Es Series High Performance Inverter



User Manual

Preface

Firstly, thank you for purchasing ES500 series inverter!

ES500 series is a high torque type vector inverter. Its motor control performance increases obviously. The inverter can implement the control of asynchronous motor and permanent magnet synchronous motor (PMSM). The function is more powerful. It is used to drive various automation production equipment involving textile, paper-making, machine tool, packing, food, crane, petroleum machinery, fan, pump etc.

This manual describes the correct use of ES500 series Inverter, including selection, parameter setting, commissioning, maintenance & inspection. Read and understand the manual before use and forward the manual to the end user.

Notes
● Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
● The drawings in the manual are shown for description only and may not match the product you purchased.
● The instructions are subject to change, without notice, due to product upgrade, specification modification as well as efforts to increase the accuracy and convenience of the manual.
● Contact our agents or customer service center if you have problems during the use.

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Chapter 1 Safety Information and Precaution

In this manual, the notices are divided two types as follows:

DANGER indicates that failure to comply with the notice will result in severe personal injury or even death.

WARNING indicates that failure to comply with the notice will result in personal injury or property damage.

Read this manual carefully so that you have a thorough understanding. Installation, commissioning or maintenance may be performed in conjunction with this chapter. The company will assume no liability or responsibility for any injury or loss caused by improper operation.

1.1 Safety Information and Warning

1.1.1 Before Installation

DANGER

- Do not install the equipment if you find water seepage, component missing or damage upon unpacking.
- Do not install the equipment if the packing list does not conform to the product you received.

WARNING

- Handle the equipment with care during transportation to prevent damage to the equipment.
- Do not use the equipment with damaged or missing components. Failure to comply will result in personal injury.
- Do not touch the components with your hands. Failure to comply will result in static electricity damage.

1.1.2 During Installation

DANGER

- Install the equipment on incombustible objects such as metal, and keep it away from combustible materials. Failure to comply may result in a fire.
- Do not loosen the fixed screws of the components, especially the screws with red mark.

WARNING

- Do not drop wire end or screw into the Inverter. Failure to comply will result in damage to the Inverter.
- Install the Inverter in places free of vibration and direct sunlight.
- Arrange the installation positions properly when two Inverters are laid in the same cabinet to ensure the cooling effect.

1.1.3 During Wiring

DANGER

- Wiring must be performed only by qualified personnel under instructions described in this manual. Failure to comply may result in unexpected accidents.
- A circuit breaker must be used to isolate the power supply and the Inverter. Failure to comply may result in a fire.
- Ensure that the power supply is cut off before wiring. Failure to comply may result in electric shock.
- Tie the Inverter to ground properly by standard. Failure to comply may result in electric shock

WARNING

- Never connect the power cables to the output terminals (U, V, W) of the Inverter.
- Pay attention to the marks of the wiring terminals and ensure correct wiring. Failure to comply will result indamage to the Inverter.
- Never connect the braking resistor between the DC bus terminals (+) and (-). Failure to comply may result in a fire.
- Use wire sizes recommended in the manual. Failure to comply may result in accidents.
- Use a shielded cable for the encoder, and ensure that the shielding layer is reliably grounded.

1.1.4 Before Power-on

DANGER

- Check that the following requirements are met:

The voltage class of the power supply is consistent with the rated voltage class of the Inverter.

The input terminals (R, S, T) and output terminals (U, V, W) are properlyconnected.

No short-circuit exists in the peripheral circuit.

The wiring is secured.

Failure to comply will result in damage to the Inverter

- Do not perform the voltage resistance test on any part of the Inverter because such test has been done in the factory. Failure to comply will result in accidents.

WARNING

- Cover the Inverter properly before power-on to prevent electric shock.
- All peripheral devices must be connected properly under the instructions described in this manual. Failure to comply will result in accidents

1.1.5 After Power-on

DANGER

- Do not open the Inverter's cover after power-on. Failure to comply may result in electric shock.
- Don't touch the drive and peripheral circuit with wet hands.
- Do not touch any I/O terminal of the Inverter. Failure to comply may result in electric shock.
- Initial power on, the drive is checking the safety of its external circuit with strong electric, so please don't touch the drive's terminals U, V, W and the motor's terminals.

1.1.6 During Operation

DANGER

- Do not touch the fan or the discharging resistor to check the temperature. Failure to comply will result in personal burnt.
- Signal detection must be performed only by qualified personnel during operation.

Failure to comply will result in personal injury or damage to the Inverter.

WARNING

- Avoid objects falling into the Inverter when it is running. Failure to comply will result in damage to the Inverter.
- Do not start/stop the Inverter by turning the contactor ON/OFF. Failure to comply will result in damage to the Inverter.

1.1.7 During Maintenance

DANGER

• Repair or maintenance of the Inverter may be performed only by qualified personnel. Failure to comply will result in personal injury or damage to the Inverter.

• Do not repair or maintain the Inverter at power-on. Failure to comply will result in electric shock.

• Repair or maintain the Inverter only ten minutes after the Inverter is powered off. This allows for the residual voltage in the capacitor to discharge to a safe value. Failure to comply will result in personal injury.

• Ensure that the Inverter is disconnected from all power supplies before starting repair or maintenance on the Inverter.

• Set and check the parameters again after the Inverter is replaced.

• All the pluggable components must be plugged or removed only after power-off.

• The rotating motor generally feeds back power to the Inverter. As a result, the Inverter is still charged even if the motor stops, and the power supply is cut off. Thus ensure that the Inverter is disconnected from the motor before starting repair or maintenance on the Inverter.

⚠ WARNING

• The running motor could feed power to inverter, even though the motor stop and power off. So please make sure cut the connect between motor and inverter.

1.2 Important Notes

1.2.1 RCD Request

The running equipment could produce large leak current which pass the protect earth conductor, please install the B type RCD in the power supply side. Please consider the equipment could produce transient and steady state. Please choose the special RCD with control higher harmonic function or general use RCD with after current.

1.2.2 Insulation Checking of Motors

Before using the drive, the insulation of the motors must be checked, especially, if it is used for the first time, if it has been stored for a long time or regularly check. This is to reduce the risk of the drive from being damaged by the poor insulation of the motor. When checking, must make sure the motors and the drive is separated, please use 500V insulation tester to measure the insulating resistance. It should not be less than 5MΩ.

1.2.3 Motor Thermal Protection

If the ratings of the driven motor are not in compliance with the drive, especially, the drive rated power more than motor rated power, be sure to adjust the protective threshold or to install thermal relay before the motor to ensure the motor is properly protected.

1.2.4 Operate Above Power Frequency

This drive can provide 0Hz~300Hz output frequency. If the user needs to run the motor above 50hz frequency, please consider the affordability of mechanical devices.

1.2.5 The Mechanical Device Resonance

The drive system may encounter mechanical resonance with the load when operating within certain band of output frequency. Skip frequencies have been set to avoid it.

1.2.6 Motor Heat and Noise

The output voltage is in PWM wave with some harmonics. Therefore, temperature rise, noise and vibration of motor are higher than 50Hz.

1.2.7 Varistors or Capacitors Used to Improve the Power Factor

Don't connect any varistor or capacitor to the output terminals of the drive, because the drive's output voltage waveform is PWM, otherwise tripping or damaging of components may occur; in addition, don't install circuit breaker or contactor at the output side of the drive.

1.2.8 Circuit Breakers Connected to the Input/output of the Drive

If contactor is connected between the input power supply and the motor, please don't use contactor to control drive start-stop. If it must be done, interval time should not less than one-hour. If frequently charging and discharging, the life of the internal capacitance of the drive will be reduced. If circuit breaker or contactor needs to be connected between output side of the drive and the motor, be sure to operate these circuit breakers or contactor when the drive has no output, to avoid damaging of the drive.

1.2.9 Using Outside the Range of Rated Voltage

The drive is unsuitable to be used out of the specified range of operation voltage; otherwise, it may be damaged. If need, please use suitable voltage regulation device.

1.2.10 Change From 3-phase to 2-phase

It is not recommended to change the drive from 3-phase input to 2-phase input. Otherwise it will lead to failure or damaged.

1.2.11 Protection Against Lightning Strike

There are transient surge suppressors inside the Drive which protects it against lighting strike. Department for frequent thunder and lightning, users should install the drive front-end protection.

1.2.12 Derating Due to Altitude

Derating must be considered when the drive is installed at high altitude, greater than 1000m. Because of the thin air, the cooling effect of drive is deteriorated. Please contact our technical advice in this case.

1.2.13 Special Usage

If users need the wiring diagram, such as common DC bus, without in the manual, please consult our company.

1.2.14 Disposing Unwanted Drive

The capacitors may explode when they are burnt. Poisonous gas may be generated when the plastic parts like front covers are burnt. Disposing method: please dispose the Drive as industrial waste.

1.2.15 Adaptable Motor

1. The standard adaptable motor is adaptable four-pole squirrel-cage asynchronous induction motor or PMSM. For other types of motor, select a proper Inverter according to the rated motor current.

2. The cooling fan and rotor shaft of non-variable-frequency motor are coaxial, which results in reduced cooling effect when the rotational speed declines. If variable speed is required, add a more powerful fan or replace it with variable-frequency motor in applications where the motor overheats easily.

3. The standard parameters of the adaptable motor have been configured inside the Inverter. It is still necessary to perform motor auto-tuning or modify the default values based on actual conditions. Otherwise, the running result and protection performance will be affected.

4. The Inverter may alarm or even be damaged when short-circuit exists on cables or inside the motor. Therefore, perform insulation short-circuit test when the motor and cables are newly installed or during routine maintenance. During the test, make sure that the Inverter is disconnected from the tested parts.

Chapter 2 Product Information

2.1 Model Description

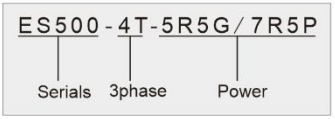


Figure 2-1 Model description

2.2 Selection Guide

Table 2-1 ES500 Inverter Model and Technical Data

Inverter Model	Power Capacity (kVA)	Rated Input Current (A)	Rated Output Current (A)	Applicable Motor (kW)
3AC 380~415V±15%				
ES500-4T0.75G/1.5P	1.5	3.4/5.0	2.1/3.8	0.7/1.5
ES500-4T1.5G/2.2P	3	5.0/5.8	3.8/5.1	1.5/2.2
ES500-4T2.2G/4.0P	4	5.8/10.5	5.1/9.0	2.2/4.0
ES500-4T4.0G/5.5P	5.9	10.5/14.6	9.0/13	4.0/5.5
ES500-4T5.5G/7.5P	8.9	14.6/20.5	13/17	5.5/7.5
ES500-4T7.5G/11P	11	20.5/26	17/25	7.5/11
ES500-4T11G/15P	17	26/35	25/32	11/15
ES500-4T15G/18P	21	35/38.5	32/37	15/18
ES500-4T18G/22P	24	38.5/46.5	37/45	18/22
ES500-4T22G/30P	30	46.5/62.5	45/60	22/30
ES500-4T30G/37P	40	62.5/76.0	60/75	30/37
ES500-4T37G/45P	57	76.0/92.0	75/91	37/45
ES500-4T45G/55P	69	92.0/113	91/112	45/55
ES500-4T55G/75P	85	113/157	112/150	55/75
ES500-4T75G/90P	114	157/180	150/176	75/90
ES500-4T90G/110P	134	180/214	176/210	90/110
ES500-4T110G/132P	160	214/256	210/253	110/132
ES500-4T132G/160P	192	256/307	253/304	132/160
ES500-4T160G/185P	231	307/350	304/340	160/185
ES500-4T185G/200P	242	350/385	340/385	185/200
ES500-4T200G/220P	250	385/430	385/430	200/220
ES500-4T220G/250P	280	430/468	430/468	220/250
ES500-4T250G/280P	355	468/525	468/525	250/280
ES500-4T280G/315P	396	525/590	525/590	280/315
ES500-4T315G/350P	445	590/665	590/665	315/350
ES500-4T350G/400P	500	665/785	665/785	350/400

2.3 Technical Specifications

Table 2-2 ES500 Inverter Technical Specifications

Item		Specifications	
Basic functions	Maximum frequency	Vector control:0~300Hz V/F control:0~3200Hz	
	Carrier frequency	0.5kHz~16kHz The carrier frequency automatically adjusted based on the load features.	
	Input frequency resolution	Digital setting:0.01Hz Analog setting: maximum frequency×0.025%	
	Control mode	Sensorless Open-loop vector control(SVC) Closed-loop vector control(FVC);V/F control	
	Startup torque	G type:0.5Hz/180%(SVC); 0Hz/200%(FVC) P type:0.5Hz/100%	
	Speed range	1:100 (SVC)	1:1000 (FVC)
	Speed stability accuracy	±0.5%(SVC)	±0.02%(FVC)
	Torque control response and precision	Response time 5ms, precision±5%(FVC)	
	Overload capacity	G type:150% rated current 60s;180% rated current 3s. P type:120% rated current 60s;150% rated current 3s.	
	Torque boost	Automatic torque boost; Manual torque boost 0.1%~30.0%	
	V/F curve	Three modes: Straight-line V/F curve; Multi-point V/F curve; N-power type V/F curve(1.2-power、1.4-power、1.6-power、1.8-power、2-power).	
	V/F separation	2 modes: complete separation, half separation	
	Ramp mode	Straight-line ramp and S-curve ramp Four kinds of acceleration/deceleration time with the range of 0.0–6500.0s	
	DC injection braking	DC braking frequency:0.00Hz~maximum frequency braking time:0.0s~36.0s Braking action current value:0.0%~100.0%	
	Jog control	Jog frequency range:0.00Hz~50.00Hz Jog acceleration and deceleration time:0.0s~6500.0s	
	Simple PLC, multistage speed operation	It implements up to 16 speeds via the simple PLC function or combination of DI terminal states.	
	Built-in PID	It can keep constant output voltage automatically when the mains voltage changes.	
	Automatic voltage regulation (AVR)	Automatically maintain a constant output voltage when grid voltage changes	
	Over voltage /Over current loss of speed control	Automatic limit of the current and voltage during the operation prevent frequent overcurrent and overvoltage trip	
	Rapid current limit	Minimizing over-current fault，Protect the normal operation of converter.	
	Torque limit and control	"Excavator" characteristics automatic limit of the torque during the operation to prevent frequent over-current trip; Closed-loop vector mode torque control can be achieved.	

Individu-alized function	High performance	Based on high performance of current vector control technology to achieve asynchronous motor and synchronous motor control.
	Power dip ride through	The load feedback energy compensates the voltage reduction so that the AC drive can continue to run for a short time.
	Fast current limit	Avoid frequent over-current fault of the frequency Inverter.
	Virtual IO	Five groups of virtual DI/Dos can realize simple logic control.
	Timing control	Timing control function: Time range 0.0Min~6500.0Min.
	Multiple communication protocols	It supports communication via:standard con-Figureuration RS-485(MODBUS protocols), optional CANlink port(need EXT2-IO extensioncard)
	Motor overheat protection	The optional EXT2-IO extension card 2 enables analog input AI3 to receive the motor temperature sensor input (PT100).
	Multiple encoder support	It supports various encoders such as differential encoder, open-collector encoder and push-pull output encoder.
Operation	Running command source	Operation panel、Control terminals、Serial communication port，You can perform switchover between these sources in various ways.
	Frequency source	There are a total of 10 frequency sources, such as digital setting, analog voltage setting, analog current setting, pulse setting and serial communication port setting. You can perform switchover between these sources in various ways.
	Auxiliary frequency source	There are ten auxiliary frequency sources. It can implement fine tuning of auxiliary frequency and frequency synthesis.
	Input terminal	Standard: 5 digital input (S1-S5) terminals，S5 supports upto 100 kHz high-speed pulse inputs. 2 analog input (AI) terminals, one of which only AI1 supports 0–10V voltage input and AI2 supports 0–10 V voltage input or 4–20mA current input. Expanding capacity: 3 extended digital input terminal(S6，S7，S8). 1 analog input terminal(AI3) that supports 0–10V voltage input and also supports motor temperature PT100 test, and supports injection molding machine signals.
	Output terminal	Standard: 1 output terminal(SP1)，Optional for the open collector output or high-speed pulse output(0~100kHz). 1 relay output terminals(TA-TB-TC). 1 analog output terminals (A01)，supports 0-20mA current output Or 0~10Vvoltage output. Expansion capability: 1 Open collector output terminals (SP2). 2 relay output terminals(TA2-TB2-TC2、TA3-TB3-TC3). 1 analog output terminals(A02)，supports 0-20mA current output or 0-10V voltage output.

2.4 Product Outline and Installation Dimension

The case type of ES500 inverter:

Power Range	Type of Inverter Case
0.75kW-11kW	Plastic
15kW-350kW	Metal

2.4.1 Inverter Outline Drawing

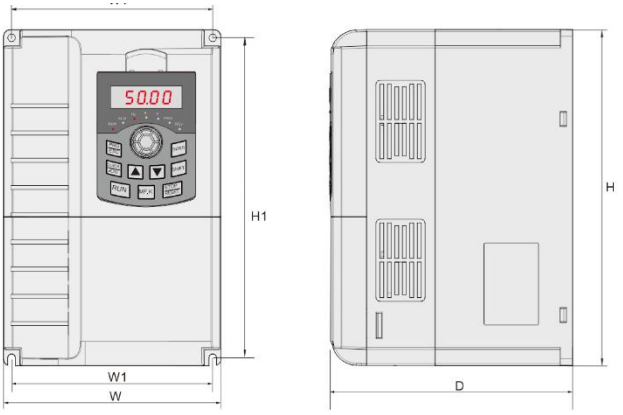


Figure 2-3 0.75~11kW plastic case inverter outline and dimension diagram

Notes: Please set the dust shied to the side of the heat emission hole to prevent the dust into the inverter inside.

