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Preface

Thank you for purchasing the SLANVERT Hope2000 series high-voltage frequency converter.

The Hope2000 series high-voltage frequency converter, independently developed by HOPE SENLAN SCIENCE AND TECHNOLOGY HOLDING CORP., LTD., is a new-generation, high-performance, and multi-functional unit-series high-voltage frequency converter. It features high power factor, high reliability, high efficiency, low harmonic content, low power consumption, easy maintenance, and small floor space. As a "high-input, high-output" type high-voltage frequency converter that directly takes high-voltage input and delivers high-voltage output via inversion, it is applicable to conventional three-phase high-voltage induction asynchronous motors and can be widely used in metallurgy, electric power, machinery, papermaking, building materials, chemical engineering, petroleum, pharmaceuticals, mining, and other industries.

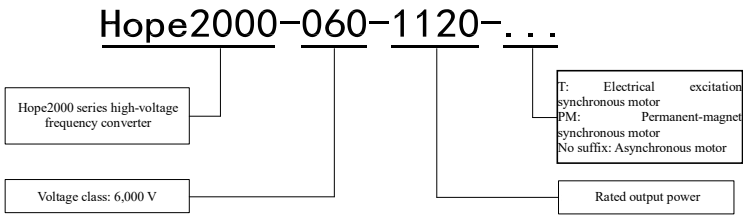
This Manual provides users with installation wiring, parameter setting, daily maintenance, fault diagnosis and troubleshooting, etc. Before installing, setting up, running and maintaining the frequency converter, please be sure to read all the contents of the User Manual of this product in detail, memorize 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 of the 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



Nameplate Description of Frequency Converter: (taking Hope2000-060-1120 as an example)

SLANVERT Frequency Converter

Product model: Hope2000-060-1120
 Rated input: three-phase 6000V 50Hz/60Hz
 Rated output: three-phase 0~6000V 0~60Hz
 Rated current: 138A

Executive standard: GB/T 12668.4
 Product No.: 1234567

Barcode



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: Operation not according to the requirements may result in abnormal operation of the system. In serious cases, it may cause frequency converter or mechanical damage.

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

Name	Meaning and Description
AI	Analog Input, see Page 93
AO	Analog Output, see Page 94
AVR	Automatic Voltage Regulation, see Page 68
EMC	Electric Magnetic Compatibility
EMI	Electric Magnetic Interference
LED	Light Emitting Diode
PID	Proportional-Integral-Derivative, see Page 95
PG	Pulse Generator
PWM	Pulse Width Modulate
Digital input n	It refers to the internal digital signal of the nth item in the digital input function definition table on Page 84. Available for X terminal, FWD, REV terminal selection
Digital output n	It refers to the internal digital signal of the nth item in the digital output function definition table on Page 89. Available for Y terminal, relay selection output

1. Safety and Precautions

1.1 Safety Precautions

I. Installation

- Read and understand the installation section below before installing the high-voltage frequency converter.
- Do not install the frequency converter at the place with or near combustible materials, or there will be a fire risk.
- Do not install it in an environment containing combustible gas, or it may pose an explosion risk.

II. Wiring

- The wiring must be operated by personnel with professional qualifications to prevent the danger of electric shock.
- Make sure the indicator light of the high-voltage live indicator is completely off. Otherwise, it may cause electric shock.
- Make sure the input power supply is completely disconnected, and hang obvious operation signs before wiring operation. Otherwise, it may cause electric shock.
- Comply with standard and local safety rules when installing external wiring. Protective isolation sections must be provided between high- and low-voltage cables and any other cables specified in CE safety standards.
- A high-voltage circuit breaker for circuit protection shall be provided at the power side of the high-voltage frequency converter.
- The grounding terminal (PE) of the frequency converter must be reliably and correctly grounded (ground resistance: $\leq 0.5 \Omega$), otherwise it may cause electric shock.
- The output terminals (U, V, and W) must never be directly connected to the AC power supply.

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

- The variable-frequency speed control system is high-voltage dangerous equipment, and any operator must strictly observe the operation rules when operating.
- Untrained on-duty personnel shall not perform any operation on the touch screen.
- The voltage of the input power terminal shall not exceed the rated voltage range, otherwise the frequency converter will be damaged.
- Check whether the parameter setting is correct before test run.
- The cabinet door cannot be opened when the input power is connected, as there is high voltage inside, and it may cause an electric shock.
- Do not use wet hands to operate the frequency converter, otherwise it may cause electric shock.
- 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.
- Even after the high-voltage circuit breaker is disconnected and the control power switch is turned off, there may still be hazardous voltages in the frequency converter cabinet (e.g., energy storage within the unit).
- There may still be dangerous voltage in the frequency converter cabinet after the circuit breaker is opened (disconnected) and the power is turned off.
- Guardrails (marked with high-voltage hazard signs) shall be installed in the necessary position, and they shall not be removed during operation.

V. Transportation and Packaging Precautions

- Do not place heavy objects on the frequency converter.
- Do not exert any force on the human-machine interface or the cover plate during handling. Otherwise, it may cause personal injury or property damage.
- The equipment in the cabinet must be protected against wind and rain. If it must be stored outdoors temporarily, a heater must be used in the cabinet to prevent condensation. Protective covers such as plastic or canvas shall be placed thereon. These measures are especially important if the equipment is placed for a long time.

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

- 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.

1. Safety and Precautions

■ 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 2500V voltage megohmmeter for test, and it shall guarantee that the measured insulation resistance is not less than 5 MΩ.

II. About the 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

It is advisable to carry out start/stop control for the frequency converter through the stop and start command. 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

Hope2000 series high-voltage frequency converter is not suitable for use outside the allowable input voltage range. If necessary, please contact the manufacturer.

■ Lightning impulse protection

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

■ Derating of frequency converter

- 1) If the ambient temperature exceeds 40°C, the frequency converter shall be derated by 5% per 1°C, 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 it for use. For every 100m, the derating is 1%.

2. Product Specifications

2.1 General Technical Specification of Hope2000 Series High-Voltage Frequency Converter

Item		Item Description
Input	Rated voltage and frequency	Three-phase: 3kV/3.3kV/6kV/6.6kV/10kV/11kV, 50Hz/60Hz
	Allowable range	Voltage fluctuation range: -20%~+15%, available for instantaneous -30%; frequency: $\pm 5\%$
Output	Output voltage	Three-phase, 0V~input voltage, error<5%
	Output frequency range	0.00~60.00 Hz
Basic specifications	Motor control mode	Without PG V/F control, with PG V/F control, without PG vector control, with PG vector control
	Overload Capacity	120% of rated current for 1 minute; Instantaneous protection at 160% of rated current
	Frequency resolution	Digital setting: 0.01Hz; simulation setting: 0.1% of the maximum frequency
	Run command channel	Human-machine interface setting, control terminal setting, communication setting, switchable via terminal
	Frequency setting channel	Human-machine interface, communication, AI1, AI2, AI3
	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: 0.10~50.00HZ; Jog acceleration & deceleration time: 0.1~600.0s
	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
	Momentary power loss handling	When powering down instantaneously, the equipment can continue operating via busbar voltage control
	DC braking capacity	Braking time: 0.0~60.0S, braking current: 0.0%~100.0% of rated current
	Analog input	3-channel analog signal input (voltage/current optional), supporting positive/negative input
	Analog output	4-channel analog signal output, selectable 0/4mA~20mA or 0/2V~10V each, programmable
	Digital input	8-channel optional multifunctional digital input
	Digital output	2-channel multifunctional digital output; 3-channel multifunctional relay output
	Communication	Internal RS485 communication interface, supporting Modbus protocol and Profibus-DP (optional)
Special features	Process PID	Two sets of PID parameters, various modification modes
	Multi-stage speed method	Encoding selection, direct selection, overlap selection and number selection method
Protection function		Overcurrent, overvoltage, undervoltage, input/output phase loss, output short circuit, output grounding, overheat, motor overload, external failure, analog input disconnection, stall prevention, motor PTC or Pt100 overheat protection, etc.
Optional accessories		One-for-one manual bypass cabinet, one-for-two manual bypass cabinet, one-for-one automatic bypass cabinet, one-for-two automatic bypass cabinet, communication

2. Product Specifications

Item		Item Description
Environment		module, SIU-0702-CU human-machine interface, Profibus-DP, and SL-PG-3
	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~+40°C/20~90%RH, without water droplet condensation
	Vibration	Less than 5.9 m/s ² (0.6g)
Structure	Protection rating	IP30 or higher
	Cooling method	Forced cooling, with control fan

2.2 Product Series Specification

Rated values of the Hope2000 series high-voltage frequency converter are as follows:

6 kV class:

Frequency converter model	Rated Capacity (kVA)	Rated output current (A)	Applicable Motor (kW)	Frequency converter model	Rated Capacity (kVA)	Rated output current (A)	Applicable Motor (kW)
Hope2000-060-160	200	20	160	Hope2000-060-710	900	88	710
Hope2000-060-200	250	25	200	Hope2000-060-800	1000	99	800
Hope2000-060-220	275	28	220	Hope2000-060-900	1125	111	900
Hope2000-060-250	315	31	250	Hope2000-060-1000	1250	123	1000
Hope2000-060-280	350	35	280	Hope2000-060-1120	1400	138	1120
Hope2000-060-315	400	39	315	Hope2000-060-1250	1600	154	1250
Hope2000-060-355	450	44	355	Hope2000-060-1400	1750	173	1400
Hope2000-060-400	500	50	400	Hope2000-060-1600	2000	198	1600
Hope2000-060-450	560	56	450	Hope2000-060-1800	2250	222	1800
Hope2000-060-500	630	62	500	Hope2000-060-2000	2500	247	2000
Hope2000-060-560	700	69	560	Hope2000-060-2240	2800	277	2240
Hope2000-060-630	800	78	630	-	-	-	-

Note: 2500kW and above models are non-standard which can be customized by contacting the manufacturer.

10 kV class:

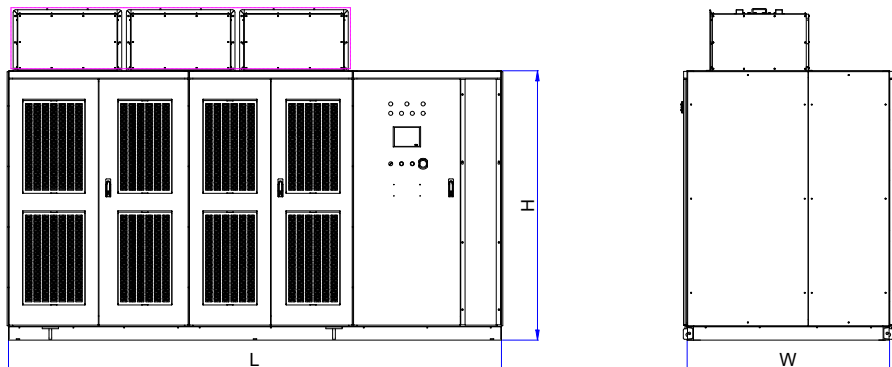
Frequency converter model	Rated Capacity (kVA)	Rated Output Current (A)	Applicable Motor (kW)	Frequency converter model	Rated Capacity (kVA)	Rated Output Current (A)	Applicable Motor (kW)
Hope2000-100-200	250	15	200	Hope2000-100-1000	1250	75	1000
Hope2000-100-250	315	19	250	Hope2000-100-1120	1400	84	1120
Hope2000-100-280	350	21	280	Hope2000-100-1250	1600	94	1250
Hope2000-100-315	400	24	315	Hope2000-100-1400	1750	105	1400
Hope2000-100-355	450	27	355	Hope2000-100-1600	2000	115	1600

2. Product Specifications

Hope2000-100-400	500	30	400	Hope2000-100-1800	2250	130	1800
Hope2000-100-450	560	34	450	Hope2000-100-2000	2500	144	2000
Hope2000-100-500	630	38	500	Hope2000-100-2240	2800	162	2240
Hope2000-100-560	700	42	560	Hope2000-100-2500	3150	182	2500
Hope2000-100-630	800	47	630	Hope2000-100-2800	3500	205	2800
Hope2000-100-710	900	53	710	Hope2000-100-3150	4000	230	3150
Hope2000-100-800	1000	60	800	Hope2000-100-3550	4500	260	3550
Hope2000-100-900	1125	68	900	Hope2000-100-4000	5000	290	4000

Note: 4500kW and above models are non-standard which can be customized by contacting the manufacturer.

The outline drawing of the Hope2000 series frequency converter is as follows:



The dimensions and weight of the Hope2000 series frequency converter are as shown in the table below: (the size and weight of the all-in-one machine are shown below)

6 kV class:

Frequency converter model	L	W	H	Weight (kg)	Frequency converter model	L	W	H	Weight (kg)
Hope2000-060-160	2400	1300	2000	2900	Hope2000-060-710	2900	1500	2000	3600
Hope2000-060-200	2400	1300	2000	2950	Hope2000-060-800	2900	1500	2000	3800
Hope2000-060-220	2400	1300	2000	2980	Hope2000-060-900	2900	1500	2000	3900
Hope2000-060-250	2400	1300	2000	3000	Hope2000-060-1000	2900	1500	2000	4000
Hope2000-060-280	2400	1300	2000	3040	Hope2000-060-1120	2900	1500	2000	4350
Hope2000-060-315	2400	1300	2000	3050	Hope2000-060-1250	2900	1500	2000	4500
Hope2000-060-355	2400	1300	2000	3060	Hope2000-060-1400	3150	1500	2000	4950
Hope2000-060-400	2400	1300	2000	3070	Hope2000-060-1600	3150	1500	2000	5200
Hope2000-060-450	2400	1300	2000	3080	Hope2000-060-1800	3150	1500	2000	5500
Hope2000-060-500	2400	1300	2000	3090	Hope2000-060-2000	4300	1300	2200	5700

2. Product Specifications

Frequency converter model	L	W	H	Weight (kg)	Frequency converter model	L	W	H	Weight (kg)
Hope2000-060-560	2400	1300	2000	3100	Hope2000-060-2240	4300	1300	2200	6600
Hope2000-060-630	2900	1500	2000	3500	-	-	-	-	-

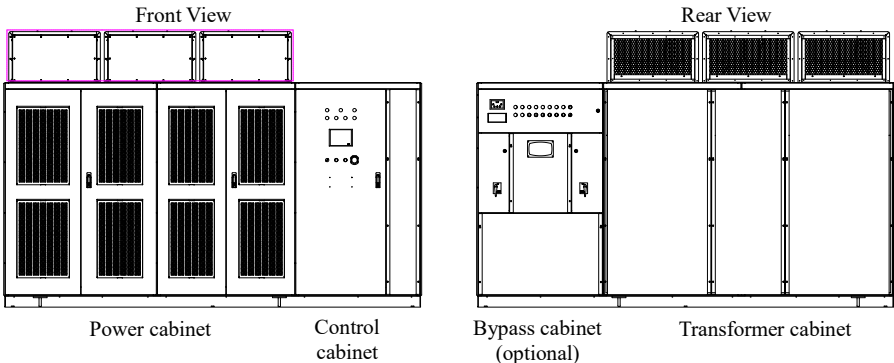
10 kV class:

Frequency converter model	L	W	H	Weight (kg)	Frequency converter model	L	W	H	Weight (kg)
Hope2000-100-200	2400	1300	2000	3000	Hope2000-100-1000	2400	1300	2000	3500
Hope2000-100-250	2400	1300	2000	3050	Hope2000-100-1120	2900	1500	2000	4500
Hope2000-100-280	2400	1300	2000	3070	Hope2000-100-1250	2900	1500	2000	4600
Hope2000-100-315	2400	1300	2000	3070	Hope2000-100-1400	2900	1500	2000	5000
Hope2000-100-355	2400	1300	2000	3080	Hope2000-100-1600	2900	1500	2000	5200
Hope2000-100-400	2400	1300	2000	3100	Hope2000-100-1800	2900	1500	2000	5500
Hope2000-100-450	2400	1300	2000	3100	Hope2000-100-2000	2900	1500	2000	5600
Hope2000-100-500	2400	1300	2000	3100	Hope2000-100-2240	3150	1500	2000	6700
Hope2000-100-560	2400	1300	2000	3120	Hope2000-100-2500	3150	1500	2000	7000
Hope2000-100-630	2400	1300	2000	3120	Hope2000-100-2800	3150	1500	2200	7500
Hope2000-100-710	2400	1300	2000	3140	Hope2000-100-3150	3150	1500	2200	7780
Hope2000-100-800	2400	1300	2000	3180	Hope2000-100-3550	4700	1300	2200	8000
Hope2000-100-900	2400	1300	2000	3200	Hope2000-100-4000	4700	1300	2200	8800

Note: The above size is the standard size, which shall be subject to the project for different products

2.3 Composition and Working Principle of System

2.3.1 Frequency Converter Component



◆ Bypass Cabinet (Optional)

The voltage at the grid side is introduced into the frequency converter, and the output of the frequency converter is sent to the motor through the high-voltage vacuum switch or the isolation switch. It is equipped with a variety of power frequency bypass cabinet specifications for users to choose from. The standard configuration is a manual bypass cabinet, and users can perform power frequency bypass operations.

◆ Transformer Cabinet

Dry phase-shifting transformer is installed to provide low voltage power supply to the power unit. Meanwhile, through the phase-shifting technology, the harmonic THD at the input side of the power grid is kept below 3% when over 70% of the load is loaded.

◆ Power Cabinet

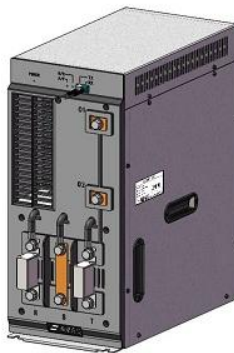
It is the core power part of the frequency converter, with multiple H-bridge power units built in. The output of each phase of the frequency converter is obtained by connecting multiple power units in series. The three-phase output of variable frequency and variable voltage can be obtained by coordinating and controlling the PWM waveform sent by each power unit.

◆ Control Cabinet

As the core control part of the frequency converter, it is responsible for the coordination and control of the whole electrical system, the control and monitoring of the power unit via fiber optics, and communication between various components. Besides, it has a remote monitoring function. It is equipped with the operation button and an LCD human-machine interface.

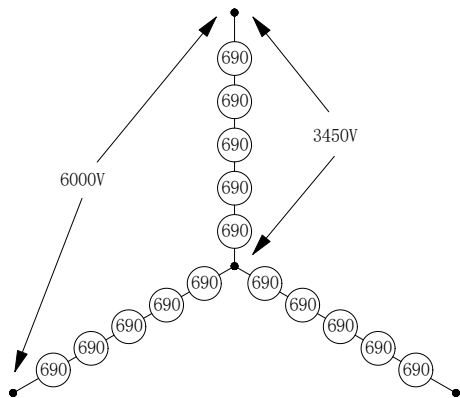
◆ Power Unit

It is the core component of the inverter, with a three-phase AC 690V input and a single-phase PWM inverter output. The unit itself is equipped with such functions as fault detection, protection, and status report. The appearance of the power unit is as shown in the figure below.



2.3.2 Unit-series Principle

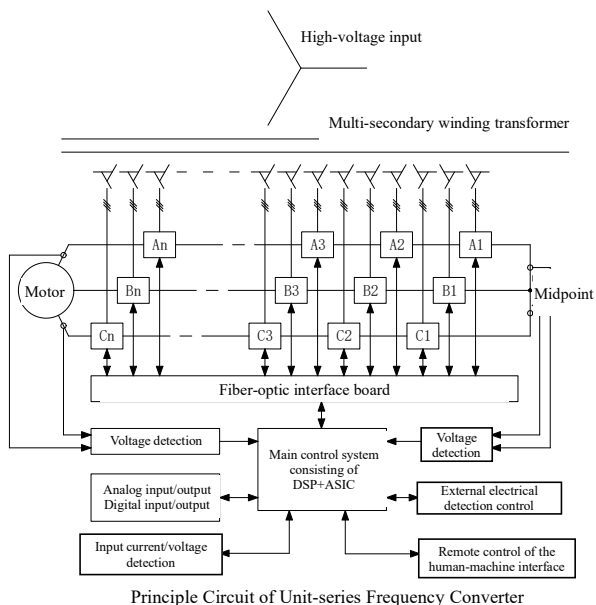
The output of each phase of the Hope2000 series high-voltage frequency converter (6kV) is achieved by connecting 5 units in series, and the principle of voltage superposition is illustrated in the figure below.



Schematic Diagram of Voltage Superposition

Each unit has a three-phase input and a single-phase inverter output. When the system is operated at 50Hz, the effective output voltage of each unit is 690V, and the phase voltage of 5 units is 3450V through superposition, and the line voltage of the three-phase output is 6000V.

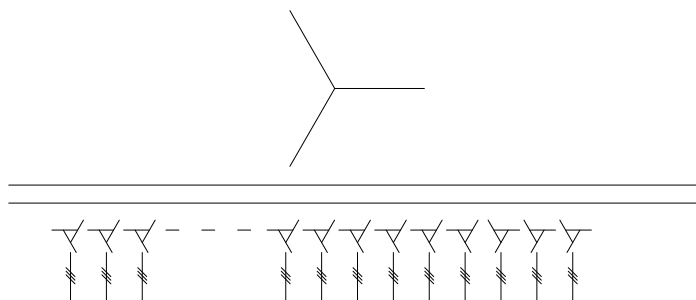
The figure below shows the schematic diagram of the circuit principle of a unit-series high-voltage frequency converter.



The grid input is supplied to the power units separately via multiple sets of secondary outputs provided by a multi-secondary winding phase-shifting transformer. Then, multiple power units are connected in series to form one phase output, which constitutes the three-phase output. The main control system controls the frequency and amplitude of the frequency converter output voltage by regulating the PWM output of each power unit, thereby achieving the purpose of controlling the motor speed. The main control system and unit communicate through fiber optics, which ensures reliable signal transmission and insulated isolation between the main control and high-voltage parts.

2.3.3 Phase-shifting Transformer

The input isolation transformer in the Hope2000 series high-voltage frequency converter is a dry-type multi-secondary winding phase-shifting transformer, and its electrical principle is shown in the figure below:



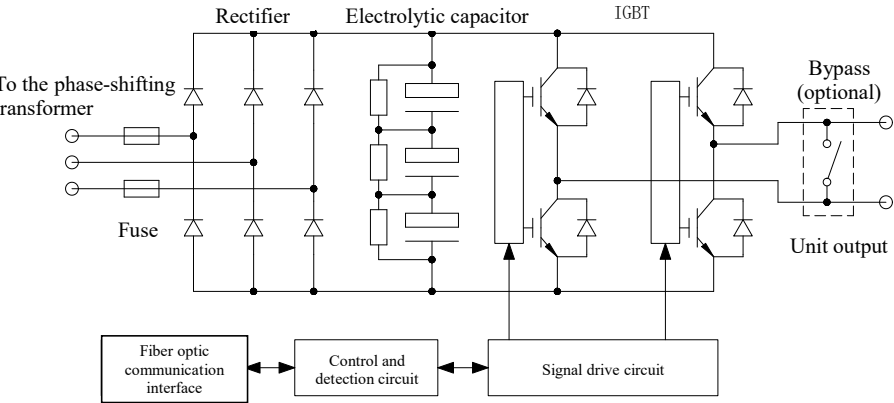
The rated input voltage of the transformer can be arbitrary, and the output voltage at the secondary winding is 690V. The secondary winding has 15 sets of windings in total (6kV system), and each set of windings realizes a certain phase shift through the extension triangle connection, $\text{Phase shift angle} = \frac{60^\circ}{\text{Number of units in each phase}}$. The phase-shifting transformer can

2. Product Specifications

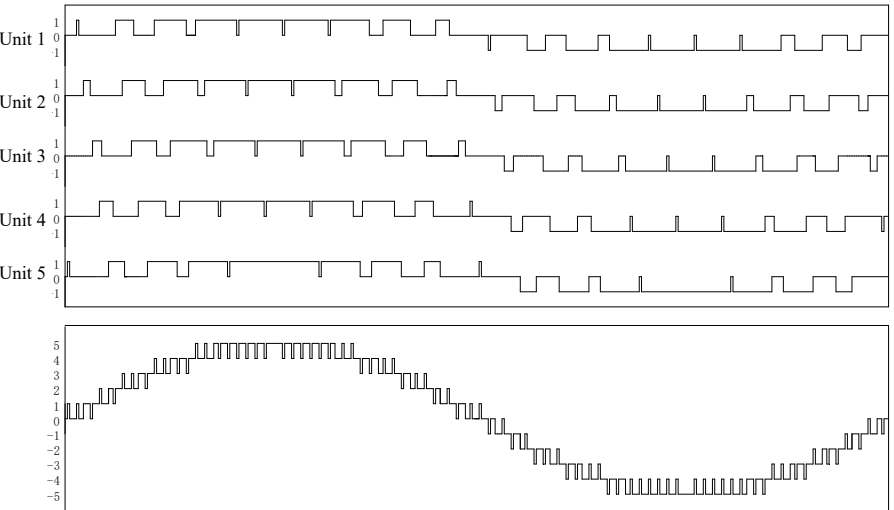
reduce the voltage and supply power to the power unit. Thus, phase-shifting multiplexing of the rectifier input current can be realized, and the leakage reactance effect of the transformer can be added to eliminate the input current harmonics at the network side. The input current THD can be controlled below 3% by using the multi-secondary winding phase-shifting transformer.

2.3.4 Electrical Principle of Power Unit

The power unit is equivalent to a single-phase inverter, and its electrical schematic diagram is shown below, mainly including a three-phase bridge rectifier circuit, a capacitor bank, and an IGBT (or IPM) inverter circuit, as well as a control circuit responsible for optical fiber communication, PWM control, fault detection, and protection.

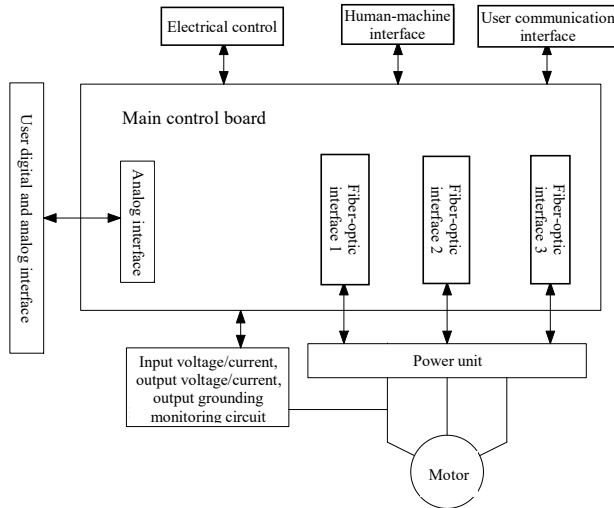


All units in the Hope2000 series high-voltage frequency converter are interchangeable, and each phase obtains a multi-pulse phase voltage output through the series connection of multiple units. The following figure shows the phase voltage output waveform obtained by 5 units in series.



The phase voltage can produce a total of $2 \times 5 + 1 = 11$ steps, and the output voltage harmonics can be suppressed below 5%.

2.3.5 Main Control System



Block Diagram of Main Control System

The block diagram of the main control system is shown above, and the main control system consists of the main control panel, external interface, and some detection circuits. The electric control interface is used for controlling the electrical switch and receiving the user's operational orders. The main control panel consists of a main control circuit, a monitoring circuit, a communication interface of an LCD human-machine interface, voltage and current detection circuits, and a fiber optic communication circuit. The main control circuit is used to compute the PWM pulse and send it to the power units through a fiber-optic communication circuit. LCD human-machine interface is used for parameter settings and status display.

The core components of the main control system of the Hope2000 series high-voltage frequency converter are DSP and FPGA dedicated chips, which feature high reliability and fast computing speed, and have obvious advantages over the main control systems based on single-chip microcomputers.

3. Handling, Installation, and Wiring

3.1 Handling and Installation of Frequency Converter

 DANGER	1. The installation 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.
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Each electrical cabinet of the Hope2000 series high-voltage frequency converter is fully assembled, tested, and packaged before leaving the factory. The cabinet must be transported as a whole during transportation. In order to improve the reliability of the variable-frequency speed control system and avoid damage to the high-voltage variable-frequency system during transportation, the basic requirements for transportation and storage are determined in this chapter. The environmental requirements for transportation and storage detailed in this chapter must be strictly followed. Violation of the relevant requirements in this chapter will affect the service life of the high-voltage variable-frequency speed control system.

3.1.1 Transportation of High-voltage Frequency Converter

The external packaging of the Hope2000 series high-voltage frequency converter can withstand the external impact of sea, land, or air transportation, but appropriate protective measures must be taken to prevent water immersion and dust contamination. In addition, it shall also prevent the impact of external mechanical damage and rough handling during the sea, land, and air transportation process. For proper handling, disassembly, and storage, please pay attention to all relevant notes and instruction labels marked on the packing cases. It is suggested to entrust a reputable logistics company to undertake the hoisting and transportation of the high-voltage variable-frequency speed control system.

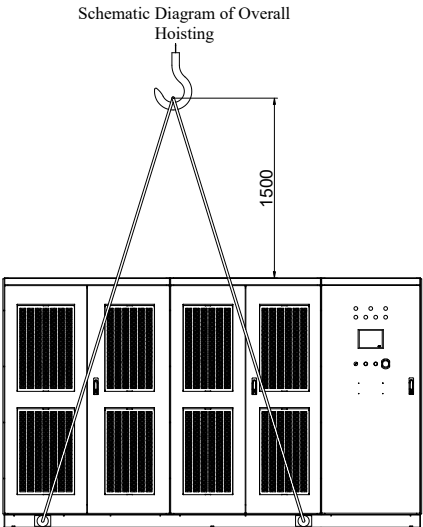
Transportation: The Hope2000 series high-voltage variable-frequency speed control system can be transported by any means of transportation, such as automobiles, trains, airplanes, and ships. Products must be handled with care during transportation, no rain, sun exposure, and there shall be no violent vibration, impact, or reverse.

Handling: In the handling process, in order to prevent the frequency converter from impact and vibration, all cabinet bodies shall not be inverted, and the angle of inclination shall not be greater than 30°. To prevent the deformation of the cabinet, the angle between the sling and the cabinet shall not be less than 60°. See the right figure. Take special care during hoisting to prevent damaging or scratching the cabinet.

The frequency converter shall be placed vertically when handling.

 **ATTENTION:** Since the fan cover will interfere with the hoisting, remove the fan cover before hoisting. Install the fan guard after hoisting.

In addition, all cabinets are provided with forklifts for easy handling.



3.1.2 Storage and Installation Conditions of High-Voltage Frequency Converter

Improper storage of power electronics can affect the life of the equipment and even cause the equipment to fail to function properly.

Storage environment: free from direct sunlight, no dust, no corrosive gases, no flammable gases, no oil mist, no steam, and no dripping;

Relative humidity 5 ~ 95%, storage temperature $-40 \sim +70$ °C, do not place where there is a sudden change in temperature causing condensation and freezing.

Do not place it directly on the ground. It shall be placed on a suitable support. If there is moisture, an appropriate amount of desiccant shall be provided. For long-term storage, it shall be placed in a ventilated environment.

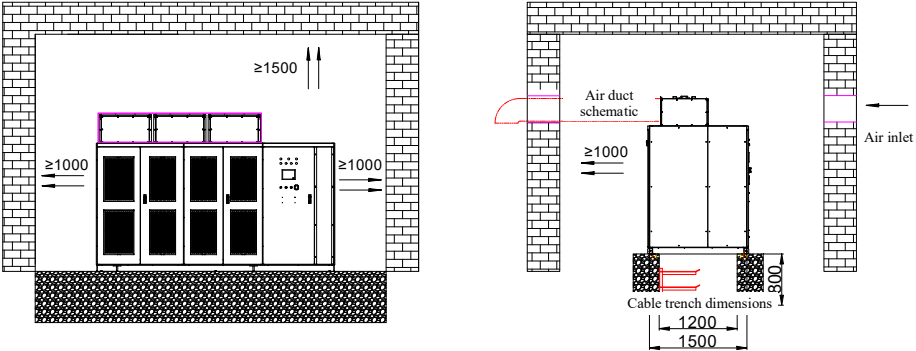
High-voltage electrical equipment is prohibited from being stored in open air or being exposed to rain!

Periodic inspection: check the storage and packaging state of the equipment once a month during the entire storage period, and pay special attention to mechanical damage, effects caused by humidity, temperature, or fire. If the package is damaged or you find that the equipment has been damaged, immediately check the damage to the device, repair the damaged device, and store the variable-frequency speed control system according to the above requirements.

