor tuning

- 0: normal running
- 1: encoder static self-learning
- 2: encoder self-learning correction
- 3: encoder self-learning ends
- 4: motor static self-learning
- 5: motor dynamic self-learning
- 6: motor static advanced self-learning
- 7: encoder dynamic self-learning

Function code	Function name	Setting range	Factory default
P21.01	Motor 1 stator resistance (Ω)	0.000~65.000	0.072
P21.02	Motor 1 rotor resistance (Ω)	0.000~65.000	0.054

P21.03	Motor 1 stator inductance (H)	0.0000~6.0000	0.0221
P21.04	Motor 1 rotor inductance (H)	0.0000~6.0000	0.0221
P21.05	Mutual inductance 1 (H)	0.0000~6.0000	0.0210

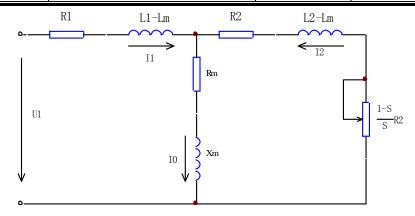


Figure 7-14 Circuit diagram of asynchronous motor steady state equivalent

R₁, R₂, L₁, L₂, L_m and I₀ in the figure respectively stand for: stator resistance, stator inductance, rotor resistance, rotor inductance, mutual inductance and excitation current. Excitation current may be calculated by the rated current and power factor of the motor, also may be measured by rotation self-tuning.

Relationship between rated torque current, excitation current and the motor rated current:

Rated torque current= power factor × motor rated current

No-load excitation current= $\sqrt{(1\text{-power factor}2)}$ x motor rated current x motor efficiency, generally the motor efficiency is 85%.

As the internal characteristic parameters, P21.01, P21.02, P21.03, P21.04 and P21.05 are only valid to the asynchronous motor, and will be automatically obtained by the self-learning operation of the inverter to the motor.

The key motor parameters affecting the inverter running control could be determined through parameter self-tuning, which will be saved in the inverter automatically after parameter self-tuning is completed, until the next parameter input or parameter self-tuning again.

Parameter self-tuning process is shown as:

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

Select the mode to execute parameter self-tuning (see start menu selection):

Function code	Function name Setting ran		Factory default
P21.06	Motor 2 stator resistance (Ω) 0.000~65.		0.072
P21.07	Motor 2 rotor resistance (Ω) 0.000~65.000		0.054
P21.08	Motor 2 stator inductance (H) 0.0000~6.000		0.0221
P21.09	Motor 2 rotor inductance (H)	0.0000~6.0000	0.0221
P21.10	Mutual inductance 2 (H) 0.0000~6.0000		0.0210

Tuning of motor 2 parameters is the same as motor 1.

7.5.3 Group P22 Motor Auxiliary Parameters

Function code	Function name	Setting range	Factory default
P22.00	Rotational inertia (kgm^2)	0~	20

P22.00 sets the motor rotational inertia, whose initial value can be calculated according to mechanical inertia, with fine adjusting in actual running.

Function code	Function name	Setting range	Factory default
P22.01	Encoder 1 type	0~3	0
P22.02	Encoder 1 pulses	500~16000	1024
P22.03	Encoder 1 frequency division factor	0~7	0
P22.04	Encoder 1 position angle	0~360	0
P22.05	Encoder 1 feedback speed filtering time (ms)	0~1000	0
P22.06	Encoder 1 direction	0~1	1
P22.07	SinCos encoder subdivision coefficient	7、9、11	11
P22.08	Resolver encoder 1 poles	2~128	2

Select the encoder 1 type, pulses per turn, frequency division factor etc. in this group. Position angle is read from self-learning, non-settable. Filtering time is adjusted within the controllable range. Set P22.06 for the encoder according to actual conditions or change the hardware wire.

P22.01 sets the encoder type, 0: incremental; 1: SinCos; 2: EnDat; 3: Resolver

P22.02 sets the encoder pulses

P22.03 is frequency division coefficient, 0~7 are corresponding to 1~128 frequency division.

P22.05 the encoder feedback filtering time is 0 when P10.00=3, and it is 5ms under other control modes, both modifiable.

P22.06 selects the encoder feedback direction, the default value is 1, no modification typically. But if the encoder wiring error is found, causing that feedback direction is opposite to the actual direction, it may be adjusted by modifying P22.06.

P22.07 sets SinCos encoder subdivision coefficient, and regulate it according to actual conditions.

Function code	Function name	Setting range	Factory default
P22.09	Encoder 2 type	0~3	0
P22.10	Encoder 2 pulses	500~16000	1024
P22.11	Encoder 2 position angle	0~360	0
P22.12	Encoder 2 direction	0~1	1
P22.13	Resolver encoder 2 poles	2~128	2

Select the encoder 2 type, pulses per turn, frequency division factor etc. in this group. Position angle is read from self-learning, non-settable. Filtering time is adjusted within the controllable range. Select P22.12 for the encoder according to actual conditions or change the hardware wire.

P22.12 selects the encoder feedback direction, the default value is 1, no modification typically. But if the encoder wiring error is found, causing that feedback direction is opposite to the actual direction, it may be adjusted by modifying P22.06.

7.5.4 Group P23 Motor Protection Parameters

Function code	Function name	Setting range	Factory default
P23.00	Motor overheat protection selection	0~2	0
P23.01	Motor sensor protection threshold value (V)	0.00~10.00	5.00
P23.02	Motor overcurrent protection time (s)	0.5~300.0	60.0

P23.00 motor overheat protection selection:

0: no protection

1: input via analog A0

2: input via analog A1

P23.01 is the set protection threshold value and P23.02 is the set overcurrent protection time.

Function code	Function name	Setting range	Factory default
P23.03	Motor low speed overcurrent threshold value (%)	0.00~150.00	150.00
P23.04	Motor low speed overcurrent time (s)	0.1~120.0	60.0
P23.05	Motor high speed overcurrent threshold value (%)	0.00~150.00	120.00
P23.06	Motor high speed overcurrent time (s)	0.1~60.0	30.0

 $P23.03 \sim P23.06$ set the motor speed and overcurrent threshold value, with overspeed set within 20%. Overcurrent rate and time are inversely proportional function, the higher the overcurrent peak, the shorter the set time. These parameters can be set after the motor report. Separate the high speed and low speed as 20%.

7.6 Group P3X Terminal Parameter Groups

7.6.1 Group P30 Digital Input Parameters

Function code	Function name	Setting range	Factory default
P30.00	Terminal X0 input function selection	0~63	7
P30.01	Terminal X1 input function selection	0~63	8
P30.02	Terminal X2 input function selection	0~63	0
P30.03	Terminal X3 input function selection	0~63	0
P30.04	Terminal X4 input function selection	0~63	8
P30.05	Terminal X5 input function selection	0~63	0
P30.06	Terminal X6 input function selection	0~63	0

Definition list of function input terminals:

No.	Function definition	No.	Function definition
0	No-function	1	Acceleration and deceleration time selection 0
2	Acceleration and deceleration time selection 1	3	Digital speed 0
4	Digital speed 1	5	Digital speed 2
6	Digital speed 3	7	Forward (FWD)

8	Reverse (REV)	9	3-wire running control
	` '		- J
10	Spare	11	Spare
12	Spare	13	External reset terminal
14	External fault terminal	15	External self-learning input terminal
16	Emergency power supply running	17	Weighing compensation input
18	Base lockout	19	Light load switch input
20	Heavy load switch input	21	Output contactor detection
22	Brake contactor detection	23	Brake switch detection
24	Motor selection	25	Encoder selection
26	Function parameter 0 (spare)	27	Function parameter 1 (spare)
28	Pulse frequency DI0 input (spare)	29	Pulse frequency DI1 input (spare)
30	Speed/torque switching	31	Frequency increase (no hold)
32	Frequency decrease (no hold)	33	Emergency stop signal
34	FWD deceleration input	35	REV deceleration input
36	FWD stop input	37	REV stop input
38	Frequency increase (no hold)	39	Frequency decrease (no hold)
40	Inching frequency selection	41	Command switching to operation panel
42	Command switching to terminal	43	Command switching to upper computer
44	Open loop main and auxiliary given switching	45	PID main given switching to internal
46	PID main given switching to analog A0	47	auxiliary given switching to invalid
48	PID auxiliary given switching to analog A0	49	FJOG command
50	RJOG command	51	PID main given switching to analog A1
52	PID auxiliary given switching to analog A1	53	Speed given mode selection
Others	Spare		

Meaning of the function code:

0: no-function

1: acceleration and deceleration time terminal 0

2: acceleration and deceleration time terminal 1

Refer to the following table for the usage.

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

- 3: digital speed 0
- 4: digital speed 1
- 5: digital speed 2
- 6: digital speed 3

See P41.00 \sim P41.15 for the usage.

- 7: terminal forward input (FWD)
- 8: terminal reverse input (REV)
- 9: 3-wire running control

They are valid only in terminal running command given mode (P10.02=1). See P10.01 for the usage.

10: spare

11: spare

12: spare

See P51.14 ~ P51.21 for the usage.

13: external reset terminal

Valid external reset terminal signal, the external signal could reset the fault of the inverter

14: external fault terminal

Valid external fault terminal signal, the inverter stops running.

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

External input signal controls self-learning start

16: emergency power supply running

Indicate the inverter under the external emergency conditions

17: weighing compensation input

Weighting compensation command input set by the user in specific applications

18: base lockout

Effectively prohibit the inverter output

19: light load switch input

20: heavy load switch input

These two functions are used in elevator industry. Comparing the actual load weight with the balance weight, if the former is less than the latter, indicating light load; otherwise heavy load.

21: output contactor feedback

It is used with output function 17 typically, to control the inverter output contactor, so as to confirm closing status of the contactor before current is output from the inverter, and timely cut off the inverter output meanwhile the contactor is tripping.

22: brake contactor feedback

It is used with output function 18 typically, to judge whether output contactor of the brake closes.

23: brake limit feedback

It is used with output function 18 typically, to judge whether the brake opens.

24: motor selection

Refer to the following table for its usage:

Motor selection	Motor parameter group selection
OFF	Motor 1 parameter group
ON	Motor 2 parameter group

25: encoder selection

Encoder selection	Encoder parameter group selection
OFF	Encoder 1 parameter group
ON	Encoder 2 parameter group

26: function parameter 0: spare

27: function parameter 1: spare

28: pulse input 0: spare

29: pulse input 1: spare

30: speed/torque mode switching

Valid input signal, the inverter control mode is switched to torque mode from speed mode.

31: frequency increase (no hold)

When the signal is valid, target frequency continues to increase, until reaching the amplitude limit; otherwise the current frequency will be kept. Stop and outage frequency is 0.

32: frequency decrease (no hold)

When the signal is valid, target frequency continues to decrease, until 0; while the signal is invalid, keep the current frequency. Stop and outage frequency is 0.

33: emergency stop (snag signal)

Valid under closed loop vector control, speed regulator given 0, which makes the inverter fast stop in the maximum reverse torque.

34: forward deceleration

Valid under the forward running conditions, target frequency 0Hz, the inverter decelerates to 0Hz.

35: reverse deceleration

Valid under the reverse running conditions, target frequency 0Hz, the inverter decelerates to 0Hz.

36: forward stop

Valid under the forward running conditions, the inverter stops.

37: reverse stop

Valid under the reverse running conditions, the inverter stops.

38: frequency increase (hold)

When the signal is valid, target frequency continues to increase, until the amplitude limit; when the signal is invalid, keep the current frequency, the same to stop and outage.

39: frequency decrease (hold)

When the signal is valid, target frequency continues to decrease, until 0; when the signal is invalid, keep the current frequency, the same to stop and outage.

40: inching frequency selection

This signal is valid under multi-speed running conditions, target frequency is inching frequency.

41: command switching to operation panel

Valid in stop status, command channel switching to panel given.

42: command switching to terminal

Valid in stop status, command channel switching to panel given.

43: command switching to Modbus communication

Valid in stop status, command channel switching to Modbus given.

44: open loop main and auxiliary given switching

Valid signal, speed channel source switches to open loop auxiliary given, namely P10.03 speed channel selection switches to P50.00 given mode.

45: valid signal if PID main given switches to internal, process closed loop control main given channel switches to digital internal given, otherwise no switching.

46: valid signal if PID main given switches to analog A0, process closed loop control main given

channel switches to A0, otherwise no switching.

- 47: valid signal if PID auxiliary given switches to invalid, process closed loop control auxiliary given channel switches to invalid, otherwise no switching.
- 48: valid signal if PID auxiliary given switches to analog A0, process closed loop control auxiliary given channel switches to A0, otherwise no switching.
- 49: FJOG command. Valid signal for inching forward command, forward running takes inching frequency as target frequency. The inverter will stop if the signal is invalid.
- 50: FJOG command. Valid signal for inching reverse command, reverse running takes inching frequency as target frequency. The inverter will stop if the signal is invalid.

Inching running shares the highest priority.

- 51: Valid signal when PID main given switches to analog A1, process closed loop control main given channel switches to A1, otherwise no switching.
- 52: Valid signal when PID auxiliary given switches to analog A1, process closed loop control auxiliary given channel switches to A1, otherwise no switching.
- 53: speed given mode selection

Refer to the following table for its usage:

Speed given mode selection	Speed given mode
OFF	P10.03 speed given mode 1
ON	P10.07 speed given mode 2

Function code	Function name	Setting range	Factory default
P30.07	P1-P2 terminal input function selection	0~63	0

PTC over temperature protection input terminal: default high level, which is reduced with over temperature signal

Function code	Function name	Setting range	Factory default
P30.00	Filtering times of terminals X0~X7 (times)	0~100	5

Improve the anti-interfance ability of terminals by properly increasing P30.08. The longer their filering times, the longer the delay times of their actions.

7.6.2 Group P31 Digital Output Parameters

Function code	Function name	Setting range	Factory default
P31.00	Output K1 function definition	0~63	2
P31.01	Output K2 function definition	0~63	25
P31.02	Output K3 function definition	0~63	0
P31.03	Output K4 function definition	0~63	0
P31.04	Output K5 function definition	0~63	0
P31.05	Output K6 function definition	0~63	0

 $Y0 \sim Y1$ terminal output can be defined as multifunctional digital output, also as high speed pulse output (function 19 and 20), K1 \sim K4 relay output also may be defined as multifunctional output, but not as pulse input.

Function definition list of multifunctional digital output:

Function set	Meaning	Function set	Meaning
0	No-function	1	RDY
2	Inverter fault	3	Running signal (RUN)
4	Frequency arrive signal (FAR)	5	Consistent frequency and speed (FDT)
6	Inverter running at zero speed	7	DC bus voltage not less than 80% rated voltage
8	More than 5% rated current during running, while 10% when it stops	9	In self-tuning
10	Speed detection 1	11	Speed detection 2
12	Output 1 for fault forecast, normal output 0	13	Self-tuning request (synchronous motor)
14	Zero servo torque direction output	15	Zero current detected
16	Generating and motoring status identification	17	Output contactor closing
18	Brake release	19	Pulse output DO0
20	Pulse output DO1	21	Radiator overheat alarm
22	Motor overheating alarm	23	Motor selection output
24	Encoder selection output	25	Brake output
26	Accumulated running time arrive	27	Single running time arrive
28	Output X1	29	Output X2
30	Stop undervoltage lockout	31	Fan control
32	Analog input disconnection	33	PTC alarm
34	In reverse		

Note 1: setting of P31.00 \sim P31.05 defines the functions of such 6 output ports as K1 \sim K2 and Y0 \sim Y3, whose range of value set and functions of the corresponding output port set for each value are shown as the following:

0: no-function

1 or 101: ready (RDY)

- 1: Normal self-check and no trouble, the related output point connected, otherwise disconnected;
- 101: Normal self-check and no trouble, the related output point disconnected, otherwise connected;
 - 2 or 102: inverter fault
- 2: The inverter is in fault shutdown status, the related output point connected, otherwise disconnected;
- 102: The inverter is in fault shutdown status, the related output point disconnected, otherwise connected;
 - 3 or 103: inverter running signal (RUN)
- 3: When the inverter is able to run normally responding to running command, the related output point connected, otherwise disconnected;
 - 103: When the inverter is able to run normally responding to running command, the related

output point disconnected, otherwise connected;

6 or 106: In zero speed running

6: When output frequency is 0 during running, the related output point connected, otherwise disconnected;

106: When output frequency is 0 during running, the related output point disconnected, otherwise connected;

7 or 107: DC bus voltage not less than 85% rated value

7: When the inverter bus voltage isn't less than 85% rated value, the related output point connected, otherwise disconnected;

107: When the inverter bus voltage isn't less than 85% rated value, the related output point disconnected, otherwise connected;

8 or 108: more than 5% rated current during running, while 10% rated current during stop

8: if the above conditions are met, the related output point connected, otherwise disconnected;

108: if the above conditions are met, the related output point disconnected, otherwise connected;

9 or 109: in self-tuning

9: when the inverter is in self-tuning status, the related output point connected, otherwise disconnected;

109: when the inverter is in self-tuning status, the related output point disconnected, otherwise connected;

10 or 110: frequency detection 1

When the inverter output frequency reaches or exceeds any frequency detection (P31.22) plus frequency detection width (P31.23), frequency detection 1 is triggered; after the related output point takes action and the inverter frequency drops to any frequency detection (P31.22) again, frequency detection 1 resets.

10: when frequency detection 1 takes action, the related output point disconnected;

110: when frequency detection 1 takes action, the related output point connected;

11 or 111: frequency detection 2

When the inverter output frequency reaches or exceeds any frequency detection (P31.22), frequency detection 2 is triggered; after the inverter frequency drops to any frequency detection (P31.22) again minus frequency detection width (31.23), frequency detection 2 resets.

11: when frequency detection 2 takes action, the related output point connected;

111: when frequency detection 2 takes action, the related output point disconnected;

12 or 112: fault forecast

12: during fault forecast, the related output point connected, otherwise disconnected;

112: during fault forecast, the related output point disconnected, otherwise connected;

13 or 113: inverter alarm

13: when the inverter is in alarm status but not fault shutdown, the related output point connected, otherwise disconnected;

113: when the inverter is in alarm status but not fault shutdown, the related output point disconnected, otherwise connected;

14 or 114: zero servo torque direction judge (for the outage emergency leveling of the motor)

14: When the inverter measures heavy load and light counterweight, the related output point connected, otherwise disconnected;

Parameter Details

114: When the inverter measures heavy load and light counterweight, the related output point disconnected, otherwise connected;

15 or 115: zero current detection

15: when output current exceeds zero current detection threshold (P31.20) during stop, the related output point connected, otherwise disconnected;

115: when output current exceeds zero current detection threshold (P31.20) during stop, the related output point disconnected, otherwise connected;

16: generating and motoring status identification 0: motoring; 1: generating

116: generating and motoring status identification 0: generating; 1: motoring

17: output contactor closing the contactor closes for output 1

It is used with function 21, to control the contactor to close before the inverter outputs any current

117: output contactor closing the contactor closes for output 0

18: brake release open the brake for output 1

It is used with functions 22 and 23, to control the external brake to open at the right time, and confirm the feedback point

118: brake release open the brake for output 0

19: pulse DO0 output (spare)

119: pulse DO0 output opposite to 19 level direction (spare)

20: pulse DO1 output (spare)

120: pulse DO1 output opposite to 20 level direction (spare)

21 or 121: greater than 90°C, overheat alarm

If the radiator temperature $\geq 80^{\circ}$ C, the related output point connected, otherwise disconnected.

22: motor overheat alarm output

23: motor switching output

Motor selection output, the related output point disconnected: motor 1, the related output point connected: motor 2

24: encoder switching output

Encoder selection output, the related output point disconnected: encoder 1;

Related output point connected: encoder 2

25: hoisting brake output

Brake opens, output point connected; brake closes, output point disconnected.

26: accumulated running time arrive

Accumulated running time of the inverter exceeds the time set in P31.25, output terminal connected, other disconnected;

27: set continuous running time arrive

Single continuous running time of the inverter exceeds the time set in P31.24, output terminal connected, other disconnected;

28: output X1

Output the level status of input terminal X1 via output terminal

29: output X2

Output the level status of input terminal X2 via output terminal

30: Under-voltage block stop, system under-voltage, effective level output of the output terminal

- 31: Fan control, the inverter is in running or overheating, the output terminal connected, otherwise disconnected after a minute delay
 - 32: Analog input disconnection
 - 33: PTC alarm

0~10V input type of analog A0 and A1 channel connects to motor PTC signal, P32.01 and P32.07 are set as 6, P32.04 and P32.10 filtering time is set as 2000ms, protection threshold P23.01, if motor PTC signal is greater than P23.01 and lasted for 2s, 52# fault will be sent.

34: in reverse

Note: "connected" above mentioned means: for the relay output, the normally open contacts (1B and 1C, 2B and 2C) connected, while the normally closed contacts (1B and 1A, 2B and 2A) disconnected; for the collector open circuit output, it means the output point is in low level status. Similarly, "not connected" above mentioned means: for the relay output, the normally open contacts (1B and 1C, 2B and 2C) disconnected, while the normally closed contacts (1B and 1A, 2B and 2A) connected; for the collector open circuit output, it means the output point is in high resistance status.