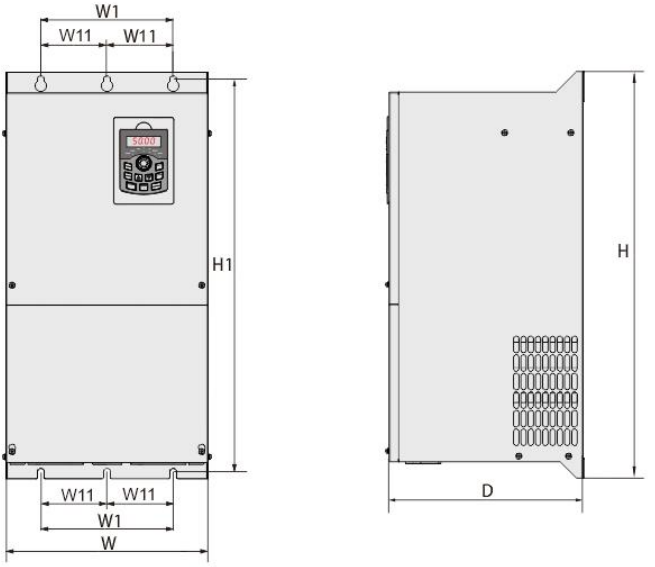


Figure 2-4 15~350kW metal case inverter outline and dimension diagram

2.4.2 External & Installation Dimension

Table 2-3 External & Installation Dimension

Models	outline size(mm)			mounting aperture(mm)			Hole Diameter (mm)
	W	H	D	W1	H1	W11	
ES500-015G/018P-T4 ES500-018G/022P-T4	217	335	184	140	324	N/A	Φ4
ES500-022G/030P-T4	228	361	203.5	139	349	N/A	Φ6
ES500-030G/037P-T4 ES500-037G/045P-T4	285	463	224	235	447	N/A	Φ6
ES500-045G/055P-T4 ES500-055G/075P-T4 ES500-075G/090P-T4	305	613	294	200	592	N/A	Φ10
ES500-090G/110P-T4 ES500-110G/132P-T4 ES500-132G/160P-T4	400	753	293	280	731.5	N/A	Φ10
ES500-160G/185P-T4 ES500-185G/200P-T4 ES500-200G/220P-T4 ES500-220G/250P-T4	520	865	343	380	836.5	190	Φ12
ES500-250G/280P-T4 ES500-280G/315P-T4 ES500-315G/350P-T4 ES500-350G/400P-T4	800	1172	412	600	1143	300	Φ14

2.4.3 Keypad External Dimension

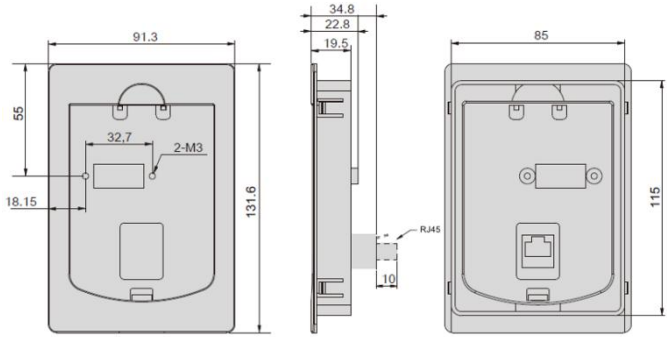


Figure 2-5 Keypad external dimension

2.5 Description of Peripheral Electrical Devices

Table 2-4 Description of Peripheral Electrical Devices

Name	Install Location	Function
Air switch MCCB	Front of input circuit	When downstream devices is over current, breaking the power.
Contactor	Between the air switch and the input of frequency inverter	The frequency inverter start and stop, should avoid frequently operating by the contactor or doing direct start-up operation.
AC Reactor	Input side of the frequency inverter	1) Improve the input power factor of the inverter; 2) Suppress the higher harmonics of the input side; prevent the other equipment damage for the voltage waveform distortion.
Input EMC Filter	Input side of the frequency inverter	1) Reduce the inverter external conduction and radiation disturbance; 2) Reduce the interference of conduction flowing from the power to the inverter, and improve the anti-interference ability of the inverter.
DC Reactor	Between EMC filter and braking resistor	1) Improve the input power factor of the inverter; 2) Improve the efficiency and thermal stability of the whole inverter. 3) Suppress the higher harmonics of the input side; reduce external conduction and radiation disturbance.
AC Output Reactor	Between the output side of the frequency inverter and motor, close to the inverter	The output side of the inverter generally contains much higher harmonics. When the motor is far from the inverter, there is large distributed capacitance in the circuit, the higher harmonics may produce resonance in the circuit, and bring two influences: 1) Destroy motor insulation performance, might damage the motor for a long time. 2) Have caused a greater leakage current and the inverter will trip frequently. Generally, when the cables from the inverter to motor are longer than 100m, an output AC line reactor should be used.

2.6 Selection of Braking Unit and Resistor

1. Resistance selection of braking resistor

When braking, the regenerative energy of motor is expended on braking resistor.

According to formula U*U/R = Pb:

U means braking voltage when system brakes stably（Different system, different braking voltage. Generally 380VAC system uses 700V）.

Pb refers to braking power.

2. Selection of braking resistor's power

In the theory, the power of braking resistor is the same as the braking power. But in consideration the derating, we could use this formula to calculate the power of the braking resistor:

K * Pr = Pb * D.

K ranges from 15% to 30%;

Pr----power of resistor;

D----braking frequency（percentage of regeneration process to whole deceleration）:

Elevator / oil pumping unit: 20%~30%

Winding and unwinding: 20%~30%

Centrifuge: 50%~60%

Occasional braking load: 5%

General application: 10%.

3. Selection guidance

Note: Table 2-5 is the guide data, according to the actual situation, the user can choose different resistance and power (the resistance must not be greater than the recommended value in the table, but the power could.). The motor's power in

the practical application system, determine the braking resistor, which have relationship with system inertia, deceleration time, potential energy of the load, the customer should select according to the actual situation. The bigger the system inertia, the shorter time required deceleration, braking more frequent, the braking resistor should have the bigger power and the smaller resistance.

Table 2-5 Selection of ES500 Inverter Braking Package

Inverter Model	Recommended Braking Resistor Power (W)	Recommended Braking Resistor Resistance (Ω)	Braking Unit	Remark
ES500-4T0.75G/1.5P	150W	≥300Ω	Standard build-in	The wiring method, please refer to Chapter 3.
ES500-4T1.5G/2.2P	150W	≥220Ω		
ES500-4T2.2G/4.0P	250W	≥200Ω		
ES500-4T4.0G/5.5P	300W	≥130Ω		
ES500-4T5.5G/7.5P	400W	≥90Ω		
ES500-4T7.5G/11P	500W	≥65Ω		
ES500-4T11G/15P	800W	≥43Ω		
ES500-4T15G/18P	1000W	≥32Ω		
ES500-4T18G/22P	1300W	≥25Ω		
ES500-4T22G/30P	1500W	≥22Ω		
ES500-4T30G/37P ES500-4T37G/45P ES500-4T45G/55P ES500-4T55G/75P ES500-4T75G/90P	2500W	≥16Ω	Optional built-in	
ES500-4T90G/110P ES500-4T110G/132P ES500-4T132G/160P ES500-4T160G/185P ES500-4T185G/200P ES500-4T200G/220P ES500-4T220G/250P ES500-4T250G/280P ES500-4T280G/315P ES500-4T315G/350P ES500-4T350G/400P	According to braking unit request	According to braking unit request	External	

2.7 Inverter Daily Maintenance

1. Daily Maintenance

Many factors such as ambient temperature, humidity, dust, vibration will cause the internal components aging and give rise to the occurrence of potential faults or lessen the service life of the inverter. Therefore, it is necessary to conduct routine maintenance to the inverter.

2. Daily inspection

a) When running, whether the motor has abnormal sound.

b) When running, whether the motor generates vibration.

c) Whether the installation environment of the inverter changes.

d) Whether the cooling fan of the inverter is working properly.

e) Whether the inverter is overheating

3. Daily cleaning

a) Reserve the inverter in a clean state.

b) Effectively remove the dust on the surface of the inverter to prevent dust entering the inside of the inverter, especially the metal dust.

c) Effectively clear the oil from the cooling fan.

4. Routine Checking

Check regularly the place which is difficult to check when the inverter is running. Routine checking items:

a) Check the air duct, and regularly clean.

b) Check whether the screws are loose.

c) Check whether the inverter is corroded.

d) Check whether the terminals have arc traces.

e) Check whether the main circuit is insulation.

Notes: When using a DC 500V Mega-Ohm-Meter to test insulating resistance, please make sure the main circuit and the inverter is disconnected. Please don't use the insulation resistance meter to test the insulation of the control circuit. High voltage test is unnecessary (it has already been conducted before delivery).

5. Replacing of quick-wearing Parts

The quick-wearing parts of the inverter mainly include cooling fan and electrolytic capacitors for filters. Their lifetime depends largely on their application environment and maintenance condition. Normally, lifetime is:

Components	Life
Fan	2~3 years
Electrolyte capacitor	4~5 years

The user can decide the replace age limit according to the running time.

1. Cooling fan

Possible cause of damages: wear of the bearing, aging of the fan vanes.

Criteria: Check if there is crack on fan vanes and other parts. When the inverter is switched on, check if there is any abnormal vibration.

2. Filtering electrolytic capacitors

Possible cause of damages: the quality of input power is bad, the ambient temperature is high, frequent loading jump and aging of electrolyte.

Criteria: Check if there is any leakage of liquids. Check if the safety valve protrudes. Measurement of static capacitance and insulation resistance.

3. Storage

After buying the inverter, when store for temporarily and long-term, the following notes are important:

1) As far as possible store into the original packaging.

2) Long-term storage will cause the deterioration of electrolytic capacitors. Therefore, the inverter must be powered within 2 years, and the conduction time is at least for 5 hours. The input voltage must be boosted gradually to the rated value by the voltage regulator.

Chapter 3 Mechanical and Electrical Installation

3.1 Mechanical Installation

3.1.1 Installation Environment

1. Ambient temperature: the surrounding environment and temperature has great influence on the life of the inverter, the running ambient temperature of the inverter should be within the temperature range of -10℃~50℃.

2. The inverter should be installed on the surface of the antifoaming goods, there must be enough space for heat dissipation around, install the inverter vertically on the support with the screw.

3. Install in the location where vibration is less than 0.6G. Pay special attention to be away from the punch press and other equipments.

4. Install in the location free of direct sunlight, wet, drops of water.

5. Install in the location reserve away from corrosive gas, flammable gas or explosive gas.

6. Install in the location avoid greasy dirt, dust, metal dust.

7. The inverter should be installed on the fire-proof plate.

Single installation: The table below shows single installation recommendation size.

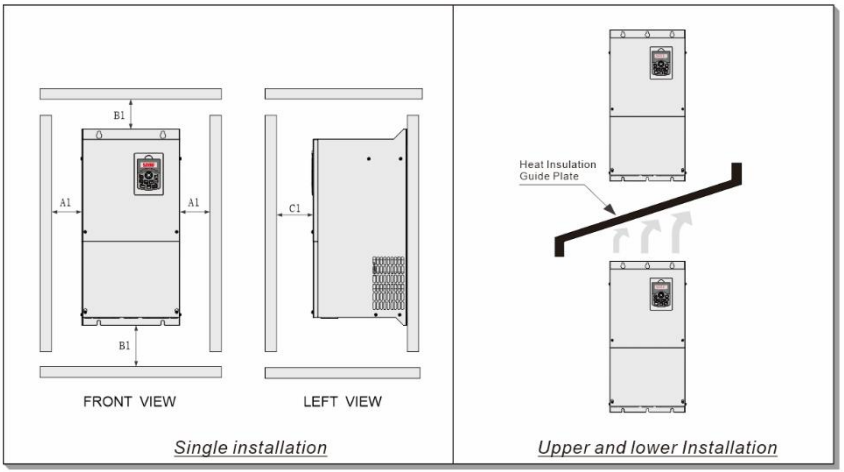


Figure 3-1 Installation Diagram

Power Rating	Installation Size		
	A1	B1	C1
0.75~4kW	≥30mm	≥100mm	≥30mm
5.5~37kW	≥50mm	≥200mm	≥50mm
45~132kW	≥50mm	≥300mm	≥50mm
160~220kW	≥50mm	≥350mm	≥50mm
250~350kW	≥50mm	≥400mm	≥50mm

Upper and lower Installation: when two inverters are mounted one on top the other, an heat insulation guide plate should be fixed in between as shown above.

3.1.2 Installation Attention

When installing, the thermal dissipation should be paid attention to. So please note the following:

1) In order to easy to dissipate the thermal, please install the inverter vertically, but cannot be inverted. If there are several inverters in the cabinet, the best method is to install side by side. When two Variable Speed Drives are installed one on top the other, the heat insulation guide plate should be installed between as shown in Figure. 3-1.

2) The requirements on installation space are shown in Figure 3-1 which should ensure the heat dissipation space of the inverter. Layout should ensure the heat dissipation condition of other components in the cabinet.

3) Mounting bracket must be flame-retardant material.

4) For the location where there is metal powder, the inverter should be mounted outside of the cabinet. If the space is sealed, should make the cabinet having space as large as possible.

3.2 Electrical Installation

3.2.1 External Electrical Part Selection

Table3-1 ES500 Inverter External Electrical Part Selection

Inverter Model	Circuit Breaker (A)	Recommended Contactor (A)	Recommended Input Side Main Circuit Wire (mm^2)	Recommended Output Side Main Circuit Wire (mm^2)	Recommended Control Circuit Wire (mm^2)
ES500-4T0.75G/1.5P	16	10	2.5	2.5	1.0
ES500-4T1.5G/2.2P	16	10	2.5	2.5	1.0
ES500-4T2.2G/4.0P	25	16	4.0	4.0	1.0
ES500-4T4.0G/5.5P	32	25	4.0	4.0	1.0
ES500-4T5.5G/7.5P	40	32	4.0	4.0	1.0
ES500-4T7.5G/11P	40	32	4.0	4.0	1.0
ES500-4T11G/15P	63	40	4.0	4.0	1.0
ES500-4T15G/18P	63	40	6.0	6.0	1.0
ES500-4T18G/22P	100	63	6.0	6.0	1.5
ES500-4T22G/30P	100	63	10	10	1.5
ES500-4T30G/37P	125	100	16	10	1.5
ES500-4T37G/45P	160	100	16	16	1.5
ES500-4T45G/55P	200	125	25	25	1.5
ES500-4T55G/75P	200	125	35	25	1.5
ES500-4T75G/90P	250	160	50	35	1.5
ES500-4T90G/110P	250	160	70	35	1.5
ES500-4T110G/132P	350	350	120	120	1.5
ES500-4T132G/160P	400	400	150	150	1.5
ES500-4T160G/185P	500	400	185	185	1.5
ES500-4T185G/200P	600	600	150*2	150*2	1.5
ES500-4T200G/220P	600	600	150*2	150*2	1.5
ES500-4T220G/250P	800	600	185*2	185*2	1.5
ES500-4T250G/280P	800	800	185*2	185*2	1.5
ES500-4T280G/315P	800	800	150*3	150*3	1.5
ES500-4T315G/350P	800	800	150*4	150*4	1.5
ES500-4T350G/400P	1000	1000	150*4	150*4	1.5

3.2.2 Wiring Diagram

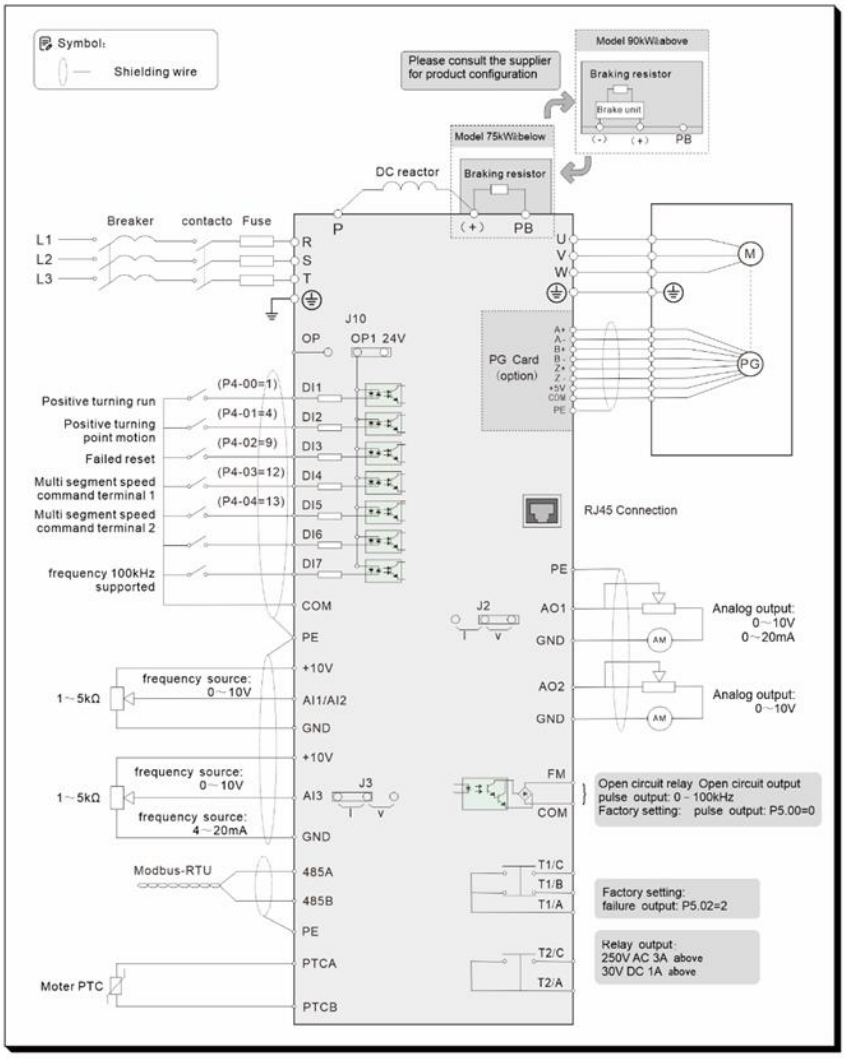


Diagram 3-1 Inverter Wiring Diagram

Notes: terminal ◎ means main circuit terminal, ○ means control circuit terminal.

3.2.3 Main Circuit Terminals

⚠ WARNING
1. Before wiring, make sure the power switch is OFF, otherwise it can lead to electric shock.
2. Only trained professionals can do wiring, so as to avoid the risk of the drive damage and the personal Injury.
3. The inverter must be properly earthed to reduce electrical accident and fire.

ATTENTION

1. Ensure that the inverter's rated input voltage is identical with the AC supply voltage before using it.
2. Confirm the motor and the inverter adaptation, otherwise, it may damage the inverter or cause the motor triping.
3. It is prohibited to connect the AC supply cables to the inverter's terminals U, V and W.
4. Braking resistor cannot be directly connected to the DC bus (+), (-).

