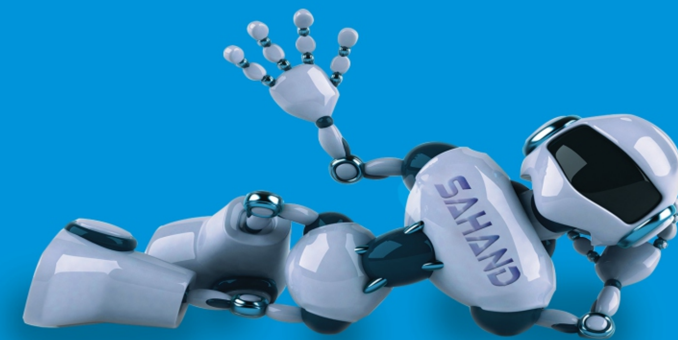
Professional AC Drive Manufacturer

SAHAND 300

AC Drives

خیالتان راحت

حفاظت و کنترل موتورهای خود را به ما بسپارید



ZAGROS
AUTOMATION SANABAD

www.Zagroscontrol.com SAHAND_ACDRIVES

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1.Introduction

Thank you for using the SAHAND300 series high-performance current vector control AC drive developed by ZAGROS AUTOMATION SANABAD Technology Co.,Ltd.

SAHAND300 series AC drive is a high-performance & low noise general-purpose AC drive, manufactured using high-quality components and incorporating the latest micro-processor technology available. It realizes high torque, high precision speed control drive, and supports speed sensorless torque control and PG torque control, which can meet various requirements of general AC drive. SAHAND300 series AC drive is a product that combines the general needs of customers with the industrial needs. It provides customers with practical functions such as main and auxiliary frequency setting, operation channel frequency binding, PID regulator, simple PLC, textile swing frequency, programmable input and output terminal control, pulse frequency setting and built-in Modbus, 485 free protocol, etc. For manufacturing and auto-mation engineering customers to provide high integration of integrated solutions.

This manual describes the matters relevant to the installation, parameters setting, abnormality diagnosis and solution, and the daily maintenance of the AC drive that need attention of the users. In order to ensure the correct installation and operation of the motor drive, give full play to its superior performance, please carefully read this manual before the installation, properly keep it and give it to the machine users.

Contact our agents or customer service center if you have problems during the use. We will serve you wholeheartedly.

The instructions are subject to change, without notice, due to the upgrade of our products.

1.1 Safety Precautions

In order to ensure your personal and equipment safety, please read this manual carefully before using the AC drive.

Warning signs and meanings

The following marks are used in this manual to indicate that it is an important part of safety. Failure to observe these precautions may result in personal injury or death, damage to the product and associated systems.

Danger!	Indicates that failure to comply with the notice will result in death, severe personal injury or serious property damage.
Warning!	Indicates that failure to comply with the notice will result in personal injury or damage to the product and associated systems.
Notice!	Tips for special attention when using this product.

Operational qualification

AC drive is a precise electric and electronic product, thus for the safety of the operators and the equipment, please ensure that the installation and parameters adjustment is done by professional motor Engineers.

Safety guidance

Safety rules and warning signs are proposed for the personal safety of operators, and measures are taken to prevent operators from personal injury and damage to the product and associated systems. Please read this manual carefully before use, and operate in strict accordance with the safety rules and warning signs in the manual.

Danger!

1. The power supply must be turned off when laying the wires.
2. When the AC power supply is cut off but the indicator light of the manipulator of AC drive is still on, there is still high voltage in the AC drive which is very dangerous, please do not touch the interior circuit and components.
3. Do not modify the interior components or circuit of AC drive by yourselves.
4. Never connect the main circuit output terminals U, V, and W directly to the AC main circuit power supply as this will damage the drive.
5. The terminal of AC drive must be grounded correctly.6. This series of AC drives can't be used for the occasions related to personal safety, e.g. the life maintaining equipment.

Warning!

1. Please do not test the voltage resistance of the interior components of the drive, as the semiconductor of the drive is easy to be punctured and damaged by high voltage.
2. The circuit board of the drive has CMOS IC which is extremely easy to be damaged by static electricity, thus please do not touch the circuit board with your hand before taking anti-static electricity measures.
3. Even if the motor is inactive, the main loop terminal of the drive may still have dangerous high voltage.
4. Only the qualified motor professionals can install the drive, lay the wire, repair and maintain the drive.

Notice!

1. When certain functions of the drive are set, the motor may immediately start after the power input.
2. Please choose a safe place to install the AC drive to avoid the high temperature, direct sunlight, humidity and splash of water drops.
3. Please prevent the children or irrelevant people against being close to the AC drive.
4. The AC drive can only be used in the places recognized by our company, and the usage in an environment not recognized by our company may lead to fire, gas explosion or electrification.
5. When the wire between the AC drive and the motor is too long, the interlayer insulation of the motor may be damaged, please use the special AC motor for AC drive, or add a reactor between the drive and the motor to prevent the AC motor from being burned due to the damage of insulation.

1.2. Technical Specifications

Item		Specifications	
Standard functions	Maximum frequency	• Vector control: 0 - 3000 Hz • V/F control: 0 - 3200 Hz	
	Carrier frequency	1 - 15 kHz The carrier frequency is automatically adjusted based on the load features.	
	Input frequency resolution	Digital setting: 0.01 Hz Analog setting: maximum frequency x 0.025%	
	Control mode	• Sensorless flux vector control (SFVC) • Closed-loop vector control (CLVC) • Voltage/Frequency (V/F) control	
	Startup torque	• G type: 1 Hz/180% (SFVC); 0 Hz/200% (CLVC) • P type: 1 Hz/150%	
	Speed range	1:100(SVC)	1:1000(FVC)
	Speed stability accuracy	±0.5%(SVC)	±0.02%(FVC)
	Torque control accuracy	±5% (FVC)	
	Overload capacity	• G type: 60s for 150% of the rated current, 3s for 180% ofthe rated current • P type: 60s for 120% of the rated current, 3s for 150% ofthe rated current	
	Torque boost	Customized boost 0.1% - 30.0%	
	V/F curve	• Straight-line V/F curve • Multi-point V/F curve • N-power V/F curve (1.2-power, 1.4-power, 1.6-power, 1.8-power, square)	
	V/F separation	Two types: complete separation; half separation	
	Ramp mode	• Straight-line ramp • S-curve ramp Four groups of acceleration/deceleration time with the range of 0.0 - 6500.0s	
	DC braking	DC braking frequency: 0.00 Hz to maximum frequency Braking time: 0.0 - 600.0s Braking action current value: 0.0% - 150.0%	
	JOG control	JOG frequency range: 0.00 - 50.00 Hz JOG acceleration/deceleration time: 0.0 - 6500.0s	
	Onboard multiple preset speeds	It implements up to 16 speeds via the simple PLC function or combination of DI terminal states.	
	Onboard PID	It realizes process-controlled closed loop control system easily.	
	Auto voltage regulation (AVR)	It can keep constant output voltage automatically when the mains voltage changes.	
	Overvoltage/ Overcurrent stall control	The current and voltage are limited automatically duringthe running process so as to avoid frequent tripping due to overvoltage/overcurrent.	
	High-speed current limiting function	Minimize over-current fault and protect normal operation of AC drive.	

Item		Specifications
	Torque limit and control	It can limit the torque automatically and prevent frequent over current tripping during the running process. Torque control can be implemented in the CLVC mode.
Individualized functions	High performance	Control of asynchronous motor and synchronous motor are implemented through the high-performance current vector control technology.
	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.
	Rapid current limit	It helps to avoid frequent overcurrent faults of the AC drive.
	Timing control	Time range: 0.0 - 6500.0 minutes
	Multiple communication protocols	It supports communication via Modbus-RTU.
	Motor overheat protection	The optional I/O extension card enables AI4 to receive the motor temperature sensor input (PT100, PT1000) so as to realize motor overheat protection.
	Multiple encoder types	It supports various encoders such as differential encoder, open-collector encoder, resolver, UVW encoder, and SIN/COS encoder.
	Advanced background software	It supports the operation of AC drive parameters and virtual oscillograph function, via which the state inside the AC drive is monitored.
RUN	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: 8 digital input (DI) terminals, one of which supports up to 50kHz high-speed pulse input 3 analog input (AI) terminals, two of which only supports 0 - 10 V voltage input and the other supports 0 - 10 V voltage input or 0 - 20 mA current input
	Output terminal	Standard 1 high-speed pulse output terminal (open-collector) that supports 0 - 50 kHz square wave signal output 2 digital output (DO) terminal 2 relay output terminal 2 analog output (AO) terminal that supports 0 - 20 mA current output or 0 - 10 V voltage output
	LCD display	Optional, English prompt operation content

	Item	Specifications
Display and operation on the operation panel	LCD display	Optional, English prompt operation content
	Parameters copy	Quick copying of parameters can be realized through LCD operation panel option.
	Key locking and function selection	It can lock the keys partially or completely and define the function range of some keys so as to prevent misfunction.
Protection mode	Protection mode	Motor short-circuit detection at power-on, input/output phase loss protection, overcurrent protection, overvoltage protection, undervoltage protection, overheat protection and overload protection
Environment	Installation location	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapour, drip or salt.
	Altitude	Lower than 1000m
	Ambient temperature	-10° C to +40° C (de-rated if the ambient temperature is between 40° C and 50° C)
	Humidity	Less than 95%RH, without condensing
	Vibration	Less than 5.9m/s (0.6g)
	Storage temperature	-20℃ ～+60℃
	IP level	IP20
	Pollution degree	PD2

2.Read below information before use

2.1 Delivery Inspection

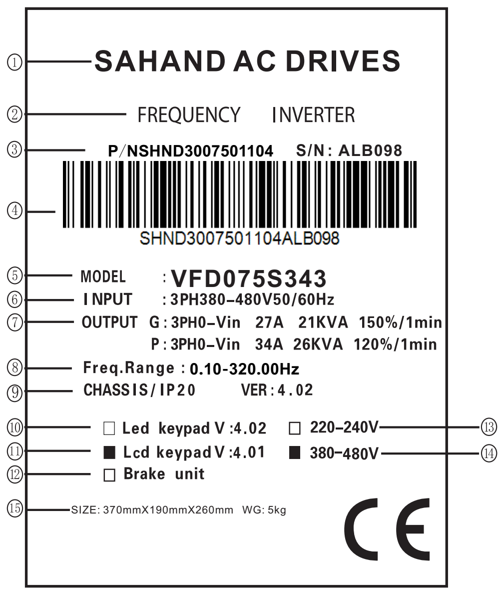
Every SAHAND300 AC drive has pass by strict quality management before delivery, and been packed to enhance its collision resistance. The customer should immediately inspect the following inspection steps after unpacking the AC drive.

◆ Check whether the AC drive is damaged during the transportation.

◆ Check whether the type and model of the AC drive are consistent with the information on the package.

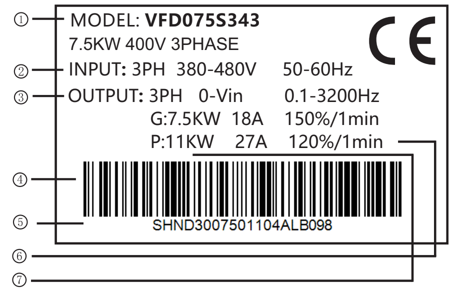
For any inconsistency between the received product and your order, or any problem of the product, please contact with our agents or distributors that sold you the product.

Description of the label of package



① Trademark of product
② Name of product
③ Serial number of production control
④ Barcode
⑤ AC drive Model
⑥ Input power Spec.
⑦ Output power Spec.
⑧ Output frequency Range
⑨ Protection grade version of mainboard
⑩ LED manipulator
⑪ LCD manipulator
⑫ Interior brake unit
⑬ Specification of 220V voltage
⑭ Specification of 380V voltage
⑮ Dimensions of exterior package, total weight

Description of the label of AC drive



① AC drive Model
② Input power Spec.
③ Output power Spec.
④ Barcode
⑤ Serial number of production control
⑥ Power card versions
⑦ Structure version

Description of Model

VFD 075 S3 43

- 43 → Voltage : 21 represents three-phase 220V
  43 represents three-phase 400V
- S3 → Serial number: SAHAND300
- 075 → Capacity specification of AC drive
  007: 1 HP(0.7kW)
  015: 2 HP(1.5kW)
  022: 3 HP(2.2kW)
  037: 5 HP(3.7kW)
  055: 7.5 HP(5.5kW)
  075: 10 HP(7.5kW)
  110: 15 HP(11kW)
  150: 20 HP(15kW)
  185: 25 HP(18.5kW)
  220: 30 HP(22kW)
  300: 40 HP(30kW)
  370: 50 HP(37kW)
- VFD → "Variable Frequency Drive".

2.2 Transport

This product is a precise device, please handle it with care during the transport, prevent it from severe collision.

2.3 Storage

This product must be in the packing box before installation. If it won't be used for a period, in order to keep it within the warranty of our company and for the future maintenance, the following matters must be paid attention to for the storage:

√The product must be put in a dust-free and dry place.
√The temperature of the storage place must be -20℃～+60℃.
√The relative humidity of the storage place must be 0%～95% without frost.
√Avoid putting the product in an environment with corrosive gas or liquid.
√It is better to put the product on a shelf or stand with a proper package.

Notice!

1. Even if the humidity meets the requirements of the criterion, if the temperature changes quickly, moisture condensation or icing may also happen, thus the product should not be stored in such place.
2. Do not put the product directly on the ground, but on a proper stand. If the surrounding environment is very bad, desiccant should be put in the packing bag.
3. When the storage period is longer than 3 months, the surrounding temperature should not exceed 30℃ , because the electrolytic condenser is stored with power off, and it will easily degrade if the temperature is high.
4. When the AC drive is installed in the installation or control panel but isn't used, especially in the construction sites or the wet places with lots of dust, the AC drive should be removed and put in a proper environment satisfying the storage requirements mentioned above.
5. The electrolytic condenser is easy to degrade with power off for a long term. Please do not store the electrolytic condenser with power off for more than one year.

2.4 Considerations for choices of AC drives

1.Use large capacity above 600 kva electric current transformer and capacitor into phase, voltage input side surge current is too large, that could undermine the input side of AC drives. At the moment the input side must be installed an AC reactor, in addition to reduce the current, and improve the effect of the input power.

2.To actuate the special AC drive or one AC drive actuate several motors, the total rated current of the motor 1.25 times can't exceed the rated current of the AC drive. It is very careful to choose the AC drive.

3.When the AC drive actuate the motor, the startup, the accelerate and decelerate are limited by the rated current of the AC drive. The starting torque is small(commercial power directly start 6 times when start current, when the AC drive starting, the starting current can't exceed two times), so when the AC drive use for high torque place(For example Elevator, Blender, Machine tool ect), the AC drive must increase one or two grade. The optimal way is increasing one grade of the motor and the AC drive at the same time.

4.To consider that when the AC drive break down and stop the output, the stop mode for the motor and the mechanical equipment, if they need sudden stop that must install the mechanical brake.

2.5 Note for parameter setting

1.Because of the highest speed for the digital operation can reach to 400Hz, so when it use in the highest speed place, it can use the speed limit function limit the output frequency.

2.When the DC braking voltage and the braking time setting too highly, that may cause the motor overheating.

3.The time for the motor accelerate and decelerate is decided by the motor rated torque、 load torque、 load inertia ect.

4.When the antistall (STALL) act in the accelerate and decelerate, please extend the accelerate and decelerate time. If the accelerate and decelerate must be very fast, and also the inertia load is very big, the AC drive can't speed up or stop the motor in requirement time, that must install the braking resistance(only can shorten the deceleration time) or increase the grade of the motor and the AC drive at the same time.

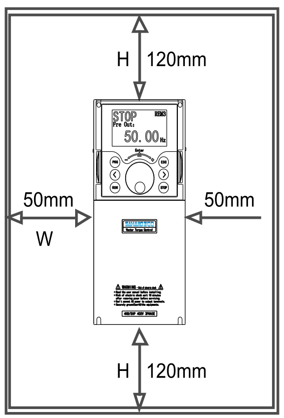
3.Mechanical and Electrical Installation

3.1 Installation Environment

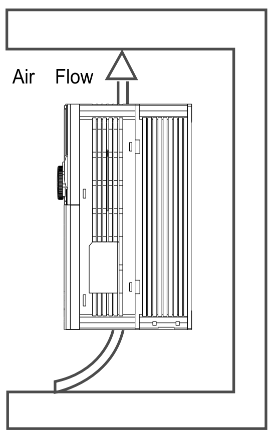
Please install the AC drive in the following environment to guarantee the usage safety of the product:

Operating Environment	Ambient temperature	-10～+50° C (14～122° F) for UL & CUL without anti-dust cover
	Relative humidity	<90%, without frost
	Pressure	86～106 kPa
	Installation height	<1000m
	Vibration	<20Hz: 9.80 m/s(1G) max 20～50H:5.88 m/(0.6G) max.
Storage and Transport Environment	Ambient temperature	-20～+60° C (-4～140° F)
	Relative humidity	<90%, without frost
	Pressure	86～106 kPa
	Vibration	<20Hz: 9.80 m/s(1G) max 20～50H:5.88 m/(0.6G) max.
Degree of Pollution	Class 2: suitable for factory environment	

3.2 Conditions for Installation



(a)



(b)

■ The AC drive shall be installed vertically with screws, and shall not be installed upside down, obliquely or horizontally on a firm structure.

■When the AC drive is running, it will generate heat. To ensure that the cooling air path is as shown in figure (b). There is a certain space in the design, and the heat generated will be emitted upward; therefore, do not install it under the heat-resistant equipment.

■When the AC drive is running, the temperature of the heat sink will rise to nearly 90 ℃. There for, the mounting surface on the back of the AC drive must be made of materials that can withstand higher temperature.

■When the AC drive is installed in the control panel, ventilation and heat dissipation shall be considered to ensure that the ambient temperature of the AC drive does not exceed the specification value. Do not install the AC drive in the airtight box with poor ventilation and heat dissipation.

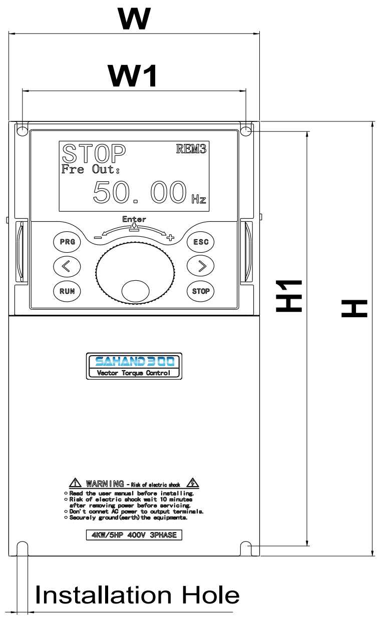
■When installing multiple AC drives in the same control panel, it is recommended to install them horizontally side by side in order to reduce the thermal impact on each other. If it has to be installed up and down, the partition board must be set to reduce the impact of heat generated at the lower part on the upper part.

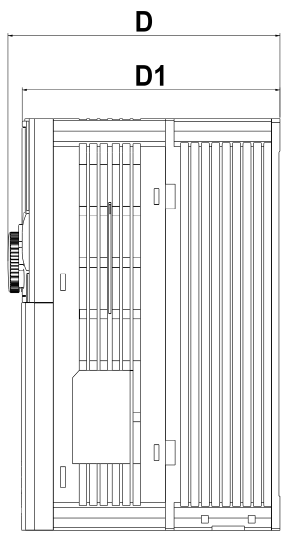
Notice!

1、Do not let all kinds of fibers, paper, wood chips (chips) or metal fragments and other foreign matters enter the AC drive or adhere to the cooling fan.
2、Installed on structures that will not burn, such as metal, or fire accidents may occur.

3.3 Installation dimension of AC drive

A Structure





380V Class

Structure	Power (Kw)	W (mm)	W1	H	H1	D	D1	Installation Hole
A Structure	0.75Kw 1.5Kw	105	93.5	16	15.2	136.5	128.5	Φ4.5
	2.2Kw 4.0Kw	105	93.5	216	206	156.7	148.8	Φ4.5
	5.5Kw 7.5Kw	126	110	260	246	183	173.3	Φ6
	11Kw 15Kw	153	137	341	327	203.3	193.6	Φ7
	18.5Kw 22Kw	180	120	422.2	419.7	203.6	194	Φ9
	30Kw 37Kw	191	120	471	450	241.4	231.6	Φ9

3.4 Instruction for Wire Layout

After removing the upper cover, the connection terminal strips are exposed, check whether the terminals of main loops and control loops are marked explicitly and pay attention to the following instructions during connection, do not make improper connections.

3.5 Basic Wire Layout

■ The power supply must be connected with the terminals of the main loops of AC drive R/L1, S/L2, T/L3. If the power supply is improperly connected with other terminals, the AC drive will be damaged. Besides, check whether the voltage/current of the power supply is within the allowable range indicated on the nameplate.

■The grounding terminals must be grounded well, on the one hand it can prevent electric shock or fire, and on the other hand it can reduce the noise interference.

■ Connect the terminals with wires, ensure the high reliability of the connection.

■After finishing the wire layout, check the following things:

1. Are all the connections correct?
2. Is there any connection left out?
3. Is there any short circuit or line-to-ground short circuit between the terminals and the connecting wires?

When the power is on, if the connections need to be changed, first the power supply should be turned off, and the filter capacitor of the DC part of the loop will need some time to discharge electricity. The work only can begin after the completion of electricity discharge. Besides, because of the residual voltage, sparks may be generated when there is a short circuit, thus it' s better to conduct the work under voltage-free conditions.

Notice!

1. Grounding wire must be connected, or electric shock or fire may happen.
2. The wiring work should be done by the professional technicians.
3. Start the work after confirming that the power is OFF or electric shock may happen.

Basic Wire Layout Graph

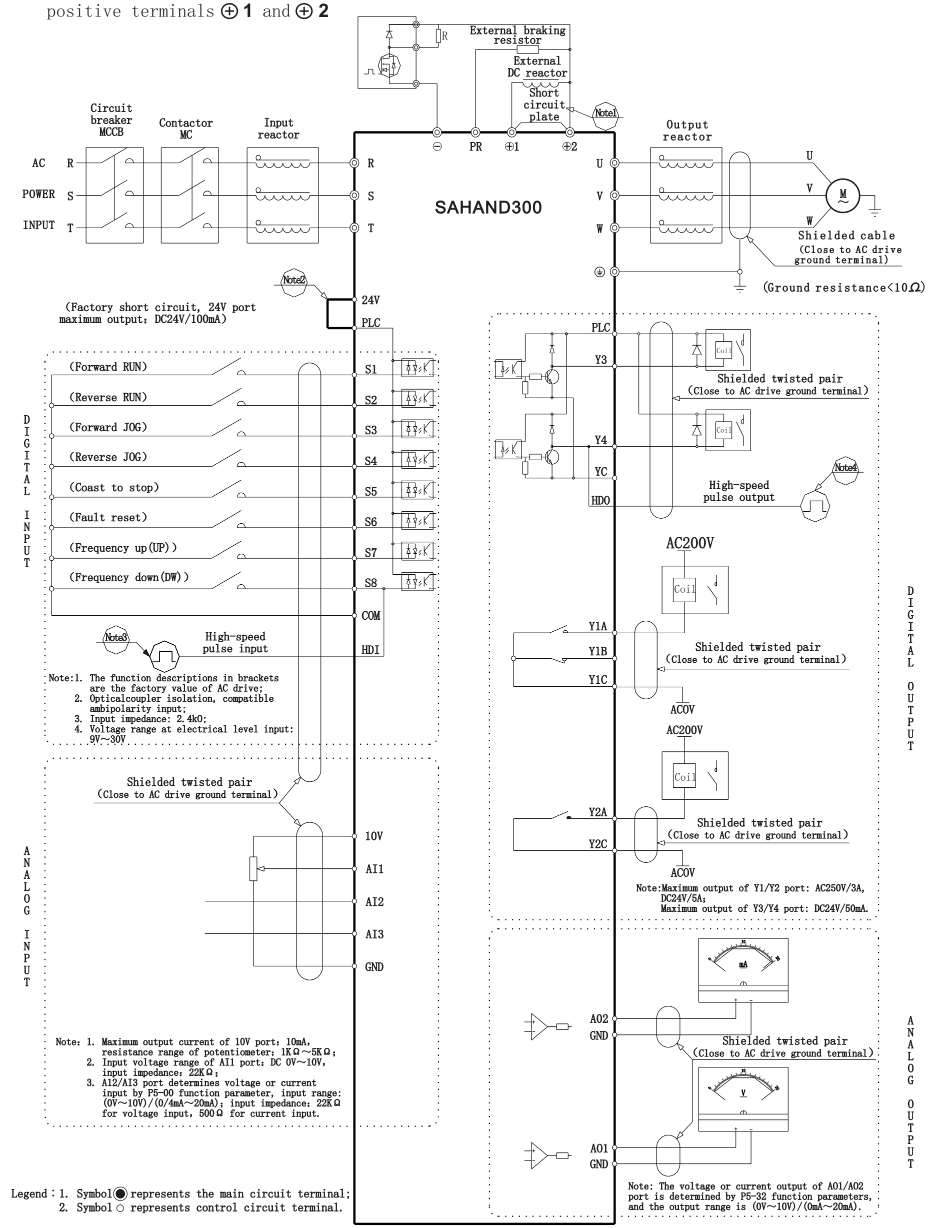
The wires of AC drive can be divided into main loop and control loop. Users can open the upper cover and see the terminals of main loop and control loop. Users must lay the wires according to the figure below to ensure the accuracy of connections.

Notice!

1. Grounding wire must be connected, or electric shock or fire may happen.
2. The wiring work should be done by the professional technicians.
3. Start the work after confirming that the power is OFF or electric shock may happen.

3.6 Standard wiring diagram

Note that in models that contains 37KW power and below, only one positive terminal ⊕ exist. On the other hand, in models above 37KW power, as shown on the figure below, there are two positive terminals ⊕1 and ⊕2



Note:

1.When installing DC reactor, be sure to remove the short connector between terminals ⊕1 and ⊕2

2.The internal power supply (24V port) or external power supply (PLC port) can be selected for S1～S8 port bias voltage, and the factory value 24V port and PLC port are short circuited;

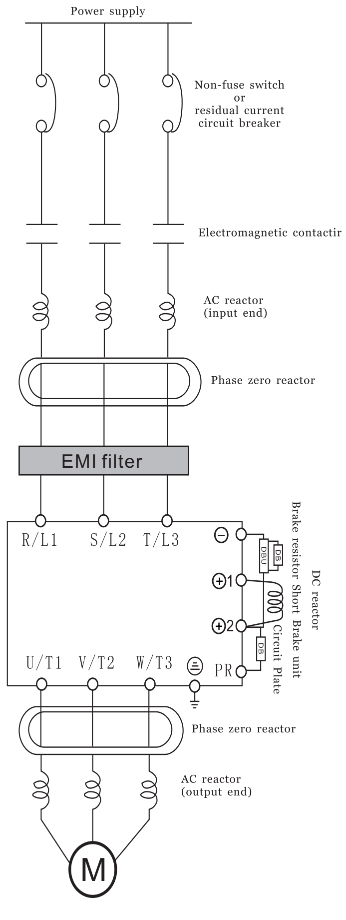
3.Port S8 is restricted by function parameter P5-00, which can be used as high-speed pulse input channel with maximum input frequency of 50KHz;

4.Port Y4 is restricted by function parameter P5-32, which can be used as high-speed pulse input channel with maximum input frequency of 50KHz.

5. DIP switch pin corresponding legend:

When the Y3 or Y4 terminals use the +24V voltage of PLC and com, the SW1 dial switch is down.
The resistance of the communication end is down to connect.
Sw2 is used for short-circuit COM and Yc.

3.7 System Wiring Diagram



Power supply	Please use the power supply in accordance with the rated specification in the usage manual
Non-fuse switch or residual current circuit breaker	The input current may be heavy when the power is turned on. Adopt a proper non-fuse switch or residual current circuit breaker.
Electromagnetic contactor	Please do not use the electromagnetic contactor as the power switch of AC drive, since it will shorten the service life of AC drive.
AC reactor (input end)	When the output capacity is over 1000kVA, it is recommended to add an AC reactor to improve the functional factor. The distance of wires should be within 10m.
Phase zeror eactor	Used for reducing the radiation interference, especially in the places with audio devices, and at the same time reducing the interference of input end and output ends as well. The effective range is AM wave band-10MHZ.
DC reactor	Improve power factor and reduce AC pulse of DC bus.
EMI filter	Used for reducing electromagnetic interference. Please refer to the appendix.
Brake resistor	Used for shortening the decelerating time of motor. Please refer to the appendix.
AC reactor (output end)	The length of motor wires will influence the magnitude of the reflection wave on the motor end. When the engine wires are longer than 20m, it is recommended to install the AC reactor. Please refer to the appendix.

3.8. Main Circuit Connection Functions

Terminal	Type	Function Description
R/L1 S/L2 T/L3	Main circuit power supply input	Input end of commercial power supply
U/T1 V/T2 W/T3	AC drive output terminal	AC drive output connected with 3-phase induction motor.
⊕2 PR	External braking resistorconnection	≤37KW with braking component which is connected to terminal⊕2, PR.To improve the brake moment of force, an external braking resistance is needed.
⊕2/⊕ ⊖	Braking unitor DC Input connection	1: Machinery≥45KW without outside braking resistance component. To improve braking power, outside braking resistance and braking component is necessary (both are optional). 2: DC input terminal;
⊕2 ⊕1	DC reactor connection	Connect DC reactor to improve the power factor, reduce the DC bus AC pulse.
⏚	Grounding terminal	For safety and small noise, AC drive's ground terminal EG should be well grounded.

General precautions for main loop wiring:

■Please do not connect the AC with the output terminal (U/T1, V/T2 and W/T3) of AC drive; otherwise it may cause AC drive damage.

■Ensure that the screws of the main loop terminals are tightened to prevent the sparks caused by the loose screw due to vibration.

■The wires of main loop and those of control loop must be separated to avoid misoperation. If an intersection is needed, make them intersect with a right angle.

■ Please use isolated cable and conduit, and connect with the two ends of the shielding layer or conduit with ground.

■If the installation place of the AC drive is extremely sensitive to interference, please add an RFI filter in a place with a distance from the AC drive as close as possible. The lower the carrier frequency of PWM is, the less the interference there will be.

■ When the AC drive is equipped with a residual current circuit breaker for the protection against electric leakage, please select the ones with action current over 200mA and action time over 0.1s to avoid the misoperation of residual current circuit breaker.

■ The AC drive, motor and wires will cause noise interference. Pay attention to the surrounding sensors, and check whether there is misoperation of the equipment to prevent the accidents.

Description of the power supply input terminals of the main loop (R/L1 S/L2 T /L3)

■Ascertain the voltage of power supply and the maximum current that can supply.

■Main loop terminal R/L1, S/L2, T/L3 is connecting to a three-phase AC power through the circuit (wiring) protection with circuit breakers or earth leakage protection circuit breakers, without considering phase sequence connection.

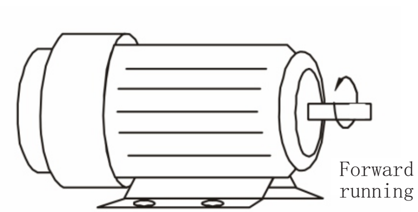
■To cut off power and avoid accident when AC drive protection power is on, electromagnetic contactor to connecting to the circuit is necessary. (The two ends of the electromagnetic contactor should be equipped with R-C surge absorber).

■ Don't use main loop ON/OFF switch to start and stop AC drive. Use loop control terminal FWD, REV or RUN/STOP button on the control panel to start and stop AC drive. If you must use main power supply ON/OFF switch to start and stop, do it no more than 1 time within one hour.

■Do not connect the 3-phase power supply machine with the single-phase power supply.

Output terminals of AC drive(U/T1. V/T2. W/T3)

■ Connect AC drive output terminal to 3 phase motor according to correct phase order. If motor rotates in wrong direction, change any 2 phase of U,V,W.



■The output terminal of AC drive can' t be connected to the inlet phase capacitor or surge absorber. If the wires are very long, it should be connected with the AC reactor on the output end.

■There is high frequency current in the extra long wire between motor and AC drive. This may cause AC drive over flow and stop. Besides, long wire increase leaking current, this leads to poor precision of current value. AC drive≤3.7KW choose wire less than 20 meters to motor, less than 50 meters for AC drive over 3.7 KW. If the wire is very long a wave filter connected to the output side AC reactor is necessary.

■Used insulation strengthened motor.

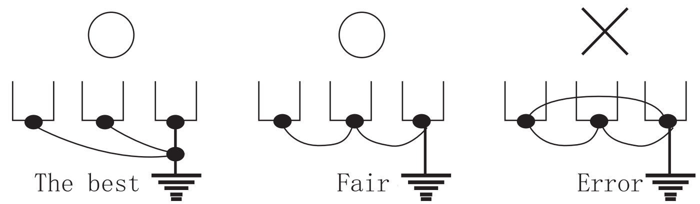
Grounding terminals of AC drive (EG)

■For safety and noise reduction, the grounding terminals of AC drive should be well grounded.

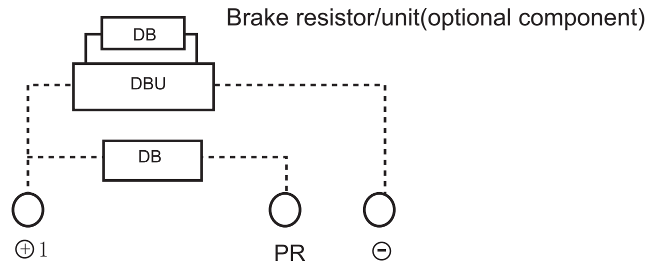
■The grounding wire of AC drive can't be grounded together with the machines with heavy current load e.g. the electric welding machine and high power motor, they should be grounded separately instead.

■In order to prevent electric shock and fire, the external metal grounding wires of electric equipment should be wide and short, and connected to the special grounding terminals of the AC drive system.

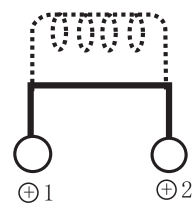
■If there is more than one AC motor speed controller connecting with the ground, Please make sure that is does not form grounding loop, shown as the following figures:



The connection terminals of the external brake resistor [⊕1,PR] and the connection terminals of the brake unit [⊖, ⊕1]



DC reactor connetion terminal ⊕1 ⊕2



DC reactor short circuit plate

3.9. AC drive control terminal connections

Type	Terminal	Name	Function Description
Power supply	10V-GND	External+10V power supply	Provide +10V power supply for external unit, maximum output current: 10mA Generally, it provides power supply to external potentiometer with resistance range of 1kΩ.～5kΩ.
	24V-COM	External+24V power supply	Provide +24V power supply to external unit, generally, it provides power supply to DI/DO terminals and external sensors. Maximum output current: 200mA
	PLC	Input terminal of external power supply	Connect to +24V by default when S1～S8 need to be driven by external signal, PLC needs to be connected to external power supply and be disconnected from +24V power supply terminal.
Analog input	AI1-GND	Analog input termianl 1	1. Input voltage range: DC 0V～10V 2. Impedance: 22kΩ
	AI2-GND	Analog input termianl 2	1. Input range: DC 0V～10V/4mA - 20mA, decided by selection of P5-00. 2. Impedance: 22kΩ(voltage input), 500Ω(current input)
	AI3-GND	Analog input termianl 3	
Digital input	S1-COM	Digital input 1	1. Optocoupler coupling isolation, compatible with dual polarity input 2. Impedance: 2.4kΩ 3. Voltage range for level input: 9V-30V 4. S8 can be used for high-speed pulse input. Maximum input frequency: 50kHz
	S2-COM	Digital input 2	
	S3-COM	Digital input 3	
	S4-COM	Digital input 4	
	S5-COM	Digital input 5	
	S6-COM	Digital input 6	
	S7-COM	Digital input 7	
	S8-COM	Digital input 8	
Analog output	AO1-GND	Analog output terminal 1	Voltage or current output is decided by P5-32. Output voltage range: 0V～10V Output current range: 0mA～20mA
	AO2-GND	Analog output terminal 2	
Digital output	Y3-YC	Digital output termianl 1	1.Optocoupler coupling isolation, dual polarity open collector output: 2.Output voltage range: 0～24 V 3.Output current range: 0～50 mA 4.Y4 is limited by P5-32 "HDO function enable". As high-speed pulse output, the maximum frequency is 50 kHz. 5.Select whether YC terminal and COM terminal are electrically connected through SW1.
	Y4-YC	Digitaloutput termianl 2	
	Y1A/Y1B/Y1C	Relay digital output 1	Contact driving capacity: 250Vac, 3A, COSØ=0.4. 30Vdc, 1A
	Y2A/Y2C	Relay digital output 2	
Commu-nication	DA,DB	RS485 interface	1. Standard RS485 communication interface; 2. Select whether to connect 120Ω termination resistor through SW2.

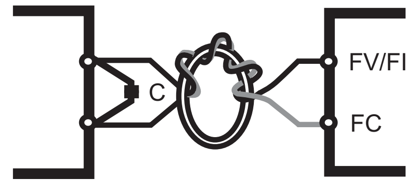
Analog input terminals (FS, FV, FI, FC)

■The connection with analog signal is especially easy to be influenced by the interference of external noise, thus the wire should be as short as possible (less than 20m), and shielding wire should be used. The outer wire mesh of the shielding wire should be basically grounded, but if the inducing noise is very loud, it is better to connect it to the FC terminal.

■For the need of using contact in this circuit, the double-fork contact which can process weak signals should be used. Besides, the terminal FC should not adopt contact control.

■While connecting with the external analog signal follower, sometimes the interference caused by the analog signal follower or the AC drive will lead to misoperation, in such conditions, the capacitor and the magnetic core of ferrite may be conncted to the external analog follower, as shown below:

Go through in-phase and encirle 3 loops or above



Ferrite magnetic ring

Input terminals of contact (S1~S8)

■While controlling the input of contacts, in order to prevent bad contact, the contacts that have high reliability for the contact with weak signals should be used.

Output terminals of transistor (Y3,Y4)

■The polarity of the external power supply should be correctly connected.

■While connecting the control relay, the surge absorber should be connected with the two ends of field coil. Please ensure that the polarity is correctly connected.

Others

■It's best to use the shielding wires as control wires, the isolation network divested segment before the terminals should not be exposed.