Note 2: P31.04=3 for default set, appointing port Y0 as running signal (RUN) output port; P31.05=2, appointing port Y1 as the inverter fault signal output port.

Note 3: running (RUN) signal given

When the inverter receives up/down direction command signal and no base lockout is provided, running signal (RUN) only can be given.

Note 4: time sequence of fault signal

Output the fault signal when the inverter has any fault. At the same time, running signal is cleared. Fault signal is latched, which will be eliminated via the external input reset signal, reset operation of the Operator, or outage, or delay time internally set.

Time sequence of fault signal is shown as Figure 7-15.



Figure 7-15 Time sequence of fault signal

Function code	Function name	Setting range	Factory default
P31.06	Output K1 action delay (s)	0.0~60.0	0.0
P31.07	Output K1 reset delay (s)	0.0~60.0	0.0
P31.08	Output K2 action delay (s)	0.0~60.0	0.0
P31.09	Output K2 reset delay (s)	0.0~60.0	0.0
P31.10	Output K3 action delay (s)	0.0~60.0	0.0
P31.11	Output K3 reset delay (s)	0.0~60.0	0.0
P31.12	Output K4 action delay (s)	0.0~60.0	0.0
P31.13	Output K4 reset delay (s)	0.0~60.0	0.0
P31.14	Output Y0 action delay (s)	0.0~60.0	0.0
P31.15	Output Y0 reset delay (s)	0.0~60.0	0.0
P31.16	Output Y1 action delay (s)	0.0~60.0	0.0
P31.17	Output Y1 reset delay (s)	0.0~60.0	0.0

Setting of signal output delay and reset delay at output end

 $P31.06 \sim P31.17$ are time constant to set action delay and reset delay for such 6 signals as K1 \sim K4 and Y0 \sim Y1 at output end. By these parameters, delay time of the actual signal corresponding to output status at each output end can be set as required. And delay time will be set respectively for delay of the above output status whether in signal triggering or signal reset.

Function code	Function name	Setting range	Factory default
P31.20	Zero current detection threshold (%)	0.0~50.0	4.0

Zero current detection threshold of the inverter

This function is used for load change detection, set output terminal function as "15: zero current detected", and output the indicator signal after the inverter output current is below zero current detection width P31.20.

When the inverter current exceeds the threshold during stop, the related output end set by function code 15 (or 115) takes action.

Note: the function parameter is percentage of the inverter output current to the motor rated current.

Function code	Function name	Setting range	Factory default
P31.21	Frequency consistence detection width (Hz)	0.00~300.00	1.00
P31.22	Any frequency detection speed (Hz)	0.00~300.00	1.00
P31.23	Any frequency detection width (Hz)	0.00~300.00	0.20

P31.21 This function is used for deviation detection between output frequency and set frequency, set output terminal function as "4: frequency arrive signal", when the deviation between the inverter output frequency and set frequency is in the set range of the function code, outputs the indicator signal, shown as the figure, frequency arrive signal FAR.

Yi represents terminals Y0-Y1 or relay terminals K1-K4.

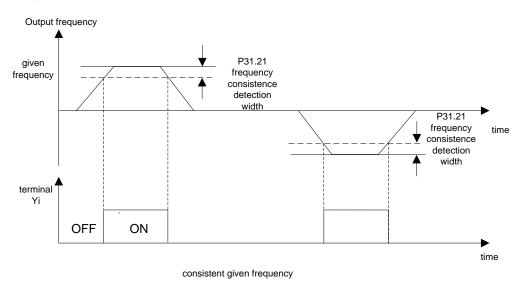


Figure 7-16 Frequency consistence detection 1

P31.22 and P31.23 are two parameters for any frequency detection: any frequency detection width and any frequency detection width, whose combination is used for frequency/speed

consistency, frequency detection 1 and frequency detection 2, to measure whether the inverter output frequency is in a specified frequency range. In frequency detection 1, when the inverter output frequency reaches or exceeds frequency detection speed (P31.22) + frequency detection width (P31.23), frequency detection 1 is triggered; after the related output point takes action and the inverter output frequency drops to frequency detection speed (P31.22), frequency detection 1 resets. Frequency detection 1 is negative logic, whose corresponding output status is OFF during triggering, while ON during reset.

In frequency detection 2, when the inverter output frequency reaches or exceeds frequency detection speed (P31.22), frequency detection 2 is triggered; after the related output point takes action and the inverter output frequency drops to frequency detection speed (P31.22) - frequency detection width (P31.23), frequency detection 2 resets. Frequency detection 2 is positive logic, whose corresponding output status is ON during triggering, while OFF during reset.

Set output terminal function as "5: frequency/speed consistency", shown as the following:

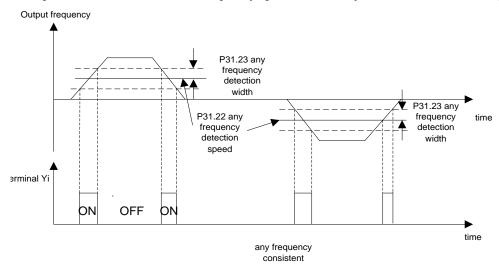


Figure 7-17 Frequency consistency detection 2

Set output terminal function as "10: speed detection 1", shown as the figure.

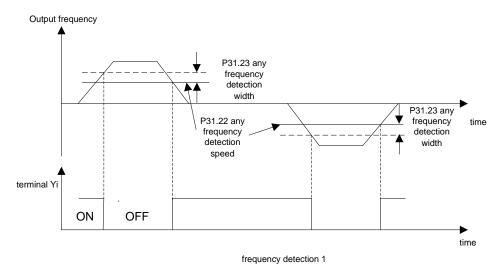


Figure 7-18 Speed detection 1

Set output terminal function as "11: speed detection 2", shown as the figure.

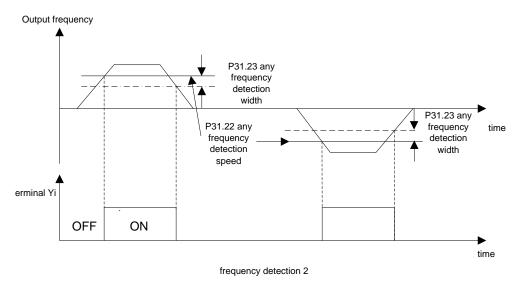


Figure 7-19 Speed detection 2

Function code	Function name	Setting range	Factory default
P31.24	Continuous running time arrive (h)	0~65535	2

Input the indicator signal after single continuous running time of the inverter arrives P31.24 from running command. Realize output indicator signal by defining the output terminal function code 27.

Function code	Function name	Setting range	Factory default
P31.25	Accumulated running time arrive (h)	0~65535	8

Output the indicator signal after accumulated running time of the inverter arrives P31.25 from electrification. Realize output indicator signal by defining the output terminal function code 26.

7.6.3 Group P32 Analog Input Parameters

Function code	Function name	Setting range	Factory default
P32.00	A0 input type	0~3	1
P32.06	A1 input type	0~3	1

Need to set analog input type parameters:

Voltage input A0 and A1: 0: 0 ~ 10V; 1: -10V ~ 10V;

Current input: 2: 0~20mA; 3: 4~20mA.

Function code	Function name	Setting range	Factory default
P32.01	A0 input function selection	0~6	0
P32.07	A1 input function selection	0~6	0

P32.01, P32.07 set input function for analog AI:

0: no-function

1: target speed signal

2: current speed signal

3: torque signal

4: compensation torque signal

When frequency given mode P10.03=3, 5, 7, A0 and A1 will be automatically set as 1

When frequency given mode P10.03=4, 6, 8, A0 and A1 will be automatically set as 2

When torque given mode P10.04=1, 2, 3, A0 and A1 will be automatically set as 3

When compensation torque given mode P10.05=2, 3, 4, A0 and A1 will be automatically set as

4.

- 5: speed limit signal
- 6: motor PTC signal

Function code	Function name	Setting range	Factory default
P32.02	A0 offset(V)	0.000~20.000	10.000
P32.03	A0 gain(%)	0.1~1000.0	100.0
P32.04	A0 filtering time (ms)	0~65535	10
P32.05	A0amplitude limit (V)	0.000~20.000	10.000
P32.08	A1offset (V)	0.000~10.000	10.000
P32.09	A1 gain (%)	0.1~1000.0	100.0
P32.10	Alfiltering time (ms)	0~65535	10
P32.11	A1 amplitude limit(V)	0.000~10.000	10.000

 $P32.02 \sim P32.05$ and $P32.08 \sim P32.11$ are used to set offset, gain, filtering time and amplitude limit for two analog input ports separately.

Offset concludes: voltage type: 0.000 offset-10.000V; 10.000 offset 0V; 20.000 offset +10.000V,

Gain is a proportionality coefficient, it is 100% typically.

Proper adjustment of **filterring time** can improve anti-interference ability of terminal input, because analog input via A0 and A1 is provided with interference signal in field applications, yet the longer the filtering time of the terminal, the longer its response delay.

Amplitude limit is only to limit the analog input final processing signal within a scope with certain control need, for current type, it needs to change amplitude limit as 20.000mA.

Actual input = analog input * gain + offset

Example 1: analog input $0\sim10V$ is speed given, whose actual corresponding input power is 0-the maximum motor frequency P20.13, need to set gain 100% and offset 10.000V

Example 2: analog input 1~10V is speed given, whose actual corresponding input frequency is 0-the maximum motor frequency P20.13, need to set gain 100% and offset 9.000V

7.6.4 Group P33 Analog Output Parameters

Function code	Function name	Setting range	Factory default
P33.00	M0 output function selection	0~16	1
P33.03	M1 output function selection	0~16	2

Analog DAC monitoring digital output 0-1000 represents 0-10.00V

Function definition list of multi-function analog output (partial common monitoring data):

Function set	Definition	Corresponding relation
0	No-function	
1	Output current	0~Ie corresponding to 0~10V

Function set	Definition	Corresponding relation
2	Output voltage	0~Ue corresponding to 0~10V
3	Torque given	0~Te corresponding to 0~10V
4	Bus voltage	0~Udc corresponding to 0~10V
5	Output total power	0~P corresponding to 0~10V
6	Output active power	0~Pe corresponding to 0~10V
7	Current speed (no sign)	0~Ne corresponding to 0~10V
8	Speed given (with sign)	0~Ne corresponding to 0~10V
9	Speed feedback (with sign)	0~Ne corresponding to 0~10V
10	Acceleration	0~50Hz/s corresponding to 0~10V
11	Radiator temperature	0~100°C corresponding to 0~10V
12	Analog A0	0~10V corresponding to output 0~10V
13	Analog A1 input	0~10V corresponding to output 0~10V
14	Analog A2 (spare)	0~10V corresponding to 0~10V
15	ModBus analog output 0	0~10000 corresponding to 0~10V
16	ModBus analog output 1	0~10000 corresponding to 0~10V

Function code	Function name	Setting range	Factory default
P33.01	M0 offset (V)	0.00~20.00	15.00
P33.02	M0 gain (%)	0.1~6000.0	100.0
P33.04	M1 offset (V)	0.00~20.00	15.00
P33.05	M1 gain (%)	0.1~6000.0	100.0

This function can be used to adjust the analog output defined in the above table. Analog after adjustment is the actual output of terminal M.

Differing from other function code, adjustment of the above parameters will exert real-time influence on M output.

Output correction mode of M0 and M1 is the same.

Actual output = M output * gain + offset

Actual output voltage range -10V~10V

When the parameters have been set:

Example 1: output is frequency 0~50.00Hz (rated frequency)

Set the gain as 100% and the offset as 15.000V

Actual output voltage is 0V for 0Hz, 5V for 50.00Hz

Example 2: output is frequency 0~50.00Hz (rated frequency)

Set the gain as 200% and the offset as 15.000V

Actual output voltage is 0V for 0Hz, 10V for 50.00Hz

Example 3: output is output current 0~2Ie (rated current)

Set the gain as 50% and the offset as 15.000V

Actual output voltage is 0V for 0A, 2Ie for 5V.

Function code	Function name	Setting range	Factory default
P33.06	M0 analog output type	0~4	0
P33.07	M1 analog output type	0~4	0

P33.06 and P33.07 are used to select analog output type:

0: no selection; 1: 0~10V; 2: -10V~10V; 3: 0~20mA; 4: 4~20mA.

Automatically set the corresponding analog output offset and gain, as well as default corresponding output 0-rated current/speed, etc. after type selection;

1: 0~10V default: offset 15.000 gain 200.0% 2: -10V~10V default: offset 15.000 gain 200.0% 3: 0~20mA default: offset 10.500 gain 385.0% 4: 4~20mA default: offset 12.150 gain 312.0%

7.7 Group P4X Speed Parameter Groups

7.7.1 Group P40 Basic Speed Parameters

Function code	Function name	Setting range	Factory default
P40.00	Panel speed	0.0~300.0	5.0

Panel given starting speed can be changed with button.

Function code	Function name	Setting range	Factory default
P40.01	Basic frequency	0.0~300.0	50.0

Basic running frequency is the corresponding minimum frequency when the inverter outputs the maximum voltage. When the standard AC motor is applied, it corresponds to the motor rated frequency, refer to the motor nameplate.

Function code	Function name	Setting range	Factory default
P40.02	Acceleration time 0 (s)	0.10~360.00	5.00
P40.03	Deceleration time 0 (s)	0.10~360.00	5.00

The function sets the frequency from accelerated running to constant speed or from constant decelerated running to stop after the inverter starts to run.

Acceleration time 0: the time P40.02 of the inverter output frequency increasing from zero frequency to the maximum frequency

Deceleration time 0: the time P40.03 of the inverter output frequency decreasing from the maximum frequency to zero frequency

Function code	Function name	Setting range	Factory default
P40.04	Acceleration time 1 (s)	0.10~360.00	5.00
P40.05	Deceleration time 1 (s)	0.10~360.00	5.00
P40.06	Acceleration time 2 (s)	0.10~360.00	5.00
P40.07	Deceleration time 2 (s)	0.10~360.00	5.00
P40.08	Acceleration time 3 (s)	0.10~360.00	5.00
P40.09	Deceleration time 3 (s)	0.10~360.00	5.00

Besides the acceleration time 0 (P40.2) and deceleration time 0 (40.03) defined above, additional 3 groups of acceleration time and deceleration time (acceleration time 1 and deceleration time 1, acceleration time 2 and deceleration time 2, acceleration time 3 and deceleration time 3) can be defined, to select the different acceleration and deceleration in different terminal status by means of defining the multifunctional terminal X (acceleration and deceleration time selection function $1 \sim 2$). Meaning of these 3 groups of acceleration time and deceleration time is the same as P40.02 and P40.03.

Function code	Function name	Setting range	Factory default
P40.10	Acceleration circular arc 0 (s)	0.00~10.00	0.00
P40.11	Acceleration circular arc 1 (s)	0.00~10.00	0.00
P40.12	Deceleration circular arc 0 (s)	0.00~10.00	0.00
P40.13	Deceleration circular arc 1 (s)	0.00~10.00	0.00

Acceleration and deceleration circular arc: to improve the time P40.10-P40.13 of arc segment increased due to smoothness of starting and terminate section during acceleration and deceleration. Segmental arc curve time applies to the conveyor belt transporting fragile goods or the applications requiring smooth speed control.

P40.10 ~ P40.13 are to set S curve (speed curve) during motor running under switching multi-speed given, they specify the acceleration time (P40.02), deceleration time (P40.03), acceleration circular arc time (P40.10 and P40.11) and deceleration circular arc time (P40.12 and P40.13), which directly affect the characteristics of S curve, therefore directly relating to the motor running efficiency and seating comfort. Specific position of the above parameters in motor running S speed curve is shown as Figure 7-20.

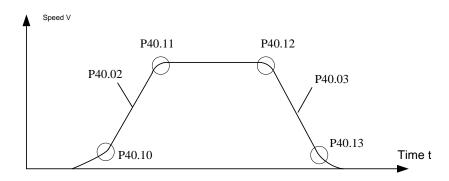


Figure 7-20 Position of S curve in motor running

7.7.2 Group P41 Digital Multi-speed Parameters

Function code	Function name	Setting range	Factory default
P41.00	Digital multi-speed given 0(Hz)	0.00~300.00	0.00
P41.01	Digital multi-speed given 1(Hz)	0.00~300.00	5.00
P41.02	Digital multi-speed given 2(Hz)	0.00~300.00	10.00
P41.03	Digital multi-speed given 3(Hz)	0.00~300.00	20.00
P41.04	Digital multi-speed given 4(Hz)	0.00~300.00	30.00
P41.05	Digital multi-speed given 5(Hz)	0.00~300.00	40.00

Function code	Function name	Setting range	Factory default
P41.06	Digital multi-speed given 6(Hz)	0.00~300.00	50.00
P41.07	Digital multi-speed given 7(Hz)	0.00~300.00	60.00
P41.08	Digital multi-speed given 8(Hz)	0.00~300.00	0.00
P41.09	Digital multi-speed given 9(Hz)	0.00~300.00	0.00
P41.10	Digital multi-speed given 10(Hz)	0.00~300.00	0.00
P41.11	Digital multi-speed given 11(Hz)	0.00~300.00	0.00
P41.12	Digital multi-speed given 12(Hz)	0.00~300.00	0.00
P41.13	Digital multi-speed given 13(Hz)	0.00~300.00	0.00
P41.14	Digital multi-speed given 14(Hz)	0.00~300.00	0.00
P41.15	Digital multi-speed given 15(Hz)	0.00~300.00	0.00

They can be considered as process open loop frequency given, to select different multistage frequency given in different terminal status by defining the multifunctional terminal X (digital multistage $0 \sim 3$). ON means the valid terminal, OFF means the invalid terminal.

Note: during process open loop running, if input terminal function sets analog and digital multistage simultaneously, then the digital multistage shares high priority.

P41.00 \sim P41.15 respectively defines the speed command value of digital multi-speed given 1 \sim 15. Four input point binary system codes of switching multi-speed given 0 \sim 3 combine 16 kinds of status, which are corresponding to the above 15 given speed commands from P41.00 to P41.15 and 0 given speed (combination code=0). Corresponding relation between multi-speed input port signal and given speed given is shown as Table 6.2.

Table 6.2 Corresponding relation between multi-speed input port combination and given speed

Multi-speed combination code	Multi-speed given 3	Multi-speed given 2	Multi-speed given 1	Multi-speed given 0	Given speed
0	0	0	0	0	Given speed 0
1	0	0	0	1	Given speed 1
2	0	0	1	0	Given speed 2
3	0	0	1	1	Given speed 3
4	0	1	0	0	Given speed 4
5	0	1	0	1	Given speed 5
6	0	1	1	0	Given speed 6
7	0	1	1	1	Given speed 7
8	1	0	0	0	Given speed 8
9	1	0	0	1	Given speed 9
10	1	0	1	0	Given speed 10
11	1	0	1	1	Given speed 11
12	1	1	0	0	Given speed 12
13	1	1	0	1	Given speed 13
14	1	1	1	0	Given speed 14
15	1	1	1	1	Given speed 15

In the table, status 0 shows no signal at input port; status 1 shows input signal at input port. Further explanation with an example: if speed given 0 has input signal, speed given 1 has input signal, speed given 2 has no input signal and speed given 3 has no input signal, then binary coding will be "0011"=3, whose corresponding given speed is given speed 3, and its given speed value will be appointed by P41.03.

Function code	Name	Setting range	Default value
P41.16	Inching frequency given (Hz)	0.00~50.00	5.00

Frequency set value set by inching operation.

7.8 Group P5X Process Control Parameter Groups

7.8.1 Group P50 Process Open Loop Parameters

Function code	Function name	Setting range	Factory default
P50.00	Open loop auxiliary given mode	0~5	0

Select process open loop auxiliary given mode P50.00 as following:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: PID given target speed

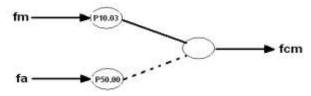


Figure 7-21 Schematic of open loop auxiliary given

P10.03 main given value f_m gives f_c , input 44 via the digital: open loop main and auxiliary given are switched to auxiliary given value, the main given value f_a .

Function code	Function name	Setting range	Factory default
P50.01	Open loop given main and auxiliary	0~6	0
	relation calculation		

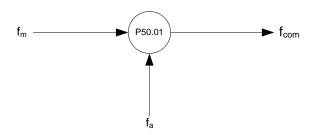


Figure 7-22 Schematic of open loop main and auxiliary given combination

Under the process open loop control mode, an auxiliary given value f_a is overlaid on the main given value f_m , to generate process open loop combination frequency given $f_{com}=f_m+f_a$.

Main given value f_m and auxiliary given value f_a are able to have addition, subtraction, offset, maximization and minimization calculation.

Process loop given main and auxiliary relation calculation P50.01 is defined as follows:

0: no calculation

1: main given + auxiliary given: auxiliary frequency given value is overlaid on the main given, with the function "plus".