The frequency converter shall be installed in an indoor place with good ventilation. When selecting the installation environment, pay attention to the following conditions:

1. The ambient temperature shall be within $-10 \sim 40$ °C. The service life of the frequency converter is greatly affected by the ambient temperature. The temperature of the surrounding environment shall not exceed the allowable range. If the ambient temperature exceeds 40 °C, the frequency converter shall be derated by 5% per 1 °C, and external forced heat dissipation must be applied;
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 it for use. For every 100m, the derating is 1%;
3. The humidity must be lower than 90% RH, without water droplet condensation;
4. It shall be installed in a place where the vibration is less than 5.9 m/s^2 (0.6g);
5. Avoid installing in places exposed to direct sunlight;
6. The place of installation shall be free from dust and metal powder;
7. It is strictly forbidden to be installed in places with corrosive and flammable gases;
8. The efficiency of the high-voltage frequency converter is above 96%, and the loss is converted into heat energy. In order to reduce the ambient temperature, the user can install a centralized ventilation duct, and then the hot air is directly led through the air duct to the outdoors. It is recommended that the exhaust air volume per 100kW frequency converter capacity be greater than $1,800 \text{ m}^3/\text{h}$. When using air conditioning for cooling, the air conditioning configuration per 100kW frequency converter capacity is greater than 2p.
9. Frequency converter installation interval and distance requirements are shown in the figure below:

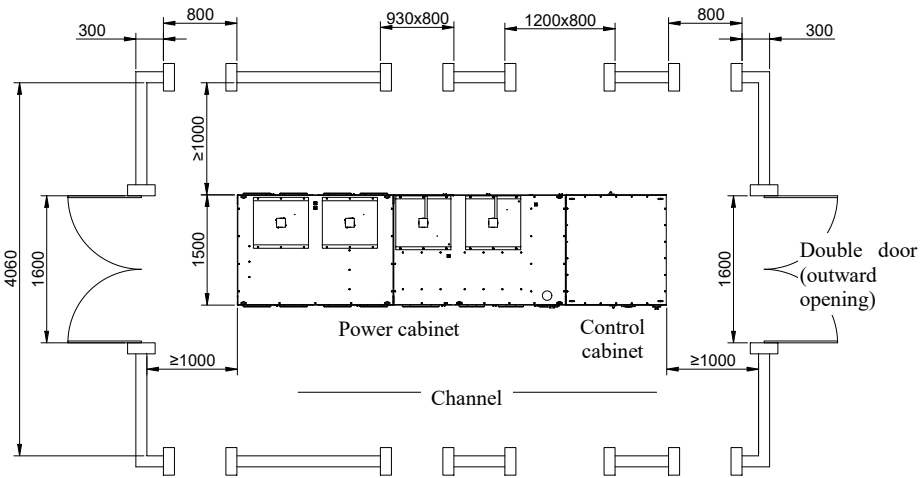
3. Handling, Installation, and Wiring



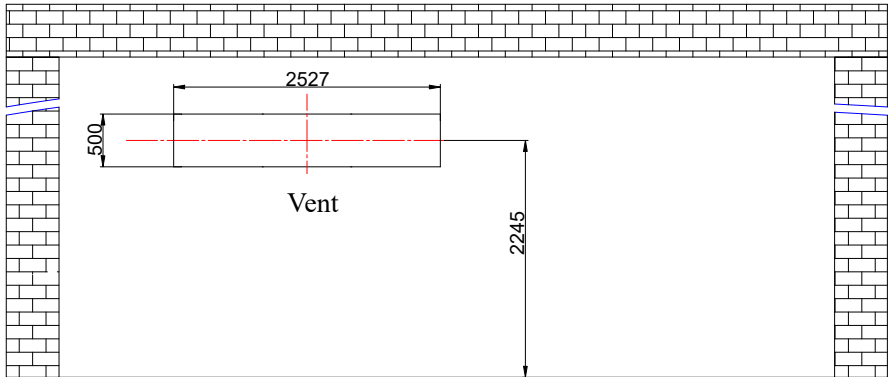
10. Civil Works and Cabinet Installation:

The cabinet of the high-voltage variable-frequency speed control system must be placed vertically on the concrete-grouted flat channel steel foundation frame with an overall surface roughness of less than 5 mm. The foundation must be made of non-combustible materials with smooth and abrasion-free surfaces. The foundation must be moisture-proof and able to withstand the weight of the variable-frequency speed control system. Cable conduits must be made of non-combustible materials with smooth and abrasion-free surfaces. They must be moisture-proof and dust-proof and able to keep animals outside. All cabinets shall be firmly welded to the base and reliably connected to the ground of the plant. The grounding resistance shall not be greater than 0.5Ω . The anti-rust treatment shall be conducted for welding parts.

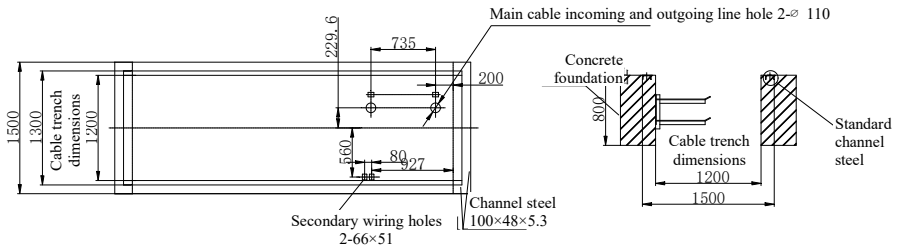
Civil Layout for Equipment Installation (taking Hope2000-060-1120 as an example):



Civil Layout (Plan)



Civil Layout (Elevation View)



Cable Trench and Channel Steel Foundation Drawing

During the civil construction of the plant, one wall shall be reserved as an opening. After the frequency converter is transported and positioned, the wall shall be bricked up.

Notes: ■ For different projects, there may be differences, which shall be subject to the actual project drawings, and the above is for reference only.

■ When selecting the installation location, do not choose an area with water pipes or liquid pipelines nearby to prevent fatal damage to the equipment in case of pipe bursting.

3.2 Wiring of the Frequency Converter

 DANGER
1. Frequency converter wiring can only be carried out by trained personnel. 2. The frequency converter must be grounded reliably, otherwise an electric shock or fire may occur. 3. It is not allowed to connect the power cable to U, V, or W. Otherwise, the frequency converter will explode. 4. 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. 5. The main circuit terminal and the wire cold press terminal must be firmly

connected.

6. Input R, S, T and output U, V, W terminals must be wired in strict accordance with the phase order.

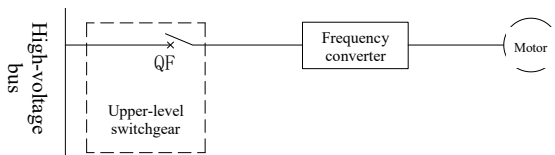
7. It is forbidden to connect a surge-absorbing capacitor to the output of the frequency converter.

3.2.1 Main Circuit Terminal Wiring and Configuration

The high-voltage power supply needs to be connected to the high-voltage frequency converter through the main circuit breaker, and the main circuit breaker is allowed to be closed only after receiving the high-voltage closing permission signal sent by the frequency converter.

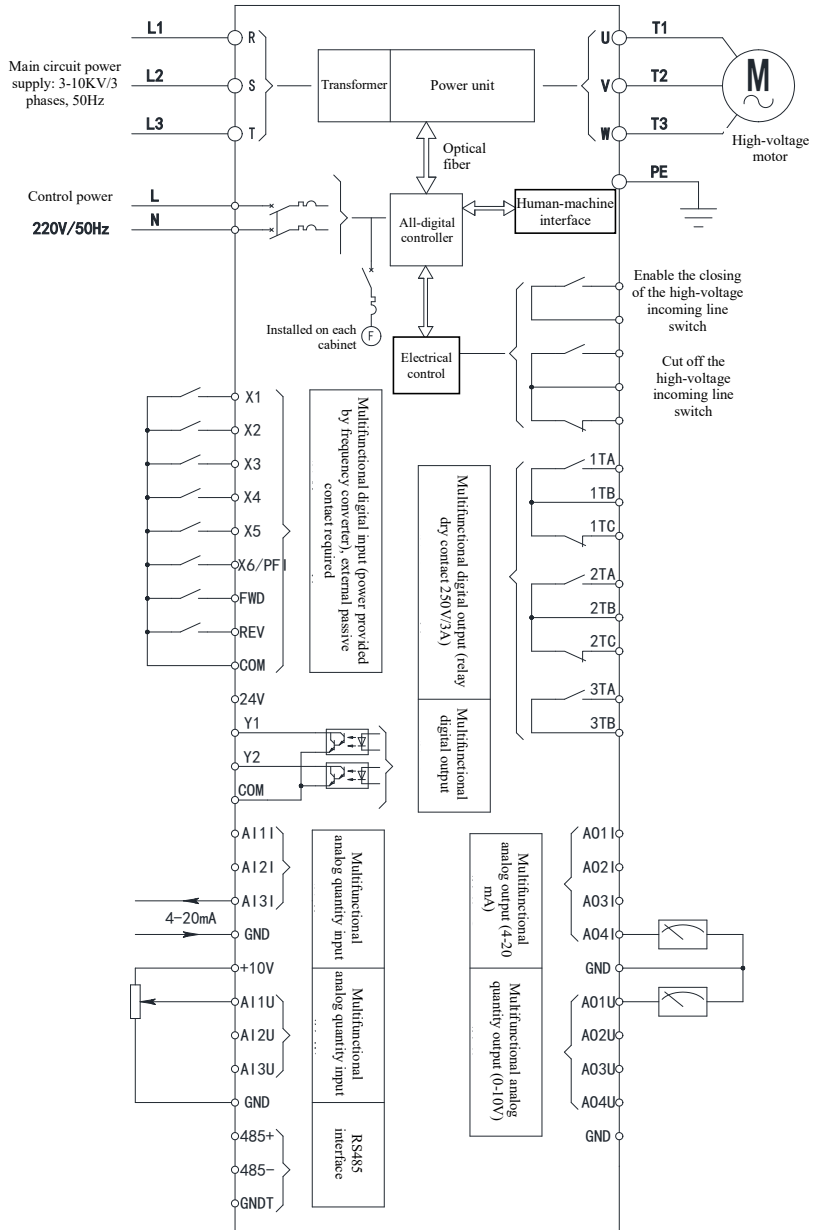
The main circuit breaker can be a vacuum or gas-insulated circuit breaker. It must be provided with overcurrent and short-circuit protection functions, and also be able to withstand the transformer closing inrush current (approximately 7~8 times the rated current of the frequency converter).

Typical main circuit drawing:



The basic operation wiring connection is shown in the figure below:

3. Handling, Installation, and Wiring

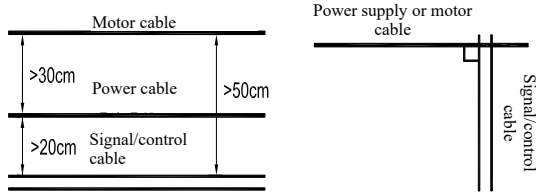


Description of the main circuit terminal function:

3. Handling, Installation, and Wiring

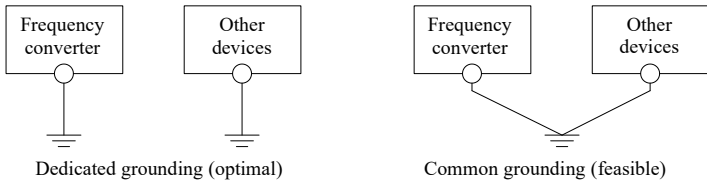
Terminal symbol	Terminal name	Description
R, S, T	Input power terminal	To the three-phase power supply
U, V, W	Frequency converter output terminal	Connect to the three-phase motor
PE	Grounding terminal	Grounding terminal on frequency converter case shall be grounded

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:

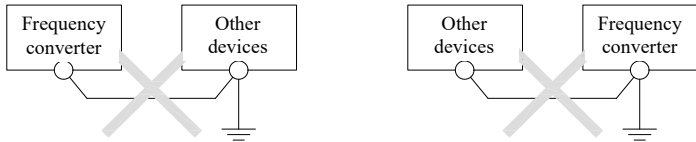


Direct earth capacitance becomes larger and intercoupling interference becomes stronger if motor cable is longer or cross sectional area of motor cable is bigger, therefore, cable with specified cross sectional area shall be applied, and its length shall be as short as possible.

See following figure for recommended earthing method when wiring:



The following earthing methods are not allowed:



3.2.2 Control Terminals and Wiring

The user terminal functions of the Hope2000 series high-voltage frequency converter are as follows:

Terminal symbol	Terminal name	Terminal Function & Description	Technical Specifications
485+	Positive terminal of 485 differential signal	RS485 communication interface	1~32 RS485 sites can be connected Input impedance: >10kΩ
485-	Negative terminal of 485 differential signal		
GNDT	485 differential signal grounding terminal	Communication interface grounding terminal	GNDT is internally isolated from GND and COM
GND	Ground	Analog input/output, grounding terminal for +10V power supply	GND is internally isolated from COM and GNDT

3. Handling, Installation, and Wiring

Terminal symbol	Terminal name	Terminal Function & Description	Technical Specifications
+10 V	+10V reference power supply	+10V power supply provided to the users	+10V: Maximum output current 100mA, voltage accuracy better than 2%
AO1I	Multifunctional analog output 1	Function selection: See the description of parameters F6-21, F6-25, F6-29, F6-33 for details	Current type: 0~20mA, load $\leq 500\Omega$
AO2I	Multifunctional analog output 2		
AO3I	Multifunctional analog output 3		
AO4I	Multifunctional analog output 4		
AO1U	Multifunctional analog output 1		Voltage type: 0~10V, output $\leq 10\text{mA}$
AO2U	Multifunctional analog output 2		
AO3U	Multifunctional analog output 3		
AO4U	Multifunctional analog output 4		
AI1I	Analog input 1	Input type selection: See the description of parameters F6-00, F6-07, F6-14 for details Note: I and U of the same analog input shall not be used at the same time.	Input current range: -20 ~ +20mA Input impedance: current input: 250 Ω
AI2I	Analog In 2		Input voltage range: -10 ~ +10V Input impedance: voltage input: 110k Ω
AI3I	Analog input 3		
AI1U	Analog input 1		
AI2U	Analog In 2		
AI3U	Analog input 3		
24V	24V power terminal	24V power supply provided to the user	Maximum output current 100mA
X1	X1 digital input terminal	See F4 menus for function selection and settings	Optocoupler-isolated Unidirectional input Input impedance: >3k Ω Input voltage range: <30V Sampling period: 1ms High level: Voltage difference with COM >10V Low level: Voltage difference with COM <3V
X2	X2 digital input terminal		
X3	X3 digital input terminal		
X4	X4 digital input terminal		
X5	X5 digital input terminal		
X6	X6 digital input terminal		
REV	REV digital input terminal		
FWD	FWD digital input terminal		
COM	Digital quantity common terminal	Common terminal for X1~X6, FWD, REV, Y1, Y2, and 24V power terminals	Internally isolated from GND and GNDT
Y1	Y1 digital output terminal	See F5 menu for function selection and settings	Optocoupler isolated OC output Specification: 24 VDC/50 mA
Y2	Y2 digital output terminal		
1TA	Output terminal of relay 1	See F5 menu for function selection and settings	TA-TB: normally open TB-TC: normally closed
1TB			

3. Handling, Installation, and Wiring

Terminal symbol	Terminal name	Terminal Function & Description	Technical Specifications
1TC	Output terminal of relay 2		Contact specifications: 250V AC /3A 24V DC/5A
2TA			
2TB			
2TC			
3TA	Output terminal of relay 3		
3TB			

Note: All terminals shall not be used beyond the scope. **The above signal points are for reference only, and the actual project drawings and materials are subject to specific projects.**

1) Analog input terminal wiring

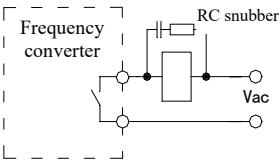
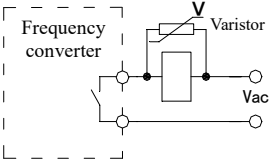
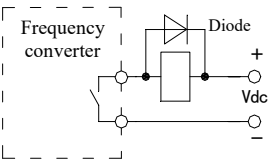
When remote operation is performed using voltage analog signals, the length of the control line between the operator and the frequency converter shall be less than 30m. Since the analog signal is susceptible to interference, the analog control line shall be separated from the high-voltage circuit, relay, contactor, and other circuits. 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 of multi-function input terminals X1~X6, FWD and REV terminals and multi-function output terminals Y1 and Y2

The multi-function input and output terminal wiring shall be separated from the analog input and output terminal wiring and the power supply line as much as possible. If a shield wire is used, the shield layer shall be grounded reliably. If necessary, the signal wire can also be used to connect the metal pipe to the equipment, and the metal pipe must be grounded, which can reduce some interference. The wiring length of the multi-function input and output terminals shall not exceed 50m. For Y1 and Y2, if driving an inductive load, a freewheeling diode shall be added.

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

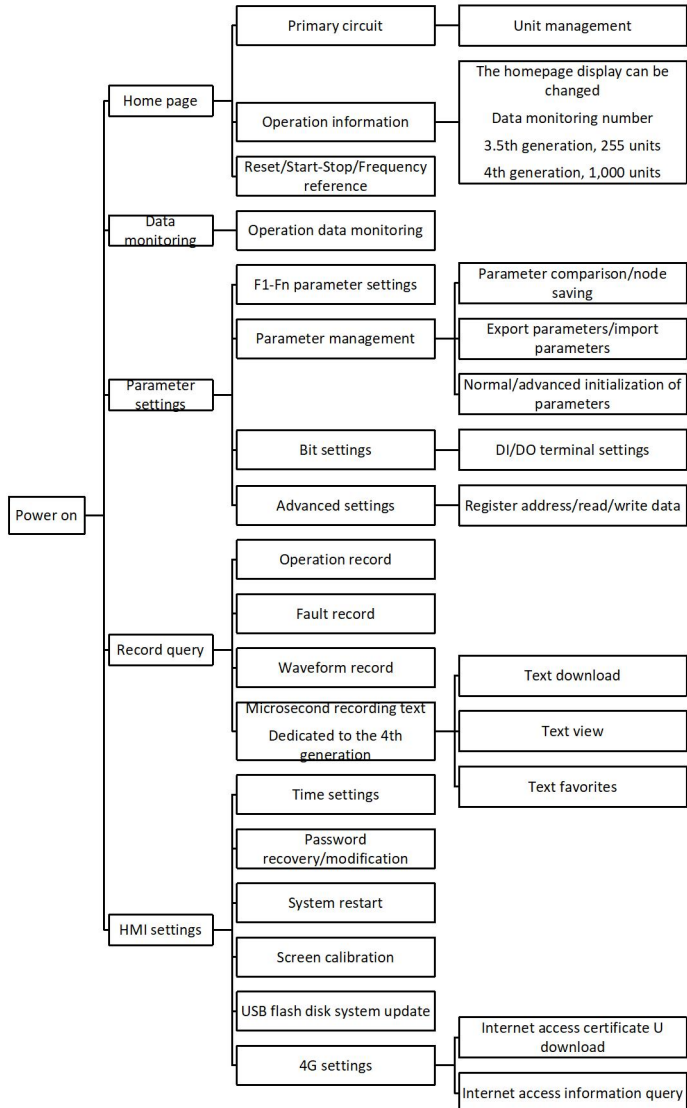
For driving inductive loads (such as electromagnetic relays, contactors, electromagnetic brakes), surge voltage snubber circuits, varistor or freewheeling diodes (for DC electromagnetic circuits, must pay attention to polarity when installing) shall be installed. The components of the snubber circuit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



4. Operation of Frequency Converter

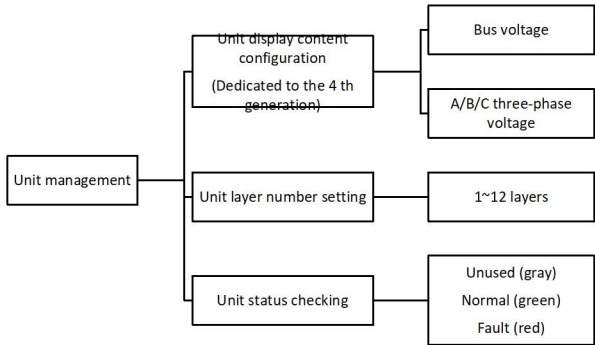
4.1 Human-machine Interface Operation

Principle Block Diagram of SLANVERT Variable-frequency High-Voltage Control System:



Unit management expansion diagram :

4. Operation of Frequency Converter



System login window:



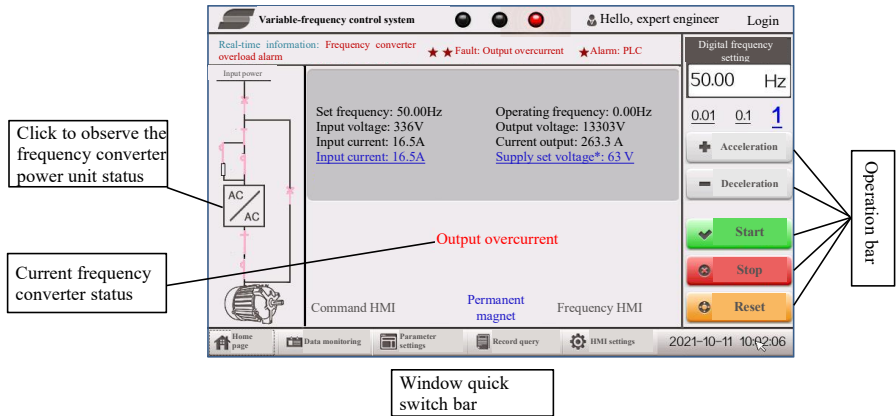
User level: The touch screen is divided into four user levels, i.e., application engineer level, product manager level, and expert engineer level. The default passwords for application engineer level and product manager level are: any number and 6666, respectively;

The application engineer level can perform simple operations, but cannot modify the function parameters of the frequency converter;

The product manager level can modify the function parameters of the frequency converter, except the manufacturer's parameters.

The expert engineer level can modify the functional parameters and manufacturer's parameters of the frequency converter, and can change/retrieve the password of the product manager level.

Home page window:



Acceleration and deceleration button: When the frequency of the frequency converter is set to the human-machine interface, the set frequency of the frequency converter is modified in combination with the currently selected acceleration/deceleration step value. It is also feasible to directly click the number under "digital frequency setting" and manually enter the required set frequency in the pop-up window.

Start button: Start the frequency converter.

Stop button: Stop the frequency converter in operation.

Reset button: Reset a fault.

Underlined button in the center of the homepage: Reselect the required monitoring parameters.

Note: The "parameter settings", "HMI settings", and "time" in the quick switch bar of the window can only be modified by users higher than the "application engineer level".

4. Operation of Frequency Converter

Unit status window: Real-time unit status can be monitored through this window. Click Previous Page or Next Page to view the status of units on each layer.

The screenshot shows the 'Unit status window' of the 'Variable-frequency control system'. The interface includes a top bar with the system name, status indicators, user 'Hello, expert engineer', and a 'Login' button. Below the bar, a 'Real-time information' section displays 'Frequency converter overload alarm', 'Fault: Output overcurrent', and 'Alarm: PLC'. The main area is a table with columns for 'Layer', 'Unit layer number configuration', 'Previous', and 'Next'. The table lists 9 layers, each with a 'Voltage (V)' and 'State' column. The 'State' column shows 'Uplink fault' for layers 1-8 and 'Unit shutdown' for layer 9. To the right of the table is a 'Digital frequency setting' panel with a display showing '50.00 Hz' and buttons for 'Acceleration', 'Deceleration', 'Start', 'Stop', and 'Reset'. The bottom of the interface has a navigation bar with icons for 'Home page', 'Data monitoring', 'Parameter settings', 'Record query', and 'HMI settings', along with a timestamp '2021-10-11 10:04:42'.

Layer	Unit layer number configuration	Previous	Next
1	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
2	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
3	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
4	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
5	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
6	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
7	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
8	0 V Uplink fault	0 V Uplink fault	0 V Uplink fault
9	0 V Unit shutdown	0 V Unit shutdown	0 V Unit shutdown

In the unit status window, press the "unit layer number configuration" button to switch to the unit layer number configuration interface.

The screenshot shows the 'Unit layer number configuration' window. The top bar is identical to the previous window. The 'Real-time information' section shows 'Output overcurrent', 'Alarm: ID of PLC does not match, frequency converter overload alarm', and 'Fault'. The main area is a grid of checkboxes for layers 1 through 12. Layers 1-6 are checked, while layers 7-12 are unchecked. A 'Confirm' button is at the bottom right. The right side features the same 'Digital frequency setting' panel as the previous window. The bottom navigation bar is also identical, with a timestamp of '2021-10-11 10:05:33'.

Data monitoring window: Different monitoring data can be switched via the left tab.

The screenshot shows the 'Data monitoring window'. The top bar and 'Real-time information' section are the same. The main area is a table with columns for 'FU-48', 'Reserved', and a numerical value. The table lists various monitoring data points for different frequency ranges (0-11, 12-23, 24-35, 36-47, 48-59, 60-71, 72-83). The right side features the same 'Digital frequency setting' panel. The bottom navigation bar is identical, with a timestamp of '2021-10-11 10:00:26'.

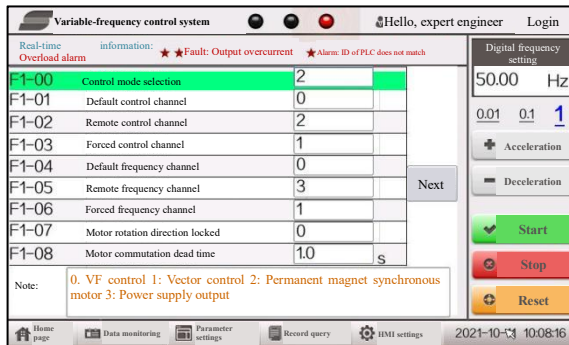
FU-48	Reserved	
0-11	FU-49	Reserved 0
12-23	FU-50	Operation frequency 0 %
24-35	FU-51	Set frequency percentage 100 %
36-47	FU-52	Grid frequency percentage 0 %
48-59	FU-53	Output voltage percentage 88.72 %
60-71	FU-54	Output current percentage 131.64 %
72-83	FU-55	Output Power Percentage -130.01 %
	FU-56	Input voltage percentage 2.24 %
	FU-57	Input current percentage 7.99 %
	FU-58	Input power percentage -1.66 %
	FU-59	All input percentage 0 %

Parameter settings:

Entering "Parameter Settings" requires the level to be higher than "Application Engineer Level". After entering, the parameters can be changed.

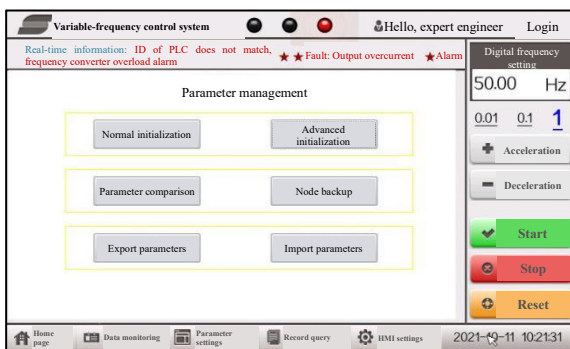


Click the parameter group name to enter the parameter setting interface, such as group F1:

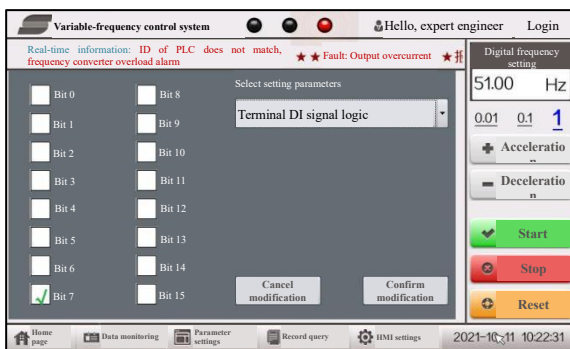


The parameter management function is feasible for parameter initialization, parameter comparison, and so on. The application engineer level can only perform common initialization operations:

4. Operation of Frequency Converter

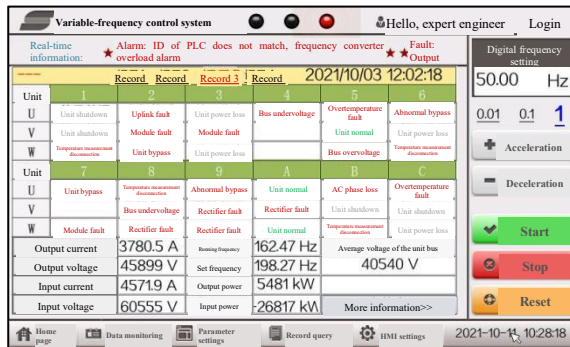


Based on bit setting, it is feasible to set the signal logic of DI and DO terminals more intuitively:

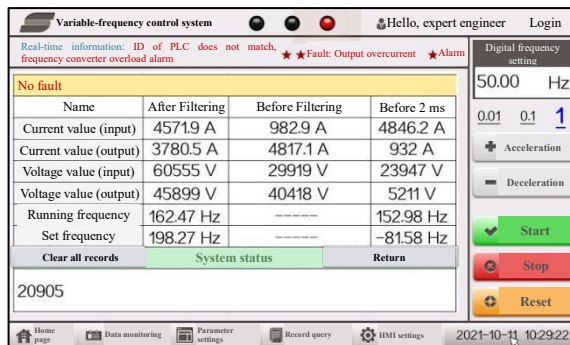


Record query:

Fault record: Record the time when the fault occurred from the latest time to the fourth time, the status of the unit at the time of the fault, output current, output voltage, output power, input current, input voltage, and fault description.



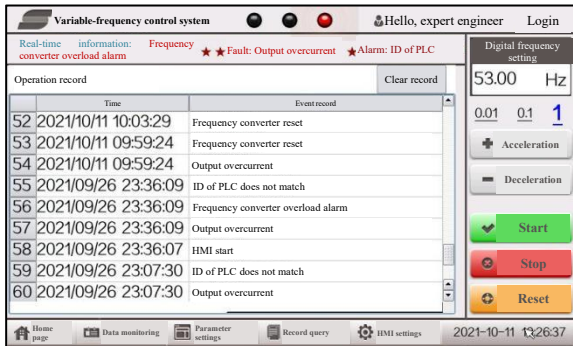
The "More Information" button allows viewing more detailed information, such as voltage, current, and operating frequency for a single record.



Clearing records requires a user level higher than the application engineer level.

Operation records: Detailed records of the time when the frequency converter fails, operates, and stops. Clearing records requires a user level higher than the application engineer level.

4. Operation of Frequency Converter



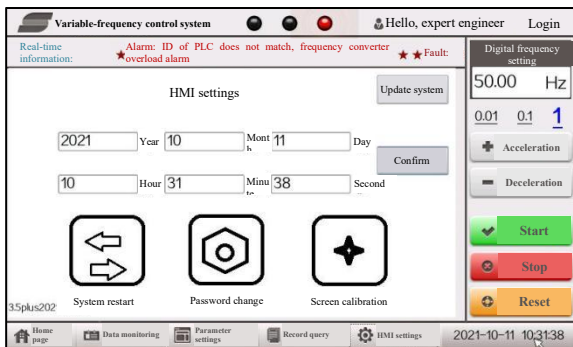
HMI settings:

After entering the HMI settings interface, you can make the following settings:

Date and time: Modify the touch screen system time;

System restart: Restart the touch screen;

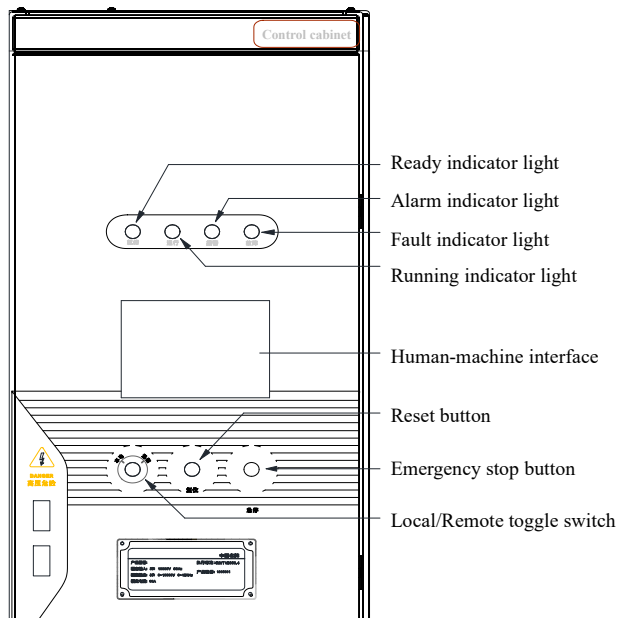
Screen calibration: Calibrate touch screen;



Password modification: On the password modification screen, you can change the password of the current user, retrieve the product manager's password, and enter the password to switch the current user's level. If the password is incorrect, the system changes the user level to the application engineer level by default.



4.2 Control Cabinet Introduction



Fault indicator light: This indicator light indicates whether the variable-frequency speed control system is in a fault state. If a fault occurs, the indicator will be on with a beep.

Alarm indicator light: This indicator light indicates whether the variable-frequency speed control system is in an alarm state. If it is in an alarm state, the indicator will be on.

Operation indicator light: This indicator light indicates whether the variable-frequency speed control system is operating. If it is in the operation state, the indicator will be on.

Ready indicator light: This indicator light indicates whether the variable-frequency speed control system is in standby & ready or normal operation. If a fault is detected, the light will be off.

4. Operation of Frequency Converter

Man-machine interface: The human-machine interface can set and view parameters, run control, display fault information, and so on.

Reset button: When the frequency converter detects the fault signal, it enters the fault state, and the fault alarm light is on. The fault can be reset by entering a reset command (human-machine interface, control terminal, control cabinet reset button, or communication command). If the fault persists, it will continue to be displayed.

Emergency stop button: If this button is pressed during operation of the frequency converter, the output will be blocked immediately, and the motor will coast to a stop.

Local/remote switch: The run command is switched to the HMI or terminal.

5. List of Functional Parameters

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

Security level: "0" indicates application engineer level, "1" indicates technical engineer level, "2" indicates product manager level, and "3" indicates expert engineer level.