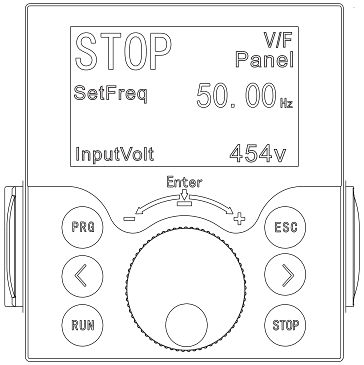
■The wires of control terminals should keep away from the wires of the main loop, or misoperation may be caused due to noise interference. If an intersection is needed, make them intersect with a right angle.

■Generally the control wires don't have good insulation. If the insulation layer is broken due to some reason, high voltage may enter the control circuit (control panel), leading to circuit damage, equipment accidents or personal Danger .

■The control wires in the AC drive should be fixed properly to prevent them from the direct contact with the charge-carrying part of the main circuit (e.g. the terminal strips of the main circuit).

4.Basic operation and commissioning

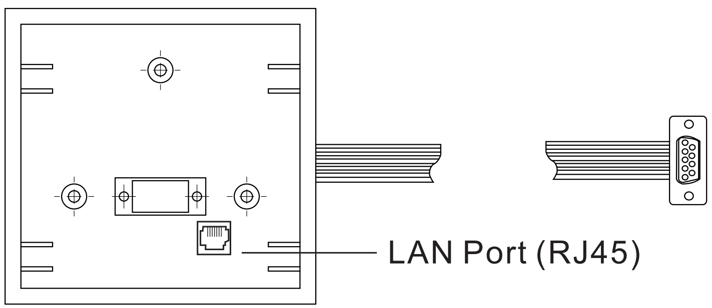
4.1 LCD operation panel:



Description of Keys on the LCD operation panel

Key	Function
PRG	Programming Set parameters
</>	Move left and right function keys
RUN	RUN key Forward RUN(FRD)
STOP	STOP key
	Number INCREASE/DECEREASE and ENTER key
ESC	Exit and fault reset function

■ External components PUZ-01



4.2 Remote controlling the panel:

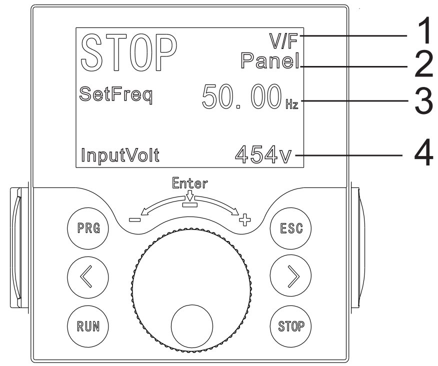
The control panel on the drive can be operated remotely.
It can be done using a network cable.

1. Remove the control panel on the drive

2. Attache the cable to the RJ45 port that located under the control panel

3. Attache the other end of the network cable to the RJ45 port that located at the back of the control panel.

Once you done the steps above, you can be able to control the drive remotely.



1. The following value represent the "Motor control mode". In order to change the mode, alternate the parameter P0-01.

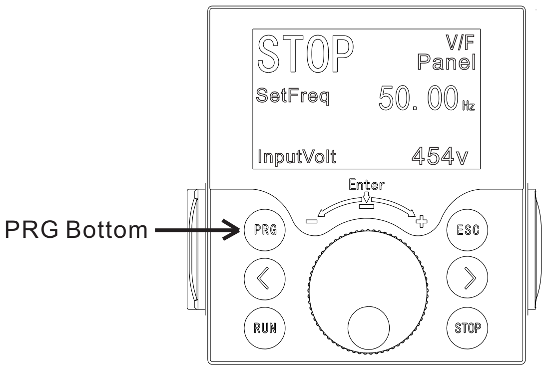
2. At this part "Command source" can be seen by the user. This item also can be changed using the parameter P0-02.

3. The set value of frequency is shown in the following part of the panel. It's not showing the real time value of the frequency.

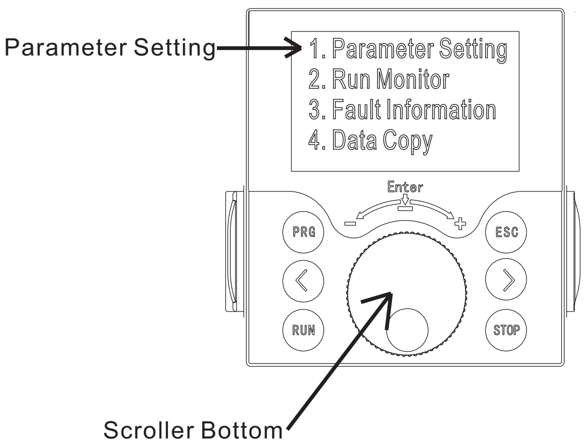
4. The real time value of the input voltage can be seen in that area of the panel. In case of wire break or sabotage, the voltage dropping can be observed by the technicians.

4.3 Reset Factory steps: Note that all changes made by user will roll back to it' s default parameters.

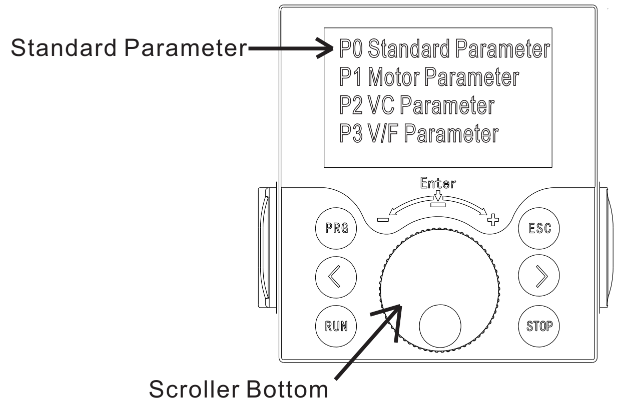
1. Press the "PRG" Botton:



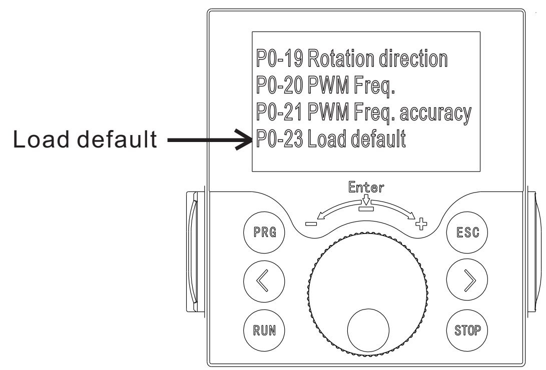
2. Then select the 1. "Parameter Setting" by scroller Bottom.



3. Select P0 "Standard Parameter" using scroller Bottom.



4. Scroll down using the scroller wheel and then Select P0-23 "Load default" using scroller Bottom.

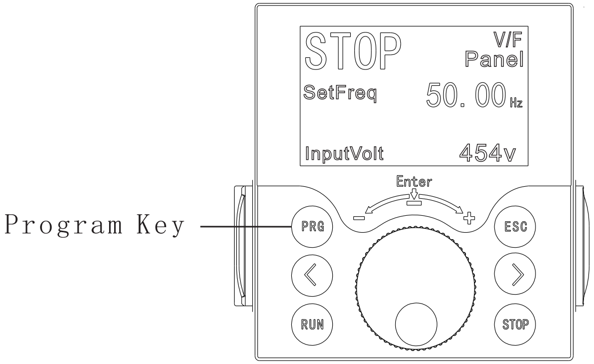


5. Use the scroll wheel to change the number to "7" and then confirm by pressing the scroller bottom.

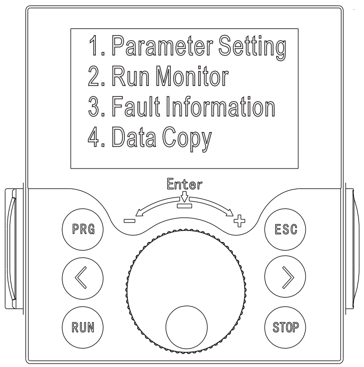
Now all drive parameters are restored to factory default.

4.4 Function parameter setting

First, Press the Program Key(PRG) for accessing the "Program Panel"

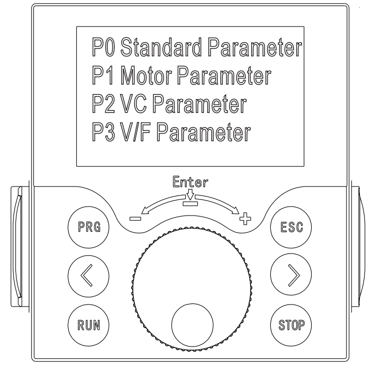


Then you'll see the panel as below:



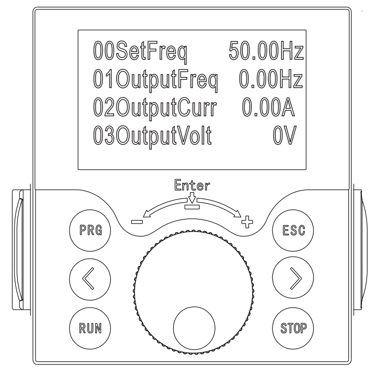
1. Parameter Setting:

By pressing Parameter Setting, you can access all the parameters and change them to the value of your interest. As you can see In the following figure, P0 to P3 is visible and also you can scroll all the way down using the scroller wheel and have access all the other parameters such as P4 to P9 and then PA to PF and at last to the A0 and A1 parameters.



2. Run Monitor:

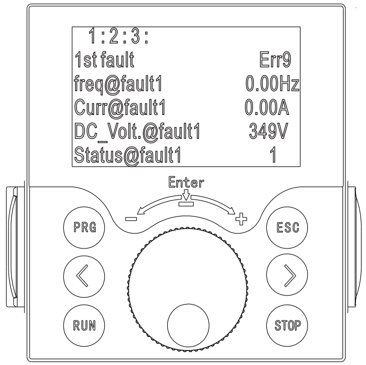
Run Monitor shows all the values online and the important set points. You can not change any values in this panel.



As you can see in the figure above, 4 parameters show in the panel. You can scroll down using the scroller wheel and observe all the 55 parameters in this panel.

3. Fault Information:

Fault Information panel will provides you with some key information of the reason why the drive stopped. The information contains the error number, the last fre- -quency and the last voltage value and also the last current value that the fault occurred.

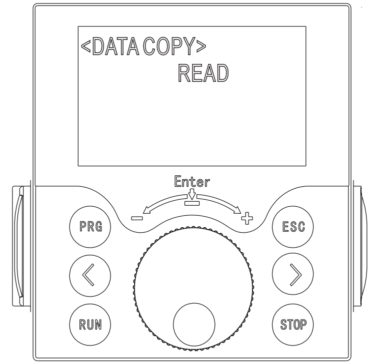


As you can see in the panel, this section contains 3 pages, meaning that it shows the last 3 errors and all the param- -eters related to it. You can access the pages using the left and right arrows and also you can scroll down using the scroller wheel in order to see the further information related to each error.

4. Data Copy:

You can provide a copy of all the parameters so that if you make a change to parameters and face some difficulties, reset all the values to the last set points.

*****Notice:** Before make any changes to the parameters, make sure that you provide a copy of all data parameters in case of wrong parameter setting or emergency situation, restore to the last backup.

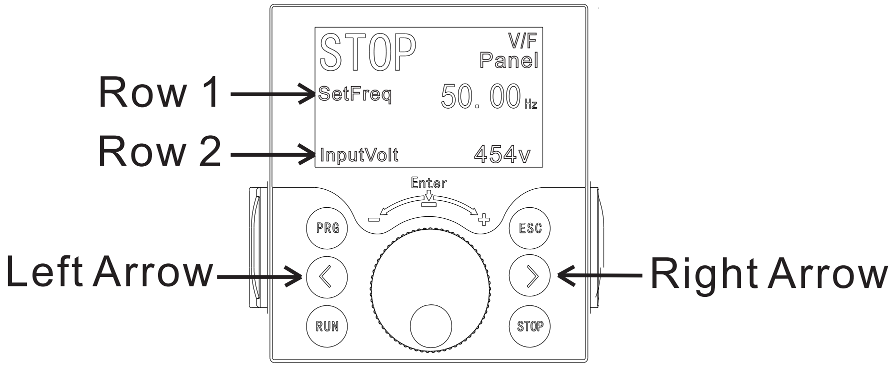


The panel shown in the figure above is in “Read” mode, meaning that by the time you press the scroll bottom, it provides a copy of all the parameters in the drive.
By the time of crisis, you can put it into “WRITE” mode using the scroller wheel and apply the last backup to the drive.

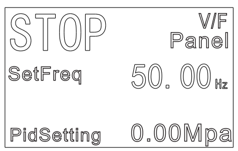
■Confirm there is no short circuit within every terminal and electricity naked part.
■Confirm all terminals connection and joints are tight and not loose
■Ensure that the motor isn’t connected with loaded machine.
■Before turning the power on, ensure that all the switches are in the disconnected state to guarantee that the AC drive won’t start or operate abnormally when the power is on.
■The power supply can only be turned on after the upper cover is installed.
■It is forbidden to operate the switch with wet hand.
■Display of the keypad panel (no indication of faults)
■The cooling fan installed in the AC drive should work normally.

4.5 Main interface monitoring item switch

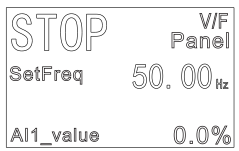
You can observe several other parameters on row 1 and 2 by pressing left arrow and right arrow bottoms.



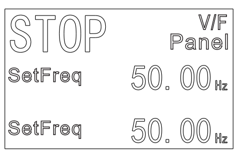
By pressing “Right Arrow” key, parameters of the row 2 will change.



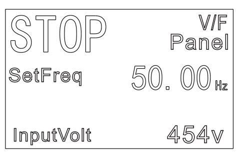
Press One time



Press Two time

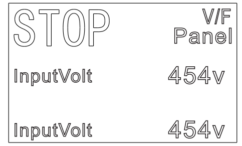


Press Three time

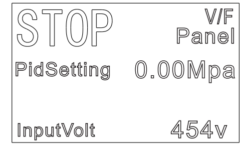


Press Four time

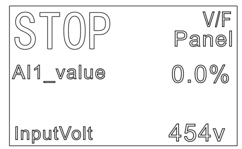
By pressing “Left Arrow” key, parameters of the row 1 will change.



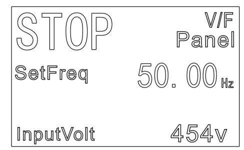
Press One time



Press Two time



Press Three time



Press Four time

4 monitoring items in the main interface, which can be switched cyclically. Set the name of the item to be monitored through parameters P7-06 and P7-07.

5.Function parameters description

5.1 P0 Standard Parameter group

P0-00	AC drive rated G/P type selection	Setting Range:0～1	Default:0

0: Applicable to constant torque load with rated parameters specified,overload factor of AC drive is 150% of rated current for one minute.
1: Applicable to variable torque load (fan and pump) with rated parameters specified, overload factor of AC drive is 120% of rated current for one minute.

P0-01	Motor control mode	Setting Range:0～2	Default:0

0: V/F control

It is applicable to applications with low load requirements or applications where one AC drive operates multiple motors, such as fan and pump.

1: Sensorless flux vector control(SVC)

It indicates open-loop vector control, and is applicable to high-performance control applications such as machine tool, centrifuge, wire drawing machine and injection moulding machine. And one AC drive can operate only one motor.

2: Closed-loop vector control(FVC)

It is applicable to high-accuracy speed control or torque control applications such as high-speed paper making machine, crane and elevator. One AC drive can operate only one motor. An encoder must be installed at the motor side, and a PG card matching the encoder must be installed at the AC drive side.

Note: If vector control is used, motor auto-tuning must be performed because the advantages of vector control can only be utilized after correct motor parameters are obtained. Better performance can be achieved by adjusting speed regulator parameters in group P2.

For the permanent magnetic synchronous motor (PMSM), the SAHAND300 does not support SFVC. CLVC is used generally. In some low-power motor applications, you can also use V/F.

P0-02	Command source selection	Setting Range:0～4	Default:0

It is used to determine the input channel of the AC drive control commands, such as RUN, STOP, FORWARD RUN, REVERSE FUN and JOG RUNNING.

You can input the commands in the following three channels:

0: Operation panel control

Commands are given by pressing keys RUN and STOP on the operation panel.

1: Terminal control

Commands are given by means of multifunctional input terminals with functions such as FWD, REV, JOGF, and JOGR.

2: Communication control

Commands are given from host computer.

3: Option card

The operation command is controlled by the input signal of the external option card. For the installation method and parameter setting of the option card, please refer to the instruction manual of the option card.

4:Terminal switchover

The operation command is given by the control terminal switching, see "terminal function description" for details.

P0-03	Main frequency source X selection	Setting Range:0～C	Default:0

0: Digital setting

The initial value of the set frequency is the value of P0-08 (Preset frequency). You can change the set frequency by pressing ▲ and ▼ on the operation panel (or using the UP/DOWN function of input terminals). When the AC drive is powered on again after power failure, the set frequency is the value memorized at the moment of the last power failure,you can change the set frequency by pressing ▲ and ▼ on the operation panel or the terminal UP/DOWN correction is memorized.

1: AI1
2: AI2
3: AI3

AI1 (0–10 V voltage input)

AI2/AI3(0–10 V voltage input or 4mA–20mA current input, determine by parameter. see "function description of analog terminal parameters" for details.

4: Pulse setting (HDI)

The frequency is set by HDI (high-speed pulse).

The signal specification of pulse setting is 9–30 V (voltage range) and 0–50 kHz (frequency range). The corresponding value 100% of pulse setting corresponds to the value of S8.For the relationship between the input pulse frequency of HDI terminal and the corresponding setting, see "functional description of input terminals" for details.

5: Communication setting

The frequency is set by means of communication.

If the AC drive is in point-point communication and receives data as the frequency source, data transmitted by the master is used as the set frequency. For details, see the description of group PB.

6: UP/DOWN control

The given frequency of the main channel is controlled by the "UP" terminal and the "DW" terminal set by the multi-functional terminal (S1-S8) and the on-off between the (COM) terminal; any end of the multi-functional terminal (X1-X8) can be defined as "UP" terminal and "DW" terminal respectively. See "functional description of input terminal parameters" for details.

7: PID

The output of PID control is used as the running frequency. PID control is generally used in on-site closed-loop control, such as constant pressure closed-loop control and constant tension closed-loop control.

When applying PID as the frequency source, you need to set parameters of "PID Function" in group PA.

8: PLC mode operation setting

When the simple programmable logic controller (PLC) mode is used as the frequency source, the running frequency of the AC drive can be switched over among the 15 frequency references. You can set the holding time and acceleration/deceleration time of the 15 frequency references. For details, refer to the descriptions of Group PD.

9-A: Reserved

B:Option card

The operation command is controlled by the input signal of the external option card. For the installation method and parameter setting of the option card, please refer to the instruction manual of the option card.

C:Terminal switchover

The main channel of frequency setting is selected by "Frequency selection terminal", and "Frequency selection terminal" can be defined by any multi-

functional terminal, see parameters [P2.00-P2.07]; the corresponding rela-tionship between terminal status and frequency setting channel is shown in the table below:
Note: In multi-reference mode, combinations of different DI terminal states correspond to different set frequencies.The SAHAND300 supports a maximum of 16 speeds implemented by 16 state combinations of four DI terminals (allocated with functions 16 to 19) in Group PD,P0-02 specifies the setting value of multi-stage speed 0,and other 1-15 multi-stage speed can correspond to any 15 " multi-reference" by FD group function code, the multiple references indicate percentages of the value of P0-10 (Maximum frequency).
If a DI terminal is used for the multi-reference function, you need to perform related setting in group P4,for details, refer to the descriptions of group related functional parameters.

P0-04	Main frequency source X Gain	Setting Range: 0.000~5.000	Default: 1.000

It is used to amplify or reduce the input signal of the main channel with a given frequency. The given frequency value of the main channel can be adjusted in proportion.

P0-05	Auxiliary frequency source Y selection	Setting Range: 0~C	Default: 0

When used as an independent frequency input channel (frequency source switched over from X to Y), the auxiliary frequency source Y is used in the same way as the main frequency source X (refer to P0-03).When the auxiliary frequency source is used for operation (frequency source is "X and Y operation"), the main frequency source X and auxiliary frequency source Y must not use the same channel.That is, P0-03 and P0-05 cannot be set to the same value.Otherwise, it may cause confusion.

P0-06	Auxiliary source Y Gain	Setting Range:0.000~5.000	Default: 1.000

It is used to amplify or reduce the input signal of the main channel with a given frequency. The given frequency value of the main channel can be adjusted in proportion.

P0-07	Main and auxiliary frequency source combination mode	Setting Range:0~7	Default: 0

0: Main frequency source X
Only [P0.03] is valid, and [P0.05] is invalid
1: Auxiliary frequency source Y
Only [P0.05] is valid, and [P0.03] is invalid
2: X+Y
Given frequency of main channel [P0.03]+Given frequency of auxiliary channel [P0.05]=output frequency of AC drive
3: X-Y
Given frequency of main channel [P0.03]-Given frequency of auxiliary channel [P0.05]=output frequency of AC drive
4: MAX(|X|,|Y|)
MAX(|P0.03|,|P0.05|),The larger one is the output frequency of AC drive
5: MIN(|X|,|Y|)
MIN(|P0.03|,|P0.05|),The smaller one is the output frequency of AC drive
6: X*Y/Main channel
[P0.03] by a percentage, which is equal to the percentage of the given frequency of auxiliary channel [P0.05] relative to the maximum frequency of [p0.10]. The product of the two is the output frequency of the AC drive.
7: Any non-zero value of the main frequency source X and auxiliary frequency source Y is valid,and the primary channel takes precedence.

P0-08	Digital setting of main source X frequency	Setting Range: 0.00~Maximum output frequency	Default: 50.00Hz

Used to set and modify the set main frequency of keyboard number when frequency set passageway is keyboard number setting. If the bit 0 of parameter [P7-03] is "1", this can quickly modify the value of this parameter through up/down key on keyboard.

P0-09	Digital setting of auxiliary source Y frequency	Setting Range: 0.00~Maximum output frequency	Default: 50.00Hz

Used to set and modify the set sub frequency of keyboard number when frequency set passageway is keyboard number setting. If the bit 0 of parameter [P7-03] is "2", this can quickly modify the value of this parameter through up/down key on keyboard.

P0-10	Maximum output frequency	Setting Range: 0.000~320.00Hz	Default: 50.00Hz

The maximum frequency limit allowed by the AC drive;When [P6-11] BIT 0 is set to "1",it is also the acceleration and deceleration time reference.

P0-11	Source of frequency upper limit selection	Setting Range: 0~5	Default: 0

It is used to set the source of the frequency upper limit,including digital setting (P0-12), including pulse setting or communication setting. If the frequency upper limit is set by means of AI1,AI2, AI3, DI5 or communication, the setting is similar to that of the main frequency source X.For details, see the description of P0-03.
For example, to AC drive runaway in torque control mode in winding application, you can set the frequency upper limit by means of analog input. When the AC drive reaches the upper limit, it will continue to run at this speed.

P0-12	Frequency upper limit digital setting	Setting Range: 0.0~100.0%	Default: 100.0%

This parameter is used to set the frequency upper limit, setting range P0-13～P0-10.

P0-13	Frequency lower limit digital setting	Setting Range: 0.0~100.0%	Default: 0.0%

If the frequency reference is lower than the value of this parameter, the AC drive can stop,run at the frequency lower limit, or run at zero speed, determined by P0-14.

P0-14	Frequency lower limit run mode	Setting Range: 0~2	Default: 1

It is used to set the AC drive running mode when the set frequency is lower than the frequency lower limit. The SAHAND300 provides three running modes to satisfy requirements of various applications.

P0-15	Acceleration time 1	Setting Range: 0.1~6500.0s	Default: Model dependent

Acceleration time indicates the time required by the AC drive to accelerate from 0 Hz to "Acceleration/Deceleration base frequency" (P6-11), that is, t1 in Figure 6-1.

P0-16	Deceleration time 1	Setting Range: 0.1～6500.0s	Default: Model dependent

Deceleration time indicates the time required by the AC drive to decelerate from "Acceleration/Deceleration base frequency" (P6-11) to 0 Hz, that is, t2 in Figure 6-1.

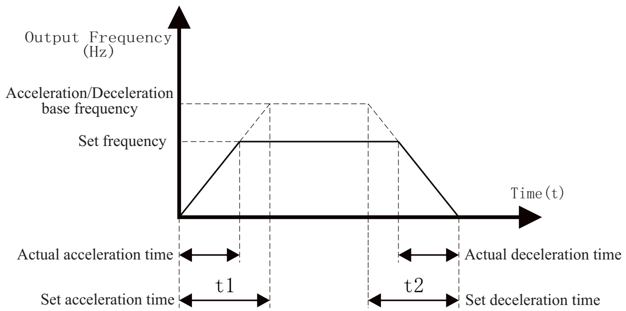


Figure 6-1 Acceleration/Deceleration time

P0-17	Acceleration/Deceleration time unit	Setting Range: 1～2	Default: 1

To satisfy requirements of different applications, the SAHAND300 provides two acceleration/deceleration time units, 0.1s and 0.01s.

P0-18	Stopping method	Setting Range: 0～1	Default: 0

0: Ramp to stop **1: Coast to stop**

P0-19	Rotation direction selection	Setting Range: 00～11	Default: 00

BIT0:

0: Forward direction operation 1: Reverse direction operation

You can change the rotation direction of the motor just by modifying this parameter without changing the motor wiring. Modifying this parameter is equivalent to exchanging any two of the motor's U, V, W wires.

Note:The motor will resume running in the original direction after parameter initialization. Do not use this function in applications where changing the rotating direction of the motor is prohibited after system commissioning is complete.

BIT1:

0: Reverse operation enable 1: Reverse operation disable

It is used to set whether the AC drive allows reverse rotation. In the applications where reverse rotation is prohibited, set the bit 1of P0-19 to 1.

P0-20	Carrier frequency	Setting Range: 1.0～15.0kHz	Default: Model dependent

It is used to set the switching frequency of IGBT of AC drive. Please set this parameter when adjusting motor noise and reducing leakage current. This function is mainly used to improve the noise and vibration that may occur in the operation of the AC drive.

When the carrier frequency is high, the current waveform is ideal and the motor noise is low. It is very suitable for places where silence is required. But at this time, the switch loss of the main components is large, the whole machine is hot, the efficiency is reduced, and the output is reduced. At the same time, the radio interference is large, the other problem of high carrier frequency operation is the increase of capacitive leakage current, which may cause its misoperation or over-current when the leakage protector is installed. When the carrier frequency is low, it is opposite to the above phenomenon.

The response of different motors to carrier frequency is also different. The best carrier frequency also needs to be adjusted according to the actual situation. But with the increase of motor capacity, the carrier frequency should be smaller.

Tip: In order to obtain better control characteristics, the ratio of carrier frequency to the highest operating frequency of the AC drive is recommended not to be less than 36. If the AC drive works in the low frequency band for a long time, it is recommended to reduce the carrier frequency to reduce the influence of dead time.

Note: When the carrier frequency is higher than the factory set value, the rated power of the AC drive shall be reduced by 5% for every 1kHz carrier frequency increased. Our company reserves the right to limit the maximum carrier frequency. Adjusting the carrier frequency will affect the following performance:

Carrier frequency	Low → High
Motor noise	Large → Small
Output current waveform	Bad → Good
Motor temperature rise	High → Low
AC drive temperature rise	Low → High
Leakage current	Small → Large
External radiation interference	Small → Large

P0-21	Carrier frequency accuracy unit	Setting Range: 1～2	Default: 2

This parameter used to confirm all resolution ratio of function code which relate to frequency.

The max output frequency of SAHAND300 can reach up to 3200Hz when the frequency resolution is 0.1Hz, but when frequency resolution is 0.01Hz then the max output frequency is 320.00Hz .

P0-22	Reserved	Setting Range: -	Default: -

P0-23	Restore default settings	Setting Range: 0～210	Default: 0～210

0: **No operation**
1: Data locked
2: Reset Error message
3～6: Undefined
7: Initialization setting-User data reset

If P0-23 is set to （1/7）, most function codes are restored to the default settings except fault records, accumulative running time , accumulative power-on time and accumulative power. consumption.

10: Back up current user parameters
If P0-23 is set to 10, the previous backup user parameters are restored.
210: Restore user backup parameters
If P0-23 is set to 210, the current parameter settings are backed up, helping you to restore the setting if incorrect parameter setting is performed.

5.2 P1 Motor Parameter

P1-00	Motor Auto-Tuning Selection	Setting Range: 0～2	Default: 0

To achieve better V/F or vector control performance, motor auto-tuning is required.

0: No auto-tuning Auto-tuning is prohibited.

1: Asynchronous motor static auto-tuning

It is applicable to scenarios where complete auto-tuning cannot be performed because the asynchronous motor cannot be disconnected from the load. Before performing static auto-tuning, properly set the motor type and motor nameplate parameters of P1-01-00 to P1-06 first. The AC drive will obtain parameters of P1-06 to P1-08 by static auto-tuning.

Set this parameter to 1, and press RUN . Then, the AC drive starts static auto-tuning.

2: Asynchronous motor (rotational) complete auto-tuning

To perform this type of auto-tuning, ensure that the motor is disconnected from the load. During the process of complete auto-tuning, the AC drive performs static auto-tuning first and then accelerates to 80% of the rated motor frequency within the acceleration time set in P0-15. The AC drive keeps running for a certain period and then decelerates to stop within deceleration time set in P0-16. Before performing complete auto-tuning, properly set the motor type, motor nameplate parameters of P1-01 to P1-06, "Encoder type" (P1-23) and "Encoder pulses perrevolution" (P1-24) first. ABZ incremental encoder" (P1-23) and vector control current loop PI parameters of P2-14 to P2-17 by complete auto-tuning.

Set this parameter to 2, and press RUN . Then, the AC drive starts complete auto-tuning.

Synchronous motor with-load auto-tuning

It is applicable to scenarios where the synchronous motor cannot be disconnected from the load. During with-load auto-tuning, the motor rotates at the speed of 10 PRM. Before performing with-load auto-tuning, properly set the motor type and motor nameplate parameters of P1-01 to P1-06 first.By with-load auto-tuning, the AC drive obtains the initial position angle of the synchronous motor, which is a necessary prerequisite of the motor's normal running. Before the first use of the synchronous motor after installation, motor auto-tuning must be performed.

Set this parameter to 11, and press RUN . Then, the AC drive starts no-load auto-tuning.

Synchronous motor no-load auto-tuning

If the synchronous motor can be disconnected from the load, no-load auto-tuning is recommended, which will achieve better running performance compared with with-load auto-tuning.During the process of complete no-load auto-tuning, the AC drive performs static auto-tuning first and then accelerates to the rated frequency of motor P0-15 according to the acceleration time set in P0-08. The AC drive keeps running for a certain period and then decelerates to stop within deceleration time set in P0-16. Before performing no-load auto-tuning, properly set the motor type, motor nameplate parameters of P1-01 to P1-06, "Encoder type" (P1-23) and "Encoder pulses perrevolution" (P1-24)

and "Number of pole pairs of resolver" (P1-27) first. The AC drive will obtain motor parameters of P1-17 to P1-21, encoder related parameters of P2-24 to P2-27 and vector control current loop PI parameters of P2-14 to P2-17 by no-load auto-tuning.

Set this parameter to 12, and press RUN . Then, the AC drive starts no-load auto-tuning.

Note: Motor auto-tuning can be performed only in operation panel mode.

P1-01	Motor type	Setting Range: 0～2	Default: 0
P1-02	Motor rated power	Setting Range: 0.01Kw～100.0Kw	Default: Model dependent
P1-03	Motor rated voltage	Setting Range: 1V～2000V	Default: Model dependent
P1-04	Motor rated current	Setting Range: Model dependent	Default: Model dependent
P1-05	Motor rated frequency	Setting Range: 0. 01Hz～Maximum frequency	Default: Model dependent
P1-06	Motor rated rotational speed	Setting Range: 1rpm～65535rpm	Default: Model dependent

Set the parameters according to the motor nameplate no matter whether V/F control or vector control is adopted. The motor auto-tuning accuracy depends on the correct setting of motor nameplate parameters.

P1-07	Stator resistance (asynchronous motor)	Setting Range: Model dependent	Default: Model dependent
P1-08	Rotor resistance (asynchronous motor)		Default: Model dependent
P1-09	Leakage inductive reactance (asynchronous motor)	Setting Range: Model dependent	Default: Model dependent
P1-10	Mutual inductive reactance (asynchronous motor)		Default: Model dependent
P1-11	No-load current (asynchronous motor)	Setting Range: Model dependent	Default: Model dependent

The parameters in F1-07 to F-11 are asynchronous motor parameters. These parameters are not found on the on the motor nameplate and are obtained by means of motor auto-tuning. Only F1-07 to F1-09 can be obtained through static motor auto-tuning. Through complete motor auto-tuning, encoder phase sequence and current loop PI can be obtained besides the parameters in F1-06 to F1-10.If it is impossible to perform motor auto-tuning on site, manually input the values of these parameters according to data provided by the motor manufacturer.

P1-23	Encoder type	Setting Range:000～114	Default: 000

BIT0:Encoder type

The SAHAND300 supports multiple types of encoder. Different PG cards are required for different types of encoder. Select the appropriate PG card for the encoder used. Any of the five encoder types is applicable to synchronous motor. Only ABZ incremental encoder and resolver are applicable to asynchronous motor.

After installation of the PG card is complete, set this parameter properly based on the actual condition. Otherwise, the AC drive cannot run properly.

BIT1:A/B phase sequence of ABZ incremental encoder

This parameter is valid only for ABZ incremental encoder and is used to set the A/B phase sequence of the ABZ incremental encoder.

BIT2:U, V, W phase sequence of UVW encoder

These two parameters can be obtained by synchronous motor no-load auto-tuning or with-load auto-tuning.They are valid only when the UVW encoder is applied to a synchronous motor.

P1-24	Encoder pulses per revolution	Setting Range:0～60000	Default: 1024

This parameter is used to set the pulses per revolution (PPR) of ABZ or UVW incremental encoder. In CLVC mode, the motor cannot run properly if this parameter is set incorrectly.

P1-25	Encoder installation angle	Setting Range:0.0～359.9°	Default: 0.0

This parameter is applicable only to synchronous motor. It is valid for ABZ incremental encoder, UVW incremental encoder, resolver and wire-saving UVW encoder, but invalid for SIN/COS encoder.It can be obtained through synchronous motor no-load auto-turning or with-load auto-tuning.After installation of the synchronous motor is complete, the value of this parameter must be obtained by motor auto-tuning. Otherwise, the motor cannot run properly.

P1-26	UVW encoder angle offset	Setting Range: 0.0～359.9°	Default: 0.0

They can be obtained by synchronous motor no-load auto-tuning or with-load auto-tuning. After installation of the synchronous motor is complete, the values of these two parameters must be obtained by motor auto-tuning. Otherwise, the motor cannot run properly.

P1-27	Number of pole pairs of resolver	Setting Range: 1～100	Default: 1

If a resolver is applied, set the number of pole pairs properly.

P1-28	Encoder wire-break fault detection time	Setting Range: 0.00～60.00s	Default: 2.00s

This parameter is used to set the time that a wire-break fault lasts. If it is set to 0.0s, the AC drive does not detect the encoder wire-break fault. If the duration of the encoder wire-break fault detected by the AC drive exceeds the time set in this parameter, the AC drive reports Err20.

5.3 P2: Vector Control Parameters

Group P2 is valid for vector control, and invalid for V/F control.

P2-00	Vector Control Mode	Setting Range: 01～12	Default: 02

Optimization mode 1:used when there is a higher torque control linearity requirement

P2-01	Speed loop proportional gain 1	Setting Range: 1～100	Default: 30
P2-02	Speed loop integral time 1	Setting Range: 0.01s～10.00s	Default: 0.50s
P2-03	Switchover frequency 1	Setting Range: 0.00～P2-06	Default: 5.00Hz
P2-04	Speed loop proportional gain 2	Setting Range:1～100	Default: 20
P2-05	Speed loop integral time 2	Setting Range: 0.01s～10.00s	Default: 1.00s
P2-06	Switchover frequency 2	Setting Range: P2-03～Maximum frequency	Default: 10.00Hz

Speed loop PI parameters vary with running frequencies of the AC drive.

• If the running frequency is less than equal to "Switchover frequency 1" (P2-03), the speed loop PI parameters are P2-01 and P2-02.

• If the running frequency is equal to or greater than "Switchover frequency 2", the speed loop PI parameters are P2-04 and P2-05.

• If the running frequency is between 1and 2, the speed loop PI parameters are obtained from the linear switchover between the two groups of PI parameters, as shown in Figure 6-2.

Figure 6-2 Relationship between running frequencies and PI parameters

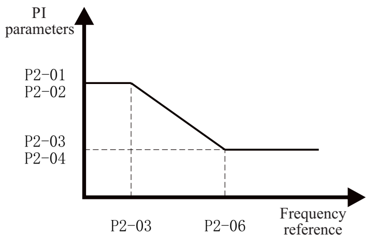


Figure 6-2 Relationship between running frequencies and PI parameters

The speed dynamic response characteristics in vector control can be adjusted by setting the proportional gain and integral time of the speed regulator. To achieve a faster system response, increase the proportional gain and reduce the integral time. Be aware that this may lead to system oscillation.

The recommended adjustment method is as follows: If the factory setting cannot meet the requirements, make proper adjustment. Increase the proportional gain first to ensure that the system does not oscillate, and then reduce the integral time to ensure that the system has quick response and small overshoot.

Note: Improper PI parameter setting may cause too large speed overshoot, and over-voltage fault may even occur when the overshoot drops.

P2-07	Slip compensation factor	Setting Range: 50%～200%	Default: 100%

For SFVC, it is used to adjust speed stability accuracy of the motor. When the motor with load runs at a very low speed, increase the value of this parameter; when the motor with load runs at a very large speed, decrease the value of this parameter. For CLVC, it is used to adjust the output current of the AC drive with same load.

P2-08	Time constant of speed loop filter	Setting Range: 0.001s～1.000s	Default: 0.050s

In the vector control mode, the output of the speed loop regulator is torque current reference. This parameter is used to filter the torque references. It need not be adjusted generally and can be increased in the case of large speed fluctuation. In the case of motor oscillation, decrease the value of this parameter properly.

If the value of this parameter is small, the output torque of the AC drive may fluctuate greatly, but the response is quick.