Introduction of main circuit terminals of three phase 380V inverter

Sign	Name	Description
R, S, T	3-phase power supply input terminals	3-phase 380V AC supply connections
(+), (-)	DC bus wire (+,-) terminals	DC bus input common point, reserved terminals for above 30kw external brake units.
(+), PB	Brake resistor wiring terminals	30kW and below, the brake resistor connected points.
P, (+)	Add reactor wiring terminals outside	Connection point of external DC reactor.
U, V, W	Inverter output terminals	Connect 3-phase motor
⏚	Earth terminal	Earth terminal

Wiring Notes:

a) Input Power R, S, T:

The frequency inverter's input side wiring is not requirements in phase order.

b) DC bus terminals (+), (-)

Notice: Wiring can only be done after the inverter's AC power is cut off, then waiting for at least 5mins and confirming the voltage between DC bus terminals plus and minus is below DC 36V.

When choosing external braking units more than 30KW for frequency inverter, do not mistake the terminals (+), (-), otherwise, it can lead to the inverter damage and fire.

When the cables from the frequency inverter to motor are longer than 10m, multi-stranded cables or close two-lane parallel wiring should be used.

Braking resistor cannot be directly connected to the DC bus, otherwise, it cause the risk of the inverter damage and fire.

c) Brake resistor terminals (+), PB:

Less than 30KW, after confirming the inverters have built-in brake units, the braking resistor terminals are effective.

Selection of braking resistor should refer to the recommended value, and wiring distance should be less than 5m, so as to reduce the risk of the inverter damage.

d) Add reactor connect terminal outside P, (+):

30kW and above frequency inverter, adding reactor outside， remove the connected piece between P and (+), then connect the reactor to the two terminals.

e) Frequency Inverter Output Side U. V. W:

The capacitors or surge absorbers cannot be connected to the output side of the inverter. Otherwise cause the frequency inverter to trip frequently or even be damaged.

Because motor cable is too long, the impact of distributed capacitance produces electrical resonance, which led to the damage of the motor insulation, the inverter triping for a bigger leakage current. When the cables from the inverter to motor are longer than 100m, an AC input reactor should be used.

f) Earth Terminal ⏚

The terminal must be properly earthed, ground resistance must be less than 0.1Ω. Otherwise, it lead to equipment abnormal operation or damaged.

Notice: It is prohibited to share the earth terminal E and the power zero line terminal N.

3.2.4 Control Circuit Terminals

1. Control circuit terminals drawing:

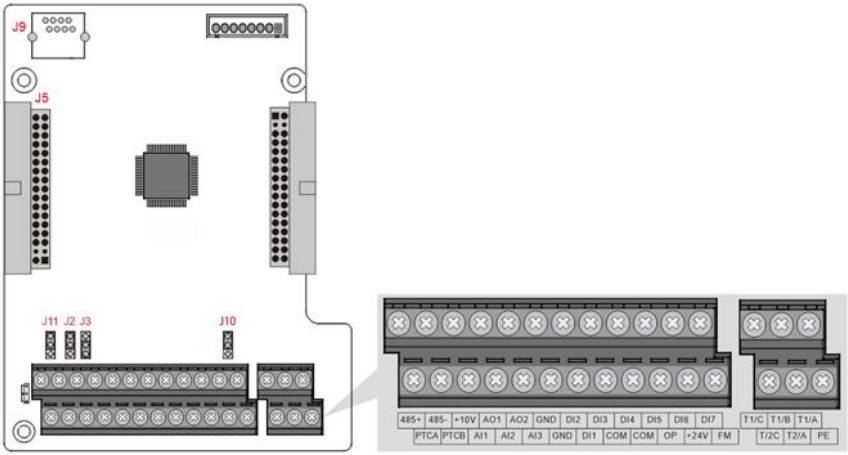


Diagram 3-2 Control Circuit Terminals

2. Description of control circuit terminals

Table 3-2 Description of Control Circuit Terminals

Type	Terminal symbol	Terminal Name	Function Description
Power	10V-GND	10V power supply	Provide +10V power for outside, normally used as working power of the external potentiometer, potentiometer resistance range: 1KΩ ~ 5KΩ. Max output current: 10mA
	24V-COM	24V power supply	Provide +24 V power for outside, generally used as the power of digital input and output terminals and external transducers. Max output current: 200mA
	OP	Input terminal of external power supply	Connect to +24 V by default. When S1~S5 need to be driven by external signal, OP needs to be connected to external power supply, JP1will not jump to any terminal.
Analog Input	AI1-GND	Analog input terminal 1	1.Input voltage range: DC 0V~10V 2.Input resistance: 22KΩ
	AI3-GND	Analoinput terminal 2	1.Input range: DC 0V~10V or 4mA~20mA, selected by jumper "JP2" on the control board. 2.Input resistance: input voltage 22KΩ, input current 500Ω.
Digital Input	DI1-COM	Digital input 1	Optical coupling isolation, compatible with dual polarity input Resistance input: 2.4 kΩ Voltage range for level input: 9–30 V S5 can be used for high-speed pulse input. Maximum input frequency: 100 kHz
	DI2-COM	Digital input 2	
	DI3-COM	Digital input 3	
	DI4-COM	Digital input 4	
	DI6-COM	Digital input 5	
Analog Output	FM-CME	Analog output 1	Output voltage or current could be selected by the JP9 jumper of the control board. Output voltage range: DC 0V~10V Output current range: DC 0~20mA

Digital Output	AO1/AO2	Digitaloutput1	Open collector output / high-speed pulse output,limited by function code P5-00; As high-speed pulse output, the highest output frequency is 100KHZ; Output voltage range: DC 0V~24V Max output current is 50mA. Note that CME and COM are internally insulated, but they are shorted by JP3 jumper externally. If you want to drive by external power, JPS no need to jump any external CME connect power supply.
Relay Output	TA-TB	Normal close terminals	Contact driving capacity: AC 250V，3A，COSø=0.4. DC 30V，1A
	TA-TC	Normal open terminals	
Auxiliary Interface	J3	Extension card interface	28 root contact pins,support expand card 1(EXT1-IO)
	J4	PG card interface	18 root contact pins,，support 5V power supply differential input PG card(PG1-DIFF)、15V power supplyOC/push-pull input PG card 2(PG2-OC)，same time just support one.
	J2	Operation panel interface	Connect to external operation panel.
Communication Terminal	485- 485+	RS485 hardware circuit	Support standard MODBUS Communication

3. Control board jumper description

Jumper No.	Jumper Location	Description
JP1	Short circuit 1、2 pin COM	Digital input source mode of connection, OP connect with COM
	Short circuit 2、3 pin 24V(Factory setting)	Digital input leak mode of connection, OP connect with 24v
JP2	Short circuit 1、2 pin V(Factory setting)	AI2 analog input choose -voltage V
	Short circuit 2、3 pin mA	AI2 analog input choose –current mA
JP3	Short circuit 1、2 pin COM(Factory setting)	Digital input internal power drive, COM serve as power supply
	Short circuit 2、3 pin or no jumper	Digital output external power drive, CME serve as power supply
JP9	Short circuit 1、2 pin V(Factory setting)	A02 output choose-voltage V
	Short circuit 2、3 pin mA	A02 output choose- current mA

Chapter 4 Operation and Display

4.1 Description of Operation Keypad

Through the operation keypad, we could modify the function parameters, monitor the working status, and perform the running control (start, stop) on the inverter.

Its outline and functional zone are as follows.

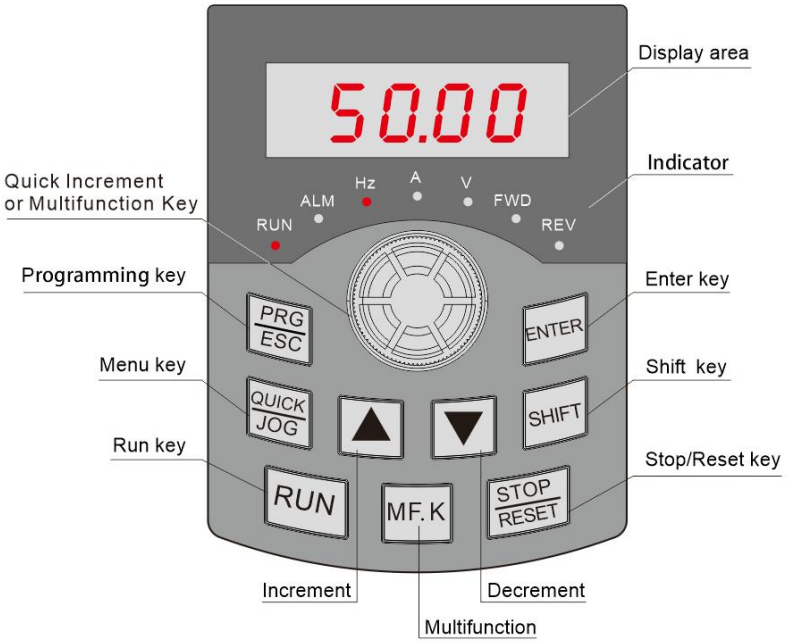


Figure 4-1 Operation Keypad Diagram

1. Description of Function Indicators

RUN: ON indicates that the Inverter is at running status, OFF indicates that the Inverter is at stop status.

FWD/REV: On indicates reverse rotation, OFF indicates forward rotation.

2. Unit Indicators

Hz: unit of frequency

A: unit of current

V: unit of voltage

3. Digital Display

The 5-number digit LED display can display the setting frequency, output frequency, monitoring data and fault codes.

4. Description of Keypad button

Table 4-1 Keypad Button Function Menu

Key	Name	Function
PRG/ESC	Programming	Enter or exit Level I menu.
ENTER	Confirmation	Enter the menu interfaces level by level, and confirm the parameter setting.
▲	Increment	Increase data or function code.
▼	Decrement	Decrease data or function code.
SHIFT	Shift	Select the displayed parameters in turn on the stop display interface and running display interface, and select the modification bit of parameters when modifying parameters.
RUN	Running	Start to run inverter under keyboard control mode.
STOP RESE	Stop/Reset	Stop inverter on running status and reset operation on fault status. The functions of this key are restricted in P7-02.
MF.K	Multifunction	Perform function switchover (such as quick switchover of command source or direction) according to the setting of P7-01.

4.2 Viewing and Modifying Function Codes

Basic function code group is inverter's whole function codes, after entering its grade menu.

The operation panel of ES500 adopts three-level menu. The three-level menu consists of function code group (Level I), function code (Level II), and function code setting value (level III), as shown in the following Figure.

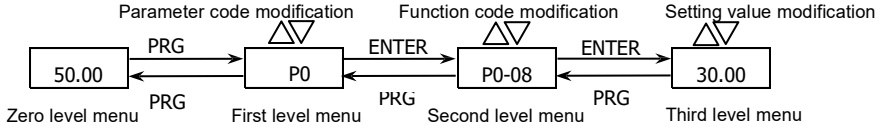


Figure 4-2 Operation procedure of Three-level Menu

Explain: You can return to Level II menu from Level III menu by pressing PRG or ENTER. If you press ENTER, the system saves the parameter setting first, and then goes back to Level II menu and shifts to the next function code. If you press PRG, the system does not save the parameter setting, but directly returns to Level II menu and remains at the current function code.

In Level III menu, if the parameter has no blinking digit, it means that the parameter cannot be modified. This maybe because:

1/ Such a function code is only readable, such as, actual detected parameter and running record parameter.

2/ Such a function code cannot be modified in the running state and can only be modified at stop status.

4.3 User Modified Function Code

In you modified menu, only the parameters that are modified to a non-default value are displayed. The menu is generated by the inverter automatically. After the mode is switched over to User modified function code, Level II menu is displayed

4.4 Definition and Operation of the Multifunction Key (MF.K)

You can define the function (command source switchover or rotation direction switchover) of the multifunction key in P7-01. For details, see the description of P7-01.

4.5 Starting or Stopping the Inverter

4.5.1 Selecting the Start/Stop Command Source

There are three start/stop command sources, namely, operation keypad control, terminal control, and communication control. You can select the command source in P0-02.

P0-02	Command Source Selection		Default: 0	Description
	Setting Range	0	Operation keypad control (Indicator OFF)	Press RUN, STOP to start or stop the Inverter.
		1	Terminal control (indicator ON)	DI terminal needs to be defined as the run/stop terminal.
		2	Communication control (Indicator Blinking)	The Modbus-RTU communication protocol is used.

1. Operation Keypad Control

Control inverter through operation keypad, use function code P0-02=0. After you press RUN, the Inverter starts running (the RUN indicator is ON). After you press STOP, when the Inverter is in running state, the Inverter stops running (the RUN indicator is OFF)

2. Terminal Control

This control mode is applicable to scenarios where the PID switch or electromagnetic button is used to start or stop the application system or scenarios where the dry contact signal is used to start or stop the Inverter.

The switch signal mode is set in P4-11. The input terminal of the start/stop signal is set in P4-00 to P4-09. For details, see the description of P4-11 and P4-00 to P4-09.

3. Communication Control

The most common configuration is when the host computer is used to control running of the inverter by means of communication, such as the RS485.

The communication interface of ES500 inverter supports the Modbus-RTU protocol, and the communication is implemented only when the host computer supports the Modbus-RTU master station protocol.

4.5.2 Start Mode

ES500 supports three start modes, namely, direct start, rotational speed tracking restart, and pre-excited start (asynchronous motor), set in P6-00.

Direct start: It is applicable to small-inertia load. The frequency curve in this mode is shown in the following Figure. DC braking before the start is applicable to inverter of load such as elevator and crane. Startup frequency is applicable to inverter with burst start under start torque, such as cement mixer.

P6-00 = 1 (Rotational speed tracking restart) It is applicable to large-inertia load. The frequency curve in this mode is shown in the following Figure. If the load motor is still rotating due to the inertia when the Inverter starts, this mode is used to prevent start overcurrent

P6-00 = 2 (Pre-excited start)

It is applicable only to inductive asynchronous motor. The Inverter performs pre-excitation before start, improving quick response of the motor and meeting the requirements of short acceleration time. The frequency curve in this mode is shown in the following Figure

4.5.3 Stop Mode

The inverter supports two stop modes, decelerate to stop and coast to stop, set in P6-10.

4.5.4 Timing Stop

ES500 supports timing stop. This function is enabled by P8-42 and the timing duration is determined by P8-43 and P8-44.

You can set the timing duration by means of analog input (such as potentiometer signal). For details, see the description of P8-43.

4.6 Setting the Running Frequency

The inverter provides two frequency sources, namely, main frequency source A and auxiliary frequency source B. You can select one frequency source and switch over between the two sources. You can also perform superposition on the two sources by setting the calculation formula to meet different control requirements of different scenarios

4.6.1 Frequency Setting by the Main Frequency Source

There are nine setting modes of main frequency sources, digital setting (UP/DOWN modification, non-retentive at power failure), digital setting (UP/DOWN modification, retentive at power failure), AI1, AI2, HDI pulse setting, multi-step speed,

simple PLC, PID, communication, and keypad potentiometer setting. You can select one in P0-03.

According to the preceding Figure, the running frequency of the Inverter can be set by means of function codes, manual adjustment, analog input, multi-speed terminal, external feedback signal, internal PID regulator, or the host computer.

4.6.2 Frequency Setting by the Auxiliary Frequency Source

The frequency setting by the auxiliary frequency source is the same as the frequency setting by the main frequency source. You can set the auxiliary frequency source in P0-04.

The relationship between the target running frequency and the main frequency source and auxiliary frequency source is set in P0-07, as follows:

1) Main frequency source A: The main frequency source is directly used to set the target running frequency.

2) Auxiliary frequency source B: The auxiliary frequency source is directly used to set the target running frequency.

3) A and B operation: There are four operation methods, namely, A+B, A-B, maximum of A and B, and minimum of A and B.

4) Frequency switchover: DI terminal is used to switch over between the preceding three frequency setting channels.

4.6.3 Binding Command Source to Frequency Source

The three command sources can be separately bound to frequency sources. When the specified command source (P0-02) is bound to a frequency source (corresponding digit in the value of P0-27), the frequency is determined by the frequency setting channel set in P0-27. In this case, both main and auxiliary frequency sources are ineffective.

4.6.4 Frequency Closed-loop Control

ES500 has a built-in PID regulator. Together with the frequency sources, the PID regulator can implement automatic adjustment of progress control, such as constant temperature, constant pressure, and tension control.

When PID frequency closed-loop control is implemented, P0-03 (Main frequency source A selection) must be set to 8 (PID). The PID-related parameters are set in group PA.

ES500 has two built-in equivalent PID calculating units. You can set the features, such as adjustment speed and accuracy, for the two units separately based on the actual conditions. Switchover between the two units can be implemented automatically or by means of an external DI terminal.

4.6.5 Swing Mode

In textile and chemical processing equipment, the application of swing frequency function can improve the coiling uniform flat of spindle. It can be achieved by setting Pb-00 to Pb-04 function code.

About the specific methods, please refer to the related function code detailed description.

4.6.6 Multi-Speed Mode

In the applications where the running frequency of the inverter need not be adjusted continuously and only several frequencies are required, the multi-speed control can be used. ES500 supports a maximum of 16 running frequencies, which are implemented by state combinations of four DI terminals. Set the function codes corresponding to DI terminals to a value among 12 to 15, and then the DI terminals are specified as the multi-frequency input terminals. The multiple frequencies are set based on the multi-frequency table in group PC. In addition, you need to set P0-03 (Main frequency source A selection) to 6(Multi-step).

ES500 supports a maximum of four DI terminals to be used as the multi-frequency input terminals. You can also use less than four DI terminals, and the empty bit is considered to be 0.

4.6.7 Setting the Motor Rotating Direction

After the inverter restores the default settings, press RUN, the inverter drive the motor to rotate. In this case, the rotating direction is regarded as forward rotation. If the rotating direction is reverse to the direction required by the equipment, power off the inverter and exchange any two of the output UVW cables (wait until the main capacitor of the Inverter is completely discharged).

In some applications where both forward rotation and reverse rotation are required, enable the reverse control (P8-13 = 0, default value) and meanwhile reverse the rotating direction by setting P0-09 to 1. Then press RUN to make the motor rotate in the reverse direction.

If the command source is terminal control and reverse rotation is required, use the default value 0 of P8-13 to enable reverse control.

When the running frequency of the Inverter is set by means of communication (P0-03 = 9) and reverse control is enabled (P8-13 = 0), the inverter instructs the reverse direction if the setting frequency is a negative value. If the given running command is reverse rotation or the set frequency is a negative value, but reverse control is disabled (P8-13 = 1), the inverter will run at 0 Hz and has no output. In some applications where reverse rotation is prohibited, do not change the rotating direction by modifying the function codes because the function codes will be restored once the Inverter restores the default settings

4.6.8 Setting the Fixed Length Control Mode

ES500 has the fixed length control function. The length pulses are sampled by the DI terminal allocated with function 27 (Length count input). The "Actual length" (Pb-06) is obtained by dividing the number of pulses sampled by the value of Pb-07 (Number of pulses per meter). If the actual length is larger than the "Set length" (Pb-05), the multifunctional DO terminal becomes ON.