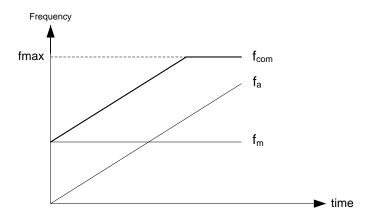


Figure 7-23 Open loop main and auxiliary given calculation 0

Process open lop combination given fcom=main given fm+auxiliary given fa

2: Main given-auxiliary given: auxiliary frequency given value is overlaid on the main given, with the function "minus".

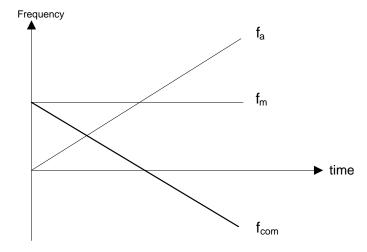


Figure 7-24 Open loop main and auxiliary given calculation 1

Process open loop combination given $f_{\text{com}}\!\!=\!\!\text{main}$ given $f_{m}\!\!-\!\!\text{auxiliary}$ given f_{a}

3: spare. 4: spare.

5: maximization: take the maximum value from the main given f_m and auxiliary given f_a .

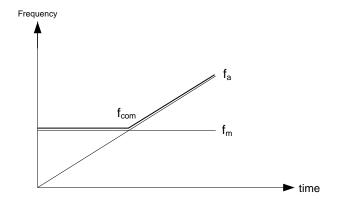


Figure 7-25 Open loop main and auxiliary given calculation 4

Process open loop combination given $f_{com}=Max\{main\ given\ f_m$, auxiliary given $f_a\}$ 6: Minimization: take the minimum value from the main given f_m and auxiliary given f_a .

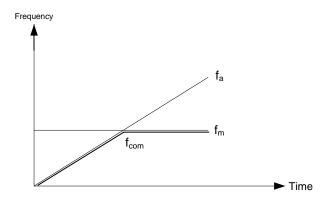


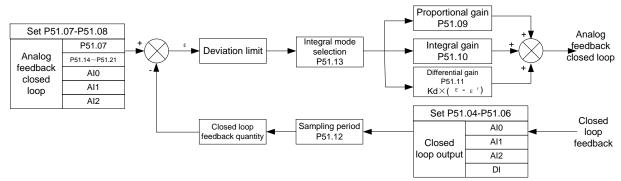
Figure 7-26 Open loop main and auxiliary given calculation 5

Process open loop combination given f_{com} =Min{ main given f_m , auxiliary given f_a }

Note: when the frequency corresponding to the resultant f_{com} exceeds the upper and lower frequency limit, output frequency is limited to the upper and lower limit.

7.8.2 Group P51 Process Close Loop Parameters

PID control is a common method for process control, to have proportional calculation, integral calculation and differential calculation for the feedback signal of controlled variable and the deviation of target signal, so as to adjust the inverter frequency and form negative feedback system, making the controlled volume to be more than the target volume. This method applies to flow control, pressure control and temperature control. The basic control functional block diagram is shown as:



 ϵ' is last deviation, ϵ is this deviation

Figure 7-27 PID functional block diagram

Function code	Function name	Setting range	Factory default
P51.00	Closed loop run control selection	0~1	0

Closed loop running control selection

0: invalid

1: valid

Function code	Function name	Setting range	Factory default
P51.01	Closed loop control main given mode	0~6	0

P51.02	Closed loop control auxiliary given mode	0~6	2
P51.03	Closed loop given main and auxiliary calculation	0~6	0

In the closed loop system with feedback, if main and auxiliary given are available, the main given value may be internal given, analog and communication; and the auxiliary given value may be analog and communication.

P51.01 closed loop control main given mode selection is shown as:

0: internal given (P51.07); 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication

P51.02 closed loop control auxiliary given mode selection is shown as:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.03 closed loop control given main and auxiliary calculation selection is shown as:

0: no calculation; 1: main+auxiliary; 2: main-auxiliary; 3: spare; 4: spare; 5: take the maximum value; 6: take the minimum value

Closed loop given main and auxiliary function is the same as open loop given main and auxiliary calculation function, see details of P50.01.

Note: closed control analog main given, auxiliary given, main feedback and auxiliary feedback can't be set as the same channel.

Function code	Function name	Setting range	Factory default
P51.04	Closed loop control main feedback mode	0~6	1
P51.05	Closed loop control auxiliary feedback mode	0~6	2
P51.06	Closed loop control feedback main and auxiliary calculation	0~6	0

In the closed loop system with feedback, the main and auxiliary feedback may be analog or pulse quantity. Process closed loop feedback main and auxiliary calculation function is the same as that of closed loop and process open loop given, see the details of P50.01.

P51.04: closed loop control main feedback mode selection is shown as:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.05: closed loop control auxiliary feedback mode selection is shown as:

0: nil; A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.06 closed loop control feedback main and auxiliary calculation selection is shown as:

0: no calculation; 1: main +auxiliary; 2: main-auxiliary; 3: spare; 4: spare; 5: take the maximum value; 6: take the minimum value

Note: closed control analog main given, auxiliary given, main feedback and auxiliary feedback can't be set as the same channel.

Function code	Function name	Setting range	Factory default
P51.07	PID internal given value	0.00~10.00	0.70
P51.08	Unit	0~3	0

Before determine the process closed loop given quantity, firstly the current control running mode P51.00=1 shall be determined firstly. When the current control running mode is analog feedback process closed loop, if P51.00 is set as 0, then the closed loop given quantity is determined by P51.07.

Function code	Function name	Setting range	Factory default
P51.09	Proportional gain Kp	0.000~10.000	0.500
P51.10	Integral gain Ki	0.000~10.000	0.500
P51.11	Differential gain Kd	0.000~10.000	0.000

The bigger the Kp, the faster the response, but oscillation may be caused if it is too big. Kp isn't able to eliminate the deviation completely, Ki may be adopted to eliminate the residual deviation; the bigger the Ki, the faster response to the deviation of the inverter, but oscillation may be caused if it is too big. If hopping feedback appears in system, Kd is required, which is able to rapidly response to the system feedback and given deviation change. The bigger the Kd, the faster the response, but oscillation may be caused if it is too big. On-line modification and E2ron operation will be executed.

Function code	Function name	Setting range	Factory default
P51.13	Integral selection mode	0~1	0

The function determines the specific operation mode during process closed loop regulation.

If output of the process closed loop regulation reaches upper or lower frequency limit (P70.00 or P70.01), two actions for selection are available in integration element.

- 0: Stop integral regulation if frequency reaches the upper or lower limit; integral quantity keeps unchanged, if the trend between given quantity and feedback quantity changes, integral quantity will change rapidly with this trend.
- 1: Continue integral regulation if frequency reaches the upper or lower limit; integral quantity makes real-time response to the change between given quantity and feedback quantity, unless the internal integral limit has been reached. When the trend between given quantity and feedback quantity changes, more time is needed to offset the influence of continued integral, therefore the integral quantity is able to follow change of the trend.

Function code	Function name	Setting range	Factory default
P51.21	Internal multi-stage given 7 (V)	0.00~10.00	10.00
P51.22	Integral action upper limit (%)	0~	100.00
P51.24	Closed loop input upper limit (%)	0~	50.0
P51.25	Closed loop input lower limit (%)	0.0~20.0	0.0
P51.26	Closed loop output upper limit (%)	0.0~	100.0

P51.22 is used with P51.13, when P51.13=1, limit value set by P51.22 shall be valid.

P51.23 closed loop output reverse selection: spare

P51.24 ~ P51.26 set limit value in process closed loop control, regulate it according to the upper limit if it exceeds P51.24, while no PID regulation is made if it is below the lower limit, set the limit value in process closed loop control.

P51.27 closed loop output lower limit: spare.

Function code	Function name	Setting range	Factory default
P51.28	Sleep selection	0~1	0
P51.29	Sleep frequency(Hz)	0.00~50.00	30.00
P51.30	Sleep delay(s)	0.00~655.35	10.00
P51.31	Wake up deviation(%)	0.00~100.00	0.10
P51.32	Wake up delay(s)	0~3600.0	10.0

Sleep parameters:

P51.28 sleep selection: 0 invalid; 1 valid

When sleep selection is valid, set sleep frequency, sleep delay, wake up deviation and wake up delay.

Function code	Function name	Setting range	Factory default
P51.33	Given acceleration and deceleration time	0.0~50.0	0.0
P51.34	Closed loop output filtering time	0.00~50.000	0.01

When the closed loop given changes suddenly, regulate these two parameters to make the given control within a certain response time, so as to make the response to the closed loop process in some environment more smoothly.

Function code	Function name	Setting range	Factory default
P51.35	Minimum given quantity	0.0~100.0	0.0
P51.36	Feedback quantity corresponding to	0.0~100.0	0.0
	minimum given quantity		
P51.37	Maximum given quantity	0.0~100.0	10.0
P51.38	Feedback quantity corresponding to	0.0~100.0	10.0
	maximum given quantity	0.0~100.0	10.0

 $P51.35 \sim P51.38$ define the relation curve of analog closed loop given and expected feedback quantity, whose set value will be the percentage of the actual given and feedback quantity to the reference value (10V or 20mA).

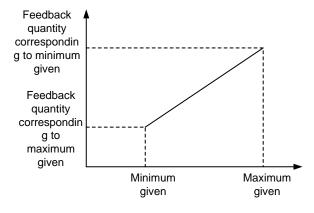


Figure 7-28 Feedback positive regulation

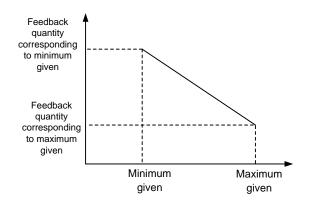


Figure 7-29 Feedback negative regulation

Function code	Function name	Setting range	Factory default
P51.39	Preset frequency (Hz)	0.001~ maximum frequency	22.0
P51.40	Preset frequency holding time (s)	0~60	0

After closed loop operation starts, the frequency firstly will be accelerated to closed loop preset frequency P51.38 according to acceleration time, then run as per the closed loop characteristics after continuously having run a period of time at this frequency point. If closed loop preset frequency function isn't required, preset frequency and holding time both can be set as 0.

Function code	Function name	Setting range	Factory default
P51.41	Deviation negation	0~1	0

Whether negate the comparative result from the feedback signal and the set value or not, 0: no negation; 1: deviation negation.

7.9 Group P6X Vector Control Parameter Groups

7.9.1 Group P60 Speed Control Parameters

Function code	Function name	Setting range	Factory default
P60.00	Speed loop zero speed P	0.00~655.35	0.00
P60.01	Speed loop zero speed I	0.00~655.35	0.00
P60.02	Speed loop zero speed D	0.00~655.35	0.00
P60.03	Speed loop low speed P	0.00~655.35	100.00
P60.04	Speed loop low speed I	0.00~655.35	5.00
P60.05	Speed loop low speed D	0.00~655.35	0.50
P60.06	Speed loop medium speed P	0.00~655.35	70.00
P60.07	Speed loop medium speed I	0.00~655.35	2.00
P60.08	Speed loop medium speed D	0.00~655.35	0.20
P60.09	Speed loop high speed P	0.00~655.35	70.00
P60.10	Speed loop high speed I	0.00~655.35	2.00
P60.11	Speed loop high speed D	0.00~655.35	0.10

Function code	Function name	Setting range	Factory default
P60.12	Switching frequency 0(%)	0.0~6553.5	10.0
P60.13	Switching frequency 1(%)	0.0~6553.5	60.0

PID regulation for speed loop, P0, I0 and D0 are taken as zero servo section regulation parameters, the rest 3 groups of parameters are divided into 3 groups by P60.12 and P60.13, P1, I1 and D1 are low speed section regulation parameters, P2, I2 and D2 are medium speed section regulation parameters, and P3, I3 and D3 are high speed section regulation parameters.

P60 parameter group mainly regulates the proportional gain and integral time of speed regulator.

Proportional gain P:

Make adjustment according to the mechanical rotational inertia connected to the motor. For the mechanical device with big rotational inertia, please increase P gain; for that with small rotational inertia, please decrease P gain.

When P gain is greater than inertia, although control response can be quicken, oscillation or overshoot may be caused to the motor; on the contrary, if P gain is less than inertia, control response becomes slow, the time for speed regulation to the steady value will be longer.

Integral time I:

When it is set as 0, indicating invalid integral (control P independently). Please set integral time I as non-zero value if deviation between the speed command and actual speed under the stable status is 0. When I is smaller, system response is fast, with oscillation if it is too small; while I is bigger, system response is slow.

Derivative time D:

generally it doesn't need to be regulated and is set according to the default. The parameter is able to quickly respond the change of system feedback and given deviation. The bigger the value, the faster the response, but oscillation may be caused if it is too big. It is valid if it is set as 0.

PID set value adjustment at high speed, medium speed and low speed:

When the motor speed is higher than switching frequency 01, $P60.09 \sim P60.11$ will work, making the system reach the good dynamic response without any oscillation; when the motor speed is lower than switching frequency 0, $P60.03 \sim P60.05$ will work. In order to realize better dynamic response at low speed, proportional gain P60.03 can be properly increased and integral time P60.04 can be reduced. When the speed is below switching frequency 1 and higher than switching frequency 0, $P60.06 \sim P60.08$ will work.

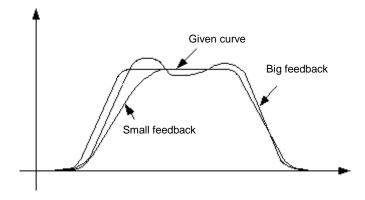


Figure 7-33 Influence of proportional constant P on feedback track

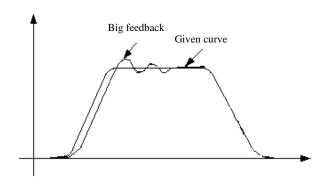


Figure 7-34 Influence of integral constant I on feedback track

7.9.2 Group P61 Current Control Parameters

Function code	Function name	Setting range	Factory default
P61.00	Current loop Kp	0.01~9.99	1.40
P61.01	Current loop Ki	0.01~9.99	1.00
P61.02	Current loop Kd	0.00~9.99	0.00
P61.03	Current loop bandwidth (Hz)	0.1~1000.0	400.0
P61.04	Magnetic link bandwidth (Hz)	0.1~1000.0	0.8
P61.05	Current loop selection	0~10	0
P61.06	V/F control current loop Max	0.0~100.0	1.0
P61.07	V/F control current loop Min	0.0~100.0	1.0

Group P61 mainly carries out PID regulatin for current loop, typically no regulation provides and set it according to the default.

7.9.3 Group P62 Torque Control Parameters

Function code	Function name	Setting range	Factory default
P62.00	Digital torque given (%)	0.0~100.0	0.0
P62.01	Torque direction	0~1	0
P62.02	Torque increase time (s)	0.01~655.35	1.00
P62.03	Torque decrease time (s)	0.01~655.35	1.00

When P10.00=2, the four parameters can be used:

When torque given mode P10.04=0, torque, direction, acceleration and deceleration time are determined by P62.00, P61.01, P62.02 and P62.03 respectively.

7.9.4 Group P63 Torque Compensation Parameters

Function code	Function name	Setting range	Factory default
P63.00	Compensation torque direction	0~1	0
P63.01	Compensation gain (%)	0.0~200.0	100.0
P63.02	Compensation offset (%)	0.0~100.0	0.0
P63.03	Light load switch compensation (%)	0.0~99.9	0.0

Function code	Function name	Setting range	Factory default
P63.04	Heavy load switch compensation (%)	0.0~99.9	0.0

When P10.05 is set as nonzero, these 5 parameters can be used, to compensate the proportional and deviation calcuation according to given compensation channel.

Compensation gain is a proportional coefficient and offset is the regulation on deviation.

Light load and heavy load switch compensation are used for elevator industry. When digital quantity is used to compensate torque function, light load switch action is to compensate light load torque, while the heavy load switch action is to compensate heavy load torque.

7.9.5 Group P64 Position Control Parameters (spare)

7.10 Group P7X Enhanced Control Parameter Groups

7.10.1 Group P70 Limit and Protection Parameters

Function code	Function name	Setting range	Factory default
P70.00	Upper frequency limit (Hz)	0.01~ max frequency	50.00
P70.01	Lower frequency limit (Hz)	0.01~ Upper frequency limit	0.00
P70.02	Maximum output frequency (Hz)	0.01~300.00	55.00

Maximum output frequency fmax is the highest frequency permitted to be output by the inverter.

Maximum output voltage Vmax is the output voltage when the inverter is running at the basic running frequency. If a standard AC motor is applied, it is the motor rated voltage, see the motor nameplate.

Upper and lower frequency limit fH and fL are the highest and lowest frequency set for the motor operation as required by production process during application of the user.

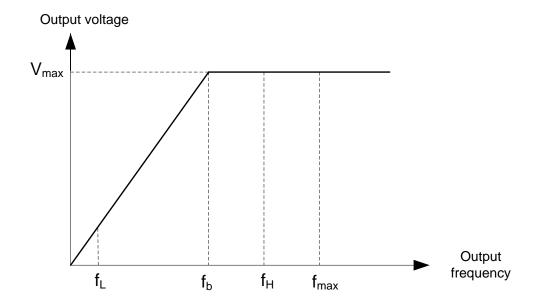


Figure 7-35 Schematic of the upper and lower frequency limit

Function code	Function name	Setting range	Factory default
P70.04	Output torque limit (%)	0.00~200.00	150.00
P70.05	Inverter acceleration	0.00~200.00	160.00
	overcurrent threshold value (%)	0.00~200.00	
P70.06	Inverter deceleration	540~800	750
F 70.00	overvoltage threshold value (V)	340~800	
P70.07	Overspeed protection	0.00~	120.00
	coefficient (%)	0.00~	120.00

P70.04 ~ P70.06 set overcurrent and overvoltage threshold for the inverter. In general, when the set speed or the motor load experiences rapid change, output current of the inverter may be greater than the overcurrent protection point, resulting overcurrent fault. Current limit function is that the inverter limits output current with sudden change not greater than the protection action value by means of controlling the transient output, so as to effectively reduce overcurrent fault and guarantee the continuous and reliable operation of the system. When the current exceeds a certain value (P70.04), the inverter enters current limit status; during the constant speed operation, load capacity may be ensured via current limit, free from any overcurrent fault. When the load is reduced, the inverter automatically exits from current limit status and restores to normal operation. The function is especially suitable in the applications with rapid speed or load change.

Function code	Function name	Setting range	Factory default
P70.08	Special function selection	0~65535	16

Set the parameter according to bit, with its specific meaning as: for example 16, indicating the classic speed loop selected for speed loop.

bit3: 8 whether calculate the rotor time constant based on the motor parameters or not (1: based on motor parameters; 0: based on slip frequency);

bit4: 16 Small speed drop for sudden increased load; small speed increase for sudden decreased load.

bit5: 32 undervoltage alarm (1: no alarm; 0: alarm)

bit7: 128 zero servo mode (1: calculate zero servo torque based on acceleration; 0: calculate zero servo torque based on feedback speed)

bit8: 256 encoder phase angle self-learning for every operation (1: Y; 0: once only for electrification)

bit10: 1024 bus voltage compensation for the emergency power operation (1: compensation; 0: no compensation)

Function code	Function name	Setting range	Factory default
P70.10	PT signal channel	0~2	0
P70.11	PT protection upper threshold (V)	0.000~10.000	10.000
P70.12	PT protection lower threshold(V)	0.000~10.000	0.000
P70.13	PT protection action delay (s)	0.0~10.0	3.0

PT70.10: PT signal channel selection (0: NC 1: AI0 2: AI1).

Triggering conditions for 49# fault (PT detection fault): after the inverter has run for 5s, "PT > P70.11" or "PT < P70.12" will continue the time set in P70.13;

Clearing conditions for 49# fault (PT detection fault): the inverter stops or clear the fault after "P70.12<PT P70.11" continues for 2s.

Function code	Function name	Setting range	Factory default
P70.14	HT signal channel	0~2	0
P70.15	HT protection upper threshold (V)	0.000~10.000	10.000
P70.16	HT protection lower threshold(V)	0.000~10.000	0.000
P70.17	HT protection action delay (s)	0.0~10.0	3.0

HT signal channel selection (0: NC 1: AI0 2: AI1).

Trigging conditions for 50# fault (Humidity fault): "HT > P70.15" or "PT < P70.16" continues the time set in P70.17.

Clearing conditions for 50# fault (Humidity fault): "P70.16<PT <P70.15"; clear the fault after it is continues for 2s.

Function code	Function name	Setting range	Factory default
P70.18	Bus undervoltage threshold (V)	0~540	380

400V bus undervoltage threshold default is 380V.

Function code	Function name	Setting range	Factory default
P70.19	Maximum no-load up intercept (%)	0~400	0
P70.20	Maximum no-load down intercept (%)	0~400	0

P70.19 and P70.20 are used to record the system inertia during no-load operation. If speed automatic limit function is applied, final speed limit will be based on this parameter, which is used by the lifting equipment with field weakening control. After system acceleration and deceleration time of the system is changed, set the software version parameter 95.01 = 12.34. The system rises or drops once, set the software version P95.01 = 12.34 again after it stops, then run once again in the opposite direction, P70.19 and P70.20 record no-load torque of system rise or drop after the system stops running. During normal operation, automatic limit function will judge the load weight, so as to decide the final running speed.

