Foreword

Thank you for choosing the Sine Electric TC760 tower crane dedicated frequency converter.

Release date: March 2025

Version: 1.0

The TC760 tower crane-specific frequency converter is a high-performance frequency converter launched by ZhengXin Electric, designed specifically for lifting applications. It can be used in closed-loop lifting applications such as tower crane hoisting, as well as open-loop lifting applications such as construction hoists, and also in applications such as tower crane slewing and luffing. The factory default values for relevant parameters can be varied according to the selection of the F20.00 lifting industry application macro.

The TC760 tower crane-specific frequency converter has the following features:

- Starting with 18.5kW, a built-in DC reactor is incorporated to reduce input current distortion, improve the power factor, and enhance product reliability.
- Closed-loop vector control ensures stable operation with high torque at low frequencies: 0Hz/150% rated torque output ensures smooth operation of the lifting equipment during startup, lifting, and descent.
- Zero servo function: When the encoder is connected, even if the brake fails, the frequency converter can drive the motor to control the full load to stay in the air or to lower it at a controlled low speed, providing a second layer of safety protection for the hoisting equipment.
- Overspeed protection: When connected to the encoder, it has overspeed protection for stopping and overspeed protection during operation, which can promptly detect abnormal speed and abnormal braking force during the lifting process to prevent hook slippage accidents.

- Dedicated control logic for brakes: Controls the opening and closing of the brakes of the lifting equipment in a reasonable timing sequence, ensuring the safe operation of the system and extending the service life of the braking system.
- Wide voltage input range and automatic voltage regulation: ensures that the output can still meet the torque output requirements of the lifting equipment when the mains voltage drops;
- Wide speed range: Meets the requirements of light-load high speed and heavy-load low speed for lifting equipment, improving equipment working efficiency.

Before using the TC760 tower crane dedicated frequency converter, please read this guide carefully and keep it safe.

When connecting the frequency converter to the motor for the first time, please correctly select the motor type (asynchronous or synchronous) and set the motor nameplate parameters: rated power, rated voltage, rated current, rated frequency, rated speed, motor connection method, and rated power factor, etc. If it is an FVC drive control mode, a PG card is required, and the encoder parameters must be set correctly.

As we are constantly striving to improve our products and product information, we will not provide further notice of any changes to the information we provide.

For the latest changes and more information, please visit www.sineedrive.com

Safety Precautions

Safety Definitions: In this manual, safety precautions are divided into the following two categories;

Danger: Failure to operate as required may result in serious injury or even death.

Notice: Failure to operate as required may result in moderate or minor injury, or equipment damage.

Users are advised to carefully read this chapter when installing, debugging, and repairing this system, and to strictly follow the safety precautions outlined in this chapter. Our company is not responsible for any injury or loss caused by improper operation.

Safety Precautions

Before installation:

Danger
1、 Do not install if you find water damage, missing parts, or damaged parts when you open the box! 2、 Do not install if the label on the outer packaging does not match the actual product name!
Notice
1、 Handle with care during transport, otherwise there is a risk of damaging the equipment! 2、 Do not use a damaged or missing part inverter, as it may cause injury! 3、 Do not touch the components of the control system with your hands, otherwise there is a risk of damage from static electricity!

During installation:

Danger
1、 Please install it on a flame-retardant object such as metal, and keep it away from flammable materials, otherwise it may cause a fire! 2、 Do not loosen the bolts securing the equipment components, especially those marked in red!
Notice
1、 Do not allow wire ends or screws to fall into the frequency converter, otherwise it will damage the frequency converter! 2、 Please install the frequency converter in a place with minimal vibration and away from direct sunlight. 3、 When the frequency converter is placed in a relatively enclosed cabinet or space, please pay attention to the installation gap to ensure heat dissipation.

When wiring:

Danger
1、 The instructions in this manual must be followed and the work must be carried out by a professional electrical engineer; otherwise, unexpected dangers may occur! 2、 A circuit breaker must be installed between the frequency converter and the power supply (it is recommended to use a circuit breaker with a current rating of at least twice the rated current), otherwise a fire may occur! 3、 Before wiring, please ensure that the power supply is in a zero-energy state, otherwise there is a risk of electric shock! 4、 Never connect the input power supply to the inverter's output terminals (U, V, W). Pay attention to the terminal markings and do not connect the wires incorrectly! Otherwise, it will damage the inverter! 5、 Please ground the inverter correctly according to the standard, otherwise there is a risk of electric shock!
Notice

1、 Ensure that the wiring meets EMC requirements and the safety standards of the area. Please refer to the preferred recommendations for the wire gauge used. Otherwise, an accident may occur! 2、 Never connect the braking resistor directly to the DC bus or terminals. Doing so could cause a fire! 3、 Please use a screwdriver with the specified torque to tighten the terminals; otherwise, there is a risk of fire. 4、 Do not connect the phase-shifting capacitor and LC/RC noise filter to the output circuit. 5、 Do not connect electromagnetic switches or electromagnetic contactors to the output circuit. Otherwise, the inverter's overcurrent protection circuit will trip, potentially causing internal damage to the inverter. 6、 Do not disassemble the internal connecting cables ofthe frequency converter, otherwise it may cause damage to the internal components of the frequency converter.

Before powering on:

Danger
1、 Please confirm that the voltage level of the input power supply is consistent with the rated voltage level of the frequency converter; check that the wiring positions on the power input terminals (R, S, T) and output terminals (U, V, W) are correct; and carefully check whether there is a short circuit in the external circuit connected to the frequency converter, and whether the connected wires are secure, otherwise the frequency converter may be damaged! 2、 No part of the frequency converter needs to undergo a withstand voltage test; this test has already been performed on the product at the factory. Otherwise, it may cause an accident!
Notice

1、 The inverter must be covered before powering it on; otherwise, it may cause electric shock! 2、 All wiring of external components must comply with the instructions in this manual, and the wiring must be done correctly according to the circuit connection methods provided in this manual. Otherwise, it may cause an accident!

After powering on:

Danger
1、 Do not touch the inverter and surrounding circuits with wet hands, otherwise there is a risk of electric shock! 2、 If the indicator lights do not illuminate or the keyboard does not display anything after powering on, please immediately disconnect the power switch. Do not touch the inverter's R, S, T terminals or any terminals on the wiring terminals with your hands or a screwdriver, as this may result in electric shock. After disconnecting the power switch, please contact our customer service personnel immediately. 3、 When powered on, the inverter automatically performs a safety check on the external high-voltage circuit. At this time, never touch the inverter's U, V, W terminals or the motor's terminals, otherwise there is a risk of electric shock!
Notice
1、 If parameter identification is required, please be aware of the risk of injury from the rotating motor, otherwise it may cause an accident! 2、 Do not arbitrarily change the frequency converter manufacturer's parameters, otherwise it may damage the equipment! 3、 Do not disassemble any parts of the inverter while it is powered on.

Running:

Danger
1、 Do not touch the cooling fan, heat sink, or discharge resistor to test the temperature, as this may cause burns! 2、 Do not attempt to test signals while the equipment is in operation if you are not a qualified technician, as this may cause personal injury or equipment damage!
Notice
1、 During the operation of the frequency converter, avoid letting anything fall into the equipment, otherwise it will cause damage to the equipment! 2、 Do not use contactors to control the start and stop of the frequency converter, otherwise it will cause damage to the equipment!

During maintenance:

Danger
1、 Do not perform maintenance or repairs on the equipment while it is powered on, as this could result in electric shock! 2、 Disconnect the main circuit power supply and confirm that the CHARGE indicator light is off, or wait at least 10 minutes after power failure before performing maintenance and repairs on the frequency converter. Otherwise, residual charge on the capacitors may cause harm to people! 3、 Do not attempt to repair or maintain the frequency converter without proper training, as this could result in personal injury or equipment damage! 4、 After replacing the frequency converter, the parameters must be set, and all pluggable interfaces must be plugged in or unplugged when the power is off!

Precautions

Motor insulation inspection

Before first use, before reusing the motor after a long period of inactivity, and during regular inspections, an insulation check should be performed on the motor to prevent damage to the frequency converter due to insulation failure in the motor windings. During the insulation check, the motor wiring must be disconnected from the frequency converter. It is recommended to use a 500V voltage-type megohmmeter, and the measured insulation resistance should be no less than 5MΩ.

Motor thermal protection

If the rated capacity of the selected motor and the inverter are not compatible, especially if the rated power of the inverter is greater than the rated power of the motor, it is necessary to adjust the relevant parameters of motor protection in the inverter or install a thermal relay in front of the motor to protect the motor.

Operating above power frequency

This frequency converter can provide an output frequency of 0.00Hz to 600.00Hz. If the customer needs to operate the motor at a frequency higher than its rated frequency, please consider the load-bearing capacity of the mechanical components.

Regarding motor heating and noise

Because the inverter output voltage is a PWM wave, which contains certain harmonics, the motor's temperature rise, noise, and vibration will be slightly higher compared to operation at the mains frequency.

Case where there is a varistor or a capacitor for improving power factor on the output side.

The inverter output is a PWM wave. If power factor correction capacitors or surge protectors are installed on the output side, it can easily cause instantaneous overcurrent in the inverter or even damage the inverter. Please do not use it.

Use beyond the rated voltage value

It is not advisable to use the dedicated closed-loop vector frequency converter for cranes outside the allowable operating voltage range specified in the manual, as this may easily damage the internal components of the frequency converter. If necessary, please use the appropriate step-up or step-down device for voltage transformation.

Lightning impulse protection

This series of frequency converters is equipped with a lightning overcurrent protection device, which has a certain self-protection capability against induced lightning. For areas where lightning strikes are frequent, customers should also install additional protection at the front end of the frequency converter.

Altitude and Deduction of Credit

In areas with an altitude exceeding 1000m, the thin air causes the inverter's heat dissipation and safety insulation to deteriorate, making it necessary to derate it. Please consult our company for technical advice in this case.

When scrapping a frequency converter, pay attention to

Electrolytic capacitors in the main circuit and on the printed circuit board may explode when burned. Burning plastic parts will produce toxic gases. Please dispose of them as industrial waste.

Part 1 overview

1.1 TC760 frequency converter model and specifications

Rated power supply voltage: Three-phase AC 340V～460V

Applicable motors: Three-phase AC asynchronous motors and permanent magnet synchronous motors

Rated power supply voltage	Model	Applicable motor power(kW)	Rated output current(A)
Three-phase exchange 340～460V	TC760-0R7-3B	0.75	2.5
	TC760-1R5-3B	1.5	4.2
	TC760-2R2-3B	2.2	5.6
	TC760-4R0-3B	4.0	9.4
	TC760-5R5-3B	5.5	13
	TC760-7R5-3B	7.5	17
	TC760-011-3B	11	25
	TC760-015-3B	15	32
	TC760-018-3B	18.5	38
	TC760-022-3B	22	45
	TC760-030-3B	30	60
	TC760-037-3B	37	75
	TC760-045-3B	45	90
	TC760-055-3B	55	110
	TC760-075-3B	75	150
	TC760-090-3	90	176
	TC760-110-3	110	210
	TC760-132-3	132	253
	TC760-160-3	160	304
	TC760-200-3	200	380
	TC760-220-3	220	426
	TC760-250-3	250	465

	TC760-280-3	280	520
	TC760-315-3	315	585
	TC760-355-3	355	650
	TC760-400-3	400	725

★: Heavy-duty models with power ratings of 0.75～75kW include a built-in braking unit; models with power ratings of 90kW and above require an external braking unit.

★Selection Principles (for reference only, actual calculations shall prevail):

l Lifting applications: Heavy-duty type, i.e., the inverter power is increased by 1 to 2 levels compared to the motor power (closed loop).

l Rotary applications: Heavy-duty type, i.e., the inverter power is increased by 1 to 2 levels compared to the motor power (open loop).

l Lever-changing applications for trolleys: heavy-duty type, i.e., inverter and motor power matching (open loop).

The technical specifications for crane-specific frequency converters are shown in Table 1-1.

Table 1-1 Technical Specifications for Crane-Specific Frequency Converters

project		specification
Power supply	Rated power suppl voltage	Three-phase 340V-10%～460V+10% 50–60Hz ±5%, voltage imbalance rate <3%
Output	Maximum outpu voltage	The maximum output voltage is the same as the input power supply voltage.
	Output current rating	100% rated current continuous output
	Maximum overload current	150% of rated current for 60 seconds
	Driving method	V/F control (VVF); Sensorless vector control (SVC);

Basic control function		Sensor-based vector control (FVC)
	Input method	Frequency (speed) input, torque input
	Start-stop contro method	Keyboard, control terminals (two-wire control, three-wire control) communication
	Frequency contro range	0.00～600.00Hz/0.0～3000.0HZ
	Input frequenc resolution	Digital input: 0.01Hz; Analog input: 0. 1% of maximum frequency.
	Speed range	1:50 (VVF), 1:200 (SVC), 1:1000 (FVC)
	Speed contro accuracy	±0.5%(VVF)、±0.2%(SVC)、±0.02%(FVC)
	Acceleration an deceleration time	0.01 seconds to 600.00 seconds / 0.1 seconds to 6000.0 seconds / 1 second to 60000 seconds
	Voltage/frequency characteristics	Rated output voltage adjustable from 20% to 100%, base frequency adjustable from 1Hz to 600Hz/3000Hz.
	Torque boost	Fixed torque boost curve or arbitrary V/F curve selectable
	Starting torque	150%/3Hz（VVF）、150%/0.25Hz（SVC）、180%/0Hz（FVC）
	Torque control accuracy	±5% of rated torque (SVC), ±3% of rated torque (FVC)
	Output voltag self-adjustment	The output voltage remains essentially constant regardless of changes in inpu voltage.
	Automatic curren limiting	Automatically limits output current to avoid frequent overcurrent tripping.
	DC braking	Braking frequency: 0.01 to maximum frequency; braking time: 0 to 30 seconds.

		Braking current: 0%～150% of rated current
	Signal input source	Communication, multi-speed, analog signals, high-speed pulses, etc.
Enter Output Function	Reference powe supply	10.5V±0.5V/20mA
	Terminal control power supply	24V/200mA
	Digital input terminal	9 (standard configuration X1 ～X7, X11, X12) + 3 (expansion card X8 ～X10) digital multi-function inputs: X7 can be selected as a high-speed pulse input terminal (F02.06=35/38/40); X1～X6, X8 ～X10, and X11, X12, a total of 11 channels, can only be used as ordinary digital input terminals.
	Analog input terminals	3 (standard configuration AI1~AI3) + 1 (expansion card AI4) analog inputs; 1-channel AI1: Supports 0 ～ 10V or -10 ～ 10V, selectable via function code F02.62; 2-channel AI2/AI3: Supports 0-10V, 0-20mA, or 4-20mA, via function code F02.63/F02.64 is optional; 1-channel AI4: Supports 0-10V or -10-10V, selectable via function code F02.65
	Digital output terminals	2 (standard Y1/Y2) open collector multi-function outputs +2-channel (R1:EA/EB/EC and R2:RA/RB/RC) relay multi-function output+2 (expansion card) multi-function relay output (R3:RA3/CA3 and R4:RA4/CA4) collector output maximum output current 50mA; Relay contact capacity 250VAC/3A or 30VDC/1A, EA-EC and RA-RC normally open, EB-EC and RB -RC normally closed; RA3-CA3, RA4-CA4

		normally open.
	Analog output terminals	Two-channel (M1/M2) multi-function analog output terminals, capable o outputting 0-10V, 0-20mA, or 4-20mA. Selectable via function codes F03.34 and F03.35
Operaion panel	LCD display	The LCD digital display shows relevant information about the frequency converter.
	Parameter copy	It can upload and download inverter parameter settings information, enabling rapid parameter copying.
Protect	Protection function	Short circuit, overcurrent, overvoltage, undervoltage, phase loss, overload overheating, overspeed, load shedding, and external faults, etc.
use condition	Installation site	Indoors, at an altitude below 1,000 meters, free from dust, corrosive gases, and direct sunlight.
	Applicable Environment	-10℃ ～ +50℃ (dilution recommended above 40℃), 20% ～ 90%RH (non-condensing)
	vibration	Less than 0.5g
	Storage environment	-40℃~+70℃
	Installation method	Wall-mounted, floor-standing control cabinet, through-wall type
Protection level		IP20/IP21 (with plastic baffle)
Cooling method		Forced air cooling

1.2 Detailed Explanation of Inverter Operating Status

1.2.1 Inverter operating status

The operating states of a frequency converter are divided into: parameter setting state, normal operation state, jogging operation state, self-learning operation state, stop state, jogging stop state, and fault state.

- Parameter setting status: After the inverter is powered on and initialized, it is in standby preparation status with no faults and no start command. At this time, the inverter has no output.
- Normal operating condition: After receiving a valid start command (keyboard, control terminal, communication), the frequency converter outputs according to the set input requirements to drive the motor to rotate.
- Jog mode: The jog mode is entered by the keyboard, external terminals or communication control, and the motor is driven to rotate at the jog input speed.
- Self-learning operation mode: Enter self-learning operation mode via keyboard, and detect relevant parameters of the motor while stationary or rotating.
- Parking status: After the run command becomes invalid, the output frequency decreases to zero according to the set deceleration time.
- Inching stop state: After the inching run command becomes invalid, the output frequency decreases to zero over the inching deceleration time.
- Fault status: The status of the frequency converter when various faults occur.

1.2.2 Inverter operating modes

The operating mode of a frequency converter refers to whether the frequency converter uses open-loop or closed-loop control to drive the motor to rotate at the required speed and torque. Operating modes include:

- General-purpose open-loop space vector control—V/F control: suitable for applications where speed changes are not rapid, speed stability accuracy requirements are not high, or multiple motor drives are required, meeting the needs of most AC motor drive applications.

- Sensorless Vector Control (SVC): Advanced speed estimation algorithm, no encoder required, vector control, and high control accuracy.
- Speed sensor vector control – FVC control: speed and current are controlled in real time in a closed loop throughout the entire process, with high speed stability and fast dynamic response. An encoder must be added when using this mode.

1.2.3 Inverter feed method

The input method of a frequency converter refers to the physical quantity that is controlled when the frequency converter drives the motor.

- The speed of the electric motor is taken as the controlled target, which is the speed setting method;
- The current of the motor is the controlled target, which is the torque command method.

The input can be set digitally or in multiple speed settings. The jog speed input mode is preferred over other input modes; that is, when the jog button M.K on the keyboard is pressed or the control terminals FJOG and RJOG are enabled, the inverter automatically switches to jog speed input regardless of the current input mode. Figures 11 and 12 detail the various input methods of the crane-specific inverter:

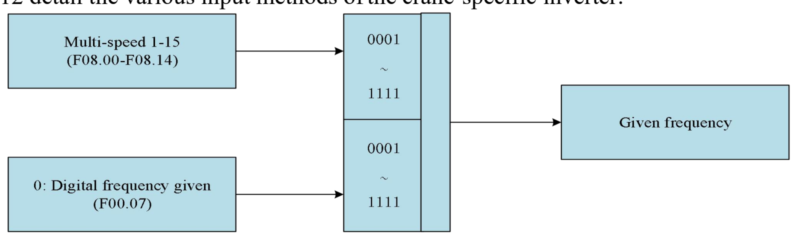


Figure 1-1 Schematic diagram of speed input method

Figure 1-2 Schematic diagram of torque input method

1.2.4 Inverter operation mode

The operating mode of a frequency converter refers to the action conditions that enable the frequency converter to enter the operating state. These modes include: keypad operation mode, terminal operation mode, and communication operation mode. Terminal operation mode is further divided into two-wire control (RUN, F/R) and three-wire control (RUN, F/R, Xi (i=1～7, 11, 12)). (The definition of Xi needs to be modified to three-wire operation and stop control.) The control logic for these operating modes is shown in Figure 1-3.

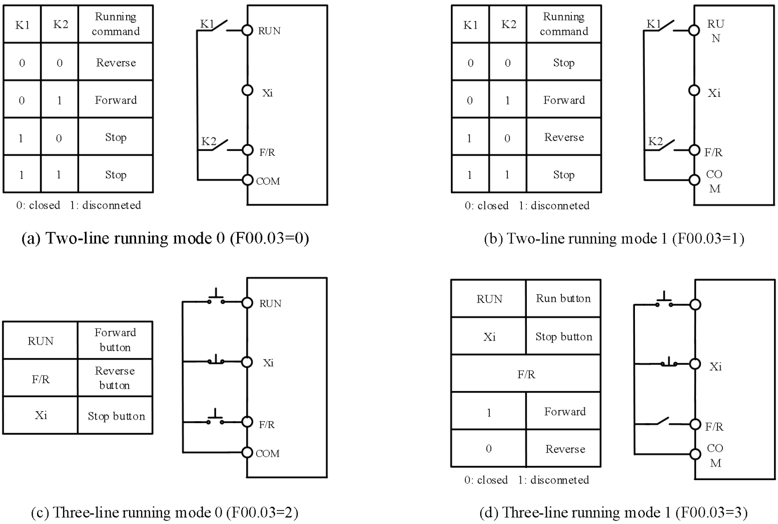


Figure 1-3 Terminal Operation Mode Control Logic Diagram

Part 2 Install

2.1 Product Confirmation

Danger
● **Do not install damaged frequency converters or frequency converters missing parts.** Risk of injury

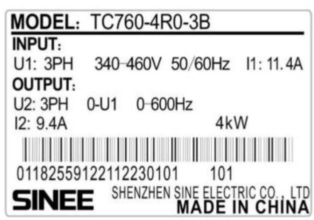
When you receive the product, please check it according to Table 2-1.

Table 2-1 Confirmed Items

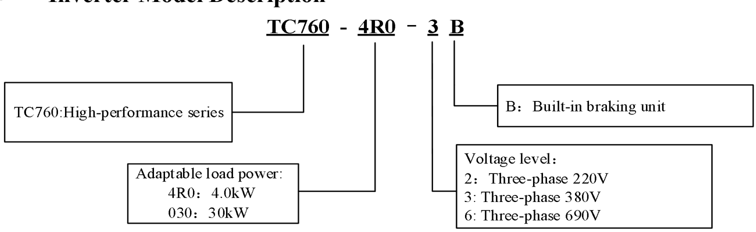
Confirm Project	Confirmation method
Does it match the ordered goods?	Please check the nameplate on the side of the frequency converter.
Are there any damaged areas?	Check the overall appearance and inspect for any damage during transport.
Check if screws or other fasteners are loose.	If necessary, check with a screwdriver.

If you encounter any problems, please contact our marketing department.

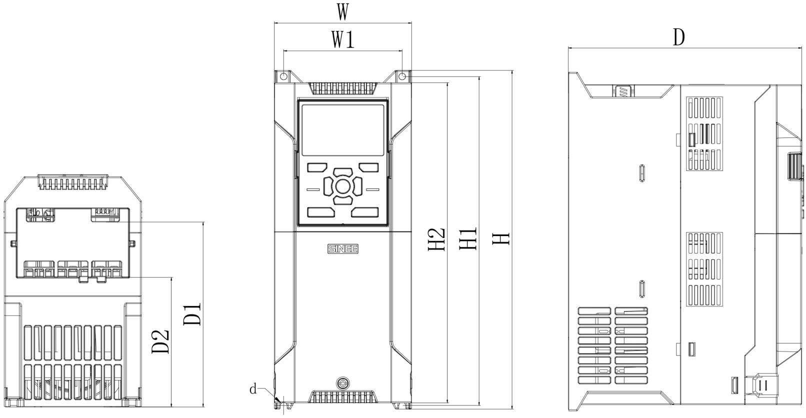
- **Nameplate**



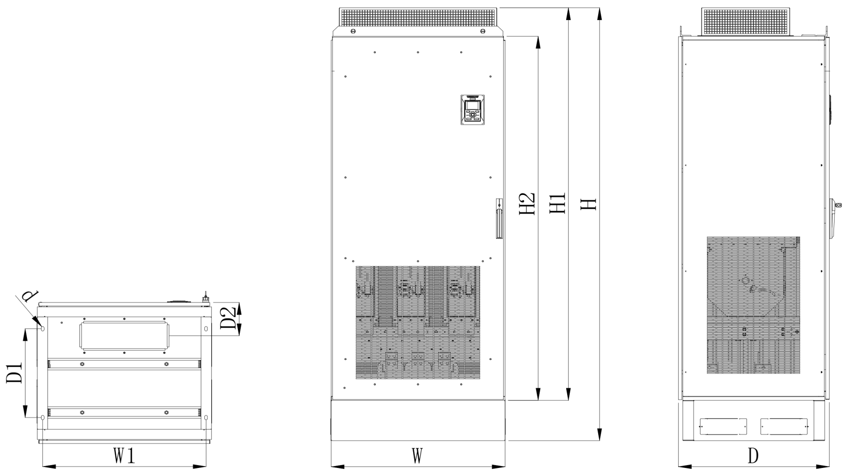
- **Inverter Model Description**



2.2 External dimensions and installation dimensions



(a) Appearance of 0.75kW～22kW frequency converter



(b) Appearance of 30kW～75kW frequency converter

Figure 2-1 Outline dimensions of the TC760 series keypad and frequency converter

Table 2-1 External Dimensions and Installation Dimensions of TC760 Series Frequency Inverters

Model	IN	W1	H	H1	H2	D	D1	D2	d	shape
TC760-0R7-3B TC760-1R5-3B TC760-2R2-3B TC760-4R0-3B	95	82	230	222	218	171	132	96	4.5	(a)
TC760-5R5-3B TC760-7R5-3B	110	95	275	267	260	187	146	105	5.5	(a)
TC760-011-3B TC760-015-3B	140	124	297	289	280	207	163	120	5.5	(a)
TC760-018-3B TC760-022-3B	190	171	350	340	330	220	173	128	7	(a)
TC760-030-3B TC760-037-3B	254	200	484	465	440	221	180.5	158	9.5	(b)
TC760-045-3B TC760-055-3B	304	240	548	524	480	266	225	193	9.5	(b)
TC760-075-3B	324	230	635	613	570	264	223	190	11.5	(b)
TC760-090-3 TC760-110-3	339	270	621	600	578	296	243	243	11.5	(b)
TC760-132-3 TC760-160-3	422	320	786	758	709	335	270	256	11.5	(b)
TC760-200-3 TC760-220-3	441	320	1025	989	942	358	/	285	11.5	(b)
TC760-250-3 TC760-280-3	560	450	1204	1171	1100	404	/	333	13	(b)
TC760-315-3 TC760-355-3 TC760-400-3	660	443	1597	1567	1504	434	375.5	323.5	13	(b)

2.3 Installation site requirements and management

Notice

1、 **When moving the machine, please support it from the bottom.**

Holding only the panel poses a risk of the main body falling and injuring your feet.

2、 **Please install it on a non-flammable material such as metal.**

Installing it on flammable materials poses a fire hazard.

3、 **When two or more frequency converters are installed in the same control cabinet, please install cooling fans and keep the air temperature at the air inlet below 40°C.**

Overheating can cause fires and other accidents.

2.3.1 Installation site

The installation site should meet the following conditions:

1、 The room is well ventilated.

2、 Ambient temperature: -10°C to 50°C.

3、 Avoid high temperature and humidity, humidity less than 90%RH, and no rain or other liquid dripping.

4、 Please install on flame-retardant objects such as metal, and never install on flammable objects such as wood.

5、 Avoid direct sunlight.

6、 It contains no flammable or corrosive gases or liquids.

7、 Free from dust, oily dust, floating fibers, and metal particles.

8、 The installation base is sturdy and vibration-free.

9、 No electromagnetic interference, keep away from interference sources.

2.3.2 **Ambient temperature**

To improve the reliability of the frequency converter, please install it in a well-ventilated place. When using it in a closed enclosure, a cooling fan or air conditioner should be installed to keep the ambient temperature below 50°C.

2.3.3 **Preventive measures**

During installation, please take protective measures for the frequency converter to prevent metal fragments or dust generated during drilling from falling into the converter. After installation, please remove the protective materials.

2.4 Installation direction and space

All TC760 series frequency inverters are equipped with cooling fans for forced air cooling. To ensure

good cooling circulation, the frequency inverter must be installed vertically, and sufficient space must be

maintained between it and adjacent objects or partitions (walls) both above and below and to the sides. Please refer to Figure 2-2.

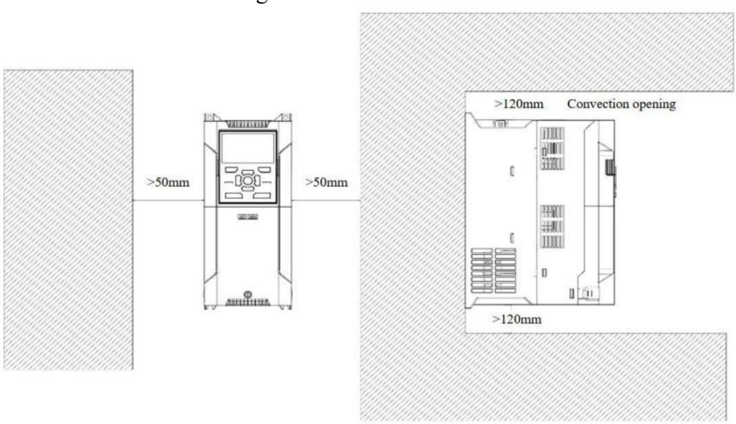


Figure 2-2 Inverter Installation Direction and Space

2.5 Panel removal and installation

For the TC760 series, the front cover needs to be removed to wire the main circuit, control circuit, and expansion card. After completing the wiring, please reinstall the wiring tray and front cover in the reverse order of disassembly shown in the diagram.

（1） TC760 series 0.75～22kW panel disassembly

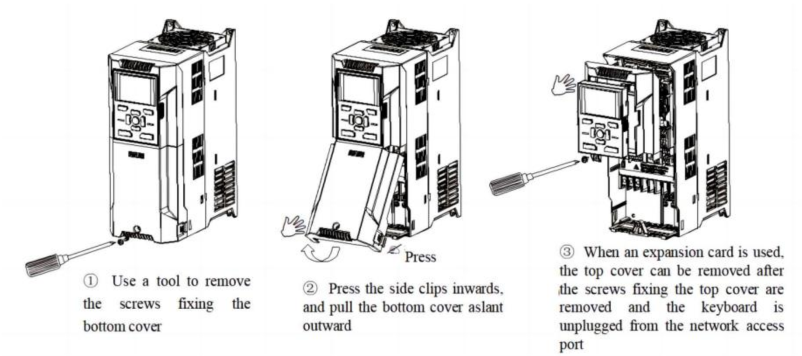


Figure 2-3 Schematic diagram of panel disassembly for 0.75～22kW

(2) Removal of the TC760 series 30-400kW faceplate

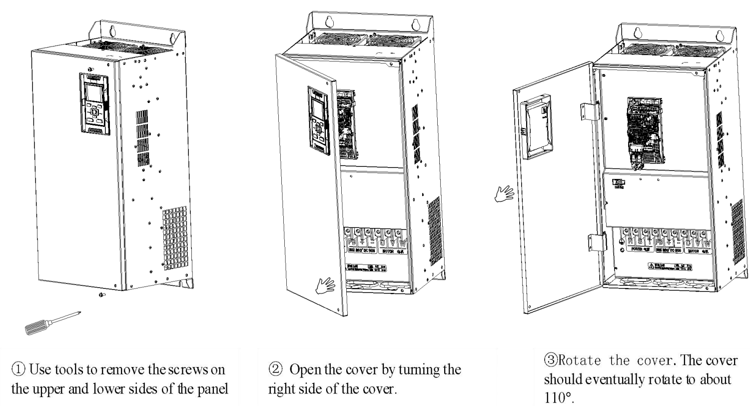


Figure 2-4 Schematic diagram of panel disassembly for 30-400kW powertrain

2.6 Through-wall installation

The TC760 series 4-160kW supports through-wall installation, which allows 70% of the total heat generated to be discharged outside the unit (cabinet), reducing heat generation. Furthermore, through-wall installation prevents foreign objects such as wood chips, paper scraps, dust, and metal dust from entering the inverter, improving its reliability.

The wall-mounted bracket is an optional accessory; please contact us to purchase it according to your needs.

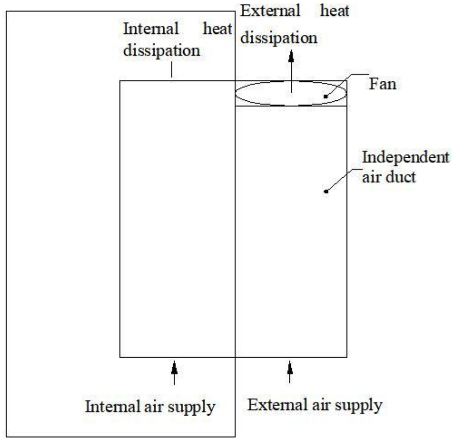


Figure 2-5 Through-wall installation method

Table 2-2 Quantity and Hole Size of Through-Wall Mounting Screws for TC760 Series 4~160kW

Inverter Model	Bracket mounting screws	Through-wall mounting screws	Opening dimensions (length × width)
TC760-0R7~4R0-3B	2×M4	6×M6	235mm×100mm
TC760-5R5~7R5-3B	2×M4	6×M6	280mm×115mm
TC760-011~015-3B	2×M4	6×M6	300mm×145mm
TC760-018~022-3B	4×M4	6×M6	355mm×195mm

TC760-030~037-3B	14×M5	6×M8	500mm×265mm
TC760-045~055-3B	14×M5	6×M8	550mm×320mm
TC760-075-3/3B	14×M5	6×M10	645mm×340mm
TC760-090~ 110-3	14×M5	6×M10	630mm×350mm
TC760-132~ 160-3	13×M6	6×M10	715mm×440mm

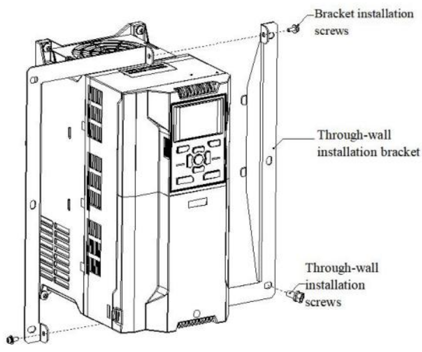


Figure 2-6 Schematic diagram of wall-mounted power supply with a power output of 0.75~22kW

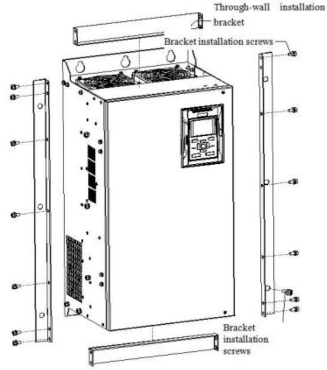


Figure 2-7 Schematic diagram of wall-mounted installation for 30~ 110kW power supplies

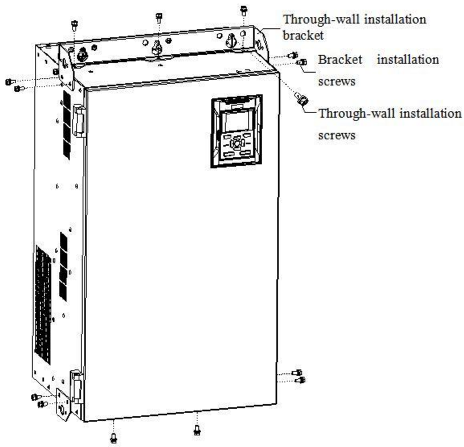


Figure 2-8 Schematic diagram of 132~ 160kW through-wall installation

Part 3 wiring

3.1 Peripheral device connection

The standard connection diagram between the crane-specific frequency converter and peripheral equipment is shown in Figure 31.

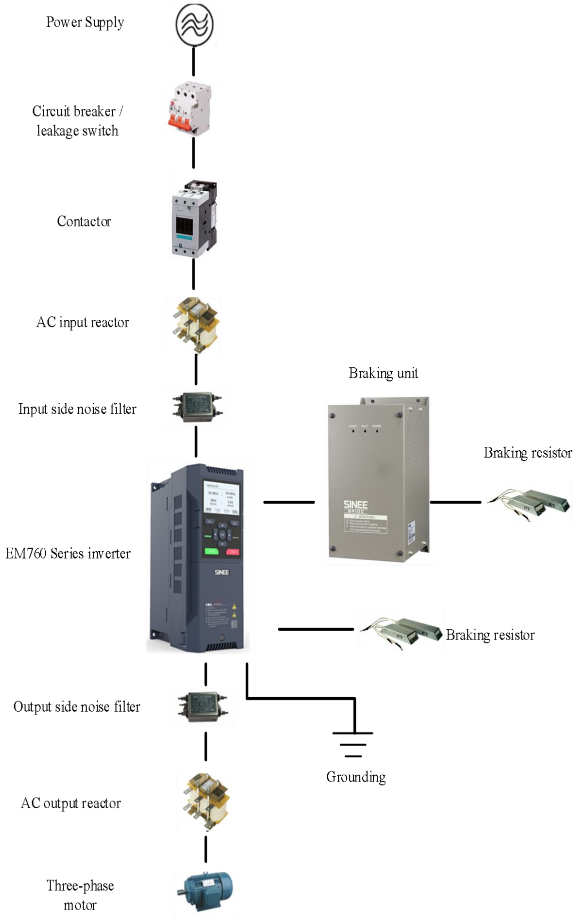


Figure 3-1 Connection diagram of frequency converter and peripheral equipment

3.2 Main circuit terminal wiring

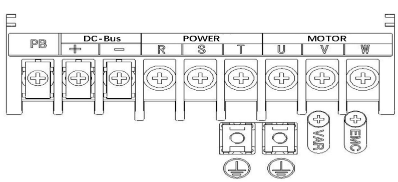
3.2.1 Main circuit terminal composition

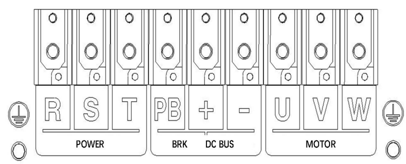
The main circuit terminals of the crane-specific frequency converter consist of the following parts:

- Three-phase AC power input terminals: R, S, T
- Ground terminal block:
- DC bus terminals:
- Energy-consuming braking resistor connection terminals: PB, l

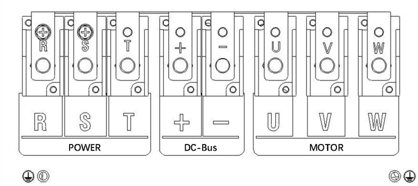
Motor terminals: U, V, W

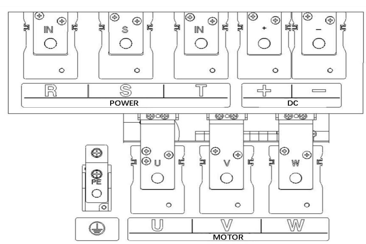
The main circuit terminals are arranged as shown in Figure 3-2.



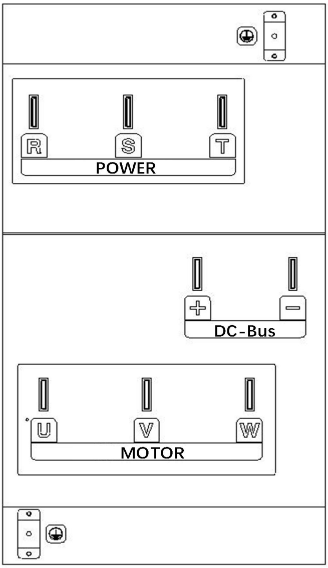


(a) 0.75-22kW main circuit terminal (b) 30-75kW main circuit terminal (PB terminal is not available in this series)





(c) 90-110kW main circuit terminals (d) 132-220kW main circuit terminals



(e) 250-400kW main power terminals

Figure 3-2 Schematic diagram of main circuit terminal arrangement

As shown in Figure 3-3, if the cable is too thick during the wiring operation of the 0.75 ～22kWfrequency converter, the cable guide rail can be removed.

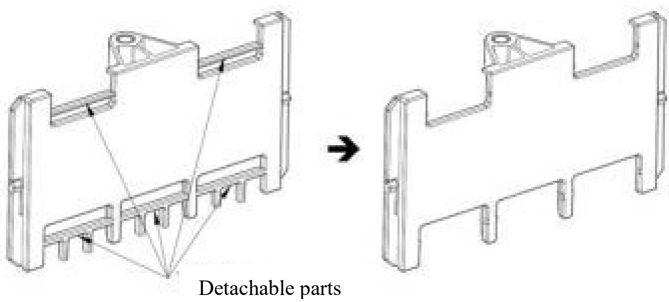


Figure 3-3 Cable guide plate

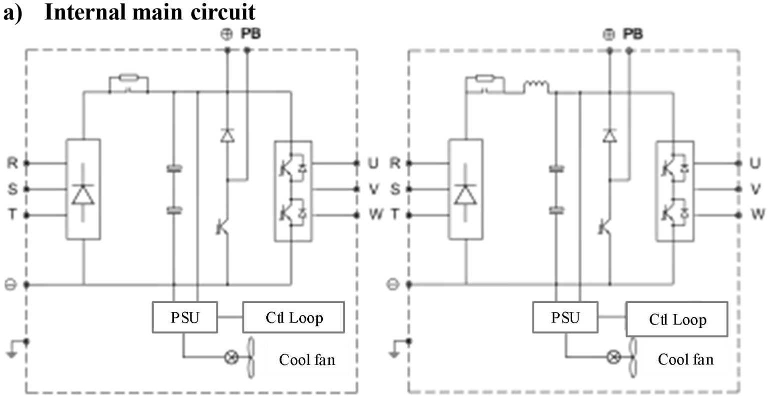
3.2.2 Main circuit terminal function

The functions of the inverter's main circuit terminals are shown in Table 3-1. Please connect the wires correctly according to the corresponding functions.

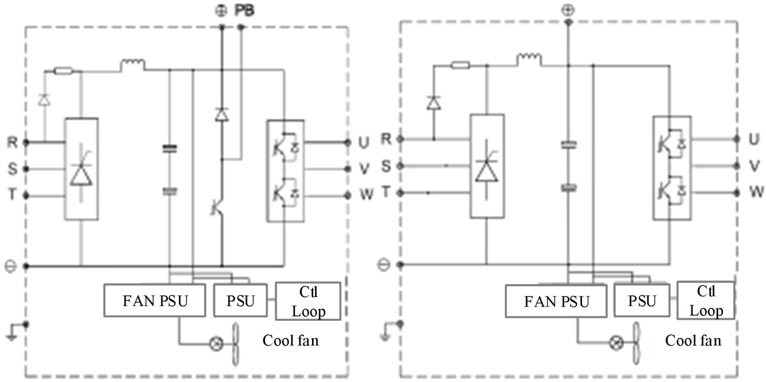
Table 3-1 Functions of Main Circuit Terminals

Terminal markings	Function Description
R、S、T	AC power input terminal, connect to three-phase AC power supply
U、V、W	The inverter's AC output terminals are connected to a three-phase AC motor.
⊕⊖	These are the positive and negative terminals of the internal DC bus, connected to the external braking unit.
⊞、PB	⊕ The braking resistor is connected to the terminal block; one end of the braking resistor is connected to the other end to PB.
⏚	Grounding terminal, connected to earth

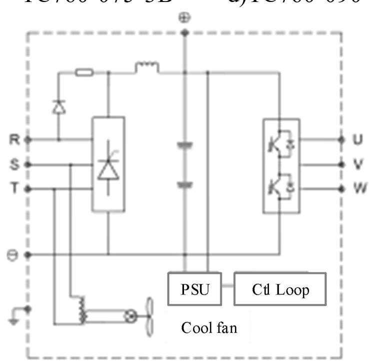
a) Internal main circuit



a) TC760-0R7-3B～TC760-7R5-3B b) TC760-011-3B～TC760-018-3B



c）TC760-022-3B～TC760-075-3B d)TC760-090-3～TC760-200-3



e）TC760-220-3～TC760-400-3

Figure 3-2 Internal main circuit of frequency converter

3.2.3 Standard wiring diagram of main circuit

The standard wiring diagram of the main circuit of the TC760 series frequency converter is shown in the figure.

TC760-0R7-3B～TC760-075-3B TC760-090-3～TC760-400-3

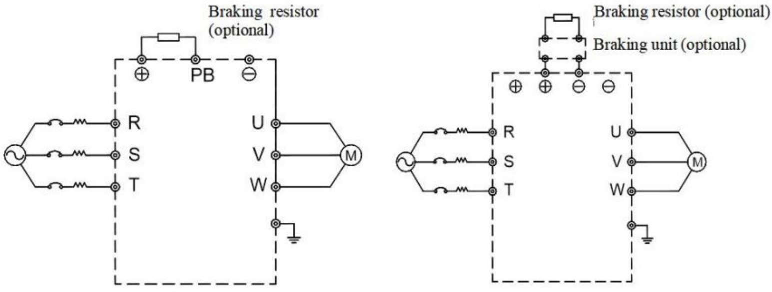


Figure 3-4 Standard wiring diagram for main circuit

3.2.4 Main circuit input side wiring

3.2.4.1 Install circuit breakers

Be sure to install an air circuit breaker (MCCB) between the power supply and the input terminals to match the frequency converter.

- Please select the MCCB capacity to be 1.5 to 2 times the rated current of the frequency converter.
- The timing characteristics of the MCCB must meet the timing characteristics of the inverter's overheat protection (150% of rated current/1 minute).
- When the MCCB is shared with multiple frequency converters or other equipment, please connect the frequency converter fault output relay contact in series with the power contactor coil as shown in Figure 33. The fault signal can disconnect the power supply.

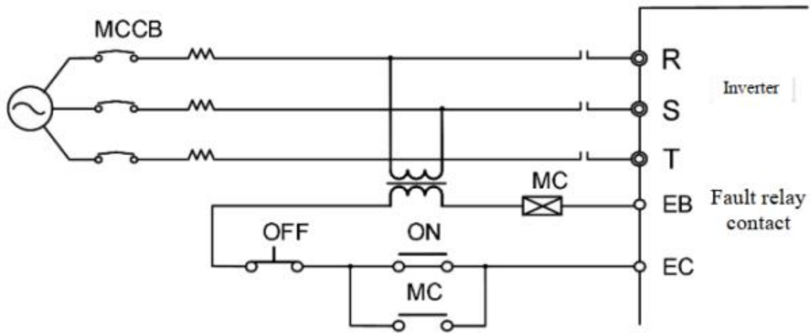


Figure 3-3 Connection to input circuit breaker

3.2.4.2 Install residual current circuit breaker

Since the output of the frequency converter is a high-frequency PWM signal, it will generate high-frequency leakage current. Please select a frequency converter-specific leakage circuit breaker with a current sensitivity of 30mA or higher. If using a regular leakage circuit breaker, please select one with a current sensitivity of 200mA or higher and an operating time of 0.1 seconds or higher.

3.2.4.3 Install electromagnetic contactor

Connect an electromagnetic contactor that matches the power of the frequency converter as shown in Figure 3-4.

- Do not use the incoming-side electromagnetic contactor to control the operation and shutdown of the frequency converter. Frequent use of this method is a major cause of frequency converter damage. The frequency of operation of the incoming-side electromagnetic contactor should not exceed once every 30 minutes.
- After the power is restored, the frequency converter will not be able to run automatically.

3.2.4.4 Connect to terminal block

The phase sequence of the input power supply is independent of the phase sequence R, S, T ofthe terminal block and can be connected arbitrarily.

3.2.4.5 Install AC reactor

Connecting a large-capacity (600KVA or above) power transformer, or when the input power supply is connected to a capacitive load, will generate a large inrush current, which can damage the rectifier section of the frequency converter. In such cases, please connect a three-phase AC reactor (optional) to the input side of the frequency converter. This will not only suppress peak current and voltage, but also improve the power factor of the system.

3.2.4.6 Install surge suppressor

When there are inductive loads (electromagnetic contactors, solenoid valves, solenoid coils, electromagnetic circuit breakers, etc.) connected near the frequency converter, be sure to install a surge suppressor.

3.2.4.7 Install power-side noise filter

It can suppress noise that enters the inverter from the power line, and it can also suppress the impact of noise generated by the inverter on the power grid.

- Inverters require dedicated noise filters; ordinary noise filters are not effective and are therefore generally not used.
- The correct and incorrect installation methods of the noise filter are shown in Figures 34 and 35.

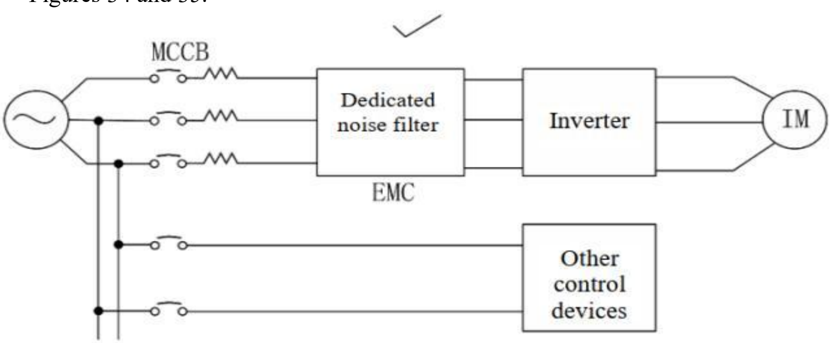
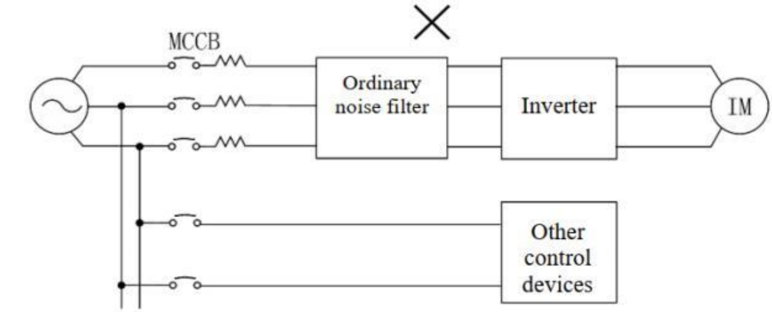
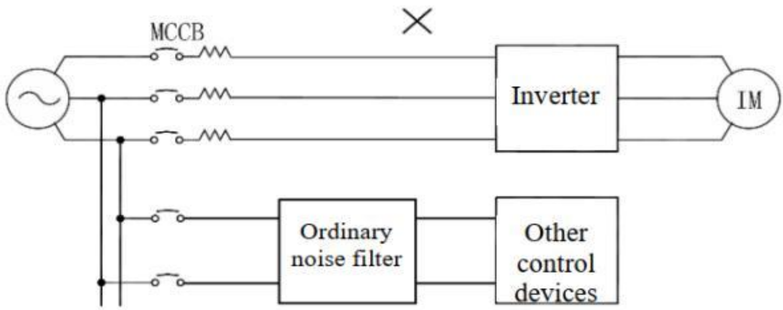


Figure 3-4 Correct installation of the noise filter



（a）



(b)

Figure 3-5 Incorrect installation of the noise filter

3.2.5 Main circuit output side wiring

3.2.5.1 Wiring between frequency converter and motor

The inverter's output terminals U, V, and W are connected to the motor's input terminals U, V, and W.

During operation, please confirm that the motor rotates forward when the forward rotation command is given. If the motor rotates in reverse, please swap any two of the output terminals U, V, and W of the inverter.

3.2.5.2 Never connect the power cord to the output terminal.

Never connect the power cord to the output terminals. Applying voltage to the output terminals will damage the internal components of the inverter.

3.2.5.3 Short-circuiting or grounding the output terminals is strictly prohibited.

Never touch the output terminals directly or short-circuit the output wires to the inverter housing, as this may result in electric shock and short circuit. Also, never short-circuit the output wires.

3.2.5.4 The use of phase-shift capacitors is strictly prohibited.

Do not connect phase-shift lead electrolytic capacitors or LC/RC filters to the output circuit, otherwise the inverter will be damaged.

The use of electromagnetic switches is strictly prohibited.

Do not connect electromagnetic switches or electromagnetic contactors to the output circuit. Otherwise, the operation of these devices will trigger overcurrent and overvoltage protection, and in severe cases, may even damage the internal components of the frequency converter.

When using electromagnetic contactors to switch power frequencies, etc., it is essential to ensure that the frequency converter and motor have stopped before switching.

3.2.5.5 Install output-side noise filter

Connecting a noise filter to the output side of the frequency converter can reduce induced interference and radio interference.

- Inductive interference: Electromagnetic induction causes noise on the signal line, which can lead to malfunctions in control equipment.
- Radio interference: The high-frequency electromagnetic waves emitted by the frequency converter itself and the cables can interfere with nearby wireless equipment, causing it to emit noise during signal reception.
- A noise filter is installed on the output side as shown in Figure 36.

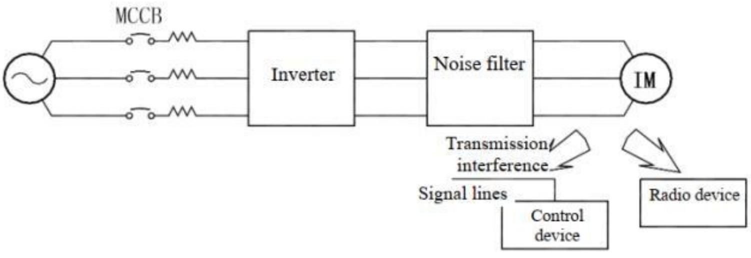


Figure 3-6 Noise filter installed on the output side

3.2.5.6 Inductive interference countermeasures

-In addition to installing noise filters as described above, other methods to suppress induced interference on the output side include routing all output cables into a grounded metal conduit. Maintaining a distance of more than 30cm between the output cables and signal lines significantly reduces the impact of induced interference, as shown in Figure 37.

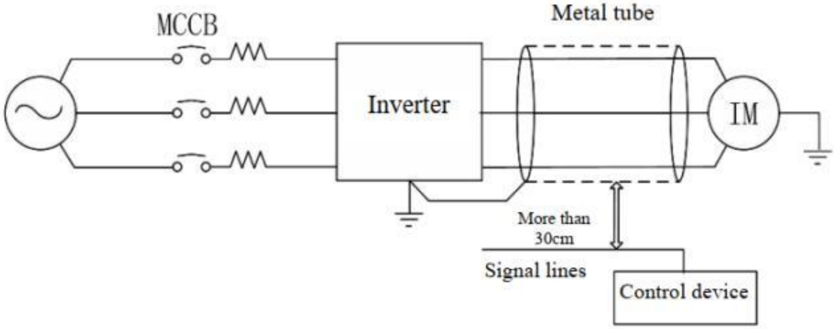


Figure 3-7 Countermeasures against Inductive Interference

3.2.5.7 Radio frequency interference countermeasures

-The input and output connections, as well as the inverter itself, can all generate radio frequency interference. Installing noise filters on both the input and output sides and shielding the inverter body with an iron box can reduce radio frequency interference, as shown in Figure 38.

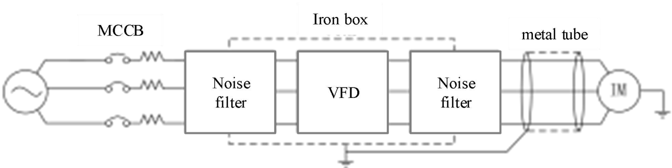


Figure 3-8 Radio Frequency Interference Countermeasures

3.2.5.8 Wiring distance between the frequency converter and the motor

The longer the wiring distance between the frequency converter and the motor, and the higher the carrier frequency, the greater the high-order harmonic leakage current on the cable. This will adversely affect the frequency converter and nearby equipment. Please refer to Table 3-2 to adjust the carrier frequency to reduce high-frequency leakage current.

- When the motor wiring exceeds 50m, please connect three dedicated AC reactors of equal capacity to the U, V, and W output terminals ofthe inverter.

Table 3-2 Wiring Distance Between Inverter and Motor and Carrier Frequency

Wiring distance between the frequency converter and the motor	Below 50m	Below 100m	Over 100m
carrier frequency	10kHz or less	Below 8kHz	Below 5kHz
F00.23 Function Code	10.0	8.0	5.0

3.2.6 grounding wire

- ⏚The grounding terminal must be grounded.
- Special case of the third type of grounding (grounding resistance below 10Ω)
- Grounding wires should never be shared with welding machines or power equipment.
- Please use the specifications for the grounding wire as required by the electrical equipment technical standards, and keep it as short as possible from the grounding point.
- When using two or more frequency converters simultaneously, do not create a loop in the grounding wires. Figure 39 shows the correct and incorrect grounding methods.

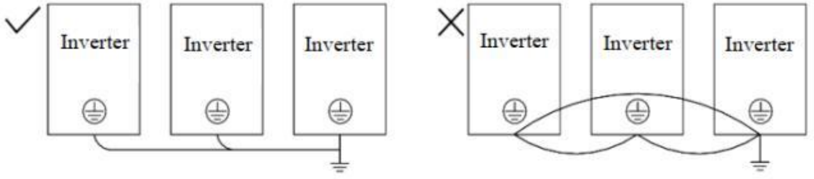


Figure 3-9 Grounding wire connection method

3.2.7 Wiring for braking resistor and braking unit

For details on the selection and wiring methods of braking resistors and braking units, please refer to Chapter 11.

3.3 Control circuit terminal wiring

3.3.1 Control circuit terminal composition

The control circuit terminals are located at the lower front of the terminal block printed circuit board and consist of the following parts:

- Analog input terminals: AI1, AI2, AI3.
- Switch input terminals: X1, X2, X3, X4, X5, X6, X7, X11, X12.
- Switch output terminals: Y1, Y2.
- Relay output terminals: R1: EA-EB-EC, R2: RA-RB-RC.
- Analog output terminals: M1, M2.
- Auxiliary power supply terminals: PLC, +24V, COM, +10V, GND.
- RS485 communication terminals: A+, A-.
- Grounding terminal: PE.

The control circuit terminals are arranged as shown in Figure 3-10.

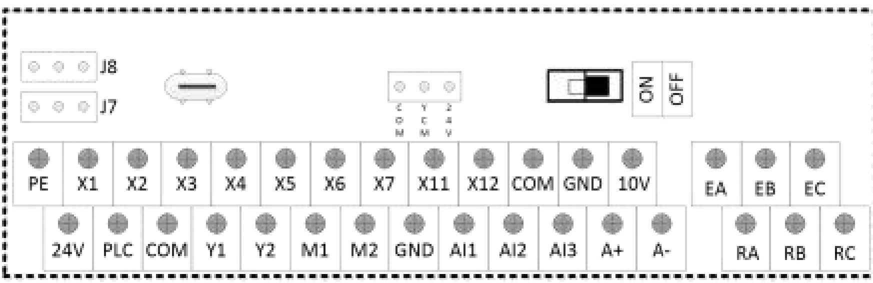


Figure 3-10 Control circuit terminal arrangement

Note: The jumpers J7 and J8 on the terminal block are manufacturer-specific jumpers. Users should not modify them arbitrarily, otherwise the frequency converter will not work properly.

3.3.2 Control circuit terminal functions and wiring

The functions of the control loop terminals are shown in Table 3-3.

Table 3-3 Functions of Control Circuit Terminals

Category	Terminal markings	Terminal Name	Terminal Function Description
Support	10V-GND	+10V power supply	Provides +10V power, maximum output current: 20mA
power supply	24V-COM	+24V power supply	It provides +24V power and is generally used as the power supply for digital input/output terminals and external devices. Maximum output current: 200mA
	PLC	Multi-functional input common terminal	It is factory defaulted to being connected to 24V. When using an external power supply to drive the digital input terminals, they must be disconnected from the 24V terminals and connected to the external power supply.
Analog Input	AI1-GND	Analog input terminal 1	Input voltage range: DC 0～10V Input impedance: 1MΩ
	AI2-GND	Analog input terminal 2	Input range: DC 0～10V/0～20mA, voltage/current mode selected by function code F02.63. Input impedance: 1MΩ for voltage mode, 250Ω for current mode
	AI3-GND	Analog input terminal 3	Input range: DC 0～10V/0～20mA, voltage/current mode selected by function code F02.64. Input impedance: 1MΩ for voltage mode, 250Ω for current mode
	X1-COM	Multi-function	

Digital input		input terminal 1	Optical isolation, compatible with NPN and PNP bipolar inputs Input impedance: 4.5 kΩ Input voltage range: 9～30V The common terminal in the factory default state is COM.
	X2-COM	Multi-function input terminal 2	
	X3-COM	Multi-function input terminal 3	
	X4-COM	Multi-function input terminal 4	
	X5-COM	Multi-function input terminal 5	
	X6-COM	Multi-function input terminal 6	
	X11-COM	Multi-function input terminal 11	
	X12-COM	Multi-function input terminal 12	
	X7-COM	High-speed pulse input terminal	In addition to serving as a multi-functional input terminal, it can also be used as a high-speed pulse input terminal, with a maximum response frequency of 100kHz. Input voltage: 12～48V; Input impedance: 1 kΩ
Analog output	M1-GND	Analog output terminal 1	Output range: DC 0～10V/0～20mA, selectable by function code F03.34
	M2-GND	Analog output terminal 2	Output range: DC 0～10V/0～20mA, selectable by function code F03.35
Multi-function	Y1-YCM	Open collector output terminal	Optocoupler isolation, open collector output Maximum output voltage: DC48V; Output

output			current: 50mA
	Y2-COM	High-speed pulse output terminal	Optocoupler isolation, open collector output Maximum output voltage: DC48V Maximum output current: 50mA When used as a high-speed pulse output, the maximum output frequency is 100kHz. Output impedance <5 kΩ
Relay output	R1：EA-EB-EC	Relay output terminals	EA-EC: Normally Open EB-EC: Normally Closed
	R2：RA-RB-RC		RA-RC: Normally Open RB-RC: Normally closed
communication	A+	RS-485 communication interface terminal	485 differential signal positive end
	A-		485 differential signal negative terminal
shield	ON	Shielding grounding	For grounding of terminal wiring shielding layer

3.3.3 Analog input terminal wiring

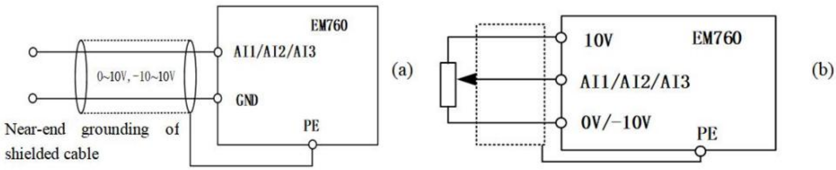
3.3.3.1 **AI1, AI2, and AI3 terminals use analog voltage signal wiring:**

When the AI2 terminal is selected to input an analog voltage signal, set function code F02.63(0/4), corresponding to input (0～10V/0～5V).

When the AI3 terminal is selected to input an analog voltage signal, set function code F02.64(0/4), corresponding to input (0～10V/0～5V).

When the analog voltage input signal is powered by an external power supply, the wiring of terminals AI1, AI2, and AI3 is shown in Figure (a) below.

When the analog voltage input signal is a potentiometer, the wiring of terminals AI1, AI2, and AI3 is shown in Figure (b).



(a) (b)

Figure 3-11 Wiring diagram of analog input voltage signal terminals

3.3.3.2 AI2 and AI3 terminal input analog current signal wiring method:

When the AI2 and AI3 terminals are selected for analog current signal input, set function codes F02.63 (1/2) and F02.64 (1/2).

The wiring diagram for AI2 and AI3 terminals is shown in Figure 3-12.

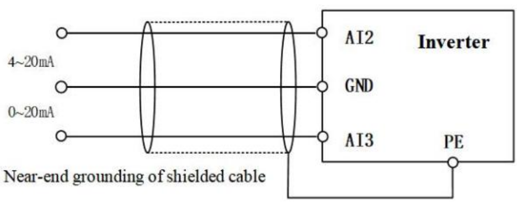
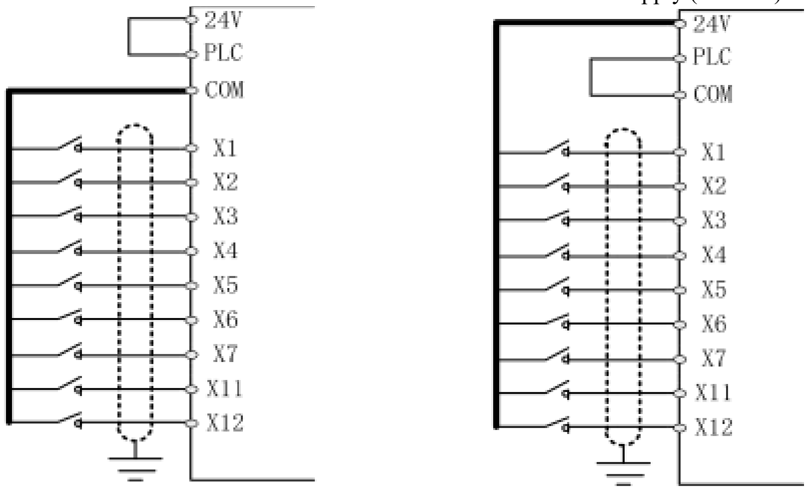


Figure 3-12 Wiring diagram for analog input current signal

3.3.4 Multi-function input terminal wiring

The TC760 series frequency converter's multi-function input terminals utilize a full-bridge rectifier circuit. The PLC terminals are the common terminals for X1–X7, X11, and X12. Current flowing through the PLC terminals can be either forward (NPN mode) or reverse (PNP mode). Therefore, the connection methods between X1–X7, X11, and X12 terminals and external connections are very flexible. A typical wiring method is shown in Figure 3-17.

A. NPN mode uses internal power supply (+24Vdc). B. PNP mode uses internal power supply (+24Vdc).



C. NPN mode uses an external power supply. D. PNP mode uses an external power supply.

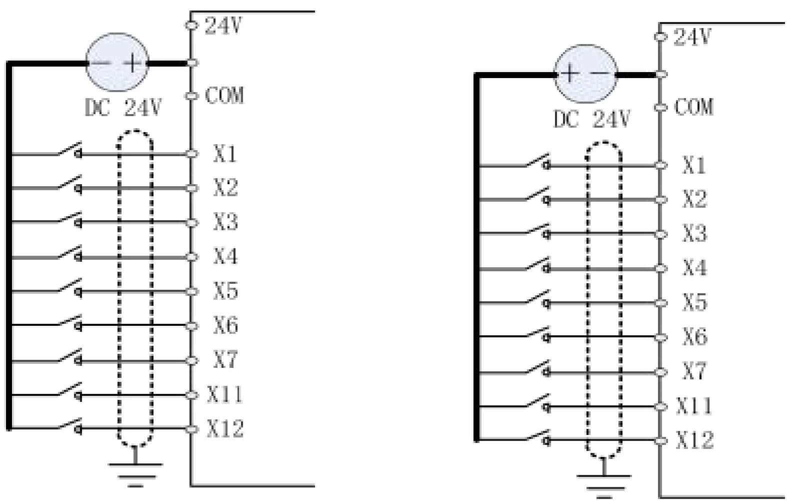
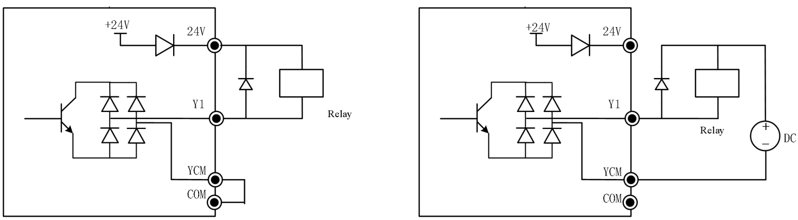


Figure 3-13 Wiring diagram for multi-function input terminals

Note: When using an external power supply, be sure to remove the jumper between the 24V and PLC terminals.

3.3.5 Multi-function output terminal wiring

The multi-function output terminals Y1 and Y2 can be powered by the internal 24V power supply of the frequency converter or an external power supply, as shown in Figure 3-15:



a: Use internal power supply　　　　b: Use an external power source

Figure 3-14 Wiring method for multi-function output terminals

Note: An anti-parallel diode must be added to the relay coil. The components of the snubber circuit should be installed close to the ends of the relay or contactor coil.

3.3.6 Analog output terminal wiring

The analog output terminals M1 and M2 can be connected to external analog meters to represent various physical quantities. The toggle switch selects the output current (0-20mA) or (0-10V).

3.3.7 Communication terminal wiring

The communication terminals A+ and A- are the RS485 communication interfaces ofthe frequency converter. Through communication with a host computer (PC or PLC controller), network control between the host computer and the frequency converter is achieved. The connection between the RS485 and RS485/RS232 converters and the TC760 series frequency converters is shown in Figures 3-16, 3-17, and 3-18.

- A single frequency converter can be directly connected to the host computer via its RS485 terminal for communication.

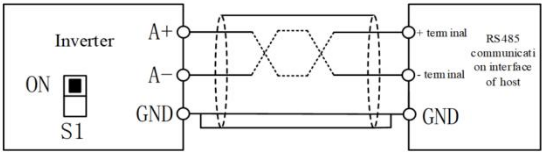


Figure 3-15 Wiring of communication terminals for a single frequency converter

- Multiple frequency converters are connected to the host computer via RS485 terminals for communication.

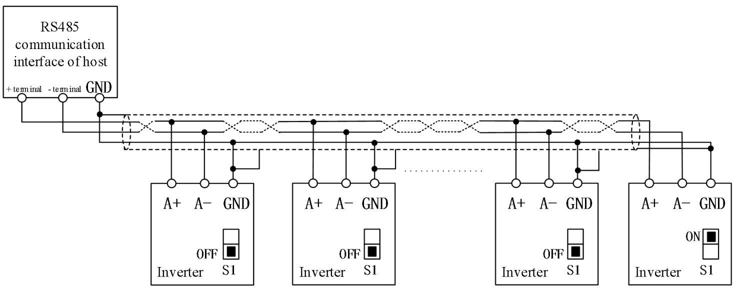


Figure 3-16 Wiring of communication terminals for multiple frequency converters

- Communication with the host computer is achieved via an RS485/RS232 converter.