F0 Basic Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F0-00	Default control channel	0: HMI1: Communication 2: Terminal 3: PLC	0	×	1	62
F0-01	Remote control channel		2	×	1	62
F0-02	Forced control channel		1	×	1	62
F0-03	Default frequency channel	0: HMI1: Communication 2: AI1 3: AI2 4: AI3 5: Reserved	0	×	1	62
F0-04	Remote frequency channel		3	×	1	62
F0-05	Forced frequency channel		1	×	1	62
F0-06	Maximum frequency	0.01 ~ 320.00Hz (frequency value corresponding to 100% analog signal)	50.00Hz	○	1	62
F0-07	Upper limit frequency	0.01 ~ 320.00Hz (maximum limit of set frequency)	50.00Hz	○	1	62
F0-08	Lower limit frequency	0.01 ~ 320.00Hz (minimum limit of set frequency)	5.00Hz	○	1	62
F0-09	Motor rotation direction locked	0: Not locked 1: Forward direction locked 2: Reverse direction locked (valid at a set frequency)	0	×	1	62
F0-12	Control mode selection	0: V/F control 1: Vector control 2: Permanent magnet synchronous motor 3: Power output	0	×	1	62

F1 acceleration & deceleration, start, stop, and jog parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F1-00	Acceleration time 1	0.1 s ~ 3,600.0 s Acceleration time: The time required for the frequency to go from "0 Hz" to "maximum frequency". The default acceleration time is 1; Deceleration time: The time required for the frequency to change from "maximum frequency" to "0Hz". The default deceleration time is 1.	120.0s	○	0	63
F1-01	Deceleration time 1		120.0s	○	0	63
F1-02	Acceleration time 2		120.0s	○	0	63
F1-03	Deceleration time 2		120.0s	○	0	63
F1-04	Acceleration time 3		120.0s	○	0	63
F1-05	Deceleration time 3		120.0s	○	0	63
F1-06	Acceleration time 4		120.0s	○	0	63
F1-07	Deceleration time 4		120.0s	○	0	63
F1-09	Fast stop time	0.1s~3600.0s (the time required for frequency to change from "maximum frequency" to "0Hz")	50.0s	○	0	63
F1-10	Start mode	0: Start from the starting frequency 1: First DC braking and then starting from the starting frequency	0	×	1	63

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		2: Speed tracking start mode 1 3: Speed tracking start mode 2				
F1-11	Start frequency	0.01~60.00Hz (set the start frequency output value, valid only when starting at the start frequency)	0.50Hz	○	1	63
F1-12	Starting frequency retention time	0.0s~60.0s (starting frequency maintenance time, valid only when starting at the start frequency)	0.0s	○	1	63
F1-13	Start delay time	0.0s~1000.0s (starting delay time after receiving the start signal)	0.0s	○	1	63
F1-14	Voltage soft start enable	0: Invalid 1: valid (the voltage starts from 0 at the time of soft start, it is valid only when starting at the start frequency)	0	×	1	64
F1-15	Starting DC braking time	0.0 ~ 60.0 s	0.0s	○	1	64
F1-16	Starting DC braking current	0.0 ~ 100.0%, taking the motor rated current as 100%	0.0%	○	1	64
F1-17	Stop mode selection	0: Deceleration stop, 1: Free stop, 2: Deceleration + DC braking	0	○	1	65
F1-18	Stop frequency	0.01~320.00Hz (When the output frequency is lower than this frequency when stopping, the output is directly stopped. Only deceleration stop is valid)	0.50Hz	○	1	65
F1-19	Stop/DC braking delay time	0.00~10.0 s	0.0s	○	1	65
F1-20	Stop DC braking time	0.0 ~ 60.0 s	0.0s	○	1	65
F1-21	Stop DC braking current	0.0 ~ 100.0%, taking the motor rated current as 100%	0.0%	○	1	65
F1-28	Motor commutation dead time	0.1s~600.0s (zero-speed hold time when motor output direction changes)	1.0s	○	1	65
F1-29	Jog frequency	0.01~60.00Hz (set frequency when using the inching control)	5.00Hz	○	1	65
F1-32	Acceleration and deceleration switch point 1	0.00~320.00Hz (the acceleration/deceleration switch is enabled if the value is not 0)	0.00Hz	○	1	66
F1-33	Acceleration and deceleration switch point 2		0.00Hz	○	1	66
F1-34	Acceleration and deceleration switch point 3		0.00Hz	○	1	66

F2 V/F Control Parameters, Synchronous Motor Control, Redundancy Control, and Superimposed Frequency Control Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F2-00	V/F curve setting	0: Reserved 1: Linear (1.0 power) 2: Derated torque V/F curve 1 (1.2 power) 3: Derated torque V/F curve 2 (1.5 power) 4: Derated torque V/F curve 3 (1.7 power)	1	×	1	67

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		5: Derated torque V/F curve 4 (2.0 power) 6: Reduced torque V/F curve 5 (3.0 power)				
F2-02	Manual torque boost amplitude	0~10.0% (boost voltage = set value * rated output voltage)	0.0%	○	1	67
F2-03	Torque boost cutoff point	0~100.0% (frequency point to end torque boost, corresponding to "maximum voltage frequency")	10.0%	○	1	67
F2-09	Anti-vibration damping coefficient	0~500 (used to reduce the output current oscillation phenomenon when the motor is lightly loaded. 0 means disabled. If the value is larger, the effect is stronger)	5	○	1	68
F2-10	Automatic voltage regulation function	0: Prohibited 1: Enabled 2: Enabled, but disabled when decelerating	0	○	1	68
F2-11	Automatic energy saving operation selection	0: Invalid 1: Valid	0	○	1	68
F2-12	Maximum frequency voltage	0~2000V (voltage value corresponding to the maximum frequency in the VF curve)	1000V	○	1	68
F2-13	Maximum voltage frequency	0.01~320.00Hz (frequency corresponding to the maximum voltage in VF curve)	50.00Hz	○	1	68
F2-21	Synchronous soft start enable	0: Prohibited 1: Enabled (synchronizing to grid output after starting to grid frequency)	0	○	1	69
F2-22	Sync rate setting	0.0~60.0 (the synchronization time is longer if the value is larger)	10.0	○	1	69
F2-23	Synchronous phase compensation	-20.0°~+20.0° (compensates for synchronous angle errors)	2.5°	×	1	69
F2-24	Voltage ramp time	0.0s~60.0s (times from 0 to maximum voltage)	5.0s	○	1	69
F2-30	Motor type selection	0: Asynchronous motor control 1: Synchronous motor VF control 2: Synchronous motor IF control 1 3: Synchronous motor IF control 2	0	○	1	69
F2-31	Initial excitation of synchronous motor	0~100.00% (maximum excitation current: 100.00%)	5.00%	○	1	69
F2-32	Synchronizing excitation of synchronous motor	0~100.00% (maximum excitation current: 100.00%)	50.00%	○	1	69
F2-33	Synchronizing current of synchronous motor	0~100.00% (rated output current: 100.00%)	50.00%	○	1	69
F2-34	Synchronizing time of synchronous motor	0.0 ~ 60.0 s	3.0s	○	1	69
F2-35	Synchronous motor stabilization time	0.0 ~ 60.0 s	3.0s	○	1	69
F2-36	Excitation control proportional coefficient	0.001 ~ 10.000	0.020	○	1	69
F2-37	Excitation control integral factor	0.001 ~ 10.000	0.002	○	1	69
F2-38	Synchronous motor flying start	0: Disabled 1: Enabled	0	○	1	70
F2-40	Control algorithm selection	0: General algorithm 1: Continuous heavy load 2: Starting heavy load only	0	○	1	70

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F2-41	Starting excitation time	0.0 ~ 360.0 s	0.5s	○	1	70
F2-42	Starting excitation current	20.0% ~ 150.0%	100.0%	○	1	70
F2-43	Starting switching frequency 1	5.00Hz~F2-44 "starting switching frequency 2"	10.00Hz	○	1	70
F2-44	Starting switching frequency 2	F2-43 "starting switching frequency 1"~30.00Hz	20.00Hz	○	1	70
F2-45	Operation switching frequency 1	F2-46 "operation switching frequency 2"~20.00Hz	15.00Hz	○	1	70
F2-46	Operation switching frequency 2	0.01Hz~F2-45 "operation switching frequency 1"	14.00Hz	○	1	70
F2-47	Voltage boost ratio	0.1 ~ 30.0%	20.0%	○	1	70
F2-48	Current set slope	1 ~ 10,000 ms	500ms	○	1	70
F2-49	Value Kp of current regulator	0.001 ~ 10.000	0.100	○	1	70
F2-50	Value Ki of current regulator	0.0001 ~ 1.0000	0.0200	○	1	70
F2-55	Parallel/redundant control	0: Stand-alone 1: Redundant master 2: Redundant slave 3: Parallel master 4: Parallel slave	0	○	1	70
F2-56	Redundant switching voltage limit	50.0% ~ 90.0%	80.0%	○	1	70
F2-57	Fault switching setting	0: All faults are switched 1: Only output fault is not switched	0	○	1	70
F2-60	Superimposed frequency value	0.01 ~ 320.00 Hz	43.00Hz	○	1	70
F2-61	Superimposed voltage value	0 ~ 20,000 V	0V	○	1	71
F2-62	Superimposed frequency starting point	0.01~320.00Hz (starting superposition frequency when operating frequency absolute value > set value)	50.00Hz	○	1	71
F2-63	Frequency superposition ramp time	0~600s (time required for voltage from 0 to the rated value)	30S	○	1	71
F2-65	Initial excitation settings	0 ~ 100.00% (maximum excitation current: 100.00%)	20.00%	○	1	71
F2-66	Intermediate excitation settings		40.00%	○	1	71
F2-67	End excitation settings		60.00%	○	1	71
F2-68	Initial excitation frequency	0.50 Hz ~ 50.00 Hz	3.00Hz	○	1	71
F2-69	Intermediate switching frequency		10.00Hz	○	1	71
F2-70	End switching frequency		20.00Hz	○	1	71

F3 vector control parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F3-00	Motor control mode	0: Without PG vector control 1: Without PG vector control 1 2: With PG vector control 2	0	×	1	72

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		3: With PG vector control 3				
F3-01	Torque boost selection	0: None 1: Manual boost 2: Automatic boost 3: Manual boost + automatic boost	1	×	1	72
F3-02	Manual torque boost amplitude	0.0%~ maximum value determined by model, the minimum unit is 0.1%	Model determination	○	1	73
F3-03	Manual torque boost end point	0.0~100.0%, taking F3-08 as 100%	10.0%	○	1	73
F3-04	Automatic torque boost degree	0.0 ~ 100.0%	80.0%	○	1	73
F3-05	Slip compensation filtering time	0.1 ~ 25.0 s	1.0s	○	1	73
F3-06	Automatic torque filtering frequency R	0.1 ~ 25.0 rad/s	1.0 rad/s	○	1	73
F3-07	Automatic torque filter frequency L	0.1 ~ 25.0 rad/s	10.0rad/s	○	1	73
F3-08	Basic frequency	0.01 ~ 320.00 Hz (Frequency corresponding to the maximum voltage in VF curve)	50.00Hz	×	1	73
F3-09	Maximum output voltage	0 ~ 20,000 V (Voltage value corresponding to the maximum frequency in the VF curve)	10000V	×	1	74
F3-10	Output voltage recovery time	1 ~ 50	5s	○	1	74
F3-11	Anti-vibration damping method	0:torq 1:id 2:iq	0	○	1	74
F3-12	Vibration damping	0 ~ 200	Model determination	○	1	74
F3-13	Anti-vibration damped filter frequency	0.1 ~ 25.0 rad/s	2.0 rad/s	○	1	74
F3-14	High-speed ASR proportional gain	0.00 ~ 200.00	5.00	○	1	74
F3-15	High-speed ASR integration time	0.010 ~ 30.000 s	1.000s	○	1	74
F3-16	Low-speed ASR proportional gain	0.00 ~ 200.00	10	○	1	74
F3-17	Low-speed ASR integration time	0.010 ~ 30.000 s	0.500s	○	1	74
F3-18	ASR parameter switching point	0.00 ~ 650.00 Hz	5.00Hz	○	1	74
F3-19	ASR filtering time	0.000 ~ 2.000 s	0.010s	○	1	74
F3-20	Acceleration compensation differential time	0.000 ~ 20.000 s	0.000s	○	1	74
F3-21	Low-speed steady-state strong PI fluctuation frequency	0 ~ 65,535	50	○	1	75
F3-22	PI linear switching	0 ~ 65,535	500	○	1	75
F3-23	Low-speed strong PI valid frequency	0 ~ 65,535	200	○	1	75

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
	threshold					
F3-24	Low-speed steady-state strong PI_KP	0 ~ 65,535	1300	○	1	75
F3-25	Low-speed steady-state strong PI_KI	0 ~ 65,535	30	○	1	75
F3-26	Low-speed steady-state strong PI intervention time	0 ~ 65,535	50	○	1	75
F3-27	ASR strong PI intervention speed deviation threshold	0 ~ 65,535	5000	○	1	75
F3-28	ASR strong PI intervention P increment	0 ~ 65,535	10	○	1	75
F3-29	ASR strong PI intervention I coefficient	0 ~ 65,535	5	○	1	75
F3-30	ASR strong PI intervention P maximum value	0 ~ 65,535	1000	○	1	75
F3-31	Motoring power limit	0.0~250.0%, take rated power of frequency converter as 100%	120.0%	○	1	75
F3-32	Regenerative power limit	0.0~250.0%, take rated power of frequency converter as 100%	120.0%	○	1	75
F3-33	Motoring torque limitation	0.0~250.0 % , taking the motor rated torque as 100% (note: for vector control only)	180.0%	○	1	75
F3-34	Regenerative torque limitation	0.0~250.0 % , taking the motor rated torque as 100% (note: for vector control only)	180.0%	○	1	75
F3-35	Pre-excitation time	0.01 ~ 5.00 s	Model determination	×	1	76
F3-36	Pre-excitation intensity	50.0 ~ 150.0%	94.0%	×	1	76
F3-37	Flux linkage reference GEN	0 ~ 2,000	110.0%	○	1	76
F3-38	Flux linkage reference MOT	0 ~ 2,000	88.0%	○	1	77
F3-39	Low-speed flux lifting	0 ~ 50%	0	○	1	77
F3-40	Weak magnetic regulator integration time	0.100 ~ 3.000 s	0.150s	○	1	77
F3-41	Flux linkage closed-loop current torque filtering time	0 ~ 65,535	5	○	1	77
F3-42	Flux linkage closed-loop light load torque threshold	0 ~ 1,000	100	○	1	77
F3-43	Generating-to-motoring current threshold 0%-100%	0 ~ 200	35	○	1	77
F3-44	Flux linkage closed-loop switch	0 ~ 1	1	○	1	77

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Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F3-45	Generating-to-motoring torque hysteresis	0 ~ 1,000	50	○	1	77
F3-46	Excitation braking flux strength	50.0 ~ 150.0%	0	○	1	77
F3-47	Rotor flux filter cutoff angular frequency coefficient	10	10	○	1	77
F3-48	Flux linkage limit value	0 ~ 65,535	16384	○	1	77
F3-49	Limiting value of rotor flux filter cutoff angular frequency filter coefficient	0 ~ 65,535	32760	○	1	77
F3-50	Minimum filter value coefficient of rotor flux filter cutoff angular frequency	0 ~ 65,535	5240	○	1	77
F3-51	Filter coefficient of rotor flux filter cutoff angular frequency	0 ~ 65,535	2	○	1	77
F3-52	Rotor flux filter system 1 (0-3 Hz generating)	0 ~ 65,535	10	○	1	77
F3-53	Rotor flux filter coefficient 2 (3Hz-4Hz)	0 ~ 65,535	10	○	1	77
F3-54	Rotor flux filter coefficient 3 (4Hz-10Hz)	0 ~ 65,535	10	○	1	78
F3-55	Rotor flux filter coefficient 4 (0-3Hz motoring)	0 ~ 65,535	30	○	1	78
F3-56	Rotor flux filter coefficient 5 (10Hz-50Hz)	0 ~ 65,535	10	○	1	78
F3-57	Minimum filter value coefficient of torque-control rotor flux filter cutoff angular frequency	0 ~ 65,535	8200	○	1	78
F3-58	Torque filtering coefficient	0 ~ 65,535	100	○	1	78
F3-59	Generating slip compensation coefficient	0 ~ 65,535	0	○	1	78
F3-60	Electric slip compensation coefficient	0 ~ 65,535	10	○	1	78
F3-61	Vector control synchronization frequency filtering cut-off frequency	1 ~ 250 rad/s	200 rad/s	○	1	78
F3-62	Flux control gain	1.0 ~ 3.0	1.0	○	1	78
F3-63	Decoupling	0: Prohibited 1: Allowed	1	×	1	78

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
	compensation allowed					
F3-64	Decoupling compensation of PI2	0: Method I 1: Method II	1	×	1	78
F3-65	Cut-off frequency of current loop	100 ~ 6000 rad/s	3666 rad/s	○	1	78
F3-66	Decoupling compensation coefficient	0.000 ~ 1.000	1.000	○	1	78
F3-67	Speed estimation filter cut-off frequency	40 ~ 160 Hz	160	○	1	78
F3-68	Feedforward switch	0: Disabled 1: Enabled	0	○	1	78
F3-69	Feedforward value	0.0~100.0%, taking the motor rated torque as 100%	0	○	1	78
F3-70	Feed-forward attenuation coefficient	0 ~ 100.0%	99.9%	○	1	79
F3-71	Feed-forward torque direction	0: Positive 1: Negative	0	○	1	79
F3-72	PG pulse number per revolution	1 ~ 8,192	1024	×	1	79
F3-73	PG type	0: Quadrature encoder 1: Single channel encoder	0	×	1	79
F3-74	PG direction selection	0: Positive 1: Negative	0	○	1	79
F3-75	PG disconnection action	0: No action 1: Alarm 2: Fault and free stop	2	○	1	79
F3-76	PG disconnection detection time	0.1 ~ 10.0 s	1.0s	○	1	79
F3-77	PG gear ratio denominator setting	1 ~ 1,000	1	×	1	79
F3-78	PG gear ratio numerator setting	1→1000	1	×	1	79
F3-79	PG speed measurement filtering time	0.000→2.000s	0.005s	○	1	79
F3-80	Control voltage selection	0: Measurement 1: Set	1	○	1	80
F3-81	Closing enabling switch	0: Disabled 1: Enabled	0	○	1	80
F3-82	Forward opening frequency	0.01→20.00Hz	3.00Hz	○	1	80
F3-83	Forward closing frequency	0.01 → 20.00 Hz	5.00Hz	○	1	80
F3-84	Reverse opening frequency	0.01 → 20.00 Hz	3.00Hz	○	1	80
F3-85	Reverse closing frequency	0.01 → 20.00 Hz	5.00Hz	○	1	80
F3-86	Forward opening current threshold	0 → 100.0%	10.0%	○	1	80
F3-87	Reverse opening current threshold	0 → 100.0%	3.0%	○	1	80
F3-88	Opening maintenance	0.01→20.00Hz	4.00Hz	○	1	80

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
	frequency					
F3-89	Opening maintenance time	0→10000ms	220ms	○	1	80
F3-90	Anti-slip frequency	0.01→20.00Hz	4.00Hz	○	1	80
F3-91	Anti-slip action time	0 → 10,000 ms	220ms	○	1	80
F3-92	Forward opening torque threshold	0 → 100.0%	6.0%	○	1	80
F3-93	Reverse opening torque threshold	0 → 100.0%	0%	○	1	81
F3-94	Closing state switching time	0 → 10,000 ms	1000ms	○	1	81
F3-95	Running frequency filter time	0→1000ms	150ms	○	1	81
F3-96	Bus voltage filtering time	0→1000ms	100ms	○	1	81
F3-97	Residual voltage filtering time	0→1000ms	2ms	○	1	81
F3-98	Tracking current	10 ~ 100%	50%	○	1	81
F3-99	DC exciting current	0 ~ 150%	150%	○	1	81
F3-100	DC exciting time	Rotor time constant multiplier	5	○	1	81
F3-101	Overvoltage suppression	0: Disabled 1: Enabled	0	○	1	81
F3-102	Lower limit of capture frequency action	0.01→50.00Hz	4.00Hz	○	1	81
F3-103	Current tracking strategy	0: Method 1 1: Method 2 2: Braking	0	○	1	81

F4 Digital Input Terminal and Multi-stage Speed

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F4-00	Terminal X1 connection settings	0: Not connected to the following signals	15	○	1	84
F4-01	Terminal X2 connection settings	1: Multi-stage speed selection 1	0	○	1	84
F4-02	Terminal X3 connection settings	2: Multi-stage speed selection 2	0	○	1	84
F4-03	Terminal X4 connection settings	3: Multi-stage speed selection 3	0	○	1	84
F4-04	Terminal X5 connection settings	4: Multi-stage speed selection 4	0	○	1	84
F4-04	Terminal X5 connection settings	5: Multi-stage speed selection 5	0	○	1	84
F4-05	Terminal X6 connection settings	6: Multi-stage speed selection 6	0	○	1	84
F4-06	Terminal FWD connection settings	7: Multi-stage speed selection 7	0	○	1	84
F4-07	Terminal REV connection settings	8: Time period selection 1 9: Time period selection 2 10: Time period selection 3 11: Time period selection 4 12: Emergency stop fault 13: External fault signal	0	○	1	84

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F4-08	Terminal control mode	0: Single-line mode (start/stop) 1: Two-wire mode 1 (forward, reverse) 2: Two-wire mode 2 (start/stop, direction) 3: Two-wire mode 3 (start/stop) 4: Three-wire mode 1 (forward, reverse, stop) 5: Three-wire mode 2 (running, direction, stop) 6: Double pulse control (start/stop)	3	×	1	85
F4-09	Terminal DI signal logic	Bit0-Bit7 correspond to DI1-DI8 (0: Positive logic 1: Negative logic)	128	○	1	86
F4-10	Digital input filtering time	0 ~ 10000 ms	50ms	○	1	86
F4-16	Multi-stage speed selection	0: Code selection, 1: Direct selection 2: Overlapping mode, 3: Number selection	0	×	1	86
F4-17	Multi-stage speed 1 set frequency	0.01 ~ 320.00 Hz	10.00Hz	○	0	86
F4-18	Multi-stage speed 2 set frequency		15.00Hz	○	0	86
F4-19	Multi-stage speed 3 set frequency		20.00Hz	○	0	86
F4-20	Multi-stage speed 4 set frequency		25.00Hz	○	0	86
F4-21	Multi-stage speed 5 set frequency		30.00Hz	○	0	87
F4-22	Multi-stage speed 6 set frequency		35.00Hz	○	0	87
F4-23	Multi-stage speed 7 set frequency		40.00Hz	○	0	87
F4-50	Terminal FWD selection	0~7:DI1~DI8	6	×	1	87
F4-51	Terminal REV selection		7	×	1	87
F4-52	Terminal STOP selection		3	×	1	88

F5 digital output and relay output settings

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F5-00	Terminal Y1 connection settings	0: Forced to 0 11: Specified alarm 1: Forced to 1 detection	0	○	1	89
F5-01	Terminal Y2 connection settings	2: Ready 12: Excitation start-stop indication switch	0	○	1	89
F5-02	Terminal T1 connection settings	3: Operation 13: Redundant master indication output switch	0	○	1	89
F5-03	Terminal T2 connection settings	4: Fault indication 14: Redundant slave 5: Alarm output switch	0	○	1	89
F5-04	Terminal T3 connection settings	6: Forward communication failure operation 16: Redundant slave 7: Reverse communication failure operation 17: Redundant master 8: External fault ready sign 9: 18: Redundant slave ready Synchronization sign 10: Reset signal 19: Set frequency standard sign	0	○	1	89

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		20: Frequency detection level 1 21: Frequency detection level 2				
F5-05	Terminal DO output logic	0: Positive logic 1: Negative logic	0	○	1	90
F5-06	Frequency arrival detection width	0.00~60.00 Hz	2.50Hz	○	1	90
F5-07	Frequency level detection value 1	0.00 ~ 320.00 Hz	50.00Hz	○	1	90
F5-08	Frequency level detection hysteresis value 1	0.00 ~ 320.00 Hz	1.00Hz	○	1	90
F5-09	Frequency level detection value 2	0.00 ~ 320.00 Hz	50.00Hz	○	1	90
F5-10	Frequency level detection hysteresis value 2	0.00 ~ 320.00 Hz	1.00Hz	○	1	90
F5-11	Y1 terminal closing delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-12	Y1 terminal opening delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-13	Y2 terminal closing delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-14	Y2 terminal opening delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-15	T1 terminal closing delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-16	T1 terminal opening delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-17	T2 terminal closing delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-18	T2 terminal opening delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-19	T3 terminal closing delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-20	T3 terminal opening delay	0.00 ~ 650.00 s	0.00s	○	1	91
F5-21	Alarm output selection 1	0 ~ 65,535	0	○	1	91
F5-22	Alarm output selection 2	0 ~ 65,535	0	○	1	91

F6 Analog Quantity and Pulse Frequency Terminal Settings

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F6-00	AI1 type	0: 0~10V or 0~20mA, corresponding to 0~100% 1: 2~10V or 4~20mA, corresponding to 0~100% 2: centered on 5V or 10mA Corresponding to -100%~100%	1	○	1	93
F6-01	AI1 gain	0.00~200.00%	100.00%	○	1	93
F6-02	AI1 offset	-50.00~50.00%	0.00%	○	1	93
F6-03	AI1 filtering time	0 ~ 10000 ms	1000ms	○	1	93
F6-07	AI2 type	0: 0~10V or 0~20mA, corresponding to 0~100% 1: 2~10V or 4~20mA, corresponding to 0~100% 2: centered on 5V or 10mA Corresponding to -100%~100%	1	○	1	93

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F6-08	AI2 gain	0.00~200.00%	100.00%	○	1	93
F6-09	AI2 offset	-50.00~50.00%	0.00%	○	1	93
F6-10	AI2 filtering time	0 ~ 10000 ms	1000ms	○	1	93
F6-14	AI3 type	0: 0~10V or 0~20mA, corresponding to 0~100% 1: 2~10V or 4~20mA, corresponding to 0~100% 2: centered on 5V or 10mA Corresponding to -100%~100%	1	○	1	93
F6-15	AI3 gain	0.00~200.00%	100.00%	○	1	93
F6-16	AI3 offset	-50.00~50.00%	0.00%	○	1	93
F6-17	AI3 filtering time	0 ~ 10000 ms	1000ms	○	1	93
F6-21	AO1 output signal	0~39 (corresponding to FU-450~FU-489)	0	○	1	94
F6-22	AO1 type	0: 0~10V 1: 2~10V 2: centered on 5V	1	○	1	94
F6-23	AO1 gain	0.00%~200.00%	100.00%	○	1	94
F6-24	AO1 offset	-50.00%~50.00%	0.00%	○	1	94
F6-25	AO2 output signal	0~39 (corresponding to FU-450~FU-489)	0	○	1	94
F6-26	AO2 type	0: 0~10V 1: 2~10V 2: Centered on 5V	1	○	1	94
F6-27	AO2 gain	0.00%~200.00%	100.00%	○	1	94
F6-28	AO2 offset	-50.00%~50.00%	0.00%	○	1	94
F6-29	AO3 output signal	0~39 (corresponding to FU-450~FU-489)	4	○	1	94
F6-30	AO3 type	0: 0~10V 1: 2~10V 2: centered on 5V	1	○	1	94
F6-31	AO3 gain	0.00%~200.00%	100.00%	○	1	94
F6-32	AO3 offset	-50.00%~50.00%	0.00%	○	1	94
F6-33	AO4 output signal	0~39 (corresponding to FU-450~FU-489)	4	○	1	94
F6-34	AO4 type	0: 0~10V 1: 2~10V 2: centered on 5V	1	○	1	94
F6-35	AO4 gain	0.00%~200.00%	100.00%	○	1	94
F6-36	AO4 offset	-50.00%~50.00%	0.00%	○	1	94
F6-46	Analog signal setting	0.00%~100.00%	0.00%	○	0	95

F7 Process PID Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	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	0	×	1	95
F7-01	PID set channel selection	0: F7-04 1: AI1 2: AI2 3: AI3 4: Host computer analog quantity 1, 5: Host computer analog quantity 2	0	×	1	96
F7-02	PID feedback channel selection	0: AI1 1: AI2 2: AI3 3: Host computer analog quantity 1 4: Host computer analog 2, 5: Output current	0	×	1	96

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		ratio 6: Output power ratio				
F7-04	PID analog signal setting	-100.00%~100.00%	0.00%	○	0	96
F7-05	PID proportional gain	0.000~10.000	0.020	○	1	96
F7-06	PID integral time	0.00~100.00 s	20.00s	○	1	96
F7-07	PID derivative setting	0.00~10.00	0.00	○	1	96
F7-12	PID sampling period	1 ~ 10,000 ms	10ms	○	0	96
F7-13	PID regulation limit	0: Direct acting; 1: Reverse acting	0	○	1	97
F7-14	PID set slope time	0.00 ~ 20.00s (time required by set value to be from 0 to 100%)	0.50s	○	0	97
F7-17	Maximum PID output limit	-100.00%~100.00%	100.00%	○	1	97
F7-18	Minimum PID output limit	-100.00%~100.00%	-100.00%	○	1	97
F7-20	PID preset size	-100.00%~100.00%	0.00%	○	1	97

F8 Encoder Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F8-01	Encoder line count	1 ~ 8,192	1024	×	1	97
F8-02	Encoder type	0: Quadrature encoder	0	×	1	97
F8-03	AB phase sequence of ABZ incremental encoder	0: Positive; 1: Negative	0	×	1	97
F8-04	UVW phase sequence of UVW encoder	0: Positive; 1: Negative	0	○	1	97
F8-05	Resolver pole number	1 ~ 10,000	1	×	1	98
F8-07	PG disconnection action	0: No action; 1: Alarm; 2: Fault and free stop	2	○	1	98
F8-08	PG disconnection detection time	0.1 s ~ 10.0 s	1.0s	○	1	98
F8-09	PG variable speed percentage denominator	0 ~ 1,000	1	×	1	98
F8-10	PG variable speed percentage numerator	0 ~ 1,000	1	×	1	98
F8-11	PG speed measurement filtering time	0.000 s ~ 2.000 s	0.015s	○	1	98
F8-12	PG installation angle	0~359.9°, relative position between motor magnetic poles and encoder, determined by installation	0.0°	×	1	98
F8-13	Z-signal enable	0: Encoder signal Z is not used 1: Encoder signal Z is used	1	×	1	98
F8-14	Non-FVC mode speed measurement enable	0: Disabled 1: Enabled	0	○	1	98
F8-15	PG installation angle re-identification	0: Disabled 1: Enabled	0	×	1	98
F8-16	PG anti-interference threshold	0 ~ 2,000 A smaller value makes the encoder	5	○	1	98

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		abnormality detection more sensitive				
F8-17	PG switching enable	0: Disabled 1: Enabled	0	×	1	98

F9 Custom Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
F9-00	Custom parameter 0	0~65535 (special parameters for PLC)	0	○	1	98
F9-01	Custom parameter 1	0~65535 (special parameters for PLC)	0	○	1	98
F9-02	Custom parameter 2	0~65535 (special parameters for PLC)	0	○	1	98
F9-03	Custom parameter 3	0~65535 (special parameters for PLC)	0	○	1	98
F9-04	Custom parameter 4	0~65535 (special parameters for PLC)	0	○	1	98
F9-05	Custom parameter 5	0~65535 (special parameters for PLC)	0	○	1	98
F9-06	Custom parameter 6	0~65535 (special parameters for PLC)	0	○	1	98
F9-07	Custom parameter 7	0~65535 (special parameters for PLC)	0	○	1	98
F9-08	Custom parameter 8	0~65535 (special parameters for PLC)	0	○	1	98
F9-09	Custom parameter 9	0~65535 (special parameters for PLC)	0	○	1	98
F9-10	Custom parameter 10	0~65535 (special parameters for PLC)	0	○	1	98
F9-11	Custom parameter 11	0~65535 (special parameters for PLC)	0	○	1	98
F9-12	Custom parameter 12	0~65535 (special parameters for PLC)	0	○	1	98
F9-13	Custom parameter 13	0~65535 (special parameters for PLC)	0	○	1	98
F9-14	Custom parameter 14	0~65535 (special parameters for PLC)	0	○	1	98
F9-15	Custom parameter 15	0~65535 (special parameters for PLC)	0	○	1	98
F9-16	Custom parameter 16	-32768~32767 (special parameters for PLC)	0	○	1	98
F9-17	Custom parameter 17	-32768~32767 (special parameters for PLC)	0	○	1	98
F9-18	Custom parameter 18	-32768~32767 (special parameters for PLC)	0	○	1	98
F9-19	Custom parameter 19	-32768~32767 (special parameters for PLC)	0	○	1	98
F9-20	Custom parameter 20	-32768~32767 (special parameters for PLC)	0	○	1	98
F9-21	Custom parameter 21	-32768~32767 (special parameters for PLC)	0	○	1	98
F9-22	Custom parameter 22	-32768~32767 (special parameters for PLC)	0	○	1	98
F9-23	Custom Parameter 23	-32768~32767 (special parameters for PLC)	0	○	1	98