P2-09	Vector control over-excitation gain	Setting Range: 0～200	Default: 64

During deceleration of the AC drive, over-excitation control can restrain rise of the bus voltage to avoid the over-voltage fault. The larger the over-excitation gain is, the better the restraining effect is.

Increase the over-excitation gain if the AC drive is liable to over-voltage error during deceleration. Too large over-excitation gain, however, may lead to an increase in output current. Therefore, set this parameter to a proper value in actual applications.

Set the over-excitation gain to 0 in applications of small inertia (the bus voltage will not rise during deceleration) or where there is a braking resistor.

P2-10	Torque upper limit source in speed control mode	Setting Range: 0～7	Default: 0
P2-11	Digital setting of torque upper limit in speed control mode	Setting Range: 0.0%～200.0%	Default: 150.0%

In the speed control mode, the maximum output torque of the AC drive is restricted by P2-10.

If the torque upper limit is analog, pulse or communication setting, 100% of the setting corresponds to the value of P2-10, and 100% of the value of P2-11 corresponds to the AC drive rated torque.

For details on the AI1, AI2 and AI3 setting, see the description of the AI curves in group P4.

For details on the pulse setting, see the description.

When the AC drive is in communication with the master, if it is currently a point-to-point communication slave and receives data as torque timing, the torque digital setting is sent directly by the host. For details, refer to the introduction of A8 group point-to-point communication.

In other conditions, the host computer writes data -100.00% to 100.00% by the communication address 0x2009, where 100.0% corresponds to the value of P2-11.

P2-14	Current loop of M-axis Kp	Setting Range: 0～6000	Default: 2000
P2-15	Current loop of M-axis Ki		Default: 1300
P2-16	Current loop of T-axis Kp		Default: 2000
P2-17	Current loop of T-axis Ki		Default: 1300

These are current loop PI parameters for vector control. These parameters are automatically obtained through "Asynchronous motor complete auto-tuning" or "Synchronous motor no-load auto-tuning", and need not be modified.

The dimension of the current loop integral regulator is integral gain rather than integral time. Note that too large current loop PI gain may lead to oscillation of the entire control loop. Therefore, when current oscillation or torque fluctuation is great, manually decrease the proportional gain or integral gain here.

P2-18	Speed loop integral property	Setting Range: 0～1	Default: 0

Integral separation 0: invalid 1: valid

P2-19	Over excitation mode selection	Setting Range: 0～2	Default: 1
P2-20	Over modulation enable selection	Setting Range: 0～1	Default: 0
P2-21	Maximum output voltage coefficient	Setting Range: 100%～110%	Default: 105%
P2-22	Field weakening automatic adjustment gain	Setting Range: 50%～200%	Default: 100%
P2-23	Negative torque limit enable	Setting Range: 0～1	Default: 0

These parameters are used to set field weakening control for the synchronous motor.

If P2-19 is set to 0, field weakening control on the synchronous motor is valid. In this case, the maximum rotational speed is related to the AC drive bus voltage. If the motor's maximum rotational speed cannot meet the requirements, invalid the field weakening function to increase the speed.

The SAHAND300 provides two field weakening modes: direct calculation and automatic adjustment.

In direct calculation mode, directly calculate the demagnetized current and manually adjust the demagnetized current by means of P2-20. The smaller the demagnetized current is, the smaller the total output current is. However, the desired field weakening effect may not be achieved.

In automatic adjustment mode, the best demagnetized current is selected automatically. This may influence the system dynamic performance or cause instability.

The adjustment speed of the field weakening current can be changed by modifying the values of P2-22 and P2-23. A very quick adjustment may cause instability. Therefore, generally do not modify them manually.

5.4 P3: V/F Control Parameters

Group F3 is valid only for V/F control.

The V/F control mode is applicable to low load applications (fan or pump) or applications where one AC drive operates multiple motors or there is a large difference between the AC drive power and the motor power.

P3-00	V/F Curve Selection	Setting Range: 0～11	Default: 0

0: Linear V/F

It is applicable to common constant torque load.

1: Multi-point V/F

It is applicable to special load such as dehydrator and centrifuge. Any such V/F curve can be obtained by setting parameters of F3-03 to F3-08.

2: Square V/F

It is applicable to centrifugal loads such as fan and pump.

3～8: V/F curve between linear V/F and square V/F

10: V/F complete separation

In this mode, the output frequency and output voltage of the AC drive are independent. The output frequency is determined by the frequency source, and the output voltage is determined by "Voltage source for V/F separation" (F3-13). It is applicable to induction heating, inverse power supply and torque motor control.

11: V/F half separation

In this mode, V and F are proportional and the proportional relationship can be set in P3-13. The relationship between V and F are also related to the rated motor voltage and rated motor frequency in Group F1.

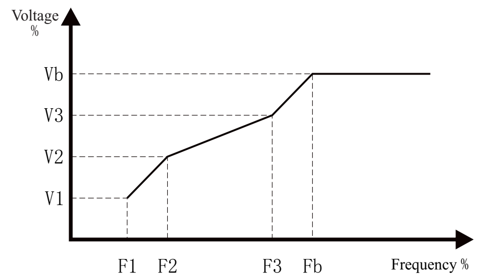
Assume that the voltage source input is X (0 to 100%), the relationship between V and F is:

V/F = 2 x X x (Rated motor voltage)/(Rated motor frequency)

P3-01	Multi-point V/F frequency 1 (F1)	Setting Range: 0.0～P3-03	Default: 1.00Hz
P3-02	Multi-point V/F voltage 1 (V1)	Setting Range: 0.0～P3-04	Default: 3%
P3-03	Multi-point V/F frequency 2 (F2)	Setting Range: P3-01～P3-05	Default: 25.00Hz
P3-04	Multi-point V/F voltage 2 (V2)	Setting Range: P3-02～P3-06	Default: 50%
P3-05	Multi-point V/F frequency 3 (F3)	Setting Range: P3-03～Maximum frequency	Default: 50.00Hz
P3-06	Multi-point V/F voltage 3 (V3)	Setting Range: P3-04～100.0%	Default: 100%

These six parameters are used to define the multi-point V/F curve. The multi-point V/F curve is set based on the motor's load characteristic. The relationship between voltages and frequencies is: V1 < V2 < V3, F1 < F2 < F3

At low frequency, higher voltage may cause overheat or even burnt out of the motor and over-current stall or over-current protection of the AC drive.



V1-V3：1st,2nd and 3rd voltage percentages of multi-point V/F

F1-F3：1st,2nd and 3rd frequency percentages of multi-point V/F

Vb：Rated motor voltage Fb：Rated motor running frequency

Figure 6-4 Setting of multi-point V/F curve

P3-07	VF Torque boost	Setting Range: 0.1～30.0%	Default: 1.0%
P3-08	Cut-off frequency of torque boost	Setting Range: 0.00Hz～Maximum frequency	Default: 50.00Hz

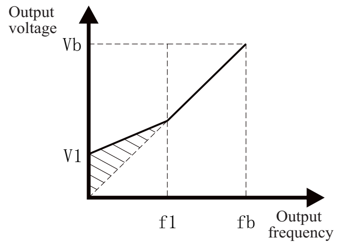
To compensate the low frequency torque characteristics of V/F control, you can boost the output voltage of the AC drive at low frequency by modifying torque boost.

If the torque boost is set to too large, the motor may overheat, and the AC drive may suffer over-current.

If the load is large and the motor startup torque is insufficient, increase the value of torque boost.

If the load is small, decrease the value of torque boost. If it is set to 0.0, the AC drive performs automatic torque boost. In this case, the AC drive automatically calculates the torque boost value based on motor parameters including the stator resistance.

Cut-off frequency of torque boost specifies the frequency under which torque boost is valid. Torque boost becomes invalid when this frequency is exceeded, as shown in the following figure.



V1: Voltage of manual torque boost
f1: Cutoff frequency of manual frequency boost
Vb: Maximum output voltage
fb: Rated running frequency

P3-10	V/F slip compensation	Setting Range: 0.0～200.0%	Default: 0.0%

This parameter is valid only for the asynchronous motor.

It can compensate the rotational speed slip of the asynchronous motor when the load of the motor increases, stabilizing the motor speed in case of load change.

If this parameter is set to 100%, it indicates that the compensation when the motor bears rated load is the rated motor slip. The rated motor slip is automatically obtained by the AC drive through calculation based on the rated motor frequency and rated motor rotational speed in group P1.

Generally, if the motor rotational speed is different from the target speed, slightly adjust this parameter.

P3-12	V/F over-excitation gain	Setting Range: 0～2.00s	Default: 0.64s

During deceleration of the AC drive, over-excitation can restrain rise of the bus voltage, preventing the over-voltage fault. The larger the over-excitation is, the better the restraining result is.

Increase the over-excitation gain if the AC drive is liable to over-voltage error during deceleration. However, too large over-excitation gain may lead to an increase in the output current. Set F3-09 to a proper value in actual applications.

Set the over-excitation gain to 0 in the applications where the inertia is small and the bus voltage will not rise during motor deceleration or where there is a braking resistor.

P3-13	V/F oscillation suppression gain	Setting Range: 0～1000	Default: Model dependent

Set this parameter to a value as small as possible in the prerequisite of efficient oscillation suppression to avoid influence on V/F control. Set this parameter to 0 if the motor has no oscillation. Increase the value properly only when the motor has obvious oscillation. The larger the value is, the better the oscillation suppression result will be.

When the oscillation suppression function is valid, the rated motor current and no-load current must be correct. Otherwise, the V/F oscillation suppression effect will not be satisfactory.

P3-15	Voltage source for V/F separation	Setting Range: 0～8	Default: 0
P3-16	Voltage digital setting for V/F separation	Setting Range: 0.0～Motor rated voltage	Default: 0V

V/F separation is generally applicable to scenarios such as induction heating, inverse power supply and motor torque control.

If V/F separated control is valid, the output voltage can be set in P3-14 or by means of analog, multi-reference, simple PLC, PID or communication. If you set the output voltage by means of non-digital setting, 100% of the setting corresponds to the rated motor voltage. If a negative percentage is set, its absolute value is used as the effective value.

0: Digital setting (P3-14)

The output voltage is set directly in P3-14.

1: AI1; 2: AI2; 3: AI3

The output voltage is set by AI terminals.

4: Pulse setting (S8)

The output voltage is set by pulses of the terminal S8. Pulse setting specification: voltage range 9－30 V, frequency range 0－50 kHz.

5: Multi-reference

If the voltage source is multi-reference, parameters in group P4 and PD must be set to determine the corresponding relationship between setting signal and setting voltage. 100.0% of the multi-reference setting in group PD corresponds to the rated motor voltage.

6: Simple PLC

If the voltage source is simple PLC mode, parameters in group FD must be set to determine the setting output voltage.

7: PID

The output voltage is generated based on PID closed loop. For details, see the description of PID in group FA.

8: Communication setting

The output voltage is set by the host computer by means of communication. The voltage source for V/F separation is set in the same way as the frequency source. For details, see P0-03. 100.0% of the setting in each mode corresponds to the rated motor voltage. If the corresponding value is negative, its absolute value is used.

P3-17	Voltage acceleration time of V/F separation	Setting Range: 0.1s～1000.0s	Default: 10.0s
P3-18	Voltage deceleration time of V/F separation	Setting Range: 0.1s～1000.0s	Default: 10.0s

P3-16 indicates the time required for the output voltage to rise from 0 V to the rated motor voltage shown as t1 in the following figure.

P3-17 indicates the time required for the output voltage to decline from the rated motor voltage to 0 V, shown as t2 in the following figure.

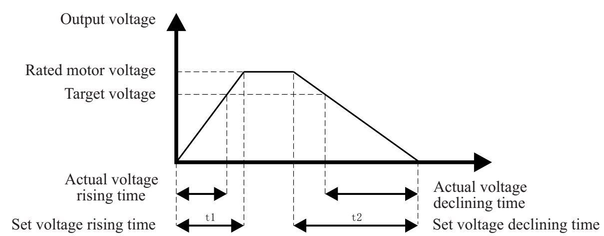


Figure 6-5 Voltage of V/F separation

5.5 P4: Input Terminals function group

The SAHAND300 provides eight S-terminals (S8 can be used for high-speed pulse input),4 pieces multiple function digit output terminals(among, need be used to as high speed pulse output terminals).

P4-00	S1 Function	Setting Range: 0～56	Default: 1 Forward RUN (FWD)
P4-01	S2 Function		Default: 2 Reverse RUN (REV)
P4-02	S3 Function		Default: 4 Forward JOG (FJOG)
P4-03	S4 Function		Default: 5Reverse JOG (RJOG)
P4-04	S5 Function		Default: 6 Coast to stop
P4-05	S6 Function		Default: 8 Fault reset (RESET)
P4-06	S7 Function		Default: 10 Terminal UP
P4-07	S8 Function		Default: 11 Terminal DOWN

The following table lists the functions available for the DI terminals.

Value	Function	Value	Function
0	No Function	14	Speed search start enable
1	Forward RUN(FWD)	15	Reserved
2	Reverse RUN(REV)	16	Multi-Reference Terminal 1
3	Three wire control	17	Multi-Reference Terminal 2
4	Forward JOG (FJOG)	18	Multi-Reference Terminal 3
5	Reverse JOG (RJOG)	19	Multi-Reference Terminal 4
6	Coast to stop	20	Terminal 1 for acceleration/deceleration time selection
7	Emergency Stop	21	Terminal 2 for acceleration/deceleration time selection
8	Fault Reset (RESET)	22	Acceleration/Deceleration prohibited
9	External fault input	23	PID control cancel
10	Terminal UP	24	PID control pause
11	Terminal Down	25	PID integral pause
12	Up and Down setting clear	26	PID characteristic switching
13	Speed control/Torque control switch over		

27	PID parameter switchover
28	PID target value switchover terminal1
29	PID target value switchover terminal2
30	PID target value switchover terminal3
31	PID feedback value switchover terminal1
32	PID feedback value switchover terminal2
33	PID feedback value switchover terminal3
34	PLC pause
35	PLC status reset
36	Swing enable
37	Swing pause
38	Swing reset
39	Frequency source switchover terminal1
40	Frequency source switchover terminal2
41	Frequency source switchover terminal3
42	Frequency source switchover terminal4
43	Command source switchover terminal 1
44	Command source switchover terminal 2
45	Counter input terminal
46	Counter reset terminal
47	Counter clock input terminal
48	Counter reset
49	DC braking command
50	Terminal pre-excitation
51	User-defined fault1

Value	Function	Value	Function
52	User-defined fault2	55	Pump 3 invalid
53	Pump 1 invalid	56	Pump 4 invalid
54	Pump 2 invalid		

P4-08	Characteristic selection of terminals S1-4	Setting Range: 0000～1111	Default: 0000

Characteristic selection of terminals S1-S4: Set the characteristics of DI terminals S1, S2, S3 and S4 respectively.

BIT 0: S1 terminal

0: effective closing
1: effective opening

BIT 1: S2 terminal

0: effective closing
1: effective opening

BIT 2: S3 terminal

0: effective closing
1: effective opening

BIT 3: S4 terminal

0: effective closing
1: effective opening

P4-09	S1-S4 terminal filtering time	Setting Range: 0.0～60.0s	Default: 0.1s

This function used to set the filtering time of multiple function input terminal. When the input terminal status change, if still keep the status after changed through the set filtering time then can regard the terminal status change is valid, otherwise, still keep the last time status, thus valid to reduce the error action which caused by the disturb.

P4-10	Characteristic selection of terminals S5-S8	Setting Range: 0000～1111	Default: 0000

Same as P4-08

P4-11	S5-S8 terminal filtering time	Setting Range: 0.00～60.00s	Default: 0.1s

Same as P4-09

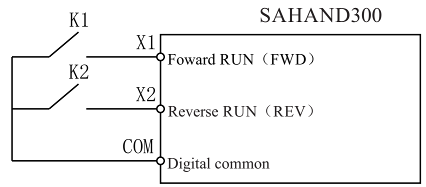
P4-12	Terminal command mode	Setting Range: 0～3	Default: 0

This parameter is used to set the mode in which the AC drive is controlled by external terminals.

0: Two-line mode 1

Integration of operation and direction. It is the most commonly used two-line mode, in which the forward/reverse rotation of the motor is decided by S1 and S2. The parameters are set as below:

K1	K2	RUN command
0	0	STOP
1	0	Foward RUN
0	1	Reverse RUN
1	1	STOP

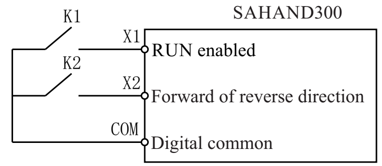


0：Setting of two-liner mode 1

1: Two-line mode 2

Separation of operation and direction. In this mode, S1 is RUN valid terminal, and S2 determines the running direction. The parameters are set as below:

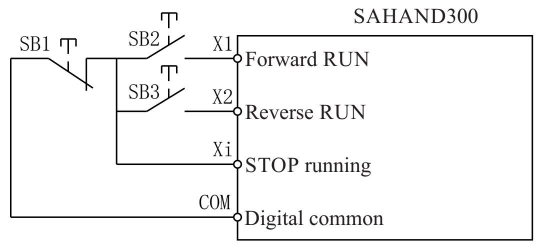
K1	K2	RUN command
0	0	STOP
1	0	Forward RUN
1	1	Reverse RUN
0	1	STOP



1：Setting of two-liner mode 2

2: Three-line mode 1

In this mode, Si is RUN valid terminal, and the direction is decided by S1 and s2. And both control the running direction at the same time.

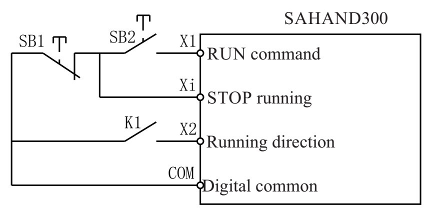


2：Setting of three-liner mode 1

3: Three-line mode 2

In this mode, Si is RUN valid terminal. The RUN command is given by S1 and the direction is decided by S2. The (SI) is valid input.

K1	RUN command
0	Forward RUN
1	Reverse RUN



3:Setting of three-liner mode 2

Tips: As shown in the preceding figure, if SB1 is ON, the AC drive instructs forward rotation when SB2 is pressed to be ON and instructs reverse rotation when SB3 is pressed to be ON.

P4-13	Terminal action mode selection	Setting Range: 000～111	Default: 111

The below status only valid under the situation that terminal control running [P0.02] set at "1" and is the two-wires system control method, means the [P2.12] set at "0" or "1". Must re-input running order again when at three-wires control method.

BIT 0: the terminal recover method of freely stop machine

0: recover the original order after invalid
1: not recover the original order after invalid
This function select is whether execute original running order when freely stop machine terminal at the terminal control running status and freely stop machine terminal change from valid to invalid.

BIT 1: Recover method of emergency stop terminal

0: recover the original order after broken
1: not recover the original order after broken
This function select is whether execute original running order when emergency stop machine terminal at the terminal control running status and emergency stop machine terminal change from valid to invalid.

BIT 2: The terminal running method select after failure reset

0: terminal control can directly start machine
1: terminal control stop machine first then can start machine

Note: When AC drive failure alarm, three set passageways which running order all can send valid reset signal to AC drive. If the AC drive currently use terminal control method and the AC drive reset after received the reset signal of terminal or other two passageway reset signal, can select whether execute terminal running orders immediately through this parameter.

P4-16	Terminal protection function selection	Setting Range: 00～11	Default: 00

The initial wiring status of periphery devices maybe affect the equipment safety when select at terminal running, this parameter provide protection actions for terminal running.

BIT 0: Terminal running order select when power on

Select execute running order method under the situation that terminal running signal valid and when AC drive power.
0: Terminal running order invalid when power on Terminal firstly stop machine then can start machine when power on.
1: Terminal running order valid when power on Terminal control can directly start machine when power on.

BIT 1: The terminal running order select when shift to terminal order through other order passageway

Select execute running order method under the situation that running order passageway shift to terminal order type when terminal running signal valid .
0: Terminal running order invalid when shifting Terminal control stop machine firstly then can start machine when shifting.
1: Terminal running order valid when shifting Terminal control can start machine directly when shifting.

P4-17	UP/DW frequency value	Setting Range: 0.000Hz～1.000Hz	Default: 0.010Hz

Storage position through UP/DW terminal modify value, the frequency value of this parameter+P0-08=actual output frequency, can select power off storage or not storage.

P4-18	UP/DW frequency adjustment select	Setting Range: 0～2	Default: 0

UP/DW terminal frequency adjustment select

0: Retentive at power failure

keep frequency record after power off or stop when power off stop machine storage UP/DW terminal adjustment. The AC drive process UP/DW adjustment running from the frequency at last time stop machine when next time power on running.

1: Non-retentive at power failure

Keep frequency record after stop machine when power off storage UP/DW terminal adjustment. The AC drive process UP/DW adjustment running from the frequency at last time stop machine when next time power on running. Not save record after power off, start running from 0.00Hz.

2: Valid operation, stop and reset

When stop machine and reset UP/DW terminal adjustment, not keep frequency record after power off or stop when stop machine and reset UP/DW terminal adjustment. The AC drive process UP/DW adjustment running from 0.00Hz frequency when next time running.

P4-19	UP/DW frequency increase/reduce speed	Setting Range: 0.1～100.0%	Default: 2.0%

Modify change speed ratio of set frequency when this function define the UP/DW terminal adjustment.

P4-20	Y1 terminal function	Setting Range: 0～39	Default: 1
P4-21	Y2 terminal function		Default: 2
P4-22	Y3 terminal function		Default: 3
P4-23	Y4 terminal function		Default: 6
P4-24	Y5 terminal function-Extension		Default: 0
P4-25	Y6 terminal function-Extension		Default: 0
P4-26	Y7 terminal function-Extension		Default: 0
P4-27	Y8 terminal function-Extension		Default: 0

Value	Function	Description
0	No Output	The output terminal has no function.
1	Forward RUN(FWD)	It indicates that the AC drive is in the state of FWD OR REV, and has output frequency(can be 0), at this time, it output "ON" signal.
2	Reverse RUN(REV)	
3	Fault output 1 (No action during self recovery	When the AC drive fails and stops, it will not action during self recovery, and will output "ON" signal after exceeding the self recovery times.

4	Fault alarm 2 (Action during self recovery	When the AC drive breaks down and stops, it will output terminal "ON" immediately.
5	Ready fo RUN	When the power supply of the main circuit and control circuit of the AC drive has been stable, and the AC drive has not detected any fault information, and the AC drive is in the operational state, it will output "ON" signal.
6	Frequency reached	Refer to P8-19 for instructions.
7	Frequency-level detection FDT1 output	Refer to P8-15, P8-16 for instructions.
8	Frequency-level detection FDT2 output	Refer to P8-17, P8-18 for instructions.
9	Frequency upper limit reached	When the AC drive operates at the upper limit fre-quency, it will output effective signal.
10	Frequency upper lower reached	When the AC drive operates at the lower limit fre-quency, it will output effective signal.
11	Current 1 reached	Refer to P8-20, P8-21 for instructions.
12	Current 2 reached	Refer to P8-22, P8-23 for instructions.
13	Zero current output	Refer to P8-24, P8-25 for instructions.
14	Output current out of limit	Refer to P8-26, P8-27 for instructions.
15	Torque limited	In the speed control mode, when the output torque reaches the limit value, the AC drive is in stall protection state and output "ON" signal at the same time.
16	OL1 motor overload pre-warning	Before the motor overload protection acts, it is judged according to the threshold value of overload pre-warning, and outputs "ON" signal after exceed-ing the pre-warning threshold. Motor overload para-meter setting parameter code P9-33.
17	OL2 AC drive overload pre-warning	10s before the overload protection of AC drive, the "ON" signal is output.
18	Zero-speed running (no output at stop)	Output frequency is 0.
19	Acceleration running	Frequency output increasing.
20	Deceleration running	Frequency output decreasing.
21	DC breaking	Output DC breaking
22	PLC step completed	When the end of a stage of program running, 500ms effective signal is output.
23	PLC cycle completed	When the end of a cycle of program running, 500ms effective signal is output.
24	Reserved	
25	Running time reached	When the starting operation time of AC drive exceeds the time set by P8-29,the "ON" signal is output.
26	Set count value reached	When the AC drive reaches the timing time, the port outputs an effective pulse signal with the width of 1 second. Refer to P8-30, P8-31 for instructions.
27	Maximum count value reached	When the count reaches the maximum value of P8-32, the terminal outputs a valid signal whose width is equal to external clock cycle, and the counter is cleared.

28	Set count value reached	When the count reaches the set value of P8-32, the terminal outputs a valid signal, the output valid signal is cancelled when the count is reset due to the counter is exceeding the maximum value of the counter.
29	AI1 input out of limit	When the value of AI1 is greater than P8-34 or less than P8-35, it output "ON" signal.
30	Model temperature reached	When the radiator temperature of AC drive module reaches the set value P8-36, it output "ON" signal.
31	Fan running	The AC drive outputs "ON" signal when the cooling fan is running.
32	Data output 1 from transfer(DO function)	BIT12 of communication output command 0X2000.
33	Data output 2 from transfer(DO function)	BIT13 of communication output command 0X2000.
34	Data output 1 from transfer(DO function)	BIT14 of communication output command 0X2000.
35	Data output 2 from transfer(DO function)	BIT15 of communication output command 0X2000.
36	Pump 1 start-up	When the multi pump control is effective, it is used as control signal of pump switching. See the multi pump control function description for details.
37	Pump 2 start-up	
38	Pump 3 start-up	
39	Pump 4 start-up	

5.6 P5: AI Terminal Parameters Group

P5-00	AI123 input signal selection	Setting Range: 0000～1110	Default: 0010

Can shift between the high resistance voltage signal and low resistance input current signal which is the input property at software setting AI joggle through this parameter, and shift of S8 terminal's HDI function.

BIT 0: Ai1 signal select
0: 0～10V

BIT 1: AI2 signal select
0: 0～10V 1: 0～20.00ma

BIT 2: S8 invalid HDI function 0: Common switch quantity function 1:HDI high speed pulse input function

BIT 3: AI3 signal select
0: 0～10V 1: 0～20.00ma

P5-01	AI1 input voltage minimum value	Setting Range: 0～10.00V	Default: 0.00V
P5-02	AI1 input voltage lower limit corresponding setting	Setting Range: 0.00～10.00%	Default: 0.00%
P5-03	AI1 input voltage maximum value	Setting Range: 0.00～10.00V	Default: 10.00V
P5-04	AI1 input voltage upper limit corresponding setting	Setting Range: 0.00～100.00%	Default: 100.00%
P5-05	AI1 filter time	Setting Range: 0.00～10.00S	Default: 0.10S

These parameters are used to define the relationship between the analog input voltage and the corresponding setting.

When the analog input voltage exceeds the maximum value (P5-03), the maximum value is used. When the analog input voltage is less than the minimum value (P5-01), the minimum value is used.

When the analog input is current input, 1 mA current corresponds to 0.5 V voltage. P5-05(AI1 filter time) is used to set the software filter time of AI1. If the analog input is liable to interference, increase the value of this parameter to stabilize the detected analog input. However, increase of the AI filter time will slow the response of analog detection. Set this parameter properly based on actual conditions.

In different applications, 100% of analog input corresponds to different nominal values. For details, refer to the description of different applications.

P5-06	AI2 input voltage minimum value	Setting Range: 0～10.00V	Default: 0.00V
P5-07	AI2 input voltage lower limit corresponding setting	Setting Range: 0.00～10.00%	Default: 0.00%
P5-08	AI2 input voltage maximum value	Setting Range: 0.00～10.00V	Default: 10.00V
P5-09	AI2 input voltage upper limit corresponding setting	Setting Range: 0.00～100.00%	Default: 100.00%
P5-10	AI2 filter time	Setting Range: 0.00～10.00S	Default: 0.10S

Please refer to the instructions of AI1 for the function and usage of AI2.

P5-11	AI3 input voltage minimum value	Setting Range: 0～10.00V	Default: 0.00V
P5-12	AI3 input voltage lower limit corresponding setting	Setting Range: 0.00～100.0%	Default: 0.00%
P5-13	AI3 input voltage maximum value	Setting Range: 0.00～10.00V	Default: 10.00V
P5-14	AI3 input voltage upper limit corresponding setting	Setting Range: 0.00～100.00%	Default: 100.00%
P5-15	AI3 filter time	Setting Range: 0.00～10.00S	Default: 0.10S

Please refer to the instructions of AI1 for the function and usage of AI3.

P5-16	HDI minimum input frequency	Setting Range: 0.00～50.00KHz	Default: 0.00KHz
P5-17	Corresponding setting of HDI minimum input frequency	Setting Range: 0.00～100.0%	Default: 0.00%
P5-18	HDI maximum input frequency	Setting Range: 0.00～50.00KHz	Default: 50.00KHz
P5-19	Corresponding setting of HDI maximum input frequency	Setting Range: 0.00～100.00%	Default: 100.00%
P5-20	HDI filter time	Setting Range: 0.00～10.00S	Default: 0.10S

These parameters are used to set the relationship between S8 pulse input and corresponding settings.

The pulses can only be input by S8.

The method of setting this function is similar to that of setting AI1 function.

P5-29	A01 output selection	Setting Range: 0～19	Default: 0
P5-30	A02 output selection		Default: 1
P5-31	HDO output selection		Default: 2

The output range of AO1 and AO2 is 0V～10 V or 0 mA～20 mA.

The output pulse frequency of the HDO terminal ranges from 0.01 kHz to 50.00 kHz.

The relationship between pulse and analog output ranges and corresponding functions is listed in the following table.

Value	Function	Description
0	Set frequency	0 to maximum output frequency
1	Output frequency	0 to maximum output frequency
2	Output current	0 to 2 times of rated motor current
3	Output voltage	0 to 1.2 times of rated AC drive voltage
4	Mechanical speed	0 to rotational speed corresponding to maximum output frequency

5	Set torque	0 to 2 times of rated motor torque
6	Output torque	0 to 2 times of rated motor torque
7	PID setting	The maximum output corresponds to 100% PID setting
8	PID feedback	The maximum output corresponds to 100% PID feedback
9	Output power	0 to 2 times of rated power
10	Bus voltage	Maximum output corresponds to 2 times of rated DC voltage of AC drive.
11	Input voltage	0 to 1.2 times of rated AC drive voltage
12	AI1 input value	Maximum output corresponding to AI1 upper limit value
13	AI2 input value	Maximum output corresponding to AI2 upper limit value
14	AI3 input value	Maximum output corresponding to AI3 upper limit value
15	PUL input value	Maximum output corresponding to PUL upper limit value
16	Module temperature	0-100℃
17	Motor temperature	The maximum output corresponds to a temperature of 100℃
18	Excitation quantity	Maximum output corresponds to 100% motor rated current
19	RS485 Communication setting	0.0% - 100.0%

P5-32	Analog quantity output signal select	Setting Range: 000～122	Default: 000

Can shift between the voltage signal and current signal output which is the input property at software setting analog quantity output joggle through this parameter, and HDO function shift of Y4 terminal.

P5-33	A01 output gain	Setting Range: 25.0%～200.0%	Default: 100.0%
P5-34	A01 offset coefficient	Setting Range: -10.0%～10.0%	Default: 0.0%
P5-35	A02 output gain	Setting Range: 25.0%～200.0%	Default: 100.0%
P5-36	A02 offset coefficient	Setting Range: -10.0%～10.0%	Default: 0.0%

These parameters are used to correct the zero drift of analog output and the output amplitude deviation. They can also be used to define the desired AO curve.

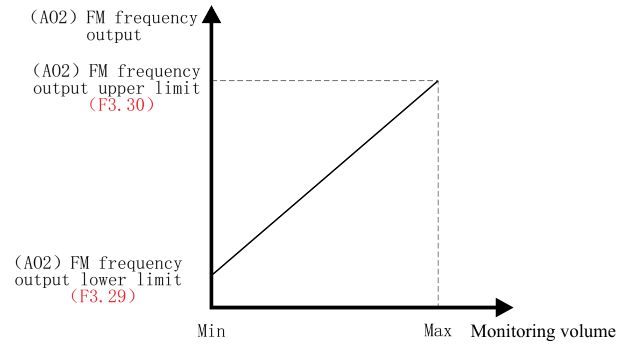
If "b" represents zero offset, "k" represents gain, "Y" represents actual output, and "X" represents standard output, the actual output is: $Y = kX + b$.

The zero offset coefficient 100% of AO1 and AO2 corresponds to 10 V (or 20 mA). The standard output refers to the value corresponding to the analog output of 0 to 10 V (or 0 to 20 mA) with no zero offset or gain adjustment.

For example, if the analog output is used as the running frequency, and it is expected that the output is 8 V when the frequency is 0 and 3 V at the maximum frequency, the gain shall be set to -0.50, and the zero offset shall be set to 80%.

P5-37	HDO pulse output lower limit	Setting Range: 0.00～50.00KHz	Default: 0.20KHz
P5-38	HDO pulse output upper limit	Setting Range: 0.00～50.00KHz	Default: 50.00KHz

Set the down limit and up limit frequency value of output signal when S8 at HDO frequency pulse output.



Setting of FM pulse frequency output

5.7 P6: Start/Stop Control Parameters Group

P6-00	Start Mode	Setting Range: 0～2	Default: 0

0: Start from start frequency

The AC drive control the AC drive start at P6-02 set start frequency and P6-02 set start frequency duration; suitable to the situation that bigger static rub torque and smaller loading inertia, or suitable when user matched outer mechanical brake equipment. Means the situation that motor shaft able to keep static after motor stopped and before start again.

1: Firstly DC retaining then start from start frequency

Firstly add a certain DC retaining energy(means electromagnetic brake gate)from the retaining current P6-05 before start and retaining time P6-06 before start, then start from the start frequency; suitable to the small inertia loading which stop machine status had corotation and reversal appearance.

2: Start again after speed tracing and direction judgement

The AC drive firstly check the speed and direction of motor, then running to set frequency start from the checked speed according to accelerate/decelerate time. It's speed trace method divided into interior speed trace and outer exterior speed trace, select through the shift terminal.

P6-01	Minimum startup frequency	Setting range: 0.00～P6-04	Default: 0.50Hz
P6-02	Startup pre-excited current	Setting range: 0～100%	Default: 30%
P6-03	Startup pre-excited time	Setting range: 0.00～60.00s	Default: Model dependent
P6-04	Startup frequency	Setting range: 0.00～60.00Hz	Default: 0.50Hz
P6-05	Startup frequency holding time	Setting range: 0.0～50.0s	Default: 0.0S
P6-06	Startup DC braking current	Setting range: 0～150%	Default: 0%
P6-07	Startup DC braking time	Setting range: 0.0～300.0s	Default: 0.0S

The lowest output frequency: This function defined as the min output frequency of AC drive, the AC drive output 0.00Hz when lower than this frequency.

Startup DC braking time: This parameter used to set the time of asynchronous motor pre-excitation when starting. This parameter can build magnetic field before motor start, able to effectively improve the start performance of motor, reduce the start current and start time.

Startup frequency: Means the initial output frequency when AC drive starting. Set the suitable start frequency can has higher start torque, can obtain some rush force for some loading with bigger static rub force under static status. But if too big set value, sometime will occur the failure appearance like output over current.

Startup frequency duration: Means the time that AC drive keep running under the start frequency.

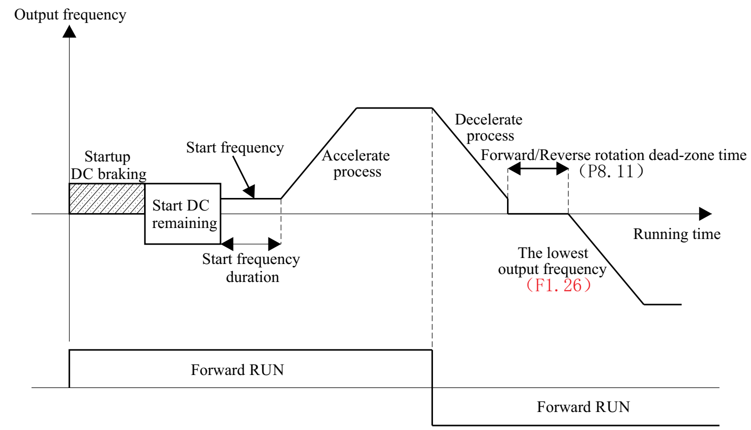
Startup pre-excited current：Means the size of retaining current which transferred into motor by AC drive when DC retaining. This value based on the output rated current of AC drive. Only has DC retaining function at starting when P6-00 select “1”.

Startup pre-excited time：Retaining time before start: means the duration of DC retain ing current when starting; only has DC retaining function when P6-00 select “1”; no DC retaining process when retaining time is 0.0s.

Note: The start frequency not limited by the down limit frequency P0-13, but limited by the min output frequency P6-01, if the set value lower than value of P6-01 then output frequency will be 0.00Hz.

Reminding: When the AC drive in the corotation and reversal under the normal running, and modify the frequency set value to process add or reduce speed running, all start at the min output frequency P6-01 or output 0.00Hz after reduced speed to the min output frequency P6-01.

Reminding: During the AC drive start to rises speed process, the AC drive output is 0 when set frequency less than start frequency.



Startup diagram

P6-08	Initial frequency of stop DC braking	Setting range: 0.00～50.00Hz	Default: 0.00Hz
P6-09	Stop DC braking current	Setting range: 0～150%	Default: 0%
P6-10	Waiting time of stop DC braking	Setting range: 0.00～60.00s	Default: 0.0s
P6-11	Stop DC braking holding time	Setting range: 0.00～600.00s	Default: 0.00s

Initial frequency of stop DC braking: means the AC drive will stop output when moderate to this frequency, start DC remaining function; when stop machine, start DC retaining function when output frequency less than the stop machine DC retaining start frequency. During the moderate stop machine process, start DC retaining when set frequency less than the stop machine DC retaining start frequency, the output frequency of AC drive jump change to be 0. If the running working situation no strict requirements of stop machine retaining, DC retaining start frequency when stop machine should set at smaller as possible.

Stop DC braking current: means the size of retaining current which transferred into motor by AC drive when DC retaining. This value based on the output rated current of AC drive. DC retaining function can provide zero torque moment. Generally, it used to improve the stop machine precision and realize quickly stop machine, but can’t be used at moderate retaining when normally running; once start DC retaining, the AC drive will stop output. If too big DC retaining current set, the AC drive easy to generate over current failure when stop machine.

Waiting time of stop DC braking: the waiting time that after AC drive moderate to stop machine DC retaining start frequency stop output, and start DC retaining.

