Preface

Thank you for purchasing EM630/TC6A series inverter.

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EM630/TC6A, a high-performance inverter series specially developed for hoisting, is widely used for tower crane hoisting, trolley hoisting, slewing and travel closed-loop. Default parameter settings are adjustable according to applications of **F20.00 selection in the hoisting industry**.

Main Features:

- Closed-loop vector control and steady performance at high torque and low frequency: smooth output of rated torque 0 Hz/150%, so that a hoist performs stably during start-up, hoisting and decline.
- Zero servo function: offers the second type safety protection to hoist under the condition that an encoder is connected by driving motor to hold full load in the air or let it go down slowly even when the braker does not work.
- Overspeed protection: When an encoder is connected, overspeed stop protection and overspeed operation protection are provided to timely discover abnormalities of speed and braking force during hoisting to prevent slip accident.
- Braker control logic: Braker control logic controls hoist to open or close at reasonable sequence, which maintains the operation safety and extends the service life of braking system.
- Wide voltage input range and automatic voltage stabilization: These functions meet torque output requirements of hoist even when voltage of power grid drops.
- Wide speed regulation range: This meets the requirements for light load at high speed and heavy load at low speed, thereby improving operating efficiency of hoist.

Please read this manual carefully before using EM630/TC6A and keep it properly.

Before connecting EM630/TC6A and a motor for the first time, please configure the motor nameplate parameters including rated frequency, rated power, rated voltage, rated current, rated rotation speed, rated power factor, and motor connection.

Since SINEE is committed to the development and improvement of products and product documents, this manual will be updated without notice.

Latest updates and additional information are available at www.sinee.cn.

Safety Information

In this manual, there are two types of safety information.

Danger: The label indicates that a failure to follow instructions may result in serious injury or even death.

Caution: The label indicates that a failure to follow instructions may result in moderate or slight injury and device damage.

Please read this chapter carefully before system installation, debugging and maintenance and always follow the safety precautions below during operation. SINEE will not undertake any damage or loss caused by a failure to follow the instructions.

Safety Precautions

Before Installation:

 **Danger**
1. Do not install inverter if the package is wetted or any component is missing or broken. 2. Do not install inverter if the label on the package is not identical to that on the inverter.

 **Danger**
1. Be careful when carrying or transporting the inverter so as to avoid damage! 2. Do not use inverter if it is damaged or any component is missing so as to avoid injury! 3. Do not touch parts of control system with bare hands so as to avoid ESD!

During Installation:

 **Danger**
1. The installation base shall be metal or other non-flammable material so as to prevent fire risk. 2. Do not unscrew the fixing bolts, especially the bolts with red mark.

 **Caution**
1. Ensure that no cable strips or screws are dropped into the inverter so as to avoid damage to the inverter. 2. Install inverter at a place with less vibration and no direct sunlight. 3. Consider the installation space for cooling purpose when inverter is installed in a closed cabinet or space.

Wiring:

Danger

1. Wiring must be performed by authorized and qualified personnel so as to avoid unexpected accidents.
2. A circuit breaker must be installed between the inverter and the mains so as to prevent fire risk.
3. Ensure that the power supply is off before wiring, and ground the inverter in accordance with the applicable wiring standard so as to avoid electric shock.
4. The grounding terminal must be grounded so as to avoid electric shock and fire risk.

Danger

1. Never connect input power supply cables to output terminals U, V and W of the inverter. Pay attention to the terminal symbols and connect to the terminals correctly so as to prevent risks of damaging the inverter.
2. Be sure that the wiring meets EMC requirements and local safety standards. Cables should be in recommended sizes so as to prevent accident risk.
3. Do not connect braking resistor to DC bus terminals + and – so as to prevent fire risk. Tighten terminals with a screwdriver of specified torque so as to prevent fire risk.
4. Do not connect a phase-shifting capacitor or an LC/RC noise filter to output circuits.
5. Do not connect a solenoid switch or an electromagnetic contactor to output circuits. Otherwise, it will trigger the action of the overcurrent protection circuit or even damage the internal parts of the inverter.
6. Do not disconnect internal cables of the inverter, or else this may possibly damage the internal parts of the inverter.

Before Power-on:

Caution

1. Verify that the input voltage is identical to the rated voltage of the inverter, input terminals R, S and T and output terminals U, V and W are correctly connected, there are no short circuit phenomena for the wiring of inverter and its peripheral circuits, and all wires are in good connection. Otherwise, this may result in inverter damage.
2. Never perform voltage withstanding test on the inverter, because it has been done at the factory. Otherwise, this may result in accident.

Danger

1. The front cover of the inverter must be closed before the inverter is powered on. Otherwise, it may result in an electric shock.
2. The wiring of all peripherals must be conducted in accordance with the guide of this manual. Otherwise, it may result in an electric hazard.

After Power-on

Danger

1. Do not touch the inverter or its peripheral circuits with wet hands to avoid the electric shock.
2. If the indicator is off or the keypad does not display any information after power-on, please cut off the power supply immediately. Never touch any terminal of R, S and T of the inverter or the connecting terminals with hands or a screw driver, or else an electric shock accident may occur. Contact our customer service personnel immediately after cutting off the power.
3. After being powered on, the inverter will automatically check the safety of the external strong circuit automatically. Therefore, do not touch wiring terminal U, V or W of the inverter or the wiring terminal of the motor with bare hands, otherwise it will result in electric shock.

Danger

1. If you need to check parameter settings, be careful of personal safety when the motor is running so as to avoid accidents.
2. Do not change the default parameter setting without approval to avoid damage.

During Operation

Danger

1. Never touch the cooling fan, the heat sink or the discharge resistor with bare hands for checking temperature, which may result in burning!
2. Only qualified technicians are allowed to detect signals during operation so as to prevent personal injury or device damage.

Caution

1. Prevent any foreign items from being dropped into the device during operation, so as to avoid damage to the device.
2. Do not control the start/stop of the inverter by ON/OFF of the contactor so as to avoid damage to the device.

Maintenance

Danger
1. Maintain and inspect the device only after the inverter is powered off to avoid an electric shock. 2. Maintain and inspect the inverter only after the main circuit is powered off and the CHARGE indicator is off. Otherwise, the residual electric charge of the capacitor may result in personal injury. 3. Maintenance and inspection can be performed by well-trained technicians only, so as to avoid personal injury. 4. Parameter setting is required if the inverter has been replaced. Plug-in & plug-out should be performed after power-off.

Safety Precautions

Motor Insulation Inspection

Motor insulation inspection shall be performed before it is put to use for the first time, put to use after it is left unused for some time or during routine inspection, in order to avoid damaging the inverter due to Disabled insulation performance of the motor winding. Make sure to disconnect the motor cable from the inverter during inspection; the 500V megohmmeter is recommended. The obtained insulation resistance shall not be lower than 5MΩ.

Motor Thermal Protection

If the selected motor does not match with the inverter in rated capacity, especially when the rated power of the motor is lower than that of the inverter, be sure to adjust the motor protection parameters of the inverter or install a thermal relay in front of the motor to protect the motor.

Operation Over Industrial Frequency

The output frequency of the inverter ranges from 0.00 Hz to 600.00 Hz. To use the inverter at over 50.00 Hz, please consider the bearing capacity of the mechanical device.

Motor Heat and Noise

Since the output voltage of the inverter presents a PWM waveform along with some harmonic waves, the temperature rise, noise and vibration of the motor would increase a little in comparison with the running under the industrial frequency.

Voltage-Sensitive Device or Power Factor Improvement Capacitor on the Output Side

The inverter outputs PWM waves. Do not use the inverter, if a power factor improvement capacitor or a lightning voltage-sensitive resistor on the output side, which may easily result in transient overcurrent of the inverter, or even damage the inverter.

Beyond Rated Voltage

Do not use EM630 inverter outside the operating voltage specified in this manual, which may easily damage its internal parts. If you have to do so, install a voltage rise or reduction device for transformation.

Surge Protection

A surge protection device is available in the EM630 to prevent it from induction lighting stroke on a certain degree. Additional protection devices are required in front of the inverter in the places where thunder and lightning are frequently seen.

Altitude and Derating

When the inverter is used in an area at an altitude of over 1,000m, the cooling effect will degrade, so it must be derated. For details, please consult SINEE.

Attentions at Inverter Scrapping

Burning the electrolytic capacitors of the mains and the PCB may result in explosion and burning plastic parts may generate toxic gas. Please handle them as industrial wastes when the inverter is scrapped.

CONTENTS

1 Overview

1.1 EM630 Model List and Technical Specifications

- Rated voltage: 3-phase, 380 - 415VAC;
- Applicable motor: 3-phase AC induction motor, power range: 4.0 - 400 kW;
- Maximum output voltage is identical to input voltage.

EM630 Model and Rated Output Current is shown in Table 1–1.

Table 1–1 EM630 Model List

Rated Voltage	Model	Motor Power (kW)	Rated Output Current (A)
3-phase, 380 - 415VAC	EM630-4R0-3B	4.0	9.4
	EM630-5R5-3B	5.5	13
	EM630-7R5-3B	7.5	17
	EM630-011-3B	11	25
	EM630-015-3B	15	32
	EM630-018-3B	18.5	38
	EM630-022-3/3B	22	45
	EM630-030-3/3B	30	60
	EM630-037-3/3B	37	75
	EM630-045-3/3B	45	90
	EM630-055-3/3B	55	110
	EM630-075-3/3B	75	150
	EM630-090-3	90	176
	EM630-110-3	110	210
	EM630-132-3	132	253
	EM630-160-3	160	304
	EM630-185-3	185	357
	EM630-200-3	200	380
	EM630-220-3	220	426
	EM630-250-3	250	465
	EM630-280-3	280	520
	EM630-315-3	315	585
	EM630-355-3	355	650
	EM630-400-3	400	725

★: Type selection principle(for reference only and actual calculations shall apply):

- Hoisting: The power rating of the inverter is 1 speed level to 2 speed levels higher than that of the motor (closed loop)
- Slewing: The power rating of the inverter is 1 speed level higher than that of the motor (open loop)
- Trolley travel: the inverter matches with the motor in power (open loop)

EM630 Technical Specifications are shown in Table 1–2.