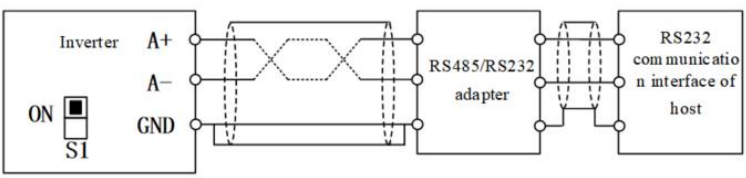


Figure 3-17 Communication Terminal Wiring

3.3.8 Wiring precautions for control circuit

- Please run the control circuit connection wires separately from other wires.
- Please route the control circuit terminals EA, EB, EC, RA, RB, RC, Y1, and Y2 separately from other control lines.

- To avoid malfunctions caused by interference, the control circuit connection wires should be twisted shielded wires, and the wiring distance should be less than 50m.
- Do not allow the shielding mesh to come into contact with other signal lines or equipment housings. Exposed shielding mesh can be sealed with insulating tape.
- Do not touch any ports or components on the control board without electrostatic discharge protection measures.

3.3.9 Standard wiring diagram for control circuit

Figure 3-19 shows a schematic diagram of the control terminal resources of the control circuit of the TC760 crane-specific frequency converter.

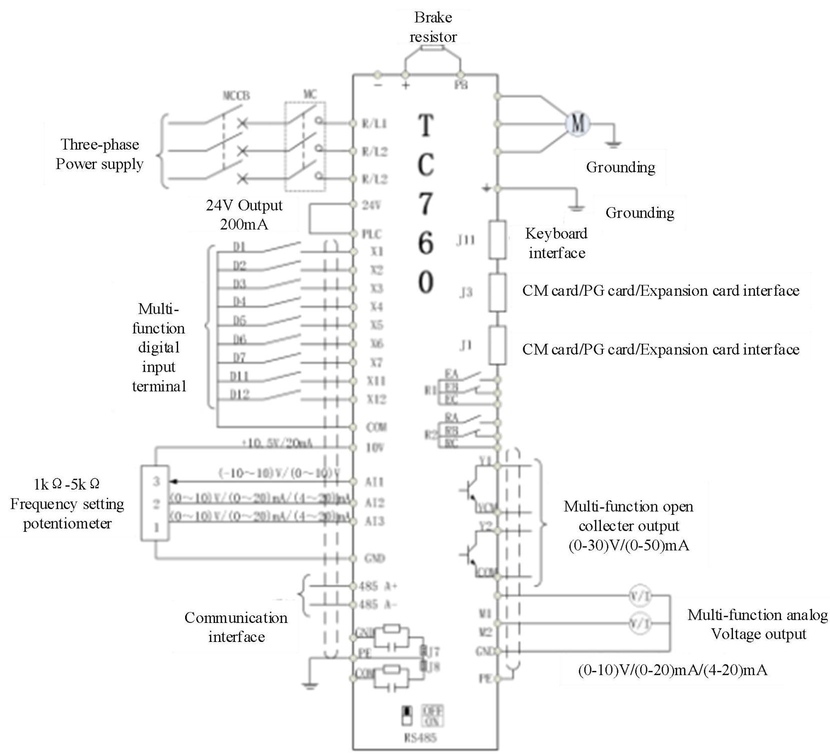


Figure 3-18 Schematic diagram of control circuit control terminal resources

Note: Starting from TC760-090-3, the braking resistor needs to be used in conjunction with an external braking unit.

3.4 Wiring inspection

After wiring is complete, please be sure to check the following items:

- Is the wiring incorrect?
- Are screws, connectors, wire lint, or other debris left inside the frequency converter?
- Are the screws loose?
- Does the stripped bare wire in the terminal section come into contact with other terminals?

Part 4 Keyboard operation

4.1 Keyboard Functions

LCD Keyboard Composition Structure

The TC760 series frequency inverter LCD keypad consists of an LCD display, nine operation buttons, and two status indicator lights.

Users can use the keyboard to set parameters, monitor status, start and stop the frequency converter, and perform other operations.

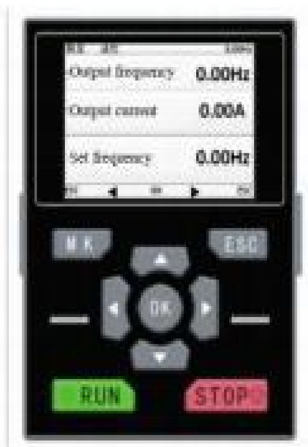


Figure 4-1 LCD Keyboard

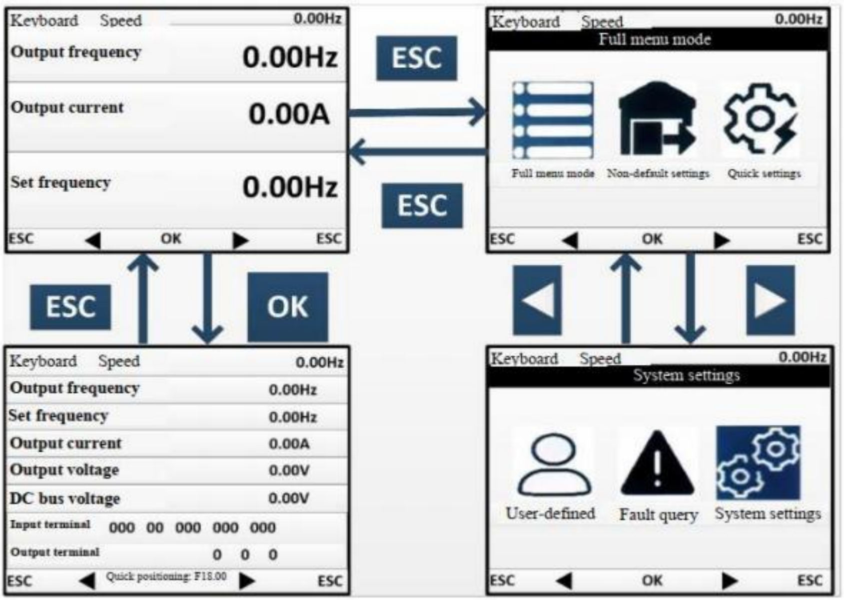
4.2 LCD keyboard operation

The LCD keyboard menu is divided into three levels from low to high: monitoring interface (level 0), menu mode selection (level 1), function code selection level (level 2), and function code details level (level 3). The menu levels will be represented by numbers later in this manual.

The menu mode selection includes six options: Full Menu Mode (displays all function codes); User-defined Mode (displays the F11 user function code group); Non-factory Default Mode (displays all function codes not equal to the factory default); Fault Query: View the three most recent saved fault records; Guided Mode: Set the function codes related to motor parameters in sequence for self-learning operation; System Settings: Set brightness, backlight time, language, and view the software version.

The keyboard power-on display defaults to the level 1 menu monitoring interface (main monitor). In the main monitor, you can use the LEFT key to switch to the second row of function codes and the RIGHT key to switch to the third row. The function

codes are those set by F12.33-F12.37. Pressing the ESC key in the level 1 menu enters the level 0 menu. In the level 0 menu, you can use the LEFT and RIGHT keys to select different menu modes. Pressing the ESC key in the level 0 menu returns to the level 1 main monitor. The menu mode selection process is shown in the following diagram.



Full menu mode

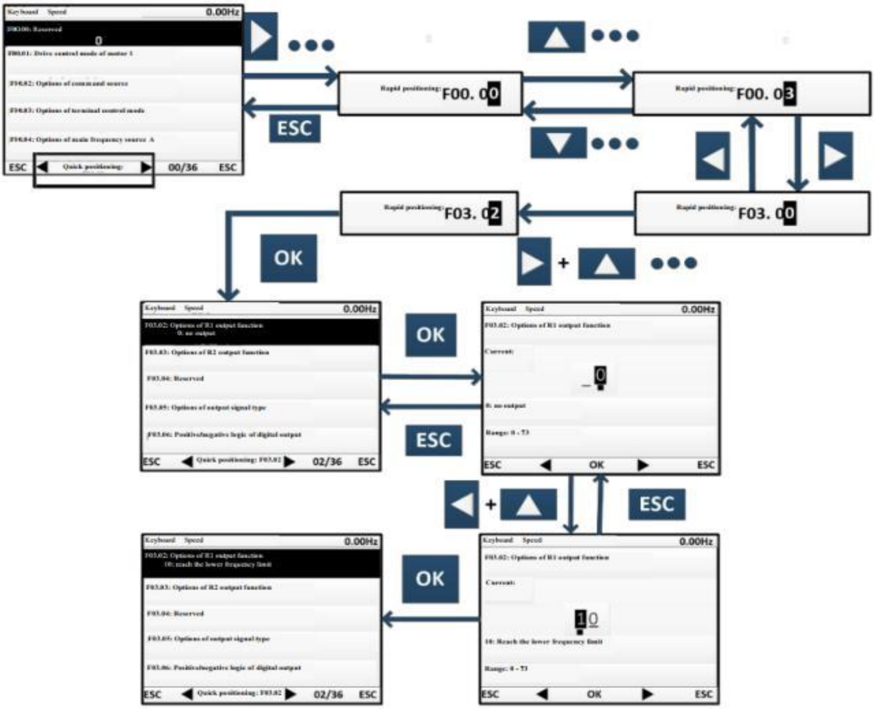
In full menu mode, pressing the OK button enters the level 2 menu where you can select any function code. Pressing the OK button again enters the level 3 menu, where you can view or modify the function codes. Except for a few special function codes, most function codes that users need can be modified.

In all menu modes, pressing the OK button after modifying the parameters will save the parameters.

Pressing the ESC key in the level 3 menu will cancel parameter modification: If the function code is equal to its unmodified value, you will exit the level 3 menu and return to the level 2 menu directly; otherwise, the parameter value will be restored to its unmodified value and displayed before you can press the ESC key to exit the level 3 menu and return to the level 2 menu.

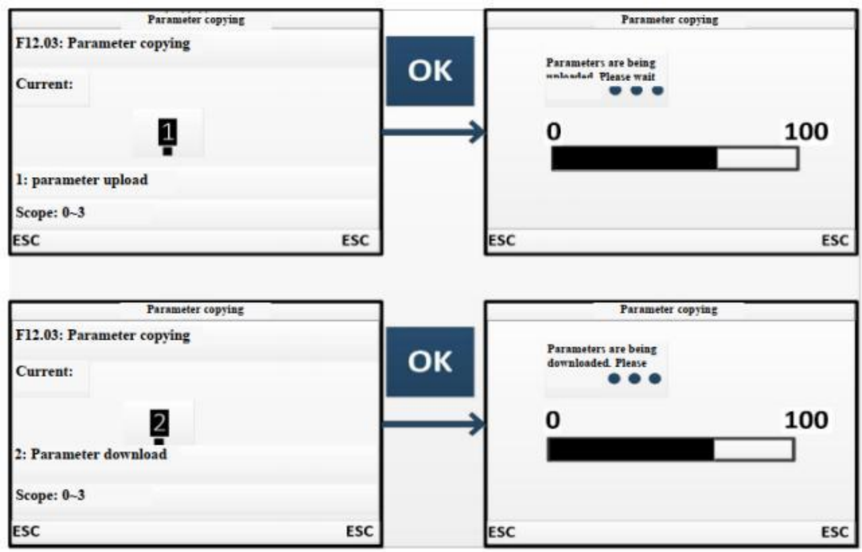
The quick location function is available in the full menu mode, which contains all the function code groups. Since there are many of them, using the quick location function will make the operation more convenient. Simply set the function code you want to jump to and press the confirmation button to jump to that function code.

In full menu mode, the entire operation process from the initial power-on state to changing the value of function code F03.02 to 10 is shown in the figure below. Within the level 2 menu, the function code progress indicator shows the current number of function code groups. As shown in the figure below, 02/36 indicates that group F03 has 36 function codes, and the cursor is currently at the position of F03.02.



4.3 Parameter copy

To facilitate parameter setting between inverters using the same functional parameters, the keyboard has parameter upload and download functions. When function code F12.03 is set to 1 and the confirmation key OK is pressed, the relevant inverter parameters are uploaded to the keyboard. The keyboard displays the progress during the upload, and the function code automatically changes to 0 upon completion. The keyboard, after uploading, can be plugged into other inverters that require the same parameters. Changing function code F12.03 to 2 initiates normal parameter download, downloading the parameters saved on the keyboard to the inverter. When function code F12.03 is changed to 3, motor parameters are also downloaded in addition to the normal parameter download. The keyboard displays the progress during the download, and similarly, the function code automatically changes to 0 upon completion.



It is especially important to note that:

1. Parameters cannot be downloaded before the keyboard has been uploaded, because the parameters on the keyboard are unknown before they are uploaded. Downloading them would corrupt the parameters in the inverter and cause it to malfunction. Therefore, if you try to download parameters before uploading them, you will be prompted that there are no parameters on the keyboard, indicating that the parameter download was unsuccessful. You can exit and try uploading and downloading again by pressing the ECS button.

2. When the CPUA software versions of the frequency converters are different, the keyboard will prompt whether to force the download if the versions are incompatible. Users need to determine if the two different versions can be downloaded together. If they can, press the OK key  to force the download; if not, press the ESC key to cancel the current operation. Uploading and downloading parameters between two

incompatible frequency converters can easily cause them to malfunction; users should operate with caution.

4.4 Running/Stopping

After setting the parameters, press the RUN button to start the inverter running normally; press the STOP button to stop the inverter. Alternatively, you can change the function code F12.00 to 5 to define the MK button as a free stop, which will also stop the inverter.

After setting function code F01.34 to the corresponding self-learning mode, the inverter will only enter the corresponding parameter identification state after the RUN button is pressed. During parameter identification, "TUNE" will be displayed. After identification is complete, the display will return to its original state, and function code F01.34 will automatically change to 0. The motor may rotate while the inverter is identifying rotational parameters. In case of an emergency, the identification can be canceled by pressing the STOP button .

Part 5 Trial run

5.1 Inverter commissioning process

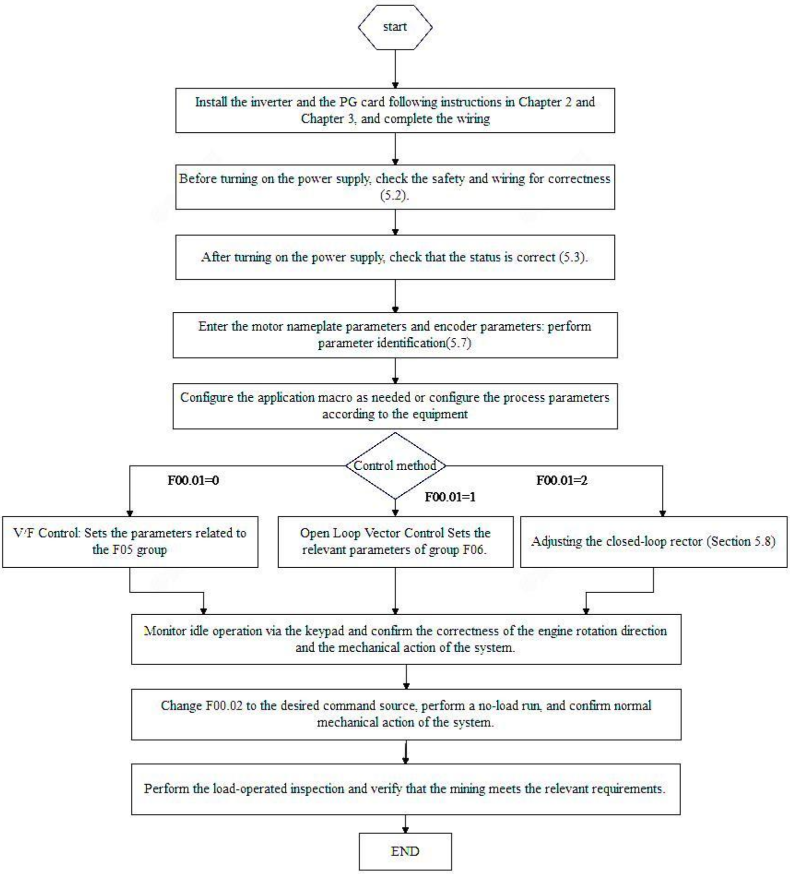


Figure 5-1 Flowchart of Inverter Commissioning

5.2 Confirmation items before power is turned on

Please make sure to check the following items before connecting the power:

Confirm Project	Confirmation content
Power connection confirmation	Please confirm that the input power voltage is consistent with the inverter's requirements.
	Confirm that the power supply circuit is connected to the circuit breaker and that the power cord is correctly connected to the R, S, and T input terminals ofthe frequency converter.
	Confirm that the inverter and motor are properly grounded.
Motor wiring confirmation	Confirm that the motor is correctly connected to the U, V, and W output terminals of the frequency converter, and that the motor wiring is secure.
Braking unit and braking resistor confirmed	Confirm that the braking resistor and braking unit are correctly wired (if regenerative braking is required during operation).
Control terminal wiring confirmation	Confirm that the connections between the inverter control terminals and other control devices are correct and reliable.
Control terminal status confirmation	Ensure all inverter control terminal circuits are disconnected to prevent operation immediately upon power-on.
PG card and encoder wiring confirmation	When closed-loop control is required, verify that the wiring of the PG card and encoder is correct and reliable.
Mechanical load confirmation	Confirm that the mechanical load is unloaded and that operation will not pose a danger.

5.3 Inverter status confirmation after power is connected

After power is connected, the inverter operation panel (keyboard) displays the following under normal conditions:

State	Show	Illustrate
Normal	Output frequency is 0, given	The factory default display is set to 0Hz.
Time	frequency is 0	
During protection	Protection codes in character or Exx format	When protection is activated, a protection code will be displayed. Please refer to Chapter 6 for protection countermeasures.

5.4 Notes on setting up application macros

F20.00 is for selecting industry application macros. Select the application macro according to the specific application, press Enter to confirm, and the factory settings will be restored once.

5.5 Start-up and shutdown control

F00.02=0: Keyboard control

The inverter's start and stop are controlled by the RUN and STOP keys on the keyboard. Pressing the RUN key enters the running state when the protection has not tripped. A solid LED above the RUN key indicates the inverter is running, while a flashing LED indicates it is decelerating and stopping.

F00.02=1: Terminal control

The start and stop control terminals defined by function codes F02.00 to F02.06 control the start and stop of the frequency converter, and the terminal control method is determined by F00.03.

F00.02=2: Communication Control

The start and stop of the frequency converter are controlled by the host computer through the RS485 communication port.

F04.00=0: Start directly

When the frequency converter starts, it first performs DC braking (no DC braking when F04.04=0), then pre-excitation (no pre-excitation when F04.07 is set to 0), and then starts at the starting frequency. After the starting frequency holding time ends, it enters the given frequency operation.

F04.00=1: Speed tracking started

When the frequency converter starts, it first performs speed tracking, and then smoothly starts from the current actual rotation frequency of the motor.

F04.19=0: Decelerate and stop

The motor decelerates and stops according to the set system deceleration time.

F04.19=1: Free Parking

When the stop command is valid, the inverter will immediately stop outputting, and the motor will coast to a stop. The stopping time depends on the inertia of the motor and the load.

Function code	Function code name	Parameter Description	Factory value	property
F00.03	Terminal control method selection	0: Terminal RUN operation, F/R forward/reverse rotation 1: Terminal RUN forward rotation, F/R reverse rotation 2: Terminal RUN forward rotation, Xi stop, F/R reverse rotation 3: Terminal RUN operation, Xi stop, F/R forward/reverse rotation	0	○

Terminal RUN: Set Xi terminal to " 1: Run terminal RUN"

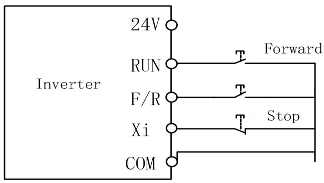
Terminal F/R: Terminal Xi is set to "2: Running Direction F/R"

Terminal control can be divided into two-wire and three-wire control methods.

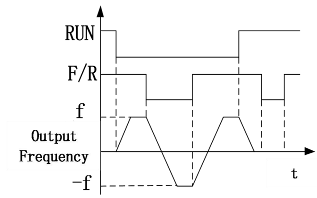
Two-wire control:

F00.03=0: Terminal RUN operation, F/R controls forward/reverse rotation.

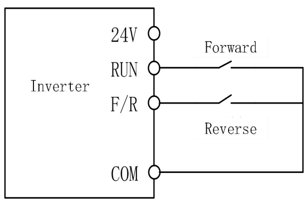
The RUN terminal's activation/deactivation controls the inverter's forward rotation and stop; the F/R terminal's activation/deactivation controls the inverter's reverse rotation and stop. When both the RUN and F/R terminals are active simultaneously, the inverter stops. The forward/reverse logic is shown in Figure 5-2(d) when the deceleration stop mode is selected.



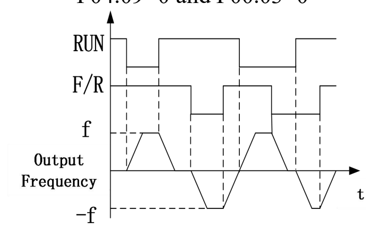
(a) Schematic diagram of two-wire control wiring with F00.03=0



(b) Logic for forward/reverse operation with F04.09=0 and F00.03=0



(c) Two-wire control wiring diagram with F00.03=1



(d) Logic for running forward/reverse circuits with F04.19=0 and F00.03=1

Figure 5-2 Two-wire control

Three-line control:

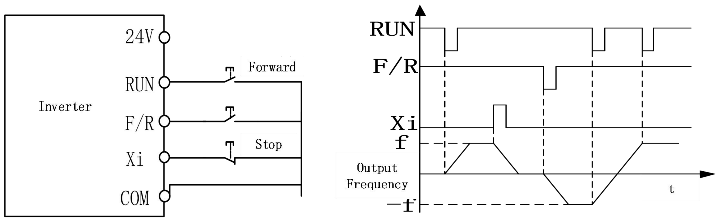
F00.03=2: Terminal RUN rotates forward, Xi stops, F/R rotates in reverse.

RUN is the normally open forward run button, and F/R is the normally open reverse run button; both are pulse edge active. Xi is the normally closed stop button, level active. Pressing the Xi button during operation will stop the vehicle. When the stop mode is selected as F04.19=0 deceleration stop, the logic is shown in Figure 5-3(b). Xi is one of the terminals X1 to X7 that has been defined as "three-wire operation and stop control" by F02.00 to F02.06.

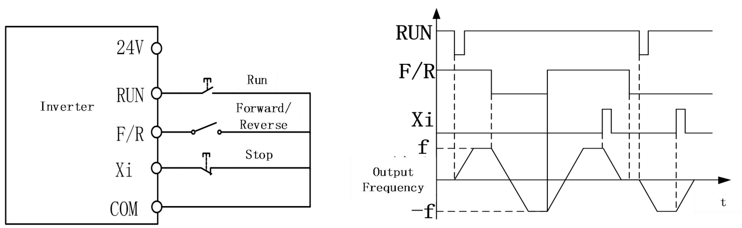
Note: X7 is a high-speed pulse input, supporting a frequency of 200kHz.

F00.03=3: Terminal RUN starts, Xi stops, F/R rotates forward/reverse.

RUN is a normally open run button, active on the pulse edge; F/R is a forward/reverse switch (open for forward rotation, closed for reverse rotation); Xi is a normally closed stop button, active at a low level. When the stop mode is selected as F04.19=0 for deceleration stop, the logic diagram is shown in Figure 5-3(d).



(a) Schematic diagram of three-wire control with F00.03=2 (b) Forward/reverse operation logic with F04.19=0 and F00.03=2



(c)Three-wire control wiring diagram with F00.03=3 (d) Forward/reverse operation logic with F04.19=0 and F00.03=3

Figure 5-3 Three-line control

5.6 Common process parameters of frequency converters

Function code	Function code name	Parameter Description	unit	Factory value	property
F00.01	Motor 1 drive control method	0: V/F control (VVF) 1: Sensorless vector control (SVC) 2: With speed sensor vector control (FVC)		0	○

F00.04	Main frequency source A selection	0: Digital frequency given F00.07 1: AI1 2: AI2 3: AI3 4: AI4 (Expansion Card) 5: High-frequency pulse input (X7) 6: Main frequency communication percentage given 7: The main frequency is directly given during communication. 8: Digital potentiometer setting		0	○
F00.07	Digital frequency given	0.00～Maximum frequency F00.16	Hz	0.00	●
F00.14	Acceleration time 1	0.00～650.00（F15.13=0）	s	15.00	●
F00.15	Deceleration time 1	0.00～650.00（F15.13=0）	s	15.00	●
F00.16	Maximum frequency	1.00～600.00	Hz	50.00	○
F00.18	Upper limit frequency	Lower limit frequency F00.19 ~ Maximum frequency F00.16	Hz	50.00	●
F00.19	Lower limit frequency	0.00～Upper frequency F00.18	Hz	0.00	●
F00.21	Inverted control	0: Allow forward/reverse rotation 1: Disable reverse rotation		0	○

Note: Common process parameters may also include input and output terminal function settings. Please refer to function groups F02 and F03 for settings.

5.7 Motor parameter identification

To achieve better control performance, motor parameter identification is necessary.

Identification method	Applicable situations	Recognition effect
F01.34=1 Asynchronous machine static self-learning	In situations where it is difficult to disconnect the motor from the load, and self-learning rotation is not permitted.	generally
F01.34=11 Synchronous machine static self-learning		
F01.34=2 Asynchronous machine rotation self-learning	In situations where the motor can be easily disconnected from the load, the motor shaft should be disconnected from the load before operation. Self-learning operation is prohibited when the motor is under load.	optimal
F01.34=12 Synchronous machine rotation self-learning		

- Before the self-identification operation, ensure that the motor is stopped; otherwise, the self-identification will not proceed normally.

Parameter identification operation steps

- If the motor can be disconnected from the load, the mechanical load can be completely disconnected from the motor when the power is off.
- After powering on, set the inverter command source to keyboard control (set F00.02=0).
- Enter the motor's nameplate parameters accurately.

Motor	Corresponding parameters
Motor 1(Motor 2 corresponds to the parameters of group	F01.00 Motor Type F01.01 Motor Rated Power F01.02 Rated voltage of the motor; F01.03 Rated current of the motor.

F14)	F01.04 Rated frequency of the motor; F01.05 Rated speed of the motor. F01.06 Motor winding connection method

- If the motor type is asynchronous:
  Set F01.34=1 and confirm, then press the RUN button. The inverter will then begin to perform stationary self-identification of the motor.
  Set F01.34=2 and confirm, then press the RUN button. The inverter will then begin to self-identify the motor's rotation.
  Set F01.34=3 and confirm, then press the RUN button. The inverter will then begin self-identifying the motor and encoder.
- If the motor type is a synchronous machine:
  After setting F01.34=11 and confirming, press the RUN button, and the frequency converter will begin to perform static self-identification of the motor.
  After setting F01.34=12 and confirming, press the RUN button, and the frequency converter will begin to automatically identify the rotation of the motor.
  After setting F01.34=13 and confirming, press the RUN button, and the frequency converter will begin to perform encoder self-identification of the motor and encoder.
  It takes about two minutes for the motor to complete its self-identification and exit the "tune" interface to return to the initial power-on state.
- If multiple motors are used in parallel, the sum of the rated power and rated current of the motors and the sum of the power and current of the connected motors are the input.
- If the two motors are to be used interchangeably, the parameters of motor 2 in group F14 need to be set separately, and the parameters of motor 2 need to be identified according to F14.34.

5.8 Closed-Loop Vector Debugging Guide (Taking Tower Crane Closed-Loop Lifting as an Example)

1. Hoisting Commissioning Begins
2. Install the frequency converter according to Chapter 2 of the instruction manual, connect the main circuit and control circuit, and confirm that the wiring (especially the power cord and motor wire, incorrect wiring will cause the machine to explode) is correct. Ensure that the wiring of all limit switches (torque, overload, overheight) is normal. After confirming that the hook is empty and no one is below it, power on the machine. If the frequency converter keypad displays normally after powering on, with no alarms or other abnormalities, proceed to the next step.
3. Set F20.00 to 1 (open-loop hoisting mechanism) and press the confirmation key (ENTER).
4. Set the motor nameplate parameters F01.00-F01.06. Set F01.34=1 (asynchronous machine static self-learning) and press the confirmation key (ENTER).
5. Set F00.02=0 (keyboard control) and press the confirmation key (ENTER).
6. Press the "RUN" key on the frequency converter keypad. The green light next to the "RUN" key will illuminate, and the keypad LEDs will display "tUne". After the green light goes out, set F00.02=1 (terminal control) to proceed to the next step.
7. Run the crane upwards at the lowest speed, enter F18.01, and check if FWD/REV on the keypad are off. If they are off, it's normal. If they are on, it means the forward/reverse wiring terminals are reversed, and you need to swap the X1 and X2 wires.
8. Run the crane upwards at the lowest speed and check if the tower crane hook moves upwards. If it moves downwards, stop the crane and de-energize it. Then, swap any two phase motor wires in UVW. If you find that the brake is not released, there is overcurrent, the speed is too high, or the crane cannot run, check if the brake main circuit wiring is normal and if the control circuit signal flow is normal.
9. Set the encoder line count F01.25 to the line count indicated on the encoder's nameplate.
10. Run the encoder upwards at the lowest speed (if the empty hook is close to the upper limit, you can first lower it slightly before performing this step). After the

speed stabilizes (approximately 5 seconds), check if the value of F18.02 fluctuates around the value of F18.01. If the two values differ significantly, the encoder line count F01.25 is incorrectly set, and you need to consult the encoder manufacturer for the specific line count value for this encoder model. If F18.02 = 0.00, check if the wiring between the PG card and the encoder is correct and if the PG card is properly inserted.

11. After confirming the previous step is successful, continue running the encoder upwards at the lowest speed. After the speed stabilizes, check if the frequency direction of F18.02 is positive. This can be determined by checking if the FWD/REV indicators on the keypad are off. If they are off, it's normal; if they are on, you need to swap the A and B signal lines on the PG card.
12. Set F20.00 to 0 (SYT315 tower crane hoisting) and press the Enter key.
13. Use the operating handle to move the crane up one gear. After the speed stabilizes, check if the value in F18.00 matches the speed of gear one in the parameter table. Then, run gears two through five, checking if the speed of each gear matches the data in the parameter table. If the speed of each gear differs from the speed in the parameter table, set F08.00 and F08.14 to 11.00 and 25.00Hz respectively. Then, run each gear and record the frequency (the value of F18.00 when it stabilizes) for each gear. Determine which function code in F08.00 or F08.14 sets the speed of each gear based on the frequency.
14. Under no-load conditions, test each gear position up and down at least 10 times. Only proceed to the next step if no problems are found.
15. For load testing, gradually increase the load. During operation, carefully observe the inverter current (F18.06). During the lowering process, carefully observe the bus voltage (F18.09). During this process, pay attention to the maximum load that can be applied to each gear position and do not exceed the limit value for each gear position. Only proceed to the next step if no problems are found.
16. Lifting test completed.

5.9 Open-loop commissioning guide (taking the open-loop slewing mechanism of a tower crane as an example)

1. Slewing Commissioning
2. Begin by installing the frequency converter according to Chapter 2 of the instruction manual. Connect the main circuit and control circuit, ensuring the wiring (especially the power and motor wires; incorrect wiring will cause the machine to explode) is correct, and that all limit switches (left and right limit switches) are properly wired. Confirm that the hook is empty and no one is below it before powering on. After powering on, the frequency converter keypad display should be normal, with no alarms or other abnormalities. Proceed to the next step.
3. Set F20.00 to 3 (tower crane slewing mechanism). Press the Enter key to set the motor nameplate parameters F01.00-F01.06. Set F01.34=1 (asynchronous machine static self -learning). Press the Enter key to set F00.02=0 (keypad control). Press the Enter key again.
4. Press the "RUN" key on the frequency converter keypad. The green light next to the "RUN" key will illuminate, and the keypad LEDs will display "tLne". After the green light goes out, set F00.02=1 (terminal control). You can then proceed to the next step.
5. Run the crane to the right at the lowest speed setting. Check if the empty hook moves to the right. If it moves to the left, stop the crane and cut off the power. Then, swap any two motor wires in UVW. Run the crane to the right at the lowest speed setting. After the speed stabilizes, check if the value in F18.00 matches the lowest speed setting in the parameter table. Then run the crane at speeds two through five, checking if the speeds at each speed match the data in the parameter table. If the speeds at each speed differ from the parameter table, set F08.00 and F08.14 to 11.00 and 25.00Hz respectively. Then run each speed setting and record the frequency (the value of F18.00 when it stabilizes) for each speed setting. Determine which function code in F08.00 or F08.14 sets the speed for each speed setting based on the frequency.
6. Test each gear up and down at least 10 times under no-load conditions. Proceed to the next step only if there are no problems.
7. With load testing, gradually increase the load. During operation, carefully observe the inverter current (F18.06); during deceleration, carefully observe the bus voltage

(F18.09). During this process, pay attention to the maximum load that can be applied to each gear and do not exceed the limit value for each gear. Proceed to the next step only if there are no problems.

8. Slewing test complete.

5.10 Ant Speed Positioning Function

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.51	Low-speed operation mode selection	0: Operate at the given frequency multiplied by the gain 1: Operate with reduced bias at a given frequency 2: Operate at maximum frequency multiplied by gain		0	○
F20.52	Frequency reduction gain	0～1000	%	100.0	●
F20.53	Frequency reduction bias	0.00～600.00	Hz	0.00	●
F20.54	Frequency reduction speed selection	0～2		1	○

1. Multiplication: When the ultra-low speed operation terminal (function 172) is active, and the ultra-low speed operation mode is set to "Frequency Reduction Gain" (F20.51=0), the original set frequency is multiplied by the "Frequency Reduction Gain Setting Value" to obtain the new set frequency, which the inverter uses as its output frequency. If the calculated frequency value is less than the braking release frequency, the braking release frequency takes priority and the inverter operates at that frequency. If the "Frequency Reduction Gain Setting Value" is set to 0, ultra-low speed operation is invalid, and the inverter operates at the normal set frequency.

2. Subtraction: When the ultra-low speed operation terminal (function 172) is active, and the ultra-low speed operation mode is set to "frequency reduction bias" (F20.51=1), the original set frequency is subtracted from the "frequency reduction bias setting value" to obtain the new set frequency, which the inverter uses as its output frequency. If the calculated frequency value is less than the braking release frequency or is negative, the braking release frequency takes priority and the inverter operates at the braking release frequency.

3. Multiplication based on maximum frequency: When the ultra-low speed operation terminal (function 172) is active, and the ultra-low speed operation mode is set to "frequency reduction bias" (F20.51=2), then the original set frequency = F20.52 (frequency reduction gain) * motor maximum frequency (F00.16/F14.78). The inverter uses this as its output frequency. If the calculated frequency value is less than the braking release frequency, the braking release frequency takes priority and operates at that frequency. If the "frequency reduction gain setting value" is set to 0, ultra-low speed operation is invalid, and the inverter operates at the normal set frequency.

4. When “Frequency Reduction Rate Selection” F20.54 is set to 1, if the ultra-low speed operation terminal is valid, the acceleration and deceleration time will switch to F00.14 and F00.15 to set the time. At this time, the acceleration and deceleration time selection function with gear change is invalid (F20.18), special acceleration (F21.21), special deceleration function is invalid (F21.22), and deceleration switch optimization (F21.38) deceleration time is invalid.

5. When “Frequency Reduction Rate Selection” F20.54 is set to 1, if the ultra-low speed operation terminal is invalid, the acceleration and deceleration time will be the current actual set time.

6. When “Frequency Reduction Rate Selection” F20.54 is set to 0, the acceleration/deceleration time is the current actual set time.

7. If the positioning point shielding function of input terminal 67 is effective, then the ultra-low speed operation function is ineffective.

5.11 Brief introduction to light-load high-speed and heavy-load low-speed functions

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.00	Overload protection torque limit threshold	0.0～150.0 (0.0: Protection invalid)	%	0.0	●
F21.01	Load detection time	0.0～5.0	s	1.5	●
F21.02	Load detection frequency percentage	10.0～100.0	%	80.0	●

F detection = Motor rated frequency * F21.02. When the inverter output reaches f detection, it maintains this frequency for a duration equal to the detection time F21.01. After the time expires, the inverter calculates the maximum frequency achievable during this operation based on the output torque or current detected at that frequency. If the frequency exceeds F21.00 (where F21.00 is not set to 0), it indicates an overload; otherwise, normal operation continues.

Setting F21.00 to 0.0 indicates that there is no overload protection function.

The light-load high-speed function means that when the given frequency is greater than the motor's rated frequency, the frequency converter calculates the highest achievable frequency based on the current load, thereby avoiding overload, overcurrent and other faults due to excessive load.

The heavy-load low-speed function means that when the current load is greater than the rated load, the frequency converter can automatically calculate the highest frequency that can be reached under heavy-load conditions based on the current load.

Because the directions of friction are different for upward and downward travel, the slack torque, allowable torque, and heavy load torque for upward and downward travel must be set separately.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.03	Upward Light Load High Speed Ratio	100.0～400.0	%	100.0	○
F21.04	Upward heavy load high speed ratio	10.0～100.0	%	100.0	○
F21.05	Upward slack rope torque	0.0～F21.06	%	0.0	○
F21.06	Upward allowable load torque	F21.05～F21.07	%	100.0	○
F21.07	Upward heavy load torque	F21.06～250.0	%	100.0	○
F21.08	Downlink light load high speed ratio	100.0～400.0	%	100.0	○
F21.09	Downlink heavy load high speed ratio	10.0～100.0	%	100.0	○
F21.10	Downward slack rope torque	0.0～F21.11	%	0.0	○
F21.11	Downward allowable load torque	F21.10～F21.12	%	100.0	○
F21.12	Downward heavy load torque	F21.11～250.0	%	100.0	○

Light load, high speed:

When the inverter's output frequency reaches the detection frequency f1 (f1 = F21.02 * motor rated frequency), this frequency is maintained for a duration of t1 (F21.01: load detection time). After this time, the inverter's output torque T (FVC is the output torque, VF is the output current) is detected and used to calculate the target frequency F allowed for this operation using the curve shown in the figure below. If the target frequency given for this operation is greater than F, the target frequency is changed to F.

The speed calculation method corresponding to different torques is as follows:

When the current torque T < slack rope torque T1, the output frequency F = a (light load high speed ratio) * motor frequency Fe;

When the current torque T > the allowable load torque T2, the output frequency F = the motor frequency Fe;

When the slack rope torque T1 < current torque T < allowable load torque T2:

Output frequency F = (T2 – T)(a - 1) * Fe / (T2 – T1) + Fe;

Heavy load, low speed:

When the inverter's output frequency reaches the detection frequency f1 (f1 = F21.02 * motor rated frequency), maintain this frequency for a duration of t1. After this time, detect the inverter's output torque T (FVC is the output torque, VF is the output current) and use it to calculate the curve shown in the figure below to obtain the target frequency F that can be allowed for this operation. If the target frequency given for this operation is greater than F, then the target frequency is changed to F.

The heavy-load low-speed function can only be enabled when T2≤T≤T3 and the heavy-load low-speed ratio b < 100.0%.

The speed calculation method corresponding to different torques is as follows:

When the current torque T < the allowable load torque T2, the output frequency F = the motor frequency Fe;

When the current torque T > the heavy load torque T3, the output frequency F = b(heavy load low speed ratio) * motor frequency Fe;

When the allowable load torque T2 < current torque T < heavy load torque T3:

Output frequency F = Fe - (T-T2)(1-b)Fe / (T3-T2).

Note: In FVC mode, the current torque T = output torque (F18.04); in VF mode, the current torque T = output current (F18.06) / motor rated current.

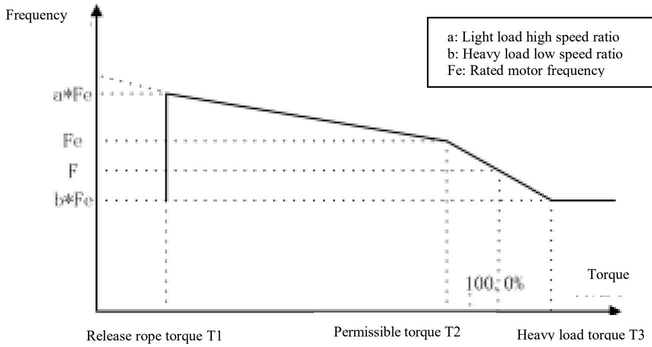


Figure 5-4 Output torque-frequency curve

5.12 Brake power-on test:

Function code	Function code name	Parameter Description	unit	Factory value	property
F20.25	Brake fault detection pulse count when stopped	0～10000 (0: Brake check and protection not available)		2000	○
F20.26	Brake torque check	0.0～180.0	%	100.0	○
F20.27	Brake torque holding time check	0.0～10.0	s	6.0	○
F20.28	Brake inspection upper limit frequency	Lower limit frequency ~ Upper limit frequency Fup	HZ	2.00	○
F20.29	Brake inspection forward detection delay	0.0～10.0	s	0.8	○
F20.30	Brake inspection reverse detection delay	0.0～10.0	s	0.8	○
F20.87	Brake fault detection torque	0.0～F20.26	%	60.0	○
F20.88	Brake fault detection torque holding time	0.0～F20.27	s	3.0	○
F20.89	Brake power-on detection pulse count	0.0～F20.20		1000	○
F20.90	Brake power-on fault detection speed limit	0.00～Fmax		0	○
F20.91	Brake detection trigger mode selection	0～1 0: Triggered by DI terminal; 1: Automatic triggering		0	○

The brake power-on testing process is shown in Figure 1:

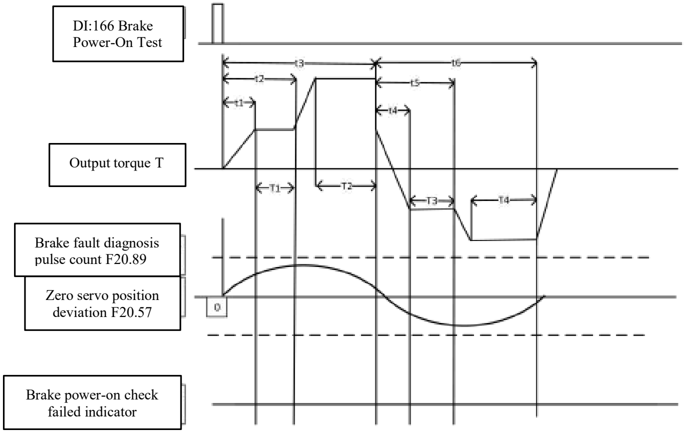


Figure 5-5 Brake power-on detection logic

t1: F20.29: Brake inspection forward detection delay;

t2: F20.88: Brake fault detection torque holding time;

t3: F20.27: Brake torque holding time check;

t4: F20.30: Brake inspection reverse detection delay;

t5: F20.88: Brake fault detection torque holding time;

t6: F20.27: Brake torque holding time check;

T1: F20.87: Brake fault detection torque;

T2: F20.26: Brake torque check;

T3: F20.87: Brake fault detection torque;

T4: F20.26: Brake torque check;

Function Introduction:

The brake is checked by applying torque in both directions, with two torque levels in each direction. When the first low torque is applied, if the error pulse exceeds the set value, an E86 fault occurs, and the inverter is in a fault state and cannot operate (manual reset is required). When the second high torque is applied, if the error pulse exceeds the set value, a C28 warning occurs. The error pulses generated by the first high torque and the second low torque are superimposed; the error pulse is not cleared when switching torque levels.

When 20.91=0: For the brake power-on check, in parameter setting mode, the Xi input terminal function needs to be set to "166: Brake Power-on Check", and the terminal closed.

The inverter first uses F20.87 to set the forward torque operation time set by F20.88, then uses F20.26 to set the forward torque operation time set by F20.27; then uses F20.87 to set the reverse torque operation time set by F20.88, and then uses F20.26 to set the reverse torque operation time set by F20.27. To prevent runaway, F20.28 needs to be set to a suitable value; generally, the default value is sufficient.

When F20.91=1, the inverter triggers this function according to its own power-on flag after power-on. The detection process is the same as terminal triggering.

The coordination between the brake power-on detection function and the zero servo:

1. During the brake power-on test, if, during the first torque check in both directions (output torque = F20.87: brake fault detection torque), F20.20 (default 2000) > zero servo position (F20.57) > F20.87 (default 1000), an E86 fault is reported, and DO: (43: brake power-on fault) becomes active. After the fault is reset, DO:43 remains active until the brake test passes.

2. When the brake is powered on for testing, if during the second torque check in both directions (output torque = F20.26: brake test torque), ifF20.20 (default 2000) > zero servo position (F18.43) > F20.87 (default 1000), a C28 warning will be issued, and DO: (43: brake power-on fault) will take effect until the brake test passes, after which DO:43 will be invalid.

3. If the number of error pulses > F20.20, zero servo is activated and C27 is displayed; run down once to exit zero servo, C27 is invalid. If it was in state C28 before zero servo, it will continue to display C28.

4. Upon the next power-on, it will no longer display C28 or E86; a retest is required.

5. After the brake power-on test is completed, the frequency converter is in the parameter setting state. If "Di:166: Brake Power-on Check" is effective after the brake power-on test has been performed once, the test will not be performed again.

6. When F20.91 is set to 0, the C28 warning will be immediately invalidated, and DO: (43: Brake power-on fault) will be invalidated.

5.13 Anti-snagging function:

Function code	Function code name	Parameter Description	unit	Factory value	property
F20.92	Percentage of detected hook-ups	0～100.0 (Motor rated frequency; this function is invalid when the value is 0)	%	0	○
F20.93	Percentage of hanging frequency error	0～100.0	%	95.0	○
F20.94	Torque being detected	0～200.0	%	120	○
F20.95	Reverse operating frequency after being hung	0～20.00	HZ	3.00	○
F20.96	Reverse running time after being hung	0～10.0	S	3.0	○

Function Introduction:

This is a function dedicated to the lifting mechanism. When F20.92 (percentage of the frequency of the hanging detection) is 0, this function will not be enabled.

When F20.92 is not 0 (it is recommended to set it to 20.0%, that is, the motor's rated frequency is 50HZ, and the detection starts at 10HZ);

When the output frequency is greater than or equal to the percentage of the detected frequency (F20.92) * the rated frequency of the motor, the detection begins. When the encoder feedback frequency is less than the acceleration/deceleration frequency (based on the acceleration/deceleration time, the inherent frequency planned by the inverter) * f20.93 (percentage of the detected frequency error) and the output torque is greater than F20.94 (detected torque), the inverter sends a reverse command and runs in reverse until the reverse running frequency after being detected (F20.95). After maintaining the reverse running time after being detected (F20.96), the E87 fault occurs.

5.14 Trolley luffing anti-sway function

Function code	Function code name	Parameter Description	unit	Factory value	property
F20.00	Selection of lifting mechanisms	2: Car Amplitude		0	○
F46.00	Anti-sway function of the car	0: Invalid 1: Valid		0	○

F46.01	Rope length source selection	0: Encoder pulse 1: Reserved 2: Point-to-point communication		2	○
F46.02	Maximum anti-shake time limit	0.00～50.0	s	15.0	○
F46.03	Set the pendulum length at point A.	0.00～200.00	m	0.00	○
F46.04	Set the pendulum length to point A, pulse high position	0～65535		0	○
F46.05	Set the pendulum length to point A, pulse low position	0～9999		0	○
F46.06	Set the pendulum length at point B.	0.00～200.00	m	0.00	○
F46.07	Set the pendulum length to point B, pulse high position	0～65535		0	○
F46.11	Distance between hook and center of gravity of load	0.00～100.00	m	10.00	○
F46.17	Car sway compensation coefficient (Kp)	0.00～10.00		1.00	•

In tower crane applications, the anti-sway function is only effective in the luffing mechanism (F20.00 = 2);
The anti-sway function is not enabled by default. To use this function, you need to set the relevant parameters.

Function Introduction:

1. The anti-sway function is enabled via function code F46.00;

The anti-sway function is prohibited from use. There are two methods: parameter setting and terminal triggering.

(1) Select whether to enable via function code F46.00:

Function code	Function code name	Parameter Description	unit	Factory value	property
F46.00	Anti-sway function of the car	0: Invalid 1: Valid		0	○

(2) Select whether to turn off the anti-shake function via the terminal function:

Function code	Setting value	Function	illustrate
F02.00-F02.06	160	Anti-sway function disabled	When the terminal is active, the anti-sway function must not be used.

2. Set acceleration/deceleration time:

After the anti-sway function is activated, to achieve the best anti-sway effect, the acceleration/deceleration time and stopping method of the luffing mechanism (F20.00=2) need to be set. The relevant parameters are as follows:

3. Rope length calculation:

Function code	Function code name	Parameter Description	unit	Setting value	property
F00.14	Acceleration time 1	0.00～650.00	s	1.00	○
F00.15	Deceleration time 1	0.00～650.00	s	1.00	○
F04.14	Acceleration and deceleration methods	0: Linear acceleration/deceleration 1: Continuous S-curve acceleration/deceleration 2: Discontinuous S-curve acceleration/deceleration		1	○
F04.15	The initial period of the S-curve during acceleration	0.00～30.00	s	0.5	○
F04.16	The time interval at the end of the S-curve during acceleration	0.00～30.00	S	0.5	○
F04.17	The initial period of the S-curve during deceleration	0.00～30.00	s	0.5	○
F04.18	The time interval at the end of the S-curve during deceleration	0.00～30.00	s	0.5	○

When using the luffing anti-sway function, an encoder and PG card (differential encoder recommended) need to be installed on the hoisting mechanism to obtain rope length data. There are two ways to obtain the rope length of the luffing mechanism:

1. Install a PG card on the luffing frequency converter and connect the encoder signal of the hoisting mechanism in parallel to the PG card of the luffing frequency converter.

2. Obtain encoder pulses from the lifting frequency converter via RS485 communication;

Function code	Function code name	Parameter Description	unit	Factory value	property
F46.01	Rope length source selection	0: Encoder pulse 1: Reserved 2: Point-to-point communication		2	○

3.1 Rope Length Source Selection – Pulse Acquisition (F46.01 = 0):

Rope length is obtained through pulses: Connect the A+, A-, B+, and B- pins ofthe hoisting encoder to the PG cards of both the hoisting inverter and the luffing inverter. The luffing inverter obtains the current pulse count and calculates the rope length based on the pulse count.

The wiring diagram for pulse acquisition of rope length is shown below:

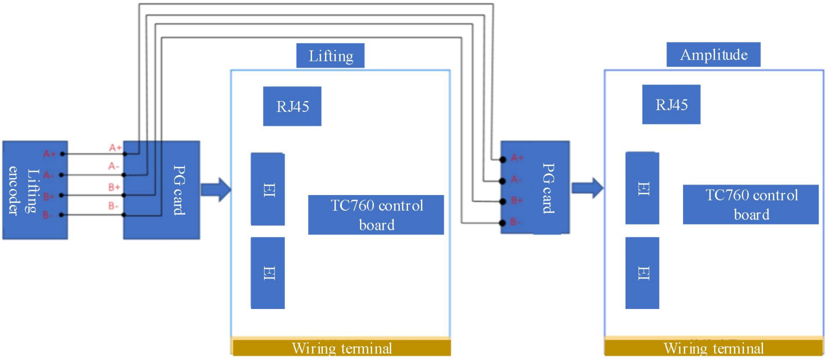


Figure 5-6. Wiring method for pulse acquisition of rope length

3.2 Rope Length Source Selection – Communication Acquisition (F46.01 = 2):

When using communication to obtain the rope length, the hoisting inverter needs to be set as the master and the luffing inverter as the slave.

Lifting: F20.00=0			Amplitude: F20.00=2		
Function code	Function code name	Setting value	Function code	Function code name	Setting value
F46.01	Rope length acquisition method selection: 0: Encoder pulse	0	F46.01	Rope length acquisition method selection: 2: Point-to point communication	2
F10.05	Master-slave communication function selection: 0: Invalid 1: Effective	1	F10.05	Master-slave communication function selection: 0: Invalid 1: Effective	0
F10.06	Master-slave selection: 0: Slave 1: Host	1	F10.06	Master-slave selection: 0: Slave 1: Host	0
F10.07	Host sends data: 0: Output frequency 1: Set frequency 2: Output torque 3: Given torque 4: PID command 5: Output current 6: Current rope length	6	F10.07	Host sends data: 0: Output frequency 1: Set frequency 2: Output torque 3: Given torque 4: PID command 5: Output current 6: Current rope length	6

The wiring diagram for obtaining the rope length via communication is as follows:

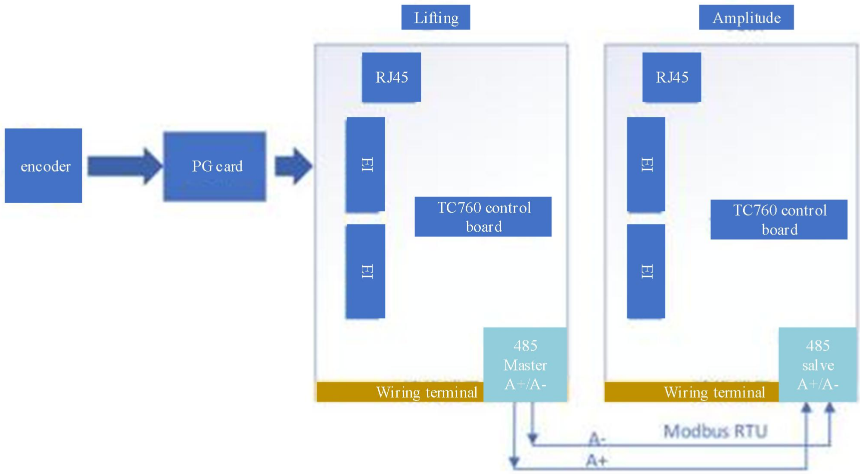


Figure 5-7 Connection method for obtaining rope length via communication

4. Rope length calibration:

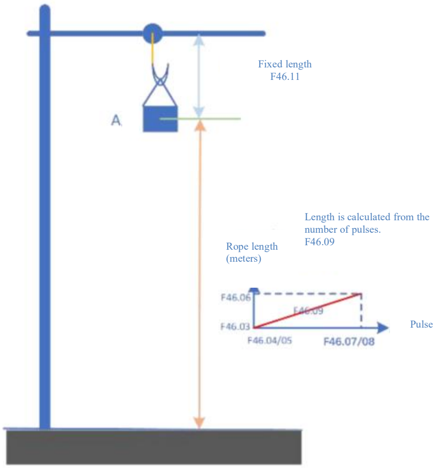
When using the anti-sway function, the rope length needs to be calibrated to obtain the correspondence between the encoder pulses and the current rope length. The method is as follows:

Function code	Function code name	Parameter Description	unit	Setting value	property
F20.45	Position pulse high level	0～65535		0	●
F20.46	Position pulse low level	0～9999		0	●
F20.47	Pulse direction	0: Direction unchanged 1: Reverse direction		0	○
F20.48	High-order initial value of pulse number	0～65535		0	○
F20.49	Initial value of low-order pulse number	0～9999		0	○
F20.50	Pulse count reset	0: No operation		0	○

		1: Force reset			
F46.01	Anti-sway long source selection	0: Encoder pulse 1: Reserved 2: Point-to-point communication (700F_H)		0	○
F46.03	Set the pendulum length at point A.	0.00～200.00m	m	0.00	○
F46.04	Set the pendulum length to point A, pulse high position	0～65535		0	○
F46.05	Set the pendulum length to point A, pulse low position	0～9999		0	○
F46.06	Set the pendulum length at point B.	0.00～200.00m	m	0.00	○
F46.07	Set the pendulum length to point B, pulse high position	0～65535		0	○
F46.08	Set the pendulum length to point B, low pulse position	0～9999		0	○
F46.11	Distance between hook and center of gravity of load	0.00～100.00m	m	10.00	○

When the amplitude inverter is equipped with a PG card and a lifting encoder is used, F46.01 needs to be set to 0, and then only the per-unit rope length needs to be set for the amplitude inverter.

Since the encoder signal is only connected to the lifting inverter and no PG card is installed on the luffing inverter, the rope length data of the trolley comes from the lifting inverter (via 485 communication), and the rope length needs to be calibrated per unit on the lifting inverter.



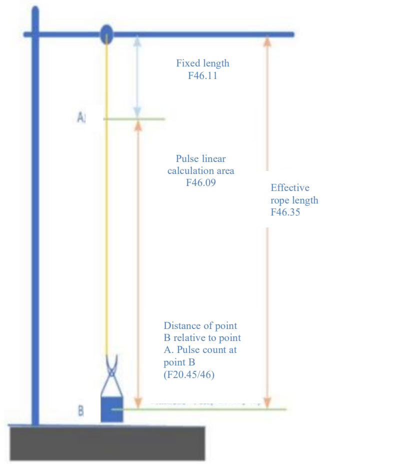


Figure 5-8 Calculation of pendulum length using pulses Figure 5-9 Calculation of effective rope length

(1). Move the hoist upwards until it reaches the upper limit position (pulse origin);

(2). After reaching the upper limit, begin calibrating point A. The system defaults to both the pulse height and rope length at point A being 0. The pulse calibration steps for this point are as follows: Set F20.48 and F20.49 to 0; Set F46.03, F46.04, and F46.05 to 0; Then use F20.50=1 to perform a pulse clearing operation. After success, F20.45 and F20.46 will both display as 0.

(3) Position the main hook at the upper stop limit, measure the distance from the center of the load to the boom (if the hoisting rope is long, the length of the hoisting rope needs to be considered; if the hoisting rope is short, the distance from the main hook to the boom can be used directly), and input the data into F46. 11;

(4) Lower the hoist until the load falls to the ground (point B);

(5) Update the pulse and position data at point B:

• Input the vertical distance between point B and point A. Measure the distance from the center of the weight to the ground beforehand and write this distance into F46.06.

Input a pulse from point B relative to point A. After reaching point B, write the current pulse count (F20.45, F20.46) to F46.07 and F46.08.

(6). Open the lifting mechanism up and down to check that the rope length data is correct.

(7) Each time a standard section is added, the height and pulse need to be reset.

5. Power failure handling:

When the inverter is powered off, if hook slippage occurs, the encoder position will change, and the rope length data will also shift. During model iteration, this deviation will worsen the anti-sway effect and may even make the swaying more severe. In this case, a zero-point calibration operation is required. The specific procedure is as follows:

(1) First, raise the hoist to the upper limit;

(2) Set F20.50=1 to clear the pulse count to 0;

6. Anti-sway compensation:

After correctly obtaining the rope length (pendulum length), adjusting the anti-sway effect only requires adjusting the gain parameter of the trolley sway compensation coefficient:

Function code	Function code name	Parameter Description	unit	Setting value	property
F46.17	Car sway compensation coefficient (Kp)	0.00～10.00		1.0	●

(1) The larger the compensation coefficient, the better the adjustment effect and the smaller the frequency overshoot —> the longer the adjustment time.

(2) The smaller the compensation coefficient, the smaller the adjustment effect and the greater the frequency overshoot —> shorter the adjustment time

At the same time, the rope length also affects the adjustment process: the longer the rope, the longer the swing period, and the longer the adjustment time.

5.15 Open-loop rotation debugging instructions (F20.00=3):

The latest solution for the slewing mechanism uses SVC control. The factory default settings can meet the needs of most applications. For customers who need fine-tuning, the following method can be used for adjustment.

Serial Number	Manifestations	Debugging steps	Reference range	unit
1	Stop rebound	1. Increase the deceleration time by 1 F00.15.	12.0~18.0	s
		2. Increase the value of the gyration coefficient F20.68.	0.200~0.400	\

2	Unstoppable	1. Increase the eddy current value at 0 gear.		\
		2. Add DC braking and set the value of F04.22 to 20s.	20	s
		3. If the machine rebounds after stopping due to DC braking, then reduce the value of F06.18.	10.0~40.0	%
		4. If DC braking still fails to stop the vehicle, increase the value ofF06.18.	40.0~100.0	%
		5. If the above methods are ineffective, please check the eddy current wiring:		
3	Slow startup	1. Reduce the acceleration time 1 F00. 14 value.	1.0~3.0	s
		2. Reduce the value of the gyration coefficient F20.68.	0.100~0.300	\
4	Start jitter	1. Reduce the value of the acceleration time F20.75 for the rotational deformation coefficient.	0.100~0.200	s
		2. Increase the value of the gyration coefficient F20.68.	0.200~0.400	\
		3. Increase the acceleration time by 1 F00. 14.	3.0~6.0	s
5	Starting against the wind is difficult	1. During the shutdown process, when it is judged that the slewing boom is close to stopping, manually switch the wind indicator to stop the machine, and start it against the wind after the slewing boom has come to a complete stop.		
		2. Increase the value of the upper limit of the electric torque for speed control,	150.0~200.0	%

		F06.10.		
		3. Increase the value of the speed control braking torque upper limit F06. 11.	150.0~200.0	%
		2. If you feel that the speed in second gear is too low, increase the value ofF08.01.	15.00~25.00	Hz

The specific annotations for the function codes mentioned above are shown in the table below:

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.14	Acceleration Time 1	Acceleration time is the time it takes for the output frequency to rise from 0.00Hz to F21.23 (10.00Hz).	s	3	●
F00.15	Deceleration time 1	The deceleration time is the time it takes for the output frequency to decrease from Fbase (50.0Hz) to 0.00Hz.	s	12	●

Increasing the value of F00. 14 can lengthen the acceleration time from 0 to 10.0 Hz, and vice versa; the actual reference range is 1.0~6.0 s.

Increasing the value of F00.15 can lengthen the deceleration time from 50.0Hz to 0, and vice versa. The actual reference range is 12.0~18.00s.

t0 = F21.23/Fbase*F00. 14

t1 = F21.23/Fbase*F00. 14 +(Fbase-F21.23)/Fbase*F15.03

t2 = F00.15

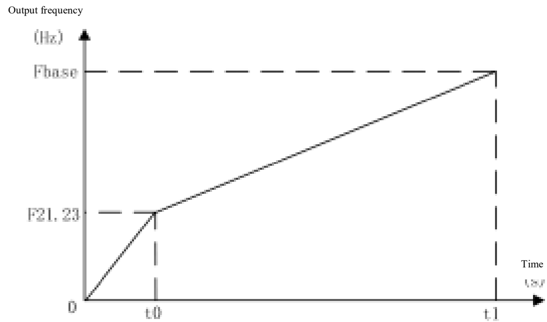


Figure 5-6: Acceleration Time 1

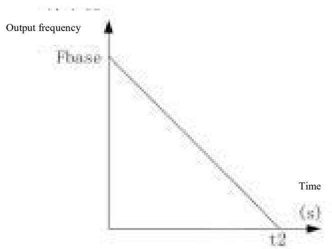


Figure 5-7: Deceleration Time 1

Function code	Function code name	Function code parameter description	unit	Factory value	property
F04.22	DC braking time for parking	Set the duration of the DC braking function for parking. If F04.22=0, the DC braking function for parking is disabled.	s	0	○

In applications with heavy loads, due to inertia, normal deceleration may not be sufficient to bring the motor to a complete stop. Increasing the DC braking time or the DC braking current can suppress motor rotation. The rotary mechanism is a high-inertia elastic load. During actual stopping, if the eddy current braking is insufficient, it may fail to stop completely. In such cases, additional DC braking is needed to ensure the rotary motor stops smoothly, thus guaranteeing a complete stop.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.10	Speed control electric torque upper limit	In motor mode, the maximum torque current value is output.	%	150	●
F06.11	Speed control braking torque upper limit	During braking, the maximum torque current value is output.	%	150	●

In rotary applications, the electric mode is primarily used during acceleration, while the braking mode is primarily used during deceleration. The upper torque limit represents the maximum output torque of the asynchronous motor. In strong winds, wind resistance exceeds the current maximum output torque of the motor. In such cases, the values of F06.10 and F06. 11 need to be increased.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.18	SVC zero-frequency holding current	The set value of the output current after entering DC braking state.	%	40	○

When DC braking is engaged, the inverter output current = F06.18 * F01.13 (asynchronous motor no-load excitation current). The larger the set value of F06.18, the more obvious the braking effect. An excessively large F06.18 value will cause the motor to stop and rebound during rotation.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.68	Tower deformation angle coefficient	Important parameters involved in slewing control.	\	0.200	○

Different tower cranes have different tower deformation angles depending on factors such as steel strength, tower height, and slewing jib length. Generally, the taller the tower, the larger the deformation angle; the stronger the steel, the smaller the deformation angle. For the same tower crane in practical applications, a higher F20.68 value results in smoother speed control during operation. However, excessive smoothness can sacrifice speed response time (slower movement), so the reference range for F20.68 is between 0. 100 and 0.400. Adjustments should be made as needed based on site requirements.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.39	linear change in DC braking current during parking - action delay time	0.00～30.00 0: No linear switching process	s	0	●
F21.40	Parking DC braking current linear switching time	0.00～30.00	s	0	●
F21.41	Parking DC braking current linear switching target value	0.0～400.0	%	0	●

In tower crane slewing applications, to address the difficulty of stopping the crane in strong winds, a linear change process is implemented for the output excitation current during the SVC zero-frequency braking process. The table below lists the field parameters for reference. The effect of F21.41 is the same as that of F06. 18; setting it too high will cause the crane to rebound when stopped, while setting it too low will prevent the crane from stopping completely.

Strong wind environment shutdown parameter table

Function code	F04.22	F21.39	F21.40	F21.41
Reference value	15s	0.5s	1.0s	80%

5.16 Closed-loop slewing commissioning instructions (F20.00=4):

Function code	Function code name	Function code parameter description	unit	Factory value	property
F04.22	DC braking time for parking	0.00～30.00 0.00: Invalid	S	10.00	○
F03.02	R1 Output Function Selection	1: Inverter in operation		0	○
F03.14	R1 Invalid Delay Time	0.000～30.000	S	0.000	○

The closed-loop rotary mechanism does not use eddy current braking during shutdown. After the inverter stops, it will default to DC braking. After the DC braking set time is completed, the wind vane will switch to DC braking after F03.14 (R1 invalid delay time). During DC braking and the R1 invalid delay period, the running command is valid, and the inverter will start directly.

The wind vane control requires customers to combine their own wind vane control logic. By default, relays EA and EC (normally open contacts) are used. During operation, EA and EC, which are normally open, change to normally closed, and the wind vane opens.

After shutdown, a 10-second DC braking process is performed. After the DC braking ends, EA and EC change from normally closed to normally open, and the wind vane is switched on. The logic diagram is as follows:

The debugging method for closed-loop rotary mechanisms is similar to that for open-loop rotary mechanisms. However, since closed-loop rotary mechanisms do not have eddy currents, the deformation coefficient intervention requires faster input and slower withdrawal. Therefore, the following function codes need to be set differently:

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.74	Low-frequency switching point of rotational deformation coefficient	0～10.00	HZ	2.00	○

F20.75	Rotational deformation coefficient accelerates filtering time	0～65.535	S	0.100	○
F20.76	Rotational deformation coefficient deceleration filtering time	0～65.535	S	8.000	○

5.17 Exception Handling

Handling abnormal motor rotation direction

- Check whether the parameter value setting of F00.03 is correct. The logic diagram is shown in Figure 5-2 and Figure 5-3.
- Check if the motor wiring is correct.
- Seek technical support.

Encoder self-learning exception handling

- Check if the number of lines on the motor encoder is correct.
- Check that all PG cards for the encoder are compatible.
- Check if the motor encoder wiring is correct.
- Seek technical support.

Part 6 Functional parameter table

6.1 Function Code Table Description

The TC760 frequency converter has 22 function codes (referred to as "function codes") as shown in Table 6-1. Each group contains several function codes. Among them, group F18 is the monitoring parameter group, used to view the frequency converter status; group F19 is the fault record group, used to view the details of the last 3 faults; the other groups are parameter setting groups, used to meet different functional requirements.

F00	Basic function parameter group	**F01**	Motor 1 Parameter Group
F02	Input terminal function group	**F03**	Output terminal function group
F04	Start-stop control parameter group	**F05**	V/F control parameter group
F06	Vector control parameter set	**F07**	Protection Function Settings Group
F08	Multi-speed and simple PLC	**F09**	PID function group
F10	Communication Function Group	**F11**	User-selected parameter groups
F12	Keyboard and display function group	**F13**	Torque control parameter group
F14	Motor 2 parameter group	**F15**	Accessibility group
F16	Customized feature groups	**F17**	Virtual I/O function group
F18	Monitoring parameter group	**F19**	Fault Recording Group
F20	Crane-specific basic function group	**F21**	Crane-specific advanced function group
F36	Automatic leveling system control parameter group	**F37**	Automatic leveling floor control parameter group
F38	Automatic floor leveling height parameter group	**F45**	Modbus communication free mapping group
F46	Anti-sway function group		

Table 6-1 Brief Introduction to Parameters of Function Codes

Note: Some parameters of the current product series are retained and will return 0 when read; some options for certain parameters are also retained and can still be set, but this may cause the inverter to malfunction. Please avoid misoperation of these parameters.

