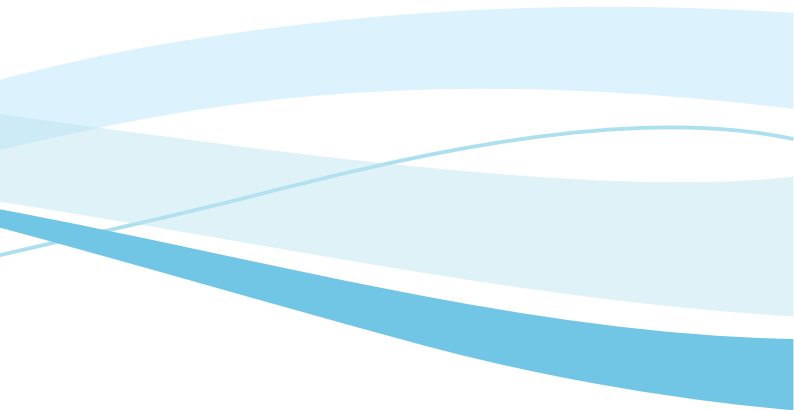


(L3.1.0)

# 860S

## USER MANUAL OF CURRENT VECTOR FREQUENCY CONVERTER



## Preface

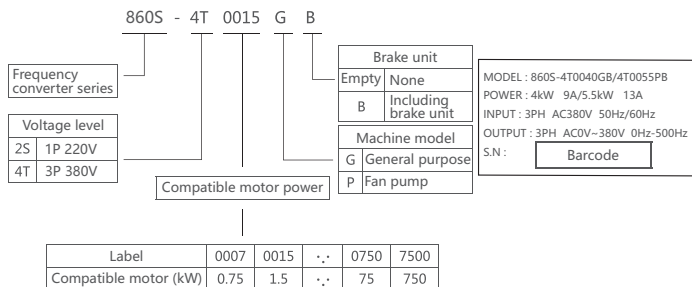
First of all, thank you for purchasing the 860S series frequency converters!

This manual provides users with precautions and guidance regarding model selection, installation, parameter setting, on-site commissioning, fault diagnosis, and routine maintenance of the product. To use this series of frequency converters correctly, please read this manual carefully in advance and keep it properly for future reference.

### Safety Precautions

- This product must be installed and maintained by professionals. Any injury and loss caused by non-compliant operation shall have nothing to do with our company.
- Please confirm whether the voltage level of the input power supply is consistent with the rated voltage level of the frequency converter; whether the wiring positions on the power input terminals (R, S, T) and output terminals (U, V, W) are correct; and pay attention to checking whether there is a short-circuit in the peripheral circuit connected to the drive, and whether the connected wires are fastened. Otherwise, it may cause damage to the drive!
- There is no need to conduct a withstand voltage test on any part of the frequency converter. This test has been carried out on the product before leaving the factory. Otherwise, it may cause an accident!
- The frequency converter must be powered on only after the cover is properly closed. Otherwise, it may cause electric shock!
- Never connect the input power supply to the output terminals (U, V, W) of the frequency converter. Do not connect the wires wrongly! Otherwise, there is a risk of explosion and property damage!
- Do not touch and operate the frequency converter with wet hands. Otherwise, there is a risk of electric shock!
- Do not use the on-off method of the contactor to control the start-stop of the drive. Otherwise, it may cause damage to the equipment!
- Confirm that maintenance and repair of the drive can only be carried out when the voltage of the frequency converter is lower than DC36V, with ten minutes after power-off as the standard. Otherwise, the residual charge on the capacitor may cause harm to people!
- Do not perform maintenance and repair on the frequency converter by non-professionally trained personnel. Otherwise, it may cause personal injury or equipment damage!
- After replacing the frequency converter, parameter settings must be carried out. All plug-in components must be plugged and unplugged when the power is off!
- If parameter identification is required, pay attention to the danger of injury caused by the rotating motor. Otherwise, it may cause an accident!
- Do not change the manufacturer's parameters of the frequency converter at will. Otherwise, it may cause damage to the equipment!
- Do not perform maintenance and repair on the equipment with power on. Otherwise, there is a risk of electric shock!
- Before the first use of the motor, its reuse after long-term storage, and during regular inspections, an insulation check of the motor should be carried out to prevent damage to the frequency converter due to the insulation failure of the motor windings. When conducting the insulation check, be sure to separate the motor connections from the frequency converter. It is recommended to use a 500V voltage-type megohmmeter, and the measured insulation resistance should be ensured to be no less than 5MΩ. If the customer needs to operate above 50Hz, consider the bearing capacity of the mechanical device.
- The standard compatible motor is a four-pole squirrel-cage asynchronous motor. If it is not this type of motor, please select the frequency converter according to the rated current of the motor. Do not change the three-phase frequency converter in the 860S series for two-phase use, otherwise it will lead to malfunctions or damage to the frequency converter. In areas where the altitude exceeds 1000M, due to the thin air, the heat-dissipation effect of the frequency converter deteriorates, and it is necessary to derate its use. In this case, please consult our company for technical advice.

## Naming Rules



## Product appearance diagram, installation hole size

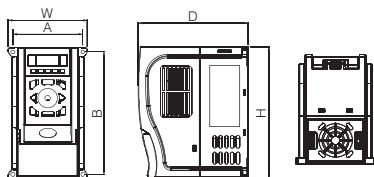


Diagram of plastic structure external dimensions and installation dimensions

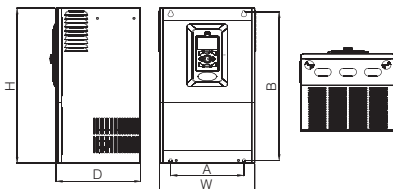
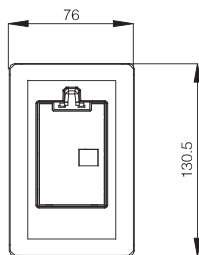


Diagram of sheet metal structure external dimensions and installation dimensions

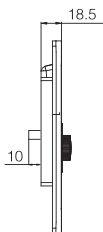
## External dimensions and installation dimensions of plastic structure

Rated output power (kW)	Input voltage	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation hole diameter (MM)
0.75~2.2	Single phase 220V range: -15%~+15%	90	157	170	101	142	5
0.75~2.2	Three phase 380V range: -15%~+15%	90	157	170	101	142	5
4		111	183	197	129	175	5
5.5~7.5		137	237	256	157	190	5

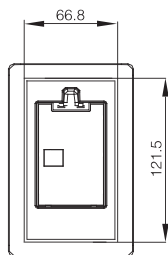
## External dimensions of the externally-connected keyboard



Front

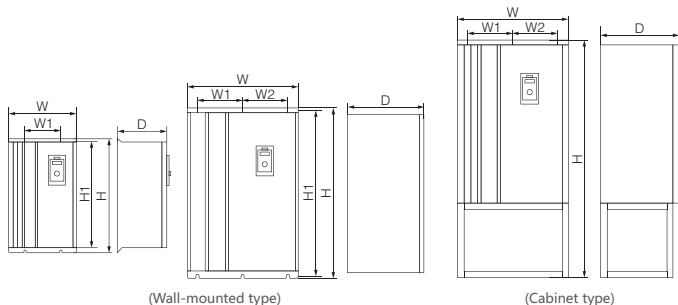


Side



Reverse (opening size)

Diagram of the external and installation dimensions of the sheet-metal structure

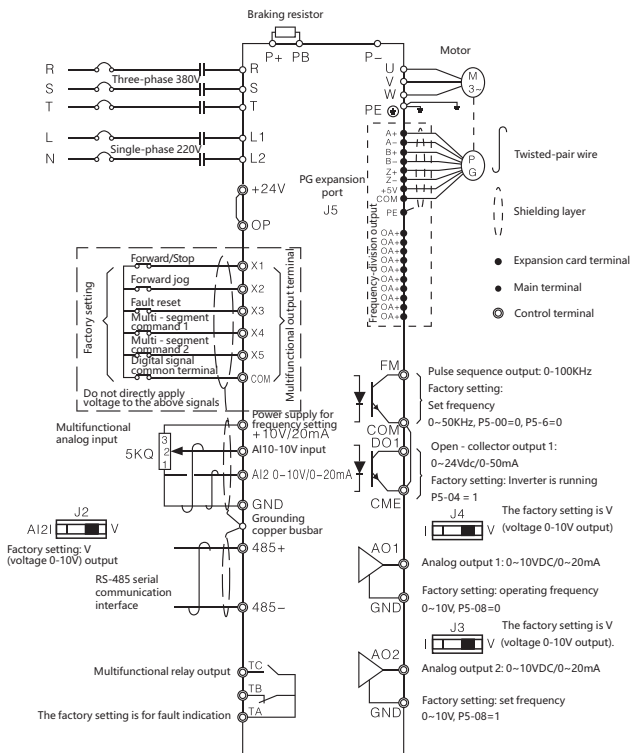


(Wall-mounted type)

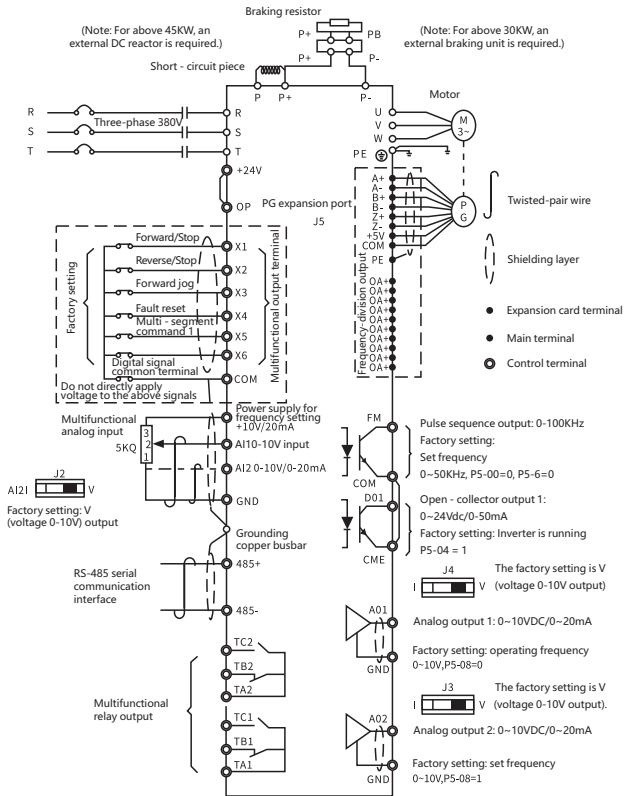
(Cabinet type)

Wall-mounted type							
Model	External dimensions			Installation dimensions			Installation hole diameter
kW	H(mm)	W(mm)	D(mm)	H1(mm)	W1(mm)	W2(mm)	mm
11-15	340	204	214	325	150		Φ6
18.5-22	360	224	214	345	150		Φ6
30-37	380	262	220	360	192		Φ9
45-75	570	380	263	547.5	240		Φ10
90-132	610	400	286	587.5	240		Φ12
160-220	810	500	355	735	200	200	Φ12
250-400	862	750	455	832	250	250	Φ12
450-560	1122	950	505	1092	350	350	Φ12
630-750	1045	1050	505	1015	400	400	Φ12

Cabinet type							
Model	External dimensions			Installation dimensions			Installation hole diameter
kW	H(mm)	W(mm)	D(mm)	H1(mm)	W1(mm)	W2(mm)	mm
160-220	1115	500	355		200	200	Φ12
250-400	1329	750	455		250	250	Φ12
450-560	1644	950	505		350	350	Φ12
630-750	1625	1050	505		400	400	Φ12



0.75-7.5kW Wiring diagram



11-400kW Wiring diagram

## Main circuit terminal diagram

⊕	PB	P+	L1		L2	U	V	W
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Main circuit wiring terminal diagram (single phase 0.75~2.2kW)

⊕	PB	P+	R	S	T	U	V	W
---	----	----	---	---	---	---	---	---

Main circuit wiring terminal diagram (three phase 0.75kW~2.2kW)

E	R	S	T	P-	P+	U	V	W	PB
---	---	---	---	----	----	---	---	---	----

Main circuit wiring terminal diagram (three phase 3.7kW)

P+	P-	E	R	S	T	U	V	W	PB
----	----	---	---	---	---	---	---	---	----

Main circuit wiring terminal diagram (three phase 5.5kW~7.5kW)

P+	PB	P-	R	S	T	U	V	W	E
----	----	----	---	---	---	---	---	---	---

Main circuit wiring terminal diagram (three phase 11kW~15kW)

P+	PB	P-	R	S	T	U	V	W	E
----	----	----	---	---	---	---	---	---	---

Main circuit wiring terminal diagram (three phase 18.5kW~22kW)

R	S	T	P+	P-		U	V	W	E
---	---	---	----	----	--	---	---	---	---

Main circuit wiring terminal diagram (30kW~37kW)


R	S	T	P	P+	P-	U	V	W	⊕
---	---	---	---	----	----	---	---	---	---

Main circuit wiring terminal diagram (45~132kW)

R	S	T	P	P+
⊕	U	V	W	P-


Main circuit wiring terminal diagram (160kW~750kW)

Instructions for main circuit terminals of single phase frequency converter

Terminal Marking	Name	Description
L1、L2	Single phase power input terminal	Connection point for single phase 220V AC power supply
U、V、W	Frequency converter output terminal	Connect to a three phase motor
 / E	Grounding terminal	Grounding terminal

Instructions: When an external braking resistor is connected to a single phase frequency converter, it is connected through an opening on the right side of the plastic housing. For details, please confirm with the technical personnel of our company.

Instructions for main circuit terminals of three phase frequency converter:

Terminal Marking	Name	Description
R、S、T	Three phase power input terminal	Connection point for three phase AC input power supply
(P1)P+、P-	DC bus positive and negative terminals	Connection point for external braking unit
P+、PB	Braking resistor connection terminal	Connection point for braking resistor of 22kW and below
P、P+	External reactor connection terminal	Connection point for external reactor. External reactor can be installed for frequency converters of 45kW and above
U、V、W	Frequency converter output terminal	Connect to a three-phase motor
 / E	Grounding terminal	Grounding terminal

Terminals of the control circuit:

485+	+10	AI1	AI2	X1	X2	X3	X4	X5	TA	TC
485-	GND	A01	A02	FM	DO1	CME	COM	OP	24V	TB

Wiring terminal diagram of control circuit for models of 7.5kW and below

485+	+10	AI1	AI2	X1	X2	X3	X4	X5	X6	COM	TA1	TB1	TC1
485-	GND	A01	A02	GND	FM	DO1	CME	COM	OP	24V	TA2	TB2	TB3

Wiring terminal diagram of control circuit for models of 11kW and above

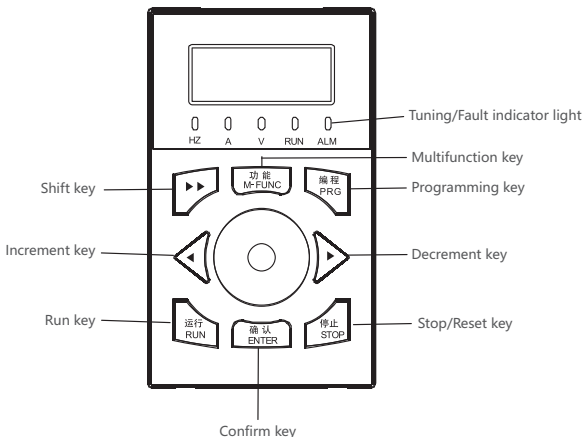
Function description of control terminals for 860S:

Terminal symbol	Terminal name	Function description
X1-OP	Digital input terminal	Optical coupler isolation, compatible with bipolar input
X2-OP		
X3-OP		
X4-OP		
X6-OP		
X5-OP	High-speed pulse input terminal	In addition to the characteristics of digital input terminals, it can also be used as a high-speed pulse input channel, with a maximum input frequency of 100kHz.
+24V-COM	Connect an external +24V power supply	Provide external +24V power supply, which is generally used as the working power supply for digital input and output terminals and the power supply for external sensors.
OP	External power input terminal	Factory default is short-circuited with +24V. When using external signals to drive terminals X1-X6, OP needs to be connected to the external power supply and disconnected from the +24V power terminal.
TA-TB	Normally closed terminal	Contact driving capacity: 250Vac, 3A
TA-TC	Normally open terminal	
DO1-CME	Digital output	Optical coupler isolation, bipolar open-collector output. Output voltage range: 0V-24V Output current range: 0mA-50mA Note: The digital output ground CME and the digital input ground COM are internally isolated. However, at the factory, CME and COM are externally short-circuited (at this time, DO1 is driven by +24V by default). When DO1 is to be driven by an external power supply, the external short-circuit between CME and COM must be disconnected.
FM-COM	High-speed pulse output	Constrained by parameter P5-00 "FM terminal output mode selection"; When used as a high-speed pulse output, the maximum frequency is up to 100kHz; When used as an open-collector output, it has the same specifications as DO1.
+10V-GND	Connect an external +10V power supply	Provide an external +10V power supply, which is generally used as the working power supply for an external potentiometer. The resistance range of the potentiometer is 1k $\Omega$ ~5k $\Omega$ .
AI1-GND	Analog input terminal 1	Input voltage range: DC 0V~10V Input impedance: 22k $\Omega$
AI2-GND	Analog input terminal 2	Input range: DC 0V~10V/0mA~20mA Input impedance: 22k $\Omega$ for voltage input and 500 $\Omega$ for current input
AO1-GND	Analog output terminal 1	Output voltage range: 0V~10V Output current range: 0mA~20mA
AO2-GND	Analog output terminal 2	Output voltage range: 0V~10V Output current range: 0mA~20mA

## Operation and display

### Introduction to the operation and display panel

The operation panel can be used to modify the functional parameters of the frequency converter, monitor the working status of the frequency converter, and control the operation (start, stop) of the frequency converter. Its appearance and functional areas are shown in the following figure:



- Function indicator light description:

HZ: Frequency status indicator light

A: Current indicator light

V: Voltage indicator light

RUN: When the light is on, it indicates that the frequency converter is in operation.

ALM: When the light is on, it indicates that the frequency converter is in a fault state.

- Digital display area

5-digit LED display, which can show set frequency, output frequency, various monitoring data, alarm codes, etc.

## List of functional parameters

P0 Basic function group				
Function code	Name	Setting range	Factory value	Change
P0-00	GP type display	1: G type (constant torque load model) 2: P type (fan, water pump load model)	Model determination	★
P0-01	The 1st motor control mode	0: Sensorless vector control (SVC) 1: Sensor-based vector control (FVC) 2: V/F control	2	●
P0-02	Command source selection	0: Operator panel command channel (LED off) 1: Terminal command channel (LED on) 2: Communication command channel (LED blinking)	0	↗
P0-03	Main frequency source X selection	0: Digital setting (not memorized after power-off) 1: Digital setting (memorized after power-off) 2: AI1 3: AI2 4: Set by the adjustable potentiometer on the keyboard 5: PULSE pulse setting (X6) 6: Multi-segment command 7: Simple PLC 8: PID 9: Given by communication	4	●
P0-04	Auxiliary frequency source Y selection	Same as P0-03 (Main frequency source X selection)	0	↗
P0-05	Selection of the range of auxiliary frequency source Y during superposition	0: Relative to the maximum frequency 1: Relative to frequency source X	0	↗
P0-06	Range of auxiliary frequency source Y during superposition	0%~150%	100%	↗
P0-07	Frequency source superposition selection	Units digit: Frequency source selection 0: Main frequency source X 1: Result of main-auxiliary operation (operation relationship determined by the tens digit) 2: Switch between main frequency source X and auxiliary frequency source Y 3: Switch between main frequency source X and the result of main-auxiliary operation 4: Switch between auxiliary frequency source Y and the result of main-auxiliary operation Tens digit: Main-auxiliary operation relationship of frequency sources 0: Main + Auxiliary 1: Main-Auxiliary 2: The maximum of the two 3: The minimum of the two	00	↗
P0-08	Preset frequency	0.00Hz to maximum frequency (P0-10)	50.00Hz	↗
P0-09	Running direction	0: Default running direction 1: Run in the direction opposite to the default direction	0	↗
P0-10	Maximum frequency	50.00Hz~500.00Hz	50.00Hz	●

P0-11	Upper limit frequency source	0: Set by P0-12 1: AI1 2: AI2 3: Set by the adjustable potentiometer on the keyboard 4: PULSE pulse setting 5: Given by communication	0	●
P0-12	Upper limit frequency	Lower limit frequency P0-14 to maximum frequency P0-10	50.00Hz	↗
P0-13	Upper limit frequency bias	0.00Hz to the maximum frequency P0-10	0.00Hz	↗
P0-14	Lower limit frequency	0.00Hz to upper limit frequency P0-12	0.00Hz	↗
P0-15	Carrier frequency	0.5KHz~16.0KHz	Model determination	↗
P0-16	Carrier frequency adjustment with temperature	0: No 1: Yes	1	↗
P0-17	Acceleration time 1	0.00S ~ 65000S	Model determination	↗
P0-18	Deceleration time 1	0.00S ~ 65000S	Model determination	↗
P0-19	Acceleration and deceleration time unit	0: 1 second 1: 0.1 second 2: 0.01 second	1	●
P0-21	Bias frequency of auxiliary frequency source during superposition	0.00Hz to the maximum frequency P0-10	0.00HZ	●
P0-22	Frequency command resolution	2 : 0.01Hz	2	●
P0-23	Digital set frequency shutdown memory selection	0: Do not remember 1: Remember	0	↗
P0-24	Motor selection	0: Motor parameter group 1 1: Motor parameter group 2	0	●
P0-25	Acceleration and deceleration time reference frequency	0: Maximum frequency (P0-10) 1: Set frequency 2: 100Hz	0	●
P0-26	Frequency command UP/DOWN reference during operation	0: Operating frequency 1: Set frequency	0	●
P0-27	Command source bundled frequency source	Units digit: Operation panel command binding frequency source selection 0: No binding 1: Digital set frequency 2: AI1 3: AI2 4: Keyboard adjustable potentiometer 5: PULSE pulse setting 6: Multi-speed 7: Simple PLC 8: PID 9: Communication given Tens digit: Terminal command binding frequency source selection Hundreds digit: Communication command binding frequency source selection Thousands digit: Automatic operation binding frequency source selection	0	●

P1 First motor parameters				
Function code	Name	Setting range	Factory value	Change
P1-00	Motor type selection	0: Common asynchronous motor 1: Variable-frequency asynchronous motor	0	●
P1-01	Motor rated power	0.1kW~1000.0kW	Model determination	●
P1-02	Motor rated voltage	1V~380V	Model determination	●
P1-03	Motor rated current	0.01A~655.35A (Inverter power ≤ 55kW) 0.1A~6553.5A (Inverter power > 55kW)	Model determination	●
P1-04	Motor rated frequency	0.01Hz~Maximum frequency	Model determination	●
P1-05	Motor rated speed	1RPM~65535RPM	Model determination	●
P1-06	Stator resistance of asynchronous motor	0.001Ω~65.535Ω (Inverter power ≤ 55kW) 0.0001Ω~6.5535Ω (Inverter power > 55kW)	Tuning parameters	●
P1-07	Rotor resistance of asynchronous motor	0.001Ω~65.535Ω (Inverter power ≤ 55kW) 0.0001Ω~6.5535Ω (Inverter power > 55kW)	Tuning parameters	●
P1-08	Leakage inductive reactance of asynchronous motor	0.01MH~655.35MH (Inverter power ≤ 55kW) 0.001MH~65.535MH (Inverter power > 55kW)	Tuning parameters	●
P1-09	Mutual inductive reactance of asynchronous motor	0.1MH~6553.5MH (Inverter power ≤ 55kW) 0.01MH~655.35MH (Inverter power > 55kW)	Tuning parameters	●
P1-10	No-load current of asynchronous motor	0.01A~P1-03 (Inverter power ≤ 55kW) 0.1A~P1-03 (Inverter power > 55kW)	Tuning parameters	●
P1-27	Encoder lines	1~65535	1024	●
P1-28	Encoder type	0: ABZ incremental encoder 2: Resolver	0	●
P1-30	AB phase sequence of ABZ incremental encoder	0: Forward 1: Reverse	0	●
P1-34	Pole pairs of resolver	1~65535	1	●
P1-36	Speed feedback PG open-circuit detection time	0.0S: No action 0.1S-10.0S	0.0S	●
P1-37	Tuning selection	0: No operation 1: Asynchronous motor static part parameter tuning 2: Asynchronous motor dynamic complete tuning 3: Asynchronous motor static complete tuning	0	●
P2 First motor vector control parameters				
Function code	Name	Setting range	Factory value	Change
P2-00	Speed loop proportional gain 1	1 ~ 100	30	↗
P2-01	Speed loop integral time 1	0.01S ~ 10.00S	0.50S	↗
P2-02	Switching frequency 1	0.00 ~ P2-05	5.00HZ	↗
P2-03	Speed loop proportional gain 2	1 ~ 100	20	↗
P2-04	Speed loop integral time 2	0.01S ~ 10.00S	1.00S	↗

P2-05	Switching frequency 2	P2-02~Maximum frequency	10.00Hz	↗
P2-06	Vector control slip gain	50% ~ 200%	100%	↗
P2-07	SVC speed feedback loop filtering time	0.000S ~ 0.100S	0.050S	↗
P2-09	Torque upper limit source in speed control mode	0: Set by function code P2-10 1: AI1 2: AI2 3: Keyboard adjustable potentiometer 4: PULSE pulse setting 5: Communication given 6: MIN(AI1, AI2) 7: MAX(AI1, AI2) Full scale of options 1-7 corresponds to P2-10	0	↗
P2-10	Digital setting of torque upper limit in speed control mode	0.0% ~ 200.0%	150.0%	↗
P2-13	Excitation regulation proportional gain	0 ~ 60000	2000	↗
P2-14	Excitation regulation integral gain	0 ~ 60000	1300	↗
P2-15	Torque regulation proportional gain	0 ~ 60000	2000	↗
P2-16	Torque regulation integral gain	0 ~ 60000	1300	↗
P2-17	Integral property of speed loop	0: Invalid; 1: Valid	0	↗
P3 V/F control parameters				
Function code	Name	Setting range	Factory value	Change
P3-00	V/F curve setting	0: Linear V/F 1: Multi-point V/F 2: Square V/F 3: 1.2-power V/F 4: 1.4-power V/F 6: 1.6-power V/F 8: 1.8-power V/F 10: VF completely separated mode 11: VF semi-separated mode	0	↗
P3-01	Torque boost	0.0%: (Automatic torque boost) 0.1%-30.0%	Model determination	↗
P3-02	Torque boost cut-off frequency	0.00Hz~Maximum frequency	50.00Hz	↗
P3-03	Multi-point V/F frequency point 1	0.00Hz ~ P3-05	0.00Hz	↗
P3-04	Multi-point V/F voltage point 1	0.0% ~ 100.0%	0.0%	↗
P3-05	Multi-point V/F frequency point 2	P3-03 ~ P3-07	0.00Hz	↗

P3-06	Multi-point V/F voltage point 2	0.0% ~ 100.0%	0.0%	↗
P3-07	Multi-point V/F frequency point 3	P3-05~Motor rated frequency (P1-04)	0.00Hz	↗
P3-08	Multi-point V/F voltage point 3	0.0% ~ 100.0%	0.0%	↗
P3-09	VF slip compensation gain	0.0% ~ 200.0%	0.0%	↗
P3-10	V/F over-excitation gain	0 ~ 200	64	↗
P3-11	V/F oscillation suppression gain	0 ~ 100	Model determination	↗
P3-13	VF separated voltage source	0: Digital setting (P3-14) 1: AI1 2: AI2 3: Keyboard potentiometer 4: PULSE pulse setting (X6) 5: Multi-segment command 6: Simple PLC 7: PID 8: Communication setting Note: 100.0% corresponds to the rated voltage of the motor	0	↗
P3-14	Digital setting of VF separated voltage	0V~Motor rated voltage	0V	↗
P3-15	Acceleration time of VF separated voltage	0.0S-1000.0S Note: It represents the time for the voltage to change from 0V to the motor rated voltage	0.0S	↗
P3-16	Deceleration time of V/F separated voltage	0.0S-1000.0S Note: It represents the time for the voltage to change from 0V to the motor rated voltage	0.0S	↗
P3-17	Selection of V/F separated shutdown mode	0: Frequency/voltage decrease independently to 0 1: Voltage decreases to 0 first, then frequency decreases to 0	0	↗
P3-18	Over-current stall operating current	50~200%	150%	●
P3-19	Over-current stall enable	0: Invalid 1: Valid	1	●
P3-20	Over-current stall suppression gain	0~100	20	●
P3-21	Current compensation coefficient for overspeed over-current stall action	50~200%	50%	●
P3-22	Over-voltage stall operating voltage	Three-phase 380~480V Machine type: 330.0V~800.0V Three-phase 200~240V Machine type: 330.0V~800.0V	770.0V	●
P3-23	Over-voltage stall enable	0: Invalid 1: Valid	1	●
P3-24	Over-voltage stall suppression frequency gain	0~100	30	↗
P3-25	Over-voltage stall suppression voltage gain	0~100	30	↗
P3-26	Over-voltage stall maximum rising frequency limit	0~50Hz	5Hz	●

P4 Input terminals				
Function code	Name	Setting range	Factory value	Change
P4-00	Function selection of X1 terminal	0: No function 1: Forward operation (FWD) 2: Reverse operation (REV) 3: Three-wire operation control 4: Forward jog (FJOG) 5: Reverse jog (RJOG) 6: Terminal UP 7: Terminal DOWN	1	●
P4-01	Function selection of X2 terminal	8: Free stop 9: Fault reset (RESET) 10: Operation pause 11: External fault normally-open input 12: Multi-segment command terminal 1 13: Multi-segment command terminal 2 14: Multi-segment command terminal 3 15: Multi-segment command terminal 4	4	●
P4-02	Function selection of X3 terminal	16: Acceleration/deceleration time selection terminal 1 17: Acceleration/deceleration time selection terminal 2 18: Frequency source switching 19: UP/DOWN setting clear (terminal, keyboard) 20: Operation command switching terminal 21: Acceleration/deceleration prohibition 22: PID pause 23: PLC status reset 24: Sway frequency pause	9	●
P4-03	Function selection of X4 terminal	25: Counter input 26: Counter reset 27: Length counting input 28: Length reset 29: Torque control prohibition 30: PULSE (pulse) frequency input (only valid for X6) 32: Immediate DC braking 33: External fault normally-closed input	12	●
P4-04	Function selection of X5 terminal	34: Frequency modification enable 35: PID action direction reverse 36: External stop terminal 1 37: Control command switching terminal 2 38: PID integral pause 39: Frequency source X and preset frequency switching 40: Frequency source Y and preset frequency switching	13	●
P4-05	Function selection of X6 terminal	41: Motor selection terminal 1 42: Motor selection terminal 2 43: PID parameter switching 44: User-defined fault 1 45: User-defined fault 2 46: Speed control/torque control switching 47: Emergency stop 48: External stop terminal 2 49: Deceleration DC braking 50: This running time clear	0	●