Function code	Function name	Setting range	Factory default
P70.21	PWM detection delay (s)	0~65535	800

After the inverter starts to run, if output current is 0 and after parameter PWM detection delay, the inverter sends 51# fault.

Function code	Function name	Setting range	Factory default
P70.22	Selection below the tower frequency limit	0~3	0

Set the running mode when target frequency is below the lower frequency limit:

0: run at the lower frequency limit;

- 1: stop;
- 2: run at zero speed;
- 3: inertia stop;

Function code	Function name	Setting range	Factory default
P71.00	Frequency hopping speed 1(Hz)	0.00~100.00	0.00
P71.01	Frequency hopping speed 2(Hz)	0.00~100.00	0.00
P71.02	Frequency hopping speed 3(Hz)	0.00~100.00	0.00
P71.03	Frequency hopping speed (Hz)	0.00~100.00	0.00

7.10.2 Group P71 Control Optimization Parameters

In order to avoid the mechanical resonance point, set the frequency hopping range for the inverter. The inverter set frequency will be automatically adjusted to frequency hopping section to run when it drops into the frequency hopping. Frequency hopping section ranges from frequency hopping speed - 0.5 * frequency hopping width to frequency modulation speed + 0.5 * frequency hopping width, with 3 frequency modulation sections set totally.

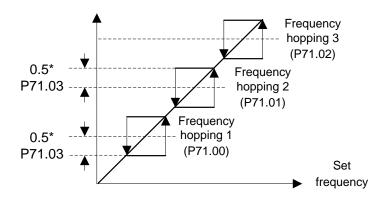


Figure 7-36 Upper and lower frequency hopping limit

Function code	Function name	Setting range	Factory default
P71.04	Inertia compensation factor (%)	0.00~100.00	0.00
P71.05	No reverse	0~1	0
P71.06	FWD and REV interval time (s)	0.0~6553.5	0.0
P71.07	PWM modulation mode(s)	0~2	2

Rotational inertia compensation factor is determined by P71.04. When the system is in torque control mode and has big system load inertia, it needs to provide the additional rotational inertia compensation during its acceleration and deceleration. For some production equipment, reverse rotation may cause equipment damage. Therefore this function may be adopted to prohibit reverse rotation.

P71.05 factory default: reverse permitted, P71.05=1: no reverse.

When rotation direction of the motor is opposite to that required by the equipment, wiring of any two terminals on output side of the inverter can be exchanged, making the forward direction of the equipment to be consistent with that defined by the inverter.

P71.06 sets the waiting time of the inverter from forward to reverse (or from reverse to forward)

when the speed exceeds 0.

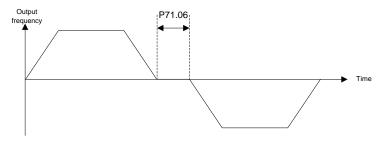


Figure 7-37 Dead time from forward to reverse

P71.07 selects PWM modulation mode. 0: 5-section type; 1: 7-section type; 2: <40%rpm 7-section, >40% rpm 5-section.

Function code	Function name	Setting range	Factory default
P71.08	V/F optimization function selection (%)	0~127	32

- 0: Nil
- 1: torque automatic lifting to improve the low speed loading performance;
- 2: oscillation suppression to control the motor oscillation during no load and light load;
- 4: slip compensation to improve speed control precision;
- 8: stator resistance compensation to improve the low speed loading performance;
- 16: dead zone compensation to improve voltage precision;
- 32: bus voltage compensation to stabilize the output voltage;

(bit selection function)

Function code	Function name	Setting range	Factory default
P71.09	V/F torque compensation (%)	0.0~30.0	0.0
P71.10	V/F compensation maximum frequency (Hz)	0.0~50.0	10.0

P71.09 provides the manual compensation torque during V/F control, to effectively improve low speed torque

P71.10 provides the maximum frequency for compensation torque during V/F control

Function code	Function name	Setting range	Factory default
P71.11	Dead zone compensation mode	0~2	0

Dead zone compensation mode

0: compensate 100% as per angle;

1: compensate 50% as per angle;

2: make compensation as per current;

Generally no adjustment.

Function code	Function name	Setting range	Factory default
P71.12	Current slow down time (s)	0.01~655.35	0.00
P71.14	Carrier frequency kHz)	1.1~8.0	2.0
P71.15	Random PWM width (kHz)	0.000~1.000	0.000

Setting of current slow down time may reduce the crash noise produced when the motor stops, which only applies to closed loop.

Carrier frequency regulation: when the inverter motor is too noisy, increase carrier frequency to

lighten it. Random PWM width can regulate the carrier frequency section, for example: when carrier frequency is 6 and random width is 1KHz, carrier frequency randomly changes within 5.5-6.5, which also is used to reduce the motor noise.

Note: default carrier frequency of AS series is related to the inverter power, the bigger the power, the lower the default carrier frequency. If the default value is exceeded, please derate it, derating 10% for each increase of 1K.

Function code	Function name	Setting range	Factory default
P71.16	Regulator mode	0~3	1

Regulation period of speed loop when set the vector control, 0: 0.5ms, 1: 1ms, 2: 4ms 3: 4ms, the bigger the value, the slower the speed regulation, to reduce the electromagnetic noise of the motor.

Regulator mode is different according to the different default carrier frequency of the inverter. When the default carrier frequency $\geq 4kHz$, default regulation mode is 1; when the default carrier frequency $\leq 3kHz$, default regulation mode is 2.

Function code	Function name	Setting range	Factory default
P71.17	Contactor on delay (s)	0.0~10.0	0.8
P71.18	Opening delay (s)	0.0~10.0	0.4
P71.19	Contactor off delay (s)	0.0~10.0	1.0
P71.20	Braking delay (s)	0.0~10.0	0.1
P71.21	Output off delay (s)	0.0~10.0	0.3

These parameters mainly are used for control system, to increase control logic of output contactor and external brake. Adjustment of delay time will realize more stable control and improve the comfort.

Also these parameters can be applied in the applications provided with lifting mechanism and requiring output contactor control.

Function code	Function name	Setting range	Factory default
P71.22	Zero speed threshold (Hz)	0.0~10.0	0.2

P71.22 sets zero speed threshold, default 0.2Hz. If the actual running frequency is below the set value, then it is zero speed.

Function code	Function name	Setting range	Factory default
P71.23	Forward dead zone compensation (%)	0~100	100
P71.24	Reverse dead zone compensation (%)	0~100	100

P71.23 makes compensation for open and close switching dead zone time of the forward upper and lower bridge arm, default 100%.

P71.24 makes compensation for open and close switching dead zone time of the reverse upper and lower bridge arm, default 100%.

Function code	Function name	Setting range	Factory default
P71.25	Zero servo compensation (%)	0~100	0

P71.25 zero servo compensation

Under the closed loop vector control mode and when the incremental encoder is used, if P71.25>0, P71.25 compensation will be overlaid on the output of zero servo regulating loop, lasted for P11.07 zero servo compensation time.

Function code	Function name	Setting range	Factory default
P71.26	Angle of power-on learning (/)	0~1	0

P71.26 0: no learning 1: self-learning, for phase angle learning of the synchronous motor

Function code	Function name	Setting range	Factory default
P71.27	Motor current gain factor (%)	50~200	150

P71.27 current gaint of the synchronous motor for phase angle self-learning

Function code	Function name	Setting range	Factory default
P71.28	Zero servo current loop gain factor (%)	50~200	100

P71.28: Torque current PI parameter used to change zero servo using zero servo gain won't be altered generally, when shake or overcurrent appears during zero servo, properly regulate P71.28.

Function code	Function name	Setting range	Factory default
P71.29	PWM modulation selection	0~1	0

PWM modulation mode

0: underflow update

1: overflow/underflow update, carrier frequency below 4k, please set as 1.

Function code	Function name	Setting range	Factory default
P71.30	Power factor compensation angle (°)	0.0~360.0	0
P71.31	Power factor compensation direction (/)	0~1	0
P71.32	Power factor compensation mode (/)	0~1	0

In order to improve power factor of the permanent magnet synchronous motor at full load secton, set P71.30 power factor compensation angle, which is increased as per 5° step length. P71.31: set compensation direction, 0: compensation in the same direction, 1: compensation in the opposite direction, default: the same direction. If the current becomes bigger and the power factor becomes lower after compensation, then compensation direction may be wrong. P71.32: set power factor compensation mode, 0: fixed value compensation, 1: torque output linear compensation.

Function code	Function name	Setting range	Factory default
P71.33	Speed precision adjustment (%)	0.0~100.0	100.0
P71.34	Performance improvement compensation	0~1000	106
P71.35	System inertia coefficient (%)	0.0~300.0	100.0
P71.36	Automatic torque lifting at low speed (%)	0.0~300.0	100.0

The above parameters are to set the characteristics of vector control 1 without speed sensor. If the acceleration and deceleration time are short, increase P71.35 to quicken speed response. If it is difficult to start, with more low speed torque requirements, please increase P71.36.

Function code	Function name	Setting range	Factory default
P71.37	Droop control gain (%)	0.0~200.0	0.0
P71.38	Droop control filtering (S)	0.00~2.00	0.05

When 2 motors are used to drive a load, the parameters play a role in keeping its entire balance. For the inverter controlling two motors, DROOP control function of one motor must be valid. DROOP control is to decelerate and accelerate the motor when torque command is too high and too low respectively, so as to keep balance. By use of DROOP control function, the ordinary motor shares the torque characteristics as those of high resistance motor.

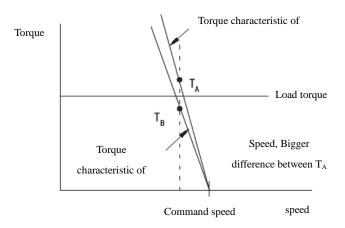


Figure 7-38 Load balance of two motors using Droop function

P71.37 adjustment principle: when torque command is 100%, set the deceleration value taking % as unit (maximum output frequency =100%). When it is set as 0.0, DROOP control will be invalid. P71.38: adjust responsiveness of DROOP control. Please reduce the set value if the response is slow, please increase it if vibration or imbalance appears.

Function code	Function name	Setting range	Factory default
P71.39	Power failure detection threshold (V)	380~550	480
P71.40	KEB bus target voltage (V)	380~550	500

It is set as 480 typically. If fault is sent during KEB, refer to the inverter bus voltage and properly increase it.

This value shall be greater than P71.39 (power failure detecton threshold) and below the inverter bus voltage during normal power supply. Refer to the inverter bus voltage and properly increase it.

Function code	Function name	Setting range	Factory default
P71.41	Power failure treatment mode	0~4	0

0: no treatment;

- 1: track start (time limit)
- 2: track start (time unlimited)
- 3: KEB (with detection undervoltage): start to use KEB, if it exceeds P71.42 (longest power failure compenstaion time), the bus voltage is still low, then undervoltage fault will be sent.
 - 4: KEB (no detection undervoltage)

Function code	Function name	Setting range	Factory default
P71.42	Longest power failure compenstaion time (s)	0.0~60.0	3.0

If it exceeds P71.42 (longest power failure compensation time) after KEB is used, the bus voltage is still low, then undervoltage fault will be sent.

Function code	Function name	Setting range	Factory default
P71.43	KEB shortest actuation time (ms)	0~2000	100

After KEB is used, P71.43 (KEB shortest actuation time) is required to exit KEB.

Function code	Function name	Setting range	Factory default
P71.44	KEB starting frequency reduction (Hz)	0.00~5.00	2.00

To make the motor to be in generating status quickly, set this value within 0-2 times of the motor rated slip frequency range

Function code	Function name	Setting range	Factory default
P71.45	KEB deceleration time (s)	000~200.00	10.0

If KEB takes action, increase this value if overvoltage appears, while decrease it if undervoltage or overcurrent appears.

Function code	Function name	Setting range	Factory default
P71.46	KEB deceleration mode	0~3	0

It does't need to set this parameter.

Function code	Function name	Setting range	Factory default
P71.47	KEB acceleration time (s)	0.00~300.00	25.00

Keep the same as the motor acceleration time set.

Set the following parameters according to the listed value, no alteration.

Function code	Function name	Setting range	Factory default
P71.48	Proportional Kp of KEB	0.00~300.00	200.00
P71.49	Integral Ki of KEB	0.00~300.00	0.00
P71.50	Differential Kd of KEB	0.00~300.00	0.00
P71.51	KEB upper integral limit (%)	0.0~300.0	100.0
P71.52	KEB lower integral limit (%)	0.0~300.0	100.0
P71.53	KEB closed loop upper output limit (%)	0.0~300.0	100.0
P71.54	KEB closed loop lower output limit (%)	0.0~300.0	100.0

Set as default value without change.

For Kp during KEB, KEB time will be too short if this value is too small, while bus overvoltage fault may be caused if it is too big.

For Ki during KEB, KEB time will be too short if this value is too small, while bus overvoltage fault may be caused if it is too big.

Function code	Function name	Setting range	Factory default
P71.55	KEB upper voltage deviation limit (V)	0.0~500.0	3000

When KEB is enabled, deviation between bus voltage and set target voltage is limited not exceeding P71.55 (KEB upper voltage deviation limit). If it is greater than this value, then it equals to this value.

Function code	Function name	Setting range	Factory default
P71.56	KEB voltage zero deviation value (V)	0.0~10.0	0.0

Bus voltage deviation is 0 if it is less than this value.

Function code	Function Name	Range	Default value
P71.57	Variable carrier frequency threshold	0.0~50.0	0.0

P71.57 variable carrier frequency threshold, output frequency is below this value. If P71.29=0, carrier frequency drops to 3K; if P71.29=1, carrier frequency drops to 2K to run. If it is set as 0, indicating the normal carrier operation.

Function code	Function name	Setting range	Factory default
P71.58	Fan control selection	0~4	0

- 0: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 1 min later.
- 1: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 5 minutes later.
- 2: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 30 minutes later.
- 3: Fan operation conditions. The fan will operate only if the radiator is greater than 40° C; when it is below 35° C, the fan will stop after 1s delay.
 - 4: Operate all the time after power on

Function code	Function name	Setting range	Factory default
P71.59	Optimal coefficient 1		0.0000
P71.60	Optimal coefficient 2	1.0~300.0	100.0
P71.61	Optimal coefficient 3	1.0~300.0	100.0

The above parameters are valid under open loop vector, P71.59 is the inverter internal parameter, no midification is needed.

P71.60 and P71.61 are control gain when switching the forward and reverse.

Function code	Function name	Setting range	Factory default
P71.62	UP/DOWN single step length	0.0~10.0	0.1

By use of UP/DOWN function, set the variation of each step with this parameter.

7.11 Group P8X Communication Parameter Groups

7.11.1 Group P80 Communication Selection Parameters

Function code	Function name	Setting range	Factory default
P80.00	Communication mode selection	0~3	0

Select the communication mode applied by the existing inverter, default 0

- 0: no communication
- 1: Profibus-DP
- 2: Modbus
- 3: CANbus

7.11.2 Group P81 Modbus Communication Parameters

Function code	Function name	Setting range	Factory default
P81.01	Communication baud rate	0~7	3
P81.02	Data format	0~2	0
P81.03	Transmission mode selection	0~1	1

The inverter supports the internationally accepted Modbus protocol, RTU format. See the appendix.

P81.00 determines communicaiton baud rate and supports 1200~57600bps.

- 0: 1200bps
- 1: 2400bps
- 2: 4800bps
- 3: 9600bps
- 4: 19200bps
- 5: 38400bps
- 6: 57600bps
- 7: 76800bps

P81.01 sets communication format, odd-even check.

- 0: format 1-8-1, no check.
- 1: format 1-8-1, even check.
- 2: format 1-8-1, odd check.

P81.02 sets transmission mode: 0: ASCII; 1: RTU

Function code	Function name	Setting range	Factory default
P81.04	Local address	1~247	1

P81.04 sets the local address, 0=broadcast address, the available address $1 \sim 247$, the reserved address $248 \sim 255$.

Function code	Function name	Setting range	Factory default
P81.05	Communication status word set 1		
P81.06	Communication status word set 2		

Monitor the communication status word value. See the communication appendix below for composition of the specific status word.

Function code	Function name	Setting range	Factory default
P81.07	Communication address format selection	0~1	1

Select communication address format, 0: hexadecimal number system; 1: decimal number system.

7.11.3 Group P82 Profibus_DP Communication Parameters

Function code	Function name	Setting range	Factory default
P82.00	Local address	0~255	0
P82.01	Big and little endian mode	0~1	0

P82.00 indicates the local address

P82.01 sets the big and little endian mode

0: the higher 8 bits will be sent firstly, then the lower 8 bits

1: the lower 8 bits will be sent firstly, then the higher 8 bits

Function code	Function name	Setting range	Factory default
P82.02	Self-defined status word 1	0~59	16
P82.03	Self-defined status word 2	0~59	13
P82.04	Self-defined status word 3	0~59	10
P82.05	Self-defined status word 4	0~59	18

P82.02 ~ P82.05 set self-defined status:

- 0: running status 1
- 1: running status 2
- 2: detection status
- 3 ~ 9: spare
- 10: output torque
- 11 ~ 12: spare
- 13: target frequency given
- 14: current running frequency
- 15: feedback speed Hz
- 16: feedback speed rpm
- 17: spare
- 18: output voltage effective value
- 19: output current effective value
- 20 ~ 21: spare
- 22: output total power
- 23: bus voltage
- 24 ~ 28: spare
- 29: output terminal status
- 30: spare
- 31: input terminal status
- 32 ~ 33: spare
- 34: analog input AI0
- 35: analog input AI1
- 36: spare
- 37: output DA0
- 38: output DA1
- 39: spare
- 40: recent fault No.
- 41 ~ 42: spare
- 43: radiator temperature
- 44 ~ 59: spare

Note: Profibus_DP communication inverter GSD document download address:

Open http://www.stepelectric.com and click "support and download".

7.12 Group P9X Fault and Display Parameter Groups

7.12.1 Group P90 Language Selection Parameters

Function code	Function name	Setting range	Factory default
P90.00	Operator language selection	0~1	0

P90.00 language selection: 0: Chinese; 1: English;

7.12.2 Group P91 LCD Display Parameters

Function code	Function name	Setting range	Factory default
P91.00	U01 display data	0~34	20
P91.01	U02 display data	0~34	2
P91.02	U03 display data	0~34	3
P91.03	U04 display data	0~34	4
P91.04	U05 display data	0~34	6
P91.05	U06 display data	0~34	16
P91.06	U07 display data	0~34	7
P91.07	U08 display data	0~34	5

Display parameters of 8 LCDs are set totally, shown as the following table:

Function code	Function name	Setting range	Factory default
0	0 no-definition	1	Output speed rpm
2	Given speed Hz	3	Feedback speed Hz
4	Output current A	5	Output voltage V
6	Output torque %	7	Bus voltage V
8	Spare	9	Spare
10	Spare	11	Count value of phase AB during Z signal
12	Count value of phase AB	13	Angle of phase U
14	Pulses corresponding to CD	15	Encoder position angle
16	Pre-torque %	17	Number of interference of phase Z
18	Number of interference of phase AB	19	Running status
20	Target speed (Hz)	21	Encoder sin central point
22	Encoder cos central point	23	Weighing compensation
24	Given speed (rpm)	25	Speed variation (rpm)
26	Weighing compensation %	27	Encoder phase C central point
28	Encoder phase D central point	29	Radiator temperature
30	Input port status	31	Output port status
32	PID given value	33	PID feedback value
34	Output power		

7.12.3 Group P92 LED Display Parameters

Function code	Function name	Setting range	Factory default
P92.00	LED display data	0~34	2

See group P90 for its meaning.

7.12.4 Group P93 Running Record Parameters

Function code	Function name	Setting range	Factory default
P93.00	Accumulative local power on time (kh)	0.000~65.535	0.000
P93.01	Accumulative local running time (kh)	0.000~65.535	0.000
P93.02	Maximum radiator temperature record (°C)	0.0~100.0	0.0

The inverter will record the following information automatically: accumulative local power on time, accumulative local running time and maximum radiator temperature record.

Function code	Function name	Setting range	Factory default
P93.03	Accumulative output power of the inverter (kWh)	0.0~999.9	0.0

The inverter starts to run after power on, accumulative output power in unit time, with the unit kWh.

Function code	Function name	Setting range	Factory default
P93.04	Accumulative output power of the inverter	0~65535	0
	(MWh)		

The inverter starts to run after power on, accumulative output power in unit time, with the unit MWh.

Function code	Function name	Setting range	Factory default
P93.05	Running time of the inverter fan (h)	0~65535	0

Running time of the inverter fan, unit h.

7.12.5 Group P94 Troubleshooting Parameters

Function code	Function name	Setting range	Factory default
P94.00	Inverter minor fault handling mode	0~3	1
P94.01	Inverter fault automatic reset time (s)	0.0~180.0	10.0
P94.02	Inverter fault automatic reset number	0~100	0

P94.00 sets fault handling mode,

- 0: when minor fault appears, no fault relay output;
- 1: when minor fault appears, fault relay output;
- 2: when 52#PTC fault appears, fault relay output and the inverter stops, no fault automatic reset,
- 3: 1 and 2 are both valid.