The following table provides a detailed explanation of each item in the function code table:

<table>
<tr><td>Function code</td><td colspan="6">F00.00～F99.99: Function code number</td></tr>
<tr><td>Function code name</td><td colspan="6">The full name of the function code. "Reserved" indicates that this function code is temporarily reserved and has no practical significance.</td></tr>
<tr><td rowspan="4">Parameter Description</td><td colspan="6">A brief description of the function codes. They are mainly divided into the following three categories:</td></tr>
<tr><td colspan="2">Entirety</td><td colspan="4">The entire function code value indicates the current parameter selection or the current meaning.</td></tr>
<tr><td colspan="2">One,ten,hundred,thousand, ten thousand</td><td colspan="4">The digits of one, ten, hundred, thousand, ten thousand respectively indicate a certain selection of the current function code or the current meaning.</td></tr>
<tr><td colspan="2">Binary system</td><td colspan="4">Each binary bit indicates a certain selection of the current function code or the current meaning.</td></tr>
<tr><td rowspan="8">unit</td><td colspan="6">The metric units for function codes. The units and abbreviations are as follows:</td></tr>
<tr><td>Hz</td><td>Hertz</td><td>kW</td><td>Kilowatt</td><td>us</td><td>Microsecond</td></tr>
<tr><td>kHz</td><td>Kilohertz</td><td>kWh</td><td>Kilowatt-hour★</td><td>ms</td><td>Millisecond</td></tr>
<tr><td>%</td><td>Percentage★</td><td>MWh</td><td>Megawatt hour</td><td>s</td><td>Second</td></tr>
<tr><td>V</td><td>Volt</td><td>mΩ</td><td>Milliohm</td><td>min</td><td>Minute</td></tr>
<tr><td>A</td><td>Ampere</td><td>mH</td><td>Millihenry</td><td>h</td><td>Hour</td></tr>
<tr><td>rpm</td><td>Revolutions per minute</td><td>℃</td><td>Degree centigrade</td><td>m</td><td>Meter</td></tr>
<tr><td colspan="6">★: %: The reference value is different for different physical quantities; kWh: kilowatt-hour, commonly known as degree.</td></tr>
<tr><td rowspan="4">Factory value</td><td colspan="6">The function code is the factory default value, or the value when the parameter is restored to the factory default value (F12.14=1). The description methods are mainly divided into the following three categories.</td></tr>
<tr><td colspan="2">Numbers (such as 50.00)</td><td colspan="4">For all power segments, the factory default value of this function code is the current value.</td></tr>
<tr><td colspan="2">Model confirmed</td><td colspan="4">The factory values of this function code vary according to different power ranges.</td></tr>
<tr><td colspan="2">XXX</td><td colspan="4">Due to variations in power range and different batches, the factory value of this function code varies.</td></tr>
<tr><td></td><td colspan="6">The attributes for changing function codes (whether changes are allowed and the conditions for changing them) are explained below:</td></tr>
</table>

property	●	Can be changed during operation: Any state, the current function code can be changed
	○	Cannot be changed during operation: Except for the operation status, all current function codes can be modified.
	×	Read-only: In any state, the current function code cannot be changed.

6.2 Functional parameter table

Function code	Function code name	Parameter Description	unit	Factory value	property
F00	**Basic function parameter group**				
F00.01	Motor 1drive contro method	0: V/F control (VVF) 1: Sensorless vector control (SVC) 2: Sensor-equipped vector control (FVC)		0	○
F00.02	Command source selection	0: Keyboard control (LOC/REM light on) 1: Terminal control (LOC/REM light off) 2: Communication control (LOC/REM light flashing)		0	○
F00.03	Terminal control method selection	0: Terminal RUN operation, F/R forward/reverse rotation 1: Terminal RUN forward rotation, F/R reverse rotation 2: Terminal RUN forward rotation, Xi stop, F/R reverse rotation 3: Terminal RUN operation, Xi stop, F/R forward/reverse rotation		0	○
F00.04	Main frequency source A selection	0: Digital frequency given F00.07 1：AI1 2: AI2 3: AI3 4: AI4 (Expansion Card) 6: Main frequency communication percentage given 7: The main frequency is directly given during communication.		0	○

F00.05	Auxiliary frequency source B selection	0: Digital frequency given F00.07 1：AI1 2: AI2 3: AI3 4: AI4 (Expansion Card) 5: High-frequency pulse input (X7) 6: Auxiliary frequency communication percentage given 7: Auxiliary frequency communication is directly given		0	
F00.06	Frequency source selection	0: Main frequency source A 1: Auxiliary frequency source B 2: Results of primary and secondary operations		0	○
F00.07	Digital frequency given	0.00Hz to maximum frequency	Hz	0.00	●
F00.08	Primary and secondary operation selection	0: Main frequency source A + auxiliary frequency source B 1: Main frequency source A - Auxiliary frequency source B 2: Take the maximum value of the primary and secondary components. 3: Take the minimum value between the primary and secondary components.		0	
F00.09	Selection of auxiliary frequency source B reference during main-auxiliary operation	0: relative to the maximum frequency 1: Relative to the main frequency source A		0	○
F00.10	Main frequency source gain	0.0～300.0	%	100.0	●
F00.11	Auxiliary frequency source gain	0.0～300.0	%	100.0	●
F00.12	Synthetic gain of primary and secondary frequency sources	0.0～300.0	%	100.0	●

F00.13	Analog adjustment of synthesized frequency	0: Main and auxiliary channel synthesis frequency 1: AI1* Main and auxiliary channel synthesis frequency 2: AI2* Main and Auxiliary Channel Synthesis Frequency 3: AI3* Main and Auxiliary Channel Synthesis Frequency 4: AI4* Main and Auxiliary Channel Synthesis Frequency 5: High-frequency pulse (PULSE) * Main and auxiliary channel synthesis frequency		0	○
F00. 14	Acceleration time 1	0.00～650.00（F15.13=0） 0.0～6500.0 （F15.13=1） 0～65000（F15. 13=2）	s	15.00	●
F00.15	Deceleration time 1	0.00～650.00（F15.13=0） 0.0～6500.0（F15.13=1） 0～65000（F15.13=2）	s	15.00	●
F00.16	Maximum frequency	20.00～600.00	Hz	50.00	○
F00.17	Upper limit frequency control selection	0: Set by F00.18		0	○
F00.18	Upper limit frequency	Lower limit frequency F00.19 ~ Maximum frequency F00.16	Hz	50.00	●
F00.19	Lower limit frequency	0.00～Upper frequency F00.18	Hz	0.00	●
F00.20	Direction of movement	0: Same direction 1: Opposite direction		0	●
F00.21	Inverted control	0: Allow forward/reverse rotation 1: Disable reverse rotation		0	○
F00.22	Forward and reverse dead zone time	0.00～650.00	s	0.00	●

F00.23	carrier frequency	1.0～16.0 (4kW rated power of frequency converter) 1.0～10.0 (Inverter rated power 5.5~ 7.5kW) 1.0～8.0 (Inverter rated power 11.00~ 45.00kW) 1.0～4.0 (Inverter rated power 55.00~ 90.00kW) 1.0～3.0 (Inverter rated power 110.00~ 400.00kW)	kHz	2.0	●
F00.24	Automatic carrier frequency adjustment	0: Invalid 1: Valid		1	○
F00.28	Motor parameter group selection	0: Motor 1 parameter group		0	○
F00.29	User password	0～65535		0	○
F00.30	Model Selection	0: Type G machine 1: Type P machine		0	○
F00.31	Frequency resolution	0: 0.01Hz 1: 0.1Hz (speed unit is 10rpm)		0	○
F00.32	Carrier frequency lower limit corresponding frequency point	0.00～F0.33	Hz	20.00	○
F00.33	Carrier frequency upper limit corresponding frequency point	10.00～150.00	HZ	50.00	○
F00.34	Carrier frequency lower limit	1.0～F00.23	kHz	2.0	○
F00.35	Input voltage selection	0： 380V 1： 440V		0	○
F00.36	Communication control start/stop channel selection	0： Modbus 1： Profinet 2: EtherCAT 3： CANopen 10: All protocols are valid.		0	○
F00.37	Communication channel selection			0	○

F00.38	Parameter lock function selection	0: Lock all command channels 1: Lock only the keyboard		0	○
F00.39	Single/Dual Brush PWM Switching Control	0: Solo 1: Double Brush 2: Automatic switching		0	○
F01	**Motor 1 Parameter Group**				
F01.00	Motor type selection	0: Ordinary asynchronous motor 1:Variable frequency asynchronous motor		0	○
F01.01	Motor rated power	0. 10～650.00	kW	4.00	○
F01.02	Motor rated voltage	50～2000	In	380	○
F01.03	Motor rated current	0.01 ～ 600.00 (motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	A	8.80	○
F01.04	Motor rated freque ncy	0.01～600.00	Hz	50.00	○
F01.05	Motor rated speed	50～60000	rpm	1440	○
F01.06	Motor winding connection method	0: Y 1: D		1	○
F01.07	Motor rated power factor	0.600～1.000		0.820	○
F01.08	motor efficiency	30.0～100.0	%	85.0	○
F01.09	asynchronous motor stator resistance	1～60000 (Motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	mΩ	4740	○
F01.10	asynchronous motor rotor resistance	1～60000 (Motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	mΩ	3120	○
F01.11	Leakage inductance of asynchronous motor	0.01 ～ 600.00 (motor rated power ≤75kW) 0.001～60.000 (motor rated power >75kW)	mH	24.60	○
F01.12	asynchronous motor mutual inductance	0. 1～6000.0 (motor rated power ≤75kW) 0.01 ～ 600.00 (motor rated power >75kW)	mH	481.2	○
F01.13	No-load excitation current of asynchronous motor	0.01 ～ 600.00 (motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	A	4.00	○

F01.14	Asynchronous motor field weakening coefficient 1	10.00～100.00	%	87.00	○
F01.15	Asynchronous motor field weakening coefficient 2	10.00～100.00	%	80.00	○
F01.16	Asynchronous motor field weakening coefficient 3	10.00～100.00	%	75.00	○
F01.17	Asynchronous motor field weakening coefficient 4	10.00～100.00	%	72.00	○
F01.18	Asynchronous motor field weakening coefficient 5	10.00～100.00	%	70.00	○
F01.19	synchronous motor stator resistance	1～60000 (Motor rated power ≤75kW) 0. 1～6000.0 (motor rated power > 75kW)	mΩ	Model confirmed	○
F01.20	Synchronous motor d-axis inductance	0.01～600.00 (Motor rated power ≤75kW) 0.001～60.000 (motor rated power > 75kW)	mH	Model confirmed	○
F01.21	Synchronous motor q-axis inductance	0.01～600.00 (Motor rated power ≤75kW) 0.001～60.000 (motor rated power > 75kW)	mH	Model confirmed	○
F01.22	Synchronous motor back electromotive force	10.0～2000.0 (back electromotive force at rated speed)	In	Model confirmed	○
F01.24	Encoder type	0: ABZ incremental encoder 4: rotary transformer		0	○
F01.25	Encoder Line Count	1～65535		1024	○
F01.26	Encoder zero pulse phase angle	0.0～359.9°		0.0	
F01.27	AB pulse phase sequence	0: Forward 1: Reverse		0	○

F01.30	Number of pole pairs of a rotary transformer	1～65535		1	○
F01.31	encoder high frequency filter coefficient	0～1		10	
F01.32	Speed feedback disconnection detection time	0.0～10.0 (0.0: Speed feedback disconnection detection is invalid)	s	0.0	○
F01.33	Speed feedback filtering time	0.000～30.000	s	0.002	○
F01.34	Motor parameter self-learning	0: No operation 1: Asynchronous machine static self-learning 2: Asynchronous machine rotating self-learning 10: No operation 11: Asynchronous machine static self-learning 12: Asynchronous machine rotating self-learning		0	○
F02	**Input terminal function group**				
F02.00	X1 Numeric Input Function Selection	0: No function 1: Run terminal RUN 2: Running direction F/R 3: Three-wire running stop control 4: Forward jog (FJOG) 5: Reverse jog (RJOG) 9: Free stop 10: Fault reset 11: Multi-speed terminal 1 12: Multi-speed terminal 2 13: Multi-speed terminal 3 14: Multi-speed terminal 4 19: Acceleration/deceleration time terminal 1 20: Acceleration/deceleration time terminal 2 21: Acceleration and deceleration prohibited 22: Operation paused 23: External Fault Input 30: Motor 1/Motor 2 switching 33: Zero Servo Commands 45: Shut down and apply DC braking 46: DC braking during shutdown 47: Immediate DC braking 48: Fastest DC braking		1	○
F02.01	X2 Numeric Input Function Selection			2	○
F02.02	X3 Numeric Input Function Selection			11	○
F02.03	X4 Numeric Input Function Selection			12	○
F02.04	X5 Numeric Input Function Selection			13	○
F02.05	X6 Numeric Input Function Selection			14	○
F02.06	X7 Numeric Input			10	○

	Function Selection	50: External Parking 57: Inverter Enable 58: Brake Inspection 59: Brake release feedback 60: Brake closure feedback 61: Absolute distance alignment 62: Positioning and Operation 63: Forward/Upward Deceleration Switch 64: Reverse/Ground Deceleration Switch 65: Forward Stop Switch 66: Reverse Stop Switch 67: Limiting shielding 68: Motor 1/Motor 2 switching (brake logic is invalid when active) 160: Anti-shake function disabled 161: Tower crane 90% torque limit input 162: Tower crane 80% torque limit input 163: Tower crane 100% weight limit input 164: Tower crane 80% weight limit input 165: Tower crane 50% weight limit input 166: Brake power-on check 172: Ultra-low speed operation			
F02.07	AI1 Numeric Input Function Selection			58	○
F02.08	AI2 digital input function selection			0	○
F02.09	AI3 Numeric Input Function Selection			0	○
F02.10	AI4 Numeric Input Function Selection (Expansion Card)			0	○
F02.11	X8 Numeric Input Function Selection (Expansion Card)			0	○
F02.12	X9 Numeric Input Function Selection (Expansion Card)			0	○
F02.13	X10 Numeric Input Function Selection (Expansion Card)			0	○
F02.15	Digital input terminal positive/negative logic 1	D7 D6 D5 D4 D3 D2 D1 D0 * X7 X6 X5 X4 X3 X2 X1 0: Positive logic closed loop valid / open loop invalid 1: Negative logic closed loop invalid / open loop valid		000 00000	○
F02.16	Digital input terminal positive/negative logic 2	D7 D6 D5 D4 D3 D2 D1 D0 X11 X10 X9 X8 AI4 AI3 AI2 AI1 0: Positive logic closed loop valid / open loop invalid 1: Negative logic closed loop invalid / open loop valid		000 00000	○

F02.17	Number of times the digital input terminal is filtered	0 to 100, where 0 represents no filtering and n indicates sampling every n ms.		2	○
F02.18	X1 Effective Delay Time	0.000～30.000	s	0.000	●
F02.19	X1 Invalid Delay Time	0.000～30.000	s	0.000	●
F02.20	X2 Effective Delay Time	0.000～30.000	s	0.000	●
F02.21	X2 Invalid Delay Time	0.000～30.000	s	0.000	●
F02.22	X3 Effective Delay Time	0.000～30.000	s	0.000	●
F02.23	X3 Invalid Delay Time	0.000～30.000	s	0.000	●
F02.24	X4 Effective Delay Time	0.000～30.000	s	0.000	●
F02.25	X4 Invalid Delay Time	0.000～30.000	s	0.000	●
F02.26	Minimum input pulse frequency	0.00～Maximum input pulse frequency F02.28	kHz	0.00	●
F02.27	Minimum input corresponding settings	-100.0～+100.0	%	0.0	●
F02.28	Maximum input pulse frequency	0.01～100.00	kHz	50.00	●
F02.29	Maximum input settings	-100.0～+100.0	%	100.0	●
F02.30	Pulse input filtering time	0.00～10.00	s	0.10	●
F02.31	Analog input function selection	Units digit: AI1 Tens digit: AI2 Hundreds: AI3 Thousands: AI4 (Expansion Card) 0: Analog Input 1: Digital input (0 for below 1V, 1 for above 3V, and the result in between is the same as the previous result)		0000D	○

F02.32	Analog input curve selection	Units digit: AI1 curve selection Tens digit: AI2 curve selection Hundreds digit: AI3 curve selection Thousands: AI4 Curve Selection 0: Curve 1 1: Curve 2 2: Curve 3 3: Curve 4		3210D	○
F02.33	Curve 1 Minimum Input	0.00～F02.35	In	0.10	●
F02.34	Curve 1 Minimum Input Corresponds to Given	–100.0～+100.0	%	0.0	●
F02.35	Curve 1 Maximum Input	F02.33～10.00	In	9.90	●
F02.36	Curve 1 Maximum Input Corresponds to Given	–100.0～+100.0	%	100.0	●
F02.37	Curve 2 Minimum Input	-10.00～F02.39	In	0.10	●
F02.38	Curve 2 Minimum Input Corresponds to Given	–100.0～+100.0	%	0.0	●
F02.39	Curve 2 Maximum Input	F02.37～10.00	In	9.90	●
F02.40	Curve 2 Maximum Input Corresponds to Given	–100.0～+100.0	%	100.0	●
F02.41	Curve 3 Minimum Input	0.00V～F02.43	In	0.10	●
F02.42	Curve 3 Minimum Input Corresponds to Given	–100.0～+100.0	%	0.0	●
F02.43	Curve 3 Inflection Point 1 Input	F02.41～F02.45	In	2.50	●

F02.44	Curve 3 inflection point 1 input corresponding to the given	–100.0～+100.0	%	25.0	●
F02.45	Curve 3 Inflection Point 2 Input	F02.43～F02.47	In	7.50	●
F02.46	Curve 3 Inflection Point 2 Input Corresponding to Given	–100.0～+100.0	%	75.0	●
F02.47	Curve 3 Maximum Input	F02.45～10.00	In	9.90	●
F02.48	Curve 3 Maximum Input Corresponds to Given	–100.0～+100.0	%	100.0	●
F02.49	Curve 4 Minimum Input	-10.00～F02.51	In	-9.90	●
F02.50	Curve 4 Minimum Input Corresponds to Given	–100.0～+100.0	%	-100.0	●
F02.51	Curve 4 Inflection Point 1 Input	F02.49～F02.53	In	-5.00	●
F02.52	Curve 4 Inflection Point 1 Input Corresponding to Given	–100.0～+100.0	%	-50.0	●
F02.53	Curve 4 Inflection Point 2 Input	F02.51～F02.55	In	5.00	●
F02.54	Curve 4 Inflection Point 2 Input Corresponding to Given	–100.0～+100.0	%	50.0	●
F02.55	Curve 4 Maximum Input	F02.53～10.00	In	9.90	●

F02.56	Curve 4 Maximum Input Corresponds to Given	-100.0～+100.0	%	100.0	●
F02.57	AI1 filtering time	0.000～10.000	s	0.100	●
F02.58	AI2 filtering time	0.000～10.000	s	0.100	●
F02.59	AI3 Filtering Time	0.000～10.000	s	0.100	●
F02.60	AI4 Filtering Time (Expansion Card)	0.000～10.000	s	0.100	●
F02.61	AD sampling hysteresis	2～50		2	○
F02.62	Analog Input AI1 Type Selection	0： 0～10V 3： -10～10V 4： 0～5V		0	○
F02.63	Analog Input AI2 Type Selection	0： 0～10V 1： 4～20mA 2： 0～20mA 4： 0～5V		1	○
F02.64	Analog Input AI3 Type Selection	0： 0～10V 1： 4～20mA 2： 0～20mA 4： 0～5V		0	○
F02.65	Analog Input AI4 Type Selection (Expansion Card)	0： 0～10V 2: Retain 3： -10～10V 4： 0～5V		2	○
F02.66	reserve				○
F02.67	reserve				○
F02.68	reserve				○
F02.69	reserve				○
F02.70	reserve				○
F02.71	reserve				○
F02.72	reserve				
F02.73	X11 Numeric Input Function Selection	0: No function		0	○
F02.74	X12 Numeric Input Function	0: No function		0	○

<table>
<tr><td></td><td>Selection</td><td></td><td></td><td></td><td></td></tr>
<tr><td>F02.75</td><td>Digital input terminal positive and negative logic 3</td><td><table><tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr><tr><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>X12</td><td>X11</td></tr></table>0: Positive logic closed (valid) / Open (invalid)
1: Inverse logic: Closed loop invalid / Open loop valid</td><td></td><td>00</td><td>○</td></tr>
<tr><td>F03</td><td colspan="5">Output terminal function group</td></tr>
<tr><td>F03.00</td><td>Y1 Output Function Selection</td><td rowspan="5">0: No output
1: Inverter running (RUN)
2: Output frequency reached (FAR)
3: Output frequency detection FDT1
4: Output frequency detection FDT2
5: Reverse operation (REV)
6: Jogging in progress
7: Inverter malfunction
8: Inverter preparation complete (READY)
9: Maximum frequency reached
10: Lower limit frequency reached
11: Current limiting effective
12: Overpressure stall effective
17: Motor overload warning
18: Inverter overheating pre-alarm
23: Zero Server
24: Undervoltage status
27: Running at zero speed</td><td></td><td>7</td><td>○</td></tr>
<tr><td>F03.01</td><td>Y2 Output Function Selection</td><td></td><td>33</td><td>○</td></tr>
<tr><td>F03.02</td><td>R1 Output Function Selection</td><td></td><td>28</td><td>○</td></tr>
<tr><td>F03.03</td><td>R2 Output Function Selection</td><td></td><td>7</td><td>○</td></tr>
<tr><td>F03.04</td><td>Y3 Output Function Selection (Expansion Card)</td><td></td><td>0</td><td>○</td></tr>
<tr><td colspan="2">28: Brake Control
29: Brake Inspection Tips
30: Overload protection activated</td><td>35: Weighing disconnection or overload alarm output
37: Rotary eddy current control
43: Abnormal power-on detection of the</td><td colspan="3"></td></tr>
</table>

31: Low voltage protection start 33: Brake failure 34: Motor and fan control		brake. 44: Select motor 1 is effective 45: Select motor 2 is effective			
F03.05	Output signal type selection	D7 D6 D5 D4 D3 D2 D1 D0 * * * * R2 R1 Y2 Y1 0: Level 1: Single pulse		00000	○
F03.06	Digital output positive/negative logic	D7 D6 D5 D4 D3 D2 D1 D0 * R4 R3 * R2 R1 Y2 Y1 0: Positive logic closed loop valid / open loop invalid 1: Negative logic closed loop invalid / open loop valid		00000	○
F03.07	Y2 Output Type Selection	0: Standard digital output; 1: High-frequency pulse output		0	○
F03.08	Output state control during jogging	D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 * | * | * | REV | FD T2 | FD T1 | FA R | RUN 0: Valid during jogging; 1: Invalid during jogging.		00000	○
F03.09	Y1 Effective Delay Time	0.000～30.000	s	0.00	●
F03.10	Y1 Invalid Delay Time	0.000～30.000	s	0.00	●
F03.11	Y2 Effective Delay Time	0.000～30.000	s	0.00	●
F03.12	Y2 Invalid Delay Time	0.000～30.000	s	0.00	●
F03.13	R1 effective delay time	0.000～30.000	s	0.00	●
F03.14	R1 Invalid Delay Time	0.000～30.000	s	0.00	●
F03.15	R2 effective delay time	0.000～30.000	s	0.00	●
F03.16	R2 Invalid Delay Time	0.000～30.000	s	0.00	●

F03.17	Y1 output single pulse time	0.000～30.000	s	0.250	●
F03.18	Y2 output single pulse time	0.000～30.000	s	0.250	●
F03.19	R1 outputs single pulse time	0.000～30.000	s	0.250	●
F03.20	R2 outputs single pulse time	0.000～30.000	s	0.250	●
F03.21	Analog output M1 selection	0: Operating frequency (absolute value) 1: Set frequency (absolute value) 2: Output torque (absolute value) 3: Set torque (absolute value)		0	○
F03.22	Analog output M2 selection	4: Output current 5: Output voltage 6: Bus voltage 7: Output power		2	○
F03.23	Y2 high-frequency pulse output function	See the Analog Output Terminal Function Table for details.		11	○
F03.24	Y2 high-frequency pulse output 100% corresponding frequency	0.00～100.00	kHz	50.00	●
F03.25	Y2 high-frequency pulse output 0% corresponds to the frequency	0.00～100.00	kHz	0.00	●
F03.27	M1 output bias	-100.0～100.0	%	0.0	●
F03.28	M1 Output Gain	-10.00～10.00		1.000	●
F03.29	M2 output bias	-100.0～100.0	%	0.0	●
F03.30	M2 Output Gain	-10.00～10.00		1.000	●
F03.31	PLC output terminal control logic selection	D7 D6 D5 D4 D3 D2 D1 D0 * R4 R3 * R2 R1 Y2 Y1 0: No output 1: Output		00000	●
F03.32	R3 Output Function Selection (Expansion	See F03.02 for details.		0	○

	Card)				
F03.33	R4 Output Function Selection (Expansion Card)	See F03.02 for details.		0	○
F03.34	Analog output type selection M1	0： 0～10V 1: 4～20mA 2: 0～20mA		0	○
F03.35	Analog output type selection M2			1	○
F04	**Start-stop control parameter group**				
F04.00	Startup method	0: Start directly		0	○
F04.01	Startup frequency	0.00～10.00	Hz	0.00	○
F04.02	Startup frequency retention time	0.00～60.00, 0.00 is invalid	s	0.00	○
F04.03	Starting DC braking current	0.0～100.0 (100.0 = motor rated current)	%	50.0	○
F04.04	DC braking time	0.00～30.00, 0.00 is invalid	s	0.00	○
F04.05	DC braking demagnetization time	0.00～30.00	s	0.00	○
F04.06	Pre-excitation current	50.0～500.0 (100.0 = no-load current)	%	100.0	○
F04.07	Pre-excitation time	0.00～10.00	s	0.10	○
F04.08	Speed tracking method	Units digit: Tracking start frequency 0: Maximum frequency 1: Shutdown frequency 2: Power frequency Tens: Search direction selection 0: Search only in the direction of the instruction. 1: If the speed cannot be found in the command direction, search in the opposite direction.		01	○
F04.10	Speed tracking deceleration time	0. 1～20.0	s	2.0	○

F04.11	Speed tracking current	30.0～150.0 (100.0 = inverter rated current)	%	50.0	○
F04.12	Speed tracking compensation gain	1.00～10.00		1.00	○
F04.14	Acceleration and deceleration methods	0: Linear acceleration/deceleration 1: Continuous S-curve acceleration/deceleration 2: Discontinuous S-curve acceleration/deceleration		0	○
F04.15	The initial period of the S-curve during acceleration	0.00～30.00（F15.13=0） 0.0～300.0 （F15.13=1） 0～3000（F15.13=2）	s	1.00	●
F04.16	The time interval at the end of the S-curve during acceleration	The setting range is the same as F04.15.	s	1.00	●
F04.17	The initial period of the S-curve during deceleration	The setting range is the same as F04.15.	s	1.00	●
F04.18	The time interval at the end of the S-curve during deceleration	The setting range is the same as F04.15.	s	1.00	●
F04.19	Parking methods	0: Decelerate and stop 1: Free parking		0	○
F04.20	Parking DC braking start frequency	0.00～Maximum frequency F00.16	Hz	0.00	○
F04.21	DC braking current for parking	0.0～100.0 (100.0 = motor rated current)	%	50.0	○
F04.22	DC braking time for parking	0.00～30.00 0.00: Invalid	s	0.00	○
F04.23	Parking DC braking demagnetization time	0.00～30.00	s	0.50	○
F04.24	Flux Braking Gain	100～200 (100: non-magnetic flux braking)		100	○

F04.26	Fault/Free-start method	0: Start using F04.00 configuration mode. 1: Speed tracking start		0	○
F04.27	Terminal start command reconfirmation	0: Unconfirmed 1: Confirmation required		0	○
F04.28	Minimum effective output frequency	0.00～50.00 (0.00: Function invalid)	Hz	0	○
F04.29	Zero speed judgment frequency	0.00～5.00	Hz	0.25	●
F04.30	Synchronizer Initial Magnetic Pole Search Method	0: Invalid 1: Method 1		1	●
F05	**V/F control parameter group**				
F05.00	V/F curve setting	0: Straight line V/F 1: Multi-point polyline V/F		0	○
F05.01	Multi-point VF frequency point F1	0.00～F05.03	Hz	0.50	●
F05.02	Multi-point VF voltage point V1	0.0～100.0 (100.0 = rated voltage)	%	1.0	●
F05.03	Multi-point VF frequency point F2	F05.01～F05.05	Hz	2.00	●
F05.04	Multi-point VF voltage point V2	0.0～100.0	%	4.0	●
F05.05	Multi-point VF frequency point F3	F05.03 ~ Rated frequency (reference frequency) of the motor	Hz	5.00	●
F05.06	Multi-point VF voltage point V3	0.0～100.0	%	10.0	●
F05.07	VF Separated Mode Voltage Source	0: VF separation voltage digital setting 1： AI1 2: AI2 3: AI3 4: High-frequency pulse (X7) 5： PID 6: Communication given Note: 100% is the rated voltage of the motor.		0	○
F05.08	VF Separation Voltage Digital Setting	0.0～100.0 (100.0 = motor rated voltage)	%	0.0	●

F05.09	VF voltage rise time	0.00～60.00	s	2.00	●
F05.10	V/F forward torque boost gain	0.00～200.00	%	3.50	●
F05.11	V/F slip compensation gain	0.00～200.00	%	0.00	●
F05.12	V/F Slip Filtering Time	0.00～100.00	s	1.00	●
F05.13	Oscillation suppression gain	0～20000		300	●
F05.14	Oscillation suppression cutoff frequency	0.00～600.00	Hz	55.00	●
F05.15	Droop control frequency	0.00～10.00	Hz	0.00	●
F05.16	Energy efficiency	0.00～50.00	%	0.00	●
F05.17	Energy-saving action time	1.00～60.00	s	5.00	●
F05.18	Synchronous machine flux compensation gain	0.00～500.00	%	100.00	●
F05.19	Synchronous machine flux compensation filter time constant	0.00～10.00	s	0.50	●
F05.20	VF separate power supply given rate of change	–50.00～50.00	%	0.00	●
F05.21	Manual torque boost cutoff frequency	0.00～50.00	Hz	50.00	●
F05.22	Automatic Torque Boost Gain	0～300		100	●
F05.23	Oscillation Suppression Method Selection	0～1		0	×

F05.24	Torque current filtering time constant	0.0～6500.0	Ms	0.0	×
F05.25	Excitation current filtering time constant	0.0～500.0	Ms	0.0	×
F05.26	Over-excitation enable potential	0～1		0	×
F05.27	Overexcitation current setting value	0.0～180.0	%	0.0	×
F05.28	Overexcitation operating voltage	110.0～140.0	%	0.0	×
F05.29	Overexcitation current adjustment proportional gain	0.00～100.00		0.00	×
F05.30	Overexcitation current adjusts integral time	0.00～600.00	Ms	0.00	×
F05.31	Overvoltage suppression, voltage regulation, proportional gain	0.00～600.00		0.00	×
F05.32	Overvoltage suppression frequency modulation integral time	0.00～600.00	Ms	0.00	×
F05.33	Undervoltage suppression frequency modulation integral time	0.00～600.00	Ms	0.00	×
F05.34	Torque booster ring proportional gain	0.00～600.00		0.50	×
F05.35	Torque boost loop integral time	0.00～600.00	ms	20.00	●
F06	**Vector control parameter set**				

F06.00	Speed proportional gain ASR_P1	0.00～100.00		12.00	●
F06.01	Velocity integral time constant ASR_T1	0.000～30.000 0.000: No points	s	0.250	●
F06.02	Speed proportional gain ASR_P2	0.00～100.00		10.00	●
F06.03	Velocity integral time constant ASR_T2	0.000～30.000 0.000: No points	s	0.300	●
F06.04	Switching frequency 1	0.00 ~ Switching frequency 2	Hz	5.00	●
F06.05	Switching frequency 2	Switching frequency 1 to maximum frequency F00.16	Hz	10.00	●
F06.06	No-load current gain	50.0～300.0	%	100.0	●
F06.07	Speed loop output filter time constant	0.000～0.100	s	0.001	●
F06.08	Vector control slip gain	10.00～200.00	%	100.00	●
F06.09	Speed control torque upper limit source selection	0: Set by F06.10 and F06.11		0	○
F06.10	Speed control electric torque upper limit	80.0～250.0	%	165.0	●
F06.11	Speed control braking torque upper limit	80.0～250.0	%	165.0	●
F06.12	Excitation Current Proportional Gain ACR-P1	0.00～10.00		0.50	●
F06.13	Excitation current integral time constant ACR-T1	0.00～300.00 0.00: No points	s	10.00	●
F06.14	Torque Current Proportional Gain ACR-P2	0.00～10.00		0.50	●

F06.15	Torque-current integral time constant ACR-T2	0.00～300.00 0.00: No points	s	10.00	●
F06.17	SVC zero-frequency processing method	0: Brake 1: No action taken 2: Sealing tube		2	
F06.18	SVC zero-frequency holding current	0.0～400.0	%	100.0	
F06.20	Voltage feedforward gain	0～100	%	0	●
F06.21	Field weakening control selection	Asynchronous machine units digit: Asynchronous field weakening mode; 0: No PI control output; Non-zero: PI control output. Tens: Asynchronous motor field weakening output voltage limiting method 0: F06.22 Output voltage limiting is based on bus voltage. 1: F06.22 Output voltage limiting is based on rated voltage. Synchronous motor unit: Synchronous motor field weakening mode 0: Invalid 1: Direct calculation 2: Automatic adjustment oftens digit: Synchronous motor field weakening output voltage limiting method 0: F06.22 Output voltage limiting is based on bus voltage. 1: F06.22 Output voltage limit is based on rated voltage.		12	○
F06.22	Weak magnetic coefficient	70.00～100.00	%	100.00	●
F06.23	Maximum field weakening current of synchronous motor	0.0～150.0 (100.0 is the rated current of the motor)	%	100.0	●
F06.24	Weakening regulator proportional	0.00～10.00		0.50	●

	gain				
F06.25	Integral time of field weakening regulator	0.000～60.000	s	0.200	●
F06.26	Synchronous machine MTPA control selection	0: Invalid 1: Valid		1	○
F06.27	Initial position self-learning gain	0～200	%	100	●
F06.28	Injection current low frequency band	0.00 ～ 100.00 (100.00 is the rated frequency of the motor)	%	10.00	●
F06.29	Low-frequency injection current	0.0 ～200.0 (100.0 is the rated current of the motor)	%	40.0	●
F06.30	Injection current low-frequency band regulator gain	0.00～10.00		0.50	●
F06.31	Injection current low-frequency band regulator integral time	0.00～300.00	ms	10.00	●
F06.32	Injected current high frequency band	0.00 ～ 100.00 (100.00 is the rated frequency of the motor)	%	20.00	●
F06.33	High-frequency injection current	0.0～30.0 (100.0 is the rated current of the motor)	%	8.0	●
F06.34	Injection current high-frequency band regulator gain	0.00～10.00		0.50	●
F06.35	Injection current high-frequency band regulator integral time	0.00～300.00	ms	10.00	●
F06.36	Synchronous machine magnetic saturation coefficient	0.00～1.00		0.60	○

F06.37	Velocity ring stiffness coefficient	0～20		11	●
F06.40	Reactive current amplitude injected by the synchronous machine	-50.0～+50.0	%	10.0	○
F06.41	Synchronous open-loop low-frequency processing method	0:VF 1:IF 2: Use IF to start and VF to stop. 3: Full-process SVC		0	○
F06.42	Synchronous open-loop low-frequency processing range	0.0～50.0	%	8.0	○
F06.43	IF Injection Current	0.0～600.0	%	80.0	○
F06.44	Magnetic pole pull-in current time constant	0.0～6000.0	ms	1.0	○
F06.45	Initial magnetic pole lead angle	0.0～359.9	°	0.0	○
F06.46	Synchronous machine speed tracking proportional gain	0.00～10.00		1.00	○
F06.47	Synchronous machine speed tracking integral gain	0.00～10.00		1.00	○
F06.48	Synchronous machine speed tracking filter time constant	0.00～10.00	ms	0.40	○
F06.49	Synchronous machine speed tracking control strength	1.0～100.0		5.0	○
F06.50	Synchronous machine speed tracking control threshold	0.00～10.00		0.20	○

F06.51	Rise time of active current injected into the synchronous machine	0. 1～50.0	s	5.0	○
F06.76	Low-speed correction factor for stator resistance of asynchronous motor	10.0～500.0	%	100.0	●
F06.77	Low-speed correction factor for rotor resistance of asynchronous motor	10.0～500.0	%	100.0	●
F06.78	Asynchronous motor slip gain switching frequency point	0. 10～Fmax	Hz	5.00	○
F06.79	Velocity ring differential time constant ASR Td1	0.000～10.000	S	0	●
F06.80	The velocity ring differential time constant ASR_Td2	0.000～10.000	S	0	●
F06.81	Velocity ring differential limiting	0.0～150.0	%	0	●
F06.82	Bus voltage filtering time constant	0.0～1500.0	ms	8.0	●
F07	**Protection Function**	**Settings Group**			
F07.00	Protective shielding	E20 | E22 | E13 | E0 6 | E05 | E04 | E07 | E08 0: Protection is effective; 1: Protection is blocked.		000 00000	○
F07.01	Motor overload protection gain	0.20～10.00		1.00	●
F07.02	Motor overload pre-alarm coefficient	50～100	%	80	●

F07.03	Motor temperature sensor type	0: No temperature sensor 1： PT100 2： PT1000 3： KTY84-130/150 4: PTC-130/150		0	●
F07.04	Motor overheat protection threshold	0～200	℃	110	●
F07.05	Motor overheating alarm threshold	0～200	℃	90	●
F07.06	Bus voltage control selection	0: Invalid 1: Undervoltage stall effective 2: Overpressure stall effective 3: Effective for both overvoltage and undervoltage stall.		0	○
F07.07	Overvoltage stall control voltage	120.0%～150.0% （380V, 100.0%=537V）	%	134.1	○
F07.08	Undervoltage stall control voltage	60.0 ~ Instantaneous stop without continuous recovery voltage (100.0 = standard bus voltage)	%	76.0	○
F07.09	Voltage determination after power outage	Voltage recovery is continuous even after a brief stop: ~100.0	%	86.0	○
F07.10	Delay time for determining the end of power outage	0.00～100.0	s	0.50	○
F07.11	Current limiting control	0: Invalid 1: Limiting Method 1 2: Limiting Method 2		2	○
F07.12	Current limiting level	20.0～180.0 (100.0 = inverter rated current)	%	150.0	●
F07.13	Fast rate limiting selection	0: Invalid 1: Valid		0	○
F07.14	Number of retries	0-20, 0: Fault retry is disabled.		0	○
F07.15	Digital output action selection during fault retry	0: No action 1: Action		0	○
F07.16	Fault retry interval	0.01～30.00	s	0.50	●
F07.17	Fault retry count and recovery	0.01～30.00	s	10.00	●

	time				
F07.18	Fault retry selection	E08 * E07 * E02 E06 E05 E04 0: Allow fault retries; 1: Disable fault retries		000000	○
F07.19	Fault Action Selection 1	E21 E16 E15 E14 E13 E12 E08 E07 0: Free parking; 1: Parking according to parking method		00000000	○
F07.20	Fault Action Selection 2	E28 E27 E25 E23 0: Free parking; 1: Parking according to parking method		0000	○
F07.21	Load drop protection selection	0: Invalid 1: Valid		0	●
F07.22	Load drop detection level	0.0～100.0	%	20.0	●
F07.23	Load drop detection time	0.0～60.0	s	1.0	●
F07.24	Load drop protection action selection	0: Report a fault, stop freely. 1: Report a fault and park according to the parking procedure.		1	○
F07.25	Motor overspeed detection level	0.0～50.0 (reference is the maximum frequency F00. 16)	%	20.0	●
F07.26	Motor overspeed detection time	0.0～60.0, 0.0: Disable motor overspeed protection	s	1.0	●
F07.27	AVR function	0: Invalid 1: Valid		1	○
F07.28	Stall fault detection time	0.0～6000.0, (0.0 does not detect stall faults)	s	0.0	○
F07.29	Stall control strength	0～100	%	20	○
F07.30	Instantaneous stop without stopping deceleration time	0.00～300.00	S	20.00	○
F07.32	Fault retry option 2	E10 E13 E15 E16 * E19 E20 * 0: Allow fault retries; 1: Disable fault retries		11111111	○

F07.34	Encoder wire breakage detection percentage	0～150.0	%	100.0	○
F07.35	Protection Shield 2	* * * * * * E18 E81 0: Protection is effective; 1: Protection is blocked.		000 00000	○
F07.36	Fault retry option 3	* * * * * * E09 E17 0: Allow fault retries; 1: Disable fault retries		11	○
F07.37	Power off, retain starting voltage	60.0～F07.38	%	76.0	○
F07.38	Power-on reading and voltage determination	F07.37～100.0	%	86.0	○
F07.39	Power-on read and determine delay time	0～100.0	S	5.00	○
F07.40	Steady-state undervoltage judgment delay time	50～6000	ms	20	○
F07.41	Input phase loss detection method selection	0: Software detection 1: Hardware detection (continuous detection) 2: Simultaneous detection of software and hardware 3: Hardware detection (in-process detection)		0	○
F07.42	Ground short circuit detection current setting value	0.00～100.0	%	20.0	○
F07.43	Warning blocking	* * * * * C32 C31 C30 0: Warning is valid; 1: Warning is blocked.		000000 00	○
F07.44	Upper limit of output phase loss detection current	10.0～100.0	%	30.0	○
F07.45	Output the number of phase loss detections	1～60000		10	○

F07.46	ILP hardware detection and judgment times	5～10000		100	●
F07.47	Soft start disconnect delay time	20～1000	mS	400	○
F08	**Multi-speed and simple PLC**				
F08.00	Multi-speed 1	0.00～Maximum frequency F00.16	Hz	0.00	●
F08.01	Multi-speed 2	0.00～Maximum frequency F00.16	Hz	5.00	●
F08.02	Multi-speed 3	0.00～Maximum frequency F00.16	Hz	10.00	●
F08.03	Multi-speed 4	0.00～Maximum frequency F00.16	Hz	15.00	●
F08.04	Multi-speed 5	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.05	Multi-speed 6	0.00～Maximum frequency F00.16	Hz	25.00	●
F08.06	Multi-speed 7	0.00～Maximum frequency F00.16	Hz	30.00	●
F08.07	Multi-speed 8	0.00～Maximum frequency F00.16	Hz	35.00	●
F08.08	Multi-speed 9	0.00～Maximum frequency F00.16	Hz	40.00	●
F08.09	Multi-speed 10	0.00～Maximum frequency F00.16	Hz	45.00	●
F08.10	Multi-speed 11	0.00～Maximum frequency F00.16	Hz	50.00	●
F08.11	Multi-speed 12	0.00～Maximum frequency F00.16	Hz	50.00	●
F08.12	Multi-speed 13	0.00～Maximum frequency F00.16	Hz	50.00	●
F08.13	Multi-speed 14	0.00～Maximum frequency F00.16	Hz	50.00	●
F08.14	Multi-speed 15	0.00～Maximum frequency F00.16	Hz	50.00	●
F08.15	Simplified PLC Operation Mode	0: Shutdown after a single run 1: Stop after a finite number of cycles 2: After a finite number of iterations, proceed according to the last segment. 3: Continuous cycle		0	●
F08.16	Finite number of iterations	1～10000		1	●
F08.17	Simple PLC memory selection	Units: Stop memory selection Tens: Power-off memory selection 0: No memory (starting from paragraph 1) 1: Memory (starting from the moment of power failure)		0	●
F08.18	Simplified PLC Time Unit	0: s (second) 1: min (minute)		0	●

F08.19	Section 1 settings	Units digit: Direction of movement selection 0: Forward rotation 1: Reverse rotation Tens: Acceleration/deceleration time selection 0: Acceleration/deceleration time 1 2: Acceleration/deceleration time 3 1: Acceleration/deceleration time 2 3: Acceleration/deceleration time 4		0	●
F08.20	First segment running time	0.0～6000.0	rpm	5.0	●
F08.21	Section 2 settings	Same F08.19		0	●
F08.22	Second segment running time	0.0～6000.0	rpm	5.0	●
F08.23	Section 3 settings	Same F08.19		0	●
F08.24	Third segment running time	0.0～6000.0	rpm	5.0	●
F08.25	Section 4 settings	Same F08.19		0	●
F08.26	4th segment running time	0.0～6000.0	rpm	5.0	●
F08.27	Section 5 settings	Same F08.19		0	●
F08.28	5th segment running time	0.0～6000.0	rpm	5.0	●
F08.29	Section 6 settings	Same F08.19		0	●
F08.30	6th segment running time	0.0～6000.0	rpm	5.0	●
F08.31	7th paragraph settings	Same F08.19		0	●
F08.32	7th segment running time	0.0～6000.0	rpm	5.0	●
F08.33	8th paragraph settings	Same F08.19		0	●
F08.34	8th segment running time	0.0～6000.0	rpm	5.0	●
F08.35	9th paragraph settings	Same F08.19		0	●
F08.36	9th segment running time	0.0～6000.0	rpm	5.0	●
F08.37	10th paragraph settings	Same F08.19		0	●

F08.38	10th segment running time	0.0～6000.0	rpm	5.0	●
F08.39	11th paragraph settings	Same F08.19		0	●
F08.40	11th segment running time	0.0～6000.0	rpm	5.0	●
F08.41	12th paragraph settings	Same F08.19		0	●
F08.42	12th segment running time	0.0～6000.0	rpm	5.0	●
F08.43	13th paragraph settings	Same F08.19		0	●
F08.44	13th segment running time	0.0～6000.0	rpm	5.0	●
F08.45	Setting in paragraph 14	Same F08.19		0	●
F08.46	14th segment running time	0.0～6000.0	rpm	5.0	●
F08.47	Section 15 settings	Same F08.19		0	●
F08.48	15th segment running time	0.0～6000.0	rpm	5.0	●
F09	**PID functiongroup**				
F09.00	PID given source	0: Digital PID given; 4: AI4 (expansion card) 1: AI1 5: PULSE (X7) 2: AI2 6: Communication given 3: AI3		0	○
F09.01	Digital PID given	0.0～PID setpoint feedback range F09.03		0.0	●
F09.02	PID feedback source	1: AI1 5: PULSE (X7) 2: AI2 6: Communication given 3: AI3 7: Reserved 4: AI4 (expansion card) 8: Output torque		1	○
F09.03	PID setpoint feedback range	0.1～6000.0		100.0	●
F09.04	PID Direct/Reverse Action Selection	Units digit: 0: positive effect; 1: negative effect Tens: Direction selection based on whether the command is active or passive. 0: Do not follow 1: Follow		0	○
F09.05	Proportional	0.00～100.00		0.40	●

	Gain 1				
F09.06	Integral Time 1	0.000～30.000, 0.000: No points awarded.	s	10.000	●
F09.07	Differential time 1	0.000～30.000	ms	0.000	●
F09.08	Proportional Gain 2	0.00～100.00		0.40	●
F09.09	Integral Time 2	0.000～30.000, 0.000: No points awarded.	s	10.000	●
F09.10	Differential time 2	0.000～30.000	ms	0.000	●
F09.11	PID parameter switching conditions	0: Do not switch 1: Switch via digital input terminal 2: Automatic switching based on deviation		0	●
F09.12	PID parameter switching deviation 1	0.00～F09.13	%	20.00	●
F09.13	PID parameter switching deviation 2	F09.12～100.00	%	80.00	●
F09.14	PID initial value	0.00～100.00	%	0.00	●
F09.15	PID initial value hold time	0.00～650.00	s	0.00	●
F09.16	PID output limit	F09.17～+100.0	%	100.0	●
F09.17	PID output lower limit	–100.0～F09.16	%	0.0	●
F09.18	PID Deviation Limit	0.00～100.00, (0.00 is invalid)	%	0.00	●
F09.19	PID derivative limiting	0.00～100.00	%	5.00	●
F09.20	PID integral separation threshold	0.00～100.00, (100.00% = Integral separation is invalid)	%	100.00	●
F09.21	PID given change time	0.000～30.000	s	0.000	●
F09.22	PID feedback filter time	0.000～30.000	s	0.000	●
F09.23	PID output filtering time	0.000～30.000	s	0.000	●
F09.24	PID feedback disconnection upper limit detection value	0.00～100.00 100.00 = Feedback disconnection invalid	%	100.00	●
F09.25	PID feedback disconnection lower limit detection value	0.00～100.00 0.00 = Feedback disconnection invalid	%	0.00	●

F09.26	PID feedback disconnection detection time	0.000～30.000	s	0.000	●
F09.27	PID sleep control selection	0: Invalid 1: Zero-speed hibernation 2: Lower limit frequency sleep mode 3: Sealing and Dormant		0	●
F09.28	Sleep Action Point	0.00～100.00 (100.00 corresponds to the PID setpoint feedback range)	%	100.00	●
F09.29	hibernation delay time	0.0～6500.0	s	0.0	●
F09.30	Awakening Action Points	0.00～100.00 (100.00 corresponds to the PID setpoint feedback range)	%	0.00	●
F09.31	Wake-up delay	0.0～6500.0	S	0.0	●
F09.32	Multi-segment PID control 1	0.0～PID setpoint feedback range F09.03		0.0	●
F09.33	Multi-segment PID control 2	0.0～PID setpoint feedback range F09.03		0.0	●
F09.34	Multi-segment PID control 3	0.0～PID setpoint feedback range F09.03		0.0	●
F09.35	Feedback voltage lower limit	Feedback voltage lower limit ~ 10.00	In	10.00	●
F09.36	upper limit of feedback voltage	0.00 ~ Upper limit of feedback voltage	In	0.00	●
F09.37	Selection of integral action within the given time interval of PID control	0: Always calculate the integral term 1: F09.21 The integral term will be calculated after the set time is reached. 2: Start calculating the integral term when the error is less than F09.38.		0	●
F09.38	The integral action of the PID input deviation within the given time interval	0.00～100.00	%	30	●
F09.39	Wake-up method selection	0: Target pressure F09.01 * Awakening action point coefficient 1: Awakening Action Point (F09.30)		0	○
F09.40	Awakening Action Point Coefficient	0.0～100.0 (100% corresponds to PID input)	%	90.0	●

F09.41	Pipeline overpressure alarm pressure	0.0～Pressure sensor range F09.03	bar	6.0	●
F09.42	Overpressure protection action time	0 to 3600 (0 is invalid)	s	0	●
F09.43	PID reverse limiting	0: Invalid 1: Valid		0	○
F10	**Communication Function Group**				
F10.00	Local Modbus communication address	1~247, 0 is the broadcast address		1	○
F10.01	Modbus communication baud rate	0：4800 3：38400 1：9600 4：57600 2：19200 5：115200		1	○
F10.02	Modbus data format	0: 1-8-N-1 (1 start bit + 8 data bits + 1 stop bit) 1: 1-8-E-1 (1 start bit + 8 data bits + 1 even parity + 1 stop bit) 2: 1-8-O-1 (1 start bit + 8 data bits + 1 odd parity + 1 stop bit) 3: 1-8-N-2 (1 start bit + 8 data bits + 2 stop bits) 4: 1-8-E-2 (1 start bit + 8 data bits + 1 even parity + 2 stop bits) 5: 1-8-O-2 (1 start bit + 8 data bits + 1 odd parity + 2 stop bits)		0	○
F10.03	Communication timeout	0.0s ～60.0s, 0.0: Invalid (also valid for master-slave configuration)	s	0.0	●
F10.04	Modbus response delay	1～20	ms	2	●
F10.05	Master-slave communication function selection	0: Invalid 1: Valid		0	○
F10.06	Master-slave selection	0: Slave 1: Master (broadcast)		0	○
F10.07	Host sends data	0: Output frequency; 3: Given torque 1: Set frequency 4: PID input 2: Output torque; 5: Output current		1	○
F10.08	Slave reception ratio coefficient	0.00～10.00 (multiples)		1.00	●
F10.09	Host transmission interval	0.000～30.000	s	0.200	●

F10.10	Communication protocol selection	0: Modbus-RTU protocol 2: CANopen protocol		0	○
F10.11	Profibus-DP card communication address	1～125		1	
F10.12	CANopen expansion card communication address	1～127		1	○
F10.13	DeviceNet expansion card communication address	1～63		1	
F10.14	Communication card process data response delay time	0.0～200.0	ms	0.0	○
F10.15	Expansion card and bus communication baud rate	Units digit: CANopen 0： 125K 1： 250K 2： 500K 3： 1M		23	○
F10.17 ～ F10.31	PZD2～PZD16 Receive Data Type Selection	When the displayed data is 65535, it means that the current PZD is reserved and unused; when it is displayed as something else, such as 4609, it means that the current function code F18.01 is selected (18D= 12H, 01D=01H, 1201H=4609D).		65535	○
F10.32 ～ F10.46	PZD2～PZD16 Send Data Type Selection			65535	○

F10.47	Communication card status	**Units digit: reserved** **Tenth digit: CANopen** 0: Initialization state 1: Pre-operation status 2: Operation Status 3: Stopped state 4: CANopen communication abnormal status 5: Modbus communication abnormal status 6: Factory Testing Status **Hundreds: Reserved**		000	×
F10.48	Communication card software version				×
F10.49	Number of process data received	1～16		2	●
F10.50	Number of process data sent	1～16		2	●
F10.51	Process data address setting method selection	0: Keyboard Settings 1: Main Site Configuration		0	●
F10.52	Communication card manual reset selection	0: Invalid 1: Valid		0	●
F10.56	485 EEPROM Write Processing Selection	0-10: Default operation (used during debugging) 11: Never trigger write operations (can be used after debugging is complete)		0	○
F10.57	SCI transmit timeout reset enable	0: Reset invalid; 1: Reset valid		1	●
F10.58	SCI send timeout reset delay time	110～10000		150	●
F10.59	CANopen communication timeout	0.10～600.00	S	600.00	S
F10.60	Inverter power-on indicator	0～1		1	×

F10.61	SCI response selection	0: Both read and write commands will be answered. 1: Read replies, write no reply 2: No response to either reading or writing.		0	○
F10.62	CANopen self-test identification code	0～65535		0	×
F11	**User-selected array**				
F11.00	User-selected parameter 1	The content displays U01.00, indicating that function code F01.00 has been selected.		U00.00	●
F11.01	User-selected parameter 2			U00.01	●
F11.02	User-selected parameter 3			U00.02	●
F11.03	User-selected parameter 4			U00.03	●
F11.04	User-selected parameter 5			U00.04	●
F11.05	User-selected parameter 6			U00.07	●
F11.06	User-selected parameter 7			U00.14	●
F11.07	User-selected parameter 8			U00.15	●
F11.08	User-selected parameter 9			U00.16	●
F11.09	User-selected parameter 10			U00.18	●
F11.10	User-selected parameter 11			U00.19	●
F11.11	User-selected parameter 12			U00.29	●
F11.12	User-selected parameter 13			U02.00	●
F11.13	User-selected parameter 14			U02.01	●
F11.14	User-selected parameter 15			U02.02	●

F11.15	User-selected parameter 16			U03.00	●
F11.16	User-selected parameter 17			U03.02	●
F11.17	User-selected parameter 18			U03.21	●
F11.18	User-selected parameter 19			U04.00	●
F11.19	User-selected parameters 20			U04.20	●
F11.20	User-selected parameter 21			U05.00	●
F11.21	User-selected parameter 22			U05.03	●
F11.22	User-selected parameter 23			U05.04	●
F11.23	User-selected parameter 24			U08.00	●
F11.24	User-selected parameter 25			U19.00	●
F11.25	User-selected parameter 26			U19.01	●
F11.26	User-selected parameter 27			U19.02	●
F11.27	User-selected parameter 28			U19.03	●
F11.28	User-selected parameter 29			U19.04	●
F11.29	User-selected parameter 30			U19.05	●
F12	**Keyboard and display function group**				
F12.00	MK Multifunction Key Selection	0: ESC function 1: Forward jog 2: Reverse jog 3: Forward/Reverse switch 4: Quick stop 5: Free stop 6: Move cursor left		1	○
F12.01	STOP button stop function selection	0: Valid only for keyboard control 1: Valid for all command channels		1	○

F12.02	Parameter locking	0: Unlocked 1: Unlocked for reference input 2: Lock all except this function code		0	●
F12.03	Parameter copy	0: No operation 1: Parameter upload keyboard 2: Parameter download to inverter		0	○
F12.04	LED display parameters 1	00000000～11111111 (0 indicates no display, 1 indicates display) bit0: Output frequency bit1: Set frequency bit2: Output current bit3: Output voltage bit4: DC bus voltage bit5: Output power bit6: Output torque bit7: Torque setpoint		00011111	●
F12.05	LED display parameters 2	00000000～01011101 (0 indicates no display, 1 indicates display) bit0: PG card feedback frequency bit1: Reserved bit2: Load speed bit3: Digital input terminal status 1 bit4: Digital input terminal status 2 bit5: Reserved bit6: Digital output terminal status bit7: Reserved		00000000	●
F12.09	Load speed display coefficient	0.01～600.00		30.00	●
F12.10	UP/DOWN acceleration/decelera tion rate	0.00: Automatic speed 0.01～500.00	Hz/s	5.00	○
F12.11	UP/DOWN offset zeroing selection	0: No clearing 1: Clear in non-running state 2: Reset to zero when UP/DOWN is invalid.		0	○
F12.12	UP/DOWN offset power-down storage selection	0: Do not store 1: Storage (only effective if the offset has been modified)		1	○
F12.13	Reset the electricity meter	0: No reset 1: Reset		0	●

F12.14	Restore factory settings	0: No operation 1: Restore factory settings (excluding motor parameters, inverter parameters, manufacturer parameters, running and power-on time records)		0	○
F12.15	Cumulative power-on time h	0～65535	h	XXX	×
F12.16	Cumulative power-on time (min)	0～59	min	XXX	×
F12.17	Cumulative running time h	0～65535	h	XXX	×
F12.18	Cumulative running time (min)	0～59	min	XXX	×
F12.19	Inverter rated power	0.40～650.00	kW	Model confirmed	×
F12.20	Inverter rated voltage	60～690	In	Model confirmed	×
F12.21	Inverter rated current	0.1～1500.0	A	Model confirmed	×
F12.22	Performance software serial number 1	XXX.XX		XXX.XX	×
F12.23	Performance software serial number 2	XX.XXX		XX.XXX	×
F12.24	Functional software serial number 1	XXX.XX		XXX.XX	×
F12.25	Functional software serial number 2	XX.XXX		XX.XXX	×
F12.26	Keyboard software serial number 1	XXX.XX		XXX.XX	×
F12.27	Keyboard software serial number 2	XX.XXX		XX.XXX	×
F12.28	Product serial number 1	XX.XXX		XX.XXX	×
F12.29	Product serial number 2	XXXX.X		XXXX.X	×

F12.30	Product serial number 3	XXXXX		XXXXX	×
F12.31	LCD Language Selection	0: Chinese 1: English		0	●
F12.32	Keyboard monitoring mode selection	0: Mode 0 1: Mode 1		1	●
F12.33	Mode 1 operating status display parameter 1 (LED stop status display parameter 5)	0.00～99.99		18.00	●
F12.34	Mode 1 operating status display parameter 2 (LED stop status display parameter 1)	0.00～99.99		18.01	●
F12.35	Mode 1 operating status display parameter 3 (LED stop status display parameter 2)	0.00～99.99		18.06	●
F12.36	Mode 1 operating status display parameter 4 (LED stop status display parameter 3)	0.00～99.99		18.08	●
F12.37	Mode 1 operating status display parameter 5 (LED stop status display parameter 4)	0.00～99.99		18.09	●
F12.38	LCD Display Parameters 1	0.00～99.99		18.00	●
F12.39	LCD large-scale display parameters 2	0.00～99.99		18.06	●

<table>
<tr><td>F12.40</td><td>LCD large-scale display parameters 3</td><td>0.00～99.99</td><td></td><td>18.09</td><td>●</td></tr>
<tr><td>F12.41</td><td>UP/DOWN zero-crossing selection</td><td>0: Zero crossing prohibited
1: Zero crossing permitted</td><td></td><td>0</td><td>○</td></tr>
<tr><td>F12.42</td><td>Digital potentiometer frequency setting</td><td>0.00～Maximum frequency 00.16</td><td>HZ</td><td>0.00</td><td>×</td></tr>
<tr><td>F12.43</td><td>Digital potentiometer torque setting</td><td>0.00～|Digital torque setpoint F13.02|</td><td>%</td><td>0.0</td><td>×</td></tr>
<tr><td>F12.46</td><td>ACLib version number</td><td></td><td></td><td>XXX.XX</td><td>×</td></tr>
<tr><td>F12.45</td><td>UP/DOWN function selection</td><td><table><tr><td>Channel sharing</td><td>scope limit</td><td>keyboard</td><td>communication</td><td>High-speed pulse</td><td>Analog quantity</td><td>Digital frequency</td><td>Multi-speed</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td colspan="8">0: Invalid 1: Valid</td></tr></table></td><td></td><td>00100010</td><td>○</td></tr>
<tr><td>F12.47</td><td>arbitrary address</td><td>0～65535</td><td></td><td>28673</td><td>●</td></tr>
<tr><td>F13</td><td colspan="5">Torque control parameter group</td></tr>
<tr><td>F13.00</td><td>Speed/torque control selection</td><td>0: Speed Control
1: Torque Control</td><td></td><td>0</td><td>○</td></tr>
<tr><td>F13.01</td><td>Torque source selection</td><td>0: Digital torque setpoint F13.02</td><td></td><td>0</td><td>○</td></tr>
<tr><td>F13.02</td><td>Digital torque command</td><td>-200.0～200.0 (100.0 = motor rated torque)</td><td>%</td><td>100.0</td><td>●</td></tr>
<tr><td>F13.03</td><td>Multi-stage torque 1</td><td>-200.0～200.0</td><td>%</td><td>0.0</td><td>●</td></tr>
<tr><td>F13.04</td><td>Multi-stage torque 2</td><td>-200.0～200.0</td><td>%</td><td>0.0</td><td>●</td></tr>
<tr><td>F13.05</td><td>Multi-stage torque 3</td><td>-200.0～200.0</td><td>%</td><td>0.0</td><td>●</td></tr>
<tr><td>F13.06</td><td>Torque control acceleration and deceleration time</td><td>0.00～120.00</td><td>s</td><td>0.05</td><td>●</td></tr>
</table>

F13.08	Upper frequency selection for torque control	0: Set by F13.09 1： AI1 2: AI2 3: AI3 4: AI4 (Expansion Card) 5: High-frequency pulse input (X7) 6: Communication given (percentage) 7: Communication setting (direct frequency setting)		0	○
F13.09	Torque control upper limit frequency	0.00～Maximum frequency F00.16	Hz	50.00	●
F13.10	Upper limit frequency offset	0.00～Maximum frequency F00.16	Hz	0.00	●
F13.11	Static friction torque compensation	0.0～100.0	%	0.0	●
F13.12	Static friction compensation frequency range	0.00～50.00	Hz	1.00	●
F13.13	Dynamic friction torque compensation	0.0～100.0	%	0.0	●
F13.18	Reverse speed limit selection	0～100	%	100	●
F13.19	Torque control speed priority enable	0: Disable 1: Enable		0	●
F14	**Motor 2 parameter group**				
F14.00	Motor type selection	0: Ordinary asynchronous motor 1: Variable frequency asynchronous motor		0	○
F14.01	Motor rated power	0. 10～650.00	kW	Model confirmed	○
F14.02	Motor rated voltage	50～2000	In	Model confirmed	○
F14.03	Motor rated current	0.01～600.00 (motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	A	Model confirmed	○
F14.04	Motor rated frequency	0.01～600.00	Hz	Model confirmed	○
F14.05	Motor rated speed	50～60000	rpm	Model confirmed	○

F14.06	Motor winding connection method	0: Y 1: D		Model confirmed	○
F14.07	Motor rated power factor	0.600～1.000		Model confirmed	○
F14.08	motor efficiency	30.0～100.0	%	Model confirmed	○
F14.09	asynchronous motor stator resistance	1～60000 (motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	mΩ	Model confirmed	○
F14.10	asynchronous motor rotor resistance	The setting range is the same as F14.09.	mΩ	Model confirmed	○
F14.11	Leakage inductance of asynchronous motor	0.01～600.00 (Motor rated power ≤75kW) 0.001～60.000 (Motor rated power >75kW)	mH	Model confirmed	○
F14.12	asynchronous motor mutual inductance	0. 1～6000.0 (Motor rated power ≤75kW) 0.01～600.00 (Motor rated power >75kW)	mH	Model confirmed	○
F14.13	No-load excitation current of asynchronous motor	0.01～600.00 (motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	A	Model confirmed	○
F14.14	Asynchronous motor field weakening coefficient 1	10.00～100.00	%	100.00	○
F14.15	Asynchronous motor field weakening coefficient 2	10.00～100.00	%	100.00	○
F14.16	Asynchronous motor field weakening coefficient 3	10.00～100.00	%	100.00	○
F14.17	Asynchronous motor field weakening coefficient 4	10.00～100.00	%	100.00	○
F14.18	Asynchronous motor field weakening coefficient 5	10.00～100.00	%	100.00	○
F14.24	Encoder type	0: ABZ incremental encoder 4: rotary transformer		0	○

F14.25	Encoder Line Count	1～65535		1024	○
F14.26	Encoder zero pulse phase angle	0.0～359.9°		0.0	○
F14.27	AB pulse phase sequence	0: Forward 1: Reverse		0	○
F14.28	UVW encoder phase sequence	0: Forward 1: Reverse		0	○
F14.29	UVW initial bias phase angle	0.0～359.9°		0.0	○
F14.30	Number of pole pairs of a rotary transformer	1～65535		1	○
F14.32	Speed feedback disconnection detection time	0.0～10.0 (0.0: Speed feedback disconnection detection is invalid)		0.0	○
F14.33	Speed feedback filtering time	0.000～0.100	s	0.002	○
F14.34	Motor parameter self-learning	0: No operation 1: Asynchronous machine static self-learning 2: Asynchronous machine rotating self-learning		0	○
F14.35	Motor 2 drive control method	0: V/F control (VVF) 1: Reserved 2: With speed sensor vector control (FVC)		0	○
F14.36	Speed proportional Gain ASR_P1	0.00～100.00		12.00	●
F14.37	Velocity integral time constant ASR_T1	0.000～30.000 0.000: No points	s	0.250	●
F14.38	Speed proportional Gain ASR_P2	0.00～100.00		10.00	●
F14.39	Velocity integral time constant ASR_T2	0.000～30.000 0.000: No points	s	0.300	●

F14.40	Switching frequency 1	0.00 ~ Switching frequency 2	Hz	5.00	●
F14.41	Switching frequency 2	Switching frequency 1 to maximum frequency F00.16	Hz	10.00	●
F14.42	Motor 2 no-load current gain coefficient	50.0～300.0	%	100.0	●
F14.43	Speed loop output filter time constant	0.000～0.100	s	0.001	●
F14.44	Vector control slip gain	50.00～200.00	%	100.00	●
F14.45	Speed control torque upper limit source selection	0: Set by F14.46 and F14.47		0	○
F14.46	Speed control electric torque upper limit	80.0～250.0	%	165.0	●
F14.47	Speed control braking torque upper limit	80.0～250.0	%	165.0	●
F14.48	Excitation Current Proportional Gain ACR-P1	0.00～10.00		0.50	●
F14.49	Excitation current integral time constant ACR-T1	0.00～600.00 0.00: No points	s	10.00	●
F14.50	Torque Current Proportional Gain ACR-P2	0.00～10.00		0.50	●
F14.51	Torque-current integral time constant ACR-T2	0.00～300.00 0.00: No points	s	10.00	●
F14.52	Position loop gain	0.000～40.000		1.000	●
F14.56	Voltage feedforward gain	0～100	%	0	●

F14.77	Motor 2 acceleration/dec elera tion time selection	0: Same as motor 1 1: Acceleration/deceleration time 1 2: Acceleration/deceleration time 2 3: Acceleration/deceleration time 3 4: Acceleration/deceleration time 4		0	○
F14.78	Maximum frequency of motor 2	20.00～600.00	Hz	50.00	○
F14.79	Motor 2 upper limit frequency	Lower limit frequency F00.19 ~ Maximum frequency F14.78	Hz	50.00	●
F14.80	Motor 2 V/F curve setting	0: Straight line V/F 1: Multi-point polyline V/F		0	○
F14.81	Motor 2 multi-point VF frequency point F1	0.00～600.00	Hz	0.50	●
F14.82	Motor 2 multi-point VF voltage point V1	0.0～100.0 (100.0 = rated voltage)	%	1.0	●
F14.83	Motor 2 multi-point VF frequency point F2	0.00～600.00	Hz	2.00	●
F14.84	Motor 2 multi-point VF voltage point V2	0.0～100.0	%	4.0	●
F14.85	Motor 2 multi-point VF frequency point F3	0.00～600.00	Hz	5.00	●
F14.86	Motor 2 multi-point VF voltage point V3	0.0～100.0	%	10.0	●
F14.87	Motor 2 parking method	0: Decelerate and stop 1: Free parking		0	○
F15	**Accessibility group**				
F15.00	Jogging frequency	0.00～Maximum frequency F00.16	Hz	5.00	●
F15.01	Inching acceleration time	0.00～650.00（F15.13=0） 0.0～	s	5.00	●
F15.02	Inching deceleration time		s	5.00	●

F15.03	Acceleration Time 2	6500.0 （F15.13=1） 0～65000（F15.13=2）	s	15.00	●
F15.04	Deceleration time 2		s	15.00	●
F15.05	Acceleration Time 3		s	15.00	●
F15.06	Deceleration time 3		s	15.00	●
F15.07	Acceleration Time 4		s	15.00	●
F15.08	Deceleration time 4		s	15.00	●
F15.09	Acceleration/d eceler ation time reference frequency	0: Maximum frequency F00.16 1: 50.00Hz		1	○
F15.10	Automatic acceleration/de celera tion time switching	0: Invalid 1: Valid		0	○
F15.11	Acceleration Time 1 and Time 2 Switching Frequency	0.00～Maximum frequency F00.16	Hz	0.00	●
F15.12	Deceleration Time 1 and Time 2 Switching Frequency	0.00～Maximum frequency F00.16	Hz	0.00	●
F15.13	acceleration/de celera tion time unit	0:0.01s 1:0.1s 2:1s		0	○
F15.14	Jump frequency point 1	0.00～600.00	Hz	600.00	●
F15.15	Jump range 1	0.00～20.00, 0.00: Invalid	Hz	0.00	●
F15.16	Jump frequency point 2	0.00～600.00	Hz	600.00	●
F15.17	Jump range 2	0.00～20.00, 0.00: Invalid	Hz	0.00	●
F15.18	Jump frequency point 3	0.00～600.00	Hz	600.00	●
F15.19	Jump range 3	0.00～20.00, 0.00: Invalid	Hz	0.00	●
F15.20	Output Frequency Arrival (FAR) Detection Width	0.00～50.00	Hz	2.50	○
F15.21	Output frequency	0.00～Maximum frequency F00.16	Hz	30.00	○

	detection FDT1				
F15.22	FDT1 hysteresis	-70.00～30.00	Hz	28.00	○
F15.23	Output frequency detection FDT2	0.00～Maximum frequency F00.16	Hz	20.00	○
F15.24	FDT2 hysteresis	-80.00～20.00	Hz	18.00	○
F15.25	Analog Level Detection ADT Selection	0: AI1 2: AI3 1: AI2 3: AI4 (Expansion Card)		0	○
F15.26	Analog Level Detection ADT1	0.00～100.00	%	20.00	●
F15.27	ADT1 Hysteresis	0.00～F15.26 (Valid only in downward direction)	%	5.00	●
F15.28	Analog Level Detection ADT2	0.00～100.00	%	50.00	●
F15.29	ADT2 Hysteresis	0.00～F15.28 (Valid only downwards)	%	5.00	●
F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		0	○
F15.31	Energy-consuming braking operating voltage	120.0～140.0 （380V, 100.0=537V）	%	128.5 (690V)	○
F15.32	Brake utilization	20～100 (100 indicates a duty cycle of 1)	%	100	●
F15.33	Setting the operating frequency to below the lower limit	0: Operating at the following frequency limits 1: Shutdown		0	○
F15.34	Fan control	0: Operation when powered on 1: Run at startup 2: Intelligent temperature control operation		1	○
F15.35	Overmodulation intensity	1.00～1.10		1.00	●
F15.36	PWM modulation mode switching selection	0: Invalid (7-segment PWM modulation) 1: Effective (5-segment PWM modulation)		0	○