P4-10	X filtering time	0.000S ~ 1.000S	0.010S	↗
P4-11	Terminal command mode	0: Two-wire type 1 1: Two-wire type 2 2: Three-wire type 1 3: Three-wire type 2	0	•
P4-12	Terminal UP/DOWN change rate	0.001Hz/S ~ 65.535Hz/S	1.00Hz/S	↗
P4-13	AI curve 1 minimum input	0.00V ~ P4-15	0.00V	↗
P4-14	Setting corresponding to AI curve 1 minimum input	-100.0% ~ +100.0%	0.0%	↗
P4-15	AI curve 1 maximum input	P4-13 ~ +10.00V	10.00V	↗
P4-16	Setting corresponding to AI curve 1 maximum input	-100.0% ~ +100.0%	100.0%	↗
P4-17	AI1 filtering time	0.00s ~ 10.00s	0.10S	↗
P4-18	AI curve 2 minimum input	0.00V ~ P4-20	0.00V	↗
P4-19	Setting corresponding to AI curve 2 minimum input	-100.0% ~ +100.0%	0.0%	↗
P4-20	AI curve 2 maximum input	P4-18 ~ +10.00V	10.00V	↗
P4-21	Setting corresponding to AI curve 2 maximum input	-100.0% ~ +100.0%	100.0%	↗
P4-22	AI2 filtering time	0.00s ~ 10.00s	0.10s	↗
P4-23	Minimum input of keyboard potentiometer	0.0V ~ P4-25	0.01V	↗
P4-24	Setting corresponding to minimum input of keyboard potentiometer	-100.0% ~ +100.0%	0.0%	↗
P4-25	Maximum input of keyboard potentiometer	P4-23 ~ +10.00V	10.00V	↗
P4-26	Setting corresponding to maximum input of keyboard potentiometer	-100.0% ~ +100.0%	100.0%	↗
P4-27	Filtering time of keyboard potentiometer	0.00s ~ 10.00s	0.10S	↗
P4-28	PULSE minimum input	0.00KHZ ~ P4-30	0.00KHZ	↗
P4-29	Setting corresponding to PULSE minimum input	-100.0% ~ 100.0%	0.0%	↗
P4-30	PULSE maximum input	P4-28 ~ 100.00KHZ	50.00KHZ	↗
P4-31	PULSE maximum input setting	-100.0% ~ 100.0%	100.0%	↗
P4-32	PULSE filtering time	0.00S ~ 10.00S	0.10S	↗
P5 Output terminals				
Function code	Name	Setting range	Factory value	Change
P5-00	FM terminal output mode selection	0: Pulse output (FMP) 1: Digital quantity output (FMR)	1	↗

P5-01	FMR output function selection	0: No output 1: Inverter is running 2: Fault output (fault shutdown) 3: Frequency level detection PDT1 output 4: Frequency reached 5: Running at zero speed (no output when stopped) 6: Motor overload pre-alarm 7: Inverter overload pre-alarm 8: Set count value reached 9: Specified count value reached 10: Length reached 11: Simple PLC cycle completed 12: Accumulated running time reached 13: Frequency is being limited 14: Torque is being limited 15: Ready to run 16: AI1>AI2 17: Upper limit frequency reached 18: Lower limit frequency reached (related to running) 19: Under-voltage state output 20: Communication setting 21: Reserved 22: Reserved 23: Running at zero speed 2 (output even when stopped) 24: Accumulated power-on time reached 25: Frequency level detection PDT2 output 26: Frequency 1 reached output 27: Frequency 2 reached output 28: Current 1 reached output 29: Current 2 reached output 30: Timing reached output 31: AI1 input over-limit 32: Unloading 33: Reverse running 34: Zero-current state 35: Module temperature reached 36: Output current over-limit 37: Lower limit frequency reached (output even when stopped) 38: Alarm output (continue running) 39: Motor over-temperature pre-alarm 40: This running time reached	0	
P5-02	Control board relay 1 function selection (TA1-TB1-Tc1)		2	
P5-03	Control board relay 2 function selection (TA1-TB1-TC1) (Standard for 11KW and above)		0	
P5-04	Do1 output function selection		1	
P5-05	Expansion card DO2 output function selection		4	
P5-06	FMP output function selection	0: Operating frequency 1: Set frequency 2: Output current 3: Output torque 4: Output power 5: Output voltage 6: PULSE input (100.0% 100.0kHz) 7: AI1 8: AI2 9: Panel potentiometer 10: Length 11: Count value 12: Communication setting 13: Motor speed 14: Output current (100.0% corresponds to 1000.0A) 15: Output voltage (100.0% corresponds to 1000.0V)	0	
P5-07	A01 output function selection		0	
P5-08	A02 output function selection		1	

P5-09	FMP output maximum frequency	0.01kHz ~ 100.00kHz	50.00kHz	↗
P5-10	A01 zero-bias coefficient	-100.0% ~ +100.0%	0.0%	↗
P5-11	A01 gain	-10.00 ~ +10.00	1.00	↗
P5-12	A02 zero-bias coefficient	-100.0% ~ +100.0%	0.0%	↗
P5-13	A02 gain	-10.00 ~ +10.00	1.00	↗
P5-17	Y1 output delay time	0.0S ~ 3600.0S	0.0s	↗
P5-18	RELAY1 output delay time	0.0S ~ 3600.0S	0.0S	↗
P6 Start-stop control				
Function code	Name	Setting range	Factory value	Change
P6-00	Starting method	0: Direct start 1: Speed tracking restart 2: Pre-excitation start (AC asynchronous motor)	0	↗
P6-01	Speed tracking method	0: Start from the stopping frequency 1: Start from zero speed 2: Start from the maximum frequency	0	●
P6-02	Speed tracking speed	1 ~ 100	20	↗
P6-03	Starting frequency	0.00Hz ~ 10.00Hz	0.00Hz	↗
P6-04	Starting frequency holding time	0.0S ~ 100.0S	0.0S	●
P6-05	Starting DC braking current / pre-excitation current	0% ~ 100%	0%	●
P6-06	Starting DC braking time / pre-excitation time	0.0S ~ 100.0S	0.0S	●
P6-07	Acceleration and deceleration method	0: Linear acceleration and deceleration 1: S-curve acceleration and deceleration A 2: S-curve acceleration and deceleration B	0	●
P6-08	S-curve starting section time proportion	0.0% ~ ( 100.0%-P6-09 )	30.0%	●
P6-09	S-curve ending section time proportion	0.0% ~ ( 100.0%-P6-08 )	30.0%	●
P6-10	Shutdown method	0: Deceleration stop 1: Free stop	0	↗
P6-11	Shutdown DC braking starting frequency	0.00Hz~Maximum frequency	0.00Hz	↗
P6-12	Shutdown DC braking waiting time	0.0S ~ 100.0S	0.0S	↗
P6-13	Shutdown DC braking current	0% ~ 100%	0%	↗
P6-14	Shutdown DC braking time	0.0S ~ 100.0S	0.0S	↗
P6-15	Braking utilization rate	0% ~ 100%	100%	↗
P7 Keyboard and display				
Function code	Name	Setting range	Factory value	Change
P7-01	MF.K key function selection	0: MF.K is invalid 1: Switch between the operation panel command channel and the remote command channel (terminal command channel or communication command channel) 2: Forward-reverse switch 3: Jog forward 4: Jog reverse	3	●

P7-02	STOP/RESET key function	0: The STOP/RES key stop function is only valid in the keyboard operation mode. 1: The STOP/RES key stop function is valid in any operation mode.	1	↗
P7-03	LED running display parameter 1	0000~FFFF BIT00: Operating frequency 1 (HZ) BIT01: Set frequency (HZ) BIT02: Bus voltage (V) BIT03: Output voltage (V) BIT04: Output current (A) BIT05: Output power (KW) BIT06: Output torque (%) BIT07: X input status BIT08: DO output status BIT09: AI1 voltage (V) BIT10: AI2 voltage (V) BIT11: AI3 voltage (V) BIT12: Count value BIT13: Length value BIT14: Load speed display BIT15: PID setting	1F	↗
P7-04	LED running display parameter 2	0000~FFFF BIT00: PID feedback BIT01: PLC stage BIT02: PULSE input pulse frequency (KHZ) BIT03: Operating frequency 2 (HZ) BIT04: Remaining running time BIT05: AI1 voltage before correction (V) BIT06: AI2 voltage before correction (V) BIT07: AI3 voltage before correction (V) BIT08: Linear velocity BIT09: Current power-on time (HOUR) BIT10: Current running time (MIN) BIT11: PULSE input pulse frequency (HZ) BIT12: Communication setting value BIT13: Encoder feedback speed (HZ) BIT14: Main frequency X display (HZ) BIT15: Auxiliary frequency Y display (HZ)	0	↗
P7-05	LED stopping display parameter	0000~FFFF BIT00: Set frequency (HZ) BIT01: Bus voltage (V) BIT02: X input status BIT03: DO output status BIT04: AI1 voltage (V) BIT05: AI2 voltage (V) BIT06: AI3 voltage (V) BIT07: Count value BIT08: Length value BIT09: PLC stage BIT10: Load speed BIT11: PID setting BIT12: PULSE input pulse frequency (KHZ)	33	↗

P7-06	Load speed display coefficient	0.0001 ~ 6.5000	1.0000	↗
P7-07	Inverter module heatsink temperature	0.0°C ~ 100.0°C	-	★
P7-08	Rectifier bridge heatsink temperature	0.0°C ~ 100.0°C	-	★
P7-09	Accumulated running time	0H ~ 65535H	-	★
P7-10	Product number	-	-	★
P7-11	Software version number	-	-	★
P7-12	Load speed display decimal places	0: 0 decimal places 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1	↗
P7-13	Accumulated power-on time	0H ~ 65535H	-	★
P7-14	Accumulated power consumption	0~65535 kWh	-	★
P8 Auxiliary functions				
Function code	Name	Setting range	Factory value	Change
P8-00	Jog running frequency	0.00Hz~Maximum frequency	6.00Hz	↗
P8-01	Jog acceleration time	0.0S ~ 6500.0S	20.0S	↗
P8-02	Jog deceleration time	0.0S ~ 6500.0S	20.0S	↗
P8-03	Acceleration time 2	0.0S ~ 6500.0S	Model determination	↗
P8-04	Deceleration time 2	0.0S ~ 6500.0S	Model determination	↗
P8-05	Acceleration time 3	0.0S ~ 6500.0S	Model determination	↗
P8-06	Deceleration time 3	0.0S ~ 6500.0S	Model determination	↗
P8-07	Acceleration time 4	0.0S ~ 6500.0S	Model determination	↗
P8-08	Deceleration time 4	0.0S ~ 6500.0S	Model determination	↗
P8-09	Skip frequency 1	0.00Hz~Maximum frequency	0.00Hz	↗
P8-10	Skip frequency 2	0.00Hz~Maximum frequency	0.00Hz	↗
P8-11	Skip frequency range	0.00Hz~Maximum frequency	0.00Hz	↗
P8-12	Forward-reverse dead-zone time	0.0S~3000.0S	0.0S	↗
P8-13	Reverse frequency prohibition	0: Allow 1: Prohibit	0	↗
P8-14	Operation mode when set frequency is lower than the lower limit frequency	0: Run at the lower limit frequency 1: Stop 2: Run at zero speed	0	↗

P8-15	Droop control	0.00HZ~10.00HZ	0.00HZ	↗
P8-16	Set the cumulative power-on arrival time	0H ~65000H	0H	↗
P8-17	Set the cumulative running arrival time	0H ~65000H	0H	↗
P8-18	Terminal operation selection upon power-on	0: Terminal operation is effective upon power-on 1: Terminal operation is ineffective upon power-on	0	↗
P8-19	Frequency detection value (PDT1)	0.00HZ~Maximum frequency	5.0%	↗
P8-20	Frequency detection hysteresis value (PDT1)	0.0%~100.0%(PDT1 level)	0.0%	↗
P8-21	Frequency arrival detection width	0.0% ~100.0%(Maximum frequency)	0	↗
P8-23	Switching frequency point between acceleration time 1 and acceleration time 2	0.00Hz~Maximum frequency	0.00Hz	↗
P8-24	Switching frequency point between deceleration time 1 and deceleration time 2	0.00Hz~Maximum frequency	0.00Hz	↗
P8-25	Terminal jog priority	0: Invalid 1: Valid	0	↗
P8-26	Frequency detection value (PDT2)	0.00HZ~Maximum frequency	50.00HZ	↗
P8-27	Frequency detection hysteresis value (PDT2)	0.0% ~100.0%(PDT2 level)	5.0%	↗
P8-28	Arbitrary arrival frequency detection value 1	0.00HZ~Maximum frequency	50.00HZ	↗
P8-29	Arbitrary arrival frequency detection width 1	0.0%~100.0%(Maximum frequency)	0.0%	↗
P8-30	Arbitrary arrival frequency detection value 2	0.00HZ~Maximum frequency	50.00HZ	↗
P8-31	Arbitrary arrival frequency detection width 2	0.0%~100.0%(Maximum frequency)	0.0%	↗
P8-32	Zero-current detection level	0.0%~300.0% 100.0% corresponds to the rated current of the motor	5.0%	↗
P8-33	Zero-current detection delay time	0.01S ~600.00S	0.10S	↗
P8-34	Output current over-limit value	0.0%(Not detected) 0.1%~300.0%(Rated current of the motor)	200.0%	↗
P8-35	Output current over-limit detection delay time	0.00S ~600.00S	0.00S	↗
P8-36	Arbitrary arrival current 1	0.0%~300.0%(Rated current of the motor)	100.0%	↗
P8-37	Arbitrary arrival current 1 width	0.0%~300.0%(Rated current of the motor)	0.0%	↗
P8-38	Arbitrary arrival current 2	0.0% ~300.0%(Rated current of the motor)	100.0%	↗
P8-39	Arbitrary arrival current 2 width	0.0% ~300.0%(Rated current of the motor)	0.0%	↗
P8-40	Timing function selection	0: Invalid 1: Valid	0	↗
P8-41	Timed running time selection	0: Set by P8-44 1 :AI1 2: AI2 analog input range corresponds to P8-44	0	↗

P8-42	Timed running time	0.0MIN ~ 6500.0MIN	0.0MIN	↗
P8-43	Lower limit of AI1 input voltage protection value	0.00V ~ P8-46	3.10V	↗
P8-44	Upper limit of AI1 input voltage protection value	P8-45 ~ 10.00V	6.80V	↗
P8-45	Module temperature reached	0°C ~ 100°C	75°C	↗
P8-46	Cooling fan control	0: Fan operates during running 1: Fan operates all the time	0	↗
P8-47	Wake-up frequency	Sleep frequency (P8-51)~ Maximum frequency (P0-10)	0.00Hz	↗
P8-48	Wake-up delay time	0.0S ~ 6500.0S	0.0S	↗
P8-49	Sleep frequency	0.00Hz~Wake-up frequency (P8-49)	0.00Hz	↗
P8-50	Sleep delay time	0.0S ~ 6500.0S	0.0S	↗
P8-51	Setting of this running arrival time	0.0MIN ~ 6500.0MIN	0.0MIN	↗
P9 Faults and Protections				
Function code	Name	Setting range	Factory value	Change
P9-00	Motor overload protection selection	0: Prohibit 1: Allow	1	↗
P9-01	Motor overload protection gain	0.20 ~ 10.00	1.00	↗
P9-02	Motor overload early-warning coefficient	50% ~ 100%	80%	↗
P9-03	Over-voltage stall gain	0 ~ 100	20	↗
P9-04	Over-voltage stall protection voltage	120% ~ 150%	130%	↗
P9-05	Over-current stall gain	0 ~ 100	0	↗
P9-06	Over-current stall protection current	100% ~ 200%	150%	↗
P9-07	Power-on ground-short-circuit protection selection	0: Invalid 1: Valid	1	↗
P9-08	Brake unit action starting voltage	650 ~ 800	760V	★
P9-09	Number of automatic fault reset	0 ~ 20	0	↗
P9-10	Fault DO action selection during automatic fault reset	0: No action 1: Action	0	↗
P9-11	Interval time of automatic fault reset	0.1S ~ 100.0S	1.0S	↗
P9-12	Input phase-loss/ contactor engagement protection selection	Units digit: Input phase-loss protection Tens digit: Contactor engagement protection 0: Prohibit 1: Allow	00	↗
P9-13	Output phase-loss protection selection	0: Prohibit 1: Allow	1	↗

P9-14	The first fault type	0: No fault 1: Reserved 2: Over-current during acceleration 3: Over-current during deceleration 4: Over-current during constant speed 5: Over-voltage during acceleration 6: Over-voltage during deceleration 7: Over-voltage during constant speed 8: Buffer resistor overload 9: Under-voltage 10: Inverter overload 11: Motor overload	-	★
P9-15	The second fault type	12: Input phase-loss 13: Output phase-loss 14: Module overheat 15: External fault 16: Communication abnormality 17: Contactor abnormality 18: Current detection abnormality 19: Motor tuning abnormality 20: Encoder/PG card abnormality 21: Parameter read-write abnormality 22: Inverter hardware abnormality 23: Motor short-circuit to ground 24: Reserved 25: Reserved	-	★
P9-16	The third (most recent) fault type	26: Running time reached 27: User-defined fault 1 28: User-defined fault 2 29: Power-on time reached 30: Load loss 31: PID feedback loss during operation 40: Fast current-limiting timeout 41: Motor switching during operation 42: Excessive speed deviation 43: Motor overspeed 45: Motor over-temperature 51: Initial position error	-	★
P9-17	Frequency at the third (most recent) fault	-	-	★
P9-18	Current at the third (most recent) fault	-	-	★
P9-19	Bus voltage at the third (most recent) fault	-	-	★
P9-20	Input terminal status at the third (most recent) fault	-	-	★

P9-21	Output terminal status at the third (most recent) fault	-	-	★
P9-22	Inverter status at the third (most recent) fault	-	-	★
P9-23	Power-on time at the third (most recent) fault	-	-	★
P9-24	Running time at the third (most recent) fault	-	-	★
P9-27	Frequency at the second fault	-	-	★
P9-28	Current at the second fault	-	-	★
P9-29	Bus voltage at the second fault	-	-	★
P9-30	Input terminal status at the second fault	-	-	★
P9-31	Output terminal status at the second fault	-	-	★
P9-32	Inverter status at the second fault	-	-	★
P9-33	Power-on time at the second fault	-	-	★
P9-34	Running time at the second fault	-	-	★
P9-37	Frequency at the first fault	-	-	★
P9-38	Current at the first fault	-	-	★
P9-39	Bus voltage at the first fault	-	-	★
P9-40	Input terminal status at the first fault	-	-	★
P9-41	Output terminal status at the first fault	-	-	★
P9-42	Inverter status at the first fault	-	-	★
P9-43	Power-on time at the first fault	-	-	★
P9-44	Running time at the first fault	-	-	★
P9-47	Fault protection action selection 1	Units digit: Motor overload (ERR11) 0: Free stop 1: Stop according to the stop mode 2: Continue running Tens digit: Input phase-loss (ERR12) (0-2) same as the units digit Hundreds digit: Output phase-loss (ERR13) (0-2) same as the units digit Thousands digit: External fault (ERR15) (0-2) same as the units digit Ten-thousands digit: Communication abnormality (ERR16) (0-2) same as the units digit	0000	↗
P9-54	Frequency selection for continued operation during fault	0: Run at the current running frequency 1: Run at the set frequency 2: Run at the upper-limit frequency 3: Run at the lower-limit frequency 4: Run at the abnormal standby frequency	0	↗
P9-55	Abnormal standby frequency	0.0%-100.0% (100.0% corresponds to the maximum frequency P0-10)	100.0%	↗

P9-56	Motor temperature sensor type	0: No temperature sensor 1: PT100 2: PT1000	0	↗
P9-57	Motor overheat protection threshold	0 ~ 200 °C	110°C	↗
P9-58	Motor overheat pre-alarm threshold	0 ~ 200°C	90°C	↗
P9-59	Function selection for no-stop during momentary power failure	0 ~ 2	0	•
P9-60	Judgment voltage for momentary action pause	80.0% ~ 100.0%	85.0%	•
P9-61	Judgment time for voltage recovery after momentary power failure	0.00s ~ 100.00S	0.50S	•
P9-62	Judgment voltage for momentary power failure action	60.0%~100.0% (standard bus voltage)	80.0%	↗
P9-63	Load loss protection selection	0: Invalid 1: Valid	0	↗
P9-64	Load loss detection level	0.0 ~ 100.0%	10.0%	↗
P9-65	Load loss detection time	0.0 ~ 60.0S	1.0S	↗
P9-67	Overspeed detection value	0.0%~50.0% (maximum frequency)	20.0%	↗
P9-68	Overspeed detection time	0.0S ~ 60.0S	1.0S	↗
P9-69	Excessive speed deviation detection value	0.0%~50.0% (maximum frequency)	20.0%	↗
P9-70	Excessive speed deviation detection time	0.0S ~ 60.0S	5.0S	↗
PA PID Function				
Function code	Name	Setting range	Factory value	Change
PA-00	PID setpoint source	0: Set by PA-01 1: AI1 2: AI2 3: Keyboard adjustable potentiometer 4: PULSE pulse setting (X5) 5: Communication setting 6: Multi-segment command setting	0	↗
PA-01	PID numerical setpoint	0.0% ~ 100.0%	50.0%	↗
PA-02	PID feedback source	0: AI1 1: AI2 2: Keyboard adjustable potentiometer 3: AI1-AI2 4: PULSE pulse setting (X6) 5: Communication setting 6: AI1 + AI2 7: MAX( AI1 , AI2 ) 8: MIN( AI1 , AI2 )	0	↗
PA-03	PID action direction	0: Positive action 1: Reverse action	0	↗
PA-04	PID setpoint and feedback range	0 ~ 65535	1000	↗
PA-05	Proportional gain KP1	0.0 ~ 100.0	20.0	↗

PA-06	Integral time TI1	0.01S ~ 10.00S	2.00S	↗
PA-07	Derivative time TD1	0.000S ~ 10.000S	0.000S	↗
PA-08	PID reverse cut-off frequency	0.00-maximum frequency	2.00Hz	↗
PA-09	PID deviation limit	0.0% ~ 100.0%	0.0%	↗
PA-10	PID derivative amplitude limit	0.00% ~ 100.00%	0.10%	↗
PA-11	PID setpoint change time	0.00 ~ 650.00S	0.00S	↗
PA-12	PID feedback filter time	0.00 ~ 60.00S	0.00S	↗
PA-13	PID output filter time	0.00 ~ 60.00S	0.00S	↗
PA-15	Proportional gain KP2	0.0 ~ 100.0	20.0	↗
PA-16	Integral time TI2	0.01S ~ 10.00S	2.00S	↗
PA-17	Derivative time TD2	0.000S ~ 10.000S	0.000S	↗
PA-18	PID parameter switching condition	0: No switching 1: Switch through X terminal 2: Automatically switch according to deviation	0	↗
PA-19	PID parameter switching deviation 1	0.0% ~ PA-20	20.0%	↗
PA-20	PID parameter switching deviation 2	PA-19 ~ 100.0%	80.0%	↗
PA-21	PID initial value	0.0% ~ 100.0%	0.0%	↗
PA-22	PID initial value holding time	0.00 ~ 650.00S	0.00s	↗
PA-23	Positive maximum value of two-time output deviation	0.00% ~ 100.00%	1.00%	↗
PA-24	Negative maximum value of two-time output deviation	0.00% ~ 100.00%	1.00%	↗
PA-25	PID integral property	Units digit: Integral separation 0: Invalid 1: Valid Tens digit: Whether to stop integration when the output reaches the limit 0: Continue integration 1: Stop integration	00	↗
PA-26	PID feedback loss detection value	0.0%: Do not judge feedback loss 0.1%~100.0%	0.0%	↗
PA-27	PID feedback loss detection time	0.0S ~ 20.0S	0.0S	↗
PA-28	PID stop operation	0: Do not operate when stopping 1: Operate when stopping	0	↗
PC multi-segment commands, simple PLC				
Function code	Name	Setting range	Factory value	Change
PC-00	Multi-segment command 0	-100.0% ~ 100.0%	0.0%	↗
PC-01	Multi-segment command 1	-100.0% ~ 100.0%	0.0%	↗
PC-02	Multi-segment command 2	-100.0% ~ 100.0%	0.0%	↗
PC-03	Multi-segment command 3	-100.0% ~ 100.0%	0.0%	↗
PC-04	Multi-segment command 4	-100.0% ~ 100.0%	0.0%	↗

PC-05	Multi-segment command 5	-100.0% ~ 100.0%	0.0%	↗
PC-06	Multi-segment command 6	-100.0% ~ 100.0%	0.0%	↗
PC-07	Multi-segment command 7	-100.0% ~ 100.0%	0.0%	↗
PC-08	Multi-segment command 8	-100.0% ~ 100.0%	0.0%	↗
PC-09	Multi-segment command 9	-100.0% ~ 100.0%	0.0%	↗
PC-10	Multi-segment command 10	-100.0% ~ 100.0%	0.0%	↗
PC-11	Multi-segment command 11	-100.0% ~ 100.0%	0.0%	↗
PC-12	Multi-segment command 12	-100.0% ~ 100.0%	0.0%	↗
PC-13	Multi-segment command 13	-100.0% ~ 100.0%	0.0%	↗
PC-14	Multi-segment command 14	-100.0% ~ 100.0%	0.0%	↗
PC-15	Multi-segment command 15	-100.0% ~ 100.0%	0.0%	↗
PC-16	Simple PLC operation mode	0: Stop after single-run completion 1: Maintain the final value after single-run completion 2: Keep looping	0	↗
PC-17	Simple PLC power-off memory selection	Units digit: Power-off memory selection 0: No power-off memory 1: Power-off memory Tens digit: Stop memory selection 0: No stop memory 1: Stop memory	00	↗
PC-18	Simple PLC segment 0 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-19	Simple PLC segment 0 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-20	Simple PLC segment 1 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-21	Simple PLC segment 1 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-22	Simple PLC segment 2 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-23	Simple PLC segment 2 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-24	Simple PLC segment 3 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-25	Simple PLC segment 3 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-26	Simple PLC segment 4 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-27	Simple PLC segment 4 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-28	Simple PLC segment 5 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-29	Simple PLC segment 5 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-30	Simple PLC segment 6 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-31	Simple PLC segment 6 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-32	Simple PLC segment 7 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-33	Simple PLC segment 7 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-34	Simple PLC segment 8 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗
PC-35	Simple PLC segment 8 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-36	Simple PLC segment 9 running time	0.0S (H) ~ 6553.5S (H)	0.0S (H)	↗

PC-37	Simple PLC segment 9 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-38	Simple PLC segment 10 running time	0.0S ( H ) ~ 6553.5S ( H )	0.0S ( H )	↗
PC-39	Simple PLC segment 10 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-40	Simple PLC segment 11 running time	0.0S ( H ) ~ 6553.5S ( H )	0.0S ( H )	↗
PC-41	Simple PLC segment 11 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-42	Simple PLC segment 12 running time	0.0S ( H ) ~ 6553.5S ( H )	0.0S ( H )	↗
PC-43	Simple PLC segment 12 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-44	Simple PLC segment 13 running time	0.0S ( H ) ~ 6553.5S ( H )	0.0S ( H )	↗
PC-45	Simple PLC segment 13 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-46	Simple PLC segment 14 running time	0.0S ( H ) ~ 6553.5S ( H )	0.0S ( H )	↗
PC-47	Simple PLC segment 14 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-48	Simple PLC segment 15 running time	0.0S ( H ) ~ 6553.5S ( H )	0.0S ( H )	↗
PC-49	Simple PLC segment 15 acceleration /deceleration time selection	0 ~ 3	0	↗
PC-50	Simple PLC running time unit	0: S (seconds) 1: H (hours)	0	↗
PC-51	Multi-segment command 0 setting method	0: Given by function code PC-00 1: AI1 2: AI2 3: Keyboard potentiometer 4: PULSE pulse 5: PID 6: Given by preset frequency (P0-08), can be modified by UP/DOWN	0	↗
Pd communication parameters				
Function code	Name	Setting range	Factory value	Change
Pd-00	Baud rate	Units digit: MODBUS 0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS	6005	↗
Pd-01	Data format	0: No parity (8-N-2) 1: Even parity (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1)	0	↗
Pd-02	Local address	1~247, 0 is the broadcast address	1	↗
Pd-03	Response delay	0MS ~ 20MS	2	↗

Pd-04	Communication timeout	0.0 (invalid), 0.15-60.05	0.0	↗
Pd-05	Data transfer format selection	Units digit: MODBUS 0: Non-standard MODBUS protocol 1: Standard MODBUS protocol	30	↗
Pd-06	Communication read current resolution	0 : 0.01A      1 : 0.1A	0	↗
PP function code management				
Function code	Name	Setting range	Factory value	Change
PP-00	User password	0 ~ 65535	0	↗
PP-01	Parameter initialization	0: No operation 01: Restore factory parameters, excluding motor parameters	0	●
PP-02	Function parameter group display selection	Units digit: U group display selection 0: Do not display; 1: Display Tens digit: A group display selection 0: Do not display; 1: Display	11	↗
PP-04	Function code modification attribute	0: Modifiable 1: Non-modifiable	0	↗
A5 control optimization parameters				
Function code	Name	Setting range	Factory value	Change
A5-00	DPWM switching upper limit frequency	0.00Hz ~ 15.00Hz	8.00Hz	↗
A5-01	PWM modulation method	0: Asynchronous modulation 1: Synchronous modulation	0	↗
A5-02	Dead-zone compensation mode selection	0: No compensation 1: Compensation mode 1 2: Compensation mode 2	1	↗
A5-03	Random PWM depth	0: Random PWM invalid 1~10: Random depth of PWM carrier frequency	0	↗
A5-04	Fast current limit enable	0: Not enabled 1: Enabled	1	↗
A5-05	Current detection compensation	0 ~ 100	5	↗
A5-06	Under-voltage point setting	60.0% ~ 140.0%	100.0%	↗
A5-07	SVC optimization mode selection	0: Not optimized 1: Optimization mode 1 2: Optimization mode 2	1	↗
A5-08	Dead-zone time adjustment	100% ~ 200%	150%	↗
A5-09	Over-voltage point setting	200 ~ 2500V	Model determination	●

## Parameter description

## P0 group Basic function group

P0-00	GP type display		Factory value	Related to the model
	Setting range	1	G type (constant torque load model)	
		2	P type (fan, water pump-like load model)	

This parameter is only for users to view the factory model and cannot be changed.

1: Applicable to constant torque loads with specified rated parameters

2: Applicable to variable torque loads (fan and water pump loads) with specified rated parameters

P0-01	First motor control mode		Factory value	2
	Setting range	0	Sensorless vector control (SVC)	
		1	Vector control with speed sensor (FVC)	
		2	V/F control	

## 0: Sensorless vector control

Refers to open-loop vector. It is suitable for general high-performance control occasions. One frequency converter can only drive one motor. Such as loads like machine tools, centrifuges, wire-drawing machines, injection molding machines, etc.

## 1: Vector control with speed sensor

Refers to closed-loop vector. An encoder must be installed at the motor end, and the frequency converter must be equipped with a PG card of the same type as the encoder. It is suitable for occasions with high-precision speed control or torque control. One frequency converter can only drive one motor. Such as loads like high-speed paper-making machinery, hoisting machinery, elevators, etc.

## 2: V/F control

Speed open-loop control. It is suitable for occasions where the load requirements are not high or one frequency converter drives multiple motors, such as fan and pump loads. It can be used in the situation where one frequency converter drives multiple motors.

Tip: When selecting the vector control mode, the motor parameter identification process must be carried out. Only accurate motor parameters can give full play to the advantages of the vector control mode.

Better performance can be obtained by adjusting the speed regulator parameters (Group P2/A2, corresponding to motor parameter group 1/2 respectively).

P0-02	Command source selection		Factory value	0
	Setting range	0	Operation panel command channel	
		1	Terminal command channel	
		2	Communication command channel	

Select the channel for the frequency converter control commands.

Frequency converter control commands include: start, stop, forward rotation, reverse rotation, jogging, etc.

0: Operation panel command channel

The running commands are controlled by the RUN, STOP/RES keys on the operation panel.

