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Preface

Thank you for purchasing SENLAN Hope530G high-performance vector control frequency converter.

The Hope530G series frequency converter is a new generation of low-noise, high-performance and multi-function frequency converter independently developed by Hope Senlan Science & Technology Holding Co., Ltd. It adopts the rotor-magnetic-field-oriented vector control mode to achieve high torque of motor, high precision, wide range speed regulation, high reliability and powerful functions. It is widely used in metallurgy, petroleum, chemical industry, power industry, building materials, coal, medicine, food, papermaking, plastic, textile industry, printing & dyeing, lifting, washing, cable, packing, machinery, ceramics, water supply, centrifuge, conveyor, dehydrator, wastewater treatment, heating & ventilating industry, as well as drawbench, agitator, extruder, winding machine, compressor, fan pumps, grinding miller, conveyor, hoister, centrifuge and so on.

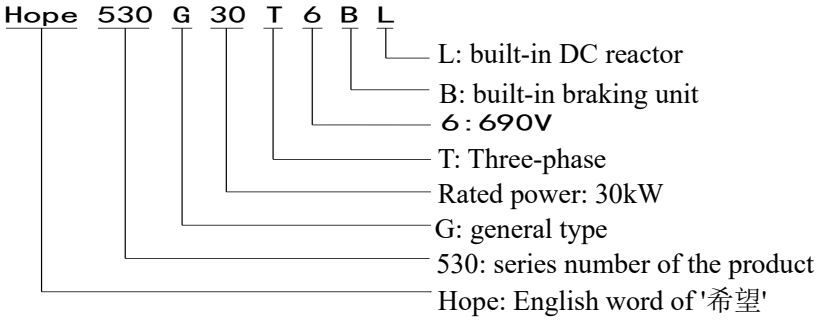
This Manual provides users with installation wiring, parameter setting, daily maintenance, fault diagnosis and troubleshooting, etc. Before installing, setting up, running and maintaining the frequency converter, please be sure to read all the contents of the User Manual of this product in detail, memorize the relevant knowledge and safety precautions of the frequency converter, and ensure the correct use and give full play to its superior performance. Technical specification of this product may change without prior notice. The user manual of this product shall be properly kept until the frequency converter is scrapped.

Precautions for Unpacking Inspection

When unpacking, please confirm the following items carefully. In case of any problem, please contact us or the Supplier directly.

Confirmation Item	Confirmation Method
Is it in line with your order?	Confirm whether the nameplate on the side of frequency converter is consistent with your order
Is there any damage to the product?	Check the overall appearance of the product to confirm whether it is damaged during transportation

Model Description of Frequency Converter



Description on frequency converter nameplate (taking Hope530G37T6 as an example)

SLANVERT Frequency Converter	
Model: Hope530G37T6	Executive standard: GB/T12668.2
Rated input: three-phase 690V 50/60Hz	Product No.: 1234567
Rated output: three-phase 0~690V 0~650Hz	
Rated current: 45A	
Rated power: 37kW	
SLANVERT	HOPE SENLAN SCIENCE AND TECHNOLOGY HOLDING CORP., LTD.

Definition of Safety Signs

For safety-related contents in this manual, please use the following signs, and the contents with safety signs must be followed.

DANGER: Improper use or failure to operate as required may result in damage to the frequency converter or personal injury or death.

ATTENTION: Failure to operate as required may cause the system to work abnormally. In extreme cases, it may result in damage to the frequency converter or machinery.

The comparison table of some terms and abbreviations is as follows:

Name	Meaning and Description
AI	Analog Input, see Page 110
AO	Analog Output, see Page 114
ASR	Automatic Speed Regulator, see Page 90
AVR	Automatic Voltage Regulation, see Page 88
EMC	Electric Magnetic Compatibility
EMI	Electric Magnetic Interference
LED	Light Emitting Diode
PFI	Pulse Frequency Input, see Page 116
PFO	Pulse Frequency Output, see Page 116
PID	Proportional-Integral-Derivative, see Page 118
PG	Pulse Generator, see Page 104
PWM	Pulse Width Modulate
UP/DOWN regulating value	The percentage that can be adjusted by the terminal, panel △/▽ keys and can be taken as frequency setting (with the maximum frequency of 100%), PID setting, etc. See Page 101
Programmable unit	Programmable software module for arithmetic operation, logic operation, comparison and other functions in the frequency converter. See Page 148
Digital input n	It refers to the internal switch signal of the option n in the digital input function definition table on Page 94, which can be selected for terminal DI, as well as for the output selection and connection of logic units, timers, and comparators
Digital output n	It refers to the internal switch signal of option n in the digital output function definition table on Page 106. It is for DO terminal and relay selection output and the input selection for logic unit, timer, analog multi-circuit switch control signal, counter and length counter
Analog output n	It refers to the internal switch signal of option n in the analog output definition table on Page 114. It is for the selection output of analog output terminals AO1, AO2 and PFO and the input selection of comparator, arithmetic unit, analog multi-circuit switch and low-pass filter

1 Safety and Precautions

1.1 Safety Precautions

I. Installation

■ Do not install the frequency converter at the place with or near combustible materials, or there will be a fire risk.

■ The frequency converter shall be installed on a smooth and solid surface, away from Humid, hot and condensed environment.

II. Wiring

■ Make sure that the high-voltage indicator light is completely off and the voltage of both positive and negative buses is below 36V, otherwise there may be danger of electric shock.

■ Make sure that the input power supply is completely disconnected before wiring, otherwise it may cause electric shock.

■ Do not directly connect a braking resistor between the DC+ and DC- terminals, as there is a risk of fire.

■ The voltage of the input power terminal shall not exceed the rated voltage range, otherwise the frequency converter will be damaged.

■ The grounding terminal (PE) of the frequency converter must be reliably and correctly grounded (resistance to ground less than or equal to 10Ω). Otherwise, it may cause electric shock.

III. Inspection before Power-on

■ The frequency converter door must be closed before power on, otherwise it may cause electric shock and explosion.

■ The frequency converter can control the motor to run at high speed. To run above the rated frequency of the motor, it must first confirm whether the motor and mechanical device can withstand high speed operation.

IV. Power-on and Operation Notes

■ Check whether the parameter setting is correct before test run.

■ Do not open the front door when the input power is connected, for there is high voltage inside and it may cause electric shock.

■ Do not use wet hands to operate the frequency converter, otherwise it may cause electric shock.

■ When the frequency converter is delivered from the factory, the automatic power-on start is enabled. If the terminal control and the running signal is valid, the power-on will start automatically.

■ Do not turn on or off the input power to control the frequency converter operation and stop.

■ When parameter initialization is performed, the parameters shall be reset.

■ When selecting the restart function (such as fault self-reset or instantaneous power failure restart), do not get close to the motor and mechanical load while the frequency converter is waiting for starting.

V. Transportation and Packaging Precautions

■ Quantity of the stacked frequency converter shall not exceed the value specified for packing case.

■ Do not place heavy objects on the frequency converter.

■ Do not open the door when transporting the frequency converter.

■ Operation panel and door shall not be stressed during handling, otherwise personal injury or property loss may be caused.

VI. Scrapping

■ It shall be scrapped as industrial wastes.

■ The electrolytic capacitor inside the frequency converter may explode when burned.

■ The plastic parts of the frequency converter will produce toxic gas when burned.

1.2 Precautions

I. About Motor and Mechanical Load

■ Compared with power frequency operation

The Hope530G series frequency converter is a kind of PWM voltage frequency converter with its output voltage containing harmonic wave. Compared with power frequency power supply, the loss generated when driving the motor and the temperature rise and noise of the motor are increased.

When the input voltage is high or the motor connection distance is long, the dielectric strength of cable and motor must be considered.

■ Constant-torque and low-speed operation

When the frequency converter drives the common motor to run at low speed for a long time, the temperature of the motor will rise due to the poor heat dissipation effect of the motor. If running at low speed constant torque for a long time is needed, it must use frequency conversion motor or forced air cooling.

■ Overload protection of motors

When the adaptive motor is selected, the frequency converter can protect the motor from overload. If the motor does not match the rated capacity of the frequency converter, the protection value must be adjusted or other protective measures must be taken to ensure the safe operation of the motor.

■ Operation above the frequency of 50Hz

In case of operation exceeding 50Hz, in addition to considering the increase of vibration and noise of the motor, it must also confirm whether the use speed range of the motor bearing and mechanical device is allowed.

- Lubrication for mechanical device

When the gearbox, gear and other mechanical devices needing to be lubricated are operated at low speed for a long time, they may be damaged due to poor lubrication effect, so they must be confirmed in advance.

- Regenerative torque load

For the occasion of lifting load, there is often a regenerative torque, the frequency converter often stops due to overvoltage protection, at this time the appropriate specification of the brake components shall be considered.

- Mechanical resonance point of load device

The frequency converter may encounter the mechanical resonance point of the load device within a certain output frequency range, which can be avoided by setting anti-vibration rubber under the base plate of the motor or by setting the frequency avoidance of the frequency converter.

- Insulation inspection of motor before being connected with the frequency converter

When the motor is used for the first time and re-used after long time placement, insulation inspection for motor shall be carried out prevent the frequency converter from damage due to insulation failure of the motor winding. Please use 1000V voltage megohmmeter for test, and it shall guarantee that the measured insulation resistance is not less than 5MΩ.

II. About Frequency Converter

- Capacitance or pressure sensitive devices improving the power factor

As the frequency converter outputs PWM voltage, if the output side is installed with capacitance or lightning protection voltage-sensitive resistor for improving power factor, it will cause the frequency converter fault trip or device damage, please be sure to remove it.

- Contactors and other switching devices installed at the output end of the frequency converter

If switches such as contactors need to be installed between the frequency converter output and the motor, please be sure to switch on and off when the frequency converter has no output, otherwise the frequency converter may be damaged.

- Occasion for frequent start and stop

Start and stop control shall be achieved for frequency converter via terminals. It is strictly prohibited to use contactors and other switching devices on the input side of the frequency converter for direct and frequent start and stop, or it will cause equipment damage.

- Use beyond rated voltage

Hope530G series frequency converters are not recommended to be used beyond the allowable input voltage range. If necessary, boost or step-down device can be used for voltage transformation.

■ Lightning impulse protection

The frequency converter is equipped with lightning overvoltage protection device, which has a certain self-protection ability for inductive lightning.

■ Leakage protector

When the frequency converter runs, there is a high-speed switching action, which will inevitably produce high-frequency leakage current, and sometimes lead to the misoperation of leakage protection circuit. When encountering the above problems, in addition to appropriately reducing the carrier frequency and shortening the lead, the leakage protector shall be correctly installed.

When installing the leakage protector, following items shall be followed:

1) The leakage protector shall be set at the input side of the frequency converter, which is more suitable to set it behind the air switch (no fuse circuit breaker).

2) Leakage protector that is insensitive to ultraharmonics or special leakage protector shall be selected for the frequency converter (sensitivity above 30mA). If the ordinary leakage protector is used, the sensitivity shall be above 200mA and the action time shall be above 0.1s.

■ Derating of frequency converter

1) When the ambient temperature exceeds 40°C, the frequency converter shall be derated by 1.5% for every 1°C increase, with a maximum operating temperature of 55°C. If the ambient temperature exceeds 50°C, the company shall be consulted before ordering, and the ambient temperature shall be specified when ordering.

2) In areas with an altitude of more than 1000m, the thin air will cause the heat dissipation effect of the frequency converter to deteriorate, and it is necessary to derate the use. For every 100m, the derating is 1%. For altitudes exceeding 3000m, please contact the manufacturer before placing an order;

3) When the set carrier frequency is above the factory default, the frequency converter shall be derated by 5% for every 1kHz increase.

2 Product Specification

2.1 General Technical Specification of Hope530G Series Frequency Converter

Item		Item Description
Input	Rated voltage and frequency	Three-phase: 690V, 50Hz/60Hz
	Allowable range	Voltage fluctuating range: ±15%; voltage unbalance: ＜3％; frequency: 47Hz~63Hz
Output	Output voltage	Three-phase, 0V~input voltage, error<5%
	Output frequency range	V/F control: 0.00Hz~650.00Hz; vector control: 0.00Hz~200.00Hz
Basic specifications	Motor control mode	Without PGV/F control, with PGV/F control, without PG vector control, with PG vector control, V/F separation control
	Steady-state speed precision	Without PG vector control: ±0.5%; with PG vector control: ±0.05%
	Starting torque	When frequency is 0.50Hz, the starting torque is ≥150％ of rated torque
	Overload Capacity	150％ rated current for 1min, 180% rated current for 15s, 200% rated current for 2s
	Frequency resolution	Digital setting: 0.01Hz; simulation setting: 0.1% of the maximum frequency
	Output frequency accuracy	Simulation setting: ±0.2% of the maximum frequency (25±10°C); Digital setting: 0.01Hz (-10°C~+40°C)
	Run command channel	Operation panel setting, control terminal setting, communication setting, switchable via terminal
	Frequency setting channel	Operation panel, communication, UP/DOWN regulated value, Al1~Al4, PFI, arithmetic unit
	Auxiliary frequency setting	For flexible auxiliary frequency trim and set frequency synthesis
	Torque boost	Automatic torque boost; manual torque boost
	V/F curve	Users can define V/F curve, linear V/F curve and 5 reduction torque characteristic curves
	Acceleration/deceleration method	Linear acceleration & deceleration, S curve acceleration & deceleration
	Jog	Jog frequency range: 0.10Hz~50.00Hz; Jog acceleration & deceleration time: 0.1s~60.0s
	Automatic energy-saving operation	Automatically optimize V/F curve according to load condition for automatic energy-saving operation
	Automatic voltage regulation (AVR)	When grid voltage changes within a certain range, automatically maintain a constant output voltage
	Automatic carrier regulation	Automatically regulate carrier frequency according to load characteristic and environment temperature
	Random PWM	Regulate motor timbre when operating
	Droop control	Applicable to the condition when several frequency converters drive the same load
	Instantaneous shutdown processing	When powering down instantaneously, the equipment can continue operating via busbar voltage control
	Dynamic braking capacity	Built-in braking unit
	DC braking capacity	Braking time: 0.0s~60.0s, braking current: 0.0%~100.0% of rated current
	PFI	Maximum input frequency: 50kHz
	PFO	Open-collector pulse square wave signal output with a range of 0Hz~50kHz, programmable
	Analog input	2-channel analog signal input (voltage/current optional), supporting positive/negative input and 2-channel analog input expansion

Item		Item Description
	Analog output	2-channel analog signal output, selectable 0/4mA~20mA or 0/2V~10V each, programmable
	Digital input	5-channel multi-functional digital input (source/sink optional), supporting digital input expansion
	Digital output	2-channel multi-functional digital output; 2-channel multi-functional relay output, supporting digital output extension
	Communication	Built-in RS485 communication interface, supporting Modbus protocol (RTU, TCP), USS command, PROFIbus-DP protocol, PROFINET protocol, etc.
Special features	Process PID	Two groups of PID parameters; various modification modes; with free PID function; with Sleep Mode
	Multi-mode PLC	User can set as many as 8 groups of PLC operation mode parameters, and the single mode PLC can reach 48 segments; it can select mode via terminal; PLC state is storable when powering down
	Multi-stage speed method	Encoding selection, direct selection, overlap selection and number selection method
	User defined menus	Thirty user parameters can be defined
	Modification parameter display	Support the parameter display that is different from ex-factory value
	Torque control function	Control torque/speed via switching terminals, torque setting methods
	Zero servo and position control function	For performing zero-speed position locking, accurate positioning and position control
	High-speed increment and decrement counter	For synchronous control of position, production counting, counting shutdown and clear positioning control
	High-speed meter counter	For fixed-length shutdown, length indication
	Textile wobble frequency function	For uniform winding displacement of spinning winding
	Programmable unit	Comparator, logical unit, trigger, arithmetic unit, filter, multiway switch, timer
	Timing watt hour meter function	Facilitate adjusting to the best energy conservation scheme
Protection function		Over-current, over-voltage, under-voltage, input/output phase loss, output short circuit, overheat, motor overload, external failure, lost connection of analog input, stall prevention, etc.
Optional accessories		Digital I/O expansion board, encoder interface board, analog input expansion board, I/O reactor, electric magnetic interference filter, Profibus-DP module, PROFINET module, Chinese/English LCD panel, operation panel installation box, operation panel extension cable, RS485 communication module, etc.
Environment	Usage location	With elevation below 1,000m, indoor, without direction sunshine, dust, corrosive gas, combustible gas, oil mist, water vapor, water drop, and salt mist, etc.
	Operation ambient temperature/humidity	-10°C~+40°C/20%~90%RH, no condensation
	Storage temperature	-20°C~+60°C
	Vibration	Less than 5.9 m/s² (0.6g)
Structure	Protection rating	IP20
	Cooling method	Forced cooling, with control fan

2.2 Product Series Specifications

See the following table for rated value of Hope530G series frequency converter:

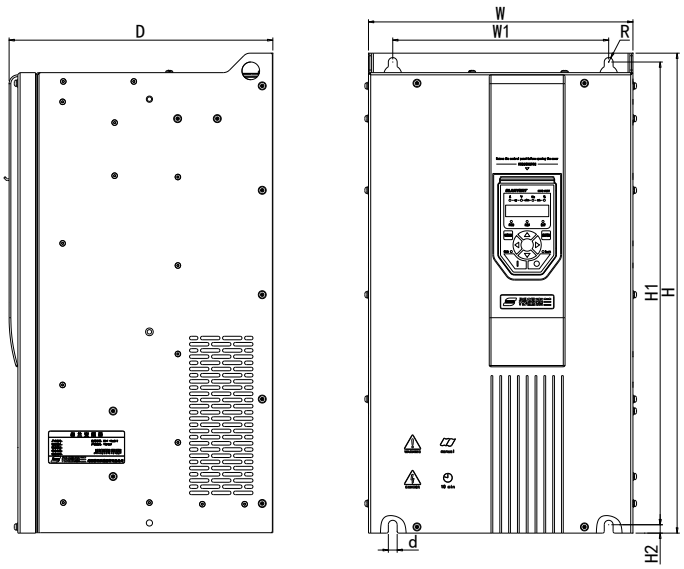
Frequency converter model	Rated capacity (kVA)	Rated output current (A)	Adaptive motor (kW)	Frequency converter model	Rated capacity (kVA)	Rated output current (A)	Adaptive motor (kW)
Hope530G18.5T6*L	25	22	18.5	Hope530G132T6L	176	148	132
Hope530G22T6*L	29	25	22	Hope530G160T6L	195	171	160
Hope530G30T6*L	38	33	30	Hope530G200T6L	240	210	200
Hope530G37T6*L	51	45	37	Hope530G220T6L	274	240	220
Hope530G45T6*L	62	54	45	Hope530G250T6L	328	287	250
Hope530G55T6*L	74	65	55	Hope530G280T6L	360	315	280
Hope530G75T6*L	103	86	75	Hope530G315T6L	406	355	315
Hope530G90T6L	116	102	90	Hope530G375T6L	440	385	375
Hope530G110T6L	138	122	110	—	—	—	—

Note 1: The penultimate character in the frequency converter model are default and indicated by '*'. If the '*' changes to letter B, it refers to built-in braking unit.

Note 2: 18.5kW~75kW models are provided with built-in DC reactor, which is optional built-in brake unit. 90kW and above models are provided with built-in DC reactor, which is not provided with built-in braking unit.

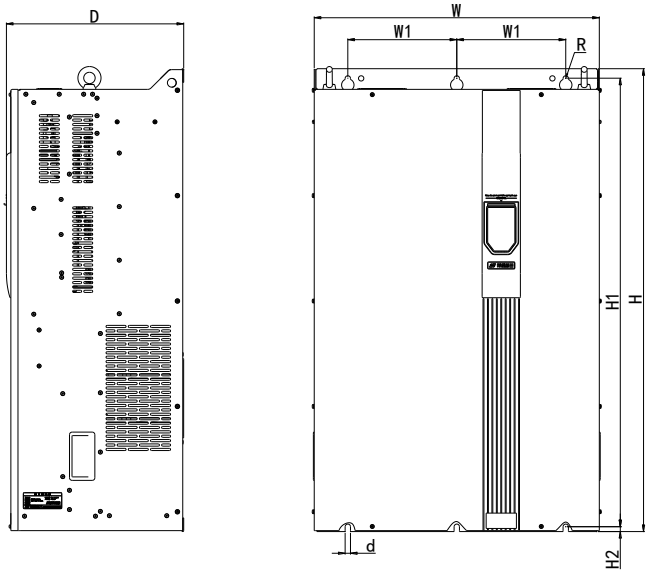
1) Installation dimensions, weight and outline drawing of Hope530G18.5T6~ Hope530G315T6 models:

Frequency converter model	W (mm)	W1 (mm)	H (mm)	H1 (mm)	H2 (mm)	D (mm)	d (mm)	R (mm)	Weight with reactor (kg)
Hope530G18.5T6*L	260	190	555	531	9	284	10	5	27
Hope530G22T6*L	260	190	555	531	9	284	10	5	28
Hope530G30T6*L	260	190	555	531	9	284	10	5	29
Hope530G37T6*L	302	230	584	559	8	306	10	5	41
Hope530G45T6*L	302	230	584	559	8	306	10	5	42
Hope530G55T6*L	349	240	668	651	6	320	10	5	59
Hope530G75T6*L	349	240	668	651	6	320	10	5	60
Hope530G90T6L	379	240	720	700	8	337	9	5	69
Hope530G110T6L	379	240	720	700	8	337	9	5	70
Hope530G132T6L	400	320	770	750	12	352	10	5	76
Hope530G160T6L	400	320	770	750	12	352	10	5	78
Hope530G200T6L	450	300	898	871	11	393	12	6	108
Hope530G220T6L	450	300	898	871	11	393	12	6	110
Hope530G250T6L	485	300	1000	980	8	395	10	5	115
Hope530G280T6L	485	300	1000	980	8	395	10	5	118
Hope530G315T6L	485	300	1000	980	8	395	10	5	120



Installation dimensions, weight and outline drawing of Hope530G375T6L models：

Frequency converter model	W (mm)	W1 (mm)	H (mm)	H1 (mm)	H2 (mm)	D (mm)	d (mm)	R (mm)	Weight with reactor (kg)
Hope530G375T6L	641	245	1052	1021	11	398	12	6	190



3 Installation and Wiring

3.1 Installation of Frequency Converter

⚠ **DANGER**	**1. All inspection work of the frequency converter can only be carried out by trained professionals.** **2. Do not install or use the frequency converter if it is damaged or its components are incomplete. Otherwise, it may result in fire and personal injury.** **3. The frequency converter shall be installed where it can withstand the weight of the frequency converter. Otherwise, there is a risk of injury or damage to property when falling.** **4. Do not put operation panel and door under heavy load during transportation, or it may fall to cause personal injury or property loss.**

3.1.1 Installation Environment

1) Ambient temperature: The lifespan of the frequency converter is greatly affected by the surrounding ambient temperature. Ensure that the operating environment temperature does not exceed the permissible range (-10°C~40°C). When the temperature exceeds 40°C, the frequency converter shall be derated by 1.5% per 1°C temperature rise, and external forced heat dissipation must be added;

2) In areas with an altitude of more than 1000m, the thin air will cause the heat dissipation effect of the frequency converter to deteriorate, and it is necessary to derate the use. For every 100m, the derating is 1%. For altitudes exceeding 3000m, please contact the manufacturer before placing an order;

3) Do not install it in places with direct sunlight, humidity, and water droplets. The humidity shall be lower than 90% RH, and there shall be no condensation of water droplets;

4) Do not install it in places with oil pollution, heavy dust and metal powder;

5) Do not install it in places with corrosive, inflammable and explosive gases in the air;

6) The frequency converter shall be installed in an area with vibration less than 5.9m/s^2 (0.6g). Special attention shall be paid to keeping it away from devices like punch presses;

7) The frequency converter shall be installed on the surface of a flame-retardant object. The frequency converter will generate a lot of heat when working, so there shall be enough space around for heat dissipation.

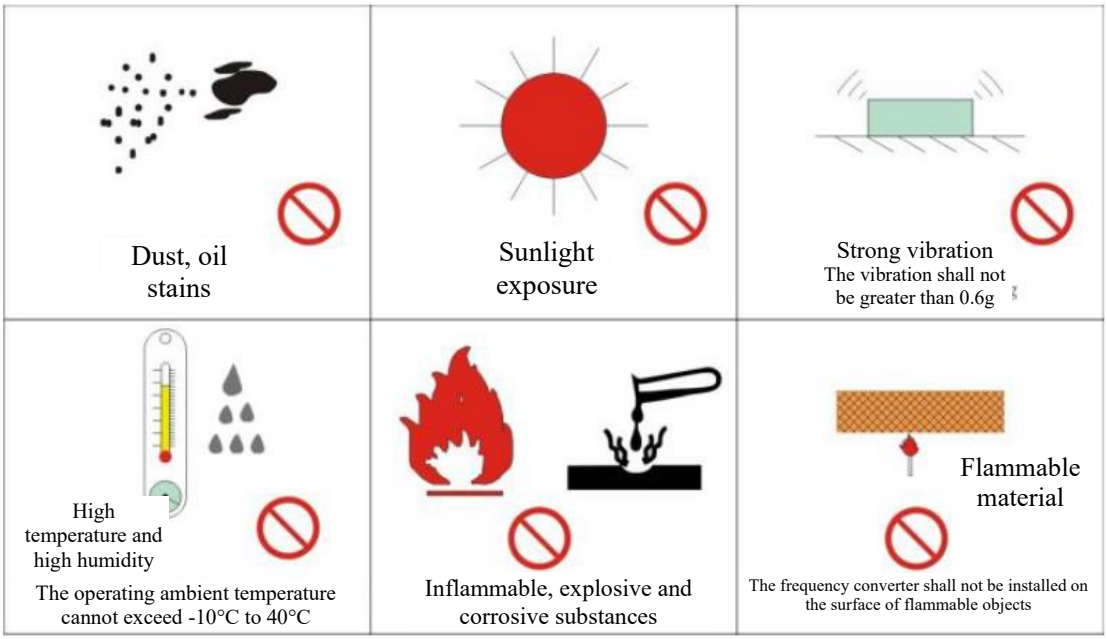


Fig. 3-1 Installation Environment Requirements

8) The frequency converter shall be installed vertically and upward and it is not allowed to be installed inversely, obliquely or horizontally. It shall be fixed on a firm structure using suitable bolts.

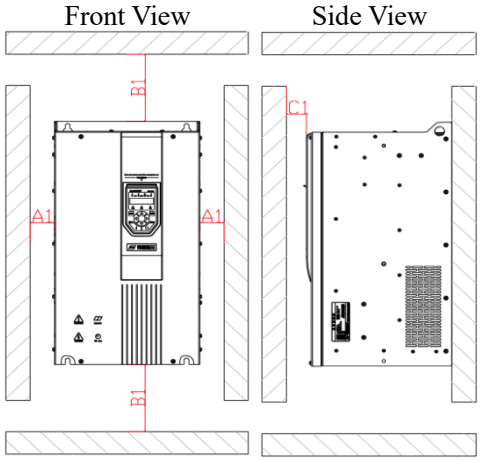
9) The Hope530G series products are cabinet-mounted units and shall be installed in the final system for use. The final system shall be furnished with appropriate fire-resistant enclosures, electrical protective enclosures and mechanical protective enclosures, and shall meet the requirements of local laws, regulations and relevant IEC standards.

3.1.2 Installation Spacing and Direction

1) Installation spacing

The surrounding space shall be reserved for the frequency converter according to the different power levels.

♦ Installation of single set

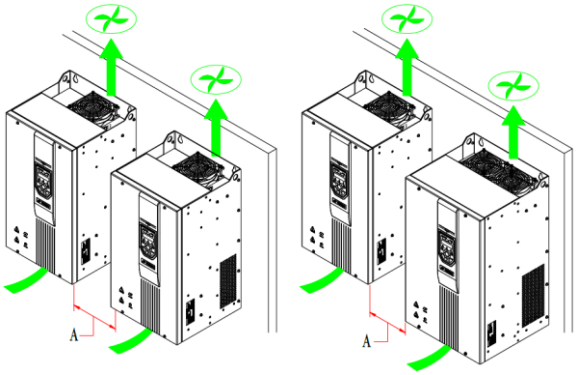


Power rating	Size requirements (Unit: mm)		
18.5~37kW	A1≥50	B1≥200	C1≥40
45~375kW	A1≥50	B1≥300	C1≥40

Fig. 3-2 Installation Spacing for a Single Set (Hope530G18.5T6~Hope530G375T6)

◆ Installation of multiple sets

Heat dissipates from the bottom to top when the frequency converter is cooling. When multiple frequency converters work, they are usually installed side by side, as shown in the figure below.



Power rating	Size requirements (Unit: mm)
18.5~375kW	A≥50

Fig. 3-3 Side-by-side Installation of Multiple Sets (Hope530G18.5T6～Hope530G375T6)

◆ Installation of upper and lower rows

In the place requiring installing frequency converters in upper and lower rows, the heat of lower row of frequency converter will raise the temperature of the frequency converter in the upper row, resulting in overheating/overload fault of upper row of frequency converter, so there shall be a heat insulation guide plate installed between upper row and lower row as shown in figure.

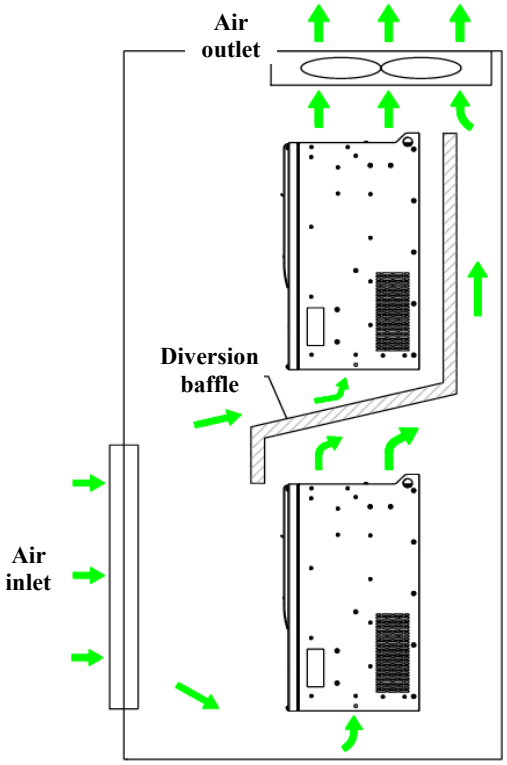


Fig. 3-4 Installation Requirements for Upper and Lower Rows

Note: The area of the air inlet must be larger than the area of air outlet, and the air volume of the air outlet fan must be greater than the sum of the air volume of all the heat dissipation fans of the frequency converter installed at the upper and lower rows. The exhaust air rate of the heat dissipation fan of a single frequency converter with various power levels is shown in the following table:

Rated power (kW)	18.5	22	30	37	45	55	75	90	110
Exhaust air rate (CFM)	120	120	180	180	200	200	400	400	550
Rated power (kW)	132	160	200	220	250	280	315	375	-
Exhaust air rate (CFM)	550	600	750	800	1000	1150	1250	1400	-

2) Installation direction

The frequency converter shall be installed vertically and upward and it is not allowed to be installed inversely or horizontally or in other ways.

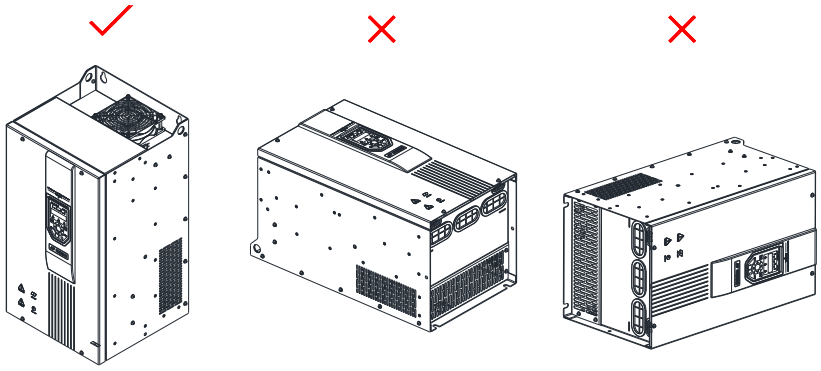


Fig. 3-5 Installation Direction Diagram

3.1.3 Complete Machine Installation for Each Model

Hope530G18.5T6~Hope530G375T6 models can be installed on wall. Products shall be installed based on installation guide according to installation and application places.

ATTENTION:

■ Fig. 3-2 shows the installation space requirements. It is required to ensure that the frequency converter has sufficient space for heat dissipation. When reserving space, it is required to consider the heat dissipation conditions of other components in the cabinet;

■ Vertical and upward installation of the frequency converter is conducive to upward heat dissipation. If there are multiple frequency converters in the cabinet, they shall be installed side by side. Fig. 3-4 shows the way to install vertically with heat insulation guide plate;

■ For applications with metal dust, it is recommended to use the installation cabinet that can completely seal the frequency converter, so that the frequency converter can be isolated from metal dust. At this time, the space in the fully sealed cabinet shall be as large as possible.

1) Wall mounting

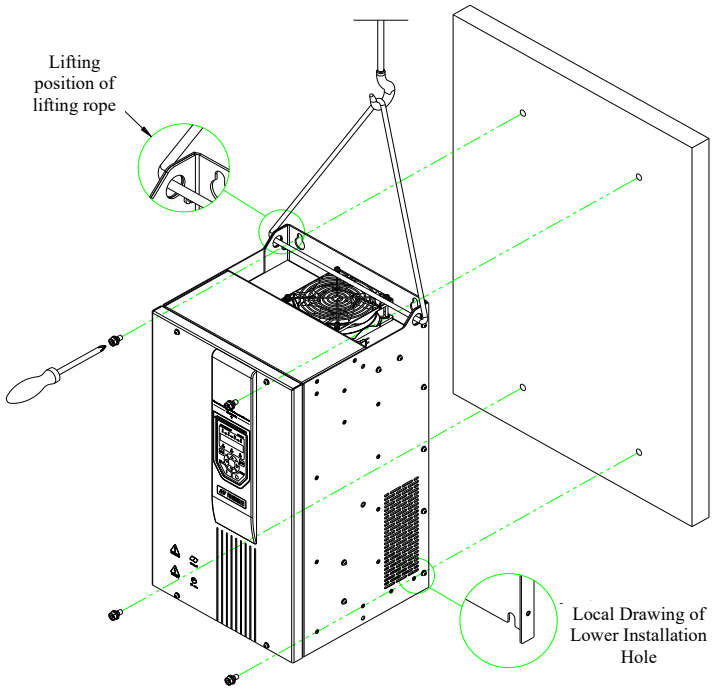


Fig. 3-6 Wall-mounted Type Hope530G18.5T6~Hope530G375T6 Models

ATTENTION: As for this installation mode, it is forbidden to fix only the two fixing nuts on the upper end of the frequency converter, otherwise the frequency converter may fall off and be damaged after a long time running.

3.1.4 Removal and Installation of Cover Plate

Wiring for main circuit and control circuit of Hope530G series shall be carried out after removing the cover plate.

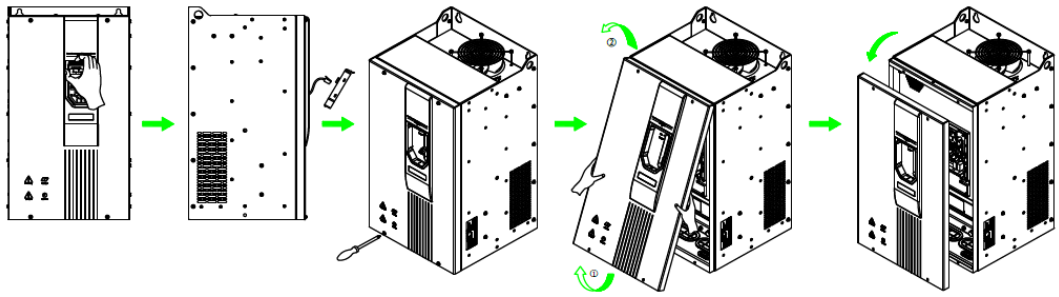
ATTENTION: Please be sure to remove the operation panel of the frequency converter before opening the frequency converter cover plate. Otherwise, the frequency converter may be damaged!

ATTENTION: One end of the operation panel connection cable is provided with a buckle, and the other end is not. The frequency converter mainboard shall be inserted into the end without a buckle!

Removal and installation of cover plate of Hope530G18.5T6~Hope530G375T6 models

Removal Steps

1. Press the spring on the upper end of the operation panel and pull out the operation panel outward.	2. Unplug the connecting cable on the back of the operation panel and remove the operation panel.	3. Unscrew the fastening screw from the upper and lower ends of cover plate with tools.	4. Hold the cover plate with both hands, ① Lift the lower end of the cover plate; ② Push slightly and upward and stuff the connecting cable of the operation panel into the cabinet, then lift the upper end of the cover plate.	5. The cover plate is removed.



Installation Steps

1. Hold the cover plate with both hands, align the cover plate bolt with the fastening hole on the upper part of the cabinet, and snap it into the fastening hole as shown in the figure from top to bottom.	2. Pull the connecting cables of operation panel out of the reserved hole on the cover plate from the cabinet.	3. Press down the lower edge of the cover plate in the direction of the arrow and tighten the fastening screw with a tool.	4. Connect the connecting cables of operation panel to the operation panel.	5. Insert the operation panel obliquely into place, press down on the upper end of the operation panel and push it forward to finish assembling the cover plate.

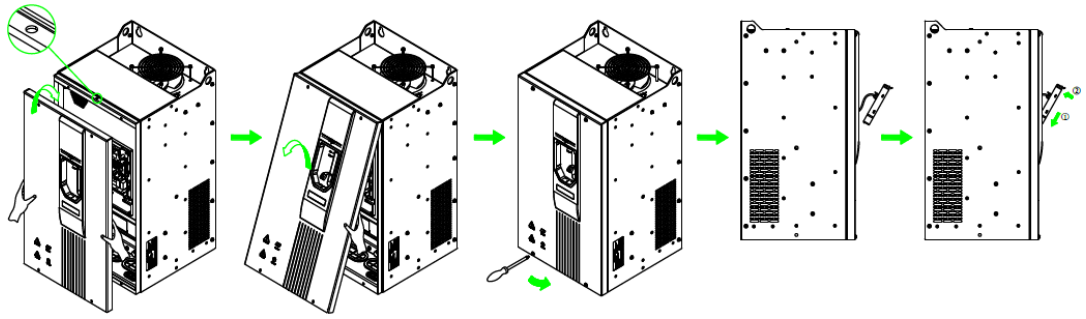


Fig. 3-7 Steps for Removal and Installation of Cover Plate of Hope530G18.5T6~Hope530G375T6 Models

3.2 Wiring of Frequency Converter

DANGER

1. Frequency converter wiring can only be carried out by trained personnel.
2. The door of the frequency converter can be opened only more than 10 minutes later after the power supply of the converter is reliably cut off and all the indicator lights of the operation panel are off.
3. Internal wiring can only be performed after verifying that the voltage between the main circuit terminals DC+ and DC- inside the frequency converter is 36V or lower.
4. The frequency converter must be grounded reliably, otherwise an electric shock or fire may occur.

5. Do not short-circuit DC+ with DC-. Otherwise, there is a risk of fire and property damage.
6. It is forbidden to connect the power cable to U, V and W.
7. Before powering on, it shall be carefully verified that the rated input voltage of the frequency converter is consistent with the voltage level of the AC power supply. Otherwise, it may cause personal injury and equipment damage.
8. The main circuit terminal and the wire cold press terminal must be firmly connected.
9. U, V and W output terminals must be wired in strict accordance with the phase order.
10. It is forbidden to connect a surge-absorbing capacitor and voltage dependent resistor to the leading-out terminal of the frequency converter.

3.2.1 Main Circuit Terminal Wiring and Configuration

For the connection between frequency converter and peripheral equipment, see the figure below:

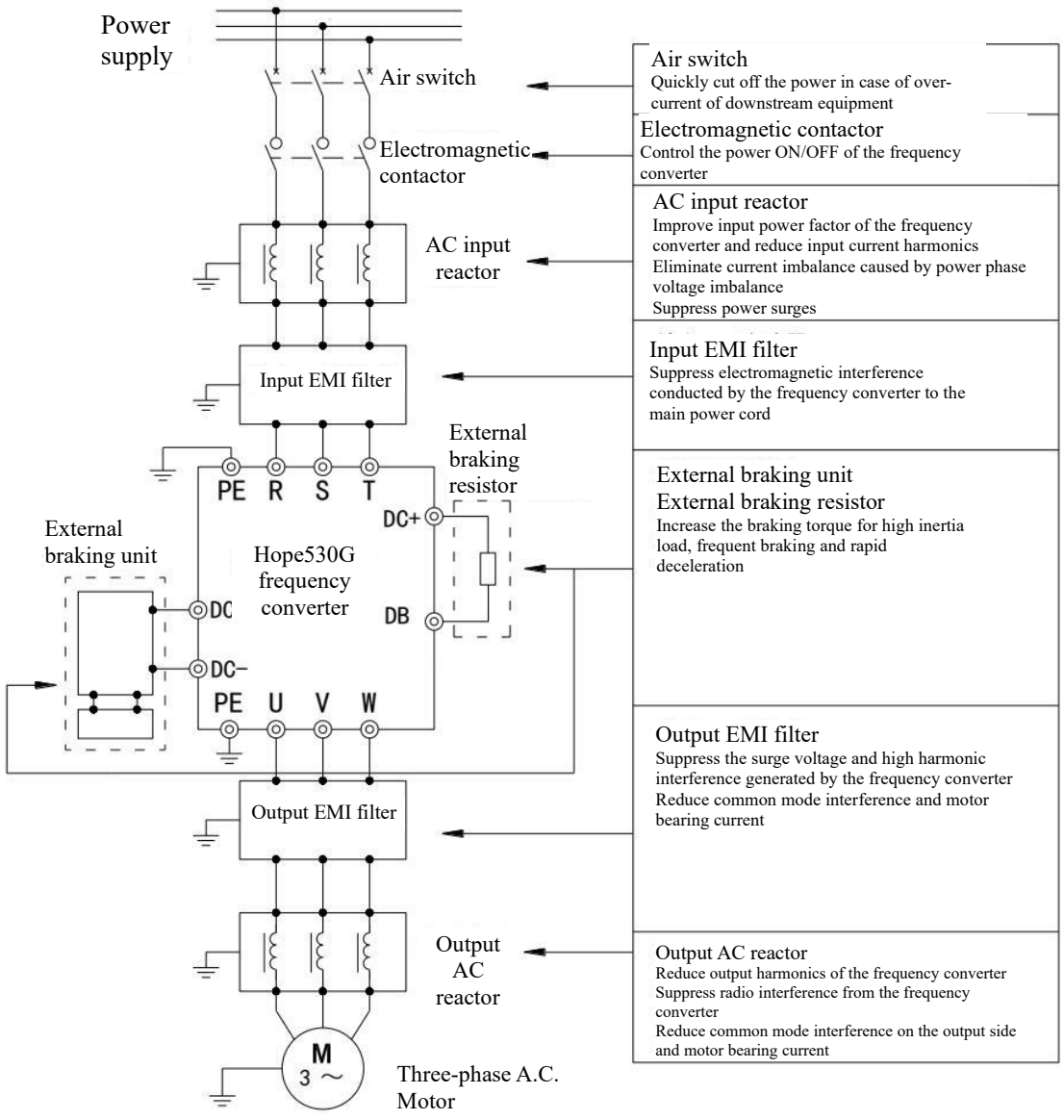


Fig. 3-8 Connection Schematic Diagram of Hope530G Frequency Converter System

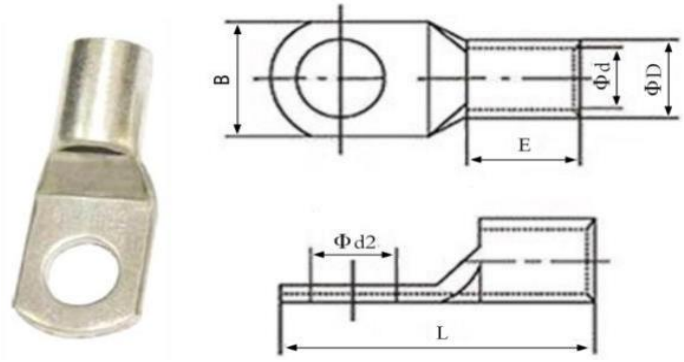
Recommended Selection of Air Switch Capacity and Input/Output Copper-core Insulated Conductors

Frequency converter model	Air Switch (A)	Input/output copper wire range (mm^2)	Recommended input/output copper wire model (mm^2)	Recommended terminal block model	Screw specifications	Tightening torque (N·m)
Hope530G18.5T6*L	63	6～10	6	SC6-8	M8	10.5
Hope530G22T6*L	63	6～10	6	SC6-8	M8	10.5
Hope530G30T6*L	100	10～16	10	SC10-8	M8	10.5
Hope530G37T6*L	100	10～16	10	SC10-8	M8	10.5
Hope530G45T6*L	125	16～25	16	SC16-8	M8	10.5
Hope530G55T6*L	160	25～35	25	SC25-8	M8	10.5
Hope530G75T6*L	200	35	35	SC35-8	M8	10.5
Hope530G90T6L	200	35～50	35	SC35-10	M10	19.0
Hope530G110T6L	315	50～70	50	SC50-10	M10	19.0
Hope530G132T6L	315	70～95	70	SC70-10	M10	19.0
Hope530G160T6L	315	70～95	70	SC70-10	M10	19.0
Hope530G200T6L	400	95～120	95	SC95-12	M12	35.0
Hope530G220T6L	400	95～120	95	SC95-12	M12	35.0
Hope530G250T6L	500	120～150	120	SC120-12	M12	35.0
Hope530G280T6L	500	120～150	120	SC120-12	M12	35.0
Hope530G315T6L	630	185～240	185	SC185-12	M12	35.0
Hope530G375T6L	850	240 or 2*120	2*120	SC120-12	M12	35.0

Recommended selection of grounding cables

Frequency converter model	Grounding copper wire range (mm^2)	Recommended grounding copper wire model (mm^2)	Recommended terminal block model	Screw specifications	Tightening torque (N·m)
Hope530G18.5T6*L	4～6	4	SC4-6	M6	4.0
Hope530G22T6*L	4～6	4	SC4-6	M6	4.0
Hope530G30T6*L	4～6	6	SC6-6	M6	4.0
Hope530G37T6*L	4～6	6	SC6-6	M6	4.0
Hope530G45T6*L	10～16	10	SC10-6	M6	4.0
Hope530G55T6*L	16～25	16	SC16-6	M6	4.0
Hope530G75T6*L	16～25	16	SC16-6	M6	4.0
Hope530G90T6L	16～25	16	SC16-6	M6	4.0
Hope530G110T6L	25～35	25	SC25-6	M6	4.0
Hope530G132T6L	35～50	35	SC35-8	M8	10.5
Hope530G160T6L	35～50	35	SC35-8	M8	10.5
Hope530G200T6L	50～70	50	SC50-8	M8	10.5
Hope530G220T6L	50～70	50	SC50-8	M8	10.5
Hope530G250T6L	70～95	70	SC70-8	M8	10.5
Hope530G280T6L	70～95	70	SC70-8	M8	10.5
Hope530G315T6L	95～120	95	SC95-8	M8	10.5
Hope530G375T6L	120～150	120	SC120-8	M8	10.5

SC crimping terminal appearance is shown below:



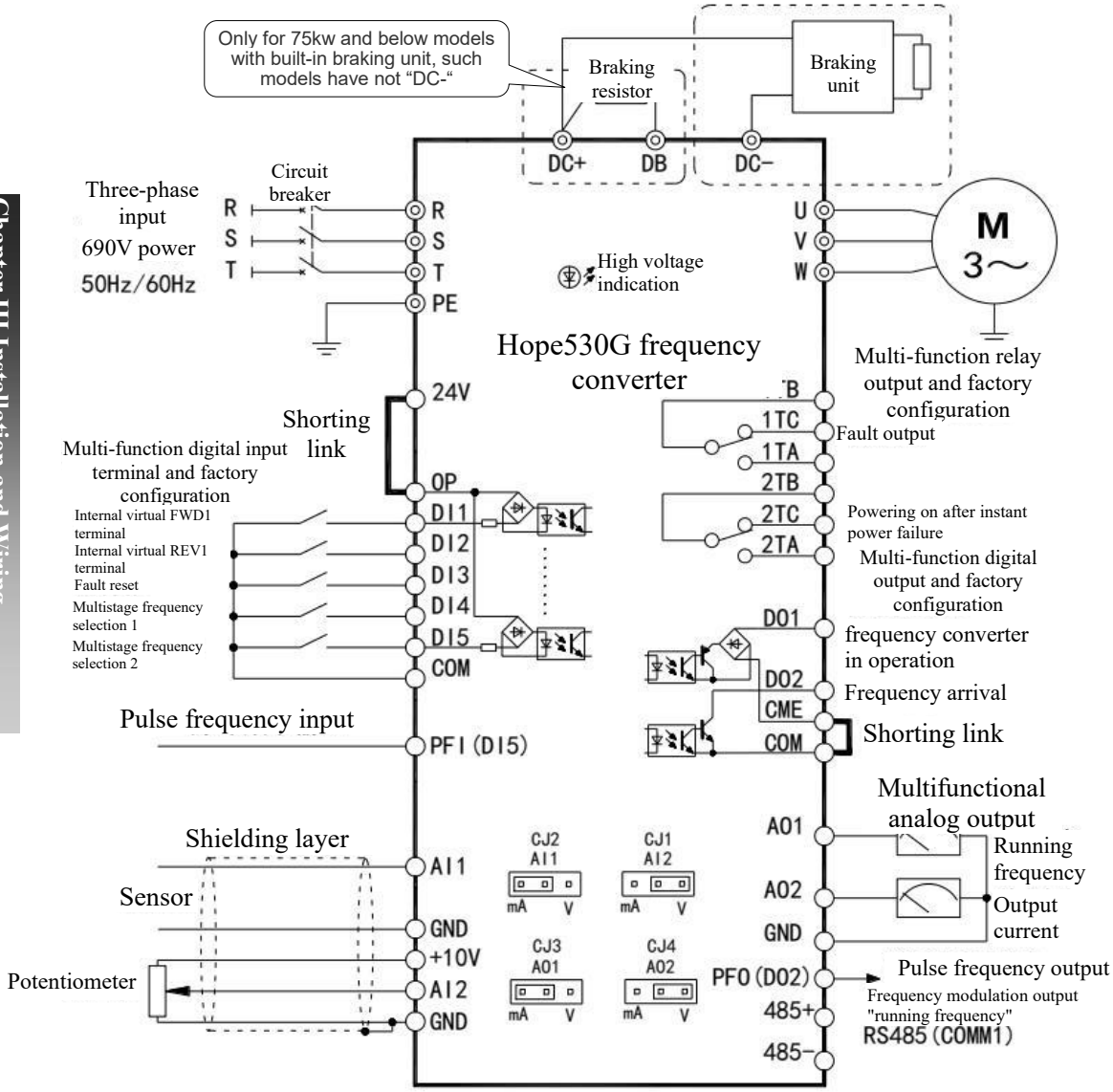
List of model and dimension of SC terminal:

Model	Dimensions (mm)						Model	Dimensions (mm)					
ITEM NO.	Φd2	B	L	ΦD	Φd	E	ITEM NO.	Φd2	B	L	ΦD	Φd	E
SC1.5-4	4.2	8	16	3.7	1.8	5	SC50-6	6.5	17.8	45	12.4	9.5	16
SC1.5-5	5.2	10	17				SC50-8	8.4	17.8	45			
SC1.5-6	6.5	10	18				SC50-10	10.5	17.8	45			
SC2.5-4	4.2	8	18	4	2.4	7	SC50-12	13	20	45			
SC2.5-5	5.2	10	20				SC50-14	15	22	46			
SC2.5-6	6.5	10	20				SC50-16	17	24	47			
SC2.5-8	8.4	12.5	23				SC70-8	8.4	21	52	14.7	11.2	20
SC4-4	4.2	10	20	4.8	3.1	7	SC70-10	10.5	21	52			
SC4-5	5.2	10	20				SC70-12	13	21	52			
SC4-6	6.5	10	20				SC70-14	15	21	52			
SC4-8	8.4	12.5	23				SC70-16	17	25	53			
SC6-4	4.2	10	24	5.5	3.8	9	SC95-8	8.4	25	58	17.4	13.5	23
SC6-5	5.2	10	24				SC95-10	10.5	25	58			
SC6-6	6.5	12	24				SC95-12	13	25	58			
SC6-8	8.4	12.5	26				SC95-14	15	25	58			
SC6-10	10.5	15	28	6.2	4		SC95-16	17	25	58			
SC10-5	5.2	12	25	6.2	4.5	9	SC120-8	8.4	28	63	19.4	15	22
SC10-6	6.5	12	25				SC120-10	10.5	28	63			
SC10-8	8.4	12.5	27				SC120-12	13	28	63			
SC10-10	10.5	15	29				SC120-14	15	28	63			
SC10-12	13	17	31				SC120-16	17	28	63			
-	-	-	-	-	-	-	SC120-20	21	28	63			

List of model and dimension of SC terminal (continued):

Model	Dimensions (mm)						Model	Dimensions (mm)					
ITEM NO.	Φd2	B	L	ΦD	Φd	E	ITEM NO.	Φd2	B	L	ΦD	Φd	E
SC16-5	5.2	12	30	7.1	5.4	12	SC150-8	8.4	30.6	70	21.2	16.5	26
SC16-6	6.5	12	30				SC150-10	10.5	30.6	70			
SC16-8	8.4	12.5	30				SC150-12	13	30.6	70			
SC16-10	10.5	16	33				SC150-14	15	30.6	70			
SC16-12	13	17	35				SC150-16	17	30.6	70			
SC25-5	5.2	13	33	8.8	6.8	12	SC150-20	21	30.6	70			
SC25-6	6.5	13	33				SC185-10	10.5	34	75	23.5	18.5	32
SC25-8	8.4	15	33				SC185-12	13	34	75			
SC25-10	10.5	18	34				SC185-14	15	34	75			
SC25-12	13	18	35				SC185-16	17	34	75			
SC25-14	15	20	38				SC185-20	21	34	75			
SC35-5	5.2	16	38	10.6	8.2	14	SC240-10	10.5	38.6	90	26.5	21	38
SC35-6	6.5	16	38				SC240-12	13	38.6	90			
SC35-8	8.4	16	38				SC240-14	15	38.6	90			
SC35-10	10.5	18	39				SC240-16	17	38.6	90			
SC35-12	13	19	40.5				SC240-18	19	38.6	90			
SC35-14	15	20	42				SC240-20	21	38.6	90			

The basic operation wiring connection is as follows :

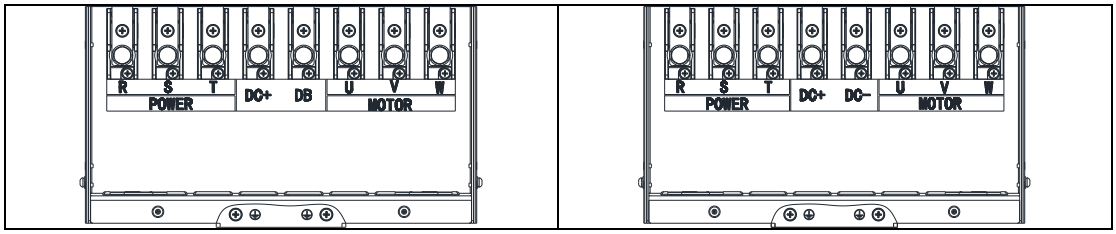


Description on major loop terminal function

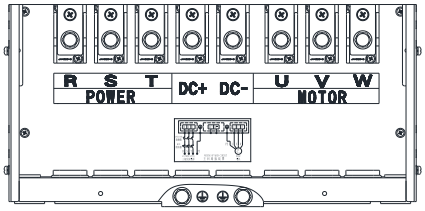
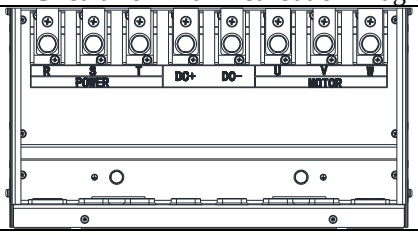
Terminal symbol	Terminal name	Description
R, S, T	Input power terminal	Connect to the three-phase 690V power supply
U, V, W	Frequency converter output terminal	Connect to the three-phase motor
DC+, DC-	DC bus terminal	Connect the braking unit between DC+ and DC-
DB	Brake output terminal	Connect the braking resistor between DC+ and DB
PE	Grounding terminal	Grounding terminal on frequency converter case shall be grounded

Arrangement of main circuit terminal of Hope530G18.5T6~Hope530G75T6 frequency converters is as follows:

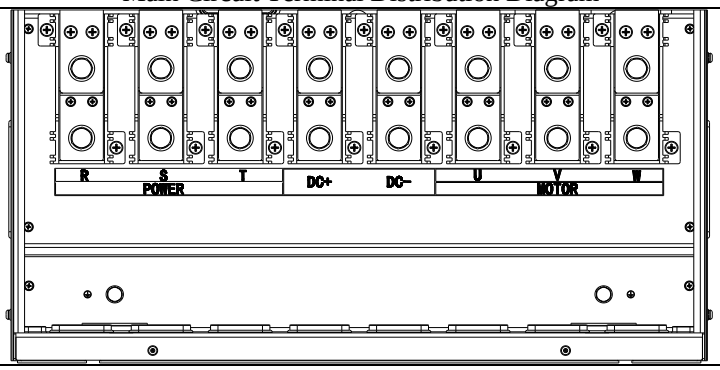
Main Circuit Terminal Distribution Diagram (with braking unit)	Main Circuit Terminal Distribution Diagram (without braking unit)



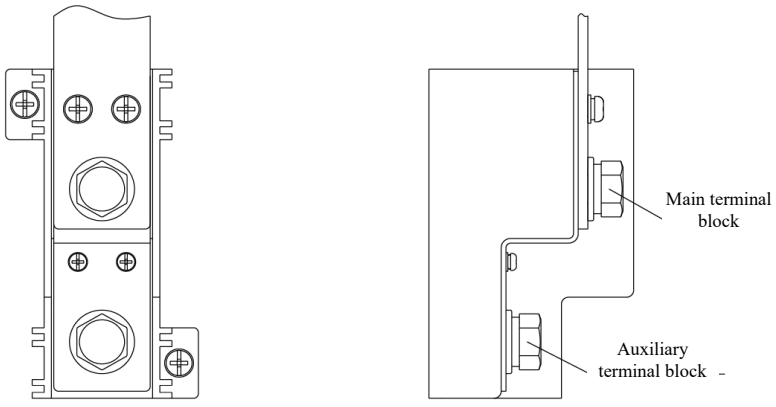
Arrangement of main circuit terminal of Hope530G90T6~Hope530G315T6 frequency converters is as follows:

Main Circuit Terminal Distribution Diagram	Main Circuit Terminal Distribution Diagram
	

Arrangement of main circuit terminal of Hope530G375T6 frequency converters is as follows:

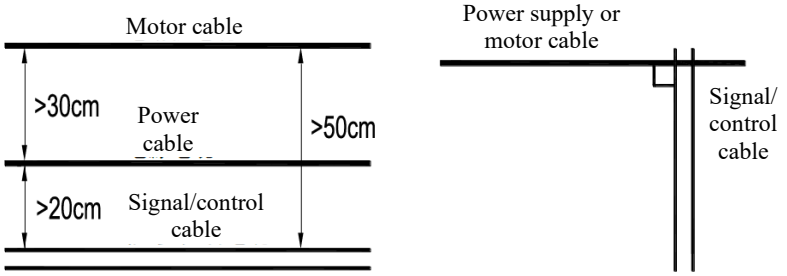
Main Circuit Terminal Distribution Diagram


ATTENTION: Each terminal block of the Hope530G375T6 models includes an upper main terminal block and a lower auxiliary terminal block. During wiring, users must prioritize connecting wires to the main terminal blocks, as illustrated in the following figure.



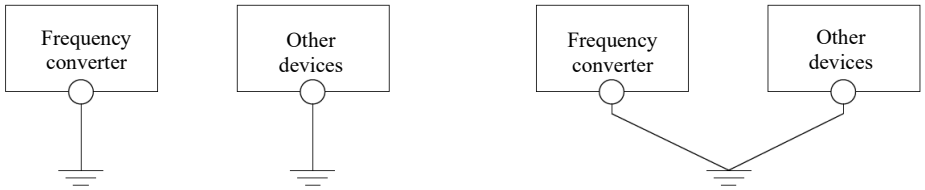
Control cable , power cable and motor cable shall be applied separately to avoid interference due to intercoupling, and enough far distance shall be maintained between

them, especially, when cables are installed in a parallel manner and with long extension distance. If signal cable has to cross power cable, the vertical crossing method shall be applied, shown as follows:

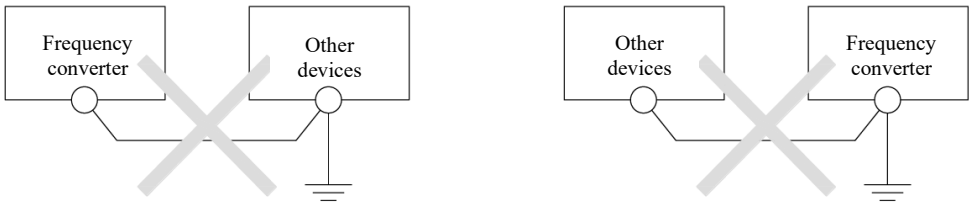


Direct earth capacitance becomes larger and intercoupling interference becomes stronger if motor cable is longer or cross sectional area of motor cable is bigger, therefore, cable with specified cross sectional area shall be applied, and its length shall be as short as possible.