Table 1–2 EM630 Technical Specifications

Items		Specifications
Input	Input Voltage Range	380V-20% - 415V+20%, 50 - 60 Hz±5%, voltage imbalance rate <3%
Output	Maximum Output Voltage	Maximum output voltage is identical to input voltage.
	Rated Output Current	100% non-stop rated current output
	Maximum Overload Current	150% rated current for 60s, 180% rated current for 10s and 200% rated current for 2s
Basic Control Functions	Control Mode	V/F and FVC
	Input Mode	Frequency (speed) input and torque input
	Start/Stop Control Mode	Keypad, control terminals (2-wire sequence, 3-wire sequence) and communication
	Frequency Control Range	0.00 - 600.00 Hz 0.00 - 600.00 Hz
	Input Frequency Resolution	Numeric input: 0.01 Hz, analog input: 0.1% of maximum frequency
	Governor Deflection	1: 50 (V/F), 1: 1000 FVC
	Speed Control Accuracy	±0.2% rated synchronous speed
	Acceleration/Deceleration Time	0.01-600.00 seconds/0.1 - 6000.0 seconds/1 - 60000 seconds
	V/F Features	Rated output voltage: 20% - 100% adjustable; frequency base: 20 Hz - 600 Hz adjustable
	Torque Boost	Fixed torque boost curve, customer defined V/F curve scaling
	Start Torque	150%/ 1 Hz (V/F), 150%/ 0 Hz (FVC)
	Torque Control Accuracy	±5% rated torque (FVC)
	AVR	The output voltage remains unchanged basically and the input voltage varies when AVR is active.
	Automatic Current Limit	Automatically limit output current to avoid frequently overcurrent trip.

Items		Specifications
	DC Brake	Brake frequency: 0.01 - Maximum frequency, brake time: 0 - 30S Brake current: 0% - 100% rated current
	Signal Input Source	Communication and preset speed
Function of Input and Output	Reference Power Supply	10 V/20 mA
	Terminal Control Power Supply	24 V/200 mA
	Numeric Input Terminal	7 numeric multi-functional input terminals
	Analog Input Terminal	3 analog inputs: 1 voltage input (0 - 10V); 2 voltage inputs (0 - 10V) or current inputs (0 - 20mA)
	Numeric Output Terminal	2 OC multi-functional outputs and 2 relay multi-functional outputs. Maximum output current of OC: 50mA; relay contact capacity: 250VAC/3A or 30VDC/1A. When the relay works, EA-EC and RA-RC is on, but EB-EC and RB-RC is off.
	Analog Output Terminal	2 multi-functional analog output terminals are with the output 0 - 10V or 0 - 20mA.
Keypad Display	LED	LED displays relevant information about the inverter.
	Parameter Copy	Upload and download the parameter setting information of the inverter to realize rapid copy.
Protection	Protection	Short circuit, overcurrent, overload, overvoltage, undervoltage, phase loss, overheating, overspeed, abnormal braker, external fault, etc.
Working Condition	Installation Site	To be installed indoor with an altitude less than 1,000 meters, free from dust, corrosive gas and direct sunlight.
	Ambient Temperature	-10˚C - +40˚C, 20% - 90%RH (no condensation)
	Vibration	< 0.5g
	Storage Temperature	-25˚C - +65˚C
	Installation Method	Wall mounting, floor mounting (electrical cabinet) and flush mounting
Protection Degree		IP20
Cooling Method		Forced air cooling

1.2 EM630 Operation Status

1.2.1 Operating Status of the Inverter

EM630 inverter operating statuses: parameter setting status, normal running status, JOG running status, autotuning status, stop status, JOG stop status and fault status.

- **Parameter setting status:** After it is powered on and initialized and is standby without a fault or a start-up command, the inverter has no output.
- **Normal running status:** Having received an active start command through keypad, control terminal or communication, the inverter drives the motor as per the setting input.
- **JOG running status:** Drives the motor at JOG input speed through setting of keypad, external terminal or communication.
- **Autotuning status:** set through keypad to autotune the parameters of the motor in stationary or rotational autotuning.
- **Stop status:** When the running command is inactive, the output frequency drops to zero as per the set deceleration time.
- **JOG stop status:** When the JOG running command is inactive, the output frequency drops to zero as per the JOG deceleration time.
- Fault status: status of the inverter under protection, and all kinds of faults and failures.

1.2.2 Control Modes of the Inverter

The control modes of the inverter refer to what kind of open loop or closed loop method is adopted to drive the motor at desired speed or torque. These modes include:

- General open loop space vector control – V/F control: suitable for occasions of low speed change and low speed stability accuracy and meet the needs of most AC motor drives.
- Feedback Vector Control — FVC control: speed and current are under real-time closed-loop control with high stability speed accuracy and high dynamic response. An encoder must be added under this control mode.

1.2.3 Setting Modes of the Inverter

The setting mode of the inverter refers to what kind of physical quantity is taken as the control object when the inverter drives the motor.

- Speed setting mode: the motor speed is taken as the control object;

- Torque setting mode: the motor torque is taken as the control object.

The inverter may be set by either numeric mode or preset speed mode. JOG speed setting is superior to other settings, i.e., when pressing M.K on keypad or turning control FJOG and RJOG on, the inverter will automatically switch to jog speed setting, no matter what the present setting mode is. In Figure 1–1 and Figure 1–2, EM630 setting modes are described in detail:

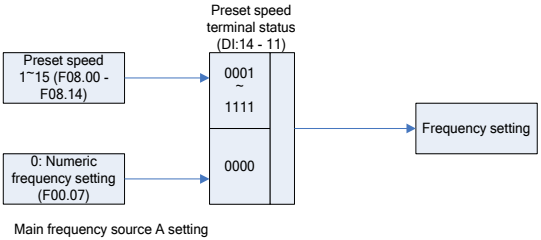


Figure 1–1 Speed Setting Mode

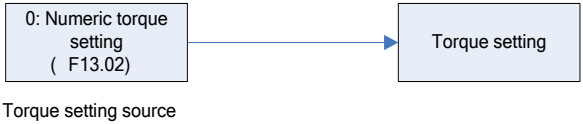


Figure 1–2 Torque Setting Mode

1.2.4 Control Modes of the Inverter

The control modes of the inverter refer to the modes to start/stop the inverter. There are three control modes, namely keypad control mode, terminal control mode and communication control mode. The terminal control mode includes 2-wire sequence (RUN and F/R) and 3-wire sequence (RUN, F/R and Xi (i=1 - 7)). Xi needs to be redefined as 3-wire start/stop control and its running mode control logic is shown in Figure 1–3.

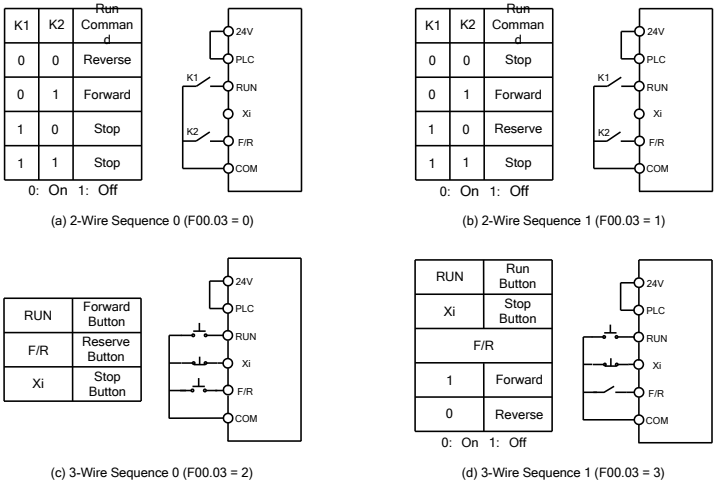


Figure 1–3 Control Logic of Terminal Control Mode

1.3 Description of Parts of EM630 Inverter (30 kW)

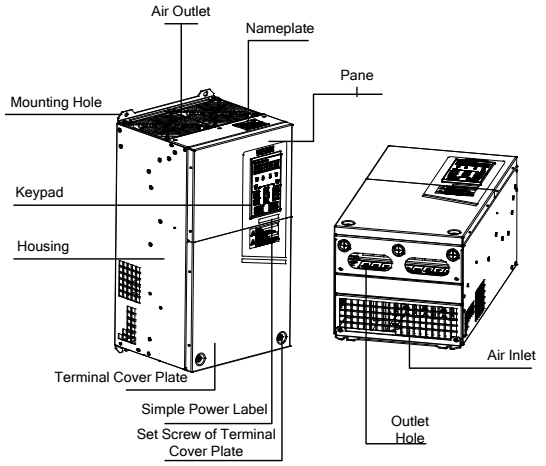


Figure 1–4 Description of Parts of EM630 Inverter (30 kW)

2 Installation

2.1 Product Verification

Caution
• Do not install the inverter if it is damaged or any component is missing so as to avoid injury!

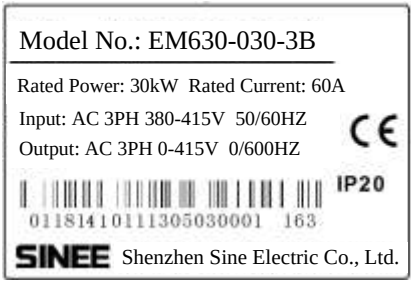
Please verify the inverter products as per Table 2–1 when you get them.

Table 2–1 Check List

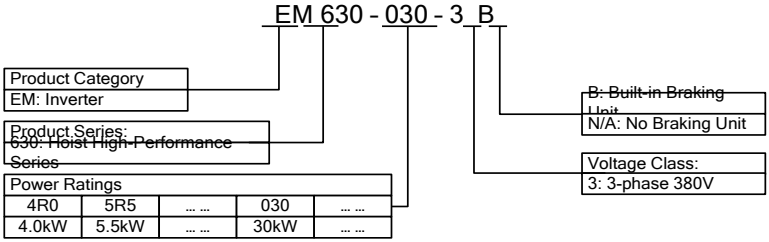
Item	Method
Check if they are identical to the purchase order.	Check the nameplate at the side of the inverter.
Any damage	Check the overall appearance to see if they are damaged in transportation.
Any loosened screws or other fastening parts.	Check with a screwdriver if necessary.