F15.37	PWM modulation switching frequency	0.00～Maximum frequency F00.16	Hz	15.00	●
F15.38	Dead zone compensation mode selection	0: No compensation 1: Compensation Mode 1 2: Compensation Mode 2		1	○
F15.39	Terminal inching priority	0: Invalid 1: Valid		0	○
F15.40	Rapid stopping deceleration time	0.00～650.00（F15.13=0） 0.0～6500.0 （F15.13=1） 0～65000（F15.13=2）	s	1.00	●
F15.41	Output power display coefficient	50.00～150.00	%	100.00	●
F15.42	Output current display coefficient	50.00～150.00	%	100.00	●
F15.41	Output voltage display coefficient	50.00～150.00	%	100.00	●
F15.42	Output current display coefficient	50.00～150.00	%	100.0	●
F15.43	Output voltage display coefficient	50.00～150.00	%	100.0	●
F15.44	Current reaches detection value	0.0～300.0 (100.0% corresponds to the rated current of the motor)	%	100.0	●
F15.45	Current reaches hysteresis	0.0～F15.44	%	5.0	●
F15.46	Torque reaches the detection value	0.0～300.0 (100.0% corresponds to the rated torque of the motor)	%	100.0	●
F15.47	Torque reaches hysteresis	0.0～F15.46	%	5.0	●
F15.48	Encoder frequency division	1～256		1	●
F15.49	PG card high frequency filter coefficient	0～255		0	●
F15.62	PG card feedback frequency filtering time	0.000～30.000	S	0.010	●
F15.63	Speed reaches the ascent limit	0.00～Fmax	HZ	30.00	●

F15.64	Speed reaches filter time	0～60000	Ms	500	●
F15.65	Speed reaches descent limit	0.00～Fmax	HZ	0.00	●
F15.66	Overcurrent detection level	0. 1～300.0 (0.0 is not tested, 100.0% corresponds to the motor's rated current)	%	200.0	●
F15.67	Overcurrent detection delay time	0.00～600.00	s	0.00	●
F15.68	Market electricity price	0.00～100.00		1.00	○
F15.69	Power frequency load factor	30.0～200.0	%	90.0	○
F16	**Customized feature groups**				
F16.00	Industry Applications	0: General Model 3: Winding and unwinding applications		0	○
F16.01	Set length	1～65535（F16.13=0） 0. 1～6553.5（F16.13=1） 0.01～655.35（F16.13=2） 0.001～65.535（F16.13=3）	m	1000	●
F16.02	Pulses per meter	0. 1～6553.5		100.0	●
F16.03	Set count value	F16.04～65535		1000	●
F16.04	Specify count value	1～F16.03		1000	●
F16.05	Scheduled operation at set time	0.0～6500.0, 0.0: Invalid	min	0.0	●
F16.06	Agent password	0～65535		0	○
F16.07	Set cumulative power-on arrival time	0～65535, 0: Power-on timeout protection.	H	0	○
F16.08	Set cumulative running time	0~65535, 0: Protection timeout period.	H	0	○
F16.09	Factory Code	0～65535		XXXXX	●
F16.10	Percentage of analog output when set length/set count value is 0	0.00～100.00	%	0.00	○
F16.11	Percentage of analog output when the set length/set count value is set.	0.00～100.00	%	100.00	○

F16.13	Set length resolution	0:1m 1:0.1m 2:0.01m 3:0.001m		0	○
F16.14	Card slot type 1	0: No card 1: PROFINET card 2: EtherCAT card 3: CANopen card 4-9: Retain 10: Incremental encoder PG card 11: Incremental encoder PG card with UVW 12: Rotation PG Card 13: Sine and Cosine PG Cards 14: Incremental encoder PG card with frequency division 15-19: Retained 20: I/O Expansion Card 1 21-29: Retained 30: PLC card		XXXX	×
F16.15	Card slot type 2	Same as card slot 1		XXXX	×
F16.16	Card Slot 1 Software Serial Number 1	0.00～65.335		XXXX	×
F16.17	Card Slot 1 Software Serial Number 2	0.00～65.335		XXXX	×
F16.18	Card Slot 2 Software Serial Number 1	0.00～65.335		XXXX	×
F16.19	Card Slot 2 Software Serial Number 2	0.00～65.335		XXXX	×
F17	**Virtual I/O function group**				
F17.00	VX1 Virtual Input Function Selection	Same as group F02, digital input terminal function selection		0	○
F17.01	VX2 Virtual Input Function Selection			0	○
F17.02	VX3 Virtual Input Function Selection			0	○
F17.03	VX4 Virtual Input Function			0	○

	Selection				
F17.04	VX5 Virtual Input Function Selection			0	○
F17.05	VX6 Virtual Input Function Selection			0	○
F17.06	VX7 Virtual Input Function Selection			0	○
F17.07	VX8 Virtual Input Function Selection			0	○
F17.08	Virtual input positive/negative logic	D7 D6 D5 D4 D3 D2 D1 D0 VX8 VX7 VX6 VX5 VX4 VX3 VX2 VX1 0: Positive logic closed loop valid / open loop invalid 1: Negative logic closed loop invalid / open loop valid		00000000B	○
F17.09	VX1～VX8 Status Setting Selection	D7 D6 D5 D4 D3 D2 D1 D0 VX8 VX7 VX6 VX5 VX4 VX3 VX2 VX1 0: VXn status is the same as VYn output status 1: Status set by F17.10		00000000B	○
F17.10	VX1～VX8 Status Settings	D7 D6 D5 D4 D3 D2 D1 D0 VX8 VX7 VX6 VX5 VX4 VX3 VX2 VX1 0: Invalid 1: Valid		00000000B	●
F17.11	VX1 effective delay time	0.00～650.00	s	0.00	●
F17.12	VX1 Invalid Delay Time	0.00～650.00	s	0.00	●
F17.13	VX2 effective delay time	0.00～650.00	s	0.00	●
F17.14	VX2 Invalid Delay Time	0.00～650.00	s	0.00	●

F17.15	VX3 effective delay time	0.00～650.00	s	0.00	●
F17.16	VX3 Invalid Delay Time	0.00～650.00	s	0.00	●
F17.17	VX4 effective delay time	0.00～650.00	s	0.00	●
F17.18	VX4 Invalid Delay Time	0.00～650.00	s	0.00	●
F17.19	VY1 Virtual Output Function Selection	Same as group F03, digital output Y1 terminal function selection		0	○
F17.20	VY2 Virtual Output Function Selection			0	○
F17.21	VY3 Virtual Output Function Selection			0	○
F17.22	VY4 Virtual Output Function Selection			0	○
F17.23	VY5 Virtual Output Function Selection			0	○
F17.24	VY6 Virtual Output Function Selection			0	○
F17.25	VY7 Virtual Output Function Selection			0	○
F17.26	VY8 Virtual Output Function Selection			0	○
F17.27	Virtual output positive/negative logic	D7: VY8, D6: VY7, D5: VY6, D4: VY5, D3: VY4, D2: VY3, D1: VY2, D0: VY1 0: Positive logic closed loop valid / open loop invalid 1: Negative logic closed loop invalid / open loop valid		00000000B	○
F17.28	Virtual output terminal control selection	D7: VY8, D6: VY7, D5: VY6, D4: VY5, D3: VY4, D2: VY3, D1: VY2, D0: VY1		11111111B	○

		0: Determined by the status of terminals X1 to X5 1: Determined by the output function status			
F17.29	VY1 Effective Delay Time	0.00～650.00	s	0.00	●
F17.30	VY1 Invalid Delay Time	0.00～650.00	s	0.00	●
F17.31	VY2 effective delay time	0.00～650.00	s	0.00	●
F17.32	VY2 Invalid Delay Time	0.00～650.00	s	0.00	●
F17.33	VY3 effective delay time	0.00～650.00	s	0.00	●
F17.34	VY3 Invalid Delay Time	0.00～650.00	s	0.00	●
F17.35	VY4 effective delay time	0.00～650.00	s	0.00	●
F17.36	VY4 Invalid Delay Time	0.00～650.00	s	0.00	●
F17.37	Virtual input terminal status	VX8 | VX7 | VX6 | VX5 | VX4 | VX3 | VX2 | VX1 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 0: Invalid 1: Valid		00000000B	×
F17.38	Virtual output terminal status	VY8 | VY7 | VY6 | VY5 | VY4 | VY3 | VY2 | VY1 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 0: Invalid 1: Valid		00000000B	×
F18	**Monitoring parameter group**				
F18.00	Output frequency	0.00 ~ Upper limit frequency	Hz	0.00	×
F18.01	Set frequency	0.00～Maximum frequency F00.16	Hz	0.00	×
F18.02	PG feedback frequency	0.00 ~ Upper limit frequency	Hz	0.00	×
F18.03	Estimating feedback frequency	0.00 ~ Upper limit frequency	Hz	0.00	×
F18.04	Output torque	-200.0～200.0	%	0.0	×

F18.05	Torque setpoint	-200.0～200.0	%	0.0	×
F18.06	Output current	0.00～650.00 (Motor rated power ≤75kW) 0.0～6500.0 (Motor rated power >75kW)	A	0.00	×
F18.07	Output current percentage	0.0～300.0 (100.0 = inverter rated current)	%	0.0	×
F18.08	Output voltage	0.0～690.0	In	0.0	×
F18.09	DC bus voltage	0～1200	In	0	×
F18.10	Simple PLC running times	0～10000		0	×
F18.11	Simplified PLC operation stage	1～15		1	×
F18.12	Current PLC running time	0.0～6000.0		0.0	×
F18.14	Load speed	0～65535	rpm	0	×
F18.15	UP/DOWN offset frequency	0.00～655.35	Hz	0.00	×
F18.16	PID given	0.0 ~ PID maximum range		0.0	×
F18.17	PID feedback	0.0 ~ PID maximum range		0.0	×
F18.18	Electricity meter: MWh	0～65535	MWh	0	×
F18.19	Electricity meter: kWh	0.0～999.9	kWh	0.0	×
F18.20	Output power	-20.00～320.00	kW	0.00	×
F18.21	Output power factor	-1.000～1.000		0.000	×
F18.22	Digital input terminal status 1	X5 | X4 | X3 | X2 | X1 0/1 | 0/1 | 0/1 | 0/1 | 0/1		00000	×
F18.23	Digital input terminal status 2	AI3 | AI2 | AI1 | X7 | X6 0/1 | 0/1 | 0/1 | 0/1 | 0/1		00000	×
F18.24	Digital input terminal status 3	AI4 | * | X10 | X9 | X8 * | 0/1 | 0/1 | 0/1 | 0/1		XXX	×
F18.25	Output terminal status 1	* | R2 | R1 | Y2 | Y1 0/1 | 0/1 | 0/1 | 0/1 | 0/1		00000	×
F18.26	AI1	0.0～100.0	%	0.0	×
F18.27	AI2	0.0～100.0	%	0.0	×
F18.28	AI3	0.0～100.0	%	0.0	×

F18.29	AI4	-100.0～100.0	%	0.0	×
F18.30	Output terminal status 2	*	*	*	R3	R4 0/1	0/1	0/1	0/1	0/1		XXX	×
F18.31	High-frequency pulse input frequency: kHz	0.00～100.00	kHz	0.00	×
F18.32	High-frequency pulse input	0～65535	Hz	0	×
	frequency: Hz				
F18.33	Count value	0～65535		0	×
F18.34	Actual length	0～65535	m	0	×
F18.35	Remaining time for scheduled execution	0.0～6500.0	min	0.0	×
F18.36	Synchronous machin e rotor position	0.0～359.9°		0.0	×
F18.37	Rotation position	0～4095		0	×
F18.38	Motor temperature	0～200	℃	0	×
F18.39	VF separates the target voltage.	0～690	In	0	×
F18.40	VF separate output voltage	0～690	In	0	×
F18.41	View content from any address			0	×
F18.42	Brake inspection time display	0～0	h	0	×
F18.43	Zero servo position deviation	0～65535		0	×
F18.45	Braking release torque	-200.0～200.0	%	0.0	×
F18.46	Rotary tower deformation gain	5.536～60.000		0.000	×

F18.47	Speed loop input	0～100.00		0.00	×
F18.48	Given the tower body deformation angle	0～100.00		0.00	×
F18.51	PID output	-100.0～100.0	%		×
F18.58	Feedback pulse high level	0～65535		XXX	×
F18.59	Feedback pulse low bit	0～65535		XXX	×
F18.60	Inverter temperature	-40～200	℃	0	×
F18.67	Energy saved (MWH)	Cumulative energy savings (MWH)	MWh	0～65535	×
F18.68	Energy saved (kWh)	Cumulative energy savings (kWh)	kWh	0.0～999.9	×
F18.69	Thousands of yuan saved in electricity bills	Cumulative electricity cost savings are high (*1000)		0～65535	×
F18.70	Electricity cost savings	Low cumulative electricity cost savings		0.0～999.9	×
F18.71	Power frequency energy consumption MWh	Power frequency energy consumption (MWH)	MWh	0～65535	×
F18.72	Power frequency energy consumption (kWh)	Power frequency power consumption (kWh)	kWh	0.0～999.9	×
F18.73	reserve				
F18.74	reserve				
F18.75	reserve				
F18.76	reserve				
F18.77	reserve				
F18.78	reserve				
F18.79	reserve				
F18.80	reserve				
F18.81	reserve				
F18.82	Digital input terminal status 4	*	*	*	*	*	*	X12	X11 |					0/1	0/1		00	×
F19	**Fault Recording Group**				

F19.00	Most recent fault category	0: No fault For fault codes, please refer to Chapter 6, Troubleshooting.		0	×
F19.01	Output frequency during fault	0.00 ~ Upper limit frequency	Hz	0.00	×
F19.02	Output current during fault	0.00～650.00 (Motor rated power ≤75kW) 0.0～6500.0 (Motor rated power >75kW)	A	0.00	×
F19.03	Bus voltage during fault	0～1200	In	0	×
F19.04	Operating status during failure	0: Not running 1: Forward acceleration 2: Reverse acceleration 3: Forward deceleration 4: Reverse deceleration 5: Forward constant speed 6: Reverse constant speed		0	×
F19.05	Working time during failure		h	0	×
F19.06	Previous fault category	Same as F19.00 parameter description		0	×
F19.07	Output frequency during fault		Hz	0.00	×
F19.08	Output current during fault		A	0.00	×
F19.09	Bus voltage during fault		In	0	×
F19.10	Operating status during failure	Same as F19.04 parameter description		0	×
F19.11	Working time during failure		h	0	×
F19.12	First and second fault categories	Same as F19.00 parameter description		0	×
F19.13	Output frequency during fault		Hz	0.00	×
F19.14	Output current during fault		A	0.00	×

F19.15	Bus voltage during fault		In	0	×
F19.16	Operating status during failure	Same as F19.04 parameter description		0	×
F19.17	Working time during failure		h	0	×
F20	**Crane-specific basic function group**				
F20.00	Selection of lifting mechanisms	0: Closed-loop lifting mechanism 1: Open-loop lifting mechanism 2: Car Amplitude 3: Open-loop rotary mechanism 4: Closed-loop rotary mechanism 5: Retain 6: Retain 7: Construction hoist without speed feedback 8: Concrete mixing plant		0	○
F20.01	Braking curve type	0: Frequency and current arrive simultaneously for braking control. 1: Frequency reaches braking control 2: No braking control		0	○
F20.02	Starting direction	0: The direction of brake release frequency is the same as the direction of operation. 1. The direction of brake release frequency is always forward.		1	○
F20.03	Stop direction	0: When the brake is closed, the direction of velocity is the same as the direction of travel. 1. When the brakes are engaged, the direction of velocity is always in the positive direction.		0	○
F20.04	Braking release current	0.0～100.0	%	20.0	●

F20.05	F20.00=2: Brake release frequency f1 during reversing F20.00=3 or 4: Brake release frequency f1 when turning left F20.00 = Other:Brake release frequency f1 during lifting	Lower limit frequency ~20.00	Hz	0.40	●
F20.06	F20.00=2: Braking release frequency f1 during forward movement F20.00=3 or 4: Brake release frequency f1 when turning right F20.00 = Other:Brake release frequency f1 during descent	Lower limit frequency ~20.00	Hz	0.40	●
F20.07	Brake release delay t1	0.0～10.0	s	0.1	●
F20.08	Brake release delay t2	0.0～10.0	s	0.5	●
F20.09	Brake release current abnormal judgment time	0.0～10.0	s	3.0	●
F20.10	F20.00=2: Braking closing frequency f3 during reversal F20.00=3 or 4: Braking frequency f3 when turning left F20.00 = Other: Brake closing	Lower limit frequency ~20.00	Hz	0.20	●

	frequency f3 during lifting				
F20.11	F20.00=2: Braking closing frequency f3 during forward movement F20.00=3 or 4: Braking frequency f3 right when turning right F20.00 = Other: Braking closing frequency f3 during descent	Lower limit frequency ~20.00	Hz	0.20	●
F20.12	Brake closing delay t3	0.0～60.0	s	0.0	●
F20.13	Delay t4 after brake closure	0.0～60.0	s	0.5	●
F20.14	Inverse control of instructions	0: Reverse direction is not allowed during operation. 1: Allows direct reverse operation during runtime.		1	○
F20.15	Restart during braking	0: Restarting is not allowed during the braking process. 1: Restarting is permitted during the braking process.		0	○
F20.16	Restart waiting time	0.0～10.0	s	0.1	○
F20.17	Brake feedback application	0: No brake feedback used 1: Used for motion detection 2: Used for full-process monitoring		0	○
F20.18	Acceleration and deceleration time varies with gear selection	0: Invalid 1: Valid		0	○
F20.19	DC braking current rise time	0.00～20.00	s	0.00	●
F20.20	Brake fault detection pulse count when stopped	0～10000 (0: Brake check and protection ineffective)		2000	●

F20.21	Brake failure reduces speed	Lower limit frequency ~20.00	Hz	0.00	●
F20.22	Immediate acceleration after deceleration - disabling function selection	0: Invalid 1: Valid		0	○
F20.23	Deceleration delay time	0.000～20.000	s	1.000	●
F20.24	Output inversion	0: Invalid 1: Valid		0	○
F20.25	Open-loop zero-servo function selection	0: Invalid 1: Effective 2: Automatic		0	●
F20.26	Brake check torque	60.0～180.0	%	150.0	●
F20.27	Brake torque holding time check	3.0～10.0	s	4.0	●
F20.28	Brake inspection upper limit frequency	Lower limit frequency ~ Upper limit frequency Fup	Hz	2.00	●
F20.29	Brake inspection forward detection delay	0.0～10.0	s	0.8	●
F20.30	Brake inspection reverse detection delay	0.0～10.0	s	0.8	●
F20.31	Brake inspection interval	0 to 1000 (0: invalid)	h	0	●
F20.32	Eddy current cut -in frequency	0.00～50.00	Hz	5.00	
F20.33	Eddy current control time	0～3600		00	●
F20.34	Cancel method selection after zero-servo automatic action	0: Cancel after brake check passes 1: Cancel after handle moves down once 2: Run and exit		1	○
F20.35	Zero servo automatic action count	1～5		1	○

F20.36	Zero servo hold time	1.0～30.0	s	3.0	○
F20.37	Control lever not returning to zero judgment time	0.0～30.0 (0.0 is invalid)	s	0.0	○
F20.38	Motor (stator and rotor) resistance low-frequency switching frequency	0～10.00	Hz	0	●
F20.39	Braking current drop time	0～20.00	s	1.00	○
F20.40	Id low frequency switching frequency	0.5～10.00	Hz	5.00	●
F20.41	VF curve mode selection	0: Same for both upward and downward lines		0	○
F20.42	Downward VF voltage point V1	0.0～100.0	%	3.5	●
F20.43	Downward VF voltage point V2	0.0～100.0	%	7.5	●
F20.44	Downward VF voltage point V3	0.0～100.0	%	14.0	●
F20.45	Position pulse high level	0～65535		0	●
F20.46	Position pulse low level	0～9999		0	●
F20.47	Pulse direction	0: Direction unchanged 1: Reverse direction		0	○
F20.48	High-order initial value of pulse number	0～65535		20000	○
F20.49	Initial value of low-order pulse number	0～9999		0	○
F20.50	Pulse count reset	0: No operation 1: Force reset		0	○
F20.51	Low-speed operation mode selection	0: Operate at the given frequency multiplied by the gain		0	○

F20.52	Frequency reduction gain	0～1		1000	●
F20.53	Frequency reduction bias	0～1		0	●
F20.54	Frequency reduction speed selection	0～1		1	○
F20.58	Speed limit after zero-servo exit	0.00～Motor rated frequency	Hz	0.00	
F20.59	SVC anomaly detection time	0～60.000	s	0.000	●
F20.60	SVC abnormal hysteresis torque	0～100.0	%	10.0	●
F20.61	SVCAbnormal Synchronization Frequency Judgment Threshold	0～50.00	Hz	2.00	●
F20.62	SVC abnormal sealing time	0～60.000	s	0.500	●
F20.63	Stator resistance low-frequency gain	1.0～500.0	%	100.0	●
F20.64	Rotor resistance low-frequency gain	20.0～500.0	%	100.0	●
F20.65	Eddy current control time unit	0: Seconds 1: Hours		0	○
F20.66	Reverse gear for rapid deceleration effectively enables	0～1		0	○
F20.67	Rotational control moment of inertia	0～6.000	Kg*m2	0	○
F20.68	Tower deformation angle coefficient	0～4.000		0	○
F20.69	Rotary motor torque filtering time	0～65.535	s	0.100	○
F20.70	Rotary motor speed estimation	0～65.535	s	0.100	○

	filtering time				
F20.71	Filtering time for turret deformation angle		s	0.100	○
F20.72	Rotation given deformation angle filtering time	0～65.535	s	5.000	○
F20.73	Slewing torque steady-state calculation delay time	0～65.535	s	10.000	○
F20.74	Low-frequency switching point of rotational deformation coefficient	0～10.00	HZ	5.00	○
F20.75	Rotational deformation coefficient accelerates filtering time	0～65.535	s	2.000	○
F20.76	Rotational deformation coefficient deceleration filtering time	0～65.535	s	0.200	○
F20.77	Rotation deformation coefficient switching mode	0: Kφ is switched by estimated frequency; 1: Kφ is switched by acceleration/deceleration output frequency.		0	○
F20.81	speed ratio of reducer	0.0～300.00		0.00	○
F20.82	Number of times the speed reducer fault was detected	0～10		0	○
F20.83	Gearbox failure shutdown method	0～1 0: Free Stop 1: Quick shutdown		1	○

F20.84	Percentage of feedback pulse error between the roller and the main unit	0.00～100.00	%	35.00	○
F20.85	Roller encoder line count	1～65535		36	○
F20.86	Gearbox fault setting number of revolutions	1～100		3	○
F20.87	Brake fault detection torque	0.0～F20.26	%	60.0	○
F20.88	Brake fault detection torque holding time	0.0～F20.27	s	3.0	○
F20.89	Brake power-on detection pulse count	0.0～F20.20		0	○
F20.90	Brake power-on fault detection speed limit	0.00～Fmax		0	○
F20.91	Brake power-on mode selection	0～2 0: No detection; 1: Automatic detection after power-on; 2: Terminal function triggered detection;		0	○
F20.92	Percentage of detected hook-ups	0～100.0 (Motor rated frequency; this function is invalid when the value is 0)	%	0.0	○
F20.93	Percentage of hanging frequency error	0～100.0	%	0.0	○
F20.94	Torque being detected	0～200.0	%	0.0	○
F20.95	Reverse operating frequency after being hung	0～20.00	Hz	0.00	○
F20.96	Reverse running time after being hung	0～10.0	s	0.0	○
F20.97	V/F reverse torque boost gain	0.00～10.00	%	2.10	○
F21	**Crane-specific advanced function group**				

F21.00	Overload protection torque limit threshold	0.0～150.0 (0.0: Protection invalid)	%	0.0	●
F21.01	Load detection time	0.0～5.0	s	1.5	●
F21.02	Load detection frequency percentage	10.0～100.0	%	80.0	●
F21.03	Upward Light Load High Speed Ratio	100.0～400.0	%	100.0	○
F21.04	Upward heavy load low speed ratio	10.0～100.0	%	100.0	○
F21.05	Upward slack rope torque	0.0～100.0	%	0.0	●
F21.06	Upward allowable load torque	F21.05～F21.07	%	100.0	○
F21.07	Upward heavy load torque	F21.06～250.0	%	100.0	●
F21.08	Downlink light load high speed ratio	100.0～400.0	%	100.0	●
F21.09	Downlink heavy load low speed ratio	10.0～100.0	%	100.0	○
F21.10	Downward slack rope torque	0.0～100.0	%	0.0	●
F21.11	Downward allowable load torque	F21.10～F21.12	%	100.0	●
F21.12	Downward heavy load torque	F21.11～250.0	%	100.0	●
F21.13	Fault terminal output selection when brake fails	0: No output		0	○
F21.15	Low voltage protection function selection	0: Not used 1. Use undervoltage protection		1	○

F21.16	Low voltage protection point	70.0～100.0	%	90.0	●
F21.17	Low voltage protection filter time	0.0～10.0	s	0.5	●
F21.18	Power-on parameter self -learning selection	0: No self-study 1: Conduct self-learning		0	○
F21.19	Motor fan control delay	0.0～600.0	s	100.0	●
F21.20	Jog switching judgment time	0.0～20.0	s	0.0	○
F21.21	Special acceleration	0: Do not use 1: Use		0	○
F21.22	Special deceleration	0: Do not use 1: Use		0	○
F21.23	Acceleration frequency switching point 1	0.00～600.00	Hz	5.00	●
F21.24	Deceleration frequency switching point 1	0.00～600.00	Hz	8.00	●
F21.25	Acceleration frequency switching point 2	0.00～600.00	Hz	50.00	●
F21.26	Deceleration frequency switching point 2	0.00～600.00	Hz	15.00	●
F21.27	Acceleration frequency switching point 3	0.00～600.00	Hz	50.00	●
F21.28	Deceleration frequency switching point 3	0.00～600.00	Hz	30.00	●

F21.29	Deceleration limit frequency limit points (DI=63,64)	0.00～ F00.16	HZ	20.00	●
F21.30	100% weight limit downlink frequency	0.00～ F01.04	HZ	15.00	●
F21.31	80% weight limit uplink frequency limit	0.00～ F00.16	HZ	0.00	●
F21.32	80% weight limit downlink frequency	0.00～ F00.16	HZ	0.00	●
F21.33	50% weight limit uplink frequency	0.00～ F00.16	HZ	0.00	●
F21.34	50% weight limit downlink frequency	0.00～ F00.16	HZ	0.00	●
F21.35	90% torque limit downshift frequency restriction	0.00～ F01.04	HZ	15.00	●
F21.36	80% torque limit upward frequency restriction	0.00～ F00.16	HZ	0.00	●
F21.37	80% torque limit downshift frequency restriction	0.00～ F00.16	HZ	0.00	●
F21.38	Deceleration switch optimization function selection	0: No optimization 1: Deceleration Optimization		0	○

F21.39	linear change in DC braking current during parking action delay time	0.00~30.00 0: No linear switching process	s	0	●
F21.40	Parking DC braking current linear switching time	0.00~30.00	s	0	●
F21.41	Parking DC braking current linear switching target value	0.0~400.0	%	0	●
F21.50	Rated load	0～6.00	t	2.00	○
F21.51	empty cage weight	0～6.00	t	1.50	○
F21.52	Weighing signal Feedback terminal 1	0: None 2: AI2 1: AI1 3: AI3		0	○
F21.53	Weighing signal feedback terminal 2	0: None 2: AI2 1: AI1 3: AI3		0	○
F21.54	Weighing sensor range	0～6.00	t	3.00	○
F21.55	Sensor sensitivity	0.0～2.0	mV	1.6	○
F21.56	Magnification	0.0～800.0		415.0	○
F21.57	Overload detection delay time	0.000～10.000	s	1.000	○
F21.58	Weighing sensor wire breakage detection level (single channel)	0～6.00	t	0.30	○
F21.59	Delay time for load cell wire breakage detection	0.000～10.000	s	0.000	○
F21.60	Weighing test correction coefficient Kx	0.00～200.00	%	100.00	●
F21.61	Weighing self-learning weight increase	0～6.00	t	0	○

F21.62	Weighing self-learning	0: Off 1: First point weighing self-learning (zeroing) 2: Second point weighing self-learning (calibration)		0	○
F21.63	Weighing signal 1:Weight (actual value)	0～6.00	t	0	×
F21.64	Weighing signal 2:Weight (actual value)	0～6.00	t	0	×
F21.65	Actual weight (net weight)	0～6.00	t	0	×
F21.66	Actual weight percentage (net weight)	0～200.00	%	0.00	×
F21.72	GPS communication interruption time	0～65535	min	0	×
F21.73	No communication lock time	2～200	h	24	○
F21.75	GPS status	3: Release		3	×
F21.76	Authorized mobile phone number for control terminal	0～10000		10000	●
F21.77	GPS SIM card ID	0～10000		10000	●
F21.78	GPS software version	0～65535		0	×
F21.79	GPS Protocol Selection	0: Standard GPS controller 1: Old version of the dongle		0	○
F21.83	Huaxing Locked -up Status	0: Deactivated status		0	×
F36	**Automatic leveling control system control parameter group**				
F36.00	Leveling operation mode selection	0: Automatic leveling is ineffective. 1: Automatic leveling is effective		0	○
F36.01	Shortest distance for high-speed operation	F36.02～65535	puls e	1000	○
F36.02	Shortest distance for medium-speed	0～F36.01	puls e	200	○

	operation				
F36.03	Uplink docking accuracy	0～65535	pulse	15	○
F36.04	Downlink docking accuracy	0～65535	pulse	20	○
F36.05	Upbound Expressway	F36.07～Maximum frequency F00.16	Hz	50.00	○
F36.06	Downstream Expressway	F36.08～Maximum frequency F00.16	Hz	50.00	○
F36.07	medium speed on the uphill	F36.09～F36.05	Hz	20.00	○
F36.08	Downward medium speed	F36. 10～F36.06	Hz	20.00	○
F36.09	Upward crawling speed	0.00～F36.07	Hz	5.00	○
F36.10	Downward crawling speed	0.00～F36.08	Hz	5.00	○
F36.11	Encoder direction	0: Forward 1: Reverse		0	○
F36.12	Encoder Line Count	1～200		50	○
F36.13	Gear circumference	0.0～6000.0		367.8	○
F36.14	Current speed	-30.000～30.000	m/s	XXX	×
F36.15	Overspeed protection speed	0.000～10.000	m/s	1.000	○
F36.16	Target floor pulse low level	0～65535		XXX	×
F36.17	High pulse level of target floor	0～65535		XXX	×
F36.18	Limit switch pulse calibration	0: Invalid 1: Lower limit calibration		0	○
F36.19	Floor height self-learning mode	0: Invalid 1: Self-learning		0	○
F36.20	Self-learning floor settings	1～80 1: Invalid		1	○
F36.21	Leveling location confirmation	0: Invalid 1: Valid		0	○

F36.22	Limit switch stop mode selection	Units digit: Upper limit 0: Quick stop 1: Deceleration stop 2: Free stop Tens digit: Lower limit 0: Quick stop 1: Deceleration stop 2: Free stop Hundreds digit: Threshold limit 0: Quick stop 1: Deceleration stop 2: Free stop Thousands digit: Total limit 0: Quick stop 1: Deceleration stop 2: Free stop		0	○
F36.23	Reserve (pulse source selection)	0: PG card 1: DI terminal		0	○
F36.24	Encoder orientation detection time	0.000～10.000 0.000: Detection invalid		1.000	○
F36.25	Encoder wire breakage detection time	0.000～10.000 0.001: Detection invalid		1.000	○
F36.26	Warning sign	0～24		XXX	×
F36.27	1st floor compensation pulse	0～32767	pulse	400	○
F36.28	Leveling threshold	0～65535	pulse	100	○
F36.29	Pulse loss	0: Not lost 1: Pulse lost		XXX	×
F36.30	Number of brakes	0～3		0	○
F36.31	Brake rated current	0.0～100.0	A	2.0	○
F36.32	Brake short circuit protection threshold	0.00～500.00	%	200.00	○
F36.33	Brake wire breakage detection time	0.00～10.00	s	5.00	○
F36.34	Brake current abnormal threshold	0.00～100.00	%	50.00	○

F36.35	Buzzer enable switch	0: Invalid 1: Valid		0	○
F36.36	Warning blocking	C24 C23 C22 C21 C20 C19 C18 C17 0: Unblocked 1: Blocked		00000010	○
F37	**Automatic leveling floor control parameter group**				
F37.00	Current pulse count low bit	0～65535	pulse	XXX	X
F37.01	Current pulse number high byte	0～65535	pulse	XXX	X
F37.02	Current floor	1～80		XXX	X
F37.03	Target floor	0～80		1	●
F37.04	Hold (call floor 1)				
F37.05	Hold (call floor 2)				
F37.06	Hold (call floor 3)				
F37.07	Hold (call floor 4)				
F37.08	Hold (call floor 5)				
F37.09	Self-learning floor number	1～80		XXX	X
F37.10	Maximum floor	1～80		1	○
F37.11	Minimum value limit of bottom-level pulse	0～65535	pulse	65535	○
F37.12	1st floor crawling speed selection	0: Use crawling speed of group F36 during the crawling phase. 1: Use multi-speed F08.14 during the crawling phase.		0	○
F37.13	Lower limit pulse low position	0～65535	pulse	1000	○
F37.14	Lower limit pulse high level	0～65535	pulse	0	○
F37.15	Retain (lower bit of the upper limit pulse)	0～65535	pulse	XXX	X
F37.16	Retain (high bit of the upper limit pulse)	0～65535	pulse	XXX	X
F38	**Automatic floor leveling height parameter group**				

F38.00	Clear floor height information	0: Invalid 1: Clear		0	○
F38.01	Floor height of the first floor	-32767～32767	pulse	0	○
F38.02	Second floor height	-32767～32767	pulse	0	○
F38.03	3rd floor height	-32767～32767	pulse	0	○
F38.04	4th floor height	-32767～32767	pulse	0	○
F38.05	5th floor height	-32767～32767	pulse	0	○
F38.06	6th floor height	-32767～32767	pulse	0	○
F38.07	7th floor height	-32767～32767	pulse	0	○
F38.08	8th floor height	-32767～32767	pulse	0	○
F38.09	9th floor height	-32767～32767	pulse	0	○
F38.10	10th floor height	-32767～32767	pulse	0	○
F38.11	11th floor height	-32767～32767	pulse	0	○
F38.12	12th floor height	-32767～32767	pulse	0	○
F38.13	13th floor height	-32767～32767	pulse	0	○
F38.14	14th floor height	-32767～32767	pulse	0	○
F38.15	15th floor height	-32767～32767	pulse	0	○
F38.16	16th floor height	-32767～32767	pulse	0	○
F38.17	17th floor height	-32767～32767	pulse	0	○
F38.18	18th floor height	-32767～32767	pulse	0	○
F38.19	19th floor height	-32767～32767	pulse	0	○
F38.20	20th floor height	-32767～32767	pulse	0	○
F38.21	21st floor height	-32767～32767	pulse	0	○
F38.22	22nd floor height	-32767～32767	pulse	0	○

F38.23	23rd floor height	-32767～32767	pulse	0	○
F38.24	24th floor height	-32767～32767	pulse	0	○
F38.25	25th floor height	-32767～32767	pulse	0	○
F38.26	26th floor height	-32767～32767	pulse	0	○
F38.27	27th floor height	-32767～32767	pulse	0	○
F38.28	28th floor height	-32767～32767	pulse	0	○
F38.29	29th floor height	-32767～32767	pulse	0	○
F38.30	30th floor height	-32767～32767	pulse	0	○
F38.31	31st floor height	-32767～32767	pulse	0	○
F38.32	32nd floor height	-32767～32767	pulse	0	○
F38.33	33rd floor height	-32767～32767	pulse	0	○
F38.34	34th floor height	-32767～32767	pulse	0	○
F38.35	35th floor height	-32767～32767	pulse	0	○
F38.36	36th floor height	-32767～32767	pulse	0	○
F38.37	37th floor height	-32767～32767	pulse	0	○
F38.38	38th floor height	-32767～32767	pulse	0	○
F38.39	39th floor height	-32767～32767	pulse	0	○
F38.40	40th floor height	-32767～32767	pulse	0	○
F38.41	41st floor height	-32767～32767	pulse	0	○
F38.42	42nd floor height	-32767～32767	pulse	0	○
F38.43	43rd floor height	-32767～32767	pulse	0	○
F38.44	44th floor height	-32767～32767	pulse	0	○
F38.45	45th floor height	-32767～32767	pulse	0	○
F38.46	46th floor height	-32767～32767	pulse	0	○

F38.47	47th floor height	-32767～32767	pulse	0	○
F38.48	48th floor height	-32767～32767	pulse	0	○
F38.49	49th floor height	-32767～32767	pulse	0	○
F38.50	50th floor height	-32767～32767	pulse	0	○
F38.51	51st floor height	-32767～32767	pulse	0	○
F38.52	52nd floor height	-32767～32767	pulse	0	○
F38.53	53rd floor height	-32767～32767	pulse	0	○
F38.54	54th floor height	-32767～32767	pulse	0	○
F38.55	55th floor height	-32767～32767	pulse	0	○
F38.56	56th floor height	-32767～32767	pulse	0	○
F38.57	57th floor height	-32767～32767	pulse	0	○
F38.58	58th floor height	-32767～32767	pulse	0	○
F38.59	59th floor height	-32767～32767	pulse	0	○
F38.60	60th floor height	-32767～32767	pulse	0	○
F38.61	61st floor height	-32767～32767	pulse	0	○
F38.62	62nd floor height	-32767～32767	pulse	0	○
F38.63	63rd floor height	-32767～32767	pulse	0	○
F38.64	64th floor height	-32767～32767	pulse	0	○
F38.65	65th floor height	-32767～32767	pulse	0	○
F38.66	66th floor height	-32767～32767	pulse	0	○
F38.67	67th floor height	-32767～32767	pulse	0	○
F38.68	68th floor height	-32767～32767	pulse	0	○
F38.69	69th floor height	-32767～32767	pulse	0	○
F38.70	70th floor height	-32767～32767	pulse	0	○

F38.71	71st floor height	-32767～32767	pulse	0	○
F38.72	72nd floor height	-32767～32767	pulse	0	○
F38.73	73rd floor height	-32767～32767	pulse	0	○
F38.74	74th floor height	-32767～32767	pulse	0	○
F38.75	75th floor height	-32767～32767	pulse	0	○
F38.76	76th floor height	-32767～32767	pulse	0	○
F38.77	77th floor height	-32767～32767	pulse	0	○
F38.78	78th floor height	-32767～32767	pulse	0	○
F38.79	79th floor height	-32767～32767	pulse	0	○
F38.80	80th floor height	-32767～32767	pulse	0	○
F45	**Modbus communication free mapping group**				
F45.00	Modbus communication free mapping enabled	0: Invalid 1: Valid		0	●
F45.01	Source address 1	0～65535		0	●
F45.02	Mapped address 1	0～65535		0	●
F45.03	Read gain 1	0.00～100.00		1.00	●
F45.04	Source address 2	0～65535		0	●
F45.05	Mapped address 2	0～65535		0	●
F45.06	Read gain 2	0.00～100.00		1.00	●
F45.07	Source address 3	0～65535		0	●
F45.08	Mapped address 3	0～65535		0	●
F45.09	Read gain 3	0.00～100.00		1.00	●
F45.10	Source address 4	0～65535		0	●
F45.11	Mapped address 4	0～65535		0	●
F45.12	Read gain 4	0.00～100.00		1.00	●
F45.13	Source address 5	0～65535		0	●
F45.14	Mapped address 5	0～65535		0	●
F45.15	Read gain 5	0.00～100.00		1.00	●

F45.16	Source address 6	0～65535		0	●
F45.17	Mapped address 6	0～65535		0	●
F45.18	Read gain 6	0.00～100.00		1.00	●
F45.19	Source address 7	0～65535		0	●
F45.20	Mapped address 7	0～65535		0	●
F45.21	Read gain 7	0.00～100.00		1.00	●
F45.22	Source address 8	0～65535		0	●
F45.23	Mapped address 8	0～65535		0	●
F45.24	Read gain 8	0.00～100.00		1.00	●
F45.25	Source address 9	0～65535		0	●
F45.26	Mapped address 9	0～65535		0	●
F45.27	Read gain 9	0.00～100.00		1.00	●
F45.28	Source address 10	0～65535		0	●
F45.29	Mapped address 10	0～65535		0	●
F45.30	Read gain 10	0.00～100.00		1.00	●
F45.31	Source address 11	0～65535		0	●
F45.32	Mapped address 11	0～65535		0	●
F45.33	Read gain 11	0.00～100.00		1.00	●
F45.34	Source address 12	0～65535		0	●
F45.35	Mapped address 12	0～65535		0	●
F45.36	Read gain 12	0.00～100.00		1.00	●
F45.37	Source address 13	0～65535		0	●
F45.38	Mapped address 13	0～65535		0	●
F45.39	Read gain 13	0.00～100.00		1.00	●
F45.40	Source address 14	0～65535		0	●
F45.41	Mapped address 14	0～65535		0	●
F45.42	Read gain 14	0.00～100.00		1.00	●
F45.43	Source address 15	0～65535		0	●
F45.44	Mapped address 15	0～65535		0	●
F45.45	Read gain 15	0.00～100.00		1.00	●
F45.46	Source address 16	0～65535		0	●

F45.47	Mapped address 16	0～65535		0	●
F45.48	Read gain 16	0.00～100.00		1.00	●
F45.49	Source address 17	0～65535		0	●
F45.50	Mapped address 17	0～65535		0	●
F45.51	Read gain 17	0.00～100.00		1.00	●
F45.52	Source address 18	0～65535		0	●
F45.53	Mapped address 18	0～65535		0	●
F45.54	Read gain 18	0.00～100.00		1.00	●
F45.55	Source address 19	0～65535		0	●
F45.56	Mapped address 19	0～65535		0	●
F45.57	Read gain 19	0.00～100.00		1.00	●
F45.58	Source address 20	0～65535		0	●
F45.59	Mapped address 20	0～65535		0	●
F45.60	Read gain 20	0.00～100.00		1.00	●
F45.61	Source address 21	0～65535		0	●
F45.62	Mapped address 21	0～65535		0	●
F45.63	Read gain 21	0.00～100.00		1.00	●
F45.64	Source address 22	0～65535		0	●
F45.65	Mapped address 22	0～65535		0	●
F45.66	Read gain 22	0.00～100.00		1.00	●
F45.67	Source address 23	0～65535		0	●
F45.68	Mapped address 23	0～65535		0	●
F45.69	Read gain 23	0.00～100.00		1.00	●
F45.70	Source address 24	0～65535		0	●
F45.71	Mapped address 24	0～65535		0	●
F45.72	Read gain 24	0.00～100.00		1.00	●
F45.73	Source address 25	0～65535		0	●
F45.74	Mapped address 25	0～65535		0	●
F45.75	Read gain 25	0.00～100.00		1.00	●
F45.76	Source address 26	0～65535		0	●
F45.77	Mapped address 26	0～65535		0	●

F45.78	Read gain 26	0.00～100.00		1.00	●
F45.79	Source address 27	0～65535		0	●
F45.80	Mapped address 27	0～65535		0	●
F45.81	Read gain 27	0.00～100.00		1.00	●
F45.82	Source address 28	0～65535		0	●
F45.83	Mapped address 28	0～65535		0	●
F45.84	Read gain 28	0.00～100.00		1.00	●
F45.85	Source address 29	0～65535		0	●
F45.86	Mapped address 29	0～65535		0	●
F45.87	Read gain 29	0.00～100.00		1.00	●
F45.88	Source address 30	0～65535		0	●
F45.89	Mapped address 30	0～65535		0	●
F45.90	Read gain 30	0.00～100.00		1.00	●
F46	**Anti-sway function group**				
F46.00	Anti-sway function of the car	0: Invalid 1: Valid		0	○
F46.01	Rope length source selection	0: Encoder pulse 1: Reserved 2: Point-to-point communication		2	○
F46.02	Maximum anti-shake time limit	0.00～50.0s	s	15.0	○
F46.03	Set the pendulum length at point A.	0.00～200.00m	m	0.00	○
F46.04	Set the pendulum length to point A, pulse high position	0～65535		0	○
F46.05	Set the pendulum length to point A, pulse low position	0～9999		0	○
F46.06	Set the pendulum length at point B.	0.00～200.00m	m	0.00	○

F46.07	Set the pendulum length to point B, pulse high position	0～65535		0	○
F46.08	Set the pendulum length to point B, low pulse position	0～9999		0	○
F46.09	Pulse calculation of pendulum length	-200.00～200.00m	m	0.00	×
F46.10	Point-to-point communication pendulum	0.00～200.00m	m	0.00	×
F46.11	Distance between hook and center of gravity of load	0.00～100.00m	m	10.00	○
F46.12	The rated operating frequency of the trolley motor	0.00～655.35	Hz	0.00	×
F46.13	The rated operating speed of the trolley	0.000～10.000	m/s	2.000	○
F46.14	Car shaking suppression coefficient	0.00～655.35 (0 means secondary gain is off)		0	○
F46.15	The coefficient of resistance of the small vehicle (zeta)	0.000～1.000		0.001	●
F46.16	The swaying of the vehicle suppresses the second-order gain (Gain2).	0.00～655.35		1.00	●
F46.17	Car sway compensation coefficient (Kp)	0.00～10.00		1.00	●

F46.18	Low-frequency switching point for trolley sway compensation	0.00～100.00	Hz	2.00	●
F46.19	Deceleration compensation coefficient decay time	0.000～60.000	s	1.000	○
F46.20	Acceleration compensation coefficient over a long period of time	0.000～60.000	s	0.500	○
F46.21	Inching detection frequency	0.00～600.00	Hz	10.00	○
F46.22	Inching detection time	0.000～60.000	s	15.000	○
F46.23	Deceleration compensation coefficient decay time (jogging)	0.000～60.000	s	1.000	○
F46.24	Suppression coefficient during acceleration	0.00～100.00		0	○
F46.25	Exit suppression coefficient during acceleration	0.00～655.35		2.00	○
F46.26	Suppress compensation frequency during acceleration	0.00～655.35	Hz	5.00	○
F46.27	Suppression coefficient during deceleration	0.00～655.35		0	○
F46.28	Exit suppression coefficient during deceleration	0.00～655.35		1.00	○
F46.29	Suppress compensation frequency during deceleration	0.00～655.35	Hz	5.00	○

F46.30	Current instruction frequency	-50.00～50.00	Hz	0	×
F46.31	Current output frequency	-50.00～50.00	Hz	0	×
F46.32	Current compensation frequency	-10.00～10.00	Hz	0	×
F46.33	The current model calculates the swing angle.	-3.000～-3.000	rad	0	×
F46.34	Current speed of the car	-10.000～10.000	m/s	0	×
F46.35	Current effective pendulum length	0.00～200.00m	m	0	×
F46.36	Current compensation coefficient	0～655.35		0	×
F46.37	Output current	0.00～100.00	A	0	×

Part 7 Parameter Description

7.1 F00 group basic function parameter group

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.01	Motor 1 drive control method	0: V/F control (VVF) 1: Sensorless vector control (SVC) 2: Sensor-equipped vector control (FVC)		2	○

F00.01=0: V/F control (VVF)

It can be used in applications where one device can drive multiple devices or where speed and precision requirements are not high.

F00.01=1: Sensorless Vector Control (SVC)

Open-loop vector control is suitable for typical high-performance control applications, where one frequency converter can only drive one motor.

F00.01=2: Speed sensor vector control (FVC) is present.

Closed-loop vector control requires an encoder to be installed on the motor, and the frequency converter must be equipped with a PG card of the same type as the encoder. It is suitable for high-precision speed or torque control applications. One frequency converter can only drive one motor.

1. To improve control performance, the motor parameters need to be self-learned before the vector control mode is run in order to obtain the correct motor parameters;

2. In vector control mode, the frequency converter can only be equipped with one motor, and the capacity of the motor and the capacity of the frequency converter should not differ too much, otherwise it may cause a decrease in control performance or the system to fail to work properly.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.02	Command source selection	0: Keyboard control (LOC/REM light on) 1: Terminal control (LOC/REM light off) 2: Communication control (LOC/REM light flashing)		1	○

F00.02=0: Keyboard control (LOC/REM light on)

The inverter's start and stop are controlled by the RUN, STOP, and multi-function keys on the keyboard. In a fault-free condition, pressing the multi-function key enters the jog operation mode; pressing the RUN key enters the running mode. A solid green LED on the RUN key indicates the inverter is running, while flashing indicates it is decelerating and stopping. Regardless of whether the reference input control mode is speed or torque, jogging always operates at the jog speed input control mode when jogging is active.

F00.02=1: Terminal control (LOC/REM light off)

The start and stop control terminals defined by function codes F02.00 to F02. 14 control the start and stop of the frequency converter. The detailed settings of the terminal control are determined by F00.03.

F00.02=2: Communication control (LOC/REM light flashes)

The inverter's start and stop are controlled by the host computer via the RS485 communication port. See Chapter 1 for details on the 7000H control word.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.03	Terminal control method selection	0: Terminal RUN operation, F/R forward/reverse rotation 1: Terminal RUN forward rotation, F/R reverse rotation 2: Terminal RUN forward rotation, Xi stop, F/R reverse rotation 3: Terminal RUN operation, Xi stop, F/R forward/reverse rotation		1	○

Terminal RUN: Set Xi terminal to "1: Run terminal RUN"

Terminal F/R: Terminal Xi is set to "2: Running Direction F/R"

Terminal control can be divided into two-wire and three-wire control methods.

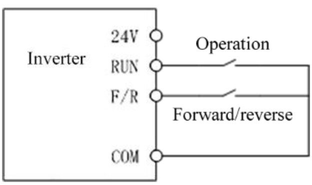
Two-wire control:

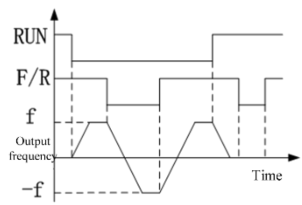
F00.03=0: Terminal RUN operation, F/R forward/reverse rotation

The RUN terminal ON/OFF controls the start and stop of the frequency converter, and the F/R terminal OFF/ON controls forward/reverse rotation; if F00.21 is set to 1, and reverse rotation is prohibited, the F/R terminal is invalid. When the stopping mode is deceleration stop, the logic diagram is shown in Figure 7-1(b).

F00.03=1: Terminal RUN rotates forward, F/R rotates in reverse.

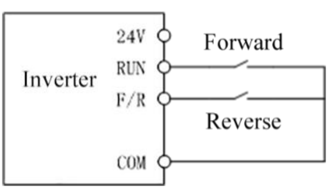
The RUN terminal ON/OFF controls the inverter's forward rotation and stop, while the F/R terminal ON/OFF controls its reverse rotation and stop. When both the RUN and F/R terminals are ON simultaneously, the inverter maintains its original state. The F/R terminal is ineffective when reverse rotation is disabled. When deceleration stop is selected as the stopping mode, the forward/reverse logic is shown in Figure 7-1(d).

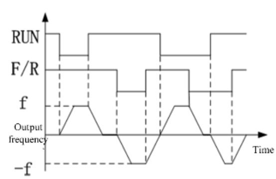




(a) Schematic diagram of two-wire control wiring with F00.03=0

(b) Logic for forward/reverse operation with F04.20=0 and F00.03=0





(c) F00.03=1 Two-wire control wiring Diagram

d) F04.20=0, F00.03=1 forward/reverse operation logic

Figure 7-1 Two-wire control

When the start/stop selection (F00.03) is set to 0 or 1, the inverter will stop running even if the RUN terminal is ON, by pressing the STOP button STOP or using an external stop command. In this case, the RUN terminal must be OFF once and then ON again before it can resume operation.

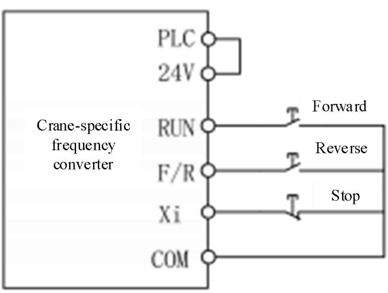
Three-line control:

F00.03=2: Terminal RUN rotates forward, Xi stops, F/R rotates in reverse.

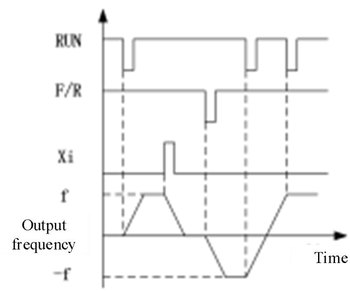
RUN is the normally open forward run button, and F/R is the normally open reverse run button; both are pulse edge active. Xi is the normally closed stop button, level active. Pressing the Xi button during operation will stop the vehicle. The logic diagram for deceleration stop when the stop mode is selected as F04.20=0 is shown in Figure 7-2(b). Xi is the terminal among X1 to X7 that has been defined as 'three-wire operation and stop control' by F02.00 to F02.06.

F00.03=3: Terminal RUN starts, Xi stops, F/R rotates forward/reverse.

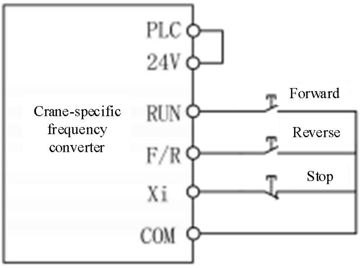
-RUN is a normally open run button, active on the pulse edge; F/R is a forward/reverse switch (open for forward rotation, closed for reverse rotation); Xi is a normally closed stop button, active at a voltage level. When the stop mode is selected as F04.20=0 for deceleration stop, the logic diagram is shown in Figure 7-2(d).



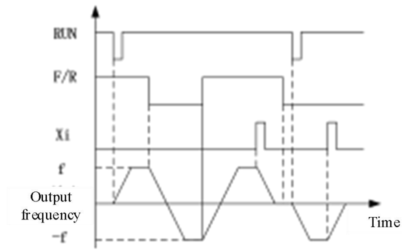
(a) Schematic diagram of three-wire control with F00.03=2logic



(b) Forward/reverse operation with F04.20=0 and F00.03=2



(c) Three-wire control wiring diagram for F00.03=3



(d) Forward/reverse operation logic for F04.20=0, F00.03=3

Figure 7-2 Three-line control

The three-wire control logic of the crane-specific frequency converter conforms to traditional electrical control methods. The buttons and rotary switches must be used correctly as shown in the diagram. Otherwise, malfunctions may occur.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.04	Main frequency source A selection	0: Digital frequency given F00.07 1: AI1 2: AI2 3: AI3 4: AI4 (Expansion Card) 5: Reserved 6: Main frequency communication given (percentage) 7: Main frequency communication setting (direct frequency input)		0	○

F00.04=0: Main frequency source A selected

The main frequency source A is determined by the digital frequency F00.07.

F00.04=1: AI1 F00.04=2: AI2

F00.04=3: AI3 F00.04=4: AI4 (Expansion Card)

The main frequency source rate A is determined by AI (percentage) * maximum frequency (F00. 16 or F14.78).

AI1 is a 0-10V voltage input;

AI2/AI3 is a 0-10V voltage input, or a 0-20mA current input, selectable by terminal S4/S5 on the terminal block;

AI4 is a -10V to 10V voltage input, and requires our IO expansion card (EC-IO-A1).

The percentage corresponding to the physical quantity input by the AI terminal is set by function codes F02.31 to F02.36. 100.00% is the percentage relative to the maximum frequency (F00. 16 or F14.78) setting value.

F00.04=6 or 7: Main frequency communication setting

The main frequency source A is determined by communication and other factors.

- If master-slave communication is enabled (F10.05=1) and the current inverter is a slave (F10.06=0), then the master frequency source A is given as "700FH (master-slave communication given) * F00.16 (maximum frequency) * F10.08 (slave receiving ratio coefficient)". The data range of 700FH is -100.00% to 100.00%. See the description for details.
- If it is for general communication (F10.05=0):

  a、 F00.04 = 6% given, the main frequency source A is given as "7001H (main channel frequency A communication percentage given) * maximum frequency (F00. 16 or F14.78)";

  b、 F00.04=7 is the direct frequency setting; the main frequency source A is set to "7015H (main channel frequency A communication setting)".
- The data range for 7001H is -100.00% to 100.00%, and the data range for 7015H is 0.00 to the maximum frequency (F00. 16 or F14.78). See the description for details.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.06	Frequency source selection	0: Main frequency source A		0	○

The total given frequency is determined by the main frequency source A.

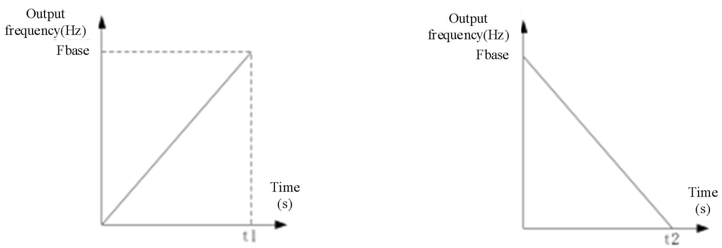
Function code	Function code name	Function code parameter description	unit	Factory value	property

F00.07	Digital frequency given	0.00Hz to maximum frequency	Hz	10.00	●

F00.07 is used to set the digital frequency, and the maximum setting value is limited by the maximum frequency (F00.16).

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.14	Acceleration time 1	0.00～650.00（F15.13=0） 0.0～6500.0（F15.13=1）0~65000（F15.13=2）	s	6.50	●
F00.15	Deceleration time 1	0.00～650.00（F15.13=0） 0.0～6500.0（F15.13=1）0~65000（F15.13=2）	s	4.00	●

Acceleration time is the time it takes for the output frequency to rise from 0Hz to the acceleration/deceleration reference frequency Fbase set by F15.09; deceleration time is the time it takes for the output frequency to fall from the acceleration/deceleration reference frequency Fbase back to 0Hz, and is independent of forward and reverse rotation. As shown in Figure 7-3.



(a) Acceleration time 1　　(b) Deceleration time 1

Figure 7-3 Acceleration and deceleration times

Note that the units for acceleration and deceleration time are 0.01 seconds, 0.1 seconds, and 1 second, which are determined by F15.13.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.16	Maximum frequency	20.00～600.00	Hz	100.00	○

F00.16 is the highest frequency that the inverter can be set to, represented by Fmax, which ranges from 20.00 to 600.00 Hz.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.17	Upper limit frequency control selection	0: Set by F00.18		0	○
F00.18	Upper limit frequency	Lower limit frequency F00.19 ~ Maximum frequency F00.16	Hz	100.00	●
F00.19	Lower limit frequency	0.00～Upper frequency F00.18	Hz	0.00	●

F00.17=0: Set by F00.18

The upper limit frequency is controlled separately by F00.18.

F00.18 is the highest frequency that the inverter is allowed to operate at after startup, denoted as Fup, and the range ofFup is Fdown to Fmax;

F00.19 is the lowest frequency that the inverter is allowed to operate at after startup, denoted as Fdown, with a range of 0.00Hz to Fup.

1. The upper and lower frequency limits should be carefully set according to the actual nameplate parameters and operating conditions of the controlled motor to avoid the motor working at low frequency for a long time, otherwise the motor life will be reduced due to overheating.

2. Relationship between maximum frequency, upper limit frequency, and lower limit frequency: 0.00Hz ≤ Fdown ≤ Fup ≤ Fmax ≤ 600.00Hz;

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.21	Inverted control	0: Allow forward/reverse rotation 1: Disable reverse rotation		0	○
F00.22	Forward and reverse dead zone time	0.00～650.00	s	0.00	●

F00.21=0: Reversal is allowed

The direction of motor rotation can be controlled by the set F/R terminal.

F00.21=1: Inversion prohibited

The motor can only run in one direction; the F/R terminal is invalid.

State when switching the motor rotation direction (forward or reverse)

If F00.22=0.00 is set, then the forward and reverse rotations will be a smooth transition.

If F00.22 is set not to 0, then during forward/reverse switching, when the speed drops to 0Hz, the inverter runs at 0Hz for the time set by F00.22, and then runs in the opposite direction to the set frequency. As shown in Figure 7-4.

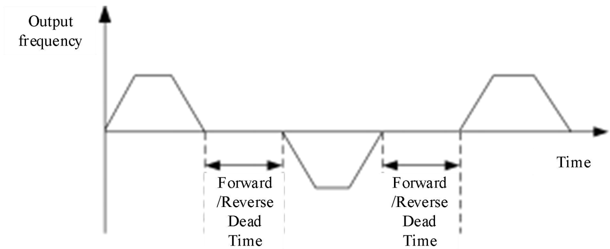


Figure 7-4 Schematic diagram of dead time for forward/reverse rotation

1. When reverse rotation is permitted, the inverter determines the current operating direction based on the status of the F/R terminals. If the forward rotation direction set by the inverter is inconsistent with the desired motor direction, simply swap any two of the inverter output terminals U, V, and W.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.23	carrier frequency	1.0～16.0 (4kW rated power of frequency converter) 1.0～10.0 (Inverter rated power 5.5~7.5kW) 1.0～8.0 (Rated power 11.00～45.00kW) 1.0～4.0 (Rated power 55.00～90.00kW) 1.0～3.0 (Rated power 110.00~400.00kW)	kHz	2.0	●

Increasing the carrier frequency can reduce motor noise, but it will increase the inverter's heat generation. When the carrier frequency is higher than the factory setting, the load needs to be derated to a certain extent for every 1kHz increase in carrier frequency. Please set F00.24= 1, and the inverter will automatically adjust the actual carrier frequency according to the current.

The recommended relationship between the rated power of the frequency converter and the carrier frequency setting is shown in Table 7-1.

Table 7-1 Relationship between Inverter Rated Power and Carrier Frequency Setting

Inverter power Pe	4kW	5.5kW～7.5kW	11kW~ 45kW	55kW~ 90kW	110kW~ 400kW
Rated carrier	8.0 kHz	6.0 kHz	4.0kHz	2.0kHz	2.0kHz
Maximum allowed carrier	16.0 kHz	10.0 kHz	8.0kHz	4.0kHz	3.0kHz

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.24	Automatic carrier frequency adjustment	0: Invalid 1: Valid		1	○

F00.24=0: Invalid

The carrier frequency is set by F00.23, but is limited by the maximum allowed carrier frequency and will not change during operation.

F00.24=1: Valid

The carrier frequency is affected by the inverter temperature and load, based on the setting of F00.23. When the inverter temperature is too high or the load is too heavy, the carrier frequency will be limited. When the value of the set carrier frequency F00.23 is greater than the limit value, the limit value is used as the carrier frequency for inverter operation.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.28	Motor parameter group selection	0: Motor 1 parameter group 1: Motor 2 Parameter Group		0	○

F00.28=0: Motor 1 parameter group

The motor parameters are group F01 and group F14.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F00.29	User password	0～65535		0	○

F00.29 is used to set a password to enable password protection, preventing unauthorized personnel from accidentally altering the frequency converter's function code parameters. When the new password is 0, the password function is invalid. After setting a non-zero user password, all parameters except this function code can only be viewed, not modified.

7.2 F01 Group Motor 1 Parameter Group

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.00	Motor type selection	0: Ordinary asynchronous motor 1: Variable frequency asynchronous motor		0	○
F01.01	Motor rated power	0. 10～650.00	kW	Model confirmed	○
F01.02	Motor rated voltage	50～2000	In	Model confirmed	○
F01.03	Motor rated current	0.01～600.00 (Motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	A	Model confirmed	○
F01.04	Motor rated frequency	0.01～600.00	Hz	Model confirmed	○
F01.05	Motor rated speed	50～60000	rpm	Model confirmed	○
F01.06	Motor winding connection method	0: Y 1: D		Model confirmed	○
F01.07	Motor rated power factor	0.600～1.000		Model confirmed	○
F01.08	motor efficiency	30.0～100.0	%	Model confirmed	○

Note: When the frequency converter is connected to the motor for the first time, please set the above parameters according to the motor's nameplate before operation.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.09	asynchronous motor stator resistance	1～60000 (Motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	mΩ	Model confirmed	○

F01.10	asynchronous motor rotor resistance	1～60000 (Motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	mΩ	Model confirmed	○
F01.11	Leakage inductance of asynchronous motor	0.01～600.00 (Motor rated power ≤75kW) 0.001～60.000 (Motor rated power >75kW)	mH	Model confirmed	○
F01.12	asynchronous motor mutual inductance	0. 1～6000.0 (motor rated power ≤75kW) 0.01～600.00 (motor rated power >75kW)	mH	Model confirmed	○
F01.13	No-load excitation current of asynchronous motor	0.01～600.00 (motor rated power ≤75kW) 0. 1～6000.0 (motor rated power >75kW)	A	Model confirmed	○

F01.09 ～F01.13 are motor parameters. Since users generally cannot know these parameters, please use the motor parameter self-identification to obtain them.

Before the motor parameters are self-identified, the frequency converter will automatically set the motor nameplate parameters set according to F01.00～F01.08 to the standard motor parameters.

The specific meanings ofthe motor parameters are shown in Figure 7-5:

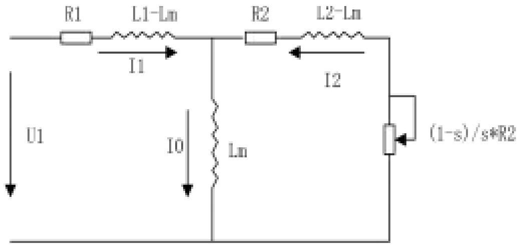


Figure 7-5 Steady-state equivalent model of asynchronous motor

In the diagram, R1, L1, R2, L2, Lm, and I0 represent: stator resistance, stator inductance, rotor resistance, rotor inductance, mutual inductance, and no-load excitation current, respectively.

Function code	Function code name	Function code parameter description	unit	Factory value	property

F01.14	Asynchronous motor field weakening coefficient 1	10.00～100.00	%	87.00	○
F01.15	Asynchronous motor field weakening coefficient 2	10.00～100.00	%	80.00	○
F01.16	Asynchronous motor field weakening coefficient 3	10.00～100.00	%	75.00	○
F01.17	Asynchronous motor field weakening coefficient 4	10.00～100.00	%	72.00	○
F01.18	Asynchronous motor field weakening coefficient 5	10.00～100.00	%	70.00	○

The field weakening coefficient values in F01.14 to F01.18 are automatically set during motor parameter self-identification, and users generally do not need to set them.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.24	Encoder type	0: ABZ incremental encoder 1～3: Reserved 4: Rotary transformer		0	○

Crane-specific frequency converters support multiple encoder types. Different encoders require different PG cards; please select the correct PG card when using them. After installing the PG card, F01.24 must be set correctly according to the actual situation; otherwise, the frequency converter may malfunction.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.25	Encoder Line Count	1～65535		1024	○

In the speed sensor vector control (FVC) mode, the encoder pulse count must be set correctly, otherwise the motor will not operate normally.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.27	AB pulse phase sequence	0: Forward 1: Reverse		0	○

During debugging, it was found that when the direction of the PG card feedback frequency was opposite to the direction of the given frequency, if F01.27 was 0, it was set to 1, and if it was 1, it was set to 0.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.30	Number of pole pairs of a rotary transformer	1～65535		1	○

Rotary transformers have a number of pole pairs, and the pole pair number parameter must be set correctly when using this type of encoder.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.32	Speed feedback disconnection detection time	0.0～10.0 (0.0: Speed feedback disconnection detection is invalid)	s	0.0	○
F01.33	Speed feedback filtering time	0.000～30.000	ms	0.002	○

F01.32=0.0: Speed feedback disconnection detection is invalid.

The inverter detected a feedback disconnection and reported an encoder fault (E22) after the time set by F01.32.

F01.33 is the speed feedback filtering time, which generally does not need to be adjusted and the default parameter can be used.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F01.34	Motor parameter self-learning	0: No operation 1: Asynchronous machine static self-learning 2: Asynchronous machine rotating self-learning		0	○

F01.34=0: Not recognized

F01.34=1: During the self-identification process of parameters (F01.09～F01.13), the motor remains stationary.

F01.34=2: The motor is rotating during the self-identification process of parameters (F01.09～F01. 13). Please disconnect the load.

- After the automatic parameter identification is completed, the setting value of F01.34 will be automatically set to 0.
- When the slip compensation setting is effective, please first perform automatic motor parameter identification so that the motor can obtain the best operating characteristics.
- This only applies to keyboard start/stop mode.

Note: When setting the parameter self-identification, please first set the start/stop control method to keyboard start/stop control (F00.02=0); before using the FVC drive control method, please perform parameter self-learning once to ensure better control effect.

7.3 F02 Group Input Terminal Function Parameter Group

The standard configuration of the crane-specific frequency converter includes 7 multi-function input terminals and 3 analog input terminals (which are fixed for digital input; that is, F02.31=111B and cannot be configured).