See following figure for recommended earthing method when wiring:



The following earthing methods are not allowed:



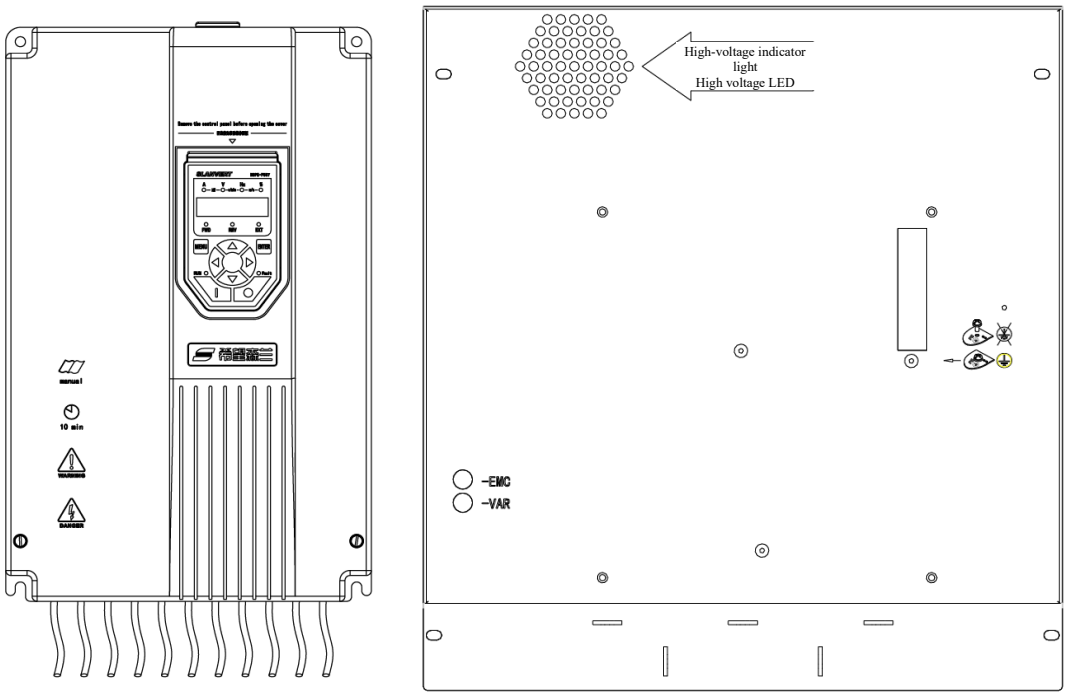
3.2.2 Incoming and Outgoing Line Methods of Frequency Converter

Hope530G18.5T6~Hope530G375T6 models adopts the down-in down-out wiring mode.

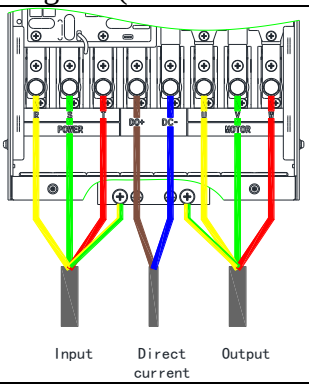
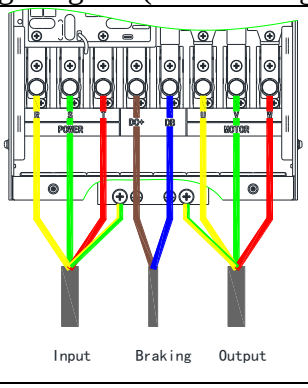
The frequency converter is provided with an internal high-voltage indicator light inside at the top left corner of pallet on mainboard, which is below the hexagonal transparent hole composed of multiple circular holes. The transparent hole is shown in the right figure below, which is for reference before wiring. Internal wiring can only be performed after the high-voltage indicator light is extinguished and the voltage between the main circuit terminals DC+ and DC- is verified (via voltmeter measurement) to be 36V or lower.

Wiring Effect Diagram of Complete Machine

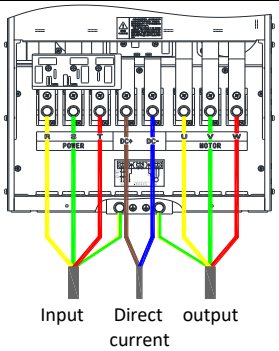
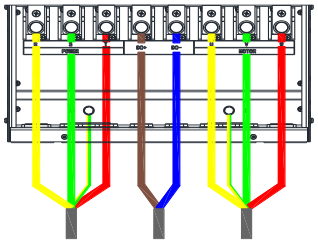
Schematic Diagram of Relative Positions of Transparent Holes

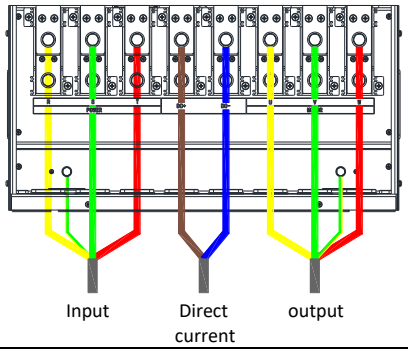


Wiring of main circuit terminal of Hope530G18.5T6~Hope530G75T6 frequency converters is as follows:

Wiring Diagram (without braking unit)	Wiring Diagram (with braking unit)
	

Wiring of main circuit terminal of Hope530G90T6L~Hope530G375T6L frequency converters is as follows:

Overall wiring Effect Diagram of Main Circuit Terminal Output Terminals(90~160kW)	Overall wiring Effect Diagram of Main Circuit Terminal Output Terminals (200~315kW)
	
Overall wiring Effect Diagram of Main Circuit Terminal Output Terminals(375kW)	



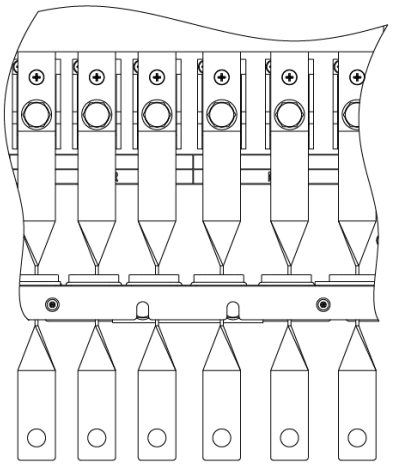
If copper bars are used to connect the terminal blocks of the steel-cased chassis frequency converter to peripheral equipment, please note the following points to ensure the electrical safety distance between the copper bars and the chassis grounding wire (PE):

① Copper bars must be covered with heat shrink tubing;

② The copper bar must be twisted 90° to pass through the chassis. After passing through the chassis, the user can decide whether to twist it another 90° to connect with peripheral equipment based on the site conditions.

The copper bar is first twisted 90° to pass through the chassis, and then twisted another 90° to connect with peripheral equipment, as shown below:

Schematic Diagram of Twisted Copper Bar



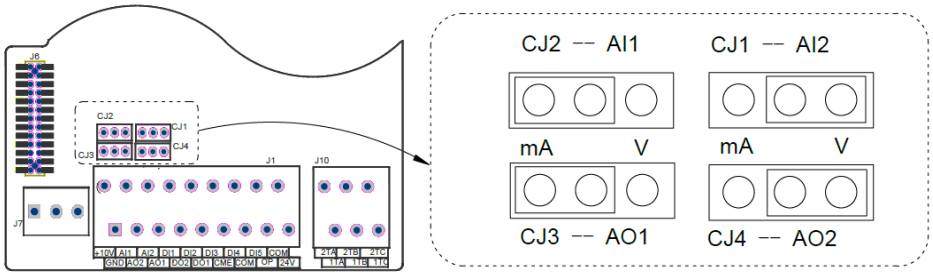
Schematic Diagram of Wiring Effect of Twisted Copper Bar on the Complete Machine

3.2.3 Control Board Terminal, Jumper and Wiring

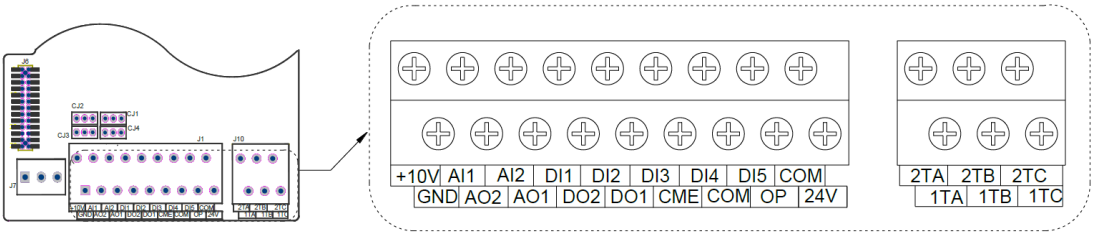
See the following table for functions of control board jumper:

Label	Name	Functions & settings			Factory settings
CJ1	AI2	AI2 input type selection	V: Voltage type	mA: Current type	V
CJ2	AI1	AI1 input type selection	V: Voltage type	mA: Current type	mA
CJ3	AO1	AO1 output type selection	V: 0~10V voltage signal	mA: 0/4~20mA current signal	mA
CJ4	AO2	AO2 output type selection	V: 0~10V voltage signal	mA: 0/4~20mA current signal	V

Control board jumper connection schematic diagram:



Terminal arrangement of Hope530G series control board (recommended to use 1mm^2 copper conductor):



The functions of the control board terminals for Hope530G series are shown in the following table:

Terminal symbol	Terminal name	Terminal Function & Description	Technical specifications
+10V	+10V reference power supply	+10V power supply provided to the users	+10V: Maximum output current 15mA, voltage accuracy >2%
GND	Ground	Grounding terminals for analog input/output, communication, and +10V power supply	GND is internally isolated from COM, OP and CME
AI1	Analog input 1	Function selection: See the description of parameters F6-00~F6-19 for details	Input voltage range: -10~+10V Input current range: -20~+20mA Input impedance: voltage input: 110kΩ Current input: 250Ω
AI2	Analog In 2	Select voltage or current output form via jumper CJ2, CJ1	
AO1	Multifunctional analog output 1	Function selection: see description for parameters F6-20 and F6-24	Current type: 0~20mA, load ≤500Ω Voltage type: 0~10V, output ≤10mA
AO2	Multifunctional analog output 2	Select voltage or current output form via jumpers CJ4 and CJ3	
DI1	DI1 digital input terminal	See F4 menus for function selection and settings	Optocoupler-isolated Support bi-directional input Input impedance: >3k Ω Input voltage range: <30V Sampling period: 1ms High level: voltage difference with OP>10V Low level: voltage difference with OP<3V
DI2	DI2 digital input terminal		
DI3	DI3 digital input terminal		
DI4	DI4 digital input terminal		
DI5	DI5 digital input terminal		
	Pulse frequency input (PFI)	DI5 can be reused for pulse frequency input. See the description of parameters F6-28～F6-30 for details	0~50 KHZ, input impedance: 1.5kΩ High level: >6V; Low level: <3V Maximum input voltage: 30V
OP	Digital input common terminal	Common terminal of DI1~DI5 terminal	Internally isolated from COM and 24V and OP is in short connection with adjacent 24V when delivering

Terminal symbol	Terminal name	Terminal Function & Description	Technical specifications
CME	DO1 and DO2 common terminal	Common terminal of DO2 (when COM and CME are short-circuited) and DO1 digital outputs	DO1: Optocoupler-isolated bidirectional open-collector output DO2: Optocoupler-isolated unidirectional open-collector output Specification: 24Vdc/50mA Output action frequency: <500Hz Break-over voltage: <2.5V (relative to CME) CME short connected to the adjacent COM at the time of delivery
DO1	DO1 digital output terminal	See F5 menu for function selection and settings	
DO2	DO2 digital output terminal		
	PFO pulse frequency output	DO2 can be reused as a Pulse Frequency Output (PFO) terminal, refer to F6-31 to F6-36 for details	0~50kHz, output specification of collector open circuit: 24V/50mA
24V	24V power terminal	24V power supply provided to the user	24V maximum output current 80mA
COM		24V power ground	
1TA	Output terminal of relay 1	See F5 menu for function selection and settings	TA-TB: normally open TB-TC: normally closed Contact specification: 250VAC/3A 24VDC/5A
1TB			
1TC			
2TA	Output terminal of relay 2		
2TB			
2TC			

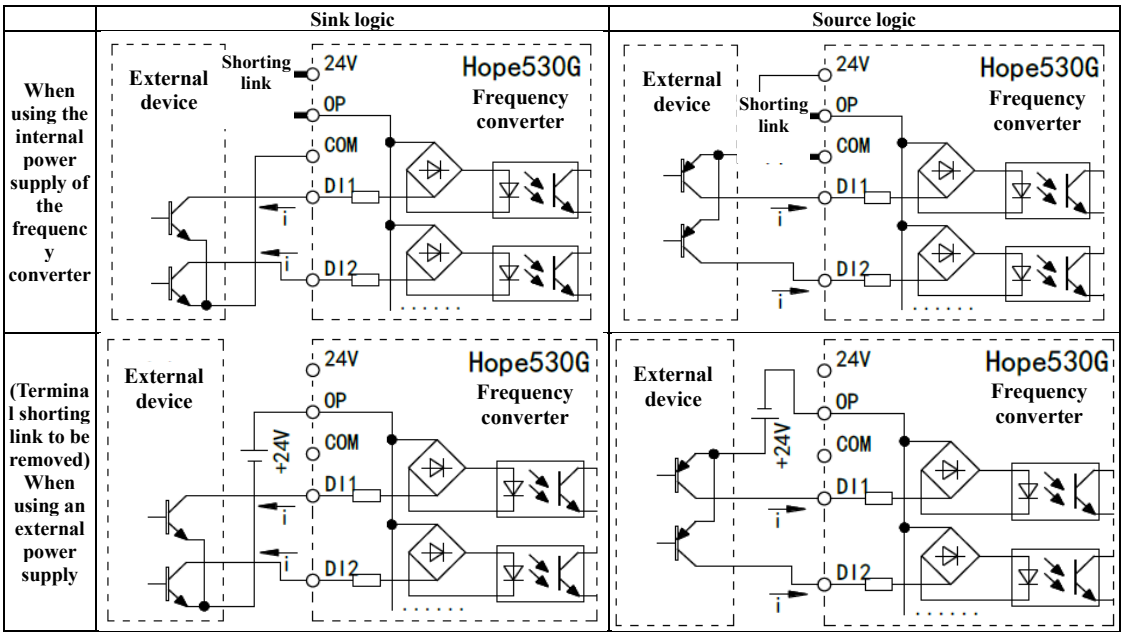
1) Analog input terminal wiring

Using analog signal for remote operation requires the length of the control line between the operator and the frequency converter to be less than 30m. Since the analog signal is easily interfered, the analog control line shall be separated from the strong current circuit, relay, contactor, etc. The wiring shall be as short as possible and the connecting wire shall be shield twisted pair. One end of the shield wire shall be connected to the GND terminal of the frequency converter.

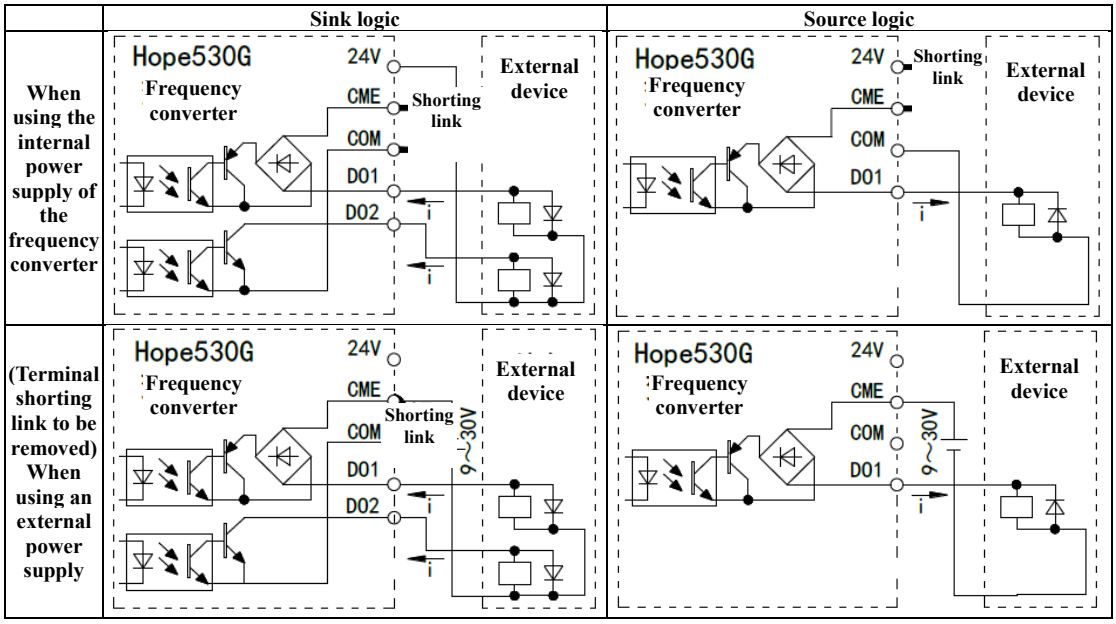
2) Wiring for multi-function input terminals DI1~DI5, and multi-function output terminals DO1 and DO2

Hope530G series frequency converter multi-function input terminals and output terminals are available in two types: sink logic and source logic. The interface mode is flexible and convenient. Typical wiring methods are as follows:

Connection of multi-function input terminal and external device:

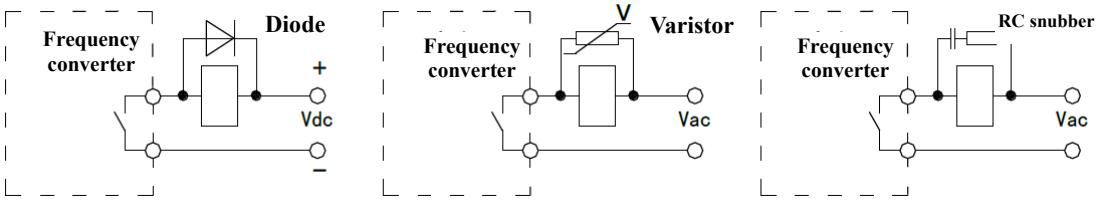


Connection of multi-function output terminal and external device:



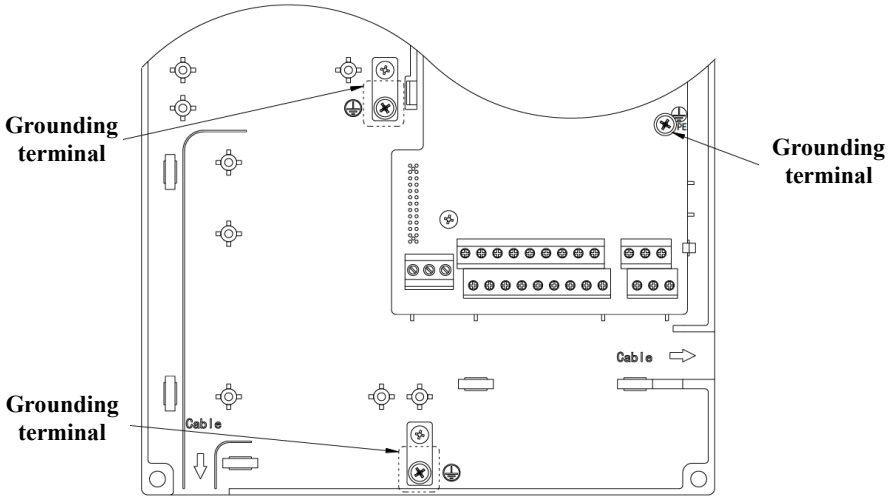
3) Wiring of relay output terminals TA, TB, and TC

For driving inductive loads (such as electromagnetic relays, contactors, electromagnetic brakes), surge voltage snubber circuits, varistor or freewheeling diodes (for DC electromagnetic circuits, must pay attention to polarity when installing) shall be installed. The components of the snubber circuit shall be installed close to the coils of the relay or contactor as shown below:

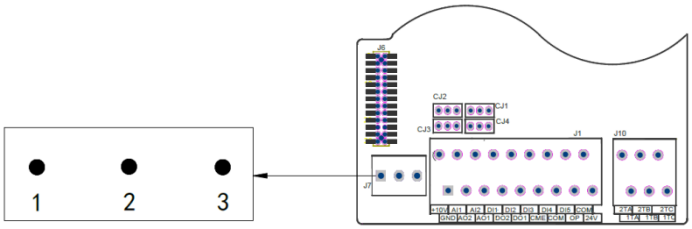


4) Grounding terminal of control board

The control board and corresponding expansion board shall be grounded reliably. The grounding between the board and the shell is shown in the figure below:



Hope530G series control board COMM1 communication port:



Pins of COMM1 communication port are defined as below:

Pin No.	Terminal name
1	485+
2	485-
3	Not connected

Note: The configuration of COMM1 communication port is shown in Page 77. The terminal of COMM1 communication port can also be replaced by a crystal port. Please contact the manufacturer if needed. Only the physical interface corresponds to the COMM1 communication port, and the other ports on the expansion board correspond to the COMM2 communication port.

Note: The LCD display panel occupies the COMM1 communication interface, which is no longer externally available; for communication purposes, a communication expansion card must be configured.

3.3 Suppression Method for Electric Magnetic Interference of Frequency Converter

Working principle of the frequency converter determines that it will produce certain interference, which may bring EMC (electric magnetic compatibility) problems to the equipment or system. As electronic equipment, the frequency converter will also be affected by external electric magnetic interference. The followings are some installation design methods meeting EMC specifications for reference in field installation and wiring of frequency converters.

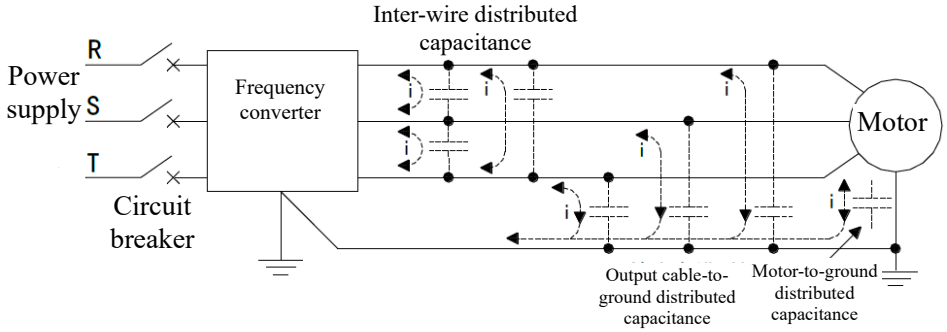
I. Measures for suppression of electric magnetic interference are shown below:

Interference propagation path	Mitigation measures
Leakage current Grounding circuit	When peripheral devices form a closed circuit through the wiring of the frequency converter, the leakage current of the frequency converter ground wire will cause misoperation of equipment. If the equipment is not grounded, misoperation will be reduced.
Power line propagation	When peripheral device and the frequency converter share the same power supply, the interference generated by the frequency converter will result in inverse power line propagation, which will make other devices in the same system misoperate. The following measures can be taken: (1) The EMI filter or ferrite common-mode filter (magnetic ring) shall be installed on input side of the frequency converter; (2) The noise of other equipment shall be controlled with isolation transformer or power filter.
Motor line radiation Power line radiation Frequency converter radiation	When measuring instruments, radio devices, sensors and other weak signal equipment or signal lines are installed in the same cabinet as the frequency converter and the line is very close to each other, they are prone to space interference and misoperation. The following measures shall be taken: (1) Easily affected equipment and signal lines shall be installed as far away from the frequency converter as possible. Shielded wires shall be used as signal lines with shielding layer grounded. Signal cables shall be encased in metal tubes, and shall be far away from the frequency converter and frequency converter input and output lines. If it is inevitable for signal cables to pass through the power cable, they shall be vertical; (2) The EMI filter or ferrite common-mode filter (magnetic ring) shall be installed on input and output side of the frequency converter respectively; (3) The motor cable shall be placed in a barrier of greater thickness, such as in a pipe of greater thickness (more than 2mm) or buried in a cement tank. The power line shall be encased in metal tubes, and shielded and grounded (the motor cables shall be 4-core cables, one of which shall be grounded on the frequency converter side, and the other side shall be connected to the motor shell).
Electrostatic induction Electromagnetic induction	(1) The signal line and power line shall not be arranged in parallel. The signal line shall not be bundled up with the power line; (2) Easily affected equipment and signal lines shall be away from frequency converter and its input and output lines; (3) Both signal cables and power cables adopt shielded cables and are respectively wrapped into metal tubes, with a distance between tubes of at least 20cm between them.

II. Leakage Current and Solution

Leakage current will occur due to the existence of the ground capacitance of the input and output cables of the frequency converter, the inter-wire capacitance and the ground capacitance of the motor. Leakage current includes ground leakage current and inter-wire leakage current, which depends on the size of distributed capacitance and carrier frequency.

Leakage current path is shown below:



Ground leakage current

The leakage current not only flows into the frequency converter system, but also may flow into other equipment through the ground wires. These leakage currents may cause mis-operation of leakage circuit breakers, relays or other equipment. The higher the carrier frequency of the frequency converter is, the greater the leakage current will be and the longer the motor cable is, the greater the leakage current will be.

Suppression measures:

Reduce the carrier frequency, but the motor noise will increase;

Motor cables shall be as short as possible;

The frequency converter system and other rest systems adopt the leakage circuit breaker designed for high harmonics and surge leakage currents.

Inter-wire leakage current

AS for the leakage current that flows through the distributed capacitance between the cables at the output side of the frequency converter, its high harmonics may result in mis-operation of the external thermal relay, especially small-capacity frequency converter. When the wiring is very long (above 50m), the leakage current will increase a lot, which will easily make the external thermal relay misoperate. It is recommended to directly monitor the motor temperature with a temperature sensor or replace the external thermal relay with the motor overload protection function of the frequency converter.

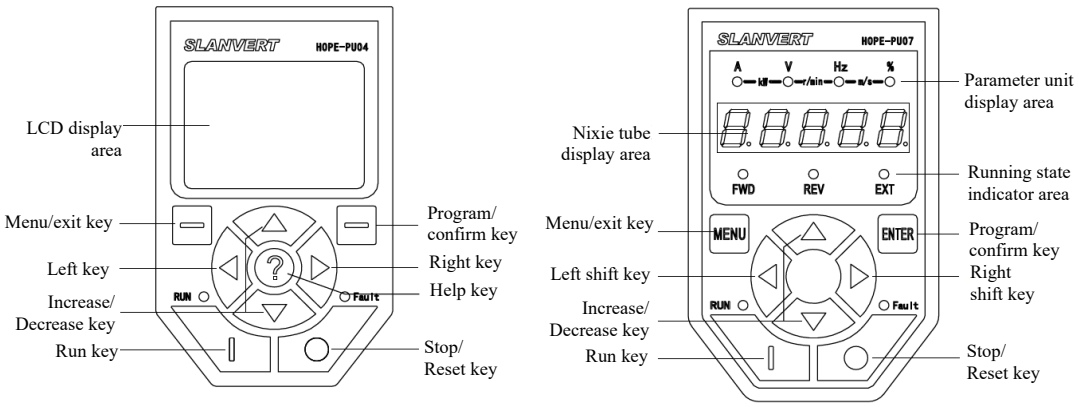
Suppressing measures: reduce carrier frequency, install electric reactor at output side.

4 Operation and Trial Run of Frequency Converter

4.1 Operation and Display of Frequency Converter

4.1.1 Functions of Operation Panel

The operation panel enables parameter setting/monitoring, operation control, and fault display. The standard configuration is HOPE-PU07, while HOPE-PU04 or HOPE-PU10 can be optionally provided based on customer requirements. Additionally, optional accessories allow cabinet-panel installation of HOPE-PU07 (LED panel), HOPE-PU04 (LCD panel), or HOPE-PU10 (LED panel with potentiometer). Outside view of HOPE-PU04 and HOPE-PU07 operation panel is shown below:



Functions of keys on HOPE-PU07 operation panel are shown below:

Key label	Key name	Function
MENU	Menu/exit key	Return to the previous menu; Enter/exit the monitoring state
ENTER	Program/confirm key	Enter the next-level menu; storage parameters; clear alarm information
△	Increase key	The number increases progressively, and increases faster when long pressing it down
▽	Decrease key	The number decreases progressively, and decreases faster when long pressing it down
◁	Left shift key	Select the bit to be modified; in monitoring mode, the monitored parameters can be displayed cyclically
▷	Right shift key	
▯	Run key	Run command
○	Stop/Reset key	Stop, fault reset

The various combinations of unit indicator lights represent the following units:

Display	Unit	Description
●—kW—○-r/min-○—m/s—○ A V Hz %	A	Ampere
○—kW—●-r/min-○—m/s—○ A V Hz %	V	Volt
○—kW—○-r/min-●—m/s—○ A V Hz %	Hz	Hertz
○—kW—○-r/min-○—m/s—● A V Hz %	%	Percentage
●—kW—●-r/min-○—m/s—○ A V Hz %	kW	kW (lights A and V are on at the same time)

Display	Unit	Description
○—kW—●-r/min-●—m/s—○ A V Hz %	r/min	RPM (lights V and Hz are on at the same time)
○—kW—○-r/min-●—m/s—● A V Hz %	m/s	m/s (lights Hz and % are on at the same time)
●—kW—●-r/min-●—m/s—○ A V Hz %	Length	m or mm (lights A, V and Hz are on at the same time)
○—kW—●-r/min-●—m/s—● A V Hz %	Time	Hour, minute, second, millisecond (V, Hz, and % lights are simultaneously lit)

The corresponding relationship between the symbols displayed on the LED operation panel and the actual symbols is as follows:

LED display symbol	Actual symbol	LED display symbol	Actual symbol	LED display symbol	Actual symbol
0	0	9	9	H	H
1	1	A	A	I	I
2	2	b	b	L	L
3	3	c	c	n	n
4	4	C	C	o	o
5	5	d	d	P	P
6	6	E	E	r	r
7	7	F	F	u	u
8	8	G	G	U	U

Note: When the highest bit of the LED operation panel displays -, it indicates that the number is negative, for example, -100.00 presents -100.00. If the lowest bit is displayed with a decimal point, it also indicates that the number is negative, for example, 20000. presents -20000.

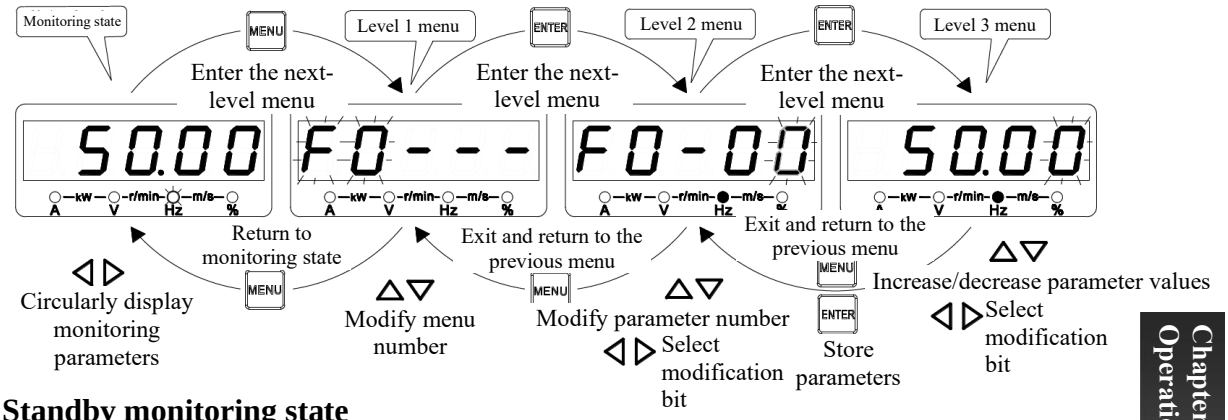
The following table shows the five state indicator lights on the operation panel, i.e., FWD, REV, EXT, RUN and Fault:

Indicator light	Display state	Indicated current state of the frequency converter
RUN indicator light	Off	Standby state
	On	Stable running state
	Flickering	Accelerating or decelerating
FWD indicator light	Off	Set direction and current running direction are reversed
	On	Set direction and current running direction are forward
	Flickering	Set direction and current operation direction are inconsistent
REV indicator light	Off	Set direction and current running direction are forward
	On	Set direction and current running direction are reversed
	Flickering	Set direction and current operation direction are inconsistent
EXT indicator light	Off	Operation panel control state
	On	Terminal control state
	Flickering	Communication control state
Fault indicator light	Off	Fault-free state
	On	Fault state

4.1.2 Display State and Operation of Operation Panel

The display state of Hope530G series frequency converter operation panel includes monitoring state (including standby monitoring state and running monitoring state),

parameter editing state, fault state, and alarm state. The conversion relationship of each state is shown below:



Standby monitoring state

Press ◁ and ▷ under the state to enable the operation panel to circularly display different standby state parameters (defined in FC-02~FC-08).

Running monitoring state

Press ◁ and ▷ under the state to circularly display different running state parameters (defined by FC-02~FC-12).

Parameter editing state

Press MENU under the monitoring state to enter the editing state. The editing state displays in the form of a three-level menu, with the sequence being: Parameter group number → Serial number within the parameter group → Parameter value. Press ENTER to enter the next level step by step, and press MENU to return to the previous menu (return to the monitoring state if in the first menu level). Change parameter group number, serial number within the parameter group or parameter value by pressing △ and ▽. At the third menu level, the modifiable bits will flicker. Use ◁ and ▷ to move the modifiable bits. Press ENTER to save the modified results, return to the second menu level, and point to the next parameter.

When FC-00 is set to 1 (only user parameters are displayed) or 2 (only parameters different from the factory defaults are displayed), the level 1 menu is not displayed to facilitate user operations.

Password verification state

If there is a user password (F0-16 is not zero), enter the password verification state before entering parameter editing. The device shows "____" at this time, and users can enter password by pressing △, ▽, ◁, and ▷, during which the "____" will be displayed all the time. Then, password protection can be released by pressing ENTER. If the password is not correct, the keyboard will flicker and display "Err". At the time, press MENU to return to the verification state and press MENU again to exit password verification state.

After the password protection is removed, the password protection automatically takes effect if pressing ENTER + ◁ in the monitoring state or pressing no keys within 2min.

When the value of FC-00 is 1 (only user parameters are displayed), user parameters are not protected by passwords. However, user password is required when changing the value of FC-00.

Fault display state

Once detecting fault signal, the frequency converter will enter fault display state with fault code flickering. Faults can be reset by inputting a reset command (via ○ on the operation panel, control terminal, or communication command). If the fault persists, the fault code will continue to be displayed, and the improperly set parameters can be modified during this period to eliminate the fault.

Alarm display state

If the frequency converter detects the alarm information, the Nixie tube will display flickering alarm code. In case of multiple alarm signals, they will be displayed alternately, and the alarm display can be temporarily shielded by pressing MENU or ◁. The frequency converter automatically detects the alarm value, and automatically clears the alarm signal if it returns to normal state. The frequency converter will not stop when alarming.

4.2 First Power-On

Please connect cables according to the technical requirements provided in section 3.2 "Frequency Converter Wiring" of this Manual.

After checking the wiring and power supply, close the AC power supply air switch at the input side of the frequency converter to supply power for the frequency converter. The frequency converter operation panel will display "8.8.8.8.8" first. Once the contactor inside the frequency converter is normally closed, the words displayed by LED Nixie tube at the set frequency, it indicates that the frequency converter has been initialized. In case of abnormalities during the power-on process, turn off the air switch on the input side to check the cause and eliminate such abnormalities.

4.3 Quick Commissioning Guide

This section gives the common and necessary commissioning steps for the speed regulation in the general mode of Hope530G series frequency converter based on the default values.

4.3.1 Common Parameter Settings for Each Control Mode

1. Select the control mode: Select control mode according to the application conditions and requirements. For details, see the description of F0-12 "motor control mode" on Page 78;

2. Select the frequency set channel and set the frequency: see F0-01 "main set channel for normal operation" on Page 76 for details;

3. Select run command channel: see F0-02 "run command channel selection" on Page 77 for details;

4. Correctly set F0-06 "maximum frequency", F0-07 "upper limit frequency", F0-08 "lower limit frequency", see Page 78 for details;

5. Motor running direction: confirm the motor wiring phase sequence and set F0-09 "direction locking" according to mechanical load requirements. See Page 78;

6. Acceleration and deceleration time: set as long as possible under the premise of meeting needs. If it is too short, it will produce too much torque, which may damage load or cause overcurrent;

7. Start and stop mode: see F1-19 "start mode" on Page 82 and F1-25 "stop mode" on Page 83 for details;

8. Parameters of motor on nameplate: rated power, number of motor poles, rated current, rated frequency, rated speed, rated voltage. See Page 135 for details;

9. Motor overload protection: see Fb-00 "heat dissipation condition of motor", Fb-01 "motor overload protection value" and Fb-02 "motor overload protection action selection" on Page 138 for details.

4.3.2 V/F Control Quick Commissioning

V/F control quick commissioning methods based on the condition without PG V/F control are introduced below. If "with PG V/F control" is adopted, set encoder parameters according to the encoder parameter description on Page 104 of this Manual.

1. See Page 86 for V/F curve settings;

2. See Page 87 for torque boost selection;

3. Motor parameters self-tuning: see the description of FA-00 on Page 135. "Static self-tuning" is only required to be executed for V/F control.

V/F control optimization adjustment:

1. F2-09 "vibration damping": it is used to eliminate motor oscillation under light load. If the motor oscillates, adjust the parameter from small to large until the oscillation is eliminated, but it should not be too large;

2. F2-02 "manual torque boost amplitude": If the starting current is too large, the value of this parameter can be reduced;

3. Automatic torque boost: in order to increase the starting torque of the frequency converter and the output torque during low speed operation, automatic torque boost is recommended (F2-01 "torque boost selection" = 2). Automatic torque boost requires correct setting of motor nameplate parameters and motor static self-tuning is also required;

4. Slip compensation: speed drop caused by load can be reduced. Slip compensation is effective only when automatic torque boost is effective. Settings required: F2-05 "slip compensation gain", F2-06 "slip compensation filtering time", and slip compensation amplitude limiting.

4.3.3 Vector Control Quick Commissioning

Vector control quick commissioning methods based on the condition without PG vector control are introduced below. If "with PG vector control" is adopted, set encoder parameters according to the encoder parameter description on Page 104 of this Manual.

1 F3-22 "magnetic flux intensity": Adjust the magnetic flux intensity to make the current of motor under no-load operation at low speed (non-flux weakening field) under vector control is close to the no-load current of the motor, see Page 93 for details;

2. Motor parameter self-tuning: no-load and complete motor self-tuning is required for vector control. If no-load complete self-tuning is not possible, correct motor parameters must be manually input, including FA-08 "motor stator resistance", FA-09 "motor leakage inductive reactance", FA-10 "motor rotor resistance", and FA-11 "motor mutual inductive reactance";

3. See Page 90 for settings of speed regulator.

4. For vector control, F2-12 "basic frequency" shall be set as the same as FA-04 "motor rated frequency".

5 Function Parameter List

Description:

Change: "○" means that both standby and operation state can be changed, "×" means that only the operation state cannot be changed, and "△" means read-only.

5.1 F0 Basic Parameters

Parameter	Name	Setting range and description	Factory default	Change	Page
F0-00	Digital set frequency	0.00Hz~F0-06 "maximum frequency"	50.00Hz	○	76
F0-01	Main set channel for normal operation	**Tens and units digit: Set channel 1** **Thousands and hundreds digit: Set channel 2** 0: F0-00 digital setting 1: COMM1 communication setting 2: COMM2 communication setting 3: AI1 4: AI2 5: AI3 6: AI4 7: UP/DOWN adjustment value 8: PFI 9: Arithmetic unit 1 10: Arithmetic unit 2 11: Arithmetic unit 3 12: Arithmetic unit 4 13: Panel potentiometer	0300	○	76
F0-02	Run command channel selection	**Units digit: Command channel 1 selection** **Tens digit: Command channel 2 selection** 0: Operation panel 1: Virtual terminal 1 (FWD1/REV1) 2: Virtual terminal 2 (FWD2/REV2) 3: COMM1 control 4: COMM2 control	10	×	77

Parameter	Name	Setting range and description	Factory default	Change	Page
F0-03	Set frequency holding mode	**Units digit: Power-down storage selection** 0: The main set frequency at which △, ▽, or communication is modified is stored to F0-00 in case of power-down 1: The main set frequency at which △, ▽, or communication is modified is not stored in case of power-down **Tens digit: Stop hold normal selection** 0: The main set frequency modified by △ and ▽, is retained for stop 1: The main set frequency modified by △ and ▽, recovers to F0-00 for stop **Hundreds digit: Stop hold forced selection** 0: Stop hold forced selection invalid 1: Stop hold forced selection valid	000	○	77
F0-04	Auxiliary set channel selection	0: None 1: F0-00 2: UP/DOWN adjustment value 3: AI1 4: AI2 5: AI3 6: AI4 7: PFI 8: Arithmetic unit 1 9: Arithmetic unit 2 10: Arithmetic unit 3 11: Arithmetic unit 4 12: Panel potentiometer	0	○	77
F0-05	Auxiliary channel gain	-1.000~1.000	1.000	○	77
F0-06	Maximum frequency	F0-07~650.00Hz (V/F) / 200.00Hz (vector control)	50.00Hz	×	78
F0-07	Upper limit frequency	F0-08 "lower limit frequency" ~ F0-06 "maximum frequency"	50.00Hz	×	78
F0-08	Lower limit frequency	0.00Hz~F0-07 "upper limit frequency"	0.00Hz	×	78
F0-09	Direction lock	0: Forward and reverse directions allowed 1: Forward direction locked 2: Reverse direction locked	0	○	78
F0-10	Parameter write protection	0: No protection, 1: Except for F0-00 and F7-04, 2: Full protection	0	○	78
F0-11	Parameter initialization	11: Initialization, 22: Initialization, except for communication parameters	00	×	78

Parameter	Name	Setting range and description	Factory default	Change	Page
F0-12	Motor control mode	0: Without PG V/F control 1: With PG V/F control 2: Without PG vector control 3: With PG vector control 4: V/F separation control 5: With PG vector control 2	0	×	78
F0-13	Rated power of frequency converter	Minimum unit: 0.01kW	Model determination	△	80
F0-14	Software version	0.00~99.99	Version determination	△	80
F0-15	Selection of IO accessories	**Units digit: IO module** 0: No accessories 1: Digital I/O expansion board 1 2: Digital I/O expansion board 2 3: Digital I/O expansion board 3 4: Analog I/O expansion board 1 **Tens digit: Communication module** 0: No accessories 1: Isolated RS485 communication expansion board 1 2: Isolated RS485 communication expansion board 2 (supports TCP) 3: Profibus-DP or PROFINET communication expansion board **Hundreds digit: PG card** 0: No accessories 1: Encoder expansion board	000	×	80
F0-16	User password setting	0000~9999, 0000 indicates that no password is set	0000	○	80
F0-17	Administrator password setting	0000~9999, 0000 indicates that no password is set	0000	○	80

5.2 F1 Acceleration & Deceleration, Start, Stop and Jog Parameters

Parameter	Name	Setting range and description	Factory default	Change	Page
F1-00	Acceleration time 1	0.01~3600.0s Acceleration time: the time required to increase the frequency by 50Hz Deceleration time: the time required to reduce the frequency by 50Hz Note: 22kW and below models are set to be 6.0s when delivering 30kW and above models are set to be 20.0s when delivering Note: The minimum unit is determined by F1-16	Model determination	○	81
F1-01	Deceleration time 1				81
F1-02	Acceleration time 2				81
F1-03	Deceleration time 2				81
F1-04	Acceleration time 3				81
F1-05	Deceleration time 3				81
F1-06	Acceleration time 4				81
F1-07	Deceleration time 4				81
F1-08	Acceleration time 5				81
F1-09	Deceleration time 5				81
F1-10	Acceleration time 6				81
F1-11	Deceleration time 6				81
F1-12	Acceleration time 7				81
F1-13	Deceleration time 7				81
F1-14	Acceleration time 8				81
F1-15	Deceleration time 8				81

Parameter	Name	Setting range and description	Factory default	Change	Page
F1-16	Minimum unit of acceleration and deceleration time	0: 0.01s 1: 0.1s	1	○	81
F1-17	Automatic acceleration/deceleration time switching point	0.00~650.00Hz, below this point is the acceleration/deceleration time 8	0.00Hz	×	81
F1-18	Emergency stop deceleration time	0.01~3600.0s, the minimum unit is determined by F1-16	10.0s	○	81
F1-19	Starting method	0: Start from the starting frequency 1: First DC braking and then starting from the starting frequency 2: Speed tracking start	0	×	82
F1-20	Starting frequency	0.00~60.00Hz	0.50Hz	○	82
F1-21	Starting frequency retention time	0.0~60.0s	0.0s	○	82
F1-22	Voltage soft start	0: Invalid 1: Valid	1	×	82
F1-23	Starting DC braking time	0.0~60.0s	0.0s	○	82
F1-24	Starting DC braking current	0.0~100.0%, taking the rated current of frequency converter as 100%	0.0%	○	82
F1-25	Stop method	0: Deceleration stop 1: Free stop 2: Deceleration + DC braking 3: Deceleration + brake locking delay	0	○	83
F1-26	Stop/DC braking frequency	0.00~60.00Hz	0.50Hz	○	83
F1-27	Stop/DC braking delay time	0.00~10.00s	0.00s	○	83
F1-28	Stop DC braking time	0.0～60.0s, as brake locking delay time at stop	0.0s	○	83
F1-29	Stop DC braking current	0.0~100.0%, taking the rated current of frequency converter as 100%	0.0%	○	84
F1-30	Zero speed delay time	0.0~60.0s	0.0s	○	84
F1-31	Selection of acceleration and deceleration modes	0: Linear acceleration & deceleration 1: S curve acceleration & deceleration	0	×	85
F1-32	S curve acceleration start time	0.01~10.00s	0.20s	×	85
F1-33	S curve acceleration end time				85
F1-34	S curve deceleration start time	0.01~10.00s	0.20s	×	85
F1-35	S curve deceleration end time				85
F1-36	Forward and reverse rotation dead time	0.0~3600.0s	0.0s	×	86
F1-37	Jog running frequency	0.10~50.00Hz	5.00Hz	○	86
F1-38	Jog acceleration time	0.1~60.0s	Model determination	○	86
F1-39	Jog deceleration time	0.1~60.0s	Model determination	○	86

5.3 F2 V/F Control Parameters

Parameter	Name	Setting range and description	Factory default	Change	Page
F2-00	V/F curve setting	0: Custom 1: Linear 2: Reduced torque V/F curve 1 3: Reduced torque V/F curve 2 4: Reduced torque V/F curve 3 5: Reduced torque V/F curve 4 6: Reduced torque V/F curve 5	1	×	86
F2-01	Torque boost selection	0: None 1: Manual boost 2: Auto boost 3: Manual boost + Auto boost	1	×	87
F2-02	Manual torque boost amplitude	0.0%~ maximum value determined by model, the minimum unit is 0.1%	Model determination	○	87
F2-03	Manual torque boost end point	0.0%~100.0%, taking F2-12 as 100%	50.0%	○	87
F2-04	Automatic torque boost degree	0.0~100.0%	80.0%	×	87
F2-05	Slip compensation gain	0.0~300.0%	0.0%	○	88
F2-06	Slip compensation filtering time	0.1~25.0s	1.0s	×	88
F2-07	Electric slip compensation amplitude limiting	0~250%, taking the motor rated slip frequency as 100%	200%	×	88
F2-08	Regenerative slip compensation amplitude limiting	0~250%, taking the motor rated slip frequency as 100%	200%	×	88
F2-09	Vibration damping	0~200	Model determination	○	88
F2-10	AVR function settings	0: Invalid 1: Always valid 2: Invalid only when decelerating	1	×	88
F2-11	Automatic energy saving operation selection	0: Invalid 1: Valid	0	○	88
F2-12	Basic frequency	1.00~650.00Hz	50.00Hz	×	89
F2-13	Maximum output voltage	260~866V	660V	×	89
F2-14	V/F frequency value F4	F2-16~F2-12	0.00Hz	×	89
F2-15	V/F voltage value V4	F2-17~100.0%, taking F2-13 as 100%	0.0%	×	89
F2-16	V/F frequency value F3	F2-18~F2-14	0.00Hz	×	89
F2-17	V/F voltage value V3	F2-19~F2-15, taking F2-13 as 100%	0.0%	×	89

Parameter	Name	Setting range and description	Factory default	Change	Page
F2-18	V/F frequency value F2	F2-20~F2-16	0.00Hz	×	89
F2-19	V/F voltage value V2	F2-21~F2-17, taking F2-13 as 100%	0.0%	×	89
F2-20	V/F frequency value F1	0.00Hz~F2-18	0.00Hz	×	89
F2-21	V/F voltage value V1	0.0%~F2-19, taking F2-13 as 100%	0.0%	×	89
F2-22	V/F separation voltage input selection	0: F2-23 1: |AI1| 2: |AI2| 3: |AI3| 4: |AI4| 5: |UP/DOWN adjustment value | 6: |PFI| 7: |Arithmetic unit 1| 8: |Arithmetic unit 2| 9: |Arithmetic unit 3| 10: |Arithmetic unit 4|	0	×	90
F2-23	V/F separation voltage digital setting	0.0~100.0%	100.0%	○	90
F2-24	V/F voltage coefficient	0: 100.0% 1: |AI1| 2: |AI2| 3: |AI3| 4: |AI4| 5: |UP/DOWN adjustment value | 6: |PFI| 7: |Arithmetic unit 1| 8: |Arithmetic unit 2| 9: |Arithmetic unit 3| 10: |Arithmetic unit 4|	0	×	90

5.4 F3 Speed, Torque and Flux Control Parameters

Parameter	Name	Setting range and description	Factory default	Change	Page
F3-00	High-speed ASR proportional gain	0.00~200.00	5.00	×	90
F3-01	High-speed ASR integration time	0.010~30.000s	1.000s	×	90
F3-02	Low-speed ASR proportional gain	0.00~200.00	10.00	×	90
F3-03	Low-speed ASR integration time	0.010~30.000s	0.500s	×	90
F3-04	ASR parameter switching point	0.00~650.00Hz	5.00Hz	×	90
F3-05	ASR filtering time	0.000~2.000s	0.010s	×	91
F3-06	Acceleration compensation differential time	0.000~20.000s	0.000s	×	91
F3-07	Torque limitation selection	0: Determined by F3-08 and F3-09 1: |AI1|×2.5 2: |AI2|×2.5 3: |AI3|×2.5 4: |AI4|×2.5 5: |Arithmetic unit 1|×2.5 6: |Arithmetic unit 2|×2.5 7: |Arithmetic unit 3|×2.5 8: |Arithmetic unit 4|×2.5	0	×	91
F3-08	Electric torque limitation	0.0~290.0%, taking the motor rated torque as 100% Note: for vector control only	180.0%	×	91
F3-09	Regenerative torque limitation		180.0%	×	91
F3-10	ASR output frequency limitation	0.0%~20.0%, only for these with PG V/F control	10.0%	×	91
F3-11	Droop	0.00~50.00Hz	0.00Hz	○	92

Parameter	Name	Setting range and description	Factory default	Change	Page
F3-12	Sag starting torque	0.0~100.0%, taking the motor rated torque as 100%	0.0%	○	92
F3-13	Torque control selection	0: Digital input 48 selection 1: Valid all the time	0	×	92
F3-14	Torque set selection	0:F3-15 setting 1:AI1×2.5 2: AI2×2.5 3: AI3×2.5 4: AI4×2.5 5: PFI×2.5 6: UP/DOWN adjustment value×2.5 7: Arithmetic unit 1×2.5 8: Arithmetic unit 2×2.5 9: Arithmetic unit 3×2.5 10: Arithmetic unit 4×2.5	0	×	93
F3-15	Digital torque setting	-290.0%~290.0%, taking the motor rated torque as 100%	0.0%	○	93
F3-16	Torque control speed limit selection	0: Determination of set frequency 1: Determination of F3-17 and F3-18	0	○	93
F3-17	Forward limit of torque control speed	0.00Hz~F0-07 "upper limit frequency"	5.00Hz	○	93
F3-18	Inverse limit of torque control speed	0.00Hz~F0-07 "upper limit frequency"	5.00Hz	○	93
F3-19	Torque set increase or decrease time	0.000~10.000s	0.020s	×	93
F3-20	Speed/Torque control switching delay time	0.001~1.000s	0.050s	×	93
F3-21	Pre-excitation time	0.10~5.00s	Model determination	×	93
F3-22	Magnetic flux intensity	50.0~150.0%	94.0%	×	93
F3-23	Low-speed flux lifting	0~50%	0%	×	93
F3-24	Weak magnetic regulator integration time	0.100~3.000s	0.150s	×	94
F3-25	Electric power limit	0.0% to 250.0%, taking the rated power of frequency converter as 100%	120.0%	×	94
F3-26	Regenerative power limit	0.0% to 250.0%, taking the rated power of frequency converter as 100%	120.0%	×	94

5.5 F4 Digital Input Terminal and Multi-stage Speed

Parameter	Name	Setting range and description	Factory default	Change	Page
F4-00	DI1 digital input terminal function	0: Not connected to the following signals 1: Multi-stage frequency selection 1 34: Stop/DC braking 35: Process PID forbidden	38	×	94

Parameter	Name	Setting range and description		Factory default	Change	Page
F4-01	DI2 digital input terminal function	2: Multi-stage frequency selection 2 3: Multi-stage frequency selection 3	36: PID parameter 2 selection 37: Three-wire stop command	39		
F4-02	DI3 digital input terminal function	4: Multi-stage frequency selection 4 5: Multi-stage frequency selection 5	38: Internal virtual FWD1 terminal 39: Internal virtual REV1 terminal	13		
F4-03	DI4 digital input terminal function	6: Multi-stage frequency selection 6 7: Multi-stage frequency selection 7	40: Internal virtual FWD2 terminal 41: Internal virtual REV2 terminal	1		

Parameter	Name	Setting range and description	Factory default	Change	Page
F4-04	DI5 digital input terminal function	8: Multi-stage frequency selection 8 9: Acceleration / deceleration time selection 1 10: Acceleration / deceleration time selection 2 11: Acceleration/deceleration time selection 3 12: External fault input 13: Fault reset 14: Forward jog operation 15: Reverse jog operation 16: Emergency stop 17: frequency converter operation prohibited 18: Free stop 19: Terminal UP/DOWN increase 20: Terminal UP/DOWN decrease 21: Terminal UP/DOWN clear 22: PLC control prohibited 23: PLC suspended 24: PLC standby reset 25: PLC mode selection 1 26: PLC mode selection 2 27: PLC mode selection 3 28: PLC mode selection 4 29: PLC mode selection 5 30: PLC mode selection 6 31: PLC mode selection 7 32: Auxiliary set channel forbidden 33: Operation interruption 42: Run command channel 1/2 switch 43: FWD1/REV1 terminal command switching to three-wire type 1 (only valid for FWD1/REV1) 44: Main set frequency channel switching 45: Simultaneous switching of main set frequency channel and run command channel 46: Acceleration & deceleration prohibited 47: Analog quantity set frequency retention 48: Speed/torque control selection 49: Multi-stage PID selection 1 50: Multi-stage PID selection 2 51: Multi-stage PID selection 3 52: Zero servo command 53: Counter presetting 54: Counter reset 55: Length counter and counter 2 reset 56: Wobble frequency input 57: Wobble frequency state reset 58: Total fan running time reset 59: PFI is reversed for position setting 60: Motor rated current selection 2 61: Motor rated current selection 3 62: Process PID paused	2		
F4-05	Positive and negative logic 1 of input terminal	**Ten-thousands digit: DI5 Thousands digit: DI4 Hundreds digit: DI3 Tens digit: DI2 Units digit: DI1** 0: Positive logic, valid if circuit is powered and invalid if circuit is not powered 1: Negative logic, invalid if circuit is powered and valid if circuit is not powered	00000	×	98

Parameter	Name	Setting range and description	Factory default	Change	Page
F4-06	Digital input terminal debounce time	0~2000ms	10ms	○	99
F4-07	DI1 input delay	0.00~650.00s	0.00s	○	99
F4-08	DI1 disconnection delay		0.00s	○	99
F4-09	DI2 input delay		0.00s	○	99
F4-10	DI2 disconnection delay		0.00s	○	99
F4-11	DI3 input delay	0.00~650.00s	0.00s	○	99
F4-12	DI3 disconnection delay		0.00s	○	99
F4-13	FWD1/REV1 and FWD2/REV2 operation mode	**Tens digit: FWD2/REV2 operation mode (0~4)** **Units digit: FWD1/REV1 operation mode (0~6)** 0: Single-wire type (start/stop) 1: Two-wire type 1 (forward, reverse) 2: Two-wire type 2 (start/stop, direction) 3: Two-wire type 3 (start, stop) 4: Two-wire type 4 (single-pulse start/stop) 5: Three-wire type 1 (forward, reversal, stop) 6: Three-wire type 2 (operation, direction, stop)	01	×	99
F4-14	UP/DOWN adjustment mode	0: Terminal level type 1: Terminal pulse type 2: Operation panel level type 3: Operation panel pulse type	0	○	101
F4-15	UP/DOWN rate/step size	0.01 to 100.00, the unit is %/s or %	1.00	○	101
F4-16	UP/DOWN memory selection	0: Power-down storage, 1: Power-down clear, 2: Cleared at stop and power-down	0	○	101
F4-17	UP/DOWN upper limit	0.0~100.0%	100.0%	○	102
F4-18	UP/DOWN lower limit	-100.0~0.0%	0.0%	○	102
F4-19	Multi-stage speed selection	0: Code selection, 1: Direct selection 2: Overlapping mode, 3: Number selection	0	×	102
F4-20~F4-67	Multi-stage frequency 1~48	0.00~650.00Hz The factory defaults of multistage frequency 1 ~ multistage frequency 48 are the multi-stage frequency numbers, for example: the multi-stage frequency 3 factory default is 3.00 Hz	n.00Hz (n=1~48)	○	102
F4-68	PG pulse number per revolution	1~8192	1024	×	104
F4-69	PG type	0: Quadrature encoder 1: Single channel encoder	0	×	104
F4-70	PG direction selection	0: Positive 1: Negative	0	×	104

Parameter	Name	Setting range and description	Factory default	Change	Page
F4-71	PG disconnection action	0: No action 1: Alarm 2: Fault and free stop	2	×	104
F4-72	PG disconnection detection time	0.1~10.0s	1.0s	×	104
F4-73	PG gear ratio denominator setting	1~1000	1	×	104
F4-74	PG gear ratio molecular setting	1~1000	1	×	104
F4-75	PG speed measurement filtering time	0.000~2.000s	0.005s	○	104
F4-76	DI6 digital input terminal function	Same as DI1~DI5	0	×	105
F4-77	DI7 digital input terminal function		0	×	
F4-78	DI8 digital input terminal function		0	×	
F4-79	DI9 digital input terminal function		0	×	
F4-80	DI10 digital input terminal function		0	×	
F4-81	Positive and negative logic 2 of input terminal	**Ten-thousands digit: DI10 Thousands digit: DI9 Hundreds digit: DI8 Tens digit: DI7 Units digit: DI6** 0: Positive logic, valid if circuit is powered and invalid if circuit is not powered 1: Negative logic, invalid if circuit is powered and valid if circuit is not powered	00000	×	105

Multi-stage Frequency Corresponding Parameter Table:

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Multi-stage frequency n	F4-20	F4-21	F4-22	F4-23	F4-24	F4-25	F4-26	F4-27	F4-28	F4-29	F4-30	F4-31	F4-32	F4-33	F4-34	F4-35
n	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Multi-stage frequency n	F4-36	F4-37	F4-38	F4-39	F4-40	F4-41	F4-42	F4-43	F4-44	F4-45	F4-46	F4-47	F4-48	F4-49	F4-50	F4-51
n	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**
Multi-stage frequency n	F4-52	F4-53	F4-54	F4-55	F4-56	F4-57	F4-58	F4-59	F4-60	F4-61	F4-62	F4-63	F4-64	F4-65	F4-66	F4-67

5.6 F5 Digital Output and Relay Output Settings

Parameter	Name	Setting range and description	Factory default	Change	Page
F5-00	Digital output terminal signal type selection	**Units digit: DO2 output selection** 0: Digital output 1: Pulse frequency output (PFO) **Tens digit: DO1 digital output signal type** **Hundreds digit: DO2 digital output signal type** **Thousands digit: T1 relay output signal type** **Ten-thousands digit: T2 relay output signal type** 0: Level output 1: Pulse output	00000	×	105
F5-01	DO1 digital output terminal function	0: Frequency converter ready for operation 1: Frequency converter running 2: Frequency reached 3: Frequency level detection signal 1 4: Frequency level detection signal 2 5: Fault output 6: Brake locking signal 7: Heavy motor load 8: Motor overload 9: Motor underload 10: Undervoltage lockout 11: External failure stop 12: Fault self-resetting 13: Instant power failure and power-on action 14: Alarm output 15: In reverse operation 16: During stop process 17: Operation interruption state 18: In operation panel control 19: Torque limiting 20: Limited by frequency upper limit 21: Limited by frequency lower limit 22: In power generation operation 23: Zero-speed operation 37: DI6 (expansion terminal) 38: DI7 (expansion terminal) 39: DI8 (expansion terminal) 40: DI9 (expansion terminal) 41: DI10 (expansion terminal) 42: Comparator 1 output 43: Comparator 2 output 44: Comparator 3 output 45: Comparator 4 output 46: Logic unit 1 output 47: Logic unit 2 output 48: Logic unit 3 output 49: Logic unit 4 output 50: Logic unit 5 output 51: Logic unit 6 output 52: Timer 1 output 53: Timer 2 output 54: Timer 3 output 55: Timer 4 output 56: A (encoder A channel) 57:B (encoder B channel) 58: PFI terminal state 59: Motor virtual loop count pulse 60: PLC running 61: PLC operation paused	1	×	106
F5-02	DO2 digital output terminal function		2		106
F5-03	T1 relay output function		5		106
F5-04	T2 relay output function		13	×	106

Parameter	Name	Setting range and description	Factory default	Change	Page
		24: Zero servo complete signal 25: Host computer digital quantity 1 26: Host computer digital quantity 2 27: Wobble frequency in upper and lower limits 28: Set count value reached 29: Specified count value reached 30: Specified count value reached 2 31: Set length of length counter reached 32: DI1 (after positive and negative logics) 33: DI2 (after positive and negative logics) 34: DI3 (after positive and negative logics) 35: DI4 (after positive and negative logics) 36: DI5 (after positive and negative logics) 62: PLC phase operation completion indication 63: PLC cycle completion indication 64: PLC mode 0 indication 65: PLC mode 1 indication 66: PLC mode 2 indication 67: PLC mode 3 indication 68: PLC mode 4 indication 69: PLC mode 5 indication 70: PLC mode 6 indication 71: PLC mode 7 indication 72: Process PID in sleep 73: Fan life expectancy reached			
F5-05	DO1 and DO2 terminal output positive and negative logic	**Tens digit: DO2 Units digit: DO1** 0: Positive logic, valid connection, invalid disconnection 1: Negative logic, valid disconnection, invalid connection	00	×	108
F5-06	DO1 terminal closing delay	0.00~650.00s	0.00s	○	108
F5-07	DO1 terminal opening delay		0.00s		108
F5-08	DO2 terminal closing delay		0.00s		108
F5-09	DO2 terminal opening delay		0.00s		108
F5-10	T1 terminal closing delay	0.00~650.00s	0.00s	○	108
F5-11	T1 terminal opening delay		0.00s		108
F5-12	T2 terminal closing delay		0.00s		108
F5-13	T2 terminal opening delay		0.00s		108
F5-14	Frequency arrival detection width	0.00~650.00Hz	2.50Hz	○	108
F5-15	Frequency level detection value 1	0.00~650.00Hz	50.00Hz	○	109