If you find any quality problem, please contact SINEE Direct Sale Department or the distributor.

- Nameplate



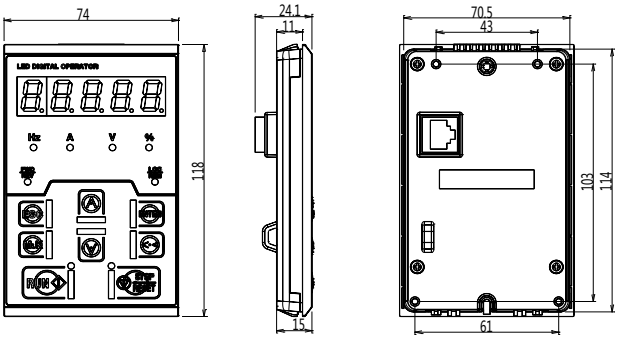
- Model Numbering Description



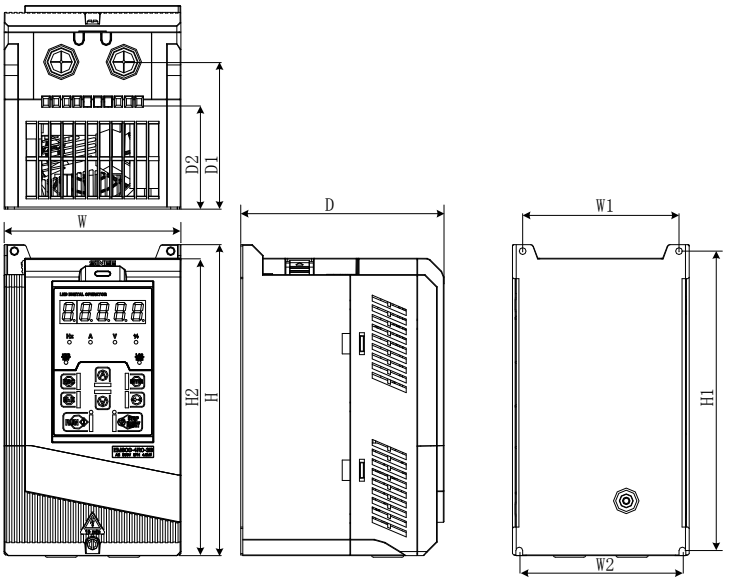
2.2 Overall and Installation Dimensions

EM630 inverters can be categorized into 12 specifications for 6 overall and installation dimensions (as shown in Figure 2–1 and Figure 2–2).

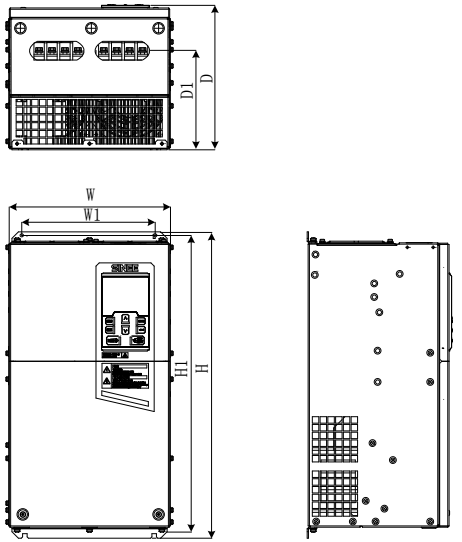
The keypad may be installed onto the metal panel separately with a hole size of 114.5 ±0.1(L)*71 ±0.1 (W)mm and the metal panel thickness of 1.2 - 2.0mm.



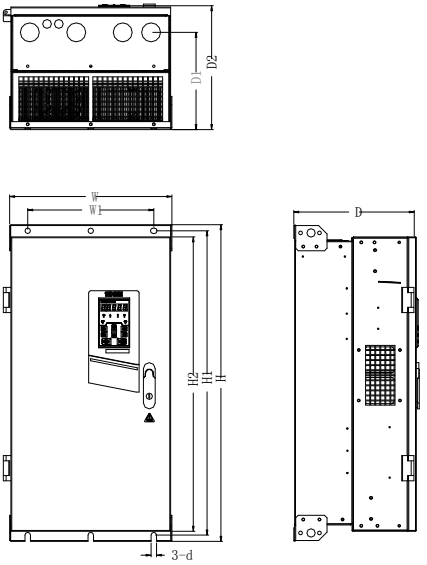
(a) Keypad Dimension



(b) Overall Dimensions of 40 kW - 18 kW Inverters



(c) Overall Dimensions of 22 kW - 75 kW Inverters



(d) Overall Dimensions of 90 kW - 400 kW Inverters

Figure 2–1 Overall Dimensions of EM630 Inverter and Keypad

Table 2–2 Overall and Installation Dimensions of EM630 Inverter

Model No.	W	W1/W2	H	H1	H2	D	D1	D2	d	Frame
EM630-4R0-3B	130	115/120	228	220	219	153	108	75	5	(b)
EM630-5R5-3B	140	130	270	261	258	172	128	94	5	(b)
EM630-7R5-3B										
EM630-011-3B	180	150	368	353	343	210	165	136	7	(b)
EM630-015-3B										
EM630-018-3B										
EM630-022-3/3B	250	200	484	470	440	222	150	--	6.5	(c)
EM630-030-3/3B										
EM630-037-3/3B										
EM630-045-3/3B	315	220	560	546	513	250	180	--	7	(c)
EM630-055-3/3B	350	250	662	638	603	262	188	--	12	(c)
EM630-075-3/3B										
EM630-090-3	386	300	753	724	700	292	231	300	13	(d)
EM630-110-3	416	300	855	825	793	307	246	315	13	(d)
EM630-132-3										

Model No.	W	W1/W2	H	H1	H2	D	D1	D2	d	Frame
EM630-160-3	497	397	1107	1076	1036	340	285	348	13	(d)
EM630-185-3										
EM630-200-3										
EM630-220-3	656	450	1348	1314	1261	388	232	395	13	(d)
EM630-250-3										
EM630-280-3										
EM630-315-3	801	680	1417	1383	1330	388	190	395	13	(d)
EM630-355-3										
EM630-400-3										

2.3 Considerations for Installation Site

Caution

1. **When carrying and transporting the inverter, please hold its bottom.**
   Only taking the face panel would result in the risk of hitting your foot due to its dropping.
2. **Please install the inverter onto a metal panel or other non-flammable material panel.**
   Installing it onto flammable materials may result in fire risk.
3. **When at least two inverters are installed in the same control cabinet, please set a cooling fan and maintain the air temperature of the air inlet below 40˚C.**
   Overheating would result in a fire or other accidents.

2.3.1 Installation Site

The installation site shall have the following conditions:

1. Well-ventilated indoor place.
2. Ambient temperature: -10°C - 40°C.
3. Avoid high temperature and high moisture, humidity < 90%RH, no water drops or any other condensation.
4. Do not install the inverter onto wood or other flammable materials.
5. No direct sunlight.
6. No flammable or corrosive gas or liquid.
7. No dust, oily dust or floating fiber or metal particles.

8. The installation base shall be solid and free from vibration.

9. No electromagnetic interference and away from interference source.

2.3.2 Ambient Temperature

For reliability purpose, please install the inverter at a well-ventilated place. A cooling fan or an air-conditioner shall be installed and the ambient temperature shall be kept below 40°C, when the inverter is installed in a closed box.

2.3.3 Precautions

Please take precautions during installation to prevent metal fragments or dusts produced by drilling or other actions from falling into the inverter. Remove the precaution objects after installation.

2.4 Installation Direction and Space

A cooling fan must be installed for EM630 inverter for forced air cooling. An inverter must be installed in vertical direction with enough space maintained with an adjacent object or a baffle (wall) for better cooling effect (see Figure 2–2).

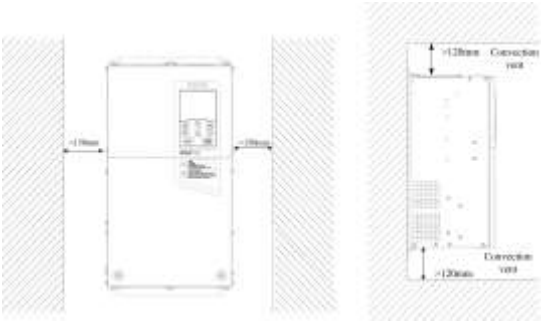


Figure 2–2 Inverter Installation Direction and Space

2.5 Assembly and Disassembly of Keypad

Generally speaking, it's not necessary to disassemble the keypad while using an inverter. What to do is to open the terminal block. If necessary, observe the following methods to disassemble or install the keypad.

- Disassemble the keypad: Put your fingers in the finger slots on the top of the keypad, press the keypad down slightly and pull it outward (as shown in Figure 2–3).

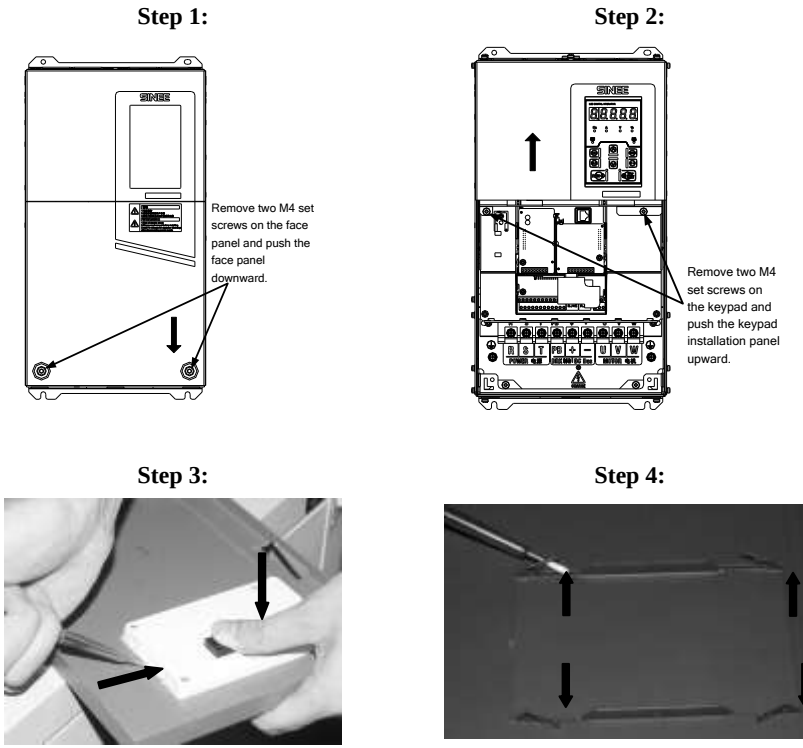


Figure 2–3 Disassemble the Keypad

- Assemble the keypad: Make the RJ-45 terminal aligned with the modular plug at the keypad bottom horizontally, and press the keypad flatly until it clicks into the right place. See Figure 2–4.