In the process of fixed length control, the length can be reset by means of the DI terminal allocated with function 28 (Length reset).

Note:

1) In the fixed length control mode, the direction cannot be identified and only the length shall be calculated based on the number of pulses.

2) Only DI6 can be allocated with the function "Length count input".

3) An automatic stop system can be implemented, if the length reached signal output by the DO is fed back to the inverter input terminal with stop function.

4.6.9 Use of the Counting Function

The count value needs to be collected by the DI terminal that is allocated with function 25. When the count value reaches Pb-08 (Set count value), the DI terminal allocated with function 8 (Set count value reached) becomes ON. Then the counter stops counting. When the count value reaches Pb-09 (Designated count value), the DI terminal allocated with function 9 (Designated count value reached) becomes ON. The counter continues to count until "Set count value" is reached.

Note:

1. Pb-09 (Designated count value) must not be greater than Pb-08 (Set count value).

2. DI6 must be used when the pulse frequency is high.

3. The DO terminal that is allocated with function 9 (Designated count value reached) and the DO terminal that is allocated with function 8 (Set count value reached) must not be the same.

4. In the RUN/STOP state of the Inverter, the counter will not stop until "Set count value" is reached.

5. The count value is retentive at power failure.

6. An automatic stop system can be implemented if the signal output by the DO terminal with the function (Count value reached) is fed back to the DI terminal of the inverter with stop function.

4.7 Setting and Auto-tuning of Motor Parameters

4.7.1 Motor Parameters to Be Set

When the Inverter runs in the vector control mode (P0-01 = 0), accurate motor parameters are required to ensure desired inverter performance and running efficiency. This is extremely different from the V/f control (P0-01 = 2).

Motor parameters (motor 1 by default) that need to be set are listed in the following table.

Parameter	Description	Remark
P1-00	Motor type	Asynchronous motor, variable frequency asynchronous motor, synchronous motor
P1-01~P1-05	Rated motor power, Rated motor voltage, Rated motor current, Rated motor frequency, Rated motor rotational speed.	Model parameters, Manual input
P1-06~P1-20	Motor internal equivalent stator resistance, inductive reactance and rotor inductance.	Auto-tuning parameters

For complicated application system with multiple motors, the parameters of motor 2 are listed in the following table.

Motor 2 Parameter	Remark
H2-00	Asynchronous motor, variable frequency asynchronous motor, synchronous motor
H2-01~H2-05	Model parameters, manual input
H2-06~H2-20	Auto-tuning parameters

4.7.2 Motor Auto-tuning

To obtain the motor parameters, the Inverter can perform dynamic auto-tuning or static auto-tuning. For the asynchronous motor that cannot be disconnected from the load, you can input the motor parameters of the same model that was successfully auto-tuned before.

Auto-tuning	Application	Result
No-load dynamic auto-tuning	It is applied to applications where the motor (synchronous motor or asynchronous motor) can be disconnected from the load.	Best
With-load dynamic auto-tuning	It is applied to applications where the motor (synchronous motor or asynchronous motor) cannot be disconnected from the load.	OK
Static auto-tuning	It is applied to applications where the motor (asynchronous motor only) cannot be disconnected from the load and dynamic auto-tuning is not allowed.	Poor
Manual input	It is applied to applications where the motor (asynchronous motor only) cannot be disconnected from the load. Input the motor parameters of the same model that was successfully autotuned before into function codes P1-00 to P1-10.	OK

The following motor auto-tuning description takes motor 1 as an example. The auto-tuning of motor 2 is the same and only the function codes are changed correspondingly. The process of motor auto-tuning is as follows:

1) If the motor can be disconnected from the load, disconnect the motor from the load mechanically after power-off so that the motor can run without load.

2) After power-on, set P0-02 (Command source selection) to 0 (Operation keypad control).

3) Input the motor nameplate parameters (such as P1-00 to P1-05) correctly and input the following parameters based on the actually selected motor.

Motor	Parameter
Motor 1	P1-00:Motor type selection P1-01:Rated motor power P1-02:Rated motor voltage P1-03:Rated motor current P1-04:Rated motor frequency P1-05:Rated motor rotational speed
Motor 2	H2-00 to H2-05, defined the same as P1-00 to P1-05

For asynchronous motor, set P1-37 (Auto-tuning selection) to 2 (Asynchronous motor complete auto-tuning). For motors 2, 3, or 4, the corresponding function code is H2-37, press ENTER on the operation keypad. The operation keypad displays:

TUNE

Then press RUN on the operation keypad. The inverter will drive the motor to accelerate/ decelerate and run in the forward/reverse direction, and the RUN indicator is ON. The auto-tuning lasts approximately 2 minutes. When the preceding display information disappears and the operation keypad returns to the normal parameter display status, it indicates that the auto-tuning is complete.

The Inverter will automatically calculate the following motor parameters:

Motor	Parameter
Motor 1	P1-06:Stator resistance (asynchronous motor) P1-07:Rotor resistance (asynchronous motor) P1-08:Leakage inductive reactance (asynchronous motor) P1-09:Mutual inductive reactance (asynchronous motor) P1-10:No-load current (asynchronous motor)
Motor 2	H2-06 to H2-10, defined the same as P1-06 to P1-10

If the motor cannot be disconnected from the load, set P1-37 (Motor 2 is H2-37) to 1 (Asynchronous motor static tuning) and then press RUN on the operation keypad. The motor auto-tuning starts.

4.7.3 Setting and Switchover of Multiple Groups of Motor Parameters

The Inverter supports switchover between two groups of motor parameters, groups H1, H2 (motor 1 parameters).

You can select the current effective motor parameter group by means of function code P0-24 or DI terminals with functions 41. When the DI terminals with functions 41 become ON, they are privileged and the setting of P0-24 becomes invalid.

4.8 Password Setting

The Inverter provides the user password protection function. When PP-00 is set to a nonzero value, the value is the user password. The password takes effect after you exit the function code editing state. When you press PRG again, "------" will be displayed, and you must enter the correct user password to enter the menu.

To cancel the password protection function, enter with password and set PP-00 to 0.

4.9 Parameter Saving and Default Setting Restoring

After a function code is modified on the operation keypad, the modification will be saved in the register of the inverter and remain effective at next power-on.

The inverter supports backup and restoration of parameter setting, which is convenient for commissioning.

The inverter also provides the retentive function on alarm information and accumulative running time.

You can restore the backup values or default settings of the function codes of the inverter or clear the running data through PP-01. For details, see the description of PP-01.

Chapter 5 Function Parameter List

If PP-00 is set to non-zero number, parameter protection is enabled. Under the situation of function parameter model and user change parameter model, you must enter the correct password to enter the parameter menu. If you want to cancel, please PP-00 is set to 0.

Customized parameters mode menu is not protected by password.

Group P and Group H are standard function parameters, Group U are monitoring function parameters. The symbols in the function code table are described as follows:

"√": The parameter settings can be modified when the inverter is either stop or running state;

"×": The parameters settings cannot be modified when the inverter is in the running state; "○":

Parameter value is the actual testing records, it cannot be modified.

5.1 Basic Function Parameter Table

Function Code	Parameter Name	Setting Range	Factory Default	Property
P0 Group: Basic Function				
P0-00	Inverter model	1: G Type (constant torque load model) 2: P Type (variable torque load, e.g. fan and water pump load models)	1	×
P0-01	Motor 1 control mode	0: Sensorless vector control (SVC) 1: Reserved 2: V/f control	0	×
P0-02	Command source selection	0: Operation keypad (LED off) 1: Terminal (LED on) 2: Communication (LED blinking)	0	√
P0-03	Main frequency source A selection	0: Digital setting (preset frequency P0-08, UP/DOWN adjustable, non-retentive at power failure) 1: Digital setting (preset frequency P0-08, UP/DOWN adjustable, retentive at power failure) 2: AI1 3: AI2 4: Reserved 5: HDI speed pulse (DI6) 6: Multi-step speed 7: Simple PLC 8: PID 9: Communication setting 10: Keypad potentiometer	0	×
P0-04	Auxiliary frequency source B selection	The same as P0-03	0	×
P0-05	Superimposed auxiliary frequency source B	0: Relative to maximum frequency 1: Relative to the frequency source A	0	√
P0-06	Superimposed auxiliary frequency source B	0% ~ 150%	100%	√

P0-07	Frequency source superposition selection	Unit's digit: frequency source selection 0: Main frequency source A 1: The operation result of A and B (operation relationship determined by ten's digit) 2: Switchover between A and B 3: Switchover between A and "A and B operation" 4: Switchover between auxiliary frequency source B and the operation result of A and B Ten's digit: A and B operation relationship 0: A+B; 1: A-B; 2: Max (A,B); 3: Min (A,B)	00	√
P0-08	Preset frequency	0.00Hz ~ maximum frequency (P0-10)	50.00Hz	√
P0-09	Rotation direction	0: Forward 1: Reverse	0	√
P0-10	Maximum frequency	50.00Hz ~ 300.00Hz	50.00Hz	×
P0-11	Frequency source upper limit	0: Set by P0-12 1: AI1; 2: AI2; 3: Reserved 4: HDI Pulse 5: Communication	0	×
P0-12	Frequency upper limit	Frequency lower limit P0-14 ~ maximum frequency P0-10	50.00Hz	√
P0-13	Frequency upper limit offset	0.00Hz ~ maximum frequency P0-10	0.00Hz	√
P0-14	Frequency lower limit	0.00Hz ~ P0-12 (frequency upper limit)	0.00Hz	√
P0-15	Carrier frequency	0.5kHz ~ 16.0kHz	Model depend	√
P0-16	Carrier frequency adjustment with temperature	0: No 1: Yes	1	√
P0-17	Acceleration time 1	0.00s ~ 65000s	Model depend	√
P0-18	Deceleration time 1	0.00s ~ 65000s	Model depend	√
P0-19	Acceleration/ Deceleration time unit	0: 1s; 1: 0.1s; 2: 0.01s	1	×
P0-21	Frequency offset of auxiliary frequency source for X and Y operation	0.00Hz ~ P0-10 (maximum frequency)	0.00Hz	√
P0-22	Frequency reference resolution	1: 0.1Hz 2: 0.01Hz	2	×
P0-23	Retentive of digital setting frequency upon power failure	0: Not store 1: Store	0	√
P0-24	Motor selection	0: Motor 1 1: motor 2	0	×

P0-25	Acceleration/ Deceleration time base frequency	0: Maximum frequency（P0-10） 1: Set frequency 2: 100Hz	0	×
P0-26	Base frequency for UP/ DOWN modification during running	0: Running frequency 1: Set frequency	0	×
P0-27	Binding command source to frequency source	Unit's digit: (Binding operation panel command to frequency source) 0: No binding 1: Digital set frequency 2: AI1 3: AI2 4: Reserved 5: HDI (DI6) 6: Multi-speed 7: Simple PLC 8: PID 9: Communication setting Ten's digit: Terminal command binding frequency source Hundred's digit: Binding communication command to frequency source Thousand's digit: automatic operation binding frequency source	0000	√
P0-28	Serial communication protocol	0: Modbus protocol	0	√
P1 Group: Motor 1 Parameters				
P1-00	Motor type	0: Common asynchronous motor 1: Variable frequency asynchronous motor 2: Permanent magnetic synchronous motor	0	×
P1-01	Rated motor power	0.1kW ~ 1000.0kW	Model depend	×
P1-02	Rated motor voltage	1V ~ 2000V	Model depend	×
P1-03	Rated motor current	0.01A ~ 655.35A（Inverter power<=55kW） 0.1A ~ 6553.5A（Inverter power>55kW）	Model depend	×
P1-04	Rated motor frequency	0.01Hz ~ maximum frequency	Model depend	×
P1-05	Rated motor speed	1rpm ~ 65535rpm	Model depend	×
P1-06	Stator resistance (asynchronous motor)	0.001Ω ~ 65.535Ω（Inverter power <=55kW） 0.0001Ω ~ 6.5535Ω（Inverter power >55kW）	Tuning parameters	×
P1-07	Rotor resistance (asynchronous motor)	0.001Ω ~ 65.535Ω（Inverter power <=55kW） 0.0001Ω ~ 6.5535Ω（Inverter power >55kW）	Tuning parameters	×

P1-08	Leakage inductance (asynchronous motor)	0.01mH ~ 655.35mH（Inverter power <=55kW） 0.001mH ~ 65.535mH（Inverter power >55kW）	Tuning parameters	×
P1-09	Mutual inductance (asynchronous motor)	0.1mH ~ 6553.5mH（Inverter power <=55kW） 0.01mH ~ 655.35mH（Inverter power >55kW）	Tuning parameters	×
P1-10	No-load current (asynchronous motor)	0.01A ~ P1-03（Inverter power <=55kW） 0.1A ~ P1-03（Inverter power >55kW）	Tuning parameters	×
P1-16	Stator resistance (synchronous motor)	0.001Ω ~ 65.535Ω（Inverter power <=55kW） 0.0001Ω ~ 6.5535Ω（Inverter power >55kW）	Tuning parameters	×
P1-17	Shaft D inductance (synchronous motor)	0.01mH ~ 655.35mH（Inverter power <=55kW） 0.001mH ~ 65.535mH（Inverter power >55kW）	Tuning parameters	×
P1-18	Shaft Q inductance (synchronous motor)	0.01mH ~ 655.35mH（Inverter power <= 55kW） 0.001mH ~ 65.535mH（Inverter power >55kW）	Tuning parameters	×
P1-20	Back EMF (synchronous motor)	0.1V ~ 6553.5V	Tuning parameters	×
P1-37	Auto-tuning selection	0: No auto-tuning 1: Asynchronous motor static auto-tuning 2: Asynchronous motor complete auto-tuning 11: Synchronous motor with-load auto-tuning 12: Synchronous motor no-load auto-tuning	0	×
P2 Group: Motor 1 Vector Control Parameters				
P2-00	Speed loop proportional gain 1	1 ~ 100	10	√
P2-01	Speed loop integral time 1	0.01s ~ 10.00s	0.50s	√
P2-02	Switchover frequency 1	0.00 ~ P2-05	5.00Hz	√
P2-03	Speed loop proportional gain 2	1 ~ 100	30	√
P2-04	Speed loop integral time 2	0.01s ~ 10.00s	1.00s	√
P2-05	Switchover frequency 2	P2-02 ~ maximum frequency	10.00Hz	√
P2-06	Vector control slip gain	50% ~ 200%	100%	√
P2-07	Time constant of speed loop fiter	0.000s ~ 0.100s	0.000s	√
P2-08	Vector control overexcitation gain	0 ~ 200	64	√

P2-09	Torque upper limit source in speed control mode	0: Function code P2-10 setting 1: AI1 2: AI2 3: Reserved 4: HDI Pulse 5: Communication 6: MIN（AI1,AI2） 7: MAX（AI1,AI2） Full range of options 1-7 corresponding to P2-10	0	√
P2-10	Digital setting of torque upper limit in speed control mode	0.0% ~ 200.0%	150.0%	√
P2-13	Excitation adjustment proportional gain	0 ~ 60000	2000	√
P2-14	Excitation adjustment integral gain	0 ~ 60000	1300	√
P2-15	Torque adjustment proportional gain	0 ~ 60000	2000	√
P2-16	Torque adjustment Integral gain	0 ~ 60000	1300	√
P2-17	Speed loop integral property	Unit's digit: integral separation 0: Disabled 1: Enabled	0	√
P2-18	Field weakening mode of synchronous motor	0: Field weakening mode invalid 1: Field weakening mode 2: Automatic adjustment	1	√
P2-19	Field weakening depth of synchronous motor	50%~500%	100%	√
P2-20	Field weakening depth of synchronous motor	1%~300%	50%	√
P2-21	Field weakening automatic adjustment gain	10%~500%	100%	√
P2-22	Field weakening integral multiple	2~10	2	√
P3 Group: V/f Control parameter				
P3-00	V/F curve setting	0: Linear 1: Multi-point 2: Square 3: 1.2 -power 4: 1.4 -power 6: 1.6 -power 8: 1.8 -power 9: Reserved 10: V/F complete separation 11: V/F half separation	0	×
P3-01	Torque boost	0.0%:（Automatic torque boost） 0.1%~30.0%	Model depend	√

P3-02	Cut-off frequency of torque boost	0.00Hz ~ maximum frequency	50.00Hz	×
P3-03	Multi-point V/F frequency 1	0.00Hz ~ P3-05	0.00Hz	×
P3-04	Multi-point V/F voltage 1	0.0% ~ 100.0%	0.0%	×
P3-05	Multi-point V/F frequency 2	P3-03 ~ P3-07	0.00Hz	×
P3-06	Multi-point V/F voltage 2	0.0% ~ 100.0%	0.0%	×
P3-07	Multi-point V/F frequency 3	P3-05~ rated motor frequency（P1-04）	0.00Hz	×
P3-08	Multi-point V/F voltage 3	0.0% ~ 100.0%	0.0%	×
P3-09	V/F slip compensation	0.0% ~ 200.0%	0.0%	√
P3-10	V/F over-excitation gain	0~200	64	√
P3-11	V/F oscillation suppression gain	0~100	Model depend	√
P3-13	V/F oscillation suppression gain	0: Digital setting（P3-14） 1: AI1 2: AI2 3: Reserved 4: HDI 5: Multi-step 6: Simple PLC 7: PID 8: Communication Note: 100.0% corresponds to the rated motor voltage	0	√
P3-14	Voltage digital setting for V/F separation	0V ~ rated motor voltage	0V	√
P3-15	Voltage rise time of V/F separation	0.0s ~ 1000.0s Note: It indicates the time for the voltage rising from 0 V to rated motor voltage.	0.0s	√