1: Terminal command channel

The running commands are controlled by multi-function input terminals such as FWD, REV, JOGF, JOGR, etc.

2: Serial port communication command channel

The running commands are given by the host computer through the communication method.

P0-03	Main frequency source X selection	Factory value	4
	Setting range	0	Digital setting (preset frequency P0-08, can be modified by UP/DOWN, not power-off memory)
1		Digital setting (preset frequency P0-08, can be modified by UP/DOWN, power-off memory)	
2		AI1	
3		AI2	
4		Keyboard-adjustable potentiometer	
5		Pulse setting (X5)	
6		Multi-speed	
7		PLC	
8		PID	
9		Communication setting	

Select the input channel for the main given frequency of the frequency converter.

0: Digital setting (no power-off memory)

The initial value is the value of P0-08 "Digital setting preset frequency".

The set frequency value of the frequency converter can be changed by the ◀, ▶ keys on the keyboard (or the UP, DOWN of the multi-function input terminals). "No memory" means that when the frequency converter is powered off and then powered on again, the set frequency value returns to the value of P0-08 "Digital setting preset frequency".

1: Digital setting (power-off memory)

The initial value is the value of P0-08 "Digital setting preset frequency".

The set frequency value of the frequency converter can be changed by the ◀, ▶ keys on the keyboard (or the UP, DOWN of the multi-function input terminals). "Memory" means that when the frequency converter is powered off and then powered on again, the set frequency is the set frequency before the last power-off (note the use in conjunction with P0-23).

2: AI1

3: AI2

4: Keyboard-adjustable potentiometer

It means that the frequency is determined by the analog input terminal. The standard unit provides 2 analog input terminals. Among them, AI1 is a 0V-10V voltage-type input, and AI2 can be a 0V-10V voltage input or a 4mA-20mA current input, selected by the J2 jumper on the control board.

## 5: Pulse setting (X5)

The frequency setting is given through the terminal pulse.

Pulse setting signal specifications: voltage range 9V-30V, frequency range 0KHz-100KHz.

Note: The pulse setting can only be input from the multi-function input terminal X5.

## 6: Multi-speed

Select the multi-speed operation mode. It is necessary to set the P4 group "Input terminals" and the PC group "Multi-speed and PLC" parameters to determine the corresponding relationship between the given signal and the given frequency.

## 7: Simple PLC

Select the simple PLC mode. When the frequency source is the simple PLC, it is necessary to set the PC group "Multi-speed and PLC" parameters to determine the given frequency.

## 8: PID

Select process PID control. At this time, it is necessary to set the PA group "PID function". The operating frequency of the frequency converter is the frequency value after the PID action. The meanings of the PID given source, given quantity, feedback source, etc. please refer to the introduction of the PA group "PID function".

## 9: Communication setting

It means that the main frequency source is given by the host computer through the communication method.

P0-04	Auxiliary frequency source Y selection	Factory value	0
	Setting range	0	Digital setting (preset frequency P0-08, can be modified by UP/DOWN, no power-off memory)
1		Digital setting (preset frequency P0-08, can be modified by UP/DOWN, with power-off memory)	
2		AI1	
3		AI2	
4		Keyboard-adjustable potentiometer	
5		Pulse setting (X5)	
6		Multi-speed	
7		PLC	
8		PID	
9		Communication setting	

When the auxiliary frequency source is used as an independent frequency setting channel (i.e., the frequency source selection is X to Y switching), its usage is the same as that of the main frequency source X. For the usage method, refer to the relevant description of P0-03.

When the auxiliary frequency source is used for superimposed setting (i.e., the frequency source selection is X+Y, X to X+Y switching, or Y to X+Y switching), there are the following special points:

1. When the auxiliary frequency source is a digital setting, the preset frequency (P0-08) does not work. The ◀, ▶ keys on the keyboard (or the UP, DOWN of the multi-function input terminals) can be used to adjust up or down based on the main set frequency.

2. When the auxiliary frequency source is an analog input setting (AI1, AI2) or a pulse input setting, 100% of the input setting corresponds to the range of the auxiliary frequency source (see the descriptions of P0-05 and P0-06). If it is necessary to adjust up or down based on the main set frequency, set the corresponding setting range of the analog input to  $-N\% \sim +N\%$  (see P4-13 and P4-26).

3. When the frequency source is a pulse input setting, it is similar to the analog setting.

Tip: The selection of the auxiliary frequency source Y and the setting value of the main frequency source X cannot be the same, that is, P0-03 and P0-04 cannot be set to the same value, otherwise it is likely to cause confusion.

P0-05	Selection of the relative value of the auxiliary frequency source Y during superposition	Factory value	0
	Setting range	0	Relative to the maximum frequency
		1	Relative to the main frequency source X
P0-06	Range of auxiliary frequency source Y during superposition	Factory value	100%
	Setting range	0% ~ 150%	

When the frequency source selection is frequency superposition setting (P0-07 is set to 1, 3, or 4), these two parameters are used to determine the adjustment range of the auxiliary frequency source. P0-05 is used to determine the object relative to which this range is defined. It can be selected to be relative to the maximum frequency or relative to the main frequency source X. If it is selected to be relative to the main frequency source, the range of the auxiliary frequency source will change as the main frequency X changes.

P0-07	Frequency source superposition selection	Factory value	00
	Setting range	Units digit	Frequency source selection
		0	Main frequency source X
		1	Result of main-auxiliary operation (the operation relationship is determined by the tens digit)
		2	Switch between main frequency source X and auxiliary frequency source Y
		3	Switch between main frequency source X and the result of main-auxiliary operation
		4	Switch between auxiliary frequency source Y and the result of main-auxiliary operation
		Tens digit	Operation relationship of main and auxiliary frequency sources
		0	Main + Auxiliary
		1	Main-Auxiliary
		2	The maximum value of the two
		3	The minimum value of the two

Select the frequency setting channel through this parameter. The frequency setting is achieved through the combination of the main frequency source X and the auxiliary frequency source Y.

Units digit: Frequency source selection:

## 0: Main frequency source X

The main frequency X is used as the target frequency.

## 1: Result of main-auxiliary operation

The result of the main-auxiliary operation is used as the target frequency (see the tens-digit description for the main-auxiliary operation relationship).

## 2: Switch between main frequency source X and auxiliary frequency source Y

When the multi-function input terminal 18: Frequency source switching is invalid, the main frequency X is used as the target frequency.  
When the multi-function input terminal 18: Frequency source switching is valid, the auxiliary frequency Y is used as the target frequency.

## 3: Switch between main frequency source X and the result of main-auxiliary operation

When the multi-function input terminal 18: Frequency source switching is invalid, the main frequency X is used as the target frequency.

When the multi-function input terminal 18: Frequency source switching is valid, the result of the main-auxiliary operation is used as the target frequency.

## 4: Switch between auxiliary frequency source Y and the result of main-auxiliary operation

When the multi-function input terminal 18: Frequency source switching is invalid, the auxiliary frequency Y is used as the target frequency.

When the multi-function input terminal 18: Frequency source switching is valid, the result of the main-auxiliary operation is used as the target frequency.

Tens digit: Main-auxiliary operation relationship of frequency sources:

## 0: Main + Auxiliary

The sum of the main frequency X and the auxiliary frequency Y is used as the target frequency.

This realizes the frequency superposition setting function.

## 1: Main-Auxiliary

The difference obtained by subtracting the auxiliary frequency Y from the main frequency X is used as the target frequency.

## 2: The maximum value of the two

The one with the largest absolute value among the main frequency X and the auxiliary frequency Y is taken as the target frequency.

## 3: The minimum value of the two

The one with the smallest absolute value among the main frequency X and the auxiliary frequency Y is taken as the target frequency.

P0-08	Preset frequency	Factory value	50.00HZ
	Setting range	0.00~maximum frequency (valid for digital setting of frequency source selection method)	

When the frequency source is selected as "digital setting" or "terminal UP/DOWN", the value of this function code is the initial value of the frequency digital setting of the frequency converter.

P0-09	Running direction	Factory value	0
	Setting range	0	Default running direction
		1	Run in the direction opposite to the default direction

By changing this function code, the rotation direction of the motor can be changed without altering the motor wiring, which is equivalent to adjusting any two of the motor's (U, V, W) wires to switch the motor's rotation direction.

Tip: After parameter initialization, the motor running direction will return to its original state. Use this with caution in situations where changing the motor rotation direction is strictly prohibited after the system is well-debugged.

P0-10	Maximum frequency	Factory value	50.00 HZ
	Setting range	50.00HZ ~ 500.00HZ	
P0-11	Upper limit frequency source	Factory value	0
	Setting range	0	Set by P0-12
		1	AI1
		2	AI2
		3	Adjustable potentiometer on the keyboard
		4	PULSE setting (X5)
		5	Communication setting

Define the source of the upper limit frequency. The upper limit frequency can come from digital setting (P0-12) or from the analog input channel. When using analog input to set the upper limit frequency, 100% of the analog input setting corresponds to P0-12.

For example, during torque control, speed control is ineffective. To avoid "run-away" due to material breakage, analog setting can be used.

Upper limit frequency. When the frequency converter runs to the upper limit frequency value, torque control becomes ineffective, and the frequency converter continues to run at the upper limit frequency.

P0-12	Upper limit frequency	Factory value	50.00HZ
	Setting range	Lower limit frequency P0-11~Maximum frequency P0-10	
P0-13	Upper limit frequency bias	Factory value	0.00HZ
	Setting range	0.00HZ~Maximum frequency P0-10	

When the upper limit frequency is set by analog quantity, P0-13 serves as the bias value of the analog quantity. The biased frequency is added to the upper limit frequency value set by P0-11 to obtain the final set value of the upper limit frequency.

P0-14	Lower limit frequency	Factory value	0.00HZ
	Setting range	0.00HZ~Upper limit frequency P0-12	

During operation, if the given frequency is less than the lower limit frequency, the frequency converter can stop, run at the lower limit frequency, or run at zero speed. The specific operation mode can be set through P8-14.

P0-15	Carrier frequency	Factory value	Related to the model
	Setting range	0.5KHZ ~ 16.0KHZ	

This function adjusts the carrier frequency of the frequency converter. By adjusting the carrier frequency, motor noise can be reduced, resonance points of the mechanical system can be avoided, the leakage current to the ground of the circuit can be decreased, and the interference generated by the frequency converter can be reduced. When the carrier frequency is low, the high-order harmonic components of the output current increase, motor losses increase, and motor temperature rise increases.

When the carrier frequency is high, motor losses decrease, motor temperature rise decreases, but the losses of the frequency converter increase, the temperature rise of the frequency converter increases, and the interference increases.

The impact of adjusting the carrier frequency on the following performance:

Carrier frequency	Low → High
Motor noise	Large → Small
Output current waveform	Poor → Good
Motor temperature rise	High → Low
Frequency converter temperature rise	Low → High
Leakage current	Small → Large
External radiation interference	Small → Large

For frequency converters of different powers, the factory settings of the carrier frequency vary. Although users can modify it as needed, it should be noted that if the carrier frequency is set higher than the factory-set value, it will cause the temperature rise of the frequency converter's heat sink to increase. In this case, users need to derate the use of the frequency converter; otherwise, there is a risk of overheating alarm for the frequency converter.

P0-16	Carrier frequency adjustment with temperature	Factory value	1
	Setting range	0	No
		1	Yes

Carrier frequency adjustment with temperature means that when the frequency converter detects that the temperature of its own heat sink is high, it automatically reduces the carrier frequency to lower the temperature rise of the frequency converter. When the temperature of the heat sink is low, the carrier frequency gradually recovers to the set value. This function can reduce the chance of overheating alarms of the frequency converter.

P0-17	Acceleration time 1	Factory value	Model determination
	Setting range		0.0S ~ 6500.0S
P0-18	Deceleration time 1	Factory value	Model determination
	Setting range		0.0S ~ 6500.0S

Acceleration time refers to the time required for the frequency converter to accelerate from zero frequency to the acceleration-deceleration reference frequency (determined by P0-25), as shown as T1 in Figure 6-1.

Deceleration time refers to the time required for the frequency converter to decelerate from the acceleration-deceleration reference frequency (determined by P0-25) to zero frequency, as shown as T2 in Figure 6-1.

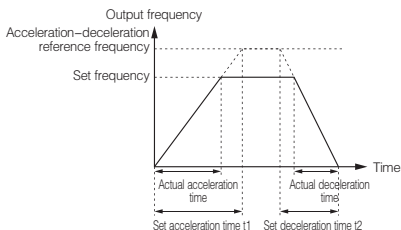


Figure 6-1 Schematic diagram of acceleration and deceleration time

Pay attention to the difference between the actual acceleration-deceleration time and the set acceleration-deceleration time.

There are 4 groups of acceleration-deceleration time options.

The first group: P0-17, P0-18;

The second group: P8-03, P8-04;

The third group: P8-05, P8-06;

The fourth group: P8-07, P8-08.

The acceleration-deceleration time can be selected through the multi-function digital input terminals (P4-00~P4-09).

P0-19	Unit of acceleration-deceleration time	Factory value	1
	Setting range	0	1 second
		1	0.1 second
		2	0.01 second

This function is used to determine the unit of all acceleration-deceleration times.

Note that when modifying this value, the number of decimal places displayed for the actual acceleration-deceleration time will change, and the corresponding acceleration-deceleration time will also change. Special attention should be paid during application.

P0-21	Offset frequency of the auxiliary frequency source during superposition	Factory value	0.00HZ
	Setting range	0.00HZ~Maximum frequency P0-10	

This function code is only valid when the frequency source is selected as the main-auxiliary operation.

When the frequency source is the main-auxiliary operation, P0-21 serves as the offset frequency, which is superimposed with the result of the main-auxiliary operation as the final frequency setting value, making the frequency setting more flexible.

P0-22	Frequency command resolution	Factory value	2
	Setting range	2	0.01HZ

This parameter is used to determine the resolution of all frequency-related function codes.

P0-23	Digital set frequency shutdown memory selection		Factory value	0
	Setting range		0	Don't remember
			1	Remember

This function is only valid when the frequency source is set digitally.

"Don't remember" means that after the frequency converter stops, the digitally set frequency value returns to the value of P0-08 "Digital set preset frequency".

"Remember" means that after the frequency converter stops, the digitally set frequency remains the same as the set frequency before the last shutdown.

P0-24	Motor selection		Factory value	0
	Setting range		0	Motor 1
			1	Motor 2

Two sets of motor parameter settings are provided. Motor parameter groups can be selected through terminals or function codes, with terminal selection taking precedence.

Motor 1 corresponds to function parameter groups P1 and P2, and Motor 2 corresponds to A2.

P0-25	Acceleration-deceleration time reference frequency		Factory value	0
	Setting range		0	Maximum frequency (P0-10)
			1	Set frequency
			2	100HZ

The acceleration-deceleration time between zero frequency and the frequency set by P0-25, as shown in the acceleration-deceleration time diagram in Figure 6-1.

P0-26	Frequency command UP/DOWN reference during operation		Factory value	0
	Setting range		0	Operating frequency
			1	Set frequency

This function is only valid for digital frequency source setting. It is used to determine the method of modifying the set frequency when the <math>\triangleleft</math>, <math>\triangle></math> keys on the keyboard or the UP/DOWN action of the terminal are used. That is, whether the target frequency is increased or decreased based on the running frequency or the set frequency.

P0-27	Command source bundled with frequency source		Factory value	0000
	Setting range	Units digit	Operation panel command binding frequency source selection	
		0	No binding	
		1	Digital set frequency source	
		2	AI1	
		3	AI2	
		4	Keyboard adjustable potentiometer	
		5	Pulse setting (X5)	
		6	Multi-speed	
		7	PLC	
		8	PID	
	9	Communication given		
	Tens digit	Terminal command binding frequency source selection (0-9, same as units digit)		
Hundreds digit	Communication command binding frequency source selection (0-9, same as units digit)			


Define the bundled combinations between three operating command channels and nine frequency setting channels to facilitate synchronous switching.

The meanings of the above frequency setting channels are the same as those of the main frequency source X selection P0-03. Please refer to the functional code description of P0-03.

Different operating command channels can be bundled with the same frequency setting channel. When "no binding" is selected, the frequency source is determined by P0-03~P0-07.

## P1 group First motor parameters

P1-00	Motor type selection	Factory value	0
	Setting range	0	General asynchronous motor
		1	Variable-frequency asynchronous motor
P1-01	Rated power	Factory value	Model determination
	Setting range	0.1KW ~ 1000.0KW	
P1-02	Rated voltage	Factory value	Model determination
	Setting range	0V ~ 2000V	
P1-03	Rated current	Factory value	Model determination
	Setting range	0.01A-655.35A (inverter power <= 55KW) 0.1A-6553.5A (inverter power > 55KW)	
P1-04	Rated frequency	Factory value	Model determination
	Setting range	0.00HZ~Maximum frequency	
P1-05	Rated speed	Factory value	Model determination
	Setting range	0RPM ~ 65535RPM	

 Notes			
1. Please set according to the nameplate parameters of the motor. 2. Excellent control performance of vector control requires accurate motor parameters, and accurate parameter identification comes from the correct setting of motor rated parameters. 3. To ensure control performance, please configure the motor according to the standard-matched motor of the inverter. If the power of the motor differs significantly from that of the standard-matched motor, the control performance of the inverter will decline significantly.			
P1-06	Stator resistance of asynchronous motor	Factory value	Model determination
	Setting range	0.001Ω~65.535Ω (inverter power ≤ 55KW) 0.0001Ω~6.5535Ω (inverter power > 55KW)	
P1-07	Rotor resistance of asynchronous motor	Factory value	Model determination
	Setting range	0.001Ω~65.535Ω (inverter power ≤ 55KW) 0.0001Ω~6.5535Ω (inverter power > 55KW)	
P1-08	Leakage inductive reactance of asynchronous motor	Factory value	Model determination
	Setting range	0.01MH~655.35MH (inverter power ≤ 55KW) 0.001MH~65.535MH (inverter power > 55KW)	
P1-09	Mutual inductive reactance of asynchronous motor	Factory value	Model determination
	Setting range	0.1MH~6553.5MH (inverter power ≤ 55KW) 0.01MH~655.35MH (inverter power > 55KW)	
P1-10	No-load current of asynchronous motor	Factory value	Model determination
	Setting range	0.01A~P1-03 (inverter power ≤ 55KW) 0.1A~P1-03 (inverter power > 55KW)	
P1-27	Number of encoder pulses	Factory value	1024
	Setting range	1 ~ 65535	

The number of pulses per revolution of the ABZ incremental encoder.

P1-28	Encoder type	Factory value	0
	Setting range	0	ABZ incremental encoder
		2	Rotary transformer

The type of encoder currently in use. Please set according to the actual situation.

P1-30	Encoder phase sequence / main direction	Factory value	0
	Setting range	0	Forward
		1	Reverse

Encoder phase sequence. This is valid when the encoder type is selected as 0: ABZ incremental encoder. The parameter value will be automatically updated after the motor auto-tuning is successfully completed.

P1-34	Number of pole pairs of resolver	Factory value	1
	Setting range	1 ~ 65535	

The number of pole pairs of the rotary transformer. Set according to the actual situation.

P1-36	Speed feedback PG disconnection detection time	Factory value	0.0
	Setting range	0.1S~10.0S	

This is used to set the detection time for encoder disconnection faults. When set to 0.0S, the inverter does not detect encoder disconnection faults. When the inverter detects a disconnection fault and the duration exceeds the time set in F1-36, the inverter will alarm ERR20.

P1-37	Tuning selection		Factory value	0
	Setting range	0	No operation	
		1	Asynchronous motor static tuning 1	
		2	Asynchronous motor complete tuning	
		3	Asynchronous motor static tuning 2	

When using vector control, to ensure the best control performance of the inverter, please disconnect the load from the motor and use rotational tuning for motor parameter self-learning; otherwise, it will affect the vector control effect. When the motor is equipped with a large-inertia load and is not easy to disconnect and vector control is required, please use static tuning 2.

Before parameter self-learning, the motor type and nameplate parameters F1-00~F1-05 need to be set correctly. When using closed-loop vector control, the encoder type and pulse number F1-27 and F1-28 need to be set additionally.

Instructions for tuning operation: Set the motor nameplate parameters and self-learning type, and then press the RUN key. The inverter will perform static tuning.

0: No operation, that is, tuning is prohibited.

1: Asynchronous motor static tuning 1 is applicable to asynchronous motors when the large-inertia load is not easy to disconnect and rotational tuning cannot be carried out.

2: Asynchronous motor dynamic tuning

During the dynamic tuning process, the inverter first performs static tuning, then accelerates to 80% of the motor rated frequency according to the acceleration time F0-17, maintains for a period of time, and then decelerates and stops according to the deceleration time F0-18 to end the tuning.

3: Asynchronous motor static tuning 2

It is applicable to the situation without an encoder. The motor parameter self-learning is carried out when the motor is in a static state (at this time, the motor may still have a slight jitter, so pay attention to safety).

Operation instructions: Set this function code to 3, and then press the RUN key. The inverter will perform no-load tuning.

Note: Tuning supports motor tuning in keyboard operation mode, terminal mode, and communication mode.

## P2 group Vector control parameters

Function codes in Group P2 are only valid for vector control, that is, they are valid when P0-01 = 0 or 1, and invalid when P0-01 = 2.

P2-00	Speed loop proportional gain 1	Factory value	30
	Setting range	1 ~ 100	
P2-01	Speed loop integral time 1	Factory value	0.50S
	Setting range	0.01S ~ 10.00S	
P2-02	Switching frequency 1	Factory value	5.00HZ
	Setting range	0.00 ~ P2-05	
P2-03	Speed loop proportional gain 2	Factory value	20
	Setting range	0 ~ 100	
P2-04	Speed loop integral time 2	Factory value	1.00S
	Setting range	0.01S ~ 10.00S	
P2-05	Switching frequency 2	Factory value	10.00HZ
	Setting range	P2-02~maximum output frequency	

When the inverter operates at different frequencies, different speed-loop PI parameters can be selected. When the operating frequency is less than the switching frequency 1 (P2-02), the speed-loop PI adjustment parameters are P2-00 and P2-01. When the operating frequency is greater than the switching frequency 2, the speed-loop PI adjustment parameters are P2-03 and P3-04. The speed-loop PI parameters between the switching frequency 1 and the switching frequency 2 are linearly switched between the two sets of PI parameters, as shown in Figure 6-2.

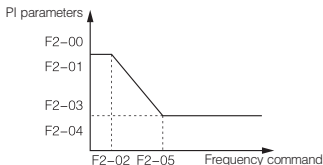


Figure 6-2 Schematic diagram of PI parameters

By setting the proportional coefficient and integral time of the speed regulator, the speed dynamic response characteristics of vector control can be adjusted. Increasing the proportional gain and reducing the integral time can both accelerate the dynamic response of the speed loop. However, if the proportional gain is too large or the integral time is too small, the system may oscillate.

Suggested adjustment method:

If the factory-set parameters do not meet the requirements, make fine-tuning based on the factory-default parameter values. First, increase the proportional gain to ensure that the system does not oscillate. Then, reduce the integral time so that the system has both a fast response characteristic and a small over-shoot.

Note: Improper PI parameter settings may lead to excessive speed over-shoot. It may even cause an over-voltage fault when the over-shoot subsides.

P2-06	Slip compensation coefficient	Factory value	100%
	Setting range	50% ~ 200%	

For sensorless vector control, this parameter is used to adjust the speed-stabilizing accuracy of the motor.

Increase this parameter when the motor speed is low under heavy load, and decrease it otherwise.

For sensor-based vector control, this parameter can adjust the output current of the inverter under the same load.

P2-07	SVC speed feedback filtering time	Factory value	0.050S
	Setting range	0.000S ~ 0.100S	

The SVC speed feedback filtering time takes effect only when P0-01 = 0. Increasing P2-07 can improve motor stability, but the dynamic response will weaken. Conversely, the dynamic response will strengthen, but if it is too small, it may cause motor oscillation. Generally, no adjustment is required.

P2-09	Speed control (drive) torque upper limit source	Factory value	0
	Setting range	0	P2-10
		1	AI1
		2	AI2
		3	Keyboard-adjustable potentiometer
		4	PULSE setting
		5	Communication setting
		6	MIN(AI1 , AI2)
7	MAX(AI1 , AI2)		
P2-10	Digital setting of speed control (drive) torque upper limit	Factory value	150.0%
	Setting range	0.0% ~ 200.0%	

In speed control mode, the output torque of the inverter is limited by the torque upper limit.

P2-09 is used to select the setting source of the torque upper limit. When set by analog quantity, 100% of the analog input setting corresponds to P2-10, and 100% of P2-10 corresponds to the rated output current of the inverter.

P2-13	M-axis current loop proportional gain	Factory value	2000
	Setting range	0 ~ 20000	
P2-14	M-axis current loop integral gain	Factory value	1300
	Setting range	0 ~ 20000	
P2-15	T-axis current loop proportional gain	Factory value	2000
	Setting range	0 ~ 20000	
P2-16	T-axis current loop integral gain	Factory value	1300
	Setting range	0 ~ 20000	

These are the vector-control current-loop PI adjustment parameters. They are automatically obtained after the dynamic tuning of the asynchronous motor and generally do not need to be modified. It should be noted that for the integral regulator of the current loop, the integral gain is directly set instead of using the integral time as the dimension. If the current-loop PI gain is set too large, it may cause the entire control loop to oscillate. Therefore, when there is current oscillation or large torque fluctuations, the PI proportional gain or integral gain here can be manually reduced.

### P3 group V/F control parameters

The function codes in this group are only valid for V/F control (P0-01 = 2) and invalid for vector control. V/F control is suitable for general-purpose loads such as fans and pumps, or applications where one inverter drives multiple motors, or where there is a significant difference between the power of the inverter and the motor.

P3-00	V/F curve setting		Factory value	0
	Setting range	0	Linear V/F curve	
1		Multi-point V/F curve		
2		Square V/F curve		
3		1.2-order V/F curve		
4		1.4-order V/F curve		
6		1.6-order V/F curve		
8		1.8-order V/F curve		
9		Reserved		
10		VF completely separated mode		
11		VF semi-separated mode		

For fan and pump-type loads, square V/F control can be selected.

Ordinary VF control methods:

0: Linear V/F curve. Suitable for ordinary constant-torque loads.

1: Multi-point V/F curve. Suitable for special loads such as dehydrators and centrifuges.

2: Square V/F curve. Suitable for centrifugal loads such as fans and pumps.

VF separation control methods:

10: VF completely separated mode. At this time, V is set separately according to the setting method of P3-13 (VF separated voltage source).

11: VF semi-separated mode.

In this case, V is proportional to F, and the voltage source is only used to adjust the slope of V/F. At this time, the relationship between V and F is related to the rated voltage and rated frequency of the motor set in group P1. If the voltage-source input is X (X is a value from 0 to 100%), then:  $V/F = 2 * X * (\text{rated voltage of the motor}) / (\text{rated frequency of the motor})$

P3-01	Torque boost	Factory value	Model determination
	Setting range	0.0% ~ 30%	
P3-02	Torque boost cut-off frequency	Factory value	50.00HZ
	Setting range	0.00HZ~maximum output frequency	

To compensate for the low-frequency torque characteristics of V/F control, some voltage boost compensation is made to the output voltage of the inverter at low frequencies. However, if the torque boost is set too large, the motor is likely to overheat and the inverter is likely to experience over-current. Generally, the torque boost should not exceed 8.0%. Adjusting this parameter effectively can effectively avoid over-current during startup. For larger loads, it is recommended to increase this parameter, and when the load is light, this parameter setting can be reduced. When the torque boost is set to 0.0, the inverter has automatic torque boost. Torque boost cut-off frequency: Below this frequency, the torque boost is effective. Beyond this set frequency, the torque boost fails. See Figure 6-3 for details.

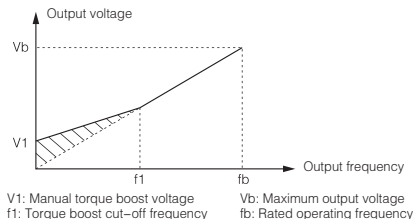


Figure 6-3 Schematic diagram of manual torque boost

P3-03	V/F frequency point P1	Factory value	0.00HZ
	Setting range	0.00HZ ~ P3-05	
P3-04	V/F voltage point V1	Factory value	0.0%
	Setting range	0.0% ~ 100.0%	
P3-05	V/F frequency point P2	Factory value	0.00HZ
	Setting range	P3-03 ~ P3-07	
P3-06	V/F voltage point V2	Factory value	0.0%
	Setting range	0.0% ~ 100.0%	
P3-07	V/F frequency point P3	Factory value	0.00HZ
	Setting range	P3-05 to motor rated frequency (P1-04) Note: The rated frequencies of the 2nd/3rd/4th motors are A2-04/A3-04/A4-04	
P3-08	V/F voltage point V3	Factory value	0.0%
	Setting range	0.0% ~ 100.0%	

Six parameters from P3-03 to P3-08 define the multi-segment V/F curve. The setting values of the V/F curve are usually set according to the load characteristics of the motor. Note:  $V1 < V2 < V3$ ,  $P1 < P2 < P3$ . Figure 6-4 is a schematic diagram of the setting of the multi-point VF curve.

Setting the voltage too high at low frequencies may cause the motor to overheat or even burn out, and the inverter may experience over-current stall or over-current protection.

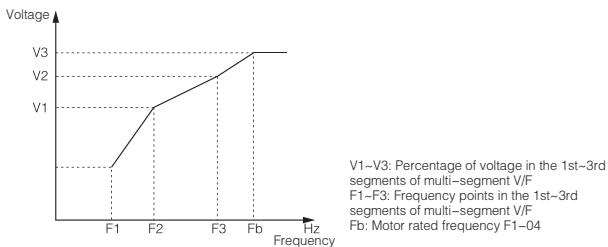


Figure 6-4 Schematic diagram of V/F curve setting

P3-09	Slip compensation coefficient	Factory value	0.0%
	Setting range	0% ~ 200.0%	

This is effective for V/F control. Setting this parameter can compensate for the slip generated by the load during V/F control, reducing the change in the motor speed with the load during V/F control. Generally, 100% corresponds to the rated slip of the motor under rated load. The following principles can be referred to for adjusting the slip compensation coefficient: when the load is the rated load and the slip compensation coefficient is set to 100%, the speed of the motor driven by the inverter is basically close to the given speed.

P3-10	VF over-excitation gain	Factory value	64
	Setting range	0 ~ 200	

The function of the VF over-excitation gain is to suppress the rise of the bus voltage during the deceleration process of the inverter, avoiding an over-voltage fault when the bus voltage exceeds the over-voltage protection limit. The larger the over-excitation gain, the stronger the suppression effect. The setting instructions are as follows:

1. In general, in cases with very small inertia, set the over-excitation gain to 0. In cases with large inertia, the over-excitation gain should be appropriately increased.
2. In cases with a braking resistor, set the over-excitation gain to 0.

P3-11	Oscillation suppression gain	Factory value	Model determination
	Setting range	0 ~ 100	

When the motor has no oscillation, select this gain as 0. Only when the motor oscillates significantly and cannot operate normally, appropriately increase this gain. The larger the gain, the more obvious the suppression of oscillation. When using the oscillation suppression function, it is required that the settings of the motor rated current and no-load current parameters do not deviate much from the actual values. The selection method of this gain is to take as small a value as possible under the premise of effectively suppressing oscillation, so as not to have too much impact on VF operation.