Function code	Function code name	Parameter Description	unit	Factory value	property
F02.00	X1 Numeric Input Function Selection	See Table 7–2 for a list of functions of the digital multifunction		1	○
F02.01	X2 Numeric Input Function Selection			2	○
F02.02	X3 Numeric Input Function Selection			0	○
F02.03	X4 Numeric Input Function Selection			10	○
F02.04	X5 Numeric Input Function Selection			11	○
F02.05	X6 Numeric Input Function Selection			12	○
F02.06	X7 Numeric Input Function Selection			13	○
F02.07	AI1 Numeric Input Function Selection			58	○
F02.08	AI2 digital input function selection			0	○
F02.09	AI3 Numeric Input Function Selection			0	○

F02.10	AI4 Numeric Input Function Selection (Expansion Card)	input terminals.		0	○
F02.11	X8 Numeric Input Function Selection (Expansion Card)			0	○
F02.12	X9 Numeric Input Function Selection (Expansion Card)			0	○
F02.13	X10 Numeric Input Function Selection (Expansion Card)			0	○
F02.73	X11 Numeric Input Function Selection			0	○
F02.74	X12 Numeric Input Function Selection			0	○

X1～X12 and AI1～AI4 are 15 multi-function digital input terminals. The function of each input terminal can be defined by setting the value of function code F02.00～F02.09.

For example, ifF02.00= 1 is defined, then the function of terminal X1 is "RUN". If the command source is selected as terminal control (F00.02= 1), then when the input of terminal X1 is valid, the inverter starts the "RUN" function. Specific optional functions are shown in Table 7-2.

Table 7-2 Overview of Digital Multifunction Input Terminal Functions

Setting value	Function	illustrate
0	No function	Set unused or faulty terminals to "0: No Function" to prevent malfunctions.
1	Run terminal	When the command source is selected as terminal control (F00.02= 1), if the function terminal is valid, the inverter will execute the corresponding RUN function according to the setting value of the terminal control mode selection (F00.03). (See the explanation of function code F00.03 for details)
2	Running direction F/R	When the command source is selected as terminal control (F00.02= 1), if the function terminal is valid, the inverter will execute the corresponding F/R function according to the setting value of the terminal control mode selection (F00.03). (See the explanation of function code F00.03 for details)

3	Three-line operation parking control	When the command source is selected as terminal control (F00.02=1) and the terminal control mode is selected as three-wire control (F00.03=2/3), if the function terminal is valid, the inverter will execute a stop command. (See the explanation of function code F00.03 for details)
4	Forward jog (FJOG)	When the command source is selected as terminal control (F00.02=1), if the FJOG function terminal is valid, the frequency converter runs in the forward direction; if the RJOG function terminal is valid, the frequency converter runs in the reverse direction; if both are valid, the frequency converter decelerates and stops. ★When reversal is prohibited, reversal jogging will be ineffective.
5	Reverse Jog (RJOG)	
6～8	reserve	
9	Free parking	If this function terminal is active during inverter operation, the output is blocked, the inverter stops in a free state, and the motor is no longer controlled by the inverter.
10	Fault Reset	If the frequency converter malfunctions and the fault is resolved, it can be reset via this terminal. It functions the same as the reset button on the keypad.
11	Multi-speed terminal 1	When speed control is enabled and the main frequency
12	Multi-speed terminal 2	source A is involved in the setting, four functional input terminals can be defined as multi-speed terminals. The current set frequency of the frequency converter is determined by the combination encoding of these four terminals and the relevant function code settings. **See Table 7–5 for details on the combination of multi-speed commands and multi-speed terminals.** ★: When a function does not have a corresponding input terminal selection, the default value is invalid (0).
13	Multi-speed terminal 3	
14	Multi-speed terminal 4	
15～18	reserve	

<table>
<tr><td>19</td><td>Acceleration/deceleration time terminal 1</td><td colspan="3">This series of frequency converters has four planned acceleration/deceleration times, and two function input terminals can be defined as acceleration/deceleration time terminals. The current acceleration/deceleration time of the frequency converter is determined by the combination encoding of these four terminals and the relevant function code settings. See the table below for details: (0/1: Current function terminal invalid/valid). For explanations of function codes F15.03 to F15.13, please refer to them.</td></tr>
<tr><td rowspan="5">20</td><td rowspan="5">Acceleration/deceleration time terminal 2</td><td>20</td><td>19</td><td>Acceleration and deceleration time</td></tr>
<tr><td>0</td><td>0</td><td>Group 1 (Acceleration time: F00. 14, Deceleration time: F00. 15)</td></tr>
<tr><td>0</td><td>1</td><td>Group 2 (Acceleration time: F15.03, Deceleration time: F15.04)</td></tr>
<tr><td>1</td><td>0</td><td>Group 3 (Acceleration time: F15.05, Deceleration time: F15.06)</td></tr>
<tr><td>1</td><td>1</td><td>Group 4 (Acceleration time: F15.07, Deceleration time: F15.08)</td></tr>
<tr><td>21</td><td>Acceleration and deceleration prohibited</td><td colspan="3">When the acceleration/deceleration disable terminal is active, acceleration/deceleration commands are prohibited, and the inverter output frequency remains unchanged. When the inverter is in overcurrent protection mode, it operates in current limiting mode.</td></tr>
<tr><td>22</td><td>pause operation</td><td colspan="3">The frequency converter decelerates and stops, but all operating parameters are memorized, such as PLC parameters, oscillation parameters, and PID parameters. When this terminal is invalidated, the frequency converter returns to its operating state before stopping.</td></tr>
<tr><td>23</td><td>External fault input</td><td colspan="3">This terminal allows input of fault signals from external devices, facilitating fault monitoring and protection of these devices by the frequency converter. Upon receiving an external fault signal, the frequency converter displays "E14" and automatically stops.</td></tr>
<tr><td>24～32</td><td>reserve</td><td colspan="3"></td></tr>
<tr><td>33</td><td>Zero servo commands</td><td colspan="3">When the drive mode is F00.01=2 or F20.25=2, if this terminal is valid in the parking state, it will directly enter the zero servo state. If this terminal is invalid, it will return to the state before startup.</td></tr>
<tr><td>34～44</td><td>reserve</td><td colspan="3"></td></tr>
</table>

45	Stop and DC braking	A stop command is triggered, and braking begins at the DC braking start frequency (F04.21). The braking time is determined by the longer of the terminal closing time and the DC braking time (F04.23).
46	DC braking during shutdown	If no stop command is triggered, braking will begin at the DC braking start frequency (F04.21) when a stop command is received. The braking time is determined by the longer of the terminal closing time and the DC braking time (F04.23).
47	Immediate DC braking	The inverter stops immediately and applies DC braking at the current frequency. The braking current is determined by the stopping DC braking current (F04.22).
48	Fastest deceleration and stopping	The frequency converter immediately decelerates and stops, and the deceleration time is determined by (F15.40).
49	reserve	
50	External parking	Park using the set parking method (F04.19) and acceleration/deceleration time of 4 (F15.07/F15.08).
51～56	reserve	
57	Inverter enable	If the current function terminal is valid and other operating conditions of the frequency converter are met, then the frequency converter's operating conditions are met. Otherwise, even if other conditions are met, it cannot operate. ★: Inverter enable function: If no terminal is selected, the function is enabled by default; if one terminal is selected, the status of the selected terminal will prevail; if more than one terminal is selected, this function will be disabled as long as one of the selected terminals is invalid.
58	Brake check input	In closed-loop control, if the rising edge of the current function terminal is valid, the inverter begins to perform a brake check.
59	Brake release feedback	This is used to provide feedback on the current release status of the brake. If the current terminal is valid, the brake is in the released state. When F20.17=1, if the current terminal is invalid, the brake is in the closed state.
60	Brake closure feedback	This terminal function only works when F20.17=2. If the current terminal is active, the brake is in the closed state.

61	Absolute distance alignment	After setting the absolute distance alignment position of F21.06 at the known height position, close this terminal to complete the alignment.
62	Positioning and running	When F21.13 is set to 2 or 3, after operation, closing this terminal controls the operation to the absolute position set by F21. 14, achieving precise positioning.
63	Forward/Upward Deceleration Switch	When the forward deceleration terminal is active, if the inverter's forward operating frequency is greater than the F21.29 setting value, the output frequency will be decelerated to the F21.29 setting value. Reverse operation is unrestricted, and the deceleration method is deceleration stop. When the deceleration limit is active, the output frequency will be limited; when the deceleration limit is inactive, the output frequency will return to the set frequency. DI-63 and DI-67 (limit shielding) are both effective, the output frequency is the set frequency, and the output direction is the given running direction.
64	Reverse/Deceleration Switch	When the reverse deceleration terminal is active, if the inverter's reverse operating frequency is greater than the F21.29 setting value, the output frequency will be decelerated to the F21.29 setting value. Forward operation is unrestricted, and the deceleration method is deceleration stop. When the deceleration limit is active, the output frequency will be limited; when the deceleration limit is inactive, the output frequency will return to the set frequency. DI-64 and DI-67 (limit shielding) are both effective, the output frequency is the set frequency, and the output direction is the given running direction.
65	Forward stop switch	When the forward stop switch (DI-65) is active and the running direction is positive, the machine will stop immediately and quickly; after the forward stop is active, the machine can start normally in reverse. DI-65 and DI-67 (limit shield) are both effective, the output frequency is the set frequency, and the output direction is the given running direction.

66	Reverse stop switch	When the reverse stop switch (DI-66) is active, the machine will stop immediately and quickly when the running direction is negative; after the reverse stop is active, the machine can start normally in the forward direction. DI-66 and DI-67 (limit shielding) are both effective, the output frequency is the set frequency, and the output direction is the given running direction.
67	Limit shielding	The limit shielding terminal DI-67 will shield DI-63, DI-64, DI-65, and DI-66. That is, when the limit terminal and the limit shielding terminal are both effective, the output frequency is the given frequency.
160	Anti-sway function disabled	The anti-sway function must not be used when the terminal is active.
161	90% torque limit	This terminal is only active when F20.00=0 (closed-loop lifting), 1 (open-loop lifting), or 2 (luffing) mechanism; When the 90% torque limit is active, forward operation is prohibited (lifting cannot move upwards, luffing cannot move outwards); when operating in reverse, the operating frequency is limited to F21.35 (the F21.35 setting value is not 0); When F21.35 is set to 0, the original operating logic is maintained after the 90% torque limit is effective;
162	80% torque limit	This terminal is only active when F20.00=0 (closed-loop lifting), 1 (open-loop lifting), or 2 (luffing) mechanism; When the 80% torque limit logic is active, the forward operation output frequency is limited to F21.36, and the reverse operation frequency is limited to F21.37. When F21.36 and F21.37 are set to 0, the original operating logic is maintained after the 80% torque limit is effective;
163	100% weight limit	This terminal is only active when F20.00=0 (closed-loop lifting), 1 (open-loop lifting), or 2 (luffing) mechanism; When the 100% weight limit logic is active, forward operation is prohibited (lifting cannot move upwards, luffing cannot move outwards); reverse operation is limited to a frequency ofF21.30. When F21.30 is set to 0, the original operating logic will be maintained after the 100% weight limit is effective;

164	80% weight limit	This terminal is only active when F20.00=0 (closed-loop lifting), 1 (open-loop lifting), or 2 (luffing) mechanism; When the 80% weight limit is effective, the forward operating frequency is limited to F21.31, and the reverse operating frequency is limited to F21.32; The frequency limit (F21.31, F21.32) is 0. After the 80% weight limit is effective, the original operating logic is maintained.
165	50% weight limit	This terminal is only active when F20.00=0 (closed-loop lifting), 1 (open-loop lifting), or 2 (luffing) mechanism; When DI = 165:50% weight limit is active, the forward operating frequency is limited to F21.33, and the reverse operating frequency is limited to F21.34. The frequency limits (F21.33, F21.34) are: 0. After the 50% weight limit is activated, the original operating logic is maintained.
166	Brake power-on check	If the brake power-on check is successful, the brake check should be performed after the inverter is powered on.
172	Ultra-low speed operation	Effective ant speed positioning function

<table>
<tr><th>Function Code</th><th>Function code name</th><th colspan="8">Parameter Description</th><th>unit</th><th>Factory value</th><th>property</th></tr>
<tr><td rowspan="3">F02.15</td><td rowspan="3">Digital input terminal positive/negative logic 1</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td><td rowspan="3"></td><td rowspan="3">00000000</td><td rowspan="3">○</td></tr>
<tr><td>*</td><td>X7</td><td>X6</td><td>X5</td><td>X4</td><td>X3</td><td>X2</td><td>X1</td></tr>
<tr><td colspan="8">0: Positive logic closed loop valid / open loop invalid
1: Negative logic closed loop invalid / open loop valid</td></tr>
<tr><td rowspan="3">F02.16</td><td rowspan="3">Digital input terminal positive/negative logic 2</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td><td rowspan="3"></td><td rowspan="3">00000000</td><td rowspan="3">○</td></tr>
<tr><td>*</td><td>X10</td><td>X9</td><td>X8</td><td>AI4</td><td>AI3</td><td>AI2</td><td>AI1</td></tr>
<tr><td colspan="8">0: Positive logic closed loop valid / open loop invalid
1: Negative logic closed loop invalid / open loop valid</td></tr>
<tr><td rowspan="3">F02.75</td><td rowspan="3">Digital input terminal positive and</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td><td rowspan="2"></td><td rowspan="2">00</td><td rowspan="2">○</td></tr>
<tr><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>X12</td><td>X11</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

	negative logic 3	0: Positive logic closed loop valid / open loop invalid 1: Negative logic closed loop invalid / open loop valid			

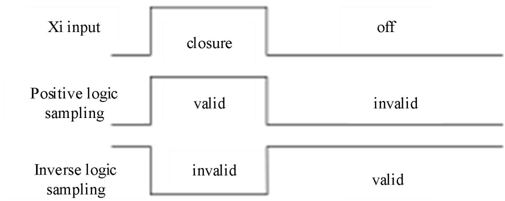


Figure 7-6 Schematic diagram of forward and reverse logic sampling at terminals 76

0: The multi-function input terminal is valid when closed and invalid when open;

1: The multi-function input terminal is valid when disconnected and invalid when closed.

★: This function is used for logical matching with other external devices.

Function code	Function code name	Parameter Description	unit	Factory value	property
F02.17	Number of times the digital input terminal is filtered	0 to 100, where 0 represents no filtering and n represents sampling once per n ms.		2	○

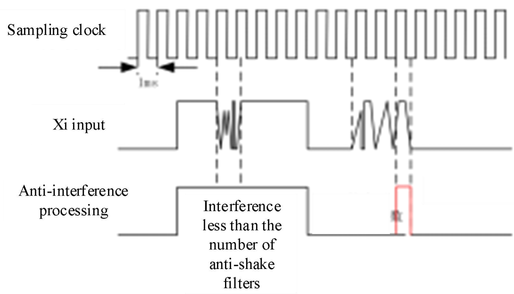


Figure 7-7 Terminal filtering sampling schematic diagram

Since the multi-function input terminal uses level triggering or pulse triggering, digital filtering is required when reading the terminal status to avoid interference.

★: The parameters for this code generally do not need to be adjusted. If adjustment is necessary, please pay attention to the relationship between the filtering time and the duration of the terminal action to avoid susceptibility to interference due to too few filtering iterations or slow response and lost instructions due to too many filtering iterations.

Function code	Function code name	Parameter Description	unit	Factory value	property
F02.18	X1 Effective Delay Time	0.000～30.000	s	0.000	●
F02.19	X1 Invalid Delay Time	0.000～30.000	s	0.000	●
F02.20	X2 Effective Delay Time	0.000～30.000	s	0.000	●
F02.21	X2 Invalid Delay Time	0.000～30.000	s	0.000	●
F02.22	X3 Effective Delay Time	0.000～30.000	s	0.000	●
F02.23	X3 Invalid Delay Time	0.000～30.000	s	0.000	●
F02.24	X4 Effective Delay Time	0.000～30.000	s	0.000	●
F02.25	X4 Invalid Delay Time	0.000～30.000	s	0.000	●

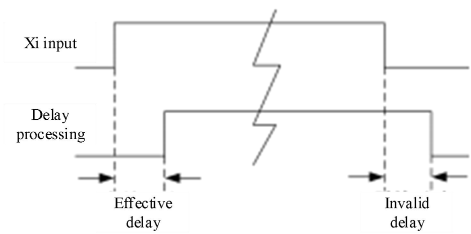


Figure 7-8 Schematic diagram of terminal delay sampling

When the state of a function terminal changes, a delay is applied to the change in state according to the function code settings. Currently, only terminals X1 to X4 support this function. Specifically, this function becomes effective only after the function terminal changes from an invalid state to an active state and maintains an active delay; conversely, this function becomes ineffective only after the function terminal changes from an active state to an invalid state and maintains an inactive delay.

★: If the function code is set to 0.000s, the corresponding delay will be invalid.

Function code	Function code name	Parameter Description	unit	Factory value	property
F02.31	Analog input function selection	Units digit: AI1 0: Reserved 1: Number input (0 for values below 1V, 1 for values above 3V, and retains the previous state between 1V and 3V) Tens digit: AI2 0: Reserved 1: Number input (same as above) Hundreds digit: AI3 0: Reserved 1: Number input (same as above) Thousands digit: AI4 (expansion card) 0: Analog input 1: Numeric input (same as above)		0001D	○

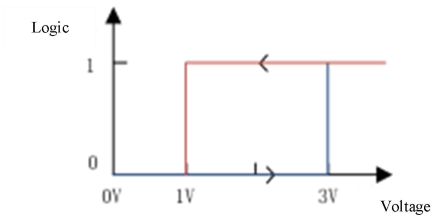


Figure 7-9 shows the relationship between analog input terminal voltage and current logic state.

The analog input terminals AI1 to AI3 of the crane-specific frequency converter are used only as digital input terminals (F02.31=111B, and cannot be changed):

- When the terminal input voltage is <1V, the corresponding logic state of the terminal is invalid;
- When the terminal input voltage is greater than 3V, the corresponding logic state of the terminal is valid.
- When the terminal input voltage is in the range of [1V, 3V], the corresponding logic state of the terminal remains unchanged.

If used as an analog input terminal, the filtering time and corresponding bias curve can be set through F02.32 to F02.60, and AI1 to AI4 can be set separately.

Function code	Function code name	Parameter Description	unit	Factory value	property
F02.32	Analog input curve selection	Units digit: AI1 curve selection 0: Curve 1 1: Curve 2 2: Curve 3 3: Curve 4 Tens digit: AI2 curve selection 0: Curve 1 1: Curve 2 2: Curve 3 3: Curve 4 Hundreds digit: AI3 curve selection 0: Curve 1 1: Curve 2 2: Curve 3 3: Curve 4 Thousan ds digit: AI4 curve selection 0: Curve 1 1: Curve 2 2: Curve 3 3: Curve 4		3210 D	○
F02.33	Curve 1 Minimum Input	0.00~F02.35	In	0.10	●
F02.34	Curve 1 Minimum Input Corresponds to Given	-100.0~ +100.0	%	0.0	●
F02.35	Curve 1 Maximum Input	F02.33~ 10.00V	In	9.90	●
F02.36	Curve 1 Maximum Input Corresponds to Given	-100.0~ +100.0	%	100.0	●
F02.37	Curve 2 Minimum Input	-10.00V~F02.39	In	0.10	●
F02.38	Curve 2 Minimum Input Corresponds to Given	-100.0~ +100.0	%	0.0	●

F02.39	Curve 2 Maximum Input	F02.37~ 10.00V	In	9.90	●
F02.40	Curve 2 Maximum Input Corresponds to Given	–100.0~ +100.0	%	100.0	●
F02.41	Curve 3 Minimum Input	0.00V~F02.43	In	0.10	●
F02.42	Curve 3 Minimum Input Corresponds to Given	–100.0~ +100.0	%	0.0	●
F02.43	Curve 3 Inflection Point 1 Input	F02.41~F02.45	In	2.50	●
F02.44	Curve 3 inflection point 1 input corresponding to the given	–100.0~ +100.0	%	25.0	●
F02.45	Curve 3 Inflection Point 2 Input	F02.43~F02.47	In	7.50	●
F02.46	Curve 3 Inflection Point 2 Input Correspondi ng to Given	–100.0~ +100.0	%	75.0	●
F02.47	Curve 3 Maximum Input	F02.45~ 10.00	In	9.90	●
F02.48	Curve 3 Maximum Input Corresponds to Given	–100.0~ +100.0	%	100.0	●
F02.49	Curve 4 Minimum Input	-10.00~ F02.51	In	-9.90	●
F02.50	Curve 4 Minimum Input Corresponds to Given	–100.0~ +100.0	%	-100.0	●
F02.51	Curve 4 Inflection Point 1 Input	F02.49~F02.53	In	-5.00	●
F02.52	Curve 4 Inflection Point 1	–100.0~ +100.0	%	-50.0	●

	Input Correspondi ng to Given				
F02.53	Curve 4 Inflection Point 2 Input	F02.51~F02.55	In	5.00	●
F02.54	Curve 4 Inflection Point 2 Input Correspondi ng to Given	–100.0~ +100.0	%	50.0	●
F02.55	Curve 4 Maximum Input	F02.53~ 10.00	In	9.90	●
F02.56	Curve 4 Maximum Input Corresponds to Given	–100.0~ +100.0	%	100.0	●
F02.57	AI1 filtering time	0.00~10.00	s	0.10	●
F02.58	AI2 filtering time	0.00~10.00	s	0.10	●
F02.59	AI3 Filtering Time	0.00~10.00	s	0.10	●
F02.60	AI4 Filtering Time (Expansion Card)	0.00~10.00	s	0.10	●

- F02.32 is used to select the corresponding bias curve for each analog input terminal, with a total of 4 bias curves available. Curves 1 and 2 are two-point biases, while curves 3 and 4 are four-point biases. The minimum input voltage for curves 2 and 4 can reach -10V, meeting the AI4 input requirements. After selecting the bias curve, the corresponding function code can be used to meet the input requirements. Its specific meaning is the same as that of HDI; see the explanation of function codes F02.26 to F02.29 for details.
- The filtering time can be adjusted appropriately based on the simulated input and actual operating conditions. Please refer to the actual results.

Function code	Function code name	Parameter Description	unit	Factory value	propert y
F02.61	AD sampling hysteresis	2～50		2	○

When analog input hysteresis occurs, or when the input line is long or there is excessive interference in the field causing large input fluctuations, this function code can be appropriately increased. The adjustment principle is to keep it as small as possible.

7.4 F03 Group Output Terminal Function Parameter Group

The crane-specific frequency converter comes standard with two multi-function output terminals and two relay output terminals.

Function code	Function code name	Parameter Description	unit	Factory value	property
F03.00	Y1 Output Function Selection	See Table 7-3 for a list of digital multifunction output terminal functions.		27	○
F03.01	Y2 Output Function Selection			33	○
F03.02	R1 Output Function Selection			28	○
F03.03	R2 Output Function Selection			7	○
F03.04	Y3 Output Function Selection (Expansion Card)			0	○

Y1 ～Y3 and R1/R2 are 5-channel multi-function digital output terminals. The function of each output terminal can be defined by setting the value of function code F03.00～F03.03.

For example, if F03.02 = 28, then the function of terminal R1 is "brake control," reflecting the brake status. If the brake is in the released state, terminal R1 outputs an active status; if the brake is in the closed state, terminal R1 outputs an inactive status. Specific selectable functions are shown in Table 7-3.

Table 7-3 Overview of Digital Multifunction Output Terminal Functions

Setting value	**Function**	**illustrate**
0	No output	Set unused or faulty terminals to "0: No Function" to prevent erroneous output.
1	Inverter is running (RUN)	The inverter's output is valid when it is in slave operation, slave stop, jogging operation, or jogging stop mode; otherwise, the output is invalid.

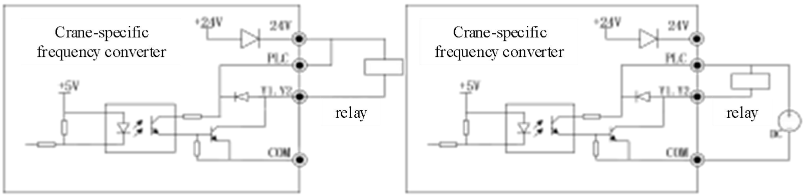
2	Output frequency reached (FAR)	The current output is valid if the frequency is in operation and |output frequency - set frequency| ≤ frequency reaches the detection width (F15.20). If the system is not in operation, or if |output frequency - set frequency| > frequency reaches the detection width (F15.20), the current output is invalid. See F15.20 for the explanation of function codes.
3	Output frequency detection FDT1	The system is in operation, and if |output frequency| > output frequency detection FDT1 (F15.21), the current output is valid. If the system is not in operation, or if |output frequency| ≤ output frequency detection FDT1 (F15.21) - FDT1 hysteresis (F15.22), the current output is invalid. Otherwise, the current output status remains unchanged. See F15.21 and F15.22 for function code explanations.
4	Output frequency detection FDT2	The system is in operation, and if |output frequency| > output frequency detection FDT2 (F15.23), the current output is valid; If the system is not in operation, or if |output frequency| ≤ output frequency detection FDT2 (F15.23) - FDT2 hysteresis (F15.24), the current output is invalid. Otherwise, the current output status remains unchanged. See F15.23 and F15.24 for function code explanations.
5	Reverse operation (REV)	The inverter's operating direction and acceleration/deceleration state are either reverse acceleration, reverse deceleration, or reverse constant speed, and the current output is valid. In other states, the current output is invalid.
6	In jog operation	The inverter is in JOG running or JOG stopped state, and the current output is valid; In other states, the current output is invalid.
7	Inverter failure	The frequency converter is in a fault state, and the current output is valid; In other states, the current output is invalid.
8	Inverter is ready to run (READY)	After the inverter is powered on, all initializations are completed and no abnormalities occur. It is ready to run, and the current output is valid. The inverter is not currently suitable for operation; the current output is invalid.

9	Upper limit frequency reached	When the JOG or slave device is running, if the output frequency (F18.00) is greater than or equal to the upper limit frequency (F00.17‖F00.18) and the set frequency (F18.01) is greater than or equal to the upper limit frequency (F00. 17‖F00. 18), the current output is valid. Otherwise, the current output is invalid.
10	Lower limit frequency reached	When the JOG or slave device is running, the output frequency (F18.00) ≤ lower limit frequency (F00. 19) and the set frequency (F18.01) ≤ lower limit frequency (F00. 19) are valid. Otherwise, the current output is invalid.
11	Reaching current limit	Output current (F18.06) ≥ current limit level (F07. 12), current output is valid; Output current (F18.06) ≤ current limit level (F07. 12) -5.0%, current output is invalid; Intermediate value, current output state remains unchanged.
12	Overvoltage stall voltage reached	Output voltage (F18.07) ≥ overvoltage stall control voltage (F07.07), current output is valid; If the output voltage (F18.07) ≤ overvoltage stall control voltage (F07.07) -10V, the current output is invalid; Intermediate value, current output state remains unchanged.
13～16	reserve	reserve
17	Motor overload warning	The current motor current is greater than or equal to the motor pre-alarm coefficient (F07.02), and the current output is valid. Otherwise, the current output is invalid.
18	Inverter overheating pre-alarm	The pre-alarm output is valid when the inverter temperature is ≥ -25°C from the overheating point; otherwise, the pre-alarm output is invalid.
19～22	reserve	
23	In zero-servo mode	When the frequency converter enters the zero servo state, the keyboard displays warning C27 and the DO output is valid; when it exits the zero servo state, the DO output is invalid.

24	Undervoltage status	If the DC bus voltage (F18.08) ≤ the power outage detection voltage (F07.31), the current output is valid; If the DC bus voltage (F18.08) is greater than or equal to the power outage termination judgment action voltage (F07.32), and the duration is greater than or equal to the power outage termination judgment delay time (F07.33), the current output is invalid.
25～27	reserve	
28	Brake control	When the output is valid, the brake is released; when the output is invalid, the brake is closed.
29	Brake inspection prompts	If a set time has elapsed since the last brake check, a second check is required, and the current output is valid; otherwise, the current output is invalid.
30	Overload protection activated	Overload protection is performed during lifting. If an overload is detected, the current terminal output is valid; otherwise, it is invalid.
31	Low voltage protection start	The current terminal output is valid when the bus voltage drops to the threshold value set by F21.16 and F21.15 = 1; otherwise, it is invalid.
32	reserve	
33	Brake failure	The current terminal output is valid when a brake failure is detected or a brake check fails; otherwise, it is invalid.
34	Motor fan control	Motor fan delay control output terminal function
35	Weighing wire breakage or overload alarm output	The output is valid if the sensor disconnection detection is effective, any sensor exceeds its range, or the actual net weight percentage is greater than 90%; otherwise, it is invalid.
37	Rotary eddy current control	During shutdown, when the inverter output frequency is less than F20.65 (eddy current cut-in frequency), the DO output is valid. After the set time of F20.32 and F20.33, the DO output becomes invalid.
43	Brake power-on detection abnormal	When the brake power-on test fails, the DO output is valid.
44	Selecting motor 1 is effective.	When F00.28=0, the DO output is valid.
45	Selecting motor 2 is effective.	When F00.28= 1, the DO output is valid.

The two multi-function output ports are open-collector outputs, with the common terminal being COM. When the selected function is invalid, the electronic switch is off

(OFF); when the selected function is valid, the electronic switch is on (ON). The open-collector outputs can be internally powered, as shown in Figure 7-10(a), or powered by an external power supply, as shown in Figure 7-10(b). If an external power supply is used, the voltage range is required to be 12–30V.



a) Internal power supply　　　　b) External power supply

Figure 7-10 Power supply method for multi-functional terminals

The relay output is provided by the internal relay of the frequency converter; the relay has one set of normally open and one set of normally closed contacts. When the selected function is invalid, EB-EC is normally closed and EA-EC is normally open; when the selected function is valid, the internal relay coil is energized, EB-EC is open, and EA-EC is energized. As shown in Figure 7-11.

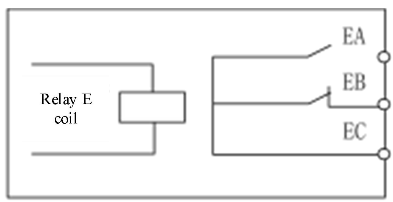


Figure 7-11 Relay

<table>
<tr><th>Function code</th><th>Function code name</th><th colspan="8">Parameter Description</th><th>unit</th><th>Factory value</th><th>property</th></tr>
<tr><td rowspan="3">F03.05</td><td rowspan="3">Output signal type selection</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td><td rowspan="3"></td><td rowspan="3">0000</td><td rowspan="3">○</td></tr>
<tr><td>*</td><td>*</td><td>*</td><td>*</td><td>R2</td><td>R1</td><td>Y2</td><td>Y1</td></tr>
<tr><td colspan="8">0: Level
1: Single pulse</td></tr>
</table>

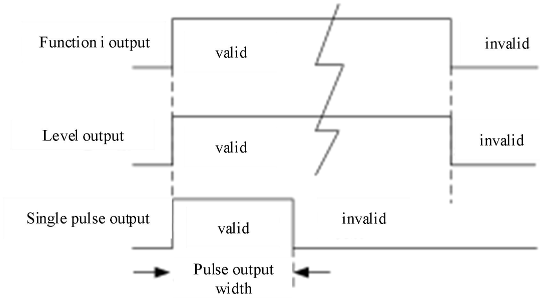


Figure 7-12 Schematic diagram of digital output terminal levels and single pulse output

The digital output terminals and relay output terminals have two output types: level and single pulse, as shown in Figure 7-12. For level output, the output state of the functional terminal is consistent with the functional state; for single pulse output, a certain pulse width of effective level is output only when the function is active.

<table>
<tr><th>Function code</th><th>Function code name</th><th colspan="8">Parameter Description</th><th>unit</th><th>Factory value</th><th>property</th></tr>
<tr><td rowspan="3">F03.06</td><td rowspan="3">Digital output positive/negative logic</td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td><td rowspan="3"></td><td rowspan="3">0000</td><td rowspan="3">○</td></tr>
<tr><td>*</td><td>*</td><td>*</td><td>Y3</td><td>R2</td><td>R1</td><td>Y2</td><td>Y1</td></tr>
<tr><td colspan="8">0: Positive logic closed loop valid / open loop invalid
1: Negative logic closed loop invalid / open loop valid</td></tr>
</table>

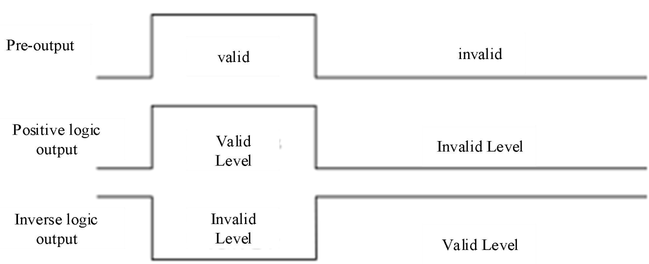


Figure 7-13 Schematic diagram of positive and negative logic output of digital output terminals

The multi-function digital output terminal status has two output logics depending on the design:

0: Positive logic, function valid, multi-function output terminal outputs valid level; Invalid logic, multi-function output terminal outputs invalid level.

1: Reverse logic: Function valid, multi-function output terminal outputs invalid level; Function invalid, multi-function output terminal outputs valid level;

★: This function is used for logical matching with other external devices.

Valid level: Y1/Y2, the default valid level is low; R1/R2, the default valid level is high.

Function code	Function code name	Parameter Description	unit	Factory value	property
F03.07	Y2 Output Type Selection	0: Normal digital output		0	○

For crane-specific frequency converters, the Y2 terminal can only be used as a general output terminal.

Function code	Function code name	Parameter Description	unit	Factory value	property
F03.09	Y1 Effective Delay Time	0.000～30.000	s	0.000	●
F03.10	Y1 Invalid Delay Time	0.000～30.000	s	0.000	●
F03.11	Y2 Effective Delay Time	0.000～30.000	s	0.000	●
F03.12	Y2 Invalid Delay Time	0.000～30.000	s	0.000	●
F03.13	R1 effective delay time	0.000～30.000	s	0.000	●
F03.14	R1 Invalid Delay Time	0.000～30.000	s	0.000	●
F03.15	R2 effective delay time	0.000～30.000	s	0.000	●
F03.16	R2 Invalid Delay Time	0.000～30.000	s	0.000	●

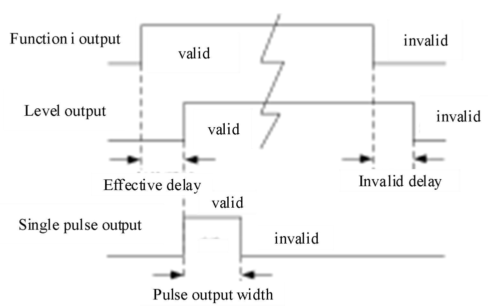


Figure 7-14 Schematic diagram of digital output terminal levels and single pulse output

When the selected function's state changes, the corresponding output terminal will respond with a delay according to the function code setting. Currently, both Y1/Y2 and R1/R2 terminals support this function. Under the default conditions, this means that: if the function changes from an invalid state to an valid state and maintains a valid delay, the corresponding output terminal will output a valid level; if the function changes from a valid state to an invalid state and maintains an invalid delay, the corresponding output terminal will output an invalid level.

★: If the function code is set to 0.000s, this delay is invalid.

Function code	Function code name	Parameter Description	unit	Factory value	prope rty
F03.17	Y1 output single pulse time	0.000～30.000	s	0.250	●
F03.18	Y2 output single pulse time	0.000～30.000	s	0.250	●
F03.19	R1 outputs single pulse time	0.000～30.000	s	0.250	●
F03.20	R2 outputs single pulse time	0.000～30.000	s	0.250	●

When the output mode of a certain function output terminal is selected as single pulse output (see F03.05 for details), the effective level pulse width is controlled by setting the single pulse output time to meet different process or control requirements. See Figures 7-12 and 7-14 for details.

Function code	Function code name	Parameter Description	unit	Factory value	prope rty
F03.21	Analog output M1 selection	See Table 7–4 for a list of analog multi-function output terminal functions.		0	○
F03.22	Analog output M2 selection			4	○

M1/M2 are two multi-functional analog output terminals. The function of each output terminal can be defined by setting the values of function codes F03.21 to F03.22.

For example, if F03.21 = 0, then the function of terminal M1 is to output the "operating frequency (absolute value)," reflecting the current operating frequency by outputting different voltage values. If the operating frequency increases from 0.00Hz to 50.00Hz (assuming F00.16 = 50.00), then by default, the voltage at the M1 output port increases from 0.00V to 10.00V, and the trend is the same. Specific optional functions areshown in Table 7-4.

Table 7-4 Overview ofAnalog Multifunction Output Terminal Functions

Setting value	Function	illustrate
0	Operating frequency (absolute value)	The range of 0.00Hz to Fmax corresponds to an output of 0.0% to 100.0%.
1	Set frequency (absolute value)	The range of 0.00Hz to Fmax corresponds to an output of 0.0% to 100.0%.
2	Output torque (absolute value)	0.0% to 200.0% corresponds to an output of 0.0% to 100.0%.
3	Set torque (absolute value)	0.0% to 200.0% corresponds to an output of 0.0% to 100.0%.
4	Output current	0.0A to 2*Ie corresponds to an output of 0.0% to 100.0%.
5	Output voltage	0.0V ～ 1.5*Ue corresponds to an output of 0.0%～100.0%.
6	bus voltage	0V～1000V corresponds to an output of 0.0%~ 100.0%.
7	Output power	0.00kW ～2*Pe corresponds to an output of 0.0%～100.0%.

★: Fmax, maximum frequency (F00. 16)

Ie, the rated current of the frequency converter (F12.21)

Ue, the rated voltage of the frequency converter (F12.20).

Pe, the rated power of the frequency converter (F12. 19).

The analog output terminals can be switched between 0.00V to 10.00V voltage signals and 0.00 snubber circuit should be installed close to the coil ends of the relay or contactor.

Analog output terminal wiring.

Function code	Function code name	Parameter Description	unit	Factory value	property
F03.27	M1 output bias	-100.0～100.0	%	0.0	●
F03.28	M1 Output Gain	-10.00～10.00		1.00	●
F03.29	M2 output bias	-100.0～100.0	%	0.0	●
F03.30	M2 Output Gain	-10.00～10.00		1.00	●

The above function codes are generally used to correct zero drift and amplitude deviation in analog output. They can also be used to customize the required AO output curve to meet different instruments or other requirements. If the bias is represented by "b", the gain by k, the actual output by Y, and the standard output by X, then the actual output is: Y = kX + b.

1. To meet the needs of different instruments or external devices, the full-scale voltage of M1 and M2 is actually 10.9V, and the full-scale current is actually 22mA.
2. The factory default settings for M1 and M2 are both 0.00 to 10.00V.
3. If high accuracy of the analog output is required, please use a multimeter to test the no-load output of terminals M1 and M2 first.

7.5 F04 group start/stop control parameter group

Function code	Function code name	Function code parameter description	unit	Factory value	property
F04.00	Startup method	0: Start directly		0	○

F04.00=0: Start directly

When the frequency converter starts, it first performs DC braking (no DC braking when F04.04=0), then pre-excitation (no pre-excitation when F04.07 is set to 0), and then starts at the starting frequency. After the starting frequency holding time ends, it enters the given frequency operation.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F04.01	Startup frequency	0.00～10.00	Hz	0.00	○
F04.02	Startup frequency retention time	0.00～60.00, 0.00 is invalid	s	0.00	○

To ensure adequate motor torque during startup, please set a suitable starting frequency. To allow sufficient magnetic flux to be established during motor startup, the starting

frequency needs to be maintained for a certain period. The starting frequency F04.01 is not subject to a lower frequency limit.

Function code	Function code name	Function code parameter description	unit	Factory value	property

F04.03	Starting DC braking current	0.0～100.0 (100.0 = motor rated current)	%	50.0	○
F04.04	DC braking time	0.00～30.00 0.00: Invalid	s	0.00	○
F04.05	DC braking demagnetization time	0.00～30.00	s	0.50	○

Before starting the frequency converter, the motor may be running at low speed or in reverse. If the frequency converter is started immediately under these conditions, it may experience an overcurrent fault. To avoid this fault, DC braking can be applied before starting the frequency converter to stop the motor from rotating, and then the motor can be run in the set direction to the set frequency.

F04.03 allows for different starting DC braking torques to be achieved by setting different values.

F04.04 sets the activation time of the DC braking system; operation will begin immediately upon the expiration of the time. If F04.04 = 0.00, the DC braking system will be ineffective during startup.

★: The DC braking process is shown in Figure 7-16.

This function should be used when a single frequency converter drives multiple motors.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F04.06	Pre-excitation current	50.0～500.0 (100.0 = no-load current)	%	100.0	○
F04.07	Pre-excitation time	0.00～10.00	s	0.10	○

The frequency converter first establishes the magnetic field according to the set pre-excitation current F04.06, and then starts running after the set pre-excitation time F04.07. If the set pre-excitation time is 0, it will start directly without going through the pre-excitation process.

F04.06 Pre-excitation current is a percentage relative to the motor's rated no-load current.

Function code	Function code name	Function code parameter description	unit	Factory value	property

F04.14	Acceleration and deceleration methods	0: Linear acceleration/deceleration 1: Continuous S-curve acceleration/deceleration 2: Discontinuous S-curve acceleration/deceleration		0	○
F04.15	The initial period of the S-curve during acceleration	0.00～30.00（F15.13=0） 0.0～300.0（F15.13= 1） 0～3000（F15.13=2）	s	0.00	●
F04.16	The time interval at the end of the S-curve during acceleration	0.00～30.00（F15.13=0） 0.0～300.0（F15.13= 1） 0～3000（F15.13=2）	s	6.00	●
F04.17	The initial period of the S-curve during deceleration	0.00 ~ System deceleration time / 2 (F15.13 = 0) 0.0 ~ System deceleration time / 2 (F15.13 = 1) 0 ~ System deceleration time / 2 (F15.13 = 2)	s	0.00	●
F04.18	The time interval at the end of the S-curve during deceleration	0.00 ~ System deceleration time / 2 (F15.13 = 0) 0.0 ~ System deceleration time / 2 (F15.13 = 1) 0 ~ System deceleration time / 2 (F15.13 = 2)	s	0.00	●

F04.14=0: Linear acceleration/deceleration

The output frequency increases or decreases linearly, and the acceleration/deceleration time is set by function codes F00.14 and F00.15 by default.

F04.14=1: Continuous S-curve acceleration/deceleration

The output frequency increases or decreases according to a curve. The S-curve is generally used in applications requiring a relatively smooth start-up and shutdown process, such as elevators and conveyor belts. Figure 7-15 shows the acceleration process: t1 is the value set by F04.15, and t2 is the value set by F04.16; during deceleration: t3 is the value set by F04.17, and t4 is the value set by F04.18. The slope of the output frequency change is fixed between t1 and t2, and between t3 and t4.

F04.14=2: Discontinuous S-curve acceleration/deceleration

Compared to continuous S-curves, discontinuous S-curves do not have overshoot. They will immediately stop the current S-curve trajectory based on changes in given conditions, acceleration/deceleration times, etc., and execute the newly planned S-curve trajectory.

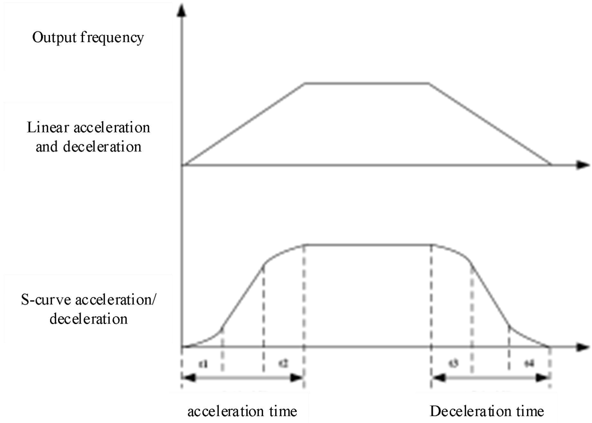


Figure 7-15 Acceleration/Deceleration Time Control Chart

Function code	Function code name	Function code parameter description	unit	Factory value	property
F04.19	Parking methods	0: Decelerate and stop 1: Free parking		0	○

F04.19=0: Decelerate and stop

The motor decelerates and stops at the set deceleration time [factory setting is F00.15 (deceleration time 1)].

F04.19=1: Free Parking

When the stop command is valid, the inverter will immediately stop outputting, and the motor will coast to a stop. The stopping time depends on the inertia of the motor and the load.

If a free stop terminal is set, the inverter will immediately enter the free stop state when the free stop terminal is active, and will not restart when the terminal is inactive; the operation command must be re-entered.

Function code	Function code name	Function code parameter description	unit	Factory value	property

F04.20	Parking DC braking start frequency	0.00～Maximum frequency F00.16	Hz	0.00	○
F04.21	DC braking current for parking	0.0～150.0 (100.0 = motor rated current)	%	50.0	○
F04.22	DC braking time for parking	0.00～30.00 0.00: Invalid	s	0.00	○
F04.23	Parking DC braking demagnetization time	0.00～30.00	s	0.50	○

F04.20 sets the frequency at which DC braking begins during deceleration and stopping. During deceleration and stopping, if the output frequency drops below this frequency and the DC braking time is not zero, DC braking will be initiated.

F04.21 allows for different DC braking torque settings to achieve different stopping torques.

F04.22 sets the duration of the DC braking function. If F04.23 = 0.00, the DC braking function is disabled. If there is an external terminal DC braking signal, the DC braking time is the larger of the effective time of the external terminal DC braking signal and the time set in F04.23.

F04.23 When the output frequency reaches the set value ofF04.21 during deceleration and stopping, DC braking will only begin after the set time ofF04.24.

The DC braking process for parking is shown in Figure 7-17.

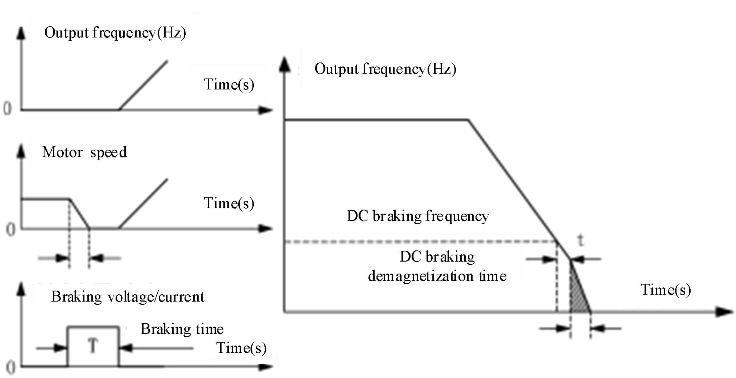


Figure 7-16 shows the DC braking initiation process, and Figure 7-17 shows the DC braking initiation process.

In situations with heavy loads, due to inertia, normal deceleration may not be able to bring the motor to a complete stop. Extending the DC braking time or increasing the DC braking current can stop the motor from rotating.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F04.27	Terminal start command reconfirmation	0: Not confirmed 1: Confirm		1	○

F04.27=0: Unconfirmed

When the running terminal (RUN or F/R terminal) is closed, F00.03 is set to 0 or 1. When the terminal is started or stopped, it will run directly upon power-on or when the start/stop mode is switched to the terminal.

F04.27= 1: Confirmed

When the running terminal is closed, F00.03 is set to 0 or 1. When the terminal is started or stopped, it cannot run directly when powered on or when the start/stop mode is switched to the terminal. The running terminal needs to be disconnected and then closed before it can run.

7.6 Group F05 V/F control parameter group

This set of function codes is only valid for V/F control and not for vector control.

V/F control is suitable for general loads such as fans and pumps, or for applications where one frequency converter drives multiple motors, or where there is a large difference between the power of the frequency converter and the power of the motor.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F05.00	V/F curve setting	0: Straight line V/F 1: Multi-point polyline V/F		1	○

F05.00=0: Linear V/F

Suitable for ordinary constant torque loads.

F05.00=1: Multi-point V/F

Suitable for special loads such as dehydrators, centrifuges, and cranes. By setting parameters F05.01 to F05.06, any V/F relationship curve can be obtained.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F05.01	Multi-point VF frequency point F1	0.00～F05.03	Hz	0.00	●
F05.02	Multi-point VF voltage point V1	0.0～100.0 (100.0 = motor rated voltage)	%	3.5	●
F05.03	Multi-point VF frequency point F2	F05.01～F05.05	Hz	2.00	●
F05.04	Multi-point VF voltage point V2	0.0～100.0	%	7.5	●
F05.05	Multi-point VF frequency point F3	F05.03 ~ Rated frequency (reference frequency) of the motor	Hz	5.00	●
F05.06	Multi-point VF voltage point V3	0.0～100.0	%	14.0	●

The F05.01 to F05.06 code parameters are valid when F05.00= 1 is selected. Any V/F curve is determined by the curves set by the input frequency percentage and output voltage percentage, and is piecewise linearized within different input ranges. The motor's rated frequency is the frequency ultimately reached by the V/F curve, which is also the frequency value corresponding to the highest output voltage. Input frequency percentage: motor rated frequency = 100.0%, output voltage percentage: motor rated voltage Ue = 100.0%.

If the slope of the V/F curve is set too high, an "overcurrent" fault may occur.

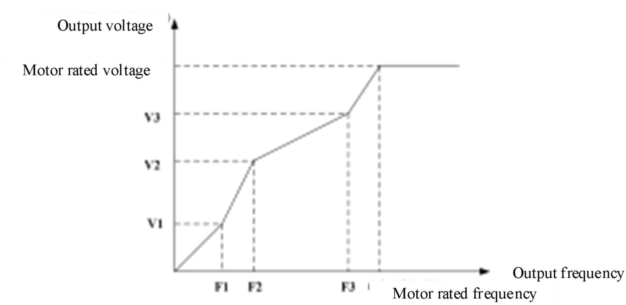


Figure 7-18 Schematic diagram of V/F curve of multi-point broken line.

Function code	Function code name	Function code parameter description	unit	Factory value	property

F05.10	V/F forward torque boost gain	0.00～200.00	%	3.50	●

Used to compensate for voltage drops caused by stator resistance and conductors, thereby improving low-frequency load capacity.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F05.11	V/F slip compensation gain	0.00～200.00	%	0.00	●
F05.12	V/F Slip Filtering Time	0.00～10.00	s	1.00	●

When the motor rotor speed decreases as the load increases, slip compensation can be enabled to ensure that the motor rotor speed is close to the synchronous speed under rated load. If the motor speed is lower than the target value, the F05. 11 setting can be increased.

★: F05. 11=0.00, slip compensation is invalid.

When starting up quickly with high inertia, the slip is 100%. When the set frequency is reached, the slip becomes 0, and the output frequency drops rapidly, which can cause overvoltage or overcurrent. The F05. 12 filter mitigates the rise in voltage and current.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F05.13	Oscillation suppression gain	0～20000		100	●
F05.14	Oscillation suppression cutoff frequency	0.00～600.00	Hz	55.00	●

In open-loop control (VVF), this parameter is adjusted to suppress motor oscillation. When the motor does not oscillate, try not to adjust this parameter, or you can appropriately decrease it; when the motor oscillates significantly, you can appropriately increase this parameter.

7.7 F06 group vector control parameter group

Function code	Function code name	Function code parameter description	unit	Factory value	property

F06.00	Speed proportional gain ASR_P1	0.00～100.00		12.00	●
F06.01	Velocity integral time constant ASR_T1	0.000～30.000 0.000: No points	s	0.200	●
F06.02	Speed proportional gain ASR_P2	0.00～100.00		8.00	●
F06.03	Velocity integral time constant ASR_T2	0.000～30.000 0.000: No points	s	0.300	●
F06.04	Switching frequency 1	0.00 ~ Switching frequency 2	Hz	5.00	●
F06.05	Switching frequency 2	Switching frequency 1 to maximum frequency F00.16	Hz	10.00	●

In FVC mode, the inverter adjusts the speed dynamic response of the vector control by adjusting the speed proportional gain and speed integral time of the speed PI regulator. Increasing the speed proportional gain or decreasing the speed integral time can speed up the dynamic response of the speed loop. However, excessively large speed proportional gain or excessively small or large speed integral time can lead to large system overshoot and thus oscillation.

Users should adjust the above speed PI parameters according to the actual load characteristics. Generally, under the premise of ensuring that the system does not oscillate, the proportional gain should be increased as much as possible, and then the integral time should be adjusted so that the system has both fast response characteristics and small overshoot.

To ensure rapid dynamic response at both low and high speeds, PI regulation needs to be performed separately at low and high speeds. During actual operation, the speed regulator automatically calculates the current PI parameters based on the current frequency. Below switching frequency 1, the speed PI parameters are P1 and T1. Above switching frequency 2, the speed PI parameters are P2 and T2. If the switching frequency is greater than F06.04 (switching frequency 1) but less than F06.05 (switching frequency 2), the transition from switching frequency 1 to switching frequency 2 is a linear transition process, as shown in Figure 7-19.

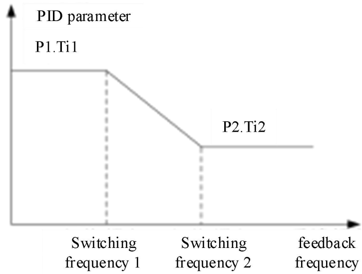


Figure 7-19 PI parameter schematic diagram

1. Parameters F06.00 to F06.05 should be adjusted with caution, and generally no adjustment is necessary.

2. When setting the switching frequency, please note that F06.04 switching frequency 1 must be less than or equal to F06.05 switching frequency 2.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.07	Speed loop output filter time constant	0.000～0.100	s	0.001	●

The speed loop output filter can reduce the impact on the current loop, but the value of F06.07 should not be set too high, as this will slow down the response. Users generally can use the factory default value.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.08	Vector control slip gain	10.00～200.00	%	100.00	●

When the motor rotor speed decreases as the load increases, slip compensation can be enabled to ensure that the motor rotor speed is close to the synchronous speed under rated load. If the motor speed is lower than the target value, the F06.08 setting can be increased.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.10	Speed control torque limit	80.0～250.0	%	200.0	●
F06.11	Speed control braking torque upper limit	80.0～250.0	%	200.0	●

Vector control is used to set the operating conditions for torque limiting. If the output torque of the frequency converter is higher than the set value of F06. 10/F06. 11, the torque limiting function will be activated to control the output torque to not exceed the upper limit of the speed control torque.

1. This code parameter represents the ratio of the output torque during torque limiting operation to the rated output torque of the frequency converter;
2. Users can set the upper limit of torque according to actual needs to protect the motor or meet the working conditions.
3. Electric mode and braking mode are set separately.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.12	Excitation Current Proportional Gain ACR-P1	0.00～10.00		0.50	●
F06.13	Excitation current integral time constant ACR-T1	0.00～300.00 0.00: No points	ms	10.00	●
F06.14	Torque Current Proportional Gain ACR-P2	0.00～10.00		0.50	●
F06.15	Torque-current integral time constant ACR-T2	0.00～300.00 0.00: No points	ms	10.00	●

The parameters of the current loop PID controller directly affect the performance and stability of the system, and under normal circumstances, users do not need to change these factory values.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.17	SVC zero-frequency processing method	0: Brake holding 1: No action 2: Seal the pipe		2	○
F06.18	SVC zero-frequency holding current	50.0～400.0 (100.0 is the motor no-load current)	%	100.0	○
F20.40	Id low-frequency switching frequency	0.5～10.00	Hz	5.00	●

When the SVC control mode (e.g., F00.01= 1) is in the zero-frequency operation phase, the inverter will select and process according to F06.17.

F06.17=0, and the current is set according to F06. 18 to perform the holding brake, so as to achieve the function of type zero servo;

F06.17=1, do not process;

F06.17=2, inverter output is blocked, free stop.

In tower crane slewing applications (SVC mode), with F06.17 set to 0, the excitation current change before entering the SVC zero-frequency braking state is shown in Figure 7-20. During normal constant speed operation (below the rated frequency), the actual output excitation current is F01.13. During deceleration, after the output frequency is lower than the set F20.40, it linearly changes to the value ofF06.18 * F01.13 based on the current speed. After entering the SVC zero-frequency braking state, the excitation current remains at the value ofF06.18 * F01.13.

In rotary mechanisms with eddy current braking, if the eddy current braking force is insufficient and the machine cannot be stopped, a zero-frequency SVC brake can be added to assist in stopping the machine. After adding the zero-frequency brake, if the machine rebounds after stopping, the value ofF06. 18 needs to be reduced to reduce the braking current of the SVC.

In slewing mechanisms without eddy current braking, it is necessary to use a zero-frequency brake (SVC) to assist in stopping the machine. A larger value ofF06.18 results in greater stopping force, which can easily lead to a rebound phenomenon during slewing stops; a smaller value ofF06. 18 results in weaker stopping force, which can easily lead to the machine failing to stop completely. In slewing applications, the default value of F06. 18 is 40.0%, and appropriate adjustments should be made based on the site conditions.

1. In SVC control mode, the time to enter zero-frequency braking is controlled by the value of F04.22 (stop DC braking time). In general slewing applications, the reference time for adding zero-frequency braking is about 15 seconds.

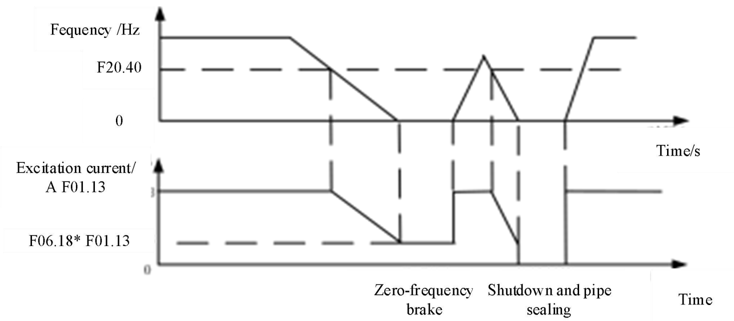


Figure 7-20: Low-frequency switching process of Id

Function code	Function code name	Function code parameter description	unit	Factory value	property
F06.20	Voltage feedforward gain	0～100	%	0	●

In vector control, voltage feedforward regulation is added to achieve automatic torque boost, i.e., stator voltage drop compensation is performed.

7.8 F07 Fault Protection Parameter Group

<table>
<tr><th>Function code</th><th>Function Code name</th><th colspan="8">Function code parameter description</th><th>unit</th><th>Factory value</th><th>property</th></tr>
<tr><td rowspan="2">F07.00</td><td rowspan="2">Protective Shielding</td><td>E20</td><td>E22</td><td>E13</td><td>E06</td><td>E05</td><td>E04</td><td>E07</td><td>E08</td><td rowspan="2"></td><td rowspan="2">00000000</td><td rowspan="2">○</td></tr>
<tr><td colspan="8">0: Protection is effective
1: Protection is blocked</td></tr>
<tr><td rowspan="2">F07.35</td><td rowspan="2">Protective shielding 2</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>E81</td><td rowspan="2"></td><td rowspan="2">00000000</td><td rowspan="2">○</td></tr>
<tr><td colspan="8">0: Protection is effective
1: Protection is blocked</td></tr>
</table>

Bit setting value = 0: After the frequency converter detects the fault corresponding to this bit, it stops outputting and enters the fault state.

Bit setting value = 1: After the frequency converter detects the fault corresponding to this bit, it will not take any protective action and will remain in its original state.

This code involves bit manipulation; to set it, simply set the corresponding bit to 0 or 1. See the table below:

Protect code	E20	E22	E13	E06	E05	E04	E07	E08
Corresponding bit	7	6	5	4	3	2	1	0
Setting value	*	*	0/1	0/1	0/1	0/1	0/1	0/1

For example, to disable E07 protection, simply set the first bit corresponding to E07 to 1, i.e., F07.00 = 00000010.

To disable protection for E08 and E13, simply set bit 0 of E08 and bit 5 of E13 to 1. That is, F07.00 = 00100001.

Unless there is a special need, please do not disable any protection functions to avoid damage to the inverter due to lack of protection after a fault occurs.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.01	Motor overload protection gain	0.20～10.00		1.00	●
F07.02	Motor overload pre-alarm coefficient	50～100	%	80	●

The inverse time curve for motor overload protection is: 200% × (F07.01) × motor rated current, which will trigger an alarm for motor overload fault after 2 seconds; 150% × (F07.01) × motor rated current, which will trigger an alarm for motor overload after 2 minutes.

Users need to set the value of F07.01 correctly according to the actual overload capacity of the motor. Setting this parameter too high can easily lead to overheating and damage to the motor without the inverter alarming!

The F07.02 warning coefficient is used to determine the extent to which a warning is issued before the motor overload protection is activated. The larger this value, the smaller the warning lead time.

When the cumulative output current of the frequency converter exceeds the product of the overload inverse time curve and F07.02, the frequency converter's multi-function digital DO outputs a "motor overload pre-alarm" ON signal.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.06	Bus voltage control selection	0: Invalid 1: Undervoltage stall effective 2: Overpressure stall effective 3: Effective for both overvoltage and undervoltage stall.		0	○
F07.07	Overvoltage stall control voltage	120.0%～150.0% （380V, 100.0%=537V）	%	128.5(690V)	●

F07.08	Undervoltage stall control voltage	60.0 ~ Voltage used to determine the end of a power outage (100.0 = standard bus voltage)	%	76.0	●

F07.06=0: Invalid

Overpressure stall is ineffective; it is recommended not to set it to 0 when there is no external braking unit.

Undervoltage stall also has no effect;

F07.06=1: Undervoltage stall effective

When the bus voltage is lower than F07.08, the frequency converter decelerates to zero and stops, and reports a steady-state undervoltage fault (E06).

F07.06=2: Overpressure stall effective

When overvoltage stall is effective, the stall control voltage is set by F07.07.

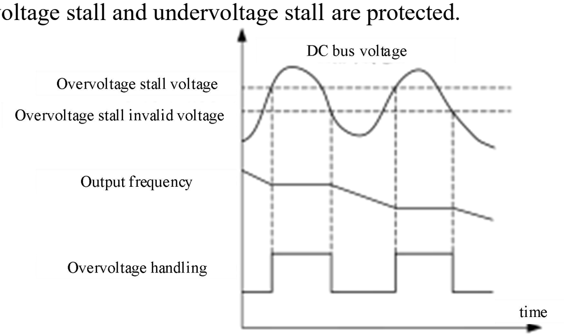
DC bus overvoltage is generally caused by deceleration. During deceleration, the DC bus voltage increases due to energy feedback.

When the DC bus voltage exceeds the overvoltage threshold, if the overvoltage stall is effective (F07.06=2/3), the inverter will pause deceleration, maintain the output frequency unchanged, and energy feedback will stop until the DC bus voltage returns to normal, at which point deceleration will resume. The overvoltage stall protection process during deceleration is shown in Figure 7-20.

Figure 7-20 Schematic diagram of overvoltage stall protection

F07.06=3: Effective for both overvoltage and undervoltage stall.

Both overvoltage stall and undervoltage stall are protected.



Function code	Function code name	Parameter Description	unit	Factory value	property
F07.09	Voltage determination after power outage	Undervoltage stall control voltage～100.0	%	86.0	●
F07.10	Delay time for determining the end of power outage	0.00～100.00	s	5.00	●

When the bus voltage is lower than the undervoltage stall control voltage (F07.08), the frequency converter enters the power-down state; when the bus voltage is higher than the power outage end judgment voltage (F07.09), and after the power outage end judgment delay time (F07. 10) continues, the frequency converter returns to normal state.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.11	Current limiting control	0: Invalid 1: Limiting Method 1 2: Limiting Method 2		0	○
F07.12	Current limiting level	20.0～180.0 (100% = motor rated current)	%	180.0	●

F07.11=0: Invalid

Current limiting is not working F07. 11=1: Limiting mode 1

F07. 11=2: Limiting mode 2

During operation, when the output current reaches the current limiting level (F07. 12), if the current limiting control is effective, the system will activate the current limiting function: reducing the output frequency to limit the increase of the output current, causing the inverter to exit the overcurrent stall state. When the output current decreases to below the current limiting action level, the original operating state is restored. The current limiting action process is shown in Figure 7-21.

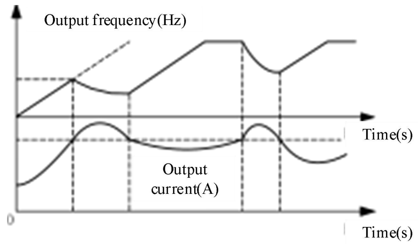


Figure 7-21 Current limiting operation process

F07. 12 is used to set the operating conditions for current limiting. If the output current of the frequency converter is higher than the set value of this code, the current limiting
function will be activated to control the output current to not exceed the current limit level.

Current limiting is only effective for V/F drive mode. This function is recommended for applications with high inertia, fan-type loads, or where a single frequency converter drives multiple motors.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.13	Fast rate limiting selection	0: Invalid 1: Valid		0	○

F07.13=0: Invalid

Fast rate limiting is not working.

F07.13=1: Valid

Rapid current limiting can reduce overcurrent faults.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.25	Motor overspeed detection level	0.0～50.0 (reference is the maximum frequency F00. 16)	%	20.0	●
F07.26	Motor overspeed detection time	0.0～60.0, 0.0: Disable motor overspeed protection	s	1.0	●

If F07.26 is set to 0, the overspeed protection is disabled.

If F07.26 is not set to 0, an overspeed fault will be reported if the detected motor speed deviation exceeds the F07.25 setting value for more than the time set by F07.26.

It is recommended to set the F07.25 value to be greater than 10% to avoid erroneously triggering the overspeed protection.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.27	AVR Function Selection	0: Invalid 1: Effective		1	○

F07.27=0: AVR (Automatic Voltage Regulator) function is invalid.

F07.27=1: AVR (Automatic Voltage Regulator) function is active, keeping the output voltage constant when the bus voltage fluctuates too much.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.28	Stall fault detection time	0.0～6000.0 (0.0: Stall fault detection is invalid)	s	0.0	○

When F07.28 = 0.0s, stall fault detection is invalid. When F07.28 is non-zero, if the motor is in a stall state for more than the time set by F07.28, an E20 stall fault will be reported.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F07.41	Input phase loss detection method	0: Software detection of ILP 1: Hardware detection ILP (continuous detection) 2: Simultaneous detection of ILP by both software and hardware 3: Hardware detection ILP (running)		0	○

0: Software detects ILP;

1: Hardware detection ILP (continuous detection);

When the frequency converter is in parameter setting or running state, if the hardware circuit detects a missing input phase, an ILP fault will occur.

2: Simultaneous software and hardware detection of ILP:

3: Hardware detection ILP (running):

When the inverter is only in operation, if the hardware circuit detects a missing input phase, it will trip the ILP fault. When F20.00 is 7 or 12, this is the default mode.

This method is mainly used in the elevator industry. When the elevator is not closed, it is in a phase loss input state, but the phase loss fault cannot be tripped. In actual operation, the cage door will be lowered, at which point the three-phase input power is normal. If the hardware detects a phase loss during operation, it needs to immediately trip the ILP fault.

7.9 F08 Group Multi-speed and Simple PLC Parameter Group

Function code	Function code name	Function code parameter description	unit	Factory value	property
F08.00	Multi-speed 1	0.00～Maximum frequency F00.16	Hz	6.00	●
F08.01	Multi-speed 2	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.02	Multi-speed 3	0.00～Maximum frequency F00.16	Hz	35.00	●
F08.03	Multi-speed 4	0.00～Maximum frequency F00.16	Hz	50.00	●
F08.04	Multi-speed 5	0.00～Maximum frequency F00.16	Hz	95.00	●
F08.05	Multi-speed 6	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.06	Multi-speed 7	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.07	Multi-speed 8	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.08	Multi-speed 9	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.09	Multi-speed 10	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.10	Multi-speed 11	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.11	Multi-speed 12	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.12	Multi-speed 13	0.00～Maximum frequency F00.16	Hz	20.00	●

F08.13	Multi-speed 14	0.00～Maximum frequency F00.16	Hz	20.00	●
F08.14	Multi-speed 15	0.00～Maximum frequency F00.16	Hz	20.00	●

With multiple speed control terminals and 15 frequency commands, combined with a digital frequency setpoint F00.07, 16 speeds can be provided.

Table 7–5 Combination of Multi-Segment Speed Commands and Multi-Segment Speed Terminals

Segment speed	Multi-speed terminal 4	Multi-speed terminal3	Multi-speed terminal2	Multi-speed terminal1	Selected frequency	Corresponding function code
1	OFF	OFF	OFF	OFF	Digital frequency given	Determined by F00.07
2	OFF	OFF	OFF	ON	Multi-spee d 1	F08.00
3	OFF	OFF	ON	OFF	Multi-spee d 2	F08.01
4	OFF	OFF	ON	ON	Multi-spee d 3	F08.02
5	OFF	ON	OFF	OFF	Multi-spee d 4	F08.03
6	OFF	ON	OFF	ON	Multi-spee d 5	F08.04
7	OFF	ON	ON	OFF	Multi-spee d 6	F08.05
8	OFF	ON	ON	ON	Multi-spee d 7	F08.06
9	ON	OFF	OFF	OFF	Multi-spee d 8	F08.07
10	ON	OFF	OFF	ON	Multi-spee d 9	F08.08
11	ON	OFF	ON	OFF	Multi-spee d 10	F08.09
12	ON	OFF	ON	ON	Multi-spee d 11	F08.10
13	ON	ON	OFF	OFF	Multi-spee d 12	F08.11
14	ON	ON	OFF	ON	Multi-spee d 13	F08.12

15	ON	ON	ON	OFF	Multi-spee d 14	F08.13
16	ON	ON	ON	ON	Multi-spee d 15	F08.14

Settings Notes:

★ The start and stop times during multi-speed operation are determined by function code F00.02.

★ The acceleration and deceleration times during multi-speed operation can be controlled by an external terminal set to the acceleration and deceleration time function.

The direction of operation during multi-speed operation is controlled by the F/R and RUN terminals.

7.10 F09 Group PID Functional Parameter Group

reserve

7.11 F10 group communication function parameter group

It supports the RTU format Modbus protocol and has an RS-485 bus "single master multiple slave" communication network (see Chapter 12 for details).

Function code	Function code name	Parameter Description	unit	Factory value	prope rty
F10.00	Local Modbus communication address	1~247, 0 is the broadcast address		1	○

For the entire communication network, the frequency converter, as a slave device, must have its own unique address. Its setting range is 1 to 247, meaning a network can support a maximum of247 slave devices.