P4 Group: Input Terminal				
P4-00	DI1 Terminal function	0: No function 1: Forward RUN（FWD） 2: Reverse RUN（REV） （When setting to 1, 2, it needs to be used with P4-11） 3: Three-line running control 4: Forward JOG（FJOG） 5: Reverse JOG（RJOG） 6: Terminal UP 7: Terminal DOWN 8: Coast to stop 9: Fault reset（RESET） 10: Run pause 11: Normally open (NO) input of external fault 12: Multi-step speed terminal 1 13: Multi-step speed terminal 2 14: Multi-step speed terminal 3 15: Multi-step speed terminal 4 16: Terminal 1 for acceleration/deceleration time selection 17: Terminal 2 for acceleration/deceleration time selection 18: Frequency source switchover 19: UP and DOWN setting clear (terminal, operation panel) 20: Command source switchover terminal 1 21: Acceleration/Deceleration prohibited 22: PID pause 23: PLC status reset 24: Swing pause 25: Counter input 26: Counter reset 27: Length count input 28: Length reset 29: Torque control prohibited 30: HDI frequency input （enabled only for DI6） 31: Reserved 32: Immediate DC braking 33: Normally closed (NC) input of external fault 34: Frequency modification 35: Reverse PID action direction 36: External STOP terminal 11 37: Command source switchover terminal 2 38: PID integral pause 39: Switchover between frequency source A and preset frequency 40: Switchover between frequency source Band preset frequency	1	×
P4-01	DI2 Terminal function		4	×
P4-02	DI3 Terminal function		9	×
P4-03	DI4 Terminal function		12	×
P4-04	DI5Terminal function		13	×
P4-05	DI6 Terminal function		0	×
			0	×
			0	×
			0	×
			0	×

		41: Motor selection terminal 1 42: Reserved 43: PID parameter switchover 44: User-defined fault 1 45: User-defined fault 2 46: Speed control/Torque control switchover 47: Emergency stop 48: External STOP terminal 2 49: Deceleration DC braking 50: Clear the current running time 51-59: Reserved		
P4-06 ~ P4-07	Reserved			×
P4-08	Braking voltage action point	100% ~ 160%	128%	√
P4-09	AVR function selection	0: Invalid 1: Valid 2: Invalid only when deceleration	0	√
P4-10	DI input terminal filter time	0.000s ~ 1.000s	0.010s	√
P4-11	Terminal command mode	0: Two-line mode 1 1: Two-line mode 2 2: Three-line mode 1 3: Three-line mode 2	0	×
P4-12	Terminal UP/DOWN change rate	0.001Hz/s ~ 65.535Hz/s	1.00Hz/s	√
P4-13	AI curve 1 minimum input	0.00V ~ P4-15	0.00V	√
P4-14	Corresponding setting of AI Curve 1 minimum input	-100.0% ~ +100.0%	0.0%	√
P4-15	AI curve 1 maximum input	P4-13 ~ +10.00V	10.00V	√
P4-16	Corresponding setting of AI Curve 1 maximum input	-100.0% ~ +100.0%	100.0%	√
P4-17	AI1 filter time	0.00s ~ 10.00s	0.10s	√
P4-18	AI curve 2 minimum input	0.00V ~ P4-20	0.00V	√

P4-19	Corresponding setting of AI Curve 2 minimum input	-100.0% ~ +100.0%	0.0%	√
P4-20	AI curve 2 maximum input	P4-18 ~ +10.00V	10.00V	√
P4-21	Corresponding setting of AI Curve 1 maximum input	-100.0% ~ +100.0%	100.0%	√
P4-22	AI2 filter time	0.00s ~ 10.00s	0.10s	√
P4-28	HDI minimum input	0.00kHz ~ P4-30	0.00kHz	√
P4-29	Corresponding setting of HDI minimum input	-100.0% ~ 100.0%	0.0%	√
P4-30	HDI maximum input	P4-28 ~ 100.00kHz	50.00kHz	√
P4-31	HDI maximum input setting	-100.0% ~ 100.0%	100.0%	√
P4-32	HDI filter time	0.00s ~ 10.00s	0.10s	√
P4-33	AI Analog input curve selection	Unit's digit: AI1 curve selection 1: Curve 1（2 points，see P4-13 ~ P4-16） 2: Curve 2（2 points，see P4-18 ~ P4-21） 3: Curve 3（2 points，see P4-23 ~ P4-26） 4: Curve 4（4 points，see H6-00 ~ H6-07） 5: Curve 5（4 points，see H6-08 ~ H6-15） Ten's digit: AI2 curve selection Curve 1 to curve 5 (same as AI1)	321	√
P4-34	Setting for AI less than minimum input	Unit's digit: AI1 set below the minimum input selection 0: Corresponding to the minimum input set 1: 0.0% Ten's digit: AI2 set below the minimum input selection， the same as above	000	√
P4-35	DI1 delay time	0.0s ~ 3600.0s	0.0s	×
P4-36	DI2 delay time	0.0s ~ 3600.0s	0.0s	×
P4-37	DI3 delay time	0.0s ~ 3600.0s	0.0s	×
P4-38	DI input terminal valid mode selection 1	0: Positive logic 1: Negative logic Unit's digit: DI1 Ten's digit: DI2 Hundred's digit: DI3 Thousand's digit: DI4 Ten thousand's digit: DI5	00000	×
P4-39	DI input terminal valid mode selection 2	0: Positive logic 1: Negative logic Unit's digit: DI6 Ten's digit: reserved Hundred's digit: reserved Thousand's digit: reserved Ten thousand's digit: reserved	00000	×

P5 Group: Output terminal				
P5-00	DO terminal output mode selection	0: High speed pulse output（HDO） 1: Open collector output（DO）	0	√
P5-01	Control board DO open collector output function selection	0: No output 1: Inverter running 2: Fault output（downtime） 3: Frequency-level detection FDT1 output 4: Frequency reached 5: Zero-speed running（no output at stop） 6: Motor overload pre-warning 7: Inverter overload pre-warning 8: Set count value reached 9: Designated count value reached 10: Length reached 11: PLC cycle completed 12: Accumulative running time reached 13: Frequency limited 14: Torque limited 15: Ready for RUN 16: AI1>AI2 17: Frequency upper limit reached 18: Frequency lower limit reached（run-related） 19: Undervoltage state output 20: Communication setting 21: Positioning completed（Reserved） 22: Positioning approached（Reserved） 23: Zero-speed running 2（having output at stop） 24: Accumulative power-on time reached 25: Frequency level detection FDT2 output 26: Frequency 1 reached output 27: Frequency 2 reached output 28: Current 1 reached output 29: Current 2 reached output 30: Timing reached output 31: AI1 input limit exceeded 32: Load becoming 0 33: Reverse running 34: Zero current state 35: Module temperature reached 36: Output current limit exceeded 37: Frequency lower limit reached（having output at stop） 38: Alarm output（continue to run） 39: Motor overheat warning 40: Current running time reached 41: Fault output (There is no output if it is the coast to stop fault and undervoltage occurs.	0	√
P5-02	Control board relays 1 function selection（TA-TB-TC）		2	√
P5-03	Reserved		0	√
P5-04	Reserved		1	√
P5-05	Reserved		4	√

P5-06	HDO High-speed pulse output function selection	0: Running frequency 1: Setting frequency 2: Output current 3: Output torque（absolute value） 4: Output power 5: Output voltage 6: HDI High-speed pulse input（DI6 terminal，100.% corresponding to 100.0kHz） 7:AI1 8:AI2 9: Reserved 10: Reserved 11: Count value 12: Communication setting 13: Motor rotational speed 14: Output current（100.0% corresponding to 1000.0A） 15: Output voltage（100.0% corresponding to 1000.0V） 16: Output torque (actual value)	0	√
P5-07	AO1 Analog output function selection		0	√
P5-08	Reserved		1	√
P5-09	HDO Output the maximum frequency	0.01kHz ~ 100.00kHz	50.00kHz	√
P5-10	AO offset coefficient	-100.0% ~ +100.0%	0.0%	√
P5-11	AO gain	-10.00 ~ +10.00	1.00	√
P5-17	DO open collector output delay time	0.0s ~ 3600.0s	0.0s	√
P5-18	Control board relay 1 TA-TB-TC output delay time	0.0s ~ 3600.0s	0.0s	√
P5-22	DO output terminal valid state selection	0: Positive logic 1: Negative logic Unit's digit: DO Ten's digit: TA-TB-TC Hundred's digit: Reserved Thousand's digit: Reserved Ten thousand's digit: Reserved	00000	√
P6 Group: Start/Stop Control				
P6-00	Start mode	0: Direct start 1: Speed tracking and restart 2: Pre-excited start（asynchronous motor）	0	√
P6-01	Speed tracking mode	0: From frequency at stop 1: From zero speed 2: From maximum frequency	0	×
P6-02	Speed tracking speed	1 ~ 100	20	√

P6-03	Startup frequency	0.00Hz ~ 10.00Hz	0.00Hz	√
P6-04	Startup frequency holding time	0.0s ~ 100.0s	0.0s	×
P6-05	Startup DC braking current/Pre-excited current	0% ~ 100%	0%	×
P6-06	Startup DC braking time/ Pre-excited time	0.0s ~ 100.0s	0.0s	×
P6-07	Acceleration/ Deceleration mode	0: Linear acceleration/deceleration 1: S-curve acceleration/deceleration A 2: S-curve acceleration/deceleration B	0	×
P6-08	Time proportion of S-curve start segment	0.0% ~（100.0%-P6-09）	30.0%	×
P6-09	Time proportion of S-curve end segment	0.0% ~（100.0%-P6-08）	30.0%	×
P6-10	Stop mode	0: Decelerate to stop 1: Coast to stop	0	√
P6-11	Initial frequency of stop DC braking	0.00Hz ~ maximum frequency	0.00Hz	√
P6-12	Waiting time of stop DC braking	0.0s ~ 100.0s	0.0s	√
P6-13	Stop DC braking current	0%~100%	0%	√
P6-14	Stop DC braking time	0.0s~100.0s	0.0s	√
P6-15	Stop DC braking time	0%~100%	100%	√
P7 Group: Operation Keypad and Display				
P7-01	MF.K Key function selection	0: MF.K key disabled 1: Switchover between operation keypad control and remote command control (terminal or communication) 2: Switchover between forward and reverse 3: Forward JOG 4: Reverse JOG	0	×
P7-02	STOP/RESET key function	0: STOP/RESET key enabled only under keypad control 1: STOP/RESET key enabled always	1	√

P7-03	LED display running parameters 1	0000~FFFF Bit00: Running frequency 1（Hz） Bit01: Set frequency（Hz） Bit02: Bus voltage（V） Bit03: Output voltage（V） Bit04: Output current（A） Bit05: Output power（kW） Bit06: Output torque（%） Bit07: DI input terminal state Bit08:DO output terminal state Bit09: AI1 voltage（V） Bit10: AI2 voltage（V） Bit11: Reserved Bit12: Count value Bit13: Length value Bit14: Load speed display Bit15: PID setting	1F	√
P7-04	LED running display parameters2	0000~FFFF Bit00: PID feedback Bit01: PLC Stage Bit02: HDI input pulse frequency（kHz） Bit03: Running frequency 2（Hz） Bit04: Remaining running time Bit05: AI1 voltage before correction（V） Bit06: AI2 voltage before correction（V） Bit07: Reserved Bit08: Linear speed Bit09: Current power-on time（Hour） Bit10: Current running time（Min） Bit11: HDI input pulse frequency（Hz） Bit12: Communication setting value Bit13: Reserved Bit14: Main frequency A display（Hz） Bit15: Auxiliary frequency B display	0	√
P7-05	LED inverter stop parameter display	0000~FFFF Bit00: Setting frequency（Hz） Bit01: Bus voltage（V） Bit02: DI terminal input status Bit03: DO terminal output status Bit04: AI1voltage（V） Bit05: AI2 voltage（V） Bit06: Reserved Bit07: Count value Bit08: Length value Bit09: PLC stage Bit10: Load speed Bit11: PID setting Bit12: HDI input pulse	33	√

P7-06	Load speed display coefficient	0.0001 ~ 6.5000	1.0000	√
P7-07	Heatsink temperature of inverter module	0.0℃ ~ 100.0℃	-	○
P7-08	Reserved		-	○
P7-09	Accumulative running time	0h ~ 65535h	-	○
P7-10	Product number	-	-	○
P7-11	Software version	-	-	○
P7-12	Number of decimal places for load speed display	0: 0 decimal place 1: 1 decimal place 2: 2 decimal place 3: 3 decimal place	1	√
P7-13	Accumulative power-on time	0h ~ 65535h	-	○
P7-14	Accumulative power consumption	0kW ~ 65535kWh	-	○
P8 Group: Auxiliary Functions				
P8-00	JOG running frequency	0.00Hz ~ maximum frequency	2.00Hz	√
P8-01	JOG acceleration time	0.0s ~ 6500.0s	20.0s	√
P8-02	JOG deceleration time	0.0s ~ 6500.0s	20.0s	√
P8-03	Acceleration time 2	0.0s ~ 6500.0s	Model depend	√
P8-04	Deceleration time 2	0.0s ~ 6500.0s	Model depend	√
P8-05	Acceleration time 3	0.0s ~ 6500.0s	Model depend	√
P8-06	Deceleration time 3	0.0s ~ 6500.0s	Model depend	√
P8-07	Acceleration time 4	0.0s ~ 6500.0s	Model depend	√
P8-08	Deceleration time 4	0.0s ~ 6500.0s	Model depend	√
P8-09	Jump frequency 1	0.00Hz ~ maximum frequency	0.00Hz	√
P8-10	Jump frequency 2	0.00Hz ~ maximum frequency	0.00Hz	√
P8-11	Frequency jump amplitude	0.00Hz ~ maximum frequency	0.01Hz	√
P8-12	Forward/Reverse rotation dead-zone time	0.0s ~ 3000.0s	0.0s	√
P8-13	Reverse control prohibition	0: Enable 1: Disable	0	√
P8-14	Running mode when set frequency lower than frequency lower limit	0: Run at frequency lower limit 1: Stop 2: Run at zero speed	0	√
P8-15	Droop control	0.00Hz ~ 10.00Hz	0.00Hz	√

P8-16	Accumulative power-on time threshold	0h ~ 65000h	0h	√
P8-17	Accumulative running time	0h ~ 65000h	0h	√
P8-18	Startup protection selection	0: No 1: Yes	0	√
P8-19	Frequency detection Value（FDT1）	0.00Hz ~ maximum frequency	50.00Hz	√
P8-20	Frequency detection hysteresis value（FDT1）	0.0% ~ 100.0%（FDT1 level）	5.0%	√
P8-21	Detection range of frequency	0.0% ~ 100.0%（maximum frequency）	0.0%	√
P8-22	Jump frequency during acceleration/deceleration	0: Invalid 1: Valid	0	√
P8-25	Frequency switchover Point between acceleration time 1 and acceleration time 2	0.00Hz ~ maximum frequency	0.00Hz	√
P8-26	Frequency switchover Point between deceleration time 1 and deceleration time 2	0.00Hz ~ maximum frequency	0.00Hz	√
P8-27	Terminal JOG preferred	0: Invalid 1: Valid	0	√
P8-28	Frequency detection value（FDT2）	0.00Hz ~ maximum frequency	50.00Hz	√
P8-29	Frequency detection hysteresis value（FDT2）	0.0% ~ 100.0%（FDT2 level）	5.0%	√
P8-30	Any frequency reaching detection value 1	0.00Hz ~ maximum frequency	50.00Hz	√
P8-31	Any frequency reaching detection amplitude 1	0.0% ~ 100.0%（maximum frequency）	0.0%	√
P8-32	Any frequency reaching detection value 2	0.00Hz ~ maximum frequency	50.00Hz	√
P8-33	Any frequency reaching detection amplitude 2	0.0% ~ 100.0% (maximum frequency）	0.0%	√
P8-34	Zero current Detection level	0.0% ~ 300.0% 100.0% Corresponding to the motor rated current	5.0%	√
P8-35	Zero current detection delay time	0.01s ~ 600.00s	0.10s	√
P8-36	Output overcurrent threshold	1.1%（no detection） 1.2% ~ 300.0%（rated motor current）	200.0%	√
P8-37	Output overcurrent detection delay time	0.00s ~ 600.00s	0.00s	√
P8-38	Any current reaching 1	0.0% ~ 300.0%（rated motor current）	100.0%	√

P8-39	Any current reaching 1 amplitude	0.0% ~300.0%（rated motor current）	0.0%	√
P8-40	Any current reaching 2	0.0% ~ 300.0%（rated motor current）	100.0%	√
P8-41	Any current reaching 2 amplitude	0.0% ~ 300.0%（rated motor current）	0.0%	√
P8-42	Timing function	0: Invalid 1: Valid	0	√
P8-43	Timing running time selection	0: P8-44 setting 1: AI1 2: AI2 3: Reserved (100% of analog input corresponds to the value of P8-44)	0	√
P8-44	Timing duration	0.0Min ~ 6500.0Min	0.0Min	√
P8-45	AI1 input voltage protection value lower limit	0.00V ~ P8-46	3.10V	√
P8-46	AI1 input voltage protection value upper limit	P8-45 ~ 10.00V	6.80V	√
P8-47	Module temperature threshold	0℃ ~ 100℃	75℃	√
P8-48	Cooling fan control	0: Fan rotating during inverter running 1: Fan keeping running	0	√
P8-49	Wakeup frequency	Dormant frequency（P8-51）~ maximum frequency（P5-10）	0.00Hz	√
P8-50	Wakeup delay time	0.0s ~ 6500.0s	0.0s	√
P8-51	Dormant frequency	0.00Hz ~ wakeup frequency（P8-49）	0.00Hz	√
P8-52	Dormant delay time	0.0s ~ 6500.0s	0.0s	√
P8-53	Current running reaching time setting	0.0Min ~ 6500.0Min	0.0Min	√
P9 Group: Fault and Protection				
P9-00	Motor overload protection selection	0: Disable 1: Enable	1	√
P9-01	Motor overload protection gain	0.20 ~ 10.00	1.00	√
P9-02	Motor overload warning coefficient	50% ~ 100%	80%	√
P9-03	Overvoltage stall gain	0 ~ 100	0	√
P9-04	Overvoltage stall protective voltage	120% ~ 150%	130%	√
P9-05	Overcurrent stall gain	0 ~ 100	20	√

P9-06	Overcurrent stall protective current	100% ~ 200%	160%	√
P9-07	Short-circuit to ground upon power-on protection function	0: Invalid 1: Valid	1	√
P9-09	Fault auto reset times	0 ~ 20	0	√
P9-10	during fault auto reset, fault DO action output terminal selection	0: No action 1: Action	0	√
P9-11	Time interval of fault auto reset	0.1s ~ 100.0s	1.0s	√
P9-12	Input phase failure protection/contactor energizing protection selection	0: Disable 1: Enable	11	√
P9-13	Output phase failure protection selection	0: Disable 1: Enable	1	√
P9-14	1st fault type	0: No fault 1: Reserved 2: Overcurrent during acceleration 3: Overcurrent during deceleration 4: Overcurrent at constant speed 5: Overvoltage during acceleration 6: Overvoltage during deceleration 7: Overvoltage at constant speed 8: Buffer resistance overload 9: Under voltage 10: Inverter overload 11: Motor overload 12: Power input phase failure 13: Power output phase failure 14: Module overheat 15: External equipment fault 16: Communication fault 17: Contactor fault 18: Current detection fault 19: Motor auto-tuning fault 20: Reserved 21: Parameter read-write fault 22: Inverter hardware fault 23: Short circuit to ground 24: Reserved 25: Reserved 26: Running time reached 27: User-defined fault 1 28: User-defined fault 2 29: Power-on time reached 30: Load becoming 0 31: PID feedback lost during running 40: Rapid current-limited overtime	—	○
P9-15	2nd fault type		—	○
P9-16	3rd (latest) fault type		—	○