Parameter	Name	Setting range and description	Factory default	Change	Page
F5-16	Frequency level detection hysteresis value 1	0.00~650.00Hz	1.00Hz	○	109
F5-17	Frequency level detection value 2	0.00~650.00Hz	25.00Hz	○	109
F5-18	Frequency level detection hysteresis value 2	0.00~650.00Hz	1.00Hz	○	109
F5-19	T3 relay output function	The same as the function of T1 and T2	5	×	109
F5-20	T4 relay output function		5		109
F5-21	T5 relay output function		5		109
F5-22	T6 relay output function		5		109
F5-23	T3 terminal closing delay	0.00~650.00s	0.00s	○	109
F5-24	T3 terminal opening delay		0.00s		110
F5-25	T4 terminal closing delay		0.00s		110
F5-26	T4 terminal opening delay		0.00s		110
F5-27	T5 terminal closing delay		0.00s		110
F5-28	T5 terminal opening delay		0.00s		110
F5-29	T6 terminal closing delay		0.00s		110
F5-30	T6 terminal opening delay		0.00s		110

5.7 F6 Analog Quantity and Pulse Frequency Terminal Settings

Parameter	Name	Setting range and description	Factory default	Change	Page
F6-00	AI1 minimum input analog quantity	-100.00%~100.00%, taking 10V or 20mA as 100%	20.00%	○	110
F6-01	AI1 maximum input analog quantity		100.00%	○	110
F6-02	Corresponding set value/feedback value of AI1 minimum input analog quantity	-100.00~100.00% Note: The highest frequency shall be used for reference for the set frequency PID reference scalar is for reference for PID feedback	0.00%	○	110
F6-03	Corresponding set value/feedback value of AI1 maximum input analog quantity		100.00%	○	110

Parameter	Name	Setting range and description	Factory default	Change	Page
F6-04	AI1 inflection point threshold value	AI1 minimum input analog quantity ~ maximum input analog quantity	20.00%	○	110
F6-05	AI1 inflection point return difference	0~10.00%	0.00%	○	110
F6-06	Corresponding set value/feedback value of AI1 inflection point	Same as F6-02 and F6-03	0.00%	○	110
F6-07	AI1 filtering time	0.000~10.000s	0.100s	○	110
F6-08	AI1 offline threshold	-20.00~20.00%	0.00%	○	110
F6-09	AI1 offline delay	0~360.00s	1.00s	○	111
F6-10	AI2 minimum input analog quantity	-100.00%~100.00%, taking 10V or 20mA as 100%	0.00%	○	111
F6-11	AI2 maximum input analog quantity		100.00%	○	111
F6-12	Corresponding set value/feedback value of AI2 minimum input analog quantity	-100.00~100.00% Note: The highest frequency shall be used for reference for the set frequency PID reference scalar is for reference for PID feedback	0.00%	○	111
F6-13	Corresponding set value/feedback value of AI2 maximum input analog quantity		100.00%	○	111
F6-14	AI2 inflection point threshold value	AI2 minimum input analog quantity ~ maximum input analog quantity	0.00%	○	111
F6-15	AI2 inflection point return difference	0~10.00%	0.00%	○	111
F6-16	Corresponding set value/feedback value of AI2 inflection point	Same as F6-02 and F6-03	0.00%	○	111
F6-17	AI2 filtering time	0.000~10.000s	0.100s	○	111
F6-18	AI2 offline threshold	-20.00~20.00%	0.00%	○	111
F6-19	AI2 offline delay	0~360.00s	1.00s	○	111

Parameter	Name	Setting range and description	Factory default	Change	Page
F6-20	AO1 function selection	0: Running frequency 1: Set frequency 2: Output current 3: Output voltage 4: Output power 5: Output torque 6: Given torque 7: PID feedback value 8: PID set value 9: PID output value 10: AI1 11: AI2 12: AI3 13: AI4 14: PFI 15: UP/DOWN adjustment value 16: DC bus voltage 17: Set frequency of acceleration and deceleration ramp 18: PG detection frequency 19: Counter deviation 20: Counter percentage 21: Arithmetic unit 1 output 22: Arithmetic unit 2 output 23: Arithmetic unit 3 output 24: Arithmetic unit 4 output 25: Arithmetic unit 5 output 26: Arithmetic unit 6 output 27: Low-pass filter 1 output 28: Low-pass filter 2 output 29: Analog multi-circuit switch output 30: Comparator 1 digital setting 31: Comparator 2 digital setting 32: Comparator 3 digital setting 33: Comparator 4 digital setting 34: Arithmetic unit 1 digital setting 35: Arithmetic unit 2 digital setting 36: Arithmetic unit 3 digital setting 37: Arithmetic unit 4 digital setting 38: Arithmetic unit 5 digital setting 39: Arithmetic unit 6 digital setting 40: COMM1 host computer analog quantity 1 41: COMM1 host computer analog quantity 2 42: Manufacturer output 1 43: Manufacturer output 2 44: COMM2 host computer analog quantity 1 45: COMM2 host computer analog quantity 2	0	○	114
F6-21	AO1 type selection	0: 0~10V or 0~20mA 1: 2~10V or 4~20mA 2: Centered on 5V or 10mA	1	○	114
F6-22	AO1 gain	0.0~1000.0%	100.0%	○	114
F6-23	AO1 bias	-100.00%~100.00%, taking 10V or 20mA as 100%	0.00%	○	114
F6-24	AO2 function selection	Same as AO1 function selection F6-20	2	○	114
F6-25	AO2 type selection	Same as AO1 type selection F6-21	0	○	114
F6-26	AO2 gain	0.0~1000.0%	100.0%	○	114
F6-27	AO2 bias	-100.00%~100.00%, taking 10V or 20mA as 100%	0.00%	○	114
F6-28	100% corresponding PFI frequency	0~50000Hz	10000Hz	○	116

Parameter	Name	Setting range and description	Factory default	Change	Page
F6-29	0% corresponding PFI frequency	0~50000Hz	0Hz	○	116
F6-30	PFI filtering time	0.000~10.000s	0.100s	○	116
F6-31	PFO function selection	Same as AO1 function selection F6-20	0	○	116
F6-32	PFO output pulse modulation method	0: Frequency modulation, 1: Duty cycle modulation	0	○	116
F6-33	100% corresponding PFO frequency	0~50000Hz, also as the duty cycle modulation frequency	10000Hz	○	116
F6-34	0% corresponding PFO frequency	0~50000Hz	0Hz	○	116
F6-35	100% corresponding PFO duty cycle	0.0~100.0%	100.0%	○	116
F6-36	0% corresponding PFO duty cycle	0.0~100.0%	0.0%	○	116
F6-37	AI3 minimum input analog quantity	0.00~100.00%, taking 10V or 20mA as 100%	0.00%	○	117
F6-38	AI3 maximum input analog quantity		100.00%	○	117
F6-39	Corresponding set value/feedback value of AI3 minimum input analog quantity	-100.00~100.00% Note: The highest frequency shall be used for reference for the set frequency PID reference scalar is for reference for PID feedback	0.00%	○	117
F6-40	Corresponding set value/feedback value of AI3 maximum input analog quantity		100.00%	○	117
F6-41	AI3 inflection point threshold value	AI3 minimum input analog quantity ~ maximum input analog quantity	0.00%	○	117
F6-42	AI3 inflection point return difference	0~10.00%	0.00%	○	117
F6-43	Corresponding set value/feedback value of AI3	Same as F6-02 and F6-03	0.00%	○	117

Parameter	Name	Setting range and description	Factory default	Change	Page
	inflection point				
F6-44	AI3 filtering time	0.000~10.000s	0.100s	○	117
F6-45	AI3 offline threshold	0.00~20.00%	0.00%	○	117
F6-46	AI3 offline delay	0~360.00s	1.00s	○	117
F6-47	AI4 minimum input analog quantity	0.00~100.00%, taking 10V or 20mA as 100%	0.00%	○	117
F6-48	AI4 maximum input analog quantity		100.00%	○	117
F6-49	Corresponding set value/feedback value of AI4 minimum input analog quantity	-100.00~100.00% Note: The highest frequency shall be used for reference for the set frequency PID reference scalar is for reference for PID feedback	0.00%	○	117
F6-50	Corresponding set value/feedback value of AI4 maximum input analog quantity		100.00%	○	117
F6-51	AI4 inflection point threshold value	AI4 minimum input analog quantity ~ maximum input analog quantity	0.00%	○	117
F6-52	AI4 inflection point return difference	0~10.00%	0.00%	○	117
F6-53	Corresponding set value/feedback value of AI4 inflection point	Same as F6-02 and F6-03	0.00%	○	117
F6-54	AI4 filtering time	0.000~10.000s	0.100s	○	117
F6-55	AI4 offline threshold	0.00~20.00%	0.00%	○	117
F6-56	AI4 offline delay	0~360.00s	1.00s	○	117
F6-57	AO3 function selection	Same as AO1 function selection F6-20	2	○	117
F6-58	AO3 type selection	Same as AO1 type selection F6-21	0	○	117
F6-59	AO3 gain	0.0~1000.0%	100.0%	○	117
F6-60	AO3 bias	-100.00%~100.00%, taking 10V or 20mA as 100%	0.00%	○	117

5.8 F7 Process PID Parameters

Parameter	Name	Setting range and description	Factory default	Change	Page
F7-00	PID control function selection	0: Do not select process PID control 1: Select process PID control 2: Select PID to correct the set frequency before the acceleration and deceleration ramp 3: Select PID to correct the set frequency after the acceleration and deceleration ramp 4: Select PID for torque correction 5: Free PID function	0	×	118
F7-01	Set channel selection	0: F7-04 1: AI1 2: AI2 3: AI3 4: AI4 5:PFI 6:UP/DOWN adjustment value 7: Arithmetic unit 1 8: Arithmetic unit 2 9: Arithmetic unit 3 10: Arithmetic unit 4	0	×	119
F7-02	Feedback channel selection	0: AI1 1: AI2 2: AI3 3: AI4 4: PFI 5: AI1-AI2 6: AI1+AI2 7: AI3-AI4 8: AI3+AI4 9: $\sqrt{\lvert AI1\rvert}$ 10: $\sqrt{\lvert AI2\rvert}$ 11: $\sqrt{\lvert AI1-AI2\rvert}$ 12: $\sqrt{\lvert AI1\rvert}+\sqrt{\lvert AI2\rvert}$ 13: Arithmetic unit 1 14: Arithmetic unit 2 15: Arithmetic unit 3 16: Arithmetic unit 4	0	×	119
F7-03	PID display coefficient	0.010~10.000, only affects the monitoring menu	1.000	○	119
F7-04	PID digital setting	-100.0~100.0%	0.0%	○	119
F7-05	Proportional gain 1	0.00~100.00	0.20	○	120
F7-06	Integration time 1	0.01~100.00s	20.00s	○	120
F7-07	Derivative time 1	0.00~10.00s	0.00s	○	120
F7-08	Proportional gain 2	0.00~100.00	0.20	○	120
F7-09	Integration time 2	0.01~100.00s	20.00s	○	120
F7-10	Derivative time 2	0.00~10.00s	0.00s	○	120
F7-11	PID parameter transition mode	0: Digital input 36 "PID parameter 2 selection" determined 1: Transition according to running frequency 2: |Arithmetic unit 1| 3: |Arithmetic unit 2| 4: |Arithmetic unit 3| 5: |Arithmetic unit 4|	0	×	120
F7-12	Sampling period	0.001~10.000s	0.010s	○	120
F7-13	Deviation limit	0.0~20.0%, taking PID set value as 100%	0.0%	○	121
F7-14	Set value increase/decrease time	0.00~20.00s	0.00s	○	121
F7-15	PID regulation characteristics	0: Direct acting; 1: Reverse acting	0	×	121
F7-16	Integral regulation selection	0: Without integral action 1: With integral action	1	×	121
F7-17	PID upper limit amplitude	F7-18 "PID lower limit amplitude" ~100.0%	100.0%	○	121
F7-18	PID lower limit amplitude	-100.0%~F7-17 "PID upper limit amplitude"	0.0%	○	121
F7-19	PID differential limit amplitude	0.0~100.0%, upper and lower limit clamping for differential component	5.0%	○	121

Parameter	Name	Setting range and description	Factory default	Change	Page
F7-20	PID preset	F7-18~F7-17	0.0%	○	122
F7-21	PID preset retention time	0.0~3600.0s	0.0s	×	122
F7-22	Multi-stage PID setting 1	-100.0~100.0%	1.0%	○	122
F7-23	Multi-stage PID setting 2		2.0%	○	122
F7-24	Multi-stage PID setting 3		3.0%	○	122
F7-25	Multi-stage PID setting 4		4.0%	○	122
F7-26	Multi-stage PID setting 5		5.0%	○	122
F7-27	Multi-stage PID setting 6		6.0%	○	122
F7-28	Multi-stage PID setting 7		7.0%	○	122
F7-29	Sleep frequency	0.00~650.00Hz	40.00Hz	○	122
F7-30	Sleep waiting time	0.0~3600.0s	60.0s	○	122
F7-31	Sleep deviation	0.00~100.00%	0.00%	○	123
F7-32	Wake-up delay time	0.000~60.000s	0.500s	○	123
F7-33	Wake-up deviation	0.00% to 100.00%. Note: The sleep function is invalid at 100.00%	100.00%	○	123
F7-34	PID correction maximum frequency	0.00~300.00 Hz. Note: It is valid when F7-00 "PID control function selection" = 2 or 3	1.00Hz	○	123

5.9 F8 Simple PLC

Parameter	Name	Setting range and description	Factory default	Change	Page
F8-00	PLC running settings	**Units digit: PLC operation mode selection** 0: No PLC operation 1: Stop after cycling the number of times set in F8-02 2: Maintain the final value after cycling the number of times set in F8-02 3: Continuous cycle **Tens digit: PLC operation interruption restart mode selection** 0: Run from the first section 1: Continue to run from the phase frequency of the interruption moment 2: Continue to run from the operation frequency of the interruption moment **Hundreds digit: PLC state parameter storage selection in case of power-down** 0: No storage 1: Storage **Thousands digit: Stage time unit selection** 0: Second 1: Minute	0000	×	124
F8-01	PLC mode settings	**Units digit: PLC operation mode and segment number division** 0: 1×48, a total of 1 mode, 48 segments of each mode 1: 2×24, a total of 2 modes, 24 segments of each mode	00	×	124

Parameter	Name	Setting range and description	Factory default	Change	Page
		2: 3×16, a total of 3 modes, 16 segments of each mode 3: 4×12, a total of 4 modes, 12 segments of each mode 4: 6×8, a total of 6 modes, 8 segments of each mode 5: 8×6, a total of 8 modes, 6 segments of each mode **Tens digit: PLC operation mode selection** 0: Terminal code selection 1: Direct selection of terminal 2~9: Mode 0~Mode 7			
F8-02	PLC cycle times	1~65535	1	×	124
F8-03~ F8-97	Settings for stages 1~48	**Units digit: Operation direction** 0: Forward 1: Reverse **Tens digit: Acceleration/Deceleration time selection** 0: Acceleration/Deceleration time 1 1: Acceleration/Deceleration time 2 2: Acceleration/Deceleration time 3 3: Acceleration/Deceleration time 4 4: Acceleration/Deceleration time 5 5: Acceleration/Deceleration time 6 6: Acceleration/Deceleration time 7 7: Acceleration/Deceleration time 8	00	○	124
F8-04~ F8-98	Time of stages 1~48	0.0~6500.0 (seconds or minutes) The unit is determined by the thousands digit of F8-00 "PLC operation mode"	0.0	○	124

PLC and multi-stage frequency corresponding parameters are shown below (division of PLC mode and stage is shown on Page 150):

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Stage n settings	F8-03	F8-05	F8-07	F8-09	F8-11	F8-13	F8-15	F8-17	F8-19	F8-21	F8-23	F8-25	F8-27	F8-29	F8-31	F8-33
Stage n time	F8-04	F8-06	F8-08	F8-10	F8-12	F8-14	F8-16	F8-18	F8-20	F8-22	F8-24	F8-26	F8-28	F8-30	F8-32	F8-34
Multi-stage frequency n	F4-20	F4-21	F4-22	F4-23	F4-24	F4-25	F4-26	F4-27	F4-28	F4-29	F4-30	F4-31	F4-32	F4-33	F4-34	F4-35
n	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Stage n settings	F8-35	F8-37	F8-39	F8-41	F8-43	F8-45	F8-47	F8-49	F8-51	F8-53	F8-55	F8-57	F8-59	F8-61	F8-63	F8-65
Stage n time	F8-36	F8-38	F8-40	F8-42	F8-44	F8-46	F8-48	F8-50	F8-52	F8-54	F8-56	F8-58	F8-60	F8-62	F8-64	F8-66
Multi-stage frequency n	F4-36	F4-37	F4-38	F4-39	F4-40	F4-41	F4-42	F4-43	F4-44	F4-45	F4-46	F4-47	F4-48	F4-49	F4-50	F4-51
n	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**
Stage n settings	F8-67	F8-69	F8-71	F8-73	F8-75	F8-77	F8-79	F8-81	F8-83	F8-85	F8-87	F8-89	F8-91	F8-93	F8-95	F8-97
Stage n time	F8-68	F8-70	F8-72	F8-74	F8-76	F8-78	F8-80	F8-82	F8-84	F8-86	F8-88	F8-90	F8-92	F8-94	F8-96	F8-98
Multi-stage frequency n	F4-52	F4-53	F4-54	F4-55	F4-56	F4-57	F4-58	F4-59	F4-60	F4-61	F4-62	F4-63	F4-64	F4-65	F4-66	F4-67

5.10 F9 Textile Wobble Frequency, Counter, Length Counter, and Zero Servo

Parameter	Name	Setting range and description	Factory default	Change	Page
F9-00	Wobble frequency input mode	0: Wobble frequency invalid 1: Automatic input 2: Manual input	0	×	128

Parameter	Name	Setting range and description	Factory default	Change	Page
F9-01	Wobble frequency control mode	0: Center frequency of wobble frequency amplitude is 100% 1: Maximum frequency of wobble frequency amplitude is 100%	0	×	128
F9-02	Preset wobble frequency	F0-08 "lower limit frequency" ~ F0-07 "upper limit frequency"	0.00Hz	○	128
F9-03	Preset frequency waiting time of wobble frequency	0.0~3600.0s	0.0s	○	128
F9-04	Wobble frequency amplitude	0.0~50.0%, relative to the center frequency or maximum frequency	0.0%	○	128
F9-05	Jump frequency	0.0~50.0%, taking the actual wobble frequency amplitude as 100%	0.0%	○	128
F9-06	Jump time	0~50ms	0ms	○	128
F9-07	Wobble frequency cycle	0.1~1000.0s	10.0s	○	128
F9-08	Rise time	0.0%~100.0%, taking F9-07 as 100%	50.0%	○	128
F9-09	Oscillation randomness	0.0%~50.0%, taking F9-07 as 100%	0.0%	○	128
F9-10	Wobble frequency restart and power-down treatment	**Units digit: Wobble frequency stop restart mode** 0: Start according to the memory before stop 1: Restart **Tens digit: Power-off storage selection under wobble frequency state** 0: Power-down storage wobble frequency state 1: Not store under power-down	00	×	128
F9-11	Counting mode selection	0: Normal counting 1: Orthogonal counting	0	×	130
F9-12	Counter increment instruction selection	High-speed counting can be achieved together with DO1 digital output terminal function F5-01 "selection of digital output 56~58"	56	○	130
F9-13	Counter decrement instruction selection		57	○	130
F9-14	Counter preset value	0~65535	0	○	130
F9-15	Set count value	F9-16 "specified count value" ~65535	10000	○	130
F9-16	Specified count value 1	0~F9-15 "set count value"	0	○	130
F9-17	Specified count value 2	0~F9-15 "set count value"	0	○	130
F9-18	Counter frequency dividing coefficient	1~65535	1	○	130
F9-19	Length counter input instruction selection	High-speed length counting can be achieved together with DO1 digital output terminal function F5-01 "selection of digital output 56~58"	0	○	132
F9-20	Length counter set length	0~65535m	1000m	○	132
F9-21	Pulses per meter of length counter	0.1~6553.5	100.0	○	132
F9-22	Zero servo control selection	0: Invalid, 1: Always valid, 2: Digital input 52 selection	0	×	132
F9-23	Zero-speed level	0~120r/min	30r/min	×	132

Parameter	Name	Setting range and description	Factory default	Change	Page
F9-24	Zero servo end amplitude	1~10000 pulses	10	○	132
F9-25	Zero servo control gain	0.00~50.00	1.00	×	132
F9-26	Position control digital settings	-32768~32767	0	○	133
F9-27	Electronic gear numerator setting	1~65535	1	○	135
F9-28	Electronic gear denominator setting	1~65535	1	○	135
F9-29~ F9-38	Reserved	-	-	-	-

5.11 FA Motor Parameters

Parameter	Name	Setting range and description	Factory default	Change	Page
FA-00	Motor parameters self-tuning	11: Static self-tuning 22: No-load complete self-tuning	00	×	135
FA-01	Motor rated power	0.40~500.00kW	Model determination	×	135
FA-02	Motor pole number	2~48	4	×	135
FA-03	Motor rated current	0.5~1200.0A	Model determination	×	135
FA-04	Motor rated frequency	1.00~650.00Hz	50.00Hz	×	135
FA-05	Motor rated speed	125~40000r/min	Model determination	×	135
FA-06	Motor rated voltage	260~866V	660V	×	135
FA-07	Motor no-load current	0.1A~FA-03 "motor rated current"	Model determination	×	137
FA-08	Motor stator resistance	0.00~50.00%	Model determination	○	137
FA-09	Motor leakage inductive reactance	0.00~50.00%	Model determination	○	137
FA-10	Motor rotor resistance	0.00~50.00%	Model determination	○	137
FA-11	Motor mutual inductive reactance	0.0~2000.0%	Model determination	○	137
FA-12	Motor core saturation coefficient 1	1.000~1.500	1.300	×	137
FA-13	Motor core saturation coefficient 2	1.000~FA-12 "motor core saturation coefficient 1"	1.100	×	137
FA-14	Motor core saturation coefficient 3	FA-15 "motor core saturation coefficient 4"~1.000	0.900	×	137

Parameter	Name	Setting range and description	Factory default	Change	Page
FA-15	Motor core saturation coefficient 4	0.300~1.000	0.700	×	137
FA-16	Motor rated current 2	0.5~1200.0A	Model determination	×	138
FA-17	Motor rated current 3	0.5~1200.0A	Model determination	×	138

5.12 Fb Protection Function and Frequency Converter Advanced Settings

Parameter	Name	Setting range and description	Factory default	Change	Page
Fb-00	Motor cooling condition	0: Ordinary motor 1: Variable frequency motor or motor with independent fan	0	○	138
Fb-01	Motor overload protection value	50.0%~150.0%, taking the motor rated current as 100%	100.0%	○	138
Fb-02	Motor overload protection action selection	0: No action 1: Alarm 2: Fault and free stop	2	×	138
Fb-03	Motor overloaded protection selection	**Units digit: Overload detection selection** 0: Keep detecting 1: Only detect at constant speed **Tens digit: Overload action selection** 0: No action 1: Alarm 2: Fault and free stop	00	×	139
Fb-04	Motor overload detection level	20.0%~200.0%, taking the motor rated current as 100%	130.0%	×	139
Fb-05	Motor overload detection time	0.0~30.0s	5.0s	×	139
Fb-06	Motor underload protection	0: No action 1: Alarm 2: Fault and free stop	0	×	139
Fb-07	Motor underload protection level	0.0%~100.0%, taking the motor rated current as 100%	30.0%	×	139
Fb-08	Underload protection detection frequency	0.00~50.00Hz	0.00Hz	○	139
Fb-09	Underload protection detection time	0.0~100.0s	1.0s	×	139
Fb-10	Analog input offline action	0: No action 1: Alarm, run at the average operation frequency of 10s before going offline 2: Alarm, run at an analog input offline forced frequency 3: Fault and free stop	0	×	139
Fb-11	Analog input offline forced frequency	0.00Hz~F0-06 "maximum frequency"	0.00Hz	○	139
Fb-12	Selection of other protection actions	**Units digit: Frequency converter input phase loss protection** 0: No action 1: Alarm 2: Fault and free stop **Tens digit: Frequency converter output phase loss protection** 0: No action 1: Alarm 2: Fault and free stop	10122	×	140

Parameter	Name	Setting range and description	Factory default	Change	Page
		Hundreds digit: Grounding test 0: No test 1: Test only when powered up 2: Test before operation 3: Test during operation **Thousands digit: Parameter storage failure action selection** 0: Alarm 1: Fault and free stop **Ten-thousands digit: AC input power-down treatment** 0: No action 1: Alarm			
Fb-13	Overcurrent & stall prevention selection	Units digit: Acceleration overcurrent & stall prevention Tens digit: Constant speed overcurrent & stall prevention 0: Invalid 1: Valid, limited time 1min 2: Valid, unlimited time Hundreds digit: Stall mode selection 0: Mode 1 1: Mode 2 2: Mode 3	011	×	140
Fb-14	Acceleration overcurrent & stall point	50.0%~200.0%, taking the rated current of the frequency converter as 100%	150.0%	×	140
Fb-15	Constant speed overcurrent & stall point	50.0%~200.0%, taking the rated current of the frequency converter as 100%	150.0%	×	140
Fb-16	Overvoltage & stall prevention selection	0: Invalid 1: Valid	1	×	140
Fb-17	Overvoltage & stall point	1125~1300V	1212V	×	140
Fb-18	DC bus undervoltage action	0: Free stop, report undervoltage fault (Er.dcL) 1: Free stop, recover power and restart in limited time 2: Free stop, recover power supply and restart during CPU operation 3: Deceleration and maintain bus voltage	0	×	141
Fb-19	DC bus undervoltage point	640~831V	690V	×	141
Fb-20	Instantaneous power failure allowable time	0.0~30.0s	0.1s	×	141
Fb-21	Instantaneous stop deceleration time	0.0~200.0s. If it is set to 0.0, the current deceleration time will be used	5.0s	×	141
Fb-22	Automatic reset times for faults	0~10, module protection and external fault without automatic reset function	0	×	142
Fb-23	Interval time for automatic reset	1.0~30.0s	5.0s	×	142
Fb-24	Fault output during automatic reset period	0: No output 1: Output	0	×	142
Fb-25	Instantaneous stop, automatic reset, and restart	0: Start by start mode 1: Tracking start	1	×	142

Parameter	Name	Setting range and description	Factory default	Change	Page
	mode after operation interruption				
Fb-26	Power-on self-start allowed	0: Prohibited 1: Allowed	1	○	142
Fb-27	Braking unit operating point	1073~1247V	1178V	○	143
Fb-28	Modulation method	0: Auto 1: Continuous modulation	0	○	143
Fb-29	Carrier frequency	18.5~30kW: 1.1k~10.0kHz, factory default: 3.0kHz 37~160kW: 1.1k~8.0kHz, factory default: 2.5kHz 200kW and above: 1.1k~5.0kHz, factory default: 2.0kHz	Model determination	○	143
Fb-30	Random PWM settings	0~30%	0%	○	143
Fb-31	Automatic adjustment selection of carrier frequency	0: Prohibited 1: Allowed	1	○	143
Fb-32	Dead zone compensation allowed	0: Prohibited 1: Allowed	1	×	143
Fb-33	Space vector angle stop memory	0: No memory; 1: Memory	0	×	144
Fb-34	Overmodulation enabled	0: Prohibited 1: Allowed	1	×	144
Fb-35	Cooling fan control	0: Power off after 3min of standby 1: Continuous operation 2: Automatic operation	0	○	144
Fb-36	Avoidance frequency 1	0.00~625.00Hz	0.00Hz	○	144
Fb-37	Avoidance frequency 1 width	0.00~20.00Hz	0.00Hz	○	144
Fb-38	Avoidance frequency 2	0.00~625.00Hz	0.00Hz	○	144
Fb-39	Avoidance frequency 2 width	0.00~20.00Hz	0.00Hz	○	144
Fb-40	Avoidance frequency 3	0.00~625.00Hz	0.00Hz	○	144
Fb-41	Avoidance frequency 3 width	0.00~20.00Hz	0.00Hz	○	145
Fb-42	Fan life expectancy settings	1~65000h	40000h	○	145

5.13 FC Keyboard Operation and Display Settings

Parameter	Name	Setting range and description	Factory default	Change	Page
FC-00	Display parameter selection	0: All 1: User parameters 2: Different from factory default	0	○	145
FC-01	Key function and automatic lock	**Units digit: Automatic key lock function** 0: Not locked 1: Fully locked 2: Fully locked except ○ 3: Fully locked except ◁ and ▷ 4: Fully locked except ○, ◁ and ▷ 5: Fully locked except □ and ○ **Tens digit: ○ function selection** 0: Valid only when in the operation panel run command channel 1: Valid when in the operation panel, terminal, and communication run command channels, and shut down according to stop mode 2: Shut down according to stop mode in the operation panel run command channel. Shut down freely in the non-operation panel run command channel and report Er.Abb **Hundreds digit: □ function selection (only for panel command channel)** 0: Select running function 1: Select jogging function **Thousands digit: Arrow key combination function selection** 0: Press and hold combination keys ◁ and △, or combination keys ▷ and ▽ simultaneously to switch the main set frequency channel and run command channel functions: invalid 1: Press and hold combination keys ◁ and △, or combination keys ▷ and ▽ simultaneously to switch the main set frequency channel and run command channel functions: valid	0000	×	145
FC-02	Monitoring parameter selection 1	-1~56 It aims to select the monitoring parameters displayed in both running and standby monitoring states Note: -1 indicates null, and 0~56 indicates FU-00~FU-56. The minimum value of FC-02 is 0.	1	○	147
FC-03	Monitoring parameter selection 2		-1	○	147
FC-04	Monitoring parameter selection 3		-1	○	147
FC-05	Monitoring parameter selection 4		-1	○	147
FC-06	Monitoring parameter selection 5		-1	○	147

Parameter	Name	Setting range and description	Factory default	Change	Page
FC-07	Monitoring parameter selection 6		-1	○	147
FC-08	Monitoring parameter selection 7		-1	○	147
FC-09	Running monitoring parameter 1	-1~56 It aims to select monitoring parameters that are displayed only in the running monitoring state Note: -1 indicates null, and 0~56 indicates FU-00~FU-56	0	○	147
FC-10	Running monitoring parameter 2		2	○	147
FC-11	Running monitoring parameter 3		4	○	147
FC-12	Running monitoring parameter 4		-1	○	147
FC-13	Speed display coefficient	0.001~10.000	1.000	○	147
FC-14	Linear velocity display coefficient	0.01~100.00	0.01	○	147
FC-15~ FC-44	User parameter 1~user parameter 30	-00.01~FU.56, excluding manufacturer parameters Fn -00.01 is null, and the others are the parameter numbers. For example, F0.01 means F0-01	-00.01	○	148
FC-45	User parameter 31	Fixed to FC-00 "display parameter selection"	FC.00	△	148
FC-46	User parameter 32	Fixed to F0-10 "Parameter writing protection"	F0.10	△	148
FC-47	Administrator parameters	Fixed to F0-17 "Administrator password"	F0.17	△	148

User parameter corresponding table:

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
User parameter n	FC-15	FC-16	FC-17	FC-18	FC-19	FC-20	FC-21	FC-22	FC-23	FC-24	FC-25	FC-26	FC-27	FC-28	FC-29	FC-30
n	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
User parameter n	FC-31	FC-32	FC-33	FC-34	FC-35	FC-36	FC-37	FC-38	FC-39	FC-40	FC-41	FC-42	FC-43	FC-44	FC-45	FC-46

5.14 Fd Retained by the Manufacturer

5.15 FE Programmable Unit

Parameter	Name	Setting range and description	Factory default	Change	Page
FE-00	Comparator 1 in-phase input selection	Options are the same as AO1 function selection F6-20	0	○	148
FE-01	Comparator 1 anti-phase input selection	Options are the same as AO1 function selection F6-20	0	○	148
FE-02	Configuration of comparator 1	**Units digit: Function settings** 0: > 1: < 2: = 3: ≠ 4: Output constant 1 5: Output constant 0	005	○	148

Parameter	Name	Setting range and description	Factory default	Change	Page
		Tens digit: Whether the input is taken in absolute value 0: Absolute value not required 1: Absolute value required **Hundreds digit: Comparator output connection protection function selection** 0: No action, 1: Alarm, 2: Reporting fault and free stop			
FE-03	Comparator 1 digital settings	-100.0~100.0%	50.0%	○	148
FE-04	Comparator 1 error band	0.0~100.0%	5.0%	○	148
FE-05	Comparator 1 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	149
FE-06	Comparator 2 in-phase input selection	Options are the same as AO1 function selection F6-20	0	○	149
FE-07	Comparator 2 anti-phase input selection	Options are the same as AO1 function selection F6-20	0	○	149
FE-08	Configuration of comparator 2	Options are the same as configuration FE-02 of comparator 1	005	○	149
FE-09	Comparator 2 digital settings	-100.0~100.0%	50.0%	○	149
FE-10	Comparator 2 error band	0.0~100.0%	5.0%	○	149
FE-11	Comparator 2 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	149
FE-12	Comparator 3 in-phase input selection	Options are the same as AO1 function selection F6-20	0	○	149
FE-13	Comparator 3 anti-phase input selection	Options are the same as AO1 function selection F6-20	0	○	149
FE-14	Configuration of comparator 3	Options are the same as configuration FE-02 of comparator 1	005	○	149
FE-15	Comparator 3 digital settings	-100.0~100.0%	50.0%	○	149
FE-16	Comparator 3 error band	0.0~100.0%	5.0%	○	149
FE-17	Comparator 3 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	149
FE-18	Comparator 4 in-phase input selection	Options are the same as AO1 function selection F6-20	0	○	149
FE-19	Comparator 4 anti-phase input selection	Options are the same as AO1 function selection F6-20	0	○	149
FE-20	Configuration of comparator 4	Options are the same as configuration FE-02 of comparator 1	005	○	149
FE-21	Comparator 4 digital settings	-100.0~100.0%	50.0%	○	149
FE-22	Comparator 4 error band	0.0~100.0%	5.0%	○	149
FE-23	Comparator 4 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	149
FE-24	Logical unit 1 input 1 selection	Options are the same as DO1 digital output terminal function F5-01	0	○	150
FE-25	Logical unit 1 input 2 selection		0	○	150
FE-26	Configuration of logical unit 1	0: And 1: Or 2: NAND 3: NOR 4: XOR (≠) 5: XNOR (=)	9	○	150

Parameter	Name	Setting range and description	Factory default	Change	Page
		6: Input 1 to direct output 7: Input 1 to inverted output 8: Output constant 1 9: Output constant 0 10: R-S trigger			
FE-27	Logical unit 1 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	150
FE-28	Logical unit 2 input 1 selection	Options are the same as DO1 digital output terminal function F5-01	0	○	150
FE-29	Logical unit 2 input 2 selection		0	○	150
FE-30	Configuration of logical unit 2	Options are the same as logical unit 1 configuration FE-26	9	○	150
FE-31	Logical unit 2 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	151
FE-32	Logical unit 3 input 1 selection	Options are the same as DO1 digital output terminal function F5-01	0	○	151
FE-33	Logical unit 3 input 2 selection		0	○	151
FE-34	Configuration of logical unit 3	Options are the same as logical unit 1 configuration FE-26	9	○	151
FE-35	Logical unit 3 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	151
FE-36	Logical unit 4 input 1 selection	Options are the same as DO1 digital output terminal function F5-01	0	○	151
FE-37	Logical unit 4 input 2 selection		0	○	151
FE-38	Configuration of logical unit 4	Options are the same as logical unit 1 configuration FE-26	9	○	151
FE-39	Logical unit 4 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	151
FE-40	Logical unit 5 input 1 selection	Options are the same as DO1 digital output terminal function F5-01	0	○	151
FE-41	Logical unit 5 input 2 selection		0	○	151
FE-42	Configuration of logical unit 5	Options are the same as logical unit 1 configuration FE-26	9	○	151
FE-43	Logical unit 5 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	151
FE-44	Logical unit 6 input 1 selection	Options are the same as DO1 digital output terminal function F5-01	0	○	151
FE-45	Logical unit 6 input 2 selection		0	○	151
FE-46	Configuration of logical unit 6	Options are the same as logical unit 1 configuration FE-26	9	○	151
FE-47	Logical unit 6 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	151
FE-48	Timer 1 input selection	Options are the same as DO1 digital output terminal function F5-01	0	○	152
FE-49	Configuration of timer 1	**Units digit: Type of timer** 0: Rising edge delay 1: Falling edge delay 2: Both rising and falling edges are delayed 3: Pulse function **Tens digit: set time multiplier** 0: 1 time 1: 10 times 2: 100 times 3: 1000 times 4: 10000 times 5: 100000 times **Hundreds digit: Output signal settings**	300	○	152

Parameter	Name	Setting range and description	Factory default	Change	Page
		0: Not inverted 1: Inverted 2: Output constant 1 3: Output constant 0 4: And 5: And after inversion 6: Or 7: Or after inversion			
FE-50	Set time of timer 1	0~40000ms, delay time = set time x multiplier	0ms	○	152
FE-51	Timer 1 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	152
FE-52	Timer 2 input selection	Options are the same as DO1 digital output terminal function F5-01	0	○	152
FE-53	Configuration of timer 2	Options are the same as configuration FE-49 of timer 1	300	○	152
FE-54	Set time of timer 2	0~40000ms, delay time = set time x multiplier	0ms	○	152
FE-55	Timer 2 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	152
FE-56	Timer 3 input selection	Options are the same as DO1 digital output terminal function F5-01	0	○	152
FE-57	Configuration of timer 3	Options are the same as configuration FE-49 of timer 1	300	○	152
FE-58	Set time of timer 3	0~40000ms, delay time = set time x multiplier	0ms	○	152
FE-59	Timer 3 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	152
FE-60	Timer 4 input selection	Options are the same as DO1 digital output terminal function F5-01	0	○	152
FE-61	Configuration of timer 4	Options are the same as configuration FE-49 of timer 1	300	○	152
FE-62	Set time of timer 4	0~40000ms, delay time = set time x multiplier	0ms	○	152
FE-63	Timer 4 output selection	Options are the same as DI1 digital input terminal function F4-00	0	○	152
FE-64	Arithmetic unit 1 input 1 selection	Options are the same as AO1 function selection F6-20	0	○	153
FE-65	Arithmetic unit 1 input 2 selection		0	○	153
FE-66	Configuration of arithmetic unit 1	0: Input 1+input 2 1: Input 1-input 2 2: Input 1 × input 2 3: Input 1 ÷ input 2 4: Taking the smaller value 5: Taking the larger value 6: |Input 1|×input 2 7: |Input 1|÷input 2 8: Input 1 to direct output (for connection) 9: Encoder position high word 10: Encoder position low word	0	○	153
FE-67	Arithmetic unit 1 digital settings	-100.0~100.0%	0.0%	○	153
FE-68	Arithmetic unit 2 input 1 selection	Options are the same as AO1 function selection F6-20	0	○	153
FE-69	Arithmetic unit 2 input 2 selection		0	○	153
FE-70	Configuration of arithmetic unit 2	Options are the same as arithmetic unit 1 configuration FE-66	0	○	153
FE-71	Arithmetic unit 2 digital settings	-100.0~100.0%	0.0%	○	154
FE-72	Arithmetic unit 3 input 1 selection	Options are the same as AO1 function selection F6-20	0	○	154

Parameter	Name	Setting range and description	Factory default	Change	Page
FE-73	Arithmetic unit 3 input 2 selection		0	○	154
FE-74	Configuration of arithmetic unit 3	Options are the same as arithmetic unit 1 configuration FE-66	0	○	154
FE-75	Arithmetic unit 3 digital settings	-100.0~100.0%	0.0%	○	154
FE-76	Arithmetic unit 4 input 1 selection	Options are the same as AO1 function selection F6-20	0	○	154
FE-77	Arithmetic unit 4 input 2 selection		0	○	154
FE-78	Configuration of arithmetic unit 4	Options are the same as arithmetic unit 1 configuration FE-66	0	○	154
FE-79	Arithmetic unit 4 digital settings	-100.0~100.0%	0.0%	○	154
FE-80	Arithmetic unit 5 input 1 selection	Options are the same as AO1 function selection F6-20	0	○	154
FE-81	Arithmetic unit 5 input 2 selection		0	○	154
FE-82	Configuration of arithmetic unit 5	Options are the same as arithmetic unit 1 configuration FE-66	0	○	154
FE-83	Arithmetic unit 5 digital settings	-100.0~100.0%	0.0%	○	154
FE-84	Arithmetic unit 6 input 1 selection	Options are the same as AO1 function selection F6-20	0	○	154
FE-85	Arithmetic unit 6 input 2 selection		0	○	154
FE-86	Configuration of arithmetic unit 6	Options are the same as arithmetic unit 1 configuration FE-66	0	○	154
FE-87	Arithmetic unit 6 digital settings	-100.0~100.0%	0.0%	○	154
FE-88	Low pass filter 1 input selection	Options are the same as AO1 function selection F6-20	0	○	155
FE-89	Low pass filter 1 filtering time	0.000~10.000s	0.010s	○	155
FE-90	Low pass filter 2 input selection	Options are the same as AO1 function selection F6-20	0	○	155
FE-91	Low pass filter 2 filtering time	0.000~10.000s	0.010s	○	155
FE-92	Analog multi-circuit switch input 1	Options are the same as AO1 function selection F6-20	0	○	155
FE-93	Analog multi-circuit switch input 2	Options are the same as AO1 function selection F6-20	0	○	155
FE-94	Analog multi-circuit switch control signal	Options are the same as DO1 digital output terminal function F5-01	0	○	155

5.16 FF Communication Parameters

Parameter	Name	Setting range and description	Factory default	Change	Page
FF-00	COMM2 communication protocol selection	0: Modbus 1: USS command 2: CAN Note: COMM1 only supports Modbus communication	0	×	156
FF-01	Communication data format	**Units digit: COMM1 data format** **Tens digit: COMM2 data format** 0:8,N,1 1:8,E,1 2:8,O,1 3:8,N,2 4:8, E, 2 5:8, O, 2	00	×	156
FF-02	Baud rate selection	**Units digit: COMM1 Baud rate** **Tens digit: COMM2 Baud rate** 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps 6: 57600 bps 7: 115200 bps 8: 250000 bps 9: 500000bps	34	×	156
FF-03	COMM1 address of the machine	0~247	1	×	156
FF-04	COMM2 address of the machine	0~247	1	×	156
FF-05	Communication timeout detection time	0.1~600.0s	10.0s	○	156
FF-06	COMM1 response delay of the machine	0~1000ms	5ms	○	156
FF-07	COMM2 response delay of the machine	0~1000ms	5ms	○	156
FF-08	Communication timeout action	**Units digit: COMM1 communication timeout action** **Tens digit: COMM2 communication timeout action** 0: No action 1: Alarm 2: Fault and free stop 3: Alarm running based on F0-00 4: Alarm running based on F0-07 5: Alarm running based on F0-08	00	×	156
FF-09	COMM2USS message PZD word count	0~4	2	×	156
FF-10	COMM1 communication set frequency ratio	0.001~30.000	1.000	○	157
FF-11	COMM2 communication set frequency ratio	0.001~30.000	1.000	○	157

5.17 Fn Manufacturer Parameters

Parameter	Name	Setting range and description	Factory default	Change
-	-	-	-	-

5.18 FP Fault Record

Parameter	Name	Content and description	Page
FP-00	Last fault type	0: No fault 1.ocb: Instantaneous overcurrent at starting 19. Co1: Output protection signal of comparator 1	162

Parameter	Name	Content and description	Page
		2.ocA: Overcurrent during acceleration 3.ocd: Overcurrent during deceleration 4.ocn: Overcurrent during constant speed operation 5.ouA: Overvoltage at acceleration 6.oud: Overvoltage at deceleration 7.oun: Overvoltage at constant speed operation 8. ouE: Overvoltage during standby 9.dcL: Undervoltage during operation 10.PLI: Input phase loss 11.PLo: Output phase loss 12.FoP: Power device protection 13.oHI: Frequency converter overheating 14.oLI: Frequency converter overload 15.oLL: Motor overload 16.EEF: External fault 17.oLP: Motor overload 18.ULd: Motor underload 20.Co2: Output protection signal of comparator 2 21.Co3: Output protection signal of comparator 3 22.Co4: Output protection signal of comparator 4 23.EEP: Parameter storage failure 24.C1E: COMM1 communication abnormality 25. C2E: COMM2 communication abnormal 26.ccF: Current detection fault 27.ArF: Poor self-tuning 28. Aco: Analog input offline 29.PGo: PG disconnection 30.rHo: Thermistor open circuit 31.Abb: Abnormal stop fault 32.cno: Charging contactor abnormality 33. GFF: Grounding fault output 34.Io1: Reserved 35.Io2: Reserved 36.PnL: Reserved 37.dcE: DC bus voltage abnormality	
FP-01	Accumulated running time in the most recent fault	Minimum unit: 1h	162
FP-02	Operation frequency in the most recent failure	Minimum unit: 0.01Hz	162
FP-03	Set frequency in the most recent fault	Minimum unit: 0.01Hz	162
FP-04	Output current in the most recent fault	Minimum unit: 0.1A	162
FP-05	Output voltage in the most recent fault	Minimum unit: 0.1V	162
FP-06	Output power in the most recent fault	Minimum unit: 0.1kW	162
FP-07	Bus voltage in the most recent fault	Minimum unit: 0.1V	162
FP-08	Inverter bridge temperature in the most recent fault	Minimum unit: 0.1°C	162
FP-09	Terminal input state 1 in the most recent fault	Ten-thousands digit: DI5 Thousands digit: DI4 Hundreds digit: DI3 Tens digit: DI2 Units digit: DI1	162

Parameter	Name	Content and description	Page
FP-10	Terminal input state 2 in the most recent fault	Ten thousands: DI10 Thousands digit: DI9 Hundreds digit: DI8 Tens digit: DI7 Units digit: DI6	162
FP-11	Second last fault type	Content & meaning same as FP-00	162
FP-12	Accumulated running time in second last fault	Minimum unit: 1h	162
FP-13	Third last fault type	Content & meaning same as FP-00	163
FP-14	Accumulated running time in third last fault	Minimum unit: 1h	163
FP-15	Fourth last fault type	Content & meaning same as FP-00	163
FP-16	Accumulated running time in fourth last fault	Minimum unit: 1h	163
FP-17	Fifth last fault type	Content & meaning same as FP-00	163
FP-18	Accumulated running time in fifth last fault	Minimum unit: 1h	163
FP-19	Single operation time in case of fault	Minimum unit: 0.1h	163
FP-20	Fault record clearing	11: Clear this menu parameter, it will automatically change to 00 after the operation is completed	163

5.19 FU Data Monitoring

Parameter	Name	Content and description	Page
FU-00	Running frequency	Reflects the frequency of the motor speed. Minimum unit: 0.01Hz	163
FU-01	Set frequency	Unit indicator flickers. Minimum unit: 0.01Hz	163
FU-02	Output current	Minimum unit: 0.1A	163
FU-03	Load current percentage	Taking the rated current of the frequency converter as 100%. Minimum unit: 0.1%	163
FU-04	Output voltage	Minimum unit: 0.1V	164
FU-05	Operating speed	Minimum unit: 1r/min	164
FU-06	Set speed	Unit indicator flickers. Minimum unit: 1r/min	164
FU-07	DC bus voltage	Minimum unit: 0.1V	164
FU-08	Output power	Minimum unit: 0.1kW	164
FU-09	Output torque	Taking the rated torque as 100%. Minimum unit: 0.1%	164
FU-10	Set torque	Taking the rated torque as 100%. Unit indicator flickers. Minimum unit: 0.1%	164
FU-11	Running linear speed	Minimum unit: 1m/s	164
FU-12	Given linear speed	Unit indicator flickers. Min. unit: 1m/s	164
FU-13	PID feedback value	Minimum unit: 0.1%	164
FU-14	PID set value	Unit indicator flickers. Minimum unit: 0.1%	164
FU-15	PID output value	Minimum unit: 0.1%	164
FU-16	Counter count value	Minimum unit: 1	164
FU-17	Actual length of length counter	Min. unit: 1m	164
FU-18	AI1	Minimum unit: 0.1%	164
FU-19	AI2	Minimum unit: 0.1%	164
FU-20	AI3	Minimum unit: 0.1%	164

Parameter	Name	Content and description	Page
FU-21	AI4	Minimum unit: 0.1%	164
FU-22	PFI	Minimum unit: 0.1%	164
FU-23	UP/DOWN regulating value	Unit indicator flickers. Minimum unit: 0.1%	164
FU-24	PLC current mode and stage	Example: 2.03 refers to the stage 3 of mode 2	164
FU-25	Cycled times of PLC	Minimum unit: 1	164
FU-26	PLC time left in current stage	Min. unit: 0.1s or 0.1min, determined by thousands digit of F8-00	165
FU-27	Arithmetic unit 1 output	Minimum unit: 0.1%	165
FU-28	Arithmetic unit 2 output	Minimum unit: 0.1%	165
FU-29	Arithmetic unit 3 output	Minimum unit: 0.1%	165
FU-30	Arithmetic unit 4 output	Minimum unit: 0.1%	165
FU-31	Arithmetic unit 5 output	Minimum unit: 0.1%	165
FU-32	Arithmetic unit 6 output	Minimum unit: 0.1%	165
FU-33	Low-pass filter 1 output	Minimum unit: 0.1%	165
FU-34	Low-pass filter 2 output	Minimum unit: 0.1%	165
FU-35	Analog multi-circuit switch output	Minimum unit: 0.1%	165
FU-36	Heat sink temperature	Minimum unit: 0.1°C	165
FU-37	Counter deviation	Taking F9-15 "set count value" as 100%. Minimum unit: 0.01%	165
FU-38	PG detection frequency	Minimum unit: 0.1Hz	165
FU-39	Output power factor	Minimum unit: 0.01	165
FU-40	Kilowatt-hour meter (high 16 bits)	Minimum unit: 0.1 kWh. Displayed in combination with FU-40 and FU-41. While displaying parameter FU-41 "kilowatt-hour meter (low 16 bits)", press and hold △ and ▽ simultaneously to clear both the kilowatt-hour meter and the kilowatt-hour timer	165
FU-41	Kilowatt-hour meter (low 16 bits)		165
FU-42	Digital input terminal state	Ten-thousands digit: DI5 Thousands digit: DI4 Hundreds digit: DI3 Tens digit: DI2 Units digit: DI1 0: Invalid 1: Valid	165
FU-43	Extended digital input terminal state	Ten thousands: DI10 Thousands digit: DI9 Hundreds digit: DI8 Tens digit: DI7 Units digit: DI6 0: Invalid 1: Valid	165
FU-44	Digital output terminal state	Thousands digit: T2 Hundreds digit: T1 Tens digit: DO2 Units digit: DO1 0: Invalid 1: Valid	165
FU-45	Extended digital output terminal state	Thousands digit: T6 Hundreds digit: T5 Tens digit: T4 Units digit: T3 0: Invalid 1: Valid	165
FU-46	Comparator output state	Thousands digit: Comparator 4 Hundreds digit: Comparator 3 Tens digit: Comparator 2 Units digit: Comparator 1 0: Output 0 1: Output 1	165
FU-47	Number of COMM1 communication errors	0~65000	165
FU-48	Number of COMM2 communication errors	0~65000	166

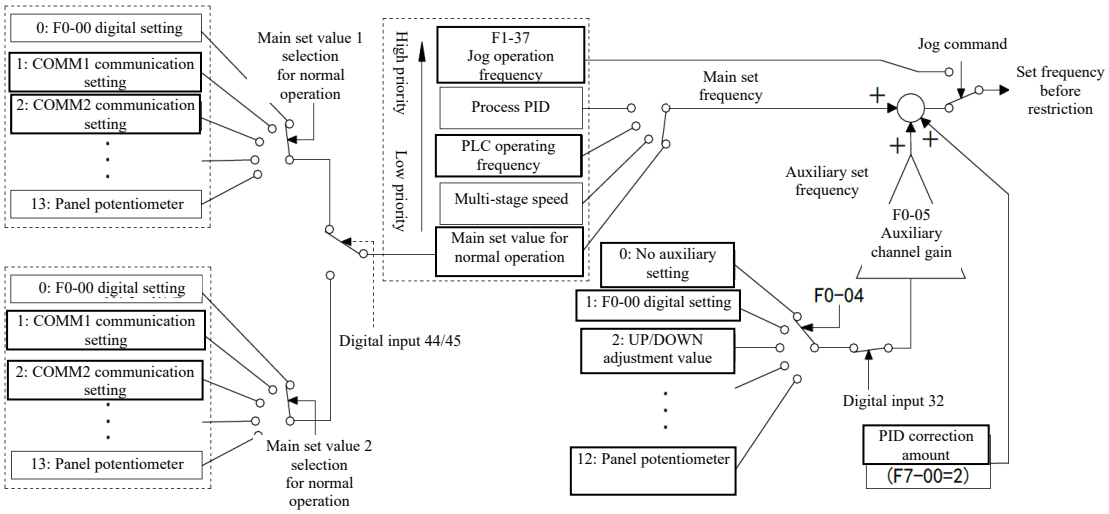
Parameter	Name	Content and description	Page
FU-49	COMM1 communication polling time	Minimum unit: 0.001s	166
FU-50	COMM2 communication polling time	Minimum unit: 0.001s	166
FU-51	Set frequency after acceleration and deceleration ramp	Minimum unit: 0.01Hz	166
FU-52	PG high position byte	Encoder feedback position indicated by binary system is high 16 bits	166
FU-53	PG low position byte	Encoder feedback position indicated by binary system is low 16 bits	166
FU-54	Counter 2 count value high byte	Count value indicated by binary system is high 16 bits	166
FU-55	Counter 2 count value low byte	Count value indicated by binary system is low 16 bits	166
FU-56	Accumulated running time of fan	Minimum unit: 1h	166
FU-57	Production date	Minimum unit: 00.00	166
FU-58	Frequency converter No.	Minimum unit: 0001	166
FU-61	Kilowatt-hour timer (high 16 bits)	Minimum unit: 0.01h. Displayed in combination with FU-61 and FU-62. While displaying parameter FU-62 "Kilowatt-hour timer (low 16 bits)", press and hold △ and ▽ simultaneously to clear both the kilowatt-hour meter and the kilowatt-hour timer	166
FU-62	Kilowatt-hour timer (low 16 bits)		166
Others	Reserved	-	-

6 Detailed Description of Function Parameters

6.1 F0 Basic Parameters

F0-00	Digital set frequency	Factory default	50.00Hz	Change	○
Setting range	0.00Hz~F0-06 "maximum frequency"				
F0-01	**Main set channel for normal operation**	Factory default	0300	Change	○
Setting range	Thousands and hundreds digit: Set channel 2 Tens and units digit: Set channel 1 0: F0-00 digital setting, adjusted via △ and ▽ on the operation panel 1: COMM1 communication setting, taking F0-00 as the initial value 2: COMM2 communication setting, taking F0-00 as the initial value 3: AI1 4: AI2 5: AI3① 6: AI4① 7: UP/DOWN adjustment value 8: PFI 9: Arithmetic unit 1 10: Arithmetic unit 2 11: Arithmetic unit 3 12: Arithmetic unit 4 13: Panel potentiometer				

Set frequency channels are as follows:



The frequency converter has 5 operation modes, which are jog, process PID, PLC, multi-stage speed, normal operation respectively from high priority to low priority. For example: The main set frequency is determined by the multi-stage frequency if multi-stage speed is valid in normal operation.

The main set value for normal operation can be selected via F0-01 "main set channel for normal operation". It can be forcibly switched using digital input 44 "main set frequency channel switching", digital input 45 "simultaneous switching of main set frequency channel and run command channel", and by pressing and holding the combination keys "◁ and △" or"▷ and ▽" to simultaneously switch the main set frequency channel and the run command channel. For details on digital inputs 44 and 45, see Page 94. For details on combination key channel switching, see Page 145. When the main set frequency channel for normal operation is forcibly switched to set channel 2 via digital input 45 "simultaneous switching of main set channel and run command channel" or the combination keys "◁ and △" on the panel, any frequency set value with higher priority than the main set value for normal operation (e.g., jog, multi-stage speed) become invalid.

Auxiliary set channels are determined by F0-04 "auxiliary set channel selection" and can be disabled by digital input 32 "auxiliary set channel disabled".

F7-00 "PID control function selection"=2, the set frequency before the ramp can be corrected.

① AI3 and AI4 are analog inputs of expansion terminals, which must be configured with expansion boards and F0-15 parameters.

- The digital input 14 "Forward jogging operation" or 15 "reverse jogging operation" is valid for terminal control.
- The set frequency ultimately used shall be limited by F0-07 "upper limit frequency" and F0-08 "lower limit frequency".

F0-02	Run command channel selection	Factory default	10	Change	×
Setting range	Tens digit: Command channel 2 selection Units digit: Command channel 1 selection 0: Operation panel 1: Virtual terminal 1 (FWD1/REV1) 2: Virtual terminal 2 (FWD2/REV2) 3: COMM1 control 4: COMM2 control				

Digital input 42 "run command channel 1/2 switch": If the input is invalid, the command source selected by command channel 1 is valid. If the input is valid, the command source selected by command channel 2 is valid. See Page 94 for details.

- The run command channel can also be forcibly switched using the function of pressing and holding the combination keys "◁ and △" or "▷ and ▽" to simultaneously switch the main set frequency channel and the run command channel. For details on run command channel switching via combination keys, see Page 145.
- COMM2 is an optional communication port. See the section of communication component in Chapter IX.

F0-03	Set frequency holding mode		Factory default	000	Change	○
Setting range	Units digit: Power-down storage selection	0: The main set frequency at which △, ▽, or communication is modified is stored to F0-00 in case of power-down 1: The main set frequency at which △, ▽, or communication is modified is not stored in case of power-down				
	Tens digit: Stop hold normal selection	0: The main set frequency modified by △ and ▽, is retained for stop 1: The main set frequency modified by △ and ▽, recovers to F0-00 for stop				
	Hundreds digit: Stop hold forced selection	0: Stop hold forced selection invalid 1: Stop hold forced selection valid				

The units digit "power-down storage selection" of this parameter is valid only when the set channel 1 (tens or units digit) or the set channel 2 (thousands or hundreds digit) of F0-01 "main set channel for normal operation"=00, 01, 02.

- The tens digit "stop hold normal selection" and hundreds digit "stop hold forced selection" of this parameter are only valid only when the set channel 1 (tens or units digit) or the set channel 2 (thousands or hundreds digit) of F0-01 "main set channel for normal operation"=00.
- When the tens digit "stop hold normal selection" of this parameter = 0, and after modifying the main set frequency with △ and ▽, this hold function is only valid if no higher priority operation mode (e.g., multi-stage speed, jog) is active before stop of the frequency converter. This digit is also affected by the hundreds digit "stop hold forced selection".
- When the hundreds digit "stop hold forced selection" = 0, stop hold is determined by the setting of the tens digit "stop hold normal selection". When "stop hold forced selection" = 1, stop hold is always forced to be valid for the main set frequency modified by △ and ▽, regardless of whether a higher priority operation mode was active before stopping or the setting of the tens digit "stop hold normal selection".

F0-04	Auxiliary set channel selection	Factory default	0	Change	○
Setting range	0: None 1: F0-00 "digital set frequency" 2: UP/DOWN adjustment value 3: AI1 4: AI2 5: AI3 6: AI4 7: PFI 8: Arithmetic unit 1 9: Arithmetic unit 2 10: Arithmetic unit 3 11: Arithmetic unit 4 12: Panel potentiometer				
F0-05	Auxiliary channel gain	Factory default	1.000	Change	○

Setting range	-1.000~1.000

See description of F0-00 and F0-01 on Page 76 for details.

F0-06	Maximum frequency	Factory default	50.00Hz	Change	×
Setting range	V/F control: F0-07 "upper limit frequency"~650.00Hz Vector control: F0-07 "upper limit frequency"~200.00Hz				
F0-07	**Upper limit frequency**	Factory default	50.00Hz	Change	×
Setting range	F0-08 "lower limit frequency" ~ F0-06 "maximum frequency"				
F0-08	**Lower limit frequency**	Factory default	0.00Hz	Change	×
Setting range	0.00Hz~F0-07 "upper limit frequency"				

F0-06 "maximum frequency": The frequency when the frequency is set at 100% is used for analog input or PFI to set the frequency.

F0-07 "upper limit frequency", F0-08 "lower limit frequency": limit the final set frequency.

F0-09	Direction lock	Factory default	0	Change	○
Setting range	0: Forward and reverse directions allowed 1: Forward direction locked 2: Reverse direction locked				

It is recommended to lock the rotation direction when only one-way rotation is required.

F0-10	Parameter write protection	Factory default	0	Change	○
Setting range	0: No protection, all parameters are allowed to be rewritten (except read-only parameters) 1: Except for F0-00 "digital set frequency", F7-04 "PID digital setting", and this parameter, all other parameters are prohibited from being rewritten 2: Except for this parameter, all parameters are prohibited from being rewritten				

This function can prevent parameters from being modified by mistake.

F0-11	Parameter initialization	Factory default	00	Change	×
Setting range	11: Initialization 22: Initialization, except for communication parameters Note: it changes to 00 automatically after the initialization				

The parameter initialization can restore the parameters to factory default setting without restoring the failure logging (failure logging can be cleared via FP-20).

F0-12	Motor control mode	Factory default	0	Change	×
Setting range	0: Without PG V/F control 1: With PG V/F control 2: Without PG vector control 3: With PG vector control 4: V/F separation control 5: With PG vector control 2				

Motor control mode:

F0-12＝0 "without PGV/F control": The speed open-loop, voltage and frequency coordinated control mode can improve the torque output capacity by torque boost and can improve the mechanical characteristics and speed control accuracy through slip compensation.

F0-12＝1 "with PGV/F control": V/F control mode with speed feedback achieved through encoder has high steady speed accuracy. It is especially suitable for applications where the encoder is not directly mounted on the motor shaft and precise speed control is required.