Stop DC braking holding time: Stop machine DC retaining duration: means the time of DC retaining current when stop, no DC retaining process when the duration is 0.0s, means the DC retaining function invalid.

P6-12	Zero speed holding current	Setting Range: 0～150%	Default: 0%
P6-13	Acceleration mode selection	Setting range: 00～11	Default: 00
P6-14	S-curve acceleration start time	Setting range: 0.01～20.00s	Default: 0.50s
P6-15	S-curve acceleration end time		Default: 0.50s
P6-16	S-curve deceleration start time		Default: 0.50s
P6-17	S-curve deceleration end time		Default: 0.50s

Accelerate/decelerate select

BIT 0: accelerate/decelerate time base

This parameter used as the accordance of select accelerate/decelerate time.

0: The max frequency The base of accelerate/decelerate time is the max frequency P0-09.

1: Fix frequency The base of accelerate/decelerate time is the 50.00Hz fix frequency.

BIT 1:accelerate/decelerate method

SAHAND300 provides two types accelerate/decelerate method; the two accelerate/decelerate method all are valid during normally start, stop machine, corotation and reversal, accelerate and decelerate process.

0: Linear Generally, it's suitable to commonly used loading.

1: S curve S type accelerate and decelerate curve mainly provide for the loading like that need retard noise and vibration when at accelerate and decelerate, reduce the start-stop impact or low frequency need gradually reduce torque, high frequency need short time accelerate. If happen over current or overload failure when starting then please reduce the set value of P6-12.

BIT 2:Reserved

BIT 3:Reserved

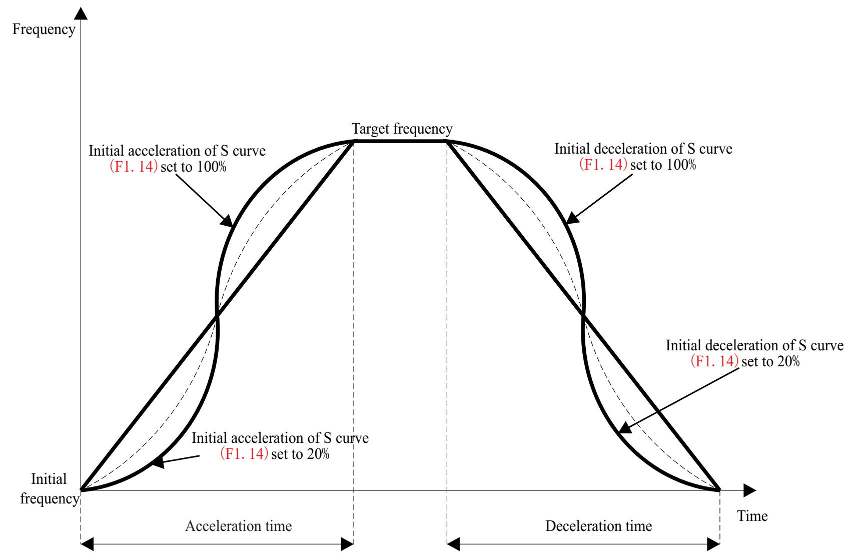
Accelerate start S word time: the frequency gradually rise speed ratio when accelerate process start.

Accelerate finish S word time: the frequency gradually rise speed ratio when accelerate process finish.

Decelerate start S word time: the frequency gradually reduce speed ratio when decelerate process start.

Decelerate finish S word time: the frequency gradually reduce speed ratio when decelerate process finish.

More bigger S word time set then more bending of S curve during the accelerate process, oppositely, S curve more close to the straight line. Can increase the S word time to make accelerate and decelerate curve more soft.



S-curve acceleration/deceleration

P6-18	Rotational speed tracking mode	Setting Range: 0～2	Default: 0

To complete the rotational speed tracking process within the shortest time, select the proper mode in which the AC drive tracks the motor rotational speed.

0: From frequency at stop

It is the commonly selected mode.

1: From zero frequency

It is applicable to restart after a long time of power failure.

2: From the maximum frequency

It is applicable to the power-generating load.

P6-19	Rotational speed tracking waiting time	Setting Range: 0.0～600.0s	Default: 1.0s

The interval between receiving start command and executing speed tracking.

P6-20	Rotational speed tracking speed	Setting Range: 0～100	Default: 20

In the rotational speed tracking restart mode, select the rotational speed tracking speed. The larger the value is, the faster the tracking is. However, too large value may cause unreliable tracking.

5.8 P7: System Configuration Parameter Group

P7-00	Parameter and key lock selection	Setting Range: 0000～1003	Default: 0000

0: Unlock

Parameter and key lock function invalid

1: Function parameter lock

Lock all set value of function parameter, forbid to modify the parameters. Need input password when unlock, the password set by P7-01.

2: Function parameter and key lock(except FWD/STOP/JOG/PRG)

Lock all set value of all function parameter, forbid to modify the parameters; at the same time, lock all keys on the keyboard except FWD/STOP/JOG/PRG. Means only can process start/stop operation on AC drive through keyboard. Need input password when unlock, the password set by P7-01.

3: Function parameter and key all locked

Lock all set value of function parameters, at the same time, lock all keys on the keyboard except PRG. Can’t process any operation on AC drive through keyboard. Need input password when unlock, the password set by P7-01.

Note: when P7-01 set as “2” or “3” function, press down “PRG” key on keyboard then automatically enter into password input interface, input the correct password then can enter into function parameter interface.

P7-01	User Password	Setting Range: 0～65535	Default: 0

Used to set user password

When the parameter and key lock select [F4.00] at lock status (not at “0”), must input this password then can unlock. The default password of leave factory is 0, please safe keep the set well password.

P7-02	Function range of keyboard " STOP " key	Setting Range: 000～111	Default: 000

BIT0: terminal control select

0: invalid to terminal order

Keyboard stop key “STOP” can’t be as stop machine key to stop machine when give running signal at terminal.

1: valid to terminal order

Keyboard stop key “STOP” can be as stop machine key to stop machine when give running signal at terminal.

BIT1: communication control select

0: invalid to communication order

Keyboard stop key “STOP” can’t be as stop machine key to stop machine when give running signal at communication.

1: valid to communication order

Keyboard stop key “STOP” can be as stop machine key to stop machine when give running signal at communication.

BIT2: expanding card control select

0: invalid to expanding card order

Keyboard stop key “STOP” can’t be as stop machine key to stop machine when give running signal at expanding card.

1: valid to expanding card order

Keyboard stop key “STOP” can be as stop machine key to stop machine when give running signal at expanding card.

BIT 3:Reserved

Note: if select valid to terminal control or communication control method then AC drive be at stop machine lock status when at terminal control or communication control and after press down the keyboard stop key stop machine. Now, if want to make AC drive run again, must use the selected running order passageway issue stop machine order, then can make AC drive run again after release the lock status.

P7-03	keyboard fly shuttle key modify the selection	Setting Range: 00～17	Default: 01

BIT0: panel number potential device setting select

0: Invalid
1: Main frequency
2: Auxiliary frequency Source Y
3: Up limit frequency
4: V/F separated voltage
5: PID Setting
6: PID Feedback
7: Torque setting

BIT1:

0: directly valid after knob modified
1: press “Enter” key valid after knob modified

P7-04	Function parameter copy	Setting Range: 0～2	Default: 0

Set function parameter copy, the parameter automatically change to be “0” after finish copy.

0: No operation

1: AC drive parameter value transmit to keyboard and save

Cop the F0 to Fd parameters group in the AC drive to the keyboard and storage.

2: Transmit the keyboard saved parameter value to AC drive

Download the copied data which in the keyboard to AC drive.

Note: will remind error when software version not compatible, unable to transmit the saved parameter value in the keyboard to AC drive.

P7-05	Display speed factor	Setting Range: 0.001～50.000	Default: 1.000

If the load speed indicate coefficient P7-05 as 2.000, the load speed is: 40.00*2.000=80.00 when the running frequency of AC drive is 40.00Hz.

P7-06	First line run display	Setting range: 0000～FFFF	Default:6321
P7-07	First line stop display		Default:CA40

The indicate content under the first row running status of keyboard: the circling monitor content of first row when set the running status of keyboard, can modify the monitor content through keyboard “< >” key when at running status, circulating between the unit of LED and LED thousand digit, jump one item each one time press the key. No power off memory function after circulating monitor parameter modified, default indicate the unit of LED setting value after power on.

The indicate content under the first row stop status of keyboard: the circling monitor content of first row when set the stop status of keyboard, can modify the monitor content through keyboard "< >" key when at stop status, circulating between the unit of LED and LED thousand digit, jump one item each one time press the key. No power off memory function after circulating monitor parameter modified, default indicate the unit of LED setting value after power on.

The set content from the BIT 0 of LED to BIT 3 of LED as below:

BIT0: The first group displays
BIT1: The second group displays
BIT2: The third group displays
BIT3: The fourth group displays

0: Given frequency	1: Output frequency	2: Output current
3: Output voltage	4: Input voltage	5: Machanical speed
6: Bus voltage	7: Output power	8: Given torque
9: Output torque	A: PID setting	B: PID feedback
C: AI1 input value	D: AI2 input value	E: HDI input value
F: Counter value		

P7-08	Second line run display	Setting range: 0000～FFFF	Default: 0792
P7-09	Second line stop display		Default: 0CA4

Only valid at double rows keyboard, the detail instruction refer to the parameter P4-06～P4-07.

P7-10	Multiple function expanding card selection	Setting Range: 0～8	Default: 0

SAHAND300 can support multiple expanding card application to meet the application of field special requirements.

P7-11	Operation panel display item selection	Setting Range: 0000～F011	Default: 8001

BIT0:LCD keyboard indicate language
Set liquid crystal keyboard language, only valid when use the liquid crystal keyboard.
0:None
1:English
BIT1:output frequency indicate select
0: Target frequency
Indicate the target frequency of currently controlled motor.
1: Syn frequency
Indicate the output frequency after AC drive calculated.

BIT2: Reserved

BIT3: LCD Contrast Adjustment
0～F : The larger the contrast value

P7-12	Accumulative power-on days	Setting range: 0～65535	Default: Ready-only
P7-13	Accumulative power-on hours	Setting range: 0.0～6553.5	Default: Ready-only

It is used to display the accumulative power-on time of the AC drive since the delivery.

P7-14	Accumulative running days	Setting range: 0～65535	Default: Ready-only
P7-15	Accumulative running hours	Setting range: 0.0～6553.5	Default: Ready-only

It is used to display the accumulative running time of the AC drive since the delivery.

P7-16	Accumulative power consumption(10000 kWh)	Setting range: 0～65535	Default: Ready-only
P7-17	Accumulative power consumption(kWh)	Setting range: 0.0～65535	Default: Ready-only

It is used to display the accumulative power consumption of the AC drive until now.

P7-18	AC drive status before power off	Setting range: 0000～FFFF	Default: Ready-only

BIT0: 0:STOP 1:RUN
BIT1: 0:FOWARD RUN 1:REVERSE RUN
BIT2: Reserved
BIT3: Reserved

5.9 P8: Auxiliary Functions

P8-00	Forward JOG running frequency(FJOG)	Setting range: 0～Maximum frequency	Default: 5.00Hz
P8-01	Reverse JOG running frequency(RJOG)	Setting range: 0～Maximum frequency	Default: 5.00Hz
P8-02	JOG acceleration time	Setting range: 0.0～6500.0s	Default: 10.0s
P8-03	JOG deceleration time	Setting range: 0.0～6500.0s	Default: 10.0s

These parameters are used to define the set frequency and acceleration/deceleration time of the AC drive when jogging. The start-up mode is "Direct start" and the stop mode is "Decelerate to stop" (P0-18) during jogging.

P8-04	Acceleration time 2	Setting range: 0.1～6500.0s	Default: 10.0s
P8-05	Deceleration time 2		Default: 10.0s
P8-06	Acceleration time 3		Default: 10.0s
P8-07	Deceleration time 3		Default: 10.0s
P8-08	Acceleration time 4		Default: 10.0s
P8-09	Deceleration time 4		Default: 10.0s

The SAHAND300 provides a total of four groups of acceleration/deceleration time, that is, the preceding three groups and the group defined by P0-15 and P0-16. Definitions of four groups are completely the same, You can switch over between the four groups of acceleration/deceleration time through different state combinations of DI terminals. For more details, see the descriptions of P4-00 to P4-07.

P8-10	Emergency stop deceleration time	Setting Range: 0.1～6500.0s	Default: 10.0s

Used to set the moderate time when emergency stop. The definition of emergency stop time same to the accelerate and decelerate time.

Emergency stop can trigger valid by “Emergency stop terminal”, the details check parameter P4-00～P4-07. After release emergency stop order and terminal control two wire system running, whether execute original running order decided b the LED decade set value of parameter P4-13, the details check parameter P4-13.

P8-11	Forward/Reverse rotation dead-zone time	Setting Range: 0.0～150.0s	Default: 0.0s

It is used to set the time when the output is 0 Hz at transition of the AC drive forward rotation and reverse rotation, as shown in the following figure.
Figure 6-15 Forward/Reverse rotation dead-zone time

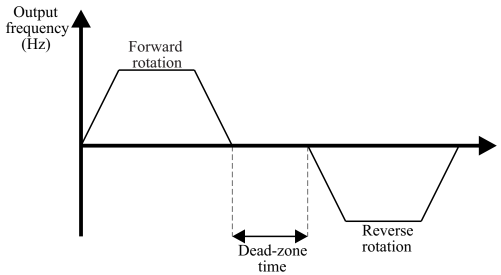


Figure 6-15 Forward/Reverse rotation Dead-zone time

P8-12	Jump frequency 1	Setting range: 0～Maximum frequency	Default: 0.00Hz
P8-13	Jump frequency 2	Setting range: 0～Maximum frequency	Default: 0.00Hz
P8-14	Frequency jump amplitude	Setting range: 0～Maximum frequency	Default: 0.00Hz

When set frequency in the jump frequency range, the actual running frequency will running at the jump frequency which more clear to the set frequency. Through set jump frequency can make the AC drive avoid the mechanical resonate points of load. Can set two jump frequency points, if make the two jump frequency set as 0 then jump frequency function canceled. The principle diagram of jump frequency and jump frequency range please refer to the picture 6-14.

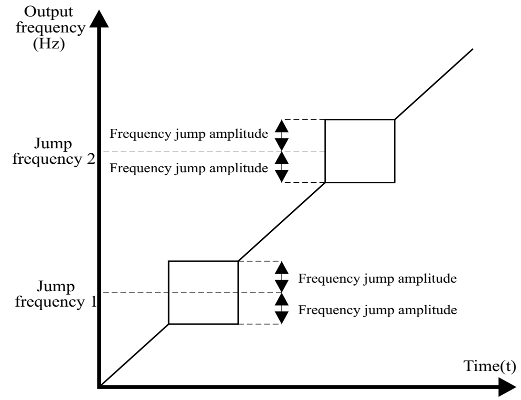


Figure 6-14 Principle of the jump frequencies and jump amplitude

P8-15	Frequency detection value (FDT1)	Setting range: 0.00～50.00Hz	Default: 30.0Hz
P8-16	Detection range of FDT1		Default: 0.00Hz
P8-17	Frequency detection value (FDT2)		Default: 50.00Hz
P8-18	Detection range of FDT2		Default: 0.00Hz

Parameters used in set frequency test level, the output frequency level test 1/2 (FDT1/2) terminal’s output signal when output frequency arrive or higher than the P8-15/ P8-17 setting value and after pass through parameter P8-16/ P8-18 setting delay frequency. Stop output signal when output frequency arrive or higher than the P8-15/ P8-17 setting value and after pass through parameter P8-16/ P8-18 setting delay frequency.

P8-19	Detection range of frequency consistent	Setting Range: 0.00～50.00Hz	Default: 3.00Hz

It is used to set the time when the output is 0 Hz at transition of the AC drive forward rotation and reverse rotation, as shown in the following figure.
Figure 6-15 Forward/Reverse rotation dead-zone time

P8-20	Current reaching 1 detection value	Setting Range: 0～200.0%	Default: 100.0%
P8-21	Current reaching 1 detection range	Setting Range: 0～100.0%	Default: 5.0%

P8-22	Current reaching 2 detection value	Setting Range: 0～200.0%	Default: 150.0%
P8-23	Current reaching 2 detection range	Setting Range: 0～100.0%	Default: 5.0%

If the output current of the AC drive is within the positive and negative amplitudes of any current reaching detection value, the corresponding DO becomes ON. The SAHAND300 provides two groups of any current reaching detection parameters, including current detection value and detection amplitudes, as shown in the following figure.

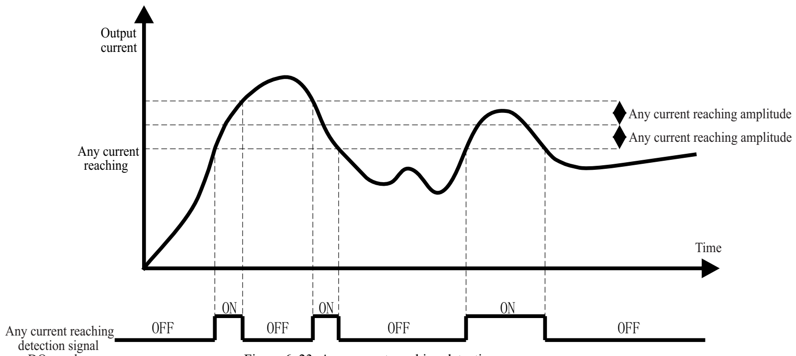


Figure 6-23 Any current reaching detection

P8-24	Zero current detection level	Setting Range: 0～200.0%	Default: 5.0%
P8-25	Zero current detection delay time	Setting Range: 0.0～650.00s	Default: 0.20s

If the output current of the AC drive is equal to or less than the zero current detection level and the duration exceeds the zero current detection delay time, the corresponding DO becomes ON. The zero current detection is shown in the following figure.
Figure 6-21 Zero current detection

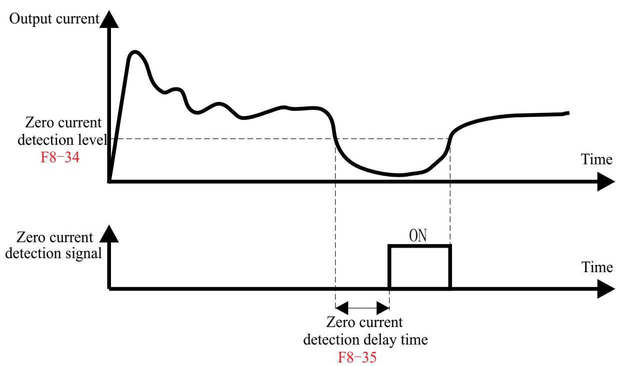


Figure 6-21 Zero current detection

P8-26	Output over-current threshold	Setting Range: 0.0%～200.0%	Default: 100.0%
P8-27	Output over-current detection delay time	Setting Range: 0.0s～650.00s	Default: 0.20s

If the output current of the AC drive is equal to or higher than the over-current threshold and the duration exceeds the detection delay time, the corresponding DO becomes ON. The output over-current detection function is shown in the following figure.
Figure 6-22 Output over-current detection

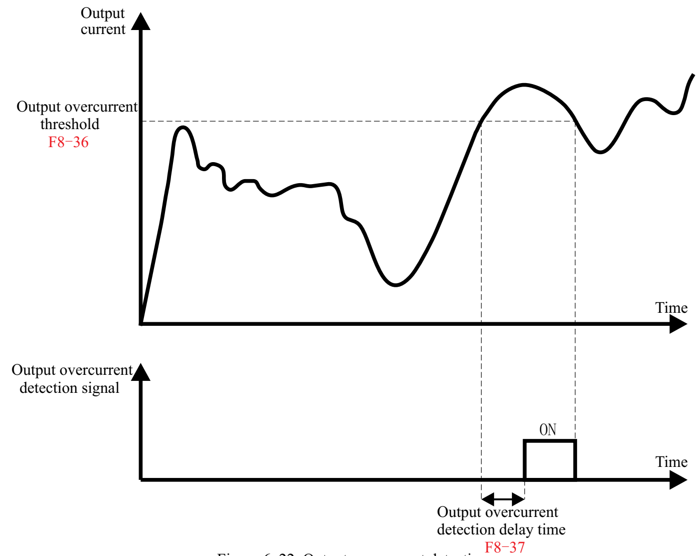


Figure 6-22 Output overcurrent detection

P8-28	Timing operation function	Setting Range: 00～31	Default: 00
P8-29	Timing duration setting	Setting Range: 0.0～6500.0Min	Default: 0.0Min

These parameters are used to implement the AC drive timing function.

If P8-28 is set to 1, the AC drive starts to time at startup. When the set timing duration is reached, the AC drive stops automatically and meanwhile the corresponding DO becomes ON.

The AC drive starts timing from 0 each time it starts up and the remaining timing duration can be queried by U0-20. The timing duration is set in unit of minute.

P8-30	Timer time unit	Setting Range: 0～2	Default: 0
P8-31	Timer set value	Setting Range: 0～65000	Default: 0

Timer' s time unit: this function used to set the timing time unit of AC drive timer.

0: Second

The time unit of timer timing is second

1: Minute

The time unit of timer timing is minute

2: Hour

The time unit of timer timing is hour

Timer setting value:

This parameter used in set the timing time of AC drive. The start of timer finished by the outer timer trigger terminal of timer (trigger terminal selected by P4-00～P4.07), start timing from that received the outer trigger signal, after the timing time arrived, output the pulse signal with width 1s by the corresponding output terminal (output terminal selected by P4-21～P4-28). If the outer trigger signal always be at triggering status, then the corresponding output terminal output pulse signal one time each at set time of each P8-31. The timer keep current timing value when trigger terminal invalid, continue accumulate timing after trigger terminal valid. Timer reset terminal can reset the timing value anytime.

P8-32	Counter Max	Setting Range: 0～65000	Default: 1000
P8-33	Counter set value	Setting Range: 0～65000	Default: 500

This parameter stipulate the counting action in the interior timer, the timing o' clock input terminal of timer selected by parameter P4-00～P4.07.

The max value of timer: when the counting vale of outer O' clock of timer reach up to the value which stipulated by parameter P8-32, output a section width equal to outer O' clock period valid signal by the corresponding output terminal(output terminal selected by P4-21～P4-28). Means when the next one counting signal input then the output terminal stop output valid signal.

The set value of timer: when the counting vale of outer O' clock of timer reach up to the value which stipulated by parameter P8-33. When the corresponding output terminal (output terminal selected by P4-21～P4-28) output valid signal, continue counting till exceed the the value which stipulated by parameter P8-32, this output valid signal cancel when caused timer reset.

The timer' s counting value all can reset it' s counting value through multiple function input terminal P4-00～P4.07 set timer reset terminal at anytime.

Required the O' clock period of timer bigger than 10ms, the min pulse width 5ms.

P8-34	AI1 voltage protection value lower limit	Setting Range: 0.00～6.80V	Default: 3.10V
P8-35	AI1 voltage protection value upper limit	Setting Range: 3.10～10.00V	Default: 6.80V

These two parameters are used to set the limits of the input voltage to provide protection on the AC drive. When the AI1 input is larger than the value of P8-35 or smaller than the value of P8-34, the corresponding DO becomes ON, indicating that AI1 input exceeds the limit.

P8-36	Module temperature reached	Setting Range: 0～100	Default: 75

When the radiator temperature of the AC drive reaches the value of this parameter, the corresponding DO becomes ON, indicating that the module temperature reaches the threshold.

5.10 P9: Fault and Protection Parameters Group

P9-00	Protection function selection 1	Setting range: 0000～1111	Default: 1111

BIT 0: Motor overload protection selection

0:The motor overload protective function is valid. The motor is exposed to potential damage due to overheating. A thermal relay is suggested to be installed between the AC drive and the motor.

1:The AC drive judges whether the motor is overloaded according to the inverse time lag curve of the motor overload protection. Set P9-32 properly based on the actual overload capacity. If the value of F9-01 is set too large, damage to the motor may result because the motor overheats but the AC drive does not report the alarm.

BIT 1: Short-circuit to ground upon power-on

It is used to determine whether to check the motor is short-circuited to ground at power-on of the AC drive. If this function is valid, the AC drive's UVW will have voltage output a while after power-on.

BIT 2: Input phase loss protection/contactor energizing protection selection

0: invalid 1: valid

It is used to determine whether to perform input phase loss or contactor energizing protection.

BIT 3: Output phase loss protection selection

0: invalid 1: valid

It is used to determine whether to perform output phase loss protection.

P9-01	Protection function selection 2	Setting range: 000～422	Default: 000

BIT 0: Output load loss protection selection

0: Invalid 1:Deceleration 2:Ramp to stop

BIT 1: Instantaneous power failure action selection

0: Invalid 1: Valid 2:Reserved

Upon instantaneous power failure or sudden voltage dip, the DC bus voltage of the AC drive reduces. This function invalids the AC drive to compensate the DC bus voltage reduction with the load feedback energy by reducing the output frequency so as to keep the AC drive running continuously.

BIT 2: Continue operation frequency selection in case of failure.

0: Current running frequency
1: Set frequency
2: Frequency upper limit
3: Frequency lower limit
4: Backup frequency upon abnormality

P9-02	Fault auto reset times	Setting range: 0～20	Default: 0

It is used to set the times of fault auto resets if this function is used. After the value is exceeded, the AC drive will remain in the fault state.

P9-03	Time interval of fault auto reset	Setting range: 0.1～100.0s	Default: 1.0s

It is used to set the waiting time from the alarm of the AC drive to fault auto reset.

P9-04	1st fault type	Setting Range: 0～65535	Default: ready-only
P9-05	2nd fault type		Default: ready-only
P9-06	3rd fault type		Default: ready-only

It is used to record the types of the most recent three faults of the AC drive. 0 indicates no fault. For possible causes and solution of each fault, refer to the troubleshooting section for instructions.

P9-07	Failure operation frequency	Setting Range: 0.0～655.35Hz	Default: ready-only

It displays the frequency when the latest fault occurs.

P9-08	Failure output current	Setting Range: 0.0～655.35A	Default: ready-only

It displays the current when the latest fault occurs.

P9-09	Failure DC-bus voltage	Setting Range: 0～65535V	Default: ready-only

It displays the bus voltage when the latest fault occurs.

P9-11	Failure S terminal status	Setting Range: 0～65535	Default: ready-only

It displays the status of all DI terminals when the latest fault occurs.
The sequence is as follows:

BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
DI0	DI9	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1

If a DI is ON, the setting is 1. If the DI is OFF, the setting is 0. The value is the equivalent decimal number converted from the DI status.

P9-12	Failure Y terminal status	Setting Range: 0～65535	Default: ready-only

It displays the status of all output terminals when the latest fault occurs.
The sequence is as follows:

BIT4	BIT3	BIT2	BIT1	BIT0
DO2	DO1	REL2	REL1	FMP

If an output terminal is ON, the setting is 1.If the output terminal is OFF, the setting is 0.The value is the equivalent decimal number converted from the DI statuses.

P9-13	Failure power on time	Setting Range: 0～65535	Default: ready-only

Power-on time upon 3rd fault

P9-14	Failure running time	Setting Range: 0～65535	Default: ready-only

It displays the present running time when the latest fault occurs.

P9-15	Frequency upon 2nd fault	Setting Range: 0～655.35Hz	Default: Ready-only
P9-16	Current upon 2nd fault	Setting Range: 0～655.35A	Default: Ready-only
P9-17	Output voltage upon 2nd fault	Setting Range: 0～65535V	Default: Ready-only

P9-18	AC drive status upon 2nd fault	Setting Range: 0～65535	Default: Ready-only
P9-19	S terminal status upon 2nd fault	Setting Range: 0～65535	Default: Ready-only
P9-20	Y terminal status upon 2nd fault	Setting Range: 0～65535	Default: Ready-only
P9-21	Power-on time upon 2nd fault	Setting Range: 0～65535	Default: Ready-only
P9-22	Running time upon 2nd fault	Setting Range: 0～65535	Default: Ready-only
P9-23	Frequency upon 3rd fault	Setting Range: 0～655.35Hz	Default: Ready-only
P9-24	Current upon 3rd fault	Setting Range: 0～655.35A	Default: Ready-only
P9-25	Output voltage upon 3rd fault	Setting Range: 0～65535V	Default: Ready-only
P9-26	AC drive status upon 3rd fault	Setting Range: 0～65535	Default: Ready-only
P9-27	S terminal status upon 3rd fault	Setting Range: 0～65535	Default: Ready-only
P9-28	Y terminal status upon 3rd fault	Setting Range: 0～65535	Default: Ready-only
P9-29	Power-on time upon 3rd fault	Setting Range: 0～65535	Default: Ready-only
P9-30	Running time upon 3rd fault	Setting Range: 0～65535	Default: Ready-only

P9-31	Backup frequency upon abnormality	Setting Range: 0.0～100.0%	Default: 100.0%

If a fault occurs during the running of the AC drive and the handling of fault is set to "Continue to run", the AC drive displays A** and continues to run at the frequency set in P9-31. The setting of F9-55 is a percentage relative to the maximum frequency.

P9-32	Motor overload protection gain	Setting Range: 0.20～10.00	Default: 1.00

P9-32=Overload ratio*Overload time/2.2 (Overload time: Minute)
For example, when the motor operates at 1.5 times of rated current, the AC drive is required to report the motor overload fault within 1 minute, then P9-32=1.5×1/2.2=0.68.

P9-33	Motor overload warning coefficient	Setting Range: 50%～100%	Default: 90%

This function is used to give a warning signal to the control system via DO before motor overload protection. This parameter is used to determine the percentage, at which pre-warning is performed before motor overload. The larger the value is, the less advanced the pre-warning will be.

When the accumulative output current of the AC drive is greater than the value of the overload inverse time-lag curve multiplied by P9-33, the DO terminal on the AC drive allocated with function " Motor overload pre-warning " becomes ON.

P9-34	Recognize voltage at instantaneous stop action	Setting Range: 0～100%	Default: 80%
P9-35	Recognize voltage at instantaneous stop pause	Setting Range: 0～100%	Default: 80%

P9-36	Recognize time at instantaneous rise action	Setting Range: 0.00～100.00s	Default: 0.50s
P9-37	Instantaneous stop deceleration time	Setting Range: 0～200%	Default: 100%

Upon instantaneous power failure or sudden voltage dip, the DC bus voltage of the AC drive reduces. This function invalids the AC drive to compensate the DC bus voltage reduction with the load feedback energy by reducing the output frequency so as to keep the AC drive running continuously.

If P9-01=1, upon instantaneous power failure or sudden voltage dip, the AC drive decelerates. Once the bus voltage resumes to normal, the AC drive accelerates to the set frequency. If the bus voltage remains normal for the time exceeding the value set in P9-36, it is considered that the bus voltage resumes to normal.

If P9-01=2, upon instantaneous power failure or sudden voltage dip, the AC drive decelerates to stop.

Action judging voltage at instantaneous power failure: The larger the setting is, the faster the deceleration time is, and the more energy the load feeds back in unit time.

If F9-59=2, upon instantaneous power failure or sudden voltage dip, the AC drive decelerates to stop.

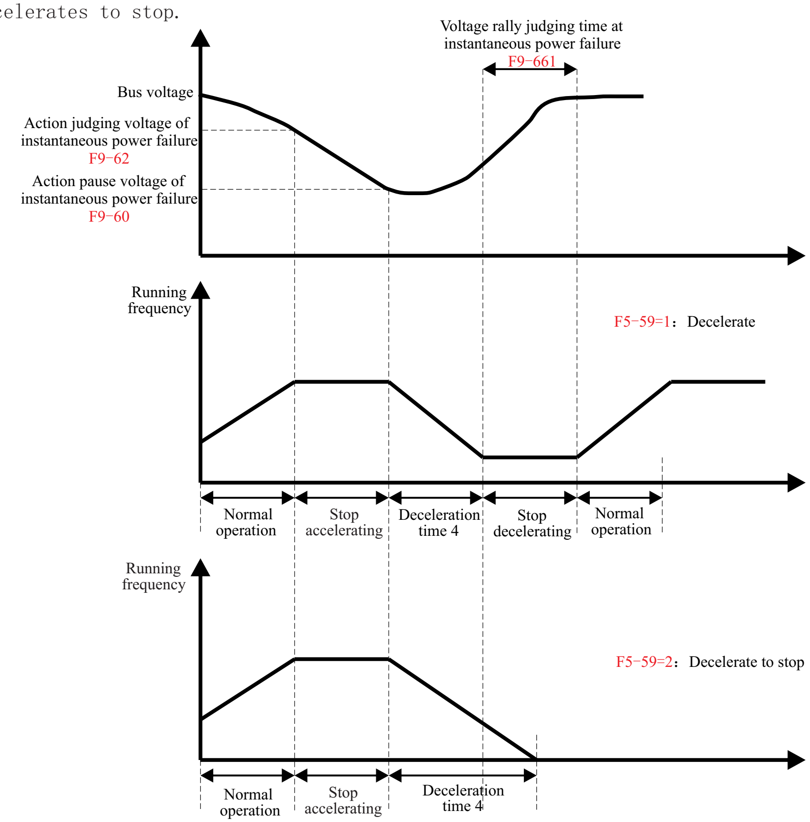


Figure 6-25 Instantaneous power failure

P9-40	Deceleration level of load becoming 0	Setting Range: 0.0～100.0%	Default: 10.0%
P9-41	Deceleration time of load becoming 0	Setting Range: 0.0～60.0s	Default: 1.0s

If protection upon load becoming 0 is valid, when the output current of the AC drive is lower than the detection level (P9-38) and the lasting time exceeds the detection time (P9-39), the output frequency of the AC drive automatically declines to 7% of the rated frequency. During the protection, the AC drive automatically accelerates to the set frequency if the load resumes to normal.

P9-42	Over-speed detection value	Setting Range: 0.0～50.0%	Default: 20.0%
P9-43	Over-speed detection time	Setting Range: 0.0～60.0s	Default: 1.0s

This function is valid only when the AC drive runs in the CLVC mode.

If the actual motor rotational speed detected by the AC drive exceeds the maximum frequency and the excessive value is greater than the value of P9-40 and the lasting time exceeds the value of P9-41, the AC drive reports Err43 and acts according to the selected fault protection action.

If the over-speed detection time is 0.0s, the over-speed detection function is valid.

P9-44	Detection value of too large speed deviation	Setting Range: 0.0～50.0%	Default: 20.0%
P9-45	Detection time of too large speed deviation	Setting Range: 0.0～60.0s	Default: 5.0s

This function is valid only when the AC drive runs in the CLVC mode.

If the AC drive detects the deviation between the actual motor rotational speed detected by the AC drive and the set frequency is greater than the value of P9-42 and the lasting time exceeds the value of P9-43, the AC drive reports Err42 and according to the selected fault protection action.

If P9-43 (Detection time of too large speed deviation) is 0.0s, this function is valid.

P9-46	Overvoltage stall gain	Setting Range: 0～100	Default: 0
P9-47	Overvoltage stall protective voltage	Setting Range: 120%～150%	Default: 130%

When the DC bus voltage exceeds the value of P9-45 (Overvoltage stall protective voltage) during deceleration of the AC drive, the AC drive stops deceleration and keeps the present running frequency. After the bus voltage declines, the AC drive continues to decelerate.

P9-44 (Overvoltage stall gain) is used to adjust the overvoltage suppression capacity of the AC drive. The larger the value is, the greater the overvoltage suppression capacity will be.

P9-48	Overcurrent stall gain	Setting Range: 0～100	Default: 20
P9-49	Overcurrent stall protective current	Setting Range: 100%～200%	Default: 150%

When the output current exceeds the overcurrent stall protective current during acceleration/deceleration of the AC drive, the AC drive stops acceleration/deceleration and keeps the present running frequency. After the output current declines, the AC drive continues to accelerate/decelerate. See Figure 6-24 for details.

P9-47(Overcurrent stall protective current):Select the current protection point of overcurrent stall function. Beyond this parameter, the AC drive starts to perform the overcurrent stall protection current function. This value is a percentage of the rated current of the motor.

P9-46 (Overcurrent stall gain) is used to adjust the overcurrent suppression capacity of the AC drive. The larger the value is, the greater the overcurrent suppression capacity will be. In the prerequisite of no overcurrent occurrence, set tF9-05 to a small value.

For small-inertia load, the value should be small. Otherwise, the system dynamic response will be slow. For large-inertia load, the value should be large. Otherwise, the suppression result will be poor and overcurrent fault may occur.

If the overcurrent stall gain is set to 0, the overcurrent stall function is valid.

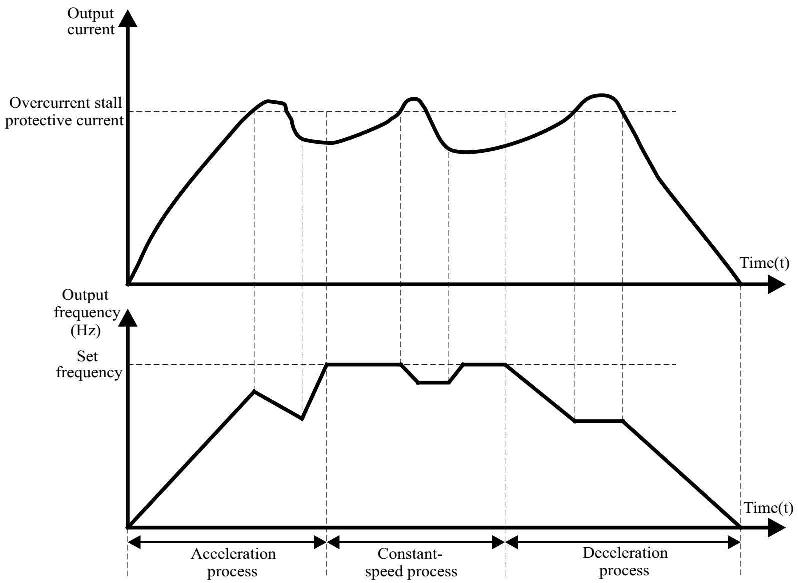


Figure 6-24 Diagram of the overcurrent stall protection function

P9-50	Input phase loss protection level	Setting Range: 0～100%	Default: 20%
P9-51	Input phase loss protection delay	Setting Range: 2.0～250.0s	Default: 8.0s

Through software measure the DC bus line wave situation to judge whether it is the status that input lack phase, judge these two function code of the machine invalid through the hardware. When bus line verification wave value reach up to P9-48 and time exceed P9-49, judge it as input lack phase. Under the motor unloading or stop status, because too small loading, the input lack phase judgement will not be triggered.