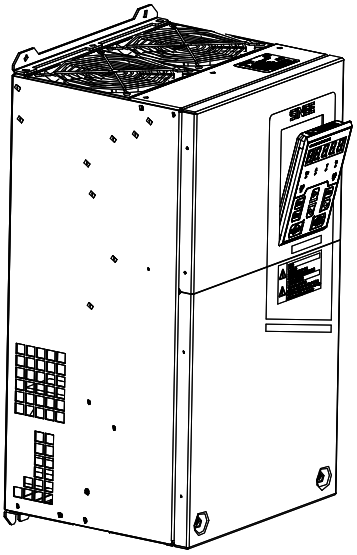


Figure 2–4 Keypad Installation

2.6 Flush Mounting

EM630 inverter (4.0 kW – 200 kW) can be changed to flush mounting type.

Installation of EM630 inverter (22 kW or above): remove the top and bottom mounting holes of the original housing (Figure 2–5) to the position shown in Figure 2–6, and install the removed bolts back to the said mounting holes again.

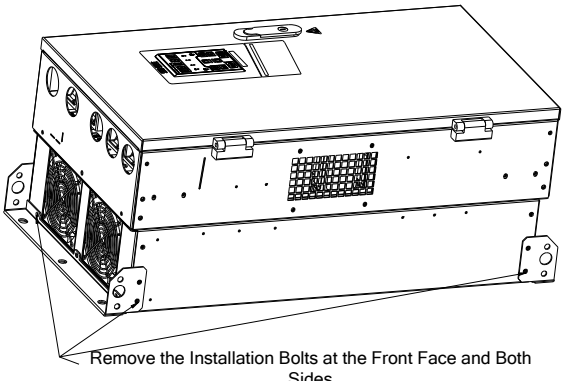


Figure 2–5 Disassemble the Top and Bottom Mounting Holes

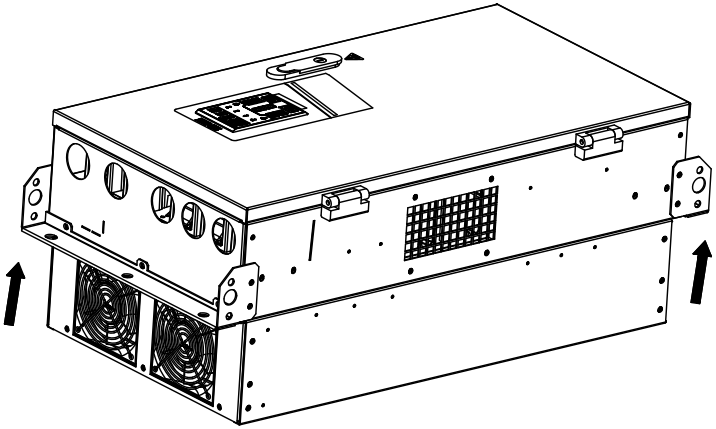


Figure 2–6 Assemble the Top and Bottom Mounting Holes

Installation of EM630 inverter (below 22 kW): as shown in Figure 2–7, insert the left and right accessories for flush mounting into the slots at the left and right sides of the plastic shell, and tighten the two front and back screws. See Figure 2–8 Installation Dimensions for Flush Mounting and Table 2–3 for Installation dimensions.

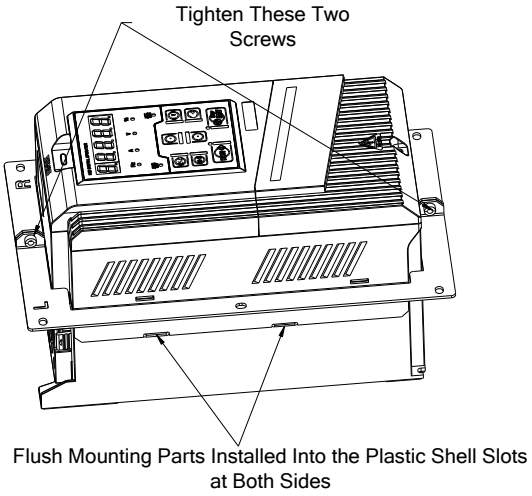
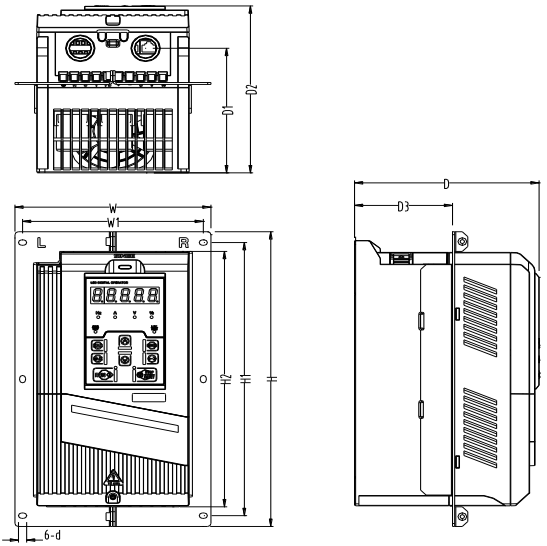
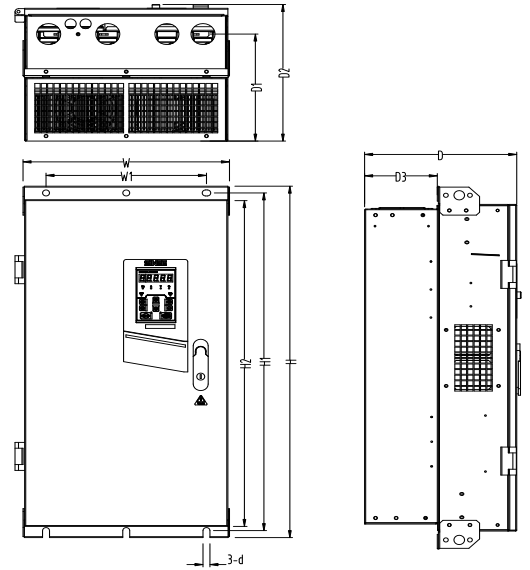


Figure 2–7 Left and Right Accessories for Flush Mounting



(a)



(b)

Figure 2–8 Installation Dimensions for Flush Mounting

Table 2–3 Installation Dimensions for Flush Mounting

Model No.	W	W1	H	H1	H2	D	D1	D2	D3	d	Frame
EM630-4R0-3B	--	--	--	--	--	153	108	153	--	--	a
EM630-5R5-3B	188	166	300	278	258	172	128	172	90	5.5	a
EM630-7R5-3B											
EM630-011-3B	224	150	431	409	343	210	165	210	122	8	a
EM630-015-3B											
EM630-018-3B											
EM630-022-3/3B	250	200	484	470	440	214	150	222	122	6.5	b
EM630-030-3/3B											
EM630-037-3/3B											
EM630-045-3/3B	315	220	560	546	513	242	180	250	140	7	b
EM630-055-3/3B	350	250	662	638	603	254	188	262	138	12	b
EM630-075-3/3B											
EM630-090-3	386	300	753	724	700	287	231	295	136	13	b
EM630-110-3	416	300	855	825	793	302	246	310	132	13	b
EM630-132-3											
EM630-160-3	497	397	1107	1076	1036	335	285	343	145	13	b
EM630-185-3											
EM630-200-3											

3 Wiring

3.1 Connection to Peripherals

Standard connection between EM630 and its peripherals is shown in Figure 3–1.

Figure 3–1 Connection of EM630 Inverter and Peripherals

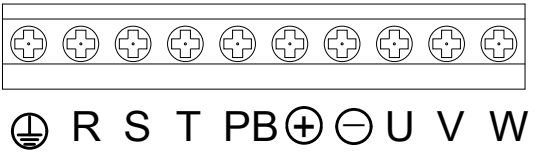
3.2 Wiring Main Circuit Terminals

3.2.1 Main Circuit Terminal Block

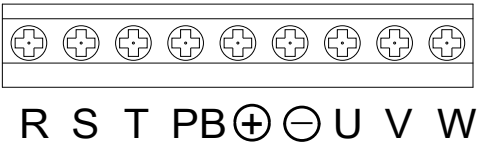
The main circuit terminals of EM630 comprise the following parts:

- 3-phase AC input terminals: R, S and T
- Grounding terminal: ⏚
- DC bus terminal: ⊕⊖
- Wiring terminal for energy consumption braking resistor: PB
- Wiring terminals of motor: U, V and W

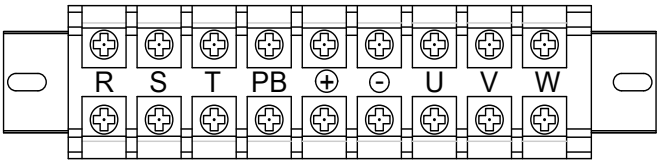
See Figure 3–2 for main circuit terminal block.