FA Motor Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
FA-00	Motor Parameter Tuning	11: Static self-tuning 22: No-load rotation self-tuning	00	○	1	99
FA-01	Motor rated power	110~50,000 kW	Model determination	○	1	99
FA-02	Motor pole number	2~256 (must be an even number)	4	○	1	99
FA-03	Motor rated current	0.5~1,200.0 A	Model determination	○	1	99
FA-04	Motor rated frequency	1.00~320.00 Hz	50.00Hz	○	1	99

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
FA-05	Motor rated speed	125~40,000 r/min	Model determination	○	1	99
FA-06	Motor rated voltage	100~20,000 V	Model determination	×	1	99
FA-07	Motor no-load current	0.1A→FA-03 "motor rated current"	0	○	1	100
FA-08	Motor stator resistance	0.00 → 50.00%	0	○	1	100
FA-09	Motor leakage inductive reactance	0.00 → 50.00%	0	○	1	100
FA-10	Motor rotor resistance	0.00 → 50.00%	0	○	1	100
FA-11	Motor mutual inductive reactance	0.0 → 2000.0%	0	○	1	100
FA-12	Motor core saturation coefficient 1	1.000→1.500	1	○	1	100
FA-13	Motor core saturation coefficient 2	1.000~FA-12 "motor core saturation coefficient 1"	1	○	1	100
FA-14	Motor core saturation coefficient 3	FA-15 "motor core saturation coefficient 4"→1.000	0.5	○	1	100
FA-15	Motor core saturation coefficient 4	0.500→1.000	0.5	○	1	100
FA-27	Identification back EMF current /Low-speed minimum current	0→100%; taking the motor rated current as 100%.	30%	×	2	101
FA-28	D-axis inductance	0~60000 (after parameter identification and manual modification, the current loop PI parameter will change)	7000	×	1	101
FA-29	Q-axis inductance	0~60000 (after parameter identification and manual modification, the current loop PI parameter will change)	7000	×	1	101
FA-30	Stator resistance	0~60000 (after parameter identification and manual modification, the current loop PI parameter will change)	2700	×	1	101
FA-31	Inductance/Resistance/Back EMF unit	Inductance (units digit) 0: uH; 1: 10uH; 2: 100uH; Resistance (×10) 0: mΩ; 1: 10mΩ; Back EMF (hundreds digit): 0: ×1; 1: ×10; 2: ×100;	0	×	1	101
FA-32	Back EMF voltage	Motor body parameter requires dynamic identification; generally 70%~105% of the motor rated voltage; after inputting this parameter, the back EMF coefficient can be automatically calculated based on this parameter and the motor rated frequency	0	×	1	101
FA-33	Back EMF coefficient	0→60000 Motor intrinsic parameters require dynamic identification; It can be calculated by 130 * back EMF voltage / rated frequency	500	×	1	101
FA-34	Integral parameter of the D-axis current loop	0→60000 (parameter identification and automatic calculation)	200	×	1	101
FA-35	Proportional parameter of D-axis current loop	0→60000 (parameter identification and automatic calculation)	300	×	1	101

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
FA-36	Integral parameter of the Q-axis current loop	0→60000 (parameter identification and automatic calculation)	200	×	1	101
FA-37	Proportional parameter of Q-axis current loop	0→60000 (parameter identification and automatic calculation)	300	×	1	102

Fb Protection Function and Frequency Converter Advanced Settings

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
Fb-00	Carrier frequency	500~5000Hz (carrier frequency output by power unit)	800Hz	○	2	102
Fb-03	Power grid failure restart	0. Restart prohibited 1. Time-limited restart (when the start signal continues)	0	○	2	102
Fb-04	Auto-reset times	0 ~ 10 times	0	○	2	102
Fb-05	Auto-reset interval time	1.0 ~ 30.0 s	5.0s	○	2	102
Fb-06	Fault output during self-reset	0. No fault output 1. Output fault	0	○	2	102
Fb-07	Grid voltage undervoltage point	10.0% ~ 70.0% (corresponding to "rated input voltage")	55.0%	○	2	103
Fb-08	Grid voltage overvoltage point	80.0% ~ 130.0% (corresponding to "rated input voltage")	120.0%	○	2	103
Fb-09	Grid voltage sag trigger point	10.0% ~ 90.0% (corresponding to "rated input voltage")	70.0%	○	2	103
Fb-10	Grid voltage sag enable	0: Prohibited 1: enabling (VF control is valid only)	1	○	2	103
Fb-11	Maximum grid voltage sag time	0 ~ 3000 ms	600ms	○	2	103
Fb-13	Motor overload detection	0. Continuous detection 1. Constant speed detection only	1	○	2	103
Fb-14	Motor overload alarm level	50.0% ~ 150.0%	110.0%	○	2	103
Fb-15	Motor overload fault level	50.0% ~ 150.0%	130.0%	○	2	103
Fb-16	Motor overload fault time	0.1 s ~ 30.0 s	2.0s	○	2	103
Fb-17	Motor overspeed protection	0. Disabled 1. Alarm only 2. Fault stop	1	○	2	103
Fb-18	Motor overspeed detection level	50.0% ~ 150.0%	110.0%	○	2	104
Fb-19	Motor overspeed detection time	0.1 s ~ 30.0 s	5.0S	○	2	104
Fb-20	Acceleration overcurrent and stall protection	0. Disabled; 1. Enabled	1	○	2	104
Fb-21	Acceleration overcurrent and stall level	50.0% ~ 150.0%	130.0%	○	2	104
Fb-22	Power-off restart timeout	1.0 ~ 60.0 s	10.0s	○	2	104

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
Fb-24	Loss power protection	0. Disabled 1. Alarm only 2. Fault stop	2	○	2	104
Fb-25	Loss power limit	5.0% ~ 50.0% (rated power)	25.0%	○	2	104
Fb-26	Cabinet door opening protection	0. Disabled 1. Alarm only 2. Fault stop	2	○	2	105
Fb-27	Temperature controller fault protection	0. Disabled 1. Alarm only 2. 30min protection after failure	1	○	2	105
Fb-28	Communication disconnection time	1.0S ~ 600.0s (time between communication disconnection and fault detection)	3.0s	○	2	105
Fb-29	HMI disconnection protection	0. Disabled 1. Alarm only 2. Fault stop	1	○	2	105
Fb-30	USER disconnection protection	0. Disabled 1. Alarm only 2. Fault stop	1	○	2	105
Fb-31	Output phase loss protection	0. Disabled 1. Alarm only 2. Fault stop	2	○	2	105
Fb-32	AI1 disconnection action	0. Disabled 1. Alarm only 2. Fault stop	0	○	2	105
Fb-33	AI2 disconnection action	3: Hold the value before 3s and alarm (only 2~10V/4~20mA disconnection protection is valid)	0	○	2	105
Fb-34	AI3 disconnection action		0	○	2	105
Fb-35	AI disconnection threshold	0.0% ~ 20.0% (only valid for 2-10V/4-20mA disconnection protection; a value below this is considered disconnection)	0.0%	○	2	105
Fb-36	Fan life expectancy	0~65,500 h	30000h	○	2	105
Fb-37	Fan stop delay	0 ~ 60min (when setting > 60min, it indicates that the fan keeps running all the time)	3min	○	2	106
Fb-38	Fan failure delay	0~120 min	30min	○	2	106
Fb-39	Starting point of fan under cabinet	30.0% ~ 150.0% (100% corresponding to rated input current)	100.0%	○	2	106

FC wave recording function settings

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
FC-00	Record waveform 1 selection	0: Vr 1: Vs 2: Vt 3: Vu 4: Vv 5: Vw	0	○	1	106
FC-01	Record waveform 2 selection	6: Ir 7: Is 8: It 9: Iu 10: Iv 11: Iw 12: Vi 13: Vo 14: Ii	0	○	1	106
FC-02	Record waveform 3 selection	15: Io 16: Fo 17: Pi 18: Po 19: VdcU 20: VdcV	0	○	1	106
FC-03	Record waveform 4 selection	21: VdcW 22: AI1 23: AI2 24: AI3	0	○	1	106
FC-04	Record waveform period	0.1~100.0 ms	0.1ms	○	1	106
FC-05	Record trigger condition 1	Failure trigger (0: Invalid; 65535: All faults are triggered; Others: triggered only when consistent with the fault code)	0	○	1	106
FC-06	Record trigger condition 2	Running time trigger (Trigger when reaching setting time, 0: invalid;	0s	○	1	106

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		Unit: 1 s)				
FC-07	Record trigger condition 3	Run-frequency trigger (Trigger when reaching setting frequency, 0.00: invalid; Unit: 0.01 Hz)	0.00Hz	○	1	106
FC-08	Record trigger condition 4	Event occurrence trigger (0: invalid 1: Trigger by voltage sag 2: Restore after voltage sag 3: Blocking command 4: Start command 5: Stop command)	0	○	1	106

Fd shore power supply, electromagnetic soft start and reactive power compensation parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
Fd-00	Power output mode	0. Power supply (shore power supply) 1. Grid tracking 2. Constant power generation 3. Reactive compensation	1	×	2	108
Fd-01	Output frequency setting	0~320.00 Hz	50.00Hz	○	0	108
Fd-02	Output voltage setting	0 ~ 20,000 V	0V	○	0	108
Fd-03	Voltage soft start time	0~600s (the time of output voltage from 0 to rated voltage)	10s	○	1	108
Fd-04	Advanced grid angle	0~45.0° (grid-tracking mode is valid)	2.5°	○	0	108
Fd-05	Tracking voltage increment	0.00~20.00% rated voltage (grid-tracking mode is valid)	0.50%	○	0	108
Fd-06	Current regulator KP	0.000~65.535 (valid in constant power generation and reactive power compensation modes)	0.100	○	2	108
Fd-07	Current regulator KI	0.000~6.5535 (constant power generation and reactive power compensation modes are effective)	0.001	○	2	108
Fd-08	Output power setting	0~20000kW (select "constant power generation" to set the output power value)	1kW	○	0	108
Fd-09	Power regulator KP	0.000~65.535 (select "constant power generation", power PI controller ratio)	1.000	○	2	108
Fd-10	Power regulator KI	0.000~6.5535 (select "constant power generation", power PI regulator integral value)	0.001	○	2	108
Fd-11	Generating phase regulation	0.00 ~ 1.000	0.065	○	2	108
Fd-12	Filter inductance value (uH)	0~65535 uH (filter inductance value that is output and sent to the grid, unit: uH)	50uH	○	2	109
Fd-20	Power supply frequency selection	0: 50Hz 1: 60Hz 2: Custom frequency	0	○	0	109
Fd-21	Custom frequency	0.00 ~ 80.00 Hz	50.00	○		109
Fd-22	Supply frequency deviation	-3.00 ~ 3.00 Hz	0.00Hz	○	0	109
Fd-23	Supply voltage selection	0~3: Supply voltage 1~4	0	○	0	109
Fd-24	Supply voltage 1	0 ~ 20,000 V	3000V	○	0	109

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
Fd-25	Supply voltage 2	0 ~ 20,000 V	6000V	○	0	109
Fd-26	Supply voltage 3	0 ~ 20,000 V	10000V	○	0	109
Fd-27	Supply voltage 4	0 ~ 20,000 V	11000V	○	0	109
Fd-28	Supply voltage deviation	-500 ~ 500 V	0V	○	0	109
Fd-29	Automatic voltage regulation upper limit	0: Disabled 10.0%→30.0%	1	○	0	109
Fd-30	Voltage rise slope	10 ~ 10,000 V/s	0	○	0	109
Fd-31	Power supply phase sequence selection	0: Positive phase sequence; 1: Negative phase sequence	0	×	0	109
Fd-32	Automatic current-limiting function	0: Disabled 1: Enabled	0	○	0	109
Fd-33	Reverse power limiting function	0: Disabled 1: Enabled (valid only for the first grid connection)	0	×	0	109
Fd-34	Overcurrent restart time	1.0 ~ 6,553.5 ms	500ms	○	1	109
Fd-35	Initial overcurrent restart value	0 ~ 100.0%	20.0%	○	1	109
Fd-36	Overcurrent restart threshold	10.0 ~ 250.0%	120.0%	○	1	110

FE Permanent-magnet Synchronous Motor Control Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
FE-00	High-speed segment speed loop proportional parameter	0 ~ 6,000	75	○	1	111
FE-01	High-speed segment speed loop integral parameter	0 ~ 6,000	50	○	1	111
FE-02	Low-speed segment speed loop proportional parameter	0 ~ 60,000	50	○	1	111
FE-03	Low-speed segment speed loop integral parameter	0 ~ 60,000	75	○	1	111
FE-04	Speed loop PI switching point 1	0.00Hz~320.00Hz (using high-speed PI parameters for speed loop above the frequency point)	200Hz	○	1	111
FE-05	Speed loop PI switching point 2	0.00Hz~320.00Hz (using low-speed PI parameters for speed loop below the frequency point)	100Hz	○	1	111
FE-06	Field weakening mode	0: Direct calculation 1: Automatic regulation 2: No flux weakening	1	×	1	111
FE-07	Field-weakening current regulation coefficient	0~120	80	○	1	111
FE-08	Field-weakening regulation coefficient	0~40	4	○	1	111
FE-09	Field-weakening output voltage regulation	0~12: the frequency converter output voltage will be larger and the field-weakening current	7	○	1	111

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
	coefficient	will be lower if the coefficient is larger				
FE-15	Control mode	Units digit: 1: SVC; 2: Reserved; 3: IF+MRAS control; 4: FVC; Tens digit: 0: Speed control; 1: Torque control	1	×	1	111
FE-17	Speed estimation coefficient 1	5~100	20	×	1	111
FE-18	Speed estimation coefficient 2	5~100	30	×	1	112
FE-19	Motoring torque limitation	0~250%, taking the motor rated torque as 100%	150%	○	1	112
FE-20	Generating torque limit	0~250%, taking the motor rated torque as 100%	150%	○	1	112
FE-21	Selection of torque upper limit source	Thousands and hundreds digits: Generating torque source; Units and tens digits: Motoring torque source 0: Digital setting; 1: Communication control word 1 setting (10000 represents 2.5 times the motor rated value); 2: Communication control word 2 setting; 3:A11; 4:A12; 5:A13; 6:A11+A12; 7:max(A11+A12); 8:min(A11,A12)	0	○	1	112
FE-22	Torque setting source selection	Torque command setting 0: Digital setting; 1: Communication control word 1 setting (10000 represents 2.5 times the motor rated value); 2: Communication control word 2 setting; 3:A11; 4:A12; 5:A13; 6:A11+A12; 7:max(A11+A12); 8:min(A11,A12)	0	○	1	112
FE-23	Set the torque current percentage	0~100%, taking the motor rated current as 100%.	150%	○	1	112
FE-24	Overspeed frequency multiple	0~200% is used to determine the overspeed alarm, taking the maximum frequency as 100%	120%	○	1	112
FE-25	High-speed filter coefficient	4~512 (steady-state performance will be better but dynamic response will be slower if the coefficient is larger)	86	○	1	112
FE-26	Low-speed segment speed filter coefficient	4~512 (steady-state performance will be better but dynamic response will be slower if the coefficient is larger)	128	○	1	112
FE-27	Percentage of zero speed crossing frequency	0.00%~5.00%, taking the motor rated frequency as 100%	0.50%	○	1	112
FE-28	Start preset current (positive)	-200%~200%, taking the motor rated current as 100%, affecting the initial value of the speed loop PI.	0	○	1	112
FE-29	Initial position detection method	0: No detection; 1: Detection method 1; 2: Detection method 2; 3: Detection method 3 4: Detection method 4; 5: Detection method 5	3	○	1	112
FE-30	Initial position identification current percentage	0~100%, 0 represents the default value of 12%	0%	○	1	113
FE-31	Start preset current	-200%~200%, taking the motor rated current	0%	○	1	113

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
	(negative	as 100%, affecting the initial value of the speed loop PI.				
FE-32	Maximum forward frequency for torque control	0.00Hz~F0-06 "maximum frequency"	50.00Hz	○	1	113
FE-33	Maximum reverse frequency for torque control	0.00Hz~F0-06 "maximum frequency"	50.00Hz	○	1	113
FE-34	Torque control increase time	0.000~36.000 s	0.020s	○	1	113
FE-35	Torque control decrease time	0.000~36.000 s	0.020s	○	1	113
FE-36	Overvoltage/undervoltage stalling enabling	Overvoltage stall (units digit): 1: Enabled; 0: Disabled Undervoltage stall (tens digit): 1: Enabled; 0: Disabled	00	○	1	113
FE-37	DC voltage adjustment coefficient	0 ~ 200%	30%	○	1	113
FE-38	Unit undervoltage point	0 ~ 700 V	700V	○	1	113
FE-39	back-EMF compensation coefficient	0 ~ 1,000	100.0%	×	1	113
FE-40	Advance angle of initial position identification	0 ~ 359	0°	○	1	113
FE-41	Initial position of parameter identification	0.0 ~ 359.9	330.0°	○	1	113
FE-42	Polarity identification detection current	0% ~ 200%	120%	○	1	113
FE-43	Polarity identification time	1 ms ~ 25 ms	25ms	○	1	113
FE-44	Overspeed detection time	0.001 s ~ 0.600 s	0.005s	○	1	113
FE-45	Speed offset detection value	0% ~ 50%	10	○	1	113
FE-46	Speed offset detection time	0.0 s ~ 60.0 s	5.0s	○	1	114
FE-47	FVC installation angle/direction identification and selection	0: Identify motor parameters only 1: Identify motor parameters. Identify encoder information with load 2: Identify motor parameters. Identify information of encoder with light load 3: Identify motor parameters. Identify information of encoder with no load 4: Selected according to FA-00	4	○	1	114
FE-48	Master/slave fault determination	0 ~ 1,000	100	○	1	114
FE-49	Locked-rotor fault frequency percentage	0.0~100.0%, taking the motor rated frequency as 100%	3.0%	○	1	114
FE-50	Excitation current percentage (initial position)	0 ~ 100.00%	100.00%	○	1	114
FE-51	Excitation current percentage (running)	0 ~ 100.00%	100.00%	○	1	114

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
FE-52	FVC initial position detection scheme	0: Detection per start 1: Detect only on first startup after power-on	1	○	1	114
FE-53	Maximum torque current ratio control enable	0: Disabled 1: Enabled	1	○	1	114
FE-54	Soft starter phase setting	Units digit: Soft starter internal phase 0: Grid-connected operation prohibited; 1: VF switching allowed; 2: Acceleration to target frequency allowed; 3: Use of phase-locked loop frequency allowed; 4: Phase locking allowed; 5: Grid connection allowed Tens digit: 1: Phase-locked loop standby phase locking enabled; 0: Phase-locked loop standby phase locking prohibited	00	○	1	114
FE-55	Online rotor position compensation enable	0: Disabled 1: Enabled	0	○	1	114
FE-56	Maximum frequency limiting mode	0: Field weakening enabled; 1: Field weakening disabled;	0	×	1	114
FE-57	Stall fault determination coefficient		0	○	1	114
FE-58	Overvoltage field strengthening coefficient	0~100%, taking the motor rated current as 100%	0%	○	1	114
FE-59	Unit overvoltage point	Unit module voltage	1140	○	1	114
FE-60	Maximum torque-current ratio adjustment coefficient	0 ~ 200	33	○	1	115
FE-61	Droop frequency	Only valid for flexible dual-drive	0.50Hz	○	1	115
FE-62	IF_MRAS switching frequency percentage	0~100%, taking the motor rated frequency as 100%	10%	○	1	115
FE-63	High-frequency injection frequency	0 ~ 1,000 Hz	100Hz	○	1	115
FE-64	Master/slave mode selection	0: Invalid 1: Master 2: Slave	0	○	1	115
FE-67	Selection of soft starter SOGI phase-locked loop enabling	0: Disabled 1: Enabled	0	×	1	115
FE-68	Soft starter switching frequency percentage	Taking the motor rated frequency as 100%	95%	×	1	115
FE-69	Custom display parameter selection	Thousands and hundreds digits: Custom display 2 Tens and units digits: Custom display 1; 0: Initial position; 1: Polarity identification confidence; 2: Soft-start grid-connection stage; 3: Number of pulse differences during encoder fault; 4: Power factor; 5: Torque percentage; 6: d-axis reference current; 7: q-axis reference current; 8: d-axis feedback current; 9: q-axis feedback	Model Confirm	○	1	115

5. List of Functional Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
		current; 10: Excitation signal output; 11: Phase-locked deviation; 12: Motor output speed rpm; 13: Rotor position; 14: Speed mode/Torque mode				
FE-81	Speed tracking method	0: General algorithm 1: Phase-locked loop frequency tracking 2: System frequency tracking	0	○	0	115

FF Communication Parameters

Parameter	Name	Setting range and description	Factory default	Change	Security level	Page
FF-00	Communication compatibility selection	0: None 1: Compatible with third-generation devices	0	○	1	115
FF-01	USER communication format	0: 8/N/1 1: 8/E/1 2: 8/O/1 3: 8/N/2	2	○	1	115
FF-02	USER communication baud rate	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	4	○	1	115
FF-03	USER communication address	0~247	1	○	1	115
FF-10	Communication process character 1 selection	Corresponding monitoring parameter 0~100	0	○	1	115
FF-11	Communication process character 2 selection	Corresponding monitoring parameter 0~100	0	○	1	116
FF-12	Communication process character 3 selection	Corresponding monitoring parameter 0~100	0	○	1	116
FF-13	Communication process character 4 selection	Corresponding monitoring parameter 0~100	0	○	1	116
FF-14	Communication process character 5 selection	Corresponding monitoring parameter 0~100	0	○	1	116
FF-15	Communication process character 6 selection	Corresponding monitoring parameter 0~100	0	○	1	116
FF-16	Communication process character 7 selection	Corresponding monitoring parameter 0~100	0	○	1	116
FF-17	Communication process character 8 selection	Corresponding monitoring parameter 0~100	0	○	1	116
FF-20	Local address for CAN communication	1 ~ 63	1	×	1	116
FF-21	CAN communication baud rate	0: 1M 1: 500K 2: 250K 3: 125K 4: 100K 5: 50K	1	×	1	116

FU Data Monitoring

Communication Address	Parameter	Name	Description
1200	FU-00	Running frequency	Unit: 0.01 Hz
1201	FU-01	Operation frequency percentage	Unit: 0.01%
1202	FU-02	Set frequency	Unit: 0.01 Hz

5. List of Functional Parameters

Communication Address	Parameter	Name	Description
1203	FU-03	Reserved	
1204	FU-04	Output measurement frequency	Unit: 0.01 Hz
1205	FU-05	Reserved	
1206	FU-06	Reserved	
1207	FU-07	PID feedback value	Unit: 0.01%
1208	FU-08	PID set value	Unit: 0.01%
1209	FU-09	PID output value	Unit: 0.01%
120A	FU-10	Reserved	
120B	FU-11	AI1 input percentage	Unit: 0.01%
120C	FU-12	AI2 input percentage	Unit: 0.01%
120D	FU-13	AI3 input percentage	Unit: 0.01%
120E	FU-14	Reserved	
120F	FU-15	Reserved	
1210	FU-16	Reserved	
1211	FU-17	Reserved	
1212	FU-18	Output current	Unit: 0.1 A
1213	FU-19	Output current percentage	Unit: 0.01%
1214	FU-20	Input current	Unit: 0.1 A
1215	FU-21	Phase-R input current	
1216	FU-22	Phase-S input current	
1217	FU-23	Phase-T input current	
1218	FU-24	Phase-U output current	
1219	FU-25	Phase-V output current	
121A	FU-26	Phase-W output current	
121B	FU-27	Reserved	
121C	FU-28	Reserved	
121D	FU-29	Reserved	
121E	FU-30	Reserved	
121F	FU-31	Output voltage	Unit: 1 V
1220	FU-32	Reserved	
1221	FU-33	Reserved	
1222	FU-34	Reserved	
1223	FU-35	Output power	Unit: 1 kW
1224	FU-36	Reserved	
1225	FU-37	Reserved	
1226	FU-38	Input voltage	Unit: 1 V
1227	FU-39	Input power	Unit: 1 kW
1228	FU-40	Voltage of the input RS line	
1229	FU-41	Voltage of the input ST line	

Communication Address	Parameter	Name	Description
122A	FU-42	Voltage of the input TR line	
122B	FU-43	Voltage of the output UV line	
122C	FU-44	Voltage of the output VW line	
122D	FU-45	Voltage of the output WU line	
122E	FU-46	Communication polling cycle	
122F	FU-47	Times of communication error	
1230	FU-48	Reserved	
1231	FU-49	Accumulated running time of fan	
1232	FU-50	Digital input/output terminal status	
1233	FU-51	Reserved	
1234	FU-52	Unit U1-4 status information	
1235	FU-53	Unit U2-8 status information	
1236	FU-54	Unit V1-4 status information	
1237	FU-55	Unit V2-8 status information	
1238	FU-56	Unit W1-4 status information	
1239	FU-57	Unit W2-8 status information	
123A	FU-58	Unit U9V9W9 status information	
123B	FU-59	System fault code	
123C	FU-60	Reserved	
123D	FU-61	Reserved	
123E	FU-62	Reserved	
123F	FU-63	Reserved	
1240	FU-64	Reserved	
1241	FU-65	Reserved	
1242	FU-66	Reserved	
1243	FU-67	Reserved	
1244	FU-68	Reserved	
1245	FU-69	Reserved	
1246	FU-70	Reserved	
1247	FU-71	Reserved	
1248	FU-72	Reserved	
1249	FU-73	Reserved	
124A	FU-74	Rated power of frequency converter	Min. unit: 1kW
124B	FU-75	DSP software version No.	
124C	FU-76	Reserved	
124D	FU-77	Reserved	
124E	FU-78	Reserved	

5. List of Functional Parameters

Communication Address	Parameter	Name	Description
124F	FU-79	Reserved	
1250	FU-80	Reserved	
1251	FU-81	Reserved	
1252	FU-82	Reserved	
1253	FU-83	Reserved	
1254	FU-84	Reserved	
1255	FU-85	Reserved	
1256	FU-86	Reserved	
1257	FU-87	Reserved	
1258	FU-88	Reserved	
1259	FU-89	Reserved	
125A	FU-90	Reserved	
125B	FU-91	Reserved	
125C	FU-92	Reserved	
125D	FU-93	Reserved	
125E	FU-94	Reserved	
125F	FU-95	Reserved	
1260	FU-96	AO1 output percentage	Unit: 0.01%
1261	FU-97	AO2 output percentage	Unit: 0.01%
1262	FU-98	AO3 output percentage	Unit: 0.01%
1263	FU-99	AO4 output percentage	Unit: 0.01%
1264	FU-100	Manufacturer information	Identify manufacturer
1265	FU-101	Device ID	Identify product type
1266	FU-102	Software ID	Identify software version
1267	FU-103	Dynamic verification code	Used for applying for dynamic passwords
1268	FU-104	System clock (lower 16 bits)	Taking the year of 1970 as the base number, unit: s
1269	FU-105	System clock (upper 16 bits)	
126A	FU-106	System status (lower 16 bits)	See notes below
126B	FU-107	System status (upper 16 bits)	
126C	FU-108	Switch status (lower 16 bits)	Corresponding to the primary circuit switch
126D	FU-109	Switch status (upper 16 bits)	
126E	FU-110	Input watt-hour meter (lower 16 bits)	Input electricity measurement
126F	FU-111	Input watt-hour meter (upper 16 bits)	
1270	FU-112	Output watt-hour meter (lower 16 bits)	Output electricity measurement
1271	FU-113	Output watt-hour meter (upper 16 bits)	
1272	FU-114	Rated power	Unit: 1 kW
1273	FU-115	Rated input voltage	Unit: 1 V
1274	FU-116	Rated input current	Unit: 0.1 A

5. List of Functional Parameters

Communication Address	Parameter	Name	Description
1275	FU-117	Rated output voltage	Unit: 1 V
1276	FU-118	Rated output current	Unit: 0.1 A
1277	FU-119	Service time of equipment	Unit: hours
1278	FU-120	Single operation time of the device	Unit: hours
1279	FU-121	Accumulated running time of fan	Unit: hours
127A	FU-122	Fault code	
127B	FU-123	Alarm information (lower 16 bits)	
127C	FU-124	Alarm information (upper 16 bits)	
127D	FU-125	Login user level	0: Operation 1: Maintenance 2: Administration 3: Manufacturer
127E	FU-126	Current frequency channel source	
127F	FU-127	Current start/stop channel source	
1280	FU-128	DI terminal status	
1281	FU-129	DO terminal status	
1282	FU-130		
1283	FU-131	Automatic restart remaining time	Valid during automatic reset
1284	FU-132	Automatic restart remaining times	Valid during automatic reset
1285	FU-133	Delay stop countdown (s)	Alarm of delayed fault stop
1286	FU-134	Current control mode	0: Not loaded 1: Asynchronous motor VF 2: Asynchronous motor vector 3: Synchronous motor VF 4: Synchronous motor vector 5: Permanent magnet synchronous 6: Power supply 7: Power generation supply 8: SVG control
1287	FU-135	Reserved	
1288	FU-136	Reserved	
1289	FU-137	Reserved	
128A	FU-138	Reserved	
128B	FU-139	Reserved	
128C	FU-140	Reserved	
128D	FU-141	Reserved	
128E	FU-142	Reserved	
128F	FU-143	Reserved	
1290	FU-144	Reserved	
1291	FU-145	Reserved	
1292	FU-146	Reserved	
1293	FU-147	Reserved	
1294	FU-148	Reserved	
1295	FU-149	Switchgear ID No.	Model determination

5. List of Functional Parameters

Communication Address	Parameter	Name	Description
1296	FU-150	Number of unit bypass layers	Bit display, see the description below

Power unit state description:

State	Content	State	Content	State	Content	State	Content
0	Bypass failure	4	Unit over-temperature	8	Uplink communication fault	12	Unit power loss
1	Abnormal bypass	5	Bus undervoltage	9	Rectifier fault	13	Unit shutdown
2	Module fault	6	AC phase loss	10	Reserved	14	Unit bypass
3	Bus overvoltage	7	Downlink communication fault	11	Temperature measurement disconnection	15	Normal

6. Detailed Description of Functional Parameters

6.1 F0 Basic Parameters

F0-00	Default control channel	Factory default	0	Security level	1	Change	×
F0-01	Remote control channel	Factory default	2	Security level	1	Change	×
F0-02	Forced control channel	Factory default	1	Security level	1	Change	×
Setting range	0: HMI 1: Communication 2: Terminal 3: PLC						



The control channel can be forcibly switched via digital input 23 "forced control channel switching" and digital input 25 "remote control channel switching". See Page 84 for details.

F0-03	Default frequency channel	Factory default	0	Security level	1	Change	×
F0-04	Remote frequency channel	Factory default	3	Security level	1	Change	×
F0-05	Forced frequency channel	Factory default	1	Security level	1	Change	×
Setting range	0: HMI 1: Communication 2: AI1 3: AI2 4: AI3						



The frequency channel can be forcibly switched via digital input 22 "forced frequency channel switching" and digital input 24 "remote frequency channel switching". See Page 84 for details.

F0-06	Maximum frequency	Factory default	50.00Hz	Security level	1	Change	○
Setting range	F0-07 "upper limit frequency"~320.00Hz						
F0-07	Upper limit frequency	Factory default	50.00Hz	Security level	1	Change	○
Setting range	F0-08 "lower limit frequency" ~ F0-06 "maximum frequency"						
F0-08	Lower limit frequency	Factory default	5.00Hz	Security level	1	Change	○
Setting range	0.01Hz~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	Motor rotation direction locked	Factory default	0	Security level	1	Change	×
Setting range	0: Unlocked 1: Forward direction locked 2: Reverse direction locked (valid at set frequency)						



Adjust the rotation direction of the motor.

F0-12	Control mode selection	Factory default	0	Security level	1	Change	×
Setting range	0: V/F control 1: Vector control 2: Permanent magnet synchronous motor 3: Power supply mode						



Control mode:

F0-12=0 "V/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 "vector control": Enter the F3 function group "vector control parameters" to set relevant parameters.

6. Detailed Description of Functional Parameters

F0-12=2 "permanent magnet synchronous motor": Control the permanent magnet synchronous motor.

F0-12=3 "power supply mode": The power supply mode can output three-phase voltage and frequency (50/60Hz) and a fixed/adjustable AC power supply. Enter the Fd function group to set the relevant parameters.

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

F1-00	Acceleration time 1	Factory default	120.0s	Security level	0	Change	○
F1-01	Deceleration time 1	Factory default	120.0s	Security level	0	Change	○
F1-02	Acceleration time 2	Factory default	120.0s	Security level	0	Change	○
F1-03	Deceleration time 2	Factory default	120.0s	Security level	0	Change	○
F1-04	Acceleration time 3	Factory default	120.0s	Security level	0	Change	○
F1-05	Deceleration time 3	Factory default	120.0s	Security level	0	Change	○
F1-06	Acceleration time 4	Factory default	120.0s	Security level	0	Change	○
F1-07	Deceleration time 4	Factory default	120.0s	Security level	0	Change	○
Setting range	0.1~3,600.0 s						

 Acceleration time: the time required to increase the running frequency to 50Hz; Deceleration time: the time required to decrease the running frequency to 0Hz.

 F1-00~F1-07 provides 4 acceleration & deceleration times. It can be selected according to digital inputs 8, 9, 10, and 11. See Page 84 for details.

F1-09	Fast stop time	Factory default	50.0s	Security level	0	Change	○
Setting range	0.1~3,600.0 s						

 F1-09 "fast stop time": When the digital input 18 "fast stop" or the communication gives a fast stop command, the frequency converter will stop according to the "fast stop time".