P9-52	Protection action selection 1	Setting Range: 0000～2222	Default: 0000

BIT 0：(Motor overload, Err11)
0：Coast to stop
1：Stop according to the stop mode
2：Continue to run
BIT 1: (Power input phase loss, Err12)
Same as BIT 0
BIT 2: (Power output phase loss, Err13)
Same as BIT 0
BIT 3: (External equipment fault, Err15)
Same as BIT 0

P9-53	Protection action selection 2	Setting Range: 0000～2122	Default: 0000

BIT 0：(Communication fault, Err16)
Same as BIT 0 in P9-52
BIT 1: (Encoder fault, Err20)
0: Coast to stop
1: Switch over to V/F control, stop according to the stop mode
2: Switch over to V/F control, continue to run
BIT 2: (EEPROM read-write fault, Err21)
0: Coast to stop
1: Stop according to the stop mode
BIT 3: (Motor overheat, Err25)
Same as BIT 0

P9-54	Protection action selection 3	Setting Range: 0000～2222	Default: 0000

BIT 0：(Communication fault, Err16)
Same as BIT 0 in P9-52
BIT 1: (Encoder fault, Err20)
0: Coast to stop
1: Switch over to V/F control, stop according to the stop mode
2: Switch over to V/F control, continue to run
BIT 2: (EEPROM read-write fault, Err21)
0: Coast to stop
1: Stop according to the stop mode
BIT 3: (Motor overheat, Err25)
Same as BIT 0

P9-55	Protection action selection 4	Setting Range: 0000～2222	Default: 0000

BIT 0：(PID feedback lost during running, Err31)
Same as BIT 0 in P9-52
BIT 1: (Too large speed deviation, Err42)
Same as BIT 0
BIT 2: (Motor over-speed, Err43)
Same as BIT 0
BIT 3: (Initial position fault, Err51)
Same as BIT 0

P9-56	Protection action selection 5	Setting Range: 0～2	Default: 0

Speed feedback fault, Err52

Same as BIT 0 in P9-52

5.11 PA: Process Control PID Function

PID control is a general process control method. By performing proportional, integral and differential operations on the difference between the feedback signal and the target signal, it adjusts the output frequency and constitutes a feedback system to stabilize the controlled counter around the target value.

It is applied to process control such as flow control, pressure control and temperature control. The following figure shows the principle block diagram of PID control.

Figure 6-26 Principle block diagram of PID control

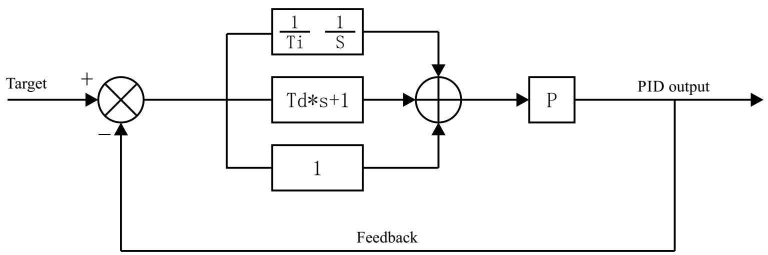


Figure 6-26 Principle blcok diagram of PID control

PA-00	PID setting source	Setting Range: 0～8	Default: 0
PA-01	PID digital setting	Setting Range: 0.00～1.00Mpa	Default: 0.5Mpa

PA-00 is used to select the channel of target process PID setting.

The PID setting is a relative value and ranges from 0.0% to 100.0%. The PID feedback is also a relative value. The purpose of PID control is to make the PID setting and PID feedback equal.

PA-02	PID feedback source	Setting Range: 0～8	Default: 2
PA-03	PID digital feedback	Setting Range: 0.00～1.00Mpa	Default: 1.00Mpa

This parameter is used to select the feedback signal channel of process PID.

The PID feedback is a relative value and ranges from 0.0% to 100.0%.

PA-04	Feedback signal gain	Setting Range: 0.00～10.000	Default: 1.000

This function is used to amplify or reduce the input signal of the feedback channel.

PA-05	Feedback signal range	Setting Range: 0～655.35	Default: 1.00

This function used to correct PID give quantity and indicate data of PID feedback quantity.

Example when at pressure control and set at the max pressure of sensor then indicate value is the pressure actual value.

Suppose use the outer voltage terminal (VS1) as the feedback signal input passageway, the down limit voltage is 0.5V when set (VS1) up limit voltage at 9V; current feedback voltage value is 4.5V, the max measure range of sensor is 30mpa.

Digit pipe indicate value=(4.5-0.5)×20/(9-0.5) = 9.4mpa

PA-06	PID control selection 1	Setting Range: 0000～1211	Default: 0000

BIT 0:Feedback feature selection

0: Forward action: When the feedback value is smaller than the PID setting, the AC drive's output frequency rises. For example, the winding tension control requires forward PID action.

1: Reverse action: When the feedback value is smaller than the PID setting, the AC drive's output frequency reduces. For example, the unwinding tension control requires reverse PID action.

Note that this function is influenced by the DI function 35 "Reverse PID action direction".

BIT 1:PID parameter switchover condition

0: Invalid 1: Valid

If it is set to valid, , the PID integral operation stops when the DI allocated with function 22 "PID integral pause" is ON In this case, only proportional and differential operations take effect.

If it is set to invalid, integral separated remains invalid no matter whether the DI allocated with function 22 "PID integral pause" is ON or not.

BIT 2:Integral separated

0: No switchover

1: Switchover via DI

2: Automatic switchover based on deviation

The switchover can be implemented either via a DI terminal or automatically implemented based on the deviation.

If you select switchover via a DI terminal, the DI must be allocated with function 27 "PID parameter switchover". If the DI is OFF, group 1 (PA-08 to PA-10) is selected. If the DI is ON, group 2 (PA-18 to PA-20) is selected.

BIT 3:Whether to stop integral operation when the output reaches the limit

0: Continue integral operation

1: Stop integral operation

If "Stop integral operation" is selected, the PID integral operation stops, which may help to reduce the PID overshoot.

PA-07	PID control selection 2	Setting Range: 00～11	Default: 00

BIT 0:PID shutdown operation

0: Shutdown without calculation

1: Operation when shutdown

It is used to select whether to continue PID operation in the state of stop. Generally, the PID operation stops when the AC drive stops.

BIT 1:Constant pressure water supply sleep function

0: Invalid 1: Valid

PA-08	Proportional gain Kp1	Setting Range: 0.00～100.00	Default: 20.00
PA-09	Integral time Ti1	Setting Range: 0.00～10.00s	Default: 2.00s
PA-10	Differential time Td1	Setting Range: 0.00～10.000s	Default: 0.000s

Proportional gain Kp1

It decides the regulating intensity of the PID regulator. The higher the Kp1 is, the larger the regulating intensity is. The value 100.0 indicates when the deviation between PID feedback and PID setting is 100.0%, the adjustment amplitude of the PID regulator on the output frequency reference is the maximum frequency.

Integral time Ti1

It decides the integral regulating intensity. The shorter the integral time is, the larger the regulating intensity is. When the deviation between PID feedback and PID setting is 100.0%, the integral regulator performs continuous adjustment for the time set in FA06. Then the adjustment amplitude reaches the maximum frequency.

Differential time Td1

It decides the regulating intensity of the PID regulator on the deviation change. The longer the differential time is, the larger the regulating intensity is. Differential time is the time within which the feedback value change reaches 100.0%, and then the adjustment amplitude reaches the maximum frequency.

PA-11	Cut-off frequency of PID reverse rotation	Setting Range: 0.00～Maximum frequency	Default: 2.00Hz

In some situations, only when the PID output frequency is a negative value (AC drive reverse rotation), PID setting and PID feedback can be equal. However, too high reverse rotation frequency is prohibited in some applications, and PA-11 is used to determine the reverse rotation frequency upper limit.

PA-12	PID deviation limit	Setting Range: 0.0～100.0%	Default: 0.0%

If the deviation between PID feedback and PID setting is smaller than the value of PA-12, PID control stops. The small deviation between PID feedback and PID setting will make the output frequency stabilize, effective for some closed-loop control applications.

PA-13	PID differential limit	Setting Range: 0.00～100.00%	Default: 0.10%

It is used to set the PID differential output range. In PID control, the differential operation may easily cause system oscillation. Thus, the PID differential regulation is restricted to a small range.

PA-14	PID setting change time	Setting Range: 0.00～10.00s	Default: 0.00s

The PID setting change time indicates the time required for PID setting changing from 0.0% to 100.0%.

PA-15	PID feedback filter time	Setting Range: 0.00～650.00s	Default: 0.00s
PA-16	PID output filter time	Setting Range: 0.00～60.00s	Default: 0.00s

PA-15 is used to filter the PID feedback, helping to reduce interference on the feedback but slowing the response of the process closed-loop system. PA-16 is used to filter the PID output frequency, helping to weaken sudden change of the AC drive output frequency but slowing the response of the process closed-loop system.

PA-17	Reserved	-	-
PA-18	Proportional gain Kp2	Setting Range: 0.00～100.00	Default: 20.00
PA-19	Integral time Ti2	Setting Range: 0.00～10.00s	Default: 2.00s
PA-20	Differential time Td2	Setting Range: 0.000～10.000s	Default: 0.000s
PA-21	PID parameter switchover deviation 1	Setting Range: 0.0%～PA-22	Default: 20.0%
PA-22	PID parameter switchover deviation 2	Setting Range: PA-21～100.0%	Default: 80.0%

In some applications, PID parameters switchover is required when one group of PID parameters cannot satisfy the requirement of the whole running process.

These parameters are used for switchover between two groups of PID parameters.

Regulator parameters PA-19 to PA-20 are set in the same way as PA-08 to PA-10.

If the BIT 0 in PA-05 is selected as automatic switchover, when the absolute value of the deviation between PID feedback and PID setting is smaller than the value of PA-21, group 1 is selected. When the absolute value of the deviation between PID feedback and PID setting is higher than the value of PA-22, group 2 is selected. When the deviation is between PA-21 and PA-22, the PID parameters are the linear interpolated value of the two groups of parameter values.

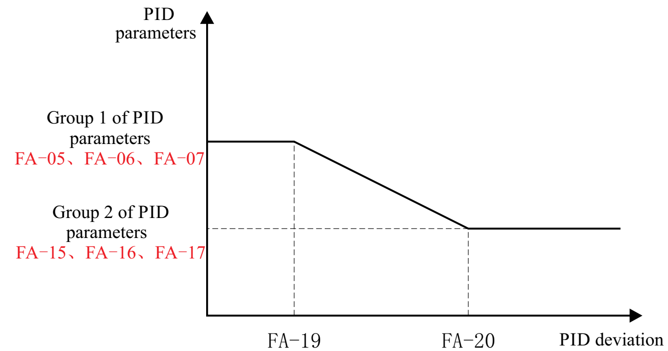


Figure 6-27 PID parameters switchover

PA-23	PID initial value	Setting Range: 0.00～100.0%	Default: 0.0%
PA-24	PID initial value running time	Setting Range: 0.0～6500.0s	Default: 0.0s

When the AC drive starts up, the PID starts closed-loop algorithm only after the PID output is fixed to the PID initial value (PA-23) and lasts the time set in PA-24.

Figure 6-28 PID initial value function

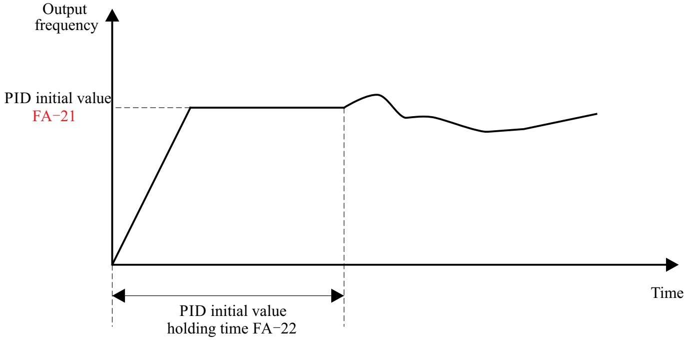


Figure 6-28 PID initial value function

PA-25	Maximum deviation between two PID outputs in forward direction	Setting Range: 0.00%～100.00%	Default: 1.00%
PA-26	Maximum deviation between two PID outputs in reverse direction	Setting Range: 0.00%～100.00%	Default: 1.00%

This function is used to limit the deviation between two PID outputs (2 ms per PID output) to suppress the rapid change of PID output and stabilize the running of the AC drive.

PA-25 and PA-26 respectively correspond to the maximum absolute value of the output deviation in forward direction and in reverse direction.

PA-27	Detection value of disconnection alarm	Setting Range: 0.0～100.0%	Default: 0.0%
PA-28	Feedback disconnection detection time	Setting Range: 0.0～120.0%	Default: 1.0%

This function code used to judge whether PID feedback loss.

When PID feedback quantity less than feedback loss test value FA-26 and after the duration exceed PID feedback loss test time FA-27, the AC drive alarm failure Err31, and handle according to the selected failure handle method.

PA-29	Dormant judge benchmark	Setting Range: 0.1～100.0%	Default: 95.0%
PA-30	Dormant base duration	Setting Range: 0.1～6500.0s	Default: 30.0s

PA-07 decade's dormant function valid, if (feedback value > give value * PA-29) then start dormant judge and time exceed PA-30 then start reduce frequency to PA-32

PA-31	Enter dormant deceleration time	Setting Range: 0.1～6500.0s	Default: 60.0s

Set the moderate time when AC drive reduce frequency during the dormant sense process.

PA-32	Sleep low holding frequency	Setting Range: 0.00～20.00Hz	Default: 10.00Hz

Set the keep time when AC drive at low position during the dormant sense process.

PA-33	Low frequency operation time	Setting Range: 0.0～6500.0s	Default: 10.0s

Enter into dormant status if output frequency<=PA-32 and time and time exceed PA-33 then output 0 frequency and enter into dormant status.

PA-34	Wake up base	Setting Range: 0.1～100.0%	Default: 50.0%
PA-35	Wake up base duration	Setting Range: 0.0～6500.0s	Default: 30.0s

When (feedback value < give value*PA-34) then start wake up judgement, if time exceed PA-35 then withdraw the dormant status.

5.12 Group PB: Communication Control Function Parameter Group

PB-00	Master and slave selection	Setting Range: 0～1	Default: 0

Select the AC drive as the master or slave in Modbus Communication. For details of Modbus communication, please refer to Appendix II (RS485 communication protocol).

0: Slave

The AC drive as sub machine, the communication address set by parameter PB-01. Now the AC drive accept the order of main machine on communication internet, and whether reply data according to parameter PB-01 set select writing operation, the delay time of reply order set by the parameter PB-05.

1: Master

The AC drive as main machine, transmit the main machine data to communication internet through broadcast order, all sub machine all accept the main machine order. The main machine transmit data set by parameter PB-09.

PB-01	Local address	Setting Range: 1～247	Default: 1

This parameter define the communication address when this machine as sub machine. If this machine as main machine, this parameter nonsense. 0 is the broadcast address.

PB-02	Baud rate selection	Setting Range: 0～7	Default: 3

Set the baud rate for communication. If the baud rate settings are different, communication will not be possible.

0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps
4: 19200bps 5: 38400bps 6: 57600bps 7: 115200bps

PB-03	Date format	Setting Range: 0～5	Default: 3

0: (N, 8, 1)No check,data format:8,stop bit:1
1: (E, 8, 1)Even parity check,data format:8,stop bit:1
2: (O, 8, 1)Odd Parity check,data format:8,stop bit:1
3: (N, 8, 2)No check,data format:8,stop bit:2
4: (E, 8, 2)Even parity check,data format:8,stop bit:2
5: (O, 8, 2)Odd Parity check,data format:8,stop bit:2

PB-04	Communication proportion setting	Setting Range: 0.000～5.000	Default: 1.000

The communication instructions sent by the upper computer are multiplied by this parameter as the communication given value or feedback value of the machine. The communication instructions of the upper computer can be modified in proportion.

PB-05	Response delay	Setting Range: 0.000～0.500s	Default: 0.000s

It refers to the intermediate interval between the end of data acceptance of the AC drive and the sending of data to the upper computer. If the response delay is less than the system processing time, the response delay shall be subject to the system processing time. If the response delay is longer than the system processing time, the system shall delay waiting after data processing, and send data to the upper computer until the response delay time is up.

PB-06	Communication timeout	Setting Range: 0.1～100.0s	Default: 1.0s

If the interval between the first communication and the next communication exceeds the communication timeout, the communication is considered to be broken, and BIT 0 in P9-51 determines the action mode of fault disconnection.

PB-07	Transmit response handle	Setting Range: 0～1	Default: 0

This parameter select whether AC drive responding when host computer send write operation order to AC drive. If host computer need AC drive reply information, the AC drive will time sharing occupy communication bus line, when do communication control, the host computer need keep enough time to reply information to AC drive. If needn’t AC drive reply information, only send order to AC drive, can select write operation without responding to improve the utilize efficiency of communication bus line. This parameter only valid to write operation, no affection to read operation.

0: Write operation has responding
1: Write operation no responding

PB-08	Master send selection	Setting Range: 0000～AAAA	Default: 0031

The data which send to sub machine when set the AC drive as communication main machine. Now the main machine AC drive send broadcast order, all sub machine will received the main machine sent orders, The main machine max send 4 frame data through circle inquiry method, respectively corresponding the set value of unit of LED, decade, hundred digit and thousand digit. Not send data when set as invalid.

BIT 0: the first group send frame selection
0:Invalid
1:Operating order given
2:Main machine given frequency
3:Main machine output frequency
4:Main machine up limit frequency
5:Main machine given torque(Keep)
6:Main machine output torque
7:Main machine torque control corotation speed limit(Keep)
8:Main machine torque control reversal speed limit(Keep)
9:Main machine given PID
A:Main machine feedback PID

BIT 1: the second group send frame selection
Same as above

BIT 2: the third group send frame selection
Same as above

BIT 3: the fourth group send frame selection
Same as above

5.13 Group PC: Optimization parameters

PC-00	Carriage frequency characteristic select	Setting Range: 000～A11	Default: 000

BIT 1:
0:Fix carriage frequency
1:the carriage frequency adjust along with the temperature

The carriage frequency adjust along with the temperature, means the AC drive measure the heat radiation self temperature more higher then automatically reduce the carriage wave frequency, convenient for reduce the rise temperature of AC drive. When radiator temperature a little lower, carriage frequency gradually recover to set value. This function able to reduce the overheat alarm of AC drive.

BIT 1:
0: Asynchronous modulation
1: Synchronous modulation

This parameter is valid only for V/F control.
Synchronous modulation indicates that the carrier frequency varies linearly with the change of the output frequency, ensuring that the ratio of carrier frequency to output frequency remains unchanged. Synchronous modulation is generally used at high output frequency, which helps improve the output voltage quality.

At low output frequency (100 Hz or lower), synchronous modulation is not required. This is because asynchronous modulation is preferred when the ratio of carrier frequency to output frequency is high.

Synchronous modulation takes effect only when the running frequency is higher than 85 Hz.If the frequency is lower than 85 Hz, asynchronous modulation is always used.

BIT 2:
0: Random PWM invalid
1～A:Random PWM depth
The setting of random PWM depth can make the shrill motor noise softer and reduce the electromagnetic interference. If this parameter is set to 0, random PWM is invalid.
BIT 3:reserved

PC-01	DPWM switchover frequency upper limit	Setting Range: 0.00～15.00Hz	Default: 12.00Hz

It is used to determine the wave modulation mode in V/F control of asynchronous motor. If the frequency is lower than the value of this parameter, the waveform is 7-segment continuous modulation. If the frequency is higher than the value of this parameter, the waveform is 5-segment intermittent modulation.
The 7-segment continuous modulation causes more loss to switches of the AC drive but smaller current ripple. The 5-segment intermittent modulation causes less loss to switches of the AC drive but larger current ripple. This may lead to motor running instability at high frequency. Do not modify this parameter generally.

PC-02	Cooling fan control	Setting Range: 0～A	Default: 0

It is used to set the working mode of the cooling fan. If this parameter is set to 0, the fan works when the AC drive is in running state. When the AC drive stops, the cooling fan works if the heat-sink temperature is higher than 40° C, and stops working if the heat-sink temperature is lower than 40° C.If this parameter is set to 1, the cooling fan keeps working after power-on.

PC-03	Rapid current limit	Setting Range: 0～1	Default: 1

The rapid current limit function can reduce the AC drive's over-current faults at maximum, guaranteeing uninterrupted running of the AC drive.
However, long-time rapid current limit may cause the AC drive to overheat, which is not allowed. In this case, the AC drive will report Err40, indicating the AC drive is overloaded and needs to stop.

PC-04	Dead zone compensation mode	Setting Range: 0～2	Default: 1

Generally, you need not modify this parameter. Try to use a different compensation mode only when there is special requirement on the output voltage waveform quality or oscillation occurs on the motor.

PC-05	Dynamic braking turn-on voltage	Setting Range: 200.0～2000.0V	Default: 690.0V

It is used to set the AC drive current detection compensation. Too large value may lead to deterioration of control performance. Do not modify it generally.

PC-06	Energy consumption braking action voltage	Setting Range: 0～100%	Default: 100%
PC-07	Overvoltage threshold	Setting Range: 0～2500.0V	Default: 810.0V

It is used to set the overvoltage threshold of the AC drive. The default values of different voltage classes are listed in the following table:

Voltage Class	Factory Value of Overvoltage point
Single-phase 220 V	400V
Three-phase 220 V	400V
Three-phase 380 V	810V
Three-phase 480 V	890V

PC-08	Undervoltage threshold	Setting Range: 200.0～2000.0V	Default: 350.0V

It is used to set the undervoltage threshold of Err09. The undervoltage threshold 100% of the AC drive of different voltage classes corresponds to different nominal values, as listed in the following table.

Voltage Class	Factory Value of Overvoltage point
Single-phase 220 V	200V
Three-phase 220 V	200V
Three-phase 380 V	350V
Three-phase 480 V	450V

PC-09	Solution of undervoltage fault	Setting Range: 0～2	Default: 0
PC-10	Allowable time of undervoltage recovery	Setting Range: 0.1～60.0s	Default: 2.0s

Set the handle method when happen lack voltage situation
0:Failure
1:If the voltage recover normal value when in lack voltage recover allowable time PC-10 then continue operating
2:Continue running after power supply recover to be normal

PC-11	Restart method after power failure	Setting Range: 0～1	Default: 0
PC-12	The waiting time of restart after power off	Setting Range: 0.00～120.0s	Default: 3.00s

The action selection of restart after power off:
0:Invalid
The AC drive power on after power off must running after received the running order. When at keyboard running control, RS485 communication control or select purchase card running, if AC drive occur power off then automatically clean the running order.
When outer terminal control running, if AC drive occur power off, execute running order according to [F1.31] set value after power on again.

1: Valid

If before power supply cut off and AC drive be at running status, then after recover the power supply and set waiting time(set by PC-12), the AC drive will automatically start. The AC drive not accept running order within the waiting time of power off and start again, but if input stop machine order during this period then AC drive release re-start status.

Note: power off and restart function can make the AC drive automatic start running after recover supply power. So, this major fortuity, please carefully adopt for human body and equipment safety.Power off and restart waiting time: when PC-11 set as valid, after AC drive power supply power on, will start running after waited the PC-12 set time. The set principle of this time mainly based on the factors that other equipment working recover preparation time relate to AC drive after recover power supply.

Power off and restart waiting time: when PC-11 set as valid, after AC drive power supply power on, will start running after waited the PC-12 set time. The set principle of this time mainly based on the factors that other equipment working recover preparation time relate to AC drive after recover power supply.

5.14 Group PD: Multi-Reference and Simple PLC Function

PD-00	Multi-band frequency 1	Setting Range: 0～100.0%	Default: 20.0%
PD-01	Multi-band frequency 2		Default: 40.0%
PD-02	Multi-band frequency 3		Default: 60.0%
PD-03	Multi-band frequency 4		Default: 80.0%
PD-04	Multi-band frequency 5		Default: 100.0%
PD-05	Multi-band frequency 6		Default: 80.0%
PD-06	Multi-band frequency 7		Default: 60.0%
PD-07	Multi-band frequency 8		Default: 40.0%
PD-08	Multi-band frequency 9		Default: 20.0%
PD-09	Multi-band frequency 10		Default: 40.0%
PD-10	Multi-band frequency 11		Default: 60.0%
PD-11	Multi-band frequency 12		Default: 80.0%
PD-12	Multi-band frequency 13		Default: 100.0%
PD-13	Multi-band frequency 14		Default: 80.0%
PD-14	Multi-band frequency 15		Default: 60.0%

The SAHAND300 multi-reference has many functions. Besides multi-speed, it can be used as the setting source of the V/F separated voltage source and setting source of process PID. In addition, the multi-reference is relative value.

Multi-reference can be the setting source of frequency, V/F separated voltage and process PID. The multi-reference is relative value and ranges from -100.0% to 100.0%.

As frequency source, it is a percentage relative to the maximum frequency. As V/F separated voltage source, it is a percentage relative to the rated motor voltage. As process PID setting source, it does not require conversion. Multi-reference can be switched over based on different states of DI terminals. For details, see the descriptions of group P4.

PD-15	PLC running mode selection	Setting Range: 0000～2122	Default: 0000

It is used to select the PLC running mode controlled by the program.

BIT 0:Circulation mode

0: Stop after the AC drive runs one cycle

After receiving the operation instruction, the AC drive starts to run from the first section of speed, and the time unit is set by the BIT 1 of PD-15; the operation time is set by the parameter PD-16～30; the operation direction and acceleration/deceleration time are selected by the parameter PD-31～45; when the operation time arrives, it will move to the next section of speed, and the operation time, direction and acceleration / deceleration time of each section of speed can be set separately; after the operation of the 15th section of speed Frequency converter output "0".If a phase runs at zero time,the run-time skips that phase.

1:Repeat after the AC drive runs one cycle

After the 15th speed of the AC drive, return to the 1st speed and start the operation again. The time unit is set by the BIT 1 of PD-15; the operation time is set by the parameters PD-16～30; the operation direction and acceleration/deceleration time are selected by the parameters PD-31～45.

2:Keep final values after the AC drive runs one cycle

The AC drive will not stop after running a single cycle, and will continue to run at the speed of the last stage with the running time not zero. The time unit is set by the BIT 1 of PD-15; the operation time is set by the parameters PD-16～30; the operation direction and acceleration/deceleration time are selected by the parameters PD-31～45.

BIT 1: Timing unit: used to set the time unit of timing when the program is running.

0:Second 1:Minute 2:Hour

BIT 2: PLC retentive selection mode

0：No storage 1：storage

This parameter is defined as whether to store the current status of program operation (number of operation stages, remaining time of this stage, acceleration and deceleration, operation direction, etc.) after power failure of AC drive when program operation is selected. If the power-off storage is selected, the BIT 4 parameter of PD-15 can be used to define the recovery mode of program operation after the next power on. If you want to ensure that the inverter can continue the state before power failure after the restoration of instantaneous power failure, you should set this parameter to "1".

BIT 3:Start mode

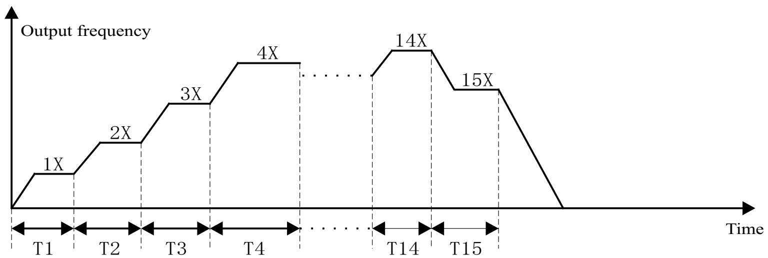
This parameter defines the operation mode when the program is started again after interruption due to various reasons (shutdown, fault, power failure, etc.).

Select "0" mode and the AC drive will restart at the first speed.

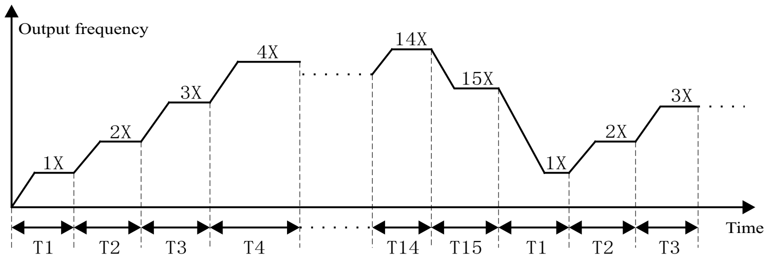
Select "1" mode and the AC drive will interrupt the instantaneous operation phase and run again.

Select "1" mode and the AC drive will run at the operation stage of the interruption moment according to the remaining time of the interruption moment.

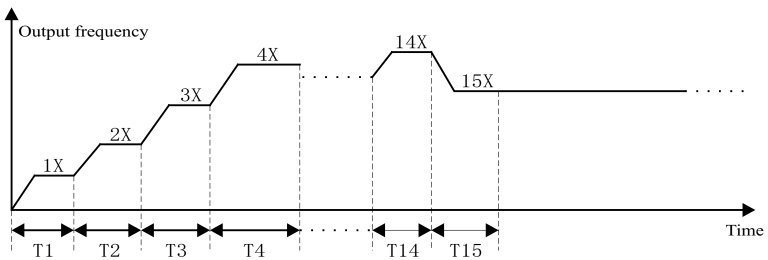
Note: The output frequency of the program is limited by the upper and lower frequency. When the given frequency is less than the lower limit frequency, press [F0.13] lower limit frequency operation mode to operate.



Single cycle diagram of program operation



Single cycle diagram of program operation



Single cycle diagram of program operation

PD-16	Running time of PLC reference 1	Setting Range: 0.0～6500.0(s/m/h)	Default: 10.0s
PD-17	Running time of PLC reference 2		
PD-18	Running time of PLC reference 3		
PD-19	Running time of PLC reference 4		
PD-20	Running time of PLC reference 5		
PD-21	Running time of PLC reference 6		
PD-22	Running time of PLC reference 7		
PD-23	Running time of PLC reference 8		
PD-24	Running time of PLC reference 9		

PD-25	Running time of PLC reference 10	Setting Range: 0.0～6500.0(s/m/h)	Default: 10.0s
PD-26	Running time of PLC reference 11		
PD-27	Running time of PLC reference 12		
PD-28	Running time of PLC reference 13		
PD-29	Running time of PLC reference 14		
PD-30	Running time of PLC reference 15		

Set the running time of PLC reference 15, and the time unit is determined by the setting value of [FC.15] BIT 1.

PD-31	PLC1 direction and acceleration/deceleration	Setting Range: 00～31	Default: 00
PD-32	PLC2 direction and acceleration/deceleration		
PD-33	PLC3 direction and acceleration/deceleration		
PD-34	PLC4 direction and acceleration/deceleration		
PD-35	PLC5 direction and acceleration/deceleration		
PD-36	PLC6 direction and acceleration/deceleration		
PD-37	PLC7 direction and acceleration/deceleration		
PD-38	PLC8 direction and acceleration/deceleration		
PD-39	PLC9 direction and acceleration/deceleration		
PD-40	PLC10 direction and acceleration/deceleration		
PD-41	PLC11 direction and acceleration/deceleration		
PD-42	PLC12 direction and acceleration/deceleration		
PD-43	PLC13 direction and acceleration/deceleration		
PD-44	PLC14 direction and acceleration/deceleration		
PD-45	PLC15 direction and acceleration/deceleration		

When the program is running, set the running direction and acceleration/deceleration time of PLC reference 15 .

BIT 0: Operation direction of this section

0: forward 1: reverse

BIT 1: Acceleration and deceleration time of this section

0: acceleration and deceleration time 1
1: acceleration and deceleration time 2
2: acceleration and deceleration time 3
3: acceleration and deceleration time 4

BIT 2: Reserved

BIT 3: Reserved

PD-46	Swing frequency control	Setting Range: 000 ~ 111	Default: 000

BIT 0: Swing frequency control

This parameter defines whether to use the swing frequency function.

0: Invalid swing frequency control 1: Valid swing frequency control

BIT 1: Swing frequency input method

The swing frequency action's input method when this parameter define swing frequency control.

0:Automatically input

Firstly running according to swing frequency preset frequency PD-47 after started, the time confirmed by the preset duration PD-48, then automatically enter into swing frequency running.

1:Manual input

Firstly running according to swing frequency preset frequency PD-47 after started, enter into swing frequency status when multiple function terminal swing frequency input terminal valid; withdraw the swing frequency status when invalid, running frequency keep at swing frequency preset frequency and running

BIT 2: Swing frequency setting mode

0:Variable swing frequency
1:Fixed swing frequency

This parameter is used to select the base value of the swing amplitude.

0: Relative to the central frequency (P0-07 frequency source selection),it is variable swing amplitude system. The swing amplitude varies with the central frequency (set frequency).

1: Relative to the maximum frequency (F0-10 maximum output frequency),it is fixed swing amplitude system. The swing amplitude is fixed.

PD-47	Preset frequency of swing frequency	Setting Range: 0.00 ~ Maximum Frequency	Default: 0.00Hz

Used to define the AC drive's running frequency before enter into swing frequency running.

PD-48	Preset frequency duration	Setting Range: 0.00 ~ 650.00s	Default: 0.00s

Used to define the swing frequency preset frequency duration before swing frequency running, invalid when swing frequency manually input.

PD-49	Swing frequency amplitude	Setting Range: 0.0% ~ 100.0%	Default: 0.0%

This parameter is used to determine the swing amplitude.

Variable swing frequency :AW=central frequency*PD-49
Fixed swing frequency:AW=maximum frequency*P0-10*PD-49

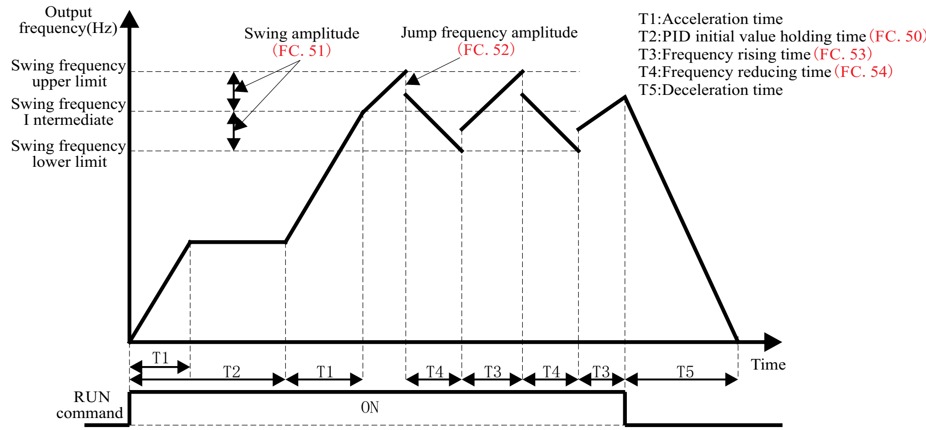
PD-50	Jump frequency amplitude	Setting Range: 0.0 ~ 50.0%	Default: 0.0%

This parameter is used to determine the jump frequency amplitude. Defined as a percentage of PD-49.

Jump frequency = Swing amplitude AW x PD-49 (Jump frequency amplitude).

PD-51	Rise time of swing frequency	Setting Range: 0.0 ~ 6500.0s	Default: 5.0s
PD-52	Falling time of Swing frequency	Setting Range: 0.0 ~ 6500.0s	Default: 5.0s

Used to set up and down time of swing frequency.



Swing frequency control

5.15 Group PF: User-Defined Function Codes

The user-defined parameter group is the parameter set by the user to the FE Group, it provides a maximum of 63 user-defined parameters. These parameters can be summed up to facilitate the debugging of the customer.

PF-00	PF parameter group function	Setting Range: 00～11	Default: 00

BIT 0:

Parameter modification is used to select whether other parameters except PF group parameters are not displayed. It is convenient for users to customize menus and not display unnecessary parameter groups

0:Normal display parameter group

1:Display PF parameter groups only

BIT 1:

This parameter is used for the programming of PF parameter group and the switching of normal function code display. The function code of PF01-PF66 is modified by setting the parameter to "1".

0:PF group function mode

1: PF group programming mode

PF-01	PF macros parameter select	Setting Range: 0～2	Default: 0

This parameter used to define the common industry' s parameter group customer made of some customers, can select the required parameter group according to macros parameter catalog, can refer macros parameter group catalog.

PF-02	PF parameter group length	Setting Range: 3～96	Default: 15

This parameter defined the length of customer made function code, to close the function code which needn' t indicate or not used.

5.16 Group A0: Torque Control and Restricting Parameters

A0-00	Control mode	Setting Range: 0～1	Default: 0

It is used to select the AC drive's control mode: speed control or torque control.

The SAHAND300 provides DI terminals with two torque related functions, function 14 (Torque control prohibited) and function 13 (Speed control/Torque control switchover). The two DI terminals need to be used together with A0-00 to implement speed control/ torque control switchover.

If the DI terminal allocated with function 13 (Speed control/Torque control switchover) is OFF, the control mode is determined by A0-00. If the DI terminal allocated with function 13 is ON, the control mode is reverse to the value of A0-00.

However, if the DI terminal with function 14 (Torque control prohibited) is ON, the AC drive is fixed to run in the speed control mode.

A0-01	Torque setting source in torque control	Setting Range: 000～677	Default: 000
A0-02	Torque digital setting in main frequency source X	Setting Range: -200.0～200.0%	Default: 100.0%
A0-03	Torque digital setting in auxiliary frequency source Y	Setting Range: -200.0～200.0%	Default: 100.0%
A0-04	Torque setting in main frequency source X Gain	Setting Range: 0.000～5.000%	Default: 1.000%
A0-05	Torque setting in auxiliary frequency source Y	Setting Range: 0.000～5.000%	Default: 1.000%

The torque setting is a relative value. 100.0% corresponds to the AC drive's rated torque. The setting range is -200.0% to 200.0%, indicating the AC drive's maximum torque is twice of the AC drive's rated torque. If the torque setting is positive, the AC drive rotates in forward direction. If the torque setting is negative, the AC drive rotates in reverse direction.