		41: Motor switchover during running 42: Too large speed deviation 43: Motor over-speed 45: Motor overheat 51: Initial position fault		
P9-17	Frequency at 3rd (latest) fault	—	—	○
P9-18	Current at 3rd (latest) fault	—	—	○
P9-19	Bus voltage at 3rd (latest) fault	—	—	○
P9-20	Input terminal status at 3rd fault (latest)	—	—	○
P9-21	Output terminal status at 3rd fault (latest)	—	—	○
P9-22	Inverter status at 3rd (latest) fault	—	—	○
P9-23	Power-on time at 3rd (latest) fault	—	—	○
P9-24	Running time at 3rd fault (latest)	—	—	○
P9-27	Frequency at 2nd fault	—	—	○
P9-28	Current at 2nd fault	—	—	○
P9-29	Bus voltage at 2nd fault	—	—	○
P9-30	Input terminal status at 2nd fault	—	—	○
P9-31	Output terminal status at 2nd fault	—	—	○
P9-32	Inverter status at 2nd fault	—	—	○
P9-33	Power-on time at 2nd fault	—	—	○
P9-34	Running time at 2nd fault	—	—	○
P9-37	Frequency at 1st fault	—	—	○
P9-38	Current at 1st fault	—	—	○
P9-39	Bus voltage at 1st fault	—	—	○
P9-40	Input terminal status at 1st fault	—	—	○
P9-41	Output terminal status at 1st fault	—	—	○
P9-42	Inverter status at 1st fault	—	—	○
P9-43	Power-on time at 1st fault	—	—	○

P9-44	Running time at 1st fault	—	—	○
P9-47	Fault protection action selection 1	Unit's digit: Motor overload（11） 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run Ten's digit: Power input phase failure（12） Hundred's digit: Power output phase failure（13） Thousand's digit: External equipment fault（15） Ten thousand's digit: Communication fault（16）	00000	√
P9-48	Fault protection action selection 2	Unit's digit: Encoder/PG card fault（20） 0: Coast to stop Ten's digit: Function code read-write fault（21） 0: Coast to stop 1: Stop according to the stop mode Hundred's digit: Reserved Thousand's digit: Motor overheat（25） Ten thousand's digit: Running time reached（26）	00000	√
P9-49	Fault protection action selection 3	Unit's digit: User-defined fault 1（27） 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run Ten's digit: User-defined fault 2（28） 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run Hundred's digit: Power-on time reached（29） 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run Thousand's digit: Off-load（30） 0: Coast to stop 1: Speed reducing stop 2: Continue to run at 7% of rated motor frequency and resume to the setting frequency if the load recovers. Ten thousand's digit: PID feedback lost during running（31） 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run	00000	√

P9-50	Fault protection action selection 4	Unit's digit: Too large speed deviation（42） 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run Ten's digit: Motor over-speed（43） Hundred's digit: Initial position fault（51）	00000	√
P9-54	Frequency selection for continuing to run upon fault	0: Running as current running frequency 1: Running as setting frequency 2: Running as frequency upper limit 3: Running as frequency lower limit 4: Running as Backup frequency upon abnormality	0	√
P9-55	Backup frequency upon abnormality	0.0% ~ 100.0% （100.0% Corresponding to the maximum frequency P0-10）	100.0%	√
P9-59	Action selection at instantaneous power failure	0: Invalid 1: Decelerate 2: Decelerate to stop	0	√
P9-60	Action pause judging voltage at instantaneous power failure	80.0% ~ 100.0%	90.0%	√
P9-61	Voltage recovers judging time at instantaneous power failure	0.00s ~ 100.00s	0.50s	√
P9-62	Action judging voltage At instantaneous power failure	60.0% ~ 100.0%（standard bus voltage）	80.0%	√
P9-63	Off-load protection	0: Invalid 1: Valid	0	√
P9-64	Off-load detection level	0.0 ~ 100.0%	10.0%	√
P9-65	Off-load detection time	0.0 ~ 60.0s	1.0s	√
P9-67	Over-speed detection value	0.0% ~ 50.0%（maximum frequency）	20.0%	√
P9-68	Over-speed detection time	0.0s no detection 0.1 ~ 60.0s	1.0s	√
P9-69	Detection value of too large speed deviation	0.0% ~ 50.0%（maximum frequency）	20.0%	√
P9-70	Detection time of too large speed deviation	0.0s no detection 0.1s ~ 60.0s	5.0s	√
PA Group: PID Function				

PA-00	PID setting source	0: PA-01 setting 1: AI1 2: AI2 3: Reserved 4: HDI (DI6) 5: Communication 6: Multi-step	0	√
PA-01	PID digital setting	0.0%~100.0%	50.0%	√
PA-02	PID feedback source	0: AI1 1: AI2 2: Reserved 3: AI1-AI2 4: HDI (DI6) 5: Communication 6: AI1+AI2 7: MAX（|AI1|, |AI2|） 8: MIN（|AI1|, |AI2|）	0	√
PA-03	PID action direction	0: Forward action 1: Reverse action	0	√
PA-04	PID setting feedback range	0 ~ 65535	1000	√
PA-05	Proportional gain Kp1	0.0 ~ 100.0	20.0	√
PA-06	Integral time Ti1	0.01s ~ 10.00s	2.00s	√
PA-07	Derivative time Td1	0.000s ~ 10.000s	0.000s	√
PA-08	PID Cut-off frequency of PID reverse rotation	0.00 ~ maximum frequency	2.00Hz	√
PA-09	PID deviation limit	0.0% ~ 100.0%	0.0%	√
PA-10	PID Differential limit	0.00% ~ 100.00%	0.10%	√
PA-11	PID setting change time	0.00 ~ 650.00s	0.00s	√
PA-12	PID feedback filter time	0.00 ~ 60.00s	0.00s	√
PA-13	PID feedback filter time	0.00 ~ 60.00s	0.00s	√
PA-14	Reserved	-	-	√
PA-15	Proportional gain Kp2	0.0 ~ 100.0	20.0	√
PA-16	Integral time Ti2	0.01s ~ 10.00s	2.00s	√
PA-17	Derivative time Td2	0.000s~10.000s	0.000s	√
PA-18	PID parameter switchover condition	0: No switchover 1: Switchover via DI terminal 2: Automatic switchover based on deviation	0	√

PA-19	PID parameter switchover deviation 1	0.0% ~ PA-20	20.0%	√
PA-20	PID parameter switchover deviation 2	PA-19 ~ 100.0%	80.0%	√
PA-21	PID initial value	0.0% ~ 100.0%	0.0%	√
PA-22	PID initial value holding time	0.00 ~ 650.00s	0.00s	√
PA-23	Maximum deviation between two times PID outputs in forward direction	0.00% ~ 100.00%	1.00%	√
PA-24	Maximum deviation between two times PID outputs in	0.00% ~ 100.00%	1.00%	√
PA-25	PID integral property	Unit's digit: Integral separated 0: Invalid 1: Valid Ten's digit: Whether to stop integral operation when the output reaches the limit 0: Continue integral operation 1: Stop integral operation	00	√
PA-26	Detection value of PID feedback loss	0.0%: Not judging feedback loss 0.1% ~ 100.0%	0.0%	√
PA-27	Detection time of PID feedback loss	0.0s ~ 20.0s	0.0s	√
Pb Group: Swing Frequency, Fixed Length and Counting				
Pb-00	Swing frequency setting mode	0: Relative to the central frequency 1: Relative to the maximum frequency	0	√
Pb-01	Swing frequency amplitude	0.0% ~ 100.0%	0.0%	√
Pb-02	Swing frequency amplitude	0.0% ~ 50.0%	0.0%	√
Pb-03	Swing frequency cycle	0.1s ~ 3000.0s	10.0s	√
Pb-04	Triangular wave rising time coefficient	0.1% ~ 100.0%	50.0%	√
Pb-05	Setting length	0m ~ 65535m	1000m	√
Pb-06	Actual length	0m ~ 65535m	0m	√
Pb-07	Number of pulses Per meter	0.1 ~ 6553.5	100.0	√
Pb-08	Set count value	1 ~ 65535	1000	√
Pb-09	Designated count value	1 ~ 65535	1000	√
PC Group: Multi-reference and Simple PLC Function				
PC-00	Multi-Reference 0	-100.0% ~ 100.0%	0.0%	√

PC-01	Multi-Reference 1	-100.0% ~ 100.0%	0.0%	√
PC-02	Multi-Reference 2	-100.0% ~ 100.0%	0.0%	√
PC-03	Multi-Reference 3	-100.0% ~ 100.0%	0.0%	√
PC-04	Multi-Reference 4	-100.0% ~ 100.0%	0.0%	√
PC-05	Multi-Reference 5	-100.0% ~ 100.0%	0.0%	√
PC-06	Multi-Reference 6	-100.0% ~ 100.0%	0.0%	√
PC-07	Multi-Reference 7	-100.0% ~ 100.0%	0.0%	√
PC-08	Multi-Reference 8	-100.0% ~ 100.0%	0.0%	√
PC-09	Multi-Reference 9	-100.0% ~ 100.0%	0.0%	√
PC-10	Multi-Reference 10	-100.0% ~ 100.0%	0.0%	√
PC-11	Multi-Reference 11	-100.0% ~ 100.0%	0.0%	√
PC-12	Multi-Reference 12	-100.0% ~ 100.0%	0.0%	√
PC-13	Multi-Reference 13	-100.0% ~ 100.0%	0.0%	√
PC-14	Multi-Reference 14	-100.0% ~ 100.0%	0.0%	√
PC-15	Multi-Reference 15	-100.0% ~ 100.0%	0.0%	√
PC-16	Simple PLC running mode	0: Stop after running one cycle 1: Keep last values after running one cycle 2: Circular running	0	√
PC-17	Simple PLC store selection	Unit's digit: Store selection when power-off 0: Not store 1: Store Ten's digit: Store selection when stop 0: Not store 1: Store	00	√
PC-18	Running time of simple PLC reference 0	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-19	Acceleration/Deceleration time of simple PLC reference 0 selection	0 ~ 3	0	√
PC-20	Running time of simple PLC reference 1	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-21	Acceleration/Deceleration time of simple PLC reference 1 selection	0 ~ 3	0	√
PC-22	Running time of simple PLC reference 2	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-23	Acceleration/Deceleration time of simple PLC reference 2 selection	0 ~ 3	0	√
PC-24	Running time of simple PLC reference 3	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-25	Acceleration/Deceleration time of simple PLC reference 3 selection	0 ~ 3	0	√

PC-26	Running time of simple PLC reference 4	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-27	Acceleration/Deceleration time of simple PLC reference 4 selection	0 ~ 3	0	√
PC-28	Running time of simple PLC reference 5	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-29	Acceleration/Deceleration time of simple PLC reference 5 selection	0 ~ 3	0	√
PC-30	Running time of simple PLC reference 6	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-31	Acceleration/Deceleration time of simple PLC reference 6 selection	0 ~ 3	0	√
PC-32	Running time of simple PLC reference 7	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-33	Acceleration/Deceleration time of simple PLC reference 7 selection	0 ~ 3	0	√
PC-34	Running time of simple PLC reference 8	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-35	Acceleration/Deceleration time of simple PLC reference 8 selection	0 ~ 3	0	√
PC-36	Running time of simple PLC reference 9	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-37	Acceleration/Deceleration time of simple PLC reference 9 selection	0 ~ 3	0	√
PC-38	Running time of simple PLC reference 10	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-39	Acceleration/Deceleration time of simple PLC reference 10 selection	0 ~ 3	0	√
PC-40	Running time of simple PLC reference 11	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-41	Acceleration/Deceleration time of simple PLC reference 11 selection	0 ~ 3	0	√
PC-42	Running time of simple PLC reference 12	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-43	Acceleration/Deceleration time of simple PLC reference 12 selection	0 ~ 3	0	√
PC-44	Running time of simple PLC reference 13	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-45	Acceleration/Deceleration time of simple PLC reference 13 selection	0 ~ 3	0	√

PC-46	Running time of simple PLC reference 14	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-47	Acceleration/Deceleration time of simple PLC reference 14 selection	0 ~ 3	0	√
PC-48	Running time of simple PLC reference 15	0.0s(h) ~ 6553.5s(h)	0.0s(h)	√
PC-49	Acceleration/Deceleration time of simple PLC reference 15 selection	0 ~ 3	0	√
PC-50	Time unit of simple PLC running	0: s (second) 1: h (hour)	0	√
PC-51	Multi-Reference 0 setting mode	0: Function code PC-00 setting 1: AI1 2: AI2 3: Reserved 4: HDI 5: PID 6: Preset frequency (P0-08) setting, modified via terminal UP/DOWN	0	√
Pd Group: Communication Parameters				
Pd-00	Baud rate	Unit's digit: MODBUS 0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS	5	√
Pd-01	MODBUS Data format	0: No check(8-N-2) 1: Even parity check(8-E-1) 2: Odd Parity check(8-O-1) 3: No check 8-N-1 (MODBUS Valid)	0	√
Pd-02	Local address	1~247, 0 Broadcast address	1	√
Pd-03	Response delay	0ms ~ 20ms (Valid for MODBUS)	2	√
Pd-04	Time for Communication timeout	0.0(invalid), 0.1s~60.0s (Valid for MODBUS)	0.0	√
Pd-06	Communication reading current resolution	0: 0.01A 1: 0.1A	0	√
PP Group: Function Code Management				
PP-00	User password	0 ~ 65535	0	√

PP-01	Parameter initialization	0: No operation 01: Restore factory settings except motor parameters 02: Clear records 04: Backup user current parameters 05: Restore the user backup parameters	0	×
PP-02	Function parameter group display selection	Unit's digit: Group U display selection 0: Not display 1: Display Ten's digit: Group P display selection 0: Not display 1: Display	11	×
PP-03	Individualized parameter display selection	Unit's digit: User-defined parameter display selection 0: Not display 1: Display（--u--group） Ten's digit: User-modified parameter display selection 0: Not display 1: Display（--p--group）	00	√
PP-04	Parameter modification property	0: Modifiable 1: Not modifiable	0	√
H0 Group: Torque Control Parameters				
H0-00	Speed/Torque control selection	0: Speed control 1: Torque control	0	×
H0-01	Torque setting source selection in torque control	0: Digital setting 1（H0-03） 1: AI1 2: AI2 3: Reserved 4: HDI 5: Communication 6: MIN（AI1,AI2） 7: MAX（AI1,AI2）（Full range of values 1-7，corresponds to the digital setting H0-03）	0	×
H0-03	Torque digital setting in torque control	-200.0% ~ 200.0%	150.0%	√
H0-05	Forward direction maximum frequency in torque control	0.00Hz ~ maximum frequency	50.00Hz	√
H0-06	Reverse direction maximum frequency in torque control	0.00Hz ~ maximum frequency	50.00Hz	√
H0-07	Acceleration time in Torque control	0.00s ~ 65000s	0.00s	√
H0-08	Deceleration time in Torque control	0.00s ~ 65000s	0.00s	√
H1 Group: Virtual IO				
H1-00	Virtual XDI1 terminal function selection	0 ~ 59	0	×

H1-01	Virtual XDI2 terminal function selection	0 ~ 59	0	×
H1-02	Virtual XDI3 terminal function selection	0 ~ 59	0	×
H1-03	Virtual XDI4 terminal function selection	0 ~ 59	0	×
H1-04	Virtual XDI5 terminal function selection	0 ~ 59	0	×
H1-05	Virtual XDI input terminal state setting mode	0: Valid or not for the XDI, it is decided by the state of virtual XDOx. 1: XDI valid or not is decided by the function code H1-06 setting. Unit's digit: Virtual XDI1 Ten's digit: Virtual XDI2 Hundred's digit: Virtual XDI3 Thousand's digit: Virtual XDI4 Ten thousand's digit: Virtual XDI5	00000	×
H1-06	Virtual XDI input terminal state setting	0: Invalid 1: Valid Unit's digit: Virtual XDI1 Ten's digit: Virtual XDI2 Hundred's digit: Virtual XDI3 Thousand's digit: Virtual XDI4 Ten thousand's digit: Virtual XDI5	00000	×
H1-07	Function selection for AI1 as DI	0 ~ 59	0	×
H1-08	Function selection for AI2 as DI	0 ~ 59	0	×
H1-09	Function selection for AI3 as DI	0 ~ 59	0	×
H1-10	Effective model selection for AI terminal as DI	0: High level valid 1: Low level valid Unit's digit: AI1 Ten's digit: AI2 Hundred's digit: AI3	000	×
H1-11	Virtual XDO1 Output function selection	0: Short with physical DIx internally 1~40: Refer to group P5 physical DO output selection	0	√
H1-12	Virtual XDO2 Output function selection	0: Short with physical DIx internally 1~40: Refer to group P5 physical DO output selection	0	√
H1-13	Virtual XDO3 Output function selection	0:Short with physical DIx internally 1~40: Refer to group P5 physical DO output selection	0	√

H1-14	Virtual XDO4 Output function selection	0: Short with physical DIx internally 1~40: Refer to group P5 physical DO output selection	0	√
H1-15	Virtual XDO5 Output function selection	0: Short with physical DIx internally 1~40: Refer to group P5 physical DO output selection	0	√
H1-16	Virtual XDO1 output delay time	0.0s ~ 3600.0s	0.0s	√
H1-17	Virtual XDO2 output delay time	0.0s ~ 3600.0s	0.0s	√
H1-18	Virtual XDO3 output delay time	0.0s ~ 3600.0s	0.0s	√
H1-19	Virtual XDO4 output delay time	0.0s ~ 3600.0s	0.0s	√
H1-20	Virtual XDO5 output delay time	0.0s ~ 3600.0s	0.0s	√
H1-21	Virtual XDO output terminal effective state selection	0: Positive logic 1: Reverse logic Unit's digit: XDO1 Ten's digit: XDO2 Hundred's digit: XDO3 Hundred's digit: XDO4 Ten thousand's digit: XDO5	00000	√