P94.01 sets automatic reset time, default 10s

P94.02 sets number of automatic reset during 30 min, default 0. The default value is not automatic reset, automatic reset fault may cause dangerous operation, please use carefully.

Function code	Function name	Setting range	Factory default
P94.03	Radiator overheating time (s)	0.0~180.0	0.5
P94.04	Overspeed protection time (s)	0.00~180.00	1.00
P94.05	Input phase loss voltage threshold	0~150	65
P94.06	Number of short circuit of braking resistor	0~100	10

P94.03 sets the protection time for radiator overheating protection (3# fault). When the radiator temperature exceeds 80° C, continue P94.03 time protection;

P94.04 sets the confirm time for overspeed protection (30# fault);

P94.05 sets the judge voltage sag value for input phase loss (29# fault). When input voltage fluctuation is greater than P94.05, it can be increased in the areas with unstable grid.

P94.06 sets fault confirm number of braking resistor fault (4# fault).

Function code	Function name	Setting range	Factory default
P94.07	SinCos encoder disconnection confirm number	0~100	2
P94.08	Input phase loss confirm time (s)	0.000~180.000	2.000
P94.09	Relay fault confirm voltage (V)	0~350	90
P94.10	Misphase judgement threshold for phase CD	300~1000	300
P94.11	ABZ protection threshold(%)	20~100	20

os encoder disconnection confirm number:

AB signal continues 94.07 protection at high or low order simultaneously;

CD signal continues 94.07+5 times protection at high or low order simultaneously.

P94.08 input phase loss confirm time set is detected only during normal running or encoder dynamic self-learning. Time protection when phase current continuously exceeds P94.08.

P94.09 is relay fault confirm voltage, which is VDC1 when the inverter doesn't run, and VDCmax and VDCmin when the inverter runs, detected once every 20ms (VDC1-VDCmax). It is greater than 94.09 and (VDC1-VDCmax)>(VDCmax-VDCmin)*5, continued for 10 times, protected.

P94.10 sets misphase judgement threshold for phase CD

- (1) For SinCos encoder, difference value of AB signal and CD signal exceeds 94.10 and lasts for 500ms protection;
- (2) Difference value between Endate absolute position and position of AB signal exceeds 94.10 protection.

P94.11 is ABZ protection threshold for the incremental encoder.

Synchronous: P10.00=2/3, feedback speed <1% rated speed, output voltage > rated voltage * 94.11 + pre-torque voltage + 3.5% rated voltage, lasted for 100ms, protected.

Asynchronous: P10.00=3, feedback speed < 1%, for big speed error, lasted for 400ms, protected.

Function code	Function name	Setting range	Factory default
P94.12	IGBT protection number	0~65535	2

Set the number of times that the inverter output current is greater than IGBT protection current threshold (21# fault).

Function code	Function name	Setting range	Factory default
P94.13	I ² t protection selection	0~3	0

Protection selection parameter P94.13 defaults to 0, then I2t protection plays a role. If it is set as 1, only 45# or 46# protection fault, applying to frequent start or stop. If it is set as 2, only 21# or 27# protection fault, applying to continuous overload applications. If it is set to 3, no protection for I²t.

Function code	Function name	Setting range	Factory default
P94.14	Analog A0 disconnection value (%)	0.0~100.0	0.0
P94.15	Analog A1 disconnection value (%)	0.0~100.0	0.0

Analog A0/A1 input signal disconnection detection value, relative to 10V percentage. If analog A0 input voltage < 10V * P94.14/P94.15, analog input disconnects.

Function code	Function name	Setting range	Factory default
P94.16	Abnormal analog treatment	0~5	0

If the inverter sends an abnormal analog input fault, set the inverter how to run. P94.16 set value:

- 0: no action of the inverter;
- 1: protection shutdown
- 2: run at the frequency for abnormal analog;
- 3: run at the frequency set in P70.00;
- 4: run at the frequency set in P70.01;
- 5: run at the frequency set in multi-speed 15.

P94.16=1, no automatic reset for the fault, automatic reset for others.

Function code	Function name	Setting range	Factory default
P94.17	Temperature sampling disconnection treatment	0~1	0

If the inverter sends temperature sampling disconnection fault, how does the inverter run.

P94.17=0, indicating no action for the inverter; 1: protection shutdown.

Function code	Function name	Setting range	Factory default
P94.18	Communication protection	0~1	1
P94.19	Communication disconnection protection time (s)	0.000~65.535	2.000

P94.18 0: not used 1: start communication protection

After the normal communication interruption lasts for P94.19, send 43# fault.

Function code	Function name	Setting range	Factory default
P94.20	Number of grounding protection (times)	0~65535	100

Set confirm times of 32# fault.

7.12.6 Group P95 Product Identification Parameters

Function code	Function name	Setting range	Factory default
P95.00	Inverter hardware version		500.04
P95.01	Control board software version		factory

Default not to use functions of the oscilloscope of the upper computer. Set P95.01 as 3728 to start the oscilloscope. Set P95.01 as 3728 again not to start the oscilloscope; it needs to reset after power failure and power on once again.

Function code	Function name	Setting range	Factory default
P95.02	Version number		100.01
P95.03	Profibus_DP software version		factory

Software and hardware version parameters of the inverter are displayed in group P95, which are set directly by the manufacturer.

7.12.7 Group P96 Inverter Product Parameters

Function code	Function name	Setting range	Factory default
P96.00	Inverter rated power (kW)	0.0~999.9	
P96.01	Inverter rated current (A)	0.0~999.9	
P96.02	Inverter maximum current (A)	0.0~999.9	
P96.03	Inverter rated voltage (V)	0~460	380
P96.04	Inverter power factor (%)	0~99	15
P96.05	Inverter sensor current (A)	0~9999	404
P96.06	Inverter module rated current (A)	0~9999	
P96.07	Built-in braking unit current (A) 0~9999		
P96.08	3-phase current balance coefficient(%)	0.800~1.200	1.000

Fixed parameters of the inverter are displayed in group P96, which are set directly by the manufacturer:

P96.00 ~ P96.04, initially set by the manufacturer;

P96.05 ~ P96.08, parameter setting of the inverter itself, determined by hardware, read-only.

Chapter 8 Fault Check

This chapter describes inverter faults, fault codes, contents, reasons and their solutions in details, and provides analysis flow chart for all kinds of faults during motor adjusting or operating.

�Danger

 Maintenance operation should start 10 minutes after power supply is cut off. At that time, charging indicator must be off completely or voltage of DC bus is lower than 24 VDC.

Or it may cause electric shock.

O To retrofit inverter privately is absolutely prohibited.

Or it may cause electric shock or human injury.

Only professional electrician can perform maintenance operation.

Leaving cable stub or metal obstacle inside inverter is prohibited.

Or it may cause fire hazard



O Don't change wiring and connect/disconnect terminal blocks during power on.

Or it may cause electric shock.

8.1 The Function of Protection and Check

When inverter fault occurs, fault LED on top of digital operator blinks. LED displays the current fault code.

Inverter has total 39 fault codes. Fault list table 8.1 shows the fault codes and their reasons, solutions.

Table 8.1 Fault list

Fault	ılt Fault display Possible reason		Solution
code	z aan dispiuj		
		Too high voltage at DC	Check network power for fast stop under high inertia
		terminal	load, no dynamic braking
		Possible short connection to	Check any short circuit between motor and output
		peripheral circuit	connection, grounding
		Losing output phase	Check any loose connection for motor and output
		Encoder fault	Check encoder or its wiring
1	Module over-current	Hardware poor contact or damage	Need maintenance by professional technician
	protection	Internal component loose	Need maintenance by professional technician
		The power circuit	
		components overheat due to	Check the cooling fan. Check whether the cooling fan
		the cooling fan or cooling	power is blocked by dirt or foreign object.
		system problem.	
			rted only after eliminating the malfunction causes,
		avoiding the damage to IGBTs	
	ADC f14	Current sensor damaged	Replace current sensor
2	ADC fault	Problem of current sampling loop	Replace control board
	Heatsink	Ambient temperature too	Reduce ambient temperature, increase ventilation. Keep
		high	the surrounding temperature below 40 $^{\circ}\!$
			to this character to test the capacity of the inverter.
		The cooling fan damaged or	Check whether the fan power cable is well connected, or
2		foreign object entered into	replace the same model fan or remove the foreign
3	overheat	the cooling system.	Objects. Chack the cooling fan Chack whether the cooling fan
		Cooling fan is abnormal	Check the cooling fan. Check whether the cooling fan power is correct and whether there is any foreign object
		Cooming run is donormal	blocking the fan.
		Temperature detect circuit fault	Need maintenance by professional technician
	D. I.	Braking unit damaged	Replace related driving module or control circuit board
4	Braking unit failure	External braking resistor circuit short	Replace the resistance or the wiring connection
5	Blown fuse Fuse blown by high current		Check the fuse circuit connection, or looseness of connectors
	Over torque	Too low input voltage	Check input power supply
6	output	Motor stop rotating or abrupt	Prevent motor stopping, reduce abrupt loading change

Fault	Fault display	Possible reason	Solution
code			
		loading change	
		Encoder failure	Check encoder or its wiring
	Missing output phase		Check the loose connection of motor and output wiring
		Too short acceleration time	Extend acceleration time
7	Speed deviation	Too high load	Reduce load
		Too low current limit	Increase current limit under allowed range
	Bus over voltage protection (in	Abnormal input voltage	Check input power supply
	acceleration running)	Re-rapid starting during motor in high speed rotating	Wait till motor stop rotating, and re-start
	Bus over voltage	Too high load rotational inertia	Select proper energy consumed braking component
0	protection (in deceleration	Too short deceleration time	Extend deceleration time
8	running	Too high braking resistance or no resistor	Connect proper braking resistor
	Bus over voltage	Abnormal input power	Check input power supply
	protection (running at	Too large load rotational inertia	Select proper energy consumed braking component
	constant speed)	Too high braking resistance or no resistor	Connect proper braking resistor
		Power voltage lower than minimum equipment working voltage	Check input power supply
		Instantaneous power off	Check input power supply, reset and restart after input
	Bus	Too high fluctuation of input power voltage	power back to normal
9	undervoltage	Loose power connection block	Check input wiring
		Internal switch power abnormal	Need maintenance by professional technician
		A large starting current load existing in the same power supply system	Alter power system to conform the specification
10	Loss of output phase	Abnormal wiring at inverter output, missing or breaking connection	Check wiring at inverter output side based on operation procedure, eliminate missing, breaking connection

Fault			
code	Fault display	Possible reason	Solution
	Loose output terminal block Insufficient motor power, less than 1/20 of maximum applicable inverter motor capacity According to the control of the control		
			Adjust the capacity of inverter or motor
		Unbalanced three phase	Check the motor wiring
		output	Check the consistency of characteristic of inverter output side and DC side terminals
		Low network voltage	Check input power supply
	Motor over	Improper motor parameter setting	Set proper motor parameters
	speed (during	Rapid start during motor running	Restart after motor stop running
	acceleration)	The acceleration time for load inertia (GD2) is too short.	Extend the acceleration time
	Motor over current at low speed (during	Low network voltage	Check input power supply
11		Too large load rotational inertia	Select proper energy consumed braking component
		Improper motor parameter setting	Set proper motor parameters
	deceleration)	Too short deceleration time	Extend deceleration time
		The deceleration time for load inertia (GD2) is too short	Prolong the slowdown time
	Motor over current at low	Abrupt load change in running	Reduce frequency and amplitude of abrupt load change
	speed (during constant speed)	Improper motor parameter setting	Set proper motor parameters
		Incorrect encoder connection	Correct wiring encoder
	Encoder failure	Encoder no signal output	Check encoder and power supply
12		Encoder wire disconnected	Re-connect
		Abnormal function code setting	Ensure the proper encoder function code setting
13	Current detected	Current keep on flowing	Slip happens by synchronous motor

Fault code	Fault display	Possible reason	Solution
	at stopping	while motor stops	Need maintenance by professional technician
		Reversed speed during operation	Check the abrupt change of external load
14	Reversed speed during operation	Phase differed between encoder and motor	Change motor or phase order
		Motor reversed by starting, current reaches the limit	Current limitation is too low or motor unmatched
15	Speed detected	Elevator slip due to loose brake	Check brake
	at stopping	Encoder interfered or loose	Tighten encoder, eliminate interference
16	Wrong motor phase	Motor reversed connected	Correct connection or adjust parameter
	Over speed in	Synchronous motor over speed by loss of excitation	Check motor
17	the same	Wrong angle self-learning for synchronous motor	Re-do the self-learning
maximum allowed speed)	Wrong encoder parameter or interference	Check encoder circuit	
	anowed speed)	Too large positive load or abrupt load change	Check the reason for abrupt load change
		Synchronous motor over speed by loss of excitation	Check motor
18	Over speed in opposite	Wrong angle self-learning for synchronous motor	Re-do the self-learning
16	direction (in maximum allowed speed)	Wrong encoder parameter or interference	Check encoder circuit
	anowed speed)	Too large reversed load or abrupt load change	Check the reason for abrupt load change
19	9 Wrong phase order or wrong paramete		Check connection or change parameter
20	Encoder 20 communication Encoder fault		Check encoder wiring and re-do encoder self-learning
	abc over current	Motor single phase shorted to earth	Check motor and output circuit
21	(3 phase instantaneous	Encoder fault	Check encoder and correct wiring
	value)	Test loop of drive board fault	Replace drive board

Earl4	Fault		
code	Fault display Possible reason		Solution
		Inactive output relay	Check relay control loop
22	Brake detection fault	Relay triggered, brake not released	Check the brake power string for loosening or breaks
		No signal detected by feedback component	Tune feedback component
	Input	Too high input voltage	Check whether input voltage matches inverter rating
23	over-voltage	Problem by detection loop of switch voltage	Need maintenance by professional technician
24	UVW encoder wire broken	Encoder wiring fault	Wiring block loose or wire broken in connection
25	Reserved for future use		
26	Encoder no self-learning	Encoder angle not learned by synchronous motor	Do an encoder self-learning
		Too long time operation under overload status. The larger the load, the shorter the time is.	Stop for a while, if problem occurs again after re-operation, check to ensure the load in allowed range.
27	Output over current (valid value)	Motor blocked	Check motor or brake
	value)	Motor coil short	Check motor
		Output short	Check wiring or motor
28	SIN/COS encoder fault	Damaged encoder or wrong wiring	Check encoder and its wiring
		Abnormal voltage at input side	Check grid voltage
29	Loss input phase	Loss input voltage phase	
		Input terminal block loose	Check input terminal wiring
	Over speed protection	Wrong encoder parameter set or interference	Check encoder circuit
30	(exceed maximum	Abrupt load change	Check the external reason for abrupt load change
	protected speed	Wrong parameter for over speed protection	Check parameter
31	Over current at	Power grid voltage too low	Check input power supply

Fault code	Fault display Possible reason		Solution
	motor high speed	Abrupt load in operation	Reduce frequency and amplitude of abrupt load change
		Incorrect motor parameter	Set motor parameter correctly
		Wrong encoder parameter or interference	Check encoder circuit
		Wrong wiring	Refer to user manual, correct the wrong wiring
32	Grounding protection	Abnormal motor	Replace motor, to have a grounding isolation test first
	protection	Large drain current to earth at inverter output side	Need maintenance by professional technician
33	Capacitor aged	Inverter capacitor aged	Need maintenance by professional technician
34	External fault	External fault signal input	Check the reason for external fault
35	Unbalance output	Abnormal wiring at inverter output side, missing or broking connection	Check inverter output side wiring follow the operation procedure, eliminate possible missing, broking connection
	•	Motor three phase unbalance	Check motor
36	Wrong parameter setting parameter setting		Modify inverter parameter
37	Current sensor fault Drive board hardware fault		Need maintenance by professional technician
38	Brake resistor short	Connection of external brake resistor short	Check the wiring of brake resistor
39	Too high instantaneous current	Three phase instantaneous current over and alarm while Ia, Ib and Ic not in operation	Need maintenance by professional technician
40	KMY detection fault	KMY detect contactor signal and KMY control signal don't match	Check the contactor of KMY control and KMY detection
41	Brake switch detect contactor signal and its control signal don't match		Check brake switch
42	IGBT short She cause is the same as		Check short circuit for motor and output wiring,
43	Communication fault	Fualt 1. Communication disconnected No communication data received within the fixed time	Check the communication signal line

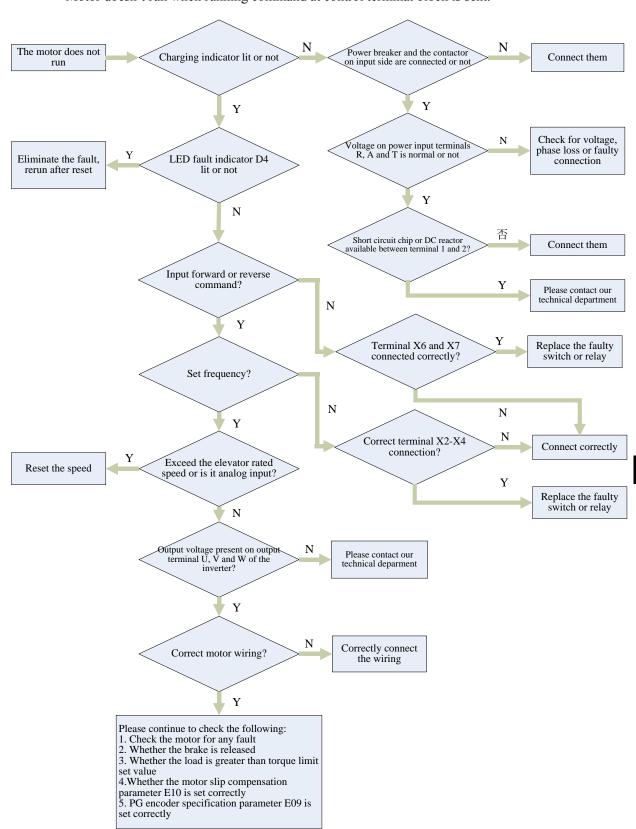
Fault code	Fault display	Possible reason	Solution	
44	The input power supply is abnormal	The input power supply changes a lot Input contactor abnormally connected Temporary electricity	Check the power supply Check input contactor	
45	I2t instantaneous over current protection	G	G	
46	I2t valid over current protection	Same as fault 21,27	Same as fault 21,27	
47	Abnormal analog input	Analog input signal disconnected Abnormal analog input signal	Modify the related parameters Check analog input signal	
48	Temperature sampling disconnection	Radiator temperature sampling disconnected	Check connection of temperature sampling	
49	PT detection PT input signal disconnected fault Abnormal PT input signal		Check PT input signal Modify the related parameters	
50	Humidity fault HT input signal disconnected Abnormal HT input signal		Check HT input signal Modify the related parameters	
51	Abnormal running output current	Improper parameter setting Disconnection between the inverter and the motor Inverter hardware fault	Check P70.21 Check the connecting line Ask the professionals to have maintenance	
52	Motor PTC overheat warning	Motor continuous overload Small motor model Abnormal PTC	Check the load Calculate the motor model Check PTC	

8.2 Fault Diagnosis Flow Chart

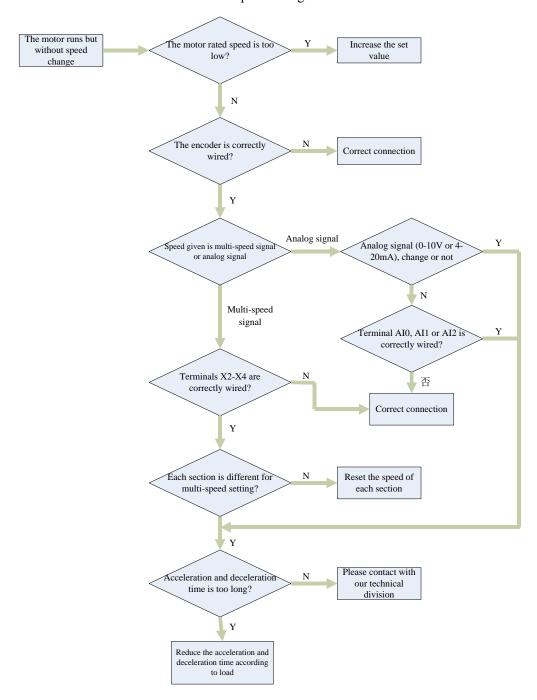
Because of the reasons of parameter setting, wrong wiring, inverter and motor might not run in a preset condition at first start. In this case please refer to the introduction in this section about the fault diagnosis procedure, to have fault analysis and handling.

Abnormal motor running:

Motor doesn't run when running command at control terminal block is sent.



■ Motor runs but doesn't have speed change.



Chapter 9 Service and Maintenance

This chapter introduces the general information about service and maintenance.

Table 9.1 The danger notice for service and maintenance



Or it may cause electric shock.