BIT 0:Main frequency source X selection(The full range of 1-7 option corresponds to A0-02)

0: Function code A0-02 setting
1: AI1
2: AI2
3: AI3
4: PULSE setting
5: Communication setting
6: MIN(AI1,AI2)
7: MAX(AI1,AI2)

BIT 1:Auxiliary frequency source Y selection(The full range of 1-7 option corresponds to A0-03)

0: Function code A0-03 setting
1: AI1
2: AI2
3: AI3
4: PULSE setting
5: Communication setting
6: MIN(AI1,AI2)
7: MAX(AI1,AI2)

BIT 2:Main and frequency source selection

0: X×[A0-04]
1: Y×[A0-05]
2: X×[A0-04] ＋ Y×[A0-05]
3: X×[A0-04] － Y×[A0-05]
4: MAX{X×[A0-04], Y×[A0-05]}
5: MIN{X×[A0-04], Y×[A0-05]}
6: Any non-zero value of the main frequency source X and auxiliary frequency source Y is valid,and the main frequency source X takes precedence.

BIT 3:reserved

A0-06	Torque given filter time	Setting Range: 0.00～10.00s	Default:0.10s

The filter time of torque give value which selected by A0-001 hundred digit, more bigger value more slow system responding.

A0-10	Forward maximum frequency in torque control	Setting Range: 0.0Hz ~ Maximum frequency	Default: 50.00Hz
A0-11	Reverse maximum frequency in torque control	Setting Range: 0.0Hz ~ Maximum frequency	Default: 50.00Hz

Two parameters are used to set the maximum frequency in forward or reverse rotation in torque control mode.

In torque control, if the load torque is smaller than the motor output torque, the motor's rotational speed will rise continuously. To avoid runaway of the mechanical system, the motor maximum rotating speed must be limited in torque control.

You can implement continuous change of the maximum frequency in torque control dynamically by controlling the frequency upper limit.

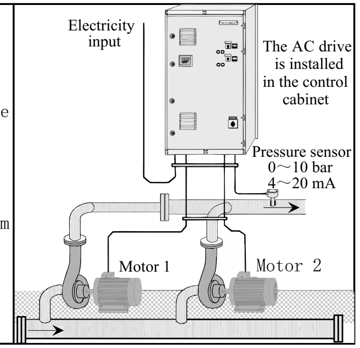
A0-12	Acceleration time in torque control	Setting Range: 0.00 ~ 100.00	Default: 0.00
A0-13	Deceleration time in torque control	Setting Range: 0.00 ~ 100.00	Default: 0.00

In torque control, the difference between the motor output torque and the load torque determines the speed change rate of the motor and load. The motor rotational speed may change quickly and this will result in noise or too large mechanical stress. The setting of acceleration/deceleration time in torque control makes the motor rotational speed change softly. However, in applications requiring rapid torque response, set the acceleration/deceleration time in torque control to 0.00s.

For example, two AC drives are connected to drive the same load. To balance the load allocation, set one AC drive as master in speed control and the other as slave in torque control. The slave receives the master's output torque as the torque command and must follow the master rapidly. In this case, the acceleration/deceleration time of the slave in torque control is set to 0.0s.

Multiple pumps control key points: multiple pumps logic together with PID (need select as positive action) can realize max four set pumps(or motor) control. Each one set pump connect to AC drive(frequency transform running) or power grind(industry frequency running), decided by the Y/T terminal of AC drive. Motor link lock function used to discriminate whether this pump connected into multiple pump control system. Will make the on/off touch point signal which one by one corresponding pump, or heat overload relay touch point (also used to other protection elements) connected into X terminal, the AC drive can know whether the corresponding pump connect into system, further more decide whether jump up this pump and running. Automatically shift function used to adjust the on/off running prior level of each pump in system, to make ensure loading of each pump balance, prevent one set pump rusted because long time not used. After the AC drive stop machine and restart again or power on after power off again, the start sequence of each pump recover to be initial status. Add pump logic divided into two types: a) assist pump directly into industry frequency(mode 1~2); b) the AC drive always control the latest input Pump pf system, the assist pump input industry frequency (mode 3~4) after AC drive soft start.

●The contactor of the same pump under the frequency transform and industry frequency must link lock; All contactor of all pumps under the AC drive mode. To guarantee safety and reliable running, please select and use the AC contactor with mechanical link lock device.
●Must process phase sequence confirmation before first time power on, to guarantee the motor running direction under frequency transform and industry frequency mode are unanimous.
●The AC drive enter into dormant status when only has one set speed adjust pump and meet the dormant condition.



5.17 Group A1: Constant Pressure Water Supply Parameter Group

A1-00	Multiple pump control	Setting Range: 0010 ~ 1144	Default: 0110

BIT 0:

0: Multiple pump control Invalid
1: Frequency transform pump fix, no timing shift
2: Frequency transform pump fix with timing shift
3: Frequency transform pump circulating, no timing shift
4: Frequency transform pump circulating, has timing shift

Multiple pumps control mode	Speed governing pump	Automatic circulating	Wiring method
1	Fix	Not support	Up picture in next page
2		Support	
3	Not Fix	Not support	Down picture in next page
4		Support	

BIT 1:Quantity of pump

Used to set the total quantity of pumps (Motors) in the multiple pump control system.

BIT 2:

0:Used to set the total quantity of pumps (Motors) in the multiple pump control system.

1:Start first then stop first, stop the finally started pump when need reduce pump (suitable to equal pump power)

BIT 3:Time unit

0:Time unit 0.1hour

1:Time unit 0.1Min

Related parameters	Setting value and meaning	
C1.04 (T1 terminal function)	40	1#Pump control
C1.05 (T2 terminal function)	41	2#Pump control

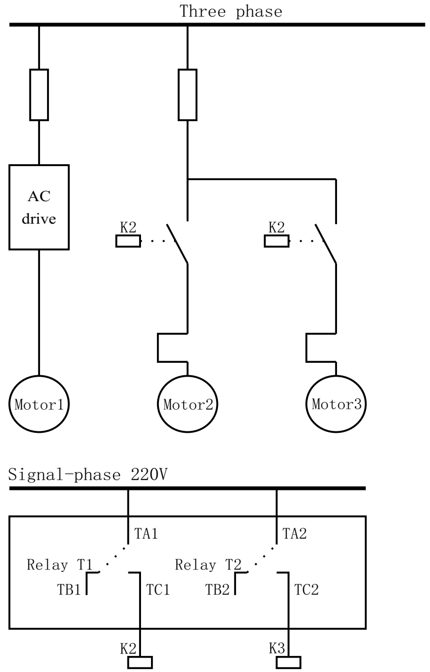


Figure 6-32 AC drive fixed connection diagram E6.00=1 or 2

Related parameters	Setting value and meaning	
C1.04 (T1terminal function)	40	1#Pump control
C1.05 (T2terminal function)	41	2#Pump control
C1.06 (T3terminal function)	42	3#Pump control

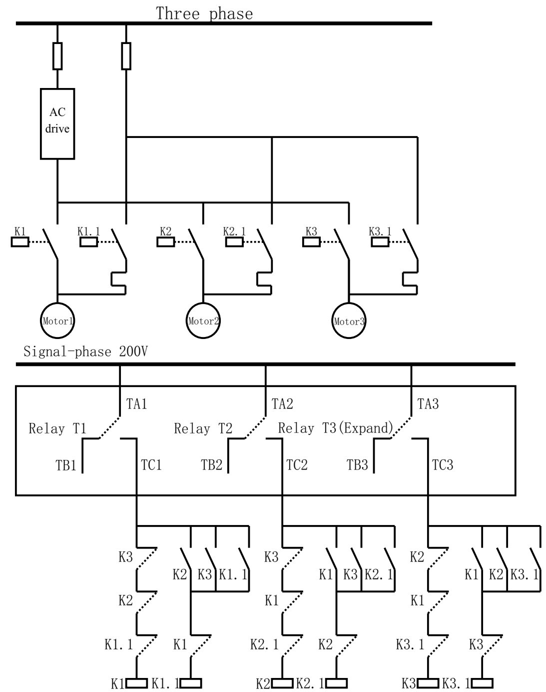


Figure 6-32 AC drive fixed connection diagram E6.00=3 or 4

A1-01	Add pump given increment 1	Setting Range: 0.0%～100.0%	Default: 0.0%
A1-02	Add pump given increment 2	Setting Range: 0.0%～100.0%	Default: 0.0%
A1-03	Add pump given increment 3	Setting Range: 0.0%～100.0%	Default: 0.0%

Add pump given increment 1, 2 and 3 valid when has one, two and three assist pumps running respectively.

Add pump given increment is one increment which defined at percentage type, used to overlap on the given value of original PID. Suppose the PID given value is 0.4Mpa, A1-01= 20%, then when the first assist pump running, the PID give value will adjusted to be 0.4*(1+20%) = 0.48Mpa.

Example: the AC drive controlled 3 set paralleling water pump supply water for pipeline. E5.05(PID given number set) set constant pressure give, control the pipeline grid pressure. Only has speed adjust pump running when smaller used water; the assist pumps one by one start after used water increased. Along with the water flow increasing, the upper end of pipeline (measure points) and end pressure difference also increasing. To make up the increased pressure difference, compensate the fallen pressure value at pipeline end, need gradually increase the PID give value through set reasonable give increment.

When the first assist pump running, the give increment is A1-01.

When the two assist pumps running, the give increment is the sum of A1-01 and A1-02.

When three assist pumps running, the give increment is the sum of A1-01, A1-02 and A1-03.

A1-04	Motor connect in judge function	Setting Range: 0～2	Default: 2

BIT 0: Valid pump judge invalid

0:Invalid

1:By S terminal invalid

2:Decided by A01-05 setting

A1-05	Motor connect in setting	Setting Range: 0000～1111	Default: 1111

0:This motor and system broken

1:This motor connect in system

After the link lock function invalid, the pump(motor) corresponding signal(link lock mode decide the signal source) valid, the AC drive regard this pump(motor) input system and ready; otherwise, regard this pump(motor) not connect in multiple pumps control system. If speed governing pump(the pump or motor which directly driven by AC drive) corresponding signal loss or invalid, then AC drive regard it be at unavailable status, and remind multiple pump control link lock alarm(Er/AL52), at the same time, action according to F0.23(failure protection select 5) thousand digit set method.

The link lock electric circuit wiring method has the below two types:

1)Make the corresponding one on/off touch point signal of pump(motor) connect into link lock electric lock electric circuit. The AC drive multiple pumps control logic able to judge whether this pump(motor) be at power off status, then make decision whether start next one set usable pump(motor).

2)Make one heat overload relay touch point(or other motor protection circuit elements) which corresponding to pump(motor) into link lock circuit. The AC drive multiple pumps control logic able to judge whether this pump(motor) be at power off status, then make decision whether stop use.

A1-06	Fix time shift time	Setting Range: 0.1～6000.0H	Default: 0.1H
A1-07	Fix time shift frequency limit	Setting Range: 0.01～Maximum frequency	Default: 50.00Hz
A1-08	Fix time shift the quantity of rest motors	Setting Range: 1～3	Default: 1

Under the unit=2 or 4 mode, when the multiple pump system running time reach up to A1-06, if now put into system buts the motor quantity which still not start above or equal to A1-08, and AC drive output frequency less than A1-07 then trigger fix time shift.

The fix time shift function used to balance the working time of each pump(motor) in the system.

A1-09	Add pump frequency 1	Setting Range: 0.0～Maximum frequency	Default: 48.0Hz
A1-10	Reduce pump frequency 1	Setting Range: 0.0～Pumping frequency	Default: 25.00Hz

The add and reduce pump frequency of the first assist pump(Controlled by the Y/T terminal which configure function is “37:2# pump control”).

The add pump condition of first assist pump:1)no assist pump running; 2) the AC drive output frequency bigger than ‘A1-09+1Hz’, and duration exceed A1-15. after the first assist pump started, the output frequency of AC drive reduce ‘A1-09- A1-10’ to weaken sudden change of output quantity.

The reduce pump condition of first assist pump: 1) only one assist pump running; 2) the AC drive output frequency less than ‘A1-10-1Hz’, and duration exceed A1-16. After the first assist pump stopped, the output frequency of AC drive rise ‘A1-09- A1-10’ to weaken sudden change of output quantity.

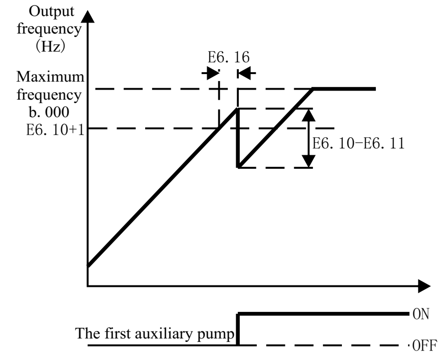


Figure 6-34 Logic diagram of pump adding according to output frequency

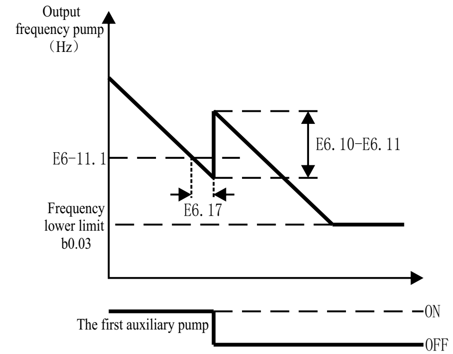


Figure 6-35 Logic diagram of pump reducing according to output frequency

A1-11	Add pump frequency 2	Setting Range: 0.0 ~ Maximum frequency	Default: 48.0Hz
A1-12	Reduce pump frequency 2	Setting Range: 0.0 ~ Pumping frequency 1	Default: 25.00Hz

The add and reduce pump frequency of the second assist pump(Controlled by the Y/T terminal which configure function is "38:3# pump control").

The add pump condition of second assist pump:1) has one assist pump running; 2) the AC drive output frequency bigger than 'A1-11+1Hz', and duration exceed A1-15. after the second assist pump started, the output frequency of AC drive reduce 'A1-11- A1-12' to weaken sudden change of output quantity.

The reduce pump condition of second assist pump:1)has two assist pumps running; 2) the AC drive output frequency less than 'A1-12-1Hz', and duration exceed A1-16. After the second assist pump stopped, the output frequency of AC drive rise 'A1-11- A1-12' to weaken sudden change of output quantity.

A1-13	Add pump frequency 3	Setting Range: 0.0 ~ Maximum frequency	Default: 48.0Hz
A1-14	Reduce pump frequency 3	Setting Range: 0.0 ~ Pumping frequency 1	Default: 25.00Hz

The add and reduce pump frequency of the third assist pump(Controlled by the Y/T terminal which configure function is "39:3# pump control").

The add pump condition of third assist pump:1)has two assist pump running; 2) the AC drive output frequency bigger than 'A1-13+1Hz', and duration exceed A1-15. after the first assist pump started, the output frequency of AC drive reduce 'A1-13- A1-14' to weaken sudden change of output quantity.

The reduce pump condition of first assist pump: 1) has three assist pump running; 2) the AC drive output frequency less than 'A1-14-1Hz', and duration exceed A1-16. after the third assist pump stopped, the output frequency of AC drive rise 'A1-13- A1-14' to weaken sudden change of output quantity.

A1-15	Add pump delay time	Setting Range: 0 ~ 3600.0s	Default: 5.0s
A1-16	Reduce pump delay time	Setting Range: 0 ~ 3600.0s	Default: 3.0s

Assist pump start and stop delay. The detail application please refer A1-09 ~ A1-14 parameter instruction.

A1-17	Industry frequency switch lock time	Setting Range: 0.02 ~ 10.00s	Default: 0.20s

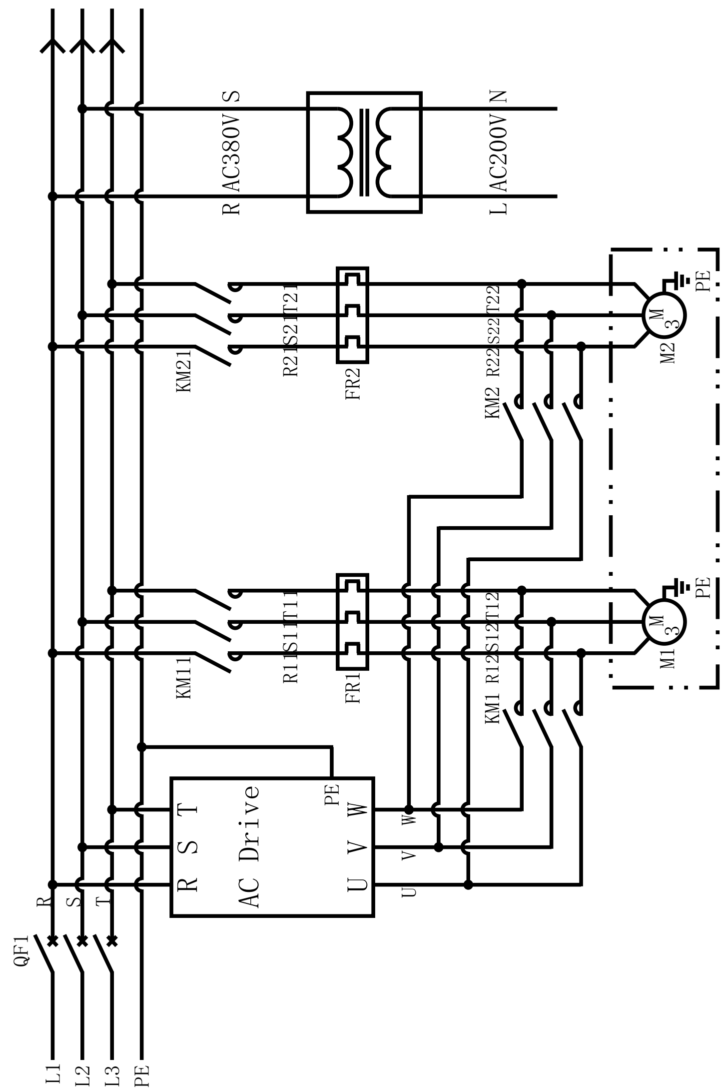
Used in the Y terminal of input and shift pump(motor) status change delay

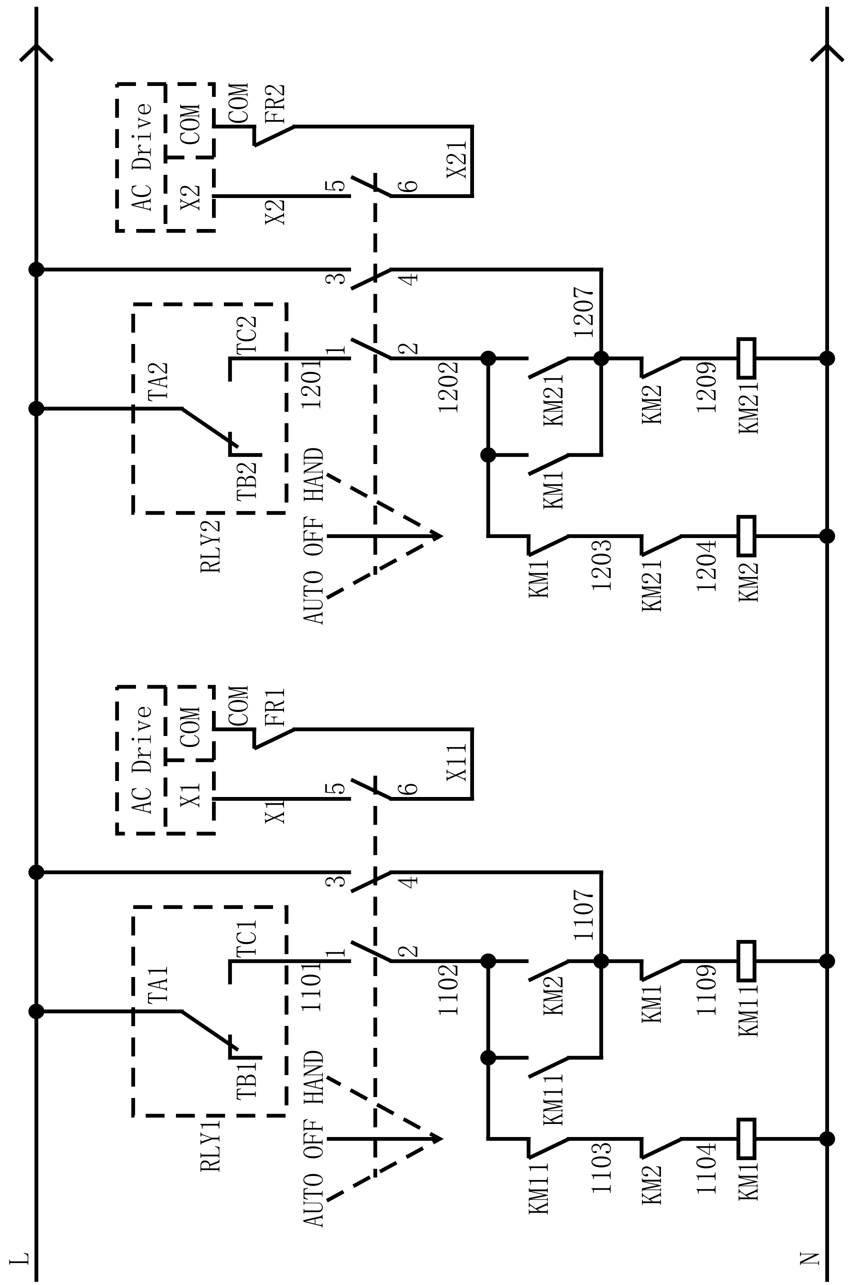
A1-18	Industry frequency switch frequency	Setting Range: 0.00 ~ Maximum frequency	Default: 50.00Hz

The shift frequency point of pump(motor) from frequency transform control to industry frequency control.

A1-19	Fix pump failure handle method	Setting Range: 0 ~ 2	Default: 0

BIT 0:
- 0:emergency stop, report failure, all assist pump stop working
- 1:emergency stop, report failure, assist pump maintain current situation
- 2:only alarm, the system continue running





5.18 Run Monitor Parameters

To access the Parameters click on PRG bottom and then select 2. Run Monitor

00	Set frequency	Set the theoretical operating frequency of the AC drive and the absolute value of the set frequency. The actual output frequency of the AC drive is shown in U-09.
01	Output frequency	
02	Output current	Display the AC drive output current value during operation.
03	Output voltage	Display the AC drive output voltage value during operation.
04	Input voltage	Display the AC drive input voltage value during operation.
05	Mechanical speed	See description of P7-05 for display value.
06	Bus voltage	Display the AC drive bus voltage value during operation.
07	Output power	Display the AC drive output power value during operation.
08	Target torque	Display the current torque upper limit setting value.
09	Output torque	Display the AC drive output torque value during operation.
10	PID setting	Display PID setting value and feedback value.
11	PID feedback	
12	AI1 input value	Display the percentage value corresponding to the analog input port, display 0～100% in percentage.
13	AI2 input value	
14	HDI input value	Display HDI high-speed pulse sampling frequency, the smallest unit is 0.01KHz
15	Counter count value	Pulse count value input through DI terminal
16	AI3 input value	Display the percentage value corresponding to the analog input port, display 0～100% in percentage.
17	Terminal S Status	The state of the input terminals, the sequence is: BIT9 (DI0) BIT8 (DI9) BIT7 (DI8) BIT6 (DI7) BIT5 (DI6) BIT4 (DI5) BIT3 (DI4) BIT2 (DI3) BIT1 (DI2) BIT0 (DI1) When the input terminal is ON, the corresponding terminal is 1, and OFF is 0, and the state of all Dis is converted to hexadecimal number display
18	Terminal Y Status	
19	AO1 output value	Display the percentage value corresponding to the analog output port.
20	AO2 output value	
21	HDO output value	Display HDO high-speed pulse output frequency, the minimum unit is 0.01Hz
22	Reserved	
23	Model temperature	Display the temperature value of the radiator of the AC drive module
24	Output excitation	Display the excitation component value of the motor during operation as a percentage of the rated current of the motor.
25	Power factor	Display the current running motor power factor.
26	Power-on time	Record the basic operation data of this power-on and operation
27	power-on operation time	
28	Accumulated time	
29	AC drive running state	
30	Maximum current	
31	Maximum voltage	

32	Maximum temperature	Record the basic operation data of this power-on and operation
33	Miniamum voltage	
34	Rated power of AC drive	Display the rated value of the AC drive factory configuration
35	Rated voltage of AC drive	
36	Rated current of AC drive	
37	AC version	
38	MC version	
39	Communication frequency	Display the data written by communication address 0x2001
40	Main frequency X display	Display the main frequency source X frequency setting
41	Auxiliary frequency Y display	Display the auxiliary frequency source Y frequency setting
42	Remaining time	Display the remaining running time when running. See the parameter for timing operation introduction P8-29
43	Target voltage upon V/F separation	Display the target output voltage and the current actual output voltage when running in the VF separation state. For VF separation, see related introduction of group P3.
44	Output voltage upon V/F separation	
45	PG feedback value	Display the motor operation frequency actually measured by the encoder.
46	Linear speed	Display the linear velocity of DI-S8 high-speed pulse sampling. The unit is meters/minute. According to the actual number of sampled pulses per minute and F8-07(the number of pulse per meter), the linear velocity value is calculated.
47	PM rotor position	Display the rotor position of the synchronous machine. Range: 0.0°～359.9°
48	Resolver position	Display the current position signal of resolver.
49	ABZ position	Display the current AB-phase pulse count of ABZ or UVW encoder.
50	Phase Z counting	Display the current Z-phase pulse count of ABZ or UVW encoder, when the encoder rotates forward or reversely, the corresponding value is increased by 1 or minus 1, and you can check whether the encoder is installed normally by checking the value. Range:0～65535
51	Communication sending value	Display the communication data when the point-to-point communication is valid, U0-63 is the communication value sent by host, and U0-64 is the data value received by the slave. Range:-100.00%～100.00%
52	Communication receiving value	
53	Motor temperature	Display the motor temperature value sampled by the expansion card AI4. Motor temperature detection see F9-56.
54	Multiple pumps control	Pump operation status during multi-pump control.

6: Regular inspection and maintenance

6.1 Daily inspection

During power-up and operation, without taking away the cover, check the operation of AC drive with eye survey from outside and confirm that there's nothing abnormal. Usually, check the followings:

- ■whether the operation performance accord with the regulation
- ■whether the environment accord with the regulation
- ■whether keyboard panel display is normal
- ■whether without abnormal noises, vibrations and abnormal odor
- ■whether without abnormality such as overheat or change in color

6.2 Periodic Inspection

Before doing the periodic inspection, first stop operation, shut off power supply and take away the cover.

Even when the power supply of the AC drive is shut off, there's still charged voltage on the filter capacitors and it takes some time to discharge. In order to avoid the danger, be sure to wait until the charge indicator goes out and test with a voltmeter to ensure the voltage is lower than safe value (≤25Vdc) before the operation of inspection.

Notice!

1.For AC drives ≤22kW, wait 5 minutes after shutting down the power, and wait 10 minutes for those ≥ 30kW. Not until the DC voltage between terminals N- and P+ is lower than DC25V could examination operation with cover removed begin.

2.No one other than the appointed operators could perform maintenance and part replacement and other operations.(Metal objects such as watches and rings should be taken off before operation, and use tools with insulation in operation.)

3.Rebuilding the AC drive is absolutely forbidden.

4.Avoid electric shock and facility accident.

List of Periodic Inspection

Inspection cycle	Inspection parts	Inspection item	Inspection method
Daily	Environment	Confirm environment temperature, humidity, vibration and whether there' s dust, gas, oil mist and water drops and so on.	With eye survey and apparatus measuring
Daily		Are there any foreign bodies like tools or dangerous goods nearby?	With eye survey
Daily	Voltage	Are voltages of main circuit and control circuit both normal?	Measure with a multi-meter
Daily	Keyboard Display Panel	Is the display clear?	With eye survey
Daily		Is any character missing?	
Half a year	Mechanism Parts	Is there any abnormal sound or vibration?	With eye survey and hearing
Half a year		Are the bolts (fasteners) loose?	Fasten
Half a year		Is there any distortion and damage?	With eye survey
Half a year		Is there color change due to over-heat?	With eye survey
Half a year		Is any character missing?	With eye survey
Daily	Main Circuit	Have any bolts been loose and dropped off?	Fasten
Half a year		Is there distortion, crack, to over-heat and aging in the machine and insulation? damage or color change due	With eye survey
Half a year		Is it stained with dust or deface-ment?	With eye survey
Half a year	Main Circuit: Terminals and Wiring	Is there color change and distortion due to overheat in the conductor?	With eye survey and hearing
Half a year		Is there any damage and color change in the wire protection?	With eye survey
Daily		Is there any damage?	With eye survey
Half a year		Is there any looseness between the bolts and the connector?	Fasten
Half a year		Is there any odors and color change?	Smell and hearing
Half a year		Is there color change. damaged and distortion due to corrosion?	With eye survey
Half a year		Is there leakage and distortion of the capacitor?	With eye survey
Daily	Main Circuit: Terminal Block	Is there leakage, color change, crack and shell inflation?	With eye survey
Daily		Has the safety valve loose? Is there significant inflation in the valve?	With eye survey
Daily		Measure static capacity according to the need	Measure with a multi-meter
Daily	Main Circuit: Filter Capacitor	Is there abnormal odor or crackle in the insulator due to overheat?	With eye survey
Daily		Is there any broken wire?	With eye survey, or open the connection at one end and measure with a multimeter

Daily	Main Circuit: Resistor	Is there abnormal noise of vibra-tion or odor?	With hearing, eye survey and smelling
Daily	Main Circuit: Transformer and Reactor	Is there noise of vibration while operating?	With eye survey
Daily		Are the junctions well connected?	With eye survey
Half a year	Main Circuit: Control PCB Connector	Is there abnormal noise or vibra-tion?	With hearing, eye survey and turn with hand (must cut off the power)
Half a year		Are the bolts loose?	Fasten
Half a year		Is there color change due to over-heat?	With eye survey
Half a year	Cooling System: Cooling Fans	Is there any blockings or foreign bodies on the radiator and the air inlet and outlet?	With hearing

Note!

Please wipe the polluted areas with chemically neutral cleaning cloth. Sweep the dust with electric cleaner.

7.Faults and Solutions

7.1List of actions to protect

The AC drive itself has the functions of over-voltage, low voltage and over-current alarms and protection. Once a failure occurs, the protective actions will work, the AC drive will stop the output, the abnormal contact will act, and the free operation of motor will stop. Please refer to the abnormality causes and solutions according to the shown abnormality information of AC drive. The abnormality records will be kept in the interior storage unit of AC drive (which can record the latest 4 faults message), and can be read on the digital operation panel or by communication via parameter reading.

Display	Fault name	Possible causes	Solutions
Err01	Inverter unit protection	1: The output circuit is grounded or short circuited. 2: The power cable between the motor and the AC drive is too long. 3: The power module is overheated. 4: The internal connections become loose. 5:The main control board is faulty. 6: The drive board is faulty. 7: The inverter module is faulty.	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: Seek technical support. 6: Seek technical support. 7: Seek technical support.
Err02	Overcurrent during acceleration	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 input voltage is too low. 6: The startup operation is performed on the rotating motor. 7: A sudden load is added during acceleration. 8: The AC drive model is of too small power class.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the acceleration time. 4: Adjust the manual torque boost or V/F curve. 5: Adjust the voltage to the normal range. 6: Select rotational speed tracking restart or start the motor after it stops. 7: Remove the added load. 8: Select an AC drive of higher power class.
Err03	Overcurrent during deceleration	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 input voltage is too low. 5: A sudden load is added during deceleration. 6: The braking unit and braking resistor are not installed.	1: Eliminate external faults. 2: Perform the motor autotuning. 3: Increase the deceleration time. 4: Adjust the voltage to the normal range. 5: Remove the added load. 6: Install the braking unit and braking resistor.

Display	Fault name	Possible causes	Solutions
Err04	Overcurrent at constant speed	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The input voltage is too low. 4: A sudden load is added during operation. 5: The AC drive model is of too small power class.	1: Eliminate external faults. 2: Perform the motor autotuning. 3: Adjust the voltage to the normal range. 4: Remove the added load. 5: Select an AC drive of higher power class.
Err05	Overvoltage during acceleration	1: The input voltage is too high. 2: An external force drives the motor during acceleration. 3: The acceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Remove the external force or install a braking resistor. 3: Increase the acceleration time. 4: Install the braking unit and braking resistor.
Err06	Overvoltage during deceleration	1: The input voltage is too high. 2: An external force drives the motor during deceleration. 3: The deceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Remove the external force or install a braking resistor. 3: Increase the deceleration time. 4: Install the braking unit and braking resistor.
Err07	Overvoltage at constant speed	1: The input voltage is too high. 2: An external force drives the motor during running.	1: Adjust the voltage to the normal range. 2: Remove the external force or install the braking resistor.
Err08	Control power supply fault	1: The input voltage is not within the allowable range.	1: Adjust the input voltage to the allowable range.
Err09	Under-voltage	1: Instantaneous power failure occurs on the input power supply. 2: The AC drive's input voltage is not within the allowable range. 3: The DC-Bus voltage is abnormal. 4: The rectifier bridge and buffer resistor are faulty. 5: The drive board is faulty. 6: The main control board is faulty.	1: Reset the fault. 2: Adjust the voltage to the normal range. 3: Contact technical support. 4: Contact technical support. 5: Contact technical support. 6: Contact technical support.
Err10	AC drive overload	1: The load is too heavy or locked rotor occurs on the motor. 2: The AC drive model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an AC drive of higher power class.
Err11	Motor overload	1: P9-23 is set improperly. 2: The load is too heavy or locked rotor occurs on the motor. 3: The AC drive model is of too small power class.	1: Set it correctly. 2: Reduce the load and check the motor and the mechanical condition. 3: Select an AC drive of higher power class.
Err12	Power input phase loss	1: The three-phase power input is abnormal. 2: The drive board is faulty.	1: Eliminate external faults. 2: Seek technical support. 3: Seek technical support.

Err12	Power input phase loss	3: The lightening board is faulty. 4: The main control board is faulty.	3: Seek technical support. 4: Seek technical support.
Err13	Power output phase loss	1: The cable connecting the AC drive and the motor is faulty. 2: The AC drive's three-phase outputs are unbalanced when the motor is running. 3: The drive board is faulty. 4: The module is faulty.	1: Eliminate external faults. 2: Check whether the motor three-phase winding is normal. 3: Seek technical support. 4: Seek technical support.
Err14	Module overheat	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.	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.
Err15	External equipment fault	1: External fault signal is input via S.	1:Reset the operation.
Err16	Communi-cation fault	1: The host computer is in abnormal state. 2: The communication cable is faulty. 3: The communication parameters in group PB are set improperly.	1: Check the cabling of host computer. 2: Check the communication cabl-ing. 3: Set the communication parame-ters properly.
Err17	Contactor faul	1: The drive board and power supply are faulty. 2: The contactor is faulty.	1: Replace the faulty drive board or power supply board. 2: Replace the faulty contactor.
Err18	Current detection fault	1: The HALL device is faulty. 2: The drive board is faulty.	1: Replace the faulty HALL device. 2: Replace the faulty drive board.
Err19	Motor auto-tuning fault	1: The motor parameters are not set according to the nameplate. 2: The motor auto-tuning times out.	1: Set the motor parameters acc-ording to the nameplate properly. 2: Check the cable connecting the AC drive and the motor.
Err20	Encoder fault	1: The encoder type is incorrect. 2: The cable connection of the encoder is incorrect. 3: The encoder is damaged. 4: The PG card is faulty.	1: Set the encoder type correctly based on the actual situation. 2: Eliminate external faults. 3: Replace the damaged encoder. 4: Replace the faulty PG card.
Err21	EEPROM readwrite fault	1: The EEPROM chip is damaged.	1: Replace the main control panel.
Err22	AC drive hardware fault	1: Overvoltage exists. 2: Overcurrent exists.	1: Handle based on over-voltage. 2: Handle based on over-current.
Err23	Short circuit to ground	1: The motor is short circuited to the ground.	1: Replace the cable or motor.
Err24	EEPORM Initializa-tion fault	1: Abnormal user data.	1: Reinitialize data and set parameters.

Err26	Running time reached	1: Accumulative running time reaches setting.	1: Clear the record through the parameter initialization function.
Err27	User-defined fault 1	1: The user-defined fault 1 signal is input via DI.	1: Reset the operation.
Err28	User-defined fault 2		
Err29	Power-on time reached	1: Accumulative power-on time reaches the setting.	1: Clear the record through the parameter initialization function.
Err30	Load becoming 0	1: The AC drive running current is lower than P9-38.	1: Check the load is disconnected or P9-38 and P9-39 is correct.
Err31	PID feedback lost during running	1: The PID feedback is lower than the setting of PA-27.	1: Check the PID feedback signal or set PA-27 to a proper value.
Err40	Motor overload	1: The load is too heavy or lockedrotor occurs on the motor. 2: The AC drive model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select the AC drive of higher power class.
Err42	Too large speed deviation	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed. 3: P9-42 and P9-43 are set incorrectly.	1: Set the encoder parameters properly. 2: Perform the motor autotuning. 3: Set F9-69 and F9-70 correctly based on the actual situation.
Err43	Motor over-speed	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed. 3: P9-40 and P9-41 are set incorrectly	1: Set the encoder parameters properly. 2: Perform the motor auto-tuning. 3: Set P9-40 and P9-41 correctly based on the actual situation.
Err45	Motor overheat	1: The cabling of the tempera-ture sensor becomes loose. 2: The motor temperature is too high.	1: Check the temperature sensor cabling and eliminate the cabling fault. 2: Lower the carrier frequency or adopt other heat radiation measures.
Err51	Pole position detection failed	1: The deviation between the motor parameters and the actual value istoo large.	1: Reconfirm whether the motor parameters are correct, and focus on whether the rated current is set too small.

7.2 Reset Alarm

■When a failure is detected from SAHAND300,the failure will be shown on the digital manipulator, and the abnormal contact will have output and the motor will slide to stop.Check the failure causes in the list below and take corr-ective measures.

■If the mentioned inspection and corrective measures can't solve the problem, please directly contact with our company.

■For restart, connect with the resetting input signal or press ESC ,or disconnect the power supply of the main loop for one time, to reset the failure status.

■If you want to change the parameters in the failure indication, please press PRG .

Note!

When inputting the right/opposite operation order, the AC drive fails to receive the failure resetting signal. You must cut off the right/opposite operation order first, and then reset.

7.3 The Causes and Solutions for AC drive's faults

Malfunction or fault can be caused by reasons such as ways of operation, setting conditions, environment or the AC drive itself. If these causes are not eliminated or no measures are taken, the drive will end up and unable to operate normally.

(1)Measures against electromagnet noises and induction noises

If there's noise source near the AC drive, the noise may invade the AC drive through radiation or power line and cause faulty actions of control circuit, and even destroy AC drive. Naturally, one solution is to improve noise capability of AC drive, but that's not economic, let alone the limited range of improvement. So it's best to take measures outside it to avoid the interference.