H2 Group: Motor 2 Control				
H2-00	Motor type	0: Common asynchronous motor 1: Variable frequency asynchronous motor 2: Permanent magnetic synchronous motor	0	×
H2-01	Rated motor power	0.1kW ~ 1000.0kW	Model depend	×
H2-02	Rated motor voltage	1V ~ 2000V	Model depend	×
H2-03	Rated motor current	0.01A~655.35A（inverter power<=55kW） 0.1A~6553.5A（inverter power >55kW）	Model depend	×
H2-04	Rated motor frequency	0.01Hz ~ maximum power	Model depend	×
H2-05	Rated motor speed	1rpm ~ 65535rpm	Model depend	×
H2-06	Stator resistance (asynchronous motor)	0.001Ω ~ 65.535Ω（inverter power <=55kW） 0.0001Ω ~ 6.5535Ω（inverter power >55kW）	Model depend	×
H2-07	Rotor resistance (asynchronous motor)	0.001Ω ~ 65.535Ω（inverter power <=55kW） 0.0001Ω ~ 6.5535Ω（inverter power >55kW）	Model depend	×
H2-08	Leakage inductance (asynchronous motor)	0.01mH~655.35mH (inverter power <=55kW) 0.001mH~65.535mH (inverter power >55kW)	Model depend	×

H2-09	Mutual inductance (asynchronous motor)	0.1mH~6553.5mH（inverter power <=55kW） 0.01mH~655.35mH（inverter power >55kW）	Model depend	×
H2-10	No-load current (asynchronous motor)	0.01A ~ H2-03 (inverter power <=55kW) 0.1A ~ H2-03 (inverter power >55kW)	Model depend	×
H2-16	Stator resistance (synchronous motor)	0.001Ω ~ 65.535Ω（inverter power <=55kW） 0.0001Ω ~ 6.5535Ω（inverter power >55kW）	Model depend	×
H2-17	Shaft D inductance (synchronous motor)	0.01mH~655.35mH (inverter power <=55kW) 0.001mH~65.535mH (inverter power >55kW)	Model depend	×
H2-18	Shaft Q inductance (synchronous motor)	0.01mH~655.35mH (inverter power <=55kW) 0.001mH~65.535mH (inverter power >55kW)	Model depend	×
H2-20	Back EMF (synchronous motor)	0.1V ~ 6553.5V	Model depend	×
H2-37	Auto-tuning selection	0: No auto-tuning 1: Asynchronous motor static auto-tuning 2: Asynchronous motor complete auto-tuning 11: Synchronous motor with-load auto-tuning 12: Synchronous motor no-load auto-tuning	0	×
H2-38	Speed loop proportional gain 1	1 ~ 100	30	√
H2-39	Speed loop integral time 1	0.01s ~ 10.00s	0.50s	√
H2-40	Switchover frequency 1	0.00 ~ H2-43	5.00Hz	√
H2-41	Speed loop proportional gain 2	1 ~ 100	20	√
H2-42	Speed loop integral time 2	0.01s ~ 10.00s	1.00s	√
H2-43	Switchover frequency 2	H2-40 ~ maximum frequency	10.00Hz	√
H2-44	Vector control slip gain	50% ~ 200%	100%	√
H2-45	Time constant of speed loop filter	0.000s ~ 0.100s	0.000s	√
H2-46	Vector control overexcitation gain	0 ~ 200	64	√
H2-47	Torque upper limit source in speed control mode	0: H2-48 setting 1: AI1 2: AI2 3: Reserved 4: HDI 5: communication 6: MIN（A, AI2） 7: MAX（AI1, AI2） Full range of options of 1-7，corresponding to H2-48 digital setting	0	√
H2-48	Digital setting of Torque upper limit in speed control mode	0.0% ~ 200.0%	150.0%	√

H2-51	Excitation adjustment proportional gain	0 ~ 20000	2000	√
H2-52	Excitation adjustment integral gain	0 ~ 20000	1300	√
H2-53	Torque adjustment proportional gain	0 ~ 20000	2000	√
H2-54	Torque adjustment integral gain	0 ~ 20000	1300	√
H2-55	Speed loop integral property	Unit's digit: Integral separated 0: Invalid 1: valid	0	√
H2-56	Field weakening mode of synchronous motor	0: No field weakening 1: Direct calculation 2: Adjustment	1	√
H2-57	Field weakening degree of synchronous motor	50% ~ 500%	100%	√
H2-58	Maximum field Weakening current	1% ~ 300%	50%	√
H2-59	Field weakening automatic adjustment gain	10% ~ 500%	100%	√
H2-60	Field weakening integral multiple	2 ~ 10	2	√
H2-61	Motor 2 control mode	0: Sensorless vector control（SVC） 1: Reserved 2: V/f control	0	×
H2-62	Motor 2 acceleration/ Deceleration time	0: Same as motor 1 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4	0	√
H2-63	Motor 2 torque boost	0.0%: Automatic torque boost 0.1% ~ 30.0%	Model depend	√
H2-65	Motor 2 oscillation suppression gain	0 ~ 100	Model depend	√
H5 Group: Control Optimization Parameters				
H5-00	DPWM switchover frequency upper limit	0.00Hz ~ 15.00Hz	12.00Hz	√
H5-01	PWM modulation model	0: Asynchronous modulation 1: Synchronous modulation	0	√
H5-02	Dead zone compensation mode selection	0: No compensation 1: Compensation mode 1 2: Compensation mode 1	1	√
H5-03	Random PWM depth	0: Random PWM invalid 1~10: PWM carrier frequency random depth	0	√
H5-04	Rapid current limit	0: Disable 1: Enable	1	√

H5-05	Current detection compensation	0 ~ 100	5	√
H5-06	Undervoltage threshold setting	60.0% ~ 140.0%	100.0%	√
H5-07	SVC optimization mode selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	√
H5-08	Dead-zone time adjustment	100% ~ 200%	150%	√
H5-09	Overvoltage threshold setting	200.0V ~ 2500.0V	Model depend	×
H6 Group: AI Analog Input Curve Setting				
H6-00	AI curve 4 minimum input	-10.00V~H6-02	0.00V	√
H6-01	Corresponding setting of AI curve 4 minimum input	-100.0%~+100.0%	0.0%	√
H6-02	AI curve 4 inflexion 1 input	H6-00~H6-04	3.00V	√
H6-03	Corresponding setting of AI curve 4 inflexion 1 input	-100.0%~+100.0%	30.0%	√
H6-04	AI curve 4 inflexion 2 input	H6-02~H6-06	6.00V	√
H6-05	Corresponding setting of AI curve 4 inflexion 2 input	-100.0%~+100.0%	60.0%	√
H6-06	AI curve 4 maximum input	H6-06~+10.00V	10.00V	√
H6-07	Corresponding setting of AI curve 4 maximum input	-100.0%~+100.0%	100.0%	√
H6-08	AI curve 5 minimum input	-10.00V~H6-10	-10.00V	√
H6-09	Corresponding setting of AI curve 5 minimum input	-100.0%~+100.0%	-100.0%	√
H6-10	AI curve 5 inflexion 1 input	H6-08~H6-12	-3.00V	√
H6-11	Corresponding setting of AI curve 5 inflexion 1 input	-100.0%~+100.0%	-30.0%	√
H6-12	AI curve 5 inflexion 2 input	H6-10~H6-14	3.00V	√
H6-13	Corresponding setting of AI curve 5 inflexion 2 input	-100.0%~+100.0%	30.0%	√
H6-14	AI curve 5 maximum input	H6-12~+10.00V	10.00V	√
H6-15	Corresponding setting of AI curve 5 maximum input	-100.0%~+100.0%	100.0%	√
H6-24	Jump point setting of AI1	-100.0%~100.0%	0.0%	√
H6-25	Jump amplitude setting of AI1	0.0%~100.0%	0.5%	√
H6-26	Jump point setting of AI2	-100.0%~100.0%	0.0%	√
H6-27	Jump amplitude setting of AI2	0.0%~100.0%	0.5%	√
HC Group: Analog Input/output Correction				

HC-00	AI1 measured voltage 1	0.500V ~ 4.000V	factory calibrated	√
HC-01	AI1 displayed voltage 1	0.500V ~ 4.000V	factory calibrated	√
HC-02	AI1 measured voltage 2	6.000V ~ 9.999V	factory calibrated	√
HC-03	AI1 displayed voltage 2	6.000V ~ 9.999V	factory calibrated	√
HC-04	AI2 measured voltage 1	0.500V ~ 4.000V	factory calibrated	√
HC-05	AI2 displayed voltage 1	0.500V ~ 4.000V	factory calibrated	√
HC-06	AI2 measured voltage 2	6.000V ~ 9.999V	factory calibrated	√
HC-07	AI2 displayed voltage 2	6.000V ~ 9.999V	factory calibrated	√
HC-12	AO target voltage 1	0.500V ~ 4.000V	factory calibrated	√
HC-13	AO measured voltage 1	0.500V ~ 4.000V	factory calibrated	√
HC-14	AO target voltage 2	6.000V ~ 9.999V	factory calibrated	√
HC-15	AO measured voltage 2	6.000V ~ 9.999V	factory calibrated	√

5.2 Monitoring Parameters Table

Function Code	Parameter Name	Minimum Unit	Communication Address
U0 Group: Basic Monitoring Parameters			
U0-00	Running frequency（Hz）	0.01Hz	7000H
U0-01	Set frequency（Hz）	0.01Hz	7001H
U0-02	Bus voltage（V）	0.1V	7002H
U0-03	Output voltage（V）	1V	7003H
U0-04	Output current（A）	0.01A	7004H
U0-05	Output power（kW）	0.1kW	7005H
U0-06	Output torque（%）	0.1%	7006H
U0-07	DI terminal input state	1	7007H
U0-08	DO terminal output state	1	7008H
U0-09	AI1 voltage（V）	0.01V	7009H
U0-10	AI2 voltage（V）	0.01V	700AH
U0-11	Reserved		700BH
U0-12	Count value	1	700CH
U0-13	Length value	1	700DH
U0-14	Load speed display	1	700EH
U0-15	PID setting	1	700FH
U0-16	PID feedback	1	7010H
U0-17	PLC stage	1	7011H
U0-18	HDI Input pulse frequency（Hz）	0.01kHz	7012H
U0-19	Feedback speed（unit 0.01Hz）	0.01Hz	7013H
U0-20	Remaining running time	0.1Min	7014H
U0-21	AI1voltage before correction	0.001V	7015H
U0-22	AI2 voltage before correction	0.001V	7016H
U0-23	Reserved		7017H
U0-24	Linear speed	1m/Min	7018H
U0-25	Current power-on time	1Min	7019H
U0-26	Current running time	0.1Min	701AH
U0-27	HDI Pulse input frequency	1Hz	701BH
U0-28	Communication setting value	0.01%	701CH
U0-29	Reserved		701DH
U0-30	Main frequency A display	0.01Hz	701EH
U0-31	Main frequency B display	0.01Hz	701FH
U0-32	Viewing any register address value	1	7020H
U0-33	Synchronous motor rotor position	0.1°	7021H
U0-34	Motor temperature	1℃	7022H

U0-35	Target torque（%）	0.1%	7023H
U0-36	Resolver position	1	7024H
U0-37	Power factor angle	0.1°	7025H
U0-38	Reserved		7026H
U0-39	Target voltage upon V/F separation	1V	7027H
U0-40	Output voltage upon V/F separation	1V	7028H
U0-41	I terminal input state visual display	1	7029H
U0-42	DO terminal output state visual display	1	702AH
U0-43	DI terminal function state visual display 1（function 01-function 40）	1	702BH
U0-44	DI terminal function state visual display 2（function 41-function 80）	1	702CH
U0-45	Reserved		702DH
U0-58	Reserved		703AH
U0-59	Setting frequency（%）	0.01%	703BH
U0-60	Running frequency（%）	0.01%	703CH
U0-61	Inverter state	1	703DH
U0-62	Current fault code	1	703EH
U0-63	Reserved	-	
U0-64	Reserved	-	
U0-65	Torque upper limit	0.01%	7041H

Chapter 6 Faults and Solutions

6.1 Faults and Trouble Shooting

ES500 provides a lot of fault information and protective functions. After a fault occurs, the Inverter implements the protection function, and displays the fault code on the operation panel (if the operation keypad is available).

Before contacting company for technical support, you can first determine the fault type, analyze the causes, and perform troubleshooting according to the following tables. If the fault cannot be rectified, contact the agent or company.

E-22 is the Inverter hardware overcurrent or overvoltage signal. In most situations, the hardware overvoltage fault causes E-22.

Fault Name	Inverter unit protection
Display	E-01
Possible Causes	1, The output circuit is grounded or short circuited. 2, The connecting cable of the motor is too long. 3, The module overheats. 4, The internal connections become loose. 5, The main control board is faulty. 6, The inverter board is faulty.
Solutions	1, Eliminate external faults. 2, Install a reactor or an output filter. 3, Check the air filter and the cooling fan. 4, Connect all cables properly. 5, Contact the agent or company 6, Contact the agent or company
Fault Name	Overcurrent during acceleration
Display	E-02
Possible Causes	1, The output circuit is grounded or short circuited. 2, Motor auto-tuning is not performed. 3, The acceleration time is too short. 4, Manual torque boost or V/F curve is not appropriate. 5, The voltage is too low. 6, The startup operation is performed on the rotating motor. 7, A sudden load is added during acceleration. 8, The Inverter model is of too small power class.
Solutions	1, Eliminate external faults. 2, Perform the motor autotuning. 3, Increase the acceleration time. 4, Adjust the manual torque boost or V/F curve. 5, Adjust the voltage to normal range. 6, Select rotational speed tracking restart or start the motor after it stops. 7, Remove the added load.
Fault Name	Overcurrent during deceleration
Display	E-03

Possible Causes	1, The output circuit is grounded or short circuited. 2, Motor auto-tuning is not performed. 3, The deceleration time is too short. 4, The voltage is too low. 5, A sudden load is added during deceleration.
Solutions	1, Eliminate external faults. 2, Perform the motor autotuning. 3, Increase the deceleration time. 4, Adjust the voltage to normal range. 5, Remove the added load.
Fault Name	Overcurrent at constant speed
Display	E-04
Possible Causes	1, The output circuit is grounded or short circuited. 2, Motor auto-tuning is not performed. 3, The voltage is too low. 4, A sudden load is added during operation. 5, The Inverter model is of too small power class.
Solutions	1, Eliminate external faults. 2, Perform the motor autotuning. 3, Adjust the voltage to normal range. 4, Remove the added load. 5, Select an Inverter of higher power class
Fault Name	Overvoltage during acceleration
Display	E-05
Possible Causes	1, The input voltage is too high. 2, An external force inverters the motor during acceleration. 3, The acceleration time is too short. 4, The braking unit and braking resistor are not installed.
Solutions	1, Adjust the voltage to normal range. 2, Cancel the external force or install a braking resistor. 3, Increase the acceleration time. 4, Install the braking unit and braking resistor.
Fault Name	Overvoltage during deceleration
Display	E-06
Possible Causes	1, The input voltage is too high. 2, An external force inverters the motor during deceleration. 3, The deceleration time is too short. 4, The braking unit and braking resistor are not installed.
Solutions	1, Adjust the voltage to normal range. 2, Cancel the external force or install the braking resistor. 3, Increase the deceleration time. 4, Install the braking unit and braking resistor.

Fault Name	Overvoltage at constant speed
Display	E-07
Possible Causes	1, The input voltage is too high. 2, An external force inverters the motor during deceleration.
Solutions	1, Adjust the voltage to normal range. 2, Cancel the external force or install the braking resistor.
Fault Name	Control power supply fault
Display	E-08
Possible Causes	The input voltage is not within the allowable range.
Solutions	Adjust the input voltage to the allowable range.
Fault Name	Undervoltage
Display	E-09
Possible Causes	1, Instantaneous power failure occurs on the input power supply. 2, The Inverter's input voltage is not within the allowable range. 3, The bus voltage is abnormal. 4, The rectifier bridge and buffer resistor are faulty. 5, The inverter board is faulty.
Solutions	1, Reset the fault. 2, Adjust the voltage to normal range. 3, Contact the agent or company. 4, Contact the agent or company 5, Contact the agent or company6, Contact the agent or company
Fault Name	Inverter overload
Display	E-10
Possible Causes	1, The load is too heavy or lockedrotor occurs on the motor. 2, The Inverter model is of too small power class.
Solutions	1, Reduce the load and check the motor and mechanical condition. 2, Select an Inverter of higher power class.
Fault Name	Motor overload
Display	E-11
Possible Causes	1, F9-01 is set improperly. 2, The load is too heavy or lockedrotor occurs on the motor. 3, The Inverter model is of too small power class.
Solutions	1, Set correctly. 2, Reduce the load and check the motor and the mechanical condition. 3, Select an Inverter of higher power class.
Fault Name	Power input phase loss
Display	E-12

Possible Causes	1, The three-phase power input is abnormal. 2, The inverter board is faulty. 3, The lightening board is faulty. 4, The main control board is faulty.
Solutions	1, Eliminate external faults. 2, Contact the agent or company. 3, Contact the agent or company 4, Contact the agent or company
Fault Name	Power output phase loss
Display	E-13
Possible Causes	1, The cable connecting the Inverter and the motor isfaulty. 2, The Inverter's three-phase outputs are unbalanced when the motor is running. 3, The inverter board is faulty. 4, The module is faulty.
Solutions	1, Eliminate external faults. 2, Check whether the motor three-phase winding is normal. 3, Contact the agent or company. 4, Contact the agent or company
Fault Name	Module overheat
Display	E-14
Possible Causes	1, The ambient temperature is too high. 2, The air filter is blocked. 3, The fan is damaged. 4, The thermally sensitive resistor of the module is damaged. 5, The inverter module is damaged.
Solutions	1, Lower the ambient temperature. 2, Clean the air filter. 3, Replace the damaged fan. 4, Replace the damaged thermally sensitive resistor. 5, Replace the inverter module.
Fault Name	External equipment fault
Display	E-15
Possible Causes	1, External fault signal is input via S. 2, External fault signal is input via virtual I/O.
Solutions	1, Reset the operation. 2, Reset the operation.

Fault Name	Communication fault
Display	E-16
Possible Causes	1, The host computer is in abnormal state. 2, The communication cable is faulty. 3, P5-28 is set improperly. 4, The communication parameters in group FD are set improperly.