P3-13	Voltage source for VF separation	Factory value	0
	Setting range	0	Digital setting (P3-14)
		1	AI1
		2	AI2
		3	Adjustable potentiometer on the keyboard
		4	PULSE pulse setting (X6)
		5	Multi-segment command
		6	Simple PLC
		7	PID
		8	Communication setting
100.0% corresponds to the rated voltage of the motor (P1-02/A4-02/A5-2/A6-02)			

Define the voltage source for VF separation. The output voltage can come from digital setting (P3-14), or from analog input channels, multi-segment commands, PLC, PID, or communication settings. When the output voltage is set by non-digital means, 100% of the input setting corresponds to the rated voltage of the motor, and the absolute value of the input setting is taken as the effective setting value.

0: Digital setting (P3-14)

The voltage is set directly through P3-14.

1: AI1 2: AI2

The voltage is determined by the analog input terminals. 0-100% of the AI input corresponds to an output voltage of 0V-the rated voltage of the motor.

4: PULSE pulse setting (X5)

The voltage setting is given through terminal pulses. It is necessary to set P4-28 to P4-31 to determine the corresponding relationship between the given signal and the given voltage (100% corresponds to the rated voltage of the motor).

Pulse given signal specifications: voltage range 9V-30V, frequency range 0KHZ-100KHZ.

Explanation: The pulse given can only be input from the multi-function input terminal X5.

#### 5: Multi-speed

When the voltage source is multi-speed, it is necessary to set the parameters of "input terminals" in group P4 and "multi-speed and PLC" in group PC to determine the corresponding relationship between the given signal and the given voltage (100% corresponds to the rated voltage of the motor).

#### 6: Simple PLC

When the voltage source is a simple PLC, it is necessary to set the parameters of "multi-speed and PLC" in group PC to determine the given output voltage (100% corresponds to the rated voltage of the motor).

#### 7: PID

The output voltage is generated according to the PID closed-loop. For specific content, refer to the PID introduction in group PA.

#### 8: Communication setting

It means that the voltage is given by the host computer through communication (100% corresponds to the rated voltage of the motor).

P3-14	Digital setting of the voltage source for VF separation	Factory value	0V
	Setting range	0V-rated voltage of the motor	

When the voltage source is set digitally, this value is directly used as the target value of the output voltage.

P3-15	Voltage rise time for VF separation	Factory value	0.0S
	Setting range	0.0S ~ 1000.0S	
P3-16	Voltage fall time for VF separation	Factory value	0.0S
	Setting range	0.0S ~ 1000.0S	

The voltage rise time for VF separation refers to the time required for the output voltage to accelerate from 0 to the rated voltage of the motor, as shown as  $t_1$  in the figure.

The voltage fall time for VF separation refers to the time required for the output voltage to decelerate from the rated voltage of the motor to 0, as shown as  $t_2$  in the figure.

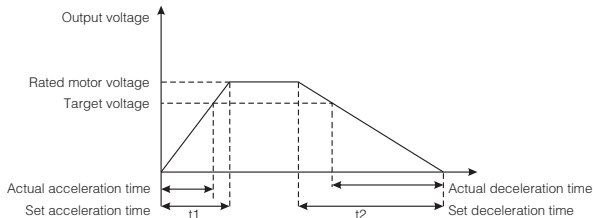


Figure 6-5 Schematic diagram of V/F separation

P3-17	V/F separation shutdown mode selection	Factory value	0.0S
	Setting range	0: Frequency/voltage is independently reduced to 0. 1: The voltage is reduced to 0 first, and then the frequency is reduced.	

0: Frequency/voltage is independently reduced to 0.

The V/F separated output voltage decreases to 0V according to the voltage fall time (P3-15); the V/F separated output frequency decreases to 0Hz simultaneously according to the deceleration time (P0-18).

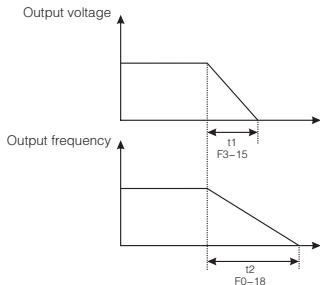


Figure 6-6 V/F separation: Output voltage/frequency independently reduced to 0

1: The frequency is reduced after the voltage is reduced to 0.

First, the V/F separated output voltage decreases to 0V according to the voltage fall time (P3-15), and then the frequency decreases to 0Hz according to the deceleration time (P0-18).

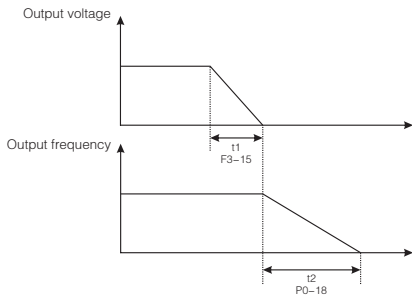


Figure 6-7 Schematic diagram of sequential decrease of V/F separation frequency/voltage

- Inverter output current (torque) limitation

During the acceleration, constant-speed, and deceleration processes, if the current exceeds the over-current stall current point (150%), the over-current stall function will take effect. When the current exceeds the over-current stall point, the output frequency starts to decrease. Only after the current drops below the over-current stall point will the frequency start to accelerate upward to the target frequency. The actual acceleration time will be automatically extended. If the actual acceleration time does not meet the requirements, "P3-21 Over-current stall operating current" can be appropriately increased.

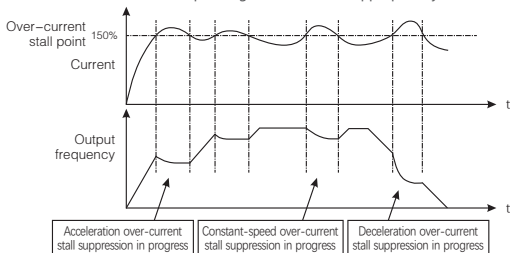


Figure 6-8 Schematic diagram of over-current stall operation

P3-18	Over-current stall operating current	150%	50%~200%	Current for starting over-current stall suppression action
P3-19	Over-current stall suppression enable	1	0~1	0 invalid, 1 valid
P3-20	Over-current stall suppression gain	20	0~100	If the current exceeds the over-current stall current point, the over-current stall suppression will take effect, and the actual acceleration time will be automatically extended.
P3-21	Multi-speed over-current stall operating current compensation coefficient	50%	50%~200%	Reduce the over-current stall operating current at high speed. The compensation coefficient is invalid when it is 50. The operating current in the field-weakening region corresponds to 3-18.

In the high-frequency region, the motor drive current is relatively small. Compared with the region below the rated frequency, for the same stall current, the motor speed drops significantly. To improve the motor's operating characteristics, the stall operating current above the rated frequency can be reduced. In some applications such as centrifuges, where the operating frequency is high, several times of field-weakening is required, and the load inertia is large, this method has a good effect on the acceleration performance.

The transition stall operating current exceeding the rated frequency =  $(f_s/f_n) * k * \text{LimitCur}$ ;  $f_s$  is the operating frequency,  $f_n$  is the rated frequency of the motor,  $k$  is "P3-21 Multi-speed over-current stall operating current compensation coefficient", and LimitCur is "P3-18 Over-current stall operating current".

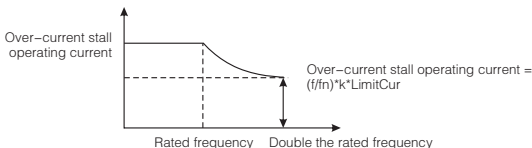


Figure 6-9 Schematic diagram of multi-speed over-current stall operation

## Remarks:

The over-current stall operating current of 150% means 1.5 times the rated current of the frequency converter. For high-power motors, when the carrier frequency is below 2kHz, due to the increase in pulsating current, the wave-by-wave current limiting response starts earlier than the over-current stall prevention action, resulting in insufficient torque. In this case, please reduce the over-current stall prevention operating current.

- Inverter bus voltage limit (and braking resistor activation voltage setting)

If the bus voltage exceeds the over-voltage stall point of 760V, it indicates that the electromechanical system is in a generating state (motor speed > output frequency). The over-voltage stall protection will take effect, adjusting the output frequency (consuming the excess regenerative electricity). The actual deceleration time will be automatically extended to avoid tripping protection. If the actual deceleration time does not meet the requirements, the over-excitation gain can be appropriately increased.

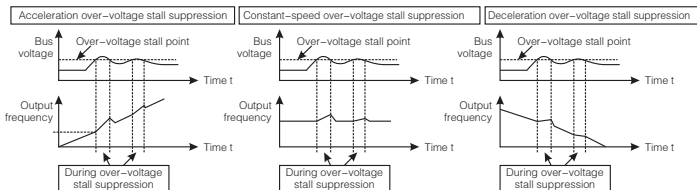


Figure 6-10 Schematic diagram of over-voltage stall operation

P3-22	Over-voltage stall operating voltage	760V	200.0V-2000.0V	-
P3-23	Over-voltage stall enable	1	0~1	0 is invalid, 1 is valid. By default, the over-voltage stall gain is valid.
P3-24	Over-voltage stall suppression frequency gain	30	0~100	Increasing P3-24 will improve the control effect of the bus voltage, but the output frequency will fluctuate. If the output frequency fluctuates significantly, P3-24 can be appropriately reduced. Increasing P3-25 can reduce the overshoot of the bus voltage.
P3-25	Over-voltage stall suppression voltage gain	30	0~100	
P3-26	Over-voltage stall maximum rising frequency limit	5Hz	0~50Hz	Over-voltage suppression maximum rising frequency limit

## Remarks:

When using a braking resistor, installing a braking unit, or using an energy feedback unit, please note: Set the value of P3-11 "Over-excitation gain" to "0". If it is not "0", it may cause excessive current during operation.

Set the value of P3-23 "Over-voltage stall enable" to "0". If it is not "0", it may cause an extension of the deceleration time.

P3-27	Slip compensation time constant	0.5s	0.1~10.0s	When the set value is too small, regenerative over-voltage fault (Err07) is likely to occur in high-inertia loads.
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The smaller the response time value of slip compensation is set, the faster the response speed will be.

## P4 group Input terminals

The 860S series frequency converter standard unit has 5 multi-function digital input terminals (where X5 can be used as a high-speed pulse input terminal) and 2 analog input terminals. If the system requires more input and output terminals, a multi-function input-output expansion card can be selected.

P4-00	Function selection of terminal X1	Factory value	1 (Forward operation)
P4-01	Function selection of terminal X2	Factory value	4 (Forward jogging)
P4-02	Function selection of terminal X3	Factory value	9 (Fault reset)
P4-03	Function selection of terminal X4	Factory value	12 (Multi-segment command terminal 1)
P4-04	Function selection of terminal X5	Factory value	13 (Multi-segment command terminal 2)
P4-05	Function selection of terminal X6	Factory value	0

This parameter is used to set the functions corresponding to the digital multi-function input terminals

Set value	Function	Explanation
0	No function	Even if there is a signal input, the frequency converter will not operate. You can set unused terminals to have no function to prevent misoperation.
1	Forward operation (FWD)	Control the forward and reverse rotation of the frequency converter through external terminals.
2	Reverse operation (REV)	
3	Three-wire operation control	This terminal is used to determine that the operation mode of the frequency converter is the three-wire control mode. For detailed instructions, please refer to the function code introduction of the three-wire control mode in P4-11.
4	Forward jogging (FJOG)	FJOG is for jogging forward operation, and RJOG is for jogging reverse operation. For the frequency, jogging acceleration and deceleration time during jogging operation, please refer to the detailed instructions of function codes P8-00, P8-01, and P8-02.
5	Reverse jogging (RJOG)	
6	Terminal UP	When the frequency is set by external terminals, this is used to modify the frequency increment and decrement commands. When the frequency source is set to digital setting, the set frequency can be adjusted up and down.
7	Terminal DOWN	
8	Free stop	The frequency converter blocks the output, and the motor stopping process is not controlled by the frequency converter. This is a common method often adopted for high-inertia loads when there is no requirement for the stopping time. This method has the same meaning as the free stop described in P6-10.
9	Fault reset (RESET)	External fault reset function. It has the same function as the RESET key on the keyboard. This function can be used to achieve remote fault reset.
10	Operation pause	The frequency converter decelerates to stop, but all operating parameters are in a memorized state, such as PLC parameters, swing-frequency parameters, and PID parameters. After this signal disappears, the frequency converter resumes operation to the state before stopping.
11	Normally open input for external fault	When an external fault signal is sent to the frequency converter, the frequency converter reports the fault and handles it according to the fault protection action mode (P9-47~P9-50).

Set value	Function	Explanation
12	Multi-speed terminal 1	The digital state combinations of these four terminals can be used to achieve the setting of 16-segment speeds in total. For detailed combinations, see Schedule 1.
13	Multi-speed terminal 2	
14	Multi-speed terminal 3	
15	Multi-speed terminal 4	
16	Acceleration/deceleration time selection terminal 1	The digital state combinations of these two terminals are used to select 4 kinds of acceleration and deceleration times. For detailed combinations, see Schedule 2.
17	Acceleration/deceleration time selection terminal 2	
18	Frequency source switching	When the frequency source selection (units digit of P0-07) is set to 2, this terminal is used to switch between the main frequency source X and the auxiliary frequency source Y. When the frequency source selection (units digit of P0-07) is set to 3, this terminal is used to switch between the main frequency source X and the result of the main-auxiliary operation. When the frequency source selection (units digit of P0-07) is set to 4, this terminal is used to switch between the auxiliary frequency source Y and the result of the main-auxiliary operation.
19	UP/DOWN setting clear (terminal, keyboard)	When the frequency setting is digital frequency setting, this terminal can clear the frequency value changed by UP/DOWN, restoring the set frequency to the value set in P0-08.
20	Operation command switching terminal	When the command source (P0-02) is set to 1, this terminal can be used to switch between terminal control and keyboard control. When the command source (P0-02) is set to 2, this terminal can be used to switch between communication control and keyboard control.
21	Acceleration/deceleration prohibition	Ensure that the frequency converter is not affected by external signals (except the stop command) and maintain the current output frequency.
22	PID pause	PID is temporarily disabled, and the frequency converter maintains the current frequency output.
23	PLC status reset	During the execution of PLC, it pauses. When it resumes operation, this terminal being active can restore the simple PLC to its initial state.
24	Swing-frequency pause	The frequency converter outputs at the center frequency. Swing-frequency is paused.
25	Counter input	Input terminal for counting pulses.
26	Counter reset	Clear the counter state.
27	Length counting input	Input terminal for length counting.
28	Length reset	Clear the length.
29	Torque control prohibition	Prohibit the frequency converter from operating in torque control mode.
30	PULSE (pulse) frequency input (only valid for X5)	It is a pulse input terminal.
31	Reserved	

Set value	Function	Explanation
32	Immediate DC braking	When this terminal is active, the frequency converter directly switches to the DC braking state.
33	Normally-closed input for external fault	When an external fault signal is sent to the frequency converter, the frequency converter reports the fault and stops operating.
34	Frequency setting takes effect	If the function of this terminal is set, when the frequency is modified, the activation of this terminal can control the moment when the modification takes effect.
35	PID action direction reversed	If this terminal is active, the PID action direction is opposite to the direction set in PA-03.
36	External stop terminal 1	When in keyboard control, this terminal can be used to stop, which is equivalent to the STOP key on the keyboard.
37	Control command switching terminal 2	It is used for switching between terminal control and communication control. When this terminal is active, if P0-02 is set to terminal control, it will switch to communication control; if P0-02 is set to communication control, it will switch to terminal control.
38	PID integral pause	When this terminal is active, the PID integral action pauses, but the proportional regulation and derivative regulation still take effect.
39	Switch between frequency source X and preset frequency	When this terminal is active, the frequency source X is replaced by the preset frequency (P0-08).
40	Switch between frequency source Y and preset frequency	When this terminal is active, the frequency source Y is replaced by the preset frequency (P0-08).
41	Motor selection 1	The digital state combinations of these two terminals are used to select 4 sets of motor parameters. For detailed combinations, see Schedule 3.
42	Motor selection 2	
43	PID parameter switching terminal	When PA-18 (PID parameter switching condition) is set to the X terminal, if this terminal is active, the PID uses the parameters of PA-15 to PA-17. If the terminal is inactive, it uses the parameters of PA-05 to PA-07.
44	User-defined fault 1	When an external fault signal is sent to the frequency converter, the frequency converter reports the fault and handles it according to the fault protection action mode (P9-47~P9-50).
45	User-defined fault 2	When an external fault signal is sent to the frequency converter, the frequency converter reports the fault and handles it according to the fault protection action mode (P9-47~P9-50).
46	Speed control / Torque control switching	Switch the frequency converter to operate in torque control or speed control mode. When this terminal is inactive, it operates in the mode defined by A0-00 (speed/torque control mode), and when active, it switches to the other mode.
47	Emergency stop	When this terminal is active, the frequency converter stops at the fastest speed.
48	External stop terminal 2	Under any control mode, this terminal can be used to stop the device, and it stops according to deceleration time 4.
49	Deceleration DC braking	When this terminal is active, the frequency converter first decelerates to the starting frequency of stop DC braking and then switches to the DC braking state.

Schedule 1 Description of Multi-speed Function

K <sub>4</sub>	K <sub>3</sub>	K <sub>2</sub>	K <sub>1</sub>	Frequency setting	Corresponding parameters
OFF	OFF	OFF	OFF	Multi-speed 0	PC-0
OFF	OFF	OFF	ON	Multi-speed 1	PC-01
OFF	OFF	ON	OFF	Multi-speed 2	PC-02
OFF	OFF	ON	ON	Multi-speed 3	PC-03
OFF	ON	OFF	OFF	Multi-speed 4	PC-04
OFF	ON	OFF	ON	Multi-speed 5	PC-05
OFF	ON	ON	OFF	Multi-speed 6	PC-06
OFF	ON	ON	ON	Multi-speed 7	PC-07
ON	OFF	OFF	OFF	Multi-speed 8	PC-08
ON	OFF	OFF	ON	Multi-speed 9	PC-09
ON	OFF	ON	OFF	Multi-speed 10	PC-10
ON	OFF	ON	ON	Multi-speed 11	PC-11
ON	ON	OFF	OFF	Multi-speed 12	PC-12
ON	ON	OFF	ON	Multi-speed 13	PC-13
ON	ON	ON	OFF	Multi-speed 14	PC-14
ON	ON	ON	ON	Multi-speed 15	PC-15

Schedule 2 Function Description of Acceleration/Deceleration Time Selection Terminals

Terminal 2	Terminal 1	Acceleration or deceleration time selection	Corresponding parameters
OFF	OFF	Acceleration time 1	P0-17、 P0-18
OFF	ON	Acceleration time 2	P8-03、 P8-04
ON	OFF	Acceleration time 3	P8-05、 P8-06
ON	ON	Acceleration time 4	P8-07、 P8-08

Schedule 3 Function Description of Motor Selection Terminals

Terminal 1	Motor selection	Corresponding parameter group
OFF	Motor 1	Group P1, P2
ON	Motor 2	Group A2

P4-10	X filter time	Factory value	0.010S
	Setting range	0.000S ~ 1.000S	

Set the sensitivity of the X terminal. If the digital input terminal is susceptible to interference and causes misoperation, increasing this parameter can enhance the anti-interference ability, but it will reduce the sensitivity of the X terminal.

P4-11	Terminal command mode	Factory value	0
	Setting range	0	Two-wire type 1
		1	Two-wire type 2
		2	Three-wire type 1
		3	Three-wire type 2

This parameter defines four different ways to control the operation of the frequency converter through external terminals.

Note: For ease of explanation, three terminals, X1, X2, and X3, are arbitrarily selected from the multi-function input terminals X1-X5 as external terminals. That is, the functions of the three terminals X1, X2, and X3 are selected by setting the values of P4-00 to P4-02. For the detailed function definitions, refer to the setting ranges of P4-00 to P4-09.

0: Two-wire mode 1: This is the most commonly used two-wire mode. The forward and reverse rotation of the motor is determined by the commands of terminals X1 and X2.

The setting of function codes is as follows:

Function code	Name	Setting value	Function description
P4-11	Terminal command mode	0	Two-wire type 1
P4-00	Function selection of X1 terminal	1	Forward operation (FWD)
P4-01	Function selection of X2 terminal	2	Reverse operation (REV)

K1	K2	Operation command
0	0	Stop
1	0	Forward rotation
0	1	Reverse rotation
1	1	Stop



Figure 6-6 Two-wire mode 1

As shown in the figure above, in this control mode, when K1 is closed, the frequency converter operates in forward rotation. When K2 is closed, it operates in reverse rotation. When K1 and K2 are both closed or both open, the frequency converter stops running.

1: Two-wire mode 2: In this mode, X1 is the enable terminal. The direction is determined by the state of X2. The setting of function codes is as follows:

Function code	Name	Setting value	Function description
P4-11	Terminal command mode	1	Two-wire type 2
P4-00	Function selection of X1 terminal	1	Operation enable
P4-01	Function selection of X2 terminal	2	Forward and reverse operation direction

K1	K2	Operation command
0	0	Stop
0	1	Stop
1	0	Forward rotation
1	1	Reverse rotation

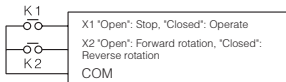


Figure 6-7 Two-wire mode 2

As shown in the figure above, in this control mode, when K1 is closed, if K2 is open, the frequency converter operates in forward rotation; if K2 is closed, the frequency converter operates in reverse rotation. When K1 is open, the frequency converter stops running.

2: Three-wire control mode 1: In this mode, X3 is the enable terminal, and the direction is controlled by X1 and X2 respectively. The setting of function codes is as follows:

Function code	Name	Setting value	Function description
P4-11	Terminal command mode	2	Three-wire type 1
P4-00	Function selection of X1 terminal	1	Forward operation (FWD)
P4-01	Function selection of X2 terminal	2	Reverse operation (REV)
P4-02	Function selection of X3 terminal	3	Three-wire operation control

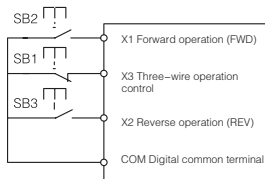


Figure 6-8 Three-wire control mode 1

As shown in the figure above, in this control mode, when the SB1 button is closed, pressing the SB2 button makes the frequency converter operate in forward rotation, and pressing the SB3 button makes it operate in reverse rotation. The frequency converter stops immediately when the SB1 button is released. During normal startup and operation, the SB1 button must be kept closed. The commands of the SB2 and SB3 buttons take effect at the rising edge of their closure. The operating state of the frequency converter is determined by the last button-pressing action of these three buttons.

3: Three-wire control mode 2: In this mode, the enable terminal is X3, the operation command is given by X1, and the direction is determined by the state of X2.

The setting of function codes is as follows:

Function code	Name	Setting value	Function description
P4-11	Terminal command mode	3	Three-wire type 2
P4-00	Function selection of X1 terminal	1	Operation enable
P4-01	Function selection of X2 terminal	2	Forward and reverse operation direction
P4-02	Function selection of X3 terminal	3	Three-wire operation control

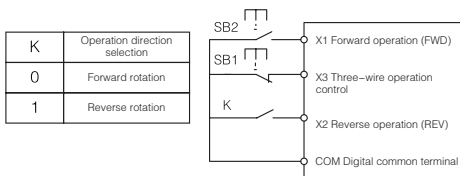


Figure 6-9 Three-wire control mode 2

As shown in the figure above, in this control mode, when the SB1 button is closed, pressing the SB2 button makes the frequency converter operate. When K is open, the frequency converter operates in forward rotation; when K is closed, the frequency converter operates in reverse rotation. The frequency converter stops immediately when the SB1 button is released. During normal startup and operation, the SB1 button must be kept closed, and the command of the SB2 button takes effect at the rising edge of its closure.

P4-12	Terminal UP/DOWN rate	Factory value	1.00HZ/S
	Setting range	0.01HZ/S ~ 65.535HZ/S	

The rate of change when adjusting the set frequency using the terminal UP/DOWN.  
 When P0-22 (frequency decimal point) is 2, the value range is 0.001HZ/S~65.535HZ/S.  
 When P0-22 (frequency decimal point) is 1, the value range is 0.01HZ/S~65.535HZ/S.

P4-13	Curve 1 minimum input	Factory value	0.00V
	Setting range	0.00V ~ P4-15	
P4-14	Curve 1 minimum input corresponding setting	Factory value	0.0%
	Setting range	-100.00% ~ 100.0%	
P4-15	Curve 1 maximum input	Factory value	10.00V
	Setting range	P4-13 ~ 10.00V	
P4-16	Curve 1 maximum input corresponding setting	Factory value	100.0%
	Setting range	-100.00% ~ 100.0%	
P4-17	A11 input filter time	Factory value	0.10S
	Setting range	0.00S ~ 10.00S	

The above function codes define the relationship between the analog input voltage and the set value represented by the analog input. When the analog input voltage exceeds the set maximum input range, the excess part will be calculated based on the maximum input. When the analog input voltage exceeds the set minimum input range, the excess part will be calculated as the minimum input or 0.0% according to the AI minimum input setting selection (P4-34).

When the analog input is a current input, 1 mA of current is equivalent to 0.5 V of voltage. In different application scenarios, the nominal value corresponding to 100% of the analog setting varies. Please refer to the instructions of each application part for details.

The following several diagrams illustrate several setting situations:

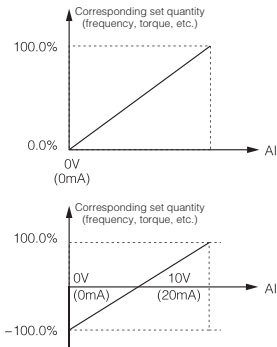


Figure 6-10 Corresponding relationship between analog given value and set quantity

P4-18	Curve 2 minimum input	Factory value	0.00V
	Setting range	0.00V ~ P4-20	
P4-19	Curve 2 minimum input corresponding setting	Factory value	0.0%
	Setting range	-100.00% ~ 100.0%	
P4-20	Curve 2 maximum input	Factory value	10.00V
	Setting range	P4-18 ~ 10.00V	
P4-21	Curve 2 maximum input corresponding setting	Factory value	100.0%
	Setting range	-100.00% ~ 100.0%	
P4-22	AI2 input filter time	Factory value	0.10S
	Setting range	0.00S ~ 10.00S	

The function of Curve 2 is similar to the setting method of Curve 1.

P4-23	Curve 3 minimum input	Factory value	0.01V
	Setting range	0V ~ P4-25	
P4-24	Curve 3 minimum input corresponding setting	Factory value	0.0%
	Setting range	0% ~ 100.0%	
P4-25	Curve 3 maximum input	Factory value	10.00V
	Setting range	P4-23 ~ 10.00V	
P4-26	Curve 3 maximum input corresponding setting	Factory value	100.0%
	Setting range	0% ~ 100.0%	
P4-27	Keyboard potentiometer input filter time	Factory value	0.10S
	Setting range	0.00S ~ 10.00S	

The function of Curve 3 is similar to the setting method of Curve 1.

P4-28	PULSE (pulse) input minimum frequency	Factory value	0.00KHZ
	Setting range	0.00KHZ ~ P4-30	
P4-29	PULSE (pulse) input minimum frequency corresponding setting	Factory value	0.0%
	Setting range	-100.00% ~ 100.0%	
P4-30	PULSE (pulse) input maximum frequency	Factory value	50.00KHZ
	Setting range	P4-28 ~ 50.00KHZ	
P4-31	PULSE (pulse) input maximum frequency corresponding setting	Factory value	100.0%
	Setting range	-100.00% ~ 100.0%	
P4-32	PULSE (pulse) input filter time	Factory value	0.10S
	Setting range	0.00S ~ 10.00S	

This group of function codes defines the corresponding relationship when using pulses as the frequency setting method. Pulse frequency input can only be carried out through the X5 channel. The application of this group of functions is similar to that of Curve 1.

P4-33	AI setting curve selection		Factory value	321
	Setting range	Units digit	AI1 Curve Selection	
		1	Curve 1 (2 points, see P4-13~P4-16)	
		2	Curve 2 (2 points, see P4-18~P4-21)	
		3	Curve 3 (2 points, see P4-23~P4-26)	
		4	Curve 4 (4 points, see A8-00~A8-07)	
		5	Curve 5 (4 points, see A8-08~A8-15)	
	Tens digit	AI2 Curve Selection (1~6, the same as above)		
Hundreds digit	Keyboard Potentiometer Curve Selection (1~6, the same as above)			

Define the setting curves corresponding to AI1 and AI2.

The 860S frequency converter standard unit provides two analog input ports.

P4-34	AI selection when below minimum input		Factory value	000
	Setting range	Units digit	AI1 setting selection when below minimum input	
		0	Setting corresponding to minimum input	
		1	0.0%	
		Tens digit	AI2 setting selection when below minimum input (0-1, the same as above)	
	Hundreds digit	Keyboard potentiometer setting selection when below minimum input (0-1, the same as above)		

If selected as 0, when the AI input is lower than the minimum input, the physical quantity is set to the setting corresponding to the minimum input of the curve.

If selected as 1, when the AI input is lower than the minimum input, the physical quantity is set to 0.0%.

P4-35	X1 delay time	Factory value	0.0S
	Setting range	0.0S ~ 3600.0S	
P4-36	X2 delay time	Factory value	0.0S
	Setting range	0.0S ~ 3600.0S	
P4-37	X3 delay time	Factory value	0.0S
	Setting range	0.0S ~ 3600.0S	

Set the delay time from the change of the X terminal state to the response of the frequency converter. Currently, only X1, X2, and X3 have the function of setting the delay time.

P4-38	Setting of effective state of X input terminal 1		Factory value	00000
	Setting range	Units digit	Setting of effective state of X1 terminal	
		0	High level	
		1	Low level	
		Tens digit	Setting of effective state of X2 terminal (0~1, the same as above)	
		Hundreds digit	Setting of effective state of X3 terminal (0~1, the same as above)	
		Thousands place	Setting of effective state of X4 terminal (0~1, the same as above)	
Ten-thousands place	Setting of effective state of X5 terminal (0~1, the same as above)			
P4-39	Setting of effective state of X input terminal 2		Factory value	00000
	Setting range	Units digit	Setting of effective state of X6 terminal	
		0	High level	
		1	Low level	
		Tens digit	Setting of effective state of X7 terminal (0~1, the same as above)	
		Hundreds digit	Setting of effective state of X8 terminal (0~1, the same as above)	
		Thousands place	Setting of effective state of X9 terminal (0~1, the same as above)	
Ten-thousands place	Setting of effective state of X10 terminal (0~1, the same as above)			

Define the setting of the effective state of the input terminal.

High level: The XI terminal is effective when connected to COM and ineffective when disconnected.

Low level: The XI terminal is ineffective when connected to COM and effective when disconnected.

## P5 group Output terminals

The 860S series frequency converter standard unit has one multi-function digital output terminal (which can be used as a high-speed pulse output terminal or an open-collector output), one multi-function relay output terminal, and two multi-function analog output terminals. If additional relay output terminals and analog output terminals are required, a multi-function input/output expansion card needs to be selected. The multi-function input/output expansion card adds two multi-function relay output terminals (Relay 2) and one multi-function digital output terminal (DO2) in terms of output.

P5-00	Selection of FM terminal output mode		Factory value	0
	Setting range	0	Pulse output (FMP)	
		1	Open-collector digital output (FMR)	

The FM terminal is a programmable multiplexed terminal. It can be used as a high-speed pulse output terminal (FMP), with a maximum pulse frequency of 100KHZ.

For FMP-related functions, see P5-06. It can also be used as an open-collector output terminal (FMR). For FMR functions, see P5-01.

P5-01	FMR output function selection (open-collector output terminal)	Factory value	0
P5-02	Control board relay 1 output selection (T/A-T/B-T/C)	Factory value	2
P5-03	Control board relay 2 output selection (T/A-T/B-T/C) (standard for 11KW and above)	Factory value	0
P5-04	DO1 output function selection	Factory value	1
P5-05	Expansion card DO2 output function selection	Factory value	4

Instructions: Relay 1 and Relay 2 refer to TA/TB/TC, etc.