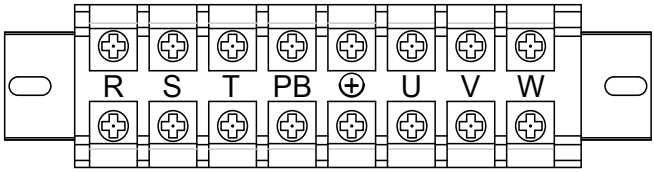
a) Main Circuit Terminal Block of Models (4.0 - 7.5 kW)



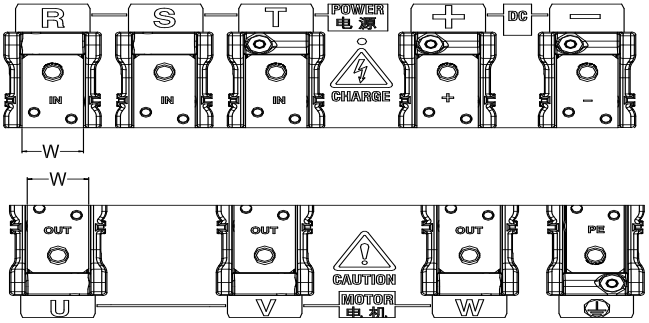
b) Main Circuit Terminal Block of Models (11 - 18.5 kW)



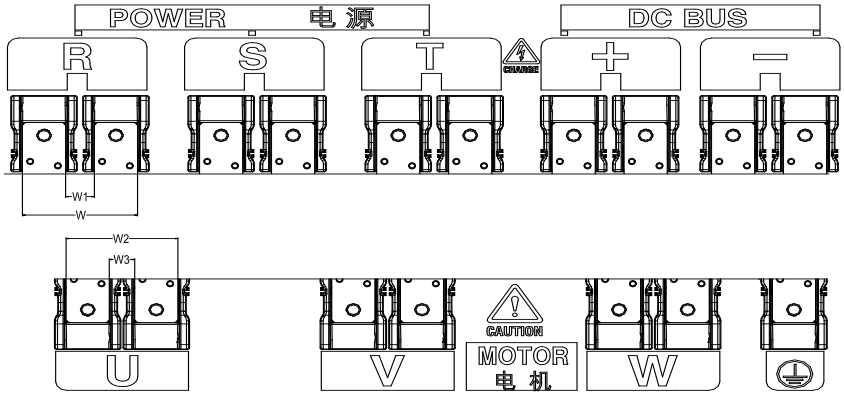
c) Main Circuit Terminal Block of Models (22 – 37 kW)



d) Main Circuit Terminal Block of Models (45 - 75 kW)



e) Main Circuit Terminal Block of Models (90 – 200 kW)



f) Main Circuit Terminal Block of Models (220 – 400 kW)

Figure 3–2 Main Circuit Terminal Block

Table 3–1 90 kW - 400 kW Terminal Dimension

Model No.	W	W1	W2	W3
EM630-090 - 132	33	-	-	-
EM630-160 - 200	39	-	-	-
EM630-220 - 280	88	22	88	22
EM630-315 - 400	104	26	101	23

Note: 1. 90 kW or above: Power input terminals are on the top and power output terminals are at the bottom of the inverter.

2. 220 kW or above: There are 2 wiring terminal blocks for each phase.

3.2.2 Main Circuit Terminal Functions

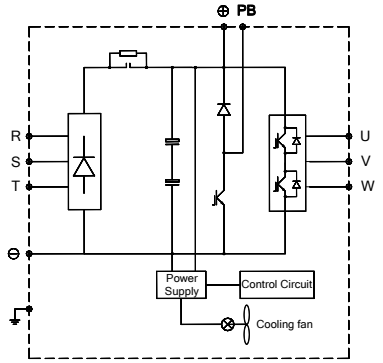
The main circuit terminal functions of EM630 are as shown in Table 3–2 and please correctly wire terminals according to functions.

Table 3–2 Main Circuit Terminal Functions

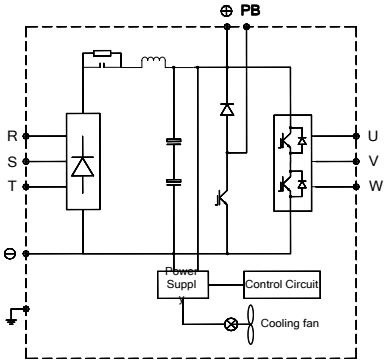
Terminal No.	Function Description
R, S and T	AC power supply input terminal, to be connected to 3-phase AC power supply.
U, V and W	AC output terminals of the Inverter, to be connected to 3-phase AC motor.
⊕⊖	Positive and negative terminals of internal DC bus, to be connected to the external braking unit
⊕, PB	Braking resistor connects to terminals, one end connected to and the other end to PB.
⏚	Grounding terminal

3.2.3 Internal Main Circuit

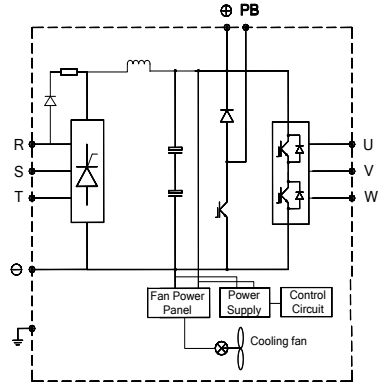
The internal main circuit structure of EM630 is shown in Figure 3–3.



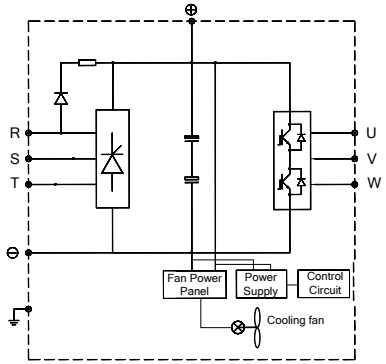
a) EM630-4R0-3B - EM630-7R5-3B



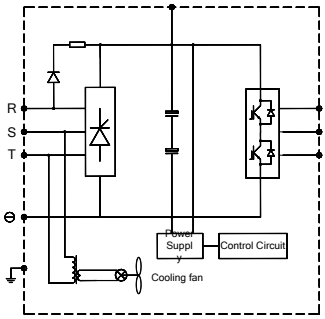
b) EM630-011-3B - EM630-018-3B



c) EM630-022-3B - EM630-200-3B



d) EM630-022-3 - EM630-200-3



e) EM630-220-3 - EM630-400-3

Figure 3–3 Internal Main Circuit of Inverter

3.2.4 Standard Wiring of Main Circuit

The standard wiring of the main circuit of EM630 inverter is shown in Figure 3–4.

- EM630-4R0-3B - EM630-075-3B
- EM630-022-3 - EM630-400-3

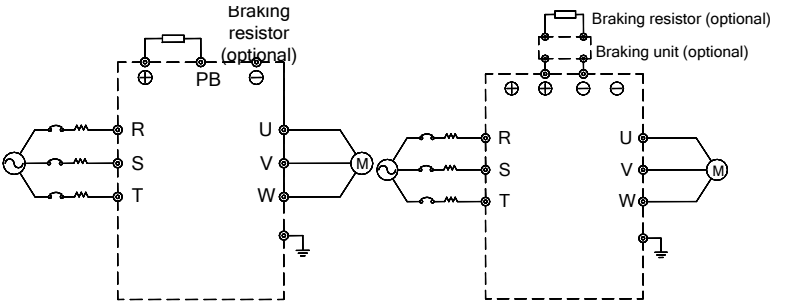


Figure 3–4 Standard Wiring of Main Circuit

3.2.5 Wiring on Input Side of Main Circuit

3.2.5.1 Circuit Breaker Installation

An air circuit breaker (MCCB) corresponding to the inverter is required between the power supply and the input terminals.

- The capacity of MCCB shall be 1.5 to 2 times that of the rated current of the inverter.
- The time characteristics of MCCB must meet the time characteristics of the overheating protection of the inverter (150% rated current/1 minute).
- When MCCB is used with multiple inverters or other devices, please connect the contact of the fault output relay to power contactor coil, so that the power supply will be turned off by a fault signal (Figure 3–5).

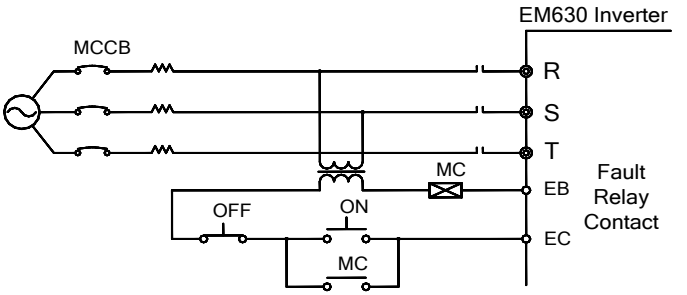


Figure 3–5 Connecting to Input Circuit Breaker

3.2.5.2 Leakage Circuit Breaker Installation

The inverter outputs high-frequency PWM signals, which generate high-frequency leakage current. Please select a leakage circuit breaker with a trigger current ≥ 30mA. For a regular circuit breaker, the trigger current ≥ 200mA and the active time at 0.1 s or above.

3.2.5.3 Electromagnetic Contactor Installation

Connect the electromagnetic contactor corresponding to the inverter power as shown in Figure 3–4.

- Do not control the start or stop of the inverter with the electromagnetic contactor on the input side. Frequent use of this method is an important cause of damaging the inverter. The operation interval between start and stop of the inverter shall not be longer than once every 30 minutes.
- The inverter will not automatically start after power failure.

3.2.5.4 Connection to Terminal Block

The input power can be connected to R, S and T randomly irrespective of their phase sequence on the terminal block.

3.2.5.5 AC Reactor Installation

Excessive surge current may be generated if the inverter is connected to a large capacity (over 600KVA) power transformer or the input power supply is connected to a capacitive load, and this may damage the rectifier. Connect a 3-phase AC reactor (optional) to the input side of the inverter, which not only suppresses peak current and voltage, but also improves the power factors of system.

3.2.5.6 Surge Suppressor Installation

It's required to install a surge suppressor, if there is an inductive load near the inverter, for example electromagnetic contactor, solenoid valve, solenoid coil and electromagnetic circuit breaker.

3.2.5.7 Noise Filter Installation at Power Supply Side

A noise filter may filter the noise transmitted between the power cable and the inverter and the impacts of the noise generated by the inverter on the power grid.

- A special noise filter is required for an inverter; a general noise filter is not adopted for effect purpose.