F1-10	Starting method	Factory default	0	Security level	1	Change	×
Setting range	0: Start from the starting frequency 1: First DC braking and then starting from the starting frequency 2: Speed tracking start mode 1 3: Speed tracking start mode 2						
F1-11	Starting frequency	Factory default	0.50Hz	Security level	1	Change	○
Setting range	0.01~60.00 Hz						
F1-12	Starting frequency retention time	Factory default	0.0s	Security level	1	Change	○
Setting range	0.0 s ~ 60.0 s						
F1-13	Start delay time	Factory default	0.0s	Security level	1	Change	×
Setting range	0.0 s ~ 1,000.0 s						

6. Detailed Description of Functional Parameters

F1-14	Voltage soft start enable	Factory default	1	Security level	1	Change	×
Setting range	0: Invalid 1: valid (the voltage starts from 0 at the time of soft start, it is valid only when starting at the start frequency)						
F1-15	Starting DC braking time	Factory default	0.0s	Security level	1	Change	○
Setting range	0.0 s ~ 60.0 s						
F1-16	Starting DC braking current	Factory default	0.0%	Security level	1	Change	○
Setting range	0.0 ~ 100.0%, taking the motor rated current as 100%						



Frequency converter starting modes:

F1-10 = 0 "start from starting frequency": When starting, the frequency converter runs at F1-11 "starting frequency". It will accelerate after the time set in F1-12 "starting frequency holding time", which can reduce the current shock when starting.

F1-10 = 1 "DC braking before starting from the starting frequency": Sometimes the motor is rotating 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 F1-15 "starting DC braking time" and F1-16 "starting DC braking current".

F1-10 = 2 "speed tracking starting mode 1": 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.

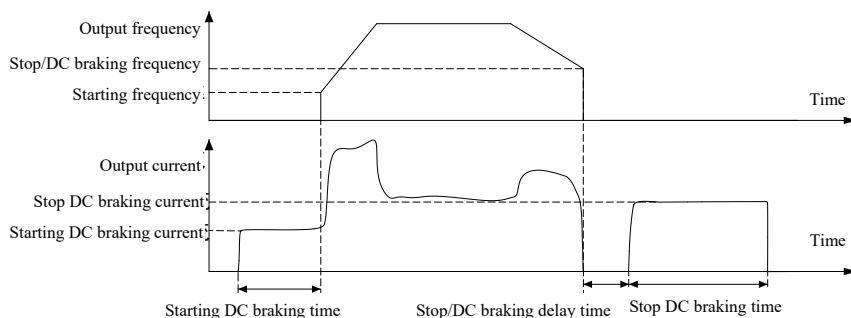
F1-10 = 3 "speed tracking starting mode 2": Automatically identify the speed and direction of the motor before starting, and then start smoothly without impact from the corresponding frequency. For the rotating motor, it is unnecessary to stop it completely for restart, which can shorten the starting time and reduce the starting impact.



In case of transient stop, self-reset and restart after operation interruption, the starting mode is speed tracking starting mode 1 or speed tracking starting mode 2.



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.

6. Detailed Description of Functional Parameters

 F1-14 "voltage soft start enable": When "starting from the starting frequency" is selected as the starting mode, and F1-12 "starting frequency retention 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 F1-14=1, to reduce the starting impact when starting and avoid the non-directional rotation of the motor caused by suddenly increased voltage. It is only valid for V/F control.

F1-17	Stop method	Factory default	0	Security level	1	Change	○
Setting range	0: Deceleration stop, 1: Free stop, 2: Deceleration + DC braking						
F1-18	Stop frequency	Factory default	0.50Hz	Security level	1	Change	○
Setting range	0.01 ~ 320.00 Hz						
F1-19	Stop/DC braking delay time	Factory default	0.0s	Security level	1	Change	○
Setting range	0.00~10.0 s						
F1-20	Stop DC braking time	Factory default	0.0s	Security level	1	Change	○
Setting range	0.0 s ~ 60.0 s						
F1-21	Stop DC braking current	Factory default	0.0%	Security level	1	Change	○
Setting range	0.0 ~ 100.0%, taking the motor rated current as 100%						

 Frequency converter stop mode:

F1-17=0 "deceleration stop": The frequency converter reduces its operating frequency and enters the standby state at F1-18 "stop frequency".

F1-17=1 "free stop": The frequency converter locks the output, and the motor slides freely. However, during jog operation stop or in case of an emergency stop, it will still perform 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.

F1-17=2 "deceleration + DC braking": The frequency converter decelerates after receiving the stop instruction and locks the output when it reaches F1-18 "stop frequency". After the F1-19 "stop DC braking waiting time", DC will be applied as set in F1-20 "stop DC braking current" in the motor. It will stop after reaching the set value of F1-20 "stop DC braking time". See Page 64 for the schematic diagram of startup/stop DC braking.

 **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-term or frequent DC braking is likely to cause the motor to overheat.

F1-28	Motor commutation dead time	Factory default	1.0s	Security level	1	Change	○
Setting range	0.1 s~600.0 s						

 Waiting time for alternation of forward and reversed rotation of the motor, which aims to minimize the impact of forward and reversed rotation on machinery.

F1-29	Jog frequency	Factory default	5.00Hz	Security level	1	Change	○
Setting range	0.01~60.00 Hz						

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

6. Detailed Description of Functional Parameters

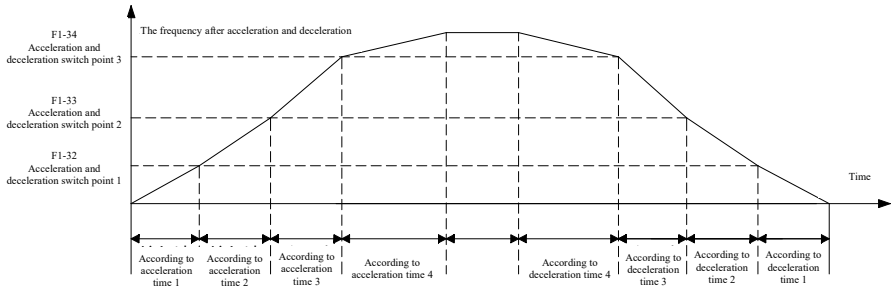


Acceleration and deceleration time of inching operation: F1-06 "acceleration time 4" and F1-07 "deceleration time 4".

F1-32	Acceleration and deceleration switch point 1	Factory default	0Hz	Security level	0	Change	○
F1-33	Acceleration and deceleration switch point 2	Factory default	0Hz	Security level	0	Change	○
F1-34	Acceleration and deceleration switch point 3	Factory default	0Hz	Security level	0	Change	○
Setting range		0.00 ~ 320.00 Hz					



Functions of "switch point of acceleration and deceleration time" 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.



The acceleration and deceleration switching point 1 is invalid when it is greater than the acceleration and deceleration switching points 2 and 3, and the acceleration and deceleration switching point 2 is invalid when it is greater than the acceleration and deceleration switching point 3.

6. Detailed Description of Functional Parameters

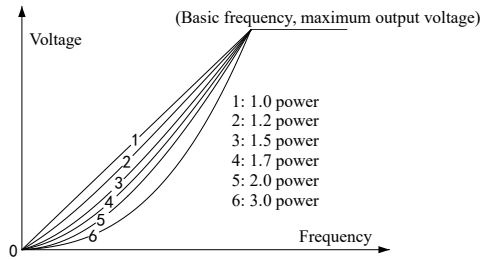
6.3 F2 V/F Control Parameters, Synchronous Motor Control, Redundancy Control, and Superimposed Frequency Control Parameters

F2-00	V/F curve setting	Factory default	1	Security level	1	Change	×
Setting range	0: Reserved 2: Derated torque V/F curve 1 (1.2 power) 4: Derated torque V/F curve 3 (1.7 power) 6: Derated torque V/F curve 5 (3.0 power)	1: Linear V/F curve (1.0 power) 3: Derated torque V/F curve 2 (1.5 power) 5: Derated torque V/F curve 4 (2.0 power)					

 V/F curves can be set to linear and various derated torque forms.

 The V/F curve of reduced torque can improve the motor efficiency of reduced torque load of fan pump under light load.

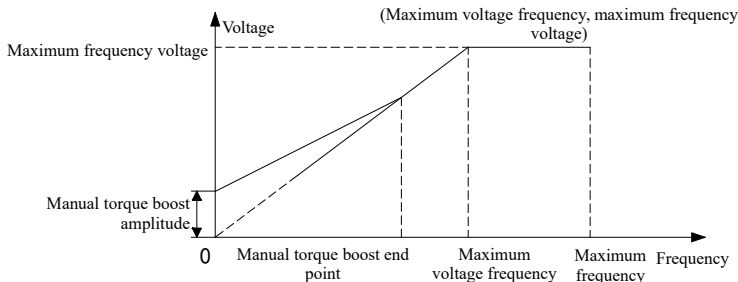
 The derated torque V/F curve can reduce noise. Linear and reduced torque V/F curves are as follows:



F2-02	Manual torque boost amplitude	Factory default	0.0%	Security level	1	Change	○
Setting range	0.0~10.0%						
F2-03	Torque boost cutoff point	Factory default	10.0%	Security level	1	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 and manual torque boost 1. The relationship between F2-02 "manual torque boost amplitude", F2-03 "manual torque boost cutoff point", F2-05 "maximum voltage frequency", and F2-12 "maximum frequency voltage" is shown below:



6. Detailed Description of Functional Parameters

F2-09	Anti-vibration damping coefficient	Factory default	5	Security level	1	Change	○
Setting range	0~500						



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	Automatic voltage regulation function	Factory default	1	Security level	1	Change	○
Setting range	0: Invalid 1: Always valid 2: Invalid only when decelerating						



Automatic voltage regulation function: When the input voltage or DC bus voltage changes, this 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 automatic voltage regulation function shall be enabled to prevent the motor from operating under excessive voltage.



The automatic voltage regulation function allows faster deceleration under the mode of "invalid only during deceleration" by comparing with the mode of "valid all the time", but the deceleration current is slightly larger. This is because deceleration increases the DC bus voltage, and if the automatic voltage regulation function 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.

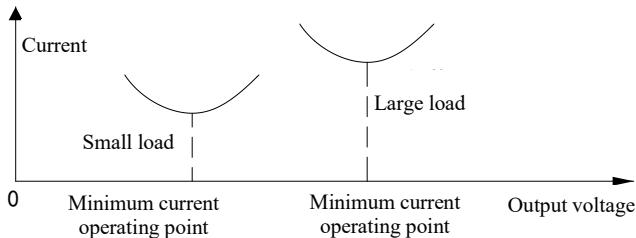


ATTENTION: If the load rotary inertia is large, the automatic voltage regulation function shall be set to "always valid" to prevent excessive voltage when decelerating and causing motor heating.

F2-11	Automatic energy saving operation selection	Factory default	0	Security level	1	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, as shown in the figure below:



The automatic energy-saving operation requires both automatic torque boost and slip compensation functions.

F2-12	Maximum frequency voltage	Factory default	10000V	Security level	1	Change	○
Setting range	0 ~ 20,000 V						
F2-13	Maximum voltage frequency	Factory default	50.00Hz	Security level	1	Change	○
Setting range	0.01 ~ 320.00 Hz						

6. Detailed Description of Functional Parameters

 F2-12 "maximum frequency voltage" and F2-13 "maximum voltage frequency" are valid for V/F control only.

F2-21	Synchronous soft start enable	Factory default	0	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled (synchronizing to grid output after starting to grid frequency)						
F2-22	Sync rate setting	Factory default	10.0s	Security level	1	Change	○
Setting range	0.0 ~ 60.0 s						
F2-23	Synchronous phase compensation	Factory default	2.5°	Security level	1	Change	○
Setting range	-20.0° ~ +20.0°						

 F2-21 "synchronous soft start enable": After the frequency converter is started, it reaches the actually reached set frequency (the same as the power grid frequency), then the frequency converter begins to track the frequency, voltage and phase of the power grid. When the output of the frequency converter is synchronized with the frequency, voltage, and phase of the power grid, the frequency converter sends a signal to allow switching. When the high-voltage bypass switch is closed, the frequency converter stops output when it receives the "grid connection completion signal". At the same time, the output switch is disconnected, the frequency converter stops, and the synchronous soft start process is completed.

F2-24	Voltage ramp time	Factory default	5.0s	Security level	1	Change	○
Setting range	0.0s~60.0s (time from 0 to maximum voltage)						

 When the starting mode is speed tracking start mode 1 or speed tracking start mode 2, the speed tracking start completion time is F2-24 "voltage ramp time".

F2-30	Motor type selection	Factory default	0	Security level	1	Change	○
Setting range	0: Asynchronous motor control 1: Synchronous motor VF control 2: Synchronous motor IF control 1 3: Synchronous motor IF control 2						
F2-31	Initial excitation of synchronous motor	Factory default	5%	Security level	1	Change	○
Setting range	0~100.00%						
F2-32	Synchronizing excitation of synchronous motor	Factory default	50%	Security level	1	Change	○
Setting range	0~100.00%						
F2-33	Synchronizing current of synchronous motor	Factory default	50%	Security level	1	Change	○
Setting range	0~100.00%						
F2-34	Synchronizing time of synchronous motor	Factory default	3.0s	Security level	1	Change	○
Setting range	0.0 ~ 60.0 s						
F2-35	Synchronous motor stabilization time	Factory default	3.0s	Security level	1	Change	○
Setting range	0.0 ~ 60.0 s						
F2-36	Excitation control proportional coefficient	Factory default	0.02	Security level	1	Change	○
Setting range	0.001 ~ 10.000						
F2-37	Excitation control integral factor	Factory	0.002	Security	1	Change	○

6. Detailed Description of Functional Parameters

		default		level			
Setting range	0.001 ~ 10.000						
F2-38	Synchronous motor flying start	Factory default	0	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
F2-40	Control algorithm selection	Factory default	0	Security level	1	Change	○
Setting range	0: General algorithm 1: Continuous heavy load 2: Starting heavy load only						
F2-41	Starting excitation time	Factory default	0.5s	Security level	1	Change	○
Setting range	0.0 ~ 360.0 s						
F2-42	Starting excitation current	Factory default	100.0%	Security level	1	Change	○
Setting range	20.0% ~ 150.0%						
F2-43	Starting switching frequency 1	Factory default	10.00Hz	Security level	1	Change	○
Setting range	5.00 Hz ~ "F2-44"						
F2-44	Starting switching frequency 2	Factory default	20.00Hz	Security level	1	Change	○
Setting range	"F2-43" ~ 30.00 Hz						
F2-45	Stop switching frequency 1	Factory default	15.00Hz	Security level	1	Change	○
Setting range	"F2-46" ~ 20.00 Hz						
F2-46	Stop switching frequency 2	Factory default	14.00Hz	Security level	1	Change	○
Setting range	0.01 Hz ~ "F2-45"						
F2-47	Voltage boost ratio	Factory default	20.0%	Security level	1	Change	○
Setting range	0.1 ~ 30.0%						
F2-48	Current set slope	Factory default	500ms	Security level	1	Change	○
Setting range	1 ~ 10,000 ms						
F2-49	Value Kp of current regulator	Factory default	0.100	Security level	1	Change	○
Setting range	0.001 ~ 10.000						
F2-50	Value Ki of current regulator	Factory default	0.0200	Security level	1	Change	○
Setting range	0.0001 ~ 1.0000						
F2-55	Parallel/redundant control	Factory default	0	Security level	1	Change	○
Setting range	0: Stand-alone 1: Redundant master 2: Redundant slave 3: Parallel master 4: Parallel slave						
F2-56	Redundant switching voltage limit	Factory default	80.0%	Security level	1	Change	○
Setting range	50.0% ~ 90.0%						
F2-57	Fault switching setting	Factory default	0	Security level	1	Change	○
Setting range	0: All faults are switched 1: Only output fault is not switched						
F2-60	Superimposed frequency value	Factory default	43.00Hz	Security level	1	Change	○

6. Detailed Description of Functional Parameters

Setting range	0.01 ~ 320.00 Hz						
F2-61	Superimposed voltage value	Factory default	0V	Security level	1	Change	○
Setting range	0 ~ 20,000 V						
F2-62	Superimposed frequency starting point	Factory default	50.00Hz	Security level	1	Change	○
Setting range	0.01~320.00Hz (starting superposition frequency when operating frequency absolute value > set value)						
F2-63	Frequency superposition ramp time	Factory default	30s	Security level	1	Change	○
Setting range	0~600s (time required for voltage from 0 to the rated value)						
F2-65	Initial excitation settings	Factory default	20.00%	Security level	1	Change	○
F2-66	Intermediate excitation settings	Factory default	40.00%	Security level	1	Change	○
F2-67	End excitation settings	Factory default	60.00%	Security level	1	Change	○
Setting range	0~100.00% (maximum excitation current: 100.00%)						
F2-68	Initial excitation frequency	Factory default	3.00Hz	Security level	1	Change	○
F2-69	Intermediate switching frequency	Factory default	10.00Hz	Security level	1	Change	○
F2-70	End switching frequency	Factory default	20.00Hz	Security level	1	Change	○
Setting range	0.50 Hz ~ 50.00 Hz						



The frequency converter parameters shall be adjusted according to the relevant parameters of the field synchronous motor, redundant control, or superposition frequency control.



F2-65~ F2-70 are used for IF control 1 parameters and IF control 2 parameters of a synchronous motor.

6.4 F3 Vector Control Parameters

F3-00	Motor control mode	Factory default	0	Security level	1	Change	×
Setting range	0: Without PG vector control 1: With PG vector control 1 2: With PG vector control 2 3: With PG vector control 3						

 Under F0-09 = 1 "vector control", the parameter shall be set.

 "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.

 "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.

 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 the internal motor dynamic model and magnetic field orientation algorithm;
3. The power level of the motor and the frequency converter shall match. If the motor rated current is too small, the control performance will decline. The motor rated current 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 F3-08 "basic frequency" to be the same as the motor rated frequency, 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 : For "with PG control mode", it is required to set PG parameters correctly (see encoder parameter description on Page 114). Improper settings may result in personal injury and property loss. After the motor cable is reconnected, the direction settings of the encoder must be checked again.

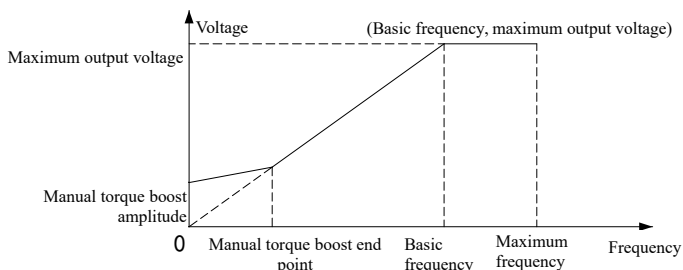
F3-01	Torque boost selection	Factory default	0	Security level	1	Change	×
Setting range	0: None 1: Manual boost 2: Automatic boost 3: Manual boost+automatic boost						

6. Detailed Description of Functional Parameters

F3-02	Manual torque boost amplitude	Factory default	Model determination	Security level	1	Change	○
Setting range	0.0%~ maximum value determined by model, the minimum unit is 0.1%						
F3-03	Torque boost cutoff point	Factory default	10.0%	Security level	1	Change	○
Setting range	0~100.0%, taking F3-08 as 100 %						
F3-04	Automatic torque boost degree	Factory default	80.0%	Security level	1	Change	○
Setting range	0 ~ 100.0%						

 Manual torque boost can improve the low speed torque and starting torque of the motor. Adjust F3-02 "manual torque boost amplitude" from small to large until it meets 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 and manual torque boost 1. The relationship between F3-02 "manual torque boost amplitude", F3-03 "manual torque boost cutoff point", F3-08 "basic frequency", and F3-09 "maximum output voltage" is shown below:



F3-05	Slip compensation filtering time	Factory default	1.0s	Security level	1	Change	○
Setting range	0.1 ~ 25.0 s						
F3-06	Automatic torque filtering frequency R	Factory default	1.0 rad/s	Security level	1	Change	○
Setting range	0.1 ~ 25.0 rad/s						
F3-07	Automatic torque filter frequency L	Factory default	10.0rad/s	Security level	1	Change	○
Setting range	0.1 ~ 25.0 rad/s						

 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 effective when automatic torque boost is turned on (F3-01 = 2 or 3).

 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, F3-05 "slip compensation filtering time" can be considered to be increased.

F3-08	Basic frequency	Factory default	50.00Hz	Security level	1	Change	×
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6. Detailed Description of Functional Parameters

Setting range	0.01~320.00Hz (frequency corresponding to the maximum voltage in VF curve)						
F3-09	Maximum output voltage	Factory default	10000V	Security level	1	Change	×
Setting range	0~20000V (voltage value corresponding to the maximum frequency in the VF curve)						
F3-10	Output voltage recovery time	Factory default	5s	Security level	1	Change	○
Setting range	1 ~ 50						



F3-08 "basic frequency" shall be set to be the same as FA-04 "motor rated frequency " when vector control is adopted.



When F3-09 "maximum output voltage" is under vector control, the maximum output voltage shall be set to the same as the FA-06 "motor rated voltage".



ATTENTION: Before vector self-learning, it is required to confirm whether the F3-08 "basic frequency" and F3-09 "maximum output voltage" are correct.

F3-11	Anti-vibration damping method	Factory default	0	Security level	1	Change	○
Setting range	0:torq 1:icd 2:iq						
F3-12	Vibration damping	Factory default	Model determination	Security level	1	Change	○
Setting range	0 ~ 200						
F3-13	Anti-vibration damped filter frequency	Factory default	2.0 rad/s	Security level	1	Change	○
Setting range	0.1 ~ 25.0 rad/s						



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.

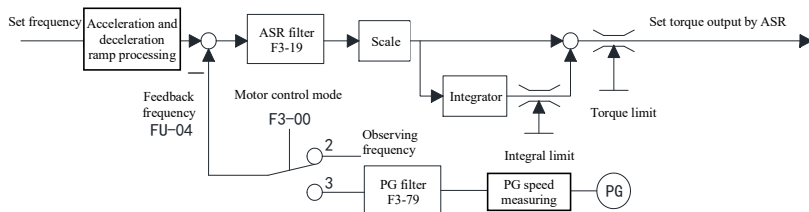
F3-14	High-speed ASR proportional gain	Factory default	5.00	Security level	1	Change	○
Setting range	0.00 ~ 200.00						
F3-15	High-speed ASR integration time	Factory default	1.000s	Security level	1	Change	○
Setting range	0.010 ~ 30.000 s						
F3-16	Low-speed ASR proportional gain	Factory default	10	Security level	1	Change	○
Setting range	0.00 ~ 200.00						
F3-17	Low-speed ASR integration time	Factory default	0.500s	Security level	1	Change	○
Setting range	0.010 ~ 30.000 s						
F3-18	ASR parameter switching point	Factory default	5.00Hz	Security level	1	Change	○
Setting range	0.00 ~ 650.00 Hz						
F3-19	ASR filtering time	Factory default	0.010s	Security level	1	Change	○
Setting range	0.000 ~ 2.000 s						
F3-20	Acceleration compensation differential time	Factory default	0.000s	Security level	1	Change	○

6. Detailed Description of Functional Parameters

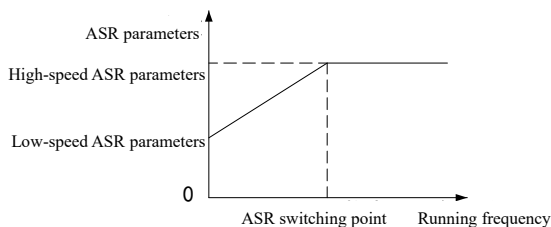
Setting range	0.000 ~ 20.000 s						
F3-21	Low-speed steady-state strong PI fluctuation frequency	Factory default	50	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-22	PI linear switching	Factory default	500	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-23	Low-speed strong PI valid frequency threshold	Factory default	200	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-24	Low-speed steady-state strong PI_KP	Factory default	1300	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-25	Low-speed steady-state strong PI_KI	Factory default	30	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-26	Low-speed steady-state strong PI intervention time	Factory default	50	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-27	ASR strong PI intervention speed deviation threshold	Factory default	5000	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-28	ASR strong PI intervention P increment	Factory default	10	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-29	ASR strong PI intervention I coefficient	Factory default	5	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-30	ASR strong PI intervention P maximum value	Factory default	1000	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-31	Motoring power limit	Factory default	120.0%	Security level	1	Change	○
Setting range	0.0~250.0%, take rated power of frequency converter as 100%						
F3-32	Regenerative power limit	Factory default	120.0%	Security level	1	Change	○
Setting range	0.0~250.0%, take rated power of frequency converter as 100%						
F3-33	Motoring torque limitation	Factory default	180.0%	Security level	1	Change	○
Setting range	0.0~250.0%, taking the motor rated torque as 100% (note: for vector control only)						
F3-34	Regenerative torque limitation	Factory default	180.0%	Security level	1	Change	○
Setting range	0.0~250.0%, taking the motor rated torque as 100% (note: for vector control only)						

 ASR: Automatic speed regulator. In vector control, ASR outputs the set torque, which is limited by F3-33 ~ F3-34.

 ASR structure diagram for vector control is shown below:



F3-18 "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 parameters F3-16 and F3-17 can be adopted when zero speed is adopted, and high-speed parameters F3-14 and F3-15 can be adopted when the operating 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 the ASR parameter switching point, as shown in the figure below. If only one set of ASR parameters is required, F3-18 "ASR parameter switching point" can be set to 0, that is, only high-speed ASR parameters are used.



F3-20 "ASR acceleration compensation differential time": The parameter differentiates the set frequency processed by acceleration and deceleration time to obtain a feedforward torque setting, which is added to the set torque to better track the set operating 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.

F3-35	Pre-excitation time	Factory default	Model determination	Security level	1	Change	×
Setting range	0.01 ~ 5.00 s						
F3-36	Pre-excitation intensity	Factory default	94.0%	Security level	1	Change	×
Setting range	50.0 ~ 150.0%						

F3-35 "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.

F3-36 "pre-excitation intensity": A flux level too high or too low below the flux weakening point will lead to the decline of torque output capacity and efficiency.

F3-37	Flux linkage reference GEN	Factory default	110.0%	Security level	1	Change	○
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6. Detailed Description of Functional Parameters

Setting range	0 ~ 2,000						
F3-38	Flux linkage reference MOT	Factory default	88.0%	Security level	1	Change	○
Setting range	0 ~ 2,000						
F3-39	Low-speed flux lifting	Factory default	0	Security level	1	Change	○
Setting range	0 ~ 50%						
F3-40	Weak magnetic regulator integration time	Factory default	0.150s	Security level	1	Change	○
Setting range	0.100 ~ 3.000 s						
F3-41	Flux linkage closed-loop current torque filtering time	Factory default	5	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-42	Flux linkage closed-loop light load torque threshold	Factory default	100	Security level	1	Change	○
Setting range	0 ~ 1,000						
F3-43	Generating-to-motoring current threshold 0%-100%	Factory default	35	Security level	1	Change	○
Setting range	0 ~ 200						
F3-44	Flux linkage closed-loop switch	Factory default	1	Security level	1	Change	○
Setting range	0 ~ 1						
F3-45	Generating-to-motoring torque hysteresis	Factory default	50	Security level	1	Change	○
Setting range	0 ~ 1,000						
F3-46	Excitation braking flux strength	Factory default	0	Security level	1	Change	○
Setting range	50.0 ~ 150.0%						
F3-47	Rotor flux filter cutoff angular frequency coefficient	Factory default	10	Security level	1	Change	○
Setting range	10						
F3-48	Flux linkage limit value	Factory default	16384	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-49	Limiting value of rotor flux filter cutoff angular frequency filter coefficient	Factory default	32760	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-50	Minimum filter value coefficient of rotor flux filter cutoff angular frequency	Factory default	5240	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-51	Filter coefficient of rotor flux filter cutoff angular frequency	Factory default	2	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-52	Rotor flux filter coefficient 1 (0-3Hz generating)	Factory default	10	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-53	Rotor flux filter coefficient 2 (3Hz-4Hz)	Factory default	10	Security level	1	Change	○
Setting range	0 ~ 65,535						

6. Detailed Description of Functional Parameters

F3-54	Rotor flux filter coefficient 3 (4Hz-10Hz)	Factory default	10	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-55	Rotor flux filter coefficient 4 (0-3Hz motoring)	Factory default	30	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-56	Rotor flux filter coefficient 5 (10Hz-50Hz)	Factory default	10	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-57	Minimum filter value coefficient of torque-control rotor flux filter cutoff angular frequency	Factory default	8200	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-58	Torque filtering coefficient	Factory default	100	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-59	Generating slip compensation coefficient	Factory default	0	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-60	Electric slip compensation coefficient	Factory default	10	Security level	1	Change	○
Setting range	0 ~ 65,535						
F3-61	Vector control synchronization frequency filtering cut-off frequency	Factory default	200 rad/s	Security level	1	Change	○
Setting range	1 ~ 250 rad/s						
F3-62	Flux control gain	Factory default	1.0	Security level	1	Change	○
Setting range	1.0 ~ 3.0						
F3-63	Decoupling compensation allowed	Factory default	1	Security level	1	Change	×
Setting range	0: Prohibited 1: Allowed						
F3-64	Decoupling compensation of PI2	Factory default	1	Security level	1	Change	×
Setting range	0: Method I 1: Method II						
F3-65	Cut-off frequency of current loop	Factory default	3666rad/s	Security level	1	Change	○
Setting range	100 ~ 6000 rad/s						
F3-66	Decoupling compensation coefficient	Factory default	1.000	Security level	1	Change	○
Setting range	0.000 ~ 1.000						
F3-67	Speed estimation filter cut-off frequency	Factory default	160	Security level	1	Change	○
Setting range	40 ~ 160 Hz						
F3-68	Feedforward switch	Factory default	0	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
F3-69	Feedforward value	Factory	0	Security	1	Change	○

6. Detailed Description of Functional Parameters

		default		level			
Setting range	0.0~100.0%, taking the motor rated torque as 100%						
F3-70	Feed-forward attenuation coefficient	Factory default	99.9%	Security level	1	Change	○
Setting range	0 ~ 100.0%						
F3-71	Feed-forward torque direction	Factory default	0	Security level	1	Change	○
Setting range	0: Positive 1: Negative						
F3-72	PG pulse number per revolution	Factory default	1024	Security level	1	Change	×
Setting range	1 ~ 8,192						
F3-73	PG type	Factory default	0	Security level	1	Change	×
Setting range	0: Quadrature encoder 1: Single channel encoder						
F3-74	PG direction selection	Factory default	0	Security level	1	Change	○
Setting range	0: Positive 1: Negative						
F3-75	PG disconnection action	Factory default	2	Security level	1	Change	○
Setting range	0: No action 1: Alarm 2: Fault and free stop						
F3-76	PG disconnection detection time	Factory default	1.0s	Security level	1	Change	○
Setting range	0.1 ~ 10.0 s						
F3-77	PG gear ratio denominator setting	Factory default	1	Security level	1	Change	×
Setting range	1 ~ 1,000						
F3-78	PG gear ratio numerator setting	Factory default	1	Security level	1	Change	×
Setting range	1 ~ 1,000						
F3-79	PG speed measurement filtering time	Factory default	0.005s	Security level	1	Change	○
Setting range	0.000 ~ 2.000 s						

 An encoder interface board, such as SL-PG-3, is required for the use of an encoder. See the section on the encoder interface board for the wiring method.

 F3-73 "PG type": When selecting a single-channel encoder, the signal must enter through channel A. A single-channel encoder is not suitable for low-speed and forward and reverse operations.

 F3-74 "PG direction selection": If selecting the forward direction for a single-channel encoder, the speed value of the encoder (query record - control information -PG detection 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 F3-76 "PG disconnection detection time", it will be deemed to be PG disconnection, and the disconnection action will be processed according to the settings of F3-75 "PG disconnection action". PG disconnection detection is only available for these "with PG V/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 F3-77 and F3-78 correctly, and the relationship between the encoder speed and the motor speed is as follows: motor speed = encoder speed × F3-78 "PG gear ratio numerator setting" ÷ F3-77 "PG gear ratio denominator setting"

6. Detailed Description of Functional Parameters

 F3-79 "PG speed measuring and filtering time": Encoder speed measuring requires F3-79 filtering, so F3-79 cannot be set too large when dynamic performance is required to be high.

 Relevant monitoring parameters: query record - control information - PG detection frequency.

 **Encoder setting verification method:** Adopt "without PG V/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** : For "with PG control mode", it is required to set PG parameters correctly. Improper settings may result in personal injury and property loss. After the motor cable is reconnected, the direction settings of the encoder must be checked again.