★: 0 is the broadcast address, which can be recognized by all slave inverters. This
address does not need to be set.

Slave and master devices connected to the same network must follow the same transmission and reception principles (baud rate, data format, and protocol format, etc.) to ensure normal communication. Therefore, the devices on the network must be configured identically for the three function codes F10.01 (baud rate), F10.02 (data format), and F10.10 (protocol format; the default for crane-specific frequency converters is Modbus-RTU protocol).

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.01	Modbus communication baud rate	0：4800 1：9600 2：19200 3：38400 4：57600 5：115200	bps	1	○

When communicating via the Modbus protocol in RTU format, six different baud rates are supported, with the unit being bps (bit/s). For example, F10.01 = 9600bps means that 9600 bits of data are transmitted per second. Under default conditions, each byte of valid data (such as 0x01) actually requires the transmission of 10 bits of data, so the transmission time is approximately 1.04ms (≈1.04167ms = 10 bits / 9600bps).

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.02	Modbus data format	0: 1-8-N-1 (1 start bit + 8 data bits + 1 stop bit) 1: 1-8-E-1 (1 start bit + 8 data bits + 1 even parity + 1 stop bit) 2: 1-8-O-1 (1 start bit + 8 data bits + 1 odd parity + 1 stop bit) 3: 1-8-N-2 (1 start bit + 8 data bits + 2 stop bits) 4: 1-8-E-2 (1 start bit + 8 data bits + 1 even parity + 2 stop bits) 5: 1-8-O-2 (1 start bit + 8 data bits + 1 odd parity + 2 stop bits)		0	○

When transmitting data via UART, the data typically consists of a start bit, valid data (default 8 bits), a parity bit (optional), and a stop bit. Crane-specific frequency converters,

when communicating via the RTU-format Modbus protocol, support a total of 6 different data formats depending on the combination.

start bit	Valid data								Check bit	Stop bit
1	7	6	5	4	3	2	1	0	NOAH	1

If F10.02=0, it means that the current data format is 1 start bit + 8 data bits + no parity + 1 stop bit.

★: N (NONE), no parity check; E (EVEN), even parity; O (ODD), odd parity.

To meet different needs, when using the Modbus protocol for network communication, communication timeout and response delay functions are also supported.

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.03	Communication timeout	0.0 ～ 60.0, 0.0: Invalid (also valid for master-slave configuration)	s	0.0	●

As shown in Figure 7-22, the communication time interval Δt is defined as the time between the start of the slave station (frequency converter) receiving the previous valid data frame and the end of the next valid data frame. If Δt is greater than the predetermined time (set by function code F10.03; if set to 0, this function is invalid), then the communication is considered to have timed out.

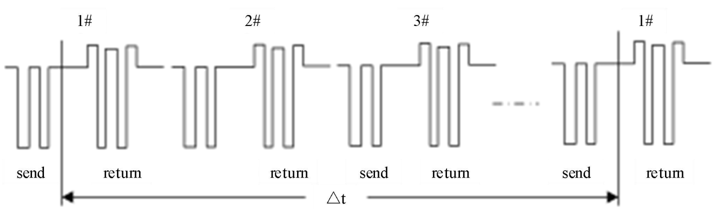


Figure 7-22 Schematic diagram of communication timeout

Use case for this function: If the master station must send data to a slave station (e.g., 1) within a certain time T, the communication timeout function for slave station

- can be enabled, and F10.03>T can be set. During normal communication, the communication timeout fault will not be triggered. However, if the master station does not send data to slave station

- within the specified time T, and the duration exceeds the setting of F10.03, a communication abnormality fault (E16) will be reported, indicating "slave station

- communication fault," allowing staff to quickly troubleshoot the problem.

★: F10.03 must be greater than the predetermined time T, but not too large, so as to avoid adverse effects caused by excessively long fault operation time.

★: F10.03 should normally be set to invalid. This parameter should only be set in continuous, periodic communication systems to monitor communication status.

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.04	Modbus response delay	1～20	ms	3	●

Define the time interval from when the frequency converter receives a valid data frame 1, to when it parses the data, and then begins to return data as the response delay (t2). To

ensure stable operation of the protocol chip, the response delay is set to a range of 1–20 ms (no 0). If the communication data involves EEPROM operations, the actual response delay will be extended, specifically "EEPROM operation time + F10.04".

1: Valid data frame: Data sent from the external master station to the local machine, with correct function code, data length, and CRC.

In Figure 7-23, there are four segments: data transmission segment (t_transmit), end-of-transmission segment (t_wait1), 75176 forward-to-transmit waiting segment

(t_wait2), data return segment (t_return), and 75176 forward-to-receive waiting segment (t_wait3).

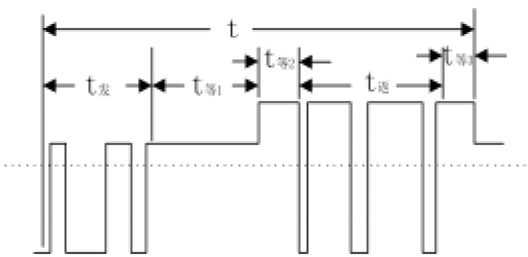


Figure 7-23 Complete Data Frame Timing Analysis Diagram

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.10	Communication protocol selection	0: Modbus-RTU protocol		0	○

The crane-specific frequency converter only supports the Modbus-RTU protocol. If you need to use other protocol formats, please contact our company.

Function code	Function code name	Parameter Description	unit	Factory value	property

F10.12	CANopen expansion card communication address	1～127		1	○

When using the CANopen expansion card for communication, the communication address of the corresponding card is set via F10.12. Each machine has a unique address.

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.15	Expansion card and bus communication baud rate	Units digit: CANopen 0: 125K 1: 250K 2: 500K 3: 1M Tens digit: DeviceNet 0: 125K 1: 250K 2: 500K		23	○

When using CANopen as the communication expansion card, it is necessary to set the baud rate for communication between the expansion card and the bus.

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.48	Communication card software version				×

The communication card software version is a read-only parameter.

Function code	Function code name	Parameter Description	unit	Factory value	property
F10.56	485 EEPROM Write Processing Selection	0-10: Default operation (used during debugging) 11: Never trigger a write operation (can be used after debugging)		0	○

For applications using a "PLC controller/HMI + frequency converter", after equipment commissioning, F10.56 can be set to 11.

Afterwards, all PLC communication write data will not be stored, which can avoid the problem of damaging the memory.

If you need to set parameters and require power-off storage, you can set F10.56=0 before proceeding.

Function code	Function code name	Parameter Description	unit	Factory value	property

F10.59	CANopen communication timeout	0.01～600.00	S	3.00	×

If the inverter fails to communicate with the host computer for the time set by F10.59, the inverter will trip to fault E33.

7.12 F11 Group User-selectable parameter group

The keypad for crane-specific frequency converters supports user-selectable functions. First, the user sets the parameters in group F11, selects a specific function code, and then enters the user-selection mode (--U--, see 4.2-LCD Keyboard Operation). At this point, the user can cycle through the selected function codes using the up or down arrow keys. This function is primarily used in situations involving fewer than 32 specific function codes, providing a shortcut for customers to access frequently used function codes and avoiding the hassle of dealing with too many codes.

Function code	Function code name	Parameter Description	unit	Factory value	property
F11.00	User-selected parameter 1	The content displays Uxx.xx, indicating that function code Fxx.xx has been selected. For example, when entering function code F11.00, the keyboard displays U00.00, which indicates that the first user-selected parameter is F00.00.		U00.00	●
F11.01	User-selected parameter 2			U00.01	●
F11.02	User-selected parameter 3			U00.02	●
F11.03	User-selected parameter 4			U00.03	●
F11.04	User-selected parameter 5			U00.04	●
F11.05	User-selected parameter 6			U00.07	●
F11.06	User-selected parameter 7			U00.14	●
F11.07	User-selected parameter 8			U00.15	●
F11.08	User-selected parameter 9			U00.16	●
F11.09	User-selected parameter 10			U00.18	●
F11.10	User-selected parameter 11			U00.19	●
F11.11	User-selected parameter 12			U00.29	●

F11.12	User-selected parameter 13			U02.00	●
F11.13	User-selected parameter 14			U02.01	●
F11.14	User-selected parameter 15			U02.02	●
Function code	Function code name	Parameter Description	unit	Factory value	property
F11.15	User-selected parameter 16			U03.00	●
F11.16	User-selected parameter 17			U03.02	●
F11.17	User-selected parameter 18			U03.21	●
F11.18	User-selected parameter 19			U04.00	●
F11.19	User-selected parameters 20			U04.20	●
F11.20	User-selected parameter 21			U05.00	●
F11.21	User-selected parameter 22			U05.03	●
F11.22	User-selected parameter 23			U05.04	●
F11.23	User-selected parameter 24			U08.00	●
F11.24	User-selected parameter 25			U19.00	●
F11.25	User-selected parameter 26			U19.01	●
F11.26	User-selected parameter 27			U19.02	●
F11.27	User-selected parameter 28			U19.03	●
F11.28	User-selected parameter 29			U19.04	●
F11.29	User-selected parameter 30			U19.05	●
F11.30	User-selected parameter 31			U19.06	●
F11.31	User-selected parameter 32			U19.12	●

F11.00=U00.00 indicates that the first user-selectable parameter is function code F00.00. The switching order of function codes in keyboard user-selection mode is the order in which function codes F11.00 to F11.31 are set and selected.

7.13 F12 group keyboard and display function parameter group

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.00	MK Multifunction Key Selection	0: No function 1: Forward jog 2: Reverse jog 3: Forward/Reverse switch 4: Hold 5: Free stop 6: Keyboard left shift key		1	○

This is a multifunction key, meaning its actual function can be achieved by setting the function code F12.00. If F12.00=0, pressing this key will have no effect; when set to other values, pressing this key will have the corresponding effect.

★: 4 is a reserved option, please do not set it.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.01	STOP button stop function selection	0: Valid only for keyboard control 1: Valid for all command channels		1	○

According to function code F00.02 (Command Source Selection), the command source is divided into three types: keyboard, terminal, and communication. If the terminal is selected as the current command source, the run and stop keys on the keyboard will be ineffective. However, in many dangerous situations, using the stop key on the keyboard to stop the machine and eliminate the danger is often the fastest way. Moreover, stopping the machine using the keyboard is the most convenient during normal operation. Therefore, function code "F12.01, STOP key stop function selection" was added, and the STOP key is always enabled by default.

★: It is not recommended to modify this parameter. If you need to, please set it with caution.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.02	Parameter locking	0: Unlocked 1: Unlocked for reference input 2: Lock all except this function code		0	●

To prevent unnecessary dangers caused by unauthorized keyboard operation or accidental operation, the keyboard has a parameter locking function. The current function code is unlocked by default, and all function codes can be configured at this time; once the function codes have been debugged according to the operating conditions, the parameters can be locked.

1: Reference input is not locked

In this locked mode, for function code operations, only function codes with reference input properties and the function code itself can be modified; other function codes cannot be modified. Function codes with parameter input properties are listed in Table 7-6:

Table 7–6 List of Function Codes with Reference Input Properties

Function code	Function code name	Function code	Function code name
F00.07	Digital frequency given	F08.08	Multi-speed 9
F08.00	Multi-speed 1	F08.09	Multi-speed 10
F08.01	Multi-speed 2	F08.10	Multi-speed 11
F08.02	Multi-speed 3	F08.11	Multi-speed 12
F08.03	Multi-speed 4	F08.12	Multi-speed 13
F08.04	Multi-speed 5	F08.13	Multi-speed 14
F08.05	Multi-speed 6	F08.14	Multi-speed 15
F08.06	Multi-speed 7	F13.02	Digital torque command
F08.07	Multi-speed 8		

2: Lock everything except this function code.

In this locked mode, no settings can be made except for this function code. This mode is mostly used when parameters have already been set and debugged, and no further parameter settings are needed. In this mode, only run, stop, and monitor operations are performed.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.03	Parameter copy	0: No operation 1: Parameter upload keyboard 2: Parameter download to inverter		0	○

For applications requiring multiple frequency converters to operate with the same parameter settings, we can first debug one frequency converter; then set F12.03=1 on the current frequency converter to temporarily upload the currently set parameters to the keyboard; finally, on other frequency converters requiring the same settings, set F12.03=2 to download the parameters to the frequency converters. This function allows for quick parameter settings for multiple frequency converters. Even if some parameter settings differ, we can first set most function codes using this function and then use other methods to set them individually. (See 4.3 Parameter Copy for details)

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.04	LED display parameters 1	00000000 ～ 11111111 (0 indicates no display, 1 indicates display) bit0: Output frequency bit1: Set frequency bit2: Output current bit3: Output voltage bit4: DC bus voltage bit5: Output power bit6: Output torque bit7: Torque setpoint		00011111	●
F12.05	LED display parameters 2	00000000 ～01011101 (0 indicates no display, 1 indicates display) bit0: PG card feedback frequency bit1: Reserved bit2: Load speed bit3: Digital input terminal status 1 bit4: Digital input terminal status 2 bit5: Reserved bit6: Digital output terminal status bit7: Reserved		00000000	●

We can enter monitoring mode by pressing the ESC key (see section 4.2 LCD keyboard operation). In this mode, we can use the right arrow key to cycle through the displays of different parameters. Function codes F12.04 to F12.05 are used to select which parameters should be displayed, i.e., added to the cyclic display queue. The selected options basically correspond to the F18 monitoring parameter group, so we can also directly access each item in the F18 group to view the current value of each parameter. This function is mainly for convenient display, especially during operation.

By default, the cyclic display queue only contains a few commonly used items: output frequency (F18.00), set frequency (F18.01), output current (F18.06), output voltage (F18.07), and DC bus voltage (F18.08). To select other display parameters, set the corresponding bit to 1; to not view the selected parameters, set the corresponding bit to 0.

★: If the number of digits exceeds the upper 3 digits of the 5-digit display, you need to switch to the upper 3 digits using the right shift key before setting it.

★: Some digits of the display parameter selection function code are reserved. Operations on the reserved digits are invalid.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.09	Load speed display coefficient	0.01～600.00		30.00	●

Most inverter outputs are displayed in frequency mode. If you need to pay attention to the current load speed (F18. 14), you can set the current parameters according to the actual working conditions to convert the frequency output into speed output so that F18. 14 can correctly display the current load speed.

IfF12.09 = 30.00 (this value is related to the number of pole pairs of the motor and the transmission ratio of the equipment, etc.), then the output frequency of 0.00 ～ 50.00Hz corresponds to the load speed of 0～1500rpm.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12. 14	Restore factory settings	0: No operation 1: Restore factory settings (excluding motor parameters, inverter parameters, manufacturer parameters, running and power-on time records)		0	○

Setting this parameter to 1 can restore all parameters except motor parameters (F01 group), inverter parameters, manufacturer parameters, power-on time (F12.15, 16), and running time (F12.17, 18) to factory settings.

★: This operation is irreversible, please set it with caution.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.15	Cumulative power-on time h	0～65535	h	0	×

F12.16	Cumulative power-on time (min)	0～59	min	0	×

F12.15 and F12.16 together are used to view the cumulative power-on time of the frequency converter from the time of manufacture to the present (as long as the frequency converter is powered on). It is accurate to 1 minute and can display up to nearly 65,536 hours (approximately 7.5 years).

If F12.15=50 and F12.16=33, it means that the frequency converter has been powered on for a total of 2 days, 2 hours and 33 minutes.

★: This parameter is for reference only, cannot be operated, and cannot be cleared.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.17	Cumulative running time h	0～65535	h	0	×
F12.18	Cumulative running time (min)	0～59	min	0	×

F12.17 and F12.18 together are used to view the cumulative operating time of the frequency converter from the time of manufacture to the present (the frequency converter

must be running). Accurate to 1 minute, the longest display can be approximately 65,536 hours (about 7.5 years).

If F12.17=47 and F12.18=39, it means that the frequency converter has accumulated 1 day, 23 hours and 39 minutes of operation.

★: This parameter is for reference only, cannot be operated, and cannot be cleared.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.19	Inverter rated power	0.40～650.00	kW	Model confirmed	×
F12.20	Inverter rated voltage	60～690	In	Model confirmed	×
F12.21	Inverter rated current	0.1～1500.0	A	Model confirmed	×

Used to view the rated power, rated voltage, and rated current of the current frequency converter.

★: This parameter is for reference only and cannot be operated.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.22	Performance software serial number 1	XXX.XX		XXX.XX	×
F12.23	Performance software serial number 2	XX.XXX		XX.XXX	×
F12.24	Functional software serial number 1	XXX.XX		XXX.XX	×
F12.25	Functional software serial number 2	XX.XXX		XX.XXX	×
F12.26	Keyboard software serial number 1	XXX.XX		XXX.XX	×
F12.27	Keyboard software serial number 2	XX.XXX		XX.XXX	×

Used to view the current software version of the frequency converter. ★: This parameter is for reference only and cannot be operated.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.28	Product serial number 1	XX.XXX		XX.XXX	×
F12.29	Product serial number 2	XXXX.X		XXXX.X	×
F12.30	Product serial number 3	XXXXX		XXXXX	×

Used to view the current product type.

★: This parameter is for reference only and cannot be operated.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.31	LCD Language Selection	0: Chinese 1: English 2: Reserved		0	●

LCD language selection.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.32	Monitoring status mode selection	0: Mode 0 1: Mode 1		1	●
F12.33	Mode 1 operating status display parameter 1(LED stop status display parameter 5)	0.00～99.99		18.00	●
F12.34	Mode 1 operating status display parameter 2(LED stop status display parameter 1)	0.00～99.99		18.01	●
F12.35	Mode 1 operating status display parameter 3(LED stop status display parameter 2)	0.00～99.99		18.06	●
F12.36	Mode 1 operating status display parameter 4(LED stop status display parameter 3)	0.00～99.99		18.08	●
F12.37	Mode 1 operating status display parameter 5(LED stop status display parameter 4)	0.00～99.99		18.09	●

F12.32=0, monitoring mode 0. The function codes for LED switching display and LCD small line (7 lines) display are determined by the settings ofF12.04～F12.08. See the parameter description for the selected function codes.

F12.32= 1, Monitoring Mode 1. The function codes for LED switching display and LCD small line (7 lines) display are determined by settings F12.33 ～F12.37, and any function code can be selected. 18.00 indicates that function code F18.00 is selected.

Function code	Function code name	Parameter Description	unit	Factory value	property
F12.38	LCD Display Parameters 1	0.00～99.99		18.00	●
F12.39	LCD large-scale display parameters 2	0.00～99.99		18.06	●

F12.40	LCD large-scale display parameters 3	0.00～99.99		18.09	●

LCD large line display function code selection. 18.00 indicates that function code F18.00 is selected. The default condition means that in LCD large line display mode, three function codes F18.00, F18.06 and F18.09 can be monitored on one screen.

★: The LCD keyboard's small line and large line display switching is shown in the following figure.

For instructions on operating the LCD keyboard, please refer to the LCD keyboard user manual.

For monitoring mode selection, please refer to Section 4 of Chapter 4.

7.14 F13 group torque control parameter group

Function code	Function code name	Function code parameter description	unit	Factory value	property
F13.00	Speed/torque control selection	0: Speed control 1: Torque control		0	○

F13.00=0: Speed control

The control method is speed input, and the input quantity is frequency.

F13.00=1: Torque control

The input control mode is torque input, and the input quantity is a percentage of the rated torque current of the motor; it is only effective when the drive mode is speed sensor vector control (FVC), that is, when F00.01=2; speed sensor vector control (FVC) can realize torque control of squirrel-cage asynchronous motors and can directly replace AC asynchronous torque motors.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F13.01	Torque source selection	0: Digital torque setpoint F13.02		0	○

F13.02	Digital torque command	-200.0～200.0 (100.0 = motor rated torque)	%	100.0	●

F13.01=0: Digital torque setpoint F13.02

The torque is set by F13.02.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F13.06	Torque control acceleration time	0.00～120.00	s	0.05	●

By setting the acceleration and deceleration time for torque control, the motor speed can be changed smoothly.

F13.06 The time it takes for the torque current to rise from 0 to the rated torque current.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F13.08	Upper frequency selection for torque control	0: Set by F13.09		0	○
F13.09	Torque control upper limit frequency	0.00～Maximum frequency F00.16	Hz	50.00	●

The torque control upper limit frequency is used to set the maximum operating frequency of the inverter in both forward and reverse directions under torque control mode.

7.15 F14 group motor 2 parameter group

The TC760 series frequency converter can switch between two motors. The two motors can have their nameplate parameters set separately, their parameters tuned separately, and their V/F control or closed-loop vector control selected separately. The encoder-related parameters can be set separately, and parameters related to the performance of V/F control or closed-loop vector control can be set individually.

All relevant parameters for the second group of motors are in group F14, and the function code definitions are consistent with those of the first group. F14.00 ～ F14.34 correspond to F01.00 ～ F01.34, representing motor nameplate parameters, motor parameters, and encoder parameters, etc.; F14.35 corresponds to F00.01, representing the motor drive mode selection; F14.36～F14.76 correspond to F06.00～F06.40, representing vector control parameters; F14.78 corresponds to F00.16, representing the maximum frequency; F14.79 corresponds to F00.18, representing the upper limit frequency; F14.80~ F14.86 correspond to F05.00 ～F05.06, representing the V/F curve, etc.; F14.77 is the acceleration/deceleration time selection for motor 2. Only parameter F14.77 will be explained below; for other parameters, please refer to the relevant parameter descriptions for motor 1.

Function code	Function code name	Parameter Description	unit	Factory value	property
F14.77	Motor 2 acceleration/deceleration time selection	0: Same as motor 1 1:Acceleration/deceleration time 1 2:Acceleration/deceleration time 2 3:Acceleration/deceleration time 3 4:Acceleration/deceleration time 4		0	○

F14.77=0, the acceleration/deceleration time of motor 2 is the same as that of motor 1. Please refer to the function code descriptions from F15.03 to F15.09 for details.

F14.77= 1/2/3/4, the acceleration/deceleration time of motor 2 is fixed as acceleration/deceleration time 1/2/3/4, which correspond to function codes F00. 14 ~ F00. 15/F15.03～F15.04/F15.05～F15.06/F15.07～F15.08 respectively.

7.16 F15 Auxiliary Function Parameter Group

Function code	Function code name	Parameter Description	unit	Factory value	property
F15.03	Acceleration Time 2	0.00 ～ 650.00 （F15.13=0） 0.0～6500.0（F15.13=1） 0~65000（F15.13=2）	s	15.00	●
F15.04	Deceleration time 2	0.00 ～ 650.00 （F15.13=0） 0.0～6500.0（F15.13=1） 0~65000（F15.13=2）	s	15.00	●
F15.05	Acceleration Time 3	0.00 ～ 650.00 （F15.13=0） 0.0～6500.0（F15.13=1） 0~65000（F15.13=2）	s	15.00	●
F15.06	Deceleration time 3	0.00 ～ 650.00 （F15.13=0） 0.0～6500.0（F15.13=1） 0~65000（F15.13=2）	s	15.00	●

F15.07	Acceleration Time 4	0.00 ～ 650.00 （ F15.13=0 ） 0.0～6500.0（F15.13=1） 0~ 65000（F15.13=2）	s	15.00	●
F15.08	Deceleration time 4	0.00 ～ 650.00 （ F15.13=0 ） 0.0～6500.0（F15.13=1） 0~ 65000（F15.13=2）	s	15.00	●
F15.09	Acceleration/deceleration time reference frequency	0: Maximum frequency F00.16 1: 50Hz		0	○
F15.13	acceleration/deceleration time unit	0:0.01s 1:0.1s 2:1s		0	○

For normal operation (non-jogging operation), the system provides four sets of acceleration/deceleration times (the first set being F00.14 and F00.15) for users to select to meet different needs. After setting them, users can switch between them using the digital input functions "19: Acceleration/Deceleration Time Terminal 1" and "20: Acceleration/Deceleration Time Terminal 2". See "Table 7-2: Overview of Digital Multifunction Input Terminal Functions" for details.

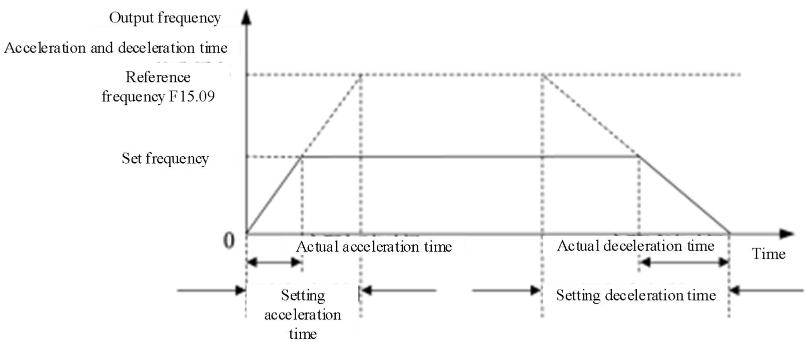


Figure 7-24 shows a schematic diagram of acceleration and deceleration times.

As shown in Figure 7-24, acceleration time is defined as the time from 0.00Hz to the acceleration/deceleration time reference frequency; deceleration time is defined as the time from the acceleration/deceleration time reference frequency to 0.00Hz. The actual acceleration/deceleration time varies depending on the ratio between the set frequency and the reference frequency.

The acceleration/deceleration time reference frequency is set by function code F15.09, indicating the reference frequency for acceleration/deceleration time. If F15.09=0, the reference frequency is set by function code F00.16 (maximum frequency). Assuming F00.16= 100.00Hz, the acceleration (deceleration) time is expressed as the time it takes for the output frequency to accelerate (decelerate) from 0.00Hz (100.00Hz) to 100.00Hz (0.00Hz).

Depending on the operating conditions, the required acceleration and deceleration time may vary greatly. The system provides three acceleration and deceleration time units, set by function code F15.13. If F15.13= 1, it indicates that the acceleration and deceleration time unit is "0. 1s". If acceleration and deceleration time 2 is currently selected, then under the default conditions, the time for the output frequency to increase from 0.00Hz to 50.00Hz (F00. 16) is 1.500s (=15.00*0. 1s).

Function code	Function code name	Parameter Description	unit	Factory value	property
F15.20	Output Frequency Arrival (FAR) Detection Width	0.00～50.00	Hz	2.50	○

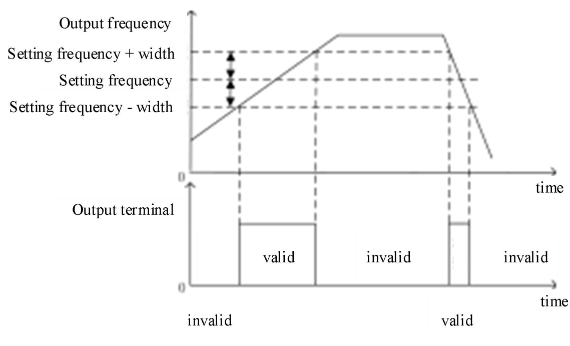


Figure 7-25 FAR detection schematic diagram

As shown in Figure 7-25, when the multi-function output terminal or relay output is set to "2: Output Frequency Arrived (FAR)", during inverter operation (non-self-learning

operation), if the absolute value of the difference between the |output frequency| and the

|given frequency| is less than or equal to the set value ofthe FAR detection width (F15.20), the corresponding function terminal outputs a valid level. Otherwise, it outputs an invalid level.

Function code	Function code name	Parameter Description	unit	Factory value	property
F15.21	Output frequency detection FDT1	0.00～Maximum frequency F00.16	Hz	30.00	○
F15.22	FDT1 hysteresis	0.00～F15.21 (Valid only in one direction downwards)	Hz	2.00	○
F15.23	Output frequency detection FDT2	0.00～Maximum frequency F00.16	Hz	20.00	○
F15.24	FDT2 hysteresis	0.00～F15.23 (Valid only in downward direction)	Hz	2.00	○

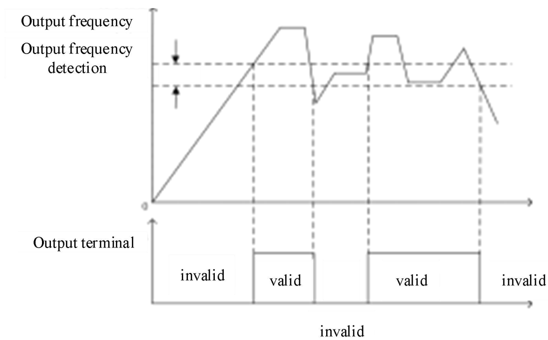


Figure 7-26 Schematic diagram ofFDT detection

As shown in Figure 7-26, when the multi-function output terminal or relay output is set to "3: Output Frequency Detection FDT1" or "4: Output Frequency Detection FDT2", during inverter operation (non-self-learning operation), if the output frequency is greater than "Output Frequency Detection FDT1/2" (F15.21/F15.23), the corresponding function terminal outputs an effective level; if the output frequency drops to less than or equal to

"Output Frequency Detection FDT1/2 (F15.21/F15.23) - FDT1/2 Hysteresis (F15.22/F15.24)", the corresponding function terminal outputs an invalid level; if the output frequency is within the range of [Output Frequency Detection - Hysteresis, Output

Frequency Detection), the output level of the corresponding function terminal remains unchanged.

Function code	Function code name	Parameter Description	unit	Factory value	property
F15.30	Energy-saving braking function selection	0: Invalid 1: Effective		1	○
F15.31	Energy-consuming braking operating voltage	120.0～140.0 （380V, 100.0=537V）	%	128.5(690V)	●
F15.32	Brake utilization	20～100 (100 indicates a duty cycle of 1)	%	100	●

Regenerative braking converts the energy generated during deceleration into heat energy in the braking resistor, thereby achieving rapid deceleration. It is suitable for braking large inertia loads or applications requiring rapid braking to a stop. In such cases, it is necessary to select appropriate braking resistors and braking units. See sections 11.1
(Braking Resistor) and 11.2 (Braking Unit) for details.

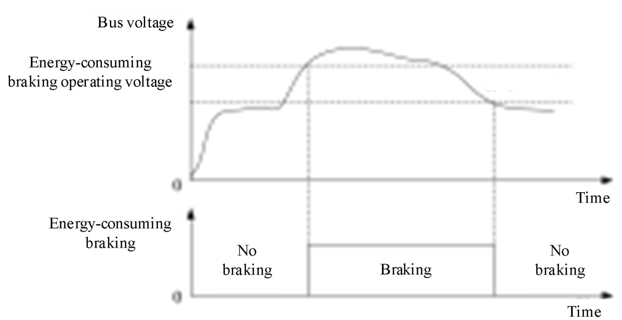


Figure 7-27 Schematic diagram of energy-saving braking

As shown in Figure 7-27, energy consumption braking begins when the energy consumption braking is effective (F15.30=1) and the bus voltage is greater than the energy consumption braking action voltage (F15.31); energy consumption braking becomes ineffective when the bus voltage decreases and falls below a certain value.

When performing regenerative braking, the IGBT in the braking unit is turned on, and the energy can be quickly released through the braking resistor. The braking utilization rate (F15.32) describes the duty cycle of the IGBT. The larger the duty cycle, the greater the braking effect.

Function code	Function code name	Parameter Description	unit	Factory value	property
F15.33	Setting the operating frequency to below the lower limit	0: Operating at the following frequency limit 1: Shutdown		0	○

When the inverter's set frequency is lower than the lower limit frequency (F00. 19), the operating status can be selected by setting the function code F15.33.

Function Code	Function code name	Parameter Description	unit	Factory value	property
F15.34	Fan control	0: Runs when powered on 1: Runs upon startup 2: Intelligent temperature control operation		1	○

To ensure efficient use of the fans, three operating modes are provided for the fan system, set by the function code fan control (F15.34). The specific operating modes ofthe fans are shown in Table 7-7.

Table 7-7 Detailed Explanation ofFan Operation

Fan control	Fan operation status
0: Operation when powered on	The fan starts running as soon as the frequency converter is powered on.
1: Run at startup	When the frequency converter starts running, the fan starts running; after 1 minute in the parameter setting state, the fan stops running.
2: Intelligent temperature control operation	When the inverter temperature is >45℃, the fan starts running; when the inverter temperature is <40℃, the fan stops running; in between, the temperature remains constant.

★: When selecting "2: Intelligent Temperature Control Operation", be sure to ensure that the inverter temperature detection module is working properly.

Function code	Function code name	Parameter Description	unit	Factory value	property

F15.38	Dead zone compensation mode selection	0: No compensation 1: Compensation Mode 1 2: Compensation Mode 2		1	○

Select the dead-zone compensation mode. This parameter generally does not need to be modified. It is only necessary to try switching between different compensation modes when there are special requirements for the quality of the output voltage waveform, or when the motor exhibits abnormalities such as oscillation.

Generally, compensation mode 1 is selected. If the motor is prone to oscillation due to high power and VF control, compensation mode 2 can be selected.

Function code	Function code name	Parameter Description	unit	Factory value	property
F15.39	Terminal inching priority	0: Invalid 1: Effective		0	○

When terminal control mode (F00.02=1) is used, this function code is used to select whether the jog command has the highest priority. If terminal jog priority is valid

(F15.39= 1), then even if the current state is running, it will still switch to jog mode when the jog terminal is valid; if terminal jog priority is invalid (F15.39=0), it is not possible to switch directly from running state to jog running state.

Function code	Function code name	Parameter Description	unit	Factory value	property
F15.40	Rapid stopping deceleration time	0.00 ～650.00 （F15.13=0 ） 0.0 ～6500.0 （F15.13=1 ） 0 ～ 65000 （F15.13=2）	s	1.00	●

Set the deceleration time when stopping quickly.

7.17 F16 Group Customized Function Parameters

Function code	Function code name	Parameter Description	unit	Factory value	property
F16.06	Agent password	0～65535		0	○

Agent password.

★: Setting this password may cause the frequency converter to malfunction. Please set it with caution.

Function code	Function code name	Parameter Description	unit	Factory value	property
F16.07	Set cumulative power-on arrival time	0 ～65535, 0: Power-on timeout protection.	h	0	○

If the cumulative power-on arrival time is set to be greater than or equal to the cumulative power-on arrival time (F12. 15), the frequency converter will be unusable.

★: Setting this parameter may cause the frequency converter to malfunction. Please set it with caution.

Function code	Function code name	Parameter Description	unit	Factory value	property
F16.08	Set cumulative running time	0~65535, 0: Protection timeout period.	h	0	○

If the cumulative running time reaches a certain threshold (F12. 17) or the cumulative power-on time reaches a certain threshold (F16.08), the frequency converter will be unusable.

★: Setting this parameter may cause the frequency converter to malfunction. Please set it with caution.

Function code	Function code name	Parameter Description	unit	Factory value	property
F16.09	Factory Code	0～65535		XXXXX	●

Factory password.

F16.22 to F16.45 are for the use of multi-point linear acceleration and deceleration functions. For a detailed explanation, please refer to the chapter containing F21.21.

7.18 F17 Virtual I/O Function Parameter Group

The TC760 series frequency converter comes standard with 8 virtual multi-function input terminals (VX1～VX8). Their functions and usage are basically the same as those of the actual input terminals. The following only explains the differences. For details on the similarities, please refer to the parameter description of the input terminal function parameter group F02.

Function code	Function code name	Parameter Description	unit	Factory value	property
F17.00	VX1 Virtual Input Function Selection	For the same function selection as group F02 digital input terminals, please refer to Table 7-2 for a list of digital multifunction input terminal functions.		11	○
F17.01	VX2 Virtual Input Function Selection			12	○
F17.02	VX3 Virtual Input Function Selection			13	○
F17.03	VX4 Virtual Input Function Selection			0	○
F17.04	VX5 Virtual Input Function Selection			0	○
F17.05	VX6 Virtual Input Function Selection			0	○
F17.06	VX7 Virtual Input Function Selection			0	○
F17.07	VX8 Virtual Input Function Selection			0	○
F17.08	Virtual input positive/negative logic	D7: VX8, D6: VX7, D5: VX6, D4: VX5, D3: VX4, D2: VX3, D1: VX2, D0: VX1 0: Positive logic closed loop valid / open loop invalid 1: Negative logic closed loop invalid / open loop valid		000 00000	○
F17.11	VX1 effective delay time	0.000～30.000	s	0.000	●
F17.12	VX1 Invalid Delay Time	0.000～30.000	s	0.000	●
F17.13	VX2 effective delay time	0.000～30.000	s	0.000	●
F17.14	VX2 Invalid Delay Time	0.000～30.000	s	0.000	●
F17.15	VX3 effective delay time	0.000～30.000	s	0.000	●
F17.16	VX3 Invalid Delay Time	0.000～30.000	s	0.000	●
F17.17	VX4 effective delay time	0.000～30.000	s	0.000	●
F17.18	VX4 Invalid Delay Time	0.000～30.000	s	0.000	●

VX1 to VX8 are functionally identical, none of them correspond to actual physical terminals, and all have forward and reverse logic functions. VX1 to VX4 have a delay function. The terminal status confirmation method is the same and can be set separately. The virtual input terminal status is directly set by the function code; this method is mainly used for remote control by a host computer. The remote control terminal can directly use the 0x41 function code to change the F17.10 value via communication to enable or disable the input terminal status.

7.19 F18 Group Monitoring Parameters Group

This set of parameters is only for viewing the current status of the frequency converter and cannot be operated.

Function code	Function code name	Parameter Description	unit
F18.00	Output frequency	Displays the current output frequency of the frequency converter. Range: 0.00 to the upper limit frequency. ★: This parameter will only be updated in real time in speed control mode.	Hz
F18.01	Set frequency	Displays the current set frequency of the frequency converter. Range: 0.00 to maximum frequency F00.16. ★: This parameter will only be updated in real time in speed control mode.	Hz
F18.02	PG feedback frequency	When using FVC control mode or other control modes with feedback encoders, the PG card feedback frequency is displayed. Range: 0.00 to upper limit frequency.	Hz
F18.03	Estimating feedback frequency	0.00 ~ Upper limit frequency	Hz
F18.04	Output torque	Displays the current output torque of the frequency converter. Range: -200.0 to 200.0. ★: This parameter will only be updated in real time under torque control mode.	%
F18.05	Torque setpoint	Displays the current set torque of the frequency converter. Range: -200.0 to 200.0. ★: This parameter will only be updated in real time under torque control mode.	%
F18.06	Output current	Displays the current output current of the frequency converter. The range varies depending on the motor's rated power rating, as follows: 0.00～650.00 (Motor rated power ≤75kW) 0.0～6500.0 (Motor rated power >75kW)	A
F18.08	Output current percentage	The current output current is displayed as a percentage (relative to the inverter's rated current). Range: 0.0 to 300.0.	%
F18.08	Output voltage	Displays the current output voltage of the frequency converter. Range: 0.0～690.0.	In
F18.09	DC bus voltage	Displays the current bus voltage. Range: 0–1200.	In
F18.10 ～ F18.13	reserve		

F18.14	Load speed	To display the current load speed, please set the load speed display factor (F12.09) for correct display. Range: 0～65535.	rpm
F18.15	UP/DOWN offset frequency	Display UP/DOWN offset frequency	Hz
18.16～F18.19	reserve		
F18.20	Output power	Displays the current output power of the frequency converter. Range: 0.00～650.00.	kW
F18.21	Output power factor	Displays the current output power factor of the frequency converter. Range: -1.00 to 1.00.	
F18.22	Digital input terminal status 1	The current valid status of input terminals X1 to X5 is displayed. The five-digit LED display shows the following from left to right: X5 X4 X3 X2 X1 0/1 0/1 0/1 0/1 0/1 The actual display result is: 00001. ★: 0 indicates that the current terminal function is invalid; 1 indicates that the current terminal function is valid.	
F18.23	Digital input terminal status 2	The display shows the current valid status of input terminals X6/X7/AI1 ～AI3, and the five-digit LED display shows the following from left to right: AI3 AI2 AI1 X7 X6 0/1 0/1 0/1 0/1 0/1 The actual display value is: 00000. ★: Crane-specific frequency converter, analog input terminals AI1 to AI3 are only used for digital input function; 0 indicates that the current terminal function is invalid; 1 indicates that the current terminal function is valid.	
F18.24	reserve		
F18.25	Output terminal status	The current valid status of the output terminals R1/R2/Y1/Y2 is displayed on the five-digit LED display from left to right: * R2 R1 Y2 Y1 0 0/1 0/1 0/1 0/1 The actual display result is: 01010. ★: 0 indicates that the current function terminal is invalid; 1 indicates that the current function terminal is valid.	

F18.26	AI1	Displays the per-unit value of the current analog input channel 1 (AI1) relative to 100.0%. Range: 0.0 to 100.0.	%
F18.27	AI2	Displays the per-unit value of the current analog input channel 2 (AI2) relative to 100.0%. Range: 0.0 to 100.0.	%
F18.28	AI3	Displays the per-unit value of the current analog input channel 3 (AI3) relative to 100.0%. Range: 0.0 to 100.0.	%
F18.29 ～ F18.41	reserve		
F18.42	Brake inspection time display	Displays the brake inspection time, used for timed brake checks. If F18.42 > brake inspection interval (F20.31), a brake check is required. Range: 0–60000.	h
F18.43	Zero servo position deviation	When running with zero servo, the current position deviation is displayed in real time. Range: 0–65535.	
F18.82	Digital input terminal status 3	The current active status of input terminals X11 and X12 is displayed, from left to right as follows: X2 X1 0/1 0/1 The actual display result is: 00 ★: 0 indicates that the current terminal function is invalid; 1 indicates that the current terminal function is valid.	

7.20 F19 Fault Recording Parameter Group

This set of parameters is only for viewing the inverter's three most recent fault types and the inverter's status at the time of the fault, and cannot be operated.

- The relevant function codes for the most recent fault information are as follows:

Function code	Function code name	Parameter Description	unit	Factory value	property
F19.00	Most recent fault category	To display the most recent fault type, see Section 9.1.		0	×
F19.01	Output frequency during fault	Displays the output frequency during the most recent fault.	Hz	0.00	×
F19.02	Output current during fault	Displays the output current during the most recent fault.	A	0.00	×
F19.03	Bus voltage during fault	Displays the output voltage at the time of the most recent fault.	In	0	×

F19.04	Operating status during failure	This displays the operating status during the most recent fault. See Table 7-8 for a summary of operating status during faults.		0	×
F19.05	Working time during failure	Displays the operating time during the most recent failure.	h	0	×

- The relevant function codes for the previous fault information are as follows:

Function code	Function code name	Parameter Description	unit	Factory value	property
F19.06	Previous fault category	To display the type of the previous fault, see Section 9.1.		0	×
F19.07	Output frequency during fault	Displays the output frequency during the previous fault.	Hz	0.00	×
F19.08	Output current during fault	Displays the output current during the previous fault.	A	0.00	×
F19.09	Bus voltage during fault	Displays the output voltage at the time of the previous fault.	In	0	×
F19.10	Operating status during failure	This displays the operating status during the previous fault. See Table 7-8 for a summary of operating status during the fault.		0	×
F19.11	Working time during failure	Displays the operating time during the previous fault.	h	0	×

- The relevant function codes for the first two faults are as follows:

Function code	Function code name	Parameter Description	unit	Factory value	property
F19.12	First and second fault categories	The types of the first two faults are displayed; see Section 9. 1 for details.		0	×
F19.13	Output frequency during fault	Displays the output frequency during the first two faults.	Hz	0.00	×
F19.14	Output current during fault	Displays the output current during the first two faults.	A	0.00	×
F19.15	Bus voltage during fault	Displays the output voltage during the first two faults.	In	0	×
F19.16	Operating status during failure	The operating status during the first two faults is displayed. See Table 7-8 for a summary of operating status during faults.		0	×
F19.17	Working time during failure	Displays the operating time during the first two faults.	h	0	×

For a detailed explanation of the different fault types, please refer to Chapter 9.

The inverter's operating status during fault conditions is explained in Table 7-8:

Table 7-8 Overview of Operating Status During Faults

Keyboard display	**Detailed Explanation of Inverter Operating Status**
0	Not running
1	positive acceleration
2	Reverse acceleration
3	Positive deceleration
4	Reverse deceleration
5	Positive constant speed
6	Reverse constant speed

7.21 F20 Group Lifting-Specific Basic Function Parameter Group

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.00	Selection of lifting mechanisms	0: Closed-loop lifting mechanism 1: Open-loop lifting mechanism 2: Car Amplitude 3: Open-loop rotary mechanism 4: Closed-loop rotary mechanism 7: Construction hoist without speed feedback 12: Automatic Leveling Elevator		0	○

F20.00=0: Closed-loop lifting mechanism

After selecting this value, the relevant function code values will be automatically set according to the closed-loop lifting mechanism macro in Table 7-9.

Table 7-9 Closed-Loop Lifting Mechanism Macro

Function code	Function code name	Function code parameter description	unit	Factory value
F00.01	Motor 1 drive control method	2: With speed sensor vector control (FVC)		2
F00.03	Terminal control method selection	1:Terminal RUN rotates forward, F/R rotates backward.		1
F00.07	Digital frequency given	0.00 ～Maximum frequency F00.16	Hz	10.00

F00.14	Acceleration time 1		s	6.50
F00.15	Deceleration time 1		s	3.00
F00.16	Maximum frequency		Hz	55.00
F00.18	Upper limit frequency		Hz	55.00
F01.01	Motor rated power	According to the actual motor nameplate settings	kW	XX
F01.03	Motor rated current	According to the actual motor nameplate settings	A	XX
F01.05	Motor rated speed	According to the actual motor nameplate settings	rpm	XX
F01.25	Encoder Line Count	Set according to the actual encoder line count.		1024
F02.00	X1 Numeric Input Function Selection	Forward rotation (ascending)		1
F02.01	X2 Numeric Input Function Selection	Reverse movement (descending)		2
F02.02	X3 Numeric Input Function Selection	Multi-speed terminal 1		11
F02.03	X4 Numeric Input Function Selection	Multi-speed terminal 2		12
F02.04	X5 Numeric Input Function Selection	Multi-speed terminal 3		13
F02.05	X6 Numeric Input Function Selection	Multi-speed terminal 4		14
F02.06	X7 Numeric Input Function Selection	Fault Reset		10
F02.07	AI1 Numeric Input Function Selection	Brake check input		58
F04.19	Parking methods	0: Decelerate and stop		0
F05.00	V/F curve setting	0: Linear V/F 1: Multi-point broken line V/F 2: 1.3 power V/F 3: 1.7 power V/F 4: Square V/F 5: VF fully separated mode (Ud=0, Uq=K*t=separated voltage source voltage) 6: VF semi-separated mode (Ud=0, Uq=K*t=F/Fe*2*separated voltage source voltage)		1
F05.02	Multi-point VF voltage point V1	0.0 ～ 100.0 (100.0 = rated voltage)	%	3.5

F05.04	Multi-point VF voltage point V2	0.0～100.0	%	7.5
F05.06	Multi-point VF voltage point V3	0.0～100.0	%	14.0
F05.10	V/F forward torque boost gain	0.00～200.00	%	3.50
F05.12	V/F Slip Filtering Time	0.00～10.00	s	1.00
F07.06	Bus voltage control selection	Units digit: Instantaneous stop/non-stop function selection 0: Invalid 1: Deceleration 2: Deceleration stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid		0
F07.11	Current limiting control	0: Invalid 1: Limiting method 1 2: Limiting method 2		0
F08.00	Multi-speed 1	0.00 ～Maximum frequency F00.16	Hz	25.00
F08.01	Multi-speed 2	0.00 ～Maximum frequency F00.16	Hz	5.00
F08.02	Multi-speed 3	0.00 ～Maximum frequency F00.16	Hz	35.00
F08.03	Multi-speed 4	0.00 ～Maximum frequency F00.16	Hz	15.00
F08.06	Multi-speed 7	0.00 ～Maximum frequency F00.16	Hz	45.00
F08.14	Multi-speed 15	0.00 ～Maximum frequency F00.16	Hz	55.00
F10.12	CANopen expansion card communication address	1～127		2
F10.15	Expansion card and bus communication baud rate	Units digit: CANopen 1：250K Tens: Reserved		21
F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		1
F20.01	Braking curve type	0: Frequency and current arrive simultaneously for braking control.		0

F20.02	Starting direction	1.The direction of brake release frequency is always forward.		1
F20.03	Stop direction	0: When the brake is closed, the direction of velocity is the same as the direction of travel.		0
F20.04	Braking release current		%	10.0
F20.05	Brake release frequency f1 during lifting		Hz	0.60
F20.06	During descent, the brak release frequency f1 decreases.		Hz	0.60
F20.07	Brake release delay t1		s	0.1
F20.08	Brake release delay t2		s	0.5
F20.10	During lifting, the braking closing frequency f3 is above		Hz	0.20
F20.11	During descent, the braking closing frequency f3 decreases.		Hz	0.20
F20.12	Brake closing delay t3		s	0.0
F20.13	Delay t4 after brake closure		s	0.5
F20.97	V/F reverse torque boost gain	0.00～10.00	%	2.10
F21.15	Low voltage protection function selection	1. Use undervoltage protection		1

F20.00=1: Open-loop lifting mechanism

After selecting this value, the relevant function code values will be automatically set according to the open-loop hoisting mechanism dedicated macro in Table 7-10.

Note: Speed open-loop operation is not recommended for lifting applications, as brake failure can easily lead to hook slippage. For small to medium power lifting equipment, the inverter's stopping mode should be set to free stop to simulate power frequency. The distance the load slides down after the brake is closed can be used to determine if the brake is loose. Speed open-loop operation is prohibited for high-power lifting equipment.

Table 7-10 Dedicated Macro for Open-Loop Lifting Mechanism

Function code	Function code name	Function code parameter description	unit	Factory value
F00.01	Motor 1 drive control method	0: V/F control (VVF)		0
F00.02	Command source selection	0: Keyboard control (LOC/REM light on) 1: Terminal control (LOC/REM light off) 2: Communication control (LOC/REM light flashing)		1
F00.03	Terminal control method selection	1: Terminal RUN rotates forward, F/R rotates backward.		1
F00.07	Digital frequency given	0.00～Maximum frequency F00.16	Hz	10.00
F00.14	Acceleration time 1		s	6.50
F00.15	Deceleration time 1		s	3.00
F00.16	Maximum frequency		Hz	55.00
F00.18	Upper limit frequency		Hz	55.00
F01.01	Motor rated power	According to the actual motor nameplate settings	kW	XX
F01.03	Motor rated current	According to the actual motor nameplate settings	A	XX
F01.05	Motor rated speed	According to the actual motor nameplate settings	rpm	XX
F02.00	X1 Numeric Input Function Selection	Forward rotation (ascending)		1
F02.01	X2 Numeric Input Function Selection	Reverse movement (descending)		2
F02.02	X3 Numeric Input Function Selection	Multi-speed terminal 1		11
F02.03	X4 Numeric Input Function Selection	Multi-speed terminal 2		12
F02.04	X5 Numeric Input Function Selection	Multi-speed terminal 3		13
F02.05	X6 Numeric Input Function Selection	Multi-speed terminal 4		14
F02.06	X7 Numeric Input Function Selection	Fault Reset		10
F02.07	AI1 Numeric Input Function Selection	Brake check input		58
F05.00	V/F curve setting	1: Multi-point broken line V/F		1

F05.02	Multi-point VF voltage point V1	0.0～100.0 (100.0 = rated voltage)	%	3.5
F05.04	Multi-point VF voltage point V2	0.0～100.0	%	7.5
F05.06	Multi-point VF voltage point V3	0.0～100.0	%	14.0
F05.10	V/F forward torque boost gain	0.00～200.00	%	3.50
F05.12	V/F Slip Filtering Time	0.00～10.00	s	1.00
F07.06	Bus voltage control selection	Units digit: Instantaneous stop/non-stop function selection 0: Invalid 1: Deceleration 2: Deceleration stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid		0
F07.11	Current limiting control	0: Invalid 1: Limiting method 1 2: Limiting method 2		0
F08.00	Multi-speed 1	0.00～Maximum frequency F00.16	Hz	25.00
F08.01	Multi-speed 2	0.00～Maximum frequency F00.16	Hz	5.00
F08.02	Multi-speed 3	0.00～Maximum frequency F00.16	Hz	35.00
F08.03	Multi-speed 4	0.00～Maximum frequency F00.16	Hz	15.00
F08.06	Multi-speed 7	0.00～Maximum frequency F00.16	Hz	45.00
F08.14	Multi-speed 15	0.00～Maximum frequency F00.16	Hz	55.00
F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		1
F20.01	Braking curve type	0: Frequency and current arrive simultaneously for braking control.		0
F20.02	Starting direction	1. The direction of brake release frequency is always forward.		1

F20.03	Stop direction	0: When the brake is closed, the direction of velocity is the same as the direction of travel.		0
F20.04	Braking release current		%	70.0
F20.05	Brake release frequency f1 during lifting		Hz	3.00
F20.06	During descent, the brake release frequency f1		Hz	3.00
	decreases.			
F20.07	Brake release delay t1		s	0.3
F20.08	Brake release delay t2		s	0.5
F20.10	During lifting, the braking closing frequency f3 is above		Hz	3.00
F20.11	During descent, the braking closing frequency f3 decreases.		Hz	2.00
F20.12	Brake closing delay t3		s	0.0
F20.13	Delay t4 after brake closure		s	0.5
F20.97	V/F reverse torque boost gain	0.00～10.00	%	2.10
F21.15	Low voltage protection function selection	1. Use undervoltage protection		1

F20.00=2: Trolley amplitude

After selecting this value, the relevant function code values will be automatically set according to the closed-loop lifting mechanism macro in Table 7-9.

Table 7-11 Macro Specific for Trolley Amplitude Variable Transmission

Function code	Function code name	Function code parameter description	unit	Factory value
F00.01	Motor 1 drive control method	0: V/F control (VVF)		0
F00.02	Command source selection	0: Keyboard control (LOC/REM light on) 1: Terminal control (LOC/REM light off) 2: Communication control (LOC/REM light flashing)		1
F00.03	Terminal control method selection	1:Terminal RUN rotates forward, F/R rotates backward.		1
F00.07	Digital frequency given	0.00 ～Maximum frequency F00.16	Hz	25.00

F00.14	Acceleration time 1		s	3.00
F00.15	Deceleration time 1		s	3.00
F00.16	Maximum frequency		Hz	50.00
F00.18	Upper limit frequency		Hz	50.00
F01.01	Motor rated power	According to the actual motor nameplate settings	kW	XX
F01.03	Motor rated current	According to the actual motor nameplate settings	A	XX
F01.05	Motor rated speed	According to the actual motor nameplate settings	rpm	XX
F02.04	X5 Numeric Input Function Selection	No function		0
F02.05	X6 Numeric Input Function Selection	No function		0
F05.00	V/F curve setting	1: Multi-point broken line V/F		1
F05.02	Multi-point VF voltage point V1	0.0 ～ 100.0 (100.0 = rated voltage)	%	3.5
F05.04	Multi-point VF voltage point V2	0.0～100.0	%	9.0
F05.06	Multi-point VF voltage point V3	0.0～100.0	%	15.0
F05.10	V/F forward torque boost gain	0.00～200.00	%	3.50
F05.12	V/F Slip Filtering Time	0.00～10.00	s	1.00
F07.06	Bus voltage control selection	Units digit: Instantaneous stop/non-stop functionselection 0: Invalid 1: Deceleration 2: Deceleration stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid		0
F07.11	Current limiting control	0: Invalid		0
F08.00	Multi-speed 1	0.00 ～Maximum frequency F00.16	Hz	38.00
F08.02	Multi-speed 3	0.00 ～Maximum frequency F00.16	Hz	50.00

F08.14	Multi-speed 15	0.00 ～Maximum frequency F00.16	Hz	50.00
F10.12	CANopen expansion card communication address	1～127		4
F10.15	Expansion card and bus communication baud rate	Units digit: CANopen 1：250K Tens: Reserved		21
F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		1
F20.01	Braking curve type	1: Frequency reaches braking control		1
F20.02	Starting direction	0:The direction of brake release frequency is the same as the direction of operation.		0
F20.05	Brake release frequency f1 during lifting		Hz	1.00
F20.06	During descent, the brake release frequency f1 decreases.		Hz	1.00
F20.07	Brake release delay t1		s	0.0
F20.08	Brake release delay t2		s	0.2
F20.10	During lifting, the braking closing frequency f3 is above		Hz	3.00
F20.11	During descent, the braking closing frequency f3 decreases.		Hz	3.00
F20.13	Delay t4 after brake closure		s	0.3
F20.97	V/F reverse torque boost gain	0.00～10.00	%	2.10
F21.15	Low voltage protection function selection	0: Undervoltage protection not used		0

F20.00=3: Open-loop rotary mechanism

After selecting this value, the relevant function code values will be automatically set according to the rotary mechanism-specific macro in Table 7-12. When not using eddy current-assisted braking, the parking mode must be set to deceleration parking.

Table 7-12 Macros for Rotary Mechanisms

Function code	Function code name	Function code parameter description	unit	Factory value
F00.01	Motor 1 drive control method	1: Sensorless Vector Control (SVC)		1
F00.02	Command source selection	0: Keyboard control (LOC/REM light on) 1: Terminal control (LOC/REM light off) 2: Communication control (LOC/REM light flashing)		1
F00.03	Terminal control method selection	1: Terminal RUN rotates forward, F/R rotates backward.		1
F00.07	Digital frequency given	0.00 ～Maximum frequency F00.16	Hz	10.00
F00.14	Acceleration time 1		s	3.00
F00.15	Deceleration time 1		s	12.00
F00.16	Maximum frequency		Hz	50.00
F00.18	Upper limit frequency		Hz	50.00
F01.01	Motor rated power	According to the actual motor nameplate settings	kW	XX
F01.03	Motor rated current	According to the actual motor nameplate settings	A	XX
F01.05	Motor rated speed	According to the actual motor nameplate settings	rpm	XX
F03.02	R1 Output Function Selection	Inverter in operation		1
F04.14	Acceleration and deceleration methods	2: Discontinuous S-curve acceleration/deceleration		2
F04.15	The initial period of the S-curve during acceleration		s	0.00
F04.16	The time interval at the end of the S-curve during acceleration		s	0.00
F04.17	The initial period of the S-curve during deceleration		s	0.00
F04.18	The time interval at the end of the S-curve during deceleration		s	8.00
F06.08	Vector control slip gain	50.00～200.00	%	50.00

F06.10	Speed control electric torque upper limit	0.0～250.0	%	150.0
F06.11	Speed control braking torque upper limit	0.0～250.0	%	150.0
F06.17	SVC zero-frequency processing method	0: Brake		0
F06.18	SVC zero-frequency holding current	50.0 ～ 400.0 (100.0 is the motor no-load current)	%	40.0
F06.76	Low-speed correction factor for stator resistance of asynchronous motor	10.0~500.0	%	50.0
F06.78	Asynchronous motor slip gain switching frequency point	0.10~Fmax	Hz	5.00
F07.06	Bus voltage control selection	Units digit: Instantaneous stop/non-stop function selection 0: Invalid 1: Deceleration 2: Deceleration stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid		0
F07.11	Current limiting control	1: Limiting Method 1		1
F07.12	Current limiting level		%	180.0
F08.00	Multi-speed 1	0.00 ～Maximum frequency F00.16	Hz	20.00
F08.02	Multi-speed 3	0.00 ～Maximum frequency F00.16	Hz	35.00
F08.05	Multi-speed 6	0.00 ～Maximum frequency F00.16	Hz	50.00
F08.14	Multi-speed 15	0.00 ～Maximum frequency F00.16	Hz	50.00
F10.12	CANopen expansion card communication address	1～127		3
F10.15	Expansion card and bus communication baud rate	Units digit: CANopen 1：250K Tens: Reserved		21
F15.03	Acceleration Time 2		s	10.00
F15.04	Deceleration time 2		s	18.00
F15.05	Acceleration Time 3		s	15.00
F15.06	Deceleration time 3		s	15.00
F15.07	Acceleration Time 4		s	15.00
F15.08	Deceleration time 4		s	8.00

F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		1
F20.01	Braking curve type	1: Frequency reaches braking control		1
F20.02	Starting direction	0: The direction of brake release frequency is the same as the direction of operation.		0
F20.03	Stop direction	0: When the brake is closed, the direction of velocity is the same as the direction of travel.		0
F20.05	Brake release frequency f1 during lifting		Hz	0.00
F20.06	During descent, the brake release frequency f1 decreases.		Hz	0.00
F20.07	Brake release delay t1		s	0.0
F20.08	Brake release delay t2		s	0.0
F20.10	During lifting, the braking closing frequency f3 is above		Hz	2.00
F20.11	During descent, the braking closing frequency f3 decreases.		Hz	2.00
F20.12	Brake closing delay t3		s	0.0
F20.13	Delay t4 after brake closure		s	2.0
F20.15	Restart during braking	0: Restarting is not allowed during braking. 1: Restarting is allowed during braking.		1
F20.20	Brake fault detection pulse count when stopped	0 ～ 10000 (0: Brake check and protection ineffective)		0
F20.59	SVC anomaly detection time	0～60.000	s	30.00
F20.60	SVC abnormal hysteresis torque	0～100.0	%	10.0
F20.61	SVC Abnormal Synchronization Frequency Judgment Threshold	0～50.00	Hz	2.00
F20.62	SVC abnormal sealing time	0～60.000	s	0.500
F20.66	Reverse gear for rapid deceleration effectively enables	0～1		1
F20.68	Tower deformation angle coefficient	0～65.535		0.200

F20.74	Low-frequency switching point of rotational deformation coefficient	0～10.00	HZ	2.00
F20.75	Rotational deformation coefficient accelerates filtering time	0～65.535	S	0.100
F20.76	Rotational deformation coefficient deceleration filtering time	0～65.535	S	4.000
F21.15	Low voltage protection function selection	0: Undervoltage protection not used		0
F21.21	Special acceleration	1: Use		1
F21.22	Special deceleration	0: Not used		0
F21.23	Acceleration frequency switching point 1		Hz	10.00
F21.25	Acceleration frequency switching point 2		Hz	50.00
F21.27	Deceleration frequency switching point 3		Hz	50.00

F20.00=4: Closed-loop rotary mechanism

After selecting this value, the relevant function code values will be automatically set according to the rotary mechanism-specific macro in Table 7-12. When not using eddy current-assisted braking, the parking mode must be set to deceleration parking.

Table 7-13 Macros for Rotary Mechanisms

Function code	Function code name	Function code parameter description	unit	Factory value
F00.01	Motor 1 drive control method	2: With speed sensor vector control (FVC)		2
F00.02	Command source selection	0: Keyboard control (LOC/REM light on) 1: Terminal control (LOC/REM light off) 2: Communication control (LOC/REM light flashing)		1
F00.03	Terminal control method selection	1: Terminal RUN rotates forward, F/R rotates backward.		1
F00.07	Digital frequency given	0.00 ～Maximum frequency F00.16	Hz	8.00
F00.14	Acceleration time 1		s	10.00
F00.15	Deceleration time 1		s	6.00

F00.16	Maximum frequency		Hz	50.00
F00.18	Upper limit frequency		Hz	50.00
F01.01	Motor rated power	According to the actual motor nameplate settings	kW	XX
F01.03	Motor rated current	According to the actual motor nameplate settings	A	XX
F01.05	Motor rated speed	According to the actual motor nameplate settings	rpm	XX
F03.02	R1 Output Function Selection	Inverter in operation		1
F04.14	Acceleration and deceleration methods	2: Discontinuous S-curve acceleration/deceleration		2
F04.15	The initial period of the S-curve during acceleration		s	0.00
F04.16	The time interval at the end of the S-curve during acceleration		s	0.00
F04.17	The initial period of the S-curve during deceleration		s	0.00
F04.18	The time interval at the end of the S-curve during deceleration		s	6.00
F04.22	DC braking time for parking		s	10.00
F06.08	Vector control slip gain	50.00～200.00	%	100.00
F06.10	Speed control electric torque upper limit	0.0～250.0	%	150.0
F06.11	Speed control braking torque upper limit	0.0～250.0	%	150.0
F06.17	SVC zero-frequency processing method	0: Brake		0
F06.18	SVC zero-frequency holding current	50.0 ～ 400.0 (100.0 is the motor no-load current)	%	100.0
F07.06	Bus voltage control selection	Units digit: Instantaneous stop/non-stop function selection 0: Invalid 1: Deceleration 2: Deceleration stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid		0
F07.11	Current limiting control	1: Limiting Method 1		1
F07.12	Current limiting level		%	180.0

F08.00	Multi-speed 1	0.00 ～Maximum frequency F00.16	Hz	20.00
F08.02	Multi-speed 3	0.00 ～Maximum frequency F00.16	Hz	35.00
F08.06	Multi-speed 7	0.00 ～Maximum frequency F00.16	Hz	50.00
F08.14	Multi-speed 15	0.00 ～Maximum frequency F00.16	Hz	50.00
F10.12	CANopen expansion card communication address	1～127		3
F10.15	Expansion card and bus communication baud rate	Units digit: CANopen 1：250K Tens: Reserved		21
F15.03	Acceleration Time 2		s	10.00
F15.04	Deceleration time 2		s	10.00
F15.05	Acceleration Time 3		s	15.00
F15.06	Deceleration time 3		s	15.00
F15.07	Acceleration Time 4		s	15.00
F15.08	Deceleration time 4		s	8.00
F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		1
F20.01	Braking curve type	1: Frequency reaches braking control		1
F20.02	Starting direction	0: The direction of brake release frequency is the same as the direction of operation.		0
F20.03	Stop direction	0: When the brake is closed, the direction of velocity is the same as the direction of travel.		0
F20.05	Brake release frequency f1 during lifting		Hz	0.00
F20.06	During descent, the brake release frequency f1 decreases.		Hz	0.00
F20.07	Brake release delay t1		s	0.0
F20.08	Brake release delay t2		s	0.0
F20.10	During lifting, the braking closing frequency f3 is above		Hz	2.00
F20.11	During descent, the braking closing frequency f3 decreases.		Hz	2.00
F20.12	Brake closing delay t3		s	0.0
F20.13	Delay t4 after brake closure		s	2.0

F20.15	Restart during braking	1. Restarting is permitted during braking.	s	1
F20.20	Brake fault detection pulse count when stopped	0 ～ 10000 (0: Brake check and protection ineffective)		0
F20.59	SVC anomaly detection time	0～60.000	s	30.00
F20.60	SVC abnormal hysteresis torque	0～100.0	%	10.0
F20.61	SVC Abnormal Synchronization Frequency Judgment Threshold	0～50.00	Hz	2.00
F20.62	SVC abnormal sealing time	0～60.000	s	0.500
F20.66	Reverse gear for rapid deceleration effectively enables	0～1		1
F20.68	Tower deformation angle coefficient	0～65.535		0.300
F20.74	Low-frequency switching Point of rotational deformation coefficient	0～10.00	HZ	2.00
F20.75	Rotational deformation coefficient accelerates filtering time	0～65.535	S	0.100
F20.76	Rotational deformation coefficient deceleration filtering time	0～65.535	S	8.000
F21.15	Low voltage protection function selection	0: Undervoltage protection not used		0
F21.21	Special acceleration	1: Use		1
F21.22	Special deceleration	0: Not used		1
F21.23	Acceleration frequency switching point 1		Hz	10.00
F21.24	Deceleration frequency switching point 1		Hz	10.00
F21.25	Acceleration frequency switching point 2		Hz	50.00
F21.26	Deceleration frequency switching point 2		Hz	50.00
F21.27	Acceleration frequency switching point 3		Hz	50.00
F21.28	Deceleration frequency switching point 3		Hz	50.00

F20.00=5: Reserved

F20.00=6: Reserved

F20.00=7: Construction hoist without speed feedback

After selecting this value, the relevant function code values will be automatically set according to Table 7-14, the dedicated macro for construction elevators without speed feedback.

Table 7-14 Macro for Construction Elevators Without Speed Feedback

Function code	Function code name	Function code parameter description	unit	Factory value
F00.01	Motor 1 drive control method	0: V/F control (VVF)		0
F00.02	Command source selection	0: Keyboard control (LOC/REM light on) 1: Terminal control (LOC/REM light off) 2: Communication control (LOC/REM light flashing)		1
F00.03	Terminal control method selection	1: Terminal RUN rotates forward, F/R rotates backward.		1
F00.07	Digital frequency given	First gear speed	Hz	15.00
F00.14	Acceleration time 1		s	6.00
F00.15	Deceleration time 1		s	2.00
F00.16	Maximum frequency		Hz	50.00
F00.18	Upper limit frequency		Hz	50.00
F00.23	carrier frequency		kHz	1.5
F01.01	Motor rated power	The sum of the power of each motor	kW	XX
F01.03	Motor rated current	The sum of the rated currents of each motor	A	XX
F01.05	Motor rated speed	According to the actual motor nameplate settings	rpm	XX
F02.00	X1 Numeric Input Function Selection	Forward rotation (ascending)		1
F02.01	X2 Numeric Input Function Selection	Reverse movement (descending)		2
F02.02	X3 Numeric Input Function Selection	Multi-speed terminal 1		11
F02.03	X4 Numeric Input Function Selection	No function		0
F02.04	X5 Numeric Input Function Selection	No function		0
F02.05	X6 Numeric Input Function Selection	9: Free Parking		9

F02.06	X7 Numeric Input Function Selection	Fault Reset		10
F02.07	AI1 Numeric Input Function Selection	Brake check input		58
F02.18	X1 Effective Delay Time	0.00～650.00	s	0.00
F02.18	X1 Effective Delay Time	0.00～650.00	s	0.00
F02.63	Analog Input AI2 Type Selection	0: 0～10V 1: 4～20mA 2: 0～20mA 3: Reserved (-10～10V) 4: 0～5V		0
F03.00	Y1 Output Function Selection	Inverter fault output		7
F03.01	Y2 Output Function Selection	Weighing wire breakage or overload alarm		35
F03.02	R1 Output Function Selection	Brake control		28
F03.03	R2 Output Function Selection	Inverter fault output		7
F05.00	V/F curve setting	1: Multi-point broken line V/F		1
F05.02	Multi-point VF voltage point V1		%	3.5
F05.04	Multi-point VF voltage point V2		%	7.5
F05.06	Multi-point VF voltage point V3		%	14.0
F05.10	V/F forward torque boost gain	0.00～200.00	%	3.50
F05.12	V/F Slip Filtering Time		s	1.00
F07.06	Bus voltage control selection	Units digit: Instantaneous stop/non-stop function selection 0: Invalid 1: Deceleration 2: Deceleration stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid		0
F07.11	Current limiting control	0: Invalid		0
F08.00	Multi-speed 1	Second gear	Hz	50.00
F08.01	Multi-speed 2	0.00 ～Maximum frequency F00.16	Hz	20.00
F08.02	Multi-speed 3	0.00 ～Maximum frequency F00.16	Hz	20.00
F08.03	Multi-speed 4	0.00 ～Maximum frequency F00.16	Hz	20.00

F08.04	Multi-speed 5	0.00 ～Maximum frequency F00.16	Hz	20.00
F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		1
F20.00	Selection of lifting mechanisms	7: Construction elevator without speed feedback		7
F20.01	Braking curve type	0: Frequency and current arrive simultaneously for braking control.		0
F20.02	Starting direction	1. The direction of brake release frequency is always forward.		1
F20.03	Stop direction	1. The direction of brake release frequency is always forward.		1
F20.04	Braking release current		%	60.0
F20.05	Brake release frequency f1 during lifting		Hz	3.00
F20.06	During descent, the brake release frequency f1 decreases.		Hz	3.00
F20.07	Brake release delay t1		s	0.3
F20.08	Brake release delay t2		s	0.5
F20.10	During lifting, the braking closing frequency f3 is above		Hz	3.00
F20.11	During descent, the braking closing frequency f3 decreases.		Hz	3.00
F20.12	Brake closing delay t3		s	0.3
F20.13	Delay t4 after brake closure		s	0.5
F20.97	V/F reverse torque boost gain	0.00～10.00	%	2.10
F21.15	Low voltage protection function selection	1. Use undervoltage protection		1
F21.21	Special acceleration	1: Use		0
F21.22	Special deceleration	0: Not used		0
F21.52	Weighing signal feedback terminal 1	0: None 1: AI1 2: AI2 3: AI3		2
F21.53	Weighing signal feedback terminal 2	0: None 1: AI1 2: AI2 3: AI3		3

F21.67	MK key resets empty cage weight	0～1		1

F20.00=12: Default parameters for automatic leveling elevators

After selecting this value, the relevant function code values will be automatically set according to Table 7-15, the dedicated macro for automatic leveling elevators.