F0-12＝2 "without PG vector control": i.e., speed sensorless vector control. It performs decoupling control for flux linkage and torque through rotor magnetic field orientation and achieves closed-loop speed control according to identified speed, so it has good mechanical characteristics. It can be used for the places that have high drive performance requirements and is inconvenient to install encoder. Torque can be controlled in this control mode.

F0-12＝3 "with PG vector control": i.e., with speed sensor vector control. It performs decoupling control for flux linkage and torque through rotor magnetic field orientation and achieves closed-loop speed control according to detected speed, so it has good dynamic performance and steady-state accuracy. It is mainly used for high-precision speed control, simple servo control and other high-performance control occasions. Torque can be controlled under this control mode and the torque control accuracy is high in low speed and power generation state.

F0-12＝4 "V/F separation control": Independent regulation of voltage and frequency can be realized.

F0-12＝5 "with PG vector control 2": It is similar to F0-12＝3 "with PG vector control", but the speed and torque control accuracy is higher. This control mode can be used in situations where high-precision torque control is needed.

📖For vector control, it shall be noted that:

1. It is generally used for the occasion of one frequency converter controlling one motor. Vector control can also be applied to multiple coaxial motors with the same model and parameters, but the parameter self-tuning shall be carried out when multiple motors are connected together, or the equivalent parameters after multiple motors are connected in parallel shall be manually input;

2. Motor parameters need to be self-tuned or accurately input for internal motor dynamic model and magnetic field orientation algorithm;

3. The power level of the motor and the frequency converter shall match. If the rated current of the motor is too small, the control performance will decline. The rated current of the motor shall not be less than 1/4 of the rated current of the frequency converter;

4. The parameters of ASR shall be set correctly to ensure steady and dynamic performance of speed control;

5. The number of poles of the motor should not exceed 8 and vector control should not be used for double-cage motor, deep-slot motor and torque motor;

6. Set F2-12 "basic frequency" to be the same as the rated frequency of the motor, which is convenient for high-speed field-weakening control.

📖V/F control is required in the following situations:

1. A single frequency converter drives multiple motors at the same time: the load of each motor is not output in a balanced way, or the motor parameter capacity is different;

2. The load current is less than 1/4 of the rated current of the frequency converter;
3. The frequency converter is not loaded (when testing);
4. The output of the frequency converter is connected to the transformer.

⚠DANGER: Where the mode with PG control is available, it is required to set PG parameters correctly (see encoder parameter description on Page 104). Improper setting may result in personal injury and property loss. After the motor cable is reconnected, the direction settings of the encoder must be checked again.

F0-13	Rated power of frequency converter	Factory default	Model determination	Change	△

📖 Rated power of frequency converter can be checked, minimum unit: 0.01kW.

F0-14	Software version	Factory default	Model determination	Change	△

📖 Software version can be checked, range: 0.00~99.99.

F0-15	Selection of IO accessories	Factory default	000	Change	×
Setting range	Units digit: IO module 0: No accessories 1: Digital I/O expansion board 1 2: Digital I/O expansion board 2 3: Digital I/O expansion board 3 4: Analog I/O expansion board 1				
	Tens digit: Communication module 0: No accessories 1: Isolated RS485 communication expansion board 1 2: Isolated RS485 communication expansion board 2 3: Profibus-DP or PROFINET communication expansion board				
	Hundreds digit: PG card 0: No accessories 1: Encoder expansion board				

📖 The models for digital I/O expansion board 1 is SL510-DIO1; The models for digital I/O expansion board 2 is SL510-DIO2; The models for digital I/O expansion board 3 include SL510-DIO3; The models for analog I/O expansion board 1 is SL510-AIO1.

📖 The models for isolated RS485 communication expansion board 1 is SL510-COMM1; The models for isolated RS485 communication expansion board 2 (supports TCP) is SL510-COMM2; The models for Profibus-DP or PROFINET communication expansion board include SL510-DP, SL510-PN.

📖 The models for encoder expansion board include SL510-PG0 , SL530-PG1.

📖 See Chapter 9 for selection of IO accessories.

F0-16	User password setting	Factory default	0000	Change	○
Setting range	0000~9999, 0000 indicates the password is disabled				

📖 After setting password, the password will take effect if no keys pressed within 2min. Under monitoring state, the password will take effect immediately if pressing ENTER + ◁ at the same time.

F0-17	Administrator password setting	Factory default	0000	Change	○
Setting range	0000~9999, 0000 indicates the password is disabled				

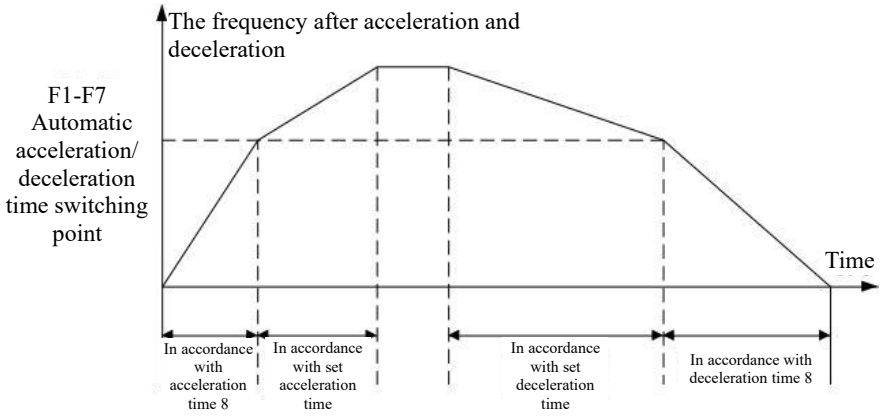
After setting password, the password will take effect if no keys pressed within 2min. Under monitoring state, the password will take effect immediately if pressing ENTER + ◁ at the same time.

6.2 F1 Acceleration & Deceleration, Start, Stop and Jog Parameters

F1-00	**Acceleration time 1**	Factory default	Model determination	Change	○
F1-01	**Deceleration time 1**	Factory default	Model determination	Change	○
F1-02	**Acceleration time 2**	Factory default	Model determination	Change	○
F1-03	**Deceleration time 2**	Factory default	Model determination	Change	○
F1-04	**Acceleration time 3**	Factory default	Model determination	Change	○
F1-05	**Deceleration time 3**	Factory default	Model determination	Change	○
F1-06	**Acceleration time 4**	Factory default	Model determination	Change	○
F1-07	**Deceleration time 4**	Factory default	Model determination	Change	○
F1-08	**Acceleration time 5**	Factory default	Model determination	Change	○
F1-09	**Deceleration time 5**	Factory default	Model determination	Change	○
F1-10	**Acceleration time 6**	Factory default	Model determination	Change	○
F1-11	**Deceleration time 6**	Factory default	Model determination	Change	○
F1-12	**Acceleration time 7**	Factory default	Model determination	Change	○
F1-13	**Deceleration time 7**	Factory default	Model determination	Change	○
F1-14	**Acceleration time 8**	Factory default	Model determination	Change	○
F1-15	**Deceleration time 8**	Factory default	Model determination	Change	○
Setting range	0.01~3600.0s, the minimum unit is determined by F1-16 "minimum unit of acceleration/deceleration time" Acceleration time: the time required to increase the frequency by 50Hz; Deceleration time: the time required to decrease the frequency by 50Hz Note: Models of 22kW and below are set to be 6.0s when delivering, and models of 30kW and above are set to be 20.0s when delivering				
F1-16	**Minimum unit of acceleration and deceleration time**	Factory default	1	Change	○
Setting range	0: 0.01s 1: 0.1s				
F1-17	**Automatic acceleration/deceleration time switching point**	Factory default	0.00Hz	Change	×
Setting range	0.00~650.00Hz, acceleration/deceleration time 8 is mandatory below this point (F1-14, F1-15)				
F1-18	**Emergency stop deceleration time**	Factory default	10.0s	Change	○
Setting range	0.01~3600.0s, the minimum unit is determined by F1-16				

F1-00~F1-15 provides 8 acceleration/deceleration times. It can be selected according to digital inputs 9, 10 and 11. See Page 95 for details.

Functions of F1-17 "automatic acceleration/deceleration time switching point" are shown below. If automatic segmental acceleration and deceleration functions are not required, this parameter can be set to zero. Automatic switch function of acceleration and deceleration time is invalid in jog operation, emergency stop and stall prevention.



F1-18 "Emergency stop deceleration time": When the digital input 16 "emergency stop" or the communication gives emergency stop command, the frequency converter will stop according to the "emergency stop deceleration time".

F1-19	Starting method	Factory default	0	Change	×
Setting range	0: Start from starting frequency 1: DC braking before starting from starting frequency 2: Speed tracking starting				
F1-20	Starting frequency	Factory default	0.50Hz	Change	○
Setting range	0.00~60.00Hz				
F1-21	Starting frequency retention time	Factory default	0.0s	Change	○
Setting range	0.0~60.0s, only valid for the condition without PGV/F control				
F1-22	Voltage soft start	Factory default	1	Change	×
Setting range	0: Invalid, start directly from the voltage corresponding to the starting frequency 1: Invalid, start with smooth rise of voltage within F1-21 "start frequency retention time"				
F1-23	Starting DC braking time	Factory default	0.0s	Change	○
Setting range	0.0~60.0s				
F1-24	Starting DC braking current	Factory default	0.0%	Change	○
Setting range	0.0~100.0%, taking the rated current of frequency converter as 100%				

Frequency converter starting mode:

F1-19＝0 "start from starting frequency": When starting, the VSD runs at F1-20 "starting frequency", it will accelerate after the time set in F1-21 "starting frequency retention time", which can reduce the current shock when starting.

F1-19＝1 "DC braking before starting from the starting frequency": Sometimes the motor is in a rotating state before starting (such as the fan may be reversed due to headwind before starting), so DC braking before starting can be used to stop the motor

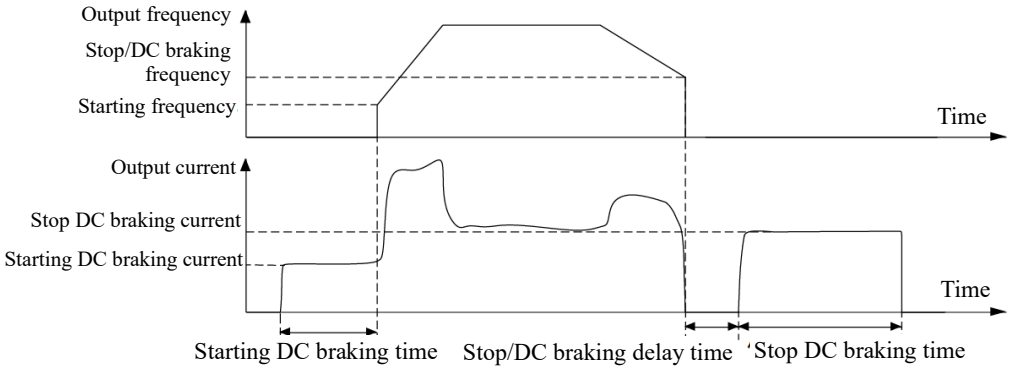
and start it again to prevent starting impact overcurrent. Relevant parameters can be set according to F1-23 "starting DC braking time" and F1-24 "start DC braking current".

F1-19＝2 "speed tracking starting": Automatically identify the speed and direction of the motor before starting, and then start smoothly without impact from the corresponding frequency. For the rotating motor, it is unnecessary to stop it completely for restart, which can shorten the starting time and reduce the starting impact.

In case of restart from instantaneous stop, self-reset and run interrupt, the Fb-25 "mode of restart from instantaneous stop, self-reset and run interrupt" can be forcibly switched to tracking start.

There is no need to select tracking start when "with PGV/F" or "with PG vector" is selected.

Start and stop DC braking are shown below :



ATTENTION: Tracking start mode is recommended for high-speed or large-inertia load starting, rather than long-time DC braking before starting.

ATTENTION: Starting from the starting frequency immediately after the free stop will lead to overcurrent due to the remanence counter electromotive force in the motor. Therefore, if the motor does not stop rotating after the free stop, it is recommended to adopt tracking starting mode to start it if it is required to be started immediately.

F1-22 "voltage soft starting": When the "starting from the starting frequency" is selected as the starting mode, and F1-21 "starting frequency hold time" is not 0, the output voltage gradually transitions from 0 to the voltage corresponding to the starting frequency within the starting frequency retention time if F1-22＝1, so as to reduce the starting impact when starting and avoid the non-directional rotation of the motor caused by suddenly increased voltage. It is valid only for the condition without PGV/F control.

F1-25	**Stop method**	Factory default	0	Change	○
Setting range	0: Deceleration stop 1: Free stop 2. Deceleration stop + DC braking 3: Deceleration stop + brake locking delay				
F1-26	**Stop/DC braking frequency**	Factory default	0.50Hz	Change	○
Setting range	0.00~60.00Hz				
F1-27	**Stop/DC braking delay time**	Factory default	0.00s	Change	○
Setting range	0.00~10.00s				
F1-28	**Stop DC braking time**	Factory default	0.0s	Change	○
Setting range	0.0~60.0s, also as brake locking delay time				

F1-29	Stop DC braking current	Factory default	0.0%	Change	○
Setting range	0.0~100.0%, taking the rated current of frequency converter as 100%				

📖Frequency converter stop mode:

F1-25＝0 "deceleration stop": The frequency converter reduces its operation frequency and enters the standby state at F1-26 "stop/DC frequency".

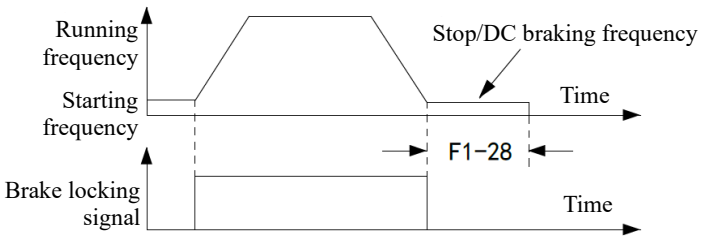
F1-25=1 "free stop": The frequency converter locks the output, and the motor slides freely. However, when stopping from jog operation or during an emergency stop, the stop is still a deceleration stop. For the stop of water pump, free stop shall not be adopted generally, because the water pump stop time is short, sudden stop will occur water hammer effect.

F1-25＝2 "deceleration stop + DC braking": The frequency converter decelerates after receiving the stop command and locks the output when it reaches F1-26 "stop DC braking frequency". After the F1-27 "stop DC braking waiting time", there will be DC current as set in F1-29 "stop DC brake current" in motor, then it will stop after reaching the F1-28 "stop DC braking time". See Page 83 for start and stop DC braking diagram. DC braking condition can be maintained forcibly via digital input 34 "Stop DC braking". See Page 96 for details.

⚠ **ATTENTION:** DC braking mode is recommended under low speed (below 10Hz generally) or for small motor.

⚠ **ATTENTION:** DC braking will consume the load mechanical energy in the rotor of the motor, so long-time or frequent DC braking is easy to cause the motor overheating.

F1-25＝3 "deceleration stop + lock delay": The frequency converter will decelerate after receiving the stop command, and maintain the operation at F1-26 "stop/DC brake frequency", and then enter the standby state after the set time of F1-28. The electromagnetic brake can be controlled by digital output 6 "brake locking signal", as shown in the brake delay timing diagram below.

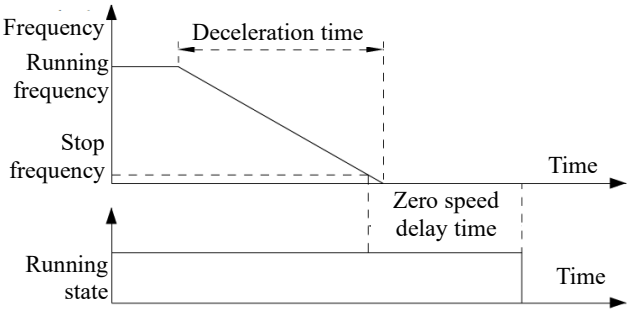


Brake Delay Timing Diagram

📖Press ENTER and double click ○ to stop the frequency converter freely under any run command channel (except communication control). However, the operation panel shall not be locked.

F1-30	Zero speed delay time	Factory default	0.0s	Change	○
Setting range	0.0~60.0s				

F1-30 "zero-speed delay time": When the shutdown mode is "**deceleration stop**", and deceleration reaches F1-26 "stop/DC braking frequency", the motor continues to decelerate to zero within the set time of F1-30 and maintain the operation at zero frequency, and the motor keeps excited for quick start at any time without the need for pre-excitation before starting. The zero-speed delay is invalid when the parameter is changed to 0. The zero-speed delay stop process is shown below:

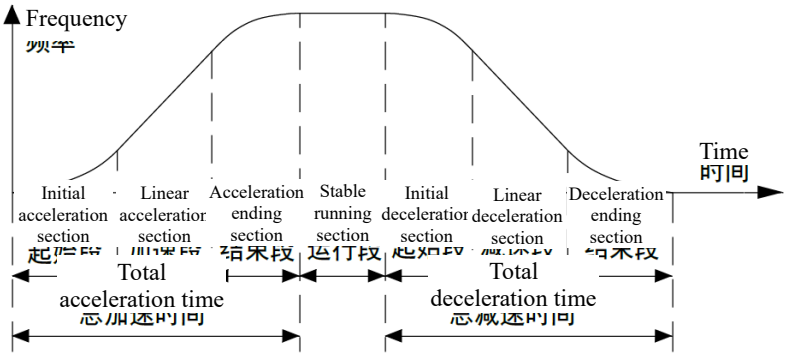


Zero-Speed Delay Timing Diagram

F1-31	Selection mode of acceleration/deceleration	Factory default	0	Change	×
Setting range	0: Linear acceleration & deceleration 1: S curve acceleration & deceleration				
F1-32	S curve acceleration start time	Factory default	0.20s	Change	×
F1-33	S curve acceleration end time	Factory default	0.20s	Change	×
F1-34	S curve deceleration start time	Factory default	0.20s	Change	×
F1-35	S curve deceleration end time	Factory default	0.20s	Change	×
Setting range	0.01~10.00s				

S curve acceleration/deceleration function: During acceleration/deceleration, the gradual acceleration is gradual and speed change is smooth, which can enhance the comfort degree of elevator when it is running, prevent objects from tipping on the conveying equipment and reduce the impact on machinery when starting and stopping.

After setting S curve time, the total acceleration/deceleration time is extended as shown below:



The total acceleration/deceleration time is calculated according to formula below:

Total acceleration/deceleration time = acceleration/deceleration time without S curve + (time of initial section + time of ending section) ÷ 2

However, if the total acceleration/deceleration time calculated in the above formula is less than the sum of the initial section and ending section, then:

Total acceleration/deceleration time = time of initial section + time of ending section

The S-curve function is automatically invalid when the automatic acceleration/deceleration time switching function is valid (F1-17 "automatic acceleration/deceleration time switching point" ≠0).

F1-36	Forward and reverse rotation dead time	Factory default	0.0s	Change	×
Setting range	0.0~3600.0s				

F1-36 "forward and reverse dead time": i.e., "waiting time for alternation of forward and reverse rotation", which aims to minimize the impact of forward and reverse rotation on machinery.

F1-37	Jog running frequency	Factory default	5.00Hz	Change	○
Setting range	0.10~50.00Hz				
F1-38	Jog acceleration time	Factory default	Model determination	Change	○
F1-39	Jog deceleration time	Factory default	Model determination	Change	○
Setting range	0.1~60.0s Note: For models of 22kW and below, the factory default values for jog acceleration/deceleration time are 6.0s, and for models of 30kW and above, the factory default values for jog acceleration/deceleration time are 20.0s.				

Under terminal control and in standby mode, digital inputs 14 "forward jog command" and 15 "reverse jog command" can achieve jog operation; when both signals are simultaneously active or simultaneously inactive, the jog operation is invalid.

Auxiliary setting and PID frequency correction are invalid during jog operation.

The start and stop mode of jog operation is set to be starting from starting frequency and stop by means of deceleration stop.

When the hundreds digit of FC-01 "key function and automatic lock" = 1 and current run command channel is operation panel, the operation panel can be used for jog operation (only unidirectional jog operation can be achieved via the operation panel).

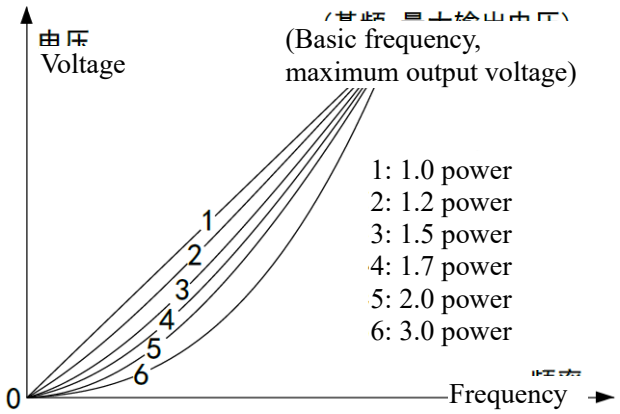
6.3 F2 V/F Control Parameters

F2-00	V/F curve setting	Factory default	1	Change	×
Setting range	0: Custom (see parameters F2-14 to F2-21) 1: Linear V/F curve (1.0 power) 2: Reduced torque V/F curve 1 (1.2 power) 3: Reduced torque V/F curve 2 (1.5 power) 4: Reduced torque V/F curve 3 (1.7 power) 5: Reduced torque V/F curve 4 (2.0 power) 6: Reduced torque V/F curve 5 (3.0 power)				

The V/F curves can be customized multi-section polyline type, linear type and multifarious reduced torque types.

The V/F curve of reduced torque can improve the motor efficiency of reduced torque load of fan pump under light load. For this type of load, motor efficiency can also be improved by automatic energy-saving operation (see the description of F2-11 on Page 88).

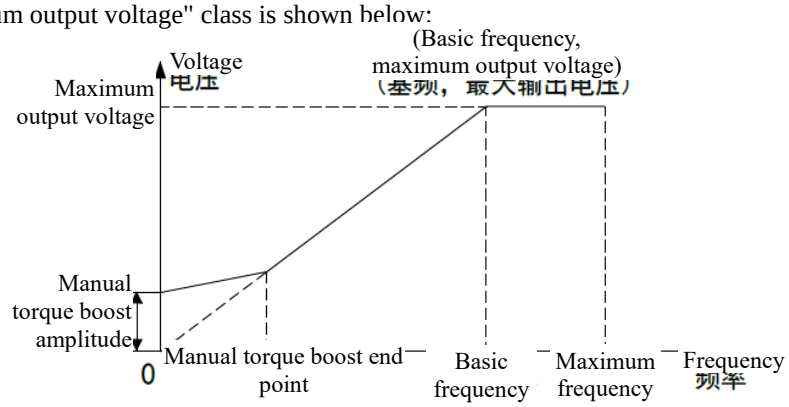
Reduced torque V/F curve and automatic energy-saving function can improve efficiency and reduce noise. Linear and reduced torque V/F curves are as follows:



F2-01	Torque boost selection	Factory default	1	Change	×
Setting range	0: No torque boost 1: Manual torque boost only 2: Automatic torque boost only 3: Manual torque boost + automatic torque boost				
F2-02	**Manual torque boost amplitude**	Factory default	Model determination	Change	○
Setting range	Models of 15kW and below: 0.0%~15.0%, taking F2-13 "maximum output voltage" as Models of 18.5kW and above: 0.0~10.0% 100%				
F2-03	**Manual torque boost end point**	Factory default	50.0%	Change	○
Setting range	0.0~100.0%, taking F2-12 "basic frequency" as 100%				
F2-04	**Automatic torque boost degree**	Factory default	80.0%	Change	×
Setting range	0.0~100.0%				

Manual torque boost can improve the low speed torque and starting torque of the motor. Adjust F2-02 "manual torque boost amplitude" from small to large until meeting the starting requirements. Do not set it too high, otherwise the motor will overheat or overcurrent.

The relation curve between output voltage V and frequency F is composed of the set V/F curve, manual torque boost and automatic torque boost. The relationship between F2-02 "manual torque boost amplitude", F2-03 "manual torque lift cutoff point", F2-12 "basic frequency" and F2-13 "maximum output voltage" class is shown below:



Automatic torque boost can change the voltage value in real time according to the load current size, compensate the voltage loss of stator impedance, automatically adapt to various load conditions, output appropriate voltage, so as to achieve larger output torque under heavy load and smaller output current under no load.

Tracking start, automatic torque boost and slip compensation of V/F control use part of motor parameters, so it is recommended to carry out static self-tuning for motor before use, so as to achieve better control performance.

F2-05	Slip compensation gain	Factory default	0.0%	Change	○
Setting range	0.0~300.0%				
F2-06	Slip compensation filtering time	Factory default	1.0s	Change	×
Setting range	0.1~25.0s				
F2-07	Electric slip compensation amplitude limiting	Factory default	200%	Change	×
F2-08	Regenerative slip compensation amplitude limiting	Factory default	200%	Change	×
Setting range	0~250%, taking the motor rated slip frequency as 100%				

Slip compensation function: If the output frequency remains unchanged, load changes will cause slip change, and the speed will reduce. Slip compensation function can adjust the output frequency of the frequency converter online according to the load torque, reduce the change of speed with the load and improve the speed control accuracy.

- Slip compensation is valid when automatic torque boost is turned on (F2-01 = 2 or 3).
- Slip compensation can be adjusted by F2-05 "slip compensation gain", which shall be adjusted according to the reduction of speed under the condition that the temperature of the motor is basically stable under load operation. When the slip compensation gain is 100%, the compensation value is the rated slip frequency at rated torque.
  The calculation formula for rated slip frequency is: rated slip frequency = rated frequency - (rated speed × number of poles ÷ 120)
- If the motor oscillates during slip compensation, F2-06 "slip compensation filtering time" can be considered to be increased.

F2-09	Vibration damping	Factory default	Model determination	Change	○
Setting range	0~200				

By adjusting the anti-vibration damping, the vibration of the motor can be suppressed under no load or light load, and the vibration can be eliminated by adjusting from small to large level.

F2-10	AVR function settings	Factory default	1	Change	×
Setting range	0: Invalid 1: Always valid 2: Invalid only when decelerating				

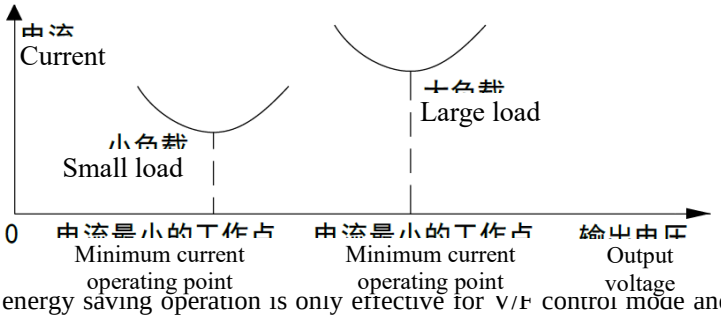
AVR function is the automatic voltage regulation function. When the input voltage or DC bus voltage changes, AVR function can remain that output voltage is free from influence, making production process and product quality stable.

- When the input voltage is higher than the rated value, the AVR function shall be turned on to prevent the motor from running under excessive voltage.
- The AVR allows faster deceleration under the mode of "invalid during deceleration only" by comparing with the mode of "always valid", but the deceleration current is slightly larger. This is because deceleration increases the DC bus voltage, and if AVR is invalid, the output voltage will also increase, which increases the motor loss and reduces the mechanical energy feedback of the motor, so that the deceleration time can be set shorter.

ATTENTION: If the load rotary inertia is large, it shall be set as AVR "always valid" to prevent excessive voltage when decelerating and causing motor heating.

F2-11	Automatic energy saving operation selection	Factory default	0	Change	○
Setting range	0: Invalid 1: Valid				

Automatic energy-saving operation: automatically adjust the output voltage to minimize the load current at the same motor speed and motor loss. This function is particularly effective for fan and pump loads with torque reduction characteristics, as shown in the figure below:



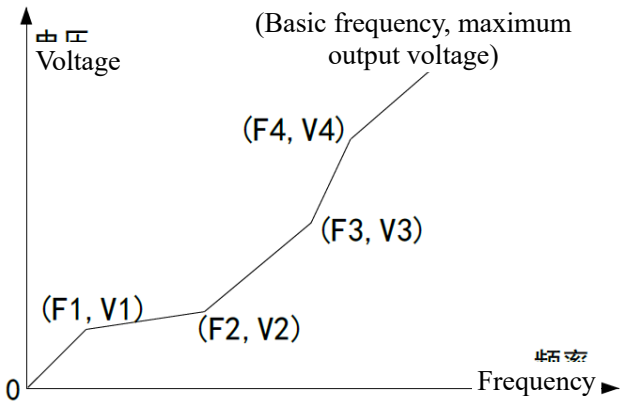
Automatic energy saving operation is only effective for V/F control mode and is only suitable for smooth load.

The automatic energy saving operation under V/F control requires both automatic torque boost and slip compensation functions.

F2-12	**Basic frequency**	Factory default	50.00Hz	Change	×
Setting range	1.00~650.00Hz				
F2-13	**Maximum output voltage**	Factory default	660V	Change	×
Setting range	260~866V, default value: 660V				
F2-14	**V/F frequency value F4**	Factory default	0.00Hz	Change	×
Setting range	F2-16 "V/F frequency value F3" ~ F2-12 "basic frequency"				
F2-15	**V/F voltage value V4**	Factory default	0.0%	Change	×
Setting range	F2-17 "V/F voltage value V3" ~ 100.0%, taking F2-13 "maximum output voltage" as 100%				
F2-16	**V/F frequency value F3**	Factory default	0.00Hz	Change	×
Setting range	F2-18 "V/F frequency value F2" ~ F2-14 "V/F frequency value F4"				
F2-17	**V/F voltage value V3**	Factory default	0.0%	Change	×
Setting range	F2-19 "V/F frequency value V2" ~ F2-15 "V/F frequency value V4", taking F2-13 "maximum output voltage" as 100%				
F2-18	**V/F frequency value F2**	Factory default	0.00Hz	Change	×
Setting range	F2-20 "V/F frequency value F1" ~ F2-16"V/F frequency value F3"				
F2-19	**V/F voltage value V2**	Factory default	0.0%	Change	×
Setting range	F2-21 "V/F frequency value V1" ~ F2-17 "V/F frequency value V3", taking F2-13 "maximum output voltage" as 100%				
F2-20	**V/F frequency value F1**	Factory default	0.00Hz	Change	×
Setting range	0.00Hz ~ F2-18 "V/F frequency value F2"				
F2-21	**V/F voltage value V1**	Factory default	0.0%	Change	×
Setting range	0.0% ~ F2-19 "V/F voltage value V2", taking F2-13 "maximum output voltage" as 100%				

F2-12 "basic frequency" is not only valid for V/F control, and it shall be set to be the same as FA-04 "rated frequency of motor" when vector control is used.

Custom V/F curve is as follows:



F2-22	V/F separation voltage input selection	Factory default	0	Change	×
Setting range	0: Digital set voltage, determined by F2-23 1: |AI1| 2: |AI2| 3: |AI3| 4: |AI4| 5: |UP/DOWN regulating value| 6: |PFI| 7: |Arithmetic unit 1| 8: |Arithmetic unit 2| 9: |Arithmetic unit 3| 10: |Arithmetic unit 4|				
F2-23	**V/F separation voltage digital setting**	Factory default	100.0%	Change	○
Setting range	0.0~100.0%, taking F2-13 "maximum output voltage" as 100%				
F2-24	**V/F voltage coefficient**	Factory default	0	Change	×
Setting range	0: 100.0% 1: |AI1| 2: |AI2| 3: |AI3| 4: |AI4| 5: |UP/DOWN regulating value| 6: |PFI| 7: |Arithmetic unit 1| 8: |Arithmetic unit 2| 9: |Arithmetic unit 3| 10: |Arithmetic unit 4|				

The V/F separation control function allows the output voltage and frequency of the frequency converter to be adjusted independently, which can be used for torque motors, linear motors and other special occasions, and can be used as a programmable power supply.

In the case of V/F separation control, the functions of torque boost, slip compensation and anti-vibration damping are invalid.

In the case of V/F separation control, voltage soft start is related to starting frequency and starting frequency retention time. See Page 83 for details.

F2-24 "V/F voltage coefficient" can correct the maximum output voltage in many ways for motor test equipment, and it is unnecessary to be set by general users. It is used for V/F control only.

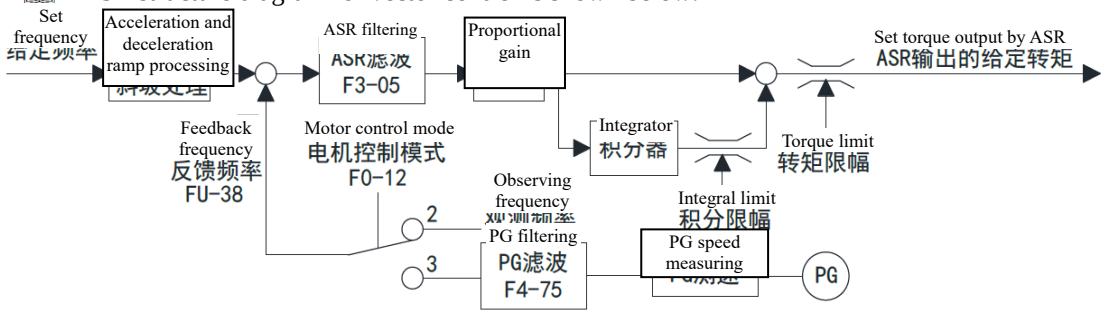
6.4 F3 Speed, Torque and Flux Control Parameters

F3-00	High-speed ASR proportional gain	Factory default	5.00	Change	×
Setting range	0.00~200.00				
F3-01	**High-speed ASR integration time**	Factory default	1.000s	Change	×
Setting range	0.010~30.000s				
F3-02	**Low-speed ASR proportional gain**	Factory default	10.00	Change	×
Setting range	0.00~200.00				
F3-03	**Low-speed ASR integration time**	Factory default	0.500s	Change	×
Setting range	0.010~30.000s				
F3-04	**ASR parameter switching point**	Factory default	5.00Hz	Change	×

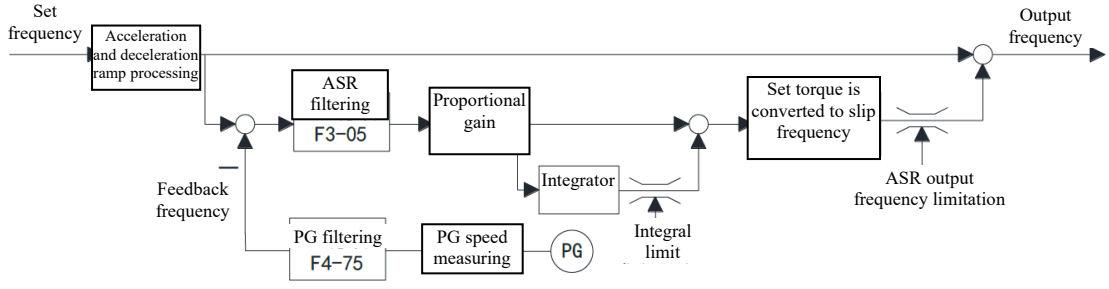
Setting range	0.00~650.00Hz				
F3-05	**ASR filtering time**	Factory default	0.010s	Change	×
Setting range	0.000~2.000s				
F3-06	**Acceleration compensation differential time**	Factory default	0.000s	Change	×
Setting range	0.000~20.000s				
F3-07	**Torque limitation selection**	Factory default	0	Change	×
Setting range	0: Determined by F3-08 "electric torque limit" and F3-09 "regeneration torque limit" 1: |AI1| × 2.5 2: |AI2| × 2.5 3: |AI3| × 2.5 4: |AI4| × 2.5 5: |Arithmetic unit 1|×2.5 6: |Arithmetic unit 2|×2.5 7: |Arithmetic unit 3|×2.5 8: |Arithmetic unit 4|×2.5				
F3-08	**Electric torque limitation**	Factory default	180.0%	Change	×
F3-09	**Regenerative torque limitation**	Factory default	180.0%	Change	×
Setting range	0.0~290.0%, taking the rated torque of motor as 100%, for vector control only				
F3-10	**ASR output frequency limitation**	Factory default	10.0%	Change	×
Setting range	0.0~20.0%, taking the maximum frequency as 100%, only for these with PGV/F control				

ASR: i.e., automatic speed regulator. In vector control, ASR outputs a given torque, which is limited by F3-07~F3-09. In case of PGV/F control, ASR outputs frequency correction, which is limited by F3-10 "ASR output frequency limit".

ASR structure diagram for vector control is shown below:



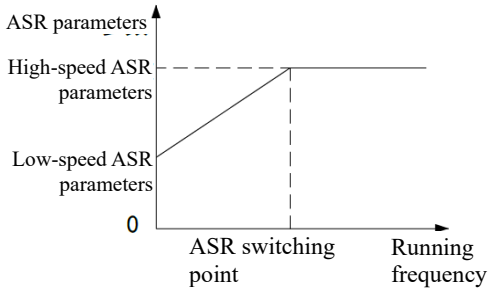
ASR structure diagram with PGV/F control is shown below:



Note: In condition with PGV/F control, F3-07＝0 and ASR is limited by F3-10. When F3-07≠0, the limitation is the items selected in F3-10×F3-07÷2.5.

F3-04 "ASR parameter switching point": ASR parameter switching can be used if different ASR parameters are required for high-speed and low-speed operation. Low-speed parameter F3-02 and F3-03 can be adopted when zero speed is used, and high-speed parameters F3-00 and F3-01

can be adopted when running frequency is above the ASR parameter switching point. Besides, there shall be a smooth transition of high and low speed parameters between zero speed and ASR parameter switching point, as shown in the figure below. If only one set of ASR parameters is required, F3-04 "ASR parameter switching point" can be set to 0, that is, only high-speed ASR parameters are used.



F3-06 "ASR acceleration compensation differential time": The parameter differentiates the set frequency processed by acceleration and deceleration time to obtain a feedforward torque set, which is added to the set torque to better track the set running frequency in the process of acceleration and deceleration and reduce overshoot.

ASR regulation method: Firstly, the proportional gain shall be increased as far as possible under the premise of ensuring the system does not oscillate, then adjust the integration time to make the system respond quickly with a small overshoot.

When the speed overshoot is too large due to improper ASR parameters, the overpressure may be caused by energy feedback during the deceleration process of speed recovery.

F3-11	Droop	Factory default	0.00Hz	Change	○
Setting range	0.00~50.00Hz				
F3-12	**Sag starting torque**	Factory default	0.0%	Change	○
Setting range	0.0~100.0%, taking the motor rated torque as 100%				

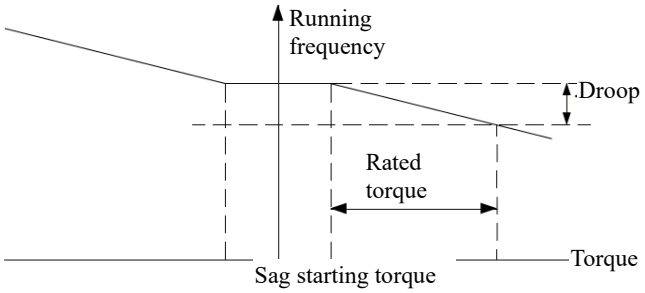
Control of sag mechanical characteristics: When multiple motors drive the same mechanical load and each motor is controlled by a separate frequency converter, the load borne by each motor and frequency converter will be different due to the different rated speed or mechanical characteristics of different motors. The sag function balances the load of each motor by adjusting the level of mechanical characteristics.

F3-11 "sag": Set the running frequency change value when motor torque is in "sag starting torque + rated torque".

Motor torque is above F3-12 "sag starting torque":

Frequency after sag treatment = initial set frequency - (current torque - sag starting torque) × sag

The sag mechanical characteristics are shown below:



F3-13	Torque control selection	Factory default	0	Change	×
Setting range	0: Conditions valid, select according to digital input 48 "speed/torque control selection" 1: Always valid				

F3-14	Torque set selection	Factory default	0	Change	×
Setting range	0: Set by F3-15 1: AI1×2.5 2: AI2×2.5 3: AI3×2.5 4: AI4×2.5 5: PFI×2.5 6: UP/DOWN regulating value×2.5 7: Arithmetic unit 1×2.5 8: Arithmetic unit 2×2.5 9: Arithmetic unit 3×2.5 10: Arithmetic unit 4×2.5 Note: All above are set with the motor torque rating being 100% Motor rated torque = motor rated power ÷ (2π × motor rated speed ÷ 60)				
F3-15	**Digital torque setting**	Factory default	0.0%	Change	○
Setting range	-290.0%~290.0%, taking the motor rated torque as 100%				
F3-16	**Torque control speed limit input selection**	Factory default	0	Change	○
Setting range	0: Determination of set frequency 1: Determination of F3-17 and F3-18				
F3-17	**Forward limit value of torque control speed**	Factory default	5.00Hz	Change	○
Setting range	0.00Hz~F0-07 "upper limit frequency"				
F3-18	**Reverse limit value of torque control speed**	Factory default	5.00Hz	Change	○
Setting range	0.00Hz~F0-07 "upper limit frequency"				
F3-19	**Torque set increase or decrease time**	Factory default	0.020s	Change	×
Setting range	0.000~10.000s, time of increasing from 0 to 290% of the rated torque of the motor				
F3-20	**Speed/Torque control switching delay time**	Factory default	0.050s	Change	×
Setting range	0.001~1.000s				

Torque control can directly control the torque of the motor according to the set torque, and can be used for tension open-loop winding control, load balance control, etc. The frequency converter will switch to speed control mode to stop when inputting stop commands in torque control mode.

- The torque control function applies only to vector control. "With PG vector control" is recommended for torque control at low speed or power generation state.
- F3-13 "torque control selection" can be set as always valid or condition valid. "Conditionally valid" refers to the torque control switched by digital input 48 "speed/torque control selection". See Page 92 for details.
- Torque control can limit the speed according to the limiting source determined by F3-16 "torque control speed limit input selection".
- F3-19 "torque set increase/decrease time" can reduce the torque command mutation. If the motor vibrates under torque control, the parameter value can be considered to be increased.
- In torque control, FWD indicator and REV indicator on the operation panel respectively represent forward and reversed directions.

F3-21	Pre-excitation time	Factory default	Model determination	Change	×
Setting range	0.10~5.00s, only valid for vector control				
F3-22	**Magnetic flux intensity**	Factory default	94.0%	Change	×
Setting range	50.0~150.0%, only valid for vector control				
F3-23	**Low-speed flux lifting**	Factory default	0%	Change	×

Setting range	0~50%, only valid for vector control				
F3-24	**Weak magnetic regulator integration time**	Factory default	0.150s	Change	×
Setting range	0.100~3.000s, only valid for vector control				

F3-21 "pre-excitation time": Before starting the motor, ensure that the motor is fully excited so that there is enough starting torque, this process generally takes 0.1-2.0s. The larger the motor capacity is, the longer the pre-excitation time will be.

F3-22 "magnetic flux intensity": Too high or too low flux level below the flux weakening point will lead to the decline of torque output capacity and efficiency.

F3-23 "low-speed flux lifting": the magnetic flux intensity, when below 10% basic frequency, can be lifted to increase torque output capacity at low speed under vector control.

F3-24 "weak magnetic regulator integral time": When operating above basic frequency or bus voltage is low, the motor will be automatically under field weakening control. F3-24 determines the speed of weak magnetic response, and it is necessary to reduce F3-24 when high dynamic performance is required.

F3-25	**Electric power limit**	Factory default	120.0%	Change	×
F3-26	**Regenerative power limit**	Factory default	120.0%	Change	×
Setting range	0.0~250.0%, taking the rated power of the frequency converter as 100%, only for vector control to limit the output power				

6.5 F4 Digital Input Terminal and Multi-stage Speed

F4-00	**DI1 digital input terminal function**	Factory default	38	Change	×
F4-01	**DI2 digital input terminal function**	Factory default	39	Change	×
F4-02	**DI3 digital input terminal function**	Factory default	13	Change	×
F4-03	**DI4 digital input terminal function**	Factory default	1	Change	×
F4-04	**DI5 digital input terminal function**	Factory default	2	Change	×
Setting range	See the table below (digital input function definition table below)				

Digital input function definition table (a same digital input function cannot be selected for any two digital input terminals at the same time):

0: Not connected to the following signals	21: Terminal UP/DOWN clear	42: Run command channel 1/2 switch
1: Multi-stage frequency selection 1	22: PLC control prohibited	43: FWD1/REV1 terminal command switching to three-wire type 1.
2: Multi-stage frequency selection 2	23: PLC suspended	44: Main set frequency channel switching
3: Multi-stage frequency selection 3	24: PLC standby reset	45: Simultaneous switching of main set frequency channel and run command channel
4: Multi-stage frequency selection 4	25: PLC mode selection 1	46: Acceleration & deceleration prohibited
5: Multi-stage frequency selection 5	26: PLC mode selection 2	47: Analog quantity set frequency retention
6: Multi-stage frequency selection 6	27: PLC mode selection 3	48: Speed/torque control selection

7: Multi-stage frequency selection 7	28: PLC mode selection 4	49: Multi-stage PID selection 1
8: Multi-stage frequency selection 8	29: PLC mode selection 5	50: Multi-stage PID selection 2
9: Acceleration / deceleration time selection 1	30: PLC mode selection 6	51: Multi-stage PID selection 3
10: Acceleration / deceleration time selection 2	31: PLC mode selection 7	52: Zero servo command
11: Acceleration/deceleration time selection 3	32: Auxiliary set channel forbidden	53: Counter presetting
12: External fault input	33: Operation interruption	54: Counter reset
13: Fault reset	34: Stop/DC braking	55: Length counter and counter 2 reset
14: Forward jog operation	35: Process PID forbidden	56: Wobble frequency input
15: Reverse jog operation	36: PID parameter 2 selection	57: Wobble frequency state reset
16: Emergency stop	37: Three-wire stop command	58: Total fan running time reset
17: frequency converter operation prohibited	38: Internal virtual FWD1 terminal	59: PFI is reversed for position setting
18: Free stop	39: Internal virtual REV1 terminal	60: Motor rated current selection 2
19: Terminal UP/DOWN increase	40: Internal virtual FWD2 terminal	61: Motor rated current selection 3
20: Terminal UP/DOWN decrease	41: Internal virtual REV2 terminal	62: Process PID paused

Hope530G is provided with five multifunctional programmable digital input terminals (DI1~DI5) and five expanded input terminals. When DI5 is used as a PFI pulse frequency input terminal, F4-04 must be set to 0.

In addition to the functions that can be selected for digital input terminals from the digital input function definition table on Page 94, the outputs of comparators, logical units, and timers can also be connected to the digital input function in the table, as described in the FE section.

Relevant monitoring parameters: FU-42 "digital input terminal state".

The digital input function is detailed as follows:

1~8: Multi-stage frequency selection. See F4-19 "multi-stage speed selection mode" on Page 102 for details.

9~11: Acceleration/deceleration time selection. Acceleration/deceleration time selections 1~8 for encoding is shown in the table below. "0" refers to invalid and "1" refers to valid:

Acceleration and deceleration time selection 3	Acceleration and deceleration time selection 2	Acceleration and deceleration time selection 1	Acceleration/Deceleration time selected
0	0	0	Acceleration/deceleration time 1 (F1-00, F1-01)
0	0	1	Acceleration/deceleration time 2 (F1-02, F1-03)
0	1	0	Acceleration/deceleration time 3 (F1-04, F1-05)
0	1	1	Acceleration/deceleration time 4 (F1-06, F1-07)
1	0	0	Acceleration/deceleration time 5 (F1-08, F1-09)
1	0	1	Acceleration/deceleration time 6 (F1-10, F1-11)
1	1	0	Acceleration/deceleration time 7 (F1-12, F1-13)

1	1	1	Acceleration/deceleration time 8 (F1-14, F1-15)
Note: Acceleration and deceleration time selection is invalid in case of simple PLC, jogging operation and emergency stop			

12: External fault input. The abnormal or fault information of the peripheral equipment of the frequency converter is input to the frequency converter through this signal, so that the frequency converter stops with external fault reported. The fault cannot be reset automatically and must be manually reset. If normally closed input is required, it can be realized by inverting the digital input terminal of F4-05. External failure can be indicated by digital output 11 "external failure shutdown".

13: Fault reset. The rising edge of the signal resets the fault, and the function is the same as the reset function of operation panel ◯.

14~15: Forward and reverse jog operation. See the description of jog function on Page 86 for details.

16: Emergency stop. If the signal is valid, the frequency converter will stop according to F1-18 "emergency stop deceleration time".

17: frequency converter running prohibited. When the signal is valid, it will prohibit the operation of the frequency converter, and the frequency converter will stop freely if it is running.

18: Free stop. If the signal is valid when the frequency converter is running, the output will be blocked immediately, and the motor will stop by inertia sliding.

19~21: UP/DOWN increase and decrease and clear. See the description on UP/DOWN on Page 101.

22~24: PLC prohibited, paused and reset. See the F8 section on Page 124.

25~31: PLC mode selections 1~7. See the F8 section on Page 124.

32: Auxiliary given channel prohibited. The auxiliary setting is invalid if the signal is valid.

33: Run interrupt. When the frequency converter is running, the frequency converter will block the output when the signal is valid. When the run interrupt command is lifted, the frequency converter will start in the way set by FB-25. It can be indicated by the digital output 17 "run interrupted state".

34: Stop DC braking. When the running frequency is less than F1-26 "stop/DC braking frequency" and F1-25 = 2 during stop, the stop DC braking will be enabled if the signal is valid until the braking time is beyond F1-28 and the command is lifted.

35: Process PID prohibited. When this signal is valid, PID operation will be disabled. Only when this signal is not effective and there is no operation mode of higher priority, PID operation will be started.

36: PID parameter 2 selection. When F7-11 "PID parameter transition mode"=0 and the signal is valid, select PID parameter 2 (F7-08~F7-10). Otherwise, select PID parameter 1 (F7-05~F7-07).

37~39: Three-wire stop command, internal virtual FWD1 and REV1 terminals. See the description on FWD1/REV1 and FWD2/REV2 running mode on Page 99.

40, 41: Internal virtual FWD2 and REV2 terminals. See the description on FWD1/REV1 and FWD2/REV2 running mode on Page 99.

42: Run command channel 1/2 switch This signal realizes the arbitrary switching between run command channel 1 and run command channel 2 set by F0-02. For example, F0-02=30, i.e., switch between operation panel and COMM1 can be achieved. When the terminal input is valid, select COMM1, otherwise, select operation panel control. Switching of run command channels is also affected by the digital input function 45. See digital input function 45 . Run command channel switching is also affected by the combination keys described in the thousands digit of FC-01. Refer to FC-01 "Key functions and auto lock".

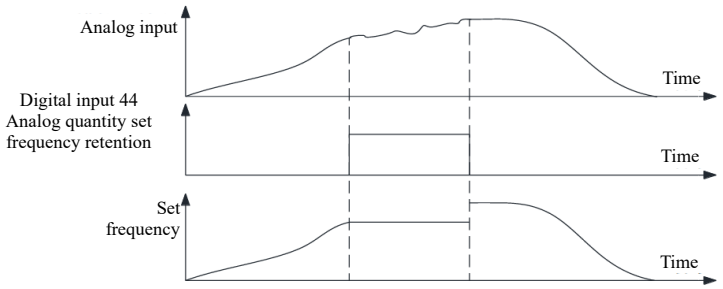
43: FWD1/REV1 terminal command switching to three-wire type 1. When the FWD1/REV1 channel is valid and the signal is also valid, it forcibly switches to three-wire mode 1. See logic and illustration of various modes of FWD1/REV1 on Page 99.

44: Main set frequency channel switching. The signal realizes the arbitrary switching between the given channel 1 and the given channel 2 set by F0-01. Example: F0-01 = 1201 realizes switching between arithmetic unit 4 and COMM1. When the terminal input is active, arithmetic unit 4 is selected for control. When the terminal input is inactive, COMM1 is selected. Switching of main set frequency channels is also affected by the digital input function 45. See digital input function 45 . Main set frequency channel switching is also affected by the combination keys described in the thousands digit of FC-01. Refer to FC-01 "Key functions and auto lock".

45: Simultaneous switching of main set frequency channel and run command channel. This signal simultaneously realizes the arbitrary switching between run command channels 1 and 2 set by F0-02 and the arbitrary switching between given channels 1 and 2 set by F0-01. Set channel 2 is forcibly selected as main set frequency channel and run command channel 2 is forcibly selected when the terminal input is valid. When terminal 45 input, run command channel 1/2 switching terminal 42 input, and the combination key function for switching command and set channels (pressing and holding "◁, △") are all inactive, run command channel 1 is selected; otherwise, run command channel 2 is selected. When terminal 45 input, main set channel switching terminal 44 input, and the combination key function for switching command and set channels (pressing and holding "◁, △") are all inactive, set channel 1 is selected; otherwise, set channel 2 is selected.

46: Acceleration & deceleration prohibited. When this signal is valid, the acceleration/deceleration process of the frequency converter stops. If not, it returns to normal acceleration/deceleration state.

47: Analog quantity set frequency retention. When a set frequency is obtained from an analog input and the signal is valid, the set frequency does not vary with the analog input. If the signal is invalid, the set frequency varies with the analog input. This feature is useful in situations where analog input commands are easily changed due to electromagnetic interference, as shown below:



48: Speed/torque control selection. When the torque control selection condition is effective, the signal can make the frequency converter switch between torque control and speed control. When it is invalid, the frequency converter is under speed control, and when it is invalid, it is under torque control.

49~51: Multi-stage PID selections 1~3. The 3 terminal functions select the set value of the current PID by code.

Multi-stage PID selection 3	Multi-stage PID selection 2	Multi-stage PID selection 1	PID setting selected
0	0	0	Determined by F7-01 "given channel selection"
0	0	1	F7-22 "multi-stage PID setting 1"
0	1	0	F7-23 "multi-stage PID setting 2"
0	1	1	F7-24 "multi-stage PID setting 3"
1	0	0	F7-25 "multi-stage PID setting 4"
1	0	1	F7-26 "multi-stage PID setting 5"
1	1	0	F7-27 "multi-stage PID setting 6"
1	1	1	F7-28 "multi-stage PID setting 7"

52: Zero servo command. See zero servo function description on Page 133.

53, 54: Counter preset and reset. See counter function description on Page 130.

55: Length counter and counter 2 reset. See length counter function description on Page 132 and description on counter 2 on Page 133.

56, 57: Wobble frequency input and state reset. See the description for textile wobble frequency functions on Page 128.

58: Total fan running time reset. See the description for fan life expectancy on Page 145.

59: PFI is reversed for position setting. In PFI position setting, the signal is valid and makes the position setting negative. See Page 133 for details.

60, 61: Motor rated current selections 2, 3. It is used for multiple motor overload protection. See Page 138 for details.

62: Process PID paused. When the signal is valid, the PID output value always remains constant; If the signal is invalid, the PID output value will be adjusted according to the PID feedback value and the PID set value.

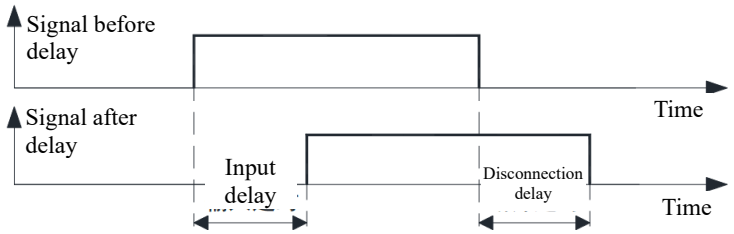
F4-05	Positive and negative logic 1 of input terminal	Factory default	00000	Change	×
Setting range	Ten-thousands digit: DI5 Thousands digit: DI4 Hundreds digit: DI3 Tens digit: DI2 Units digit: DI1				

	0: Positive logic, valid when there is power in the loop, and invalid when power is off. 1: Negative logic, invalid when there is power in the loop, and valid when power is off				
F4-06	**Digital input terminal debounce time**	Factory default	10ms	Change	○
Setting range	0~2000ms				

Digital input debounce time: Define the debounce of digital input terminal, and the signal with duration shorter than the debounce time will be neglected.

F4-07	**DI1 input delay**	Factory default	0.00s	Change	○
F4-08	**DI1 disconnection delay**	Factory default	0.00s	Change	○
F4-09	**DI2 input delay**	Factory default	0.00s	Change	○
F4-10	**DI2 disconnection delay**	Factory default	0.00s	Change	○
F4-11	**DI3 input delay**	Factory default	0.00s	Change	○
F4-12	**DI3 disconnection delay**	Factory default	0.00s	Change	○
Setting range	0.00~650.00s				

Digital input delay is shown below:

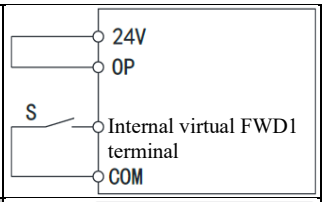
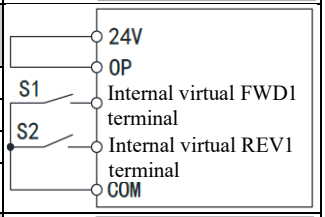
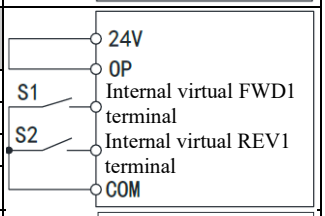
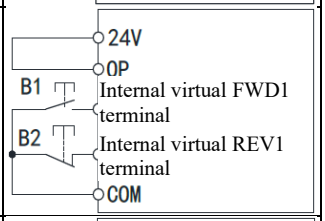
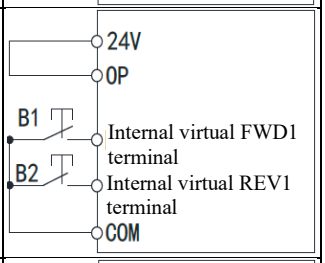
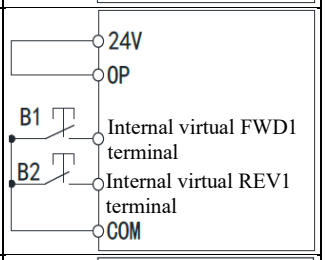
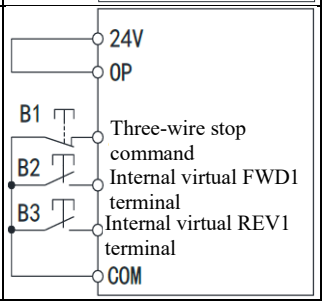


F4-13	**FWD1/REV1 and FWD2/REV2 operation mode**	Factory default	01	Change	×
Setting range	Tens digit: FWD2/REV2 operation mode (04) 0: Single-wire type (start/stop) 2: Two-wire type 2 (start/stop, direction) 4: Two-wire type 4 (single-pulse start/stop) 6: Three-wire type 2 (operation, direction, stop)	Units digit: FWD1/REV1 operation mode (0~6) 1: Two-wire type 1 (forward, reverse) 3: Two-wire type 3 (start, stop) 5: Three-wire type 1 (forward, reversal, stop)			

Relevant digital input 37 "3-wire stop command", 38 "internal virtual FWD1 terminal", 39 "internal virtual REV1 terminal", 40 "internal virtual FWD2 terminal", 41 "internal virtual REV2 terminal".

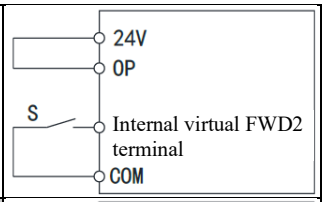
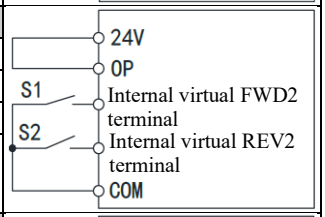
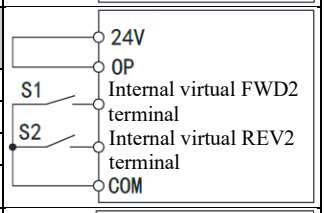
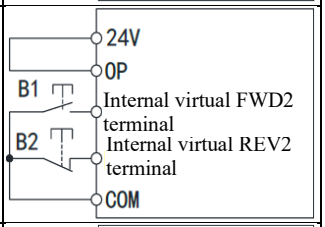
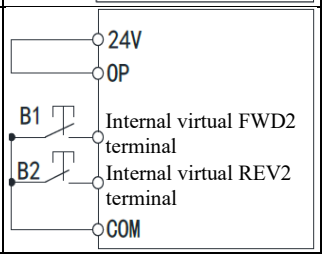
The table below lists the logic and diagrams of various operating modes of FWD1/REV1. In the table, S stands for valid level. B is valid edge:

F4-13 units digit	Mode name	Running logics	Diagram

<table>
<tr><td>0</td><td>Single-wire type (start/stop)</td><td colspan="3">S: Running switch, run when valid
Note: The direction is determined by the direction of the set frequency</td><td> 
</td></tr>
<tr><td rowspan="5">1</td><td rowspan="5">Two-wire type 1 (forward, reverse)</td><td colspan="3">S2 (revere) | S1 (forward) | Meaning</td><td rowspan="5"> 
</td></tr>
<tr><td>Invalid</td><td>Invalid</td><td>Stop</td></tr>
<tr><td>Invalid</td><td>Valid</td><td>Forward</td></tr>
<tr><td>Valid</td><td>Invalid</td><td>Reverse</td></tr>
<tr><td>Valid</td><td>Valid</td><td>Stop</td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">Two-wire type 2 (start/stop, direction)</td><td colspan="3">S2 (direction) | S1 (start/stop) | Meaning</td><td rowspan="5"> 
</td></tr>
<tr><td>Invalid</td><td>Invalid</td><td>Stop</td></tr>
<tr><td>Invalid</td><td>Valid</td><td>Forward</td></tr>
<tr><td>Valid</td><td>Invalid</td><td>Stop</td></tr>
<tr><td>Valid</td><td>Valid</td><td>Reverse</td></tr>
<tr><td>3</td><td>Two-wire type 3 (start, stop)</td><td colspan="3">B1: Run button (normally on)
B2: Stop button (normally off)
Note: The direction is determined by the direction of the set frequency</td><td> 
</td></tr>
<tr><td>4</td><td>Two-wire type 4 (single-pulse start/stop)</td><td colspan="3">B1: Forward start/stop button (normally on)
B2: Reverse start/stop button (normally on)</td><td> 
</td></tr>
<tr><td>5</td><td>Three-wire type 1 (forward, reverse and stop) Additional digital input 37 "three-wire stop command" required</td><td colspan="3">B1: Stop button (normally off)
B2: Forward button (normally on)
B3: Reverse button (normally on)</td><td> 
</td></tr>
<tr><td>6</td><td>Three-wire type 2 (run, direction and stop) Additional digital input 37 "three-wire stop command" required</td><td colspan="3">B1: Stop button (normally off)
B2: Run button (normally on)
S: Direction switch, reversed when effective</td><td> 
</td></tr>
</table>

The table below lists the logic and diagrams of various operating modes of FWD2/REV2. In the table, S stands for valid level. B is valid edge:

F4-13 tens digit	Mode name	Running logics	Diagram

<table>
<tr><td>0</td><td>Single-wire type (start/stop)</td><td colspan="3">S: Running switch, run when valid
Note: The direction is determined by the direction of the set frequency</td><td> 
</td></tr>
<tr><td rowspan="5">1</td><td rowspan="5">Two-wire type 1 (forward, reverse)</td><td>S2 (revere)</td><td>S1 (forward)</td><td>Meaning</td><td rowspan="5"> 
</td></tr>
<tr><td>Invalid</td><td>Invalid</td><td>Stop</td></tr>
<tr><td>Invalid</td><td>Valid</td><td>Forward</td></tr>
<tr><td>Valid</td><td>Invalid</td><td>Reverse</td></tr>
<tr><td>Valid</td><td>Valid</td><td>Stop</td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">Two-wire type 2 (start/stop, direction)</td><td>S2 (direction)</td><td>S1 (start/stop)</td><td>Meaning</td><td rowspan="5"> 
</td></tr>
<tr><td>Invalid</td><td>Invalid</td><td>Stop</td></tr>
<tr><td>Invalid</td><td>Valid</td><td>Forward</td></tr>
<tr><td>Valid</td><td>Invalid</td><td>Stop</td></tr>
<tr><td>Valid</td><td>Valid</td><td>Reverse</td></tr>
<tr><td>3</td><td>Two-wire type 3 (start, stop)</td><td colspan="3">B1: Run button (normally on)
B2: Stop button (normally off)
Note: The direction is determined by the direction of the set frequency</td><td> 
</td></tr>
<tr><td>4</td><td>Two-wire type 4 (single-pulse start/stop)</td><td colspan="3">B1: Forward start/stop button (normally on)
B2: Reverse start/stop button (normally on)</td><td> 
</td></tr>
</table>

In terminal control mode, although single-wire or two-wire running modes 1 and 2 are of valid level, it is necessary to restart by giving the stop signal before operation signal when frequency converter stops due to the stop command generated by other sources.