The function selection of the multi-function output terminals is as follows:

Setting value	Function	Description
0	No output	The output terminal has no function.
1	Inverter is running	It indicates that the frequency converter is running and has an output frequency (which can be zero), and an ON signal is output at this time.
2	Fault output (fault shutdown)	When a fault occurs in the frequency converter and it stops due to the fault, an ON signal is output.
3	Frequency level detection PDT reached	Please refer to the detailed instructions of function codes P8-19 and P8-20.
4	Frequency reached	Please refer to the detailed instructions of function code P8-21.
5	Running at zero speed	The frequency converter is running and the output frequency is 0, and an ON signal is output.
6	Motor overload pre-alarm	Before the motor electronic thermal protection operates, it is judged according to the overload prediction value, and an ON signal is output after exceeding the prediction value. The motor overload parameters are set in P9-00~P9-02.

Setting value	Function	Description
7	Inverter overload pre-alarm	When the inverter overload is detected, 10 seconds before the protection action, an ON signal is output.
8	Set count pulse value reached	When the count value reaches the value set in PB-08, an ON signal is output.
9	Specified count pulse value reached	When the count value reaches the value set in PB-09, an ON signal is output. For the counting function, refer to the function description of Group PB.
10	Length reached	When the detected actual length exceeds the length set in PB-05, an ON signal is output.
11	Simple PLC cycle completed	When the simple PLC finishes running one cycle, a pulse signal with a width of 250MS is output.
12	Accumulated running time reached	When the cumulative operating time of the frequency converter exceeds the time set in PB-17, an ON signal is output.
13	Frequency limiting	When the set frequency exceeds the upper and lower frequency limits and the output frequency of the frequency converter reaches the upper and lower frequency limits, an ON signal is output.
14	Torque limiting	How to set the cumulative running time and the upper and lower frequency limits in the frequency converter? When the torque limiting function is activated, the stall protection function will act automatically, automatically changing the output frequency. Meanwhile, an ON signal is output to indicate that the output torque is being limited. This output signal can be used to reduce the load or display the overload status signal on the monitoring device.
15	Ready to run	When the power supply of the main circuit and control circuit is established, the protection function of the frequency converter does not operate, and the frequency converter is in a runnable state, an ON signal is output.
16	AI1 > AI2	When the value of analog input AI1 is greater than that of another input AI2, an ON signal is output.
17	Upper limit frequency reached	When the running frequency reaches the upper limit frequency, an ON signal is output.
18	Lower limit frequency reached	When the running frequency reaches the lower limit frequency, an ON signal is output.
19	Under-voltage state output	When the frequency converter is in an under-voltage state, an ON signal is output.
20	Communication setting	Refer to the relevant instructions in the communication protocol.
21	Reserved	Reserved
22	Reserved	Reserved
23	Zero-speed running 2 (also output when stopped)	When the output frequency of the frequency converter is 0, an ON signal is output (also output when stopped).
24	Accumulated power-on time reached	When P7-13 (the cumulative power-on time of the frequency converter) exceeds the time set in PB-16, an ON signal is output.
25	Frequency level detection PDT2 output	Please refer to the detailed instructions of function codes P8-28 and P8-29.
26	Frequency reached 1 output	Please refer to the detailed instructions of function codes P8-30 and P8-31.
27	Frequency reached 2 output	Please refer to the detailed instructions of function codes P8-32 and P8-33.
28	Current reached 1 output	Please refer to the detailed instructions of function codes P8-38 and P8-39.
29	Current reached 2 output	Please refer to the detailed instructions of function codes P8-40 and P8-41.

Setting value	Function	Description
30	Timing arrival output	When P8-42 (timing function selection) is valid, when the current running time of the frequency converter reaches the set timing time, an ON signal is output.
31	AI1 input exceeds upper and lower limits	When the value of analog input AI1 is greater than P8-46 (AI1 input protection upper limit) or less than P8-45 (AI1 input protection lower limit), an ON signal is output.
32	Unloading	When the frequency converter is in a load-loss state, an ON signal is output.
33	Running in reverse	When the frequency converter is running in reverse, an ON signal is output.
34	Zero-current state	Please refer to the detailed instructions of function codes P8-28 and P8-29.
35	Module temperature reached	When P7-07 (the temperature of the inverter module heat sink) reaches the value of P8-47 (module temperature reached), an ON signal is output.
36	Output current over limit	Please refer to the detailed instructions of function codes P8-36 and P8-37.
37	Lower limit frequency reached (also output when stopped)	When the running frequency reaches the lower limit frequency, an ON signal is output (also output when stopped).
38	Fault output	When a fault occurs in the frequency converter, an ON signal is output.
39	Motor over-temperature alarm	When the motor temperature reaches P9-58 (motor overheat pre-alarm threshold), an ON signal is output (the motor temperature can be viewed through U0-34).
40	Current running time reached	When the current running start time of the frequency converter exceeds the time set by F8-53, an ON signal is output.

P5-06	FMP output selection (pulse output terminal)	Factory value	0
P5-07	AO1 output selection (analog output terminal 1)	Factory value	0
P5-08	AO2 output selection (analog output terminal 2)	Factory value	1

The pulse frequency output range of the FMP terminal is 0.01KHZ~P5-09 (FMP maximum output frequency), and P5-09 can be set between 0.01KHZ and 100.00KHZ.

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

The range of pulse output or analog output has the following calibration relationship with the corresponding functions as shown in the table below:

Setting value	Function	Range
0	Running frequency	0-maximum output frequency
1	Set frequency	0-maximum output frequency
2	Output current	0-2 times the rated current of the motor
3	Output torque	0-2 times the rated torque of the motor
4	Output power	0-2 times the rated power

Setting value	Function	Range
5	Output voltage	0~1.2 times the rated voltage of the frequency converter
6	PULSE pulse input	0.01KHZ~100.00KHZ
7	AI1	0V~10V
8	AI2	0V~10V / 0~20MA
9	Panel potentiometer	0V~10V
10	Length	0~maximum set length
11	Count value	0~maximum count value
12	Communication setting	0.0%~100%
13	Motor speed	0~speed corresponding to the maximum output frequency
14	Output current	0.0A~1000.0A (100.0% corresponds to 1000.0A)
15	Output voltage	0.0V~1000.0V (100.0% corresponds to 1000.0V)

P5-09	FMP maximum output frequency	Factory value	50.00KHZ
	Setting range	0.01KHZ ~ 100.00KHZ	

When the FM terminal is selected as the pulse output, it is the maximum frequency value of the output pulse.

P5-10	AO1 zero-bias coefficient	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
P5-11	AO1 gain	Factory value	1.00
	Setting range	-10.00 ~ 10.00	
P5-12	AO2 zero-bias coefficient	Factory value	0.00%
	Setting range	-100.0% ~ 100.0%	
P5-13	AO2 gain	Factory value	1.00
	Setting range	-10.00 ~ 10.00	

If the zero-bias is represented by "B", the gain is represented by "K", the actual output is represented by "Y", and the standard output is represented by "X", then the actual output is:

$$Y = KX + B.$$

The zero-bias coefficients of AO1 and AO2, 100% corresponds to 10V (20MA). The standard output means that the output of 0V~10V (20MA) corresponds to the quantity 0~maximum represented by the analog output.

It is generally used to correct the zero-drift of the analog output and the deviation of the output amplitude. It can also be customized into any required output curve. For example: if the analog output content is the running frequency, and it is desired to output 8V (16MA) when the frequency is 0, and output 3V (6MA) when the frequency is the maximum frequency, then the gain should be set to "-0.50" and the zero-bias should be set to "80%".

P5-17	The output delay time of FMR	Factory value	0.0S
	Setting range		0.0S ~ 3600.0S
P5-18	The output delay time of RELAY1	Factory value	0.0S
	Setting range		0.0S ~ 3600.0S

## P6 group Start-stop control

P6-00	Startup method	Factory value	0
	Setting range	0	Direct start (When the DC braking time is not 0, perform DC braking first and then start)
		1	Speed tracking restart
		2	Asynchronous motor pre-excitation start (when the pre-excitation time is not 0, pre-excite first and then start)

### 0: Direct start

If the starting DC braking time is set to 0, the frequency converter will start running from the starting frequency. If the starting DC braking time is not 0, DC braking will be performed first, and then it will start running from the starting frequency. It is applicable to small-inertia loads in cases where the motor may rotate during startup.

### 1: Speed tracking restart

The frequency converter first judges the speed and direction of the motor, and then starts with the tracked motor frequency to smoothly and shocklessly start the rotating motor. It is applicable to the instantaneous power failure restart of large-inertia loads. To ensure the performance of speed tracking restart, the motor F1 group parameters need to be accurately set.

### 2: Asynchronous motor pre-excitation start

It is only effective for asynchronous motors and is used to establish a magnetic field before the motor starts running.

For the pre-excitation current and pre-excitation time, please refer to the description of function codes P6-05 and P6-06. If the pre-excitation time is set to 0, the frequency converter will cancel the pre-excitation process and start from the starting frequency. If the pre-excitation time is not 0, pre-excitation will be carried out first and then start, which can improve the dynamic response performance of the motor.

P6-01	Speed tracking mode	Factory value	0
	Setting range	0	Start from the stop frequency
		1	Start from zero speed
		2	Start from the maximum frequency

To complete the speed tracking process in the shortest time, select the way the frequency converter tracks the motor speed:

0: Track downward from the frequency at the time of power failure. This method is usually selected.

1: Track upward from 0 Hz, which is used when restarting after a long power failure.

2: Track downward from the maximum frequency, which is generally used for generating loads.

P6-02	Speed tracking speed	Factory value	20
	Setting range	1 ~ 100	

When in the speed tracking restart mode, select the speed of speed tracking. The larger the parameter, the faster the tracking speed. However, if it is too large, it may lead to unreliable tracking.

P6-03	Starting frequency	Factory value	0.00HZ
	Setting range	0.00HZ ~ 10.00HZ	
P6-04	Starting frequency hold time	Factory value	0.0S
	Setting range	0.0S ~ 100.0S	

To ensure the starting torque, set an appropriate starting frequency. In addition, to wait for the motor to build up magnetic flux during startup, the starting frequency should be maintained for a certain period before starting to accelerate. The starting frequency value P6-03 is not limited by the lower limit frequency. If the frequency setting value (frequency source) is less than the starting frequency, the frequency converter cannot start and remains in standby mode. When switching between forward and reverse rotation, the starting frequency hold time has no effect. The hold time is not included in the acceleration time but is included in the operation time of the simple PLC.

Example 1:

P0-03 = 0, the frequency source is digital setting

P0-08 = 2.00HZ, the digital set frequency is 2.00HZ

P6-03 = 5.00HZ, the starting frequency is 5.00HZ

P6-04 = 2.0S, the starting frequency hold time is 2.0S

At this time, the frequency converter will be in standby mode, and the output frequency of the frequency converter is 0HZ.

Example 2:

P0-03 = 0, the frequency source is digital setting

P0-08 = 10.00HZ, the digital set frequency is 10.00HZ

P6-03 = 5.00HZ, the starting frequency is 5.00HZ

P6-04 = 2.0S, the starting frequency hold time is 2.0S

At this time, the frequency converter accelerates to 5HZ, remains at this frequency for 2S, and then accelerates to the set frequency of 10HZ.

P6-05	Starting DC braking/ pre-excitation current	Factory value	0%
	Setting range	0% ~ 100%	

P6-06	Starting DC braking/pre-excitation time	Factory value	0.0S
	Setting range	0.0S ~ 100.0S	

Starting DC braking is generally used to make the motor stop completely before starting. Pre-excitation is generally used to establish a magnetic field in the motor before starting to improve the response speed.

If the starting method is direct start, when the frequency converter starts, it first performs DC braking according to the set starting DC braking current. After the set starting DC braking time, it starts to run. If the set DC braking time is 0, it starts directly without DC braking. The larger the DC braking current, the greater the braking force.

If the starting method is asynchronous motor pre-excitation start, when the frequency converter starts, it first pre-establishes a magnetic field according to the set starting pre-excitation current. After the set starting pre-excitation time, it starts to run. If the set pre-excitation time is 0, it starts directly without pre-excitation.

There are two situations for the starting DC braking current/pre-excitation current relative to the base value.

- 1) When the rated current of the motor is less than or equal to 80% of the rated current of the frequency converter, the percentage base value is relative to the rated current of the motor.
- 2) When the rated current of the motor is greater than 80% of the rated current of the frequency converter, the percentage base value is relative to 80% of the rated current of the frequency converter.

P6-07	Acceleration and deceleration mode	Factory value	0
	Setting range	0	Linear acceleration and deceleration
		1	S-curve acceleration and deceleration A
		2	S-curve acceleration and deceleration B

Select the way the frequency of the frequency converter changes during startup and shutdown.

0: Linear acceleration and deceleration

The output frequency increases or decreases in a straight line. The acceleration and deceleration time changes according to the set acceleration and deceleration time. The 860S series frequency converter provides 4 acceleration and deceleration times. The acceleration and deceleration time can be selected through the multi-function digital input terminals (P4-00~P4-08).

1: S-curve acceleration and deceleration A

The output frequency increases or decreases according to the S-curve. The S-curve is generally used in places where a relatively smooth startup and shutdown process is required, such as elevators and conveyor belts.

2: S-curve acceleration and deceleration B

When the target frequency changes dynamically in real-time, the output frequency increases or decreases in real-time according to the S-curve. It is applicable to occasions with high requirements for comfort and fast real-time response.

Note: The S-curve acceleration and deceleration B time and the target frequency should not be too large. When the acceleration and deceleration time is greater than 100S or the target frequency is greater than 6 times the rated frequency of the motor, the dynamic S-curve becomes invalid and automatically switches to the linear acceleration and deceleration mode.

P6-08	Proportion of the starting segment of the S-curve	Factory value	30.0%
	Setting range	0.0% ~ 40.0%	

P6-09	Proportion of the ending segment of the S-curve	Factory value	30.0%
	Setting range	0.0% ~ 40.0%	

Function codes P6-08 and P6-09 define the time proportions of the starting and ending segments of the S-curve acceleration and deceleration A respectively, and they satisfy:  $P6-08 + P6-09 \leq 100.0\%$ .

In Figure 6-13, T1 is the parameter defined by parameter P4-08. During this period, the slope of the output frequency change gradually increases. T2 is the time defined by parameter P4-09. During this period, the slope of the output frequency change gradually changes to 0. In the time between T1 and T2, the slope of the output frequency change is fixed.

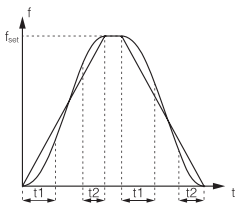


Figure 6-3 Schematic diagram of S-curve acceleration and deceleration A

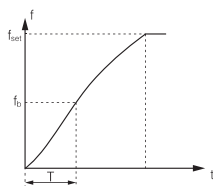


Figure 6-4 Schematic diagram of S-curve acceleration and deceleration B

P6-10	Shutdown mode	Factory value	0
	Setting range	0	Decelerated stop
		1	Free stop

#### 0: Decelerated stop

After the stop command becomes effective, the frequency converter reduces the output frequency according to the deceleration method and the defined acceleration and deceleration time. It stops when the frequency drops to 0.

#### 1: Free stop

After the stop command becomes effective, the frequency converter immediately terminates the output. The load stops freely according to mechanical inertia.

P6-11	Starting frequency of DC braking during shutdown	Factory value	0.00HZ
	Setting range	0.00HZ~maximum frequency	
P6-12	Waiting time for DC braking during shutdown	Factory value	0.0S
	Setting range	0.0S ~ 36.0S	

P6-13	DC braking current during shutdown	Factory value	0%
	Setting range	0% ~ 100%	
P6-14	DC braking time during shutdown	Factory value	0.0S
	Setting range	0.0S ~ 36.0S	

Starting frequency of DC braking during shutdown: During the decelerated shutdown process, when the operating frequency drops to this frequency, the DC braking process begins.

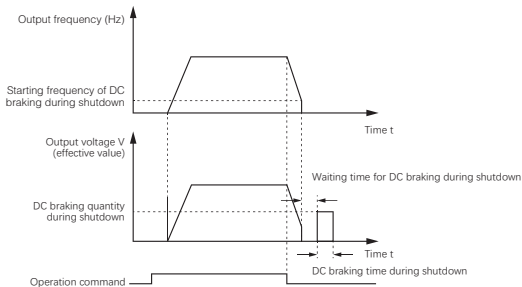
Waiting time for DC braking during shutdown: After the operating frequency drops to the starting frequency of DC braking during shutdown, the frequency converter stops outputting for a period of time first, and then starts the DC braking process. This is used to prevent faults such as over-current that may occur when DC braking starts at a relatively high speed.

DC braking current during shutdown: There are two situations for the DC braking current during shutdown relative to the base value.

1. When the rated current of the motor is less than or equal to 80% of the rated current of the frequency converter, the percentage base value is relative to the rated current of the motor.
2. When the rated current of the motor is greater than 80% of the rated current of the frequency converter, the percentage base value is relative to 80% of the rated current of the frequency converter.

DC braking time during shutdown: The time for which the DC braking amount is maintained. If this value is 0, the DC braking process is cancelled.

The DC braking process during shutdown is shown in the schematic diagram below.



P6-15	Braking usage rate	Factory value	100%
	Setting range	0% ~ 100%	

It is effective for frequency converters with built-in braking units. The braking effect of the braking unit can be adjusted.

**P7 group Keyboard and display**

P7-01	Function selection of M-FUNC key		Factory value	3	
	Setting range	0	The function of the M-FUNC key is invalid.		
		1	Switch between the operation panel command channel and the remote command channel (terminal command channel or serial port communication command channel).		
		2	Forward and reverse rotation switching.		
		3	Forward jog command.		
		4	Reverse jog command.		

The M-FUNC key is a multi-function key. The function of the M-FUNC key on the keyboard can be defined through parameter settings. Switching can be carried out via this key during both shutdown and operation.

0: When set to 0, this key has no function.

1: Switch between keyboard commands and remote operation. It refers to the switching of the command source, switching from the current command source to keyboard control (local operation).

If the current command source is keyboard control, this command has no effect.

2: Forward and reverse rotation switching

The direction of the frequency command can be switched through the M-FUNC key on the keyboard. This is only valid when the command channel is the operation panel command channel.

3: Forward jogging

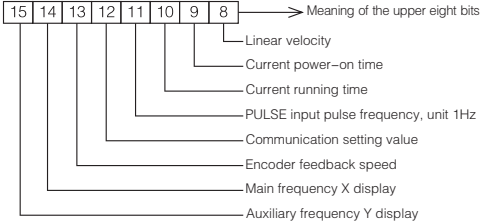
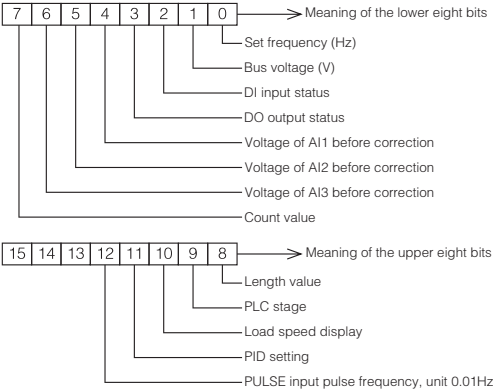
Forward jogging (FJOG) can be achieved through the M-FUNC key on the keyboard.

4: Reverse jogging

Reverse jogging (RJOG) can be achieved through the M-FUNC key on the keyboard.

P7-02	Function of STOP/RESET key		Factory value	1	
	Setting range	0	The stop function of the STOP/RES key is only effective in the keyboard control mode.		
		1	The stop function of the STOP/RES key is effective in any control mode.		

P7-03	LED operation display parameter 1	Factory value	1F
	Setting range	0000 ~ FFFF	<p>Meaning of the lower eight bits</p> <ul style="list-style-type: none"> <li>Bit 7: Operating frequency (Hz)</li> <li>Bit 6: Set frequency (Hz)</li> <li>Bit 5: Bus voltage (V)</li> <li>Bit 4: Output voltage (V)</li> <li>Bit 3: Output current (A)</li> <li>Bit 2: Output power (kW)</li> <li>Bit 1: Output torque (%)</li> <li>Bit 0: DI input status</li> </ul> <p>Meaning of the upper eight bits</p> <ul style="list-style-type: none"> <li>Bit 15: DO output status</li> <li>Bit 14: AI1 voltage (V)</li> <li>Bit 13: AI2 voltage (V)</li> <li>Bit 12: AI3 voltage (V)</li> <li>Bit 11: Count value</li> <li>Bit 10: Length value</li> <li>Bit 9: Load speed display</li> <li>Bit 8: PID setting</li> </ul> <p>When it is necessary to display the above parameters during operation, set the corresponding positions to 1 and set them in hexadecimal format.</p>
P7-04	LED operation display parameter 2	Factory value	0
	Setting range	0000 ~ FFFF	<p>Meaning of the lower eight bits</p> <ul style="list-style-type: none"> <li>Bit 7: PID feedback</li> <li>Bit 6: PLC stage</li> <li>Bit 5: Feedback speed, unit 0.1HZ</li> <li>Bit 4: Feedback speed</li> <li>Bit 3: Remaining running time</li> <li>Bit 2: Voltage of AI1 before correction</li> <li>Bit 1: Voltage of AI2 before correction</li> <li>Bit 0: Voltage of AI3 before correction</li> </ul>

P7-04	Setting range	0000 ~ FFFF	 <p>When it is necessary to display the above parameters during operation, set the corresponding positions to 1 and set them in hexadecimal format.</p>
P7-05	LED shutdown display parameters	Factory value	<p style="text-align: center;">33</p>  <p>When it is necessary to display the above parameters during operation, set the corresponding positions to 1 and set them in hexadecimal format.</p>

P7-06	Load speed display coefficient	Factory value	1.0000
	Setting range	0.0001 ~ 6.5000	

Through this parameter, the output frequency of the inverter is corresponded to the load speed. Set this parameter when it is necessary to display the load speed. For the specific calculation method, see the description in P7-12.

P7-07	Temperature of the radiator of the inverter module	Factory value	-
	Setting range	0.0°C ~ 100.0°C	

Display the temperature of the inverter module IGBT. The over-temperature protection values of the inverter module IGBT may vary for different models.

P7-08	Temperature of the radiator of the rectifier module	Factory value	-
	Setting range	0.0°C ~ 100.0°C	

Display the temperature of the rectifier module. The over-temperature protection values of the rectifier modules may vary for different models.

P7-09	Accumulated running time	Factory value	0H
	Setting range	0H ~ 65535H	

Display the accumulated operating time of the inverter up to now. When this time reaches the set operating time (P8-17), the multi-function digital output (12) of the inverter will act.

P7-10	Product number	Factory value	-
	Setting range	Inverter product number	
P7-11	Software version number	Factory value	-
	Setting range	Control board software version number	
P7-12	Decimal point position for load speed display	Factory value	1
	Setting range	0	0 decimal places
		1	1 decimal place
		2	2 decimal places
		3	3 decimal places

The calculation method of load speed is as follows:

If the load speed display coefficient is 2.000 and the decimal point position of load speed is 2 (i.e., 2 decimal places)

During the operation of the inverter:

If the operating frequency is 40.00HZ,  $4000 \times 2.000 = 8000$ . With 2 decimal places shown, the load speed is 80.00.

When the inverter is stopped:

If the set frequency is 50.00HZ,  $5000 \times 2.000 = 10000$ . With 2 decimal places shown, the load speed is 100.00.

P7-13	Accumulated power-on time	Factory value	0H
	Setting range	0H ~ 65535H	

Display the accumulated power-on time of the inverter up to now. When this time reaches the set power-on time (P8-17), the multi-function digital output (24) of the inverter will act.

P7-14	Accumulated power consumption	Factory value	0
	Setting range	0 ~ 65535	

Display the accumulated power consumption of the inverter up to now.

## P8 group Auxiliary functions

P8-00	Jog running frequency	Factory value	6.00HZ
	Setting range	0.00HZ~maximum frequency	
P8-01	Jog acceleration time	Factory value	20.0S
	Setting range	0.0S ~ 6500.0S	
P8-02	Jog deceleration time	Factory value	20.0S
	Setting range	0.0S ~ 6500.0S	

Define the given frequency and acceleration/deceleration times of the inverter during jogging. The jogging process starts and stops according to startup mode 0 (P6-00, direct startup) and shutdown mode 0 (P6-10, decelerated stop).

The jog acceleration time refers to the time required for the inverter to accelerate from 0HZ to the maximum output frequency (P0-10).

The jog deceleration time refers to the time required for the inverter to decelerate from the maximum output frequency (P0-10) to 0HZ.

P8-03	Acceleration time 2	Factory value	Model determination
	Setting range	0.0S ~ 6500.0S	
P8-04	Deceleration time 2	Factory value	Model determination
	Setting range	0.0S ~ 6500.0S	
P8-05	Acceleration time 3	Factory value	Model determination
	Setting range	0.0S ~ 6500.0S	
P8-06	Deceleration time 3	Factory value	Model determination
	Setting range	0.0S ~ 6500.0S	
P8-07	Acceleration time 4	Factory value	Model determination
	Setting range	0.0S ~ 6500.0S	
P8-08	Deceleration time 4	Factory value	Model determination
	Setting range	0.0S ~ 6500.0S	

The acceleration and deceleration times can be selected as P0-17 and P0-18 as well as the above three sets of acceleration and deceleration times. Their meanings are all the same. Please refer to the relevant instructions of P0-17 and P0-18. The acceleration and deceleration times 1~4 during the operation of the frequency converter can be selected through different combinations of the multi-function digital input terminal X. Please refer to the function codes P4-01~P4-05.

P8-09	Jump frequency 1	Factory value	0.00HZ
	Setting range	0.00HZ~maximum frequency	
P8-10	Jump frequency 2	Factory value	0.00HZ
	Setting range	0.00HZ~maximum frequency	
P8-11	Jump frequency range	Factory value	0.00HZ
	Setting range	0.00~maximum frequency	

When the set frequency is within the jump frequency range, the actual operating frequency will run at the jump frequency boundary closer to the set frequency. By setting the jump frequencies, the inverter can avoid the mechanical resonance points of the load. This inverter can set two jump frequency points. If both jump frequencies are set to 0, this function will not work.

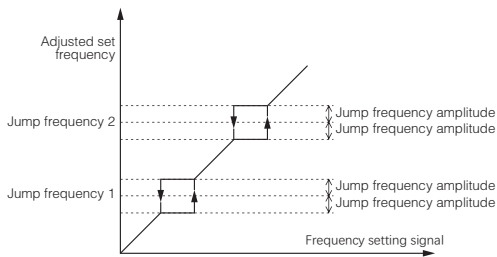


Figure 6-11 Schematic Diagram of Jump Frequency

P8-12	Forward and reverse dead-time	Factory value	0.0S
	Setting range	0.00S ~ 3000.0S	

Set the transition time at zero-frequency output during the forward-reverse transition process of the inverter, as shown in the following figure:

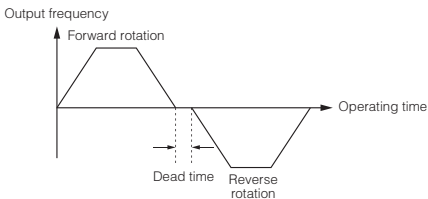


Figure 6-12 Schematic Diagram of Forward and Reverse Dead-time

P8-13	Reverse rotation control	Factory value	0
	Setting range	0	Allow reverse rotation
		1	Prohibit reverse rotation

When this parameter is 0: Reverse rotation can be controlled via the keyboard, terminals, or communication.  
 When this parameter is 1: The reverse rotation control function is ineffective regardless of the command source selection. That is, the reverse rotation control function is ineffective for keyboard, terminal, and communication control.

P8-14	The set frequency is lower than the lower limit frequency for action		Factory value	0
	Setting range	0	Operate at the lower limit frequency	
		1	Stop operation	
		2	Operate at zero speed	

Select the running state of the frequency converter when the set frequency is lower than the lower limit frequency. To prevent the motor from running at a low speed for a long time, this function can be used to select stop.

P8-15	Droop control		Factory value	0.00HZ
	Setting range		0.00HZ ~ 10.00HZ	

When multiple frequency converters drive the same load, uneven load distribution occurs due to different speeds, causing the frequency converter with a higher speed to bear a heavier load. The droop control characteristic is that the speed droops as the load increases, enabling balanced load distribution. This parameter adjusts the frequency variation of the frequency converter with speed droop.

P8-18	Selection of start-up protection		Factory value	0
	Setting range	0	No protection	
		1	Protect	

This parameter is related to the safety protection function of the frequency converter. If this parameter is set to 1, and the running command is valid when the frequency converter is powered on (for example, the terminal running command is in a closed state before power-on), the frequency converter will not respond to the running command. The running command must be withdrawn once, and the frequency converter will respond only after the running command becomes valid again. In addition, if this parameter is set to 1 and the running command is valid at the moment of fault reset of the frequency converter, the frequency converter will also not respond to the running command. The running command must be withdrawn first to eliminate the running protection state. Setting this parameter to 1 can prevent the danger caused by the motor responding to the running command during power-on or fault reset without awareness.

P8-19	Frequency detection value (PDT1 level)		Factory value	50.00HZ
	Setting range		0.00HZ~maximum frequency	

P8-20	Frequency detection hysteresis value (PDT1 hysteresis)		Factory value	5.0%
	Setting range		0.0%~100.0% (PDT1 level)	

Set the detected value of the output frequency and the hysteresis value for the release of the output action.

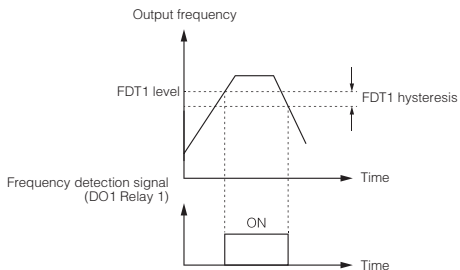


Figure 6-13 Schematic Diagram of PDT Level

P8-21	Frequency arrival detection amplitude	Factory value	0.0%
	Setting range	0.00~100% maximum frequency	

When the output frequency of the frequency converter reaches the set frequency value, this function can adjust its detection amplitude. As shown below:

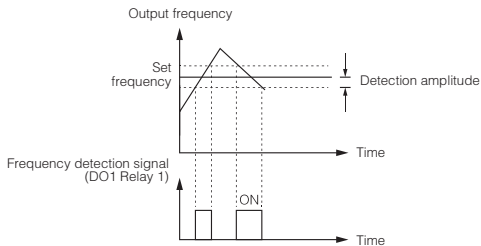


Figure 6-14 Schematic diagram of frequency arrival detection amplitude

P8-22	Is the skip frequency effective during acceleration and deceleration	Factory value	0
	Setting range	0: Invalid 1: Valid	

If this function code is set to be valid, when the operating frequency is within the skip frequency range, the actual operating frequency will directly skip the set skip frequency boundaries.

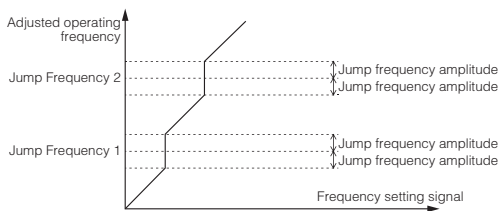


Figure 6-11 Schematic Diagram of the Effectiveness of Skip Frequency during Acceleration and Deceleration

P8-23	Operation time arrival action selection	Factory value	0
	Setting range	0: Continue running 1: Fault prompt	
P8-24	Power-on time arrival action selection	Factory value	0
	Setting range	0: Continue running 1: Fault prompt	

When set to 1: Fault prompt, if the running time or power-on time is reached, according to the fault protection action selection in Group P9, the frequency converter will stop freely, stop with deceleration, or continue running (please refer to the detailed description of function codes P9-47 to P9-50).