F3-80	Control voltage selection	Factory default	1	Security level	1	Change	○
Setting range	0: Measurement 1: Set						
F3-81	Closing enabling switch	Factory default	0	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
F3-82	Forward opening frequency	Factory default	3.00Hz	Security level	1	Change	○
Setting range	0.01~20.00 Hz						
F3-83	Forward closing frequency	Factory default	5.00Hz	Security level	1	Change	○
Setting range	0.01~20.00 Hz						
F3-84	Reverse opening frequency	Factory default	3.00Hz	Security level	1	Change	○
Setting range	0.01~20.00 Hz						
F3-85	Reverse closing frequency	Factory default	5.00Hz	Security level	1	Change	○
Setting range	0.01~20.00 Hz						
F3-86	Forward opening current threshold	Factory default	10.0%	Security level	1	Change	○
Setting range	0~100.0%						
F3-87	Reverse opening current threshold	Factory default	3.0%	Security level	1	Change	○
Setting range	0~100.0%						
F3-88	Opening maintenance frequency	Factory default	4.00Hz	Security level	1	Change	○
Setting range	0.01~20.00 Hz						
F3-89	Opening maintenance time	Factory default	220ms	Security level	1	Change	○
Setting range	0 ~ 10000 ms						
F3-90	Anti-slip frequency	Factory default	4.00Hz	Security level	1	Change	○
Setting range	0.01~20.00 Hz						
F3-91	Anti-slip action time	Factory default	220ms	Security level	1	Change	○
Setting range	0~10,000 ms						
F3-92	Forward opening torque threshold	Factory default	6.0%	Security level	1	Change	○

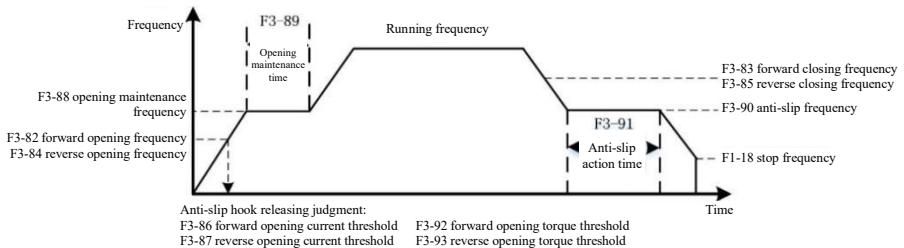
6. Detailed Description of Functional Parameters

Setting range	0~100.0%						
F3-93	Reverse opening torque threshold	Factory default	0%	Security level	1	Change	○
Setting range	0~100.0%						
F3-94	Closing state switching time	Factory default	1,000 ms	Security level	1	Change	○
Setting range	0~10,000 ms						
F3-95	Running frequency filter time	Factory default	150 ms	Security level	1	Change	○
Setting range	0~1,000 ms						
F3-96	Bus voltage filtering time	Factory default	100 ms	Security level	1	Change	○
Setting range	0~1,000 ms						
F3-97	Residual voltage filtering time	Factory default	2 ms	Security level	1	Change	○
Setting range	0~1,000 ms						
F3-98	Tracking current	Factory default	50%	Security level	1	Change	○
Setting range	10 ~ 100%						
F3-99	DC exciting current	Factory default	150%	Security level	1	Change	○
Setting range	0 ~ 150%						
F3-100	DC exciting time	Factory default	5	Security level	1	Change	○
Setting range	Rotor time constant multiplier						
F3-101	Overvoltage suppression	Factory default	0	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
F3-102	Lower limit of capture frequency action	Factory default	4.00Hz	Security level	1	Change	○
Setting range	0.01 ~ 50.00 Hz						

F3-103	Current tracking strategy	Factory default	0	Security level	1	Change	○
Setting range	0: Method 1 1: Method 2 2: Braking						



The control closing logic diagram is as follows:





ATTENTION: Closing control must ensure that the terminal controls the FWD to go up and the REV to go down.



Function code settings:



1. Method to enable closing logic functions

- (1) Set F3-81 to 1 to enable the closing logic functions;
- (2) select 22 for the solenoid gate control relay T1 output function.



2. Opening setting instructions:



2.1 Following forward opening conditions must be met at the same time:

- (1) Current operating frequency is greater than F3-82 (forward opening frequency, unit: Hz);
- (2) Current output torque is greater than F3-92 (forward opening torque threshold, set value: 100.0, corresponding to 100% rated torque);
- (3) Current output current is greater than F3-86 (forward opening current threshold, set value: 100.0, corresponding to 100% rated current).



2.2 Following reverse opening conditions must be met at the same time:

- (1) Current operating frequency is greater than F3-84 (reverse opening frequency, unit: Hz);
- (2) Current output torque is greater than F3-93 (reverse opening torque threshold, set value: 100.0, corresponding to 100% rated torque);
- (3) Current output current is greater than F3-87 (reverse opening current threshold, set value: 100.0, corresponding to 100% rated current).



ATTENTION: The set opening frequency must be lower than or equal to the current running frequency. Otherwise, it is impossible to open the brake. In case of sliding when opening, the opening torque and the set current value can be appropriately increased.



3. Closing setting:



3.1 Following forward closing conditions must be met at the same time:

- (1) Stop instruction received;
- (2) The current operating frequency is less than or equal to F3-83 (forward closing frequency, unit: Hz);
- (3) Free stop by directly closing.



3.2 Following reverse closing conditions must be met at the same time:

- (1) Stop instruction received;
- (2) The current operating frequency is less than or equal to F3-85 (reverse closing frequency, unit: Hz);
- (3) Free stop by directly closing.



ATTENTION: The set closing frequency shall be lower than or equal to the minimum frequency at which the system operates.



4. Troubleshooting for hook slipping:



4.1 Troubleshooting for hook slipping during stop and closing:

6. Detailed Description of Functional Parameters

(1) When the frequency is the same as that in F3-90 (anti-slip frequency), the frequency converter maintains the output and waits for the closing, and the maintenance time can be set according to F3-91 "anti-slip action time". In case of slip, the F3-91 set value shall be increased, and the value shall be decreased in case of towing hook (with abnormal noise caused by friction).



ATTENTION: The set anti-slip frequency shall be less than or equal to the closing frequency (the minimum value of forward closing and reverse closing), and the set F1-18 (stop frequency) shall be less than the anti-slip frequency.



4.2 Troubleshooting for hook slipping when releasing:

(1) Appropriately increase the releasing current threshold (F3-86/F3-87) and releasing torque threshold (F3-92/F3-93) corresponding to the operating direction.

6.5 F4 Digital Input Terminal and Multi-stage Speed

F4-00	X1 digital input terminal function	Factory default	15	Security level	1	Change	○
F4-01	X2 digital input terminal function	Factory default	0	Security level	1	Change	○
F4-02	X3 digital input terminal function	Factory default	0	Security level	1	Change	○
F4-03	X4 digital input terminal function	Factory default	0	Security level	1	Change	○
F4-04	X5 digital input terminal function	Factory default	0	Security level	1	Change	○
F4-05	X6 digital input terminal function	Factory default	0	Security level	1	Change	○
F4-06	FWD digital input terminal function	Factory default	0	Security level	1	Change	○
F4-07	REV digital input terminal function	Factory default	0	Security level	1	Change	○
Setting range	0~26, see the digital input function definition table below						



Digital input function definition table:

0: Not connected to the following signals	7: Multi-stage speed selection 1	14: External alarm signal time	21: Operation interruption
1: Multi-stage speed selection 1	8: Acceleration/deceleration selection 1	15: Fault reset	22: Forced frequency channel switching
2: Multi-stage speed selection 2	9: Acceleration/deceleration selection 2	16: Forward jogging	23: Forced control channel switching
3: Multi-stage speed selection 3	10: Acceleration/deceleration selection 3	17: Reverse jogging	24: Remote frequency channel switching
4: Multi-stage speed selection 4	11: Acceleration/deceleration selection 4	18: Fast stop	25: Remote control channel switching
5: Multi-stage speed selection 5	12: Emergency stop fault	19: Free stop time	26: Grid connection completion signal
6: Multi-stage speed selection 6	13: External fault signal	20: Start prohibited time	27: Reserved



Relevant monitoring parameters: FU-128 "digital input terminal state".



The digital input function is detailed as follows:

1~7: Multi-stage speed selection. See F4-16 "multi-stage speed selection mode" on Page 86 for details.

8~11: Acceleration/deceleration time selection. When the acceleration and deceleration time is directly selected from 1 to 4, and multiple signals are valid at the same time, the priority of the smaller number is higher.

12: Emergency stop fault. When the signal is valid, the frequency converter stops immediately and reports the emergency stop fault, which cannot be automatically reset and must be manually reset. If a normally closed input is required, it can be realized by inverting the digital input terminal of F4-09.

13: External fault signal. 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 a normally closed input is required, it can be realized by inverting the digital input terminal of F4-09. External fault can be indicated by digital output 8 "external fault".

14: External alarm signal. Through this signal, the alarm information of the peripheral equipment of the frequency converter is input to the frequency converter, and the frequency converter triggers the external alarm. The alarm automatically resets when the external alarm is removed.

15: Fault reset. The rising edge of the signal resets the fault.

6. Detailed Description of Functional Parameters

16~17: Forward and reverse jog operations. See the description of the jog function on Page 65 for details.

18: Fast stop. If the signal is valid, the frequency converter will stop according to F1-29 "fast stop time".

19: 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.

20: Start 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.

21: Operation interruption. When the frequency converter is in operation, the frequency converter will block the output when the signal is valid. When the operation is interrupted and the command is lifted, the frequency converter will start in speed-tracking mode.

22: Forced frequency channel switching. When the signal is effective, the normal operating frequency setting channel will be forcibly switched to the frequency channel set by F0-05. Once it is invalid, the frequency setting channel restores.

23: Forced control channel switching. When the signal is valid, the normal operation control channel will be forcibly switched to the control channel set by F0-02. Once it is invalid, the control channel restores.

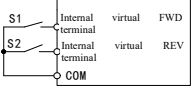
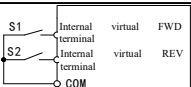
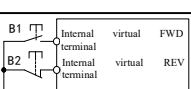
24: Remote frequency channel switching. When the signal is effective, the normal operating frequency setting channel will be forcibly switched to the frequency channel set by F0-04. Once it is invalid, the frequency setting channel restores.

25: Forced control channel switching. When the signal is valid, the normal operation control channel will be forcibly switched to the control channel set by F0-01. Once it is invalid, the control channel restores.

26: Grid connection completion signal. High level is valid.

F4-08	Terminal control mode	Factory default	3	Security level	1	Change	○
Setting range	0: Single line mode (start-stop) 4: Three-wire mode 1 (forward, reverse, stop) 1: Two-wire mode 1 (forward, reverse) 5: Three-wire mode 2 (running, direction, stop) 2: Two-wire mode 2 (start-stop, direction) 6: Double-pulse control (start/stop) 3: Two-wire mode 3 (start/stop)						

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

F4-08	Mode name	Running logic			Diagram
0	Single-wire type (start/stop)	S: Running switch, run when valid Note: The direction is determined by the direction of the set frequency			
1	Two-wire type 1 (Forward rotation, reverse rotation)	S2 (reverse)	S1 (forward)	Meaning	
		Invalid	Invalid	Stop	
		Invalid	Valid	Forward	
		Valid	Invalid	Reverse	
2	Two-wire type 2 (Start/stop, direction)	S2 (direction)	S1 (start/stop)	Meaning	
		Invalid	Invalid	Stop	
		Invalid	Valid	Forward	
		Valid	Invalid	Stop	
3	Two-wire type 3 (Start, stop)	S2 (direction)	S1 (start/stop)	Meaning	
		Invalid	Invalid	Stop	
		Invalid	Valid	Forward	
		Valid	Invalid	Stop	

6. Detailed Description of Functional Parameters

F4-08	Mode name	Running logic	Diagram
4	Three-wire type 1 (Forward, reverse, stop) Digital input 37 "three-wire stop command" is required to be attached	B1: Stop button (normally closed) B2: Forward button (normally open) B3: Reverse button (normally open)	
5	Three-wire type 2 (Run, direction, stop) Digital input 37 "three-wire stop command" is required to be attached	B1: Stop button (normally closed) B2: Run button (normally open) S: Direction switch, reversed when effective	
6	Two-wire type 4 (Start/stop)	B1: Forward run/stop button (normally open) B2: Reverse run/stop button (normally open)	

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 closed stop button is open.

For two-wire type 4, press the forward button once in standby mode to start the frequency converter in forward operation. Press it again to stop the frequency converter. The same logic applies to reverse operation.

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.

F4-09	Terminal DI signal logic	Factory default	128	Security level	1	Change	○
Setting range	Bit0-Bit7 corresponding to DI1-DI8 (0: Positive logic 1: Negative logic)						
F4-10	Digital input filtering time	Factory default	50ms	Security level	1	Change	○
Setting range	0 ~ 10000 ms						

X terminal signal filtering time: It defines the debounce time for digital input signals. Signals with a duration shorter than the filtering time will be ignored.

F4-16	Multi-stage speed selection	Factory default	0	Security level	1	Change	×
Setting range	0: Code selection 1: Direct selection 2: Overlapping mode 3: Number selection						
F4-17	Multi-stage speed 1 set frequency	Factory default	10.00Hz	Security level	1	Change	○
F4-18	Multi-stage speed 2 set frequency	Factory default	15.00Hz	Security level	1	Change	○
F4-19	Multi-stage speed 3 set frequency	Factory default	20.00Hz	Security level	1	Change	○
F4-20	Multi-stage speed 4 set frequency	Factory default	25.00Hz	Security level	1	Change	○

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F4-21	Multi-stage speed 5 set frequency	Factory default	30.00Hz	Security level	1	Change	○
F4-22	Multi-stage speed 6 set frequency	Factory default	35.00Hz	Security level	1	Change	○
F4-23	Multi-stage speed 7 set frequency	Factory default	40.00Hz	Security level	1	Change	○
Setting range	0.01 ~ 320.00 Hz						

 **F4-16=0 "code selection"**: Use binary coding of multi-stage frequency selections 1~3 to select multi-stage speed 1 ~ 7 set frequencies. For example, X1~X3 are set to "multi-stage speed selections 1~3". The corresponding coding selection relation is shown below. In the table, "0" refers to an invalid case, and "1" refers to a valid case:

X3	X2	X1	Selection result	X3	X2	X1	Selection result
0	0	0	Multi-stage speed invalid	1	0	0	F1-14 (multi-stage speed 4 set frequency)
0	0	1	F1-11 (multi-stage speed 1 set frequency)	1	0	1	F1-15 (multi-stage speed 5 set frequency)
0	1	0	F1-12 (multi-stage speed 2 set frequency)	1	1	0	F1-16 (multi-stage speed 6 set frequency)
0	1	1	F1-13 (multi-stage speed 3 set frequency)	1	1	1	F1-17 (multi-stage speed 7 set frequency)

 **F4-16=1 "direct selection"**: "Multi-stage speed selection 1"~"multi-stage speed selection 7" directly correspond to "multi-stage speed 1 set frequency"~"multi-stage speed 7 set frequency". When multiple selection signals are valid, the selection signal with the smaller number is valid. For example, X1~FWD are set to "multi-stage speed 1 set frequency"~"multi-stage speed 7 set frequency". The corresponding relationship is shown below. In the table, "0" refers to an invalid case, "1" refers to a valid case, and "-" refers to any state:

FWD	X6	X5	X4	X3	X2	X1	Selection result
0	0	0	0	0	0	0	Multi-stage speed invalid
-	-	-	-	-	-	1	F1-11 (multi-stage speed 1 set frequency)
-	-	-	-	-	1	0	F1-12 (multi-stage speed 2 set frequency)
-	-	-	-	1	0	0	F1-13 (multi-stage speed 3 set frequency)
-	-	-	1	0	0	0	F1-14 (multi-stage speed 4 set frequency)
-	-	1	0	0	0	0	F1-15 (multi-stage speed 5 set frequency)
-	1	0	0	0	0	0	F1-16 (multi-stage speed 6 set frequency)
1	0	0	0	0	0	0	F1-17 (multi-stage speed 7 set frequency)

 **F4-16=2 "Superimposed method"**: The set frequency is the sum of all selected multi-stage speeds (limited by upper and lower limit frequencies).

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

 **F4-16 = 3 "number selection"**: The number of valid signals among "multi-stage speed selection 1"~"multi-stage speed selection 7" determines that the multi-stage frequency is selected for the set frequency. For example, if any 3 of them are valid, then set frequency = multi-stage speed 3 set frequency.

F4-50	Terminal FWD selection	Factory default	6	Security level	1	Change	○
Setting range	0~7:D11~D18						

 Select the source of the forward command of the terminal.

F4-51	Terminal REV selection	Factory default	7	Security level	1	Change	○
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6. Detailed Description of Functional Parameters

Setting range	0~7:DI1~DI8
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Terminal reverse command source selection.

F4-52	Terminal STOP selection	Factory default	3	Security level	1	Change	○
Setting range	0~7:DI1~DI8						



Terminal stop command source selection.

6.6 F5 Digital Output and Relay Output Settings

F5-00	Terminal Y1 connection settings	Factory default	0	Security level	1	Change	○
F5-01	Terminal Y2 connection settings	Factory default	0	Security level	1	Change	○
F5-02	Terminal T1 connection settings	Factory default	0	Security level	1	Change	○
F5-03	Terminal T2 connection settings	Factory default	0	Security level	1	Change	○
F5-04	Terminal T3 connection settings	Factory default	0	Security level	1	Change	○
Setting range	0~21, see the digital output function definition table below						



Digital output function definition table:

0: Forced to 0	6: Forward operation	12: Excitation start-stop switch	18: Redundant slave ready sign
1: Forced to 1	7: Reverse operation	13: Redundant master output switch	19: Set frequency standard
2: Ready indication	8: External fault	14: Redundant slave output switch	20: Frequency detection
3: Operation indication	9: Synchronization sign	15: Redundant master communication failure	21: Frequency detection level 1
4: Fault indication	10: Reset signal	16: Redundant slave communication failure	22: Frequency detection level 2
5: Alarm indication	11: Specified alarm	17: Redundant master ready sign	



The digital output function is detailed as follows:

0: Forced to be 0. Forced to output disconnection signal.

1: Forced to be 1. Forcibly output a connected signal.

2: Ready indication. Trouble-free state after applying high voltage.

3: Operation indication. When the frequency converter is running.

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

5: Alarm indication. This signal is effective when the frequency converter alarms.

6: Forward operation. This signal is valid when the frequency converter is in forward operation.

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

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

9: Synchronization sign. The signal is effective when the output voltage of the frequency converter is synchronized with the frequency, voltage, and phase of the grid.

10: Reset signal. This signal is valid when resetting the frequency converter.

11: Specified alarm detection. The signal is effective when the alarm position selected by F5-21 and F5-22 has an alarm.

12: Excitation start-stop switch. The signal is effective when the excitation start-stop switch is active.

13: Redundant master output switch. If the output switch of the redundant master is closed, a valid signal is output.

14: Redundant slave output switch. If the redundant slave output switch is closed, a valid signal is output.

15: Redundant master communication failure. If the redundant master is in the communication failure state, a

valid signal is output.

16: Redundant slave communication failure. If the redundant slave is in a communication failure state, a valid signal is output.

17: Redundant master ready sign. The redundant master is in the trouble-free state after it is powered on.

18: Redundant slave ready sign. The redundant slave is in the trouble-free state after it is powered on.

19: Set frequency arrival sign. The signal is effective when the frequency converter operating frequency reaches the set frequency.

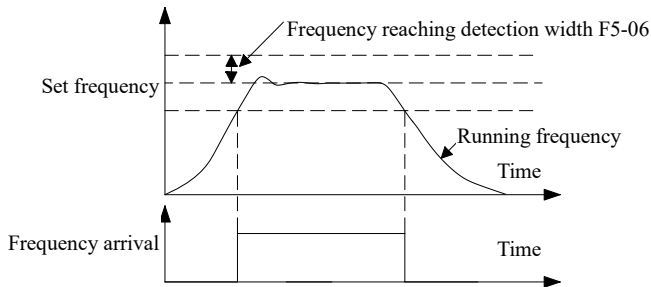
20: Frequency detection level 1. The signal is effective when the running frequency of the frequency converter reaches the detection level 1.

21: Frequency detection level 2. The signal is effective when the running frequency of the frequency converter reaches the detection level 2.

F5-06	Frequency arrival detection width	Factory default	2.50Hz	Security level	1	Change	○
Setting range	0.00~60.00 Hz						



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:

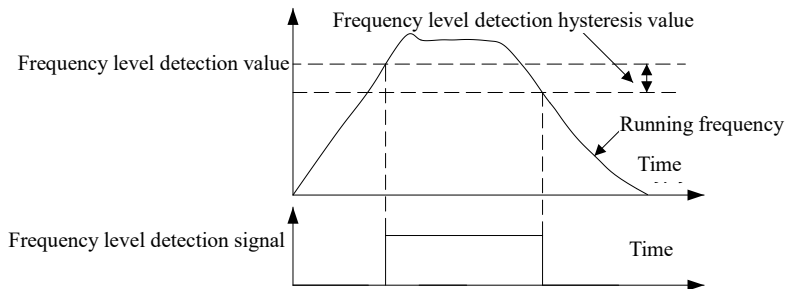


F5-07	Frequency level detection value 1	Factory default	50.00Hz	Security level	1	Change	○
F5-08	Frequency level detection hysteresis value 1	Factory default	1.00Hz	Security level	1	Change	○
F5-09	Frequency level detection value 2	Factory default	25.00Hz	Security level	1	Change	○
F5-10	Frequency level detection hysteresis value 2	Factory default	1.00Hz	Security level	1	Change	○
Setting range	0.00 ~ 320.00 Hz						



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

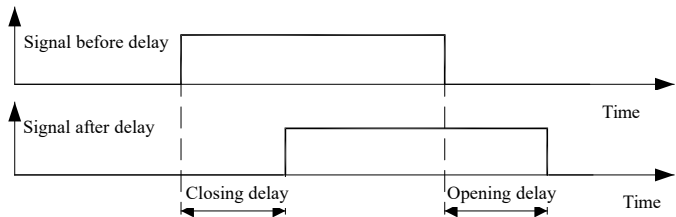
6. Detailed Description of Functional Parameters



F5-11	Y1 terminal closing delay	Factory default	0.00s	Security level	1	Change	○
F5-12	Y1 terminal opening delay	Factory default	0.00s	Security level	1	Change	○
F5-13	Y2 terminal closing delay	Factory default	0.00s	Security level	1	Change	○
F5-14	Y2 terminal opening delay	Factory default	0.00s	Security level	1	Change	○
F5-15	T1 terminal closing delay	Factory default	0.00s	Security level	1	Change	○
F5-16	T1 terminal opening delay	Factory default	0.00s	Security level	1	Change	○
F5-17	T2 terminal closing delay	Factory default	0.00s	Security level	1	Change	○
F5-18	T2 terminal opening delay	Factory default	0.00s	Security level	1	Change	○
F5-19	T3 terminal closing delay	Factory default	0.00s	Security level	1	Change	○
F5-20	T3 terminal opening delay	Factory default	0.00s	Security level	1	Change	○
Setting range		0.00 ~ 650.00 s					



Digital output delay is shown below:



F5-21	Alarm output selection 1	Factory default	0	Security level	1	Change	○
F5-22	Alarm output selection 2	Factory default	0	Security level	1	Change	○

6. Detailed Description of Functional Parameters

Setting range	0 ~ 65,535
---------------	------------



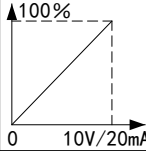
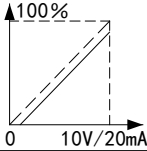
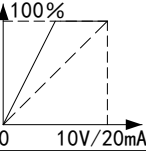
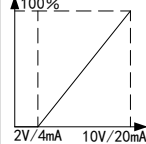
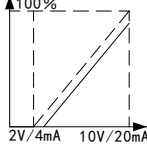
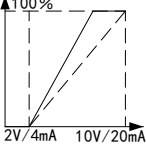
It is used to select the alarm information that needs to be monitored, and the corresponding bit (in binary) is 1, indicating that the alarm information is allowed to be output through the digital output terminal. Otherwise, the alarm will be ignored.

6. Detailed Description of Functional Parameters

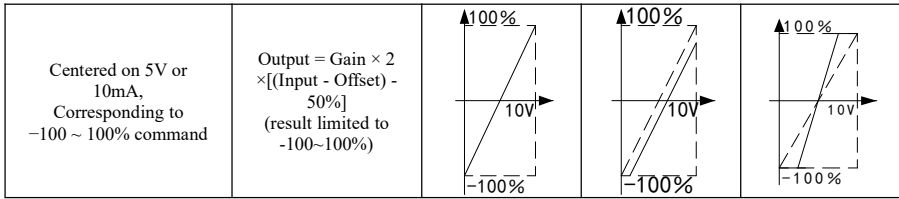
6.7 F6 Analog and Pulse Frequency Terminal Settings

F6-00	AI1 type	Factory default	1	Security level	1	Change	○
Setting range	0: 0~10V or 0~20mA, corresponding to 0~100% 1: 2~10V or 4~20mA, corresponding to 0~100% 2: Centered on 5V or 10mA, corresponding to -100%~100%						
F6-01	AI1 gain	Factory default	100.00%	Security level	1	Change	○
Setting range	0.00% ~ 200.00%						
F6-02	AI1 offset	Factory default	0.00%	Security level	1	Change	○
Setting range	-50.00% ~ 50.00%						
F6-03	AI1 filtering time	Factory default	10000ms	Security level	1	Change	○
Setting range	0 ~ 10000 ms						
F6-07	AI2 type	Factory default	1	Security level	1	Change	○
F6-08	AI2 gain	Factory default	100.00%	Security level	1	Change	○
F6-09	AI2 offset	Factory default	0.00%	Security level	1	Change	○
F6-10	AI2 filtering time	Factory default	1000ms	Security level	1	Change	○
F6-14	AI3 type	Factory default	1	Security level	1	Change	○
F6-15	AI3 gain	Factory default	100.00%	Security level	1	Change	○
F6-16	AI3 offset	Factory default	0.00%	Security level	1	Change	○
F6-17	AI3 filtering time	Factory default	1000ms	Security level	1	Change	○
Setting range	All settings for AI2 and AI3 are the same as those of AI1						

 The table below shows the calculation formula, characteristic curve, and adjustment diagram of the analog input (the dashed line shows the factory setting characteristic, the solid line is the adjusted characteristic):

Mode	Output calculation formula	Basic Curve	Offset = 10.00%	Gain = 200.0%
0 ~ 10 V or 0 ~ 20 mA, Corresponding to 0 ~ 100% commands	Output = Gain × (Input - Offset) (result limited to -100~100%)			
2 ~ 10 V or 4 ~ 20 mA, Corresponding to 0 ~ 100% commands	Output = Gain × [5/4 (Input - Offset) - 25%] (result limited to 0~100%)			

6. Detailed Description of Functional Parameters



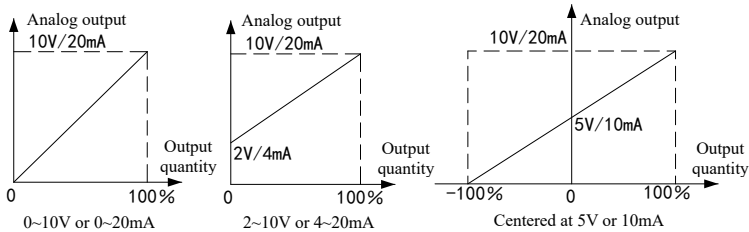
"Filtering time": Increasing it slows down the response but enhances the anti-interference ability. Reducing it makes the response faster, but lowers the anti-interference.

F6-21	AO1 output signal	Factory default	0	Security level	1	Change	○
Setting range	0~39 (corresponding to FU-450~FU-489)						
F6-22	AO1 type	Factory default	1	Security level	1	Change	○
Setting range	0: 0~10V or 0~20mA 1: 2~10V or 4~20mA 2: centered on 5V or 10mA						
F6-23	AO1 gain	Factory default	100.00%	Security level	1	Change	○
Setting range	0.00% ~ 200.00%						
F6-24	AO1 offset	Factory default	0.00%	Security level	1	Change	○
Setting range	-50.00% ~ 50.00%						
F6-25	AO2 output signal	Factory default	0	Security level	1	Change	○
F6-26	AO2 type	Factory default	1	Security level	1	Change	○
F6-27	AO2 gain	Factory default	100.00%	Security level	1	Change	○
F6-28	AO2 offset	Factory default	0.00%	Security level	1	Change	○
F6-29	AO3 output signal	Factory default	4	Security level	1	Change	○
F6-30	AO3 type	Factory default	1	Security level	1	Change	○
F6-31	AO3 gain	Factory default	100.00%	Security level	1	Change	○
F6-32	AO3 offset	Factory default	0.00%	Security level	1	Change	○
F6-33	AO4 output signal	Factory default	4	Security level	1	Change	○
F6-34	AO4 type	Factory default	1	Security level	1	Change	○
F6-35	AO4 gain	Factory default	100.00%	Security level	1	Change	○
F6-36	AO4 offset	Factory default	0.00%	Security level	1	Change	○
Setting range	All settings for AO2, AO3, and AO4 are the same as those of AO1						

6. Detailed Description of Functional Parameters



Three types of analog output are shown below:



Range adjustment and zero point correction can be corrected by adjusting gain and offset.

Calculation formula: 0~10V:Output $\left(\left(\frac{\text{Output quantity}}{\text{Maximum value of the selected signal}} \right) \times \text{Gain} + \text{Offset} \right) \times 10\text{V} .$

$$2 \sim 10 \text{ V Output} = \left(\left(\frac{\text{Output quantity}}{\text{Maximum value of the selected signal}} \right) \times \text{Gain} \times \frac{4}{5} + \frac{1}{5} + \text{Offset} \right) \times 10\text{V} .$$

$$\text{Centered on 5V Output} = \left(\frac{\text{Output quantity}}{\text{Maximum value of the selected signal}} \times \text{Gain} \times \frac{1}{2} + \frac{1}{2} + \text{Offset} \right) \times 10\text{V} .$$

F6-46	Analog signal setting	Factory default	0.00%	Security level	1	Change	○
Setting range	0.00%~100.00%						

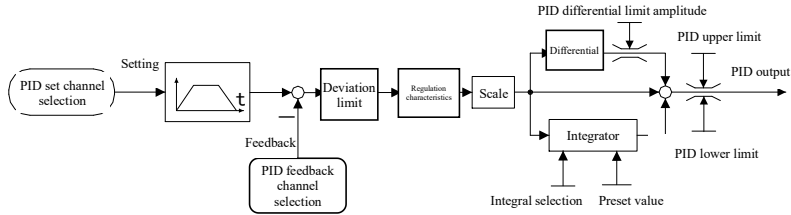
6.8 F7 Process PID Parameters

F7-00	PID control function selection	Factory default	0	Security level	1	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%)						



A process PID can be used to control tension, pressure, flow, liquid level, temperature, and other process variables. The proportional link produces control effects proportional to the deviation to minimize the deviation, and the integral link mainly aims to eliminate the steady-state error. 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 in the deviation signal through the 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:

6. Detailed Description of Functional Parameters



There are also two correction working modes of the process PID: set frequency correction before the acceleration and deceleration ramp, and set frequency correction after the acceleration and deceleration ramp. **Set frequency correction before acceleration and deceleration ramp:** The PID output is superimposed on the set frequency before the acceleration and deceleration ramp for correction.

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.

F7-01	PID set channel selection	Factory default	0	Security level	1	Change	×
Setting range	0: F7-04 1: AI1 2: AI2 3: AI3 4: Host computer analog quantity 1 5: Host computer analog quantity 2						
F7-02	PID feedback channel selection	Factory default	0	Security level	1	Change	×
Setting range	0: AI1 1: AI2 2: AI3 3: Host computer analog quantity 1 4: Host computer analog quantity 2 5: Output current ratio 6: Output power ratio						

Normalized input and output used for the process PID: Both the input and output ranges are $\pm 100\%$. The calibration of the input is related to the selection of the feedback channel, sensor characteristics, and analog input settings. The calibration of output takes the maximum frequency as 100% in frequency control mode.

There are filtering links in the set channel and the feedback channel. For example, the filtering time of AI1 is F6-26. These filtering links will affect the control performance and can be set according to actual needs.

F7-04	PID analog signal setting	Factory default	0.00%	Security level	1	Change	○
Setting range	-100.00 ~ 100.00%						
F7-05	PID proportional gain	Factory default	0.020	Security level	1	Change	○
Setting range	0.000 ~ 10.000						
F7-06	PID integral time	Factory default	20.00s	Security level	1	Change	○
Setting range	0.00 ~ 100.00 s						
F7-07	PID derivative setting	Factory default	0.00	Security level	1	Change	○
Setting range	0.00 ~ 10.00						

PID parameter regulation principles: The proportional gain shall first be 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 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	PID sampling period	Factory	10ms	Security	1	Change	○
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6. Detailed Description of Functional Parameters

		default		level			
Setting range	1 ~ 10000 ms						

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

F7-13	PID regulation polarity	Factory default	0	Security level	1	Change	○
Setting range	0: Positive action 1: Reverse action						

PID regulation polarity: Positive action refers to the increase in speed required for a quantitative increase under stable operating conditions, while negative action indicates that speed reduction is required when a quantitative increase is set under stable operating conditions.

F7-14	PID set slope time	Factory default	0.00s	Security level	0	Change	○
Setting range	0.00 ~ 20.00s (time required by set value to be from 0 to 100%)						

PID set ramp 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.

F7-17	Maximum PID output limit	Factory default	100.00%	Security level	1	Change	○
Setting range	-100.00% ~ 100.00%						
F7-18	Minimum PID output limit	Factory default	-100.00%	Security level	1	Change	○
Setting range	-100.00% ~ 100.00%						

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

F7-20	PID preset size	Factory default	0.00%	Security level	1	Change	○
Setting range	-100.00% ~ 100.00%						

 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.