Table 7-15 Macro Specific for Automatic Leveling Elevator

Function code	Function code name	Function code parameter description	unit	Factory value
F00.01	Motor 1 drive control method	0: V/F control (VVF)		0
F00.02	Command source selection	1: Terminal control		1
F00.03	Terminal control method selection	1: Terminal RUN rotates forward, F/R rotates backward.		1
F00.07	Digital frequency given	Manually operate the hopper's rising and falling frequency	Hz	15.00
F00.14	Acceleration time 1		s	6.00
F00.15	Deceleration time 1		s	2.00
F00.16	Maximum frequency		Hz	50.00
F00.18	Upper limit frequency		Hz	50.00
F01.01	Motor rated power	hopper lifting motor rated power	kW	XX
F01.03	Motor rated current	Hopper lifting motor rated current	A	XX
F01.05	Motor rated speed	The rated speed of the hopper lifting motor	rpm	XX
F02.00	X1 Numeric Input Function Selection	Forward rotation		1
F02.01	X2 Numeric Input Function Selection	Reverse operation		2
F02.02	X3 Numeric Input Function Selection	Multi-speed terminal 1		11
F02.03	X4 Numeric Input Function Selection			152
F02.04	X5 Numeric Input Function Selection			97
F02.05	X6 Numeric Input Function Selection			150
F02.06	X7 Numeric Input Function Selection			151

F02.07	AI1 Numeric Input Function Selection			58
F02.15	Digital input terminal positive/negative logic 1	D7 D6 D5 D4 D3 D2 D1 D0 * X7 X6 X5 X4 X3 X2 X1 0: Positive logic closed is valid/open is invalid 1: Negative logic closed is invalid/open is valid		01011000
F02.18	X1 Effective Delay Time	0.00～650.00	s	0.00
F02.20	X2 Effective Delay Time	0.00～650.00	s	0.00
F02.24	X4 Effective Delay Time	0.00～650.00	s	0.20
F02.63	Analog Input AI2 Type Selection	0: 0～10V 1: 4～20mA 2: 0～20mA 3: Reserved (-10～10V) 4: 0～5V		0
F03.00	Y1 Output Function Selection	Inverter fault output		7
F03.01	Y2 Output Function Selection	Weighing wire breakage or overload alarm		35
F03.02	R1 Output Function Selection	Brake control		28
F03.03	R2 Output Function Selection	Brake control		7
F05.00	V/F curve setting	1: Multi-point broken line V/F		1
F05.02	Multi-point VF voltage point V1		%	3.5
F05.04	Multi-point VF voltage point V2		%	7.5
F05.06	Multi-point VF voltage point V3		%	14.0
F05.10	V/F forward torque boost gain	0.00～200.00	%	3.50
F05.12	V/F Slip Filtering Time		s	1.00

F07.06	Bus voltage control selection	Units digit: Instantaneous stop/non-stop function selection 0: Invalid 1: Deceleration 2: Deceleration stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid		0
F07.11	Current limiting control	0: Invalid		0
F08.00	Multi-speed 1	0.00 ～Maximum frequency F00.16	Hz	50.00
F08.01	Multi-speed 2	0.00 ～Maximum frequency F00.16	Hz	20.00
F08.02	Multi-speed 3	0.00 ～Maximum frequency F00.16	Hz	20.00
F08.03	Multi-speed 4	0.00 ～Maximum frequency F00.16	Hz	20.00
F08.04	Multi-speed 5	0.00 ～Maximum frequency F00.16	Hz	20.00
F12.34	Mode 1 operating status display parameter 2 (LED stop status display parameter 1)	0.00～99.99		21.65
F12.40	LCD large-scale display parameters 3	0.00～99.99		21.65
F15.30	Energy-saving braking function selection	0: Invalid 1: Valid		1
F20.00	Selection of lifting mechanisms	12: Automatic Leveling Elevator		12
F20.03	Stop direction	0: When the brake is closed, the direction of velocity is the same as the direction of travel.		0
F20.04	Braking release current		%	30.0
F20.05	Brake release frequency f1 during lifting		Hz	3.00
F20.06	During descent, the brake release frequency f1 decreases.		Hz	0.50
F20.07	Brake release delay t1		s	0.3

F20.10	During lifting, the braking closing frequency f3 is above		Hz	1.00
F20.11	During descent, the braking closing frequency f3 decreases.		Hz	0.50
F20.12	Brake closing delay t3		s	0.1
F20.13	Delay t4 after brake closure		s	0.5
F20.97	V/F reverse torque boost gain	0.00～10.00	%	2.10
F21.15	Low voltage protection function selection	0: Undervoltage protection not used		1
F21.21	Special acceleration	1: Use		0
F21.22	Special deceleration	0: Not used		0
F21.52	Weighing signal feedback terminal 1	0: None 1: AI1 2: AI2 3: AI3		2
F21.53	Weighing signal feedback terminal 2	0: None 1: AI1 2: AI2 3: AI3		3
F21.67	MK key resets empty cage weight	0～1		1
F36.01	Shortest distance for high-speed operation	F36.02～65535	pulse	2000
F36.02	Shortest distance for medium -speed operation	0～F36.01	pulse	600
F36.03	Uplink docking accuracy	0～65535	pulse	18
F36.04	Downlink docking accuracy	0～65535	pulse	12
F36.12	Encoder Line Count	1～200		100

Industry-specific macros cannot guarantee to meet the application needs of all users. Therefore, after selecting an application macro, it may be necessary to fine-tune the relevant parameters.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.01	Braking curve type	0: Frequency and current arrive simultaneously for braking control. 1: Frequency reaches braking control 2: No braking control		0	○

F20.01=0: Frequency and current arrive at braking control simultaneously.

When the brake is released, it is necessary to simultaneously determine whether the brake release current F20.04 has been reached and whether the brake release delay F20.07 has been reached, as shown in Figure 7-28.

F20.01=1: Frequency reaches braking control

When the brake is released, only check whether the pre-release delay F20.07 has been reached. In Figure 7-28, do not use the current judgment shown in the figure.

F20.01=2: No braking control

No brake control logic, for general applications, mainly used for debugging.

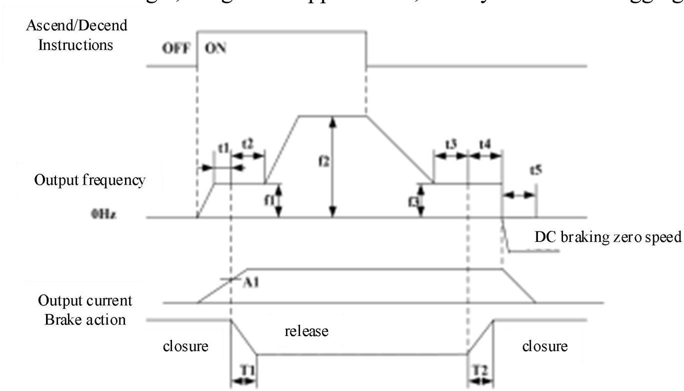
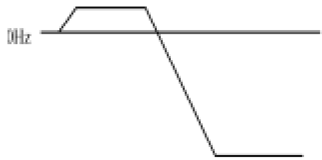
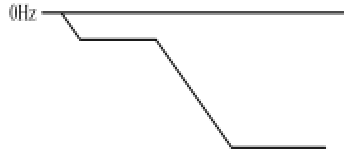


Figure 7-28 Schematic diagram of brake control logic

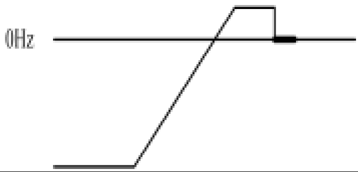
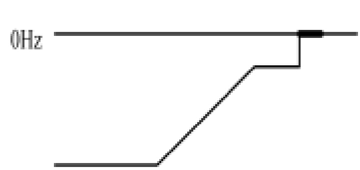
Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.02	Starting direction	0: The direction of brake release frequency is the same as the direction of operation. 1. The direction of brake release frequency is always forward.		1	○
F20.03	Stop direction	0: When the brake is closed, the direction of velocity is the same as the direction of travel. 1. When the brakes are engaged, the direction of velocity is always in the positive direction.		0	○

The two function codes above are mainly for downward movement and have no effect on upward movement.

start up:

	
When descending as shown in Figure 7-29, F20.02= 1, the starting direction is upward. After the brakes are released and there is a delay, the descent will begin.	When Figure 7-30 is descending, F20.02 = 0, and the starting direction is downward.

stop:

	
When descending as shown in Figure 7-31, F20.03 = 1, the braking closing frequency is in the upward direction.	When Figure 7-32 descends, 0.03=0, the braking closing frequency is the same as the running direction.

If the above two parameters are set to 1, it must first be confirmed that the motor's forward rotation direction is lifting, and the motor's rotation direction cannot be adjusted by the parameters. To adjust the motor's rotation direction, it is necessary to swap the two phase output lines.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.04	Braking release current	10.0～100.0	%	20.0	●

When F20.01=0, it is necessary to determine whether the current set by F20.04 has been reached before the brake is released. The reference value for the set value is the rated

torque of the motor in FVC mode and the rated current of the motor in VF mode.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.05	Brake release frequency f1 during lifting	Lower limit frequency ~20.00	Hz	0.40	●

F20.06	During descent, the brake release frequency f1 decreases.	Lower limit frequency ~20.00	Hz	0.40	●

The brake release frequency f1 needs to be set to an appropriate value based on the rated slip of the motor. If the motor slip is large and F20.05 (F20.06) is set too small, the output torque will be small in VF mode, and there will be a feeling of dropping when the brake is released. If the motor slip is small and F20.05 (F20.06) is set too large, there may be overcurrent during startup in VF mode.

1. In VF mode, F20.05 and F20.06 must not be set to 0; they must be set to a frequency approximately equal to the motor's rated slip.
2. In FVC mode, F20.05 and F20.06 can be set to 0.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.07	Brake release delay t1	0.0～10.0	s	0. 1	●

After startup, the inverter output frequency reaches the brake release frequency f1 and waits for t1 time to release the brake (if F20.01=0, it is also necessary to determine if the current reaches the set value ofF20.04).

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.08	Brake release delay t2	0.0～10.0	s	0.5	●

F20.08 needs to be set according to the mechanical release time after the brake receives the release command. Generally, the set time is 0. 1 to 0.2 seconds longer than the mechanical release time. If the motor starts to accelerate before the brake is fully released, overcurrent may occur.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.09	Brake release current abnormal judgment time	0.0～10.0	s	3.0	●

When F20.01=0, if the output current has not reached the value set by F20.04 within the time set by F20.09, a startup abnormality fault will be reported.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.10	During lifting, the braking closing frequency f3 is above	Lower limit frequency ~20.00	Hz	0.20	●
F20.11	During descent, the braking closing frequency f3 decreases.	Lower limit frequency ~20.00	Hz	0.20	●

The brake closing frequency f3 needs to be set to an appropriate value based on the rated slip of the motor. If the motor slip is large and F20.10 (F20. 11) is set too small, the output torque will be small in VF mode, and there will be a feeling of dropping during the brake closing process. If the motor slip is small and F20.10 (F20. 11) is set too large, there may be overcurrent in VF mode during the brake closing process.

1. In VF mode, F20.10 and F20. 11 must not be set to 0; they must be set to the motor's rated slip.
Frequency of approximately the same size
2. In FVC mode, F20.10 and F20. 11 can be set to 0.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20. 12	Brake closing delay t3	0.0～10.0	s	0.0	●

After the stop command is issued, the inverter output frequency reaches the braking closing frequency f3, and then waits for t3 time before the brake closes.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.13	Delay t4 after brake closure	0.0～10.0	s	0.5	●

F20.13 needs to be set according to the mechanical closing time after the brake receives the closing command. Generally, the set time is 0. 1 to 0.2 seconds longer than the mechanical release time.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20. 14	Inverse control of instructions	0: Reverse direction is not allowed during operation. 1: Allows direct reverse operation during runtime.		1	○

F20.14=0: Direct reverse operation is not allowed during runtime.

If a reverse operation command is received during operation, the braking process must be completed before the reverse start is initiated.

F20.14=1: Allows direct reverse operation during runtime.

It starts in reverse without braking.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.15	Restart during braking	0: Restarting is not allowed during the braking process. 1: Restarting is permitted during the braking process.		0	○

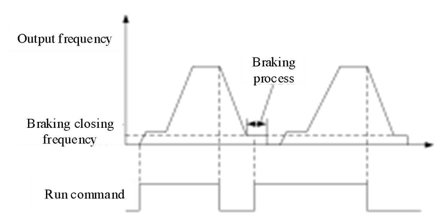


Figure 7-33 Schematic diagram showing that restarting is not allowed during braking.

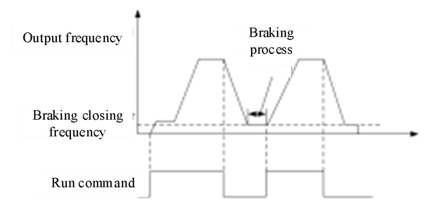


Figure 7-34 Schematic diagram of restarting allowed during braking.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.16	Restart waiting time	0.0～10.0	s	0.1	○

F20.16 is the waiting time required when restarting after braking has ended.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.17	Brake feedback application	0: No brake feedback used 1: Used for motion detection 2: Used for full-process monitoring		0	○

F20.17=0: Brake feedback not used

The release and closing of the brake are determined by frequency, current and time.

F20.17=1: Used for motion detection

If no feedback signal is detected within F20.08 after the brake release signal is issued, the brake is considered to have a release fault; if no feedback signal is detected within F20.13 after the brake closure signal is issued, the brake is considered to have a closure fault (E30: brake sensor abnormality); no detection is performed at other times.

F20.17=2: Used for full-process monitoring

There must be two feedback terminals, namely, a release feedback contact and a closing feedback contact. The feedback signal is detected upon power-up. Within the time set by F20.08, upon receiving the release feedback signal, the system immediately enters the operation phase according to the given speed command. If no release feedback signal is received, "E30: Brake sensor malfunction" is reported. Within the time set by F20.13, upon receiving the closing feedback signal, the system immediately enters the DC braking phase. If no closing feedback signal is received, "E30: Brake sensor malfunction" is reported.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.20	Brake fault detection pulse count when stopped	0 to 10000 (0: Brake check and protection invalid)		2000	●

In the stopped state, if the number of feedback pulses reaches the set value of F20.20, the brake is judged to have failed. F20.20 also applies to the judgment threshold during brake inspection. If F20.20 is 0, the brake inspection and protection are turned off.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.24	Output inversion	0: Invalid 1: Effective		0	○

The output reverse function is not enabled by default. If the actual motor running direction does not conform to the specification, the actual output direction of the motor can be changed through this function code.

F20.24=0: Invalid; F20.24=1: Valid

Before changing this function, ensure the motor is running normally before enabling reverse output. For closed-loop applications, simply setting F20.24 to 1 will achieve reverse operation without changing the encoder direction.

1. This function is suitable for specific situations where it is inconvenient to change the motor wiring. For batch issues prone to wiring errors, it is still recommended to modify the wiring diagram. This will prevent incompatibility problems during parameter copying, etc.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.25	Open-loop zero-servo function selection	0: Invalid 1: Effective 2: Automatic		0	●

F20.25=0: Invalid

In open-loop control without an encoder, setting this parameter to 0 disables the zero servo, prevents brake checks, and eliminates overspeed protection.

F20.25=1: Valid

Set this parameter to 1 and press the OK button; the system will directly enter zero-servo state from the stop state. Set this parameter to 0 and press the OK button to exit zero-servo state.

F20.25=2: Automatic

When using open-loop control with an encoder, the zero servo is automatically activated when hook slippage is detected to prevent the heavy object from falling.

1. When setting F20.25 to 2 in open-loop control, it is essential to ensure that an encoder is connected and its parameters are set correctly in order to effectively prevent the load from falling when the brake fails and the hook slips.

2. Regardless of the value of F20.25 during closed-loop control, the zero servo can be automatically activated to prevent the heavy object from falling when the brake fails and the hook slips.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.26	Brake torque check	0.0～180.0	%	100.0	●
F20.27	Brake torque holding time check	0.0～10.0	s	6.0	●
F20.28	Brake inspection upper limit frequency	Lower limit frequency ~ Upper limit frequency Fup	Hz	2.00	●

F20.29	Brake inspection forward detection delay	0.0～10.0	s	0.8	●
F20.30	Brake inspection reverse detection delay	0.0～10.0	s	0.8	●

Brake check requires setting the Xi input terminal function to function "58" "Brake Check" in parameter setting mode. Then, close the terminal. The inverter will first run forward with the torque set in F20.26 for the time set in F20.27, and then reverse with the torque set in F20.26 for the time set in F20.27. To prevent runaway, F20.28 needs to be set to a suitable value; the default value is generally sufficient. See Figure 7-35 for details.

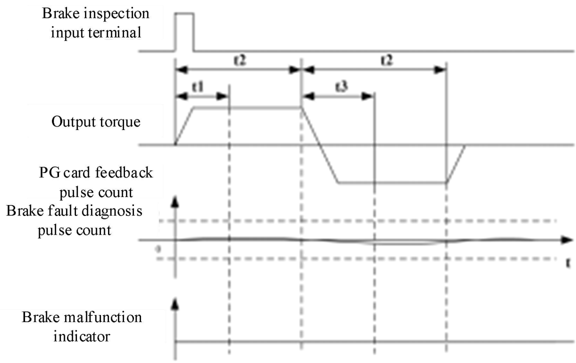


Figure 7-35 Schematic diagram of brake inspection

In the diagram, t1 represents the forward detection delay of the brake check (F20.29), t2 represents the brake check torque holding time (F20.27), and t3 represents the reverse detection delay of the brake check (F20.30).

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.31	Brake inspection interval	0 to 1000 (0: invalid)	h	0	●

When the cumulative power-on time reaches the brake check time F20.31 setting, the terminal set as the brake check reminder output becomes active, driving the external buzzer to remind the driver to perform a brake check. The driver can silence the buzzer using the

fault reset button. The driver should perform a brake check with the hook empty under

appropriate circumstances; the check time will only be reset to zero after a normal check. If no check is performed, the brake check reminder terminal will become active again when
the inverter is powered on, driving the buzzer.

1. During brake check operation, do not respond to other commands.
2. To prevent accidental pressing of the brake check button when the brake is not closed, the brake check shall only be performed in the parameter setting state. It shall not be performed in any other state such as operation, shutdown, or fault.
3. When F20.31 is set to 0, brake check reminders will not be performed.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.32	Eddy current cut-in frequency	0.00～50.00	Hz	5.00	●
F20.33	Eddy current control time	0～3600		30	●

After shutdown, when the inverter controls the slewing mechanism to return to the zero position, the output is valid when the output frequency is less than F20.32 (eddy current cut-in frequency), and the valid time is set by F20.33; when the set time is reached, the output becomes invalid. Additionally, if the inverter receives a start command before the set time is reached, it immediately switches to an invalid state. The specific timing is shown in Figure 7-36.

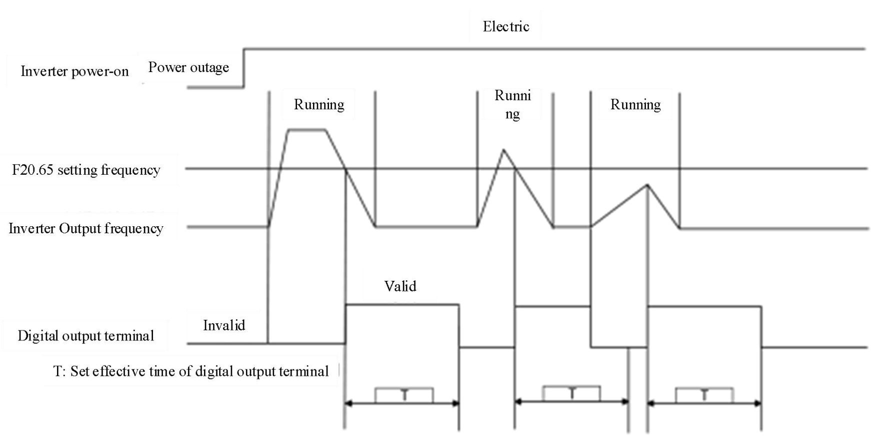


Figure 7-36 Timing diagram of auxiliary eddy current braking time output terminal

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.34	Cancel method selection after zero-servo automatic action	0: Cancel after brake check passes 1: Cancel after handle moves down once 2: Run and exit		1	○
F20.35	Zero servo automatic action count	1～5		1	○
F20.36	Zero servo hold time	1.0～30.0	S	3.0	○

Upon detecting hook slippage (the encoder pulse value change in the parking state exceeds F20.20), the driver immediately switches to zero servo state. The holding time is set by F20.36. After the holding time expires, the zero servo state becomes invalid. If hook slippage is detected again after the zero servo state becomes invalid, the driver will re-enter the zero servo state. Once the number of times the driver enters the zero servo state reaches the set value ofF20.35, the driver will remain in the zero servo state indefinitely.

After F20.34=0 is enabled for zero servo, it must successfully pass the brake check before exiting the zero servo state.

After F20.34= 1 is enabled for zero servo, the zero servo state can be exited by operating the

handle down once (i.e., giving a down-run command);

After F20.34=2 enables zero servo, you can exit the zero servo state by running the program.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.51	Low-speed operation mode selection	0: Operate at the given frequency multiplied by the gain 1: Operate with reduced bias at a given frequency 2: Operate at maximum frequency multiplied by gain		0	○

F20.52	Frequency reduction gain	0～1000	%	100.0	●
F20.53	Frequency reduction bias	0.00～600.00	Hz	0.00	●

Ant speed function: When the DI172 ultra-low speed operation terminal is active and the DI67 positioning shield is inactive, the ant speed function is active. When F20.51=0, the operating frequency is the given frequency multiplied by the gain (F20.52); when F20.51= 1, the operation is the given frequency with reduced bias (F20.53); when F20.51=2, the operation is the maximum frequency (F00. 16) multiplied by the gain (F20.52).

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.66	Reverse gear for rapid deceleration effectively enables	0: Invalid 1: Effective		0	○

During the operation of the handle, the gear position is reversed. The deceleration time will be the time set by F15.08. When the set value ofF15.08 is less than the set value ofF00.15, and this function is effective, the reverse gear rapid deceleration function is effective, which is generally used in tower crane slewing control.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.67	Rotational control moment of inertia	0～65.535	Kg*m2	0.000	○

Set the moment of inertia of the tower crane's slewing mechanism.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.68	Tower deformation angle coefficient	0～65.535		0.000	○

Different tower cranes have different tower deformation angles depending on factors such as steel strength, tower height, and slewing jib length. Generally speaking, the taller the tower, the larger the deformation angle; the stronger the steel, the smaller the deformation angle. A larger deformation angle requires a larger deformation angle coefficient.

In tower crane slewing applications, F20.68 is a crucial parameter for ensuring smooth operation. For the same tower crane:

lThe larger the value of F20.68, the smoother the speed control during operation, and the less the boom shakes during operation;

lThe smaller the value ofF20.68, the faster the speed control response during operation, and the more prone the boom is to shaking during operation;

Therefore, the value of F20.68 should not be too high or too low, and the reference range is between 0.100 and 0.400.

lWhen the boom vibrates during slewing and rebounds after stopping, F20.68 can be increased in increments of 0.100.

lWhen the slewing operation is slow to start or fails to start, or the stopping distance is long, F20.68 can be reduced in units of 0.100.

1. The setting value for F20.68, which is not for tower crane slewing applications, must be 0!

2. A slewing mechanism with eddies will reduce the deformation coefficient of the slewing mechanism at low speeds. Generally, the value of F20.68 is relatively smaller for slewing mechanisms with eddies than for those without. The specific actual situation depends on the on-site phenomena of the tower crane.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.69	Rotary motor torque filtering time	0～65.535	s	0.100	○
F20.70	Rotary motor speed estimation filtering time	0～65.535	s	0.100	○
F20.71	Filtering time for turret deformation angle		s	0.100	○
F20.72	Rotation given deformation angle filtering time	0～65.535	s	5.000	○
F20.73	Slewing torque steady-state calculation delay time	0～65.535	s	10.000	○

F20.69~F20.73 are the filter time settings for the rotation-related parameters, which are generally not adjusted.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F20.74	Low-frequency switching point of rotational deformation coefficient	0～10.00	HZ	5.00	○
F20.75	Rotational deformation coefficient accelerates filtering time	0～65.535	s	2.000	○
F20.76	Rotational deformation coefficient deceleration filtering time	0～65.535	s	0.200	○

F20.74 to F20.76 are adjustments to the tower deformation angle coefficient F20.68 during operation. When rotating, the tower deformation angle coefficient actually accelerates to the set value of F20.68 over time t1; when rotating and decelerating, when the frequency is less than the set value of F20.74, the tower deformation angle coefficient actually decelerates to 0 over time t2, as shown in Figure 7-37.

The larger the setting value of F20.74, the longer the time t1; the smaller the setting value ofF20.74, the shorter the time t1.

The larger the setting value of F20.75, the longer the t2 time; the smaller the setting value ofF20.75, the shorter the t2 time.

In addition, when F20.74 is 0, the tower deformation angle coefficient remains at the set value ofF20.68 throughout the entire operation process, as shown in Figure 7-38.

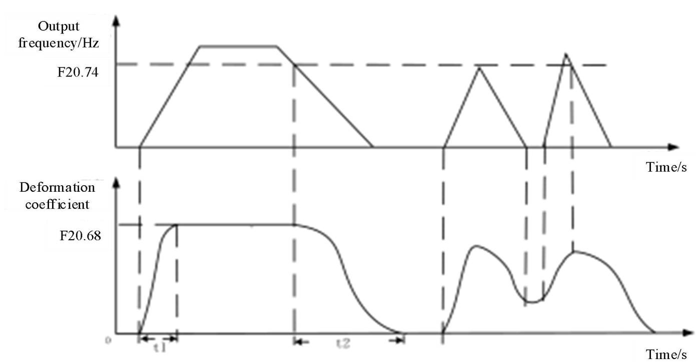


Figure 7-37 shows the change process ofF20.68 during operation when F20.74 is not 0.

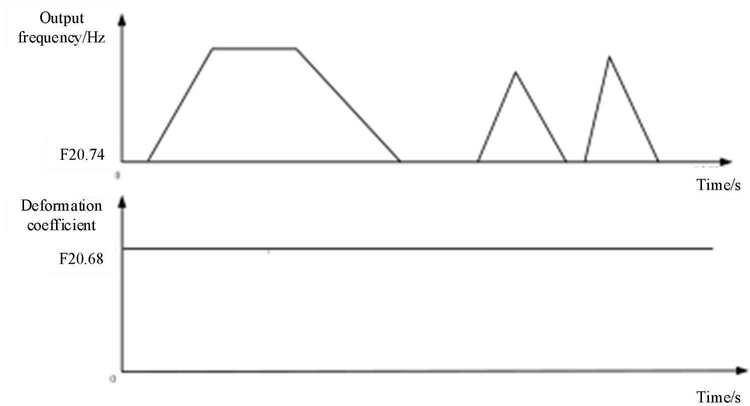


Figure 7-38 shows the change process ofF20.68 during operation when F20.74 is 0.

Table 7-16 provides four sets of parameter configurations for the slewing schemes currently available on the market.

Table 7-16: Configuration Table for Different Slewing Schemes

	F20.74	F20.75	F20.76
Open-loop vector	2.0Hz	2.000s	2.000s
Open-loop vector	2.0Hz	0.100s	4.000s
Closed-loop	2.0Hz	0.100s	8.000s
Closed-loop	2.0Hz	0.100s	8.000s

7.22 F21 Group Lifting-Specific Advanced Function Parameter Group

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.00	Overload protection torque limit threshold	0.0～150.0 (0.0: Protection invalid)	%	0.0	●
F21.01	Load detection time	0.0～5.0	s	0.0	●
F21.02	Load detection frequency percentage	10.0～100.0	%	80.0	●

f_detection = Motor rated frequency * F21.02;

When the inverter output reaches the detection frequency f, it maintains this frequency for a duration equal to the detection time F21.01. After the time expires, the output torque is detected. In VF mode, the output current is detected. The inverter calculates the maximum frequency that can be reached in this operation based on the output torque or current detected at this frequency.

If it is greater than F21.00, it indicates overload; otherwise, continue normal operation.

When F21.01 is set to 0, the light-load high-speed or heavy-load low-speed logic is not performed.

> For user convenience, the parameters for the light-load high-speed function and the heavy-load low-speed function are already fixed when the motor's rated frequency is (33Hz, 50Hz motor), and users do not need to set them. This function is mainly used in the closed-loop lifting application macro (F20.00=0). When switching to other macros, this function is automatically disabled. The factory default values are the parameters for a 50Hz motor.
>
> Setting F21.00 to 0.0 indicates that there is no overload protection function.
>
> The light-load high-speed function means that when the given frequency is greater than the motor's rated frequency, the frequency converter calculates the highest achievable frequency based on the current load, thereby avoiding overload, overcurrent and other faults due to excessive load.
>
> The heavy-load low-speed function means that when the current load is greater than the rated load, the frequency converter can automatically calculate the highest frequency that can be reached under heavy-load conditions based on the current load.
>
> Because the directions of friction are different for upward and downward movement (the friction does negative work downward when moving upward, and positive work upward when moving downward), the slack torque, allowable torque, and heavy load torque for upward and downward movement must be set separately.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.03	Upward Light Load High Speed Ratio	100.0～400.0	%	100.0	○
F21.04	Upward heavy load high speed ratio	10.0～100.0	%	100.0	○
F21.05	Upward slack rope torque	0.0～99.9	%	0.0	●

F21.06	Upward allowable load torque	F21.05～F21.07	%	100.0	○
F21.07	Upward heavy load torque	F21.06～250.0	%	100.0	●
F21.08	Downlink light load high speed ratio	100.0～400.0	%	100.0	●
F21.09	Downlink heavy load high speed ratio	10.0～100.0	%	100.0	○
F21.10	Downward slack rope torque	0.0～99.9	%	0.0	●
F21.11	Downward allowable load torque	F21.10～F21.12	%	100.0	●
F21.12	Downward heavy load torque	F21.11～250.0	%	100.0	●

F21.03: Upward light load high speed ratio:

The uplink light-load high-speed function can only be enabled when F21.03 is greater than 100.0%. This parameter determines the maximum frequency that can be achieved during uplink operation under light-load high-speed conditions.

To use the light load high speed multiplier function, you need to set the light load high speed multiplier b (F21.03), slack rope torque T1 (F21.05), allowable load torque T2 (F21.06), detection frequency f1 (F21.02), and detection time t1 (F21.01).

Maximum frequency of light load high speed during upward movement = F21.03 * motor rated frequency.

F21.04: Upward heavy load low speed ratio:

The heavy-load low-speed function can only be enabled when the F21.04 value is less than 100.0%. This parameter determines the minimum frequency for heavy-load low speed.

Minimum frequency for heavy load on the uphill direction = F21.04 * motor rated frequency.

F21.05: Upward slack rope torque:

This parameter serves as the benchmark for calculating the target frequency. The output torque should be detected during unloaded and steady-speed operation, and the detection result should be used as the value of this parameter.

F21.06: Permissible upward torque:

100.0% corresponds to the motor torque at rated frequency. In VF mode, this parameter corresponds to the motor current.

F21.07: Upward heavy load torque:

The heavy-load low-speed function is calculated based on output torque in FVC mode and output current in VF mode. It is disabled at the factory. To use this function, the following parameters are required: upward heavy-load low-speed multiplier b (F21.04), upward allowable torque T2 (F21.06), upward heavy-load torque T3 (F21.07), detection frequency f1 (F21.02), and detection time t1 (F21.01).

F21.08: Downlink light load high speed ratio:

The downhill light-load high-speed function can only be enabled when F21.08 is greater than 100.0. This parameter determines the maximum frequency that the motor can reach under light-load high-speed conditions during downhill operation. To use the downhill light-load high-speed multiplier, the following parameters are required: downhill light-load high-speed multiplier b (F21.08), slack rope torque T1 (F21.10), allowable load torque T2 (F21.11), detection frequency f1 (F21.02), and detection time t1 (F21.01).

The maximum frequency of light-load high speed during downhill operation = F21.08 * motor rated frequency.

F21.09: Downlink heavy load low speed ratio:

The heavy-load low-speed function can only be enabled when the F21.09 value is less than 100.0%. This parameter determines the minimum frequency for downlink heavy-load low speed.

Minimum frequency for heavy load in the downlink direction = F21.09 * motor rated frequency.

F21.10: Downward slack rope torque:

This parameter serves as the benchmark for calculating the target frequency. The output torque should be detected during unloaded and steady-speed operation, and the detection result should be used as the value of this parameter.

F21.11: Permissible downward torque:

100.0% corresponds to the motor torque at rated frequency. In VF mode, this parameter corresponds to the motor current.

F21.12: Downward heavy load torque:

The heavy-load low-speed function is calculated based on output torque in FVC mode and output current in VF mode. It is disabled at the factory. To use this function, the following parameters are required: downlink heavy-load low-speed multiplier b (F21.09), downlink allowable torque T2 (F21.11), heavy-load torque T3 (F21.12), detection frequency f1 (F21.02), and detection time t1 (F21.01).

Light load, high speed:

When the inverter's output frequency reaches the detection frequency f1 (f1 = F21.02 * motor rated frequency), this frequency is maintained for a duration of t1 (F21.01: load detection time). After this time, the inverter's output torque T (FVC is the output torque, VF is the output current) is detected and used to calculate the target frequency F allowed for this operation using the curve shown in the figure below. If the target frequency given for this operation is greater than F, the target frequency is changed to F.

The speed calculation method corresponding to different torques is as follows:

When the current torque T < slack rope torque T1, the output frequency F = a (light load high speed ratio) * motor frequency Fe;

When the current torque T > the allowable load torque T2, the output frequency F = the motor frequency Fe;

When the slack rope torque T1 < current torque T < allowable load torque T2:

Output frequency F = (T2 – T)(a – 1) * Fe / (T2 – T1) + Fe;

Heavy-duty high-speed:

When the inverter's output frequency reaches the detection frequency f1 (f1 = F21.02 * motor rated frequency), maintain this frequency for a duration of t1. After this time, detect the inverter's output torque T (FVC is the output torque, VF is the output current) and use it to calculate the curve shown in the figure below to obtain the target frequency F that can be allowed for this operation. If the target frequency given for this operation is greater than F, then the target frequency is changed to F.

The heavy-load low-speed function can only be enabled when T2≤T≤T3 and the heavy-load low-speed ratio b < 100.0%.

The speed calculation method corresponding to different torques is as follows:

When the current torque T < the allowable load torque T2, the output frequency F = the motor frequency Fe;

When the current torque T > the heavy load torque T3, the output frequency F = b(heavy load low speed ratio) * motor frequency Fe;

When the allowable load torque T2 < current torque T < heavy load torque T3:
Output frequency F = Fe - (T-T2)(1-b)Fe / (T3-T2).

Note: In FVC mode, the current torque T = output torque (F18.04); in VF mode, the current torque T = output current (F18.06) / motor rated current.

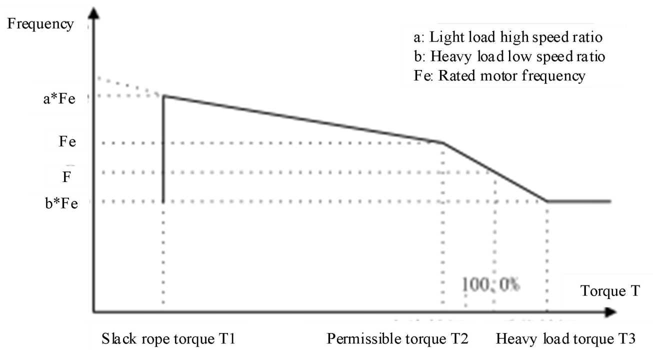


Figure 7-39 Output torque-frequency curve

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.15	Low voltage protection function selection	0: Not used 1. Use undervoltage protection		1	○
F21.16	Low voltage protection point	70.0～100.0	%	90.0	●
F21.17	Low voltage protection filter time	0.000～60.000	s	0.500	●

F21.15=0: Not used

The low voltage protection is ineffective.

F21.15=1: Use undervoltage protection

When the bus voltage is lower than the set value ofF21.16, the upper limit output frequency is automatically adjusted according to the proportion of voltage reduction to ensure that the motor can maintain full torque output. 100.0% in F21. 16 corresponds to the rated DC bus voltage.

To avoid oscillation caused by adjusting too quickly when the output frequency is already near the upper limit, F21.17 can be increased.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.18	Power-on parameter self-identification and selection	0: No self-identification performed 1: Perform self-identification		0	○

F21.18=0: No self-identification performed.

It does not automatically identify parameters after power-on.

F21.18=1: Perform self-identification

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.19	Motor fan control delay	0.0～600.0	s	100.0	●

If a motor stops operating under heavy load for an extended period without external cooling measures, the motor temperature will continue to rise (potentially exceeding 20K) due to the large heat capacity of the motor coil and core, potentially leading to insulation damage. Therefore, a cooling fan needs to be added to the motor tail, and this fan needs to continue running for a period of time after the inverter stops to dissipate the heat from the motor core and coil.

If an output terminal is defined as "34: Motor Fan Control" function, this terminal will remain valid after the inverter starts running, and will continue to maintain the time set by F21. 19 (Motor Fan Control Delay) after the inverter stops running, before becoming invalid.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.21	Special acceleration	0: Do not use 1: Use		0	○
F21.22	Special deceleration	0: Do not use 1: Use		0	○

F21.23	Acceleration frequency switching point 1	0.00～F21.25	Hz	5.00	●
F21.24	Deceleration frequency switching point 1	0.00～F21.26	Hz	8.00	●
F21.25	Acceleration frequency switching point 2	F21.23～F21.27	Hz	50.00	●
F21.26	Deceleration frequency switching point 2	F21.24～F21.28	Hz	15.00	●
F21.27	Acceleration frequency switching point 3	F21.25～600.00	Hz	50.00	●
F21.28	Deceleration frequency switching point 3	F21.26～600.00	Hz	30.00	●

Special acceleration and deceleration functions: When they are active (F21.21 or F21.22 is set to 1), if the relationship "output frequency ≤ switching point 1" is satisfied, acceleration/deceleration time 1 is active; if the relationship "switching point 1 < output frequency ≤ switching point 2" is satisfied, acceleration/deceleration time 2 is active; if the relationship "switching point 2 < output frequency ≤ switching point 3" is satisfied, acceleration/deceleration time 3 is active; see Figure 7-40 for details.

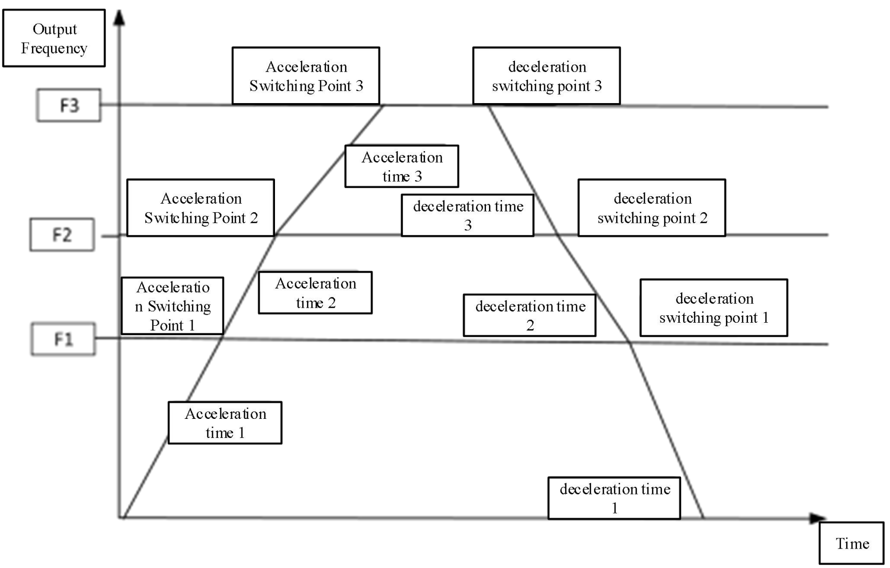


Figure 7-40 Schematic diagram of special acceleration/deceleration switching

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.29	Deceleration limit frequency limit points (DI=63,64)	0.00～ F00.16	HZ	20.00	●
F21.30	100% weight limit downlink frequency	0.00～ F01.04	HZ	15.00	●
F21.31	80% weight limit uplink frequency limit	0.00～ F00.16	HZ	0.00	●
F21.32	80% weight limit downlink frequency	0.00～ F00.16	HZ	0.00	●
F21.33	50% weight limit uplink frequency	0.00～ F00.16	HZ	0.00	●
F21.34	50% weight limit downlink frequency	0.00～ F00.16	HZ	0.00	●
F21.35	90% torque limit downshift frequency restriction	0.00～ F01.04	HZ	15.00	●
F21.36	80% torque limit upward frequency restriction	0.00～ F00.16	HZ	0.00	●
F21.37	80% torque limit downshift frequency restriction	0.00～ F00.16	HZ	0.00	●

F21.29: Deceleration limit frequency limit point:

When F21.29 is not set to 0, and input terminal DI=63 (forward/upward deceleration switch) is active, forward operation will occur, and the output frequency will be limited to F21.29;

When F21.29 is not set to 0, and input terminal DI=64 (reverse/grounding deceleration switch) is active, the circuit will run in reverse, and the output frequency will be limited to F21.29.

F21.30: 100% weight limit reverse limiting frequency:

When F21.30 is not set to 0, and the input terminal DI=163 (100% weight limit input) is valid, forward operation is not allowed (lifting cannot go upward, luffing cannot go outward), and reverse operation is allowed. The operating frequency is limited to F21.30. **F21.31: 80% weight limit positive limiting frequency:**

F21.32: 80% weight limit reverse limiting frequency:

When DI-164 (80% weight limit terminal) is active, the output frequency is limited to F21.31 when operating in the forward direction and to F21.32 when operating in the reverse direction. When F21.31 and F21.32 are set to 0, the original operating logic is maintained. **F21.33: 50% weight limit positive limiting frequency:**

F21.34: 50% weight limit reverse limiting frequency:

When DI-165 (50% weight limit terminal) is active, the output frequency is limited to F21.33 during forward operation and to F21.34 during reverse operation. When F21.33 and F21.34 are set to 0, the original operating logic is maintained.

F21.35: 90% torque limit reverse frequency:

When F21.35 is not set to 0, and input terminal DI=161 (90% torque limit input) is valid, forward operation is not allowed (lifting cannot move upward, luffing cannot move

outward), and reverse operation is allowed. The operating frequency is limited to F21.35. **F21.36: 80% torque limit positive limiting frequency:**

F21.37: 80% torque limit reverse frequency:

When DI-162 (80% torque limit terminal) is active, the output frequency is limited to F21.36 during forward operation and to F21.37 during reverse operation. When F21.36 and F21.37 are set to 0, the original operating logic is maintained.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.39	linear change in DC braking current during parking - action delay time	0.00～30.00 0: No linear switching process	s	0.00	●
F21.40	Parking DC braking current linear switching time	0.00～30.00	s	0.00	●
F21.41	Parking DC braking current linear switching target value	0.0～400.0	%	0.0	●

In tower crane slewing applications, to address the difficulty of stopping the crane in strong winds, a linear change process is implemented for the output excitation current during the SVC zero-frequency braking process. Table 7-17 lists the field parameters for reference, and Figure 7-41 shows the change in excitation current during zero-frequency braking in slewing operations. The effect of F21.41 is the same as that of F06. 18; setting it too high results in rebound during shutdown, while setting it too low prevents the crane from stopping.

Table 7-17 Shutdown Parameters in Strong Wind Environments

Function code	F04.22	F21.39	F21.40	F21.41
Reference value	15s	0.5s	1.0s	80%

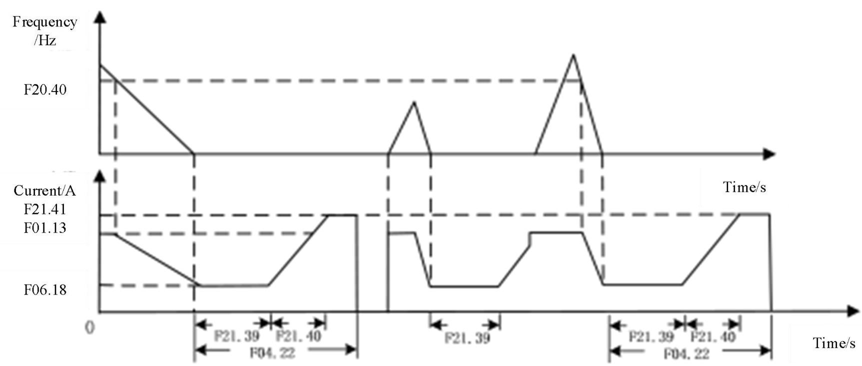


Figure 7-41 shows the variation of excitation current during zero-frequency braking in slewing operation.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.50	Rated load	0～6.00	t	2.00	○
F21.51	empty cage weight	0～6.00	t	1.50	○
F21.52	Weighing signal feedback terminal 1	0: None 1： AI1 2: AI2 3: AI3		0	○
F21.53	Weighing signal feedback terminal 2	0: None 1： AI1 2: AI2 3: AI3		0	○
F21.54	Weighing sensor range	0～6.00	t	3.00	○
F21.55	Sensor sensitivity	0.0～2.0	Mv	1.6	○

F21.56	Magnification	0.0～800.0		415.0	○
F21.57	Overload detection delay time	0.000～10.000	s	1.000	○
F21.58	Weighing sensor wire breakage detection level (single channel)	0～6.00	t	0.30	○
F21.59	Delay time for load cell wire breakage detection	0.000～10.000	s	0.000	○
F21.60	Weighing test correction coefficient Kx	0.00～200.00	%	100.00	●
F21.61	Weighing self-learning weight increase	0～6.00	t	0.00	○
F21.62	Weighing self-learning	0: None 1: First point weighing self-learning (zeroing) 2: Second point weighing self-learning (calibration)		0	○
F21.63	Weighing signal 1: Weight (actual value)	0～6.00	t	0.00	×
F21.64	Weighing signal 2: Weight (actual value)	0～6.00	t	0.00	×
F21.65	Actual weight (net weight)	0～6.00	t	0.00	×
F21.66	Actual weight percentage (net weight)	0～200.00	%	0.00	×

F21.50: Rated load

Input value for the rated load capacity of the construction hoist (excluding the weight of the empty cage).

F21.51: Empty cage weight

The set weight of the empty cage of the construction hoist

F21.52: Weighing signal feedback terminal 1

Select signal input terminal for load cell 1

F21.53: Weighing signal feedback terminal 2

Select signal input terminal for load cell 2

F21.54: Weighing sensor range

The maximum range of the weighing uranium pin sensor corresponds to the weight in tons.

F21.55: Sensor sensitivity

Weighing shaft pin sensor sensitivity setting value

F21.56: Magnification

Manufacturer specifications, please do not change.

F21.57: Overload detection delay time

When the load on the construction hoist exceeds the rated load, the detection delay time is...

F21.58: Load cell disconnection detection level

Weighing pin sensor disconnection detection value (single channel), detection threshold when the pin sensor is disconnected or malfunctioning.

F21.59: Delay time for detecting disconnection of load cell wires

When the weight value reported by the weighing pin sensor is less than the set value ofF21.58, the disconnection detection delay time setting value is activated.

F21.60: Weighing sensor correction coefficient

Correction factor between actual weight value and displayed weight value

F21.61: Weighing self-learning weight increase

The weight of the standard weight added during weighing self-learning.

F21.62: Weighing Self-Learning

The weighing self-learning method uses a two-point test method to learn the empty cage weight and correction coefficient.

The specific steps are as follows:

1. Weighing self-learning 1: When the cage is empty, set F21.61=0, and then start the first self-learning step by setting F21.62=1;

2. Weighing Self-Learning 2: Place the corresponding standard weight, set F21.61 = standard weight, and then set F21.62 = 2 to start the second self-learning step;

3. After steps 1 and 2 (and these two steps are mandatory), self-learning is complete, and the system will automatically write the learned value into the corresponding function code. If the weighing self-learning increment F21.62 is the same for both self-learning 1

and self-learning 2, or if the feedback value is the same, that self-learning session is invalid. If the weighing sensor correction coefficient after self-learning is greater than 200.00%,

please check the weighing sensor, standard weight setting, wiring, and related circuits for any abnormalities.

F21.63: Weighing signal 1 weight (actual value)

Weighing sensor 1 displays actual weight value

F21.64: Weighing signal 2 - weight (actual value)

Weighing sensor 2 displays the actual weight value.

F21.65: Actual weight (net weight)

The actual load capacity displayed on the construction hoist (excluding the weight of the empty cage).

F21.66: Actual weight percentage (net weight)

Percentage of actual load capacity to rated load capacity of construction hoist

Introduction to weighing protection function:

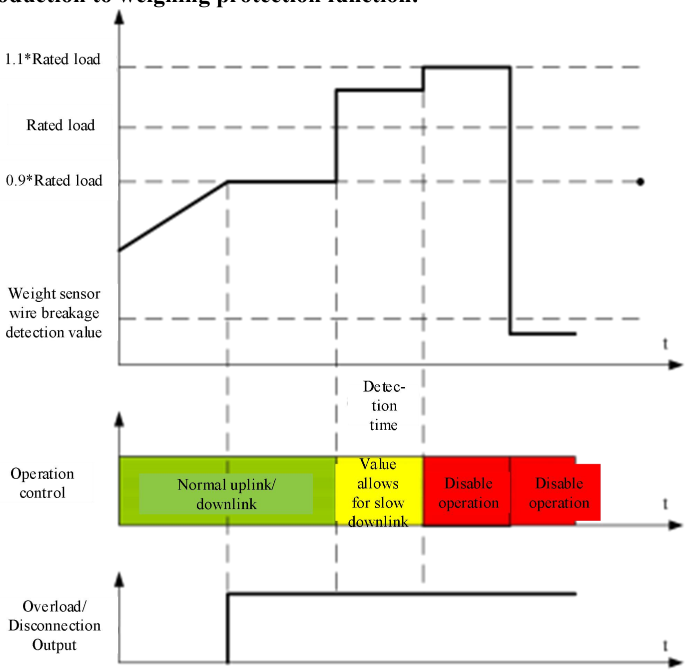


Figure 7-42 Weighing protection function logic

1. When the detected weight is greater than the wire breakage detection value but less than or equal to 90% of the rated load, the frequency converter will operate normally.

2. When the detected weight is greater than the rated load but less than 1.1 times the rated load, the frequency converter is only allowed to descend at low speed; the current design uses the first speed setting at this time.

3. When the detected weight is greater than or equal to 1.1 times the rated load, the frequency converter stops running; it will restart when the detected weight is less than the rated load.

4. When the detected weight is identified as a disconnection of the weight sensor, and the system is in parameter setting mode, the inverter will stop running; disconnection detection is only performed in parameter setting mode.

5. When the detected weight is greater than or equal to 90% of the rated load or when the sensor is disconnected, the digital output terminal set to "35: Weighing disconnection or overload alarm output" will activate, the audible and visual alarm light will flash and an alarm sound will be emitted.

Function code	Function code name	Function code parameter description	unit	Factory value	property
F21.72～79	GPS related parameters				

For GPS-related parameters, please refer to the GPS module manual.

Part 8 Motor parameter self-identification

8.1 Motor parameter self-identification

When vector control is selected as the drive method, motor parameter self-identification must be performed. For non-vector control, in order to obtain higher control accuracy, it is still recommended to perform parameter self-identification on the first run.

The motor parameters required for vector control calculations are generally not readily available to users. The TC760 frequency converter provides a motor parameter self-identification function. After enabling the self-identification function, the frequency converter automatically tests the relevant parameters of the connected motor and stores them in its internal memory. Figure 8-1 shows the specific meaning of the motor parameters for a three-phase asynchronous motor.

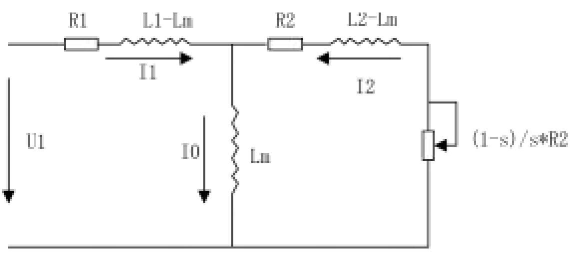


Figure 8-1 Equivalent circuit of a three-phase asynchronous motor

In the diagram, R1, R2, L1, L2, Lm, and I0 represent: stator resistance, rotor resistance, stator self-inductance, rotor self-inductance, mutual inductance, and no-load excitation current, respectively; leakage inductance is Ls = L - Lm.

8.2 Precautions before self-identification

- Motor parameter self-identification is the process of automatically calculating motor parameters. The TC760 frequency converter can perform motor static self-identification and motor rotation self-identification.
  - Motor stationary self-identification is suitable for use when the motor load cannot be unloaded, and motor parameters can still be obtained.

- The motor rotation self-identification is suitable for use when the motor load can be unloaded. Before operation, the motor shaft should be unloaded, and it is forbidden to perform the rotation self-identification operation with the motor under load.
- The motor will rotate during self-recognition. Please be careful!

- Before the self-identification operation, ensure that the motor is stopped; otherwise, the self-identification will not proceed normally.
- The self-identification operation is only valid when controlled by the keyboard (i.e., F00.02=0).
- To ensure proper self-identification of motor parameters, the nameplate parameters of the controlled motor should be correctly set. For Y-series motors configured according to the inverter's specified power, the factory default settings are sufficient for most requirements.
- To ensure control performance, the power rating of the motor and the frequency converter should be matched, or generally the motor should be only one or two sizes smaller than the frequency converter.
- After the motor parameter self-identification operation is completed normally, the settings ofF01.09～F01. 13 will be updated and automatically saved.
- When F12. 14= 1 restores the factory settings, the contents of the function code parameter values from F01.00 to F01. 13 remain unchanged.

8.3 Self-identification operation steps

- In the parameter setting state, set F00.02=0 to keyboard control and disconnect the motor from the load.
- Based on the parameters on the motor nameplate, set the function code parameter values for F01.00 Motor Type, F01.01 Motor Rated Power, F01.02 Motor Rated Voltage, F01.03 Motor Rated Current, F01.04 Motor Rated Frequency, F01.05 Motor Rated Speed, F01.06 Motor Winding Connection, and F01.07 Motor Rated Power Factor.
- Set F01.34= 1 for asynchronous motor static self-learning, then press the button to start the static self-identification of the motor.

- Alternatively, set F01.34=2 for rotational self-learning, then press the button to start the motor's rotational self-identification.
- It takes about two minutes for the motor to complete its self-identification, and the interface will return to the initial power-on state.
- During the self-identification process, pressing the STOP key will display "E24 Parameter Identification Abnormal" and pressing the STOP key will return to the parameter setting state.
- If self-identification fails, "E24 Parameter Identification Abnormal" will be displayed. Pressing the STOP/RESET key will return to the parameter setting state. For troubleshooting, see Section 9.1.
- After the identification is completed, please set the command source selection (F00.02) to the required control mode (generally F00.02=1 terminal control).

Part 9 Troubleshooting

9.1 Fault details

When the frequency converter malfunctions, the keypad display will show the corresponding protection code and its parameters. The protection relay will activate, the protection output terminals will activate, and the frequency converter will stop outputting. If the motor is rotating during protection operation, it will either stop automatically or decelerate until it comes to a complete stop. The protection content and countermeasures for the TC760 series frequency converter are shown in Table 9-1.

Note 1: All power terminal wiring checks must be performed 10 minutes after power is turned off to prevent electric shock.

Note 2: Observe the phenomenon after completing each step. Only proceed to the next step if the problem is not resolved.

Note 3: For items involving time parameter adjustments, unless otherwise specified, adjustments should be made in units of 2 seconds.

Table 9-1 Protection Contents and Countermeasures for TC760 Series Frequency Inverters

Fault Codes	Fault type	Cause of the fault	Troubleshooting
E01	Short circuit protection	1.Phase-to-phase short circuit	Check for short circuits between motor cable connections.
		2.Short circuit to ground	Check the motor cable for damaged insulation or short circuit to ground.
		3. Short circuit in external braking resistor	1. Check if there is a short circuit between the PB and + terminals of the frequency converter. 2. Check if the braking resistor is short-circuited to the resistor box casing.
		4. Acceleration and deceleration times are too short.	Acceleration process protection increases the acceleration time F00. 14.Deceleration process protection increases the deceleration time by F00. 15.

		5. Excessive on-site interference	1. After investigating the cause and implementing countermeasures, reset and resume operation. 2. If the fault is reported again, seek technical support.
		6. Inverter module damaged	Seeking technical support
E02 E04	Instantaneous overcurrent Steady-state overcurrent	1. Acceleration and deceleration time is too short.	Acceleration process protection increases the acceleration time F00. 14. The deceleration process protection increases the deceleration time by F00. 15.
		2. The motor is rotating when started.	Reset the fault, wait for the motor to stop, and then run it again.
		3. The brake is not engaged when the motor is running.	With the hook unloaded, check if the brake can open normally. If it cannot open normally, check the wiring.
		4. The motor parameters are unsuitable; parameter identification is required.	Refer to the slewing commissioning guide to identify motor parameters.
		5. Phase-to-phase short circuit on the output side of the frequency converter	Check the motor cable for short circuits.
		6. Inverter module damaged	Seeking technical support
E03 E05	Instantaneous overvoltage Steady-state overvoltage	1. The deceleration time is too short, resulting in excessive regenerative energy in the motor.	Increase the value of deceleration time F00. 15
		2. The regenerative braking function is not activated.	Confirm F15.30= 1 to activate energy-saving braking (for inverters of 75kW and below).
		3. The braking unit or braking resistor is open-circuited.	Check that the wiring of the external braking unit and braking resistor is secure.

E06	Steady-state undervoltage	1.Loose input power supply terminals	Check the input power supply and wiring, and tighten the input terminal screws.
		2.The switch contacts on the input power supply are aging.	Check air switches and contactors
		3.Input power supply voltage drops too much	Check if the input voltage is below 340Vac
E07	Input phase loss	1. Input power supply phase loss	Check if the input power connection is loose.
		2.Large fluctuations in input power.	Observe whether the three-phase power input voltage is normal.
E08	Output phase loss	1.Output U, V, W phase loss	1. Check the wiring between the frequency converter and the motor. 2. Check if the output terminals are loose.
E09	Inverter overload	1.Acceleration and deceleration time is too short.	Acceleration process protection increases the acceleration time F00. 14. The deceleration process protection increases the deceleration time by F00. 15.
E13	Motor overload	1. The brake was not engaged during operation, resulting in overload.	Check if the brake of the empty hook can be opened normally. If it cannot be opened, please check the wiring.
		2. The load is too heavy.	1. Reduce the load appropriately. 2. If the slewing mechanism starts against the wind, refer to the countermeasures for the difficulty of starting against the wind.
		3. Incorrect motor power/current setting	When both motors are rotating, check whether the rated power F01.01 and rated current F01.03 of the motors are the sum of the values of the two motors.
		4.Excessive braking time/excessive braking	Reduce the DC braking time

		intensity/repeated DC braking	F04.22 and DC braking current F04.21 (adjust in 10% increments each time).
E10	Radiator overheating	The ambient temperature is too high	1. Open the electrical control cabinet doors and let it cool down for a while. 2. Reset the fault and close the electrical control cabinet door to prevent rain.
		Cooling fan failure	Replace the cooling fan or seek technical support
E11	Parameter setting conflict	1. Parameter setting logic conflict	1. Check if there are any illogical or unreasonable settings in the parameters configured before the fault occurred.
E12	Motor overheating	1.The motor temperature sensor detects a large temperature.At the set threshold 2. Motor temperature sensor disconnected wire 3. Ambient temperature is too high 4. Overload	Confirm whether the motor thermal protection threshold is met. suitable 2. Check if the sensor is disconnected. 3. Enhance motor heat dissipation 4. Inappropriate motor selection
E14	External faults	1. External equipment fault terminal activated.	1. Inspect external equipment and troubleshoot any malfunctions.
E15	Inverter memory failure	1. Interference causes memory read/write errors.	Press the STOP/RESET button to reset and try again.
		2. Repeated writing to the internal memory by the controller caused memory damage.	1. Before continuous communication, et F10.56 to 11, then the communication write operation will not write to the inverter EEPROM, thus avoiding damage to the inverter caused by frequent writing. 2. Commonly used setpoints such as frequency should be set using control commands 7001H-

			7019H. 3. For parameters that need to be frequently modified, such as frequency setting, use the 0x41 command to write to the register. 4. For function codes that change frequently, please add 8000H to the address of the function code.
E16	Communication error	1.In systems with discontinuous communication, communication timeout has been enabled.	Confirm F10.03 = 0.0
		2. Communication disconnection	Check if the communication cable is disconnected.
E17	Temperature sensor malfunction	1.The inverter temperature sensor is disconnected or short-circuited.	1. Check if the inverter temperature sensor wiring is properly connected
E18	Soft start relay not suction	1. Power outage during operation	1. After the inverter is stopped and then powered off, the fault is directly reset. 2. If the power outage is caused by the leakage protection tripping during operation, disconnect the EMC screw of the frequency converter.
		2. Input power supply phase loss or excessive voltage drop.	Observe whether the three-phase power input voltage is normal.
		3. Loose input power supply terminals	Tighten the input terminal screws
		4. Aging of the switch contacts on the input power supply.	Check air switches and contactors

E19	Current detection circuit malfunction	1. Damage to the detection circuit of the driver board or control board.	1. Seek technical support.
E20	Stall failure	1. Deceleration time set too short	1. Extend the deceleration time.
		2. Abnormal energy consumption during deceleration and stopping braking	2. Check the energy consumption braking situation.
		3. The load is too heavy.	3. Check if the motor is being driven by other loads and cannot be stopped.
E22	Encoder failure	1.The cable between the encoder and the PG card is not properly connected 2.The encoder line count parameter does not match the actual value.	1. Set F00.01=0 (V/F control), apply the first gear speed, run once in both the up and down directions with the hook empty, and check if F18.02 (PG card feedback frequency) is equal to 10.00Hz (first gear speed). 2. According to the motor nameplate, verify the motor parameters (F01.01~F01.06) and encoder parameters (F01.24=0, F01.25= 1024) on site. After verification, perform static self-learning. 3. Check if the wiring of the PG card and encoder is correct.
		3. PG card not installed correctly.	Check if the PG card is inserted properly.
		4. On-site interference	Try disconnecting the PE cable from the PG card.
		5. Damaged PG card	Replace PG card
		6. Encoder damaged	Replace motor encoder
E23	Keyboard memory failure	1.Interference causes memory read/write errors	Press the STOP/RESET button to reset and try again.
		2. Memory failure	Seeking technical support

E24	Motor parameter identification anomaly	1. The STOP/RESET button was pressed during parameter identification.	Press the STOP/RESET button to reset the fault.
		2.Motor not connected	Check the wiring between the frequency converter and the motor.
		3.The self-learning rotary motor was not disconnected from the load.	Rotary self-learning motors must be disconnected from the load. If self-learning is performed under load, select static self-learning (F01.34= 1).
		4. Motor malfunction	Check the motor
E25	Motor overspeed protection	1. The encoder line count F01.25 is set incorrectly.	1. Correctly set the encoder line count (F01.25= 1024) 2. Set F00.01=0 (V/F control), apply the first gear speed, run once in both the up and down directions with the hook empty, and check if F18.02 (PG card feedback frequency) is equal to 10.00Hz (first gear speed).
E27	The cumulative power-on time has reached	1. The set power-down time has expired. The dealer has enabled the F16.07 cumulative power-downtime expired function.	1. Please contact the dealer.
	Cumulative running time reached	1. Set runtime expired. The dealer has enabled the F16.08 cumulative runtime expired function.	1. Please contact the dealer.
E29	Internal communication failure	1. Internal SPI communication error	1. Power off and then power off again 2. Seek technical support

E30	Brake sensor malfunction	1.When F20. 17=2 activates the brake feedback function, a brake feedback signal is not received within the set time.	1. Increase the feedback time: F20.08 = 1.50s, F20. 13 = 2.0s 2. Set F20. 17=0 (This method is the most effective, but brake feedback detection is not performed at this time).
		2. When F20. 17=2, the frequency converter is not running, and the brake closure feedback signal is abnormal.	1. Check the status of the inverter's digital input terminals. The correct feedback status is: F18.22=00100 when the lifting inverter is not running, and F18.22=01000 when the lifting inverter is running. Other statuses are abnormal; please check the brake feedback circuit. 2. Set F20. 17=0 (This method is the most effective, but brake feedback detection is not performed at this time).
E31	The joystick was not returned to zero.	1.The control lever got stuck when the power was on and did not return to zero.	1. Return the joystick to zero to reset the fault.
		2. The controller issues a running command or multi-speed instruction when the frequency converter is powered on.	2. For non-lifting equipment that can operate immediately upon power-up, set the start command confirmation setting on terminal F04.27 to 0 (no confirmation) and the non-zeroing judgment time for operating lever F20.37 to 0 to disable this protection. For lifting applications,it is recommended to modify the controller software to avoid the

			danger of starting immediately upon power-up.
E32	Startup check error	1.Brake wear or malfunction causes the set opening current threshold to not be reached after the opening time has elapsed.	Check if the brakes are worn and tighten them.
E33	CANopen communication timeout	1. Communication wiring malfunction	Check if the CAN communication card wiring is correct.
		2. The CAN communication card went offline after being interfered with.	1. Communication uses twisted-pair cables. 2. Try to keep communication lines and power lines separate;
		3. CAN communication card damaged	Seeking technical support
E42	profinet Message timeout	1. Communication cable between PLC and communication card Cable breakage or poor contact	1. Check if the communication cable is disconnected.
E81	Encoder line count error	1. Incorrect encoder line count setting	1. Ensure that the encoder self-learns on the motor shaft under no-load conditions.
		2. When the encoder line count is self-learning, the motor shaft is under load. 3.Incorrect motor rated frequency setting	2. According to the motor nameplate, verify the motor parameters (F01.01-F01.06) and encoder parameters (F01.24-F01.25) on site. After verification, perform encoder self-learning.
E86	Brake power-on fault detection	1. The brake is severely worn.During power-on testing, when the first small torque (F20.81) is applied, the error pulse exceeds the set value, triggering an E86 fault.	1. Immediately check if the brakes are worn.

E87	Tower crane Hoisting start-up failure	1. The lifting hook starts to lift the suspended heavy object.	1. Check if the lifting hook is hanging on any heavy objects.
C27	Lifting zero servo action warning	1. Wear on the hoist motor brake causes hook slippage.	1. First, move downwards to safely place the heavy object on the ground. 2. Next, check if the brakes are worn and tighten them if necessary.
C28	Brake power-on detection warning	1. Brake wear: During power-on testing, when the second stage of high torque (F20.26) is applied,the error pulse exceeds the set value, triggering warning C28	1. Immediately check if the brakes are worn.

9.2 Fault Analysis

After the frequency converter is powered on, if the motor fails to operate as expected due to incorrect function settings or wiring errors in the external control terminals, refer to the analysis in this section to implement corresponding countermeasures. If a fault code is displayed, refer to the troubleshooting steps in section 9. 1.

9.2.1 **Function code parameters cannot be set**

➢ Pressing the UP and DOWN keys does not change the parameter display.

When the frequency converter is running, some code parameters cannot be modified and must be stopped before they can be modified.

Setting F12.02 parameter lock to 1 or 2 will also restrict parameter changes; please set F12.02 to 0. The same issue will occur if a user password is set.

9.2.2 **abnormal motor rotation**

➢ Pressing the RUN key on the keyboard will not cause the motor to rotate.

- Start-up and shutdown are controlled by terminals: Check the setting of command source F00.02.
- Closing the free stop terminals FRS and COM: This disconnects the free stop terminals FRS and COM.