P8-25	Acceleration time 1/2 switching frequency point	Factory value	0.00HZ
	Setting range	0.00HZ~maximum frequency	
P8-26	Deceleration time 1/2 switching frequency point	Factory value	0.00HZ
	Setting range	0.00HZ~maximum frequency	

This parameter is used to achieve dynamic switching of acceleration and deceleration times during the operation of the frequency converter (when and only when it is for Motor 1 and there is no terminal-selected acceleration and deceleration time).

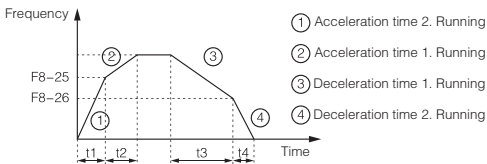


Figure 6-12 Schematic Diagram of Acceleration/Deceleration Time Switching

During the acceleration process, if the operating frequency is less than the acceleration time 1/2 switching frequency point, it will operate with acceleration time 2; otherwise, it will operate with acceleration time 1. During the deceleration process, if the operating frequency is less than the deceleration time 1/2 switching frequency point, it will operate with deceleration time 2; otherwise, it will operate with deceleration time 1.

P8-27	Terminal jog priority	Factory value	0
	Setting range	0: Invalid 1: Valid	
P8-28	Frequency detection value (PDT2 level)	Factory value	50.00HZ
	Setting range	0.00HZ~maximum frequency	
P8-29	Frequency detection hysteresis value (PDT2 hysteresis)	Factory value	5.0%
	Setting range	0.0%~100.0% (PDT2 level)	

The function of PDT2 is similar to the setting method of PDT1 (P8-19, P8-20).

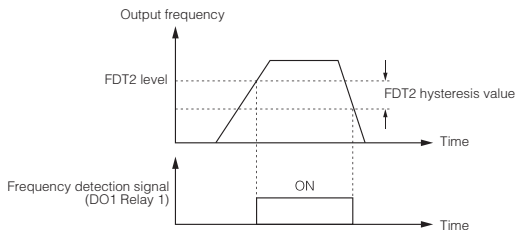


Figure 6-12 Schematic Diagram of PDT2 Level

P8-30	Arbitrary arrival frequency detection value 1	Factory value	50.00HZ
	Setting range	0.00HZ~maximum frequency	
P8-31	Arbitrary arrival frequency detection amplitude 1	Factory value	0.0%
	Setting range	0.0%~100.0% (maximum frequency)	
P8-32	Arbitrary arrival frequency detection value 2	Factory value	50.00HZ
	Setting range	0.00HZ~maximum frequency	
P8-33	Arbitrary arrival frequency detection amplitude 2	Factory value	0.0%
	Setting range	0.0%~100.0% (maximum frequency)	

When the output frequency of the frequency converter is within the positive and negative detection amplitudes of the arbitrary arrival frequency detection values 1 and 2, a pulse signal is output. As shown in the figure below:

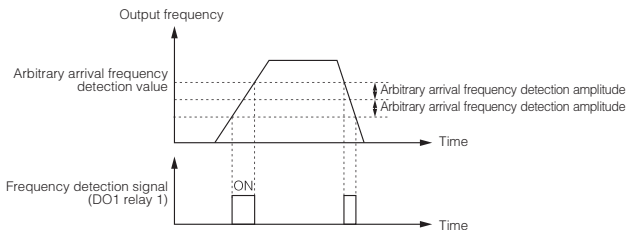


Figure 6-12 Schematic diagram of arbitrary arrival frequency detection

P8-34	Zero current detection level	Factory value	5.0%
	Setting range	0.0%~300.0% (Rated current of the motor)	
P8-35	Zero current detection delay time	Factory value	0.10S
	Setting range	0.01S ~ 600.00S	

When the output current of the frequency converter is less than or equal to the zero-current detection level and the duration exceeds the zero-current detection delay time, a pulse signal is output. As shown in the figure below:

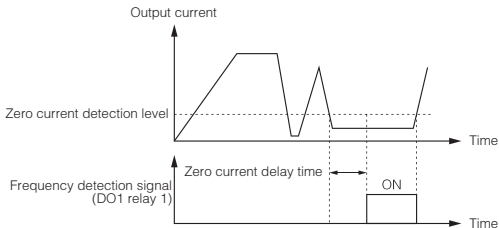


Figure 6-12 Schematic Diagram of Zero-current Detection

P8-36	Output current overlimit value	Factory value	200.0%
	Setting range	0.0% (No detection) 0.1%~300.0% (Motor rated current)	
P8-37	Detection delay time of output current overlimit	Factory value	0.00S
	Setting range	0.00S ~ 600.00S	

When the output current of the frequency converter is greater than or equal to the output current overlimit detection point and the duration exceeds the detection delay time of the software overcurrent point, the multi-function DO of the frequency converter outputs an ON signal. As shown in the following figure:

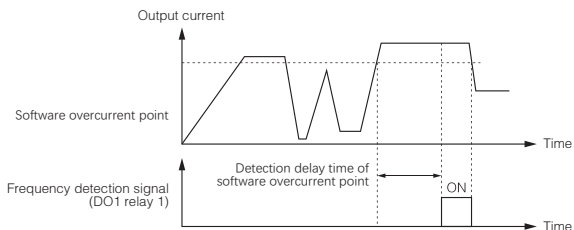


Figure 6-12 Schematic Diagram of Software Overcurrent Point Detection

P8-38	Arbitrary arrival current 1	Factory value	100.0%
	Setting range	0.0%~300.0% (Rated current of the motor)	
P8-39	Width of arbitrary arrival current 1	Factory value	0.0%
	Setting range	0.0%~300.0% (Rated current of the motor)	
P8-40	Arbitrary arrival current 2	Factory value	100.0%
	Setting range	0.0%~300.0% (Rated current of the motor)	
P8-41	Width of arbitrary arrival current 2	Factory value	0.0%
	Setting range	0.0%~300.0% (Rated current of the motor)	

When the output current of the frequency converter is within the positive and negative detection widths of arbitrary arrival currents 1 and 2, a pulse signal is output. As shown in the figure below:

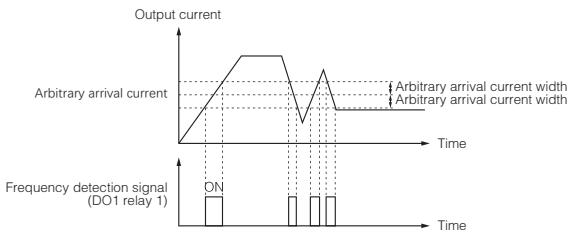


Figure 6-12 Schematic Diagram of Arbitrary Arrival Frequency Detection

P8-42	Timing function selection	Factory value	0
	Setting range	0	Invalid
		1	Valid
P8-43	Timed operation time selection	Factory value	0
	Setting range	0	P8-44 Setting
		1	AI1
		2	AI2
		3	Reserve
			The analog input range corresponds to P8-44
P8-44	Timed operation time	Factory value	0.0MIN
	Setting range	0.0MIN ~ 6500.0MIN	

This function is used to achieve the timed operation of the frequency converter. When the timing function selection in P8-42 is effective, the frequency converter starts timing during operation. When the set timed operation time is reached, the frequency converter stops and outputs a pulse signal. The timing is cleared for the next operation.

The remaining timed operation time can be viewed through U0-20.

The set timed operation time is determined by P8-43 and P8-44.

P8-45	AI1 input voltage lower limit of protection	Factory value	3.10V
	Setting range	0.00V ~ P8-46	
P8-46	AI1 input voltage upper limit of protection	Factory value	6.80V
	Setting range	P8-45 ~ 10.00V	

When the value of analog input AI1 is greater than P8-46 (AI1 input protection upper limit) or less than P8-47 (AI1 input protection lower limit), a pulse signal is output.

P8-47	Module temperature reached	Factory value	75°C
	Setting range	0.00V ~ P8-46	

When P7-07 (Inverter module heat sink temperature) reaches this value, a pulse signal is output.

P8-49	Wake-up frequency	Factory value	0.00HZ
	Setting range	P8-51 (Sleep frequency)~P0-10 (Maximum frequency)	
P8-50	Wake-up delay time	Factory value	0.0S
	Setting range	0.0S ~ 6500.0S	
P8-51	Sleep frequency	Factory value	0.00HZ
	Setting range	0.00HZ~P8-49 (Wake-up frequency)	
P8-52	Sleep delay time	Factory value	0.0S
	Setting range	0.0S ~ 6500.0S	

This group of parameters is used to achieve the sleep and wake-up functions in water supply applications. During the operation of the frequency converter, when the set frequency is less than or equal to the sleep frequency of P8-51, after the delay time of P8-52, the frequency converter enters the sleep state and stops automatically.

If the frequency converter is in the sleep state and the current operation command is valid, when the set frequency is greater than or equal to the wake-up frequency of P8-49, after the delay time of P8-50, the frequency converter starts to operate.

Generally, please set the wake-up frequency to be greater than or equal to the sleep frequency. If both the wake-up frequency and the sleep frequency are set to 0.00HZ, the sleep and wake-up functions will be invalid.

When the sleep function is enabled, if the frequency source uses PID, whether the PID operates in the sleep state is affected by the function code PA-28. At this time, it is necessary to select that PID operates when stopped (PA-28 = 1).

P8-53	Time reached for this run	Factory value	0.0MIN
	Setting range	0.0MIN ~ 6500.0MIN	

**P9 group Faults and protection**

P9-00	Motor overload protection selection	Factory value	1
	Setting range	0	Prohibit
		1	Allow

If selected as 0: The frequency converter has no overload protection for the load motor. In this case, a heating relay is installed in front of the motor.

If selected as 1: The frequency converter has an overload protection function for the motor. The protection value is shown in P9-01.

P9-01	Motor overload protection gain	Factory value	1.00
	Setting range	0.20 ~ 10.00	

The motor overload protection follows an inverse time-limit curve;  $220\% \times (P9-01) \times$  rated motor current for 1 minute, and  $150\% \times (P9-01) \times$  rated motor current for 60 minutes.

P9-02	Motor overload early warning coefficient	Factory value	80%
	Setting range	50% ~ 100%	

The reference quantity for this value is the motor overload current. When the frequency converter detects that the output current reaches  $(P9-02) \times$  the motor overload current and lasts for the time specified by the inverse time-limit curve, a pre-alarm signal is output from the DO or relay.

P9-03	Overvoltage stall gain	Factory value	20
	Setting range	0 (No overvoltage stall) ~ 100	

Adjust the ability of the frequency converter to suppress overvoltage stall. The larger this value is, the stronger the ability to suppress overvoltage.

For loads with small inertia, this value should be small, otherwise the dynamic response of the system will be slowed down.

For loads with large inertia, this value should be large, otherwise the suppression effect will not be good and overvoltage faults may occur.

P9-04	Overvoltage stall protection voltage	Factory value	130%
	Setting range	120% ~ 150%	

Select the protection point of the overvoltage stall function. When this value is exceeded, the frequency converter starts to execute the overvoltage stall protection function.

P9-05	Overcurrent stall gain	Factory value	0
	Setting range	0 ~ 100	

Adjust the ability of the frequency converter to suppress overcurrent stall. The larger this value is, the stronger the ability to suppress overcurrent.  
 For loads with small inertia, this value should be small, otherwise the dynamic response of the system will be slowed down.  
 For loads with large inertia, this value should be large, otherwise the suppression effect will not be good and overcurrent faults may occur.

P9-06	Overcurrent stall protection current	Factory value	150%
	Setting range		100% ~ 200%

Select the current protection point for the overcurrent stall function. When the current exceeds this value, the frequency converter will start to execute the overcurrent stall protection function.

P9-07	Power-on short-circuit-to-ground protection selection	Factory value	1
	Setting range	0	Prohibit
		1	Allow

You can choose whether the frequency converter detects if there is a short-circuit-to-ground fault in the motor when powering on. If this function is enabled, the frequency converter will output for a short time immediately after power-on.

P9-09	Number of automatic fault resets	Factory value	0
	Setting range		0 ~ 20

When the frequency converter selects automatic fault reset, it is used to set the number of times of automatic reset. When this value is exceeded, the frequency converter will be on standby for fault and wait for repair.

P9-10	Selection of fault relay action during automatic fault reset	Factory value	0
	Setting range		0: No action 1: Action

After selecting the automatic fault reset function of the frequency converter, during the execution of the fault reset, this parameter setting can be used to determine whether the fault relay needs to act to block the fault alarm caused thereby and enable the equipment to continue running.

P9-11	Interval time for automatic fault reset	Factory value	1.0S
	Setting range		0.1S ~ 100.0S

The waiting time from the frequency converter's fault alarm to its automatic fault reset.

P9-12	Input phase loss protection selection	Factory value	00
	Setting range		Units digit: Input phase-loss protection Tens digit: Contactor suction protection 0: Prohibited, 1: Allowed.

P9-13	Selection of output phase-loss protection	Factory value	1
	Setting range	0: Prohibit 1: Allow	

Select whether to protect against the situation of output phase loss.

P9-14	First fault type	0 ~ 99
P9-15	Second fault type	
P9-16	Third (most recent) fault type	

Record the last three fault types of the frequency converter. 0 indicates no fault. For details, see the description in Chapter 8.

P9-17	Frequency at the third fault	Display the frequency at the most recent fault										
P9-18	Current at the third fault	Display the current at the most recent fault										
P9-19	Bus voltage at the third fault	Display the bus voltage at the most recent fault										
P9-20	Input terminal status at the third fault	<p>This value is a decimal number. It shows the status of all digital input terminals at the most recent fault, in the order of:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>BIT9</td><td>BIT8</td><td>BIT7</td><td>BIT6</td><td>BIT5</td><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td> </tr> </table> <p style="text-align: center;">DI0 DI9 DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1</p> <p>Convert the status of each bit into the corresponding decimal number for display. When the input terminal is ON, it corresponds to 1, and when it is OFF, it corresponds to 0. Through this value, you can understand the situation of the digital output signals at that time.</p>	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0			
P9-21	Output terminal at the third fault	<p>This value is a decimal number. It shows the status of all input terminals at the most recent fault, in the order of:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td> </tr> </table> <p style="text-align: center;">DO2 DO1 REL2 REL1 FMP</p> <p>Convert the status of each bit into the corresponding decimal number for display. When the input terminal was ON, it corresponds to 1; when it was OFF, it corresponds to 0. Through this value, the situation of digital output signals at that time can be understood.</p>	BIT4	BIT3	BIT2	BIT1	BIT0					
BIT4	BIT3	BIT2	BIT1	BIT0								
P9-22	Frequency converter status at the third fault	Reserved										
P9-23	Time at the third fault	Start timing from the current power-on										
P9-24	Time at the third fault	Start timing from the start of operation										
P9-27	Frequency at the second fault	Same as P9-17 to P9-24, third-fault information										
P9-28	Current at the second fault											
P9-29	Bus voltage at the second fault											
P9-30	Input terminal status at the second fault											

P9-31	Output terminal at the second fault	Same as the third-fault information from P9-17 to P9-24
P9-32	Inverter status at the second fault	
P9-33	Time at the second fault	
P9-34	Time at the second fault	
P9-37	Frequency at the first fault	
P9-38	Current at the first fault	
P9-39	Bus voltage at the first fault	
P9-40	Input terminal status at the first fault	
P9-41	Output terminal status at the first fault	
P9-42	Inverter status at the first fault	
P9-43	Time at the first fault	
P9-44	Time at the first fault	

P9-47	Fault protection action selection 1	Factory value	00000	
	Setting range	Units digit	Motor overload (ERR11)	
		0	Free stop	
		1	Stop according to the stop mode	
		2	Continue running	
		Tens digit	Input phase loss (ERR12) (0~2, same as the units digit)	
		Hundreds digit	Output phase loss (ERR13) (0~2, same as the units digit)	
		Thousands digit	External fault (ERR15) (0~2, same as the units digit)	
Ten-thousands digit		Communication abnormality (ERR16) (0~2, same as the units digit)		
P9-48	Fault protection action selection 2	Factory value	00000	
	Setting range	Units digit	Encoder fault (ERR20)	
		0	Free stop	
		1	Switch to VF and stop according to the stop mode	
		2	Switch to VF and continue running	
		Tens digit	Function code read-write abnormality (ERR21)	
		0	Free stop	
		1	Stop according to the stop mode	
		Hundreds digit	Reserved	
		Thousands digit	Motor overheat (ERR25) (0~2, same as the units digit of P9-47)	
Ten-thousands digit		Running time reached (ERR26) (0~2, same as the units digit of P9-47)		

P9-49	Fault protection action selection 3		Factory value	00000
	Setting range	Units digit	User-defined fault 1 (ERR27) (0~2, same as the units digit of P9-47)	
		Tens digit	User-defined fault 2 (ERR28) (0~2, same as the units digit of P9-47)	
		Hundreds digit	Power-on time reached (ERR29) (0~2, same as the units digit of P9-47)	
		Thousands digit	Load loss (ERR30)	
		0	Free stop	
		1	Stop according to the stop mode	
		2	Decelerate to 7% of the motor rated frequency and continue running, and automatically resume running at the set frequency if there is no load loss	
	Ten-thousands digit	PID feedback loss during operation (ERR31) (0~2, same as the units digit of P9-47)		
P9-50	Fault protection action selection 4		Factory value	00000
	Setting range	Units digit	Excessive speed deviation (ERR42) (0~2, same as the units digit of P9-47)	
		Tens digit	Motor overspeed (ERR43) (0~2, same as the units digit of P9-47)	
		Hundreds digit	Initial position error (ERR51) (0~2, same as the units digit of P9-47)	
		Thousands digit	Speed feedback error (ERR52) (0~2, same as the units digit of P9-47)	
		Ten-thousands digit	Program execution logic error (ERR99) (0~2, same as the units digit of P9-47)	

When the selection is "free stop": the frequency converter displays ERR\*\*, and stops directly.

When the selection is "stop according to the stop mode": the frequency converter displays A\*\*, stops according to the stop mode, and displays ERR\*\* after stopping.

When the selection is "continue running": the frequency converter continues to run and displays A\*\*, and the operating frequency is set by P9-54.

P9-54	Frequency selection for continuous operation during fault		Factory value	0
	Setting range	0	Run at the current operating frequency	
		1	Run at the set frequency	
		2	Run at the upper-limit frequency	
		3	Run at the lower-limit frequency	
		4	Run at the abnormal standby frequency	
P9-55	Abnormal standby frequency	Factory value	100.0% (current target frequency)	
	Setting range		60.0% ~ 100.0%	

When a fault occurs during the operation of the frequency converter and the fault handling method is to continue running, the frequency converter prompts A\*\* and runs at the set frequency determined by this function.

P9-56	Types of motor temperature sensors	Factory value	0
	Setting range	0	No temperature sensor
		1	PT100
		2	PT1000
P9-57	Motor overheating protection threshold	Factory value	110°C
	Setting range		0°C ~ 200°C
P9-58	The pre-alarm threshold for motor overheating	Factory value	90°C
	Setting range		0°C ~ 200°C

If the system uses a motor temperature sensor, a multi-functional input/output expansion card needs to be selected. The analog input AI3 of the expansion card also serves as the input for the motor temperature sensor (refer to the dip switch settings on the expansion card). The sensor is connected to AI3 and PGND for use. The motor temperature can be viewed using U0-34 (refer to the introduction of the U0 group). When the motor temperature exceeds P9-58 (motor overheating pre-alarm threshold), the inverter outputs a motor over-temperature pre-alarm signal which is effective.

When the motor temperature exceeds P9-57 (motor overheating protection threshold), the inverter prompts a fault and handles it according to the fault protection action mode.

P9-59	Selection of Instantaneous Stop without Stop Function	Factory value	0
	Setting range		0 ~ 2
P9-60	Judgment Voltage for Pausing Instantaneous Stop Action	Factory value	85%
	Setting range		80% ~ 100%
P9-61	Judgment Time for Voltage Recovery in Instantaneous Stop without Stop	Factory value	0.50S
	Setting range		0.00S ~ 100.00S
P9-62	Judgment Voltage for Instantaneous Stop without Stop Action	Factory value	80.0%
	Setting range		60.0%~100.0% (standard bus voltage)

This function means that the inverter will not stop during an instantaneous power outage. In the event of an instantaneous power outage or sudden voltage drop, the inverter reduces the output speed and compensates for the voltage drop by using the feedback energy from the load to maintain the operation of the inverter for a short period.

If the instantaneous stop without stop function is selected to be effective, when the bus voltage is lower than the voltage indicated by the instantaneous stop without stop action judgment voltage (P9-62), the inverter decelerates according to the instantaneous stop action selection. When the bus voltage recovers and exceeds the voltage indicated by the instantaneous stop without stop action judgment voltage (P9-62), and the duration remains for the instantaneous stop without stop voltage recovery judgment time (P9-61), the inverter resumes running at the set frequency; otherwise, the inverter will continuously reduce the operating frequency and stop when it reaches 0. The instantaneous stop without stop function is shown in the figure.

If the deceleration time for the instantaneous stop action is too long, the feedback energy from the load is relatively small, and effective compensation for the low voltage cannot be carried out; if the deceleration time is too short, the feedback energy from the load is large, which may cause overvoltage protection. Please adjust the deceleration time appropriately according to the load inertia and the weight of the load.

When the instantaneous stop action selection is set to automatic deceleration, if the current operating frequency is greater than or equal to the instantaneous stop automatic deceleration frequency switching point (P9-60), it decelerates according to deceleration time 3; otherwise, it decelerates according to deceleration time 4.

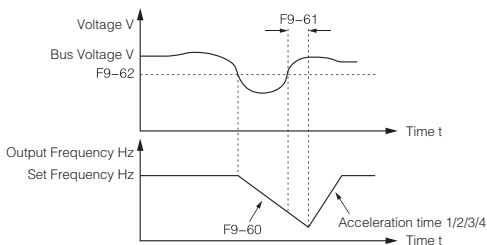


Figure 6-22 Schematic Diagram of Instantaneous Stop without Stop

P9-63	Selection of load loss protection	Factory value	0
	Setting range	0	Invalid
1		Valid	
P9-64	Load loss detection level	Factory value	10.0%
	Setting range	0.0% ~ 100.0%	
P9-65	Load loss detection time	Factory value	1.0S
	Setting range	0.0S ~ 60.0S	

If this function is effective, when the inverter loses load, the output frequency of the inverter is 7% of the rated frequency; if the load loss recovers, it will operate at the set frequency. The load loss detection level and detection time can be set.

P9-66	Frequency decimal point during fault	Factory value	000
	Setting range	Units digit	Frequency decimal point for the third fault
		1	1 decimal place
		2	2 decimal places
		Tens digit	Frequency decimal point for the second fault (1-2, same as the units digit)
Hundreds digit	Frequency decimal point for the second fault (1-2, same as the units digit)		

Since the frequency decimal point is configurable, this function code is used to record the position of the decimal point of the frequency at the moment of a fault (for the display of the fault frequency (P9-17\P9-27\P9-37)).

Note: The data displayed by this function code is in the form of H.XXX, where H. indicates hexadecimal data.

P9-67	Overspeed detection value	Factory value	20.0%
	Setting range	0.0%~50.0% (maximum frequency)	
P9-68	Overspeed detection time	Factory value	1.0S
	Setting range	0.0S ~ 60.0S	

When it is FVC, if the actual operating frequency of the motor exceeds the maximum frequency range by more than P9-67 (overspeed detection value) and the duration exceeds P9-68 (overspeed detection time), the inverter prompts a fault and handles it according to the fault protection action mode.

P9-69	Excessive speed deviation detection value	Factory value	20.0%
	Setting range	0.0%~50.0% (maximum frequency)	
P9-70	Excessive speed deviation detection time	Factory value	5.0S
	Setting range	0.0S ~ 60.0S	

When in FVC mode, if the difference between the actual operating frequency of the motor and the given operating frequency of the inverter is greater than P9-69 (excessive speed deviation detection value) and the duration exceeds P9-70 (excessive speed deviation detection time), the inverter will prompt a fault and handle it according to the fault protection action mode.

## PA group Process control PID function

PID control is a commonly used method for process control. It adjusts the output frequency of the inverter by performing proportional, integral, and derivative operations on the difference between the feedback signal of the controlled quantity and the target quantity signal, forming a negative feedback system to stabilize the controlled quantity at the target quantity. It is applicable to process controls such as flow control, pressure control, and temperature control. The basic principle block diagram of the control is as follows:

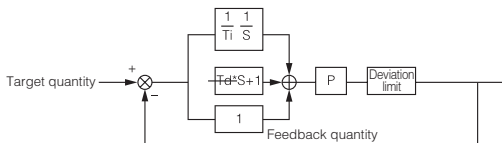


Figure 6-15 Principle Block Diagram of Process PID

PA-00	PID given source		Factory value	0	
	Setting range	0	PA-01		
		1	AI1		
		2	AI2		
		3	Keyboard adjustable potentiometer		
		4	PULSE Pulse (X5)		
		5	Communication setting		
		6	Multi-speed setting		

When the frequency source is selected as PID, that is, P0-03 or P0-04 is selected as 8, this group of functions takes effect. (Please refer to function codes P0-03 and P0-04). This parameter determines the target quantity given channel of the process PID. The set target quantity of the process PID is a relative value, and the set 100% corresponds to 100% of the feedback signal of the controlled system; the range of PID (PA-04) is not necessary, because no matter what the range is set to, the system operates according to the relative value (0~100%). However, if the PID range is set, the actual values of the signals corresponding to the PID given and feedback can be visually observed through the keyboard display parameters.

PA-01	PID keyboard setting		Factory value	50.0%
	Setting range		0.0% ~ 100.0%	

When PA-00 = 0 is selected, that is, the target source is set by the keyboard. This parameter needs to be set. The reference value of this parameter is the feedback quantity of the system.

PA-02	PID feedback source		Factory value	0	
	Setting range	0	AI1		
		1	AI2		
		2	Keyboard adjustable potentiometer		
		3	AI1-AI2		
		4	PULSE Pulse (X5)		
		5	Communication setting		
		6	AI1 + AI2		
		7	MAX ( AI1 , AI2 )		
8		MIN ( AI1 , AI2 )			

This parameter is used to select the PID feedback channel.

PA-02	PID feedback source		Factory value	0
	Setting range	0	AI1	
		1	AI2	
		2	Keyboard adjustable potentiometer	
		3	AI1-AI2	
		4	PULSE Pulse (X5)	
		5	Communication setting	
		6	AI1 + AI2	
		7	MAX ( AI1 , AI2 )	
8	MIN ( AI1 , AI2 )			

This parameter is used to select the PID feedback channel.

PA-03	PID action direction		Factory value	0
	Setting range	0	Positive action	
		1	Reverse action	

Positive action: When the feedback signal is greater than the PID setting, the output frequency of the inverter is required to decrease in order to balance the PID. For example, the tension PID control of winding.

Reverse action: When the feedback signal is greater than the PID setting, the output frequency of the inverter is required to increase in order to balance the PID. For example, the tension PID control of unwinding.

The result of this function is affected by terminal function 35: PID action direction inversion.

PA-04	PID given feedback range		Factory value	1000
	Setting range	0 ~ 65535	The PID given feedback range is a dimensionless unit. It is used for the display of PID given and feedback.	
PA-05	Proportional gain P1		Factory value	20.0
	Setting range		0.0 ~ 100.0	
PA-06	Integral time I1		Factory value	2.00S
	Setting range		0.01S ~ 10.00S	
PA-07	Derivative time D1		Factory value	0.000S
	Setting range		0.00 ~ 10.000	

Proportional gain P: Determines the adjustment intensity of the entire PID regulator. The larger the P value, the greater the adjustment intensity. When this parameter is 100, it means that when the deviation between the PID feedback quantity and the set quantity is 100%, the adjustment amplitude of the PID regulator to the output frequency command is the maximum frequency (ignoring the integral and derivative effects).  
 Integral time I: Determines the speed at which the PID regulator integrally adjusts the deviation between the PID feedback quantity and the set quantity. The integral time refers to the time it takes for the integral regulator (ignoring the proportional and derivative effects) to continuously adjust until the adjustment amount reaches the maximum frequency (P0-09) when the deviation between the PID feedback quantity and the set quantity is 100%. The shorter the integral time, the greater the adjustment intensity.  
 Derivative time D: Determines the intensity of the PID regulator's adjustment of the rate of change of the deviation between the PID feedback quantity and the set quantity. The derivative time means that if the feedback quantity changes by 100% within this time, the adjustment amount of the derivative regulator is the maximum frequency (P0-09) (ignoring the proportional and integral effects). The longer the derivative time, the greater the adjustment intensity.

PA-08	Reverse rotation cut-off frequency	Factory value	2.00HZ
	Setting range	0.00~maximum frequency	
PA-09	Deviation limit	Factory value	0.0%
	Setting range	0.0% ~ 100.0%	

Deviation limit: When the PID feedback deviation is within this range, the PID stops adjusting.

PA-10	Derivative amplitude limit	Factory value	0.1%
	Setting range	0% ~ 100%	

PA-11	PID given change time	Factory value	0.00S
	Setting range	0.00S ~ 650.00S	

The PID given change time refers to the time required for the actual value of PID to change from 0.0% to 100.0%.

When the PID setting changes, the actual value of the PID setting will not respond immediately. Instead, it changes linearly according to the given change time to prevent sudden changes in the setting.

PA-12	PID feedback filter time	Factory value	0.00S
	Setting range	0.00S ~ 60.00S	
PA-13	PID output filter time	Factory value	0.00S
	Setting range	0.00S ~ 60.00S	

Filter the PID feedback and output values to eliminate sudden changes.

PA-15	Proportional gain P2	Factory value	20.0
	Setting range	0.0 ~ 100.0	
PA-16	Integral time I2	Factory value	2.00S
	Setting range	0.01S ~ 10.00S	
PA-17	Derivative time D2	Factory value	0.000S
	Setting range	0.00 ~ 10.000	

The setting method is similar to that of PA-05, PA-06 and PA-07. It is used in situations where PID parameters need to be changed. Please refer to the introduction of PA-18.

PA-18	PID parameter switching conditions		Factory value	0
	Setting range	0	No switching	
		1	X switching	
		2	Automatically switch according to deviation	
PA-19	PID parameter switching deviation 1	Factory value	20.0%	
	Setting range	0.0% ~ PA-20		
PA-20	PID parameter switching deviation 2	Factory value	80.0%	
	Setting range	PA-19 ~ 100.0%		

In some application scenarios, a set of PID parameters may not meet the entire operation process. In this case, multiple sets of PID parameters may be required for switching.

When set to "No switching", the PID parameters remain constant as parameter set 1.

When set to "X switching", when the multi-function terminal function is selected as 43: PID parameter switching terminal and this terminal is valid, parameter set 2 is selected; otherwise, parameter set 1 is selected.

When set to "Automatically switch according to deviation", when the deviation between the set value and the feedback is less than the PID parameter switching deviation 1 (PA-19), PA-05, PA-06, and PA-07 are used as the PID adjustment parameters. When the deviation between the set value and the feedback is greater than the PID switching deviation 2 (PA-20), PA-15, PA-16, and PA-17 are used as the PID adjustment parameters. For the deviation range between switching deviation 1 and switching deviation 2, the PID parameters are linearly switched between the two sets of PID parameters, as shown in the following figure:

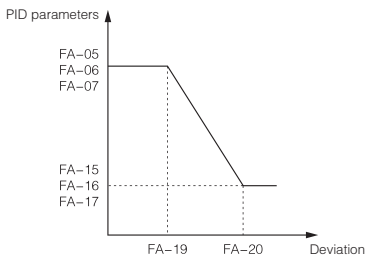


Figure 6-16 PID parameter switching

PA-21	PID initial value	Factory value	0.0%
	Setting range	0.0% ~ 100.0%	
PA-22	PID initial value holding time	Factory value	0.00S
	Setting range	0.00S ~ 650.00S	

When the PID is running, the inverter first outputs and operates with the PID initial value (PA-21) for a duration of PA-22 (PID initial value holding time), and then starts normal PID adjustment.