For two-wire type 3 and three-wire running mode, the run button becomes invalid when the normally-off stop button is open.

Even if the operation mode has determined the operating direction, it will still be restricted by the direction lock function.

If the terminal command has no direction information, the operation direction shall be determined by the state (positive and negative) of set frequency channels.

DANGER: When the running signal exists and Fb-26 "power-on self-start permit" = 1 (default value), the frequency converter will start automatically when it is powered on.

F4-14	**UP/DOWN adjustment mode**	Factory default	0	Change	○
Setting range	0: Terminal level type 1: Terminal pulse type 2: Operation panel level type 3: Operation panel pulse type				
F4-15	**UP/DOWN rate/step size**	Factory default	1.00	Change	○
Setting range	0.01~100.00. Min. unit: 0.01%/s (level type); 0.01% (pulse type)				
F4-16	**UP/DOWN memory selection**	Factory default	0	Change	○
Setting range	0: Power-down storage, 1: Power-down clear, 2: Cleared at stop and power-down				

F4-17	UP/DOWN upper limit	Factory default	100.0%	Change	○
Setting range	0.0~100.0%				
F4-18	**UP/DOWN lower limit**	Factory default	0.0%	Change	○
Setting range	-100.0~0.0%				

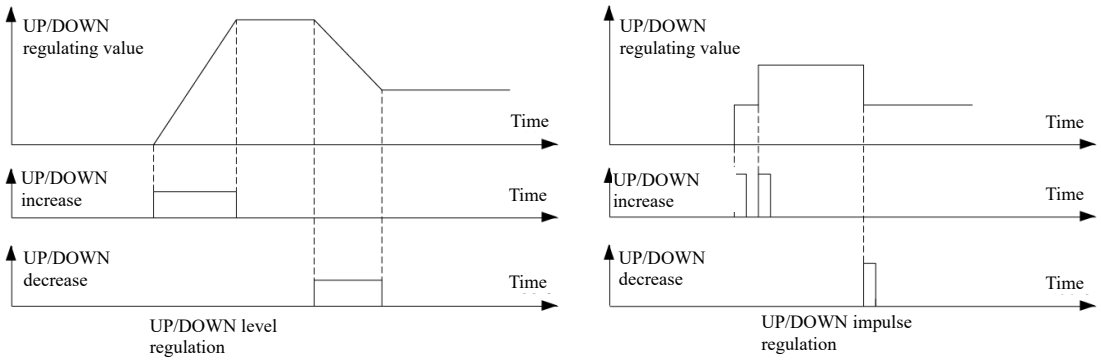
UP/DOWN function achieves the continuous regulation of switching mode with the regulating value can be used for frequency setting, PID setting and so on.

Under the condition of **F4-14=0 "terminal level type"**, FU-23 "UP/DOWN regulating value" increases and decreases at the rate set in F4-15 when digital input 19 "terminal UP/DOWN increase" or 20 "terminal UP/DOWN decrease" is valid. When the digital input 19 and 20 are both valid or invalid, the value of FU-23 remains unchanged.

Under the condition of **F4-14=1 "terminal pulse type"**, FU-23 "UP/DOWN regulating value" increases and decreases at the step length set in F4-15 for each effective impulse of digital input 19 "terminal UP/DOWN increase" or 20 "terminal UP/DOWN decrease".

The conditions of **F4-14＝2 and 3** are similar to 0 and 1, and the difference is that △ and ▽ of operation panel replaces digital inputs 19 and 20, and △ and ▽ can only be used for regulation when the value of FU-23 "UP/DOWN regulating value" is currently displayed.

Two control modes (UP/DOWN) are shown below:



Digital input 21 "terminal UP/DOWN clear". The rising edge of the signal clears the FU-23 "UP/DOWN regulating value".

F4-19	Multi-stage speed selection	Factory default	0	Change	×
Setting range	0: Code selection 1: Direct selection 2: Overlapping mode 3: Number selection				
F4-20~F4-67	**Multi-stage frequency 1~48**	Factory default	n.00Hz (n=1~48)	Change	○
Setting range	0.00~650.00Hz. Note: Multi-stage frequencies 32~48 are for simple PLC operation The factory default values of multi-stage frequencies 1~48 are their respective multi-stage frequency numbers. For example: The factory default value of multi-stage frequency 3 is 3.00Hz				

F4-19=0 "code selection": Use binary coding of multi-stage frequency selections 1~5 to select multi-stage frequencies 1~31. For example: DI1~DI5 are respectively set to be "multi-stage frequency selections 1~5", then the corresponding coding selection relation is shown below. In the table, "0" refers to invalid case, and "1" refers to valid case:

DI5	DI4	DI3	DI2	DI1	Selection result	DI5	DI4	DI3	DI2	DI1	Selection result
0	0	0	0	0	Set frequency for normal operation	1	0	0	0	0	F4-35 multi-stage frequency 16
0	0	0	0	1	F4-20 multi-stage frequency 1	1	0	0	0	1	F4-36 multi-stage frequency 17

0	0	0	1	0	F4-21 multi-stage frequency 2	1	0	0	1	0	F4-37 multi-stage frequency 18
0	0	0	1	1	F4-22 multi-stage frequency 3	1	0	0	1	1	F4-38 multi-stage frequency 19
0	0	1	0	0	F4-23 multi-stage frequency 4	1	0	1	0	0	F4-39 multi-stage frequency 20
0	0	1	0	1	F4-24 multi-stage frequency 5	1	0	1	0	1	F4-40 multi-stage frequency 21
0	0	1	1	0	F4-25 multi-stage frequency 6	1	0	1	1	0	F4-41 multi-stage frequency 22
0	0	1	1	1	F4-26 multi-stage frequency 7	1	0	1	1	1	F4-42 multi-stage frequency 23
0	1	0	0	0	F4-27 multi-stage frequency 8	1	1	0	0	0	F4-43 multi-stage frequency 24
0	1	0	0	1	F4-28 multi-stage frequency 9	1	1	0	0	1	F4-44 multi-stage frequency 25
0	1	0	1	0	F4-29 multi-stage frequency 10	1	1	0	1	0	F4-45 multi-stage frequency 26
0	1	0	1	1	F4-30 multi-stage frequency 11	1	1	0	1	1	F4-46 multi-stage frequency 27
0	1	1	0	0	F4-31 multi-stage frequency 12	1	1	1	0	0	F4-47 multi-stage frequency 28
0	1	1	0	1	F4-32 multi-stage frequency 13	1	1	1	0	1	F4-48 multi-stage frequency 29
0	1	1	1	0	F4-33 multi-stage frequency 14	1	1	1	1	0	F4-49 multi-stage frequency 30
0	1	1	1	1	F4-34 multi-stage frequency 15	1	1	1	1	1	F4-50 multi-stage frequency 31

F4-19=1 "direct selection": "Multi-stage frequency selection 1" ~ "multi-stage frequency selection 8" directly correspond to "multi-stage frequency 1" ~ "multi-stage frequency 8". When multiple selection signals are valid, the selection signal with the smaller number is valid. For example: If DI1~DI8② are respectively set to be "multi-stage frequency selection 1" ~ "multi-stage frequency selection 8", the corresponding relationship is shown in the table below, in which, "0" refers to invalid case, "1" refers to valid case and "-" refers to any state:

DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1	Selection result
0	0	0	0	0	0	0	0	Set frequency for normal operation
-	-	-	-	-	-	-	1	F4-20 multi-stage frequency 1
-	-	-	-	-	-	1	0	F4-21 multi-stage frequency 2
-	-	-	-	-	1	0	0	F4-22 multi-stage frequency 3
-	-	-	-	1	0	0	0	F4-23 multi-stage frequency 4
-	-	-	1	0	0	0	0	F4-24 multi-stage frequency 5
-	-	1	0	0	0	0	0	F4-25 multi-stage frequency 6
-	1	0	0	0	0	0	0	F4-26 multi-stage frequency 7
1	0	0	0	0	0	0	0	F4-27 multi-stage frequency 8

F4-19=2 "overlapping selection": The set frequency is the sum of all selected multi-stage frequencies (limited by upper and lower limit frequencies).

② DI6~DI10 are extended digital terminal inputs, which must be configured with expansion boards and F0-15 parameters.

For example, if only "multi-stage frequency selection 1", "multi-stage frequency selection 3", and "multi-stage frequency selection 4" are valid, then: set frequency = multi-stage frequency 1 + multi-stage frequency 3 + multi-stage frequency 4

F4-19=3 "number selection": The number of valid signals among "multi-stage frequency selection 1" ~ "multi-stage frequency selection 8" determines that multi-stage frequency is selected for setting value. For example: If any 3 of them are valid, then set frequency = multi-stage frequency 3.

F4-68	**PG pulse number per revolution**	Factory default	1024	Change	×
Setting range	1~8192				
F4-69	**PG type**	Factory default	0	Change	×
Setting range	0: Quadrature encoder 1: Single channel encoder				
F4-70	**PG direction selection**	Factory default	0	Change	×
Setting range	0: Positive (leading phase B of phase A of orthogonal encoder is positive direction) 1: Negative (leading phase A of phase B of orthogonal encoder is positive direction)				
F4-71	**PG disconnection action**	Factory default	2	Change	×
Setting range	0: No action 1: Alarm (display AL.PGo) 2: Fault and free stop (displaying Er.PGo fault code)				
F4-72	**PG disconnection detection time**	Factory default	1.0s	Change	×
Setting range	0.1~10.0s				
F4-73	**PG gear ratio denominator setting**	Factory default	1	Change	×
F4-74	**PG gear ratio molecular setting**	Factory default	1	Change	×
Setting range	1~1000				
F4-75	**PG speed measurement filtering time**	Factory default	0.005s	Change	○
Setting range	0.000~2.000s				

Encoder interface board, such as SL510-PG0, is required for the use of encoder. See the section of encoder interface board in Chapter 9 for the wiring method.

F4-69 "PG type": When selecting a single-channel encoder, the signal must enter through channel A. Single-channel encoder is not suitable for low speed and forward and reversal operations.

F4-70 "PG direction selection": If selecting forward direction for single-channel encoder, the speed value of the encoder (FU-38 'testing frequency') is always positive. Otherwise, it is always negative.

PG disconnection detection and processing: If the speed regulator's set frequency is greater than 0.5Hz and the encoder has no pulse generated within F4-72 "PG disconnection detection time", it will be deemed to be PG disconnection, and the disconnection action will be processed according to the settings of F4-71 "PG disconnection action". PG disconnection detection is valid only for "with PGV/F control" and "with PG vector control".

When the encoder is connected to the motor shaft through gears and other speed shifting devices, it is necessary to set F4-73 and F4-74 correctly, and the relationship between the encoder speed and the motor speed is as follows:

Motor speed = encoder speed × F4-74 "PG gear ratio numerator setting" ÷ F4-73 "PG gear ratio denominator setting"

F4-75 "PG speed measuring and filtering time": Encoder speed measuring requires F4-75 filtering, so F4-75 cannot be set too large when dynamic performance is required to be high.

Relevant monitoring parameters: FU-38 "PG detection frequency".

Encoder setting verification method: Adopt "without PGV/F control" mode to run in the direction and frequency allowed by the load, and observe whether the direction of FU-38 "PG detection frequency" is consistent with the direction displayed on the operation panel and whether the value is close to the set frequency.

DANGER: Where the mode with PG control is available, it is required to set PG parameters correctly. Improper setting may result in personal injury and property loss. After the motor cable is reconnected, the direction settings of the encoder must be checked again.

F4-76	**DI6 digital input terminal function**	Factory default	0	Change	×
F4-77	**DI7 digital input terminal function**	Factory default	0	Change	×
F4-78	**DI8 digital input terminal function**	Factory default	0	Change	×
F4-79	**DI9 digital input terminal function**	Factory default	0	Change	×
F4-80	**DI10 digital input terminal function**	Factory default	0	Change	×
Setting range	See the digital input function definition table on Page 94				

DI6~DI10 digital input terminal is on the expansion board. See the section of digital I/O expansion board in Chapter 9.

Input of extended DI is always 0 or 1 when expansion board is not connected.

Debounce of DI6~DI10 digital input terminal is also achieved by F4-06 "digital input debounce time".

Relevant monitoring parameters: FU-43 "extended digital input terminal state".

F4-81	**Positive and negative logic 2 of input terminal**	Factory default	00000	Change	×
Setting range	Ten-thousands digit: DI10 Thousands digit: DI9 Hundreds digit: DI8 Tens digit: DI7 Units digit: DI6 0: Positive logic, valid when there is power in the loop, and invalid when power is off. 1: Negative logic, invalid when there is power in the loop, and valid when power is off				

6.6 F5 Digital Output and Relay Output Settings

F5-00	**Digital output terminal signal type selection**	Factory default	00000	Change	×
Setting range	**Units digit: DO2 output selection**	0: Digital output 1: PFO pulse frequency output			
	Tens digit: DO1 digital output signal type **Hundreds digit: DO2 digital output signal type** **Thousands digit: T1 relay output signal type** **Ten-thousands digit: T2 relay output signal type**	0: Level output 1: Pulse output			

When the units digit of F5-00=0, DO2 output signal is level signal. See F5-02 for the output functions. When units of F5-00=1, DO2 outputs the pulse signal of particular frequencies. See PFO function parameters on Page 116.

The output signal type of the corresponding terminals for F5-00 (ten-thousands digit, thousands digit, hundreds digit, and tens digit of F5-00) = 0, the output signal type of the corresponding terminals (T2, T1, DO2, and DO1) is level signal. The output signal type of the corresponding terminals for F5-00 (ten-thousands digit, thousands digit, hundreds digit, and tens digit of F5-00) = 1, the output signal type of the corresponding terminals (T2, T1, DO2, and DO1) is single pulse

signal, the width of the single pulse = the corresponding terminal opening delay (F5-13, F5-11, F5-09, and F5-07) + 10ms. The single pulse is output only once when the terminal function switches from invalid to valid, and there is no output at other times. For digital output, the specific output function selection can be found in the corresponding terminal function selection parameters (F5-04, F5-03, F5-02, and F5-01).

F5-01	**DO1 digital output terminal function**	Factory default	1	Change	×
F5-02	**DO2 digital output terminal function**	Factory default	2	Change	×
F5-03	**T1 relay output function**	Factory default	5	Change	×
F5-04	**T2 relay output function**	Factory default	13	Change	×
Setting range	0~73, see the digital output function definition table below				

- Relevant monitoring parameters: FU-44 "digital output terminal state".
- When DO2 is used as the PFO pulse frequency output terminal, the units digit of F5-00 must be set to 1.
- Digital output function definition table

0: Frequency converter ready for running	25: Host computer digital quantity 1	50: Logical unit 5 output
1: Frequency converter running	26: Host computer digital quantity 2	51: Logical unit 6 output
2: Frequency reached	27: Wobble frequency in upper and lower limits	52: Timer 1 output
3: Frequency level detection signal 1	28: Set count value reached	53: Timer 2 output
4: Frequency level detection signal 2	29: Specified count value reached	54: Timer 3 output
5: Fault output	30: Specified count value reached 2	55: Timer 4 output
6: Brake locking signal	31: Set length of length counter reached	56: A (encoder A channel)
7: Motor overload	32: DI1 (after positive and negative logics)	57: B (encoder B channel)
8: Motor overload	33: DI2 (after positive and negative logics)	58: PFI terminal state
9: Motor underload	34: DI3 (after positive and negative logics)	59: Motor virtual loop count pulse
10: Undervoltage lockout	35: DI4 (after positive and negative logics)	60: PLC running
11: External fault shutdown	36: DI5 (after positive and negative logics)	61: PLC running paused
12: Fault self-resetting	37: DI6 (expansion terminal)	62: PLC phase running completion indication
13: Instant power failure and power-on action	38: DI7 (expansion terminal)	63: PLC cycle completion indication
14: Alarm output	39: DI8 (expansion terminal)	64: PLC mode 0 indication
15: Reverse running	40: DI9 (expansion terminal)	65: PLC mode 1 indication
16: During stop process	41: DI10 (expansion terminal)	66: PLC mode 2 indication
17: Run interrupted state	42: Comparator 1 output	67: PLC mode 3 indication
18: In operation panel control	43: Comparator 2 output	68: PLC mode 4 indication
19: Torque limiting	44: Comparator 3 output	69: PLC mode 5 indication
20: Limited by frequency upper limit	45: Comparator 4 output	70: PLC mode 6 indication
21: Limited by frequency lower limit	46: Logical unit 1 output	71: PLC mode 7 indication

22: Regenerative running	47: Logical unit 2 output	72: Process PID in sleep
23: Zero-speed running	48: Logical unit 3 output	73: Fan life expectancy reached
24: Zero servo completed	49: Logical unit 4 output	

The digital output function is detailed as follows:

0: Frequency converter ready for running. The charging contactor has been closed and free from faults.

1: Frequency converter running. When the frequency converter is running.

2: Frequency reached. It is effective when the operation frequency of the frequency converter is within the positive and negative detection width of the set frequency. See F5-14 on Page 108.

3~4: Frequency level detection signals 1, 2. See F5-15 to F5-18 on Page 109.

5: Fault output. If the frequency converter is in the fault state, there will be effective signal output.

6: Brake locking signal. See relevant descriptions of F1-25 "stop mode" on Page 83 for details.

7: Heavy motor load. The signal is valid when the frequency converter detects heavy motor load. See Page 139 for details.

8: Motor overload. The signal is valid in case of motor overload. See Page 138 for details.

9: Motor underload. The signal is valid in case of motor underload. See Page 139 for details.

10: Undervoltage lockout. This signal is effective when the DC bus undervoltage results in stop.

11: External fault stop. The signal is valid in case of stop due to external fault. The signal is invalid once the external fault is reset.

12: Fault self-resetting. This signal is valid in the event of a failure and when waiting for the frequency converter to reset by itself. See Page 142 for details.

13: Instant power failure and power-on action. The signal is effective when the main circuit is undervoltage and waiting for restart. See Page 141 for details.

14: Alarm output. This signal is effective when the frequency converter alarms.

15: Reverse running This signal is effective when the frequency converter is running in reverse.

16: During stop process. This signal is valid when the frequency converter decelerates for stop.

17: Run interrupted state. The signal is valid when the frequency converter is in run interrupted state.

18: In operation panel control. This signal is valid when the run command channel is the operation panel.

19: Torque limiting. The signal is valid when the torque reaches limiting value.

20: Limited by frequency upper limit. Set frequency ≥ upper limit frequency, and the signal is valid when the running frequency reaches the upper limit frequency.

21: Limited by frequency lower limit. When the set frequency is ≤ the lower limit frequency and the running frequency reaches the lower limit frequency, the signal is valid.

22: Regenerative running. The frequency converter is under power generation state.

23: Zero-speed running. The signal is valid when the motor speed is lower than F9-23 "zero-speed level".

24: Zero servo complete. When the position deviation of zero servo is less than the end amplitude of zero servo, the signal is valid, otherwise, it is invalid.

25~26: Host computer digital quantities 1, 2. Available for programmable units. See Page 158 for details.

27: Wobble frequency in upper and lower limits. See the description for F9 textile wobble frequency functions on Page 128 for details.

28~30: Set count value reached, specified count value reached and specified count value reached 2. See the description of F9 counter on Page 130.

31: Set length of length counter reached. See the description of F9 counter on Page 132.

32~36: DI1~DI5 (after positive and negative logics). Digital input signals after positive and negative logics and debounce can be used for programmable units.

37~41: DI6~DI10 (expansion terminals). The extended digital input signal after debounce can be used for programmable units.

42~45: Comparators 1~4 output. Available for programmable units.

46~51: Logical units 1~6 output. Available for programmable units.

52~55: Timers 1~4 output. Available for programmable units.

56, 57: Encoder channels A and B. Input state of encoder channel A and B can be used as high-speed input of counter and length counter.

58: PFI terminal state. It can be used as high-speed input of counter and length counter.

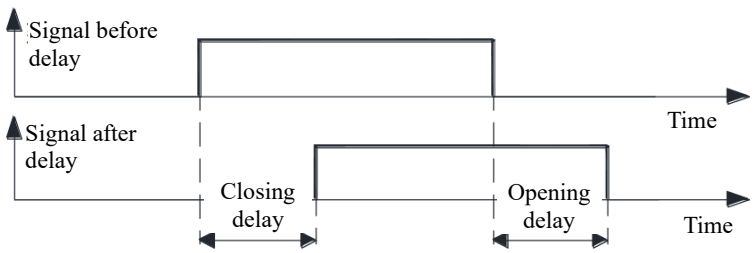
59: Motor virtual loop count pulse. A pulse signal with a 50% duty cycle can be connected to a counter for diameter calculation during winding control.
60: PLC running. The signal is valid when the frequency converter is under simple PLC operation mode.
61: PLC running paused. The signal is valid when digital input 23 "PLC running paused" signal is valid.
62: PLC stage running completion indication. Simple PLC sends a 500ms pulse signal after completing each stage.
63: PLC cycle completion indication. Simple PLC sends a 500ms pulse signal after completing each circulation.
64~71: PLC mode 0 indication ~ PLC mode 7 indication. It is used to output PLC mode number indicating current selection.
72: PID sleep running. The signal is valid in sleep running. See PID sleep settings on Page 122.
73: Fan life expectancy reached. See the description on fan life expectancy settings of fan on Page 145.

F5-05	DO terminal output positive & negative logics	Factory default	00	Change	×
Setting range	Tens digit: DO2 Units digit: DO1 0: Positive logic, connected when valid and disconnected when invalid. 1: Negative logic, disconnected when valid and connected when invalid.				

The function can be output after taking DO1 and DO2 signal values reversely.

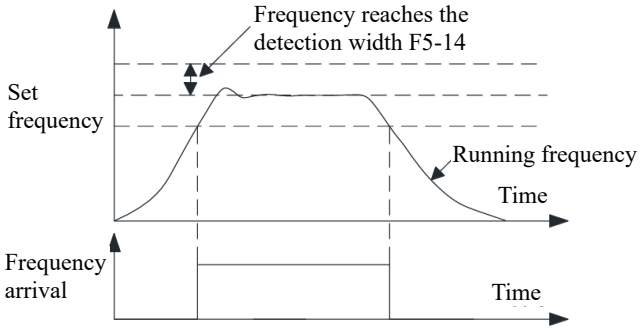
F5-06	DO1 terminal closing delay	Factory default	0.00s	Change	○
F5-07	DO1 terminal opening delay	Factory default	0.00s	Change	○
F5-08	DO2 terminal closing delay	Factory default	0.00s	Change	○
F5-09	DO2 terminal opening delay	Factory default	0.00s	Change	○
F5-10	T1 terminal closing delay	Factory default	0.00s	Change	○
F5-11	T1 terminal opening delay	Factory default	0.00s	Change	○
F5-12	T2 terminal closing delay	Factory default	0.00s	Change	○
F5-13	T2 terminal opening delay	Factory default	0.00s	Change	○
Setting range	0.00~650.00s				

Digital output delay is shown below:



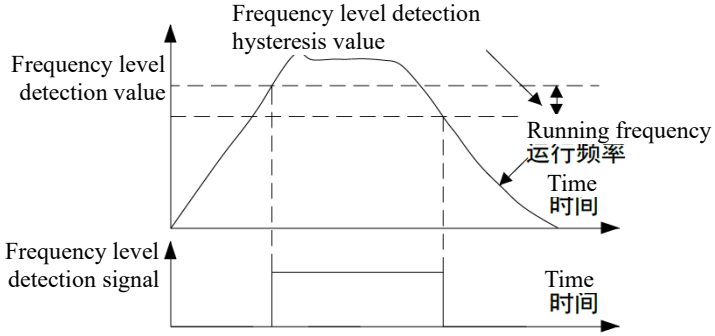
F5-14	Frequency arrival detection width	Factory default	2.50Hz	Change	○
Setting range	0.00~650.00Hz				

When the operation frequency of the frequency converter is within the positive and negative detection width near the set frequency, the frequency arrival signal is sent, as shown in the figure below:



F5-15	**Frequency level detection value 1**	Factory default	50.00Hz	Change	○
F5-16	**Frequency level detection hysteresis value 1**	Factory default	1.00Hz	Change	○
F5-17	**Frequency level detection value 2**	Factory default	25.00Hz	Change	○
F5-18	**Frequency level detection hysteresis value 2**	Factory default	1.00Hz	Change	○
Setting range	0.00~650.00Hz				

When the running frequency is greater than the "frequency level detection value", the digital output "frequency level detection signal" is effective until the running frequency is less than the "frequency level detection value - frequency level detection lagged value", as shown in the following figure:



F5-19	**T3 relay output function**	Factory default	5	Change	×
F5-20	**T4 relay output function**	Factory default	5	Change	×
F5-21	**T5 relay output function**	Factory default	5	Change	×
F5-22	**T6 relay output function**	Factory default	5	Change	×
Setting range	0~73, see the digital output function definition table on Page 106.				

T3~T6 relay output terminals are on the expansion board. See the section of digital I/O expansion board in Chapter 9.

Relevant monitoring parameters: FU-45 "extended digital input terminal state".

F5-23	**T3 terminal closing delay**	Factory default	0.00s	Change	○

F5-24	**T3 terminal opening delay**	Factory default	0.00s	Change	○
F5-25	**T4 terminal closing delay**	Factory default	0.00s	Change	○
F5-26	**T4 terminal opening delay**	Factory default	0.00s	Change	○
F5-27	**T5 terminal closing delay**	Factory default	0.00s	Change	○
F5-28	**T5 terminal opening delay**	Factory default	0.00s	Change	○
F5-29	**T6 terminal closing delay**	Factory default	0.00s	Change	○
F5-30	**T6 terminal opening delay**	Factory default	0.00s	Change	○
Setting range	0.00~650.00s				

T3~T6 relay output terminals are on the expansion board. See the section of digital I/O expansion board in Chapter 9.

Input of T3~T6 is always 0 or 1 when expansion board is not connected.

Closing delay and opening delay functions of T3~T6 relay output terminal are the same as those of T1.

6.7 F6 Analog Quantity and Pulse Frequency Terminal Settings

F6-00	**AI1 minimum input analog quantity**	Factory default	20.00%	Change	○
F6-01	**AI1 maximum input analog quantity**	Factory default	100.00%	Change	○
Setting range	-100.00%~100.00%, taking 10V or 20mA as 100% Note: Select the voltage or current type input through the jumper on the control board.				
F6-02	**Corresponding set value/feedback value of AI1 minimum input analog quantity**	Factory default	0.00%	Change	○
F6-03	**Corresponding set value/feedback value of AI1 maximum input analog quantity**	Factory default	100.00%	Change	○
Setting range	-100.00~100.00% Note: The highest frequency shall be used for reference for the set frequency; PID reference scalar is taken as reference value for PID feedback.				
F6-04	**AI1 inflection point threshold value**	Factory default	20.00%	Change	○
Setting range	AI1 minimum input analog quantity ~ maximum input analog quantity				
F6-05	**AI1 inflection point return difference**	Factory default	0.00%	Change	○
Setting range	0.0~10.00%				
F6-06	**Corresponding set value/feedback value of AI1 inflection point**	Factory default	0.00%	Change	○
Setting range	Same as F6-02 and F6-03				
F6-07	**AI1 filtering time**	Factory default	0.100s	Change	○
Setting range	0.000~10.000s				
F6-08	**AI1 offline threshold**	Factory default	0.00%	Change	○
Setting range	-20.00~20.00%				

F6-09	**AI1 offline delay**	Factory default	1.00s	Change	○
Setting range	0~360.00s				
F6-10	**AI2 minimum input analog quantity**	Factory default	0.00%	Change	○
F6-11	**AI2 maximum input analog quantity**	Factory default	100.00%	Change	○
F6-12	**Corresponding set value/feedback value of AI2 minimum input analog quantity**	Factory default	0.00%	Change	○
F6-13	**Corresponding set value/feedback value of AI2 maximum input analog quantity**	Factory default	100.00%	Change	○
F6-14	**AI2 inflection point threshold value**	Factory default	0.00%	Change	○
F6-15	**AI2 inflection point return difference**	Factory default	0.00%	Change	○
F6-16	**Corresponding set value/feedback value of AI2 inflection point**	Factory default	0.00%	Change	○
F6-17	**AI2 filtering time**	Factory default	0.100s	Change	○
F6-18	**AI2 offline threshold**	Factory default	0.00%	Change	○
F6-19	**AI2 offline delay**	Factory default	1.00s	Change	○
Setting range	All settings for AI2 are the same as that of AI1				

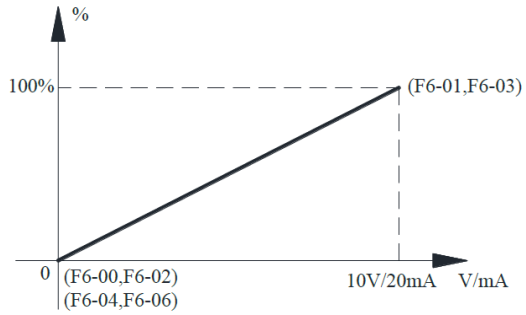
Maximum and minimum input analog quantities take -100.00~100.00%, corresponding to voltage inputs of -10V~10V (or current signals of -20mA~20mA). Minimum and maximum input analog quantities are the set or feedback minimum significant signals. For example: AI1 input signal is 0~10V, while the actual need is 2~8V, corresponding to 0~100.00%, then F6-00=20.00 (20.00%), F6-01=80.00 (80.00%). Similarly, when the input of AI1 is current signal, the actual demand is 4~20mA corresponding to 0~100.00%, then F6-00=20.00 (20.00%), F6-01=100.00 (100.00%).

📖 Both analog inputs AI1 and AI2 can input current signal (-20mA~20mA) or voltage signal (-10V~10V).

📖 AI1 and AI2 have the same electrical characteristics and the parameter settings with same meanings. The following takes AI1 channel parameters as an example:

Analog input example 1:

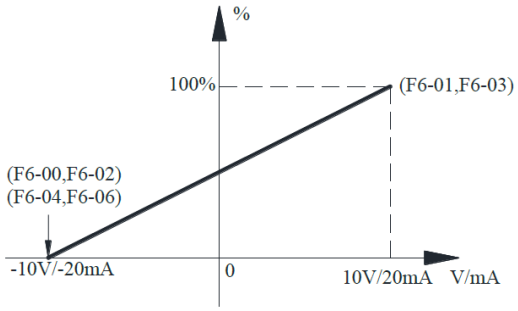
Most applications where the analog input voltage is 0~10V/0~20mA with corresponding set/feedback value of 0~100%, default factory values can be directly used. At this point, the inflexion point input analog quantity coincides with the minimum input analog quantity.



F6-00=0.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=0.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=100.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=0.00 Inflection point threshold value
F6-05=0.00 Inflection point return difference
F6-06=0.00 Corresponding set/feedback value of inflection point

Analog input example 2:

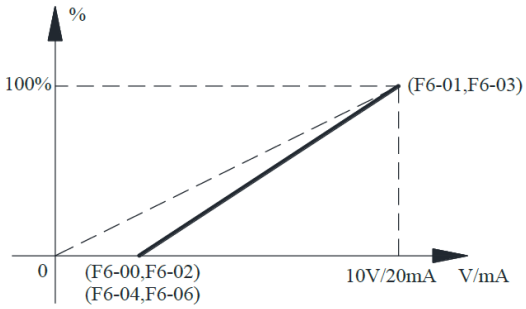
Some applications where the analog input voltage is -10~10V/-20~20mA with corresponding set/feedback value of 0~100%, the parameter settings are as follows.



F6-00=-100.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=0.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=100.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=-100.00 Inflection point threshold value
F6-05=0.00 Inflection point return difference
F6-06=0.00 Corresponding set/feedback value of inflection point

Analog input example 3:

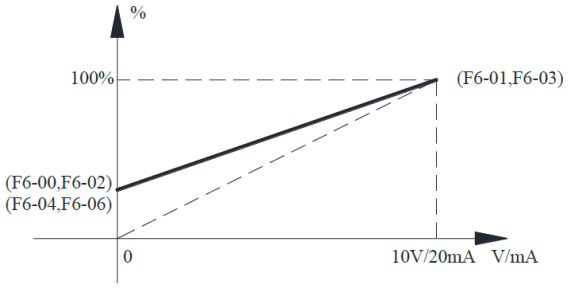
Most applications where the analog input voltage is 2~10V/4~20mA with corresponding set/feedback value of 0~100％, the parameter settings are as follows. At this point, the inflexion point input analog quantity coincides with the minimum input analog quantity.



F6-00=20.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=0.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=100.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=20.00 Inflection point threshold value
F6-05=0.00 Inflection point return difference
F6-06=0.00 Corresponding set/feedback value of inflection point

Analog input example 4: (applications with bias)

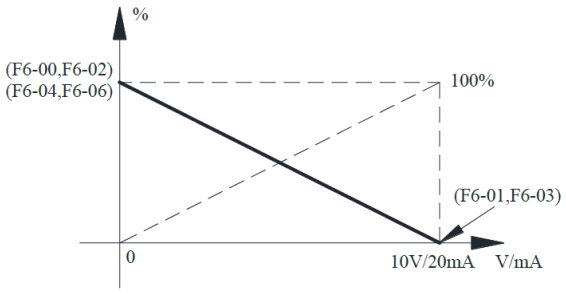
Some applications where the analog input voltage is 0~10V/0~20mA with corresponding set/feedback value of 20~100％, the parameter settings are as follows. At this point, the inflexion point input analog quantity coincides with the minimum input analog quantity.



F6-00=0.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=20.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=100.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=0.00 Inflection point threshold value
F6-05=0.00 Inflection point return difference
F6-06=20.00 Corresponding set/feedback value of inflection point

Analog input example 5: (reverse polarity application)

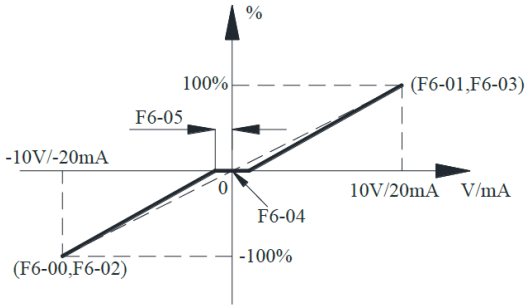
Some applications where the analog input voltage is 0~10V/0~20mA with corresponding set/feedback value of 100～0％, the parameter settings are as follows. At this point, the inflexion point input analog quantity coincides with the minimum input analog quantity.



F6-00=0.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=100.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=0.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=0.00 Inflection point threshold value
F6-05=0.00 Inflection point return difference
F6-06=100.00 Corresponding set/feedback value of inflection point

Analog input example 6: (applications with inflection point)

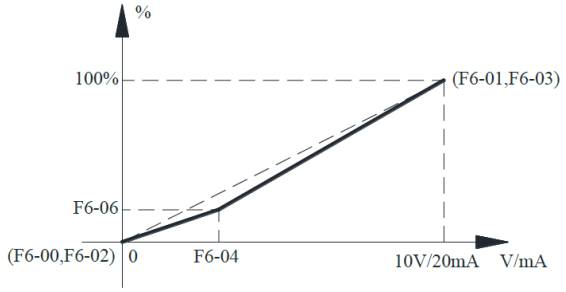
Some applications where the analog input voltage is -10~10V/-20~20mA with corresponding set/feedback value of -100~100%, the parameter settings are as follows. In this application, when the analog input is given as the frequency setting, the motor's rotating direction is determined by the positive and negative input, and the inflection point is used to set the dead zone of the forward and reversed rotation.



F6-00=-100.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=-100.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=100.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=0.00 Inflection point threshold value
F6-05=5.00 Inflection point return difference
F6-06=0.00 Corresponding set/feedback value of inflection point

Analog input example 7: (applications with inflection point)

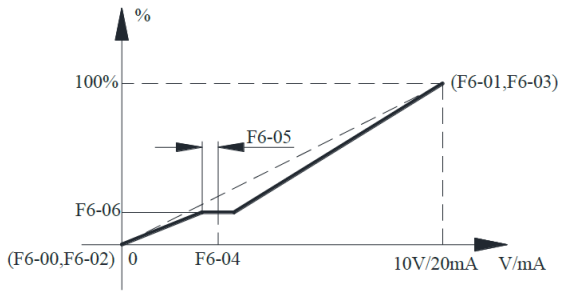
For some applications where the analog input voltage is 0~10V/0~20mA with 2 sections of slope, the parameter settings are as follows.



F6-00=0.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=0.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=100.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=30.00 Inflection point threshold value
F6-05=0.00 Inflection point return difference
F6-06=20.00 Corresponding set/feedback value of inflection point

Analog input example 8: (applications with inflection point)

For some applications where the analog input voltage is 0~10V/0~20mA with 2 sections of slope, the parameter settings are as follows.



F6-00=0.00 Minimum input analog quantity
F6-01=100.00 Maximum input analog quantity
F6-02=0.00 Corresponding set/feedback value of minimum input analog quantity
F6-03=100.00 Corresponding set/feedback value of maximum input analog quantity
F6-04=30.00 Inflection point threshold value
F6-05=5.00 Inflection point return difference
F6-06=20.00 Corresponding set/feedback value of inflection point

All settings for AI2 are the same as that of AI1.

- "Filtering time": Increasing it slows down the response but enhances the anti-interference ability. Reducing it makes the response faster, but lowers the anti-interference.
- "Offline threshold" and "offline delay": The offline state can be confirmed when the analog input is lower than the offline threshold and the duration exceeds the offline delay time. The offline action is determined by Fb-10 "analog input offline action".

ATTENTION: When the input signals are positive and negative, and it is impossible to judge the disconnection internal judgement will be unnecessary if the disconnection threshold is set to zero.

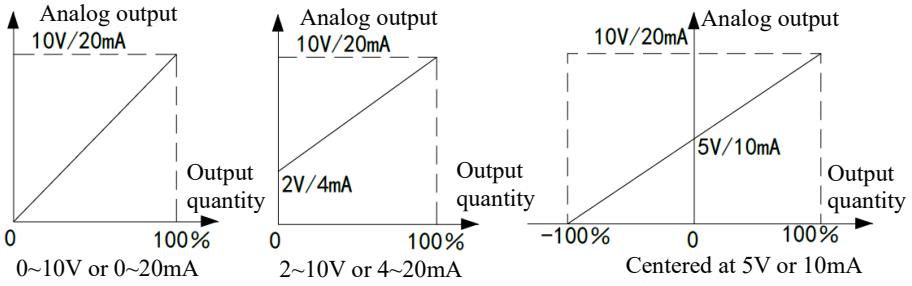
F6-20	**AO1 function selection**	Factory default	0	Change	○
Setting range	See the analog output definition in the table below.				
F6-21	**AO1 type selection**	Factory default	1	Change	○
Setting range	0: 0~10V or 0~20mA 1: 2~10V or 4~20mA 2: Centered by 5V or 10mA				
F6-22	**AO1 gain**	Factory default	100.0%	Change	○
Setting range	0.0~1000.0%				
F6-23	**AO1 bias**	Factory default	0.00%	Change	○
Setting range	-100.00%~100.00%, taking 10V or 20mA as 100%				
F6-24	**AO2 function selection**	Factory default	2	Change	○
F6-25	**AO2 type selection**	Factory default	0	Change	○
F6-26	**AO2 gain**	Factory default	100.0%	Change	○
F6-27	**AO2 bias**	Factory default	0.00%	Change	○
Setting range	All settings for AO2 are the same as that of AO1.				

Analog Output Definition

0: Running frequency (take max. frequency as full amplitude)	13: AI4	28: Low-pass filter 2 output
1: Set frequency (take max. frequency as full amplitude)	14: PFI	29: Analog multi-circuit switch output
2: Output current (take 2-time rated current of frequency converter as full amplitude)	15: UP/DOWN adjustment value	30: Comparator 1 digital setting
3: Output voltage (take 1.5-time rated voltage of frequency converter as full amplitude)	16: DC bus voltage (take 2000V as full amplitude)	31: Comparator 2 digital setting
4: Output power (take 2-time rated voltage of motor as full amplitude)	17: Set frequency after acceleration and deceleration ramp (take max. frequency as full amplitude)	32: Comparator 3 digital setting
5: Output torque (take 2.5-time rated torque of motor as full amplitude)	18: PG detection frequency (take max. frequency as full amplitude)	33: Comparator 4 digital setting
6: Set torque (take 2.5-time rated torque of motor as full amplitude)	19: Counter deviation (take set count value as full amplitude)	34: Arithmetic unit 1 digital setting
7: PID feedback value	20: Count percentage (take set count value as full amplitude)	35: Arithmetic unit 2 digital setting

8: PID set value	21: Arithmetic unit 1 output	36: Arithmetic unit 3 digital setting
9: PID output value	22: Arithmetic unit 2 output	37: Arithmetic unit 4 digital setting
10: AI1	23: Arithmetic unit 3 output	38: Arithmetic unit 5 digital setting
11: AI2	24: Arithmetic unit 4 output	39: Arithmetic unit 6 digital setting
12: AI3	25: Arithmetic unit 5 output	40: COMM1 host computer analog quantity 1
	26: Arithmetic unit 6 output	41: COMM1 host computer analog quantity 2
	27: Low-pass filter 1 output	42: Manufacturer output 1
		43: Manufacturer output 2
		44: COMM2 host computer analog quantity 1
		45: COMM2 host computer analog quantity 2

Three types of analog output are shown below:

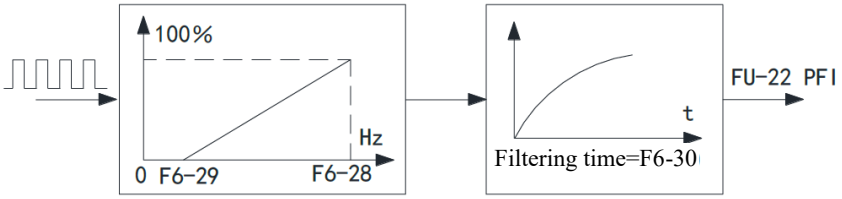


Range adjustment and zero point correction can be corrected by adjusting gain and offset. Calculation formula: Output = output × gain + bias.

F6-28	**100% corresponding PFI frequency**	Factory default	10000Hz	Change	○
F6-29	**0% corresponding PFI frequency**	Factory default	0Hz	Change	○
Setting range	0~50000Hz				
F6-30	**PFI filtering time**	Factory default	0.100s	Change	○
Setting range	0.000~10.000s				

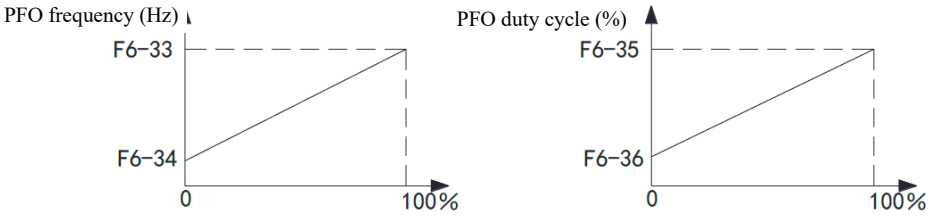
PFI function: The input pulse frequency is converted to a percentage and filtered, which can be monitored by FU-22 "PFI", as shown in the figure below. It can be used for cascade synchronous control for frequency setting, and can also be used for PID feedback to realize constant linear speed control.

When DI5 is used as a PFI pulse frequency input terminal, F4-04 must be set to 0.



F6-31	**PFO function selection**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
F6-32	**PFO output pulse modulation method**	Factory default	0	Change	○
Setting range	0: Frequency modulation, 1: Duty cycle modulation				
F6-33	**100% corresponding PFO frequency**	Factory default	10000Hz	Change	○
Setting range	0~50000Hz, also as the duty cycle modulation frequency				
F6-34	**0% corresponding PFO frequency**	Factory default	0Hz	Change	○
Setting range	0~50000Hz				
F6-35	**100% corresponding PFO duty cycle**	Factory default	100.0%	Change	○
F6-36	**0% corresponding PFO duty cycle**	Factory default	0.0%	Change	○
Setting range	0.0~100.0%				

PFO function: Output the internal percentage signal as pulse frequency or duty cycle, as shown below:



When DO2 is used as the PFO pulse frequency output terminal, the value of F5-00 must be set to 1.

In case of frequency modulation, duty cycle is fixed at 50%; in case of duty cycle modulation, the pulse frequency is fixed as F6-33.

F6-37	**AI3 minimum input analog quantity**	Factory default	0.00%	Change	○
F6-38	**AI3 maximum input analog quantity**	Factory default	100.00%	Change	○
F6-39	**Corresponding set value/feedback value of AI3 minimum input analog quantity**	Factory default	0.00%	Change	○
F6-40	**Corresponding set value/feedback value of AI3 maximum input analog quantity**	Factory default	100.00%	Change	○
F6-41	**AI3 inflection point threshold value**	Factory default	0.00%	Change	○
F6-42	**AI3 inflection point return difference**	Factory default	0.00%	Change	○
F6-43	**Corresponding set value/feedback value of AI3 inflection point**	Factory default	0.00%	Change	○
F6-44	**AI3 filtering time**	Factory default	0.100s	Change	○
F6-45	**AI3 offline threshold**	Factory default	0.00%	Change	○
F6-46	**AI3 offline delay**	Factory default	1.00s	Change	○
F6-47	**AI4 minimum input analog quantity**	Factory default	0.00%	Change	○
F6-48	**AI4 maximum input analog quantity**	Factory default	100.00%	Change	○
F6-49	**Corresponding set value/feedback value of AI4 minimum input analog quantity**	Factory default	0.00%	Change	○
F6-50	**Corresponding set value/feedback value of AI4 maximum input analog quantity**	Factory default	100.00%	Change	○
F6-51	**AI4 inflection point threshold value**	Factory default	0.00%	Change	○
F6-52	**AI4 inflection point return difference**	Factory default	0.00%	Change	○
F6-53	**Corresponding set value/feedback value of AI4 inflection point**	Factory default	0.00%	Change	○
F6-54	**AI4 filtering time**	Factory default	0.100s	Change	○
F6-55	**AI4 offline threshold**	Factory default	0.00%	Change	○
F6-56	**AI4 offline delay**	Factory default	1.00s	Change	○
Setting range	The settings of AI3 and AI4 are basically the same as those of AI1, except for very few parameters.				

📖 The input voltage range of AI3 and AI4 is 0~10V and the input current range is 0~20mA.

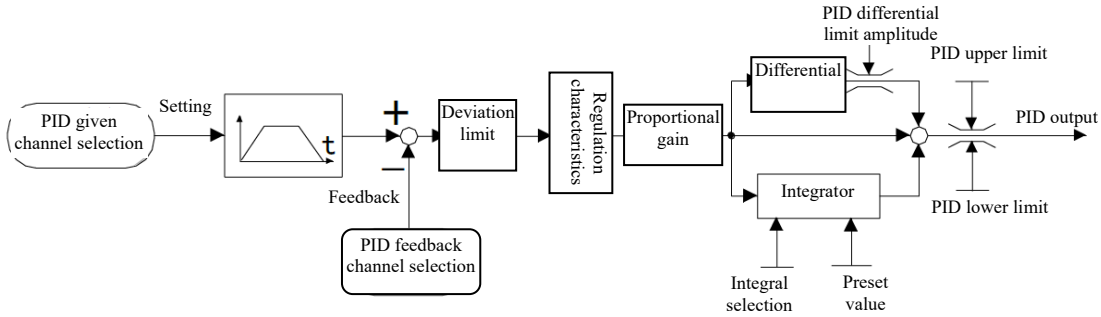
📖 AI3 and AI4 are located on the expansion board, as described in the section of analog input expansion board of Chapter 9.

F6-57	**AO3 function selection**	Factory default	2	Change	○
F6-58	**AO3 type selection**	Factory default	0	Change	○
F6-59	**AO3 gain**	Factory default	100.0%	Change	○
F6-60	**AO3 bias**	Factory default	0.00%	Change	○
Setting range	All settings for AO3 are the same as that of AO1.				

6.8 F7 Process PID Parameters

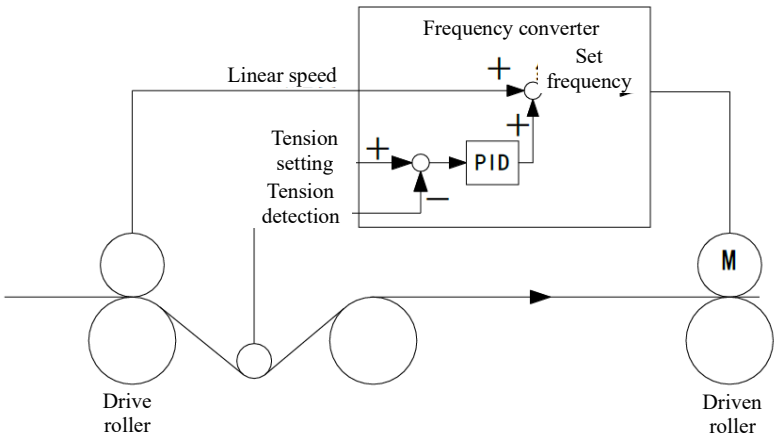
F7-00	PID control function selection	Factory default	0	Change	×
Setting range	0: Do not select process PID control 1: Select process PID control (PID output is scaled with the maximum frequency as 100%) 2: Select PID to correct set frequency before acceleration and deceleration ramp (PID output is scaled with the maximum frequency as 100%) 3: Select PID to correct set frequency after acceleration and deceleration ramp (PID output is scaled with the maximum frequency as 100%) 4: Select PID for torque correction (PID output takes 2.5-time rated torque of motor as 100%) 5: Free PID function				

Process PID can be used to control tension, pressure, flow, liquid level, temperature and other process variables and has the sleep function suitable for constant pressure water supply and other industry applications. See Page 122 for details. The proportional link produces control effects proportional to the deviation to minimize the deviation and the integral link mainly aims to eliminate static difference. The longer the integral time is, the weaker the integral effect is, and the shorter the integral time is, the stronger the integral effect will be. The differential link predicts the change of the deviation signal through the variation trend of the deviation, and produces the control signal to suppress the deviation before the deviation becomes larger, so as to accelerate the response speed of the control. Structure of process PID is as follows:



There are also three correction working modes of process PID: set frequency correction before acceleration and deceleration ramp, set frequency correction after acceleration and deceleration ramp, and torque correction. These correction modes make it easy to use the frequency converter for master-slave synchronization or tension control.

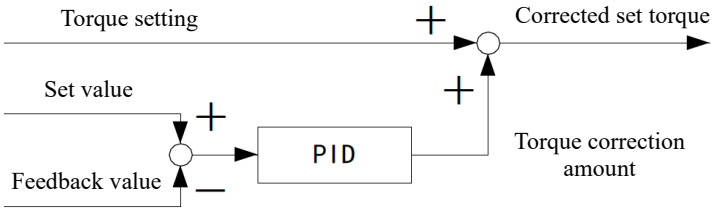
Set frequency correction before acceleration and deceleration ramp: PID output is overlaid on the set frequency before acceleration and deceleration ramp for correction as shown below:



Set frequency correction after acceleration and deceleration ramp: The PID output is superimposed on the set frequency after the acceleration and deceleration ramp.

Compared with the method of "set frequency correction before acceleration and deceleration ramp", this method can also perform correction during the acceleration and deceleration process.

Torque correction mode: PID output is overlaid on the set torque, and the set torque is corrected as shown in the figure below. Torque correction mode is valid only when torque control is selected. This mode has the fastest response speed and can be used for synchronous control of rigidly connected systems.



Free PID function: As a programmable module, PID's input and output can be defined separately, and PID output can be connected to analog output, etc.

Under position control, process PID works as a position loop regulator in process PID or frequency correction mode. See Page 133 for details.

F7-01	Set channel selection	Factory default	0	Change	×
Setting range	0: F7-04 "PID digital setting" 1: AI1 2: AI2 3: AI3 4: AI4 5: PFI 6: UP/DOWN regulating value 7: Arithmetic unit 1 8: Arithmetic unit 2 9: Arithmetic unit 3 10: Arithmetic unit 4				
F7-02	**Feedback channel selection**	Factory default	0	Change	×
Setting range	0: AI1 1: AI2 2: AI3 3: AI4 4: PFI 5: AI1-AI2 6: AI1+AI2 7: AI3-AI4 8: AI3+AI4 9: $\sqrt{\lvert AI1\rvert}$ 10: $\sqrt{\lvert AI2\rvert}$ 11: $\sqrt{\lvert AI1-AI2\rvert}$ 12: $\sqrt{\lvert AI1\rvert}+\sqrt{\lvert AI2\rvert}$ 13: Arithmetic unit 1 14: Arithmetic unit 2 15: Arithmetic unit 3 16: Arithmetic unit 4				
F7-03	**PID display coefficient**	Factory default	1.000	Change	○
Setting range	0.010~10.000, only monitoring menu FU-13 "PID feedback value" and FU-14 "PID set value" are affected				
F7-04	**PID digital setting**	Factory default	0.0%	Change	○
Setting range	-100.0~100.0%				

The process PID adopts normalized input and output: the input and output ranges are ±100%, and the calibration of the input is related to the selection of feedback channel, sensor characteristics and analog input settings and the output is calibrated at a maximum frequency of 100% during frequency control.

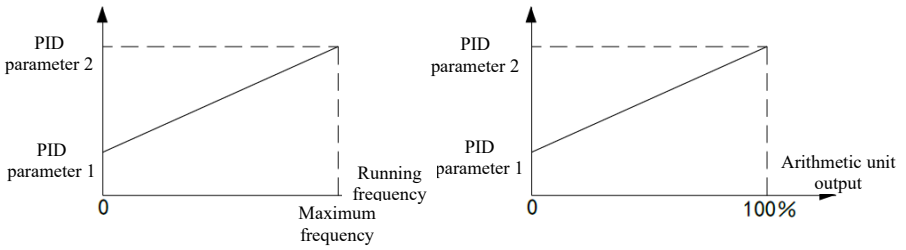
There are filtering links in the given channel and feedback channel. For example, the filtering time of AI1 is F6-07. These filtering links will affect the control performance and can be set according to actual needs.

In some machines (such as centrifuges), the square root of inlet pressure signal and flow rate are linearly related, and flow rate can be controlled through square root feedback.

F7-03 "PID display system" is used to calibrate FU-13 "PID feedback value" and FU-14 "PID set value", which achieves to be in line with physical units with no effect on control.

F7-05	Proportional gain 1	Factory default	0.20	Change	○
Setting range	0.00~100.00				
F7-06	**Integration time 1**	Factory default	20.00s	Change	○
Setting range	0.01~100.00s				
F7-07	**Derivative time 1**	Factory default	0.00s	Change	○
Setting range	0.00~10.00s				
F7-08	**Proportional gain 2**	Factory default	0.20	Change	○
Setting range	0.00~100.00				
F7-09	**Integration time 2**	Factory default	20.00s	Change	○
Setting range	0.01~100.00s				
F7-10	**Derivative time 2**	Factory default	0.00s	Change	○
Setting range	0.00~10.00s				
F7-11	**PID parameter transition mode**	Factory default	0	Change	×
Setting range	0: Digital input 36 "PID parameter 2 selection" determined 1: Transition according to running frequency 2: |Arithmetic unit 1| 3: |Arithmetic unit 2| 4: |Arithmetic unit 3| 5: |Arithmetic unit 4|				

Hope530G has 2 sets of PID parameters, i.e., PID parameter 1 (F7-05, F7-06 and F7-07) and PID parameter 2 (F7-08, F7-09 and F7-10), The both of them can be switched by digital input 36 "PID parameter 2 selection". It can also be switched gradually according to the running frequency or the output of arithmetic unit, so it is especially suitable for revolving system with a large revolving diameter change.



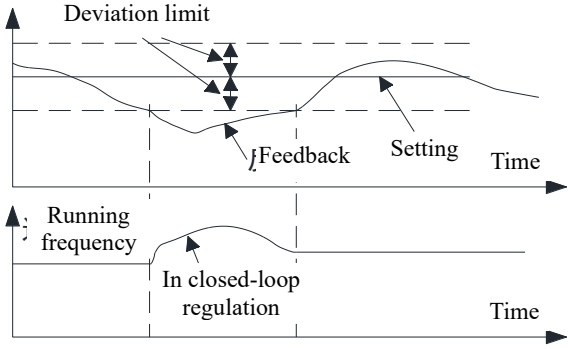
PID parameter regulation principles: The proportional gain shall be firstly increased from a smaller value (e.g. 0.20) until the feedback signal starts to oscillate, and then reduced by 40-60% to stabilize the feedback signal. The integral time shall be reduced from a larger value (e.g. 20.00s) until the feedback signal starts to oscillate, and then increased it by 10-50% to stabilize the feedback signal. If the demand of system for overshoot and dynamic error is high, differential action can be added.

F7-12	Sampling period	Factory default	0.010s	Change	○
Setting range	0.001~10.000s				

PID sampling cycle: general settings shall be 5 to 10 times smaller than the response time of the controlled object.

F7-13	Deviation limit	Factory default	0.0%	Change	○
Setting range	0.0~20.0%, taking PID set value as 100%				

When the deviation between the set value and the feedback value is less than the deviation limit, the PID stops regulating and the output remains unchanged. This function eliminates the frequent action of the control. As shown below:



F7-14	Set value increase/decrease time	Factory default	0.00s	Change	○
Setting range	0.00~20.00s				

Set value increase or decrease time: It can make the set value increase or decrease smoothly, and is used to reduce the impact caused when the PID is initially activated.

F7-15	PID regulation characteristics	Factory default	0	Change	×
Setting range	0: Direct action 1: Reverse action				

PID regulation characteristics: Direct action refers to the increase in speed required for quantitative increase under stable operating conditions, such as heating control, while reverse action indicates that reduction in speed is required when a quantitative increase is set under stable operating conditions, such as refrigeration control.

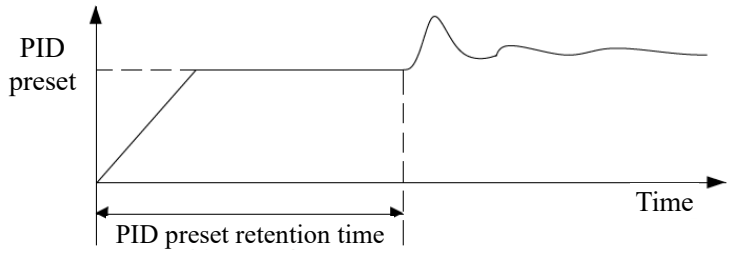
F7-16	Integral regulation selection	Factory default	1	Change	×
Setting range	0: Without integral action 1: With integral action				
F7-17	PID upper limit amplitude	Factory default	100.0%	Change	○
Setting range	F7-18 "PID lower limit amplitude" ~100.0%				
F7-18	PID lower limit amplitude	Factory default	0.0%	Change	○
Setting range	-100.0%~F7-17 "PID upper limit amplitude"				
F7-19	PID differential limit amplitude	Factory default	5.0%	Change	○
Setting range	0.0~100.0%, upper and lower limit clamping for differential component				

Users can limit the amplitude of the PID according to requirements. Appropriate amplitude limiting can reduce overshoot and avoid excessive control output.

When F7-00 setting "1: Select process PID control", PID output limit is also limited by F0-08 "lower limit frequency". When only unidirectional operation is required, the dynamic response capability of system can be improved by appropriately setting the "lower limit frequency". For example, after process PID sleep is waken up, quick regulation can be achieved to maintain pipe network voltage stability; It is not recommended to set "lower limit frequency" when forward and reverse operations are required.

F7-20	PID preset	Factory default	0.0%	Change	○
Setting range	F7-18 "PID lower limit" ~ F7-17 "PID upper limit"				
F7-21	**PID preset retention time**	Factory default	0.0s	Change	×
Setting range	0.0~3600.0s				

PID presetting function: During the preset hold time, the output of PID is kept as the preset value, which is equivalent to open-loop control. At the end of the preset stage, the initial value of PID integrator is set to the preset value and the PID closed-loop control is switched. As shown below:



If the preset hold time is set to zero, PID control is carried out with the preset value as the initial value of the integrator, which is equivalent to the preload of PID and can improve the response speed when starting.