- Correct and incorrect installation methods of a noise filter (as shown in Figure 3–6 and Figure 3–7)

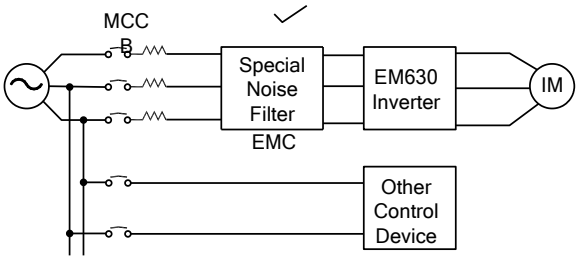
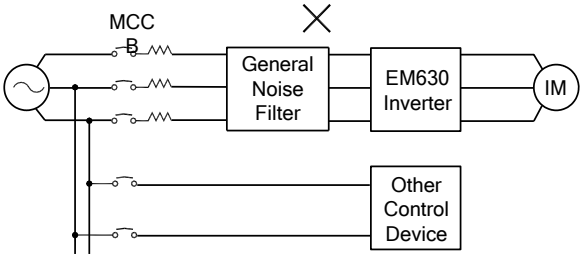
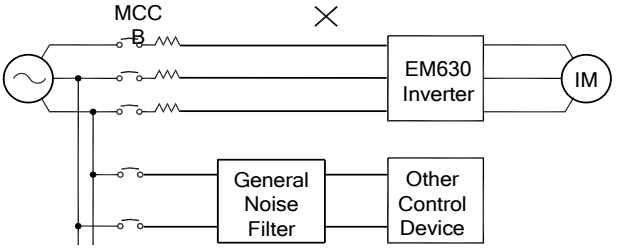


Figure 3–6 Correct Installation of Noise Filter



(a)



(b)

Figure 3–7 Incorrect Installation of Noise Filter

3.2.6 Wiring on Output Side of Main Circuit

3.2.6.1 Inverter and Motor Connection

Connect the output terminals U, V and W of the inverter to the input terminals U, V and W of the motor.

Confirm whether a motor runs forward after receiving a forward running command. If not, please switch any two connection cables of output terminals U, V and W of inverter.

3.2.6.2 Never Connecting the Power Supply Cable to Output Terminals

Never connecting the power supply cable to output terminals. If the output terminals are connected to the power supply, the internal parts of the inverter would be damaged.

3.2.6.3 Never Short-Circuiting or Grounding Output Terminals

Never touch the output terminals with bare hands or connect the output cable to the inverter housing, so as to avoid electric shock or short circuit. In addition, Do not short-circuit the output cable.

3.2.6.4 Never Using an Phase-Shifting Capacitor

Never connect a phase-shifting electrolytic capacitor or an LC/RC filter to the output circuit so as to prevent the inverter from being damaged.

3.2.6.5 Never Using an Electromagnetic Switch

Do not connect a solenoid switch or an electromagnetic contactor to output circuits. Otherwise, it will trigger the action of overcurrent or overvoltage protection circuit or damage the internal parts of the inverter.

To set an electromagnetic contactor for the switch of the power supply, stop the inverter and the motor at first.

3.2.6.6 Noise Filter Installation at Output Side

Connecting a noise filter to the output side of the inverter could reduce the inductive interference and the radio interference.

- Inductive interference: Signal line contains noises due to electromagnetic induction, thus resulting in incorrect actions of control devices.
- Radio interference: high-frequency electromagnetic waves transmitted by the inverter and the cable will cause radio devices nearby to make noises while receiving signals.

- Noise Filter Installation on the Output Side (As Shown in Figure 3–8).

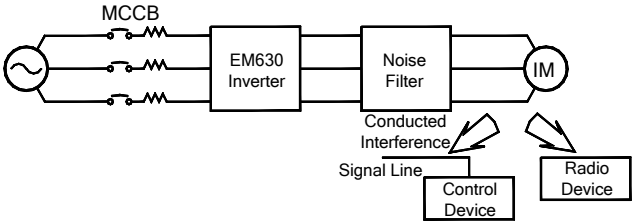


Figure 3–8 Noise Filter Installation on the Output Side

3.2.6.7 Countermeasures Against Inductive Interference

In addition to the installation of a noise filter, the method of the all output cables into the grounded metal pipe can be adopted to suppress the inductive interference on the output side. The distance between the output cable and the signal line shall be greater than 30cm and the inductive interference decreases substantially, as shown in Figure 3–9.

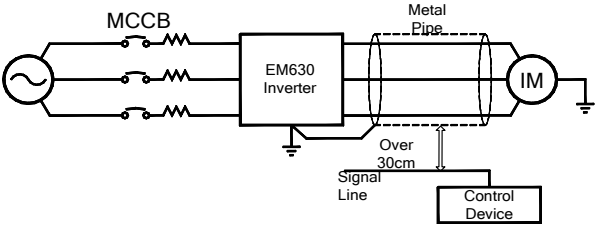


Figure 3–9 Countermeasures Against Inductive Interference

3.2.6.8 Countermeasures Against RF Interference

The RF interference may be produced by input cables, output cables and the inverter and reduced by installing a noise filter on both the input and output sides and covering the inverter with an iron box. See Figure 3–10.

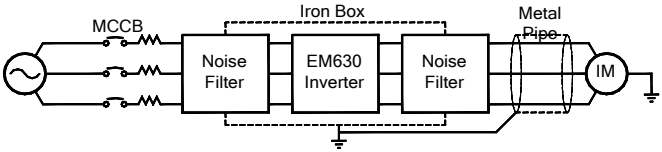


Figure 3–10 Countermeasures Against RF Interference

3.2.6.9 Wiring Distance Between Inverter and Motor

The longer the wiring distance between the inverter and the motor is, the higher the carrier frequency will be and the greater the high-frequency harmonic leakage current on its cables will be accordingly. As a result, an adverse impact may be produced upon the inverter and its devices nearby. Adjust the carrier frequency by reference to Table 3–3 to reduce the high-frequency leakage current.

- If the motor wiring is over 50m, connect a 3-phase inverter output AC reactor of the same capacity to the terminals U, V and W of the inverter.

Table 3–3 Wiring Distance and Carrier Frequency Between the Inverter and the Motor

Wiring Distance Between Inverter and Motor	Below 50m	Below 100m	Below 100m
Carrier Frequency	Below 10 kHz	Below 8 kHz	Below 5 kHz
F00.23 Function Code	10.0	8.0	5.0

3.2.7 Main Circuit Cable and Terminal Screw Size

Main circuit cable and terminal screw sizes are shown in Table 3–4.

Table 3–4 Cable and Terminal Screw Specifications

Model No.	Terminal Symbol	Terminal Screw	Tightening Torque (N.m)	Cable Size (mm^2)	Cable Type
EM630-4R0-3B	⊕,⊖, R, S, T, U, V, W, PB,⏚	M3.5	1.2 - 1.5	4	750V Cable
EM630-5R5-3B		M4	1.5 - 2.0	6	
EM630-7R5-3B					
EM630-011-3B	R, S, T, PB,⊕,⊖, U, V, W	M5	3.0 - 4.0	10	
EM630-015-3B					
EM630-018-3B					
EM630-022-3/3B	R, S, T,⊕,⊖, U, V, W,⏚	M6	4.0 - 5.0	16	
EM630-030-3/3B				25	
EM630-037-3/3B		M8	9.0 - 10.0	25	
EM630-045-3B	⏚,R, S, T, PB,⊕, U, V, W,⏚	M8	9.0 - 10.0	35	
EM630-055-3B		M10	17.0 - 22.0	35	
EM630-075-3B				60	
EM630-045-3	⏚,R, S, T,⊖,⊕, U, V, W,⏚	M8	9.0 - 10.0	35	
EM630-055-3		M10	17.0 - 22.0	35	
EM630-075-3				60	

Model No.	Terminal Symbol	Terminal Screw	Tightening Torque (N.m)	Cable Size (mm^2)	Cable Type
EM630-090-3	R, S, T, ⊕, ⊖, U, V, W, ⏚	M10	17.0 - 22.0	60	
EM630-110-3		M10	17.0 - 22.0	90	
EM630-132-3		M10	17.0 - 22.0	90	
EM630-160-3		M12	31.0 - 39.0	120	
EM630-185-3		M12	31.0 - 39.0	180	
EM630-200-3		M12	31.0 - 39.0	180	
EM630-220-3		2*M10	17.0 - 22.0	2*120	
EM630-250-3		2*M10	17.0 - 22.0	2*120	
EM630-280-3		2*M10	17.0 - 22.0	2*150	
EM630-315-3		2*M12	31.0 - 39.0	2*150	
EM630-355-3		2*M12	31.0 - 39.0	2*150	
EM630-400-3		2*M12	31.0 - 39.0	2*180	

Note: 1. Take the voltage drop into consideration for selecting cables. Generally speaking, the voltage drop value calculated by the following formula shall be less than 5V.

Voltage drop = $\sqrt{3}$ *Cable Resistor (Ω/KM) * Cable Length (m) * Rated Current (A) $*10^{-3}$

2. If the power cable is laid in the plastic duct, it shall be one grade higher.
3. The cable shall be connected to the round wiring terminals of the applicable cable and the terminal screw.
4. The size of grounding cable should be the same as the power cable if the selected power cable is less than $16mm^2$, or not less than 1/2 of the power cable if the selected power cable is greater than $16mm^2$. Anyway, at least $16mm^2$ is a must.

3.2.8 Grounding Cable

- The ground terminal ⏚ must be grounded.
- The third type grounding method specially (grounding resistance less than 10Ω).
- Never share the grounding cable with welder or power device.

- Please select the grounding wire of the specifications as stipulated in the *Technical Standards of Electrical Equipment* and keep it as short as possible when connecting to the ground point.
- Do not allow the grounding cable to form a circuit when two or more inverters are used. Correct and incorrect grounding methods are shown in Figure 3–11.

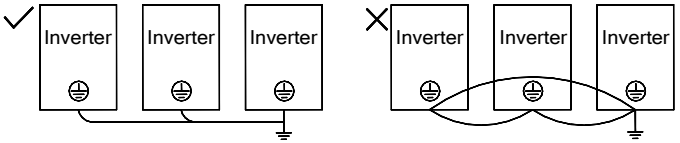


Figure 3–11 Connection Methods of Grounding Cable

3.2.9 Braking Resistor and Braking Unit Wiring

See Chapter 11 for type selection and wiring methods of the braking resistor and the braking unit.