6.9 F8 Encoder Parameters

F8-00	Reserved	Factory default	0	Security level	1	Change	×
Setting range	Reserved						
F8-01	Encoder line count	Factory default	1024	Security level	1	Change	×
Setting range	1~8192						
F8-02	Encoder type	Factory default	0	Security level	1	Change	×
Setting range	0: Quadrature encoder						
F8-03	AB phase sequence of ABZ incremental encoder	Factory default	0	Security level	1	Change	×
Setting range	0: Positive 1: Negative						
F8-04	UVW phase sequence of UVW encoder	Factory default	0	Security level	1	Change	○

6. Detailed Description of Functional Parameters

Setting range	0: Positive 1: Negative						
F8-05	Resolver pole number	Factory default	1	Security level	1	Change	×
Setting range	1~10000						
F8-06	Reserved	Factory default	0	Security level	1	Change	×
Setting range	Reserved						
F8-07	PG disconnection action	Factory default	2	Security level	1	Change	○
Setting range	0: No action 1: Alarm 2: Fault and free stop						
F8-08	PG disconnection detection time	Factory default	1.0s	Security level	1	Change	○
Setting range	0.1s~10.0s						
F8-09	PG variable speed percentage denominator	Factory default	1	Security level	1	Change	×
Setting range	0~1000						
F8-10	PG variable speed percentage numerator	Factory default	1	Security level	1	Change	×
Setting range	0~1000						
F8-11	PG speed measurement filtering time	Factory default	0.015s	Security level	1	Change	○
Setting range	0.000s~2.000s						
F8-12	PG installation angle	Factory default	0.0°	Security level	1	Change	×
Setting range	0~359.9°, relative position between motor magnetic poles and encoder, determined by installation						
F8-13	Z-signal enable	Factory default	1	Security level	1	Change	×
Setting range	0: Encoder signal Z is not used 1: Encoder signal Z is used						
F8-14	Non-FVC mode speed measurement enabling	Factory default	0	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
F8-15	PG installation angle re-identification	Factory default	0	Security level	1	Change	×
Setting range	0: Disabled 1: Enabled						
F8-16	PG anti-interference threshold	Factory default	5	Security level	1	Change	○
Setting range	0 ~ 2,000 A smaller value makes the encoder abnormality detection more sensitive						
F8-17	PG switching enable	Factory default	0	Security level	1	Change	×
Setting range	0: Disabled 1: Enabled						

6.10 F9 Custom Parameters

F9-00 ~ F9-15	Custom parameter 0~Custom parameter 15	Factory default	0	Security level	1	Change	○
Setting range	0~65535 (special parameters for PLC)						
F9-16 ~	Custom parameter 16~Custom parameter 23	Factory default	0	Security level	1	Change	○

6. Detailed Description of Functional Parameters

F9-23							
Setting range	-32768~32767 (special parameters for PLC)						



PLC customization parameter operation function: Achieve the automation of the production process according to the set operating parameters.

6.11 FA Motor Parameters

FA-00	Motor Parameter Tuning	Factory default	00	Security level	1	Change	○
Setting range	11: Static self-tuning 22: No-load rotation self-tuning						
FA-01	Motor rated power	Factory default	Model determination	Security level	1	Change	○
Setting range	110~50,000 kW						
FA-02	Motor pole number	Factory default	4	Security level	1	Change	○
Setting range	2~256 (must be an even number)						
FA-03	Motor rated current	Factory default	Model determination	Security level	1	Change	○
Setting range	0.5~1,200.0 A						
FA-04	Motor rated frequency	Factory default	50.00Hz	Security level	1	Change	○
Setting range	1.00~320.00 Hz						
FA-05	Motor rated speed	Factory default	Model determination	Security level	1	Change	○
Setting range	125~40,000 r/min						
FA-06	Motor rated voltage	Factory default	Model determination	Security level	1	Change	×
Setting range	100~20,000 V						



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 the 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 should match, and the motor rated current 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 prevent slippage during

6. Detailed Description of Functional Parameters

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 click start;
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	Security level	1	Change	○
Setting range	0.1A→FA-03 "motor rated current"						
FA-08	Motor stator resistance	Factory default	0	Security level	1	Change	○
Setting range	0.00 → 50.00%						
FA-09	Motor leakage inductive reactance	Factory default	0	Security level	1	Change	○
Setting range	0.00 → 50.00%						
FA-10	Motor rotor resistance	Factory default	0	Security level	1	Change	○
Setting range	0.00 → 50.00%						
FA-11	Motor mutual inductive reactance	Factory default	0	Security level	1	Change	○
Setting range	0.00→2000.0%						
FA-12	Motor core saturation coefficient 1	Factory default	1	Security level	1	Change	○
Setting range	1.000→1.500						
FA-13	Motor core saturation coefficient 2	Factory default	1	Security level	1	Change	○
Setting range	1.000~FA-12 "motor core saturation coefficient 1"						
FA-14	Motor core saturation coefficient 3	Factory default	0.5	Security level	1	Change	○
Setting range	FA-15 "motor core saturation coefficient 4"→1.000						
FA-15	Motor core saturation coefficient 4	Factory default	0.5	Security level	1	Change	○
Setting range	0.500→1.000						



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:

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

6. Detailed Description of Functional Parameters

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= $2\pi \times \text{frequency} \times \text{inductance}$.

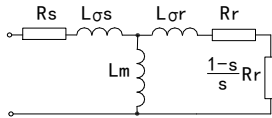
 The frequency converter adopts the parameters of the T-I equivalent circuit (as shown in the figure below) of the induction motor. The conversion relationship between the conventional T-type equivalent circuit (as shown in the figure below) and the T-I equivalent circuit parameters is as follows:

T-I type circuit stator resistance= R_s

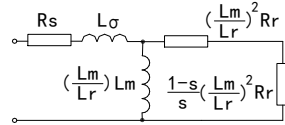
T-I equivalent circuit rotor resistance = $(L_m/L_r)^2 R_r$

T-I equivalent circuit leakage inductance = $(L_m/L_r)^2 L_{\sigma}$

T-I equivalent circuit mutual inductance = L_m^2/L_r



T type equivalent circuit



T-I type equivalent circuit

FA-27	Identification back EMF current /Low-speed minimum current	Factory default	30%	Security level	2	Change	×
Setting range	0→100%; taking the motor rated current as 100%.						
FA-28	D-axis inductance	Factory default	7000	Security level	1	Change	×
Setting range	0~60000 (after parameter identification and manual modification, the current loop PI parameter will change)						
FA-29	Q-axis inductance	Factory default	7000	Security level	1	Change	×
Setting range	0~60000 (after parameter identification and manual modification, the current loop PI parameter will change)						
FA-30	Stator resistance	Factory default	2700	Security level	1	Change	×
Setting range	0~60000 (after parameter identification and manual modification, the current loop PI parameter will change)						
FA-31	Inductance/Resistance/Back EMF unit	Factory default	0	Security level	1	Change	×
Setting range	Inductance (units digit) 0: uH; 1: 10uH; 2: 100uH; Resistance (×10) 0: mΩ; 1: 10mΩ; Back EMF (hundreds digit) 0: ×1; 1: ×10; 2: ×100;						
FA-32	Back EMF voltage	Factory default	0	Security level	1	Change	×
Setting range	Motor body parameter requires dynamic identification; generally 70%~105% of the motor rated voltage; after inputting this parameter, the back EMF coefficient can be automatically calculated based on this parameter and the motor rated frequency						
FA-33	Back EMF coefficient	Factory default	500	Security level	1	Change	×
Setting range	0→60000 Motor intrinsic parameters require dynamic identification; It can be calculated by 130 * back EMF voltage / rated frequency						
FA-34	Integral parameter of the D-axis current loop	Factory default	200	Security level	1	Change	×
FA-35	Proportional parameter of D-axis current loop	Factory default	300	Security level	1	Change	×
FA-36	Integral parameter of the Q-axis current loop	Factory default	200	Security level	1	Change	×

6. Detailed Description of Functional Parameters

FA-37	Proportional parameter of Q-axis current loop	Factory default	300	Security level	1	Change	×
Setting range	0→60000 (parameter identification and automatic calculation)						

6.12 Fb Protection Function and Frequency Converter Advanced Settings

Fb-00	Carrier frequency	Factory default	800Hz	Security level	2	Change	○
Setting range	500~5000Hz (carrier frequency output by power unit)						

 Fb-00 "carrier frequency": If the carrier frequency is high, the motor operation noise is low, and the harmonic current of the motor is small, so heating is reduced, but the common-mode current becomes larger, the interference is large, and the heat production of the frequency converter is large. It will be opposite if the carrier frequency is low. The carrier frequency can be appropriately raised if 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-03	Power grid failure restart	Factory default	0	Security level	2	Change	○
Setting range	0: Restart prohibited 1: Time-limited restart (when the start signal continues)						

 The following processing methods are available when the input voltage is too low:

Fb-03=0: Power failure is treated as a fault, triggering a free stop with an undervoltage fault reported. Power failure can be determined if the power grid voltage is below the undervoltage point.

Fb-03=1: The output is blocked so that the voltage drop of the unit's DC bus slows down. If the voltage recovers within 10s, it shall be restarted (speed tracking start), and a fault will be reported in case of undervoltage timeout.

 Handling method for Fb-03=1 can avoid undervoltage stop caused by instantaneous power outage for fan, centrifuge, and other large-inertia loads.

 In case of undervoltage in operation, free stop will be triggered with undervoltage fault reported. There will be an alarm only in case of undervoltage in standby mode.

Fb-04	Auto-reset times	Factory default	0	Security level	2	Change	○
Setting range	0~10 times						
Fb-05	Auto-reset interval time	Factory default	5.0s	Security level	2	Change	○
Setting range	1.0~30.0 s						
Fb-06	Fault output during self-reset	Factory default	0	Security level	2	Change	○
Setting range	0: No fault output 1: Fault output						

 Automatic fault reset function: For faults occurring during operation, press Fb-05 "automatic reset interval" and Fb-04 "automatic reset times" for automatic reset and restart. It can avoid tripping caused by misoperation, instantaneous overvoltage of power supply or external non-repetitive impact.

 Automatic reset process: In case of a fault during operation, the fault will be automatically reset after the automatic reset interval. If the fault disappears, start again according to the speed tracking start mode. If the fault still exists and the reset times have not exceeded that in Fb-04, continue to try automatic reset. Otherwise, the fault will be reported, and the machine will stop.

 Reset conditions for the number of times of fault reset: After the frequency converter fault self-reset, there is

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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-06 "fault output during automatic reset": Select whether digital output 4 "fault indication" is valid during the automatic reset.

 Automatic reset is invalid for power device protection, external fault, and emergency stop fault.

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

Fb-07	Grid voltage undervoltage point	Factory default	55.0%	Security level	2	Change	○
Setting range	10.0 ~ 70.0% (corresponding to "rated input voltage")						
Fb-08	Grid voltage overvoltage point	Factory default	120.0%	Security level	2	Change	○
Setting range	80.0 ~ 130.0% (corresponding to "rated input voltage")						
Fb-09	Grid voltage sag trigger point	Factory default	70.0%	Security level	2	Change	○
Setting range	10.0 ~ 90.0% (corresponding to "rated input voltage")						
Fb-10	Grid voltage sag enable	Factory default	1	Security level	2	Change	○
Setting range	0: Prohibited 1: Enabling (VF control is valid only)						
Fb-11	Maximum grid voltage sag time	Factory default	600ms	Security level	2	Change	○
Setting range	0~3,000 ms						

 When the power grid voltage is lower than Fb-09 "grid voltage sag trigger point" and the time is less than Fb-11 "maximum grid voltage sag time", it is regarded as a voltage sag. In case of a voltage sag, if Fb-10=1, the frequency converter blocks the output so that the voltage drop of the unit's DC bus slows down. If the voltage recovers within the Fb-11 "maximum grid voltage sag time", it shall be restarted (speed tracking start), and a fault will be reported in case of a timeout.

Fb-13	Motor overload detection	Factory default	1	Security level	2	Change	○
Setting range	0: Continuous detection 1: Detection only at constant speed						
Fb-14	Motor overload alarm level	Factory default	110.0%	Security level	2	Change	○
Setting range	50.0%~150.0%						
Fb-15	Motor overload fault level	Factory default	130.0%	Security level	2	Change	○
Setting range	50.0%~150.0%						
Fb-16	Motor overload fault detection time	Factory default	2.0s	Security level	2	Change	○
Setting range	0.1s ~ 30.0 s						

 Motor overload: When the motor current exceeds Fb-15 and the duration exceeds the time set in Fb-16, the frequency converter reports "motor overload fault" and stops. This function can be used to detect whether the mechanical load is abnormal and the current is too large.

Fb-17	Motor overspeed protection	Factory default	1	Security level	2	Change	○
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Setting range	0: Disabled		1: Alarm		2: Fault stop			
Fb-18	Motor overspeed detection level		Factory default	110.0%	Security level	2	Change	○
Setting range	50.0%~150.0%							
Fb-19	Motor overspeed detection time		Factory default	5.0s	Security level	2	Change	○
Setting range	0.1s ~ 30.0 s							

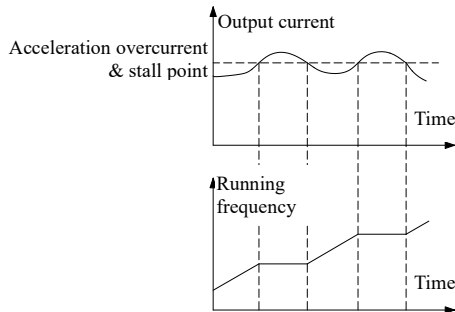


Motor overspeed: When the frequency converter detects that the motor speed exceeds that in Fb-18 and the duration exceeds the time set in Fb-19, the frequency converter reports "motor overspeed fault" and stops.

Fb-20	Acceleration overcurrent and stall protection		Factory default	1	Security level	2	Change	○
Setting range	0: Disabled 1: Valid							
Fb-21	Acceleration overcurrent and stall level		Factory default	130.0%	Security level	2	Change	○
Setting range	50.0%~150.0%							



During the acceleration process, when the Fb-20 "acceleration overcurrent and stall protection" is valid and the output current is greater than the Fb-21 "acceleration overcurrent and stall level", the acceleration is temporarily stopped, and the acceleration continues after the current decreases, as shown in the figure below:



Fb-22	Power-off restart timeout		Factory default	10.0s	Security level	2	Change	○
Setting range	1.0~60.0 s							



When the system power-off restart time exceeds the Fb-22 "power-off restart timeout period", the frequency converter will stop.

Fb-24	Loss power protection		Factory default	2	Security level	2	Change	○
Setting range	0: Disabled 1: Alarm 2: Fault stop							
Fb-25	Loss power limit		Factory default	25.0%	Security level	2	Change	○
Setting range	5.0~50.0% (rated power)							



When the difference between the input power and the output power of the frequency converter exceeds the Fb-25 "loss power limit", the frequency converter will act according to the Fb-24 "loss power protection".

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Fb-26	Cabinet door opening protection	Factory default	2	Security level	2	Change	○
Setting range	0: Disabled 1: Alarm 2: Fault stop						
Fb-27	Temperature controller fault protection	Factory default	1	Security level	2	Change	○
Setting range	0: Disabled 1: 30min protection after failure						



To protect the life safety of users and prevent electric shock caused by opening the cabinet door or not closing the cabinet door properly when the frequency converter is connected to the high-voltage power supply, the mode of operation of the frequency converter when the cabinet door is accidentally opened or not closed properly can be set according to Fb-26.

Fb-28	Communication disconnection time	Factory default	10.0s	Security level	2	Change	○
Setting range	1.0 ~ 600.0s (time between communication disconnection and fault detection)						
Fb-29	HMI disconnection protection	Factory default	1	Security level	2	Change	○
Setting range	0: Disabled 1: Alarm 2: Fault stop						
Fb-30	USER disconnection protection	Factory default	1	Security level	2	Change	○
Setting range	0: Disabled 1: Alarm 2: Fault stop						
Fb-31	Output phase loss protection	Factory default	2	Security level	2	Change	○
Setting range	0: Disabled 1: Alarm 2: Fault stop						



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-32	AI1 disconnection action	Factory default	0	Security level	2	Change	○
Fb-33	AI2 disconnection action	Factory default	0	Security level	2	Change	○
Fb-34	AI3 disconnection action	Factory default	0	Security level	2	Change	○
Setting range	0: Disabled 1: Alarm 2: Fault stop 3: Hold the value before 3s and alarm (only 2~10V/4~20mA off-line protection is valid)						
Fb-35	AI disconnection threshold	Factory default	0.0%	Security level	2	Change	○
Setting range	0.0~20.0%						



AI disconnection: The frequency converter will determine a disconnection fault when the detected analog input signal is lower than the disconnection threshold.

Fb-36	Fan life expectancy	Factory default	30000h	Security level	2	Change	○
Setting range	0~65,500 h						



When the accumulated operation time reaches the fan life expectancy setting, the digital output terminal function 11, "fan life expectancy is reached", will be valid. It is suggested to replace the fan with the same model. After replacing the fan, monitoring parameter FU-49 "accumulated running time of fan" is automatically cleared, and digital

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output terminal function 11 "fan life expectancy is reached" is invalid.

 Relevant parameters: Digital output terminal function 11 "specified alarm detection";

Monitoring parameter: FU-49 "cumulative operating time of fan".

Fb-37	Fan stop delay	Factory default	3min	Security level	2	Change	○
Setting range	0~60min (when setting > 60min, it indicates that the fan keeps operating all the time)						
Fb-38	Fan failure delay	Factory default	30min	Security level	2	Change	○
Setting range	0~120 min						
Fb-39	Starting point of fan under cabinet	Factory default	100.0%	Security level	2	Change	○
Setting range	30.0% ~ 150.0% (100% corresponding to rated input current)						

 Fan stop delay: For applications with frequent start-stop cycles, it is advisable to set it to "continuous operation" to avoid frequent fan starts and stops.

6.13 FC Waveform Recording Function Settings

FC-00	Record waveform 1 selection	Factory default	0	Security level	1	Change	○
FC-01	Record waveform 2 selection	Factory default	0	Security level	1	Change	○
FC-02	Record waveform 3 selection	Factory default	0	Security level	1	Change	○
FC-03	Record waveform 4 selection	Factory default	0	Security level	1	Change	○
Setting range	0: Vr 1: Vs 2: Vt 3: Vu 4: Vv 5: Vw 6: Ir 7: Is 8: It 9: Iu 10: Iv 11: Iw 12: Vi 13: Vo 14: Li 15: Io 16: Fo 17: Pi 18: Po 19: VdcU 20: VdcV 21: VdcW 22: AI1 23: AI2 24: AI3						
FC-04	Record waveform period	Factory default	0.1ms	Security level	1	Change	○
Setting range	0.1~100.0 ms						
FC-05	Record trigger condition 1	Factory default	0	Security level	1	Change	○
Setting range	Fault triggered (0: invalid; 65535: All faults are triggered, others: triggered only when consistent with the fault code)						
FC-06	Record trigger condition 2	Factory default	0	Security level	1	Change	○
Setting range	Running time trigger (triggered when reaching the set time, 0: invalid; Unit: 1s)						
FC-07	Record trigger condition 3	Factory default	0	Security level	1	Change	○
Setting range	Running frequency trigger (triggered when reaching the set frequency, 0: invalid, unit: 0.01Hz)						
FC-08	Record trigger condition 4	Factory default	0	Security level	1	Change	○
Setting range	Event occurrence trigger (0: invalid 1: voltage sag triggered 2: voltage sag recovery 3: block command 4: start command 5: stop command)						

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It is feasible to query the waveform recorded in FC-01 "record waveform 1 selection" - FC-03 "record waveform 4 selection" from the waveform capture record under the condition of FC-05 "record trigger condition 1" - FC-08 "record trigger condition 4" and within the time set in FC-04 "record waveform period", or the waveforms that need to be analyzed can also be saved and restored via software.

6.14 Fd Shore Power Supply, Electromagnetic Soft Starter and Reactive Power Compensation Parameters

Fd-00	Power output mode	Factory default	0	Security level	2	Change	×
Setting range	0: Power supply (shore power supply) 1: Grid tracking 2: Constant power generation 3: Reactive compensation						

 Under F0-09=3 "power supply mode", the parameter shall be set.

 Fd-00 = 0 "power supply (shore power supply)": output fixed/adjustable AC power supply of three-phase voltage and frequency (50/60Hz).

 Fd-00=1 "grid tracking" or 2 "constant power generation": The parameters are used in the factory only and are forbidden to be used by users.

 Fd-00 = 3 "reactive compensation": The high voltage frequency converter is used as a reactive power compensation cabinet to improve the power factor of the grid side.

Fd-01	Output frequency setting	Factory default	50.00Hz	Security level	0	Change	○
Setting range	0.00~320.00Hz (select "power supply", output frequency value)						
Fd-02	Output voltage setting	Factory default	0V	Security level	0	Change	○
Setting range	0~20000V (select "power supply", output voltage value)						
Fd-03	Voltage soft start time	Factory default	10s	Security level	1	Change	○
Setting range	1~600s (select "power supply", the time of output voltage from 0 to rated voltage)						
Fd-04	Advanced grid angle	Factory default	0°	Security level	2	Change	○
Setting range	0~45.0° (valid in grid-tracking mode)						
Fd-05	Tracking voltage increment	Factory default	0%	Security level	2	Change	○
Setting range	0.00~35.00% of rated voltage (valid in grid-tracking mode)						
Fd-06	Current regulator KP	Factory default	0.100	Security level	2	Change	○
Setting range	0.000~65.535 (valid in constant power generation and reactive power compensation modes)						
Fd-07	Current regulator KI	Factory default	0.0010	Security level	2	Change	○
Setting range	0.0000~6.5535 (valid in constant power generation and reactive power compensation modes)						
Fd-08	Output power setting	Factory default	1kW	Security level	0	Change	○
Setting range	0~20000kW (select "constant power generation" to set the output power value)						
Fd-09	Power regulator KP	Factory default	0.020	Security level	2	Change	○
Setting range	0.000~65.535 (select "constant power generation", power PI controller ratio)						
Fd-10	Power regulator KI	Factory default	0.0010	Security level	2	Change	○
Setting range	0.0000~6.5535 (select "constant power generation", power PI regulator integral value)						
Fd-11	Generating phase regulation	Factory	0.065	Security	2	Change	○

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		default		level			
Setting range	0.000 ~ 1.000						
Fd-12	Filter inductance value (uH)	Factory default	50 uH	Security level	2	Change	○
Setting range	0~65535 uH (filter inductance value that is output and sent to the grid, unit: uH)						
Fd-20	Power supply frequency selection	Factory default	0	Security level	0	Change	○
Setting range	0: 50Hz 1: 60Hz 2: Custom frequency						
Fd-21	Custom frequency	Factory default	50.00Hz	Security level	0	Change	○
Setting range	0.00 ~ 80.00 Hz						
Fd-22	Supply frequency deviation	Factory default	0.00Hz	Security level	0	Change	○
Setting range	-3.00~3.00 Hz						
Fd-23	Supply voltage selection	Factory default	0	Security level	0	Change	○
Setting range	0: Power supply voltage 1 1: Power supply voltage 2 2: Power supply voltage 3 3: Power supply voltage 4						
Fd-24	Supply voltage 1	Factory default	3000V	Security level	0	Change	○
Fd-25	Supply voltage 2	Factory default	6000V	Security level	0	Change	○
Fd-26	Supply voltage 3	Factory default	10000V	Security level	0	Change	○
Fd-27	Supply voltage 4	Factory default	11000V	Security level	0	Change	○
Setting range	0 ~ 20,000 V						
Fd-28	Supply voltage deviation	Factory default	0V	Security level	0	Change	○
Setting range	-500~500 V						
Fd-29	Automatic voltage regulation upper limit	Factory default	1	Security level	0	Change	○
Setting range	0: Disabled 1: 0.0~30.0%						
Fd-30	Voltage rise slope	Factory default	0V/s	Security level	0	Change	○
Setting range	10 ~ 10,000 V/s						
Fd-31	Power supply phase sequence selection	Factory default	0	Security level	0	Change	×
Setting range	0: Positive phase sequence; 1: Negative phase sequence						
Fd-32	Automatic current-limiting function	Factory default	0	Security level	0	Change	○
Setting range	0: Disabled 1: Enabled						
Fd-33	Reverse power limiting function	Factory default	0	Security level	0	Change	×
Setting range	0: Disabled 1: Enabled (valid only for the first grid connection)						
Fd-34	Overcurrent restart time	Factory default	500.0ms	Security level	1	Change	○
Setting range	1.0 ~ 6,553.5 ms						
Fd-35	Initial overcurrent restart value	Factory	20.0%	Security	1	Change	○

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		default		level			
Setting range	0 ~ 100.0%						
Fd-36	Overcurrent restart threshold	Factory default	120.0%	Security level	1	Change	○
Setting range	10.0 ~ 250.0%						

 Adjust the power parameters according to the use conditions of the power mode on site.

6.15 FE Permanent-magnet Synchronous Motor Control Parameters

FE-00	High-speed segment speed loop proportional parameter	Factory default	75	Security level	1	Change	○
Setting range	0 ~ 6,000						
FE-01	High-speed segment speed loop integral parameter	Factory default	50	Security level	1	Change	○
Setting range	0 ~ 6,000						
FE-02	Low-speed segment speed loop proportional parameter	Factory default	50	Security level	1	Change	○
Setting range	0 ~ 60,000						
FE-03	Low-speed segment speed loop integral parameter	Factory default	75	Security level	1	Change	○
Setting range	0 ~ 60,000						

 A too-large proportional coefficient will cause high-frequency oscillation of speed, and mechanical oscillation or electromagnetic noise will increase significantly. A too-small proportional coefficient or too-large moment of inertia will cause low-frequency oscillation of the speed and obvious speed overshoot, which may cause overvoltage if no discharge measures are taken.

 If the integral coefficient is too small, the response will be slow, and there will be a steady-state error in speed control. If the integral coefficient is too large, low frequency oscillation of speed and the speed overshoot will be caused. In general, the greater the moment of inertia is, the greater the integral and proportional coefficients will be, which may increase the speed filter coefficient. To decrease the integral coefficient, the proportional coefficient can be appropriately increased

FE-04	Speed loop PI switching point	Factory default	200Hz	Security level	1	Change	○
Setting range	0.00~320.00Hz (using high-speed PI parameters for speed loop above the frequency point)						
FE-05	Speed loop PI switching point	Factory default	100Hz	Security level	1	Change	○
Setting range	0.00~320.00Hz (using low-speed PI parameters for speed loop below the frequency point)						
FE-06	Field weakening mode	Factory default	1	Security level	1	Change	○
Setting range	0: Direct calculation 1: Automatic regulation 2: No flux weakening						
FE-07	Field-weakening current regulation coefficient	Factory default	80	Security level	1	Change	○
Setting range	0~120						
FE-08	Field-weakening regulation coefficient	Factory default	4	Security level	1	Change	○
Setting range	0~40						
FE-09	Field-weakening output voltage regulation coefficient	Factory default	7	Security level	1	Change	○
Setting range	0~12 (the frequency converter output voltage will be larger and the field-weakening current will be lower if the coefficient is larger)						
FE-15	Control mode selection	Factory default	1	Security level	1	Change	○
Setting range	Units digit: 1: SVC 2: Reserved 3: IF+MRAS control 4: FVC Tens digit: 0: Speed control; 1: Torque control						
FE-17	Speed estimation coefficient 1	Factory	20	Security	1	Change	○

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		default		level			
Setting range	5~100						
FE-18	Speed estimation coefficient 2	Factory default	30	Security level	1	Change	○
Setting range	5~100						
FE-19	Electric torque limitation	Factory default	150%	Security level	1	Change	○
Setting range	0~250%, taking the motor rated torque as 100%						
FE-20	Generating torque limit	Factory default	150%	Security level	1	Change	○
Setting range	0~250%, taking rated current of motor as 100% (this parameter limits the D-axis current)						
FE-21	Selection of torque upper limit source	Factory default	0	Security level	1	Change	○
Setting range	Thousands and hundreds digits: Generating torque source; Units and tens digits: Motoring torque source 0: Digital setting; 1: Communication control word 1 setting (10000 represents 2.5 times the motor rated value); 2: Communication control word 2 setting; 3: AI1; 4: AI2; 5: AI3; 6: AI1+AI2; 7: max(AI1, AI2); 8: min(AI1, AI2)						
FE-22	Torque setting source selection	Factory default	0	Security level	1	Change	○
Setting range	Torque command setting 0: Digital setting; 1: Communication control word 1 setting (10000 represents 2.5 times the motor rated value); 2: Communication control word 2 setting; 3:AI1; 4:AI2; 5:AI3; 6:AI1+AI2; 7:max(AI1+AI2); 8:min(AI1,AI2)						
FE-23	Set the torque current percentage	Factory default	150%	Security level	1	Change	○
Setting range	0~100%, taking the motor rated current as 100%						
FE-24	Overspeed frequency multiple	Factory default	120%	Security level	1	Change	○
Setting range	0~200% is used to determine the overspeed alarm, taking the maximum frequency as 100%						
FE-25	High-speed filter coefficient	Factory default	86	Security level	1	Change	○
Setting range	4~512 (steady-state performance will be better but dynamic response will be slower if the coefficient is larger)						
FE-26	Low-speed segment speed filter coefficient	Factory default	128	Security level	1	Change	○
Setting range	4~512 (steady-state performance will be better but dynamic response will be slower if the coefficient is larger)						
FE-27	Percentage of zero speed crossing frequency	Factory default	0.50%	Security level	1	Change	○
Setting range	0.00%~5.00%, taking the motor rated frequency as 100%						
FE-28	Start preset current (positive)	Factory default	0	Security level	1	Change	○
Setting range	-200%~200%, taking the motor rated current as 100%, affecting the initial value of the speed loop PI.						
FE-29	Initial position detection method	Factory default	3	Security level	1	Change	○
Setting range	0: No detection; 1: Detection method 1; 2: Detection method 2; 3: Detection method 3; 4: Detection method 4; 5: Detection method 5 Detection mode 1 is 180° different from detection mode 2, and very few motors use detection mode 2. During position detection, the motor will be injected with a voltage pulse, and the injection of the pulse will make the motor produce an abnormal sound. The greater the motor power is, the greater the abnormal sound will be.						