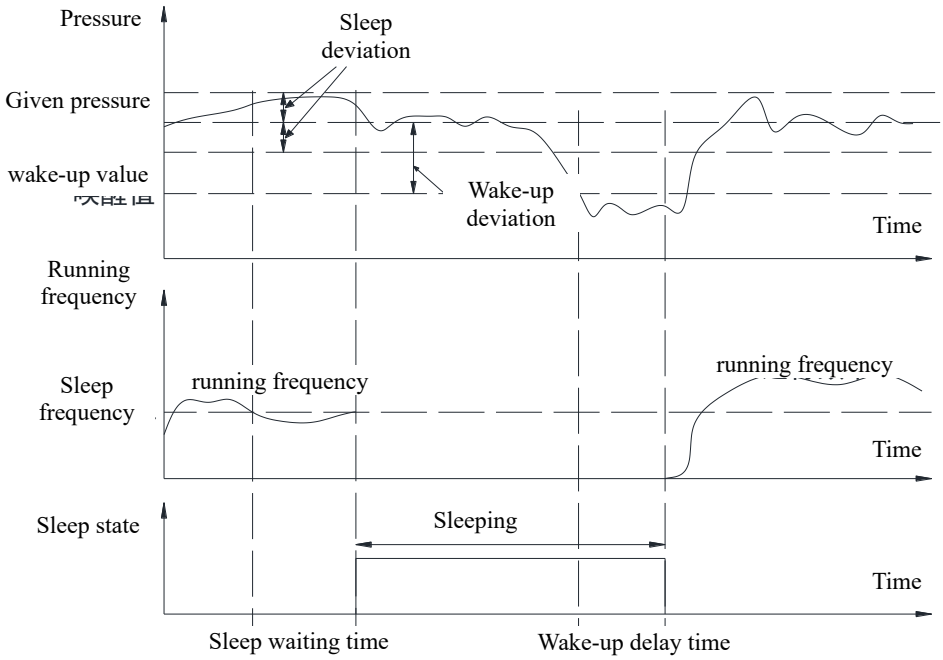
F7-22	Multi-stage PID setting 1	Factory default	1.0%	Change	○
F7-23	**Multi-stage PID setting 2**	Factory default	2.0%	Change	○
F7-24	**Multi-stage PID setting 3**	Factory default	3.0%	Change	○
F7-25	**Multi-stage PID setting 4**	Factory default	4.0%	Change	○
F7-26	**Multi-stage PID setting 5**	Factory default	5.0%	Change	○
F7-27	**Multi-stage PID setting 6**	Factory default	6.0%	Change	○
F7-28	**Multi-stage PID setting 7**	Factory default	7.0%	Change	○
Setting range	-100.0~100.0%				

For multi-stage PID control, see digital inputs 49, 50 and 51 "multi-stage PID selections 1~3" on Page 94.

F7-29	Sleep frequency	Factory default	40.00Hz	Change	○
Setting range	0.00~650.00Hz				
F7-30	**Sleep waiting time**	Factory default	60.0s	Change	○

Setting range	0.0~3600.0s				
F7-31	**Sleep deviation**	Factory default	0.00%	Change	○
Setting range	0.00~100.00%				
F7-32	**Wake-up delay time**	Factory default	0.500s	Change	○
Setting range	0.000~60.000s				
F7-33	**Wake-up deviation**	Factory default	100.00%	Change	○
Setting range	0.00~100.00% note: The sleeping function will not work when it is 100.00%				

When applying to the process PID, such as the constant-pressure water supply situation, the sleeping function can be used. When water consumption decreases and the operation frequency is lower than F7-29 "sleep frequency", the feedback quantity is larger than the sum of PID set value and F7-31 "sleep deviation" and the hold time is beyond F7-30 "sleep waiting time", and the process PID enters sleep state and enables digital output "72: Process PID in sleep". When the feedback quantity is lower than difference value between PID set value and F7-33 "wakeup deviation" and the hold time is beyond F7-32 "wakeup delay time", the process PID wakes up and enters working state. As shown below:



When the process PID sleeping is waked up, the starting method is determined by the Fb-25 "restart from instantaneous stop, self-reset and run interrupt" and F1-19 "starting method". It is suggested to start from the starting frequency in occasions not allowing reversal.

Relevant digital output function "72: Process PID in sleep", which is applied to start other small-power pumps during sleeping state.

F7-34	**PID correction maximum frequency**	Factory default	1.00Hz	Change	○
Setting range	0.00~300.00 Hz. Note: It is valid when F7-00 "PID control function selection" = 2 or 3				

6.9 F8 Simple PLC

F8-00	PLC running settings	Factory default	0000	Change	×
Setting range	Units digit: PLC operation mode selection 0: No PLC running 1: Stop after cycling the number of times set in F8-02 2: Maintain the final value after cycling the number of times set in F8-02 3: Continuous cycle				
	Tens digit: PLC operation interruption restart mode selection 0: Run from the first stage 1: Continue to run from the phase frequency of the interruption moment 2: Continue to run from the running frequency of the interruption moment				
	Hundreds digit: PLC state parameter storage selection in case of power outage 0: Do not store 1: Store				
	Thousands digit: Stage time unit selection 0: second 1: minute				
F8-01	**PLC mode settings**	Factory default	00	Change	×
Setting range	Units digit: PLC operation mode and segment number division 0: 1×48, 1 mode in total, 48 sections for each mode 1: 2×24, 2 modes in total, 24 sections for each mode 2: 3×16, 3 modes in total, 16 sections for each mode 3: 4×12, 4 modes in total, 12 sections for each mode 4: 6×8, 6 modes in total, 8 sections for each mode 5: 8×6, 8 modes in total, 6 sections for each mode				
	Tens digit: PLC operation mode selection 0: Terminal code selection 1: Direct selection of terminal 2: Mode 0 3: Mode 1 4: Mode 2 5: Mode 3 6: Mode 4 7: Mode 5 8: Mode 6 9: Mode 7				
F8-02	**PLC cycle times**	Factory default	1	Change	×
Setting range	1~65535				
F8-03~ F8-97	**Stage 1 Direction and Acceleration & Deceleration Settings**	Factory default	00	Change	○
Setting range	Units digit: Running direction 0: Forward 1: Reverse				
	Tens digit: Acceleration/Deceleration time selection 0: Acceleration and deceleration time 1 1: Acceleration and deceleration time 2 2: Acceleration and deceleration time 3 3: Acceleration and deceleration time 4 4: Acceleration and deceleration time 5 5: Acceleration and deceleration time 6 6: Acceleration and deceleration time 7 7: Acceleration and deceleration time 8				
F8-04~ F8-98	**Stage 1 runtime**	Factory default	0.0	Change	○
Setting range	0.0~6500.0 (second or minute), the unit is determined by the thousands digit of F8-00 "PLC running setting"				

For the settings of stages 2 to 48, refer to stage 1. The factory value of multi-stage frequency n is the respective stage number. The parameter correspondence table of each stage is as follows:

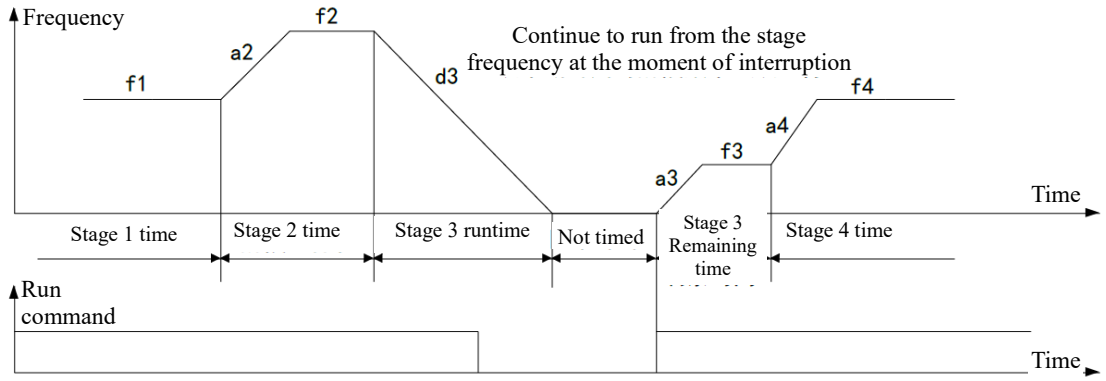
n	1	2	3	4	5	6	7	8
Stage n settings	F8-03	F8-05	F8-07	F8-09	F8-11	F8-13	F8-15	F8-17
Stage n time	F8-04	F8-06	F8-08	F8-10	F8-12	F8-14	F8-16	F8-18
Multi-stage frequency n	F4-20	F4-21	F4-22	F4-23	F4-24	F4-25	F4-26	F4-27
n	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Stage n settings	F8-19	F8-21	F8-23	F8-25	F8-27	F8-29	F8-31	F8-33
Stage n time	F8-20	F8-22	F8-24	F8-26	F8-28	F8-30	F8-32	F8-34
Multi-stage frequency n	F4-28	F4-29	F4-30	F4-31	F4-32	F4-33	F4-34	F4-35
n	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Stage n settings	F8-35	F8-37	F8-39	F8-41	F8-43	F8-45	F8-47	F8-49

Stage n time	F8-36	F8-38	F8-40	F8-42	F8-44	F8-46	F8-48	F8-50
Multi-stage frequency n	F4-36	F4-37	F4-38	F4-39	F4-40	F4-41	F4-42	F4-43
n	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Stage n settings	F8-51	F8-53	F8-55	F8-57	F8-59	F8-61	F8-63	F8-65
Stage n time	F8-52	F8-54	F8-56	F8-58	F8-60	F8-62	F8-64	F8-66
Multi-stage frequency n	F4-44	F4-45	F4-46	F4-47	F4-48	F4-49	F4-50	F4-51
n	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Stage n settings	F8-67	F8-69	F8-71	F8-73	F8-75	F8-77	F8-79	F8-81
Stage n time	F8-68	F8-70	F8-72	F8-74	F8-76	F8-78	F8-80	F8-82
Multi-stage frequency n	F4-52	F4-53	F4-54	F4-55	F4-56	F4-57	F4-58	F4-59
n	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**
Stage n settings	F8-83	F8-85	F8-87	F8-89	F8-91	F8-93	F8-95	F8-97
Stage n time	F8-84	F8-86	F8-88	F8-90	F8-92	F8-94	F8-96	F8-98
Multi-stage frequency n	F4-60	F4-61	F4-62	F4-63	F4-64	F4-65	F4-66	F4-67

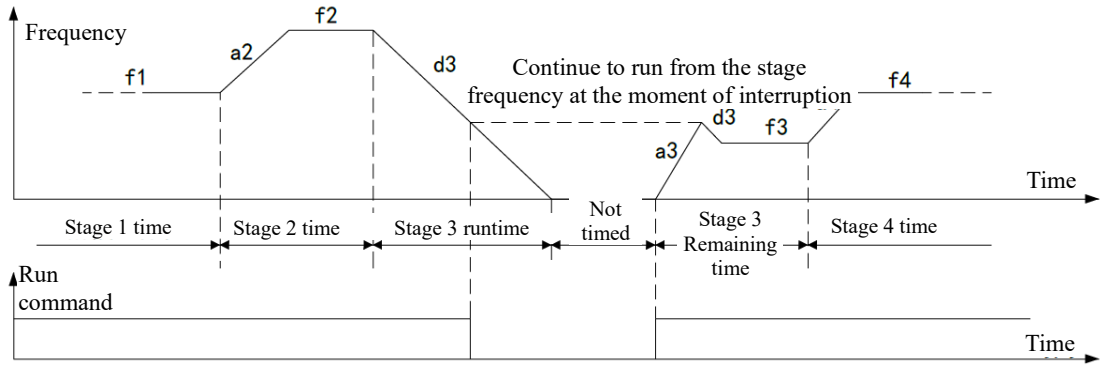
Simple PLC running function: automatically switch the set frequency according to the set running time to realize the automation of the production process.

Mode of restart after PLC run interrupt: It is determined by the tens digit of F8 – 00 °PLCPLC running setting". When the PLC running is interrupted (fault or stop), select "run from the first stage"; you can also select "continue to run from the stage frequency at the time of interrupt" or "continue to run from the running frequency at the time of interrupt", the starting method is determined by F1-19, as shown below:

In all the figures in this stage, fn is the multi-segment frequency n of stage n, an and dn are the acceleration and deceleration time of stage n, Tn is the time of stage n, n=1~48.



Continue to run from the stage frequency at the moment of interruption



Continue to run from the operation frequency at the moment of interruption

The PLC state can be selected for power-down storage, so that the next time it is restarted, it can continue to run from the state when it was stopped. For example: after one day's work is over, the frequency converter stops and powers off. The next day, it only needs to be powered on and start running, and the work that was not completed the previous day can be continued.

When modifying F8-00, F8-01 or F8-02, the status of PLC will be reset automatically.

The PLC of Hope530G can choose multiple modes, which is equivalent to having multiple sets of simple PLC settings. Users can switch between different modes to meet the production process requirements of products of different specifications. For example, a set of cement pipe pile centrifugal manufacturing equipment can choose different modes to produce pipe piles of different specifications. To produce 6 kinds of pipe piles, each specification requires 8 stages of PLC operation, and can be set to F8-01 units digit = 4 (a total of 6 modes, 8 stages for each mode).

The switching mode during running takes effect after stopping, and the maximum mode number that can be selected is determined by the units digit of F8-01.

The division of PLC modes and stages is as follows. You can find the stages included in each mode according to the table below:

1 mode × 48 stages	**Mode 0**							
Stages in each mode	Stages 1~48							
2 modes × 24 stages	**Mode 0**				**Mode 1**			
Stages in each mode	Stages 1~24				Stages 25~48			
3 modes × 16 stages	**Mode 0**			**Mode 1**			**Mode 2**	
Stages in each mode	Stages 1~16			Stages 17~32			Stages 33~48	
4 modes × 12 stages	**Mode 0**		**Mode 1**		**Mode 2**		**Mode 3**	
Stages in each mode	Stages 1~12		Stages 13~24		Stages 25~36		Stages 37~48	
6 modes × 8 stages	**Mode 0**	**Mode 1**		**Mode 2**		**Mode 3**	**Mode 4**	**Mode 5**
Stages in each mode	Stages 1~8	Stages 9~16		Stages 17~24		Stages 25~32	Stages 33~40	Stages 41~48
8 modes × 6 stages	**Mode 0**	**Mode 1**	**Mode 2**	**Mode 3**	**Mode 4**	**Mode 5**	**Mode 6**	**Mode 7**
Stages in each mode	1~6	7~12	13~18	19~24	25~30	31~36	37~42	43~48

The coding selection method of PLC mode is as follows:

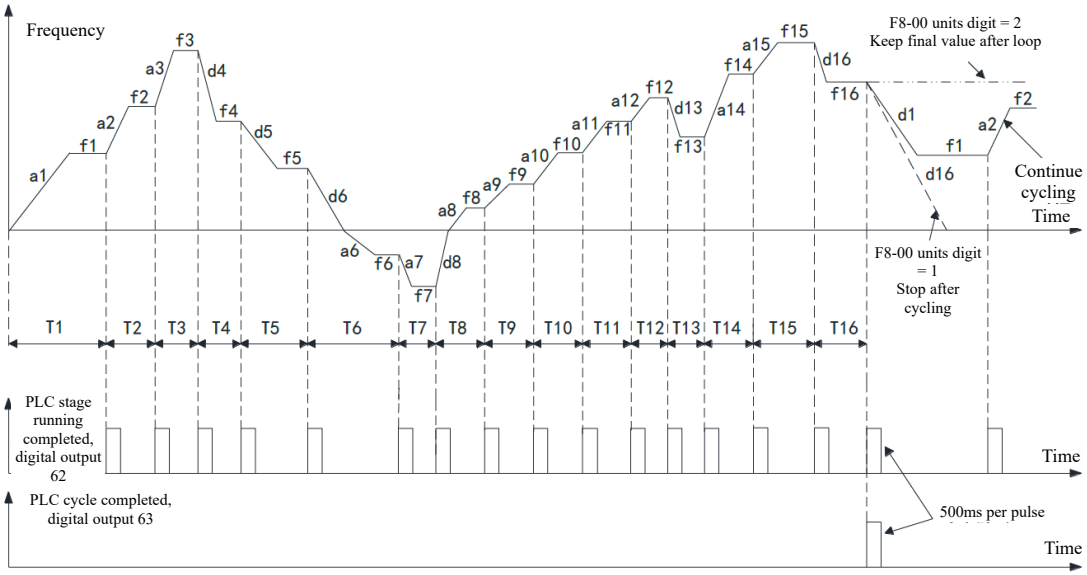
Digital input 27 "PLC mode selection 3"	**Digital input 26 "PLC mode selection 2"**	**Digital input 25 "PLC mode selection 1"**	**Selected PLC mode**
0	0	0	Mode 0
0	0	1	Mode 1
0	1	0	Mode 2
0	1	1	Mode 3
1	0	0	Mode 4
1	0	1	Mode 5
1	1	0	Mode 6
1	1	1	Mode 7

An example of PLC mode direct selection is shown in the following table, DI1~DI7 are respectively set to "PLC mode selection 1~7" (digital input 25~31):

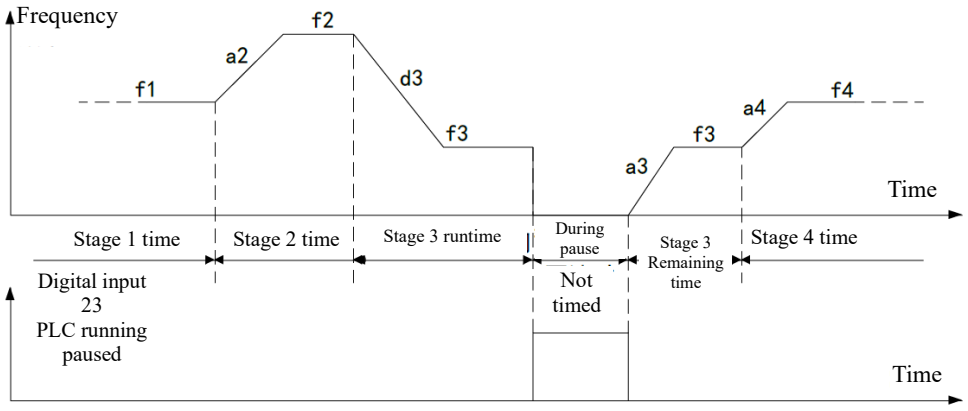
DI7	DI6	DI5	DI4	DI3	DI2	DI1	Selected PLC mode
0	0	0	0	0	0	0	Mode 0
-	-	-	-	-	-	1	Mode 1
-	-	-	-	-	1	0	Mode 2
-	-	-	-	1	0	0	Mode 3
-	-	-	1	0	0	0	Mode 4
-	-	1	0	0	0	0	Mode 5
-	1	0	0	0	0	0	Mode 6
1	0	0	0	0	0	0	Mode 7

Each stage of the PLC has its own multi-stage frequency as a given, as well as its own stage running time, running direction and acceleration and deceleration time selection. If the user does not need a stage, the running time of the stage can be set to 0.

The following figure shows the operation process of mode 0 when F8-01 units digit = 2:



When the digital input 23 "PLC running paused" is valid, the PLC suspends the operation; when it is invalid, it resumes the stage operation before the suspension (the starting mode is determined by F1-19), as shown in the following figure:



When the digital input 22 "PLC control prohibited" is valid, it will switch to the low-priority operation mode (see the description of F0-01 on Page 76). When it is invalid, the PLC will resume operation.

Digital input 24 "PLC standby state reset": If this signal is valid in standby state, the PLC's running stage, number of cycles, and running timing will be reset.

- Relevant digital outputs 60 "PLC running", 61 "PLC running paused", 62 "PLC stage running completion indication", 63 "PLC cycle completion indication", 64~71 "PLC mode 0 indication" ~ "PLC mode 7 indication".
- Related monitoring parameters FU-24 "PLC current mode and stage", FU-25 "PLC cycle times", FU-26 "PLC current stage remaining time".

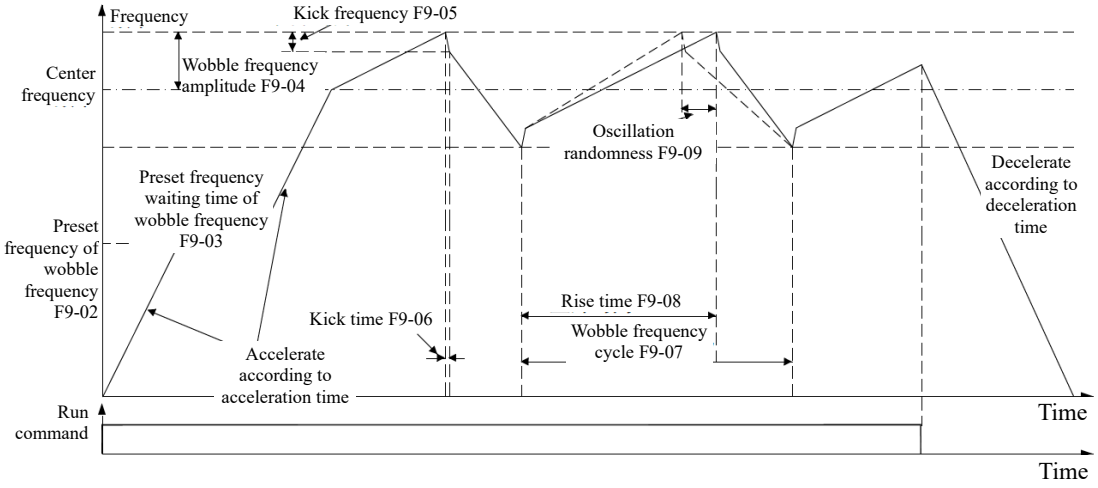
6.10 F9 Textile Wobble Frequency, Counter, Length Counter, Zero Servo and Position Control

F9-00	**Wobble frequency input mode**	Factory default	0	Change	×
Setting range	0: Wobble frequency invalid 1: Automatic input 2: Manual input				
F9-01	**Wobble frequency control mode**	Factory default	0	Change	×
Setting range	0: Center frequency of swing is 100% 1: Maximum frequency of swing is 100%				
F9-02	**Preset wobble frequency**	Factory default	0.00Hz	Change	○
Setting range	F0-08 "lower limit frequency" ~ F0-07 "upper limit frequency"				
F9-03	**Preset frequency waiting time of wobble frequency**	Factory default	0.0s	Change	○
Setting range	0.0~3600.0s				
F9-04	**Wobble frequency amplitude**	Factory default	0.0%	Change	○
Setting range	0.0~50.0%, taking center frequency or maximum frequency as 100%				
F9-05	**Jump frequency**	Factory default	0.0%	Change	○
Setting range	0.0~50.0%, taking the actual wobble frequency amplitude as 100%				
F9-06	**Jump time**	Factory default	0ms	Change	○
Setting range	0~50ms				
F9-07	**Wobble frequency cycle**	Factory default	10.0s	Change	○
Setting range	0.1~1000.0s				
F9-08	**Rise time**	Factory default	50.0%	Change	○
Setting range	0.0~100.0%, taking F9-07 "wobble frequency cycle" as 100%				
F9-09	**Oscillation randomness**	Factory default	0.0%	Change	○
Setting range	0.0~50.0%, taking F9-07 "wobble frequency cycle" as 100%				
F9-10	**Wobble frequency restart and power-down treatment**	Factory default	00	Change	×
Setting range	Units digit: Restart mode after swing frequency stop 0: Start according to the memory before stop 1: Start again				
	Tens digit: Power-down storage selection in wobble frequency state 0: Storage wobble frequency state in power-down state 1: No storage at power-down				

Wobble frequency function: the forming process of spindle, superimposed by 2 independence movements. A constant rotational motion and a reciprocating motion. Through the superposition of these two movements, the yarn forms a diamond-shaped network on the surface of the drum.

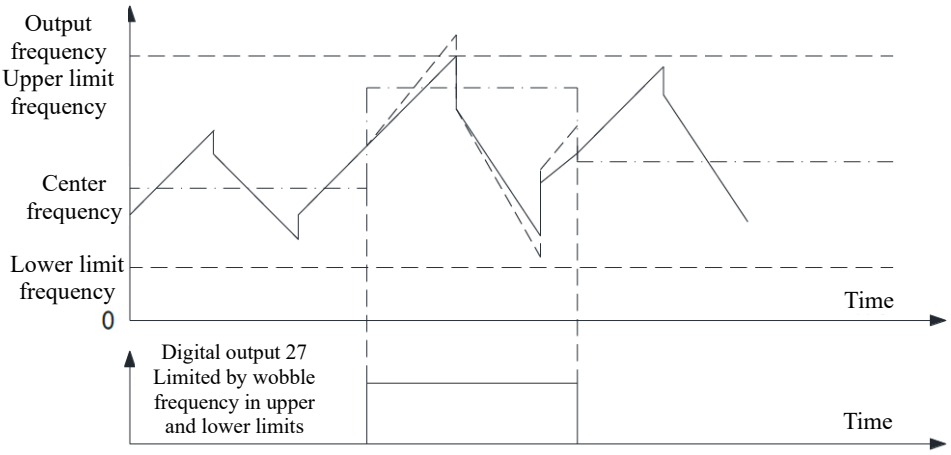
If the two movements are in constant speed, it is bound to form bulges at the intersection of yarns. To disrupt the intersection point of each layer, the speed of reciprocating movement needs to change constantly. The wobble frequency function of the frequency converter is specially designed for this problem, which can make the molding spindle free from bulges and flat and consistent.

- The wobble frequency function is only valid for V/F control, and the wobble frequency function is automatically disabled in vector control mode, jog, and PID closed-loop operation.
- Typical work of wobble frequency is shown below:



F9-00＝1 "automatic input" process is shown below: first, accelerate to F9-02 "wobble frequency preset frequency" and wait for the F9-03 "wobble frequency preset frequency waiting time" (if "manual input" mode is adopted, wait until digital input 56 wobble frequency input is valid), then transit to wobble frequency center frequency and operate according to the preset F9-04 "wobble frequency amplitude", F9-05 "kick frequency", F9-06 "kick time", F9-07 "wobble frequency cycle" and F9-08 "rise time" wobble frequency until there is stop command.

- F9-00＝2 "manual input" mode: The difference from automatic input is that the end condition of the preset state of wobble frequency is that digital input 56 "wobble frequency input" is valid. If digital input 56 is invalid, return to the preset state of wobble frequency, which is irrelevant to F9-03 "preset wobble frequency waiting time".
- The source of the center frequency is the set frequency of ordinary operation, multistage speed and PLC.
- F9-04 "wobble frequency amplitude": The wobble frequency shall be proper, otherwise the motor will be heating. It is generally 0.5~2Hz.
- F9-05 "kick frequency": set the kick frequency at the place of output frequency kick to overcome the actual speed lag caused by the inertia of the cylinder. It is only used when the cylinder inertia is relatively large.
- F9-06 "kick time": set the time of kick frequency.
- F9-07 "wobble frequency cycle": set a complete wobble frequency cycle.
- F9-08 "rise time": set the time of rising stage. Actual rise time = wobble frequency cycle × rise time, actual fall time = wobble frequency cycle × (1- rise time).
- F9-09 "oscillation randomness" : when the value is not 0, the actual rise time will change randomly within a certain range, and the wobble frequency cycle remains unchanged. Random oscillation function can prevent the accumulation of some high-elastic fibers when winding.
- F9-10 "Wobble frequency restart and power-off processing": determine whether to restart according to the memorized state (preset or swing frequency) after shutdown or power-off.
- Digital input 57 "wobble frequency state reset": under "automatic input" mode, switch to the preset frequency for operation; Under manual input mode, the wobble frequency is prohibited and the center wobble frequency is adopted.
- Digital output 27 "upper and lower limits of wobble frequency": if the center frequency or oscillation amplitude is set too high, making the wobble frequency exceed the upper and lower limits of frequency, the size of the wobble frequency will be automatically reduced, so that the wobble frequency range can just meets the requirements of the upper and lower limit frequencies, during which the signal of wobble frequency in upper and lower limits is output, as shown in the figure below:



Wobble frequency is only effective in stable operation. When the center frequency changes in the operation of the wobble frequency, the wobble frequency function will automatically fail in the transition process, and then it will be automatically put into use after the transition to stable operation.

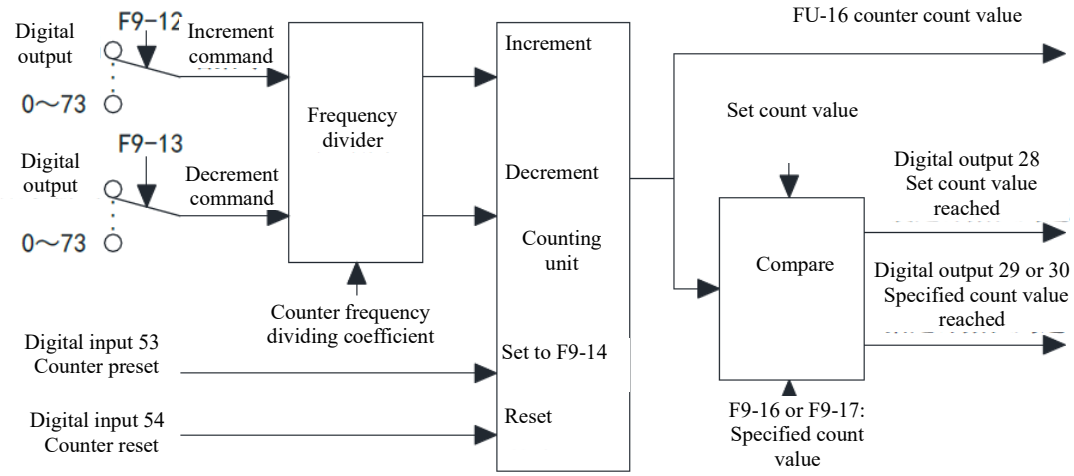
It is recommended to set F2-09 'vibration damping' to zero when using the wobble frequency function.

F9-11	Counting mode selection	Factory default	0	Change	×
Setting range	0: Normal counting 1: Orthogonal counting				
F9-12	Counter increment instruction selection	Factory default	56	Change	○
Setting range	See the digital output function definition table on Page 106				
F9-13	Counter decrement instruction selection	Factory default	57	Change	○
Setting range	See the digital output function definition table on Page 106				
F9-14	Counter preset value	Factory default	0	Change	○
Setting range	0~65535				
F9-15	Set count value	Factory default	10000	Change	○
Setting range	F9-16 "specified count value" ~65535				
F9-16	Specified count value 1	Factory default	0	Change	○
F9-17	Specified count value 2	Factory default	0	Change	○
Setting range	0~F9-15 "set count value"				
F9-18	Counter frequency dividing coefficient	Factory default	1	Change	○
Setting range	1~65535				

The counter of Hope530G can perform high-speed increment and decrement counting. The maximum frequency of using the encoder interface can reach 300kHz, the maximum frequency of using the PFI terminal state can reach 50kHz, and the maximum frequency of using the common terminal to realize the normal increment and decrement counting can reach 500Hz.

The counter can be stored after power-off, and the value saved at the time of power-off is used as the initial value of the counter when it is powered on next time.

The counter can be preset or cleared with digital inputs 53 "counter preset" and 54 "counter reset". The counter function is as follows:



Note: In quadrature counting mode (F9-11=1), the increment and decrement command channels are fixed as encoder A and B channels, no need to select.

F9-12 "counter increment command selection", F9-13 "counter decrement command selection"

- When selecting digital output 32~41 "DI1~DI10", the input signal is affected by F4-06 "Digital input debounce time";
- Select digital output 56, 57 "encoder A, B channel" to achieve high-speed counting function, the highest input frequency can reach 300kHz;

Selecting digital output 58 "PFI terminal status" can also realize high-speed counting function, and the maximum input frequency can reach 50kHz;

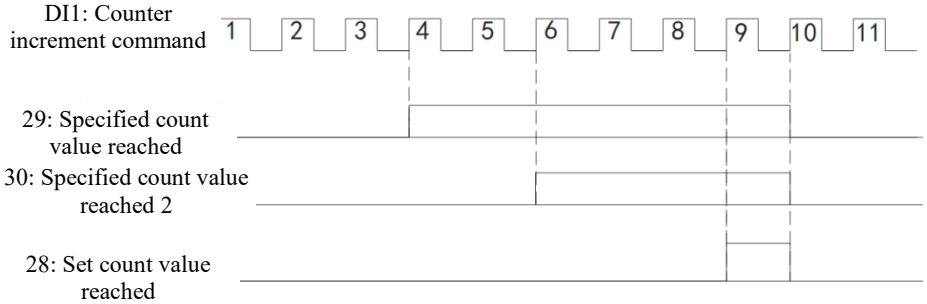
- When other digital outputs are selected, the count sampling time is 1ms.

F9-14 "counter preset value": used for the calculation of FU-37 "counter deviation" and when the digital input 53 "counter preset" is valid, set the counter to F9-14.

F9-15 "set count value": when the count value reaches F9-15 "set count value", digital output 28 "set count value reached" becomes valid; when the next count-up pulse signal arrives, digital output 28 changes to invalid.

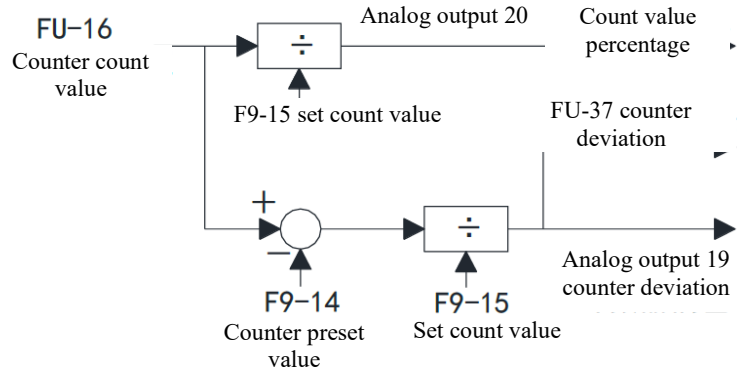
F9-16 "designated count value 1": when the count value reaches F9-16 "designated count value 1", digital output 29 "designated count value reached" becomes valid; until the number of pulses reaches (F9-15 "designated count value" +1), digital output 29 becomes invalid.

Example: Set F9-12 "counter increment command selection" = 32 (DI1), F9-15 "set count value" = 9, F9-16 "specified count value" = 4, and F9-17 "specified count value 2" =6, then when DI1 input pulse number = 4, digital output 29 becomes valid. When input pulse number = 6, digital output 30 becomes valid. When input pulse number = 9, digital output 28 becomes valid. When the next pulse arrives, digital outputs 29, 30 and 28 simultaneously become invalid. As shown below:



F9-18 "Counter frequency division coefficient": Count the input pulses after combining, and combine the F9-18 pulses into one count pulse.

The relevant monitoring parameters are FU-16 "counter count value", FU-37 "counter deviation", and the relevant analog output quantities are 19 "counter deviation", 20 "count value percentage", which can be connected to analog output, arithmetic unit, PID feedback, etc. Their meanings are as follows:



F9-19	Length counter input instruction selection	Factory default	0	Change	○
Setting range	See the digital output function definition table on Page 106				
F9-20	Length counter set length	Factory default	1000m	Change	○
Setting range	0~65535m				
F9-21	Pulses per meter of length counter	Factory default	100.0	Change	○
Setting range	0.1~6553.5				

F9-19 "length counter input command selection":

- When selecting digital output 32~41 "DI1~DI10", the input signal is affected by F4-06 "Digital input debounce time";
- Select digital output 56, 57 "encoder A, B channel" to achieve high-speed meter counting function, the highest input frequency can reach 300kHz;
- Selecting the digital output 58 "PFI terminal status" can also realize the high-speed meter counting function, and the maximum input frequency can reach 50kHz; when the PFI is used as the position reference, the position-controlled counter 2 can be started at the same time;
- When other digital outputs are selected, the sampling time is 1ms.

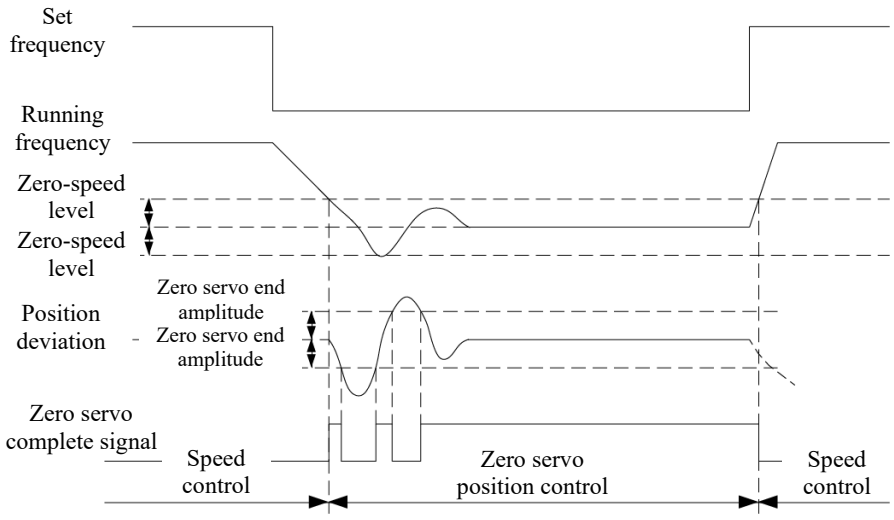
F9-20 "length counter set length": when FU-17 "length counter actual length" reaches F9-20 "length counter set length", digital output 31 "length counter set length reached" becomes valid .

Digital input 55 "length counter and counter 2 reset": when valid, FU-17 "length counter actual length" is cleared.

F9-22	Zero servo control selection	Factory default	0	Change	×
Setting range	0: Invalid 1: Always valid 2: Condition valid, selected through digital input 52 "Zero servo command"				
F9-23	Zero-speed level	Factory default	30r/min	Change	×
Setting range	0~120r/min				
F9-24	Zero servo end amplitude	Factory default	10	Change	○
Setting range	1~10000 pulses				
F9-25	Zero servo control gain	Factory default	1.00	Change	×

Setting range	0.00~50.00

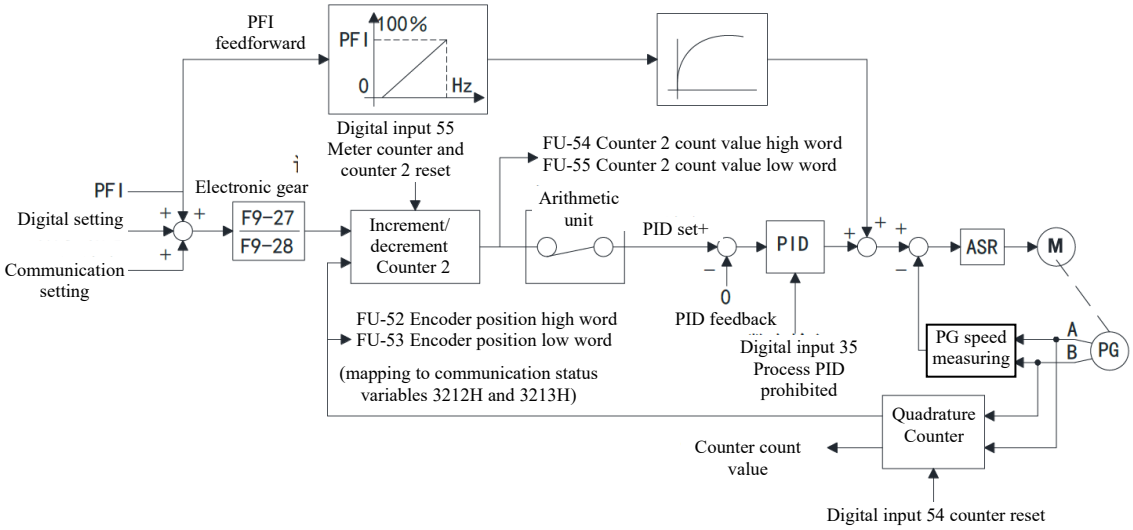
- Zero servo is only valid for "with PG vector control".
- When F9-22 "zero servo control selection" is equal to 1, or equal to 2 and digital input 52 "zero servo command" is valid, zero servo is allowed.
- When the zero servo is allowed, when the set frequency is zero and the motor decelerates to F9-23 "zero-speed level", the current position will be memorized, and it will be transferred to zero servo position control.
- When the position deviation of zero servo is less than F9-24 "zero servo end amplitude", digital output 24 "zero servo complete" is valid, otherwise it is invalid. An example of the zero servo control sequence is as follows:



- Only quadrature encoder can be used for zero servo. The number of pulses in F9-24 "zero servo end amplitude" refers to the number of all edges (rising and falling edges) of the quadrature encoder A and B two-phase signals.
- The response characteristics of zero servo control can be adjusted by F9-25 "zero servo control gain". Note: The performance of the ASR speed loop should be adjusted first, and then the zero servo control gain.

F9-26	**Position control digital settings**	Factory default	0	Change	○
Setting range	-32768~32767				

- The realization of position control is mainly based on 32-bit bipolar counter 2 and process PID. The functional block diagram is as follows:



Three ways of position setting: pulse signal (input pulse sequence of the PFI terminal), digital setting (F9-26) and communication setting (analog quantity 1 of the host computer), the latter two are only read once at the moment of starting, namely, change of the two settings will not take effect during operation and it will works when restarted.

- When selecting pulse sequence for the position setting, the input of the length counter must be "58: PFI terminal state", namely, F9-19=58. Besides, the feedforward gain of position setting and filtering adjustment can be achieved by the PFI gain and filtering time. It shall be noted that the frequency setting shall select the frequency correction mode when the PFI and PID work at front/back of the slope.
- When selecting PFI for the position setting, the position setting direction can be determined by the multifunctional digital input "59: reverse direction of the PFI position setting".
- Range of the digital and communication settings: -32768~32767. Directly use the process PID control to form position loop and take the PID output connected by an arithmetic unit as set speed, then form a speed closed loop together with speed feedback, making double closed loops.
- Three settings are in the form of accumulation internally and when one is used, the other two should be guaranteed to be 0.
- The electronic gear can amplify or shrink the position setting without truncation error. See Page 135 for details.
- The counter 2 is an up-and-down counter. In its internality, the increase count input is fixed to the position setting after handing of the electronic gear and the decrement count input is fixed to 4 times of the frequency quadrature count value of the quadrature encoder, which is the position feedback. At the instant of the frequency converter starting, the converter reads out the position setting and adds it to the counter 2 (PFI is added to the counter 2 in real time). Then the feedback will carry out decrement to the counter 2 and the count value of the counter 2 is the positional deviation.
- When applying to the communication position setting, the three processes that are transmitted to the frequency converter by the host computer are: master control word (3200H), frequency setting (3201H) and position setting (3202H, namely, analog quantity 1 of the host computer and see the Page 158 for details). The return content includes: major status word (3210H), operation frequency (3211H), encoder position high word (3212H) and encoder position low word (3213H), with the latter two mapped by arithmetic units 1 and 2. See the Page 155 and Page 158 for details.
- The frequency converter adopts "with PG vector control". If "with PGV/F control" can meet the requirements, the latter is preferred.
- When the digital input "54: Counter reset" is valid, clear FU-16 "counter count value", and also clear the position feedback, namely FU-52 "encoder position high word", FU-53 "encoder position low word" is cleared at the same time. See Page 166 for details.
- When the digital input "55: Length counter and counter 2 reset" is valid, the length counter and counter 2 are cleared at the same time, that is, FU-54 "counter 2 count value high word", FU-55 "counter 2 count value low word" is cleared. See Page 166 for details.

F9-27	**Electronic gear numerator setting**	Factory default	1	Change	○
F9-28	**Electronic gear denominator setting**	Factory default	1	Change	○
Setting range	1~65535				

Please correctly set the parameter to prevent the motor revolving speed from significant change and see the Page 133 for details.

F9-29~ F9-38	**Reserved**	Factory default	-	Change	-

6.11 FA Motor Parameters

FA-00	**Motor parameters self-tuning**	Factory default	00	Change	×
Setting range	11: Static self-tuning 22: No-load complete self-tuning				
FA-01	**Motor rated power**	Factory default	Model determination	Change	×
Setting range	0.40~500.0kW				
FA-02	**Motor pole number**	Factory default	4	Change	×
Setting range	2~48				
FA-03	**Motor rated current**	Factory default	Model determination	Change	×
Setting range	0.5~1200.0A				
FA-04	**Motor rated frequency**	Factory default	50.00Hz	Change	×
Setting range	1.00~650.00Hz				
FA-05	**Motor rated speed**	Factory default	Model determination	Change	×
Setting range	125~40000r/min				
FA-06	**Motor rated voltage**	Factory default	660V	Change	×
Setting range	260~866V				

Be sure to input the motor nameplate parameters FA-01~FA-06 before running the frequency converter.

FA-00＝11 "static self-tuning": Measure the stator resistance, leakage inductance and rotor resistance of the motor. It is recommended to input no-load current before operation.

FA-00=22 "no-load complete self-tuning": In addition to the parameters measured by static self-tuning, it also measures mutual inductance, no-load current, and iron core saturation coefficient. The start of the no-load complete self-tuning process includes a stationary self-tuning process. During a complete self-tuning, the motor will rotate.

Notes on self-tuning:

1. The nameplate parameters of the motor must be set before self-tuning, otherwise the motor may be damaged;
2. The power levels of the motor and the frequency converter shall match, and the rated current of the motor shall not be less than 1/4 of the rated current of the frequency converter;
3. When changing the rated power of the motor, the motor parameter value determined by the model will be restored to the factory value;
4. When replacing the motor or output cable, be sure to redo the parameter self-tuning;

5. Motor parameter self-tuning needs to set the run command channel to operation panel control;

6. Before performing no-load complete self-tuning, confirm that: the motor and the mechanical load are disengaged; there is no problem in accelerating the motor to 80% of the basic frequency; the mechanical brake device should be released; in the case of a lift, please remove the mechanical load connected to the motor to Prevents slippage during self-tuning.

📖 Parameter self-tuning operation:

1. Input the nameplate parameters FA-01~FA-06 of the motor, especially when the vector control is used, the input parameters must be correct. Otherwise, the control performance of the frequency converter will be affected;

2. Before the no-load complete self-tuning, set F2-12 "basic frequency" and F2-13 "maximum output voltage", and select the appropriate acceleration and deceleration time to ensure that there is no overcurrent or overvoltage during acceleration and deceleration;

3. Confirm that the motor is in a static state, set FA-00 "motor parameter self-tuning" to the corresponding value, and then press to run;

4. After the measurement is completed, it will automatically stop, the measurement results will be automatically recorded in the motor parameters, and FA-00 will automatically become 00.

📖 The motor may rotate slightly during the execution of the motor stationary self-tuning.

FA-07	Motor no-load current	Factory default	Model determination	Change	×
Setting range	0.1A~FA-03 "motor rated current"				
FA-08	**Motor stator resistance**	Factory default	Model determination	Change	○
Setting range	0.00~50.00%				
FA-09	**Motor leakage inductive reactance**	Factory default	Model determination	Change	○
Setting range	0.00~50.00%				
FA-10	**Motor rotor resistance**	Factory default	Model determination	Change	○
Setting range	0.00~50.00%				
FA-11	**Motor mutual inductive reactance**	Factory default	Model determination	Change	○
Setting range	0.0~2000.0%				
FA-12	**Motor core saturation coefficient 1**	Factory default	1.300	Change	×
Setting range	1.000~1.500 (iron core saturation coefficient corresponding to 50% magnetic flux)				
FA-13	**Motor core saturation coefficient 2**	Factory default	1.100	Change	×
Setting range	1.000~FA-12 "motor core saturation coefficient 1" (iron core saturation coefficient corresponding to 75% magnetic flux)				
FA-14	**Motor core saturation coefficient 3**	Factory default	0.900	Change	×
Setting range	FA-15 "motor core saturation coefficient 4" ~ 1.000 (iron core saturation coefficient corresponding to 125% magnetic flux)				
FA-15	**Motor core saturation coefficient 4**	Factory default	0.700	Change	×
Setting range	0.500~1.000 (iron core saturation coefficient corresponding to 150% magnetic flux)				

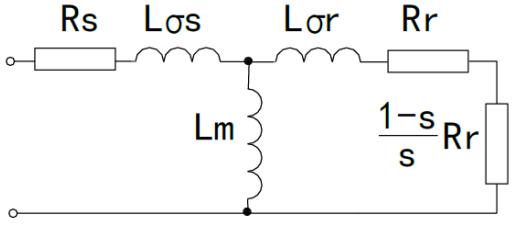
If the parameter self-tuning cannot be performed, or if you know the exact parameters of the motor , you can manually calculate and input the motor parameters. The formula for calculating the percentage value of motor parameters is as follows:

$$\text{Resistance or reactance percentage (\%)} = \frac{\text{Resistance or reactance } (\Omega)}{\text{Rated voltage (V)} / (\sqrt{3} \times \text{rated current (A)})} \times 100\%$$

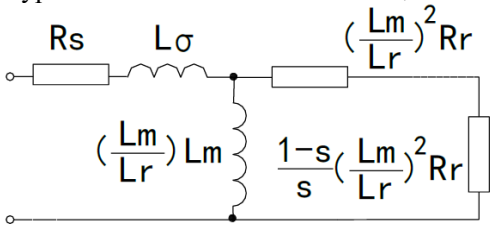
Note: The inductive reactance is the inductive reactance at the rated frequency of the motor. The calculation formula of the inductive reactance is: Inductive reactance=2π×frequency×inductance.

The frequency converter adopts the parameters of the T-I type equivalent circuit (as shown in the figure below) of the induction motor. The conversion relationship between the conventional T type equivalent circuit (as shown in the figure below) to the T-I type equivalent circuit parameters is as follows:

T-I type circuit stator resistance=R_s
T-I type circuit leakage inductance=$(L_m/L_r)^2 L_\sigma$
T-I type circuit rotor resistance=$(L_m/L_r)^2 R_r$
T-I type circuit mutual inductance=L^2_m/L_r



T type equivalent circuit



T-I type equivalent circuit

FA-16	**Motor rated current 2**	Factory default	Model determination	Change	○
FA-17	**Motor rated current 3**	Factory default	Model determination	Change	○
Setting range	0.5~1200.0A				

By utilizing "motor rated current 2" and "motor rated current 3" and FA-03 "motor rated current" of general machines, overload protection can be conducted to multiple different motors. The used one is chosen via the multifunctional digital input terminals and see the table below for choice:

60: Motor rated current selection 2	61: Motor rated current selection 3	Motor rated current value
Invalid	Invalid	FA-03 "Motor rated current"
Invalid	Valid	FA-17 "Motor rated current 3"
Valid	×	FA-16 "Motor rated current 2"

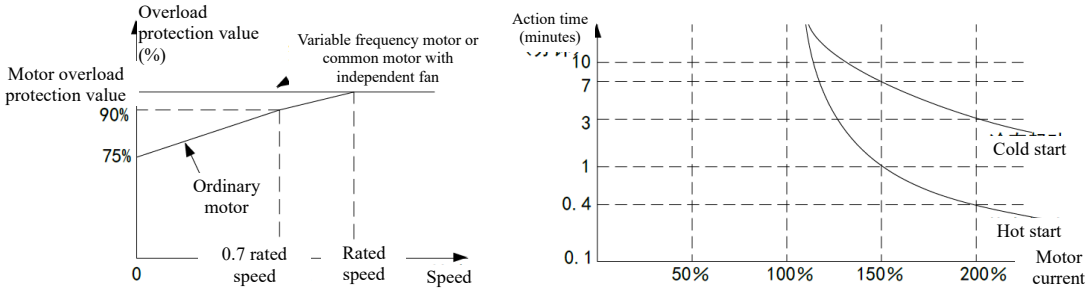
Relevant digital input functions: "60: Motor rated current selection 2", "61: Motor rated current selection 3", the former has higher priority.

6.12 Fb Protection Function and Frequency Converter Advanced Settings

Fb-00	**Motor cooling condition**	Factory default	0	Change	○
Setting range	0: Common motor 1: Variable frequency motor or common motor with independent fan				
Fb-01	**Motor overload protection value**	Factory default	100.0%	Change	○
Setting range	50.0%~150.0%, taking the motor rated current as 100%				
Fb-02	**Motor overload protection action selection**	Factory default	2	Change	×
Setting range	0: No action, 1: Alarm, still in operation, 2: Fault and free stop				

Fb-00 "Motor Heat Dissipation Conditions" requires the user to specify the type of motor brought by the frequency converter to understand the heat dissipation conditions of the motor. When the ordinary motor runs at low speed, the heat dissipation effect of the self-cooling fan becomes poor, and the overload protection value of the frequency converter decreases correspondingly at low speed, as shown in the following figure:

Fb-01 "motor overload protection value": used to adjust motor overload protection curve. The motor runs at rated speed. If Fb-01 is set to 100% and the motor runs at 150% rated current suddenly, overload protection will be triggered 1min later. Protection time curve is shown as follows:



In case of motor overload protection, it is necessary to wait for a period of time to cool the motor before continuing to run it.

⚠ **ATTENTION:** Motor overload protection is only applicable to the occasion with one frequency converter driving one motor. When a frequency converter drives multiple motors at the same time, install thermal protection devices on each motor separately.

Fb-03	**Motor overloaded protection selection**	**Factory default**	**00**	**Change**	×
Setting range	Units digit: Overload detection selection 0: Always detect 1: Only detect when running at constant speed Tens digit: overload action selection 0: no action 1: Alarm, and continue to run 2: Fault and free stop				
Fb-04	**Motor overload detection level**	**Factory default**	**130.0%**	**Change**	×
Setting range	20.0%~200.0%, taking the motor rated current as 100%				
Fb-05	**Motor overload detection time**	**Factory default**	**5.0s**	**Change**	×
Setting range	0.0~30.0s				

📖 Motor overload: when the motor current exceeds Fb-04 and the duration exceeds the time set by Fb-05, it will respond according to the action mode set by Fb-03. This function can be used to detect whether the mechanical load is abnormal and the current is too large.

Fb-06	**Motor underload protection**	Factory default	0	Change	×
Setting range	0: No action, 1: Alarm, still in operation, 2: Fault and free stop				
Fb-07	**Motor underload protection level**	Factory default	30.0%	Change	×
Setting range	0.0%~100.0%, taking the motor rated current as 100%				
Fb-08	**Underload protection detection frequency**	Factory default	0.00Hz	Change	○
Setting range	0.00~50.00Hz				
Fb-09	**Underload protection detection time**	Factory default	1.0s	Change	×
Setting range	0.0~100.0s				

📖 Motor underload protection: when the output current is lower than Fb-07 and the frequency is higher than Fb-08, and the duration exceeds the time set by Fb-09, it will respond according to the action mode set by Fb-06. This function can timely detect faults such as the water pump idling, the transmission belt is broken, and the motor side contactor is open.

📖 When the frequency converter is under no-load test, do not open this protection function.

Fb-10	**Analog input offline action**	Factory default	0	Change	×
Setting range	0: No action 1: Send AL.ACo alarm signal, run at the average running frequency 10s before the disconnection occurs 2: Send out AL.ACo alarm signal, press Fb-11 "Analog input drop forced frequency" to run 3: Send Er.ACo fault signal and free stop				
Fb-11	**Analog input offline forced frequency**	Factory default	0.00Hz	Change	○
Setting range	0.00Hz~F0-06 "maximum frequency"				

Analog input disconnection protection: When the frequency converter detects that the analog input signal is less than the corresponding disconnection threshold and the disconnection time is greater than the delay time, it is considered that the disconnection has occurred.

Related parameters: F6-08 "AI1 disconnection threshold" and F6-18 "AI2 disconnection threshold". F6-45 "AI3 Drop Threshold" and F6-55 "AI4 Drop Threshold".

Fb-12	**Selection of other protection actions**	Factory default	10122	Change	×
Setting range	Units digit: Frequency converter input phase loss protection 0: No action 1: Alarm, and continue to run 2: Fault and free stop				
	Tens digit: Frequency converter output phase loss protection 0: No action, 1: Alarm, still in operation, 2: Fault and free stop				
	Hundreds digit: Grounding test 0: No detection 1: Detection only when power on 2: Detection before running 3: Detection during running				
	Thousands digit: Parameter storage failure action selection 0: Alarm, and continue to run 1: Fault and free stop				
	Ten-thousands digit: AC input power failure processing 0: No action 1: Alarm reminder				

Frequency converter output phase loss protection: In case of frequency converter output phase loss, the motor operates with single phase and current and torque ripple become larger, so output phase loss protection can avoid damage to motor and mechanical load.

When the output frequency or current is very low, the output phase loss protection is invalid.

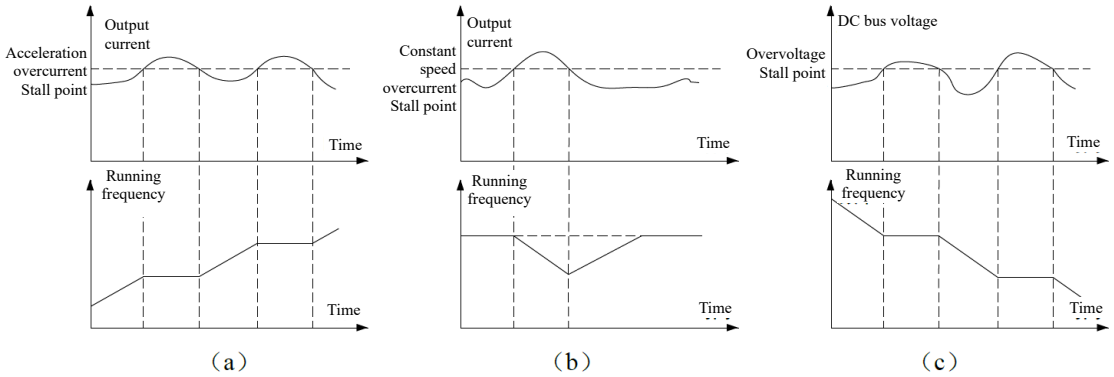
Fb-13	**Overcurrent & stall prevention selection**	Factory default	011	Change	×
Setting range	Ones place: Accelerate overcurrent stall prevention selection Tens digit: Constant-speed over-current stall prevention selection 0: Invalid 1: Valid, limited time 1min 2: Valid, unlimited time Hundreds digit: Stall mode selection 0: Mode 1 (frequency limit) 1: Mode 2 (voltage limit) 2: Mode 3 (frequency, voltage limit)				
Fb-14	**Acceleration overcurrent & stall point**	Factory default	150.0%	Change	×
Setting range	50.0%~200.0%, taking the rated current of the frequency converter as 100%				
Fb-15	**Constant speed overcurrent & stall point**	Factory default	150.0%	Change	×
Setting range	50.0%~200.0%, taking the rated current of the frequency converter as 100%				
Fb-16	**Overvoltage & stall prevention selection**	Factory default	1	Change	×
Setting range	0: Invalid; 1: Valid				
Fb-17	**Overvoltage & stall point**	Factory default	1212V	Change	×
Setting range	1125～1300V, factory default: 1212V				

During the acceleration process, when the Fb-13 units digit "acceleration overcurrent stall prevention selection" is valid and the output current is greater than the Fb-14 "acceleration overcurrent stall point", the acceleration is temporarily stopped, and the acceleration continues after the current decreases, as shown in the following figure (a):

In the process of constant speed running, when Fb-13 tens digit "constant speed overcurrent stall prevention selection" is valid and the output current is greater than Fb-15 "constant speed overcurrent stall point", decelerate operation, after the current is reduced, accelerate to the original running frequency, as shown in the following figure (b):

During the deceleration process, when Fb-16 "Overvoltage stall prevention selection" is valid and the DC bus voltage exceeds Fb-17 "Overvoltage stall point", the deceleration is temporarily

stopped, and the DC bus voltage drops to the normal level and then continues to decelerate, as shown in the figure below (c):



If the stall duration exceeds 1min in actual running, the frequency converter will appear "Er.Abb abnormal stop fault", select "2: valid, infinite" to shield this fault.

Stall mode 1: It is suitable for motor loads. In order to prevent the overcurrent protection caused by the instantaneous increase of the load, the output frequency is automatically adjusted to prevent the current from continuously increasing.

Stall mode 2: It is suitable for power loads. At this time, the output frequency is usually fixed. In order to prevent the overcurrent protection caused by the instantaneous increase of the load, the output voltage is automatically adjusted to prevent the current from increasing continuously.

Stall mode 3: By adjusting the output voltage and output current, the overcurrent protection caused by the transient increase of the load is prevented.

Fb-18	**DC bus undervoltage action**	Factory default	0	Change	×
Setting range	0: Free stop, report undervoltage fault (Er.dcL) 1: Free stop, within Fb-20 "Instantaneous power failure allowable time", restart after power recovery, if it exceeds, it will report undervoltage fault (Er.dcL) 2: Free stop, restart when the power supply recovers during CPU running, no undervoltage fault is reported 3: Deceleration running, when the power supply recovers during CPU running, it will accelerate to the set frequency, and no undervoltage fault will be reported				
Fb-19	**DC bus undervoltage point**	Factory default	690V	Change	×
Setting range	640~831V				
Fb-20	**Instantaneous power failure allowable time**	Factory default	0.1s	Change	×
Setting range	0.0~30.0s				
Fb-21	**Instantaneous stop deceleration time**	Factory default	5.0s	Change	×
Setting range	0.0~200.0s, if set to 0.0, the currently selected deceleration time will be used				

The detection of instantaneous power outage is achieved by the detection of DC bus voltage. When the DC bus voltage is lower than Fb-19 "DC bus undervoltage point", there are the following treatment methods:

Fb-18=0: Deem undervoltage as a fault with free stop triggered and DC bus undervoltage fault reported;

Fb-18=1: Block the output, so that the DC bus voltage drops slowly. If the voltage recovers within Fb-20 "instantaneous power failure allowable time", it will restart (the

starting mode is determined by Fb-25 "mode of restart from instantaneous stop, self-reset and run interrupt"), a fault will be reported if the undervoltage times out;

Fb-18=2: Block the output, so that the DC bus voltage drops slowly, as long as the CPU is not powered down due to undervoltage (it can be judged by whether the display on the operation panel disappears), and the voltage recovery is detected, it will restart (the starting method is determined by Fb-25 "mode of restart from instantaneous stop, self-reset and run interrupt");

Fb-18=3: At the moment of undervoltage, it will start to decelerate according to Fb-21 "instantaneous stop deceleration time" or the current deceleration time. The DC bus voltage is maintained by the kinetic energy feedback of the load during deceleration. If the voltage recovers, it will accelerate to the set frequency. The DC bus voltage holding time is related to the load inertia, speed, torque and deceleration time.

- Handling method for Fb-18＝1, 2 and 3 can avoid undervoltage shutdown caused by instantaneous power outage for fan, centrifuge and other large-inertia load.
- Fb-20 "Instantaneous power failure allowable time": This parameter is only used when Fb-18=1.
- In case of undervoltage during running, free stop will be triggered with undervoltage fault reported (Er.dcL). There will only be alarm in case of undervoltage in standby mode (AL.dcL).