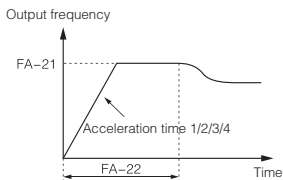


Figure 6-16 PID Initial Value

PA-23	Positive maximum value of the output deviation for two times	Factory value	1.00%
	Setting range	0.00% ~ 100.00%	
PA-24	Negative maximum value of the output deviation for two times	Factory value	1.00%
	Setting range	0.00% ~ 100.00%	

This function code is used to limit the difference between two beats (2MS/beat) of the PID output, thus preventing the PID output from changing too quickly. PA-23 and PA-24 respectively correspond to the maximum output deviation values during forward rotation and reverse rotation.

PA-25	PID integral property		Factory value	00
	Setting range	Units digit	Integral separation	
		0	Invalid	
		1	Valid	
		Tens digit	When the output is limited, whether to stop integration	
		0	Continue integration	
1	Stop integration			

#### Integral separation

When it is effective, if terminal function 22: integral pause is effective, the PID integral stops calculating. Only the proportion and differential are calculated.

Whether to stop integration when the output is limited:

If it is to stop integration, when the PID output value reaches the maximum or minimum value, the PID integral stops calculating.

If it is to continue integration, the PID integral is calculated at all times.

PA-26	PID feedback loss detection value	Factory value	0.0%
	Setting range		0.0%: Do not judge feedback loss 0.1%~100.0%
PA-27	PID feedback loss detection time	Factory value	0.0S
	Setting range		0.0S ~ 20.0S

This function code is used to determine whether the PID feedback is lost. When the PID feedback is less than the feedback loss detection value (PA-26) and the duration reaches PA-27 (feedback loss detection time), the frequency converter reports a fault and operates according to the fault handling method.

PA-28	PID shutdown operation		Factory value	0
	Setting range	0	Do not calculate when shutting down	
		1	Calculate when shutting down	

It is used to select whether the PID continues to calculate in the shutdown state. In general applications, the PID should stop calculating in the shutdown state.

### PC group Multi-segment speed function and simple PLC function

The simple PLC function means that a programmable logic controller (PLC) is built into the frequency converter to automatically control the multi-segment frequency logic. The running time, running direction and running frequency can be set to meet the technological requirements. This series of frequency converters can achieve 16-segment speed change control and there are 4 acceleration and deceleration times to choose from. When the set PLC completes one cycle, an ON signal can be output by the multi-functional digital output terminal or multi-functional relay. For detailed instructions, see P5-02~P5-05. When the frequency source is selected as P0-07, P0-03, P0-04 to be in the multi-segment speed operation mode, it is necessary to set PC-00~PC-15 to determine its characteristics.

PC-00	Multi-speed 0	Factory value	0.0%
	Setting range	-100.0%~100.0% 100.0% corresponds to the maximum frequency (P0-10)	
PC-01	Multi-speed 1	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-02	Multi-speed 2	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-03	Multi-speed 3	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-04	Multi-speed 4	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-05	Multi-speed 5	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-06	Multi-speed 6	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-07	Multi-speed 7	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-08	Multi-speed 8	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-09	Multi-speed 9	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-10	Multi-speed 10	Factory value	0.0HZ
	Setting range	-100.0% ~ 100.0%	
PC-11	Multi-speed 11	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-12	Multi-speed 12	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	

PC-13	Multi-speed 13	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-14	Multi-speed 14	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
PC-15	Multi-speed 15	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	

Instructions: The signs of PC-00 to PC-15 determine the running direction of the simple PLC. If it is a negative value, it indicates running in the reverse direction.

Schematic diagram of the simple PLC:

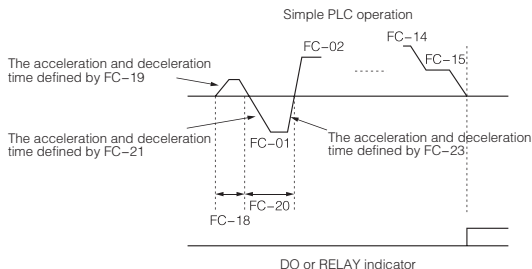


Figure 6-18 Schematic diagram of simple PLC

PC-16	PLC operation mode	Factory value	0
	Setting range	0	Stop when single-run ends
		1	Maintain the final value when single-run ends
		2	Keep cycling
PC-17	PLC power-off memory selection	Factory value	00
	Setting range	Units digit	Power-off memory selection
		0	Do not remember
		1	Remember
		Tens digit	Shutdown memory selection
		0	Do not remember during shutdown
1		Remember during shutdown	

## PLC operation mode

0: Stop when single-run ends. After the frequency converter completes a single-cycle, it will automatically stop, and a new running command is required to start again.

1: Maintain the final value when single-run ends. After the frequency converter completes a single-cycle, it will automatically maintain the running frequency and direction of the last segment.

2: Keep cycling. After the frequency converter completes one cycle, it will automatically start the next cycle. The system will stop until a shutdown command is given.

PLC power-off memory means remembering the running stage and running frequency of the PLC before power-off. When power is restored next time, it will continue to run from the remembered stage. If "do not remember" is selected, the PLC process will start anew each time power is restored.

PLC shutdown memory means recording the running stage and running frequency of the previous PLC during shutdown. When running next time, it will continue to run from the remembered stage. If "do not remember" is selected, the PLC process will start anew each time it is started.

PC-18	PLC segment 0 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-19	PLC segment 0 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-20	PLC segment 1 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-21	PLC segment 1 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-22	PLC segment 2 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-23	PLC segment 2 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-24	PLC segment 3 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-25	PLC segment 3 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-26	PLC segment 4 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-27	PLC segment 4 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	

PC-28	PLC segment 5 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-29	PLC segment 5 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-30	PLC segment 6 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-31	PLC segment 6 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-32	PLC segment 7 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-33	PLC segment 7 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-34	PLC segment 8 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-35	PLC segment 8 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-36	PLC segment 9 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-37	PLC segment 9 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-38	PLC segment 10 running time	Factory value	0.0S(H)
	Setting range	0.0 S(H) ~ 6553.5S(H)	
PC-39	PLC segment 10 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-40	PLC segment 11 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-41	PLC segment 11 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	

PC-42	PLC segment 12 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-43	PLC segment 12 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-44	PLC segment 13 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-45	PLC segment 13 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-46	PLC segment 14 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-47	PLC segment 14 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-48	PLC segment 15 running time	Factory value	0.0S(H)
	Setting range	0.0S(H) ~ 6553.5S(H)	
PC-49	PLC segment 15 acceleration and deceleration time	Factory value	0
	Setting range	0 ~ 3	
PC-50	PLC running time unit selection	Factory value	0
	Setting range	0	S
		1	H
PC-51	Multi-speed 0 setting method	Factory value	0
	Setting range	0	Function code PC-00 setting
		1	AI1
		2	AI2
		3	Keyboard adjustable potentiometer
		4	PULSE pulse
		5	PID
		6	Preset frequency (P0-08) setting, can be modified by UP/DOWN

This parameter determines the target quantity setting channel for multi-speed 0.

## PD group Communication parameters

PD-00	Baud rate		Factory value	6005
	Setting range	Units digit	MODBUS baud rate	
		0	300BPS	
		1	600BPS	
		2	1200BPS	
		3	2400BPS	
		4	4800BPS	
		5	9600BPS	
		6	19200BPS	
7	38400BPS			

This parameter is used to set the data transfer rate between the host computer and the frequency converter. Note that the baud rates set by the host computer and the frequency converter must be the same; otherwise, communication cannot be carried out. The higher the baud rate, the faster the communication speed.

PD-01	Data format		Factory value	0
	Setting range	0	No parity: Data format <8,N,2>	
		1	Even parity: Data format <8,E,1>	
		2	Odd parity: Data format <8,O,1>	
		3	No parity: Data format <8-N-1>	

The data formats set by the host computer and the frequency converter must be the same; otherwise, communication cannot be carried out.

PD-02	Local address	Factory value	1
	Setting range	1~247, with 0 being the broadcast address	

When the local address is set to 0, it is the broadcast address, enabling the host computer's broadcast function. The local address is unique (except for the broadcast address), which is the basis for realizing point-to-point communication between the host computer and the frequency converter.

PD-03	Response delay	Factory value	2MS
	Setting range	0~20MS	

Response delay refers to the time interval between the end of data reception by the frequency converter and the sending of data to the host computer. If the response delay is less than the system processing time, the response delay is subject to the system processing time. If the response delay is longer than the system processing time, after the system finishes processing the data, it has to wait until the response delay time elapses before sending the data to the host computer.

PD-04	Communication timeout time	Factory value	0.0 S
	Setting range	0.0S (invalid), 0.1~60.0S	

When this function code is set to 0.0S, the communication timeout time parameter is invalid. When this function code is set to a valid value, if the time interval between one communication and the next exceeds the communication timeout time, the system will report a communication fault error (ERR16). Under normal circumstances, it is set to be invalid. If this parameter is set in a continuous communication system, the communication status can be monitored.

PD-05	Data transmission format selection	Factory value	30
	Setting range	Units digit: MODBUS 0: Non - standard MODBUS protocol 1: Standard MODBUS protocol Tens digit: PROFIBUS - DP 0: PPO1 format    1: PPO2 format 2: PPO3 format    3: PPO5 format	
PD-06	Communication read current resolution	Factory value	0
	Setting range	0	0.01A
		1	0.1A

It is used to determine the output unit of the current value when reading the output current through communication.

The 860S series frequency converters are equipped with RS485 communication interfaces and support the MODBUS communication protocol. Users can achieve centralized control through a computer or PLC, set the operating commands of the frequency converter, modify or read function code parameters, and read the operating status and fault information of the frequency converter.

## I. Protocol Content

This serial communication protocol defines the information content and the format used in serial communication. It includes: the host polling (or broadcasting) format; the encoding method of the host, including the function code for the required action, transmitted data, and error checking, etc. The slave's response also adopts the same structure, including action confirmation, returned data, and error checking, etc. If the slave encounters an error when receiving the information or cannot complete the action required by the host, it will organize a fault message as a response and feedback it to the host.

## II. Application Method

The frequency converter is connected to a "single-master and multi-slave" PC/PLC control network with an RS485 bus.

### III. Bus Structure

#### (1) Interface Mode

RS485 hardware interface

#### (2) Transmission Mode

Asynchronous serial, half - duplex transmission mode. At the same time, only one of the host and the slave can send data while the other can only receive data. During the asynchronous serial communication process, data is sent frame by frame in the form of messages.

#### (3) Topology Structure

Single - host and multi - slave system. The setting range of the slave address is 1~247, and 0 is the broadcast communication address. The slave addresses in the network must be unique.

### IV. Protocol Explanation

The communication protocol of the 860S series frequency converters is an asynchronous serial master - slave MODBUS communication protocol. Only one device (the host) in the network can establish the protocol (referred to as "query/command"). Other devices (slaves) can only respond to the host's "query/command" by providing data or take corresponding actions according to the host's "query/command". The host here refers to a personal computer (PC), industrial control equipment, programmable logic controller (PLC), etc., and the slave refers to the 860S frequency converter. The host can communicate with a single slave separately or send broadcast messages to all lower - level slaves. For a host's "query/command" for a single access, the slave must return an information (referred to as a response). For a broadcast message sent by the host, the slave does not need to feedback a response to the host.

### V. Communication Data Structure

The MODBUS protocol communication data format of the 860S series frequency converters is as follows: Using the RTU mode, message transmission must start with a pause interval of at least 3.5 character times. At the network baud rate, different character times are available, which is the easiest to achieve (as shown by T1 - T2 - T3 - T4 in the figure below). The first field of the transmission is the device address. The transmissible characters are hexadecimal 0...9, A...F. Network devices continuously detect the network bus, including during the pause interval. When the first field (address field) is received, each device decodes it to determine if it is sent to itself. After the last transmitted character, a pause of at least 3.5 character times marks the end of the message. A new message can start after this pause. The entire message frame must be transmitted as a continuous stream. If there is a pause of more than 1.5 character times before the frame is completed, the receiving device will discard the incomplete message and assume that the next byte is the address field of a new message. Similarly, if a new message starts less than 3.5 character times after the previous one, the receiving device will consider it a continuation of the previous message. This will result in an error because the value in the final CRC field cannot be correct.

RTU frame format:

Frame header START	3.5 character time
Slave address ADR	Communication address: 1 - 247
Command code CCNT	03: Read slave parameters; 06: Write slave parameters
Data content DATA(N - 1)	Data content: Function code parameter address, number of function code parameters, function code parameter values, etc.
Data content DATA(N - 2)	
.....	
Data content DATA0	
High bit of CRC CHK	Detection value: CRC value.
Low bit of CRC CHK	
END	3.5 character time

Check method - CRC check method: CRC (CYCLICAL REDUNDANCY CHECK)

When using the RTU frame format, the message includes an error detection field based on the CRC method. The CRC field checks the entire content of the message. The CRC field is two bytes, containing a 16-bit binary value. It is calculated by the transmitting device and added to the message. The receiving device recalculates the CRC of the received message and compares it with the value in the received CRC field. If the two CRC values are not equal, it indicates that there is an error in the transmission. CRC first stores 0XFFFF, and then calls a process to process the consecutive 8-bit bytes in the message with the value in the current register. Only the 8-bit data in each character is valid for CRC, and the start bit, stop bit, and parity bit are all invalid. During the CRC generation process, each 8-bit character is XORed separately with the content of the register. The result is shifted towards the least significant bit, and the most significant bit is filled with 0. The LSB is extracted for detection. If the LSB is 1, the register is XORed separately with a preset value. If the LSB is 0, no such operation is performed. The entire process is repeated 8 times. After the last bit (the 8th bit) is completed, the next 8-bit byte is XORed separately with the current value of the register. The value in the final register is the CRC value after all bytes in the message have been processed. When the CRC is added to the message, the low-order byte is added first, and then the high-order byte. The simple CRC function is as follows:

```
UNSIGNED INT CRC_CHK_VALUE(UNSIGNED CHAR
```

```
*DATA_VALUE,UNSIGNED CHAR LENGTH)
{
    UNSIGNED INT CRC_VALUE=0XFFFF;
    INT I;
    WHILE(LENGTH--)
    {
        CRC_VALUE^=*DATA_VALUE++;
        FOR(I=0;I<8;I++)
    }
}
```

```

        IF(CRC_VALUE&0X0001)
        {
            CRC_VALUE=(CRC_VALUE>>1)^0XA001;
        }
        ELSE
        {
            CRC_VALUE=CRC_VALUE>>1;
        }
    }
}
RETURN(CRC_VALUE);
}

```

#### Address Definition of Communication Parameters

This part is the content of communication, which is used to control the operation of the frequency converter, set the frequency converter status and related parameters. Read and write function code parameters (some function codes cannot be changed and are only for manufacturers' use):

Parameter Address Identification Rule for Function Codes:

The rule for representing the parameter address is based on the function code group number and label:

High - order byte: 70 - 7F, F0 - FF, A0 - AF, B0 - BF, C0 - CF

Low - order byte: 00 - FF

For example, for P3 - 12, the address is represented as F30C;

Note:

The PF group: parameters cannot be read or changed; some parameters cannot be changed when the frequency converter is in operation; some parameters cannot be changed regardless of the operating state of the frequency converter; when changing function code parameters, attention should also be paid to the parameter range, unit, and related instructions.

In addition, since the EEPROM is frequently stored, it will reduce the service life of the EEPROM. Therefore, for some function codes, there is no need to store them in the communication mode, and only the value in the RAM needs to be changed. To achieve this function, just change the high - order F of the function code address to 0.

The corresponding function code address is represented as follows:

High - order byte: 00 - 0F

Low - order byte: 00 - FF

For example, if the function code P3 - 12 is not stored in the EEPROM, the address is represented as 030C;

This address representation can only be used for writing to the RAM and cannot be used for reading. When reading, it is an invalid address.

Shutdown/Operation Parameter Section:

Parameter address	Parameter description
1000H	Communication setting value (-10000 ~ 10000) (decimal)
1001H	Operating frequency
1002H	Bus voltage
1003H	Output voltage
1004H	Output current
1005H	Output power
1006H	Output torque
1007H	Operating speed
1008H	X input flag
1009H	Y output flag
100AH	AI1 voltage
100BH	AI12 voltage
100CH	Keyboard potentiometer voltage
100DH	Counter value input
100EH	Length value input
100FH	Load speed
1010H	PID setting
1011H	PID feedback
1012H	PLC step
1013H	PULSE input pulse frequency, unit 0.01kHz
1014H	Feedback speed, unit 0.1Hz
1015H	Remaining running time
1016H	AI1 voltage before calibration
1017H	AI2 voltage before calibration
1018H	Keyboard potentiometer voltage before calibration
1019H	Linear velocity

Parameter address	Parameter description
101AH	Current power - on time
101BH	Current running time
101CH	PULSE input pulse frequency, unit 1Hz
101DH	Communication setting value
101EH	Actual feedback speed
101FH	Main frequency X display
1020H	Auxiliary frequency Y display
1019H	Linear velocity
101AH	Current power - on time
101BH	Current running time
101CH	PULSE input pulse frequency, unit 1Hz
101DH	Communication setting value
101EH	Actual feedback speed
101FH	Main frequency X display
1020H	Auxiliary frequency Y display

**Note:**

The communication setting value is the percentage of the relative value. 10000 corresponds to 100.00% and - 10000 corresponds to - 100.00%.

For data with the dimension of frequency, this percentage is relative to the maximum frequency (P0 - 10); for data with the dimension of torque, this percentage is relative to P2 - 10 (digital setting of torque upper limit).

Control commands input to the frequency converter: (write - only)

Command address	Command function
2000H	0001: Forward operation
	0002: Reverse operation
	0003: Forward jogging
	0004: Reverse jogging
	0005: Free stop
	0006: Deceleration stop
	0007: Fault reset

Control commands input to the frequency converter: (read - only)

Command address	Command function
3000H	0001: Forward operation
	0002: Reverse operation
	0003: Stop operation

Parameter lock password verification: (If the return value is 8888H, it means the password verification is passed)

Command address	Content of the input password
1F00H	*****

Digital output terminal control: (write - only)

Command address	Content of the input password
2001H	BIT0: Y1 output control BIT1: Y2 output control BIT2: RELAY1 output control BIT3: RELAY2 output control BIT4: FMR output control BIT5: VY1 BIT6: VY2 BIT7: VDO3 BIT8: VDO4 BIT9: VDO5

Analog output AO1 control: (write - only)

Command address	Command content
2002H	0 ~ 7FFF represents 0% ~ 100%

Analog output AO2 control: (write - only)

Command address	Command content
2003H	0 ~ 7FFF represents 0% ~ 100%

Pulse (PULSE) output control: (write - only)

Command address	Command content
2004H	0 ~ 7FFF represents 0% ~ 100%

Frequency converter fault description:

Command address	Frequency converter fault information
8000H	0000: No fault 0001: Reserved 0002: Over - current during acceleration 0003: Over - current during deceleration 0004: Over - current during constant speed 0005: Over - voltage during acceleration 0006: Over - voltage during deceleration 0007: Over - voltage during constant speed 0008: Buffer resistor overload fault 0009: Under - voltage fault 000A: Inverter overload 000B: Motor overload 000C: Input phase - loss 000D: Output phase - loss 000E: Module overheating 000F: External fault 0010: Communication anomaly 0011: Contactor anomaly 0012: Current detection fault 0013: Motor tuning fault 0014: Encoder/PG card fault

Command address	Frequency converter fault information
8000H	0015: Parameter read - write exception 0016: Inverter hardware failure 0017: Motor to - ground short - circuit fault 0018: Reserved 0019: Reserved 001A: Running time reached 001B: User - defined fault 1 001C: User - defined fault 2 001D: Power - on time reached 001E: Load loss 001F: PID feedback loss during operation 0028: Fast current - limiting timeout fault 0029: Motor switching fault during operation 002A: Excessive speed deviation 002B: Motor overspeed 002D: Motor overheating 005A: Incorrect encoder line count setting 005B: Encoder not connected 005C: Initial position error 005E: Speed feedback error

### PP group User password

PP-00	User password	Factory value	0
	Setting range	0 ~ 65535	

Set it to any non - zero number, and the password protection function will take effect. 0000: Clear the previously set user password value and make the password protection function invalid. When the user password is set and takes effect, when entering the parameter setting state again, if the user password is incorrect, only parameter viewing is allowed, and parameter modification is not permitted. Please remember the set user password. If you accidentally set it wrong or forget it, please contact the manufacturer.

PP-01	Parameter initialization	Factory value	0
	Setting range	0	No operation
		1	Restore factory setting values, excluding factory parameters

1. Restore factory settings, excluding motor parameters. Motor parameters will not be restored, the decimal point of the frequency command (P0.22) will not be restored, and the recorded information will not be restored.

PP-02	Display selection for function parameter mode		Factory value	11
	Setting range	Units digit	Group U display selection	
		0	Not displayed	
		1	Displayed	
		Tens digit	Group A display selection	
		0	Not displayed	
1		Displayed		
PP-04	Function code read-only control		Factory value	0
	Setting range	0	Function code read - only invalid	
		1	Function code valid	

When this function code is selected as 1, all function codes cannot be modified and are read - only.

### A0 group Torque control and limit parameters

A0-00	Speed/Torque Control Mode		Factory value	0
	Setting range	0	Speed control	
		1	Torque control	

It is used to select the control mode of the frequency converter: speed control or torque control. Note: This function code cannot be used to switch the control mode during the operation of the frequency converter. The multi - function digital DI terminal of 860S has two functions related to torque control: torque control prohibition (Function 29), and speed control / torque control switching (Function 46). These two terminals need to be used in conjunction with A0 - 00 to achieve the switching between speed and torque control.

When the speed control/torque control switching terminal is invalid, the control mode is determined by A0 - 00. If the speed control/torque control switching is effective, the control mode is equivalent to the value of A0 - 00 being reversed. In any case, when the torque control prohibition terminal is effective, the frequency converter is fixed in the speed control mode.

A0-01	Source of drive torque upper limit	Factory value	0
	Setting range	0	Digital setting (A0 - 03)
		1	AI1
		2	AI2
		3	Keyboard adjustable potentiometer
		4	PULSE pulse setting
		5	Communication given
		6	MIN(AI1, AI2)
		7	MAX(AI1, AI2)
Full scale of options 1 ~ 7 corresponds to A0 - 03			
A0-03	Digital setting of drive torque upper limit	Factory value	150.0%
	Setting range	-200.0% ~ 200.0%	

A0 - 01 is used to select the torque setting source, and there are 8 torque setting methods in total. The torque setting adopts relative values, with 100.0% corresponding to the rated torque of the motor. The setting range is - 200.0% to 200.0%, indicating that the maximum torque of the frequency converter is 2 times the rated torque of the frequency converter. When the torque given value is positive, the frequency converter runs forward; when the torque given value is negative, the frequency converter runs in reverse. The descriptions of each torque setting source are as follows:

0: Digital setting (A0 - 03) means that the target torque directly uses the set value of A0 - 03.

1: AI1

2: AI2

3: AI3

It means that the target torque is determined by the analog input terminals. The 860S control board provides 2 analog input terminals (AI1, AI2). Among them, AI1 is a voltage - type input of 0V ~ 10V;

AI2 can be a voltage input of 0V ~ 10V or a current input of 0mA ~ 20mA, which is selected by the J2 jumper on the control board.

For the input voltage values of AI1 and AI2, the corresponding relationship curves with the target torque can be freely selected by the user through P4 - 33.

The 860S provides 5 sets of corresponding relationship curves, among which 3 sets of curves are in a linear relationship (2 - point correspondence), and 2 sets of curves are arbitrary curves with 4 - point correspondence. The user can set them through the function codes P4 - 13 to P4 - 27 and the function codes of group A6.

The function code P4 - 33 is used to set the three - way analog input of AI1 ~ AI3, respectively selecting which set of the 5 sets of curves.

When AI is used as the frequency given, the voltage/current input corresponding to the set 100.0% refers to the percentage relative to the digital torque setting of A0 - 03.

## 4: PULSE Pulse (X5)

The target torque setting is given through the high - speed pulse of terminal DI5.

Pulse given signal specifications: voltage range 9V ~ 30V, frequency range 0KHZ ~ 100KHZ. The pulse setting can only be input from the multi - function input terminal X5.

The relationship between the input pulse frequency of the DX5 terminal and the corresponding setting is set through P4 - 28 to P4 - 31. This corresponding relationship is a two - point linear correspondence. The 100.0% corresponding to the pulse input refers to the percentage relative to the digital torque setting of A0 - 03.

5: Communication given means that the target torque is given by the communication method.

A0-05	Torque control forward maximum frequency	Factory value	50.00HZ
	Setting range	0.00HZ ~ Maximum frequency (P0 - 10)	
A0-06	Torque control reverse maximum frequency	Factory value	50.00HZ
	Setting range	0.00HZ ~ Maximum frequency (P0 - 10)	

During torque control, the acceleration and deceleration times for the frequency upper limit are set in F8 - 07 (acceleration)/F8 - 08 (deceleration).

It is used to set the forward or reverse maximum operating frequency of the frequency converter in torque control mode. When the frequency converter is in torque control, if the load torque is less than the motor output torque, the motor speed will keep rising. To prevent accidents such as run - away of the mechanical system, it is necessary to limit the maximum speed of the motor during torque control. If dynamic and continuous change of the maximum frequency in torque control is required, it can be achieved by controlling the upper limit frequency.

A0-07	Torque control acceleration time	Factory value	0.00S
	Setting range	0.00S ~ 65000S	
A0-08	Torque control deceleration time	Factory value	0.00S
	Setting range	0.00S ~ 65000S	

In torque control mode, the difference between the motor output torque and the load torque determines the rate of change of the speed of the motor and the load. Therefore, the motor speed may change rapidly, causing problems such as noise or excessive mechanical stress. By setting the torque control acceleration and deceleration times, the motor speed can change smoothly.

In torque control with low - torque startup, it is not recommended to set the torque acceleration and deceleration times. If the torque acceleration and deceleration times are set, it is recommended to appropriately increase the speed filtering coefficient. In applications where rapid torque response is required, set the torque control acceleration and deceleration times to 0.00S.

For example, when two motors are rigidly connected to drive the same load, to ensure even load distribution, one frequency converter is set as the master unit and adopts speed control mode, and the other frequency converter is set as the slave unit and adopts torque control. The actual output torque of the master unit is used as the torque command of the slave unit. At this time, the torque of the slave unit needs to follow that of the master unit quickly, so the torque control acceleration and deceleration times of the slave unit are set to 0.00S.

## A2 group Second Motor Parameters

The 860S can switch and operate between two motors. The nameplate parameters of the two motors can be set respectively, motor parameter tuning can be carried out respectively, V/F control or vector control can be selected respectively, encoder - related parameters can be set respectively, and parameters related to the performance of V/F control or vector control can be set separately.

The function codes in Group A2 correspond to Motor 2. All the parameters in Group A2 have the same content definition and usage method as the relevant parameters of the first motor. Therefore, they will not be repeated here. Users can refer to the description of the relevant parameters of the first motor.

A2-00	Motor type selection	Factory value	0
	Setting range	0	Common asynchronous motor
		1	Variable - frequency asynchronous motor
2	Permanent magnet synchronous motor		
A2-01	Rated power	Factory value	Model determination
	Setting range	0.1KW ~ 1000.0KW	
A2-02	Rated voltage	Factory value	Model determination
	Setting range	0V ~ 2000V	
A2-03	Rated current	Factory value	Model determination
	Setting range	0.01A ~ 655.35A (Inverter power ≤ 55KW) 0.1A ~ 6553.5A (Inverter power > 55KW)	
A2-04	Rated frequency	Factory value	Model determination
	Setting range	0.00HZ ~ Maximum frequency	
A2-05	Rated speed	Factory value	Model determination
	Setting range	ORPM ~ 65535RPM	
A2-06	Stator resistance of asynchronous motor	Factory value	Model determination
	Setting range	0.001Ω - 65.535Ω (Inverter power ≤ 55KW) 0.0001Ω - 6.5535Ω (Inverter power > 55KW)	
A2-07	Rotor resistance of asynchronous motor	Factory value	Model determination
	Setting range	0.001Ω - 65.535Ω (Inverter power ≤ 55KW) 0.0001Ω - 6.5535Ω (Inverter power > 55KW)	
A2-08	Leakage reactance of asynchronous motor	Factory value	Model determination
	Setting range	0.01mH - 65.535mH (Inverter power ≤ 55KW) 0.001mH - 6.5535mH (Inverter power > 55KW)	
A2-09	Mutual reactance of asynchronous motor	Factory value	Model determination
	Setting range	0.1mH - 6553.5mH (Inverter power ≤ 55KW) 0.01mH - 655.35mH (Inverter power > 55KW)	

A2-10	No - load current of asynchronous motor		Factory value	Model determination
	Setting range		0.01A ~ P1 - 03 (Inverter power ≤ 55KW) 0.1A ~ P1 - 03 (Inverter power > 55KW)	
A2-27	Number of encoder pulses		Factory value	1024
	Setting range		1 ~ 65535	
A2-28	Encoder type		Factory value	0
	Setting range	0	ABZ incremental encoder	
		1	UVW incremental encoder	
		2	Resolver	
		3	Sine - cosine encoder	
	4	UVW encoder in wire - saving mode		
A2-30	Encoder phase sequence / main direction		Factory value	0
	Setting range	0	Forward	
		1	Reverse	
A2-31	Encoder installation position angle		Factory value	0.0°
	Setting range		0.0° ~ 359.9°	
A2-32	UVW signal direction		Factory value	0
	Setting range	0	Forward	
		1	Reverse	
A2-33	UVW zero-point signal position angle		Factory value	0.0°
	Setting range		0.0° ~ 359.9°	
A2-34	Number of resolver pole pairs		Factory value	1
	Setting range		1 ~ 65535	
A2-36	Speed feedback PG disconnection detection time		Factory value	0.0S
	Setting range		0.0: No action 0.1S ~ 10.0S	
A2-37	Tuning selection		Factory value	0
	Setting range	0	No operation	
		1	Asynchronous motor static tuning	
		2	Asynchronous motor complete tuning	
		11	Synchronous motor no-load encoder zero position angle tuning	
	12	Synchronous motor load encoder zero position angle tuning		

Set the parameter information of Motor 2. For detailed introduction, refer to the parameters of the first motor in Group P1.