Solutions	1, Check the cabling of host computer. 2, Check the communication cabling. 3, Set P5-28 correctly. 4, Set the communication parameters properly.
Fault Name	Contactor fault
Display	E-17
Possible Causes	1, The inverter board and power supply are faulty. 2, The contactor is faulty.
Solutions	1, Replace the faulty inverter board or power supply board. 2, Replace the faulty contactor.
Fault Name	Current detection fault
Display	E-18
Possible Causes	1, The HALL device is faulty. 2, The inverter board is faulty.
Solutions	1, Replace the faulty HALL device. 2, Replace the faulty inverter board.
Fault Name	Motor auto-tuning fault
Display	E-19
Possible Causes	1, The motor parameters are not set according to the nameplate. 2, The motor auto-tuning times out.
Solutions	1, Set the motor parameters according to the nameplate properly. 2, Check the cable connecting the Inverter and the motor.
Fault Name	EEPROM readwrite fault
Display	E-21
Possible Causes	The EEPROM chip is damaged.
Solutions	Replace the main control board.
Fault Name	Inverter hardware fault
Display	E-22
Possible Causes	1, Overvoltage exists. 2, Overcurrent exists.
Solutions	1, Handle based on overvoltage. 2, Handle based on overcurrent.
Fault Name	Short circuit to ground
Display	E-23
Possible Causes	The motor is short circuited to the ground.
Solutions	Replace the cable or motor.
Fault Name	Accumulative running time reached
Display	E-26
Possible Causes	The accumulative running time reaches the setting value.
Solutions	Clear the record through the parameter initialization function.

Fault Name	User-defined fault 1
Display	E-27
Possible Causes	1, The user-defined fault 1 signal is input via S. 2, User-defined fault 1 signal is input via virtual I/O.
Solutions	1, Reset the operation. 2, Reset the operation.
Fault Name	User-defined fault 2
Display	E-28
Possible Causes	1, The user-defined fault 2 signal is input via S 2, The user-defined fault 2 signal is input via virtual I/O.
Solutions	1, Reset the operation. 2, Reset the operation.
Fault Name	Accumulative power-on time reached
Display	E-29
Possible auses	The accumulative power-on time reaches the setting value.
Solutions	The accumulative power-on time reaches the setting value.
Fault Name	Load becoming 0
Display	E-30
Possible auses	The Inverter running current is lower than P9-64.
Solutions	Check that the load is disconnected or the setting of P9-64 and P9-65 is correct.
Fault Name	PID feedback lost during running
Display	E-31
Possible auses	The PID feedback is lower than the setting of PA-26.
Solutions	Check the PID feedback signal or set PA-26 to a
Fault Name	Pulse-by-pulse current limit fault
Display	E-40
Possible auses	1, The load is too heavy or lockedrotor occurs on the motor. 2, The Inverter model is of too small power class.
Solutions	1, Reduce the load and check the motor and mechanical condition. 2, Select an Inverter of higher power class.
Fault Name	Motor switchover fault during running
Display	E-41
Possible auses	Change the selection of the motor via terminal during running of the Inverter.
Solutions	Perform motor switchover after the Inverter stops.
Fault Name	Too large speed deviation
Display	E-42
Possible Causes	1, The encoder parameters are set incorrectly. 2, The motor auto-tuning is not performed. 3, P9-69 and P9-70 are set incorrectly.

Solutions	1, Set the encoder parameters properly. 2, Perform the motor autotuning. 3, Set P9-69 and P9-70 correctly based on the actual situation.
Fault Name	Motor over-speed
Display	E-43
Possible Causes	1, The encoder parameters are set incorrectly. 2, The motor auto-tuning is not performed.3: P9-69 and P9-70 are set incorrectly.
Solutions	1, Set the encoder parameters properly. 2, Perform the motor autotuning. 3, Set P9-69 and P9-70 correctly based on the actual situation.
Fault Name	Motor overheat
Display	E-45
Possible Causes	1, The cabling of the temperature sensor becomes loose. 2, The motor temperature is too high.
Solutions	1, Check the temperature sensor cabling and eliminate the cabling fault. 2, Lower the carrier frequency or adopt other heat radiation measures.
Fault Name	Initial position fault
Display	E-51
Possible auses	The motor parameters are not set based on the actual situation.
Solutions	Check that the motor parameters are set correctly and whether the setting of rated current is too small.

6.2 Common Faults and Solutions

You may come across the following faults during the use of the Inverter. Refer to the following table for simple fault analysis.

SN	Fault	Possible Causes	Solutions
1	There is no display at power-on.	1: There is no power supply to the Inverter or the power input to the Inverter is too low. 2: The power supply of the switch on the inverter board of the AC inverter is faulty. 3: The rectifier bridge is damaged. 4: The control board or the operation panel is faulty. 5: The cable connecting the control board and the inverter board and the operation panel breaks.	1:Check the power supply. 2:Check the bus voltage. 3:Re-connect the 8-core and 28-core cables. 4:Contact the agent or company for technical support.
2	“HC” is displayed at power-on.	1: The cable between the inverter board and the control board is in poor contact. 2: Related components on the control board are damaged. 3: The motor or the motor cable is short circuited to the ground. 4: The HALL device is faulty. 5: The power input to the Inverter is too low.	1:Re-connect the 8-core and 28-core cables. 2:Contact the agent or company for technical support.

3	"E-23" is displayed at power-on.	1: The motor or the motor output cable is short-circuited to the ground. 2: The Inverter is damaged.	1:Measure the insulation of the motor and the output cable with a megger. 2:Contact the agent or company for technical support.
4	The Inverter display is normal upon power-on. But "HC" is displayed after running and ops immediately.	1:The cooling fan is damaged or locked-rotor occurs. 2: The external control terminal cable is short circuited.	1:Replace the damaged fan. 2:Eliminate external fault.
5	E-14 (module overheat) fault is reported frequently.	1: The setting of carrier frequency is too high. 2: The cooling fan is damaged, or the air filter is blocked. 3: Components inside the Inverter are damaged (thermal coupler or others).	1:Reduce the carrier Frequency (P5-15). 2:Replace the fan and clean The air filter. 3:Contact the agent or company for technical support.
6	The motor does not rotate after the Inverter runs.	1: Check the motor and the motor cables. 2: The Inverter parameters are set improperly (motor parameters). 3: The cable between the inverter board and the control board is in poor contact. 4: The inverter board is faulty.	1:Ensure the cable between the Inverter and the motor is normal. 2:Replace the motor or clear mechanical faults. 3:Check and re-set motor parameters.
7	The DI terminals are disabled.	1: The parameters are set incorrectly. 2: The external signal is incorrect. 3: The jumper bar across OP and +24V becomes loose. 4: The control board is faulty.	1:Check and reset the parameters in group H4. 2:Re-connect the external signal cables. 3:Re-confirm the jumper bar across OP and +24 V. 4:Contact the agent or company for technical support.
8	The Inverter reports overcurrent and overvoltage frequently.	1: The motor parameters are set improperly. 2:The acceleration/deceleration time is improper. 3: The load fluctuates.	1:Re-set motor parameters or re-perform the motor autotuning. 2:Set proper acceleration/deceleration time. 3:Contact the agent or company for technical support.
9	E-17 is reported upon power-on or running.	The soft startup contactor is Not picked up.	1:Check whether the contactor cable is loose. 2:Check whether the contactor is faulty. 3:Check whether 24V power supply of the contactor is faulty. 4:Contact the agent or company for technical support.
11	 Is displayed upon power-on.	Related component on the control board is damaged.	Replace the control board.

Appendix A Modbus Communication Protocol

ES500 series inverter provides RS485 communication interface, and support Modbus-RTU communication protocol. The user could centralize control through PC or PLC. This communication protocol could set inverter operation command, change and read function code parameter, and read inverter working state and fault information.

1. Protocol Content

The serial communication protocol definites the deliver content of series communication and use format, Including: host machine poll (broadcast) format; the coding method of host machine. The content is as follows: request of operative function code, deliver data and error verify etc. If the slave report error when it receive information, or couldn't finish the request of operative function, it will organize an error report to feedback to host machine.

1.1 Method

The inverter connects "MCU" PC/PLC control net with RS485, as communication slave machine.

2.2 Bus structure

a) Method of interface

RS485 hardware interface

b) Topological structure

Single host and sevel slave system. The setting range of slave address is 1~247, 0 is broadcast communication address. The net slave address is only.

c) Communication deliver method.

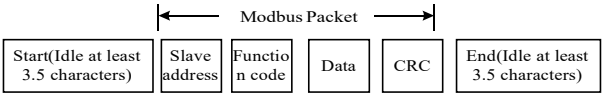
Asynchronization serial, half duplex transmission. The host and slave just send the data by only one, the other one accept the data at the same time. The data in serial asynchronization communication is sent one by one in message.

ES500 series inverter communication protocol is an asynchronization serial host-slave Modbus one, and the only one equipment could build protocol in the net. The slaves just response or make some action the host query command through providing data.

Host means PC, industry control equipment or PLC etc; the slave means ES500 series inverter. Host could communicate with one slave, and also communicate with all the slave. For visiting the host "query/command", the slave need response. But for the broadcast from the host, the slave not need to response.

2. Protocol Form

2.1 ES500 series MODBUS protocol form as follows:



2.2 RTU frame format

FH START	3.5 characters time
Slave address ADR	Communication address:1~247， the address is 0 which is representative broadcast address
Command code CMD	03:read slave parameter;06:write slave parameter
Digit content DATA（N-1）	Function code parameter address, quantity of function code parameter and value
Digit content DATA（N-2）	
……	
Digit content DATA0	
CRC CHK high-order	Test value: CRC value
CRC CHK low-order	

END	3.5 characters time

CMD and DATA

a) Command code:03H, read N words (Word) (maximum reading quantity is 12).

b) Command code:06H read one word (Word), for example: read 5000 (1388H) to slave address 02H, the F00AH address of inverter.

c) CRC methods:

CRC (Cyclical Redundancy Check) use RTU frame format, the message include error detection region based on CRC. CRC region detects the whole message content. CRC region is two bytes, including CRC a 16-bit binary values. It is calculated by the deliver equipment and added to message. The receiving equipment recalculate the receiving CRC, and compare with the value in CRC regain. If the two CRC is different, which means the deliver is wrong.

CRC is stored in 0xFFFF first, and then transfer and settle continuous 8 bytes and value in current register. Just 8bit in each character is valid for CRC, start bit and stop bit and parity check bit is all invalid.

In the CRC producing process, each 8 bit character need to be different with the content of register. The result move to LSB, and the MSD is filled by 0. If the tested LSB is 1, register is different with the preset value. The whole process need repeat 8 times.

CRC is add to message, and low byte first and the high byte, CRC simple function is as follows;

```
unsigned int crc_chk_value(unsigned char *data_value,unsigned char length)
{
unsigned int crc_value=0xFFFF;
int i;
while(length--)
{
crc_value^=*data_value++;
for(i=0;i<8;i++)
{
if(crc_value&0x0001)
{
crc_value=(crc_value>>1)^0xa001;
}
else
{
crc_value=crc_value>>1;
}
}
}
return(crc_value);
}
```

d) Definition of communication protocol address Use function code group no. and mark no. to show rules:

High byte: F0~FF (group), A0~AF (C group), 70~7F (d group)

Low byte: 00~FF

For example: function code is H1.12, address is 0xF10C;

Note:

FF group: could not read and change parameters;

d group: could just read, but not change parameter.

Some parameter couldn't be changed when the inverter is running; some other parameter never be changed in any state; if we want to change the function code parameter, please note the range, unit and description of the parameter.

Function code group	Communication visit address	Communication modify the function code address of RAM
H0~HE Group	0xF000~0xFEFF	0x0000~0xEFF
C0~CC Group	0xA000~0xACFF	0x4000~0x4CFF
d0 Group	0x7000~0x70FF	

In addition, the life of the EE PROM will be shortened if EE PROM is frequently stored. So the users should reduce the times of storing EE PROM. And some parameter under communication mode is no need to store, and just need to change the value in RAM.

If the H group parameter, and need to realize above function, just change the function code high bit H to 0.

If the C group parameter, and need to realize above function, just change the function code high bit C to 4.

The corresponding function code address is as follows;

High byte: 00~0F（H group）, 40~4F（C group）

Low byte: 00~FF

Such as: function code H1.12 won't be stored to EEPROM，address is 0x010C;

Function code C0.06 won't be stored to EEPROM，address is 0x4006;

The address is just written RAM，not to reas.

Halt/operation parameter:

Parameter Address	Parameter Description
0x 1000	Communication setting value（-10000~10000）（decimal system）
0x 1001	Operation frequency
0x 1002	Bus voltage
0x 1003	Output voltage
0x 1004	Output current
0x 1005	Output power
0x 1006	Output torque
0x 1007	Operation speed
0x 1008	DI terminal input mark
0x 1009	DO terminal output mark
0x 100A	AI1 voltage
0x 100B	AI2 voltage
0x 100C	AI3 voltage
0x 100D	Count value input
0x 100E	Length input
0x 100F	Load speed
0x 1010	PID setting
0x 1011	PID feedback
0x 1012	PLC step
0x 1013	HDI input pulse frequency, unit 0.01kHz
0x 1014	Feedback speed, unit 0.1Hz

0x 1015	Residue operation time
0x 1016	AI1 voltage before revising
0x 1017	AI2 voltage before revising
0x 1018	AI3 voltage before revising
0x 1019	Linear speed
0x 101A	Current power on time
0x 101B	Current running time
0x 101C	HDI input pulse frequency, unit 1Hz
0x 101D	Communication setting value
0x 101E	Practical feedback speed
0x 101F	Main frequency A display
0x 1020	Auxiliary frequency B display

Note: communication setting value is relative vale percentage, 10000 is corresponding 100.00%, -10000 is corresponding -100.00%.

For the frequency dimensional data, the percent is corresponding to the max frequency (P5-10); for the torque dimensional data, the percent is P2-10,H2-48.

Control command input to inverter (just write)

Command Word Address	Command Function
0x 2000	0001: foreward running
	0002: reveral running
	0003: foreword jog
	0004: reveral jog
	0005: halt freely
	0006: slowing down halt
	0007: fault reset

Read inverter state: (read only)

Status word address	Status word function
0x 3000	0001: foreward running
	0002: reveral running
	0003: halt

Parameter lock password verify:(if back to 8888H，means password verify successfully)

Password address	Input password content
0x 1F00	*****
0x 2001	BIT0:SP2 output control BIT1:TA3-TB3-TC3 relay 3 output control BIT2:TA1-TB1-TC1 relay 1 output control BIT3:TA2-TB2-TC2 relay 2 output control BIT4:SP1 output control BIT5:XDO1;BIT6:XDO2 BIT7:XDO3;BIT8:XDO4 BIT9:XDO5

Analog output A01 control:(write only)

Command address	Command content
0x 2002	0~7FFF means 0%~100%

Analog output A02 control:(write only)

Command address	Command content
0x 2003	0~7FFF means 0%~100%

Pulse (HDI) output control:(write only)

Command address	Command content
0x 2004	0~7FFF means 0%~100%

Inverter fault description:

Inverter fault address	Inverter fault information
0x 8000	0000:no fault 0001:retain 0002:Over-current during acceleration 0003:Over-current during deceleration 0004:Over-current in constant speed operation 0005:Over-voltage during acceleration 0006:Over-voltage during deceleration 0007:Over-voltage in constant speed 0008:buffer resistance over-load fault 0009:underload fault 000A:inverter overload 000B:motor overload 000C:input phase loss 000D:outputphase loss 000E:module over-heat 000F:external fault 0010:communication abnormal 0011:contactor abnormal 0012:current detecting fault 0013:motor tune fault 0014:encoder/PG card fault 0015:parameter read and write abnormal 0016:inverter hardware fault 0017:motor short trouble to ground 0018:retain 0019:retain 001A:reach operation time 001B:User defined fault 1 001C:User defined fault 2 001D:reach power on time 001E:lose load 001F:PID feedback lose in running 0028:rapid current-limiting overtime fault 0029:switch motor fault in running 002A:speed variation larger 002B:motor over-speed 002D:motor over-heat 005A:encoder wiring setting error 005B:unconnect encoder 005C:initial position error 005E:speed feedback error

HD Group Communication Parameter Description

Pd-00	Baud rate	Default	6005
	Setting range	Unit: MODUBS baud rate 0:300BPS 1:600BPS 2:1200BPS 3:2400BPS 4:4800BPS 5:9600BPS 6:19200BPS 7:38400BPS 8:57600BPS	

This parameter is used to set the data deliver speed between upper machine and inverter.

Note: the baul rate of upper machine is same with inverter, otherwise the communication couldn't continue. The baud rate is larger, the speed of communication is higher.

Pd-01	Data format	Default	0
	Setting range	0:No verify:Data format<8,N,2> 1:even verify:Data format<8,E,1> 2:odd verify:Data format<8,O,1> 3:No verify:Data format<8-N-1>	

The upper machine is same with the inverter's setting format, otherwise the communication couldn't continue.

Pd-02	Machine address	Default	1
	Setting range	1~247，0 is broadcast address	

The machine address set to 0, and broadcast address, realize upper machine broadcast function.

Pd-03	Response delay	Default	2ms
	Setting range	0~20ms	

Response delay: it means the time between the finish time of inverter data receiving and upper mamchine send data time. If the response time is less than system handle time, the response delay time is according to system handle time, if the response delay is longer than system handle time, wait the system handle the data,till get the response delay, and send the data to upper machine.

Pd-04	Communication overtime	Default	0.0 s
	Setting range	0.0 s（invalid）;0.1~60.0s	

When the function code is set to 0.0s, the communication overtime parameter is invalid.

When the function code is valid value, the time between two communication time is over communication overtime, the system will report E-16. Generally it is set to invalid.

Set Sub parameter to watch the communication state in the continue communication system.

Guarantee Agreement

Warranty of the company products executes in accordance with "the quality assurance" in instructions.

1. Warranty period is 12 months from the date of purchasing the product

2. Even within 12 months, maintenance will also be charged in the following situations:

2.1. Incorrect operation (according to the manual) or the problems are caused by unauthorized repair or transformation.

2.2. The problems are caused by exceeding the requirements of standards specifications to use the inverter.

2.3 After purchase, loss is caused by falling damage or improper transportation.

2.4 The devices' aging or failure is caused by bad environment (corrosive gas or liquid).

2.5 Earthquake, fire wind disaster, lightning, abnormal voltage or other accompanied natural disasters cause the damage.

2.6 Damage is caused during transport (note: the mode of transportation is determined by customers, the company helps to handle the transferring procedures of goods).

2.7 Unauthorized tearing up the product identification (e.g.: Nameplate, etc.); the serial number does not match the warranty card.

2.8 Failing to pay the money according purchase agreement.

2.9 Cannot objective actually describe the installation, wiring, operation, maintenance or other using situation to the company's service units.

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