Never remould inverter unauthorizedly.
 Or it may cause electric shock and human injury

Only professional electrician can operate the product maintenance. Never leave any wire stubs, metal pieces inside the inverter.

Or it may cause fire hazard.

Table 9.2 The caution notice for service and maintenance



 $\ensuremath{\mathbb{O}}$ Do not alter wiring and remove wiring terminal while power is on.

Or it may cause electric shock

9.1 Warranty

Our company provides warranty service if inverter (main body) has the following situation:

Our company will be responsible for the repairs within the warranty period (counted date from leaving factory) if inverter has failure or damage in normal operation condition. An appropriate maintenance cost will be charged if the warranty period is due.

If the failure was caused by following reasons, a certain cost will occur even within warranty period:

- 1) Problem caused by not follow up instruction manual or unauthorized repair or alter
- 2) Problem caused by over specified limit usage
- 3) Drop the product or transport damage
- 4) Damage caused by earthquake, fire hazard, flood, lighting, abnormal voltage or other natural disasters, or its affiliate reason

9.2 Product Inquiry

If product damages, has fault or other problem, please contact to our office or customer service department and prepare the following information:

Inverter Model

Serial number

Date of purchase

Information needs to be provided: damage description, unclear question and fault occurred

9.3 Routine Check

Inverter hull can't be taken off during energizing or operation. To observe the state of operation can only go through visual check. The following items can be routinely checked:

- 1) Does ambient environment fulfill standard specification?
- 2) Does operation conform to the standard specification?
- 3) Any abnormal noise, vibration or others?
- 4) Proper working cooling fan installed in inverter?
- 5) Any over-heat situation?

9.4 Periodic Check

To start a periodic check, inverter should stop operating, switch off power, then remove the hull. The charging capacitor in main circuit may still have charged voltage and needs time to discharge it. Therefore the check operation can only start after charging indicator is off and DC bus voltage measured by multimeter is lower than safety value (below 24VDC).

There will be an electric shock hazard if you touch the terminal block right after power off.

Table 9.3 lists the items needed to be periodic check.

Table 9.3 Periodic check item

	Area	Item	Method	Judgment
				1) Ambient temperature
		Ensure ambient temperature, humidity,	1) Visual check,	lower than 40°C.
		vibration, check any dust, corrosive gas, oil mist	thermometer,	Humidity and other
Operation	on environment	or water drop, etc	hydrometer	environment index meet
		2) Any dangerous goods in surrounding area	2) Visual Check	the requirements
				2) No dangerous good
		1) Is LCD clearly displayed? Even backlight?		1) Even backlight
LC	D display	2) Any missing letter in screen?	Visual check	2) Correct display
С	onnector	1) Loosening bolt	1) Tightening	1) Normal condition
Termir	nal block, bolt	2) Loosening connector	2) Visual check	2) Secured installation
		1) Shielded layer broken or faded		
	Wire	2) Deformed copper connector	Visual check	Normal condition
		D.H. 11 (1)	Hearing check, visual	1) No
	Electromagnetic contactor, relay			2) Can hear contactor
		2) Is contact point proper closed	check	closing
	Charging capacitor	Any leaking, color change, crack and swollen		
		enclosure	Visual check	Normal condition
Main		2) Does safety valve go out? Any swollen on it?		
circuit	Heatsink	1) Is dust piled up?		
		2) Air duct blocked or attached by foreign object	Visual check	Normal condition
			1) Hearing, visual	
			check. Manual turn fan	
	G 1' 6	1) Any abnormal noise	blade after power off.	1) Rotating smoothly
	Cooling fan	2) Any abnormal vibration	2) Visual check	2), 3) no abnormalities
		3) Color changed due to overheat	3) Visual check,	
			olfaction check	
	Connection	Any dust or attached foreign object on two row		
Control	Connection component	terminal strip between control board and main	Visual check	Normal condition
		circuit		
circuit	Control board		1) Visual Check,	
		1) Any color change or odor smell on control PCB	olfaction check	Normal condition
		2) Any crack, damage, deform on PCB	2) Visual check	

Appendix A Inverter EMC Installation Guide

This appendix introduces EMC inverter design, installation from aspects of noise suppression, wiring requirement, grounding, peripheral equipment surge absorption, current leakage, install area dividing, installation precaution, using power filter, and radiation noise treatment.

A.1 Noise Suppression

The principle of inverter decides that a certain noise may produce. The effect to the peripheral equipments depends on the type of noise, noise transmission path, design and installation of kinetic system, wiring and grounding.

A.1.1 Types of Noise

Types of noise see Fig. A.1.

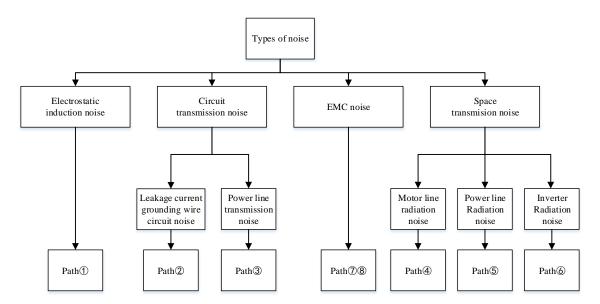


Fig. A.1 Diagram for noise type

A.1.2 Noise Transmission Route

Noise transmission path see Fig. A.2.

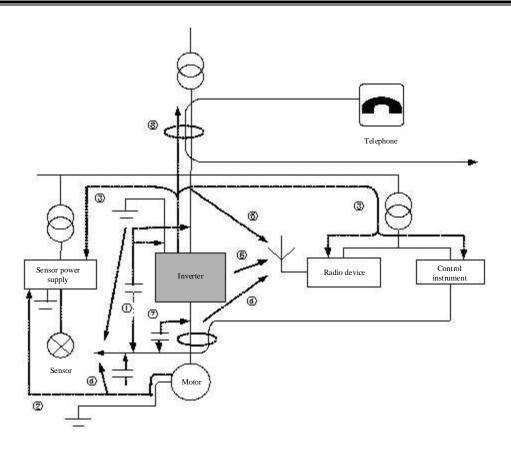


Fig. A.2 Noise transmission route

A.1.3 Basic Method for Noise Suppression

Basic methods against noise suppression see Table A.1.

Table A.1 Basic countermeasure for noise suppression

N o.	Cause	Countermeasure
① ⑦ ⑧	If signal cable runs in parallel with power cable or they are bundled, noise will be transmitted in signal cable due to the electromagnetic induction and static induction. Peripheral device may be wrongly triggered. If the peripheral device becomes a close loop circuit by wiring to inverter, the inverter grounding current leakage will cause wrong	1) Avoid signal cable and power cable in parallel running, or bundled; 2) Keep susceptible peripheral device far away from inverter; 3) Lay easy affected signal cable far away from inverter input/output power cable; 4) Use shielded wire for signal cable and power cable. It is better to insert into metal tube separately (minimum 20 cm between metal tubes) Don't ground the peripheral device can avoid the wrong action caused by current leakage
3	action of the peripheral device. If the peripheral device shares the same power supply with inverter, noise created by inverter can be transmitted alone the power cable. The peripheral devices linked in the system may cause wrong action.	Install a noise filter at inverter input side, or use isolate transformer/power filter to other peripheral devices for noise isolation

- If weak current peripheral devices, such as control computer, gauges, radio device, sensor and their cable are installed in the same cabinet with inverter, and their wiring is closed to the inverter, radiate interference may cause wrong action.
- 1) Easy affected peripheral devices and their cable should be installed far away from inverter. Shielded cable should be used for signal cable and shielded layer grounds to the earth. Signal cable inserts into metal tube and away from inverter and its input/output power cable. A perpendicular cross must be wired in case of inevitable cable crossing between signal cable and power cable.
- 2) To install radio noise filter or linear noise filter (Ferrite Common Mode Choke) on both input and output side of inverter can suppress radiated noise of inverter input and output power cable.
- 3) Cable from inverter to motor should be inserted into a thick shield of 2mm or thicker, or be buried in a cement groove. Cable should be inserted into a metal tube and its shield should be grounded (4 core cable can be taken for motor wiring, one core grounds to earth at inverter side and connects to the motor enclosure at the other end).

A.2 Wiring Requirement

A.2.1 Requirement for Cable Laying

In order to avoid mutual coupling of interference, control signal cable should be laid separately from power cable and as far as possible from them. Fig. A.3(a) shows this situation. Fig. A.3(b) shows that a perpendicular cross must be ensured when a signal cable must pass a power cable of power supply or motor.

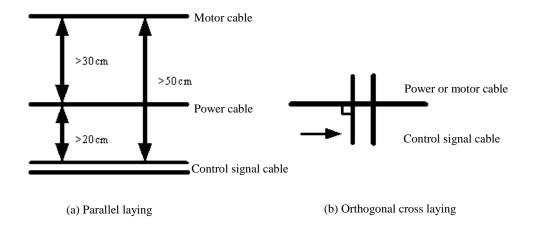


Fig. A.3 Wiring requirement

A.2.2 Requirement for Cable Cross Section Area

The larger the cable cross section is, the larger the earth capacitance, and the higher the ground current leakage will be. If the cross section of motor power cable is too large, motor should be used

Inverter EMC Installation Guide

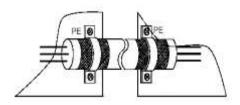
with decreased rating and reduces the output current (reduce 5% of current for each increasing level of cross section).

A.2.3 Requirement for Shielded Cable

High frequency, low impedance, shielded armor cable, such as copper mesh, aluminum mesh, should be used.

A.2.4 Installation Requirement for Shielded Cable

Normally control cable should be a shielded cable, and shielded metal mesh should be connected to metal cabinet by 360° ring type clamp fixed. Fig. A.4 shows the correct connection. Shielded connection shown in Fig. A.5 is wrong.



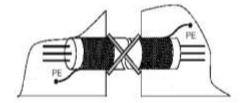


Fig. A.4 Correct shielded grounding

Fig. A.5 Incorrect shielded grounding

A.3 Grounding

A.3.1 Type of Grounding

Fig. A.6 lists the methods for electrode to ground.

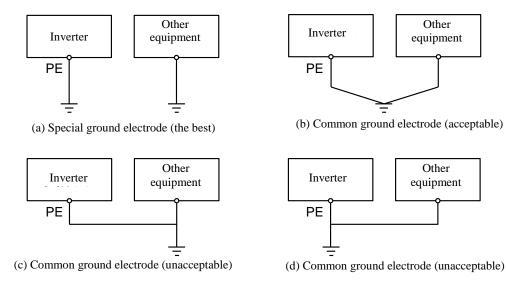


Fig. A.6 Diagram for special grounding

Mathod (a) is the best grounding method in above 4 connections. It is strongly suggested for users

to adopt this grounding method.

A.3.2 Precaution for Ground Wiring

- 1) Grounding cable must be selected to have a standard cross section in order to minimize the grounding impedance. Flat cable has less high-frequency impedance than round conductor cable, flat cable is better in this case if they have the same cross section area.
- 2) To have grounding cable as short as possible, and grounding spot should be connected to inverter as close as possible.
- 3) If motor takes 4-core cable, one core must be grounded at inverter side. Other end is connected to the motor grounding terminal. The best grounding solution is that both motor and inverter have their individual ground electrode.
- 4) If all grounding terminals of different parts in control system are connected together, noise may be created because of ground current leakage. It may affect the peripheral devices other than inverter. In the same control system, grounding for inverter and other weak current devices, such as computer, sensor or audio device, should be wired separately.
- 5) In order to acquire low high-frequency impedance, all equipment fix bolts can be taken as high-frequency terminal to connect the cabinet back panel. Be aware to remove insulating paint before installation.
- 6) Grounding cable should be laid away from the I/O wiring of noise sensitive device, and should keep short.

A.4 Surge Absorber Installation

Relays, contactors and electromagnetic brakes can create large amount of noise. Surge absorber needs to be installed even those components aren't inside the inverter case. Wiring is shown in Fig. A.7.

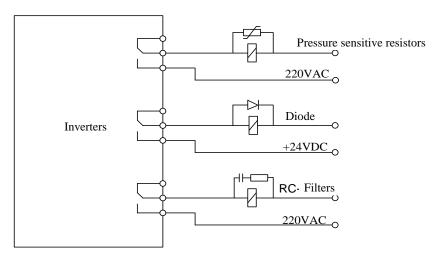


Fig. A.7 Requirement for relay, contactor, EM brake

A.5 Leakage Current and Its Solution

Leakage current flows through the linear capacitor and motor capacitor at input/output side of inverter. Current as shown in Fig. A.8, includes ground leakage current and interline leakage current. The amount of leakage current is decided by the size of carrier frequency and capacitance.

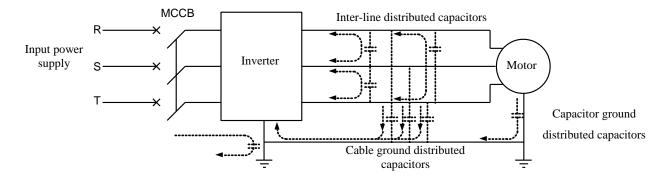


Fig. A.8 Leakage current path

A.5.1 Ground Leakage Current

Besides inverter, ground leakage current can also flow into other devices by grounding cable. It might trigger the wrong action of leakage current breaker, relay or other devices. The higher the inverter carrier frequency, the longer the motor cable is, the higher the leakage current will be.

Suppression measure: lower carrier frequency; short motor cable, take special designed leakage breaker for ultraharmonics/surge.

A5.2 Cable Inter-line Leaking

The leakage current flowed through distributed interline capacitors at inverter output side, may trigger the wrong action of external thermal relay due to its ultraharmonics. Especially for small inverter which capacity is below 7.5 KW, the long cable (more than 50m) causes increasing leakage current. External thermal relay is easy wrongly triggered.

Suppression measure: lower carrier frequency; install AC output reactor at output side; recommend to use temperature sensor and monitor the motor temperature directly, or to use electronic thermal relay for motor overload protect carried by inverter to replace external thermal relay.

A.6 Radiation Suppression

Normally inverter is installed in a metal cabinet. Only minor radiation may affect the devices outside the metal cabinet. The main radiation source is the power cable connected externally. Since all inverter power cable, motor cable, control cable and keyboard wire need to be wired to outside of shielded cabinet, the outgoing position should be special handled, or shield will be invalid.

In Fig. A.9, part of cable inside the shielded cabinet plays as antenna. It picks up noise radiation in the cabinet and transmits to the outside air via cable. In Fig. A.10, wiring cable shielded layer to cabinet grounding at the outlet, noise radiation picked up in the cabinet will then flow into the earth directly via shielded cabinet, and will not affect the environment.

By using shielded layer grounding introduced in Fig. A.10, the place where cable shielded layer connects to the grounding cabinet should be close to the cable outlet, otherwise the unshielded cable between grounding point and outlet will still be functioned as antenna and have coupling affection.

The distance between grounding point and outlet should be less than 15cm, the short, the better.

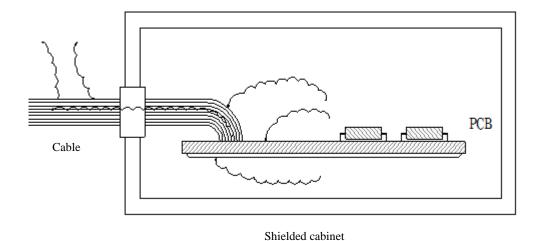


Fig. A.9 Radiation brought by cables from shielded cabinet

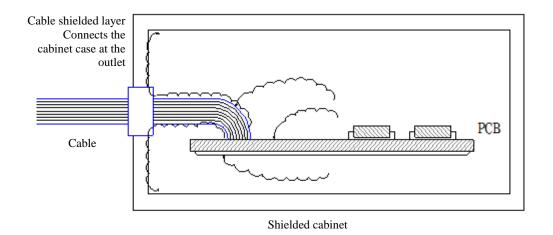


Fig. A.10 Cable shielded layer connects to shielded cabinet and suppress the radiation

A.7 Power Cable Filter Guide

Devices which create strong interference or are sensitive to surrounding interference can use power cable filter.

A.7.1 Function of Power Cable Filter

- 1) Power cable filter is a dual low-pass filter, it allows only DC and current with 50Hz. High frequency electromagnetic interference current is not allowed to pass. It can not only suppress electromagnetic interference created by device itself into the power cable, but also prevent interference on power cable into the device.
- 2) Power cable filter can meet both criterion for conduct emission and conduct susceptibility EMC. It can suppress the radiation interference at the same time.

A.7.2 Precaution for Power Cable Filter Installation

- 1) In cabinet, filter should be installed to the inlet of power cable as close as possible. The filter power cable inside the cabinet should keep short.
- 2) If filter input and output cable are laid to close, high frequency interference will bypass the filter and start to couple directly. Power cable filter will lose the function.
- 3) Normally, there is a designated grounding terminal on filter enclosure. If only one conductor is used to connect filter grounding terminal to the cabinet, filter will not be properly functional due to the high frequency impedance of long conductor. The correct way is to attach the filter enclosure to the metal conductive surface of cabinet and possible keep the large contact area. Note to remove insulating paint, ensure good electrical contact.

A.8 Installation Section Divide for EMC Inverter

In the driving system consist of inverter and motor, inverter and the peripheral devices, such as controller, sensors, are normally installed in the same cabinet. Control cabinet can suppress the outside interference by taking measures at the main conjunction. Therefore radio noise filter and input cable AC reactor should be installed at input cable terminal in control cabinet. To meet the EMC requirement, Electromagnetic Compatibility (EMC) should also be fulfilled inside the cabinet.

In the driving system consist of inverter and motor, inverter, brake unit and contactors are all sources of high noise intensity. It will affect the noise sensitive peripheral devices, such as automation equipments, encoder and sensors. Based on their electrical characteristics they can be installed in different EMC zones. The most effective measure to reduce interference is to separate the noise source and noise receiver in space. Fig. A.11 shows the division of inverter EMC installation zone.

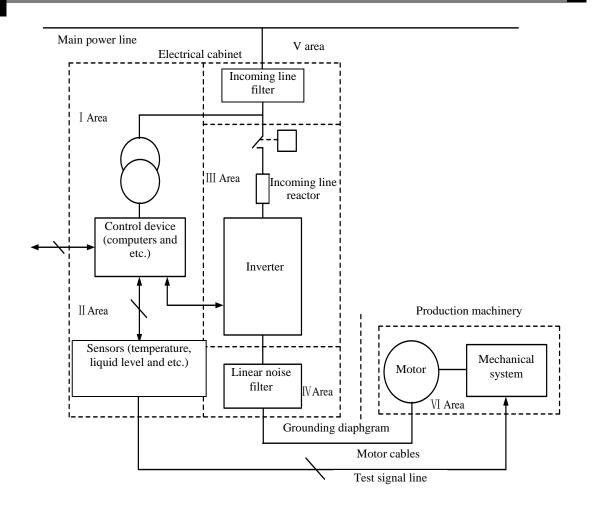


Fig. A.11 Diagram for inverter EMC installation zone

Above installation zones are described as follows:

Zone I: control power transformer, control device, sensors and etc.

Zone II: control signal cables and their connection, require certain ability for anti-interference

Zone III: major noise source includes incoming cable reactor, inverter, brake unit, contactors etc.

Zone IV: Output noise filter and its wiring

Zone V: Power supply (include wiring of radio noise filter)

Zone VI: Motor and its cable

Each zone must be separated and keep a minimum 20cm distance to avoid electromagnetic coupling. The grounded separator is the best to divide each zone for coupling. Cables in different zones should be inserted into individual cable ducts. When filter is required, it should be installed at entrance point of each zone. All bus cables (such as RS485) and signal cables from cabinet must be shielded.

A.9 Precaution for Electrical Installation

Fig. A.12 shows the inverter electrical installation.

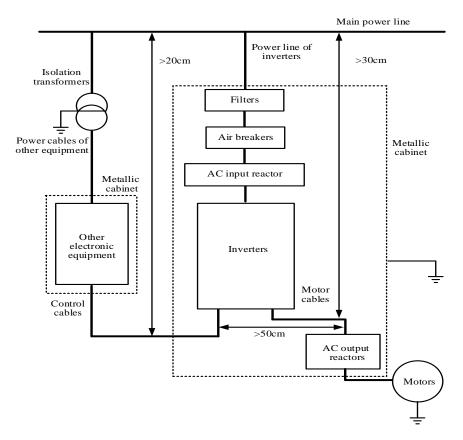


Fig. A.12 Inverter electrical installation diagram

To satisfy requirement of EMC, please note during installation:

- 1) Inverter should be installed inside the cabinet. Enclosure of devices, such as inverter back panel, input filter enclosure, all must be installed on the back of control cabinet firmly, and ensure having good electrical contact between them; to minimize the space between inverter and filter, a space less than 15cm can maximum reduce the grounding cable high frequency impedance between inverter and input filter, reduce high frequency noise.
- 2) At entrance of control cabinet (not more than 5 cm from the outlet) installs a wide grounding block. To ensure a good electrical contact, all input, output cable shielded layers should be connected to the grounding block and fixed by 360° ring type clamp.
- 3) Motor cable must use shielded cable, and the best to have metal interlocked conduit, or double layers of metal mesh shielded cable. The 360° ring type clamp (such as Fig. A.4) must be used as metal cable clamp to fix the shielded layer of motor cable at inverter side to the back board of cabinet. There

are two fixing locations: one is to close the inverter (the best is less than 15 cm), other location is to fix it on the ground block. 360° ring type connection should be taken to connect the motor metallic case when shielded layer of motor cable goes through the motor terminal box at motor side. If this type of connection is hard to do, the shielded layer can be braided, stretched and connected to the motor ground terminal. The stretched width should be greater than 1/5 of the braid length. The length of motor cable core and cable from PE flexible pipe should be as short as possible. The best is to keep it less than 5 cm.