- The run command is switched to be enabled by the terminal. At this time, the run command can only be controlled by the terminal: modify it to disable it.
- The status combination of the running command channel was changed from terminal control to keyboard control.
- Setting the reference input frequency to 0 increases the reference input frequency.

Abnormal input power supply or control circuit malfunction.

➢ When the control terminals RUN and F/R are both ON, the motor will not rotate.

- External terminal start/stop function setting is invalid: Check the setting of function setting code F00.02.
- Free stop terminal FRS=ON: Makes the free stop terminal FRS=OFF.
- Control switch malfunction: Check the control switch.
- Setting the reference input frequency to 0 increases the reference input frequency.

➢ The motor can only rotate in one direction.

Reverse Reversal Prohibition Effective: When the reverse reversal prohibition code parameter F00.21 is set to 1, the frequency converter is not allowed to reverse.

➢ The motors rotate in opposite directions

The output phase sequence of the frequency converter is inconsistent with the input of the motor: In the power-off state, the rotation direction of the motor can be changed by arbitrarily swapping any two motor connection wires.

9.2.3 **The motor acceleration time is too long**

➢ The current limiting level parameter is set too low.

When the overcurrent limiting setting is effective, if the inverter's output current reaches its set current limit level, the output frequency will remain unchanged during acceleration until the output current is less than the limit level value, at which point the output frequency can continue to rise. In this case, the motor's acceleration time will be longer than the set time. Check if the inverter's current limit level is set too low.

➢ The set acceleration time is too long: Please check the acceleration time code parameter.

9.2.4 The motor deceleration time is too long

- When energy-saving braking is effective
  - If the braking resistor value is too large, the braking power will be too small: Please refer to this manual to select the braking resistor with the minimum allowable resistance value.
  - The brake utilization rate setting (F15.32) is too small, which prolongs the deceleration time: increase the brake utilization rate value.
  - The deceleration time setting is too long: Please check the deceleration time code parameter.
- When stall protection is effective
  - When the overvoltage stall protection trips, the output frequency remains unchanged when the DC bus voltage exceeds the overvoltage stall voltage (F07.07). When the DC bus voltage is lower than F07.07, the output frequency continues to decrease, thus extending the deceleration time. If the braking time requirement is relatively short, please use a braking unit and braking resistor.
  - The set deceleration time is too long. Please check the deceleration time code parameter.

9.2.5 Electromagnetic interference and radio frequency interference

- When the frequency converter is running, it will generate electromagnetic interference and radio frequency interference to the control equipment because it operates in a high-frequency switching state. The following measures can be taken:
  - Reduce the carrier frequency of the frequency converter (F00.23).
  - The main circuit wiring and control circuit wiring are routed separately and independently. The control circuit uses shielded wire and is connected according to the wiring method shown in Chapter 3.
  - A noise filter is installed on the input side of the frequency converter.
  - A noise filter is installed on the output side of the frequency converter.
  - The cable is encased in a metal conduit. The frequency converter is installed inside a metal chassis.
  - The frequency converter and motor must be reliably grounded.

9.2.6 **Residual current circuit breaker tripped**

- When the frequency converter is running, the residual current circuit breaker trips.
  - Since the output of the frequency converter is a high-frequency PWM signal, it will generate high-frequency leakage current. Please select a frequency converter-specific leakage circuit breaker with a current sensitivity of 30mA or higher. If using a regular leakage circuit breaker, please select one with a current sensitivity of 200mA or higher and an operating time of 0. 1 seconds or higher.
  - Reduce the carrier frequency of the frequency converter (F00.23)
  - Under the guidance of service personnel, disconnect the jumper wire of the Y capacitor on the driver board or EMC board.

9.2.7 **Mechanical vibration**

- The natural frequency of the mechanical system resonates with the carrier frequency of the frequency converter.

  The motor is fine, but the machine produces a sharp, resonant sound because the mechanical system's natural frequency resonates with the inverter's carrier frequency. Please adjust the carrier frequency (F00.23) to avoid the resonant frequency.
- The natural frequency of the mechanical system resonates with the output frequency of the frequency converter.

  The natural frequency of the mechanical system resonates with the output frequency of the frequency converter, generating mechanical noise. Please use the oscillation suppression function (F05. 13), or install anti-vibration rubber and other anti-vibration measures on the motor base plate.
- PID control oscillation

  The PID controller's adjustment parameters P, Ti, and Td are mismatched. Please reset the PID parameters.

9.2.8 **The motor continues to rotate even after the frequency converter stops outputting.**

- Insufficient DC braking during parking

- The DC braking torque for parking is too low. Please increase the DC braking current setting (F04.21).
- The DC braking time for parking is too short. Please increase the DC braking time setting (F04.22). Generally, prioritize increasing the DC braking current for parking.

9.2.9 **The output frequency is not output at the given frequency.**

- Given a frequency exceeding the upper limit

  When the given frequency exceeds the upper limit frequency setting, the output frequency will be set to the upper limit frequency. Reset the given frequency to within the upper limit frequency range; or check ifF00.16, F00.17, and F00. 18 are appropriate.

- The light-load high-speed or heavy-load low-speed function has been enabled and the corresponding conditions have been met. Please refer to the function description for group F21.

Part 10 Maintenance and upkeep

10.1 Routine maintenance and upkeep of frequency converters

Due to changes in the operating environment of the frequency converter, such as the effects of temperature, humidity, smoke, and dust, as well as the aging of internal components, various malfunctions may occur. Therefore, daily inspections and regular maintenance must be performed on the frequency converter during storage and use.

- Before using the frequency converter after transportation, check whether the components are intact and whether the screws are tightened.
- During normal use, the frequency converter should be cleaned of dust regularly and the screws should be checked for looseness.
- If the frequency converter is not used for a long period of time, it is recommended to power it on once every six months for half an hour during the storage period to prevent electronic components from failing.
- Inverters should be avoided in humid environments or environments with heavy metal dust. If use in such environments is unavoidable, they must be placed in an electrical cabinet with protective measures or in a field protection room.

When the frequency converter is running normally, please confirm the following:

- Check if the motor makes any abnormal noises or vibrations.
- Check if the frequency converter and motor are overheating abnormally.
- Is the ambient temperature too high?
- Is the output current value normal?
- Is the inverter's cooling fan operating normally?

Depending on usage, customers should conduct regular inspections of the frequency converter to eliminate faults and safety hazards. During inspection, the power must be disconnected, and the inspection can only proceed after the keypad LEDs have turned off. The inspection items are shown in Table 10-1.

Table 10-1 Items for Regular Inspections

Inspection items	Inspection content	Abnormal Countermeasures
Main circuit terminal and control circuit terminal screws	Are the screws loose?	Tighten with a screwdriver
heat sink	Are there any dust or foreign objects?	Blow it away with dry compressed air at a pressure of 4-6 kg/cm².
PCB Printed Circuit Board		
Cooling fan	Are there any abnormal sounds or vibrations? Has the cumulative operating time reached 20,000 hours?	Replace the cooling fan
Power components	Is there dust accumulation?	Blow it away with dry compressed air at a pressure of 4-6 kg/cm².
Electrolytic capacitors	Does it change color, have an odor, or bubble?	Replace electrolytic capacitor

To ensure the long-term normal operation of the frequency converter, regular maintenance and replacement of its internal components are necessary, taking into account their lifespan. The lifespan of frequency converter components varies depending on their operating environment and conditions. The replacement intervals for frequency converters shown in Table 10-2 are for user reference only.

Table 10-2 Inverter Component Replacement Time

Component Name	Standard replacement years
Cooling fan	2-3 years
Electrolytic capacitors	4-5 years

The replacement time for inverter components listed in the table above is subject to the following conditions:

Ambient temperature: 40°C.

Load factor: below 80%.

Operating time: Less than 12 hours per day.

10.2 Warranty information for frequency converters

Our company will provide warranty service for the frequency converter under the following conditions:

The warranty covers only the inverter itself; if the inverter malfunctions or is damaged within twelve months under normal use, the company will provide warranty service; after twelve months, reasonable repair fees will be charged.

Within one year, a certain repair fee shall also be charged if the following situations occur:

- Failure to operate the inverter correctly according to the instructions in this manual may result in damage to the inverter.
- Inverter damage caused by floods, fires, abnormal voltage, etc.
- Inverter damage caused by wiring errors, etc.
- Damage to the frequency converter caused by unauthorized modifications, etc.

Service fees will be calculated based on actual costs.

If there is a separate agreement, the agreement shall take precedence.

Part 11 Optional accessories

11.1 Braking Resistor

During inverter operation, rapid motor deceleration or a motor carrying a potential energy load can cause the inverter's internal capacitors to charge, resulting in a voltage surge across the power module and potentially damaging the inverter. The inverter will mitigate this by using an external braking resistor to release energy promptly, depending on the load conditions. This external braking resistor is an energy-dissipating braking method, meaning all energy is dissipated within the resistor. Therefore, the power rating and resistance value of the braking resistor must be carefully selected.

Selection of braking resistor value

During braking, almost all of the motor's regenerative energy is consumed by the braking resistor. The braking power can be estimated using the following formula:

$Pb = P * Td * \eta$

In the formula, Pb represents braking power.

P—Motor power

Td—The ratio of braking torque to the rated torque of the motor; for hoisting applications, Td = 100%.

η—The efficiency of mechanical energy conversion during feedback, typically η = 0.7

According to the formula:

U2/R=Pb determines the value of the braking resistor.

In the formula, U is the braking voltage for stable braking of the system (which varies depending on the system; for a 380VAC system, it is generally taken as 700V, and for a 660VAC system, it is generally taken as 1140V).

Pb—Braking power

Braking resistor power selection

In theory, the power of the braking resistor is the same as the braking power, but in actual use, it needs to be derated by 70%.

According to the formula: $0.7 * Pr = Pb * D$

In the formula, Pr represents the resistance power.

D — Braking frequency (the proportion of the energy regeneration process in the entire working process)

The braking frequency D for common load types is as follows:

Elevator D= 10-15%

Oilfield pumping unit D= 10-20%

Unwinding and winding hoisting machinery D=50-60%

The load D for accidental braking is 5%.

Other D= 10%

The resistance value of the braking resistor affects the braking torque; the smaller the resistance, the greater the braking torque. Due to the limitation of the maximum current of the braking unit, the minimum allowable braking resistor values for each inverter model are shown in Table 11-1.

Table 11-1 Selection of Braking Units with Input AC 380V ~ 415V

Inverter models	Braking unit	Minimum power of braking resistor for lifting applications（kW）	Minimum power of braking resistor for translational applications （kW）	Minimum permissible braking resistor value (Oh)
TC760-0R7-3B	Built-in brake	≥0.35	≥0.14	180
TC760-1R5-3B	Built-in brake	≥0.75	≥0.4	180
TC760-2R2-3B	Built-in brake	≥1.1	≥0.55	130
TC760-4R0-3B	Built-in brake	≥2.0	≥1.0	90
TC760-5R5-3B	Built-in brake	≥2.7	≥1.4	60
TC760-7R5-3B	Built-in brake	≥3.7	≥1.9	60
TC760-011-3B	Built-in brake	≥5.5	≥2.8	30
TC760-015-3B	Built-in brake	≥7.5	≥3.8	20
TC760-018-3B	Built-in brake	≥9	≥4.5	20
TC760-022-3B	Built-in brake	≥11	≥5.5	15
TC760-030-3B	Built-in brake	≥15	≥7.5	15
TC760-037-3B	Built-in brake	≥18	≥9	10
TC760-045-3B	Built-in brake	≥22	≥11	10

TC760-055-3B	Built-in brake	≥27	≥14	7.5
TC760-075-3B	Built-in brake	≥37	≥19	6
TC760-090-3	BR100-160	≥45	≥22	5
TC760-110-3	BR100-160	≥55	≥27	5
TC760-132-3	BR100-200	≥66	≥33	4
TC760-160-3	BR100-315	≥80	≥40	3
TC760-200-3	BR100-400	≥100	≥50	2.5
TC760-220-3	BR100-400	≥110	≥55	2.5
TC760-250-3	BR100-400	≥125	≥62	2.5
TC760-280-3	BR100-315*2	≥70 * 2	≥35 * 2	3 * 2
TC760-315-3	BR100-315*2	≥80 * 2	≥40 * 2	3 * 2
TC760-355-3	BR100-315*2	≥90 * 4	≥45 * 5	3 * 2
TC760-400-3	BR100-400*2	≥100 * 2	≥50 * 2	2.5 * 2

Note: The conductors listed in the table above refer to the leads of a single resistor. When resistors are connected in parallel, the busbar after parallel connection should be enlarged accordingly. For single-phase resistors, use cables with a withstand voltage of AC300V or higher; for three-phase resistors, use cables with a withstand voltage of AC450V or higher and a temperature resistance of 105℃ .

11.2 Braking Unit

The TC760 series frequency converters can be equipped with our BR100 series braking units, with a power range of TC760-90KW～400kW. Our braking unit models and specifications are as follows:

Model Specifications	Application scenarios	Minimum resistance (Oh)	Average braking current Iav(A)	Peak current Imax (A)
BR100-045	Energy-efficient braking	10	45	75
BR100-160	Energy-efficient braking	6	75	150
BR100-200	Energy-efficient	5	100	200

	braking			
BR100-315	Energy-efficient braking	3	120	300
BR100-400	Energy-efficient braking	3	200	400
BR100-500	Energy-efficient braking	3	250	450

When using the minimum resistance, the BR100 braking unit can operate continuously at a braking frequency D=33%.

When D>33%, intermittent operation is required; otherwise, over-temperature protection failure will occur.

11.3 Selection of connecting wires

All braking units and braking resistors operate at high voltage >400VDC and are in a non-continuous operating state. Please select appropriate wires.

Specifications and Models	Average braking current Iav(A)	Peak braking current Imax (A)	Cross-sectional area of copper core cable (mm2)
BR100-045	45	75	10
BR100-160	75	150	16
BR100-200	100	200	25
BR100-315	120	300	25
BR100-400	200	400	35
BR100-500	250	450	35

Flexible cables offer greater flexibility. Because cables may come into contact with high-temperature equipment, it is recommended to use copper-core, heat-resistant flexible cables or flame-retardant cables. The distance between the braking unit and the frequency converter/braking resistor should be as close as possible, ideally not exceeding 2 meters. Otherwise, the DC-side cable connections should be twisted together and fitted with ferrite cores to reduce radiation and inductance.

11.4 Option Card

I/O expansion card

Specifications and Models	illustrate	Terminal function
EM760-IO-A1	I/O expansion card	3-channel multi-function digital signal input: X8~X10 Two relay outputs: R3's function is set by function code F03.32, and R4's function is set by function code F03.33. 2-channel analog signal input: One I4 port, supporting -10V to +10V or 0 to +10V voltage input. One multi-function sensor input, supporting PT100/PT1000/PTC/KTY84

Communication card expansion card

Specifications and Models	illustrate	Communication rate
EM760-CM-C1	CANopen communication card	125kbps、250kbps、500kbps、1Mbps

PROFINET communication card (EM760-CM-PN1)

After connecting the frequency converter to the Profinet communication card, the converter's communication parameters must be configured. Only after configuring the communication parameters can the Profinet master station control the start and stop of the frequency converter.

parameter	Parameter name	Parameter value	meaning
F00.02	Command source selection	2	Operation commands are controlled by the communication card.
F00.04	Main frequency	7	Frequency is given

	source selection		directly for communication.
F00.36	Communication control start/stop channel selection	1	Profinet control
F00.37	Communication channel selection	1	Profinet channel given
F10.51	Process data address setting method	1	0: Keyboard Configuration 1: Main site configuration
F10.65	PN card IP address setting method	0	0: Main site configuration 1: Keyboard Configuration

Note: The PROFINET communication card can only be inserted into card slot 2.

For detailed usage instructions, please refer to the "EM760-CM-PN1-Profinet Card User Manual".

Encoder expansion card (PG card)

The TC760 frequency converter is equipped with a variety of universal PG cards. Users should select the appropriate PG card according to the encoder output format, as shown in the table below:

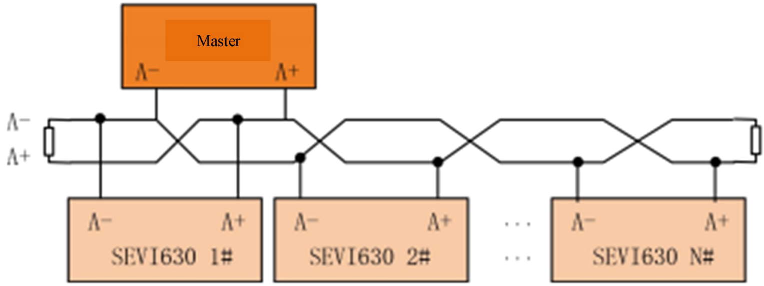
Specifications and Models	name	Supported encoder types
EM760-PG-0D1	Open collector/differential PG card	Open collector, push-pull complementary, voltage output, differential output encoder
EM760-PG-0D2	Open collector/differential PG card with frequency divider output	Open collector, push-pull complementary, voltage output, differential output encoder
EM760-PG-R1	Rotary Transformer PG Card	Rotary transformer output type encoder
TC760-PG-D1	Differential PG card with phase sequence detection	Differential output encoder

Part 12 TC760 frequency converter MODBUS communication protocol

12.1 Scope of application

1、 Applicable series: TC760 series

2、 Applicable Networks: Supports MODBUS-RTU protocol format and has RS-485 bus for "single master multiple slave" communication network.



12.2 Interface method

RS-485 asynchronous half-duplex communication mode, least significant bit first sent;

RS-485 network address: 1 to 247 can be set, 0 is the broadcast address;

RS-485 terminal default data format: 1-8-N-1[] (1-8-E-1, 1-8-O-1, 1-8-N-2, 1-8-E-2 and 1-8-O-2 are optional).

RS-485 terminal default baud rate: 9600bps (4800bps, 19200bps, 38400bps, 57600bps and 115200bps optional);

It is recommended to use twisted-pair shielded cable as the communication cable to reduce the impact of external interference on communication.

[2]: 1-8-N-1, indicating 1 start bit - 8 characters per byte - no parity - 1 stop bit. E, even parity. O, odd parity.

12.3 Protocol Format

12.3.1 Message Format

As shown, a standard MODBUS message includes a start marker, an RTU (Remote Terminal Unit) message, and an end marker.

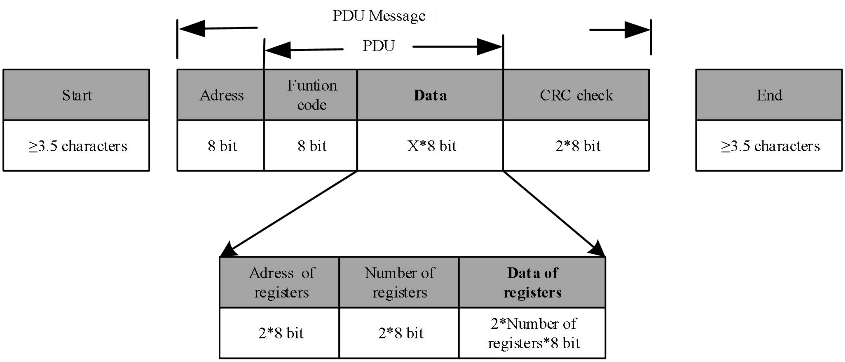


Figure 12-1 Schematic diagram of RTU mode message frame

The RTU message includes an address code, a PDU (Protocol Data Unit), and a CRC checksum. The PDU includes a function code and a data portion (mainly including register address, number of registers, and register contents; the detailed definitions of each function code differ, see section 12.3.3 for details).

[3]: CRC checksum: low byte first, high byte last.

12.3.2 Address code

Address range	use
1～247	slave machine
0	broadcast

12.3.3 Function code

The MODBUS function codes are categorized as shown.

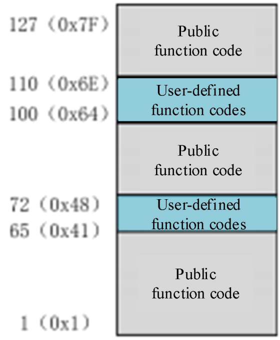


Figure 12-2 Classification of MODBUS function codes

As shown, the TC760 series products mainly involve common function codes, such as 0x03 (read multiple registers or status word), 0x06 (write a single register or command), 0x10 (write multiple registers or command), and 0x08 (diagnostic function code).

In addition, to perform certain specific functions, such as writing to registers (RAM) but not storing in EEPROM, user-defined function codes 0x41 (write a single register or command, without saving) and 0x42 (write multiple registers or command, without saving) are defined in the user-defined function codes.

When valid but abnormal data is received from the device, relevant exception information will be returned (see 12.3.7 for details). To distinguish it from normal communication data, an exception function code is defined. Corresponding to the normal request function code, the exception function code = request function code + 0x80.

Table 12–1 TC760 Series Product Function Codes

Function code	Exception function codes	Function
03	83	Read multiple registers or status word function codes
41	C1	Write to a single register or command function code, without saving.
42	C2	Write to multiple registers or command function codes without saving.
08	88	Diagnostic function codes
06	86	Write a single register or command function code
10	90	Write multiple registers or command function codes

The following sections provide detailed explanations ofthe different PDU components due to their varying functions.

12.3.3.1 0x03 Read multiple registers or status word function codes

In a remote device, this function code is used to read the contents of a contiguous block of holding registers. The request PDU specifies the starting register address and the number of registers.

The register data in the response message is divided into two bytes for each register. For each register, the first byte includes the high-order bits and the second byte includes the low-order bits.

- Request PDU

Function code	1 byte	**0x03**
Starting address	2 bytes	0x0000～0xFFFF
Number of registers	2 bytes	1～16

- Response PDU

Function code	1 byte	**0x03**
byte count	1 byte	2×N*
Register value	N*×2 bytes	

N* = Number of registers

- Error PDU

Error codes	1 byte	**0x83**
Exception codes	1 byte	01 or 02 or 03 or 04

The following is an example of a request to read registers F19.00 to F19.05 (related to the most recent fault):

ask		response			
domain name	(0x)	Domain name (normal)	(0x)	Domain name (abnormal)	(0x)
Function code	03	Function code	03	Function	83
Starting address Hi	13	byte count	0C	Exception codes	03 (Example, same below)
Starting address Lo	00	Register value Hi (F19.00)	00		
Number of registers Hi	00	Register value Lo (F19.00)	11		

Number of registers Lo	06	Register value Hi (F19.01)	00	
		Register value Lo (F19.01)	00	
		Register value Hi (F19.02)	00	
		Register value Lo (F19.02)	00	
		Register value Hi (F19.03)	01	
		Register value Lo (F19.03)	2C	
		Register value Hi (F19.04)	00	
		Register value Lo (F19.04)	00	
		Register value Hi (F19.05)	00	
		Register value Lo (F19.05)	00	

The returned data shows that the inverter previously experienced a fault code 17 (0011H): temperature sensor malfunction. At that time, the output frequency was 0.00Hz, the output current was 0.00A, the bus voltage was 300V (012CH), the acceleration/deceleration status was standby, and the working time was 0 hours.

★: Currently, the MODBUS protocol 0x03 function code supports reading multiple function codes across groups. However, it is recommended that customers do not read across groups unless there are special requirements, so that customers' software programs do not need to be upgraded after our product upgrades.

12.3.3.2 0x41 Write a single register or command function code (without saving).

In a remote device, use the function code to write a single non-holding register.

The request PDU specifies the address to be written to the register.

A normal response is an answer to the request, and is returned after the register contents are written.

- Request PDU

Function code	1 byte	**0x41**
Register address	2 bytes	0x0000～0xFFFF
Register value	2 bytes	0x0000～0xFFFF

- Response PDU

Function code	1 byte	**0x41**
Register address	2 bytes	0x0000～0xFFFF
Register value	2 bytes	0x0000～0xFFFF

- Error PDU

Error codes	1 byte	**0xC1**
Exception codes	1 byte	01 or 02 or 03 or 04

Here is an example of a request to change the main frequency source A (7001H) to "-50.00%":

ask		response			
domain name	(0x)	Domain name (normal)	(0x)	Domain name (abnormal)	(0x)
Function	41	Function	41	Function	C1
Register address Hi	70	Register address Hi	70	Exception codes	03
Register address Lo	01	Register address Lo	01		
Register value Hi	EC	Register value Hi	EC		
Register value Lo	78	Register value Lo	78		

★: This function code cannot be used to operate on the "○" attribute parameter (which cannot be modified at runtime). It can only be used to modify the "●" attribute parameter (which can be modified at runtime). Otherwise, error code 1 will be returned.

12.3.3.3 0x42 Writes multiple registers or command function codes (without saving).

In a remote device, use the function code to write consecutive non-holding register blocks (1 to 16 registers).

The requested data field specifies the value to be written. Each register divides the data into two bytes.

A normal response returns the function code, starting address, and the number of registers written.

- Request PDU

Function code	1 byte	**0x42**
Starting address	2 bytes	0x0000～0xFFFF
Number of registers	2 bytes	1～16
byte count	1 byte	2×N*
Register value	N*×2 bytes	

N* = Number of registers

- Response PDU

Function code	1 byte	**0x42**
Starting address	2 bytes	0x0000～0xFFFF
Number of registers	2 bytes	1～16

- Error PDU

Error codes	1 byte	**0xC2**
Exception codes	1 byte	01 or 02 or 03 or 04

Here is an example of a request to set acceleration time 1 (F00.14) to 5.00 and deceleration time 1 (F00.15) to 6.00:

<table>
<tr><th colspan="2">ask</th><th colspan="4">response</th></tr>
<tr><th>domain name</th><th>(0x)</th><th>Domain name (normal)</th><th>(0x)</th><th>Domain name (abnormal)</th><th>(0x)</th></tr>
<tr><td>Function</td><td>42</td><td>Function</td><td>42</td><td>Function</td><td>C2</td></tr>
<tr><td>Starting address Hi</td><td>00</td><td>Starting address Hi</td><td>00</td><td rowspan="2">Exception codes</td><td rowspan="2">03</td></tr>
<tr><td>Starting address Lo</td><td>0E</td><td>Starting address Lo</td><td>0E</td></tr>
<tr><td>Number of registers Hi</td><td>00</td><td>Number of registers Hi</td><td>00</td><td colspan="2" rowspan="4"></td></tr>
<tr><td>Number of registers Lo</td><td>02</td><td>Number of registers Lo</td><td>02</td></tr>
<tr><td>byte count</td><td>04</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Register value Hi</td><td>01</td></tr>
</table>

(F00.14)		
Register Value Lo (F00.14)	F4	
Register Value Hi (F00.15)	02	
Register Value Lo (F00.15)	58	

★: This function code cannot be used to operate on the "○" attribute parameter (which cannot be modified at runtime). It can only be used to modify the "●" attribute parameter (which can be modified at runtime). Otherwise, error code 1 will be returned.

12.3.3.4 0x08 Diagnostic function code

Modbus function code 08 provides a series oftests to check the communication system between client (master) devices and server (slave) devices, or various internal error states within the server.

This function uses a 2-byte sub-function code field in the query to define the type of test to be performed. The server responds normally.

Copy function codes and sub-function codes. Some diagnostics may cause remote devices to return corresponding data through the data fields of a normal response.

Typically, sending diagnostic functions to a remote device does not affect the operation of user programs on that device. Diagnostics cannot access user logic, such as discrete values and registers. Some functions can arbitrarily reset error counters on the remote device.

The diagnostic function we use is primarily line diagnostics (0000), used to test whether the master and slave devices can communicate normally. A normal response to a returned query data request is to send back the same data. It also copies function codes and sub-function codes.

- Request PDU

Function code	1 byte	**0x08**
Sub-function code	2 bytes	0x0000～0xFFFF
data	2 bytes	0x0000～0xFFFF

- Response PDU

Function code	1 byte	**0x08**
Sub-function code	2 bytes	0x0000～0xFFFF

data	2 bytes	0x0000～0xFFFF

- lError PDU

Error codes	1 byte	**0x88**
Exception codes	1 byte	01 or 03 or 04

- Sub-function code

Sub-function	meaning	Data domain (request)	Data domain (response)
0000	Return query data	any	Copy request data
…			

0000: Returns the data passed in the requested data field in the response. The entire message should be identical to the request message.

The following table shows an example of requesting a remote device to return query data. It uses sub-function code 0000. The returned data is sent using a two-byte data field (0xA537).

<table>
<tr><th colspan="2">ask</th><th colspan="4">response</th></tr>
<tr><th>domain name</th><th>(0x)</th><th>Domain name (normal)</th><th>(0x)</th><th>Domain name (abnormal)</th><th>(0x)</th></tr>
<tr><td>Function</td><td>08</td><td>Function</td><td>08</td><td>Function</td><td>88</td></tr>
<tr><td>Sub-function code Hi</td><td>00</td><td>Sub-function code Hi</td><td>00</td><td rowspan="2">Exception codes</td><td rowspan="2">03</td></tr>
<tr><td>Sub-function code Lo</td><td>00</td><td>Sub-function code Lo</td><td>00</td></tr>
<tr><td>Data Hi</td><td>A5</td><td>Data Hi</td><td>A5</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Data Lo</td><td>37</td><td>Data Lo</td><td>37</td></tr>
</table>

12.3.3.5 0x06 Write a single register or command function code

In a remote device, use the function code to write a single holding register.

The request PDU specifies the address to be written to the register.

A normal response is an answer to the request, and is returned after the register contents are written.

- Request PDU

Function code	1 byte	**0x06**
Register address	2 bytes	0x0000～0xFFFF

Register value	2 bytes	0x0000～0xFFFF

- Response PDU

Function code	1 byte	**0x06**
Register address	2 bytes	0x0000～0xFFFF
Register value	2 bytes	0x0000～0xFFFF

- Error PDU

Error codes	1 byte	**0x86**
Exception codes	1 byte	01 or 02 or 03 or 04

The following is an example of a request to change the drive control mode (F00.01) of motor 1 to "2: FVC":

ask		response			
domain name	(0x)	Domain name (normal)	(0x)	Domain name (abnormal)	(0x)
Function	06	Function	06	Function	86
Register address Hi	00	Register address Hi	00	Exception codes	03
Register address Lo	01	Register address Lo	01		
Register value Hi	00	Register value Hi	00		
Register value Lo	02	Register value Lo	02		

★: Frequently modified inverter function codes should not be completed using 0x06, as this may damage the inverter.

The 0x41 "Modify Only, Do Not Save" user-defined function code corresponds to the 0x06 standard common function code. Its function code definition is the same as the corresponding standard function code (the request, response, and error PDUs are all the same). The difference is that when the slave responds to this user-defined function code, it only modifies the corresponding value in RAM and does not save it to EEPROM (holding register).

For F00.07 type inverters that frequently require function code modification, it is recommended to use function code 0x41 (modifying the main frequency source A can also be done directly by operating 7001H, see sections 12.3.3.2 and 12.3.4 for details) to avoid damaging the inverter. Specific operations are as follows.

ask	response

domain name	(0x)	Domain name (normal)	(0x)
Function	41	Function	41
Register address Hi	00	Register address Hi	00
Register address Lo	07	Register address Lo	07
Register value Hi	13	Register value Hi	13
Register value Lo	88	Register value Lo	88

The above data indicates that changing the given frequency (F00.07) to 50.00Hz takes effect immediately but is not stored in the EEPROM. That is, after the change, the inverter operates at 50.00Hz, but after power-on, it operates at the previous frequency.

12.3.3.6 0x10 Write multiple registers or command function codes

In a remote device, use the function code to write consecutive blocks of registers (1 to 16 registers).

The requested data field specifies the value to be written. Each register divides the data into two bytes.

A normal response returns the function code, starting address, and the number of registers written.

- Request PDU

Function code	1 byte	**0x10**
Starting address	2 bytes	0x0000～0xFFFF
Number of registers	2 bytes	1～16
byte count	1 byte	2×N*
Register value	N*×2 bytes	

- N* = Number of registers

  Response PDU

Function code	1 byte	**0x10**
Starting address	2 bytes	0x0000～0xFFFF
Number of registers	2 bytes	1～16

- Error PDU

Error codes	1 byte	**0x90**
Exception codes	1 byte	01 or 02 or 03 or 04

The following is an example of a request to write 00 01 and 00 03 to two registers starting at F03.00 (i.e., to set the functions of the Y1 and Y2 output terminals):

ask		response			
domain name	(0x)	Domain name (normal)	(0x)	Domain name (abnormal)	(0x)
Function	10	Function	10	Function	90
Starting address Hi	03	Starting address Hi	03	Exception codes	03
Starting address Lo	00	Starting address Lo	00		
Number of registers Hi	00	Number of registers Hi	00		
Number of registers Lo	02	Number of registers Lo	02		
byte count	04				
Register value Hi (F03.00)	00				
Register value Lo (F03.00)	01				
Register value Hi (F03.01)	00				
Register value Lo (F03.01)	03				

★: Frequently modified inverter function codes should not be completed using 0x10 to avoid damaging the inverter. See section 12.3.3.5 for details.

12.3.4 Register address distribution

Table 12-2 Detailed Explanation of MODBUS Protocol Register Address Definitions

Address space		illustrate	
Function code 0000H～6F63H		For function code FXX.YY, the high-order bits ofthe address are hexadecimal representations of XX, and the low-order bits are hexadecimal representations of YY. For example, F12.03 has an address of 0C03H (12D=0CH, 03D=03H).	
Control commands (Write only)	7000H control word	0000H	Invalid instruction
		0001H	Forward rotation
		0002H	Reverse operation
		0003H	JOG forward
		0004H	JOG Reversal
7000H ～ 71FFH		0005H	Slow down and stop
		0006H	Quick stop
		0007H	Free parking

		0008H	Fault Reset
		0009H	+/- Input Toggle
		000BH	JOG Parking
		Other ~00FFH	reserve
	7001H	Main channel frequency A communication percentage given	-100.00%～100.00% (100% = maximum frequency)
	7002H	Auxiliary channel frequency B communication percentage given	-100.00%～100.00% (100% = maximum frequency)
	7003H	Torque communication given	-200.00%～200.00% (100% = digital torque setpoint)
	7004H	Process PID given communication given	-100.00%～100.00%
	7005H	Process PID feedback communication given	-100.00%～100.00%
	7006H	VF separation mode voltage given	0.00%～100.00% (given numerical baseline)
	7007H~ 7009H	reserve	
	700AH	Upper limit frequency communication given	0.00%～200.00% (given numerical baseline)
	700BH	Torque control upper limit frequency communication given	0.00%～200.00% (given numerical baseline)
	700CH	Inertia compensation linear velocity input	0.00%～100.00% (given numerical baseline)
	700DH~ 700EH	reserve	
	700FH	Master-slave communication given	-100.00%～100.00% (maximum value baseline)
	7010H~ 7013H	reserve	
	7014H	External faults	External device (including option card) fault input
	7015H	Main channel frequency A communication given	0.00 ~ Maximum frequency

	7016H	Auxiliary channel frequency B communication given	0.00 ~ Maximum frequency	
	7017H	Upper limit frequency communication given	0.00 ~ Maximum frequency	
	7018H	Torque control upper limit frequency communication given	0.00 ~ Maximum frequency	
	7019H	Torque upper limit communication given for speed control	0.0～250.0% (You can send it as 100.0% or directly)	
	701AH~ 71FFH	reserve		
Work status 7200H～73FFH	7200H Status word 1	Bit7～0 Running status	00H	Parameter settings
			01H	Slave operation
			02H	JOG running
			03H	Self-learning operation
			04H	Stop the machine
			05:00	JOG Parking
			06H	Fault status
			07H	Factory self-inspection
			08H～0FFH	reserve
		Bit15～8 Fault Information	00H	Inverter is operating normally
			xxH	Inverter fault status, "xx" represents the fault code.
	7201H Status word 2	Bit0 Given direction	1	-Given valid
			0	+Given valid
		Bit1 Direction of movement	1	Frequency output inversion
			0	Frequency output forward rotation
		Bit3～2 Operating mode	00	Speed control method
			01	Torque control method
			10	reserve
			11	reserve
		Bit4 Parameter protection	1	Parameter protection is effective
			0	Parameter protection invalid
		Bit6～5	reserve	
		Bit8～7 Given method	00	Keyboard control
			01	Terminal control
			10	Communication control

		11	reserve						
	Bit9	reserve							
	Bit15～10	reserve							
7202H Monitoring frequency +/- status word 1 (1: -; 0: +)	Bit0	Output frequency							
	Bit1	Input frequency							
	Bit2	Synchronization frequency							
	Bit3	PG feedback frequency							
	Bit4	Estimating feedback frequency							
	Bit5	Estimating slip frequency							
	Bit6	Load speed							
	Bit15～7	reserve							
7203H	Output frequency								
7204H	Output voltage								
7205H	Output power								
7206H	Operating speed								
7207H	bus voltage								
7208H	Output torque								
7209H	Digital input 1	15	14	13	12	11	10	9	8
		*	*	*	*	*	X11	X10	X9
		7	6	5	4	3	2	1	0
		X8	X7	X6	X5	X4	X3	X2	X1
720AH	Switch input 2	15	14	13	12	11	10	9	8
		VX8	VX7	VX6	VX5	VX4	VX3	VX2	VX1
		7	6	5	4	3	2	1	0
		*	*	*	*	AI4	AI3	AI2	AI1
720BH	Switch output 1	15	14	13	12	11	10	9	8
		*	*	*	*	*	*	*	*
		7	6	5	4	3	2	1	0
		*	*	*	Y3	Y2	Y1	R2	R1
720CH	Switch output 2	15	14	13	12	11	10	9	8
		VY8	VY7	VY6	VY5	VY4	VY3	VY2	VY1
		7	6	5	4	3	2	1	0
		*	*	*	*	*	*	*	*
720DH	First two faults								
720EH	The first three failures								
720FH	Recent failure								
7210H	Recent fault output frequency								
7211H	Recent fault output current								
7212H	The most recent bus voltage fault								
7213H	Recent fault operation status								
7214H	Last fault operation time								

<table>
<tr><td rowspan="26"></td><td>7215H</td><td colspan="3">Set acceleration time</td></tr>
<tr><td>7216H</td><td colspan="3">Set deceleration time</td></tr>
<tr><td>7217H</td><td colspan="3">Cumulative length</td></tr>
<tr><td>7218H</td><td colspan="3">reserve</td></tr>
<tr><td>7219H</td><td colspan="3">UP/DOWN offset frequency sign (0/1: +/-)</td></tr>
<tr><td>721AH~
7221H</td><td colspan="3">reserve</td></tr>
<tr><td rowspan="8">7222H</td><td rowspan="6">Bit7～0
Running status</td><td>00H</td><td>Stopped</td></tr>
<tr><td>01H</td><td>Forward rotation (upward)</td></tr>
<tr><td>02H</td><td>Reversal (downward movement)</td></tr>
<tr><td>03H</td><td>JOG forward</td></tr>
<tr><td>04H</td><td>JOG Reversal</td></tr>
<tr><td>05H
~ 0FFH</td><td>reserve</td></tr>
<tr><td rowspan="2">Bit15～8
Fault Information</td><td>00H</td><td>Inverter is normal</td></tr>
<tr><td>xxH</td><td>Inverter fault status, "xx" represents the fault code.</td></tr>
<tr><td rowspan="4">7223H</td><td rowspan="4">GPS status</td><td>0</td><td>reserve</td></tr>
<tr><td>1</td><td>Locked status</td></tr>
<tr><td>2</td><td>Unlocked status</td></tr>
<tr><td>3</td><td>Status deactivated (function disabled)</td></tr>
<tr><td>7224H</td><td colspan="3">Output current</td></tr>
<tr><td>7225H</td><td colspan="3">Given frequency</td></tr>
<tr><td>7226H</td><td colspan="3">Current load capacity</td></tr>
<tr><td>7227H</td><td colspan="3">Current height</td></tr>
<tr><td>7228H</td><td colspan="3">Total power-on time</td></tr>
<tr><td>7229H~
73FFH</td><td colspan="3">reserve</td></tr>
<tr><td rowspan="6">Product Information
7500H～75FFH</td><td>7500H</td><td colspan="2">Performance software serial number 1</td><td>Corresponds to function code F12.22</td></tr>
<tr><td>7501H</td><td colspan="2">Performance software serial number 2</td><td>Corresponds to function code F12.23</td></tr>
<tr><td>7502H</td><td colspan="2">Functional software serial number 1</td><td>Corresponds to function code F12.24</td></tr>
<tr><td>7503H</td><td colspan="2">Functional software serial number 2</td><td>Corresponds to function code F12.25</td></tr>
<tr><td>7504H</td><td colspan="2">Keyboard software serial number 1</td><td>Corresponds to function code F12.26</td></tr>
<tr><td>7505H</td><td colspan="2">Keyboard software serial number 2</td><td>Corresponds to function code F12.27</td></tr>
</table>

	7506H	Product serial number 1	Corresponds to function code F12.28
	7507H	Product serial number 2	Corresponds to function code F12.29
	7508H	Product serial number 3	Corresponds to function code F12.30
	7509H~ 75FFH	reserve	
other	reserve		

12.3.5 Frame data length definition

The number of read/write registers in the PDU section of a MODBUS message RTU frame ranges from 1 to 16. The actual length of the RTU frame varies depending on the function code; see the diagram for details.

Table 12–3 RTU Frame Length and Function Code Comparison Table

Function code (0x)	RTU frame length (bytes)			Maximum length (byte)
	ask	Normal response	Abnormal response	
03	8	5+2No.]	5	37
41（06）	8	8	5	8
08	8	8	5	8
42（10）	9+2Nw]	8	5	41

[4]: Nr≤16 indicates the number of registers requested to be read;
[5]: Nw≤16, indicating the number of registers to be written;

[6]： Nw+Nr≤16；

12.3.6 CRC check

CRC checks the data by placing the low byte first and the high byte last.

The sending device first calculates the CRC value and appends it to the transmitted message. The receiving device, upon receiving the message, recalculates the CRC value and compares it with the received CRC value. If the two values are not equal, it indicates that an error occurred during transmission.

The calculation process ofCRC checksum:

(1) Define a CRC register and assign it an initial value, FFFFH.

(2) Perform an XOR operation between the first byte of the transmitted information and the value of the CRC register, and place the result in the CRC register. Starting from the address code, the start bit and stop bit are not included in the calculation.

(3) Extract and check the LSB (least bit of the CRC register).

(4) If LSB is 1, shift each bit of the CRC register to the right by one bit, fill the highest bit with 0, perform an XOR operation between the value of the CRC register and A001H, and put the result into the CRC register.

(5) If the LSB is 0, the bits of the CRC register are shifted one bit to the right, and the highest bit is filled with 0.

(6) Repeat steps 3, 4, and 5 until 8 shifts are completed.

(7) Repeat steps 2, 3, 4, 5, and 6 to process the next byte of the sent information. Continue until all bytes of the sent information have been processed.

(8) After the calculation is completed, the content of the CRC register is the CRC check value.

(9) In systems with limited time resources, it is recommended to use the lookup table method to implement CRC verification.

The simple CRC function is as follows (programmed in C language):

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

```
                {
                        crc_value = crc_value>>1;
                }
        }
    }
    return(crc_value); }
```

The above is only a theoretical explanation ofCRC check. This method takes a long time to execute, especially when the check data is long. Therefore, the following two table lookup methods are used for 16-bit and 8-bit controllers respectively.

1 CRC16 lookup table for 8-bit processors: (This program returns the result with the high byte first; please reverse the order when sending.)

```
constUint8 crc_l_tab[256] = {
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40
};
constUint8 crc_h_tab[256] = {
0x00,0xC0,0xC1,0x01,0xC3,0x03,0x02,0xC2,0xC6,0x06,0x07,0xC7,0x05,0xC5,0xC4,0x04,
```

```
0xCC,0x0C,0x0D,0xCD,0x0F,0xCF,0xCE,0x0E,0x0A,0xCA,0xCB,0x0B,0xC9,0x09,0x08,0xC8,
0xD8,0x18,0x19,0xD9,0x1B,0xDB,0xDA,0x1A,0x1E,0xDE,0xDF,0x1F,0xDD,0x1D,0x1C,0xDC,
0x14,0xD4,0xD5,0x15,0xD7,0x17,0x16,0xD6,0xD2,0x12,0x13,0xD3,0x11,0xD1,0xD0,0x10,
0xF0,0x30,0x31,0xF1,0x33,0xF3,0xF2,0x32,0x36,0xF6,0xF7,0x37,0xF5,0x35,0x34,0xF4,
0x3C,0xFC,0xFD,0x3D,0xFF,0x3F,0x3E,0xFE,0xFA,0x3A,0x3B,0xFB,0x39,0xF9,0xF8,0x38,
0x28,0xE8,0xE9,0x29,0xEB,0x2B,0x2A,0xEA,0xEE,0x2E,0x2F,0xEF,0x2D,0xED,0xEC,0x2C,
0xE4,0x24,0x25,0xE5,0x27,0xE7,0xE6,0x26,0x22,0xE2,0xE3,0x23,0xE1,0x21,0x20,0xE0,
0xA0,0x60,0x61,0xA1,0x63,0xA3,0xA2,0x62,0x66,0xA6,0xA7,0x67,0xA5,0x65,0x64,0xA4,
0x6C,0xAC,0xAD,0x6D,0xAF,0x6F,0x6E,0xAE,0xAA,0x6A,0x6B,0xAB,0x69,0xA9,0xA8,0x68,
0x78,0xB8,0xB9,0x79,0xBB,0x7B,0x7A,0xBA,0xBE,0x7E,0x7F,0xBF,0x7D,0xBD,0xBC,0x7C,
0xB4,0x74,0x75,0xB5,0x77,0xB7,0xB6,0x76,0x72,0xB2,0xB3,0x73,0xB1,0x71,0x70,0xB0,
0x50,0x90,0x91,0x51,0x93,0x53,0x52,0x92,0x96,0x56,0x57,0x97,0x55,0x95,0x94,0x54,
0x9C,0x5C,0x5D,0x9D,0x5F,0x9F,0x9E,0x5E,0x5A,0x9A,0x9B,0x5B,0x99,0x59,0x58,0x98,
0x88,0x48,0x49,0x89,0x4B,0x8B,0x8A,0x4A,0x4E,0x8E,0x8F,0x4F,0x8D,0x4D,0x4C,0x8C,
0x44,0x84,0x85,0x45,0x87,0x47,0x46,0x86,0x82,0x42,0x43,0x83,0x41,0x81,0x80,0x40
};
Uint16CRC(Uint8  * buffer, Uint8 crc_len)
{
    Uint8    crc_i,crc_lsb,crc_msb;
    Uint16 crc;
    crc_msb = 0xFF;
    crc_lsb = 0xFF;
    while(crc_len--)
     {
        crc_i = crc_lsb ^ *buffer;
        buffer ++;
        crc_lsb = crc_msb ^ crc_l_tab[crc_i];
        crc_msb = crc_h_tab[crc_i]; }
    crc = crc_msb;
crc = (crc << 8) + crc_lsb;
    return crc; }
```

l CRC16 lookup table for 16-bit processors: (This program returns the result with the high byte first; please reverse the order when sending.)

```
const Uint16 crc_table[256] = {
0x0000,0xC1C0,0x81C1,0x4001,0x01C3,0xC003,0x8002,0x41C2,0x01C6,0xC006
,0x8007,0x41C7,0x0005,0xC1C5,0x81C4,0x4004,0x01CC,0xC00C,0x800D,0x41CD
,0x000F,0xC1CF,0x81CE,0x400E,0x000A,0xC1CA,0x81CB,0x400B,0x01C9,0xC009
,0x8008,0x41C8,0x01D8,0xC018,0x8019,0x41D9,0x001B,0xC1DB,0x81DA,0x401A
,0x001E,0xC1DE,0x81DF,0x401F,0x01DD,0xC01D,0x801C,0x41DC,0x0014,0xC1D4
,0x81D5,0x4015,0x01D7,0xC017,0x8016,0x41D6,0x01D2,0xC012,0x8013,0x41D3
,0x0011,0xC1D1,0x81D0,0x4010,0x01F0,0xC030,0x8031,0x41F1,0x0033,0xC1F3
,0x81F2,0x4032,0x0036,0xC1F6,0x81F7,0x4037,0x01F5,0xC035,0x8034,0x41F4
,0x003C,0xC1FC,0x81FD,0x403D,0x01FF,0xC03F,0x803E,0x41FE,0x01FA,0xC03A
,0x803B,0x41FB,0x0039,0xC1F9,0x81F8,0x4038,0x0028,0xC1E8,0x81E9,0x4029
,0x01EB,0xC02B,0x802A,0x41EA,0x01EE,0xC02E,0x802F,0x41EF,0x002D,0xC1ED
,0x81EC,0x402C,0x01E4,0xC024,0x8025,0x41E5,0x0027,0xC1E7,0x81E6,0x4026
,0x0022,0xC1E2,0x81E3,0x4023,0x01E1,0xC021,0x8020,0x41E0,0x01A0,0xC060
,0x8061,0x41A1,0x0063,0xC1A3,0x81A2,0x4062,0x0066,0xC1A6,0x81A7,0x4067
,0x01A5,0xC065,0x8064,0x41A4,0x006C,0xC1AC,0x81AD,0x406D,0x01AF,0xC06F
,0x806E,0x41AE,0x01AA,0xC06A,0x806B,0x41AB,0x0069,0xC1A9,0x81A8,0x4068
,0x0078,0xC1B8,0x81B9,0x4079,0x01BB,0xC07B,0x807A,0x41BA,0x01BE,0xC07E
,0x807F,0x41BF,0x007D,0xC1BD,0x81BC,0x407C,0x01B4,0xC074,0x8075,0x41B5
,0x0077,0xC1B7,0x81B6,0x4076,0x0072,0xC1B2,0x81B3,0x4073,0x01B1,0xC071
,0x8070,0x41B0,0x0050,0xC190,0x8191,0x4051,0x0193,0xC053,0x8052,0x4192
,0x0196,0xC056,0x8057,0x4197,0x0055,0xC195,0x8194,0x4054,0x019C,0xC05C
,0x805D,0x419D,0x005F,0xC19F,0x819E,0x405E,0x005A,0xC19A,0x819B,0x405B
,0x0199,0xC059,0x8058,0x4198,0x0188,0xC048,0x8049,0x4189,0x004B,0xC18B
,0x818A,0x404A,0x004E,0xC18E,0x818F,0x404F,0x018D,0xC04D,0x804C,0x418C
,0x0044,0xC184,0x8185,0x4045,0x0187,0xC047,0x8046,0x4186,0x0182,0xC042
,0x8043,0x4183,0x0041,0xC181,0x8180,0x4040};
Uint16 CRC16(Uint16 *msg , Uint16 len){
Uint16 crcL = 0xFF , crcH = 0xFF;
```

```
    Uint16 index;
    while(len--){
        index = crcL ^ *msg++;
        crcL = ((crc_table[index] & 0xFF00) >> 8) ^ (crcH);
        crcH = crc_table[index] & 0xFF; }
return (crcH<<8) | (crcL); }
```

12.3.7 Abnormal information response

When the master device sends a request to the slave device, the master expects a normal response. A query from the master may result in one of the following four events:

l If the slave device receives a request without communication errors and can process the query normally, then the slave device will return a normal response;

l If the slave device does not receive the request due to a communication error, it cannot return any information. The slave device will consider it a timeout.

l If the slave device receives a request but detects a communication error (parity, address, frame error, etc.), it will not return a response. The slave device will treat it as a timeout.

l If the slave device receives a request without communication errors but cannot process the request (such as a request to read a non-existent register), the slave will return an exception response to notify the master of the actual error.

An abnormal response message has two fields that are different from those in a normal response:

- **Function Code Field: In a normal response, the slave copies the function code from the original request in the corresponding function code field. The MSB of all function codes is 0. In an abnormal response, the slave sets the MSB of the function code to 1. That is, abnormal response function code = normal response function code + 0x80.**
- Data Field: In a normal response, the slave station can return data in the data
- field; in an abnormal response, the slave station returns an exception code in the data field. Specific exception codes are defined as shown below.

Table 12–4 Definition of Exception Codes

Exception codes	name	meaning
01H	illegal functions	The function code received from the slave station (frequency converter) is outside the configured range (see Chapter 1 for details).
02H	Illegal data address	The data address received from the slave station (inverter) is not allowed; in particular, the combination of register start address and transmission length is invalid (see Chapter 1 for details).
03H	Illegal data frame	The slave station (frequency converter) detected an error in the query data frame length or a CRC checksum.
04H	Equipment failure	An unrecoverable error occurred when the slave device (frequency inverter) attempted to execute the requested operation. Possible causes include logical errors or EEPROM write failure.
05:00	Data out of range	The data received from the slave station (frequency converter) exceeds the minimum to maximum value range of the corresponding register.
06H	Parameters are read-only	The current register is read-only and cannot be written to.
07H	Parameters cannot be changed during operation.	The inverter is currently running, and write operations to the registers are not permitted. If operation is required, please stop the inverter.
08H	The parameters are password protected	The current register is password protected

12.4 Agreement Description

12.4.1 Inter-frame and intra-frame time interval definitions

A complete MODBUS message not only contains the necessary data units but also start and end markers. Therefore, as shown in [example code], an idle level of at least 3.5 character transmission times is defined as the start and end markers, and an idle level of more than 1.5 character transmission times during message transmission is considered a transmission anomaly.

The specific start and end times and abnormal intervals are related to the baud rate, as shown in the figure. For example, if the baud rate is 9600bps and the sampling period is 1ms, then the start and end time interval is an idle level of greater than or equal to 4ms ($3.5\times10/9600=3.64\approx4$), and the abnormal data interval is an idle level of greater than or equal to 2ms (1.5×10/9600 = 1.56≈2) and less than 4ms between bits of a frame of data (then the idle level between normal data bits is less than or equal to 1ms).

Table 12–5 Comparison of Time Interval and Baud Rate (when t-tuning = 1ms)

Baud rate (bps)	Start and end interval time T (t adjustment)	Abnormal interval time T (t-tuning)	Remark
4800	8	4	A normal frame allows for a quiet period of ≤3ms. A quiet period of ≥8ms indicates the end of a data frame.
9600	4	2	A normal frame allows for a quiet period of ≤1ms; a quiet period of ≥4ms indicates the end of a data frame.
19200	2	1	A normal frame allows for a low-level idle period of less than 1ms. An idle period of ≥2ms indicates the end of a data frame.
higher	**1**	**1**	**A 1ms idle time indicates the end of a frame.**

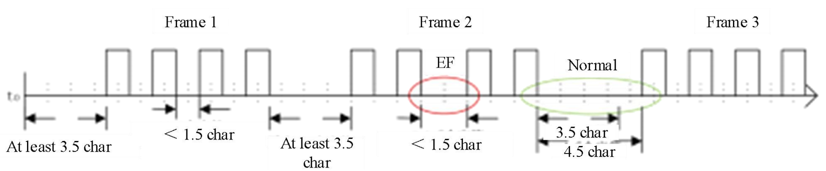


Figure 12-3 shows a diagram illustrating data frame correctness.

12.4.2 Data frame processing

After receiving a data frame, the system first performs preprocessing to determine if it is a valid frame destined for the local machine, then checks if the data is correct, and finally performs appropriate processing. If the received frame is not valid, no data will be sent back; if the received frame is valid but incorrect, a corresponding error information frame will be sent back.

A valid frame is one that meets the following conditions: address (local or broadcast) and length (not less than 3).

Correct frame: A valid frame that involves a correct memory address, memory content within the defined range, and is currently processable.

12.4.3 Response delay

Define the response delay (set by function code F10.04) as the time interval from when the inverter receives a valid data frame [_____] (data on the RS-485 network, different from commands sent from the keyboard), to parsing the data, and then starting to return data. Since the standard protocol defines start and stop characters, there cannot be no response delay; it must be at least "3.5 character time interval + 1ms (485 protocol chip settling time, t = 2)". The specific minimum time interval is related to the baud rate. For example, if the baud rate is 9600bps, the minimum response delay is 5ms ($3.5 \times 10 / 9600 + 1 = 4.64 \approx 5$).

If the communication data involves EEPROM operations, the time interval will be longer.

[7]: Valid data frame: Data sent from the external master station (not the keyboard) to the local machine, and whose function code, data length and CRC are correct.

In this code, the segments are: data transmission segment (t_transmit), end-of-transmission segment (t_wait1), 75176 forward-to-transmit waiting segment (t_wait2), data return segment (t_return), and 75176 forward-to-receive waiting segment (t_wait3).

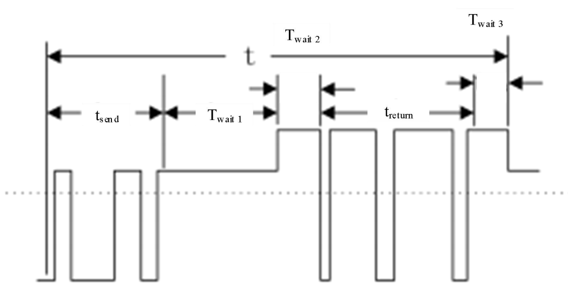


Figure 12-4 shows the timing analysis diagram of the complete data frame.

12.4.4 Communication timeout

The communication time interval Δt is defined as the time between the start of the previous valid data frame received by the slave station (frequency converter) and the end of the next valid data frame received. If Δt is greater than the predetermined time (set by function code F10.03; if set to 0, this function is invalid), then the communication is considered to have timed out.

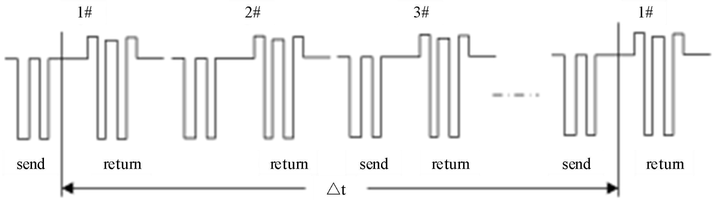


Figure 12-5 485 Network Link Data Diagram

12.5 For example

1) Inverter running forward

Issued: 01 41 70 0000 01 E6 C5

Response: 01 41 70 0000 01 E6 C5 (Normal)

Response: 01 C1 04 70 53 (In case of an anomaly, assume it is a device failure)

	send		Normal return		Exception return	
*	Frame header	≥3.5	characters of free space			
1	address	1	address	01	address	01
2	Function code	1	Function code	41	Function code	C1
3	Register address Hi	0	Register address Hi	70	Exception codes	04 (Hypothesis)
4	Register address Lo	0	Register address Lo	00	CRC check Lo	70
5	Register value Hi	0	Register value Hi	00	CRC check Hi	53
6	Register value Lo	1	Register value Lo	01		
7	CRC check Lo	6	CRC check Lo	E6		
8	CRC check Hi	5	CRC check Hi	C5		
*	Frame end	≥3.5	characters of free space			

2) Inverter free stop

Issued: 01 41 70 0000 07 66 C7

Return: 01 41 70 0000 07 66 C7 (Normal)

Response: 01 C1 04 70 53 (In case of an anomaly, assume it is a device failure)

	send		Normal return		Exception return	
*	Frame header	≥3.5 characters of free space				
1	address	01	address	01	address	01
2	Function code	41	Function code	41	Function code	C1
3	Register address Hi	70	Register address Hi	70	Exception codes	04 (Hypothesis)

4	Register address Lo	00	Register address Lo	00	CRC check Lo	70
5	Register value Hi	00	Register value Hi	00	CRC check Hi	53
6	Register value Lo	07	Register value Lo	07		
7	CRC check Lo	66	CRC check Lo	66		
8	CRC check Hi	C7	CRC check Hi	C7		
*	Frame end	≥3.5 characters of free space				

3) Change the set frequency (e.g., 50.00Hz/1388H) command word (when F00.04=7)

Issue: 01 41 70 15 13 88 3B 97

Return: 01 41 70 15 13 88 3B 97 (normal time)

Response: 01 C1 04 70 53 (In case of an anomaly, assume it is a device failure)

	send		Normal return		Exception return	
*	Frame header	≥3.5 characters of free space				
1	address	01	address	01	address	01
2	Function code	41	Function code	41	Function code	C1
3	Register address Hi	70	Register address Hi	70	Exception codes	04 (Hypothesis)
4	Register address Lo	15	Register address Lo	15	CRC check Lo	70
5	Register value Hi	13	Register value Hi	13	CRC check Hi	53
6	Register value Lo	88	Register value Lo	88		
7	CRC check Lo	3B	CRC check Lo	3B		
8	CRC check Hi	97	CRC check Hi	97		
*	Frame end	≥3.5 characters of free space				

4) Read the most recent fault information (read function codes F19.00 to F19.05)

Issue: 01 03 13 00 00 06 C1 4C

Return: 01 03 0C 00 11 00 00 00 00 01 2C 00 00 00 0053 5B (Normal)

Response: 01 83 04 40 F3 (In case of an anomaly, assume it is a device failure)

	send		Normal return		Exception return	
*	Frame header	≥3.5 characters of free space				
1	address	01	address	01	address	01
2	Function code	03	Function code	03	Function code	83
3	Starting address Hi	13	byte count	0C	Exception codes	04 (Hypothesis)
4	Starting address Lo	00	Register value Hi (F19.00)	00	CRC check Lo	40
5	Number of registers Hi	00	Register value Lo (F19.00)	11	CRC check Hi	F3

6	Number of registers Lo	06	Register value Hi (F19.01)	00	
7	CRC check Lo	C1	Register value Lo (F19.01)	00	
8	CRC check Hi	4C	Register value Hi (F19.02)	00	
9			Register value Lo (F19.02)	00	
10			Register value Hi (F19.03)	01	
11			Register value Lo (F19.03)	2C	
12			Register value Hi (F19.04)	00	
13			Register value Lo (F19.04)	00	
14			Register value Hi (F19.05)	00	
15			Register value Lo (F19.05)	00	
16			CRC check Lo	53	
17			CRC check Hi	5B	
*	Frame end	≥3.5 characters of free space			

5) Check if the line is connected.

Issued: 01 08 00 00 AA 55 5E 94

Response: 01 08 00 00 AA 55 5E 94 (Normal)

Response: 01 88 04 47 C3 (In case of an anomaly, assume it is a device failure)

	send		Normal return		Exception return	
*	Frame header	≥3.5 characters of free space				
1	address	01	address	01	address	01
2	Function	08	Function	08	Function code	88
3	Sub-function code Hi	00	Sub-function code Hi	00	Exception codes	04 (Hypothesis)
4	Sub-function code Lo	00	Sub-function code Lo	00	CRC check Lo	47
5	Data Hi	AA	Data Hi	AA	CRC check Hi	C3
6	Data Lo	55	Data Lo	55		
7	CRC check Lo	5E	CRC check Lo	5E		
8	CRC check Hi	94	CRC check Hi	94		
*	Frame end	≥3.5 characters of free space				

6) Change the carrier frequency (F00.23) to 4.0kHz. (Because this type of function code is generally intended to be stored in EEPROM after modification, function code 0x06 is used).

Issued: 01 06 00 17 00 28 39 D0

Return: 01 06 00 17 00 28 39 D0 (Normal)

Response: 01 86 04 43 A3 (In case of an anomaly, assume it is a device failure)

	send		Normal return		Exception return	
*	Frame header	≥3.5 characters of free space				
1	address	01	address	01	address	01
2	Function code	06	Function code	06	Function code	86
3	Register address Hi	00	Register address Hi	00	Exception codes	04 (Hypothesis)
4	Register address Lo	17	Register address Lo	17	CRC check Lo	43
5	Register value Hi	00	Register value Hi	00	CRC check Hi	A3
6	Register value Lo	28	Register value Lo	28		
7	CRC check Lo	39	CRC check Lo	39		
8	CRC check Hi	D0	CRC check Hi	D0		
*	Frame end	≥3.5 characters of free space				

Appendix I Universal Encoder Expansion Card (PG Card)

I.1 Overview

When using vector control, users must purchase a suitable PG card from our company.

- Selection Guide:

The EM760-PG-OD1 does not support encoder disconnection and phase sequence error detection;

The TC760-PG-D1 supports encoder disconnection and phase sequence error detection;

- Configuration scheme description:

The frequency converter is equipped with various universal PG cards. Users should select the appropriate PG card according to the encoder output format. See the table below for specific PG card models:

Specifications and Models	illustrate	Encoder Interface
EM760-PG-OD1	It can be used with differential (line-driven) output encoders, open-collector output encoders, and push-pull complementary output encoders. It supports encoders with rated voltages of 5V and 12V (5V by default).	9-pin terminal block
EM760-PG-OD2	It can be used with differential (line-driven) output encoders, open-collector output encoders, and push-pull complementary output encoders, and features frequency division output functionality. The output is an NPN type open-collector output. It supports encoders with rated voltages of 5V and 12V (5V by default).	Input: 9-pin push-button terminal block Output: 4-pin push-button terminal block
EM760-PG-R1	Rotary Transformer PG Card	8-pin terminal block

TC760-PG-D1	It can work with differential (line-driven) output encoders and supports encoders with rated voltages of 5V and 12V (5V by default). Open collector encoders and push-pull complementary output encoders are not supported.	9-pin terminal block

I.2 Mechanical installation instructions:

Please install and remove the PG card only after the inverter is safely powered off. Remove the screws on the inverter PG card holder; either 1 or 2 in the installation diagram is acceptable.

Install the copper post provided with the PG card at the screw location and secure the PG card with the screws.

First, set the direction of the DIP switch according to the encoder's rated voltage.

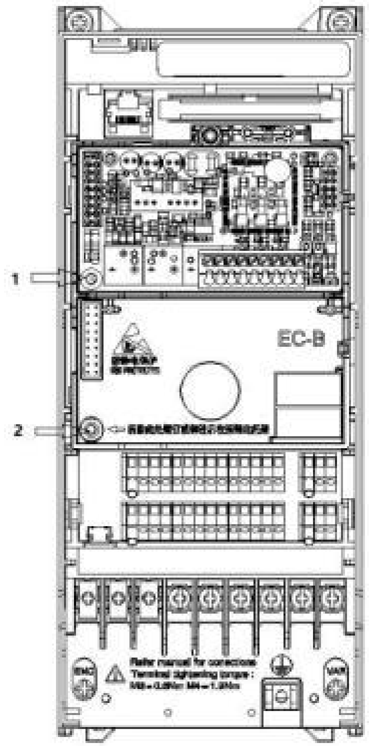
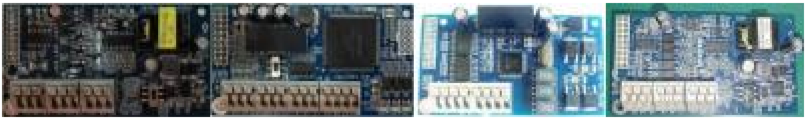


Figure 1 shows a schematic diagram of PG card installation.

The actual product image is as follows:



EM760-PG-OD1 EM760-PG-OD2 EM760-PG-R1 TC760-PG-D1

Figure 2 shows a real PG card.

I.3 Specifications and terminal block signal definitions:

Appendix 1: Terminal Signal Description for PG Card (EM760-PG-OD1)

Serial Number	Terminal Signal	illustrate
1	ON	ground signal
2	VP	Power output voltage: 5V±5% or 12V±5% (selectable via DIP switch) Maximum output current: 200mA
3	0V	Power and signal common terminal
4	A+	Encoder signal input, maximum response frequency 100kHz
5	A-	
6	B+	
7	B-	
8	Z+	
9	WITH-	

Appendix 2: Terminal Signal Description for the PG Card (EM760-PG-OD2)

Serial Number	Terminal Signal	illustrate
1	ON	ground signal
2	VP	Power output voltage: 5V±5% or 12V±5% (selectable via DIP switch) Maximum output current: 200mA
3	0V	Power and signal common terminal
4	A-	Encoder signal input, maximum response frequency 300kHz
5	B-	
6	WITH-	
7	A+	
8	B+	
9	Z+	

10	TO THE	Frequency division output signal, OC (NPN type open collector) output
11	BO	
12	LIKE THIS	
13	WITH	Signal common terminal

Appendix 3 PG Card (EM760-PG-R1) Terminal Signal Description

Serial Number	Terminal Signal	illustrate
1	ON	ground signal
2	N/A	N/A
3	SIN+	The rotary transformer feedback signal is 3.5±0. 175Vrms, 10kHz.
4	SIN-	
5	COS-	
6	COS+	
7	EXC+	Rotary transformer excitation signal 7Vrms, 10kHz
8	EXC-	
1	ON	ground signal

Appendix 4: Terminal Signal Description for PG Card (TC760-PG-D1)

Serial Number	Terminal Signal	illustrate
1	ON	ground signal
2	VP	Power output voltage: 5V±5% or 12V±5% (selectable via DIP switch) Maximum output current: 200mA
3	0V	Power and signal common terminal
4	A+	Encoder signal input, maximum response frequency 100kHz
5	A-	
6	B+	
7	B-	
8	Z+	
9	WITH-	

I.4 Terminal wiring instructions:

First, set the DIP switch direction according to the encoder's rated voltage to ensure the PG card's VCC terminal outputs the corresponding voltage.

When using an NPN type OC gate output encoder, connect the encoder signal to the push-button terminals (A-, B-, Z-).

When using a PNP type OC gate output encoder, connect the encoder signal to the push-button terminals (A+, B+, Z+).

When using a differential or push-pull complementary output encoder, directly connect the corresponding signal lines to the PG card terminals.

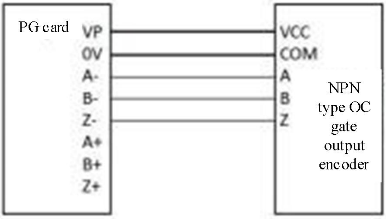


Figure 3 Use NPN type OC gate output encoder

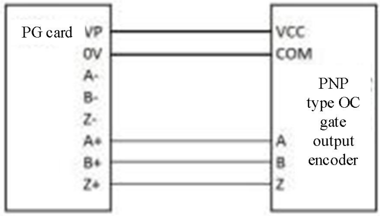


Figure 4 Use PNP type OC gate output encoder

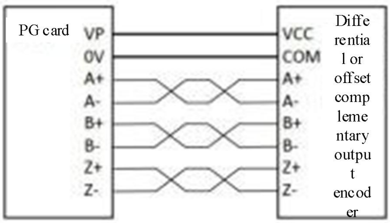


Figure 5 Use Differential or offset complementary output encoder