1.Install surge killer on relay or contactor in order to restrain switching surge noises at on and off switching.

2.Try to shorten the wiring of control circuit or program control circuit, and separate it from main circuit wiring.

3.For circuits regulated to use shielded wire for wiring, wiring must comply with the wiring regulations. And if the wiring is too long, an isolation amplifier should be added.

4.The grounding terminal of AC drive should be grounded according to regulations, and the grounding should be separate and not shared with electric welding machine or power devices.

5.Add a noise filter on the input terminal of the AC drive to avoid noise invasion from the power line.

(2)Environment setup measures

AC drive is a device made up of electronic parts, and its admissible environment is described in the specifications in detail. If the regulations cannot be followed, corresponding measures or solutions must be taken.

1.Avoid vibrations, and use vibration-proof pads when necessary.

Make sure that the vibration is under regulation. Because of the effect of vibration on electronic parts equals to mechanical stress, it should not be taken for long or repeatedly, which may cause faults in the AC drive.

2.Avoid corrosive gases and dusty environment, both of which will cause electronic parts rust and bad contact, and what' s more, insulation will be decreased due to moisture absorption and cause short circuit accidents. Regular measure is treating with paint and dust-proof, and in strict conditions, inner-pressure suited for clean air or self-protective whole sealing structures are adopted.

3.The temperature of the around environment should be appropriate, the life-span and reliability of electronic parts is affected by both too high and too low temperature. Take semiconductor module for example, once the regulated limit is exceeded, damage will be instant. Therefore, except equipping with cooler and sun-shade to keep the temperature in the regulated range, cleaning and spot check on air filter in the AC drive rack and the angles of cooling fan are also necessary. Besides, the internal microprocessor may stop working under extremely low temperature, space heaters must be equipped in low temperature areas.

4.No damp, and never should dewing occur. When AC drive needs to be left unused for a long time, be careful that dewing may occur as soon as air-conditioning is stopped. It would be best that the cooling device of the electric room has dehumidification function.

(3)Prevent AC drive from interfering other machines

It is common that an AC drive interferes other machines at the same site, and this should be avoided through taking measures or solutions beforehand.

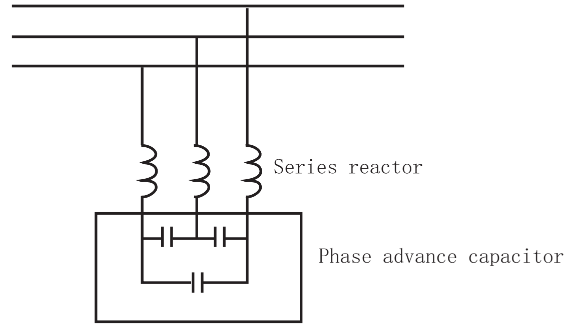
High-order harmonics on the power supply side

When the AC drive is running, there will be high-order harmonics flowing to the power supply and adversely affecting the system. The countermeasures are as follows:

1. Separate the power supply system and set up a dedicated transformer to connect the power to the AC drive.

2. Insert a reactor or filter on the input side of the AC drive to reduce high-order harmonic components as shown in the figure:

3. If there is a phase-in capacitor, a reactor should be connected in series to prevent too much high-harmonic current from flowing in and causing overheating to burn the capacitor.



4. Add a reactor or magnetic ring to the output side of the AC drive.

The temperature of the motor rises

When the motor is used for variable speed operation, if the motor is a synchronous ventilation type induction motor, it will have a cooling effect at low speeds. Poor, so overheating may occur. In addition, the waveform output by the AC drive contains high-order harmonics, so copper loss and iron loss are increased.

Check the data for the load status and operating range for reference, and add the following countermeasures when necessary:

1. The motor is changed to an independent power supply ventilation type or the first-level capacity specification is improved.

2. The motor matching is changed to a special motor for AC drive.

3. Limit the operating range and avoid low-speed belt operation.

8. Appendix

8.1 Appendix I: Functional code table

P0 Standard Parameter group				
Function Code	Parameter Name	Setting Range	Default	Address
P0-00	AC drive rated G/P type selection	0: heavy load rating (G) constant torque application 1: light load rating (P) decreasing torque application	0	0000H
P0-01	Motor control mode	0: V/F control 1: Sensorless flux vector control(SVC) 2: Closed-loop vector control(FVC)	0	0001H
P0-02	Command source selection	0: Operation panel control 1: Terminal control 2: RS485 Communication control 3: Option card 4: Terminal switchover	0	0002H
P0-03	Main frequency source X selection	0: Operation panel digital setting frequency 1: AI1 2: AI2 3: AI3 4:Terminal pulse HDI setting 5: RS485 communication setting 6: UP/DW setting 7: PID control setting 8: PLC mode operation setting 9: reserved A: reserved B: Option card C: Terminal switchover	0	0003H
P0-04	Main source X Gain	0.000～5.000	1.000	0004H
P0-05	Auxiliary frequency source Y selection	Same as P0-03	0	0005H
P0-06	Auxiliary source Y Gain	0.000～5.000	1.000	0006H
P0-07	Main and Auxiliary frequency source combination mode	0: Main frequency source X is valid 1: Auxiliary frequency source Y is valid 2: X+Y 3: X-Y 4: MAX (|X|, |Y|) 5: MIN (|X|, |Y|) 6: X*Y 7: Any non-zero value of the main frequency source X and auxiliary frequency source Y is valid,and the primary channel takes precedence.	0	0007H
P0-08	Digital setting of main source X frequency	0.00～Maximum output frequency	50.00Hz	0008H

P0-09	Digital setting of auxiliary source Y frequency	0.00～Maximum output frequency	50.00Hz	0009H
P0-10	Maximum output frequency	0.00～320.00Hz	50.00Hz	000AH
P0-11	Source of frequency upper limit selection	0: Set by P0-12 1: AI1 2: AI2 3: AI3 4: Terminal pulse setting 5: RS485 Communication setting	0	000BH
P0-12	Source of frequency upper limit digital setting	0～100.0%	100.0%	000CH
P0-13	Source of frequency lower limit digital setting	0～100.0%	0.00%	000DH
P0-14	Frequency lower limit run mode	0: Stop 1: Run at frequency lower limit 2: Run at zero speed	1	000EH
P0-15	Acceleration time 1	0.1～6500.0s	Model dependent	000FH
P0-16	Deceleration time 1	0.1～6500.0s	Model dependent	0010H
P0-17	Acceleration/ Deceleration time unit	1: 0.1s 2: 0.01s	1	0011H
P0-18	Stopping method	0: Ramp to stop 1: Coast to stop	0	0012H
P0-19	Rotation direction selection	BIT0: 0: Forward direction operation 1: Reverse direction operation BIT1: 0: Reverse operation enable 1: Reverse operation disable	00	0013H
P0-20	Carrier frequency	1.0～15.0KHz	Model dependent	0014H
P0-21	Carrier frequency accuracy unit	1: 0.1Hz 2: 0.01Hz	2	0015H
P0-22	Reserved	-	-	0016H
P0-23	Restore default setting	0: No operation 1: Data locked 2: Reset Error message 3～6: Undefined 7: Initialization setting—User data reset 10: Back up current user parameters 210: Restore user backup parameters	0～210	0017H

P1 Motor parameters

Function Code	Parameter Name	Setting Range	Default	Address
P1-00	Motor Auto-tuning selection	0: No auto-tuning 1: Asynchronous motor stationary auto-tuning 2: Asynchronous motor (rotational)complete auto-tuning 3: reserved	0	0100H
P1-01	Motor type	0: Common asynchronous motor 1: Variable frequency asynchronous motor 2: Permanent magnetic synchronous motor	0	0101H
P1-02	Motor rated power	0.01kW～100.0kW	Model dependent	0102H
P1-03	Motor rated voltage	1V～2000V	Model dependent	0103H
P1-04	Motor rated current	P1-11～650.00A (AC Drive=55kW) P1-11～6500.0A (AC Drive>55kW)	Model dependent	0104H
P1-05	Motor rated frequency	0.01Hz～maximum frequency	Model dependent	0105H
P1-06	Motor rated rotational speed	1rpm～65535rpm	Model dependent	0106H
P1-07	Stator resistance (asynchronous motor)	0.001Ω～65.535Ω (AC Drive=55kW) 0.0001Ω～6.5535Ω (AC Drive>55kW)	Model dependent	0107H
P1-08	Rotor resistance (asynchronous motor)		Model dependent	0108H
P1-09	Leakage inductive reactance (asynchronous motor)	0.01mH～655.35mH (AC Drive=55kW) 0.001mH～65.535mH (AC Drive>55kW)	Model dependent	0109H
P1-10	Mutual inductive reactance (asynchronous motor)		Model dependent	010AH
P1-11	No-load current (asynchronous motor)	0.01A～P1-04 (AC Drive=55kW) 0.1A～P1-04 (AC Drive>55kW)	Model dependent	010BH
P1-12～P1-22	Reserved	-	-	010CH～0110H
P1-23	Encoder type	BIT0: Encoder type 0: ABZ incremental encoder 1: UVW incremental encoder 2: Resolver 3: SIN/COS encoder 4: Wire-saving UVW encoder	000	0117H

P1-23	Encoder type	BIT1: A/B phase sequence of ABZ incremental encoder 0: Forward 1: Reverse BIT2: U, V, W phase sequence of UVW encoder 0: Forward 1: Reverse	000	0117H
P1-24	Encoder pulses per revolution	0～60000	1024	0118H
P1-25	Encoder installation angle	0.0～359.9°	0.0°	0119H
P1-26	UVW encoder angle offset	0.0～359.9°	0.0°	011AH
P1-27	Number of pole pairs of resolvert	1～100	1	011BH
P1-28	Encoder wire-break fault detection time	0.00～60.00s	2.00s	011CH

P2 Vector Control Parameters

Function Code	Parameter Name	Setting Range	Default	Address
P2-00	Vector control mode	BIT0: SFVC optimization mode selection 0: No optimization 1: Optimization mode1 2: Optimization mode2 BIT1: Reserved	02	0200H
P2-01	Speed loop proportional gain 1	1～100	30	0201H
P2-02	Speed loop integral time 1	0.01～10.00s	0.50s	0202H
P2-03	Switchover frequency 1	0.00～P2-06	5.00Hz	0203H

P2-04	Speed loop proportional gain 2	1～100	20	0204H
P2-05	Speed loop integral time 2	0.01～10.00s	1.00s	0205H
P2-06	Switchover frequency 2	P2-03～maximum frequency	10.00Hz	0206H
P2-07	Slip compensation factor	50～200%	100%	0207H
P2-08	Time constant of speed loop filter	0.001～1.000s	0.050s	0208H
P2-09	Vector control over-excitation gain	0～200	64	0209H
P2-10	Torque upper limit source in speed control mode	0: P2-11 function code setting 1: AI1 2: AI2 3: AI3 4: Pulse setting 5: Communication setting 6: MIN(AI1,AI2) 7: MAX(AI1,AI2)	0	020AH
P2-11	Digital setting of torque upper limit	0.0～200.0%	150.0%	020BH
P2-12	Reserved	-	-	020CH
P2-13	Reserved	-	-	020DH
P2-14	Current loop of M-axis Kp	0～60000	2000	020EH
P2-15	Current loop of M-axis Ki		1300	020FH
P2-16	Current loop of T-axis Kp		2000	0210H
P2-17	Current loop of T-axis Ki		1300	0211H
P2-18	Speed loop integral property	0: Invalid 1: Valid	0	0212H
P2-19	Over excitation mode selection	0: No field weakening 1: Direct calculation 2: Automatic adjustment	1	0213H
P2-20	Over modulation enable selection	0～1	0	0214H
P2-21	Maximum output voltage coefficient	100～110%	105%	0215H

P2-22	Field weakening automatic adjustment gain	50～200%	100%	0216H
P2-23	Negative torque limit enable	0～1	0	0217H

P3 V/F Control Parameters

Function Code	Parameter Name	Setting Range	Default	Address
P3-00	V/F curve selection	0:Linear V/F 1:Multipoint V/F 2:Square V/F 3:1.2-power V/F 4:1.4-power V/F 5:1.5-power V/F 6:1.6-power V/F 7:1.7-power V/F 8:1.8-power V/F 9:Reserved 10:V/F complete separation 11:V/F half separation	0	0300H
P3-01	Multi-point V/F frequency1 (F1)	0.00～P3-03	1.00Hz	0302H
P3-02	Multi-point V/F voltage1 (V1)	0.0～P3-04	3.0%	0301H
P3-03	Multi-point V/F frequency2 (F2)	P3-01～P3-05	25.00Hz	0304H
P3-04	Multi-point V/F voltage2 (V2)	P3-02～P3-06	50.0%	0303H
P3-05	Multi-point V/F frequency3 (F3)	P3-03～maximum frequency	50.00Hz	0306H
P3-06	Multi-point V/F voltage3 (V3)	P3-04～100%	100%	0305H
P3-07	V/F Torque boost	0.0～30.0%	1.0%	0307H
P3-08	Cut-off frequency of torque boost	0.00～maximum frequency	50.00Hz	0308H
P3-09	Online torque compensation gain	80～150	100	0309H
P3-10	V/F slip compensation gain	0～200.0%	0.0%	030AH
P3-11	Slip compensation time constant	0.1～10.0s	0.5s	030BH
P3-12	Over-excitation gain	0～2.00	0.64	030CH
P3-13	V/F oscillation suppression gain	0～1000	Model dependent	030DH
P3-14	Oscillation suppression mode selection	0～4	3	
P3-15	Voltage source for V/F separation selection	0: Digital setting (P3-15) 1: Ai1 2: AI2 3: AI3 4: Pulse setting (DI5) 5: Multi-reference 6: Simple PLC 7: PID 8: Communication setting	0	030EH
P3-16	Voltage digital setting for V/F separation	0V～rated motor voltage	0V	030FH

P3-17	Voltage acceleration time of V/F separation	0.0～1000.0s	10.0s	030FH
P3-18	Voltage deceleration time of V/F separation	0.0～1000.0s	10.0s	0310H
P3-19	V/F separation shutdown mode	0 : Frequency/ voltage independent reduction to0 . 1 : After the voltage is reduced to 0 , the frequency is reduced to 0 again.	0	0312H
P3-20	Overcurrent stall action current	50～200 %	150%	0312H
P3-21	Overcurrent stall suppression enable	0 : Invalid 1 : Valid	1	0312H
P3-22	Overcurrent stall suppression gain	0～100	20	0312H
P3-23	Stall current compensation factor	50～200 %	50%	0312H
P3-24	Overvoltage stall action voltage	200 . 0 V～2000 . 0 V 220 V: 380 V690 V: 1250 V 380 V: 760 V1140 V: 1900 V 480 V: 850 V	Model dependent	0312H
P3-25	Overvoltage stall enable	0 : Invalid 1 : Valid	1	0312H
P3-26	Overvoltage stall frequency gain	0～100	30	0312H
P3-27	Overvoltage stall voltage gain	0～100	30	0312H
P3-28	Overvoltage stall maximum frequency	0～50 Hz	5Hz	0312H

P3-29	Automatic up- scaling enable	0～1	0	0312H
P3-30	Minimum electric torque current	0 A～64 A	32A	0312H
P3-31	Minimum generation torque current	10～100	20	0312H
P3-32	Automatic up- scaling KP	0～100	30	0312H
P3-33	Automatic up- scaling KI	0～100Hz	30Hz	0312H

P4 Input Terminals function				
Function Code	Parameter Name	Setting Range	Default	Address
P4-00	S1 terminal function	0: No function 1: Forward RUN (FWD) 2: Reverse RUN (REV) 3: Three-Wire control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6: Coast to stop 7: Emergency stop 8: Fault reset (RESET) 9: External fault input 10: Terminal UP 11: Terminal DOWN 12: UP and DOWN setting clear 13: Speed control/Torque control switchover 14: Speed search start enable 15: Reserved 16: Multi-reference terminal 1 17: Multi-reference terminal 2 18: Multi-reference terminal 3 19: Multi-reference terminal 4 20: Terminal 1 for acceleration/deceleration time selection 21: Terminal 2 for acceleration/deceleration time selection 22: Acceleration/Deceleration prohibited 23: PID control cancel 24: PID control pause 25: PID integral pause 26: PID characteristic switching 27: PID parameter switchover 28: PID target value switchover terminal1 29: PID target value switchover terminal2 30: PID target value switchover terminal3 31: PID feedback value switchover terminal1 32: PID feedback value switchover terminal2 33: PID feedback value switchover terminal3 34: PLC pause 35: PLC status reset 36: Swing enable 37: Swing pause 38: Swing reset	1	0400H
P4-01	S2 terminal function		2	0401H
P4-02	S3 terminal function		4	0402H
P4-03	S4 terminal function		5	0403H
P4-04	S5 terminal function		6	0404H
P4-05	S6 terminal function		8	0405H

P4-06	S7 terminal function	39: Frequency source switchover terminal1 40: Frequency source switchover terminal2 41: Frequency source switchover terminal3 42: Frequency source switchover terminal4 43: Command source switchover terminal 1 44: Command source switchover terminal 2 45: Counter input terminal 46: Counter reset terminal 47: Counter clock input terminal 48: Counter reset 49: DC braking command 50: Terminal pre-excitation 51: User-defined fault1 52: User-defined fault2 53: Pump 1 invalid 54: Pump 2 invalid 55: Pump 3 invalid 56: Pump 4 invalid	10	0406H
P4-07	S8 terminal function		11	0407H
P4-08	Characteristic selection of terminal S1-S4	BIT0: S1 terminal 0: Effective closing 1: Effective opening BIT1: S2 terminal 0: Effective closing 1: Effective opening BIT2: S3 terminal 0: Effective closing 1: Effective opening BIT3: S4 terminal 0: Effective closing 1: Effective opening	0000	0408H
P4-09	Filter time of terminal S1-S4	0.000～60.00s	0.10s	0409H
P4-10	Characteristic selection of terminal S5-S8	BIT0: S5 terminal 0: Effective closing 1: Effective opening BIT1: S6 terminal 0: Effective closing 1: Effective opening BIT2: S7 terminal 0: Effective closing 1: Effective opening BIT3: S8 terminal 0: Effective closing 1: Effective opening	0000	040AH
P4-11	Filter time of terminal S5-S8	0.000～60.00s	0.1s	040BH
P4-12	Terminal command mode	0: Two-line mode 1 Terminal set as 1 is forward running, terminal set as 2 is reverse running 1: Two-line mode 2 Terminal set as 1 is start running, terminal set as 2 is switch forward and reverse running 2: Three-line mode 1 Terminal set as 1 is forward running, terminal set as 2 is reverse running, terminal set as 3 is stop running 3: Three-line mode 2 Terminal set to 1 is start running,terminal set as 2 is switch forwardand reverse, terminal set as 3 is Stop running	0	040CH

P4-13	Terminal action mode selection	BIT0: Terminal of coast to stop recovery mode 0: Restore the original instruction after invalidation 1: Do not restore the original instruction after invalidation BIT1: Terminal of emergency stop recovery mode 0: Restore the original instruction after invalidation 1: Do not restore the original instruction after invalidation BIT2: Select the terminal operation mode after fault reset 0: The terminal operation command is valid immediately 1: The terminal operation command is valid only after it is canceled	111	040DH
P4-14	Reserved	-	-	040EH
P4-15	Reserved	-	-	040FH
P4-16	Terminal protection function selection	BIT0: 0: Invalid terminal operation command when power on 1: Valid terminal operation command when power on BIT1: When the run command setting channel terminal switching,selection of run command is valid 0: The running command is valid after stopping during switching 1: The run command is valid immediately when switching	00	0410H
P4-17	UP/DW frequency value	0.0～1.000Hz	0.010Hz	0411H
P4-18	UP /DW frequency adjustment selection	0: Retentive at power failure 1: Non-retentive at power failure 2: Valid operation, stop and reset	0	0412H
P4-19	Speed of UP/DW frequency increase and decrease	0.1～100.0%/s	2.0%/s	0413H
P4-20	Y1 terminal function	0: No output 1: Forward running 2: Reverse running 3: Fault output1 (no output at auto-reset period) 4: Fault output2 (output at auto-reset period) 5: Ready for RUN 6: Frequency reached 7: Frequency-level detection FDT1 output 8: Frequency-level detection FDT2 output 9: Frequency upper limit reached 10: Frequency lower limit reached	1	0414H
P4-21	Y2 terminal function		2	0415H
P4-22	Y3 terminal function		3	0416H

P4-23	Y4 terminal function	11: Current 1 reached 12: Current 2 reached 13: Zero current output 14: Output current out of limit 15: Torque limited 16: OL1 motor overload pre-warning 17: OL2 AC drive overload pre-warning 18: Zero-speed running (no output at stop) 19: Acceleration running 20: Deceleration running 21: Dc breaking 22: PLC step completed 23: PLC cycle completed 24: Reserved 25: Accumulative running time reached 26: Timing reached 27: Maximum count value reached 28: Set count value reached 29: AI1 input out of limit 30: Module temperature Reached 31: Fan running 32: Data output 1 from transfer(DO function) 33: Data output 2 from transfer(DO function) 34: Data output 3 from transfer(DO function) 35: Data output 4 from transfer(DO function) 36: Pump 1 start-up 37: Pump 2 start-up 38: Pump 3 start-up 39: Pump 4 start-up	6	0417H
P4-24	Y5 terminal function-Extension		0	0418H
P4-25	Y6 terminal function-Extension		0	0419H
P4-26	Y7 terminal function-Extension		0	041AH
P4-27	Y8 terminal function-Extension		0	041BH

P5 Analog terminal parameters

Function Code	Parameter Name	Setting Range	Default	Address
P5-00	AI123 input signal selection	BIT0: AI1 signal selection 0: 0～10V BIT1: AI2 signal selection 0: 0～10V 1: 0～20.00mA BIT2: S8 invalid HDI function 0: Common switch quantity function 1:HDI high speed pulse input function BIT3: AI3 signal selection 0: 0～10V 1: 0～20.00mA	0010	0500H
P5-01	AI1 input voltage minimum value	0.00～10.00V	0.00V	0501H
P5-02	AI1 input voltage lower limit corresponding setting	0.00～100.00%	0.00%	0502H
P5-03	AI1 input voltage maximum value	0.00～10.00V	10.00V	0503H
P5-04	AI1 input voltage upper limit corresponding setting	0.00～100.00%	100.00%	0504H
P5-05	AI1 filter time	0.00～10.00s	0.10s	0505H

P5-06	AI2 input voltage minimum value	0.00～10.00V	0.00V	0506H
P5-07	AI2 input voltage lower limit corresponding setting	0.00～100.00%	0.00%	0507H
P5-08	AI2 input voltage maximum value	0.00～10.00V	10.00V	0508H
P5-09	AI2 input voltage upper limit corresponding setting	0.00～100.00%	100.00%	0509H
P5-10	AI2 filter time	0.00～10.00s	0.10s	050AH
P5-11	AI3 input voltage minimum value	0.00～10.00V	0.00V	050BH
P5-12	AI3 input voltage lower limit corresponding setting	0.00～100.00%	0.00%	050CH
P5-13	AI3 input voltage maximum value	0.00～10.00V	10.00V	050DH
P5-14	AI3 input voltage upper limit corresponding setting	0.00～100.00%	100.00%	050EH
P5-15	AI3 filter time	0.00～10.00s	0.10s	050FH
P5-16	HDI minimum input frequency	0.00～50.00KHz	0.00KHz	0510H
P5-17	Corresponding setting of HDI minimum input frequency	0.00～100.00%	0.00%	0511H
P5-18	HDI maximum input frequency	0.00～50.00KHz	50.00KHz	0512H
P5-19	Corresponding setting of HDI maximum input frequency	0.00～100.00%	100.00%	0513H
P5-20	HDI filter time	0.00～10.00s	0.10s	0514H
P5-21 ～ P5-28	Reserved	-	-	0515H ～ 051CH
P5-29	AO1 output selection	0: Set frequency 1: Output frequency 2: Output current 3: Output voltage 4: Mechanical speed 5: Set torque 6: Output torque 7: PID setting 8: PID feedback 9: Output power 10: Bus voltage 11: Input voltage 12: AI1 input value 13: AI2 input value 14: AI3 input value	0	051DH
P5-30	AO2 output selection		1	051EH

P5-31	HDO output selection	15: PUL input value 16: Module temperature 17: Motor temperature 18: Excitation quantity 19: RS485 communication settings	2	051FH
P5-32	Analog output signal selection	BIT0: AO1 signal selection 0: 0～10V 1: 4.00～20.00mA 2: 0.00～20.00mA BIT1: AO2 signal selection 0: 0-10V 1: 4.00-20.00mA 2: 0.00-20.00mA BIT2: HDO function enable 0: Ordinary switching value Y4 function 1: HDO high speed pulse output function BIT3: Reserved	000	0520H
P5-33	AO1 output gain	25.0～200.0%	100.0%	0521H
P5-34	AO1 output offset coefficient	-10.0～10.0%	0.0%	0522H
P5-35	AO2 output gain	25.0～200.0%	100.0%	0523H
P5-36	AO2 output offset coefficient	-10.0～10.0%	0.0%	0524H
P5-37	HDO pulse output lower limit	0.00～50.00KHz	0.20KHz	0525H
P5-38	HDO pulse output upper limit	0.00～50.00KHz	50.00KHz	0526H

P6 Start/Stop Control parameters

Function Code	Parameter Name	Setting Range	Default	Address
P6-00	Start mode	BIT0: Start mode 0: Direct start 1: First braking and then start by startup frequency 2: Rotational speed tracking RESTART (Speed Search)	0	0600H
P6-01	Minimum output frequency	0.00～P6-04	0.50Hz	0601H
P6-02	Startup pre-excited current	0～100%	30%	0602H
P6-03	Startup pre-excited time	0.00～60.00s	Model dependent	0603H
P6-04	Startup frequency	0.00～60.00Hz	0.50Hz	0604H
P6-05	Startup frequency holding time	0.00～50.00s	0.0s	0605H
P6-06	Startup DC braking current	0～150%	0%	0606H
P6-07	Startup DC braking time	0.0～300.0s	0.0s	0607H

P6-08	Initial frequency of stop DC braking	0.00～50.00Hz	0.00Hz	0608H
P6-09	Stop DC braking current	0～150%	0%	0609H
P6-10	Waiting time of stop DC braking	0.00～60.00s	0.0s	060AH
P6-11	Stop DC braking holding time	0.00～600.0s	0.0s	060BH
P6-12	Zero speed holding current	0～150%	0%	060CH
P6-13	Acceleration mode selection	BIT0: Acceleration/Deceleration time frequency base 0: Base:50.00Hz 1:Maximum frequency BIT1: S-curve selection 0: Straight line 1: Curve	00	060DH
P6-14	S-curve acceleration start time	0.01～20.00s	0.50s	060EH
P6-15	S-curve acceleration end time		0.50s	060FH
P6-16	Start of S-curve deceleration time		0.50s	0610H
P6-17	End of S-curve deceleration time		0.50s	0611H
P6-18	Rotational speed tracking mode (Speed Searrch)	0: From frequency at stop 1: From zero speed 2: From maximum frequency	0	0612H
P6-19	Waiting time of rotational speed tracking	0.0～600.0s	1.0s	0613H
P6-20	Tracking speed of rotational speed	0～100	20	0614H
P6-21	Torque tracking closed loop current KP	0～1000	50	0615H
P6-22	Torque tracking closed loop current KI	0～1000	50	0616H
P6-23	Torque tracking current	30～200%	100%	0617H
P6-24	Torque tracking current lower limit	10～100%	30%	0618H
P6-25	Torque tracking rise time	0.5～30s	1.1s	0619H
P6-26	Torque tracking demagnetization time	0.00～5.00s	1.00s	061AH

P7 System configuration parameters

Function Code	Parameter Name	Setting Range	Default	Address
P7-00	Parameter and key lock selection	BIT0: 0: Not locked 1: Function parameter locking 2: Function parameters and key locking (except RUN/STOP/JOG) 3: Function parameters and keys are fully locked BIT1,BIT2,BIT3: Reserved	0	0700H
P7-01	User password	0～65535	0000	0701H
P7-02	STOP key function	BIT0: 0: Invalid for terminal command 1: Valid for terminal command BIT1: 0: Invalid for communication command 1: Valid for communication command BIT2: 0: Invalid for expansion card command 1: Valid for expansion card command	000	0702H

P7-03	MF.K Key function selection	BIT0: Panel digital potentiometer setting selection 0: Invalid 1: Main frequency 2: Auxiliary frequency 3: Upper frequency 4: V/F separated voltage 5: PID setting 6: PID feedback 7: Torque setting BIT1: 0: Directly valid after the knob is modified 1: Press the Enter key to be valid after the knob is modified	01	0703H
P7-04	Copy of function parameters	0: No operation 1: Proofread data, parameter copy 2: Write keyboard data to AC drive	0	0704H
P7-05	Display speed factor	0.001～50.000	1.000	0705H
P7-06	First line run display	BIT0: The first group displays BIT1: The second group displays BIT2: The third group displays BIT3: The fourth group displays 0: Given frequency 1: Output frequency 2: Output current 3: Output voltage 4: Input voltage 5: Mechanical speed 6: Bus voltage 7: Output power 8: Given torque 9: Output torque A: PID setting B: PID feedback C: AI1 input value D: AI2 input value E: HDI input value F: Counter value	6321	0706H
P7-07	First line stop display		Ca40	0707H
P7-08	Second line run display		0792	0708H
P7-09	Second line stop display		0CA4	0709H
P7-10	Multi-function expansion card selection	0～8	0	070AH
P7-11	operation panel display item selection	BIT0: LCD operation panel display language Set LCD operation panel display language, only valid when using LCD operation panel. 0: None 1: English BIT1: Output frequency display selection 0: Target frequency displays the target frequency of the current control motor. 1: Synchronous frequency displays the output frequency after converting operation. BIT2: Reserved BIT3: LCD Contrast Adjustment 0～F : The larger the contrast value	8001	070BH
P7-12	Accumulated power-on days	0～65535	Read-only	070CH
P7-13	Accumulated power-on hours	0.0～6553.5	Read-only	070DH
P7-14	Accumulated running days	0～65535	Read-only	070EH
P7-15	Accumulated running hours	0.0～6553.5	Read-only	070FH

P7-16	Accumulative power consumption (10000 kWh)	0～65535 million kWh	Read-only	0710H
P7-17	Accumulative power consumption	0～65535kWh	Read-only	0711H
P7-18	AC drive status before power off	BIT0: 0: Stop 1: Run BIT1: 0: Forward RUN 1: Reverse RUN BIT2: Reserved BIT3: Reserved	Read-only	0712H

P8 Auxiliary Functions

Function Code	Parameter Name	Setting Range	Default	Address
P8-00	Forward JOG running frequency(FJOG)	0.00Hz to maximum frequency	5.00Hz	0800H
P8-01	Reverse JOG running frequency(RJOG)	0.00Hz to maximum frequency	5.00Hz	0801H
P8-02	JOG acceleration time	0.1～6500.0s	10.0s	0802H
P8-03	JOG deceleration time		10.0s	0803H
P8-04	Acceleration time 2		10.0s	0804H
P8-05	Deceleration time 2		10.0s	0805H
P8-06	Acceleration time 3		10.0s	0806H
P8-07	Deceleration time 3		10.0s	0807H
P8-08	Acceleration time 4		10.0s	0808H
P8-09	Deceleration time 4		10.0s	0809H
P8-10	Emergency stop deceleration time		10.0s	080AH
P8-11	Forward/Reverse rotation dead-zone time	0.0～150.00s	0.00s	080BH
P8-12	Jump frequency 1	0.00Hz to maximum frequency	0.00Hz	080CH
P8-13	Jump frequency 2		0.00Hz	080DH
P8-14	Jump frequency amplitude		0.00Hz	080DH
P8-15	Frequency detection value (FDT1)		30.00Hz	080FH
P8-16	Detection range of FDT1		0.00Hz	0810H

P8-17	Frequency detection value (FDT2)	0.00Hz to maximum frequency	50.00Hz	0811H
P8-18	Detection range of FDT2		0.00Hz	0812H
P8-19	Detection range of frequency consistent		3.00Hz	0813H
P8-20	current reaching 1 detection value	0～200.0%	100.0%	0814H
P8-21	current reaching 1 detection range	0～100.0%	5.0%	0815H
P8-22	current reaching 2 detection value	0～200.0%	150.0%	0816H
P8-23	Current reaching 2 detection range	0～100.0%	5.0%	0817H
P8-24	Zero current detection level	0～200.0%	5.0%	0818H
P8-25	Zero current detection delay time	0.0s～650.0s	0.20s	0819H
P8-26	Output overcurrent threshold	0.0%～200.0%	100.0%	081AH
P8-27	Output overcurrent detection delay	0.0%～650.0%	0.20s	081BH
P8-28	Timing operation function	BIT0: Timing function selection 0: Invalid 1: Valid BIT1: Timing operation time selection 0: P8-29 setting 1: AI1 2: AI2 3: AI3 Analog input range 100% corresponds to P8-28	00	081CH
P8-29	Timing duration setting	0.0～6500.0Min	0.0Min	081DH
P8-30	Timer time unit	0: Second 1: Minute 2: Hour	0	081EH
P8-31	Timer set value	0～65000	0	081FH
P8-32	Counter Max	0～65000	1000	0820H
P8-33	Counter set value	0～65000	500	0821H
P8-34	AI1 voltage protection value lower limit	0.0～P8-35	3.10V	0822H
P8-35	AI1 voltage protection value upper limit	P8-34～10.00V	6.80V	0823H
P8-36	Module temperature reached	0～100℃	75.0℃	0824H

P9 Fault and protection parameters				
Function Code	Parameter Name	Setting Range	Default	Address
P9-00	Protection function selection 1	BIT0: Motor overload protection selection 0: Invalid 1: Valid BIT1: Ground fault duringpower-on 0: Invalid 1: Valid BIT2: Input phase loss protection selection 0: Invalid 1: Valid BIT3: Output phase loss protection selection 0: Invalid 1: Valid	1111	0900H
P9-01	Protection function selection 2	BIT0: Output load loss protection selection 0: Invalid 1: Deceleration 2: Ramp to stop BIT1: Instantaneous power failure action selection 0: Invalid 1: Valid BIT2: Continue operation frequency selection in case of failure 0: Operate at current operation frequency 1: Operate at set frequency 2: Operate at the upper limit frequency 3: Operate at the lower limit frequency 4: Operation at abnormal standby frequency	000	0901H
P9-02	Fault auto reset times	0: OFF Automatic reset function is turned off, only manual reset is allowed. 1-20: ON This function is on, 1-20 is the number of times of self recovery after failure (defined as the maximum number of times of auto reset after each failure)	0	0902H
P9-03	Time interval of fault auto reset	0.1～100.0s	1.0s	0903H
P9-04	1st fault type	1 -- ERROR_INVERTER UNIT 2 -- ERROR_OC_DURING_ACC 3 -- ERROR_OC_DURING_DEC 4 -- ERROR_OC_AT_CONST_SPEED 5 -- ERROR_OV_DURING_ACC 6 -- ERROR_OV_DURING_DEC 7 -- ERROR_OV_AT_CONST_SPEED 8 -- ERROR_CONTROL POWER SUPPLY 9 -- ERROR_UV 10 -- ERROR_OL_AC DRIVE 11 -- ERROR_OL_MOTOR 12 -- ERROR_LOSE_PHASE_INPUT 13 -- ERROR_LOSE_PHASE_OUTPUT 14 -- ERROR_OH_MODULE	Read-only	0904H

P9-05	2nd fault type	15 -- ERROR_EXTERNAL EQUIPMENT 16 -- ERROR_COMMUNICATE 17 -- ERROR_CONTACTOR 18 -- ERROR_CURRENT_DETECTION 19 -- ERROR_AUTO-TUNING 20 -- ERROR_ENCODER 21 -- ERROR_EEPROM_READWRITE 22 -- ERROR_HARDWARE_AC DRIVE 23 -- ERROR_MOTOR_SHORT_TO_GND 24 -- ERROR_ERRPROM_INITIALIZETE 26 -- ERROR_RUNNING TIME_REACHED 27 -- ERROR_USER-DEFINED_1	Read-only	0905H
P9-06	3rd fault type	28 -- ERROR_USER-DEFINED_2 29 -- ERROR_POWER-ON_TIME_REACHED 30 -- ERROR_LOAD_0 31 -- ERROR_PID_FDB_LOSE 40 -- ERROR_PBP_CURRENT_LIMIT 41 -- ERROR_SWITCH_MOTOR_WHEN_RUN 42 -- ERROR_TOO_LARGE_SPEED_DEVIATION 43 -- ERROR_MOTOR_OS 45 -- ERROR_MOTOR_OH 51 -- ERROR_POLE_POSITION_DETECTION 52 -- ERROR_ZERO_POSITION_INDENTIFICATION 53 -- ERROR_FEEDBACK_UVW_SIGNAL	Read-only	0906H
P9-07	Failure operation frequency	0.00～655.35Hz	Read-only	0907H
P9-08	Failure output current	0～655.35A	Read-only	0908H
P9-09	Failure DC-bus voltage	0～65535V	Read-only	0909H
P9-10	Failure AC drive status	BIT0: Direction of operation 0: FWD 1: REV BIT1: Running state 0: STOP 1: CONST 2: ACC 3: DEC BIT2: RESERVED BIT3: RESERVED	Read-only	090AH
P9-11	Failure S terminal status	0～65535	Read-only	090BH
P9-12	Failure Y terminal status	0～65535	Read-only	090CH
P9-13	Failure power on time	0～65535	Read-only	090DH
P9-14	Failure running time	0～65535	Read-only	090EH
P9-15	Frequency upon 2nd fault	0～655.35Hz	Read-only	090FH
P9-16	Current upon 2nd fault	0～655.35A	Read-only	0910H
P9-17	Output voltage upon 2nd fault	0～65535V	Read-only	0911H