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FE-30	Initial position identification current percentage	Factory default	0%	Security level	1	Change	○
Setting range	0~100%, 0 represents the default value of 12%						
FE-31	Start preset current (negative)	Factory default	0%	Security level	1	Change	○
Setting range	-200%~200%, taking the motor rated current as 100%, affecting the initial value of the speed loop PI.						
FE-32	Maximum forward frequency for torque control	Factory default	50.00Hz	Security level	1	Change	○
Setting range	0.00Hz~F0-06 "maximum frequency"						
FE-33	Maximum reverse frequency for torque control	Factory default	50.00Hz	Security level	1	Change	○
Setting range	0.00Hz~F0-06 "maximum frequency"						
FE-34	Torque control increase time	Factory default	0.020s	Security level	1	Change	○
Setting range	0.000~36.000 s						
FE-35	Torque control decrease time	Factory default	0.020s	Security level	1	Change	○
Setting range	0.000~36.000 s						
FE-36	Overvoltage/undervoltage stalling enabling	Factory default	0	Security level	1	Change	○
Setting range	Units digit: 1: Overvoltage stall enabled; 0: Overvoltage stall disabled Tens digit: 1: Undervoltage stall enabled; 0: Undervoltage stall disabled						
FE-37	DC voltage adjustment coefficient	Factory default	30%	Security level	1	Change	○
Setting range	0 ~ 200%						
FE-38	Unit undervoltage point	Factory default	700V	Security level	1	Change	○
Setting range	0 ~ 700 V						
FE-39	back-EMF compensation coefficient	Factory default	100.0%	Security level	1	Change	○
Setting range	0 ~ 1,000						
FE-40	Advance angle of initial position identification	Factory default	0°	Security level	1	Change	○
Setting range	0 ~ 359						
FE-41	Initial position of parameter identification	Factory default	330.0°	Security level	1	Change	○
Setting range	0 ~ 359.9						
FE-42	Polarity identification detection current	Factory default	120%	Security level	1	Change	○
Setting range	0% ~ 200%						
FE-43	Polarity identification time	Factory default	25ms	Security level	1	Change	○
Setting range	1 ms ~ 25 ms						
FE-44	Overspeed detection time	Factory default	0.005s	Security level	1	Change	○
Setting range	0.001 s ~ 0.600 s						
FE-45	Speed offset detection value	Factory default	10	Security level	1	Change	○
Setting range	0% ~ 50%						

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FE-46	Speed offset detection time	Factory default	5.0s	Security level	1	Change	○
Setting range	0.0s~60.0s						
FE-47	FVC installation angle/direction identification and selection	Factory default	4	Security level	1	Change	○
Setting range	0: Identify motor parameters only 1: Identify motor parameters. Identify encoder information with load 2: Identify motor parameters. Identify information of encoder with light load 3: Identify motor parameters. Identify information of encoder with no load 4: Selected according to FA-00						
FE-48	Master/slave fault determination	Factory default	100	Security level	1	Change	○
Setting range	0 ~ 1,000						
FE-49	Locked-rotor fault frequency percentage	Factory default	3.0%	Security level	1	Change	○
Setting range	0.0~100.0%, taking the motor rated frequency as 100%						
FE-50	Excitation current percentage (initial position)	Factory default	100.00%	Security level	1	Change	○
Setting range	0~100.00%						
FE-51	Excitation current percentage (running)	Factory default	100.00%	Security level	1	Change	○
Setting range	0~100.00%						
FE-52	FVC initial position detection scheme	Factory default	1	Security level	1	Change	○
Setting range	0: Detection per start 1: First startup detection						
FE-53	Maximum torque current ratio control enable	Factory default	1	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
FE-54	Soft starter phase setting	Factory default	0	Security level	1	Change	○
Setting range	Units digit: Soft starter internal phase 0: Grid connection operation prohibited; 1: VF switching allowed; 2: Acceleration to target frequency allowed; 3: Use of phase-locked loop frequency allowed; 4: Phase locking allowed; 5: Grid connection allowed Tens digit: 1: Phase-locked loop standby phase locking enabled; 0: Phase-locked loop standby phase locking prohibited						
FE-55	Online rotor position compensation enable	Factory default	0	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
FE-56	Maximum frequency limiting mode	Factory default	0	Security level	1	Change	○
Setting range	0: Field weakening enabled; 1: Field weakening disabled;						
FE-57	Stall fault determination coefficient	Factory default	0	Security level	1	Change	○
Setting range							
FE-58	Overvoltage field strengthening coefficient	Factory default	0%	Security level	1	Change	○
Setting range	0~100%, taking the motor rated current as 100%						
FE-59	Unit overvoltage point	Factory default	1140	Security level	1	Change	○
Setting range	Unit module voltage						

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FE-60	Maximum torque-current ratio adjustment coefficient	Factory default	33	Security level	1	Change	○
Setting range	0~200						
FE-61	Droop frequency	Factory default	0.50Hz	Security level	1	Change	○
Setting range	Only valid for flexible dual-drive						
FE-62	IF_MRAS switching frequency percentage	Factory default	10%	Security level	1	Change	○
Setting range	0~100%, taking the motor rated current as 100%						
FE-63	High-frequency injection frequency	Factory default	100Hz	Security level	1	Change	○
Setting range	0~1000Hz						
FE-64	Master/slave mode selection	Factory default	0	Security level	1	Change	○
Setting range	0: Invalid 1: Master 2: Slave						
FE-67	Selection of soft starter SOGI phase-locked loop enabling	Factory default	16	Security level	1	Change	○
Setting range	0: Disabled 1: Enabled						
FE-68	Soft starter switching frequency percentage	Factory default	95%	Security level	1	Change	○
Setting range	Taking the motor rated frequency as 100%						
FE-69	Custom display parameter selection	Factory default	Model confirmation	Security level	1	Change	○
Setting range	Thousands and hundreds digits: Custom display 2; tens and units digits: Custom display 1; 0: Initial position; 1: Polarity identification confidence; 2: Soft-start grid-connection stage; 3: Number of pulse differences during encoder fault; 4: Power factor; 5: Torque percentage; 6: d-axis reference current; 7: q-axis reference current; 8: d-axis feedback current; 9: q-axis feedback current; 10: Excitation signal output; 11: Phase-locked deviation; 12: Motor output speed rpm; 13: Rotor position; 14: Speed mode/Torque mode						
FE-81	Speed tracking method	Factory default	0	Security level	0	Change	○
Setting range	0: General algorithm 1: Phase-locked loop frequency tracking 2: System frequency tracking						

6.16 FF Communication Parameters

FF-00	Communication compatibility selection	Factory default	0	Security level	1	Change	○
Setting range	0: None 1: Compatible with third-generation devices						
FF-01	USER communication format	Factory default	2	Security level	1	Change	○
Setting range	0: 8/N/1 1: 8/E/1 2: 8/O/1 3: 8/N/2						
FF-02	USER communication baud rate	Factory default	4	Security level	1	Change	○
Setting range	0: 1,200bps 1: 2,400bps 2: 4,800bps 3: 9,600bps 4: 19,200bps 5: 38,400bps						
FF-03	USER communication address	Factory default	1	Security level	1	Change	○
Setting range	0~247						
FF-10	Communication process character 1 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						

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FF-11	Communication process character 2 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						
FF-12	Communication process character 3 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						
FF-13	Communication process character 4 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						
FF-14	Communication process character 5 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						
FF-15	Communication process character 6 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						
FF-16	Communication process character 7 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						
FF-17	Communication process character 8 selection	Factory default	0	Security level	1	Change	○
Setting range	Corresponding monitoring parameter 0~100						
FF-20	Local address for CAN communication	Factory default	1	Security level	1	Change	×
Setting range	1 ~ 63						
FF-21	CAN communication baud rate	Factory default	1	Security level	1	Change	×
Setting range	0: 1M 1: 500K 2: 250K 3: 125K 4: 100K 5: 50K						

 The RS485 Modbus-RTU protocol of SLANVERT high-voltage frequency converter consists of three layers: physical layer, data link layer, and 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-RTU protocol is a master-slave protocol. The communication between the master and the slave has two types, i.e., the master requests and the slave responds, or the master broadcasts and the slave does not respond. Only one device can transmit on the bus at any time, and the master polls the slave. The slave cannot send messages without receiving the command from the master. The master 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 master.

 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)

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-	-	-	-	Fd	13 (0DH)	FU	18 (12H)
F4	4 (04H)	F9	9 (09H)	-	-	-	-

 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 F0-06 'maximum frequency', the minimum unit is 0.01Hz, so for the Modbus-RTU protocol, communication transmission 5000 represents 50.00Hz.

 Communication command variables:

Name	Modbus address	Change	Description
Master control word	3200H	○	Bit 0: Run command, valid when writing in 1 Bit 1: Stop command, valid when writing in 1 Bit 2: Free stop command, valid when writing in 1 Bit 3: Fast stop command, valid when writing in 1 Bit 4: Fault reset command, valid when writing in 1 Bit 5: Not used Bit 6: Not used Bit 7: Not used Bit 8: Forward jogging, valid when it is 1 Bit 9: Reversed jogging, valid when it is 1 Bit 10: Not used Bit 11: Not used Bit 12: Not used Bit 13: Not used Bit 14: Master unit access permission Bit 15: Slave unit access permission
Communication set frequency	3201H	○	-320.00 ~ 320.00 Hz
Host computer analog quantity 1	3202H	○	Range: -100.00% ~ 100.00%
Host computer analog quantity 2	3203H	○	

 Communication status variables:

Name	Modbus address	Change	Description
Master status word	3210H	△	Bit 0: System ready sign Bit 1: System alarm sign Bit 2: System fault sign Bit 3: System operating sign Bit 4: Delay waiting and operation sign Bits 5~7: Reserved Bit 8: High voltage hazard indication Bit 9: High voltage normal indication Bit 10: Forward operation indication Bit 11: Reverse operation indication Bits 12~14: Reserved Bit 15: Token-holding status
Fault code	3211H	△	
Process character 1 selection output	3212H	△	Corresponding to the content selected in FF-10
Process character 2 selection output	3213H	△	Corresponding to the content selected in FF-11
Process character 3 selection output	3214H	△	Corresponding to the content selected in FF-12
Process character 4 selection output	3215H	△	Corresponding to the content selected in FF-13
Process character 5 selection output	3216H	△	Corresponding to the content selected in FF-14
Process character 6 selection output	3217H	△	Corresponding to the content selected in FF-15
Process character 7 selection output	3218H	△	Corresponding to the content selected in FF-16

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Name	Modbus address	Change	Description
Process character 8 selection output	3219H	△	Corresponding to the content selected in FF-17
Alarm character (lower 16 bits)	321AH	△	Detected via Fb-01. See Page 125 for faults and solutions

 The Hope2000 high-voltage 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 16 (write multiple parameters; the maximum number of words is 10), and function 8 (loop test). Among them, function 16 supports 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 (for baud rates of 19,200 bit/s and 38,400 bit/s: 2 ms).

 Format of RTU frames is as follows:

Slave address (1 byte)	Modbus function number (1 byte)	Data (multiple bytes)	CRC16 (2 bytes)
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 Function 3: Multi-reading. The number of words read ranges from 1 to 50.

 Function 16: Multi-writing. The number of words written ranges from 1 to 10.

 Function 8: Loop test, the test function number is 0000H, and the frame is required to be returned as it is.

 Abnormal response: When the slave station cannot complete the request sent by the master station, it returns an abnormal response message.

6. Detailed Description of Functional Parameters

6.17 Fault Record

Fault record: (address is in HEX format)

Fault record 1		Fault record 2		Fault record 3		Fault record 4	
Address	Name	Address	Name	Address	Name	Address	Name
5000	Fault name	5020	Fault name	5040	Fault name	5060	Fault name
5001	Timestamp (upper word)	5021	Timestamp (upper word)	5041	Timestamp (upper word)	5061	Timestamp (upper word)
5002	Timestamp (lower word)	5022	Timestamp (lower word)	5042	Timestamp (lower word)	5062	Timestamp (lower word)
5003	Output current	5023	Output current	5043	Output current	5063	Output current
5004	Output voltage	5024	Output voltage	5044	Output voltage	5064	Output voltage
5005	Input current	5025	Input current	5045	Input current	5065	Input current
5006	Input voltage	5026	Input voltage	5046	Input voltage	5066	Input voltage
5007	Instantaneous output current value	5027	Instantaneous output current value	5047	Instantaneous output current value	5067	Instantaneous output current value
5008	Instantaneous output voltage value	5028	Instantaneous output voltage value	5048	Instantaneous output voltage value	5068	Instantaneous output voltage value
5009	Instantaneous input current value	5029	Instantaneous input current value	5049	Instantaneous input current value	5069	Instantaneous input current value
500A	Instantaneous input voltage	502A	Instantaneous input voltage	504A	Instantaneous input voltage	506A	Instantaneous input voltage
500B	Output current value before 2ms	502B	Output current value before 2ms	504B	Output current value before 2ms	506B	Output current value before 2ms
500C	Output voltage value before 2ms	502C	Output voltage value before 2ms	504C	Output voltage value before 2ms	506C	Output voltage value before 2ms
500D	Input current value before 2ms	502D	Input current value before 2ms	504D	Input current value before 2ms	506D	Input current value before 2ms
500E	Input voltage value before 2ms	502E	Input voltage value before 2ms	504E	Input voltage value before 2ms	506E	Input voltage value before 2ms
500F	Running frequency	502F	Running frequency	504F	Running frequency	506F	Running frequency
5010	Set frequency	5030	Set frequency	5050	Set frequency	5070	Set frequency
5011	Operating frequency before 2ms	5031	Operating frequency before 2ms	5051	Operating frequency before 2ms	5071	Operating frequency before 2ms
5012	Set frequency before 2ms	5032	Set frequency before 2ms	5052	Set frequency before 2ms	5072	Set frequency before 2ms
5013	Output power	5033	Output power	5053	Output power	5073	Output power
5014	Input power	5034	Input power	5054	Input power	5074	Input power
5015	System status information	5035	System status information	5055	System status information	5075	System status information
5016	Status of U-phase units 1~4	5036	Status of U-phase units 1~4	5056	Status of U-phase units 1~4	5076	Status of U-phase units 1~4
5017	Status of U-phase units 5~8	5037	Status of U-phase units 5~8	5057	Status of U-phase units 5~8	5077	Status of U-phase units 5~8
5018	Phase U unit 9~C status	5038	Phase U unit 9~C status	5058	Phase U unit 9~C status	5078	Phase U unit 9~C status
5019	Status of V-phase units 1~4	5039	Status of V-phase units 1~4	5059	Status of V-phase units 1~4	5079	Status of V-phase units 1~4
501A	Status of V-phase units 5~8	503A	Status of V-phase units 5~8	505A	Status of V-phase units 5~8	507A	Status of V-phase units 5~8
501B	Phase V unit 9~C status	503B	Phase V unit 9~C status	505B	Phase V unit 9~C status	507B	Phase V unit 9~C status
501C	Status of W-phase units 1~4	503C	Status of W-phase units 1~4	505C	Status of W-phase units 1~4	507C	Status of W-phase units 1~4
501D	Status of W-phase units 5~8	503D	Status of W-phase units 5~8	505D	Status of W-phase units 5~8	507D	Status of W-phase units 5~8

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Fault record 1		Fault record 2		Fault record 3		Fault record 4	
501E	Phase W unit 9~C status	503E	Phase W unit 9~C status	505E	Phase W unit 9~C status	507E	Phase W unit 9~C status
501F	Average voltage of the unit bus	503F	Average voltage of the unit bus	505F	Average voltage of the unit bus	507F	Average voltage of the unit bus

 Frequency converter fault code and name are as follows:

0: No fault	13: Reserved	33: Unit major fault
1: HMI communication disconnection	14: Motor overspeed	34: Abnormal main circuit
2: User communication disconnection	15: frequency converter overload	35: Transformer overtemperature
3: PLC communication disconnection	16: Analog signal AI1 disconnection	36: Locked-rotor fault
4: Fan fault	17: Analog signal AI2 disconnection	37: frequency converter hardware failure
5: External fault	18: Analog signal AI3 disconnection	38~39: Reserved
6: Abnormal stall protection	19: Temperature controller faulted	40: Output phase error
7: Power undervoltage	20: Abnormal power detected	41: Input overload protection
8: Power supply phase sequence error	21: Motor tuning fault	42: Motor underload protection
9: Reserved	22~29: Reserved	43~44: Reserved
10: Output phase loss	30: Output overcurrent	45: Parallel chain fault
11: Unit minor fault	31: Power supply overvoltage	46~49: Reserved
12: Motor heavy load	32: Door-opening protection	50: Emergency stop fault

6.18 FU Data Monitoring

1200	FU-00	Running frequency	Minimum unit	0.01Hz	Change	△
1201	FU-01	Operation frequency percentage	Minimum unit	0.01%	Change	△
1202	FU-02	Set frequency	Minimum unit	0.01Hz	Change	△
1204	FU-04	Output measurement frequency	Minimum unit	0.01Hz	Change	△
1207	FU-07	PID feedback value	Minimum unit	0.01%	Change	△
1208	FU-08	PID set value	Minimum unit	0.01%	Change	△
1209	FU-09	PID output value	Minimum unit	0.01%	Change	△
120B	FU-11	AI1 input percentage	Minimum unit	0.01%	Change	△
120C	FU-12	AI2 input percentage	Minimum unit	0.01%	Change	△
120D	FU-13	AI3 input percentage	Minimum unit	0.01%	Change	△
1212	FU-18	Output current	Minimum unit	0.1A	Change	△
1213	FU-19	Output current percentage	Minimum unit	0.01%	Change	△
1214	FU-20	Input current	Minimum unit	0.1A	Change	△
1215	FU-21	Phase-R input current	Minimum unit	1	Change	△
1216	FU-22	Phase-S input current	Minimum unit	1	Change	△
1217	FU-23	Phase-T input current	Minimum unit	1	Change	△
1218	FU-24	Phase-U output current	Minimum unit	1	Change	△
1219	FU-25	Phase-V output current	Minimum unit	1	Change	△
121A	FU-26	Phase-W output current	Minimum unit	1	Change	△
121F	FU-31	Output voltage	Minimum unit	1V	Change	△
1223	FU-35	Output power	Minimum unit	1KW	Change	△

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1226	FU-38	Input voltage	Minimum unit	1V	Change	△
1227	FU-39	Input power	Minimum unit	1KW	Change	△
1228	FU-40	Voltage of the input RS line	Minimum unit	1	Change	△
1229	FU-41	Voltage of the input ST line	Minimum unit	1	Change	△
122A	FU-42	Voltage of the input TR line	Minimum unit	1	Change	△
122B	FU-43	Voltage of the output UV line	Minimum unit	1	Change	△
122C	FU-44	Voltage of the output VW line	Minimum unit	1	Change	△
122D	FU-45	Voltage of the output WU line	Minimum unit	1	Change	△
122E	FU-46	Communication polling cycle	Minimum unit	1	Change	△
122F	FU-47	Times of communication error	Minimum unit	1	Change	△
1231	FU-49	Accumulated running time of fan	Minimum unit	1	Change	△
1232	FU-50	Digital input/output terminal status	Minimum unit	1	Change	△
1234	FU-52	Unit U1-4 status information	Minimum unit	1	Change	△
1235	FU-53	Unit U2-8 status information	Minimum unit	1	Change	△
1236	FU-54	Unit V1-4 status information	Minimum unit	1	Change	△
1237	FU-55	Unit V2-8 status information	Minimum unit	1	Change	△
1238	FU-56	Unit W1-4 status information	Minimum unit	1	Change	△
1239	FU-57	Unit W2-8 status information	Minimum unit	1	Change	△
123A	FU-58	Unit U9V9W9 status information	Minimum unit	1	Change	△
123B	FU-59	System fault code	Minimum unit	1	Change	△
124A	FU-74	Rated power of frequency converter	Minimum unit	1KW	Change	△
124B	FU-75	DSP software version No.	Minimum unit	1	Change	△
1260	FU-96	AO1 output percentage	Minimum unit	0.01%	Change	△
1261	FU-97	AO2 output percentage	Minimum unit	0.01%	Change	△
1262	FU-98	AO3 output percentage	Minimum unit	0.01%	Change	△
1263	FU-99	AO4 output percentage	Minimum unit	0.01%	Change	△
1264	FU-100	Manufacturer information	Minimum unit	1	Change	△
Description		Identify manufacturer				
1265	FU-101	Device ID	Minimum unit	1	Change	△
Description		Identify product type				
1266	FU-102	Software ID	Minimum unit	1	Change	△
Description		Identify software version				
1267	FU-103	Dynamic verification code	Minimum unit	1	Change	△
Description		Used for applying for dynamic passwords				
1268	FU-104	System clock (lower 16 bits)	Minimum unit	1	Change	△
1269	FU-105	System clock (upper 16 bits)	Minimum unit	1	Change	△
Description		Taking the year of 1970 as the base number				
126A	FU-106	System status (lower 16 bits)	Minimum unit	1	Change	△
126B	FU-107	System status (upper 16 bits)	Minimum unit	1	Change	△
126C	FU-108	Switch status (lower 16 bits)	Minimum unit	1	Change	△
126D	FU-109	Switch status (upper 16 bits)	Minimum unit	1	Change	△

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Description		Corresponding to the primary circuit switch				
126E	FU-110	Input watt-hour meter (lower 16 bits)	Minimum unit	1	Change	△
126F	FU-111	Input watt-hour meter (upper 16 bits)	Minimum unit	1	Change	△
Description		Input electricity measurement				
1270	FU-112	Output watt-hour meter (lower 16 bits)	Minimum unit	1	Change	△
1271	FU-113	Output watt-hour meter (upper 16 bits)	Minimum unit	1	Change	△
Description		Output electricity measurement				
1272	FU-114	Rated power	Minimum unit	1KW	Change	△
1273	FU-115	Rated input voltage	Minimum unit	1V	Change	△
1274	FU-116	Rated input current	Minimum unit	1A	Change	△
1275	FU-117	Rated output voltage	Minimum unit	1V	Change	△
1276	FU-118	Rated output current	Minimum unit	1A	Change	△
1277	FU-119	Service time of equipment	Minimum unit	1h	Change	△
1278	FU-120	Single operation time of the device	Minimum unit	1h	Change	△
1279	FU-121	Accumulated running time of fan	Minimum unit	1h	Change	△
127A	FU-122	Fault code	Minimum unit	1	Change	△
127B	FU-123	Alarm information (lower 16 bits)	Minimum unit	1	Change	△
127C	FU-124	Alarm information (upper 16 bits)	Minimum unit	1	Change	△
127D	FU-125	Login user level	Minimum unit	1	Change	△
Description		0: Application engineer 1: Technical engineer 2: Product manager 3: Specialist engineer				
127E	FU-126	Current frequency channel source	Minimum unit	1	Change	△
Description		0: HMI 1: Communication 2: AI1 3: AI2 4: AI3 5: Reserved				
127F	FU-127	Current start/stop channel source	Minimum unit	1	Change	△
Description		0: HMI 1: Communication 2: AI1 3: AI2 4: AI3 5: Reserved				
1280	FU-128	DI terminal status	Minimum unit	1	Change	△
1281	FU-129	DO terminal status	Minimum unit	1	Change	△
1283	FU-131	Automatic restart remaining time	Minimum unit	1	Change	△
Description		Valid during automatic reset				
1284	FU-132	Automatic restart remaining times	Minimum unit	1	Change	△
Description		Valid during automatic reset				
1285	FU-133	Delay stop countdown (s)	Minimum unit	1	Change	△
Description		Alarm of delayed fault stop				
1286	FU-134	Current control mode	Minimum unit	1	Change	△
Description		0: Not loaded 1: Asynchronous motor VF 2: Asynchronous motor vector 3: Synchronous motor VF 4: Synchronous motor vector 5: Permanent magnet synchronous 6: Power supply 7: Power generation supply 8: SVG control				
1295	FU-149	Switchgear ID No.	Minimum unit	1	Change	△
1296	FU-150	Number of unit bypass layers	Minimum unit	1	Change	△

7. Troubleshooting and Exception Handling

7.1 Faults of frequency converter and Solutions

Table for faults and solutions:

Fault code	Fault type	Possible fault causes	Troubleshooting method
1	HMI communication fault	Disconnected communication line or wrong parameters	Check the communication line or seek for service
2	User communication disconnection	Communication parameters are not properly set	Check the FF menu setting
		Severe communication interference	Check the wiring and grounding of communication loop
		Host computer is not working	Check the host computer and wiring
3	PLC communication disconnection	Disconnected communication line or wrong parameters	Check the communication line or seek for service
4	Fan fault	Contact damage or circuit fault of control fan	Replace the contactor or check the control circuit
5	External fault	External fault terminal is closed	Solve the external fault
6	Abnormal stall protection	The stall state lasts for 1 minute	Set the operating parameters correctly
		PG is connected reversely which causes overspeed	Check PG wiring
7	Power supply undervoltage	Input voltage is abnormal or power fails during operation	Inspect the input power supply and wiring
		There is heavy load impact	Check load
		Input phase loss	Inspect the input power supply and wiring
8	Power phase sequence error		Replace the input phase sequence
10	Output phase loss	Outputs U, V and W have phase loss	Check the output wiring; check the motor and cable
11	Unit minor fault		
12	Motor heavy load	Motor current exceeds the overload detection level and is beyond the detection time	Check load Check the overload protection setting
14	Motor overspeed		
15	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 the speed track starting or restart after the motor is completely stopped
		Input voltage is too low	Check input voltage

Fault code	Fault type	Possible fault causes	Troubleshooting method
16	Analog signal AI1 disconnection	The wiring is disconnected or the external equipment is damaged	Check the external wiring and external equipment
17	Analog signal AI2 disconnection		
18	Analog signal AI3 disconnection	The threshold of connection loss is not properly set	Check the settings of the Fb-35
19	Temperature controller fault		
20	Abnormal power detected		
21	Motor tuning fault		
30	Output overcurrent	There is phase-to-phase or to-ground short circuit inside the motor or wiring	Check the motor and wiring
		The starting voltage is too high	Check the torque boost setting
		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
		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
		Abnormal load	Inspect the load
31	Power supply overvoltage	The power of frequency converter is too small	Use the frequency converter with large power class
		Input voltage abnormality	Check the input power
		Restart the rotating motor	Set to the speed track starting; restart after the motor is completely stopped
		There is potential energy load or the load inertia is too large	Select proper dynamic braking assembly outside
		The motor runs abnormally and has vibration	Adjust the F2-03 parameter to reduce vibration
		The set time of acceleration and deceleration is too short	Extend the time of acceleration and deceleration properly
		Load inertia is large	Adopt the dynamic braking assembly
32	Door open protection	Voltage detection circuit fault	Seek service
		The cabinet door is not closed or travel switch is damaged	Check the closing state of cabinet door and check the travel switch and its connection point
33	Unit major fault		
34	Main circuit abnormality		
35	Phase-shifting transformer 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

7. Troubleshooting and Exception Handling

Fault code	Fault type	Possible fault causes	Troubleshooting method
36	Locked-rotor fault		
37	Frequency converter hardware failure		
40	Output phase error		
41	Input overload protection		
42	Motor underload protection		
45	Parallel chain fault		
50	Emergency stop fault	There is external fault input	Check peripheral equipment

7.2 Alarms of frequency converter and Solutions

Table for alarms and solutions:

Alarm name	Content and description	Countermeasure	Corresponding bits of alarm characters
External alarm	External alarm signal is valid		Bit0
Communication disconnection	Communication timeout	Refer to solutions to corresponding faults	Bit2
Touch screen disconnection	Communication disconnection or wrong parameters	Refer to solutions to corresponding faults	Bit3
PLC communication disconnection	Communication disconnection or wrong parameters	Refer to solutions to corresponding faults	Bit4
Unit bypass	The power unit experiences faults and operates at low voltage due to the bypass of the frequency converter	Record the fault information and handle it after the frequency converter is shut down.	Bit5
ID of PLC does not match		Check whether the ID of PLC is matched	Bit6
Cabinet door open	Cabinet door is not closed and detection switch is broken	Refer to solutions to corresponding faults	Bit7
One abnormal circuit of control power	One circuit of control power has no output or is in fault as detected	Check the wiring of control power	Bit8
Abnormal alarm of fan			Bit9
Fan life alarm			Bit10
Alarm for overspeed of motor			Bit11
Output phase loss	Output phase loss	Refer to solutions to corresponding faults	Bit12
AI1 disconnection	Analog input signal is lower than the connection loss threshold	Refer to solutions to corresponding faults	Bit13
AI2 disconnection	Analog input signal is lower than the connection loss threshold	Refer to solutions to corresponding faults	Bit14

AI3 disconnection	Analog input signal is lower than the connection loss threshold	Refer to solutions to corresponding faults	Bit15
Transformer overtemperature alarm	Air intake of transformer cabinet is blocked; cooling fan of transformer cabinet is broken; output overload	Refer to solutions to corresponding faults	Bit16
Temperature controller fault			Bit17
Motor overload alarm	Motor current exceeds the overload detection level and is beyond the detection time	Refer to solutions to corresponding faults	Bit18
Synchronous fiber optic disconnection			Bit19
Frequency converter overload alarm	Output current of frequency converter is larger than the overload protection level and beyond the detection time	Refer to solutions to corresponding faults	Bit20

7.3 Abnormal Operation of the frequency converter and Solutions

Table for abnormal operation and solutions:

Phenomena	Occurrence conditions	Possible cause	Countermeasure
Human-machine interface No response	Some keys or all keys have no response	Connecting line of HMI has poor contact	Check the connecting line and seek for service from our company in case of exceptions
		No operation permission	
		HMI is damaged	Change the HMI
Parameters cannot be modified	Some parameters cannot be modified	Insufficient security level	Enter the password corresponding to the level
		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
Frequency converter stops accidentally during running	Frequency Converter stops automatically without stop order	Fault exists	Find out fault causes and reset the faulty part
		PLC cycle completed	Check PLC parameter setting
		Run command channel switch	Check operation and status of run command channel
	Motor stops automatically without stop order	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

7. Troubleshooting and Exception Handling

		PID direct action. Feedback value > set value PID reverse action. Feedback value < set value	Check PID setting and feedback
Frequency converter Unable to start	frequency converter cannot be started under the command	Digital input 19 "free stop" is valid	Check the free stop terminal
		Digital input 20 "start prohibited" is valid	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 F4-09 setting

8. Maintenance and After-sales Service



DANGER

- 1. Only professionally trained personnel can disassemble components, perform maintenance, and replace components;**
- 2. Before inspection and maintenance, please make sure that the frequency converter has been disconnected from the power supply, the high-voltage indicator lights are off, and wait a few minutes for full discharge inside the frequency converter. Otherwise, there will be electric shock danger;**
- 3. Do not leave screws, washers, 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, the equipment may be damaged.**

8.1 Daily Care and 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 conforms to the requirements;
2. Whether the operating parameters of the frequency converter are within the specified range;
3. Whether there is abnormal vibration or sound;
4. Whether there is abnormal smell;
5. Whether the fan rotates normally;
6. Whether the input voltage is within the specified range and the voltage of each phase is in balance.

8.2 Periodic 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 screws of the control terminals are loosened;
2. Whether the terminals of the main loop are in poor contact, and whether the copper bar joints are overheated;
3. Whether power cables and control cables are damaged, especially the surface contacting the metal surface, and whether there are scratches;
4. Whether the insulation binder of the cold-pressed terminal of the power cable has fallen off;
5. The dust in the 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 the 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.

8. Maintenance and After-sales Service

 **DANGER : The control circuit shall not go through the withstand voltage test and insulation test, or the circuit components will be damaged.**

8.3 Replacement for Vulnerable Parts of Frequency Converter

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. Ensure to install the protective cover.

◆ 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 the 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-term storage will lead to the deterioration of electrolytic capacitors. It is imperative to power them on at least once within 2 years. The power-on duration must be at least 5 hours, and the input voltage must be gradually increased to the rated value using a voltage regulator.

8.5 After-sales Service

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 a fault, please contact the Company promptly. Within the warranty period, the Company will provide free repair

service for any fault due to product manufacturing and design defects, and any defect beyond the warranty period will be repaired by the Company after payment, according to the customer's requirements.

9. Optional Accessories

The optional accessories listed below, if necessary, please order from our company.

9.1 Encoder Interface Board (SL-PG-3)

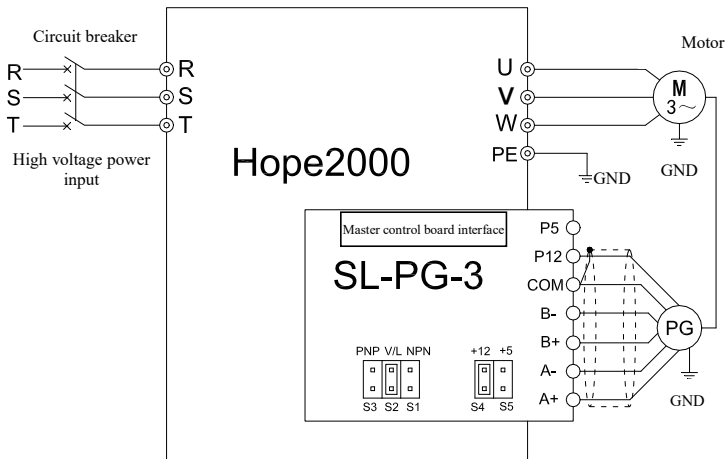
The encoder interface board functions to receive the encoder signal so that the frequency converter can perform "with PG V/F control" or "with PG-based vector control".

Installation method: (1) Confirm that the power supply of the frequency converter is cut off; (2) Insert the large end of the plastic column attached to the interface board into the main control board; (3) Align the socket on the interface board with the pin (J12) on the interface of the main control board, align the two mounting holes on the interface board with the placed plastic column, and press down.

The encoder interface board can be adapted to almost all encoders of output forms: open collector (NPN, PNP), voltage type, complementary push-pull type, and differential output type. The encoder interface board provides 12V and 5V isolated power supplies.

! ATTENTION: The interface type and power supply of the encoder must be correctly selected through the jumper. The factory jumper: 12V, NPN encoder.

Basic wiring is as follows (take the 12V differential output encoder as an example):



The functions and specifications of the encoder interface board terminals are as follows:

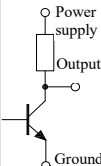
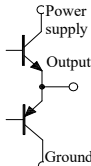
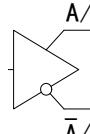
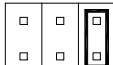
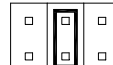
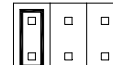
Terminal symbol	Terminal name	Terminal Function & Description	Technical Specifications
Z+	Encoder Z+ input	Encoder Z in-phase signal input	Maximum input frequency: 300kHz; The single-channel encoder is only connected to the A channel; Non-differential input type must be connected from A+ or B+, and A- and B- shall be overhead
Z-	Encoder Z- input	Encoder Z out-phase signal input	
A+	Encoder A+ input	Encoder A in-phase signal input	
A-	Encoder A- input	Encoder A out-phase signal input	
B+	Encoder B+ input	Encoder B in-phase signal input	

Terminal symbol	Terminal name	Terminal Function & Description	Technical Specifications
	terminal		
B-	Encoder B- input terminal	Encoder B out-phase signal input	
COM	Power ground	P12 and P5 power supplies and input signal ground Isolated from the GND of the main control board	-
P12	12V power supply terminal	12V power supply for users	Maximum output current: 80mA
P5	5V power terminal	5V power supply for users	Maximum output current: 200mA

The instructions for using the power jumper of the encoder interface board are as follows:

Power supply used	12V	5V
Jumper position	+ 12 + 5  S4 S5	+ 12 + 5  S4 S5

The instructions for using the output type jumper of the encoder are as follows:

Type	NPN type	Voltage type	Complementary push-pull type	Differential output type	PNP type
Output structure	Power supply Output Ground 	Power supply Output Ground 	Power supply Output Ground 	A/B A/B 	Power supply Output Ground 
Jumper position	PNP V/L NPN  S3 S2 S1		PNP V/L NPN  S3 S2 S1		PNP V/L NPN  S3 S2 S1

 ATTENTION	1. Check whether the coaxiality of the connection between the mechanical shaft and the encoder meets the requirements. If not, torque fluctuations 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
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	to the COM of the encoder interface board. 3. The encoder signal line and power line must be separated. Otherwise, electromagnetic interference will affect the output signal of the encoder. 4. The grounding of the encoder shell can reduce interference.
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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.		Receipt date	MM/DD/YYYY
Unpacking inspection and power-on test: ☐ Normal ☐ Abnormal						
To be filled by the user	After the installation and commissioning are 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.

HOPE SENLAN SCIENCE AND TECHNOLOGY HOLDING CORP., LTD.