3.3 Wiring Control Circuit Terminals

3.3.1 Control Circuit Terminals

The control circuit terminals are located at the bottom front of the terminal block and the PCB and comprise:

- Analog input terminals: AI1, AI2 and AI3.
- Numeric input terminals: X1, X2, X3, X4, X5, X6 and X7.
- Numeric output terminals: Y1 and Y2.
- Relay output terminals: EA, EB, EC, RA, RB and RC.
- Analog Output Terminals: M1 and M2.
- Auxiliary power supply terminals: PLC, +24V, COM, +10V and GND
- RS485 communication interface: A+ and A-.
- Ground terminal: PE.

See Figure 3–12 for control circuit terminal block.

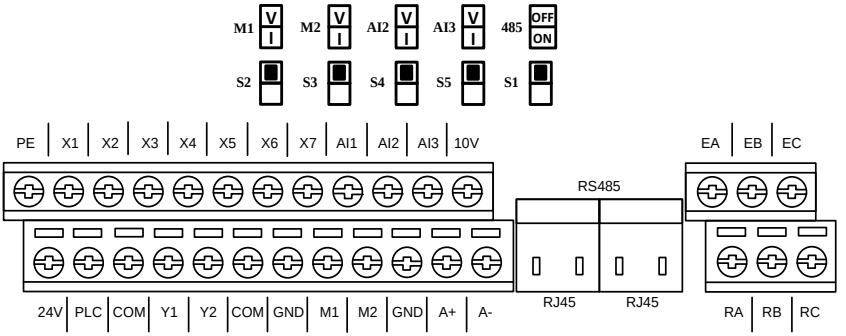


Figure 3–12 Control Circuit Terminal Block

Note: The jump wires J9 and J10 of the terminal block are equipped by the manufacturer. No user is allowed to change them, or else the inverter may not work normally.

3.3.2 Function and Wiring of Control Circuit Terminals

See Table 3–5 for the functions of control circuit terminals.

Table 3–5 Control Circuit Terminal Functions

Mode	Terminal No.	Terminal	Terminal Function
Auxiliary Power Supply	10V-GND	+10V Power Supply	Offers a +10V power supply, maximum output current: 20mA.
	24V-COM	+24V Power Supply	Offers a +24V power supply, generally used as a working power supply for numeric input or output terminal, or external device power supply. Maximum output current: 200mA
	PLC	Multi-function Input Common Terminal	Default setting: connecting to a 24V power supply When driving the numeric input terminal with an external power supply, disconnect it from a 24V and connect it to the external power supply.
Analog Output	AI1-GND	Analog Input Terminal 1	Input voltage range: DC 0 - 10V Input impedance: 1MΩ
	AI2-GND	Analog Input	Input range: DC 0 - 10V/0 - 20mA;

Mode	Terminal No.	Terminal	Terminal Function
		Terminal 2	select the voltage/current mode by the switch S4 on the terminal block Input impedance: voltage mode 1MΩ, current mode 250Ω
	AI3-GND	Analog Input Terminal 3	Input range: DC 0 - 10V/0 - 20mA; select the voltage/current mode by the switch S5 on the terminal block. Input impedance: voltage mode 1MΩ, current mode 250Ω
Numeric Input	X1-COM	Multi-function Input Terminal 1	Optocoupler isolation, compatible with bipolar input of NPN and PNP. Input impedance: 4.5 kΩ Input voltage range: 9 - 30V
	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	
	X7-COM	High Speed Pulse Input Terminal	In addition to being used as multi-function input terminal, it can be used as high speed pulse input terminal as well with the maximum response frequency of 100 kHz. Input voltage: 12 - 48V Input impedance: 1 kΩ
Analog Output	M1-GND	Analog Output Terminal 1	Output range: DC 0 - 10V/0 - 20mA; selected by the switch S2 on the terminal block.
	M2-GND	Analog Output Terminal 2	Output range: DC 0 - 10V/0 - 20mA; selected by the switch S3 on the terminal block.
Multi-Function Output	Y1-COM	OC Output Terminal	Optocoupler isolation, OC output Maximum output voltage: DC48V Output current: 50mA

Mode	Terminal No.	Terminal	Terminal Function
	Y2-COM	High Speed Pulse Output Terminal	Optocoupler isolation, OC output Maximum output voltage: DC48V Maximum output current: 50mA For high speed pulse output, maximum output frequency 100 kHz Output impedance <5 kΩ
Relay Output	EA-EB-EC	Relay Output Terminal	EA-EC: NO EB-EC: NC
	RA-RB-RC		RA-RC: NO RB-RC: NC
Communication	A+	RS-485 communication Terminal	RS485 communication input (+) RS485 communication input (-)
	A-		
Shield	PE	Shielded Ground	For shielded ground of terminal cables

3.3.3 Analog Input Terminal Wiring

3.3.3.1 Wiring Terminals AI1, AI2 and AI3 Through Analog Voltage Signal:

When selecting the analog voltage signal input for terminals AI2 and AI3, configure the voltage mode through switches S4 and S5 of the terminal block. See Figure 3–13.

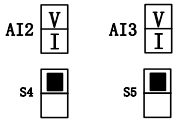
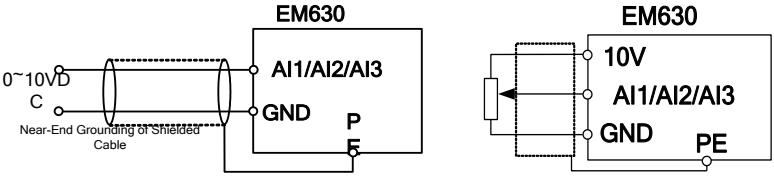


Figure 3–13 Configuring Voltage Modes with S4 and S5

When the analog voltage input signal is powered by the external power supply, terminals AI1, AI2 and AI3 are wired as Figure 3–14-a.

When the analog voltage input signal is generated by potentiometer, terminals AI1, AI2 and AI3 are wired as Figure 3–14-b.



(a) (b)

Figure 3–14 Wiring of Terminals AI1, AI2 and AI3

3.3.3.2 Wiring Terminals AI2 and AI3 (Input Analog Current Signal):

When selecting the analog current signal input on terminals AI2 and AI3, configure the current mode through switches S4 and S5 of the terminal block. See Figure 3–15.

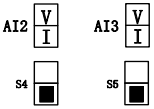


Figure 3–15 Configuring Current Modes with S4 and S5

3.3.4 Wiring of Terminals AI2 and AI3 (As Shown in Figure 3–15)

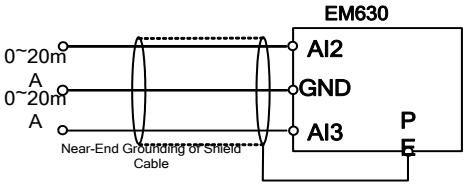
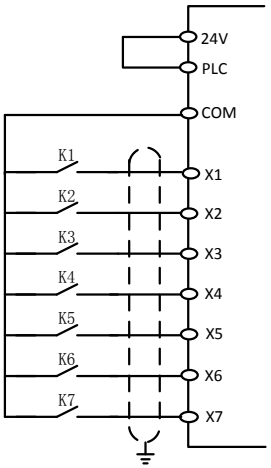


Figure 3–16 Wiring of Terminals AI2 and AI3

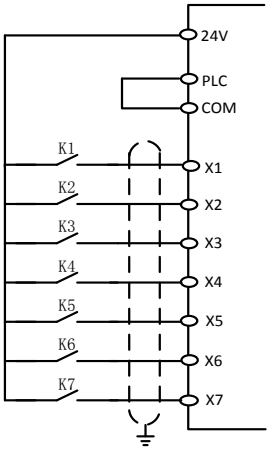
3.3.5 Wiring of Multi-function Input Terminal

The multi-function input terminals of EM630 inverter adopt the full bridge rectifier. The terminal PLC is the common terminal of X1 - X7. The current passing through the PLC terminal can be forward (NPN Mode) or reverse (PNP Mode), so that it is flexible to connect terminals X1 - X7 to external devices. The typical wirings are as shown in the following:

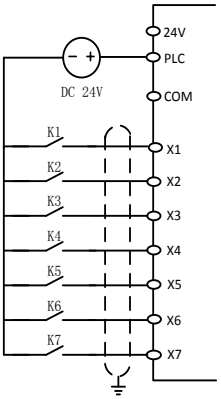
A. NPN mode with internal power supply (+24Vdc)



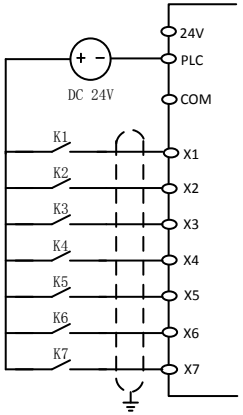
B. PNP mode with external power supply (+24Vdc)



C. NPN mode with external power supply



D. PNP mode with external power supply

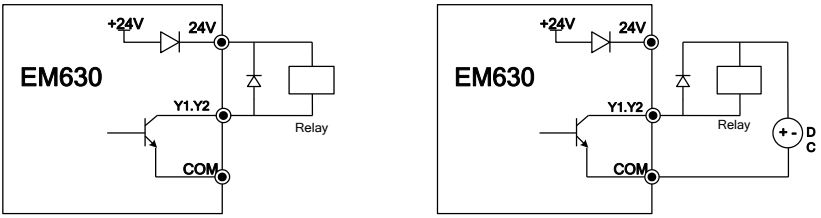


Note: The short-circuit bar relay output terminal wiring between 24V power supply and PLC terminal must be removed, when using an external power supply.

The surge voltage absorbing circuit should be installed to drive the inductive load (relay, contactor, etc.), for example RC absorbing circuit (please note that the leakage current should be less than the holding current of the contactor or relay under control), VDR and fly-wheel diode (for DC electromagnetic circuit, please pay attention to the polarity at installation). The component of absorbing circuit should be installed near the two sides of relay or contactor coil.