- 4) Shielded cable must be taken for terminal block control cable. Its shielded layer should be connected to the ground block at the cabinet entrance and taken 360° ring type metal clamp. At inverter side shielded layer can be fixed on inverter metal case by using metal cable clamp. If that way is difficult to use, the shielded layer can be woven to a broad and short braid, and connect to the PE terminals after stretched. The best length of cable core and cable from PE flexible pipe should keep less than 15 cm.
 - 5) Keyboard cable can't go out of the shielded cabinet.
 - 6) The holes or seams on shielded cabinet should keep small and not more than 15cm.

A.10 EMC Standard Fulfilled by AS500 Series High-Performance Inverter

AS500 series high performance vector inverter can meet the EMC standard as shown in Table A.2 after installing proper I/O filter, AC reactor (refer to the ACCESSORIES SELECTION for the proper type of filter and reactor) and following above mentioned wiring precautions.

Table A.2 AS500 series High-Performance inverter EMC performance summary

Item	Criteria	Level of satisfying criteria	
Conducted harassment		$0.15 \le f < 0.50MHz$, $100dB(\mu v/m)$ ——Quasi-peak valu	
emission	EN12015.1998	$0.50 \le f < 5.0MHz$, $86dB(\mu v/m)$ ——Quasi-peak valu	
emission		$0.15 \le f < 0.50MHz$, $100dB(\mu\nu/m)$ ——Quasi-peak valu	
Radiated harassment	EN12015.1998	30≤ <i>f</i> <230 <i>MHz</i> , 40 <i>dB</i> (μ <i>ν/m</i>) ——Quasi-peak valu	
emission	EN12013.1998	230≤ <i>f</i> <1000 <i>MHz</i> , 47 <i>dB</i> (μ <i>ν/m</i>) ——Quasi-peak valu	
Electrostatic discharge	EN12016.2004	Critaria D. (contact discharge 4000V sin discharge 2000V)	
immunity	EN12010.2004	Criteria B (contact discharge 4000 v, air discharge 8000 v)	
Radiated electromagnetic	EN12016 2004	Land 2 Criteria A/2N/m	
field immunity	EN12016.2004	Level 3 Criteria A(3 v/m)	
Electrical Fast Transient	EN12016.2004	Level 4 Criteria D (heavy appeart and 12VV/2 SkHz)	
(EFT) Immunity	EN12010.2004	Level 4 Citteria B (neavy current end ±2KV/2.5KHZ)	
Surge immunity	EN12016.2004	Criteria B(±1KV)	

Conducted immunity	EN12016.2004	Criteria A(3V,0.15~80MHz)

Appendix B Standard Compatibility

(1) European Low Voltage Directive

AS500 series inverter complies with the standard of EN61800-5-1:2007, and its clause of Low Voltage Directive 2006/95/EC.

This inverter complies also the following standard:

EN61800-5-1:2007: Adjustable speed electrical power drive systems –Part 5-1: Safety requirements-Electrical, thermal and energy.



(2) European EMC Regulations

AS500 series inverter meets the following EMC standards once you start to install the product according the recommendation provided by this handbook.

EN12015.1998 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Emission.

EN12016.2004 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Immunity.

EN61800-3:2004: Power Drive Category D3.



(3) ISO9001 Quality Management System

Shanghai Sigriner STEP Electric Co., Ltd executes the quality management according the standard of ISO9001.

Appendix C Modbus Communication Protocol

The inverter whose Modbus address is set as hexademical number system:

Modbus address of register = register address + 0x999A

Modbus address of register bit = register address*16 + bit No. n (n=0... 15)

Modbus address of inverter parameter = parameter No. expressed in hexademical (for example, Modbus address of P10.23: 0x1023)

The inverter whose Modbus address is set as decimal number system:

Modbus address of register = register address + 10000

Modbus address of register bit = register address*16 + bit No. n (n=0... 15)

Modbus address of inverter parameter = parameter No. expressed in demical (for example,

Modbus address of P10.23: 1023)

C.1 Command Data [registers 3 and 6] [bits 1 and 5]

Read the register in this table with function code 3, write the register in this table with function code 6

Read the bit in this table with function code 1, write the bit in this table with function code 5

Register address	Contents
	Communication control word
	bit0 1: FWD 0: invalid
	bit1 1: REV 0: invalid
	bit2 1: run 0: stop
	bit3 reserved (1: with external fault)
	bit4 1: reset fault command
0000Н	bit7~5 reserved (multi-speed selection # attached table Z-1)
	bit8 reserved (1: valid inching frequency #)
	bit10~9 acceleration and deceleration time selection 0: curve 1 1: curve 2
	bit11 reserved (1: lockout base #)
	bit12 1: select running and given command 2 0: select running and given command 1
	bit13 1: select PID parameter group 2 0: select PID parameter group 1
	bit15~14 not used*
0001H	Modbus target frequency given value, communication given value
0001H	0~30000: 0.00~300.00Hz
0002Н	Reserved (Modbus current frequency given value)
	IQ10(1.0): rated frequency
000211	Reserved (Modbus PID given value)
0003Н	10000 corresponds to 100% given quantity
0004Н	Reserved (Modbus PID target value validity 1: valid 0: invalid)

	Personal (AQ1 sustant value)
0005Н	Reserved (AO1 output value)
	-1024~1024: -5.00~5.00V
0006Н	Reserved (AO2 output value)
	-1024~1024: -5.00~5.00V
	Multifunctional port output#
	bit0 1: DO0 (relay A) ON 0: OFF
	bit1 1: DO1 (relay B) ON 0: OFF
	bit2 1: DO2 ON 0: OFF
	bit3 1: DO3 ON 0: OFF
0007H	bit4 1: DO4 (OC) ON 0: OFF
	bit5 1: DO5 (OC) ON 0: OFF
	bit6 not used
	bit7 not used
	bit15~8 not used
	# actual terminal output value = Modbus set value internal output value of function
	terminal
	Reserved (validity of Modbus broadcast data)
	bit0 1: valid Modbus broadcast given of terminal DI0 0: invalid
	bit1 1: valid Modbus broadcast given of terminal DI1 0: invalid
	bit2 1: valid Modbus broadcast given of terminal DI2 0: invalid
	bit3 1: valid Modbus broadcast given of terminal DI3 0: invalid
	bit4 1: valid Modbus broadcast given of terminal DI4 0: invalid
	bit5 1: valid Modbus broadcast given of terminal DI5 0: invalid
0008H	bit6 1: valid Modbus broadcast given of terminal DI6 0: invalid
	bit7 1: valid Modbus broadcast given of terminal DI7 0: invalid
	bit8 not used
	bit9 not used
	bit10 1: valid target frequency broadcast given value 0: invalid
	bit11 1: valid current frequency broadcast given value 0: invalid
	bit12 1: valid running command broadcast given value (FWR, REV, start, stop)
	bit15~13 not used
0009H	Reserved (target frequency broadcast given value)
000AH	Reserved (current frequency broadcast given value)
	Reserved (running signal broadcast given value)
	bit0 Modbus broadcast given value # of terminal DI0 (the corresponding specific function is
	set by the parameter)
	bit1 Modbus broadcast given value # of terminal DI1 (the corresponding specific function is
	set by the parameter)
000BH	bit2 Modbus broadcast given value # of terminal DI2 (the corresponding specific function is
	set by the parameter)
	bit3 Modbus broadcast given value # of terminal DI3 (the corresponding specific function is
	set by the parameter)
	bit4 Modbus broadcast given value # of terminal DI4 (the corresponding specific function is
	set by the parameter)
	set by the parameter)

	bit5 Modbus broadcast given value # of terminal DI5 (the corresponding specific function is
	set by the parameter)
	bit6 Modbus broadcast given value # of terminal DI6 (the corresponding specific function is
	set by the parameter)
	bit7 Modbus broadcast given value # of terminal DI7 (the corresponding specific function is
	set by the parameter)
	bit8 not used
	bit9 not used
	bit10 1: FWD 0: invalid
	bit11 1: REV 0: invalid
	bit12 1: run 0: stop
	bit13 1: external fault
	bit14 1: reset fault command
	bit15 not used
	# adopted value of the function input terminal = (Modbus broadcast value & broadcast given
	validity actual input value of function terminal
000CH~0018H	Reserved (broadcast data)
	Virtual input terminals
	bit0: virtual terminal X0
	bit1: virtual terminal X1
	bit2: virtual terminal X2
	bit3: virtual terminal X3
0019Н	bit4: virtual terminal X4
	bit5: virtual terminal X5
	bit6: virtual terminal X6
	bit7: virtual terminal X7
	bit8~15: reserved
	#actual terminal input value = Modbus set value input value of outer terminal
	Reserved control word (79 spaces)
001AH~0068H	001AH: communication given torque -1000~1000 → -100.0%~100.0% motor rated torque
	001BH: speed limit value 0~40000 → 0.00~400.00Hz
	Parameter update request
	After the parameter is received from the inverter via Modbus, it is saved in its parameter
	image area.
0069Н	0x55: update the actual parameter in RAM by use of that in image area.
	0xAA: update the actual parameter in RAM by use of the default factory parameter.
	0: no update.
	[Note]: the unit is automatically cleared after every update.
006AH~01F9H	Reserved (parameter)
01FAH~046FH	Reserved 630 spaces
0.0111	

C.2 Monitoring Data [register 4] [bit 2]

Read the register in this table with function code 4 and read the bit in this table with function code

2.

Register address	Contents
	Status word of the inverter status
	bit0 1: with running signal 0: no running signal
	bit1 1: in service
	bit2 1: in zero speed
	bit3 1: in forward 0: in reverse
	bit4 1: normal power-on of the inverter 0: abnormal power-on of the inverter
0470Н	bit5 1: in lockout base
0470H	bit6 not used
	bit7 1: in fault
	bit8 reserved (1: in fault retry)
	bit9 reserved (1: wrong parameter setting)
	bit10 1: in self-tuning
	bit11 1: request self-tuning
	bit15~12 not used
	Detection status
	bit0 1: frequency detection LF, frequency ≤ detection frequency
	bit1 1: frequency detection GF, frequency ≥ detection frequency
	bit2 1: frequency detection EF, given and feedback frequency in detection frequency band
	bit3 1: speed arrive
0471H	bit4 reserved (1: in analog signal given frequency command loss)
04/1H	bit5 1: in over-torque detection
	bit6 1: in undervoltage detection
	bit7 1: bus voltage greater than 85% rated voltage
	bit8 1: exceeding 5% rated current during running, exceeding 10% rated current during stop
	bit9 1: fault forecast
	bit15~10 not used
0472H	Reserved (given target frequency)
0473H	Current running frequency
0473H	5000 corresponding to 50.00Hz
0474H	Reserved (PID given value)
0475H	Reserved (PID feedback value)
0476H	Reserved (PID output value)
0477H	Reserved (PID proportional item)
0478H	Reserved (PID integral item)
0479H	Reserved (PID differential item)
0.45 1.77	Reserved (communication fault)
047AH	bit0 1: communication overtime

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	bit1 1: frame format
	bit2 1: CRC error
	bit3 1: data length error
	bit4 1: odd-even check error
	bit5 1: overload error
	bit6 1: illegal command
	bit7 reserved (Operator communication fault)
	bit15~8 not used
	Parameter updating status
	bit0 1: in updating 0: update completed
047BH	bit1 reserved (1: data exceeding limit)
	bit2 reserved (1: data mismatched)
	bit3~15 not used
047CH~0484H	Not used (9 units)
	Inverter output monitoring 1
	bit0 1: normal power-on 0: abnormal power-on
	bit1 1: fault 0: normal
	bit2 1: running signal 0: no running signal
	bit3 1: frequency/speed arrive signal
	bit4 1: consistent frequency/speed
	bit5 1: in zero speed
0485H	bit6 1: DC bus voltage greater than 85% rated voltage
	bit7 1: exceeding 5% rated current during running, exceeding 10% rated current during stop
	bit8 1: in self-tuning
	bit9 1: speed detection 1
	bit10 1: speed detection 2
	bit11 1: fault forecast
	bit12 1: self-tuning request
0486Н	Reserved (inverter output monitoring 2)
0487H	Reserved (inverter output monitoring 3)
0488H	Reserved (inverter output monitoring 4)
	Water pump output monitoring 1
	bit0 1: water pump sleep
	bit1 1: motor 1 start
	bit2 1: motor 2 start
	bit3 1: motor 3 start
	bit4 1: motor 4 start
0489H	bit5 1: motor 5 start
310711	bit6 1: motor 6 start
	bit7 reserved (Y8)
	bit8 reserved (Y9)
	bit9 reserved (Y10)
	bit10 reserved (Y11)
	bit11 reserved (Y12)
	0.111 10.001.104 (11.2)

	bit12 reserved (Y13)
	bit13 reserved (Y14)
	bit14 reserved (Y15)
	bit15 reserved (Y16)
	Water pump output monitoring 2
	bit0 reserved (Y17)
	bit1 reserved (Y18)
	bit2 reserved (Y19)
	bit3 reserved (Y20)
	bit4 reserved (Y21)
	bit5 reserved (Y22)
	bit6 reserved (Y23)
048AH	bit7 reserved (Y24)
	bit8 reserved (Y25)
	bit9 reserved (Y26)
	bit10 reserved (Y27)
	bit11 reserved (Y28)
	bit12 reserved (Y29)
	bit13 reserved (Y30)
	bit14 reserved (Y31)
	bit15 reserved (Y32)
	Fault indication 1
	bit0 module overcurrent protection
	bit1 ADC fault
	bit2 radiator overheat
	bit3 braking unit failure
	bit4 reserved
	bit5 reserved
	bit6 speed variation
048BH	bit7 bus overvoltage
	bit8 bus undervoltage
	bit9 output phase loss
	bit10 motor low speed overcurrent
	bit11 encoder fault
	bit12 reserved
	bit13 reserved
	bit14 reserved
	bit15 motor phase sequence error
	Fault indication 2
	bit0 overspeed in the same direction
	bit1 overspeed in the opposite direction
048CH	bit2 reserved
	bit3 encoder communication fault
	bit4 abc overcurrent

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	bit5 brake detection fault
	bit6 input overvoltage
	bit7 reserved
	bit8 reserved
	bit9 no self-learning of the encoder
	bit10 output overcurrent
	bit11 SINCOS encoder fault
	bit12 input phase loss
	bit13 overspeed protection
	bit14 motor high speed overcurrent
	bit15 grounding protection
	Fault indication 3
	bit0 capacitor ageing
	bit1 external fault
	bit2 reserved
	bit3 reserved
	bit4 current sensor fault
	bit5 braking resistor short circuit
	bit6 too large instantaneous current value
048DH	bit7 output contactor fault
	bit8 brake switch fault
	bit9 IGBT short circuit protection
	bit10 communication fault
	bit11 abnormal input power
	bit12 reserved
	bit13 reserved
	bit14 reserved
	bit15 reserved
	Reserved (fault indication 4)
048EH	bit15~0 reserved
	Multifunctional terminal input status
	bit0 1: multifunctional terminal X0 ON 0: OFF
	bit1 1: multifunctional terminal X1 ON 0: OFF
	bit2 1: multifunctional terminal X2 ON 0: OFF
	bit3 1: multifunctional terminal X3 ON 0: OFF
	bit4 1: multifunctional terminal X4 ON 0: OFF
048FH	bit5 1: multifunctional terminal X5 ON 0: OFF
	bit6 1: multifunctional terminal X6 ON 0: OFF
	bit7 1: multifunctional terminal X7 ON 0: OFF
	bit8 not used
	bit9 not used
	bit15~10 not used
	Multifunctional terminal output status
0490Н	bit0 1: K1 ON 0: OFF

	bit1 1: K2 ON 0: OFF
	bit2 1: Y0 ON 0: OFF
	bit3 1: Y1 ON 0: OFF
	bit4 1: Y3 (K3) ON 0: OFF
	bit5 1: Y4 (K4) ON 0: OFF
	bit6 not used
	bit7 not used
	bit15~8 not used
0491H	Feedback speed (Hz) -30000~30000 → -300.00~300.00Hz
0492H	Given speed -30000~30000 → -300.00~300.00Hz
0493H	Given speed filtering value
0494H	Output voltage effective value
0495H	Output current effective value
0496H	Output torque -1000~1000 → -100.0%~100.0% inverter rated current
0497H	Driver efficiency
0498H	Bus voltage
0499H	Analog input AI0/TM motor temperature detection input -10000~10000→-10.000~10.000V
049AH	Analog input AI1 -10000~10000→-10.000~10.000V
049BH	Analog input AI2 (reserved)
049CH	System time
049DH	Radiator temperature
049EH	Phase U voltage (instantaneous value)
049FH	Phase V voltage (instantaneous value)
0490H	Phase W voltage (instantaneous value)
04A1H	Phase U current (instantaneous value)
04A 2H	Phase V current (instantaneous value)
04A 3H	Phase W current (instantaneous value)
04A 4H	Output active power
04A 5H	Total output power
04A 6H	Reactive power
04A 7H	Power factor
04A 8H	Feedback speed (rpm) -9999~9999 →-999.9~999.9
04A 9H	Pre-torque
04AAH~04B9H	Reserve 16 units
	View[0~31]: The specific monitoring contents are related to the inverter model. Please refer
	to "select LCD display data content" in the Inverter Instructions.
	04BAH: View[0]//no-definition
	04BBH: View[1]
04BAH~04D9H	04BCH: View[2]
	04BDH: View[3]
	04BEH: View[4]
	04BFH: View[5]
	04C0H: View[6]

	04C1H: View[7]
	04C2H: View[8]
	04C3H: View[9]
	04C4H: View[10]
	04C5H: View[11]
	04C6H: View[12]
	04C7H: View[13]
	04C8H: View[14]
	04C9H: View[15]
	04CAH: View[16]
	04CBH: View[17]
	04CCH: View[18]
	04CDH: View[19]
	04CEH: View[20]
	04CFH: View[21]
	04D0H: View[22]
	04D1H: View[23]
	04D2H: View[24]
	04D3H: View[25]
	04D4H: View[26]
	04D5H: View[27]
	04D6H: View[28]
	04D7H: View[29]
	04D8H: View[30]
	04D9H: View[31]
	Uxx monitoring data (curve data)
	04DAH: U01 data value (curve 1)
	04DBH: U02 data value (curve 2)
	04DCH: U03 data value (curve 3)
	04DDH: U04 data value (curve 4)
	04DEH: U05 data value (curve 5)
	04DFH: U06 data value (curve 6)
	04E0H: U07 data value (curve 7)
04DAH~04E5H	04E1H: U08 data value (curve 8)
04DAH~04E3H	
	04E2H: low byte: U01 logo (curve 1 configuration); high byte: U02 logo (curve 2
	configuration)
	04E3H: low byte: U03 logo (curve 3 configuration); high byte: U04 logo (curve 4
	configuration)
	04E4H: low byte: U05 logo (curve 5 configuration); high byte: U06 logo (curve 6
	configuration)
	04E5H: low byte: U07 logo (curve 7 configuration); high byte: U08 logo (curve 8
	configuration)
04E6H~04E9H	Reserve 4 units (for the driver)
U4EUП~U4E9H	Neserve + units (for the uriver)

	1_,			
04EAH~05E9H		Phase U current (buffer 256 points, for graphical display) [take sample once every 10 PWM		
055111 0 5531	periods]			
05EAH~06E9H		at (buffer 256 points, for graphical display)		
06EAH~07E9H		nt (buffer 256 points, for graphical display)		
07EAH		(for graphical display)		
07EBH	-	or graphical display)		
07ECH		d (for graphical display)		
07EDH	-	or graphical display)		
07EEH~09EDH	Reserve 512 sp	paces (for graphical display)		
		Fault code		
	Historical	Actual speed at faulty moment -30000~30000→-300.00~300.00Hz		
0A34H~0A38H	fault 0	Given speed at faulty moment -30000~30000→-300.00~300.00Hz		
	(the earliest)	Bus voltage at faulty moment		
		Current at faulty moment		
		Fault code		
	Historical	Actual speed at faulty moment -30000~30000→-300.00~300.00Hz		
0A39H~0A3DH	fault 1	Given speed at faulty moment -30000~30000→-300.00~300.00Hz		
	lauit 1	Bus voltage at faulty moment		
		Current at faulty moment		
		Function code		
	Historical fault 2	Actual speed at faulty moment -30000~30000→-300.00~300.00Hz		
0A3EH~0A42H		Given speed at faulty moment -30000~30000→-300.00~300.00Hz		
		Bus voltage at faulty moment		
		Current at faulty moment		
		Function code		
	TT' . 1	Actual speed at faulty moment -30000~30000→-300.00~300.00Hz		
0A43H~0A47H	Historical	Given speed at faulty moment -30000~30000→-300.00~300.00Hz		
	fault 3	Bus voltage at faulty moment		
		Current at faulty moment		
		Function code		
	TT	Actual speed at faulty moment -30000~30000→-300.00~300.00Hz		
0A48H~0A4CH	Historical	Given speed at faulty moment -30000~30000→-300.00~300.00Hz		
	fault 4	Bus voltage at faulty moment		
		Current at faulty moment		
		Function code		
		Actual speed at faulty moment -30000~30000→-300.00~300.00Hz		
0A4DH~0A51H	Historical	Given speed at faulty moment -30000~30000→-300.00~300.00Hz		
	fault 5	Bus voltage at faulty moment		
		Current at faulty moment		
		Function code		
	Historical	Actual speed at faulty moment -30000~30000→-300.00~300.00Hz		
0A52H~0A56H	fault 6	Given speed at faulty moment -30000~30000→-300.00~300.00Hz		
		Bus voltage at faulty moment		
	<u> </u>	<u> </u>		

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	•	Current at faulty moment
		Function code
	Historical	Actual speed at faulty moment -30000~30000→-300.00~300.00Hz
0A57H~0A5BH	fault 7	Given speed at faulty moment -30000~30000→-300.00~300.00Hz
	(the latest)	Bus voltage at faulty moment
		Current at faulty moment

Appendix D Special Program Parameter Specification and Simple Debugging Manual of Permanent Magnet Synchronous Motor

The company has developed inverter products specially used for the control of permanent magnet synchronous motor, with the standard program version number of 050.04.329.01.