P9-18	AC drive status upon 2nd fault	0～65535	Read-only	0912H
P9-19	S terminal status upon 2nd fault	0～65535	Read-only	0913H
P9-20	Y terminal status upon 2nd fault	0～65535	Read-only	0914H
P9-21	Power-on time upon 2nd fault	0～65535	Read-only	0915H
P9-22	Running time upon 2nd fault	0～65535	Read-only	0916H
P9-23	Frequency upon 3rd fault	0～655.35Hz	Read-only	0917H
P9-24	Current upon 3rd fault	0～655.35A	Read-only	0918H
P9-25	Output voltage upon 3rd fault	0～65535	Read-only	0919H
P9-26	AC drive status upon 3rd fault	0～65535	Read-only	091AH
P9-27	S terminal status upon 3rd fault	0～65535	Read-only	091BH
P9-28	Y terminal status upon 3rd fault	0～65535	Read-only	091CH
P9-29	Power-on time upon 3rd fault	0～65535	Read-only	091DH
P9-30	Running time upon 3rd fault	0～65535	Read-only	091EH
P9-31	Backup frequency upon abnormality	0.0～100.0%	100.0%	091FH
P9-32	Motor overload protection gain	0.20～10.00	1.00	0920H
P9-33	Motor overload warning coefficient	50～100%	90%	0921H
P9-34	Recognize voltage at instantaneous stop action	0～100%	80%	0922H
P9-35	Recognize voltage at instantaneous stop pause	0～100%	80%	0923H
P9-36	Recognize time at instantaneous rise action	0.00～100.00s	0.50s	0924H
P9-37	Instantaneous stop deceleration gain	0～200%	100%	0925H
P9-38	IPF_Freq.Ki	0.0～100.0%	10%	0925H
P9-39	IPF_Act. Judg. V	0～200%	100%	0925H
P9-40	Detection level of load becoming 0	0.0～100.0%	10.0%	0926H
P9-41	Detection time of load becoming 0	0.0～60.0s	1.0s	0927H

P9-42	Over-speed detection value	0.0～50.0%(Maximum frequency)	20.0%	0928H
P9-43	Over-speed detection time	0.0～60.0s	1.0s	0929H
P9-44	Detection value of too large speed deviation	0.0～50.0%(Maximum frequency)	20.0%	092AH
P9-45	Detection time of too large speed deviation	0.0～60.0s	5.0s	092BH
P9-46	Overvoltage stall gain	0～100	0	092CH
P9-47	Overvoltage stall protective voltage	120～150%	130%	092DH
P9-48	Overcurrent stall gain	0～100	20	092EH
P9-49	Overcurrent stall protective current	100～200%	150%	092FH
P9-50	Input phase loss protection level	0～100%	20%	0930H
P9-51	Input phase loss protection delay	2～250.0s	8s	0931H
P9-52	Protection action selection 1	BIT0: Motor overload (Err11) action select 0: Immediately-stop, fault alarm 1: Emergency stop, fault alarm 2: Only warning, AC drive continues to operate BIT1: Input phase loss (Err12) action select Same as BIT0 BIT2: Output phase loss (Err13) action select Same as BIT0 BIT3: External fault (Err15) action select Same as BIT0	0000	0932H
P9-53	Protection action selection 2	BIT0: Abnormal communication (Err16) action selection Same as P9-52 BIT0 BIT1: Encoder failure (Err20) action select 0: Immediately-stop, fault alarm 1: Emergency stop, fault alarm 2: Switch to VF, continue operation BIT2: Function code reading and writing abnormal (Err21) action selection 0: Immediately-stop, fault alarm 1: Emergency stop, fault report BIT3: Motor overheating (Err25) action select Same as BIT0	0000	0933H
P9-54	Protection action selection 3	BIT0: User defined fault 1 (Err27) action selection Same as P9-52 BIT0 BIT1: User defined fault 2 (Err28) action selection Same as BIT0	0000	0934H

P9-54	Protection action selection 3	BIT2: Power on time arrival (Err29) action selection Same as BIT1 BIT3: Load loss (Err30) action selection 0: Immediately-stop, fault alarm 1: Emergency stop, fault alarm 2: Directly jump to 7% of the rated frequency of the motor to continue operation, and automatically return to the set frequency operation during noload operation	0000	0934H
P9-55	Protection action selection 4	BIT0: Loss of PID feedback during operation (Err31) action selection Same as P9-52 BIT0 BIT1: Excessive speed deviation (Err42) action selection Same as BIT0 BIT2: Motor over speed (Err43) action selection Same as BIT0 BIT3: Initial position error (Err51) action selection Same as BIT0	0000	0935H
P9-56	Protection action selection 5	BIT0: Speed feedback error (Err52) action selection Same as P9-52 BIT0	0	0936H

PA Process PID control parameters

Function Code	Parameter Name	Setting Range	Default	Address
PA-00	PID setting source	0: PID setting source 1: AI1 2: AI2 3: AI3 4: Terminal pulse setting(PUL) 5: Communication setting 6: PLC setting 7: UP/DW control 8: Terminal selection	0	0A00H
PA-01	PID digital setting	0.00～PA-05	0.5Mpa	0A01H
PA-02	PID control feedback signal source	0: PID setting source 1: AI1 2: AI2 3: AI3 4: Terminal pulse feedback 5: Communication feedback 6: AI1 + AI2 7: MAX(|AI1|,|AI2|) 8: MIN(|AI1|,|AI2|)	2	0A02H
PA-03	PID digital feedback	0.00～PA-05	1.00Mpa	0A03H

PA-04	Feedback signal gain	0.00～10.000	1.000	0A04H
PA-05	Feedback signal range	0～655.35	1.00	0A05H
PA-06	PID control selection 1	BIT0: Feedback feature selection 0: Positive characteristic when the feedback signal of PID is less than the given value, the output frequency of AC drive will rise. 1: Negative characteristic when the feedback signal of PID is less than the given value, the output frequency of AC drive will decrease. BIT1: PID parameter switching condition 0: Invalid 1: Valid When the multi-functional digital terminal integration pause is effective, the PID integration stops operation, and at this time, the PID only has the proportional and differential functions. BIT2: Integral separation 0: No switching 1: Switching through DI terminal 2: Switch automatically according to deviation BIT3: Stop integration after output to limit value 0: Continue integral 1: Stop integral After the PID operation output reaches the maximum or minimum value, you can choose whether to stop the integration. If stop integral is selected, then PID integral stops calculation at this time, which may help to reduce PID overshoot.	0000	0A06H
PA-07	PID control selection 2	BIT0: PID shutdown operation 0: Shutdown without calculation 1: Operation when shutdown BIT1: Constant pressure water supply sleep function 0: Invalid 1: Valid BIT2: Reserved BIT3: Reserved	00	0A07H
PA-08	Proportional gain Kp1	0.00～100.00	20.00	0A08H
PA-09	Integral time Ti1	0.00～10.00s	2.00s	0A09H
PA-10	Differential time Td1	0.00～10.000s	0.000s	0A0AH
PA-11	Cut-off frequency of PID reverse rotation	0.00～maximum frequency	2.00Hz	0A0BH
PA-12	PID deviation limit	0.0～100.0%	0.0%	0A0CH
PA-13	PID differential limit	0.0～100.00%	0.10%	0A0DH

PA-14	PID setting change time	0.00～10.00s	0.00s	0A0EH
PA-15	PID feedback filter time	0.00～650.00s	0.00s	0A0FH
PA-16	PID output filter time	0.00～60.00s	0.00s	0A10H
PA-17	Reserved	-	-	0A11H
PA-18	Proportional gain Kp2	0.00～100.00	20.00	0A12H
PA-19	Integral time Ti2	0.00～10.00s	2.00s	0A13H
PA-20	Differential time Td2	0.00～10.000s	0.000s	0A14H
PA-21	PID parameter switchover deviation 1	0.0～PA-22	20.0%	0A15H
PA-22	PID parameter switchover deviation 2	PA-21～100.0%	80.0%	0A16H
PA-23	PID initial value	0.0～100.0%	0%	0A17H
PA-24	PID initial value running time	0.0～6500.0s	0.0s	0A18H
PA-25	Maximum deviation between two PID outputs in forward direction	0.00～100.00%	1.00%	0A19H
PA-26	Maximum deviation between two PID outputs in reverse direction	0.00～100.00%	1.00%	0A1AH
PA-27	Detection value of disconnection alarm	0.0～100.0%	0.0%	0A1BH
PA-28	Feedback disconnection detection time	0.0～120.0%	1.0%	0A1CH
PA-29	Dormant judgment benchmark	0.1～100.0%	95.0%	0A1DH
PA-30	Dormant base duration	0.0～6500.0S	30.0s	0A1EH
PA-31	Enter dormant deceleration time	0.0～6500.0S	60.0s	0A1FH
PA-32	Sleep low holding frequency	0.00～20.00Hz	10.00Hz	0A20H
PA-33	Low frequency operation time	0.0～6500.0S	10.0s	0A21H
PA-34	Wake-up base	0.1～100.0%	50.0%	0A23H

PA-35	Wake-up base duration	0.0～6500.0S	30.0s	0A24H

PB Communication control function parameters

Function Code	Parameter Name	Setting Range	Default	Address
PB-00	Master-slave selection	Master-slave selection 0:Slave 1:Master	0	0B00H
PB-01	Address	1～247	1	0B01H
PB-02	Baud rate selection	0：1200bps 1：2400bps 2：4800bps 3：9600bps 4：19200bps 5：38400bps 6: 57600bps 7: 115200bps	3	0B02H
PB-03	Data format	0: (N,8,1)No check,data format:8, stop bit:1 1: (E,8,1)Even parity check,data format:8, stop bit:1 2: (0,8,1)Odd Parity check,data format:8, stop bit:1 3: (N,8,2)No check,data format:8, stop bit:2 4: (E,8,2)Even parity check,data format:8, stop bit:2 5: (0,8,2)Odd Parity check,data format:8, stop bit:2	3	0B03H
PB-04	Communication proportion setting	0.000～5.000	1.000	0B04H
PB-05	Communication response delay	0～0.500s	0.000s	0B05H
PB-06	Communication timeout failure time	0.1～100.0s	1.0s	0B06H
PB-07	Transmission response processing	0: Write response 1: Write no response	0	0B08H
PB-08	Master send selection	BIT0: The first set of transmission frame selection 0: Invalid 1: Run command setting 2: Master set frequency 3: Master output frequency 4: Master upper limit frequency 5: Master set torque (reserved) 6: Master output torque 7: Limit of forward speed of master torque control (reserved) 8: Limit of reserved speed of master torque control (reserved) 9: PID set by the mater A:master feedback PID BIT1: Second set of transmission frame selection Ditto	0031	0B09H

PB-08	Master send selection	BIT2: The third set of transmission frame selection Ditto BIT3: Selection of the fourth set of trans-mission frames Ditto	0031	0B09H

PC Optimization Parameters

Function Code	Parameter Name	Setting Range	Default	Address
PC-00	Carrier frequency characteristic selection	BIT0: 0：Temperature independent 1:Temperature related BIT1: 0:Asynchronous modulation 1: Synchronous modulation BIT2：0: Random PWM invalid 1-A:Random PWM	0000	0C00H
PC-01	DPWM switchover frequency upper limit	0～15.00Hz	12.00Hz	0C01H
PC-02	Cooling fan control	0: The operation of the fan isjust related to the temperature 1～A: The operation is related to the temper--ature, and during run, the fan is operating.	0	0C02H
PC-03	Rapid current limit enable	0～1	1	0C03H
PC-04	Dead zone compensation mode	0～2	1	0C04H
PC-05	Dynamic braking turn-on voltage	200～2000.0V	690.0V	0C05H
PC-06	Action voltage of energy consumption braking	0～100%	100%	0C06H
PC-07	Overvoltage threshold	0～2500.0V	810.0V	0C07H
PC-08	Undervoltage threshold	200.0～2000.0V	350.0V	0C08H
PC-09	Solution of undervoltage fault	0: Fault 1: Continue to operate within the allowable time of undervoltage recovery 2: Continue to operate after the power supply returns to normal	0	0C09H
PC-10	Allowable time of undervoltage recovery	0.1～60.0s	2.0s	0C0AH
PC-11	Restart method after power failure	0: Invalid 1: Valid	0	0C0BH
PC-12	Waiting time for restart after power failure	0.0～120.00s	3.00S	0C0CH

PD Internal control PLC Function and frequency parameters

Function Code	Parameter Name	Setting Range	Default	Address
PD-00	Multi-frequency 1	0～100.0%	20.0%	0D00H
PD-01	Multi-frequency 2		40.0%	0D01H
PD-02	Multi-frequency 3		60.0%	0D02H
PD-03	Multi-frequency 4		80.0%	0D03H
PD-04	Multi-frequency 5		100.0%	0D04H
PD-05	Multi-frequency 6		80.0%	0D05H
PD-06	Multi-frequency 7		60.0%	0D06H
PD-07	Multi-frequency 8		40.0%	0D07H
PD-08	Multi-frequency 9		20.0%	0D08H
PD-09	Multi-frequency 10		40.0%	0D09H
PD-10	Multi-frequency 11		60.0%	0D0AH
PD-11	Multi-frequency 12		80.0%	0D0BH
PD-12	Multi-frequency 13		100.0%	0D0CH
PD-13	Multi-frequency 14		80.0%	0D0DH
PD-14	Multi-frequency 15		60.0%	0D0EH
PD-15	PLC running mode	BIT0: Circulation mode 0: Stop after the AC drive runs one cycle 1: Repeat after the AC drive runs one cycle 2: Keep final values after the AC drive runs one cycle BIT1:Chronograph unit 0: Second 1: Minute 2: Hour BIT2: Power down storage mode 0: No 1: Yes BIT3: Start-up mode 0: Rerun from stage one 1: Rerun from downtime 2: Continue operation with the rest of the downtime phase	0000	0D0FH
PD-16	Running time of PLC reference 1	0.0～6500.0 (s/m/h)	10.0s	0D10H

PD-17	Running time of PLC reference 2	0.0～6500.0 (s/m/h)	10.0s	0D11H
PD-18	Running time of PLC reference 3		10.0s	0D12H
PD-19	Running time of PLC reference 4		10.0s	0D13H
PD-20	Running time of PLC reference 5		10.0s	0D14H
PD-21	Running time of PLC reference 6		10.0s	0D15H
PD-22	Running time of PLC reference 7		10.0s	0D16H
PD-23	Running time of PLC reference 8		10.0s	0D17H
PD-24	Running time of PLC reference 9		10.0s	0D18H
PD-25	Running time of PLC reference 10		10.0s	0D19H
PD-26	Running time of PLC reference 11		10.0s	0D1AH
PD-27	Running time of PLC reference 12		10.0s	0D1BH
PD-28	Running time of PLC reference 13		10.0s	0D1CH
PD-29	Running time of PLC reference 14		10.0s	0D1DH
PD-30	Running time of PLC reference 15		10.0s	0D1EH
PD-31	Running direction and acceleration/ deceleration time of PLC reference 1	BIT0: Operation direction of this section 0: Forward 1: Reverse BIT1: Acceleration and deceleration time of this section 0: Acceleration and deceleration time 1 1: Acceleration and deceleration time 2 2: Acceleration and deceleration time 3 3: Acceleration and deceleration time 4 BIT2: Reserved BIT3: Reserved	00	0D1FH
PD-32	Running direction and acceleration/ deceleration time of PLC reference 2		00	0D20H
PD-33	Running direction and acceleration/ deceleration time of PLC reference 3		00	0D21H

PD-34	Running direction and acceleration/ deceleration time of PLC reference 4	BIT0: Operation direction of this section 0: Forward 1: Reverse BIT1: Acceleration and deceleration time of this section 0: Acceleration and deceleration time 1 1: Acceleration and deceleration time 2 2: Acceleration and deceleration time 3 3: Acceleration and deceleration time 4 BIT2: Reserved BIT3: Reserved	00	0D22H
PD-35	Running direction and acceleration/ deceleration time of PLC reference 5		00	0D23H
PD-36	Running direction and acceleration/ deceleration time of PLC reference 6		00	0D24H
PD-37	Running direction and acceleration/ deceleration time of PLC reference 7		00	0D25H
PD-38	Running direction and acceleration/ deceleration time of PLC reference 8		00	0D26H
PD-39	Running direction and acceleration/ deceleration time of PLC reference 9		00	0D27H
PD-40	Running direction and acceleration/ deceleration time of PLC reference 10		00	0D28H
PD-41	Running direction and acceleration/ deceleration time of PLC reference 11		00	0D29H
PD-42	Running direction and acceleration/ deceleration time of PLC reference 12		00	0D2AH

PD-43	Running direction and acceleration/ deceleration time of PLC reference 13		00	0D2BH
PD-44	Running direction and acceleration/ deceleration time of PLC reference 14		00	0D2CH
PD-45	Running direction and acceleration/ deceleration time of PLC reference 15		00	0D2DH
PD-46	Swing frequency control	BIT0: Swing frequency setting mode 0: Invalid swing frequency control 1: Effective swing frequency control BIT1: Frequency swing input mode 0: Automatic input 1: Manual input BIT2: Swing control 0: Variable swing 1: Fixed swing	000	0D2EH
PD-47	Preset frequency of swing frequency	0.00～maximum frequency	0.00Hz	0D2FH
PD-48	Preset frequency duration	0.00～650.00s	0.00s	0D30H
PD-49	Swing frequency amplitude	0.0～100.0%	0.0%	0D31H
PD-50	Jump frequency amplitude	0.0～50.0%	0.0%	0D32H
PD-51	Rise time of swing frequency	0.00～6500s	5.0s	0D33H
PD-52	Falling time of swing frequency	0.00～6500s	5.0s	0D34H

PF User-defined parameters

Function Code	Parameter Name	Setting Range	Default	Address
PF-00	PF parameter group function	BIT0: 0: Normal display parameter group 1: Only display PF parameter group BIT1: 0: PF group function mode 1: PF group programming mode	00	0F00H
PF-01	PF macro parameter selection	0: According to the user programming mode 1-2: Call the application macro defined by the manufacturer	0	0F01H
PF-02	PF parameter group length	0～96	15	0F02H
PF-03	Motor Control Mode	0～2	User Defined	0F03H
PF-04	Command Source	0～4	User Defined	0F03H
PF-05	Main Source X Selection	0～C	User Defined	0F03H
PF-06	Max Output Frequency	0.00～320.00Hz	User Defined	0F03H
PF-07	Main Frequency X	0.00～50.00Hz	User Defined	0F03H
PF-08	Acceleration Time 1	0.1～6500.0S	User Defined	0F03H

PF-09	Deceleration Time 1	0.1～6500.0S	User Defined	0F03H
PF-10	Stoping Method	0～1	User Defined	0F03H
PF-11	Auto Tuning Selection	0～3	User Defined	0F03H
PF-12	Motor Type	0～2	User Defined	0F03H
PF-13	Motor Power	0.01～100.00KW	User Defined	0F03H
PF-14	Motor Voltage	1～20000V	User Defined	0F03H
PF-15	Motor Current	6.30～650.00A	User Defined	0F03H
PF-16	Motor Frequency	0.01～50.00Hz	User Defined	0F03H
PF-17	Multi Pumps Control	1.0～15.0KHz	User Defined	0F03H

A0 Torque control parameters

Function Code	Parameter Name	Setting Range	Default	Address
A0-00	Control mode	0: Speed control 1: Torque control	0	1000H
A0-01	Torque setting source selection	BIT0: Main frequency source X selection(The full range of 1-7 option corresponds to A3-02) 0: Function code A3-02 setting 1: AI1 2: AI2 3: AI3 4: PULSE setting 5: Communication setting 6: MIN(AI1,AI2) 7: MAX(AI1,AI2) BIT1: Auxiliary frequency source Y selection (The full range of1-7 option corresponds to A3-03) 0: Function code P5-11 setting 1: AI1 2: AI2 3: AI3 4: PULSE setting 5: Communication setting 6: MIN(AI1,AI2) 7: MAX(AI1,AI2) The full range of 1-7 option corresponds to P5-11 BIT 2:Main and frequency source selection 0: X×[A3-03] 1: Y×[A3-04] 2: X×[A3-03] ＋ Y×[A3-04] 3: X×[A3-03] － Y×[A3-04] 4: MAX{X×[A3-03], Y×[A3-04]} 5: MIN{X×[A3-03], Y×[A3-04]} 6: Any non-zero value of the main frequency source X and auxiliary frequency source Y is valid,and the main frequency source X takes precedence.	000	1000H
A0-02	Torque digital setting in main frequency source X	-200～200.0%	100%	1002H
A0-03	Torque digital setting in auxiliary frequency source Y	-200～200.0%	100%	1003H
A0-04	Torque setting in main frequency source X Gain	0～5.000%	1.000%	1004H
A0-05	Torque setting in auxiliary frequency source Y Gain	0～5.000%	1.000%	1005H

A0-06	Torque given filter time	0.0～10.00s	0.10s	1006H
A0-07 ～ A0-09	Reserved	-	-	1007H ～ 1009H
A0-10	Forward maximum frequency in torque control	0.0Hz～maximum frequency	50.00Hz	100AH
A0-11	Reverse maximum frequency in torque control	0.0Hz～maximum frequency	50.00Hz	100BH
A0-12	Acceleration time in torque control	0.00～100.00s	0.00s	100CH
A0-13	Deceleration time in torque control	0.00～100.00s	0.00s	100DH

A1 Constant Pressure Water Supply Parameters

Function Code	Parameter Name	Setting Range	Default	Address
A1-00	Multiple pump control	BIT0: 0: Multiple pump control is invalid 1: Frequency transform pump fix, no timing shift 2: Frequency transform pump fix with timing shift 3: Frequency transform pump circulating, no timing shift 4: Frequency transform pump circulating, has timing shift BIT1: Quantity of pump BIT2: 0: Start first then stop(suitable to unequal pump power) 1: Start first then stop firs(suitable to equal pump power) BIT3: 0:Time unit 0.1hour 1:Time unit 0.1Min	0110	1100H
A1-01	Add pump given increment 1	0.0～100.0%	0.0%	1101H
A1-02	Add pump given increment 2	0.0～100.0%	0.0%	1102H
A1-03	Add pump given increment 3	0.0～100.0%	0.0%	1103H
A1-04	Motor connect-in judge function	Valid pump judge invalid 0: Invalid 1: By S terminal invalid 2: Decided by A01-05 setting	2	1104H
A1-05	Motor connect-in setting	0: This motor and system isconnect 1: This motor connect-in system	1111	1105H
A1-06	Timing rotation time	0.1～6000.0h	0.1h	1106H

A1-07	Timing rotation frequency limit	0.01～maximum frequency	50.0Hz	1107H
A1-08	Timing rotation the quantity of rest motors	1～3	1	1108H
A1-09	Add pump frequency 1	0.00～maximum frequency	48.00Hz	1109H
A1-10	Reduce pump frequency 1	0.00～A1-09	25.00Hz	110AH
A1-11	Add pump frequency 2	0.00～maximum frequency	48.00Hz	110BH
A1-12	Reduce pump frequency 2	0.00～A1-11	25.00Hz	110CH
A1-13	Add pump frequency 3	0.00～maximum frequency	48.00Hz	110DH
A1-14	Reduce pump frequency 2	0.00～A1-13	25.00Hz	110EH
A1-15	Add pump delay time	0～3600.0s	5.0S	110FH
A1-16	Reduce pump delay time	0～3600.0s	3.0S	1110H
A1-17	Industry frequency switch lock time	0.02～10.00s	0.20s	1111H
A1-18	Industry frequency switch frequency	0.00～maximum frequency	50.00Hz	1112H
A1-19	Fixed pump Trubleshooting	0 to 2 Bitt0: 0: Emergency stop, report failure, all auxiliary pumps stop working. 1: Emergency stop, report failure, auxiliary pump maintains the status quo	0	1113H

Run Monitor

Function Code	Parameter Name	Setting Range	Default	Address
00	Set frequency	-	-	2110H
01	Output frequency	-	-	2111H
02	Output current	-	-	2112H
03	Output voltage	-	-	2113H
04	Input voltage	-	-	2114H
05	Mechanical speed	-	-	2115H
06	Bus voltage	-	-	2116H
07	Output power	-	-	2117H
08	Target torque	-	-	2118H
09	Output torque	-	-	2119H
10	PID setting	-	-	211AH
11	PID feedback	-	-	211BH
12	AI1 input value	-	-	211CH
13	AI2 input value	-	-	211DH
14	HDI input value	-	-	211EH

15	Counter count value	-	-	211FH
16	AI3 input value	-	-	2120H
17	Terminal S Status	-	-	2121H
18	Terminal Y Status	-	-	2122H
19	AO1 output value	-	-	2123H
20	AO2 output value	-	-	2124H
21	HDO output value	-	-	2125H
22	Reserved	-	-	2126H
23	Model temperature	-	-	2127H
24	Output excitation	-	-	2128H
25	Power factor	-	-	2129H
26	Power-on time	-	-	212AH
27	power-on operation time	-	-	212BH
28	Accumulated time	-	-	212CH
29	AC drive running state	-	-	212DH
30	Maximum current	-	-	212EH
31	Maximum voltage	-	-	212FH
32	Maximum temperature	-	-	2130H
33	Miniamum voltage	-	-	2131H
34	Rated power of AC drive	-	-	2132H
35	Rated voltage of AC drive	-	-	2133H
36	Rated current of AC drive	-	-	2134H
37	AC version	-	-	2135H
38	MC version	-	-	2136H
39	Communication frequency	-	-	2137H
40	Main frequency X display	-	-	2138H
41	Auxiliary frequency Y display	-	-	2139H
42	Remaining time	-	-	213AH
43	Target voltage upon V/F separation	-	-	213BH
44	Output voltage upon V/F separation	-	-	213CH
45	PG feedback value	-	-	213DH

46	Linear speed	-	-	213EH
47	PM rotor position	-	-	213FH
48	Resolver position	-	-	2140H
49	ABZ position	-	-	2141H
50	Phase Z counting	-	-	2142H
51	Communication sending value	-	-	2143H
52	Communication receiving value	-	-	2144H
53	Motor temperature	-	-	2145H
54	Multiple pumps control	-	-	2146H
*	**To access the Parameters click on PRG bottom and then select 2. Run Monitor**			

8.2 Appendix II: RS485 communication protocol

● Introduction to communication protocol

SAHAND300 series AC drive is equipped with RS485 communication interface as standard, and adopts master-slave communication of international standard ModBus communication protocol. Users can realize centralized control (set converter control command、 operation frequency、 modification of relevant function code parameters, monitoring of converter working status and fault information, etc.) through PC / PLC, master computer, main station AC drive, etc., to adapt to specific application requirements.

● Application mode

1. SAHAND300 series AC drive has a "single master and multi slave" control network connected to RS485 bus. When the master uses the broadcast command (slave address is 0), the slave does not answer.

2. SAHAND300 only provides RS485 interface, asynchronous half duplex. If the communication port of external equipment is RS232, an additional RS232 / RS485 converter is required.

3. Modbus protocol defines the information content and use format of asynchronous transmission in serial communication, which can be divided into rut mode and ASCII mode. SAHAND300 is RTU (remote terminal unit) mode.

● Frames in Communication structure

The format of communication data is as follows:

Byte composition: including start bit, 8 data bits, parity bit and stop bit.

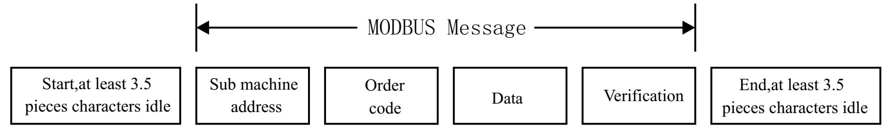
Start Bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Parity Bit	Stop Bit

The information of a frame must be transmitted in a continuous data str-eam. If the interval of more than 1.5 bytes before the end of the whole frame transmission, the receiving device will clear these incomplete information and mistakenly think that the next byte is the address domain part of the new frame. Similarly, if the interval time between the start of a new frame and the previous frame is less than 3.5 bytes, the receiving device will consider it as the continuation of the previous frame. Due to the frame confusion, the final CRC check value is not correct, resulting in communication errors.

Frame header	3.5 bytes transmission time
slave address	mail address: 0-247 (decimal) (0 is broadcast address)
Command code	03h: read slave parameters 06h: write slave parameters 08h: loop self test
Data area	Parameter address, number of parameters, parameter value, etc
CRC CHK low	Test value: 16 bit CRC test value
CRC CHK high	
Frame tail	3.5 bytes transmission time

In the RTU mode, the new one frame use at least 3.5 pieces bytes transmit time stop interval as start. The follow transmit data region are in proper sequence: sub machine address, operation order code, data and CRC verify byte, each region transmit byte all are hexadecimal 0....9, A....F. The internet equipment continue sense the internet bus line, include within the stop in-terval time. When received the first region(address information), each in-ternet equipment all decoding this byte to judge whether it is send to own. At the final one byte transmit finished, and make one at least 3.5 pieces bytes transmit time interval to present this frame finished, after this, a new message can start.

RUT Date Frame Format



● Order code and communication data description

Order code: o3H, read N pieces byte(word), the max can continue read five words.

Example: from the AC drive which sub machine address is 01h, the start address of memory is 2100H(［C-00］), reading continue 3 pieces words, then the structure description of this frame as below:

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	03H
Start address high position	21H
Start address low position	00H
Data quantity high position	00H
Data quantity low position	03H
CRC CHK low position	0FH
CRC CHK high position	F7H
END	3.5 pieces bytes transmit time

RTU sub machine responding information(when normal)

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	03H
Bytes quantity low position	06H
Data address 2100H high position	13H
Data address 2100H low position	88H
Data address 2101H high position	00H
Data address 2101H low position	00H

Data address 2102H high position	00H
Data address 2102H low position	00H
CRC CHK low position	90H
CRC CHK high position	A6H
END	3.5 pieces bytes transmit time

RTU sub machine responding information (when abnormal)

START	3.5 bytes transmit time
Sub machine address	01H
Order code	83H
Error code	04H
CRC CHK low position	40H
CRC CHK high position	F3H
END	3.5 bytes transmit time

Order code:06H, write one word

Function: write one word data into appointed data address, can use into modify the frequency transformer parameter value.

Example: write the 5000(1388H) in the 3000H address of sub machine address 1 frequency transformer. Then the structure description of this frame as below:

RTU main machine order information

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	06H
Check the code high position	30H
Check the code low position	00H
Data high position	13H
Data low position	88H
CRC CHK low position	8BH
CRC CHK high position	9CH
END	3.5 pieces bytes transmit time

RTU sub machine responding information(when normal)

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	06H
Check the code high position	30H
Check the code low position	00H
Data high position	13H
Data low position	88H
CRC CHK low position	8BH
CRC CHK high position	9CH
END	3.5 pieces bytes transmit time

RTU sub machine responding information(when abnormal)

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	86H
Error code	01H
CRC CHK low position	83H
CRC CHK high position	A0H
END	3.5 pieces bytes transmit time

Order code: 08H, return circuit self check

Function: send back the sub machine responding information which same to the main machine order information, used to check whether the signal transmit between main machine and sub machine are normal.

RTU main machine order information

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	08H
Check the code high position	00H
Check the code low position	00H
Data high position	13H
Data low position	88H
CRC CHK low position	EDH
CRC CHK high position	5DH
END	3.5 pieces bytes transmit time

RTU sub machine responding information (when normal)

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	08H
Check the code high position	00H
Check the code low position	00H
Data high position	13H
Data low position	88H
CRC CHK low position	EDH
CRC CHK high position	5DH
END	3.5 pieces bytes transmit time

RTU sub machine responding information (when abnormal)

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	88H
Error code	03H
CRC CHK low position	06H
CRC CHK high position	01H
END	3.5 pieces bytes transmit time

● Communication frame error verify method

The standard Modbus series internet adopt two type error test method. Odd-even verification used to verify each character, CRC test used to verify one frame data.

1: Odd-even verification

The user can configure the controller at odd or even verification, or no verification. This will decide the odd-even verification position of each character how to set.

If appointed odd or even verification, the digit bit of "1" will count the digit bit of each character(ASCII mode 7 data capacity, 8 data bit in RTU). Example, RTU character frame include the below 8 pieces data bit: the number of whole "1" in 1 1 0 0 0 1 0 1 is 4 pieces, if use even verification, the odd-even verification bit of frame will be 0, then obtain the quantity of whole "1" still be 4, also not process verification test. Replace one attached stop bit fill to the need transmit character frame.

2: CRC-16(circulating redundancy verification)

Use RTU frame format, the frame include the counting frame error test area which based on CRC method. CRC region test the content of the whole frame. CRC region is two bits, include the 16 bits binary system value. This calculating method of CRC adopt international standard CRC verification rules, the user can reference the relate standard CRC algorithm when edit the CRC algorithm, write out the CRC calculating procedure which really in accordance with requirements.

● The definition of communication data address

This part is the address definition of communication data, used to control the running of AC drive, obtain the status information of AC drive and the relate function parameter setting of AC drive, etc.

(1) SAHAND300 series function parameter address description rules

Use the function parameter serial number of AC drive as the register address, divided into two parts at high bits and low bits. High bits represent the function parameter located group serial number, low bits represent the serial number in group of function parameter, need translate into hexadecimal. The address of detail parameter please check the communication address column in the parameter overview table in chapter?

Note: because the communication exist the possibility that frequently rewrite parameter value, if EEPROM frequently been storage then will reduce the working life. For the users, some function code parameter needn't storage under the communication mode, only need to change the value of RAM in the sheet then can meet use requirements. AC80B communication agreement stipulated that when use the write order, only write in AC drive RAM, not storage when power off, if use write order (41H), write in EEPROM, means storage when power off.

Control order function instruction	Address definition	Data meanings instruction		R/W characteristics
Communication running control order	2000H	BIT0	0-Invalid 1-RUN	W
		BIT1	0-Forward 1-Reverse	
		BIT2	0-Invalid 1-Stop	
		BIT3	0-Invalid 1-Reset	
		BIT4-7	DO1-DO4	
		BIT8-15	Reserved	
Communication frequency setting	2001H	Setting range:0-Maximum frequency		W
Communication set upper limit frequency	2002H	Setting range:0-Maximum frequency		W
Communication PID give value	2003H	Setting range 0-100.0%		W
Communication PID feedback value	2004H	Setting range 0-100.0%		W
Communication AO1 output value	2005H	Setting range 0-100.0%		W
Communication AO2 output value	2006H	Setting range 0-100.0%		
Communication HDO output value	2007H	Setting range 0-50000HZ		W
Communication VF separate voltage setting	2008H	Setting range 0-100.0%		W
Communication torque setting value	2009H	Setting range 0-100.0%		W

Monitor command function instruction	Address definition	Data meanings instruction		R/W characteristics
AC drive operation status	2100H	BIT0	RUN	W
		BIT1	REV	
		BIT2	Ready	
		BIT3	Fault	
		BIT4	Jogging	
		BIT5	Pre-alarm	
		BIT6	Auto-turning	
		BIT7-10	Operation control mode 0:Operation panel control 1:Terminal control 2:RS485 control 3:Option card 4:Terminal switchover	

AC drive operation status	2100H	BIT11-12	Motor control mode 0: V/F mode 1 SVC control 2 FVC control	W
		BIT13	Hibernation sign	
AC drive fault type	2101	1 -- ERROR_INVERTER UNIT 2 -- ERROR_OC_DURING_ACC 3 -- ERROR_OC_DURING_DEC 4 -- ERROR_OC_AT_CONST_SPEED 5 -- ERROR_OV_DURING_ACC 6 -- ERROR_OV_DURING_DEC 7 -- ERROR_OV_AT_CONST_SPEED 8 -- ERROR_CONTROL POWER SUPPLY 9 -- ERROR_UV 10 -- ERROR_OL_AC DRIVE 11 -- ERROR_OL_MOTOR 12 -- ERROR_LOSE_PHASE_INPUT 13 -- ERROR_LOSE_PHASE_OUTPUT 14 -- ERROR_OH_MODULE 15 -- ERROR_EXTERNAL EQUIPMENT 16 -- ERROR_COMMUNICATE 17 -- ERROR_CONTACTOR 18 -- ERROR_CURRENT_DETECTION 19 -- ERROR_AUTO-TUNING 20 -- ERROR_ENCODER 21 -- ERROR_EEPROM_READWRITE 22 -- ERROR_HARDWARE_AC DRIVE 23 -- ERROR_MOTOR_SHORT_TO_GND 24 -- ERROR_ERRPROM_INITIALIZETE 26 -- ERROR_RUNNING TIME_REACHED 27 -- ERROR_USER-DEFINED_1 28 -- ERROR_USER-DEFINED_2 29 -- ERROR_POWER-ON_TIME_REACHED 30 -- ERROR_LOAD_0 31 -- ERROR_PID_FDB_LOSE 40 -- ERROR_PBP_CURRENT_LIMIT 41 -- ERROR_SWITCH_MOTOR_WHEN_RUN 42 -- ERROR_TOO_LARGE_SPEED_DEVIATION 43 -- ERROR_MOTOR_OS 45 -- ERROR_MOTOR_OH 51 -- ERROR_POLE_POSITION_DETECTION 52 -- ERROR_ZERO_POSITION_INDENTIFI-CATION 53 -- ERROR_FEEDBACK_UVW_SIGNAL		W

8.3 Appendix three: Product specification

Product standard specification

Voltage	380V
Power (Kw)	Rated output current(A)
0.75	3.4
1.5	4.8
2.2	6.2
4.0	11.0
5.5	14.0
7.5	18.0
11	27.0
15	34.0
18.5	41.0
22	52.0
30	65.0
37	80.0
45	96.0
55	128.0
75	165.0
90	185.0
110	210.0
132	250.0
160	307.0
200	380.0
220	450.0
250	480.0
280	520.0
315	605.0
350	670.0
400	750.0

8.5 Appendix five: Braking resistor

Braking resistor selection list

AC drive model	Resistance specifications		Braking torque%	Applicable motor/KW type G	Applicable motor/KW type P
	Resistance Ω	Power W			
VFD007S343	750	80	125	0.75	-
VFD015S343	400	300	125	1.5	2.2
VFD022S343	250	300	125	2.2	3.0
VFD040S343	125	500	125	4.0	5.5
VFD055S343	100	500	125	5.5	7.5
VFD075S343	75	1000	125	7.5	11
VFD110S343	50	1000	125	11	15
VFD150S343	40	1500	125	15	18.5
VFD185S343	32	4800	125	18.5	22
VFD220S343	27.2	4800	125	22	30
VFD300S343	20	6000	125	30	37
VFD370S343	16	9600	125	37	45

Note!

1. If the AC drive of 400V class, ≥37KW or above, to achieve rapid braking, a brake unit must be installed.
2. Select the resistance value and frequency of use established by our company.
3. The company does not bear any responsibility for the damage to the AC drive or other equipment caused by the use of braking resistors and braking modules not provided by our company.
4. The installation of the braking resistor must consider the safety and flammability of the environment.
5. To change the resistance and power number, please contact your local dealer.
6. The braking resistor and braking module need to be ordered separately. For details, please contact your local dealer.