Fb-22	Automatic reset times for faults	Factory default	0	Change	×
Setting range	0~10, module protection and external fault without automatic reset function				
Fb-23	**Interval time for automatic reset**	Factory default	5.0s	Change	×
Setting range	1.0~30.0s				
Fb-24	**Fault output during automatic reset period**	Factory default	0	Change	×
Setting range	0: No output 1: Output				
Fb-25	**Instantaneous stop, automatic reset, and restart mode after operation interruption**	Factory default	1	Change	×
Setting range	0: Start by start mode 1: Tracking start				

Automatic fault reset function: For faults occurring during operation, press Fb-23 "automatic reset interval" and Fb-22 "automatic reset times of faults" for automatic reset and restart. It can avoid tripping caused by misoperation, instantaneous overvoltage of power supply or external non-repetitive impact.

- Self-reset process: When a fault occurs during running, the fault will be reset automatically after the automatic reset interval; if the fault disappears, restart according to the setting mode of Fb-25 "restart from instantaneous stop, self-reset and run interrupt"; If the fault still exists and the number of resets has not exceeded Fb-22 at this time, continue to try automatic reset; otherwise, it will report a fault and stop.
- Reset conditions for the number of times of fault reset: After the frequency converter fault self-reset, there is no fault for 10 consecutive minutes; Once fault is detected, fault shall be manually reset, and then power shall be connected again after power outage.
- Fb-24 'automatic reset during failure output': Select digital output 5 "fault output" to check whether it is valid during automatic reset.
- Automatic reset is invalid for power device protection (Er.FoP) and external fault (Er.EEF).

⚠ **Danger: Use the automatic reset function with caution. Otherwise, personal injury or property loss may occur.**

Fb-26	Power-on self-start allowed	Factory default	1	Change	○
Setting range	0: Prohibited 1: Allowed				

For the terminal run command channel and the level-type running mode is selected (the tens or units digit of F4-13 is equal to 0, 1, 2), if the run command is valid when power on, you can choose whether to power on and starts immediately or not according to this parameter.

Fb-27	Built-in braking unit operating point	Factory default	1178V	Change	○
Setting range	1073~1247V				

Using the braking unit can dissipate energy on the braking resistor to achieve the purpose of fast shutdown. When the DC bus voltage exceeds the working point of the braking unit, the braking unit will be automatically put into use.

Fb-28	Modulation method	Factory default	0	Change	○
Setting range	0: Auto (automatic switching between continuous and discontinuous modulation) 1: Continuous modulation				

The automatic mode has lower switching loss when switching to discontinuous modulation, but the harmonics are larger than the continuous modulation mode.

Fb-29	Carrier frequency	Factory default	Model determination	Change	○
Setting range	18.5~30kW: 1.1k~10.0kHz, factory default: 3.0kHz				
	37~160kW: 1.1k~8.0kHz, factory default: 2.5kHz				
	200kW and above: 1.1k~5.0kHz, factory default: 2.0kHz				
Fb-30	**Random PWM settings**	Factory default	0%	Change	○
Setting range	0~30%				
Fb-31	**Automatic adjustment selection of carrier frequency**	Factory default	1	Change	○
Setting range	0: Prohibited 1: Allowed				

Fb-29 "carrier frequency": If the carrier frequency is high, the motor operation noise is low and the harmonic current of the motor is small, so the heating is reduced, but the common-mode current becomes larger, the interference is large and the heat productivity of the frequency converter is large. It will be opposite if the carrier frequency is low. The carrier frequency can be appropriately raised in case of mute operation is required. When the set carrier frequency is above the factory default, the frequency converter needs to be derated by 5% for every increase of 1kHz.

Fb-30 "random PWM setting": Random PWM scatters the spectrum of the carrier wave and improves the sound. This parameter can be used to make the sound less harsh when the carrier frequency is low. A setting of 0% indicates a fixed carrier frequency.

Fb-31 "carrier frequency automatic adjustment selection": The carrier frequency can be adjusted automatically according to the temperature of the frequency converter's radiator, output current, and output frequency to avoid the frequency converter failure due to overheating. When the temperature of the radiator is too high and the low-frequency current is too large, the carrier frequency will automatically decrease.

Fb-32	Dead zone compensation allowed	Factory default	1	Change	×
Setting range	0: Prohibited 1: Allowed				

Dead time compensation can reduce output harmonics and reduce torque ripple. However, when the frequency converter is used as a power supply, it is necessary to disable the dead zone compensation function.

Fb-33	Space vector angle stop memory	Factory default	0	Change	×
Setting range	0: No memory; 1: Memory				

It is used to maintain synchronization when the synchronous motor stops and restarts, and is only valid for V/F control.

Fb-34	Overmodulation enabled	Factory default	1	Change	×
Setting range	0: Prohibited 1: Allowed				

Over-modulation enable: When over-modulation is allowed, the voltage output capability of the frequency converter is large, and the output voltage can be close to or higher than the power supply voltage, but at this time, due to the over-modulation effect, the torque ripple of the motor is large. When the overmodulation function is disabled, the torque ripple caused by overmodulation can be avoided, and the control performance can be improved for loads such as grinding machines.

Fb-35	Cooling fan control	Factory default	0	Change	○
Setting range	0: Power off after 3min of standby 1: Continuous operation 2: Automatic operation				

In occasions with frequent starts and stops, it should be set to "always running" to avoid frequent start and stop of the fan.

Automatic operation: The fan runs automatically according to the internal temperature of the frequency converter.

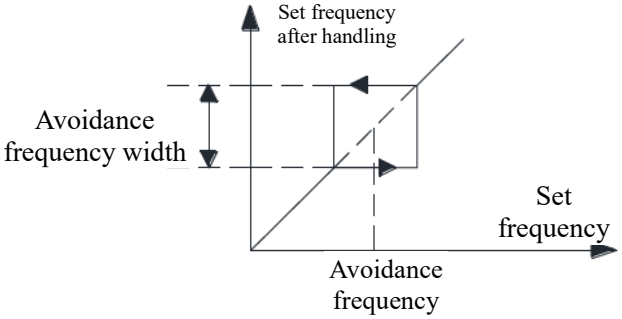
Turn off after 3 minutes of standby: automatic control according to the running state.

Fb-36	Avoidance frequency 1	Factory default	0.00Hz	Change	○
Setting range	0.00~625.00Hz				
Fb-37	Avoidance frequency 1 width	Factory default	0.00Hz	Change	○
Setting range	0.00~20.00Hz				
Fb-38	Avoidance frequency 2	Factory default	0.00Hz	Change	○
Setting range	0.00~625.00Hz				
Fb-39	Avoidance frequency 2 width	Factory default	0.00Hz	Change	○
Setting range	0.00~20.00Hz				
Fb-40	Avoidance frequency 3	Factory default	0.00Hz	Change	○
Setting range	0.00~625.00Hz				

Fb-41	Avoidance frequency 3 width	Factory default	0.00Hz	Change	○
Setting range	0.00~20.00Hz				

Frequency avoidance function is to make the operation frequency of the frequency converter avoid the mechanical resonance point.

In the process of acceleration and deceleration, the running frequency normally passes through the avoidance frequency, which only prevents the frequency converter from operating within the width of the avoidance frequency steadily.



Fb-42	Fan life expectancy settings	Factory default	40000h	Change	○
Setting range	1~65000h				

When the accumulated operation time reaches the fan life expectancy setting, the digital output terminal function of "73: Fan life expectancy reached" will be effective. It is suggested to replace a fan with same model. After replacement, make use of external terminal input of "58: Accumulated fan running time reset" to realize zero clearing of the accumulated time of the fan. Besides, the "73: Fan life expectancy reached" will be invalid.

Relevant parameters: Digital input terminal function 58: Accumulated fan running time reset; Digital output terminal function 73: Fan life expectancy reached; Monitoring parameter: FU-56 "accumulated fan running time".

6.13 FC Keyboard Operation and Display Settings

FC-00	Display parameter selection	Factory default	0	Change	○
Setting range	0: Display all menus 1: Display only the parameters selected by the user 2: Display only the parameters different from the factory defaults				

FC-00=1: Only the parameters selected by FC-15 ~ FC-46 "User Parameters 1~32" are displayed. The user password is invalid for these parameters, but the user password is required to modify FC-00.

FC-00=2: Only the parameters that are different from the default values are displayed for easy commissioning and maintenance.

FC-01	Key function and automatic lock	Factory default	0000	Change	×
Setting range	Units digit: Automatic key lock function 0: Not locked 1: All locked 2: All locked except ○ 3: All locked except ◁, ▷ 4: All locked except ○, ◁, ▷ 5: All locked except ▯, ○				
	Tens digit: ○ function selection 0: Valid only when in the operation panel run command channel 1: Valid when in the operation panel, terminal, and communication run command channels, and shut down according to stop mode				

	2: Shut down according to stop mode in the operation panel run command channel. Shut down freely in the non-operation panel run command channel and report Er.Abb
	Hundreds digit: function selection (only for panel command channel) 0: Select running function 1: Select jogging function
	Thousands digit: Arrow key combination function selection 0: Press and hold combination keys ◁ and △, or combination keys ▷ and ▽ simultaneously to switch the main set frequency channel and run command channel function is invalid 1: Press and hold combination keys ◁ and △, or combination keys ▷ and ▽ simultaneously to switch the main set frequency channel and run command channel function is valid

Automatic key lock function. If no key is pressed within 1 minute, the keys will be automatically locked; in the monitoring state, press ◁ + ENTER, keys will be locked immediately; press ENTER + MENU for 3s to unlock.

The relationship between the thousands digit "arrow key combination function selection" of FC-01 and the relevant digital input states is shown in the following table:

Condition		State				
Digital input 45 "Simultaneous switching of main set frequency channel and run command channel"		**Already associated with the terminal**	**Not associated with a terminal**			
Digital input 42 "run command channel 1/2 switch"		**Any state**	**Take effect**		**Not take effect**	
Digital input 44 "main set frequency channel switching"		**Any state**	**Take effect**	**Not take effect**	**Take effect**	**Not take effect**
Press and hold combination keys ◁ and △ for 1s	Execution result: Run command channel 1 switches to 2	Invalid	Invalid	Invalid	Valid	Valid
	Execution result: Main set frequency channel 1 switches to 2	Invalid	Invalid	Valid	Invalid	Valid
Press and hold combination keys ▷ and ▽ for 1s	Execution result: Run command channel 2 switches back to 1	Invalid	Invalid	Invalid	Valid	Valid
	Execution result: Main set frequency channel 2 switches back to 1	Invalid	Invalid	Valid	Invalid	Valid
Note	"Associated with terminal" means it has been selected for a digital input terminal function. For example, F4-00=45 indicates digital input 45 is associated with terminal DI1; "Associated with a terminal and the terminal input is valid" is abbreviated as "Valid"; "Not associated with a terminal or associated with a terminal but the terminal input is invalid" is abbreviated as "Invalid";					

The run command channel switching and normal running main set channel switching generated by pressing and holding combination keys ◁ and △ are not saved after power loss, nor are they saved when the "Direction key combination function selection" is disabled; they will automatically revert to the state after pressing and holding combination keys ▷ and ▽ for 1s.

For the run command channel switching and normal running main set channel switching generated by pressing and holding the combination keys ◁ and △, only the execution result produced after pressing and holding the combination keys ▷ and ▽ for 1s can manually switch them back.

After the main set frequency channel and the run command channel are switched by pressing and holding the combination keys ◁ and △, you must wait until the main set frequency channel

and run command channel are switched back by pressing and holding the combination keys ▷ and ▽ before digital input 42 "run command channel 1/2 switch" and digital input 44 "main set frequency channel switching" can respond. However, digital input 45 "simultaneous switching of main set frequency channel and run command channel" is not subject to this restriction. When the digital input 45 is associated with a terminal, the main set frequency channel and the run command channel are forcibly associated with the current state of digital input 45. When the digital input 45 is unassociated with the terminal, if the long-press results of the combination keys ◁ and △ or combination keys ▷ and ▽ remain valid before digital input 45 was associated with the terminal, the run command channel and the main set frequency channel will automatically revert to their respective effective states.

FC-02	**Run/stop monitoring parameter 1**	Factory default	1	Change	○
FC-03	**Run/stop monitoring parameter 2**	Factory default	-1	Change	○
FC-04	**Run/stop monitoring parameter 3**	Factory default	-1	Change	○
FC-05	**Run/stop monitoring parameter 4**	Factory default	-1	Change	○
FC-06	**Run/stop monitoring parameter 5**	Factory default	-1	Change	○
FC-07	**Run/stop monitoring parameter 6**	Factory default	-1	Change	○
FC-08	**Run/stop monitoring parameter 7**	Factory default	-1	Change	○
FC-09	**Running monitoring parameter 1**	Factory default	0	Change	○
FC-10	**Running monitoring parameter 2**	Factory default	2	Change	○
FC-11	**Running monitoring parameter 3**	Factory default	4	Change	○
FC-12	**Running monitoring parameter 4**	Factory default	-1	Change	○
Setting range	-1~56 Note: -1 indicates null; 0~56 represents FU-00~FU-56; the minimum value of FC-02 is 0				

Run/stop monitoring parameters: Select the parameters to be monitored from the FU menu and display them in standby and running state.

Running monitoring parameters: Select the parameters to be monitored from the FU menu and display them only in the running state

FC-13	**Speed display coefficient**	Factory default	1.000	Change	○
Setting range	0.001~10.000 FU-05 "running speed" = 120 × running frequency ÷ number of poles of motor × FC-13 "speed display coefficient" FU-06 "set speed" = 120 × set frequency ÷ number of poles of motor × FC-13 "speed display coefficient"				

It is only used for speed conversion and has no influence on actual speed and motor control

FC-14	**Linear velocity display coefficient**	Factory default	0.01	Change	○
Setting range	0.01~100.00 FU-11 "running linear speed" = running frequency × FC-14 "linear speed display coefficient" FU-12 "set linear speed" = set frequency × FC-14 "linear speed display coefficient"				

It is only used for line speed conversion and has no effect on actual linear speed and motor control.

FC-15~ FC-44	**User parameter 1~user parameter 30**	Factory default	-00.01	Change	○
Setting range	-00.01~FU.56, except the manufacturer parameter Fn, -00.01 is empty, the others are the parameter numbers, for example, F0.01 means F0-01				
FC-45	**User parameter 31**	Factory default	FC.00	Change	△
FC-46	**User parameter 32**	Factory default	F0.10	Change	△
FC-47	**Administrator parameters**	Factory default	F0.17	Change	△
Setting range	Fixed to F0-17 "Administrator password"				

User parameters 1 to 30 are used to select parameters commonly used or concerned by users. When FC-00=1, only these parameters are displayed. This function is especially suitable for supporting users.

User parameters 31 and 32 are fixed as "display parameter selection" and "parameter write protection" and cannot be modified.

Setting example: set F0.01 in FC-15 to indicate that the first function of the user parameter is F0-01, and then set FC-00 to 1. In this way, when entering the menu in the monitoring state, only three parameters of F0-01, FC-00 and F0-10 can be seen.

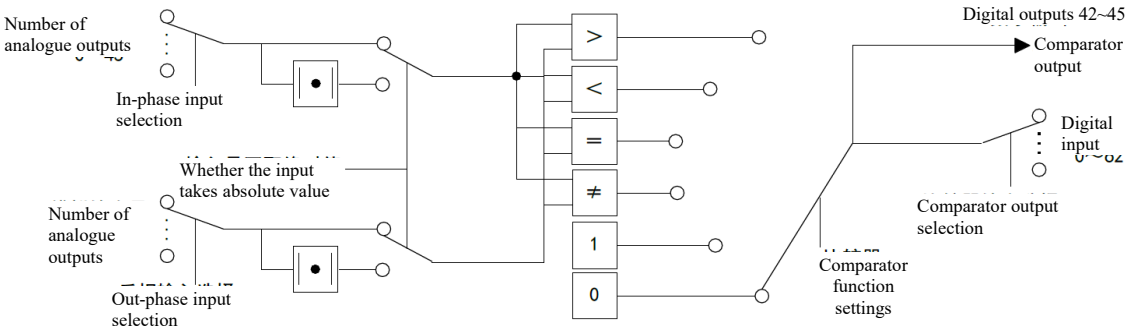
When the administrator password F0-17≠0 is set, only the user parameters are displayed.

6.14 FE Programmable Unit

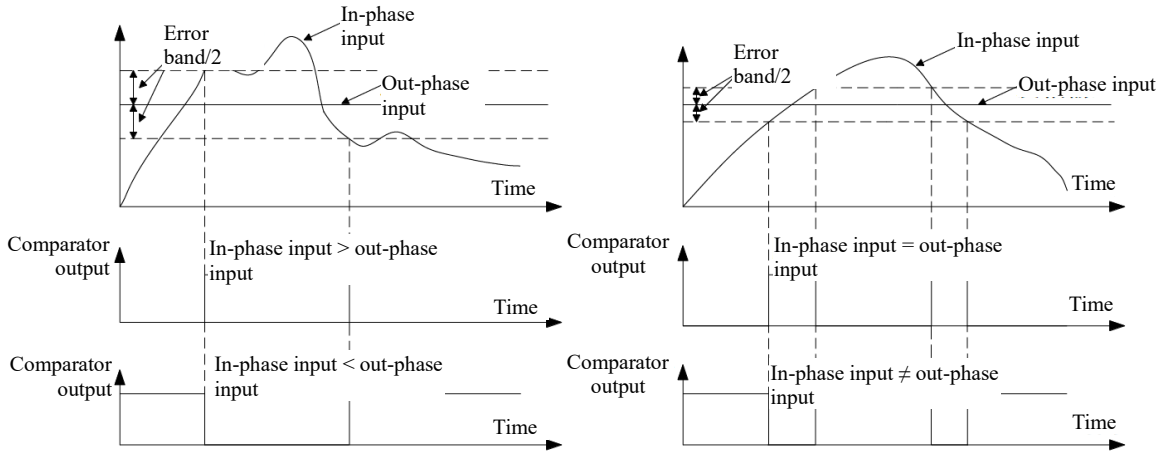
FE-00	**Comparator 1 in-phase input selection**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-01	**Comparator 1 anti-phase input selection**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-02	**Configuration of comparator 1**	Factory default	005	Change	○
Setting range	Units digit: Function settings 0: In-phase input > out-phase input, the comparator outputs 1, otherwise it is 0 1: In-phase input < out-phase input, the comparator outputs 1, otherwise it is 0 2: In-phase input = out-phase input (|in-phase input - out-phase input| ≤ error band/2), the comparator outputs 1, otherwise it is 0 3: In-phase input ≠ out-phase input (|in-phase input - out-phase input| > error band/2), the comparator outputs 1, otherwise it is 0 4: The comparison is invalid, the output is always 1 5: The comparison is invalid, the output is always 0				
	Tens digit: Whether the input is taken in absolute value 0: Absolute value not required 1: Absolute value required				
	Hundreds digit: Comparator output connection protection function selection 0: No action 1: Alarm, and continue to run 2: Report fault (Er.Co1 or Er.Co2), and free stop				
FE-03	**Comparator 1 digital settings**	Factory default	50.0%	Change	○
Setting range	-100.0~100.0%, corresponding to analog output 30				
FE-04	**Comparator 1 error band**	Factory default	5.0%	Change	○

Setting range	0.0~100.0%				
FE-05	**Comparator 1 output selection**	Factory default	0	Change	○
Setting range	See the digital input function definition table on Page 94				
FE-06	**Comparator 2 in-phase input selection**	Factory default	0	Change	○
FE-07	**Comparator 2 anti-phase input selection**	Factory default	0	Change	○
FE-08	**Configuration of comparator 2**	Factory default	005	Change	○
FE-09	**Comparator 2 digital setting** (corresponding to analog output 31)	Factory default	50.0%	Change	○
FE-10	**Comparator 2 error band**	Factory default	5.0%	Change	○
FE-11	**Comparator 2 output selection**	Factory default	0	Change	○
FE-12	**Comparator 3 in-phase input selection**	Factory default	0	Change	○
FE-13	**Comparator 3 anti-phase input selection**	Factory default	0	Change	○
FE-14	**Configuration of comparator 3**	Factory default	005	Change	○
FE-15	**Comparator 3 digital setting** (corresponding to analog output 32)	Factory default	50.0%	Change	○
FE-16	**Comparator 3 error band**	Factory default	5.0%	Change	○
FE-17	**Comparator 3 output selection**	Factory default	0	Change	○
FE-18	**Comparator 4 in-phase input selection**	Factory default	0	Change	○
FE-19	**Comparator 4 anti-phase input selection**	Factory default	0	Change	○
FE-20	**Configuration of comparator 4**	Factory default	005	Change	○
FE-21	**Comparator 4 digital setting** (corresponding to analog output 33)	Factory default	50.0%	Change	○
FE-22	**Comparator 4 error band**	Factory default	5.0%	Change	○
FE-23	**Comparator 4 output selection**	Factory default	0	Change	○
Setting range	All settings of comparators 2 to 4 are the same as those of comparator 1				

Comparator: Compare any two quantities in the analog output definition table on Page 114, the result of the comparison can select the signal in the digital input function definition table on Page 94, and output to the digital output function definition table on Page 106 at the same time. The structure of the comparator is as follows:



The function of the comparator is as follows:



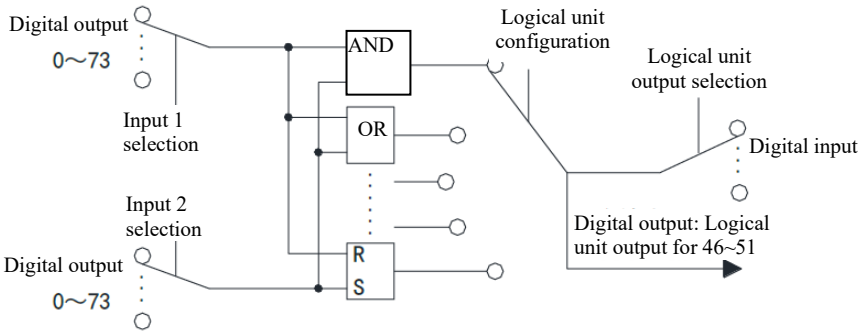
The frequency converter can use the result of the comparison of the two signals as the trigger signal of the frequency converter's protection action, and select the required protection action through the hundreds digit of "comparator configuration".

FE-24	**Logical unit 1 input 1 selection**	Factory default	0	Change	○
Setting range	See the digital output function definition table on Page 106				
FE-25	**Logical unit 1 input 2 selection**	Factory default	0	Change	○
Setting range	See the digital output function definition table on Page 106				
FE-26	**Configuration of logical unit 1**	Factory default	9	Change	○
Setting range	0: Logical AND 1: Logical OR 2: Logical NAND 3: Logical NOR 4: Logical XOR (≠) 5: Logical XNOR (=) 6: Input 1 for direct output, input 2 ignored 7: Input 1 for inverted output, input 2 ignored 8: Output constant 1 9: Output constant 0 10: R-S flip-flop function (input 1 is reset terminal R, and input 2 is set terminal S)				
FE-27	**Logical unit 1 output selection**	Factory default	0	Change	○
Setting range	See the digital input function definition table on Page 94				
FE-28	**Logical unit 2 input 1 selection**	Factory default	0	Change	○
FE-29	**Logical unit 2 input 2 selection**	Factory default	0	Change	○
FE-30	**Configuration of logical unit 2**	Factory default	9	Change	○

FE-31	**Logical unit 2 output selection**	Factory default	0	Change	○
FE-32	**Logical unit 3 input 1 selection**	Factory default	0	Change	○
FE-33	**Logical unit 3 input 2 selection**	Factory default	0	Change	○
FE-34	**Configuration of logical unit 3**	Factory default	9	Change	○
FE-35	**Logical unit 3 output selection**	Factory default	0	Change	○
FE-36	**Logical unit 4 input 1 selection**	Factory default	0	Change	○
FE-37	**Logical unit 4 input 2 selection**	Factory default	0	Change	○
FE-38	**Configuration of logical unit 4**	Factory default	9	Change	○
FE-39	**Logical unit 4 output selection**	Factory default	0	Change	○
FE-40	**Logical unit 5 input 1 selection**	Factory default	0	Change	○
FE-41	**Logical unit 5 input 2 selection**	Factory default	0	Change	○
FE-42	**Configuration of logical unit 5**	Factory default	9	Change	○
FE-43	**Logical unit 5 output selection**	Factory default	0	Change	○
FE-44	**Logical unit 6 input 1 selection**	Factory default	0	Change	○
FE-45	**Logical unit 6 input 2 selection**	Factory default	0	Change	○
FE-46	**Configuration of logical unit 6**	Factory default	9	Change	○
FE-47	**Logical unit 6 output selection**	Factory default	0	Change	○
Setting range	All settings of logical units 2~6 are the same as those of logical unit 1				

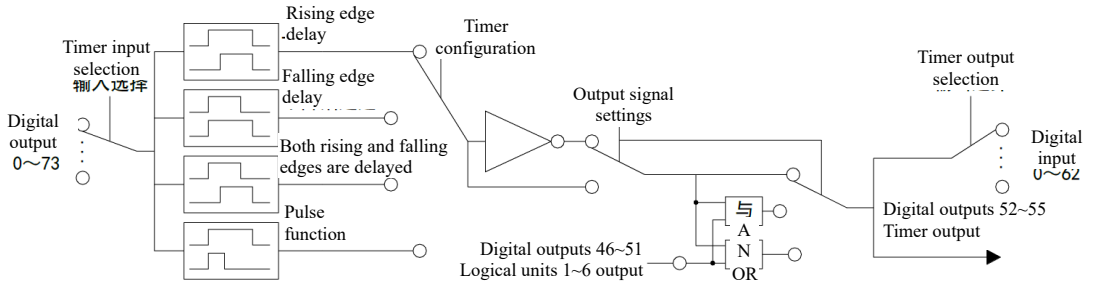
The logical unit can perform logical operations on the two signals in the digital output function definition table on Page 106, and the result can select the signal in the digital input function definition table on Page 94, and output to the digital output function definition table on Page 106.

The logical unit structure diagram is as follows:

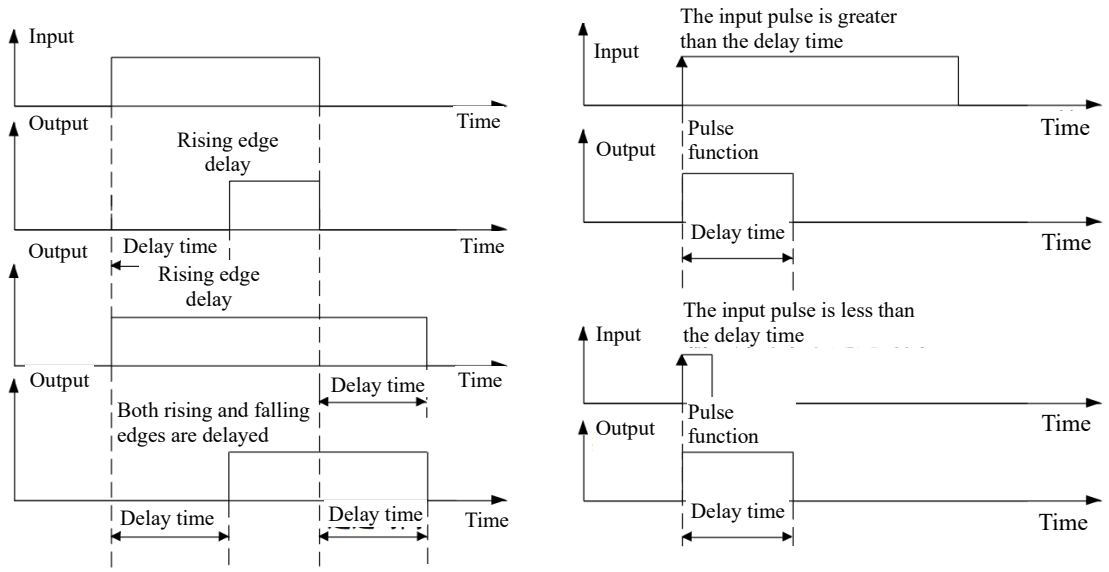


FE-48	**Timer 1 input selection**	Factory default	0	Change	○
Setting range	See the digital output function definition table on Page 106				
FE-49	**Configuration of timer 1**	Factory default	300	Change	○
Setting range	Units digit: Type of timer 0: Rising edge delay 1: Falling edge delay 2: Both rising and falling edges are delayed 3: Pulse function				
	Tens digit: set time multiplier 0: 1 times 1: 10 times 2: 100 times 3: 1000 times 4: 10000 times 5: 100000 times				
	Hundreds digit: Output signal settings 0: No inversion 1: Inversion 2: Output always 1 3: Output always 0 4: Output with logical unit n AND 5: Output with logical unit n NAND 6: Output with logical unit n OR 7: Output with logical unit n NOR Note: n refers to the number of the timer, for example, the number of timer 1 is 1.				
FE-50	**Set time of timer 1**	Factory default	0ms	Change	○
Setting range	0~40000ms, delay time = set time x multiplier				
FE-51	**Timer 1 output selection**	Factory default	0	Change	○
Setting range	See the digital input function definition table on Page 94				
FE-52	**Timer 2 input selection**	Factory default	0	Change	○
FE-53	**Configuration of timer 2**	Factory default	300	Change	○
FE-54	**Set time of timer 2**	Factory default	0ms	Change	○
FE-55	**Timer 2 output selection**	Factory default	0	Change	○
FE-56	**Timer 3 input selection**	Factory default	0	Change	○
FE-57	**Configuration of timer 3**	Factory default	300	Change	○
FE-58	**Set time of timer 3**	Factory default	0ms	Change	○
FE-59	**Timer 3 output selection**	Factory default	0	Change	○
FE-60	**Timer 4 input selection**	Factory default	0	Change	○
FE-61	**Configuration of timer 4**	Factory default	300	Change	○
FE-62	**Set time of timer 4**	Factory default	0ms	Change	○
FE-63	**Timer 4 output selection**	Factory default	0	Change	○
Setting range	All settings of timers 2 to 4 are the same as timer 1				

The timer can delay any signal in the digital output function definition table on Page 106. As a result, the signal in the digital input function definition table on Page 94 can be selected and output to the digital output function definition table on Page 106. The timer structure is shown in the figure below:



The various functions of the timer are as follows:

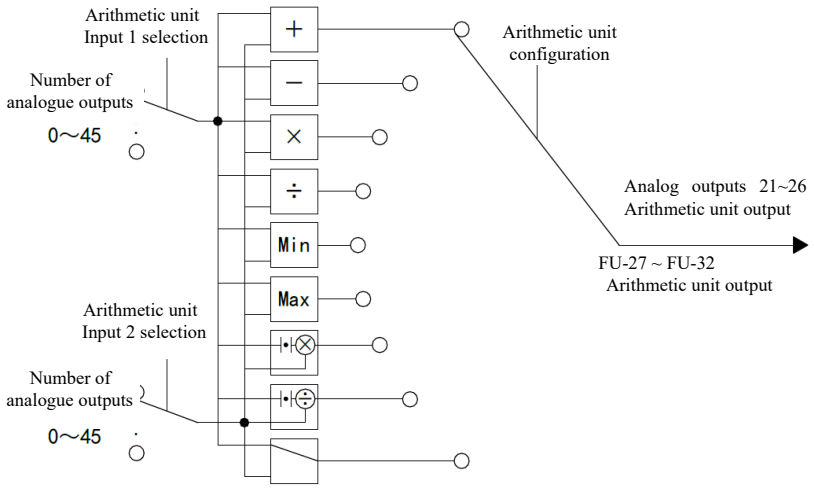


A timer can be used to debounce the signal, such as the rising edge delay function, when the input pulse is less than the delay time, there is no output.

FE-64	**Arithmetic unit 1 input 1 selection**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-65	**Arithmetic unit 1 input 2 selection**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-66	**Configuration of arithmetic unit 1**	Factory default	0	Change	○
Setting range	0: Input 1 + input 2 1: Input 1 - input 2 2: Input 1 × input 2 3: Input 1 ÷ input 2 4: Take the smaller of the two inputs 5: Take the larger of the two inputs 6: Take the absolute value of input 1 and multiply it by input 2 7: Take the absolute value of input 1 and divide by input 2 8: Input 1 for direct output (for connection) 9: Encoder position high word 10: Encoder position low word				
FE-67	**Arithmetic unit 1 digital settings**	Factory default	0.0%	Change	○
Setting range	-100.0~100.0%, corresponding to analog output 34				
FE-68	**Arithmetic unit 2 input 1 selection**	Factory default	0	Change	○
FE-69	**Arithmetic unit 2 input 2 selection**	Factory default	0	Change	○
FE-70	**Configuration of arithmetic unit 2**	Factory default	0	Change	○

FE-71	**Arithmetic unit 2 digital setting** (corresponding to analog output 35)	Factory default	0.0%	Change	○
FE-72	**Arithmetic unit 3 input 1 selection**	Factory default	0	Change	○
FE-73	**Arithmetic unit 3 input 2 selection**	Factory default	0	Change	○
FE-74	**Configuration of arithmetic unit 3**	Factory default	0	Change	○
FE-75	**Arithmetic unit 3 digital setting** (corresponding to analog output 36)	Factory default	0.0%	Change	○
FE-76	**Arithmetic unit 4 input 1 selection**	Factory default	0	Change	○
FE-77	**Arithmetic unit 4 input 2 selection**	Factory default	0	Change	○
FE-78	**Configuration of arithmetic unit 4**	Factory default	0	Change	○
FE-79	**Arithmetic unit 4 digital setting** (corresponding to analog output 37)	Factory default	0.0%	Change	○
FE-80	**Arithmetic unit 5 input 1 selection**	Factory default	0	Change	○
FE-81	**Arithmetic unit 5 input 2 selection**	Factory default	0	Change	○
FE-82	**Configuration of arithmetic unit 5**	Factory default	0	Change	○
FE-83	**Arithmetic unit 5 digital setting** (corresponding to analog output 38)	Factory default	0.0%	Change	○
FE-84	**Arithmetic unit 6 input 1 selection**	Factory default	0	Change	○
FE-85	**Arithmetic unit 6 input 2 selection**	Factory default	0	Change	○
FE-86	**Configuration of arithmetic unit 6**	Factory default	0	Change	○
FE-87	**Arithmetic unit 6 digital setting (corresponding to analog output 39)**	Factory default	0.0%	Change	○
Setting range	All settings of arithmetic units 2~6 are the same as those of arithmetic unit 1, but the configuration range of arithmetic units 3~6 is 0~8.				

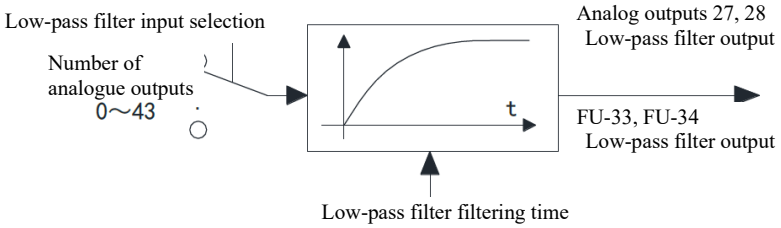
Arithmetic unit: Perform mathematical operations on any two quantities in the analog output definition table on Page 114, and the results can be queried in the FU menu, which can be used as frequency setting, PID setting, PID feedback, etc.; at the same time output to analog output definition table on Page 114. The arithmetic unit structure is as follows:



Arithmetic units 1 and 2 can map the high word and low word of the encoder position of FU-52 and 53. Please refer to the description of position control on Page 133 for details.

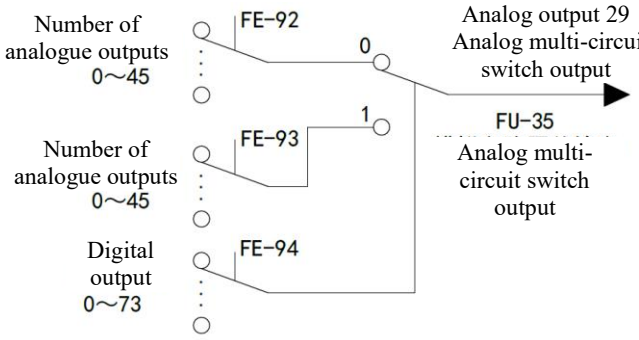
FE-88	**Low pass filter 1 input selection**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-89	**Low pass filter 1 filtering time**	Factory default	0.010s	Change	○
Setting range	0.000~10.000s				
FE-90	**Low pass filter 2 input selection**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-91	**Low pass filter 2 filtering time**	Factory default	0.010s	Change	○
Setting range	0.000~10.000s				

Low-pass filter: Digital low-pass filter can be performed on any quantity in the analog output definition table on Page 114, and the result can be queried in the FU menu; at the same time, it is output to the analog output definition table on Page 114. The structure of the low-pass filter is as follows:



FE-92	**Analog multi-circuit switch input 1**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-93	**Analog multi-circuit switch input 2**	Factory default	0	Change	○
Setting range	See analog output definition table on Page 114				
FE-94	**Analog multi-circuit switch control signal**	Factory default	0	Change	○
Setting range	See the digital output function definition table on Page 106				

Analog multi-circuit switch: The output of the analog multi-circuit switch is selected by FE-94, and the result can be queried in FU-35 "Analog multi-circuit switch output" and simultaneously output to the analog output definition table on Page 114. The block diagram of the analog multi-circuit switch is as follows:



6.15 FF Communication Parameters

FF-00	**COMM2 communication protocol selection**	Factory default	0	Change	×
Setting range	0: Modbus protocol 1: Compatible with USS commands 2: CAN bus Note: COMM1 only supports Modbus communication				
FF-01	**Communication data format**	Factory default	00	Change	×
Setting range	Tens digit: COMM2 data format Units digit: COMM1 data format 0:8,N,1 (1 start bit, 8 data bits, no odd-even check, 1 stop bit) 1:8,E,1 (1 start bit, 8 data bits, even parity check, 1 stop bit) 2:8,O,1 (1 start bit, 8 data bits, odd parity check, 1 stop bit) 3:8,N,2 (1 start bit, 8 data bits, no odd-even check, 2 stop bits) 4: 8,E,2 (1 start bit, 8 data bits, even parity check, 2 stop bits) 5: 8,O,2 (1 start bit, 8 data bits, odd parity check, 2 stop bits)				
FF-02	**Baud rate selection**	Factory default	34	Change	×
Setting range	Tens digit: COMM2 baud rate Units digit: COMM1 baud rate 0: 1,200bps 1: 2,400bps 2: 4,800bps 3: 9,600bps 4: 19,200bps 5: 38,400bps 6: 57,600bps 7: 115,200bps 8: 250,000bps 9: 500,000bps Note: Modbus and compatible USS command protocol selection range is 0~5, and CAN bus selection range is 0~9				
FF-03	**COMM1 address of the machine**	Factory default	1	Change	×
FF-04	**COMM2 address of the machine**	Factory default	1	Change	×
Setting range	0~247 Note: Modbus selection range is 1~247, compatible with USS command selection range 0~31, and CAN bus selection range is 0~127				
FF-05	**Communication timeout detection time**	Factory default	10.0s	Change	○
Setting range	0.1~600.0s				
FF-06	**COMM1 response delay of the machine**	Factory default	5ms	Change	○
FF-07	**COMM2 response delay of the machine**	Factory default	5ms	Change	○
Setting range	0~1000ms				
FF-08	**Communication timeout action**	Factory default	00	Change	×
Setting range	Tens digit: COMM2 communication overtime action Units digit: COMM1 communication overtime action 0: No action 1: Alarm 2: Fault and free stop 3: Alarm, run according to F0-00 4: Alarm, run at the upper limit frequency 5: Alarm, run at the lower limit frequency				
FF-09	**COMM2USS message PZD word count**	Factory default	2	Change	×

Setting range	0~4				
FF-10	**COMM1 communication set frequency ratio**	Factory default	1.000	Change	○
FF-11	**COMM2 communication set frequency ratio**	Factory default	1.000	Change	○
Setting range	0.001~30.000, the communication set frequency is multiplied by this parameter as the frequency setting				

The COMM1 communication port is the RS485 interface of the local control board. See Page 30.

The COMM2 is the optional communication port. See Chapter IX Communication Components.

The Hope530G frequency converter RS485Modbus protocol consists of three layers, i.e., the physical layer, the data link layer, and the application layer. The physical layer and data link layer adopt Modbus protocol based on RS485, and the application layer controls frequency converter operation, stop, parameter reading and writing and other operations.

The Modbus protocol is a Master-slave protocol. The communication between the host and the slave has two types, i.e., the host requests and the slave responds, or the host broadcasts and the slave does not respond. Only one device can transmit on the bus at any time, and the host polls the slave. The slave cannot send messages without receiving the command from the host. The host can send the command repeatedly if the communication is not correct. If no response is received within a given period of time, the polled slave is considered lost. If the slave cannot execute a certain message, it sends an exception message to the host.

Communication writes to the frequency converter parameters only by modifying the values in RAM. If it is required to write RAM parameters to EEPROM, it is necessary to rewrite the communication variable "EEP write command" (Modbus address 3209H) to 1.

Frequency converter parameter addressing method: The high 8 bits of 16-bit Modbus parameter address are the group number of parameters, and the lower 8 bits are the number in the group of the parameter, all of them are addressed in hexadecimal way. For example, the address of parameter F4-17 is 0411H. For communication variables (control words, status words, etc.), the parameter group number is 50 (32H). Note: Communication variables include frequency converter parameters that can be accessed by communication, special command variables for communication and special status variables for communication. Corresponding communication parameter group number of menu code is shown in the table below:

Menu code	Parameter group No.	Menu code	Parameter group No.	Menu code	Parameter group No.	Menu code	Parameter group No.
F0	0 (00H)	F5	5 (05H)	FA	10 (0AH)	FF	15 (0FH)
F1	1 (01H)	F6	6 (06H)	Fb	11 (0BH)	Fn	16 (10H)
F2	2 (02H)	F7	7 (07H)	FC	12 (0CH)	FP	17 (11H)
F3	3 (03H)	F8	8 (08H)	Fd	13 (0DH)	FU	18 (12H)
F4	4 (04H)	F9	9 (09H)	FE	14 (0EH)	Communication variable	50 (32H)

Data type in communication: The data transmitted in communication is 16-bit integer, and the minimum unit can be derived from the decimal point position of the parameter in the parameter list. For example, for F0-00 "Digital set frequency", the minimum unit of is 0.01Hz, so for Modbus protocol, communication transmission 5000 represents 50.00Hz.

Communication command variables:

Name	Modbus address	Change	Description
Master control word	3200H	○	Bit 0: ON/OFF1 (operation on rising edge; stop when it is 0) Bit 1: OFF2 (free stop if it is 0) Bit 2: OFF3 (emergency stop if it is 0) Bit 3: Drive lockout (drive lockout if it is 0) Bit 4: Ramp enabling (stop acceleration and deceleration if it is 0) Bit 5: Not used

			Bit 6: Not used Bit 7: Fault reset (fault reset on rising edge) Bit 8: Forward jogging Bit 9: Reverse jogging Bit 10: Not used Bit 11: Set value is reversed (set frequency is reversed if it is 1, and set frequency is not reversed if it is 0) Bit 12: Host computer digital quantity 1 (for programmable unit) Bit 13: UP Bit 14: DOWN Bit 15: Host computer digital quantity 2 (for programmable unit)
Communication set frequency	3201H	○	A non-negative number with a unit of 0.01Hz, multiplied by the communication set frequency ratio and used as frequency setting
Host computer analog quantity 1	3202H	○	Range: -32768~32767 Except for position control, please set the value within the range of -10000~10000
Host computer analog quantity 2	3203H	○	
Extended control word 1	3204H	○	Bit 0 to Bit 15 correspond to digital inputs 1 to 16
Extended control word 2	3205H	○	Bit 0 to Bit 15 correspond to digital inputs 17 to 32
Extended control word 3	3206H	○	Bit 0 to Bit 15 correspond to digital inputs 33 to 48
Extended control word 4	3207H	○	Bit 0 to Bit 13 correspond to digital inputs 49 to 62, and the remaining bits are reserved
Extended control word 5	3208H	○	Reserved
EEPROM write	3209H	○	When writing 1 in the address, the parameters in RAM of the frequency converter will write in EEPROM

Note: Digital input 37 "3-wire stop command", 38 "Internal virtual FWD1 terminal", 39 "Internal virtual REV1 terminal", 40 "Internal virtual FWD2 terminal", 41 "Internal virtual REV2 terminal" are only used for terminal control, communication modification is invalid.

Communication status variables:

Name	Modbus address	Change	Description
Master status word	3210H	△	Bit 0: Ready Bit 1: Operational readiness Bit 2: Running Bit 3: Fault Bit 4: OFF2 is valid (valid when it is 0) Bit 5: OFF3 is in stop (valid when it is 0) Bit 6: Charging contactor is disconnected Bit 7: Alarm Bit 8: Reserved Bit 9: Reserved Bit 10: Frequency level detection signal 1 Bit 11: Reserved Bit 12: Reserved Bit 13: Reserved Bit 14: Forward running Bit 15: Reserved
Running frequency	3211H	△	Non-negative number of unit 0.01Hz
Arithmetic unit 1 output	3212H	△	Unit: 0.01%, When used as encoder position high and low words, the unit is the number of pulses
Arithmetic unit 2 output	3213H	△	
Set frequency	3214H	△	Non-negative number of unit 0.01Hz

Output current	3215H	△	Unit: 0.1A
Output torque	3216H	△	Unit 0.1% rated torque
Output voltage	3217H	△	Unit: 0.1V
Bus voltage	3218H	△	Unit: 0.1V
Fault code	3219H	△	See Page 167 for faults and solutions
Alarm word 1	321AH	△	See Page 170 for faults and solutions
Alarm word 2	321BH	△	See Page 170 for faults and solutions
Extended status word 1	321CH	△	Bit 0 to Bit 15 correspond to digital outputs 0 to 15
Extended status word 2	321DH	△	Bit 0 to Bit 15 correspond to digital outputs 16 to 31
Extended status word 3	321EH	△	Bit 0 to Bit 15 correspond to digital outputs 32 to 47
Extended status word 4	321FH	△	Bit 0 to Bit 15 correspond to digital outputs 48 to 63
Extended status word 5	3220H	△	Bit 0 to Bit 9 correspond to digital outputs 64 to 73

Hope530G frequency converter supports Modbus protocol in RTU (remote terminal unit) mode. The supported functions are: function 3 (read multiple parameters, the maximum number of words is 50), function 6 (write a single parameter), function 8 (loop test), function 16 (write multiple parameters, the maximum number of words is 10), function 22 (mask write). Among them, functions 6, 16 and 22 support broadcasting (the address of the broadcast message is 0). The start and end of an RTU frame are marked by at least 3.5 character intervals (Baud rate of 19,200bit/s and 38,400bit/s: 2ms). Format of RTU frames is as follows:

Slave address (1 byte)	Modbus function number (1 byte)	Data (multiple bytes)	CRC16 (2 bytes)

Function 3: Multi-reading. The number of words read ranges from 1 to 50. The format of report is shown below.

Example: read the master status word, running frequency and arithmetic unit 1 output of slave No. 1 (the address is 3 words starting from 3210H):

The master sends out:

Slave address	01H
Modbus function number	03H
Initial address (high byte)	32H
Initial address (low byte)	10H
Read word count (high byte)	00H
Read word count (low byte)	03H
CRC (low byte)	0AH
CRC (high byte)	B6H

The slave responds:

Slave address	01H
Modbus function number	03H
Returned byte count	06H
High byte of 3210H contents	44H
Low byte of 3210H contents	37H
High byte of 3211H contents	13H
Low byte of 3211H contents	88H
High byte of 3212H contents	00H
Low byte of 3212H contents	00H
CRC (low byte)	5FH
CRC (high byte)	5BH

Function 6: Write only. The number of words written is fixed as 1, and the content returned by slave is consistent with that issued by the host. The format of report is shown below.

Example: The contents of address 3200H can be changed to be 003FH to make the 1# slave operate forward:

The master sends out:

Slave address	01H
Modbus function number	06H
Initial address (high byte)	32H
Initial address (low byte)	00H
Write data high bytes	00H
Write data low bytes	3FH
CRC (low byte)	C7H
CRC (high byte)	62H

The slave responds:

Slave address	01H
Modbus function number	06H
Initial address (high byte)	32H
Initial address (low byte)	00H
Write data high bytes	00H
Write data low bytes	3FH
CRC (low byte)	C7H
CRC (high byte)	62H

Function 16: Multi-writing. The number of words written ranges from 1 to 10. The format of report is shown below.

Example: Change the two words starting at address 3200H to 003FH and 1388H to make the 1# slave operate forward at 50.00Hz:

The master sends out:

Slave address	01H
Modbus function number	10H
Initial address (high byte)	32H
Initial address (low byte)	00H
Written word count (high byte)	00H
Written word count (low byte)	02H
Written byte count	04H
High byte of the first number	00H
Low byte of the first number	3FH
High byte of the second number	13H
Low byte of the second number	88H
CRC (low byte)	83H
CRC (high byte)	94H

The slave responds:

Slave address	01H
Modbus function number	10H
Initial address (high byte)	32H
Initial address (low byte)	00H
Written word count (high byte)	00H
Written word count (low byte)	02H
CRC (low byte)	4FH
CRC (high byte)	70H

Example: Change the two words starting at address 3200H to 003EH and 1388H to stop 1# slave at forward 50.00Hz:

The master sends out:

Slave address	01H
Modbus function number	10H
Initial address (high byte)	32H
Initial address (low byte)	00H
Written word count (high byte)	00H
Written word count (low byte)	02H
Written byte count	04H
High byte of the first number	00H

The slave responds:

Slave address	01H
Modbus function number	10H
Initial address (high byte)	32H

Low byte of the first number	3EH
High byte of the second number	13H
Low byte of the second number	88H
CRC (low byte)	D2H
CRC (high byte)	54H

Initial address (low byte)	00H
Written word count (high byte)	00H
Written word count (low byte)	02H
CRC (low byte)	4FH
CRC (high byte)	70H

📖 Feature 22: Mask Write

When operating on the control word, the "read-change-write" method is cumbersome and time-consuming, and the mask write function provides users with a convenient way to modify one or several bits of the control word. This function is only valid for control word (including main control word and extended control word, but invalid for communication fault reset). The procedure is as follows:

Result = (Operand & AndMask) | (OrMask & (~AndMask)), i.e.:

When OrMask is all 0, the result is the AND of the operand and AndMask, which can be used to clear one or several bits to 0;

When OrMask is all 1, the bit of the operand corresponding to AndMask is 0 will be rewritten to 1, which can be used to set a certain bit or several bits to 1;

When AndMask is all 0, the result is OrMask;

When AndMask is all 1, the result is unchanged.

Example: Set bit 7 (digital input 24: PLC standby state reset) of the 3205H address (extended control word 2) of slave machine 1 to 1 and clear it to zero. The master sends and the slave responds as follows (the slave returns the master command as it is):

Set bit 7 of extended control word 2 to 1

Slave address	01H
Modbus function number	16H
Operand address high byte	32H
Operand address low byte	05H
AndMask high byte	FFH
AndMask low byte	7FH
OrMask high byte	FFH
OrMask low byte	FFH
CRC (low byte)	3EH
CRC (high byte)	68H

Reset bit 7 of extended control word 2

Slave address	01H
Modbus function number	16H
Operand address high byte	32H
Operand address low byte	05H
AndMask high byte	FFH
AndMask low byte	7FH
OrMask high byte	00H
OrMask low byte	00H
CRC (low byte)	3FH
CRC (high byte)	D8H

📖 Function 8: Loop test, the test function number is 0000H, and the frame is required to be returned as it is, as shown in the following example.

📖 Abnormal response: When the slave station cannot complete the request sent by the master station, it returns an abnormal response message, as shown in the following example.

Example of loop test:

Example of abnormal response:

Slave address	1 byte
Response code	1 byte (Modbus function number +

Slave address	01H
Modbus function number	08H
Test function number high byte	00H
Test function number low byte	00H
Test data high byte	37H
Test data low byte	DAH
CRC (low byte)	77H
CRC (high byte)	A0H

	80H)
Error code	1 byte, meaning as follows: 1: Modbus function number that cannot be processed 2: Unreasonable data address 3: Data value out of range 4: Operation failed (write read-only parameters, change parameters that cannot be changed during running, etc.)
CRC (low byte)	-
CRC (high byte)	-

USS Directive Compatibility

Hope530G also has a compatible USS command mode, which is designed to be compatible with the host computer commands that support the USS protocol. It can control the operation of the Hope530G series frequency converter through the host computer software (including PC, PLC and other host computer software) supporting the USS protocol. Input the set frequency of the frequency converter, read the running state parameters of the frequency converter, the running frequency of the frequency converter, the output current, output voltage, and DC bus voltage of the frequency converter. If the user has this demand, please consult the manufacturer.

6.16 FP Fault Record

FP-00	**Last fault type**	Minimum unit	1	Change	△
Description	See list of faults below				
FP-01	**Accumulated running time in the most recent fault**	Minimum unit	1h	Change	△
FP-02	**Operation frequency in the most recent failure**	Minimum unit	0.01Hz	Change	△
FP-03	**Set frequency in the most recent fault**	Minimum unit	0.01Hz	Change	△
FP-04	**Output current in the most recent fault**	Minimum unit	0.1A	Change	△
FP-05	**Output voltage in the most recent fault**	Minimum unit	0.1V	Change	△
FP-06	**Output power in the most recent fault**	Minimum unit	0.1kW	Change	△
FP-07	**Bus voltage in the most recent fault**	Minimum unit	0.1V	Change	△
FP-08	**Inverter bridge temperature in the most recent fault**	Minimum unit	0.1℃	Change	△
FP-09	**Terminal input state 1 in the most recent fault**	Minimum unit	1	Change	△
Description	Ten-thousands digit: DI5 Thousands digit: DI4 Hundreds digit: DI3 Tens digit: DI2 Units digit: DI1 (0: Invalid 1: Valid)				
FP-10	**Terminal input state 2 in the most recent fault**	Minimum unit	1	Change	△
Description	Ten Thousand: DI10 Thousand: DI9 Hundred: DI8 Ten: DI7 Piece: DI6 (0: Invalid state 1: Valid state)				
FP-11	**Second last fault type**	Minimum unit	1	Change	△
FP-12	**Accumulated running time in second last fault**	Minimum unit	1h	Change	△

FP-13	**Third last fault type**	Minimum unit	1	Change	△
FP-14	**Accumulated running time in third last fault**	Minimum unit	1h	Change	△
FP-15	**Fourth last fault type**	Minimum unit	1	Change	△
FP-16	**Accumulated running time in fourth last fault**	Minimum unit	1h	Change	△
FP-17	**Fifth last fault type**	Minimum unit	1	Change	△
FP-18	**Accumulated running time in fifth last fault**	Minimum unit	1h	Change	△
FP-19	**Single operation time in case of fault**	Minimum unit	0.1h	Change	△
FP-20	**Fault record clearing**	Minimum unit	1	Change	○
Setting range	11: Clear this menu parameter, it will automatically change to 00 after the operation is completed				

The frequency converter fault list is as follows:

0: No fault	13.oHI: Frequency converter overheating	26.ccF: Current detection fault
1.ocb: Instantaneous overcurrent at starting	14.oLI: Frequency converter overload	27.ArF: Poor self-tuning
2.ocA: Overcurrent during acceleration	15.oLL: Motor overload	28. Aco: Analog input offline
3.ocd: Overcurrent during deceleration	16.EEF: External fault	29.PGo: PG disconnection
4.ocn: Overcurrent during constant speed operation	17.oLP: Motor overload	30.rHo: Thermistor open circuit
5.ouA: Overvoltage at acceleration	18.ULd: Motor underload	31.Abb: Abnormal stop fault
6.oud: Overvoltage at deceleration	19. Co1: Output protection signal of comparator 1	32.cno: Charging contactor abnormality
7.oun: Overvoltage at constant speed operation	20.Co2: Output protection signal of comparator 2	33. GFF: Grounding fault output
8. ouE: Overvoltage during standby	21.Co3: Output protection signal of comparator 3	34.Io1: Reserved
9.dcL: Undervoltage during operation	22.Co4: Output protection signal of comparator 4	35.Io2: Reserved
10.PLI: Input phase loss	23.EEP: Parameter storage failure	36.PnL: Reserved
11.PLo: Output phase loss	24.C1E: COMM1 communication abnormality	37.dcE: DC bus voltage abnormality
12.FoP: Power device protection	25. C2E: COMM2 communication abnormal	

6.17 FU Data Monitoring

FU-00	**Running frequency**	Minimum unit	0.01Hz	Change	△
Description	Frequency reflecting motor speed				
FU-01	**Set frequency**	Minimum unit	0.01Hz	Change	△
Description	Unit indicator flashes				
FU-02	**Output current**	Minimum unit	0.1A	Change	△
FU-03	**Load current percentage**	Minimum unit	0.1%	Change	△

Description	The rated current of the frequency converter is 100%				
FU-04	**Output voltage**	Minimum unit	0.1V	Change	△
FU-05	**Operating speed**	Minimum unit	1r/min	Change	△
Description	FU-05 = 120 × running frequency ÷ number of motor poles × FC-13 "speed display coefficient"				
FU-06	**Set speed**	Minimum unit	1r/min	Change	△
Description	FU-06 = 120 × set frequency ÷ number of motor poles × FC-13 "speed display coefficient", the unit indicator flashes				
FU-07	**DC bus voltage**	Minimum unit	0.1V	Change	△
FU-08	**Output power**	Minimum unit	0.1kW	Change	△
FU-09	**Output torque**	Minimum unit	0.1%	Change	△
FU-10	**Set torque**	Minimum unit	0.1%	Change	△
Description	When the rated torque is 100%, the unit indicator flashes				
FU-11	**Running linear speed**	Minimum unit	1m/s	Change	△
Description	FU-11 "running linear speed" = running frequency × FC-14 "linear speed display coefficient"				
FU-12	**Given linear speed**	Minimum unit	1m/s	Change	△
Description	FU-12 "set linear speed" = set frequency × FC-14 "linear speed display coefficient", the unit indicator flashes when displayed				
FU-13	**PID feedback value**	Minimum unit	0.1%	Change	△
Description	FU-13 "PID feedback value" = PID feedback channel × F7-03 "PID display coefficient"				
FU-14	**PID set value**	Minimum unit	0.1%	Change	△
Description	FU-14 "PID set value" = PID set channel × F7-03 "PID display coefficient", and the unit indicator flashes				
FU-15	**PID output value**	Minimum unit	0.1%	Change	△
FU-16	**Counter count value**	Minimum unit	1	Change	△
FU-17	**Actual length of length counter**	Minimum unit	1m	Change	△
FU-18	**AI1**	Minimum unit	0.1%	Change	△
FU-19	**AI2**	Minimum unit	0.1%	Change	△
FU-20	**AI3**	Minimum unit	0.1%	Change	△
FU-21	**AI4**	Minimum unit	0.1%	Change	△
FU-22	**PFI**	Minimum unit	0.1%	Change	△
FU-23	**UP/DOWN regulating value**	Minimum unit	0.1%	Change	△
Description	Unit indicator flashes				
FU-24	**PLC current mode and stage**	Minimum unit	0.01	Change	△
Description	Example: 2.03 refers to the stage 3 of mode 2				
FU-25	**Cycled times of PLC**	Minimum unit	1	Change	△

FU-26	**PLC time left in current stage**	Minimum unit	0.1s/min	Change	△
FU-27	**Arithmetic unit 1 output**	Minimum unit	0.1%	Change	△
FU-28	**Arithmetic unit 2 output**	Minimum unit	0.1%	Change	△
FU-29	**Arithmetic unit 3 output**	Minimum unit	0.1%	Change	△
FU-30	**Arithmetic unit 4 output**	Minimum unit	0.1%	Change	△
FU-31	**Arithmetic unit 5 output**	Minimum unit	0.1%	Change	△
FU-32	**Arithmetic unit 6 output**	Minimum unit	0.1%	Change	△
FU-33	**Low-pass filter 1 output**	Minimum unit	0.1%	Change	△
FU-34	**Low-pass filter 2 output**	Minimum unit	0.1%	Change	△
FU-35	**Analog multi-circuit switch output**	Minimum unit	0.1%	Change	△
FU-36	**Heat sink temperature**	Minimum unit	0.1°C	Change	△
FU-37	**Counter deviation**	Minimum unit	0.01%	Change	△
Description	FU-37 = (FU-16 "Counter count value" - F9-14 "Counter preset value") ÷ F9-15 "Set count value" ×100%				
FU-38	**PG detection frequency**	Minimum unit	0.1Hz	Change	△
Description	Signed number, which can represent forward and reverse				
FU-39	**Output power factor**	Minimum unit	0.01	Change	△
FU-40	**Kilowatt-hour meter (high 16 bits)**	Minimum unit	0.1kWh	Change	△
FU-41	**Kilowatt-hour meter (low 16 bits)**				
Description	Displayed in combination with FU-40 and FU-41. When parameter FU-41 "Kilowatt-hour meter (low 16 bits)" is displayed, press and hold △ and ▽ simultaneously to clear both the kilowatt-hour meter and the kilowatt-hour timer.				
FU-42	**Digital input terminal state**	Minimum unit	1	Change	△
Description	Ten-thousands digit: DI5 Thousands digit: DI4 Hundreds digit: DI3 Tens digit: DI2 Units digit: DI1 (0: Invalid 1: Valid)				
FU-43	**Extended digital input terminal state**	Minimum unit	1	Change	△
Description	Ten-thousands digit: DI10 Thousands digit: DI9 Hundreds digit: DI8 Tens digit: DI7 Units digit: DI6 (0: Invalid 1: Valid)				
FU-44	**Digital output terminal state**	Minimum unit	1	Change	△
Description	Thousands digit: T2 Hundreds digit: T1 Tens digit: DO2 Units digit: DO1 (0: Invalid 1: Valid)				
FU-45	**Extended digital output terminal state**	Minimum unit	1	Change	△
Description	Thousands digit: T6 Hundreds digit: T5 Tens digit: T4 Units digit: T3 (0: Invalid 1: Valid)				
FU-46	**Comparator output state**	Minimum unit	1	Change	△
Description	Thousands digit: Comparator 4 Hundreds digit: Comparator 3 Tens digit: Comparator 2 Units digit: Comparator 1 (0: Output 0 1: Output 1)				
FU-47	**Number of COMM1 communication errors**	Minimum unit	1	Change	△
Description	0~65000				