This version includes PMSM with sensor vector control, sensor torque control, open-loop vector control PM, and voltage vector V/f control for asynchronous motors (only used to determine the sensor direction).

This document explains the permanent magnet synchronous motor debugging process in detail, and supplements the relevant parameters. This manual is used together with the user manual of AS500 general-purpose inverter. We apologize for any inconvenience caused

■ Explanation of Parameters

Explain the area division of parameter groups

Function code area	Domain	Function code description
D1Vtlt	P10 group	Basic control parameter group
P1X control parameters	P15 group	High performance control
	P20 group	Basic motor parameter group
200	P21 group	Advanced motor parameter
P2X motor parameters	P22 group	Auxiliary parameter group
	P23 group	Protection parameter group
DCV vector control renemeters	P60 group	Speed loop control parameter
P6X vector control parameters	P61 group	Current loop control parameter

♦ P1X control parameters

P10 group Basic control parameter group

Function code	Name	Setting range	Factory setting
P10.00	Control mode selection	0 - 5	0

0: **voltage vector V/f control**: only for determining the encoder direction, without load operation capacity.

1. Backup

- 2: With speed sensor torque control: the need for installing a speed sensor, with high torque output accuracy.
 - 3: With speed sensor vector control: the need for installing a speed sensor, able to achieve

high-precision speed and torque performance.

4: **Open-loop vector control PM:** suitable for universal variable speed drive occasions with no speed sensor and large starting torque requirement.

5. Backup

> P15 group High performance control parameter group

Function code	Name	Setting range	Factory setting
P15.00	PM-SVC coefficient (%)	0 - 100	5

External synchronization phase with the injection current of (P15.05*motor rated current) when the operating frequency is below (P15.00* rated frequency) with the motor rated frequency p.u.

Recommended setting parameters 5% and 10%.

Function code	Name	Setting range	Factory setting
P15.01	PM low speed compensation	0 - 1000	140
113.01	coefficient 1 (%)	0 - 1000	140

Recommended setting parameter: 140% for medium-high frequency motor (with the rated frequency greater than 30Hz).

This parameter can be appropriately increased for low-frequency motor (with the rated frequency below 30Hz), up to 400%.

Function code	Name	Setting range	Factory setting
P15.02	Control state word	0 - 3	2

Bit 0 is the high-frequency injection enable bit; 1

Bit 1 is external synchronous startup enable bit; 2

Recommended setting parameter: 2

Function code	Name	Setting range	Factory setting
P15.03	PM current control strategy	0 - 3	1

0: Id = 0 suitable for non-salient pole motor (SPM);

1: MTPA maximum torque per ampere control, suitable for salient pole machine (IPM), requiring motor parameters;

2: **UPF** unit power factor control, suitable for non-salient and salient pole machines;

Note: Common for three control modes: sensor vector control, sensor torque control and open-loop vector control.

Function code	Name	Setting range	Factory setting
P15.04	Initial magnetic pole judgment	0 - 3	1

0: **not judged** Before the motor starts, the initial angle of magnetic pole is not judged.

1: **DC injection start** increasingly inject the DC current to (P15.05* motor rated current) and drag the motor pole to the excitation direction.

Advantages: smooth start with noise, and able to achieve start with load by setting P15.05 parameters.

Disadvantages: the motor may reverse for long time when the initial magnetic pole is judged.

Relevant parameters: P15.05 (DC injection size). P15.05 parameter shall be greater than startup load. If the motor is started with 100% load, it is recommended to set P15.05 to 110%.

2: Pulse voltage injection start inject the voltage pulse to judge the initial magnetic pole.

Advantages: motor start without reversal, short initial magnetic pole judgment, and able to achieve start with load by setting P15.05 parameters.

Disadvantages: the motor starts with noise.

Relevant parameters: P15.05 (DC injection size), with the same function as DC injection start.

P15.10(pulse injection time), recommended setting parameter 1 - 2ms.

3: **AC injection start** inject the AC current to (P15.05* motor rated current).

Advantages: smooth start with noise, and able to achieve start with load by setting P15.05 parameters. The motor rotates at a set frequency at the initial magnetic pole judgment stage.

Disadvantages: long time of initial magnetic pole judgment stage.

Relevant parameters: P15.05 (DC injection size), the same as DC injection start.

P15.12 (Pole positioning frequency), motor rotation frequency at the initial magnetic pole judgment stage.

P15.13 (Pole positioning time), pole position duration after the injection current reaches (P15.05* motor rated current).

Function code	Name	Setting range	Factory setting
P15.05	DC injection size (%)	0 - 300	30

With the motor rated current p.u., pay attention to this parameter setting in the load start.

Use only in self-learning 8 (encoder angle self-learning) under the modes with sensor vector control and sensor torque control.

Function code	Name	Setting range	Factory setting
P15.06	Injected high frequency (Hz)	0 - 60000	1500
P15.07	Injected high frequency amplitude (%)	0 - 100.0	20.0
P15.08	High frequency Kp	0 - 6553.5	5.00
P15.09	High frequency Ki	0 - 6.5535	0.0500

Use this parameter when P15.02=1 in the open-loop vector control PM control mode. It is recommended to set P15.04 to 2 in case of high frequency injection.

Note: A high salient pole ratio is required for high frequency injection, so it is not applicable to the surface-mount motor.

Function code	Name	Setting range	Factory setting
P15.10	Pulse injection time (ms)	0 - 6553.5	2.0

Use this parameter when P15.04=2 in the open-loop vector control PM control mode.

Function code	Name	Setting range	Factory setting
P15.11	Upper limit of flux linkage	0 - 100	0
	compensation (%)	0 - 100	O

Upper threshold of online flux linkage correction, the default value 0 recommended.

Function code	Name	Setting range	Factory setting
P15.12	Pole positioning frequency (Hz)	0 - 655.35	0.50Hz
P15.13	Pole positioning time (s)	0 - 65.535	2.000

Use this parameter when P15.04=3 in the open-loop vector control PM control mode.

Function code	Name	Setting range	Factory setting
P15.14	Field weakening mode selection	0 - 1	0

Field weakening control applies to the modes with sensor vector control, sensor torque control and open-loop vector control PM.

0: voltage closed-loop field weakening control

Advantages: in and out of field weakening smoothly.

Disadvantages: deep field weakening out of control easily and enter field weakening too early.

Relevant parameters:

P15.15 (field weakening voltage coefficient), used to adjust the voltage limit circle.

P15.16 (voltage closed-loop field weakening Kp)

P15.17 (voltage closed-loop field weakening Ki)

1: New field weakening mode

Advantages: stable deep field weakening current and simple parameter setting. Only P15.15 (Field weakening voltage coefficient) rather than PI parameter is set.

Disadvantages: the speed loop of the motor will be soft. If necessary, the PI of the speed loop can be hardened.

Relevant parameters:

Function code	Name	Setting range	Factory setting
P15.15	Field weakening voltage	0 - 2.00	1.00
	coefficient	0 - 2.00	1.00

Used to adjust the voltage limit circle.

The voltage limit circle amplitude is P15.15 *inverter rated voltage/motor rated voltage, with Vdc/ $\sqrt{2}$ p.u.

Recommended setting parameter: 1.00

Function code	Name	Setting range	Factory setting
P15.16	Voltage closed-loop field	0 - 655.35	0.10
	weakening Kp		
P15.17	Voltage closed-loop field	0 - 6.5535	0.0050
	weakening Ki		

Voltage closed-loop field weakening control mode PI parameter. When the parameter is not set properly, the speed will oscillate in the field weakening area.

Recommended setting parameter:

P15.16 = 0.10 P15.17 = 0.0050

♦ P2X motor parameters

> P20 group Basic motor parameter group

Function code	Name	Setting range	Factory setting
P20.00	Type of motor 1	0 - 1	0
P20.01	Rated power of motor 1 (kW)	0.4 - 560.0	Depending on the inverter
P20.02	Rated current of motor 1 (A)	0.1 - 6553.5	Depending on the inverter
P20.03	Rated frequency of motor 1 (Hz)	0 - 300.00	50.00
P20.04	Rated speed of motor 1 (rpm)	0 - 30000	1460
P20.05	Rated voltage of motor 1 (V)	0 - 460	380
P20.06	Number of poles of motor 1	2 - 128	4
P20.07	Rated slip frequency of motor 1 (Hz)	0.10 - 655.35	1.40
P20.08	Maximum slip frequency of motor 1 (Hz)	0.10 - 655.35	2.80
P20.09	Phase sequence of motor 1	0 - 1	1
P20.10	No-load current coefficient of motor 1 (%)	1 - 100.00	30.00

Pag 12	Maximum power coefficient of	50 400	250
P20.12	motor 1 (%)	50 - 400	250

P20.00 motor type: 0: asynchronous motor, 1: synchronous motor.

P20.01 - P20.06 are used to set the inverter-driven motor parameters and shall be set correctly according to the motor nameplate before use.

P20.09: motor rotation direction, 0 is rotation with negative phase sequence and 1 is rotation with positive phase sequence.

P20.07, P20.08 and P20.10 are used only for the voltage vector V/f control suitable for asynchronous motor.

P20.12: maximum power coefficient of motor, used to limit the maximum torque currently allowed to output by the inverter under the vector control mode (with speed sensor vector control or open-loop vector control PM). When the current actual output power of the inverter is less than the power set by P20.12, the maximum torque allowed to output by the inverter is P70.04 output torque limit; otherwise, it will be gradually reduced and the power is maintained no more than P20.12.

P20.14 - P20.26: parameters of motor 2, the same with those of motor 1.

P20.27: enable motor parameter calculation, used for asynchronous motor only. When the voltage vector V/f control is used, the parameter calculation function may be enabled to improve V/f operating performance. 0: disable motor parameter calculation function; 1: Parameter calculation method 1 (recommended); 2. Parameter calculation method 2.

> P21 group Advanced motor parameter group

Function code	Name	Setting range	Factory setting
P21.11	PM1 stator resistance (Ω)	0 - 65.535	0
P21.12	PM1 motor shaft D inductance	0 - 6553.5	0
P21.13	PM1 motor shaft Q inductance	0 - 6553.5	0
P21.14	PM1 Counter electromotive	0 - 6553.5	0
	force coefficient (V)	0 - 0333.3	U

P21.12 and P21.13: set the shaft D and shaft Q inductance of PMSM, in the display format of "yyyy.n", in which, "yyyy" is inductance; "n" is decimal places. The specific calculation of inductance is: $yyyy*10^{-n}$ (H), the minimum inductance that can be set is 0.001μ H.

P21.15 - P21.18: second group of permanent magnet synchronous motor parameters, no more detailed description here.

P21.00 - P21.10: asynchronous motor parameters, no more detailed description here.

Note: The above parameters are obtained by static self-learning of motor, and the following problems may occur in the self-learning process.

- 1. The carrier frequency and current loop bandwidth may not be adjusted manually.
- 2. 37# fault. Firstly, check the connection between inverter and motor; secondly, improve the current loop bandwidth (P61.03); finally, check the inverter current sensor.

> P22 group Auxiliary parameter group

Function code	Name	Setting range	Factory setting	
P22.15	Position angle self-learning	0 - 2	0	
	selection	0 2	Ü	

- 0: Self-learning is not conducted after power on and shall be conducted manually.
- 1: Dynamic self-learning of encoder (self-learning 7).
- 2: New self-learning of encoder (self-learning 8).

> P23 group Protection parameter group

Function code	Name	Setting range	Factory setting	
P23.00	Motor protection function selection	0 - 1	1	
P23.02	Continuous running current	50.0 - 180.0	110.0	
P23.03	1min overcurrent threshold	120.0 - 300.0	120.0	

P23.00: motor protection function selection, 0: not protected, 1: enable motor inverse time limit protection.

P23.02: continuous running current, not protected if less than this current.

P23.03: 1min overcurrent threshold, equal to the current running for 1 minute, the inverter reports 31# fault.

♦ P6X vector control parameters

P60 group Speed loop control parameter group

Function code	Name	Setting range	Factory setting	
P60.03	Speed loop low speed P	0 - 655.35	50.00	
P60.04	Speed loop low speed Ti	0 - 65535	500	
P60.09	Speed loop high speed P	0 - 655.35	50.00	
P60.10	Speed loop high speed Ti	0 - 65535	500	
P60.12	Switching frequency f0	0 - 6553.5	10.0%	
P60.13	Switching frequency f1	0 - 6553.5	60.0%	

Note: the low speed section PT is used below the switching frequency f0(P60.12) and the high speed section PT is used above the switching frequency f1(P60.13); the middle part of the two frequency switching points is the linear transition region of low speed PI and intermediate speed PI.

➤ P61 group Current loop control parameter group

Function code	Name	Setting range	Factory setting	
P61.00	Current loop Kp	0 - 655.35	0.50	
P61.01	Current loop Ki	0 - 65535	0.25	

P61.03	Current loop bandwidth	0 - 6553.5	300.0	
P61.05	Current loop bandwidth	0 - 65535	1	
	selection	0 - 05555	4	

When P61.05 = 4, the current loop parameters are calculated through the current loop bandwidth (P61.03) and the motor self-learning parameter is required.

When P61.05 = 0, the current loop parameters are P61.00 and P61.01 and the motor self-learning parameter is not required.

■ Simple debugging process

♦ Simple debugging process of PMSM with sensor vector control

- ➤ Power on to check whether the program version number (P95.01) is the scheduled program version;
- ➤ Check whether P96.00 is consistent with the actual power of the inverter. If not, please do not run and contact us immediately.
- ➤ Determine whether the parameter initialization is required. If so, do it.

 It is recommended to make the parameter initialization in the first use of the inverter or the replacement of the inverter drive motor.
- ➤ Input the motor nameplate parameters in P20 group. Carry out the static self-learning of motor (self-learning 4 and motor type 1 (PMSM)) and optimized self-learning of inverter (self-learning 5).
- Modify the control mode to with sensor vector control and carry out self-learning of initial position angle of encoder.
 - Static self-learning of encoder (self-learning 1), dynamic self-learning of encoder (self-learning 7) and dynamic self-learning of motor (self-learning 8)
- ➤ Select the current control strategy (P15.03), appropriate speed loop parameters and current loop parameters.
- > Set the control parameters, protection parameters, speed curve and other parameters.
- Run the inverter.

♦ Simple debugging process of PMSM open-loop vector PM

- ➤ Power on to check whether the program version number (P95.01) is the scheduled program version;
- Check whether P96.00 is consistent with the actual power of the inverter. If not, please do not run and contact us immediately.
- ➤ Determine whether the parameter initialization is required. If so, do it.

 It is recommended to make the parameter initialization in the first use of the inverter or the replacement of the inverter drive motor.
- ➤ Input the motor nameplate parameters in P20 group. Carry out the static self-learning of motor (self-learning 4 and motor type 1 (PMSM)) and optimized self-learning of inverter (self-learning 5).
- ➤ Optimize the q shaft inductance parameter. If P21.13 is more than twice of P21.12, P21.13 parameter shall be reduced to less than twice of P21.12.
- > Select the open-loop vector PM control mode and set P15 group parameters.
- ➤ Calibrate the counter electromotive force, run to the rated frequency without load, record the output voltage at this time and modify P21.14 parameter to this voltage.
- > Set the appropriate speed loop and current loop parameters.
- > Set the control parameters, protection parameters, speed curve and other parameters.
- Run the motor.

Appendix E Customer Complaint

Customer Name:						
Tel:			Fax:			
Complaint Category: □Marketing	□Publicity	□Service	□Quality	□Business	□Product	□Others
Complaints:						
				The Comp	lainant (Sig	nature):
			•	Complaints	Unit(Officia	l Seal):
					Date:	

Appendix F Product Warranty Card

Customer Name:	
Tel:	Fax:
Warranty Product:	
Warranty Content:	
	Warranty Person(Signature):
	Warranty Unit(OfficialSeal):
	Date:

Warranty Agreement

1. Warranty period of the product is 18 months (bar code information on the inverter shall prevail).

During the warranty, if the product has any fault or damage during its normal use according to the

operation instruction, the company will provide free repair.

2. During the warranty, if the product is damaged due to one of the following reasons, a certain

maintenance fee will be charged:

A. Machine damage due to improper use and arbitrary repair or modification;

B. Machine damage due to fire, flood, abnormal voltage, other natural disaster and secondary

disaster:

C. Hardware damage due to artificial fall and transportation after purchase;

D. Machine damage caused by improper operation not following the user manual provided by

the company;

E. Fault and damage caused by the obstacle other than the machine (such as external

equipment factor);

3. When the product has any fault or damage, please correctly fill in the Product Warranty Card in

details.

4. Collection of maintenance fee will be based on the latest Maintenance Price List.

5. Typically the warranty card won't be reissued, please be sure to reserve it and show it to the

maintenance personnel during warranty.

6. If you have any problem during service, please timely contact our agent or the company.

7. Power of interpretation of the agreement shall be owned by Shanghai Sigriner STEP Electric

Co., Ltd.

Shanghai Sigriner STEP Electric Co., Ltd

(Customer service center) service hotline: 400-821-0325

Address: 1560# Siyi road, Jiading district, Shanghai

Postcode: 201801

Tel.: 021-69926000

Fax: 021-69926000

Website: http://www.stepelectric.com

Notice to Customers

Dear customers:

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 developed electrical and electronic equipment, the following six hazardous substances are restricted: lead, mercury, cadmium, hexavalent chrome, PBB and PBDE.

In China, 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, became a RoHS direction of Chinese Version and was 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 be disassembled and disposed by the qualified company (including small individual businesses) with corresponding business scope listed in directory (or temporary directory).

All electronic components, PCB filters, wire straps, structural parts used in our products are selected and purchased by following *the Electronic Information Products Pollution Control Management Measures* and RoHS directive. The six hazardous substances (lead, mercury, cadmium, hexavalent chrome, PBB and PBDE), are strictly controlled. During manufacturing PCB components are welded on a XinChi lead free welding production line with a lead free welding technology.

Hazardous substances may be contained in the following assemblies:

Type of assembly	Electronic components	PCB Board	Metal sheet	Radiator	Plastic piece	Conductor
Possible hazardous	Six hazardous substances: lead, mercury, cadmium, hexavalent chrome, PBB and PBDE					
substances						

- 1) Environment analysis: Our electronic products will produce some heat in operation, which may lead the spread of little amount of hazardous substances. It will not cause any serious consequence for ambient environment. Once the life cycle of those electronic products is end and the product is discarded, the heavy metal and chemical hazardous substances contained in the products may seriously contaminate the soil and water resource.
 - 2) Life cycle of electronic products and devices: Any electronic products and devices has its life

cycle and will be discarded, replaced and upgraded by a new product, even it is still functional. The life cycle of our company electronic products is generally not more than 20 years.

3) Electronic products discard treatment: If the discarded electronic products aren't treated properly, it may contaminate the environment. Our customers are required to follow up the related national regulation and set up a reclaiming system. It can't be discarded as a regular household refuse or solid industrial wastes. The discarded products shall be stored in an environment-friendly way, or reclaimed by qualified company, and should be strictly complied 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 unqualified individual or company is prohibited in disassembling, utilizing, disposing of electronic wastes.

Please don't throw away the electronic waste together with your ordinary domestic waste. Please call local waste disposing agencies or environment protection agencies for the advice of proper electronic waste handling.

Shanghai STEP Electric Corporation