A2-38	Speed loop proportional gain 1	Factory value	30
	Setting range		1 ~ 100
A2-39	Speed loop integral time 1	Factory value	0.50S
	Setting range		0.01S ~ 10.00S
A2-40	Switching frequency 1	Factory value	5.00HZ
	Setting range		0.00 ~ P2-05
A2-41	Speed loop proportional gain 2	Factory value	20
	Setting range		0 ~ 100
A2-42	Speed loop integral time 2	Factory value	1.00S
	Setting range		0.01S ~ 10.00S
A2-43	Switching frequency 2	Factory value	10.00HZ
	Setting range		P2-02 ~ Maximum output frequency
A2-44	Slip compensation coefficient	Factory value	100%
	Setting range		50% ~ 200%
A2-45	Speed loop filter time constant	Factory value	0.000S
	Setting range		0.000S ~ 0.100S
A2-46	Vector control over-excitation gain	Factory value	64
	Setting range		0 ~ 200
A2-47	Speed control (drive) torque upper limit source	Factory value	0
	Setting range	0	Setting of function code A2-48
		1	AI1
		2	AI2
		3	Adjustable potentiometer on the keyboard
		4	PULSE setting
		5	Communication setting

A2-48	Digital setting of speed control (drive) torque upper limit	Factory value	150.0%
	Setting range	0.0% ~ 200.0%	
A2-51	M - axis current loop proportional gain	Factory value	2000
	Setting range	0 ~ 20000	
A2-52	M - axis current loop integral gain	Factory value	1300
	Setting range	0 ~ 20000	
A2-53	T - axis current loop proportional gain	Factory value	2000
	Setting range	0 ~ 20000	
A2-54	T - axis current loop integral gain	Factory value	1300
	Setting range	0 ~ 20000	
A2-55	Speed loop derivative time	Factory value	0
	Setting range	0 ~ 65535	
A2-56	Synchronous machine field - weakening mode	Factory value	1
	Setting range	0	No field weakening
		1	Direct calculation
		2	Automatic adjustment
A2-57	Synchronous machine field - weakening coefficient	Factory value	100%
	Setting range	100% ~ 1000%	
A2-58	Maximum field - weakening current	Factory value	50%
	Setting range	1% ~ 300%	
A2-59	Field - weakening automatic tuning coefficient	Factory value	100%
	Setting range	10% ~ 500%	
A2-60	Field - weakening integral multiple	Factory value	2
	Setting range	2 ~ 10	

Set the vector control parameters of Motor 2. For detailed introduction, refer to the vector control parameter information of Motor 1 in Group P2.

A2-61	The second motor control mode	Factory value	0
	Setting range	0	Sensorless vector control (SVC)
		1	Sensor - based vector control (FVC)
		2	V/F control

Set the control mode of motor 2. For detailed introduction, refer to the control mode of motor 1 (P0 - 01).

A2-62	The second motor control mode	Factory value	0
	Setting range	0	Same as the first motor
		1	Acceleration and deceleration time 1
		2	Acceleration and deceleration time 2
		3	Acceleration and deceleration time 3
		4	Acceleration and deceleration time 4

Select the acceleration and deceleration time of motor 2. When it is 0, it is the same as that of motor 1. Different acceleration and deceleration times can be selected through terminals. When it is 1, 2, 3, or 4, a specific set of acceleration and deceleration times is directly specified.

A2-63	The second motor torque boost	Factory value	Model determination
	Setting range	0.0%: Automatic torque boost 0.1% ~ 30.0%	

Set the torque boost of motor 2. For detailed introduction, refer to the torque boost of motor 1 (P3 - 01).

A2-65	The second motor oscillation suppression gain	Factory value	Model determination
	Setting range	0 ~ 100	

## A5 group Control optimization parameters

A5-00	Upper limit frequency of DPWM switching	Factory value	8.00HZ
	Setting range	0.00HZ ~ 15HZ	

It is only valid for V/F control. The wave generation mode during V/F operation of the asynchronous motor is determined. If it is lower than this value, it is the 7-segment continuous modulation mode; otherwise, it is the 5-segment discontinuous modulation mode.

When it is in the 7-segment continuous modulation mode, the switching loss of the frequency converter is large, but the current ripple is small. In the 5-segment discontinuous modulation mode, the switching loss is small and the current ripple is large. However, at high frequencies, it may lead to the instability of the motor operation and generally does not need to be modified.

For the instability of V/F operation, please refer to function code P3-11. For the loss and temperature rise of the frequency converter, please refer to function code P0-15.

A5-01	PWM modulation mode	Factory value	0
	Setting range	0	Asynchronous modulation
		1	Synchronous modulation

It is only valid for V/F control. Synchronous modulation means that the carrier frequency changes linearly with the output frequency, ensuring that the ratio (carrier ratio) between the two remains constant. It is generally used when the output frequency is high, which is beneficial to the quality of the output voltage. When the output frequency is low (below 100HZ), synchronous modulation is generally not required because the ratio of the carrier frequency to the output frequency is relatively high at this time, and asynchronous modulation has more obvious advantages.

Synchronous modulation takes effect only when the operating frequency is higher than 85HZ. Below this frequency, the asynchronous modulation mode is fixed.

A5-02	Dead - zone compensation mode selection	Factory value	1
	Setting range	0	No compensation
		1	Compensation mode 1
		2	Compensation mode 2

This parameter generally does not need to be modified. Only when there are special requirements for the quality of the output voltage waveform, or when the motor experiences abnormal conditions such as oscillation, it is necessary to try switching to different compensation modes.

A5-03	Random PWM depth	Factory value	0
	Setting range	0	Random PWM is invalid.
		1 ~ 10	Random depth of PWM carrier frequency

Set random PWM, which can make the monotonous and harsh motor noise softer and help reduce external electromagnetic interference. When the random PWM depth is set to 0, random PWM is invalid. Different effects can be obtained by adjusting different depths of random PWM.

A5-04	Fast current limiting enable	Factory value	1
	Setting range	0	Disable
		1	Enable

Enabling the fast current - limiting function can minimize the occurrence of over - current faults in the frequency converter and ensure its uninterrupted operation. If the frequency converter remains in the fast current - limiting state for a long time, it may be damaged due to overheating, etc. This situation is not allowed. Therefore, when the frequency converter is in fast current - limiting for a long time, it will alarm with fault ERR40, indicating that the frequency converter is overloaded and needs to be shut down.

A5-05	Current detection compensation	Factory value	5
	Setting range	0 ~ 100	

It is used to set the current detection compensation of the frequency converter. Setting it too large may lead to a decline in control performance, and generally no modification is required.

A5-06	Undervoltage point setting	Factory value	100.0%
	Setting range	60.0% ~ 140.0%	

It is used to set the voltage value of the under-voltage fault ERR09 of the frequency converter. For frequency converters with different voltage levels, 100.0% corresponds to different voltage points, which are: single-phase 220V or three-phase 220V: 200V; three-phase 380V: 350V.

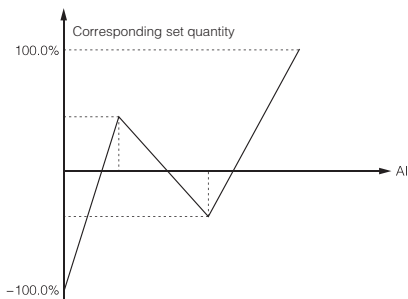
A5-07	SVC optimization mode selection	Factory value	1
	Setting range	0	Do not optimize.
		1	Optimization mode 1
		2	Optimization mode 2

A5-08	Dead time adjustment	Factory value	150%
	Setting range	100% ~ 200%	
A5-09	Overvoltage point setting	Factory value	Model determination
	Setting range	200V ~ 2200V	

**A6 group AI curve setting**

A6-00	Curve 4 minimum input	Factory value	0.00V
	Setting range		-10.00V ~ A8-02
A6-01	Curve 4 minimum input corresponding setting	Factory value	0.0%
	Setting range		-100.0% ~ 100.0%
A6-02	Curve 4 inflection point 1 input	Factory value	3.00V
	Setting range		A8-00 ~ A8-04
A6-03	Curve 4 inflection point 1 input corresponding setting	Factory value	30.0%
	Setting range		-100.0% ~ 100.0%
A6-04	Curve 4 inflection point 2 input	Factory value	6.00V
	Setting range		A8-02 ~ A8-06
A6-05	Curve 4 inflection point 2 input corresponding setting	Factory value	60.0%
	Setting range		-100.0% ~ 100.0%
A6-06	Curve 4 maximum input	Factory value	10.00V
	Setting range		A8-06 ~ 10.00V
A6-07	Curve 4 maximum input corresponding setting	Factory value	100.0%
	Setting range		-100.0% ~ 100.0%
A6-08	Curve 4 minimum input	Factory value	-10.00V
	Setting range		-10.00V ~ A8-10
A6-09	Curve 5 minimum input corresponding setting	Factory value	-100.0%
	Setting range		-100.0% ~ 100.0%
A6-10	Curve 5 inflection point 1 input	Factory value	-3.00V
	Setting range		A8-08 ~ A8-12
A6-11	Curve 5 inflection point 1 input corresponding setting	Factory value	-30.0%
	Setting range		-100.0% ~ 100.0%
A6-12	Curve 5 inflection point 2 input	Factory value	3.00V
	Setting range		A8-10 ~ A8-14
A6-13	Curve 5 inflection point 2 input corresponding setting	Factory value	30.0%
	Setting range		-100.0% ~ 100.0%
A6-14	Curve 5 maximum input	Factory value	10.00V
	Setting range		A8-14 ~ 10.00V
A6-15	Curve 5 maximum input corresponding setting	Factory value	100.0%
	Setting range		-100.0% ~ 100.0%

The functions of curves 4 and 5 are similar to those of curves 1, 2, and 3, but an additional inflection point input is added to achieve a more flexible corresponding relationship. Diagram:



A6-24	AI1 setting jump point	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
A6-25	AI1 setting jump amplitude	Factory value	0.5%
	Setting range	0.0% ~ 100.0%	
A6-26	AI2 setting jump point	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
A6-27	AI2 setting jump amplitude	Factory value	0.5%
	Setting range	0.0% ~ 100.0%	
A6-28	AI3 setting jump point	Factory value	0.0%
	Setting range	-100.0% ~ 100.0%	
A6-29	AI3 setting jump amplitude	Factory value	0.5%
	Setting range	0.0% ~ 100.0%	

Set the AI set - value jump function. If the jump point - amplitude < actual value < jump point + amplitude, then the AI given value is the AI setting jump point.

**AC group AIAO calibration**

AC-00	AI1 measured voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	
AC-01	AI1 sampled voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	
AC-02	AI1 measured voltage 2	Factory value	Factory calibration
	Setting range	6.000V ~ 9.999V	
AC-03	AI1 sampled voltage 2	Factory value	Factory calibration
	Setting range	6.000V ~ 9.999V	
AC-04	AI2 measured voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	
AC-05	AI2 sampled voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	
AC-06	AI2 measured voltage 2	Factory value	Factory calibration
	Setting range	6.000V ~ 9.999V	
AC-07	AI2 sampled voltage 2	Factory value	Factory calibration
	Setting range	-9.999V ~ 10.000V	
AC-08	Measured voltage 1 of keyboard potentiometer	Factory value	Factory calibration
	Setting range	-9.999V ~ 10.000V	
AC-09	Sampled voltage 1 of keyboard potentiometer	Factory value	Factory calibration
	Setting range	-9.999V ~ 10.000V	
AC-10	Measured voltage 2 of keyboard potentiometer	Factory value	Factory calibration
	Setting range	-9.999V ~ 10.000V	
AC-11	Sampled voltage 2 of keyboard potentiometer	Factory value	Factory calibration
	Setting range	-9.999V ~ 10.000V	
AC-12	A01 ideal voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	

AC-13	A01 measured voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	
AC-14	A01 ideal voltage 2	Factory value	Factory calibration
	Setting range	6.000V ~ 9.999V	
AC-15	A01 measured voltage 2	Factory value	Factory calibration
	Setting range	6.000V ~ 9.999V	
AC-16	A02 ideal voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	
AC-17	A02 measured voltage 1	Factory value	Factory calibration
	Setting range	0.500V ~ 4.000V	
AC-18	A02 ideal voltage 2	Factory value	Factory calibration
	Setting range	6.000V ~ 9.999V	
AC-19	A02 measured voltage 2	Factory value	Factory calibration
	Setting range	6.000V ~ 9.999V	

This group of function codes is used to calibrate the analog input and output AI/AO. Set according to the actual situation. The function parameters in this group have been calibrated at the factory, and when restoring the factory settings, they will be restored to the values after factory calibration.

Analog input AI calibration:

The measured voltage refers to the actual voltage measured by a precision measuring instrument, and the sampled voltage refers to the voltage display value sampled by the frequency converter itself. See the voltage before AI calibration in group U0 (U0 - 21, U0 - 22, U0 - 23) for display.

Analog output AO calibration:

The ideal voltage refers to the theoretical output voltage value of the frequency converter. The measured voltage refers only to the actual output voltage value measured by a precision instrument.

**U0 group Monitoring parameter group**

Function code	Name	Unit
U0-00	Operating frequency (HZ)	0.01HZ
U0-01	Set frequency (HZ)	0.01HZ
U0-02	Bus voltage (V)	0.1V
U0-03	Output voltage (V)	1V
U0-04	Output current (A)	0.01A
U0-05	Output power (KW)	0.1KW
U0-06	Output torque (%)	0.1%
U0-07	X input status	1
U0-08	DO output status	1
U0-09	AI1 voltage (V)	0.01V
U0-10	AI2 voltage (V)	0.01V
U0-11	AI3 voltage (V)	0.01V
U0-12	Count value	1
U0-13	Length value	1
U0-14	Load speed display	1
U0-15	PID setting	1
U0-16	PID feedback	1
U0-17	PLC stage	1
U0-18	PULSE input pulse frequency (HZ)	0.01KHZ
U0-19	Feedback speed (unit 0.1HZ)	0.1HZ
U0-20	Remaining running time	0.1MIN
U0-21	AI1 voltage before calibration	0.001V
U0-22	AI2 voltage before calibration	0.001V
U0-23	AI3 voltage before calibration	0.001V
U0-24	Linear velocity	1M/MIN
U0-25	Current power - on time	1MIN

Function code	Name	Unit
U0-26	Current running time	0.1MIN
U0-27	PULSE input pulse frequency	1HZ
U0-28	Communication set value	0.01%
U0-29	Encoder feedback speed	0.01HZ
U0-30	Main frequency X display	0.01HZ
U0-31	Auxiliary frequency Y display	0.01HZ
U0-32	View value of any memory address	1
U0-33	Rotor position of synchronous machine	0.0°
U0-34	Motor temperature value	
U0-35	Target torque (%)	0.1%
U0-36	Resolver position	1
U0-37	Power factor angle	0.1°
U0-38	ABZ position	
U0-39	VF - separated target voltage	1V
U0-40	VF - separated output voltage	1V
U0-41	Intuitive display of X input status	
U0-42	Intuitive display of DO input status	
U0-43	Intuitive display of X function status 1	
U0-44	Intuitive display of X function status 2	
U0-45	Fault information	
U0-46	Reserved	
U0-47	Reserved	
U0-48	Reserved	
U0-49	Reserved	
U0-50	0.5MSA occupancy time	0.1MS
U0-51	0.5MSB occupancy time	0.1MS
U0-52	0.5MSC occupancy time	0.1MS

Function code	Name	Unit
U0-53	0.5MSD occupancy time	0.1MS
U0-54	0.5MSA execution time	0.1MS
U0-55	0.5MSB execution time	0.1MS
U0-56	0.5MSC execution time	0.1MS
U0-57	0.5MSD execution time	0.1MS
U0-58	Z - signal counter	1
U0-59	Set frequency (%)	0.01%
U0-60	Operating frequency (%)	0.01%
U0-61	Frequency converter status	1
U0-62	Current fault code	1
U0-63	Point - to - point communication sending value	0.01%
U0-64	Number of slave stations	1
U0-65	Torque upper limit	0.01%
U0-66	Communication expansion card model	100 : CANOpen 200 : Profibus-DP 300 : CANLink
U0-67	Communication expansion card version number	Display range
U0-68	DP card frequency converter status	BIT0 - Operating status BIT1 - Operating direction BIT2 - Whether the frequency converter has a fault BIT3 - Target frequency reached BIT4 - BIT7 - Reserved BIT8 - BIT15 - Fault code
U0-69	Transmission speed of DP card /0.01HZ	0.00 - Maximum frequency

This group of function codes is used by users to display the operating status information of the frequency converter. Among them, U0 - 00 to U0 - 31 are the operating and stop monitoring parameters defined in P7 - 03 and P7 - 04.

## EMC (Electromagnetic Compatibility) Guidance

### Definition

Electromagnetic compatibility refers to the ability of electrical equipment to operate in an electromagnetic interference environment, not interfere with the electromagnetic environment, and stably achieve its functions.

### Definition

According to the requirements of the national standard GB/T12668.3, frequency converters need to meet the requirements of both electromagnetic interference and electromagnetic immunity.

The standard implemented in the design of the 860S series frequency converters is: IEC/EN61800 - 3:2004 (ADJUSTABLE - SPEED ELECTRICAL POWER DRIVE SYSTEMS PART 3: EMC REQUIREMENTS AND SPECIFIC TEST METHODS), which is equivalent to the national standard GB/T12668.3.

IEC/EN61800 - 3 mainly examines frequency converters from two aspects: electromagnetic interference and electromagnetic immunity. For electromagnetic interference, it mainly tests the radiation interference, conduction interference, and harmonic interference of the frequency converter (this requirement applies to frequency converters used in civil applications). For electromagnetic immunity, it mainly tests the conduction immunity, radiation immunity, surge immunity, electrical fast transient/burst immunity, ESD immunity, and power - supply low - frequency - end immunity of the frequency converter (specific test items include: 1. Immunity test to input voltage dips, interruptions, and variations; 2. Immunity test to commutation notches; 3. Immunity test to harmonic input; 4. Input frequency variation test; 5. Input voltage unbalance test; 6. Input voltage fluctuation test). Tested in strict accordance with the above - mentioned requirements of IEC/EN61800 - 3, and when our company's products are installed and used according to the guidance shown in 6.3, they will have good electromagnetic compatibility in general industrial environments.

### EMC Guidance

Influence of harmonics:

High - order harmonics in the power supply can damage the frequency converter. Therefore, in some places with poor power grid quality, it is recommended to install an AC input reactor.

Electromagnetic interference and installation precautions:

There are two types of electromagnetic interference. One is the interference of electromagnetic noise in the surrounding environment on the frequency converter, and the other is the interference generated by the frequency converter on surrounding equipment.

Installation precautions:

- The grounding wires of the frequency converter and other electrical products should be well - grounded.
- The power input and output power lines of the frequency converter and weak - current signal lines (such as control circuits) should be arranged as little as possible in parallel, and if possible, arranged vertically.
- It is recommended to use shielded cables for the output power lines of the frequency converter, or use steel pipes to shield the power lines, and the shielding layer should be reliably grounded. For the leads of equipment affected by interference, it is recommended to use twisted - pair shielded control wires, and the shielding layer should be reliably grounded.
- For motor cables with a length exceeding 100M, it is required to install an output filter or reactor.

Methods for dealing with the interference of surrounding electromagnetic equipment on the frequency converter:

Generally, the reason for the electromagnetic influence on the frequency converter is the installation of a large number of relays, contactors, or electromagnetic brakes near the frequency converter. When the frequency converter malfunctions due to this interference, the following methods are recommended to solve the problem:

- Install a surge suppressor on the device causing interference.
- Install a filter at the input end of the frequency converter. Refer to 6.3.6 for specific operations.
- Use shielded cables for the control signal lines and detection circuit leads of the frequency converter, and reliably ground the shielding layer.

Methods for dealing with the interference of the frequency converter on surrounding equipment:

This part of the interference is divided into two types: one is the radiation interference of the frequency converter, and the other is the conduction interference of the frequency converter. These two types of interference cause surrounding electrical equipment to be affected by electromagnetic or electrostatic induction, and then cause the equipment to malfunction. For several different interference situations, refer to the following methods to solve:

- For measuring instruments, receivers, sensors, etc., the signals are generally weak. If they are close to the frequency converter or in the same control cabinet, they are likely to be interfered and malfunction. The following methods are recommended to solve: Keep as far away from the interference source as possible; Do not arrange the signal lines parallel to the power lines, especially do not bundle them together in parallel; Use shielded cables for the signal lines and power lines, and ensure good grounding; Add a ferrite magnetic ring on the output side of the frequency converter (select a suppression frequency in the range of 30 - 1000MHz), and wind it 2 - 3 turns. For severe situations, an EMC output filter can be selected for installation.
- When the equipment affected by interference and the frequency converter use the same power supply, conduction interference occurs. If the above methods cannot eliminate the interference, an EMC filter should be installed between the frequency converter and the power supply (refer to 6.3.6 for specific selection operations).
- The peripheral equipment is grounded separately, which can eliminate the interference caused by the leakage current in the grounding wire of the frequency converter when sharing the same ground.

Leakage current and treatment:

When using a frequency converter, there are two forms of leakage current: one is the leakage current to the ground; the other is the leakage current between lines.

- Factors affecting the leakage current to the ground and solutions:

There is a distributed capacitance between the wire and the ground. The larger the distributed capacitance, the larger the leakage current; effectively reduce the distance between the frequency converter and the motor to reduce the distributed capacitance. The larger the carrier frequency, the larger the leakage current. The leakage current can be reduced by reducing the carrier frequency. However, reducing the carrier frequency will cause an increase in motor noise. Please note that installing a reactor is also an effective way to solve the leakage current. The leakage current will increase with the increase of the loop current, so when the motor power is large, the corresponding leakage current is large.

- Factors causing the leakage current between lines and solutions:

There is a distributed capacitance between the output wirings of the frequency converter. If the current passing through the line contains high - order harmonics, resonance may occur and cause leakage current. At this time, if a thermal relay is used, it may malfunction. The solution is to reduce the carrier frequency or install an output reactor. It is recommended not to install a thermal relay in front of the motor when using a frequency converter, but to use the over - current protection function of the frequency converter for the motor.

Precautions for installing an EMC input filter at the power input end:

- Note: When using the filter, please use it strictly according to the rated value; since the filter belongs to Class I electrical appliances, the metal shell of the filter should be in good contact with the metal ground of the installation cabinet over a large area, and good electrical conductivity and continuity are required. Otherwise, there is a risk of electric shock and it will seriously affect the EMC effect.
- Through EMC testing, it is found that the ground of the filter must be connected to the PE terminal ground of the frequency converter on the same common ground, otherwise it will seriously affect the EMC effect.
- Install the filter as close as possible to the power input end of the frequency converter.

## Fault Diagnosis and Countermeasures

Fault code	Fault name	Fault cause troubleshooting	Fault handling countermeasures
ERR02	Over-current during acceleration	<ol style="list-style-type: none"> <li>1. There is a ground or short - circuit in the output circuit of the frequency converter.</li> <li>2. The control mode is vector control and parameter identification has not been carried out.</li> <li>3. The acceleration time is too short.</li> <li>4. Manual torque boost or the V/F curve is inappropriate.</li> <li>5. The voltage is low.</li> <li>6. Starting a rotating motor.</li> <li>7. Abruptly adding load during the acceleration process.</li> <li>8. The selected frequency converter is too small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Eliminate peripheral faults.</li> <li>2. Conduct motor parameter identification.</li> <li>3. Increase the acceleration time.</li> <li>4. Adjust the manual torque boost or V/F curve.</li> <li>5. Adjust the voltage to the normal range.</li> <li>6. Select speed tracking start or wait for the motor to stop before starting.</li> <li>7. Remove the abruptly added load.</li> <li>8. Select a frequency converter with a higher power rating.</li> </ol>
ERR03	Over-current during deceleration	<ol style="list-style-type: none"> <li>1. There is a ground or short - circuit in the output circuit of the frequency converter.</li> <li>2. The control mode is vector control and parameter identification has not been carried out.</li> <li>3. The deceleration time is too short.</li> <li>4. The voltage is low.</li> <li>5. Abruptly adding load during the deceleration process.</li> <li>6. The braking unit and braking resistor have not been installed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Eliminate peripheral faults.</li> <li>2. Conduct motor parameter identification.</li> <li>3. Increase the deceleration time.</li> <li>4. Adjust the voltage to the normal range.</li> <li>5. Remove the abruptly added load.</li> <li>6. Install a braking unit and resistor.</li> </ol>
ERR04	Over-current during constant speed	<ol style="list-style-type: none"> <li>1. There is a ground or short - circuit in the output circuit of the frequency converter.</li> <li>2. The control mode is vector control and parameter identification has not been carried out.</li> <li>3. The voltage is low.</li> <li>4. Check if there is an abrupt load addition during operation.</li> <li>5. The selected frequency converter is too small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Eliminate peripheral faults.</li> <li>2. Conduct motor parameter identification.</li> <li>3. Adjust the voltage to the normal range.</li> <li>4. Remove the abruptly added load.</li> <li>5. Select a frequency converter with a higher power rating.</li> </ol>
ERR05	Over-voltage during acceleration	<ol style="list-style-type: none"> <li>1. The input voltage is too high.</li> <li>2. During the acceleration process, an external force drags the motor to operate.</li> <li>3. The acceleration time is too short.</li> <li>4. The braking unit and braking resistor have not been installed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the voltage to the normal range.</li> <li>2. Remove this external force or install a braking resistor.</li> <li>3. Increase the acceleration time.</li> <li>4. Install a braking unit and resistor.</li> </ol>
ERR06	Over-voltage during deceleration	<ol style="list-style-type: none"> <li>1. The input voltage is too high.</li> <li>2. During the deceleration process, an external force drags the motor to operate.</li> <li>3. The deceleration time is too short.</li> <li>4. The braking unit and braking resistor have not been installed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the voltage to the normal range.</li> <li>2. Remove this external force or install a braking resistor.</li> <li>3. Increase the acceleration time.</li> <li>4. Install a braking unit and resistor.</li> </ol>
ERR07	Over-voltage during constant speed	<ol style="list-style-type: none"> <li>1. The input voltage is too high.</li> <li>2. During the operation process, an external force drags the motor to operate.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the voltage to the normal range.</li> <li>2. Remove this external force or install a braking resistor.</li> </ol>
ERR08	Control power supply fault	The input voltage is not within the range specified by the standard.	Adjust the voltage to the range required by the specification.
ERR09	Under-voltage fault	<ol style="list-style-type: none"> <li>1. Momentary power failure.</li> <li>2. The input voltage of the frequency converter is not within the required range of the standard.</li> <li>3. The bus voltage is abnormal.</li> <li>4. The rectifier bridge and buffer resistor are abnormal.</li> <li>5. The drive board is abnormal.</li> <li>6. The control board is abnormal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reset the fault.</li> <li>2. Adjust the voltage to the normal range.</li> <li>3. Seek technical support.</li> <li>4. Seek technical support.</li> <li>5. Seek technical support.</li> <li>6. Seek technical support.</li> </ol>

ERR10	Frequency converter overload	<ol style="list-style-type: none"> <li>1. Check if the load is too heavy or the motor is blocked.</li> <li>2. The selected frequency converter is too small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduce the load and check the mechanical condition of the motor.</li> <li>2. Select a frequency converter with a higher power rating.</li> </ol>
ERR11	Motor overload	<ol style="list-style-type: none"> <li>1. Check if the motor protection parameter P9 - 01 is set appropriately.</li> <li>2. Check if the load is too heavy or the motor is blocked.</li> <li>3. The selected frequency converter is too small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set this parameter correctly.</li> <li>2. Reduce the load and check the motor and its mechanical condition.</li> <li>3. Select a frequency converter with a higher power rating.</li> </ol>
ERR12	Input phase-loss	<ol style="list-style-type: none"> <li>1. The three - phase input power supply is abnormal.</li> <li>2. The drive board is abnormal.</li> <li>3. The lightning - protection board is abnormal.</li> <li>4. The main control board is abnormal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and eliminate problems in the peripheral circuit.</li> <li>2. Seek technical support.</li> <li>3. Seek technical support.</li> <li>4. Seek technical support.</li> </ol>
ERR13	Output phase-loss	<ol style="list-style-type: none"> <li>1. The leads from the frequency converter to the motor are abnormal.</li> <li>2. The three - phase output of the frequency converter is unbalanced when the motor is running.</li> <li>3. The drive board is abnormal.</li> <li>4. The module is abnormal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Eliminate peripheral faults.</li> <li>2. Check whether the three - phase windings of the motor are normal and troubleshoot.</li> <li>3. Seek technical support.</li> <li>4. Seek technical support.</li> </ol>
ERR14	Module overheating	<ol style="list-style-type: none"> <li>1. The ambient temperature is too high.</li> <li>2. The air duct is blocked.</li> <li>3. The fan is damaged.</li> <li>4. The module thermistor is damaged.</li> <li>5. The inverter module is damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lower the ambient temperature.</li> <li>2. Clean the air duct.</li> <li>3. Replace the fan.</li> <li>4. Replace the thermistor.</li> <li>5. Replace the inverter module.</li> </ol>
ERR15	External equipment failure	<ol style="list-style-type: none"> <li>1. Input the external fault signal through the multi - function terminal X.</li> <li>2. Input the external fault signal through the virtual IO function.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reset for operation.</li> <li>2. Reset for operation.</li> </ol>
ERR16	Communication failure	<ol style="list-style-type: none"> <li>1. The upper - computer is not working properly.</li> <li>2. The communication cable is abnormal.</li> <li>3. The communication parameters in the PD group are set incorrectly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the wiring of the upper - computer.</li> <li>2. Check the communication connection cable.</li> <li>3. Set the communication parameters correctly.</li> </ol>
ERR17	Contact failure	<ol style="list-style-type: none"> <li>1. The drive board and power supply are abnormal.</li> <li>2. The contactor is abnormal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the drive board or power supply board.</li> <li>2. Replace the contactor.</li> </ol>
ERR18	Current detection failure	<ol style="list-style-type: none"> <li>1. Check if the Hall device is abnormal.</li> <li>2. The drive board is abnormal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the Hall device.</li> <li>2. Replace the drive board.</li> </ol>
ERR19	Motor tuning failure	<ol style="list-style-type: none"> <li>1. The motor parameters are not set according to the nameplate.</li> <li>2. The parameter identification process times out.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set the motor parameters correctly according to the nameplate.</li> <li>2. Check the leads from the frequency converter to the motor.</li> </ol>
ERR21	EEPROM read-write failure	<ol style="list-style-type: none"> <li>1. The EEPROM chip is damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the main control board.</li> </ol>
ERR23	Ground short-circuit fault	<ol style="list-style-type: none"> <li>1. The motor is short - circuited to the ground.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the cable or the motor.</li> </ol>
ERR40	Wave-by-wave current-limiting fault	<ol style="list-style-type: none"> <li>1. Check if the load is too heavy or the motor is blocked.</li> <li>2. The selected frequency converter is too small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduce the load and check the mechanical condition of the motor.</li> <li>2. Select a frequency converter with a higher power rating.</li> </ol>
ERR42	Excessive speed deviation fault	<ol style="list-style-type: none"> <li>1. The encoder parameters are set incorrectly.</li> <li>2. Parameter identification has not been carried out.</li> <li>3. The speed deviation detection parameters P9 - 69 and P9 - 70 are set unreasonably.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set the encoder parameters correctly.</li> <li>2. Conduct motor parameter identification.</li> <li>3. Set the detection parameters reasonably according to the actual situation.</li> </ol>

# Certificate of Conformity

This product has been inspected and meets the factory-exit standards, so it is permitted to leave the factory.

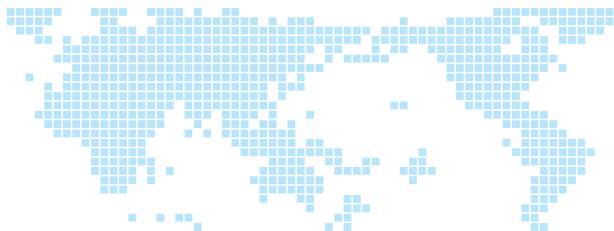
Product Name: Frequency converter

Product Model: \_\_\_\_\_

Inspector: \_\_\_\_\_







Due to the continuous innovation of product technology, please refer to the actual product.  
In case of any change, no further notice will be given.