FU-48	**Number of COMM2 communication errors**	Minimum unit	1	Change	△
Description	0~65000				
FU-49	**COMM1 communication polling time**	Minimum unit	0.001s	Change	△
FU-50	**COMM2 communication polling time**	Minimum unit	0.001s	Change	△
FU-51	**Set frequency after acceleration and deceleration ramp**	Minimum unit	0.01Hz	Change	△
Description	The frequency generated after the acceleration and deceleration ramps				
FU-52	**PG high position byte**	Minimum unit	1	Change	△
FU-53	**PG low position byte**	Minimum unit	1	Change	△
Description	The size of the actual position is reflected in the position control, expressed in 32-bit binary numbers, the high word is the high 16 bits, and the low word is the low 16 bits				
FU-54	**Counter 2 count value high byte**	Minimum unit	1	Change	△
FU-55	**Counter 2 count value low byte**	Minimum unit	1	Change	△
Description	In position control, it reflects the deviation between the set position and the actual position, expressed in 32-bit binary numbers, the high word is the high 16 bits, and the low word is the low 16 bits				
FU-56	**Accumulated running time of fan**	Minimum unit	1h	Change	△
FU-57	**Production date**	Minimum unit	00.01	Change	△
Description	Example: 19.01 means January 19				
FU-58	**Frequency converter No.**	Minimum unit	0001	Change	△
FU-61	**Kilowatt-hour timer (high 16 bits)**	Minimum unit	0.1h	Change	△
FU-62	**Kilowatt-hour timer (low 16 bits)**				
Description	Displayed in combination with FU-61 and FU-62. When parameter FU-62 "Kilowatt-hour timer (low 16 bits)" is displayed, press and hold △ and ▽ simultaneously to clear both the kilowatt-hour meter and the kilowatt-hour timer.				
Others	**Reserved**	Minimum unit	-	Change	-

7 Troubleshooting and Exception Handling

7.1 Frequency Converter Faults and Troubleshooting

Table for faults and solutions:

Fault display (fault code)	Fault type	Possible fault causes	Troubleshooting method
Er.ocb Er.ocb (1)	Instantaneous overcurrent at starting	There is phase-to-phase or to-ground short circuit inside the motor or wiring	Check the motor and wiring
		The inverter module is damaged	Seek service
		The starting voltage is too high	Check the torque boost setting
Er.ocA Er.ocA (2)	Overcurrent during acceleration	Acceleration time is too short	Extend acceleration time
		V/F curve is not suitable	Adjust the V/F curve or the torque boost setting
		Restart the rotating motor	Set to the speed track starting; restart after the motor is completely stopped
		The power grid voltage is low	Check the input power
		The power of frequency converter is too small	Use the frequency converter with large power class
		Vector control does not perform parameter self-tuning	Perform parameter self-tuning
Er.ocd Er.ocd (3)	Overcurrent during deceleration	Deceleration time is too short	Extend deceleration time
		There is potential energy load or the inertia torque is too large	Add a proper energy consumption braking assembly outside
		The power of frequency converter is too small	Use the frequency converter with large power class
		Vector control does not perform parameter self-tuning	Perform parameter self-tuning
Er.ocn Er.ocn (4)	Overcurrent of constant speed operation	The load changes suddenly	Reduce the sudden change of load
		Abnormal load	Inspect the load
		The power grid voltage is low	Check the input power
		The power of frequency converter is too small	Use the frequency converter with large power class
		Vector control does not perform parameter self-tuning	Perform parameter self-tuning
Er.ouA Er.ouA (5)	Overvoltage during acceleration	Input voltage abnormality	Check the input power
		Restart the rotating motor	Set to the speed track starting; restart after the motor is completely stopped
Er.oud Er.oud (6)	Overvoltage during deceleration	Deceleration time is too short	Extend deceleration time
		There is potential energy load or the load inertia is too large	Select proper dynamic braking assembly outside
		Input voltage abnormality	Check the input power
		Inappropriate ASR parameters	Adjust ASR parameters to reduce overshooting
Er.oun Er.oun (7)	Overvoltage at constant speed operation	Input voltage abnormality	Check the input power
		The set time of acceleration and deceleration is too short	Extend the time of acceleration and deceleration properly
		Input voltage has abnormal changes	Install the input reactor
		Load inertia is large	Adopt the dynamic braking assembly
Er.ouE Er.ouE (8)	Overvoltage in standby mode	Input voltage is too high	Check the input power
		DC bus voltage detection circuit fault	Seek service

Fault display (fault code)	Fault type	Possible fault causes	Troubleshooting method
Er.dcL Er.dcL (9)	Undervoltage during running	Input voltage is abnormal or power fails during operation	Inspect the input power supply and wiring
		There is heavy load impact	Check load
		Charging contactor is damaged	Check and replace
		Input phase loss	Inspect the input power supply and wiring
Er.PLI Er.PLI (10)	Input phase loss	Inputs R, S, and T have phase loss	Check installation wiring
		Three input phases are unbalanced	Check input voltage
Er.PLo Er.PLo (11)	Output phase loss	Outputs U, V and W have phase loss	Check output wiring, motor, and cable
Er.FoP Er.FoP (12)	Protection for power devices	Output with phase-to-phase or grounding short circuit	Rewire
		Connection wires or plug-ins of the control board are loose	Check and reconnect wiring
		The connecting wire between the motor and the frequency converter is too long	Add an output reactor or filter
		There is serious interference or the frequency converter is damaged	Seek service
Er.oHI Er.oHI (13)	Frequency converter overtemperature	Excessive ambient temperature	Decrease the ambient temperature
		Air ducts are blocked or fans are damaged	Clear the air ducts or replace the fans
		Overload	Check the load or select large-power frequency converter
Er.oLI Er.oLI (14)	Frequency converter overload	Overload	Check the load or select large-power frequency converter
		Temperature of frequency converter is too high	Check fans, air ducts, and ambient temperature
		Acceleration time is too short	Extend acceleration time
		Carrier frequency is set too high	Reduce the carrier frequency or select the frequency converter with larger capacity
		V/F curve is not suitable	Adjust the V/F curve and the torque boost
		Restart the rotating motor	Set to speed tracking start Or restart the motor after it is completely stopped
		Input voltage is too low	Check input voltage
Er.oLL Er.oLL (15)	Motor overload	V/F curve is not suitable	Correctly set the V/F curve and the torque boost
		Input voltage is too low	Check input voltage
		The ordinary motor runs with heavy load at low speed for a long time	Add an independent cooling fan or select the variable frequency motor
		Motor nameplate or overload protection is not properly set	Correctly set FA-03, Fb-00 and Fb-01
		Motor is locked or too large sudden load change	Check load
Er.EEF Er.EEF (16)	External fault	External fault terminal is closed	Solve the external fault
Er.oLP Er.oLP (17)	Motor overload	Motor current exceeds the overload detection level and is beyond the detection time	Check load Check the overload protection setting

Fault display (fault code)	Fault type	Possible fault causes	Troubleshooting method
Er.ULd Er.ULd (18)	Motor underload	Output current of frequency converter is less than the underload protection level and beyond the detection time	Check load Check the underload protection setting
Er.Co1 Er.Co1 (19)	Output protection signal of comparator 1	Generated by comparator 1	Check comparator 1 output definition
Er.Co2 Er.Co2 (20)	Output protection signal of comparator 2	Generated by comparator 2	Check comparator 2 output definition
Er.Co3 Er.Co3 (21)	Comparator 3 output protection signal	Generated by comparator 3	Check comparator 3 output definition
Er.Co4 Er.Co4 (22)	Comparator 4 output protection signal	Generated by comparator 4	Check comparator 4 output definition
Er.EEP Er.EEP (23)	Parameter storage failure	Parameter writing error	After reset, try again. If the problem still exists, please seek service
Er.C1E Er.C1E (24)	Abnormal COMM1 communication	Communication parameters are not properly set	Check the FF menu setting
		Severe communication interference	Check the wiring and grounding of communication loop
Er.C2E Er.C2E (25)	Abnormal COMM2 communication	Host computer is not working	Check the host computer and wiring
Er.ccF Er.ccF (26)	Current detection fault	The internal cable or plug-in of the frequency converter is loose	Check and reconnect wiring
		Current sensor is damaged or the circuit is abnormal	Seek service
Er.ArF Er.ArF (27)	Poor self-tuning	Motor nameplate parameter setting error	Set the parameters correctly according to the motor nameplate
		Missing motor or motor phase loss	Check motor wiring
		During complete self-tuning, the motor is not at no load	Take the motor off the mechanical load
		Self-tuning oscillation	Adjust F2-09 "Anti-vibration damping"
Er.Aco Er.Aco (28)	Analog input connection loss	The wiring is disconnected or the external equipment is damaged	Check the external wiring and external equipment
		The threshold of connection loss is not properly set	Check the settings of F6-06 and F6-13
Er.PGo Er.PGo (29)	PG disconnection	The wiring with encoder interface board fails	Check wiring
		Jumper of encoder interface board is not set properly	Refer to section 9.6 to check the jumper
		F4-72 "PG disconnection detection time" is too short	Increase the set value properly
		Encoder fault	Check and replace the damaged encoder
Er.rHo Er.rHo (30)	Thermistor open-circuit	Thermistor is disconnected	Check thermistor connections or seek service
Er.Abb Er.Abb (31)	Abnormal stop fault	The stall state lasts for 1 minute	Set the operating parameters correctly
		Stop using ○ not on the operation panel	-
		PG is connected reversely which causes overspeed	Check PG wiring

Fault display (fault code)	Fault type	Possible fault causes	Troubleshooting method
Er.cno Er.cno (32)	Charging contactor is abnormal (only valid for hardware detection)	The power grid voltage is too low	Check power grid
		Contactor damage	Replace contactor and seek service
		The power-on buffer resistor is damaged	Replace the buffer resistor and seek service
		Control loop is damaged	Seek service
Er.GFF Er.GFF (33)	Output grounding fault	Outputs U, V, W have grounding current	Check output wiring, check motor and cable
Er.Io1 Er.Iol (34)	Reserved	-	-
Er.Io2 Er.Io2 (35)	Reserved	-	-
Er.PnL Er.PnL (36)	Reserved	-	-
Er.dcE Er.dcE (37)	Abnormal DC bus voltage	Detect loop abnormality	Seek service

7.2 Frequency Converter Alarms and Troubleshooting

Table for alarms and solutions:

Alarm display	Alarm name	Content and description	Countermeasure	Corresponding Bits of Alarm Characters
AL.oLL AL.oLL	Motor overload	Temperature rise of motor is detected by the thermal model is too high	Refer to solutions to corresponding faults	Word 1 Bit 0
AL.oLP AL.oLP	Motor overload prediction	Motor current exceeds the overload detection level and is beyond the detection time	Refer to solutions to corresponding faults	Word 1 Bit 1
AL.ULd AL.ULd	Motor underload	Output current of frequency converter is less than the underload protection level and beyond the detection time	Refer to solutions to corresponding faults	Word 1 Bit 2
AL.Aco AL.Aco	Analog input connection loss	Analog input signal is lower than the connection loss threshold	Refer to solutions to corresponding faults	Word 1 Bit 4
AL.PLI AL.PLI	Input phase loss	Input phase is lost or three phases are imbalanced	Refer to solutions to corresponding faults	Word 1 Bit 5
AL.PLo AL.PLo	Output phase loss	Output phase loss	Refer to solutions to corresponding faults	Word 1 Bit 6
AL.C1E AL.C1E	Abnormal COMM1 communication	Communication timeout	Refer to solutions to corresponding faults	Word 1 Bit 7
AL.C2E AL.C2E	Abnormal COMM2 communication			Word 1 Bit 8
AL.EEP AL.EEP	Abnormal EEP storage	Parameter writing failure	Refer to solutions to corresponding faults Press ENTER to clear	Word 1 Bit 9
AL.dcL AL.dcL	DC busbar undervoltage	The DC bus voltage is below the undervoltage point	The information is normal as per switching off display	Word 1 Bit 11

Alarm display	Alarm name	Content and description	Countermeasure	Corresponding Bits of Alarm Characters
AL.Co1 AL.Col	Comparator 1 alarm	Generated by comparator 1	Check comparator 1 output definition	Word 1 Bit 12
AL.Co2 AL.Co2	Comparator 2 alarm	Generated by comparator 2	Check comparator 2 output definition	Word 1 Bit 13
AL.Co3 AL.Co3	Comparator 3 alarm	Generated by comparator 3	Check comparator 3 output definition	Word 1 Bit 14
AL.Co4 AL.Co4	Comparator 4 alarm	Generated by comparator 4	Check comparator 4 output definition	Word 1 Bit 15
AL.PGo AL.PGo	Encoder offline	Encoder no signal	Refer to solutions to corresponding faults	Word 2 Bit 0
AL.cno AL.cno	Contactor abnormality	The power grid voltage is too low	Check power grid	Word 2 Bit 1
		Contactor damage	Replace contactor and seek service	
		The power-on buffer resistor is damaged	Replace the buffer resistor and seek service	
		Control loop is damaged	Seek service	
AL.PLL AL.PLL	AC input power failure alarm	Three-phase power outage	Check the three-phase input line of the power grid	Word 2 Bit 2
AL.PcE AL.PcE	Parameter abnormality	Improper parameter setting	Correct parameter settings or restore factory defaults. Press ENTER to clear	Word 2 Bit 3
AL.oHI AL.oHI	Frequency converter overtemperature	Excessive ambient temperature	Decrease the ambient temperature	Word 2 Bit 4
		Air ducts are blocked or fans are damaged	Clear the air ducts or replace the fans	
		Overload	Check the load or select large-power frequency converter	

7.3 Abnormal Operation of the Frequency Converter and Solutions

Table for abnormal operation and solutions:

Phenomena	Occurrence conditions	Possible cause	Countermeasure
The keys on the operation panel have no response	Some keys or all keys have no response	Operation panel keys are automatically locked	Press and hold ENTER + MENU for 3s to unlock
		The connection wire of the operation panel is in poor contact	Check the connecting line and seek for service from our company in case of exceptions
		The keys on the operation panel are damaged	Replace the operation panel
		The chip is damaged	Seek service from our company
Parameters cannot be modified	Some parameters cannot be modified	F0-10 is set to 1 or 2	Set F0-10 into 0
		Attributes of parameters are changed to read only	Users cannot modify read-only parameters
	Non-modifiable under running state	Attributes of parameters are changed to non-modifiable under operating state	Modify under standby state

Phenomena	Occurrence conditions	Possible cause	Countermeasure
Frequency converter stops accidentally during running	The frequency converter stops automatically with no stop command, and the running indicator light is off	Fault exists	Find out fault causes and reset the faulty part
		PLC cycle completed	Check PLC parameter setting
		Run command channel 1/2 switch	Check operation and status of run command channel
		Fb-18=3 "Deceleration during instantaneous power failure", and the power failure time is too long	Check DC bus undervoltage action settings and input voltage
	The motor automatically stops with no stop command, and the frequency converter running indicator light is on	Automatic fault reset period	Check the setting of fault automatic reset and fault causes
		In PLC paused state	Check PLC function setting
		Run interrupt	Check run interrupt setting
		Set frequency is 0, under zero frequency operation	Check the set frequency
		PID direct action. Feedback > set PID reaction. Feedback < set	Check PID setting and feedback
The frequency converter cannot start	The frequency converter does not start after giving starting command, and the running indicator light is not on	"Free stop" is valid with the digit 18 inputted	Check the free stop terminal
		"Frequency converter operation prohibited" is valid with the digit 17 inputted	Check the operation prohibition terminal of frequency converter
		Stop button is not closed under the control mode of three-wire type 1, type 2 or two-wire type 3	Check the stop button and wiring
		Run command channel error	Modify the run command channel
		frequency converter is in fault	Troubleshoot
		The logic of input terminal is set improperly	Check the settings of F4-05 and F4-81
		The bus voltage of parallel models is inconsistent	Check the power input loop, voltage detection loop, etc.

8 Maintenance and After-sales Services

⚠DANGER
1. Only professionally trained personnel can disassemble components, perform maintenance, and replace parts; **2. Before inspection and maintenance, make sure the frequency converter is powered off, the high voltage indicator is off, and the voltage between DC+ and DC- is less than 36V, otherwise there is a risk of electric shock;** **3. Do not leave screw, washer and other metal parts in the machine; otherwise, equipment may be damaged and there will be fire risks;** **4. After replacing the control board, relevant parameters must be set before operation, otherwise equipment may be damaged.**

8.1 Daily Maintenance

It is necessary to periodically check the frequency converter and its operating environment because faults may be caused by dust, humidity, vibration and other factors in the environment, as well as aging and failure of devices. Maintaining a good operating environment, recording daily operation data, and finding out abnormal phenomena early are good ways to prolong the service life of the frequency converter. Following aspects shall be inspected in the daily maintenance of frequency converter:

1. Whether the operating environment of the frequency converter meets the requirements;

2. Whether the operating parameters of the frequency converter are within the specified range;

3. Whether there is abnormal vibration or noise;

4. Whether there is an abnormal odor;

5. Whether the fan is functioning normally;

6. Whether the input voltage is within the specified range, and whether the voltage of each phase is in balance.

8.2 Regular Maintenance

Users can inspect the frequency converter regularly once every three/six months as per the using environment. General inspection contents are as follows:

1. Whether the control terminal screws are loose;

2. Whether terminals of main loop are in poor contact, and whether the copper bar joints are overheated;

3. Whether power cables and control cables are damaged, especially whether the surface contacting with metal surface has scratches;

4. Whether the insulation cable tie of cold-pressed terminal of power cable has fallen off;

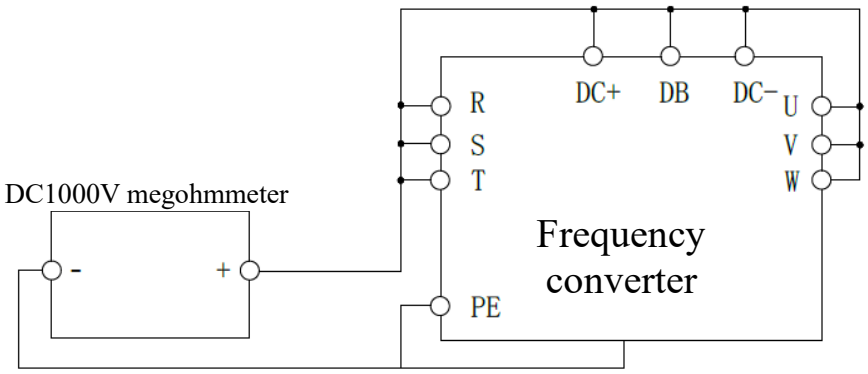
5. The dust in circuit board and air duct shall be cleaned thoroughly, and the dust collector shall be used for the best;

6. Frequency converters stored for a long time must go through one power-on test within two years, which shall last for nearly five hours. A voltage regulator shall be used to increase the voltage to rated value slowly without load.

DANGER: If the insulation test of the motor is carried out, the connection between the motor and the frequency converter must be disconnected, otherwise the frequency converter will be damaged.

DANGER: The control circuit shall not go through the withstand voltage test and insulation test, or circuit components will be damaged.

If you need to perform insulation test on the frequency converter, please connect as shown in the figure below, and you need to loosen the two Phillips screws corresponding to VAR and EMC (see Section 3.3 of Chapter 3 for details). The high-voltage (>1000V) test has been completed before the product leaves the factory, it is strictly forbidden to perform the test again. The measurement result is required to be greater than 1MΩ.



8.3 Replacement of Frequency Converter Consumable Parts

Vulnerable parts of the frequency converter mainly include filtering electrolytic capacitors and cooling fans, with service life closely related to the operating environment and maintenance status. Users can determine whether the vulnerable parts need to be replaced according to the operating time.

- Cooling fan

Possible causes of damage: bearing wear, blade aging (fan lifespan is generally 30,000 to 40,000 hours).

Determination criteria: whether there are cracks on fan blades and abnormal vibration sound when starting the machine.

Precautions for replacement:

1. Replace the fan with the model specified by the manufacturer (rated voltage, current, speed, and air volume must be the same);

2. The direction marked on the fan must be consistent with the supply air direction of the fan;

3. Do not forget to install the fan guard.

- Filter electrolytic capacitor

Possible cause of damage: High ambient temperature, frequent load jump, resulting in increased pulsating current, electrolyte aging.

Determination criteria: Whether there is liquid leakage, and whether the safety valve has bulged. Determination results of electrostatic capacitance and insulation resistance.

It is recommended that the busbar electrolytic capacitor be replaced every 4 to 5 years.

8.4 Storage of Frequency Converter

After the user purchases the frequency converter, the following aspects must be paid attention to for temporary storage and long-term storage:

◆ Avoid storage in places with high temperature, high humidity, high dust content, or metal dust;

◆ Long-time storage will lead to deterioration of electrolytic capacitor, it must be guaranteed to be powered at least once for 5h every time within two years, the input voltage must be increased slowly to the rated value with the voltage regulator.

8.5 After-sales Services

The warranty period of the product is 12 months from the date of purchase, but repair is paid even within the warranty period in the following cases.

1. Damage caused by failure to operate and use according to user's manual;
2. Man-made damage caused by modification without permission;
3. Damage caused by use beyond the requirements of standard specifications;
4. Damage caused by falling down after purchase or caused in transport;
5. Damage caused by fire, flood, abnormal voltage, strong lightning strike, etc.

In case of abnormal working conditions of the frequency converter, check and adjust according to the Manual. In case of fault, please contact the supplier or the local electric company of SLANVERT or the company headquarters in time. Within the warranty period, the Company will provide free repair service for any fault due to the product manufacturing and design defects, and any defect beyond the warranty period will be repaired by the Company after being paid according to customer requirements.

9 Optional Accessories

The optional accessories listed below, if necessary, please order from our company.

9.1 Braking Assemblies

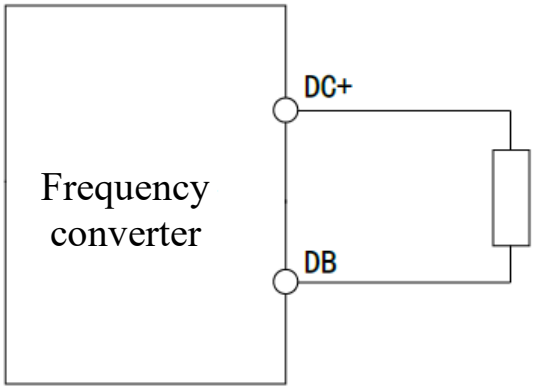
For the frequency converter with built-in braking unit, you can choose a suitable braking resistor. The recommended selection of braking resistor and insulated cable is as follows:

Frequency converter specifications and models	Resistance value (Ω)	Brake copper wire range (mm^2)	Recommended brake copper wire model (mm^2)	Recommended terminal block model	Screw specifications	Tightening torque (N·m)
Hope530G18.5T6BL	≥75	1.5	1.5	OT1.5-8	M8	10.5
Hope530G22T6BL	≥63	1.5	1.5	OT1.5-8	M8	10.5
Hope530G30T6BL	≥46	1.5	1.5	OT1.5-8	M8	10.5
Hope530G37T6BL	≥38	1.5~2.5	2.5	OT2.5-8	M8	10.5
Hope530G45T6BL	≥31	1.5~2.5	2.5	OT2.5-8	M8	10.5
Hope530G55T6BL	≥25	2~4	4	OT4-8	M8	10.5
Hope530G75T6BL	≥19	2~4	4	OT4-8	M8	10.5

Note: When the resistance value exceeds the recommended data in the table, the braking ability will be weakened; generally, it should not be greater than 1.5 to 2.0 times the recommended resistance value.

For the detailed dimension data of SC terminals, see the list of SC terminal models and dimensions on Page 20.

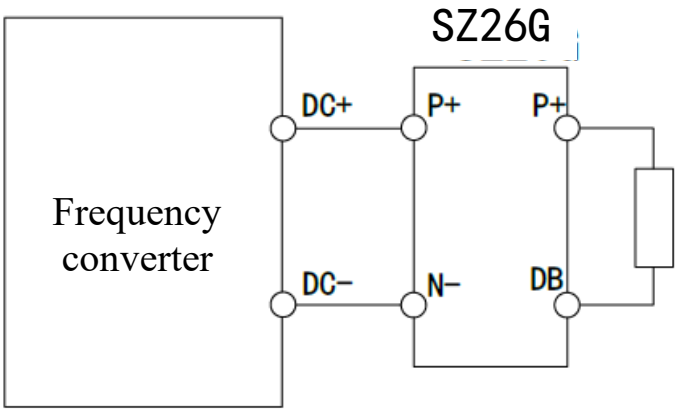
The wiring diagram of the built-in braking unit is as follows:



For frequency converters without built-in braking unit, SZ26G series braking unit and braking resistor are required. The resistance value of the braking resistor shall not be less than the recommended value, otherwise the frequency converter may be damaged. The power of the braking resistor must be determined according to the power generation conditions of the actual load (the size of the power generation, the frequency of power generation, etc.).

The SZ26G series braking unit cooperates with the braking resistor to absorb the regenerative electric energy during motor braking and prevent overvoltage of the frequency converter. In addition to being used in SLANVERT frequency converters, it can also be used in frequency converters of other brands. At the same time, five braking voltages of 1105V, 1155V, 1205V, 1255V, and 1305V（It is 1305V when all are not

shorted) are available, and multiple units can be used in parallel to obtain greater braking power. The wiring diagram of SENLAN SZ series braking unit is as follows:



The wiring between the braking unit and the frequency converter and between the braking unit and the braking resistor shall be within 5m, and the surrounding loop area shall be minimized.

SENLAN SZ series braking unit specifications are as follows:

Braking unit model	Rated current (A)	Light load power (kW)	Heavy load power (kW)	Resistance value (Ω)
SZ26G-40	40	75~90	18.5~55	≥24
SZ26G-60	60	110~132	75~90	≥16
SZ26G-80	80	160	110	≥12
SZ26G-120	120	200~280	132~160	≥8
SZ26G-160	160	315~375	200~250	≥6
SZ26G-240	240	400~560	280~375	≥4

Note: When the resistance value exceeds the recommended data in the table, the braking ability will be weakened; generally, it should not be greater than 1.5 to 2.0 times the recommended resistance value.

ATTENTION: The braking resistor is a heating device, so be sure to install the cabinet independently when using it, otherwise there is a risk of fire.

9.2 Communication Assemblies

■ Operation panel extension cable: The length of the operation panel extension cable can be customized.

■ Profibus-DP module, model is SL510-DP.

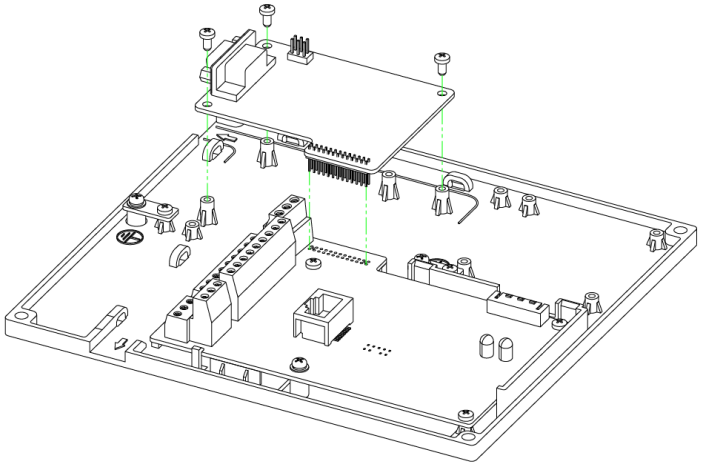
■ OPROFINET module, model is SL510-PN.

■ Isolated RS485 communication module, model is SL510-COMM1.

■ Isolated RS485 communication module (supports TCP) , model is SL510-COMM2.

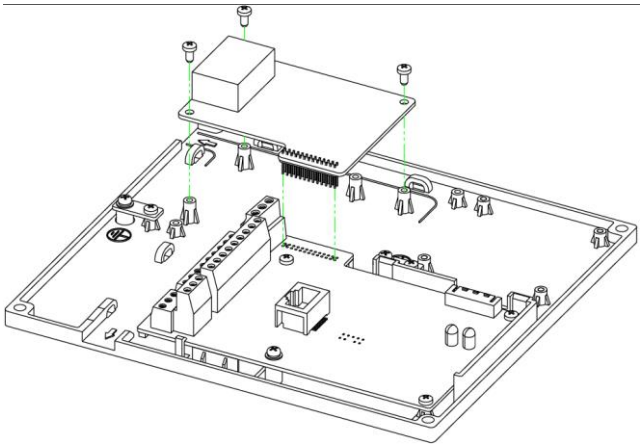
(I) Profibus-DP module

The installation and wiring diagrams for the Profibus-DP module on the control board of models are as follows:



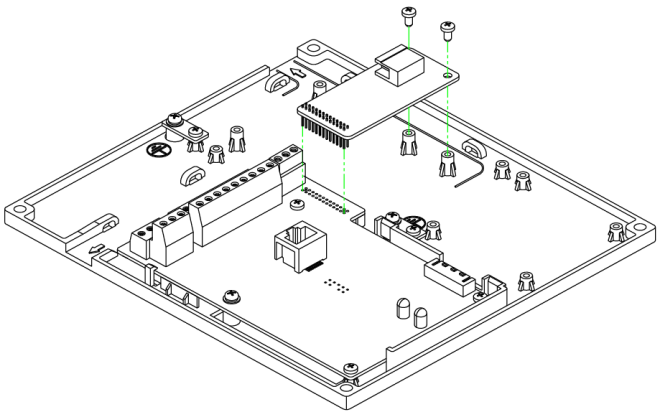
(II) PROFINET module

The schematic diagram of the installation and wiring of the PROFINET module on the control board is as follows:



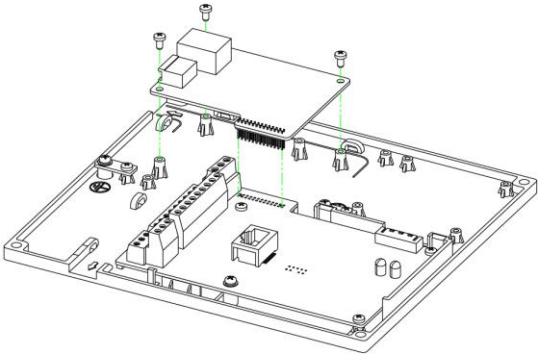
(III) Isolated RS485 communication module

The installation and wiring diagram of the isolated RS485 communication module on the control board is as follows:



(IV) Isolated RS485 communication module (supports TCP)

The wiring diagram for installing the isolated RS485 communication module on the control board is as follows:



9.3 AC Reactor

The AC reactor on the input side can suppress the higher harmonics of the input current of the frequency converter and improve the power factor on the input side. It is recommended to use in the following situations:

- The grid capacity is much greater than the frequency converter capacity and the frequency converter power is greater than 30kW;
- A thyristor load or a power factor compensation device with switch control is connected to the same power supply;
- The voltage unbalance of the three-phase power supply is greater than 3%;
- The power factor on the input side needs to be improved.

The AC reactor on the output side has the following functions:

- Reduce output harmonics of frequency converter;
- Prevent motor insulation damage;
- Reduce the common mode interference on the output side and reduce the motor shaft current.

9.4 EMI Filter and Ferrite Common Mode Filter

The EMI filter is used to suppress the radiation interference generated by the frequency converter, as well as external radio interference and the interference of the instantaneous impact and surge to the frequency converter. The ferrite common mode filter (magnetic ring) is used to suppress the radiated interference generated by the frequency converter.

Filters shall be used in situations where there is a high requirement to prevent radio interference and compliance with CE, UL, and CSA standards, or when there are equipment with insufficient anti-interference ability around the frequency converter. When installing, keep the wiring as short as possible, and the filter shall be as close to the frequency converter as possible.

9.5 Digital I/O Expansion Board

Digital I/O expansion board is used to expand the number of digital input terminals and relay output terminals.

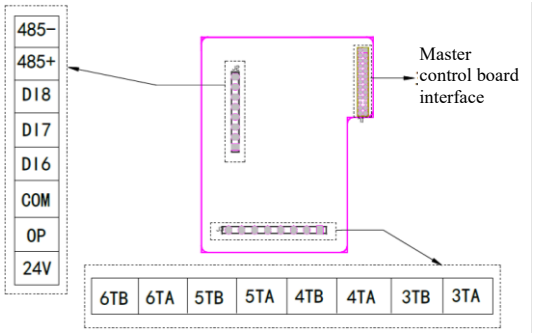
For the basic wiring of the digital input part, see the connection diagram of the multi-function input terminals and external devices on Page 28.

The digital I/O expansion board provides multiple digital inputs and relay outputs, which can be selected by the user. The models of digital I/O expansion boards applicable to the Hope530G series are shown in the table below:

Expansion board model	Expansion function	Remarks
SL510-DIO1	3DI+4T+RS485	3 digital inputs, 4 relay outputs, RS485 communication, with SL510-DIO2 additionally supporting RTC function
SL510-DIO2	3DI+4T+RS485+RTC	
SL510-DIO3	5DI+2T	5 digital inputs, 2 relay outputs

Taking SL510-DIO1 as examples, the functional specifications are as follows:

The terminal distribution of SL510-DIO1 expansion boards is as follows:

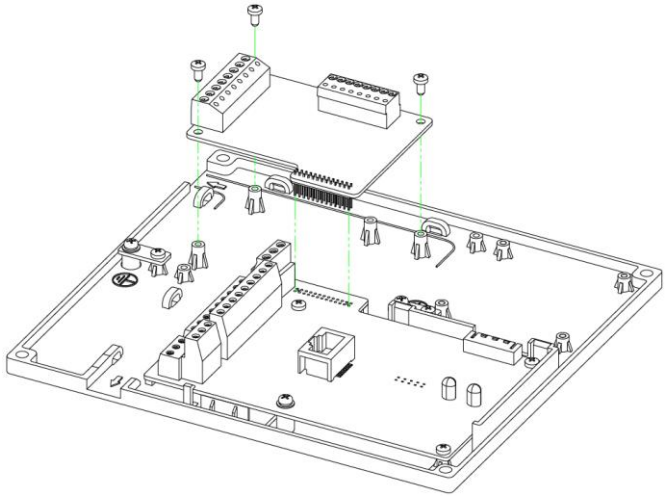


The terminal function descriptions of the SL510-DIO1 expansion boards are as follows:

Terminal symbol	Terminal name	Terminal Function & Description	Technical specifications
24V	24V power terminal	24V power supply provided to the user	24V maximum output current 80mA
COM		24V power ground	
OP	Digital input common terminal	Common terminal of DI6~DI8 terminals	The interior is isolated from COM and 24V. For the use of the OP terminal, see the basic operation wiring connection diagram on Page 22
DI6	DI6 digital input terminal	See F4 menus for function selection and settings Monitoring parameters: FU-43	Optocoupler-isolated Support bi-directional input Input impedance: >3k Ω Input voltage range: <30V Sampling period: 1ms High level: Voltage difference with OP >10V Low level: Voltage difference with OP <3V
DI7	DI7 digital input terminal		
DI8	DI8 digital input terminal		
485+	Positive terminal of 485 differential signal	RS485 communication interface	1~32 RS485 sites can be connected Input impedance: >10kΩ

Terminal symbol	Terminal name	Terminal Function & Description	Technical specifications
485-	Negative terminal of 485 differential signal		
3TA	Output terminal of relay 3	See F5 menu for function selection and settings Monitoring parameters: FU-45	TA-TB: normally open Contact specification: 250VAC/3A 24VDC/5A
3TB			
4TA	Output terminal of relay 4		
4TB			
5TA	Output terminal of relay 5		
5TB			
6TA	Output terminal of relay 6		
6TB			

Installation method: Confirm the frequency converter is powered off, then install the SL510-DIO1 expansion boards onto the control board as shown in the diagram below.



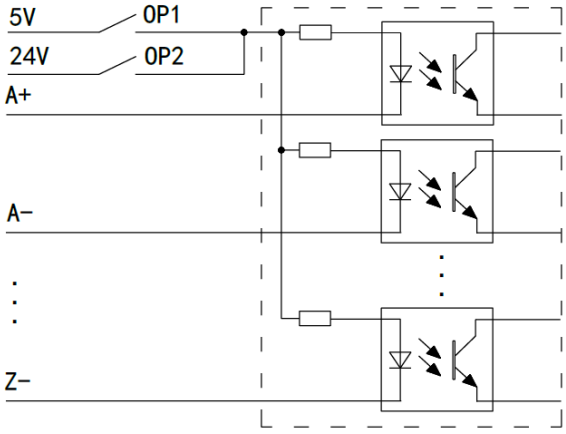
9.6 Encoder Interface Board

The encoder interface board is used to receive the encoder signal, so that the frequency converter can run "with PGV/F control" or "with PG vector control". It can also be used for high-speed counting or meter counting by a counter or length counter. Additionally, it can be connected to the frequency setting and other purposes through analog output 18 "PG detection frequency".

The models for encoder expansion board include SL510-PG0(Pulse generator signal adapter board), SL530-PG1(Resolver encoder signal adapter board). SL510-PG0 provides isolated power supplies of 24V and 5V.

ATTENTION: SL510-PG0 must correctly select the encoder interface type and power supply through jumpers. The factory jumper is 24V.

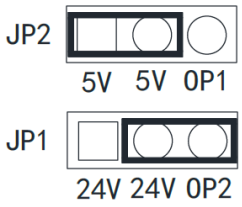
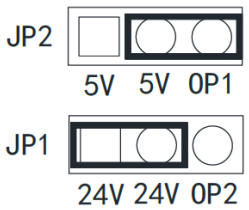
The basic wiring for SL510-PG0 is as follows:



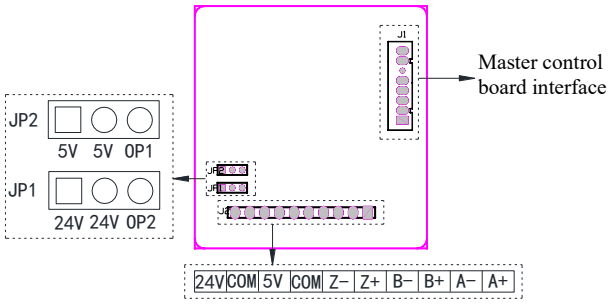
The terminal functions and specifications of the SL510-PG0 encoder interface board are shown in the table below:

Terminal symbol	Terminal name	Terminal Function & Description	Technical specifications
A+	Encoder A+ input terminal	Encoder A in-phase signal input	Maximum input frequency: 300kHz; The single-channel encoder is only connected to the A channel; Non-differential input type must be connected from A+, B+, or Z+. In this case, A-, B-, and Z- must all be shorted to the COM of the encoder interface board
A-	Encoder A- input terminal	Encoder A out-phase signal input	
B+	Encoder B+ input terminal	Encoder B in-phase signal input	
B-	Encoder B- input terminal	Encoder B out-phase signal input	
Z+	Encoder Z+ input terminal	Encoder Z in-phase signal input	
Z-	Encoder Z- input terminal	Encoder Z out-phase signal input	
COM	Power ground	The 24V and 5V power supplies and input signal grounds are isolated from the main control board GND	-
24V	24V power terminal	24V power supply for users	Maximum output current: 80mA
5V	5V power terminal	5V power supply for users	Maximum output current: 200mA

The instructions for using the power jumper of the SL510-PG0 encoder interface board are as follows:

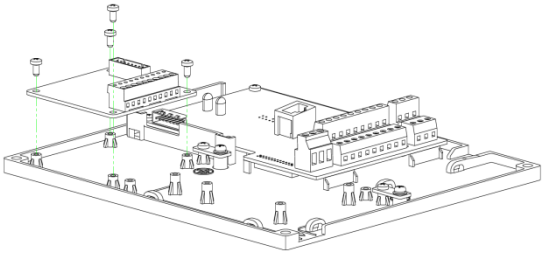
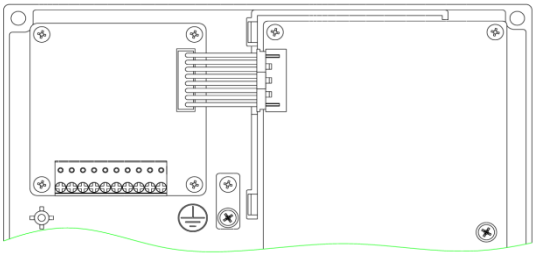
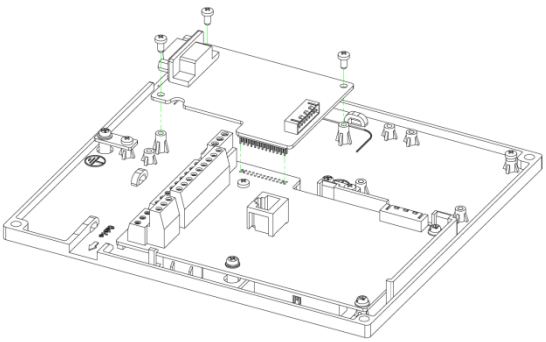
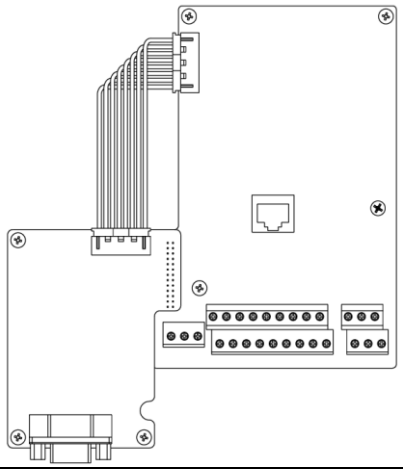
Power Supply	24V	5V
Jumper Position		

The wiring terminals of the SL510-PG0 encoder expansion board are distributed as follows:



Installation method: (1) Confirm that the frequency converter is powered off; (2) Install the encoder signal adapter board according to the encoder installation diagram; (3) Connect the encoder expansion board to the control board according to the method shown in the encoder wiring diagram.

The wiring and installation diagrams of SL510-PG0 and SL530-PG1 on the Complete Machine are as follows:

SL510-PG0 Installation diagram	SL510-PG0 Wiring Diagram
	
SL510-PG1 Installation diagram	**SL510-PG1 Wiring Diagram**
	

⚠ **ATTENTION**	**1. Check whether the coaxiality of the connection between the mechanical shaft and the encoder meets the requirements. If not, torque fluctuation and mechanical vibration will occur.** **2. It is recommended to use a shielded twisted pair to connect the encoder and the encoder interface board. The shielding layer of the shielded line close to the frequency converter end must be connected to the COM of the encoder interface board.** **3. The encoder signal line and power line must be separated, otherwise electric magnetic interference will affect the output signal of the encoder.** **4. Grounding the encoder housing can reduce interference.**

9.7 Operation Panel Option

The operation panel options can be installed away from the frequency converter. The options are as follows:

List of operation panel options

Order No.	Product details
H510-E-1-0m	HOPE-PU04 + installation box
H510-E-1-2m	HOPE-PU04 + installation box + 2m extension cable
H510-E-1-3m	HOPE-PU04 + installation box + 3m extension cable
H510-E-1-5m	HOPE-PU04 + installation box + 5m extension cable
H510-E-2-0m	HOPE-PU07 + installation box
H510-E-2-2m	HOPE-PU07 + installation box + 2m extension cable
H510-E-2-3m	HOPE-PU07 + installation box + 3m extension cable
H510-E-2-5m	HOPE-PU07 + installation box + 5m extension cable

9.7.1 Functions of Operation Panel

The HOPE-PU07 is the standard LED operation panel, but it can also be configured with the HOPE-PU04 (LCD operation panel) or HOPE-PU10 (LED operation panel with potentiometer) based on customer requirements. External extension operation panels can use HOPE-PU04, HOPE-PU07, or HOPE-PU10. For functions and display information, please refer to the relevant content in Chapter 4.

HOPE-PU04 liquid crystal display (LCD) operation panel can set and view parameters, run control, display faults, alarm information, help information, parameter copying and other functions. The operation panel is as follows:

Note 1: The communication data format of the LCD operation panel is fixed to range 0 (i.e., 8, N, 1). Refer to the description of parameters FF-01 for details.

Note 2: The LCD display panel occupies the COMM1 communication interface. COMM1 is no longer available externally. For communication, a communication expansion card needs to be configured.

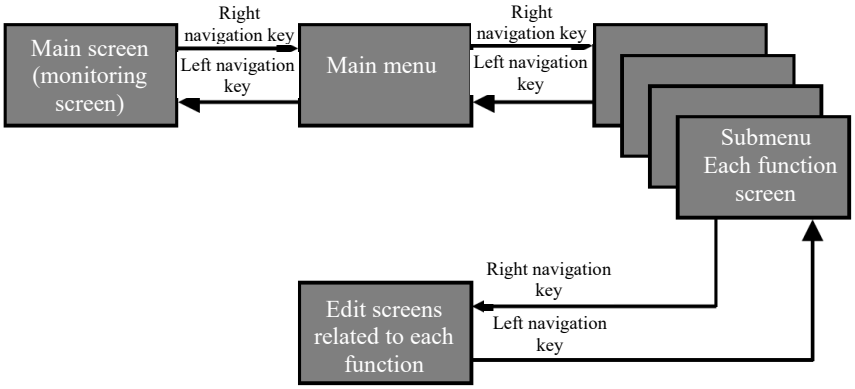
(1) The meanings of the two status indicators RUN and Fault on the operation panel are shown in the following table:

Indicator light	Display state	Indicated current state of the frequency converter
RUN indicator light	Off	Standby state
	On	Stable running state
	Flickering	Accelerating or decelerating
Fault indicator light	Off	Fault-free state
	On	Fault state

(2) Functions of keys on HOPE-PU04 operation panel are shown below:

Key label	Key name	Function
	Left/right navigation keys	The corresponding function is completed according to the display of its corresponding position.
	Increase key	The number increases progressively, and increases faster when long pressing it down
	Decrease key	The number decreases progressively, and decreases faster when long pressing it down
	Left shift key	Select the bit to be modified; in monitoring mode, the monitored parameters can be displayed cyclically
	Right shift key	
	Run key	Run command
	Stop/Reset key	Stop, fault reset
	Help key	When there are alarms and faults displayed, press this key to display help information

(3) The basic hierarchical structure of the LCD operation panel is as follows:

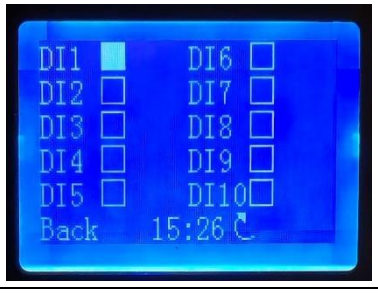


(4) Menu structure function table:

Main menu	Submenu	Function
All parameters	Each functional group number	Set frequency converter parameters
PID regulator	-	Set PID-related parameters
I/O port settings	Digital input	Enter related parameters
	Digital output	
	Analog/pulse input	
	Analog/pulse output	
I/O port status	DI terminal status	Show related status
	DO terminal status	
	Relay terminal	
	Analog input terminal	
Parameter backup	Upload to panel	Perform related operations
	Download to frequency converter (excluding model parameters)	
	Parameters different from the panel	
	Clear backup data	
	Download to frequency converter (including model parameters)	
Modified parameters	-	Display parameters different from factory values
User parameters	User parameter list	Modify related functions
	Change user parameters	Define user parameter function number
LCD settings	LCD contrast adjustment	Modify display contrast
	Time settings	Set time

Main menu	Submenu	Function
	Monitor menu font	Modify the main screen display mode
	Monitoring item switching time	Modify the main screen monitoring item switching time
	∧∨ key given selection	Define the role of the ∧∨ keys in the main screen
	LCD software version Vx.xx	Current software version
	Font library version Vx.xx	Current font library version
	LCD monitoring content selection	Modify the monitoring content of six monitoring items on the main screen
	Only set by the manufacturer	For use by the manufacturer's personnel only

(5) Description of main screen and some sub-screen interfaces

Screen name	Screen	Screen introduction
Large font main screen		There are two types of main screen monitoring displays: large font and small font, which can be changed in the LCD settings menu. The running LOGO reflects the current operating status of the frequency converter. Clockwise rotation indicates forward rotation of the frequency converter, while counterclockwise rotation indicates reverse rotation. A dashed-line LOGO indicates that the frequency converter is in acceleration or deceleration.
Small font main screen		
Modify set frequency on the main screen		Users can modify the set frequency (or digital PID setting) on the main screen. Use the "\V key setting selection" function in the "LCD settings" menu to choose whether to modify the "set frequency" or the "digital PID setting". The display when the set frequency is modified is shown in the left figure
DI terminal monitoring screen		Monitoring I/O port status: Select "I/O port status" in the "Main menu" to view the status of DI terminals, DO terminals, relay terminals, and analog input terminals. On the DI terminal monitoring screen: ■ indicates that the DI terminal (DO terminal, relay terminal) is short-circuited; □ indicates the terminal is disconnected.

Analog input terminal monitoring screen		Analog input terminal monitoring screen

Example: Modifying F0-00 function

Main screen		
Press the "Menu" (right) key to enter the main menu screen ↓ ↑ Press the "Return" (left) key to go back to the monitoring screen		
Main menu screen		
Press the "Enter" (right) key to enter the function selection screen ↓ ↑ Press the "Return" (left) key to go back to the main menu screen		
Function Selection Screen		
Press the "Enter" (right) key to enter the next function selection screen ↓ ↑ Press the "Return" (left) key to go back to the previous function selection screen		
Function Selection Screen		

Press the "Edit" (right) key to enter the function edit screen ↓		↑ Press the "Save" (right) key to save and return to the previous function selection screen. Press the "Cancel" (left) key to not save and return to the previous function selection screen
Function edit screen		Use the "Left shift", "Right shift", "Increase" and "Decrease" keys to modify parameter values

(6) Description of combination key:

■ Keyboard lock: (the function of FC-01 needs to be modified) Hold down the left key and then press the ▽ key, and it will return to the monitoring screen display once this is successfully done.

■ Keyboard unlock: Simultaneously press the left key and the △ key (for more than 3s).

■ Password lock: Simultaneously press the left key and the ▷ key.

■ Free stop: (The panel is not locked, and the run command channel is non-communication control) First hold down the left key, and then double-click the ○ key.

■ In the parameter setting interface, press the ◁ key and the △ key at the same time to enter the previous parameter setting interface.

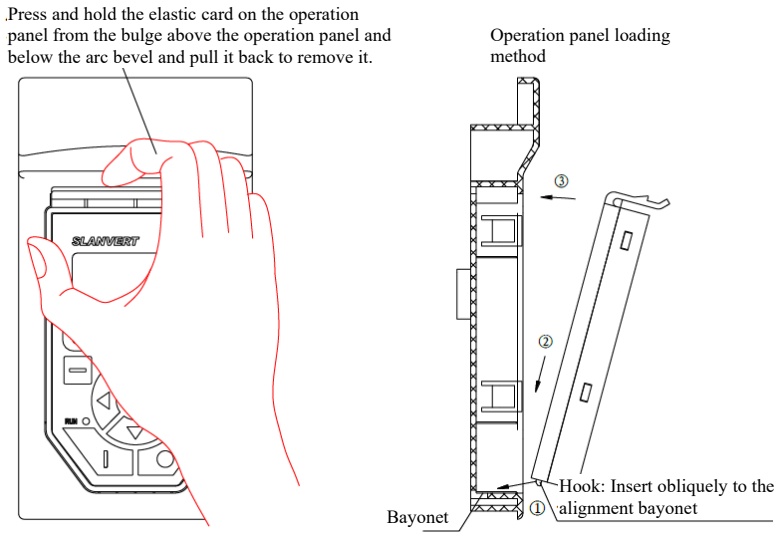
■ In the parameter setting interface, press the ◁ key and the ▽ key at the same time to enter the next parameter setting interface.

■ Administrator password input: Press the left key and the ◁ key simultaneously.

9.7.2 Removal and Installation of the Operation Panel

Removal: Put your fingers on the protrusions above the operation panel and below the arc-shaped slope, press firmly on the shrapnel on the upper end of the operation panel and pull it out, as shown in the figure below.

Installation: Connect the bottom fixing bayonet of the operation panel to the bayonet hook under the installation slot of the operation panel, press and hold the upper part of the operation panel and push it inward with your finger, and then release it, as shown in the following figure:



9.7.3 The operation panel is installed on the cabinet panel

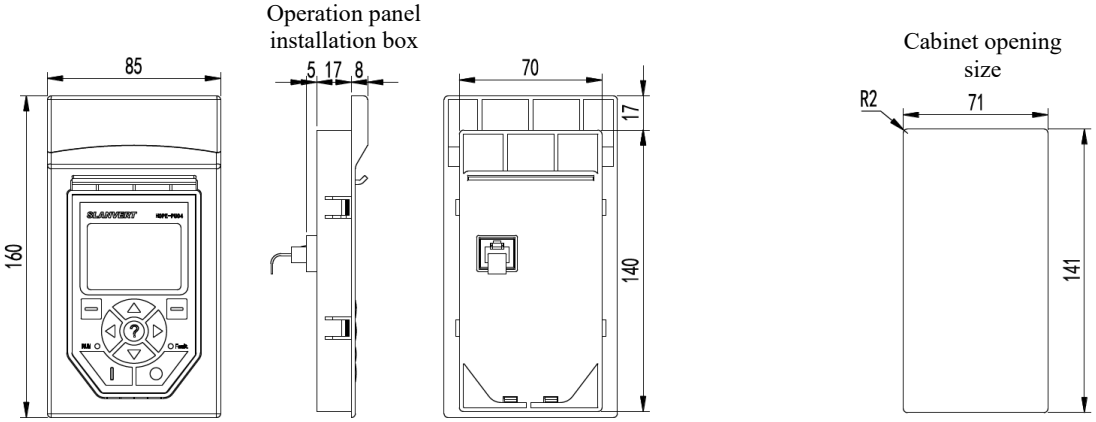
The extended operator panel HOPE-PU04 or HOPE-PU07 for the Hope530G series frequency converter can be installed on the cabinet panel. The operator panel and the frequency converter main unit are connected via an extension cable. The user can install it using the operator panel installation box. The installation steps are as follows:

① Opening holes on the cabinet panel as shown in the following figure;

② Install the operation panel installation box (optional) on the cabinet panel;

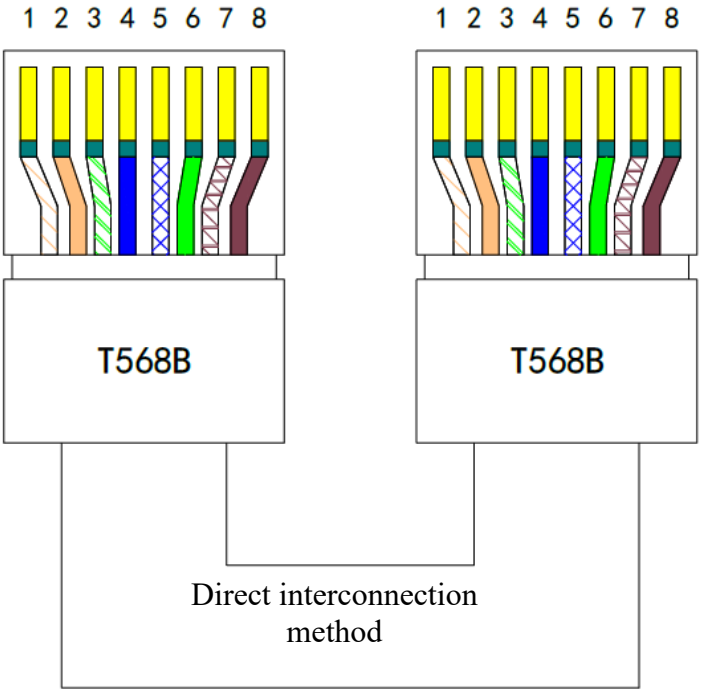
③ Install the operation panel into the installation box;

④ Insert the socket at the end of the extension cable into the operation panel. Insert the other end into the corresponding socket on the circuit board of frequency converter and lock it. Put the chassis cover carefully.



Note: Requirements for extension cables of operation panel are as follows:

Connection of extended cables of operation panel for HOPE-PU04 and HOPE-PU07 shall be subject to standard T568B (direct interconnection method) with RJ-45 joint (crystal head) adopted in crimping mode of corresponding relationship, i.e., 1-1, 2-2, 3-3, …., 8-8 (colors of cables crimped in slot position 1~8 of crystal head are respectively white-orange, orange, white-green, blue, white-blue, green, white-brown, brown according to T568B). as shown in the figure below:



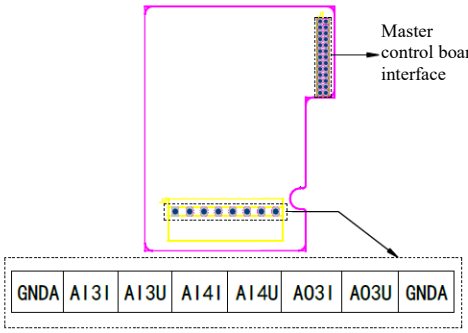
9.8 Analog I/O Expansion Board

The analog I/O expansion board is used to expand the number of analog input and analog output terminals.

The analog I/O expansion board provides multiple analog inputs and outputs, and supports analog voltage input and analog current input. The models of analog I/O expansion boards applicable to each model of the Hope530G series are shown in the table below:

Expansion board model	Expansion function	Remarks
SL510-AIO1	2AI+1AO	2-channel analog input (both voltage and current) 1-channel analog output (both voltage and current)

The terminal distribution of SL510-AIO1 expansion board is as follows:

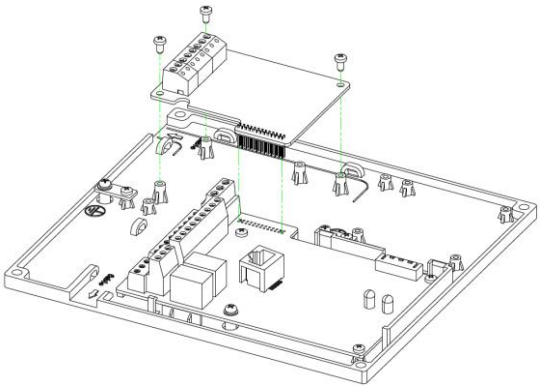


The terminal functions of the SL510-AIO1 expansion boards are described as follows:

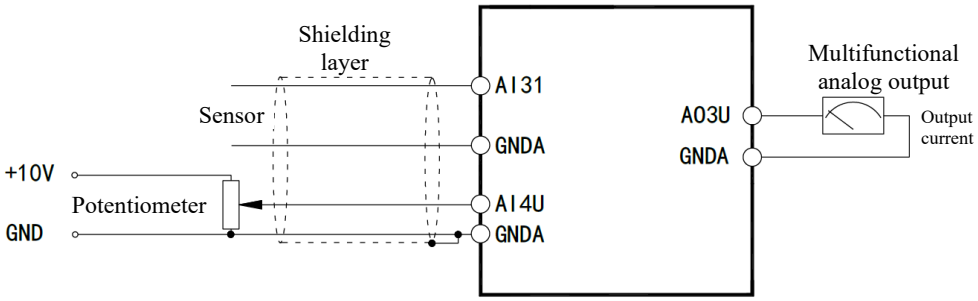
Terminal symbol	Terminal name	Terminal Function & Description	Technical specifications
GNDA	Ground	Grounding terminal for analog input/output	GNDA is internally isolated from COM, OP, and CME
AI31	Analog input 3I (current input)	Function selection: Refer to the description of	Input voltage range: 0~10V Input current range: 0~20mA

Terminal symbol	Terminal name	Terminal Function & Description	Technical specifications
AI3U	Analog input 3U (voltage input)	parameters F6-37 to F6-56.	Input impedance: voltage input: 110kΩ Current input: 250Ω
AI4I	Analog input 4I (current input)		
AI4U	Analog input 4U (voltage input)		
AO3I	Multi-function analog output 3I (current output)	Function selection: Refer to the description of parameters F6-57 to F6-60.	Current type: 0~20mA, load ≤500Ω Voltage type: 0~10V, output ≤10mA
AO3U	Multi-function analog output 3U (voltage output)		

Installation method: Confirm that the frequency converter is powered off, and then install the SL510-AIO1 expansion board on the control board as shown in the figure below.



Wiring method: The AI and AO terminals of the SL510-AIO1 expansion boards have two types, i.e., voltage type and current type. Only one can be used for the same channel. Taking AI3 as a current type input, AI4 as a voltage type input, and AO3 as a voltage type output as examples, the actual wiring method during installation is as shown in the figure below:



Wiring Diagram for SL510-AI01

10 Appendix: Revision Information

Revision Information for Manual Version 1.01

1. Starting from software version V1.21, the kilowatt-hour meter and kilowatt-hour timer in the FU parameter group have been expanded from 16 bits to 32 bits.

2. Precautions for connection were added for the use of copper busbars to connect the terminals of the metal-enclosed frequency converter to peripheral devices.

3. The hundreds digit "Stop hold forced selection" was added in F0-03.

4. The factory default value of F3-04 "ASR parameter switching point" was changed from 0.00Hz to 5.00Hz;

5. The F3-22 factory default value was changed from 90.0% to 94.0%.

6. F5-00 was expanded from only the units digit to the ten-thousands digit, and a description for selecting the digital output signal type (level output or pulse output) was added.

7. Options 44 "COMM2 host computer analog quantity 1" and 45 "COMM2 host computer analog quantity 2" were added to AO function, option 40 was changed from "Host computer analog quantity 1" to "COMM1 host computer analog quantity 1", and option 41 was changed from "Host computer analog quantity 2" to "COMM1 host computer analog quantity 2".

8. Parameter F7-34 "PID correction maximum frequency" and its description were added.

9. The thousands digit "Direction key combination function selection" was added to FC-01, with supplementary descriptions for its associated digital input options 42, 44, and 45.

10. Option 4 "8, E, 2" and option 5 "8, O, 2" were added to FF-01.

11. Optional accessories SL530-PG1, as well as related descriptions were added.

12. Optional accessories for the LED operation panel with potentiometer and related description were added.

User Parameter Record Form

Parameter Code	Parameter Value	Remarks

Parameter Code	Parameter Value	Remarks

SLANVERT Frequency Converter Service Warranty Card NO

To be filled by the Seller	User company		Tel		Fax	
	Company address		Contact			
	Seller		Tel		Fax	
	Company address		Service personnel			
	Product model		Product No.		Received on	Date
	Unpacking inspection and power-on test: □ Normal □ Abnormal					
To be filled by the user	After the installation and commissioning is completed, the user confirms whether the product runs normally: □ Normal □ Abnormal					
	User comments:					

Filling instructions:

1. This form is to be filled out in detail by the service personnel and the user.

2. In order to protect the legitimate rights and interests of users, please keep this card properly, and enjoy one-year warranty (from the date of receipt of the product) and lifetime maintenance services with this document.

3. If there are service problems, please call the service number: 400-619-6968.

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