3.3.6 Wiring of Multi-function Output Terminal

Y1 and Y2 can be powered by internal 24V or external supply. See Figure 3–17.



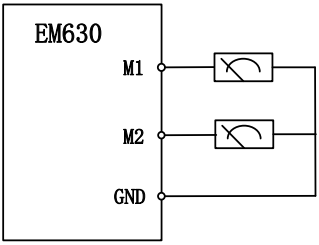
a. Internal power supply b. External power supply

Figure 3–17 Wiring of Multi-function Output Terminal

1. An antiparallel diode must be added, in order to use an internal power supply (as shown in Figure 3–17-a).

3.3.7 Analog Output Terminal Wiring

External analog table of analog output terminals M1 and M2 may indicate multiple physical quantities. Select (0 - 20mA) or (0 - 10V) by DIP switch; M1 corresponds to S2; M2 corresponds to S3. The wiring of DIP switch and terminal is as follows:



V I S2		M1 for analog voltage output
		M1 for analog current output
V I S3		M2 for analog voltage output
		M2 for analog current output

3.3.8 Wiring of Communication Terminal

Communication terminals A+ and A- are RS485 communication interfaces of the inverter. Realize the networking control of the host controller (PLC or PLC controller) and the inverter by connecting to the host controller for communication. RS485 and RS485/RS232 are connected to EM630 inverter as shown in Figure 3–18, Figure 3–19 and Figure 3–20.

- RS485 terminal of single inverter directly connects to the host controller for communication:

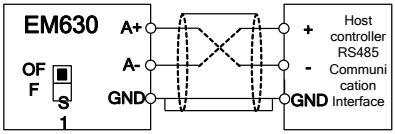


Figure 3–18 Wiring of Single Inverter Communication Interface

- RS485 terminals of multiple inverters connect to the host controller for communication:

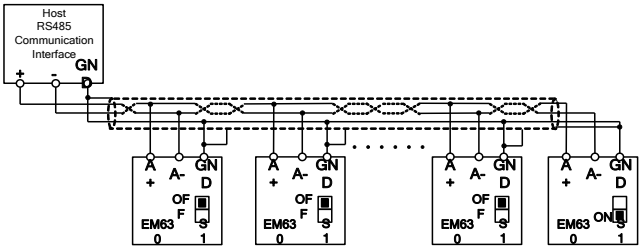


Figure 3–19 Wiring of Communication Interfaces of Multiple Inverters

- Connect to the host controller for communication through RS485/RS232 converter

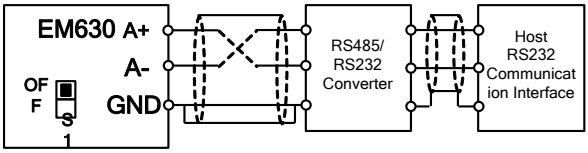


Figure 3–20 Wiring of Communication Interface

3.3.9 Control Circuit Cable and Screw Size

- The length of the cable for transmitting control signal should be limited to 50m and its distance from the power cable should be greater than 30cm, in order to reduce the interference and attenuation of the control signals. Please use the shielded twisted-pair cable when the analog signals are input externally.
- It's recommended to use 0.5 - 1 mm^2 cable as the control circuit cable.
- The terminal block of EM630 inverter shall be through control circuit connection terminal. Please use a PH0 cross screwdriver for installation with

the tightening torque of 0.5N.m.

3.3.10 Attentions for Control Circuit Wiring

- Separate the control circuit cable from other cables.
- Separate the cable of control circuit terminals EA, EB, EC, Y1 and Y2 from the cables of other control circuit terminals.
- To prevent malfunctions caused by interference, use shielded twisted-pair cables for control circuit, with the wiring distance less than 50m.
- Wrap the shield net with insulating tape to prevent the shield net from contacting with other signal cables and housing of device.
- It's not allowed to contact various ports or components without ESD measures.

3.3.11 Standard Wiring of Control Circuit

The standard wiring of the control circuit of EM630 inverter is shown in Figure 3–21.

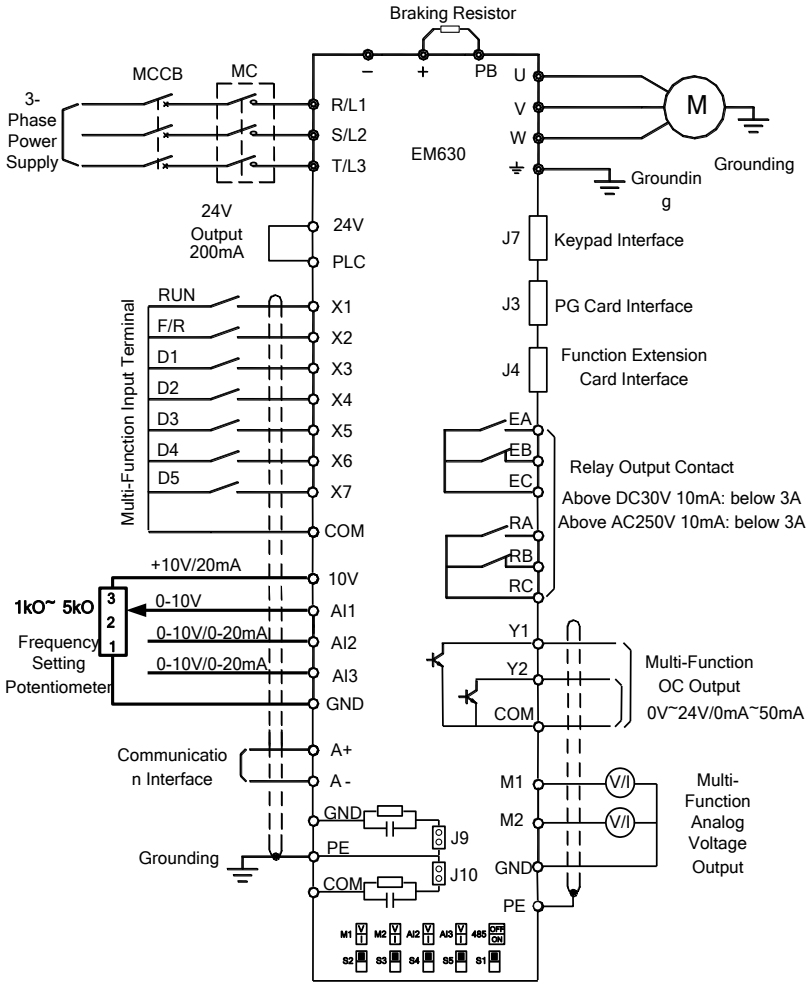


Figure 3–21 Standard Wiring of Control Circuit

3.4 Extending Keypad Wire

1) External keypad interface adopts RJ45 interface and the extending wire is general network cable (connection plug executes the standard EIA/TIA568B).

2) Wiring is shown in Figure 3–22.

This wiring mode will facilitate your installation and debugging greatly.

It's recommended that the keypad extension line is not longer than 3m.

If cables above cat5 are used and the electromagnetic environment is good, the extension line can be up to 15m.

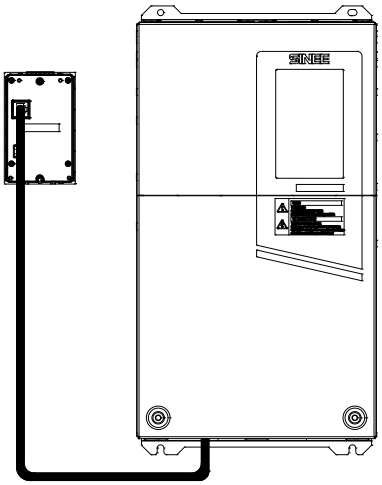


Figure 3–22 Wiring of Keypad Extension Line

3.5 Wiring Verification

Verify the following items after wiring:

- Whether the wiring is incorrect.
- Whether there are screws, connector plugs or wire fragments inside the inverter.
- Whether the screws are loosened.
- Whether the bare wire on one terminal connects to other terminals.

4 Keypad Operation

4.1 Keypad Function

4.1.1 Structure of LED Keypad

The control panels of EM630 can be classified into two categories: LED keypad and LCD keypad.

LED keypad comprises a 5-bit LED display, 8 operation buttons and 8 status and unit indicators.

A user may operate the inverter by keypad through parameter setting, status monitoring, start/stop operation, etc. The keypad's appearance and function area are as shown in Figure 4–1.

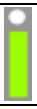
Figure 4–1 LED Keypad

4.1.2 Functions of Buttons and Indicators of LED Keypad

Functions of buttons and indicators of LED keypad are shown in Table 4–1.

Table 4–1 Functions of Buttons and Indicators of LED Keypad

Button/Indicator	Name	Function
	Right Shift	Select the group number and the function code of current function parameters under selection. Select the bit switch monitoring parameters of the parameters under selection.
	Escape	Back to the previous menu. Escape from editing the present parameter by entering menu mode from the monitoring mode.
	Multi-Functional Programmable Button	For non-function, JOG forward, JOG reverse, forward/reverse switch, utmost stop and coast to stop options through the function code F12.00.
	Enter	Enter the next menu. Confirm and save the parameter modification and enter the next parameter.
	Run	Press this button to start the inverter if the keypad control is valid.
	Stop/Reset	Press this button to stop the inverter if the keypad control is active. In the fault status, back to the parameter setting status.
	Up	Select function code, menu group or increase set parameter value. Increase the present effective reference numeric input data.
	Down	Select function parameter, menu group or decrease set parameter value. Decrease the present effective reference numeric input data.
	LED	Display function setting, running monitoring, fault monitoring code and parameter.
	Frequency Indicator	On when the present parameter is frequency.
	Current Indicator	On when the present parameter is current.

Button/Indicator	Name	Function
	Voltage Indicator	On when the present parameter is voltage.
	Percentage Indicator	On when the present parameter is percentage.
	Forward/Reverse Indicator	On at the time of monitoring or displaying some special frequency as negative.
	Communication Control Indicator	On when F00.02 is set to keypad control, off when F00.02 is set to terminal control, flashes when F00.02 is set to communication control.
	Status Indicator	On when the inverter is running, flashes when stopping, off after stop.
	Fault Indicator	On when the inverter is in the fault state.

4.2 LED Keypad Operation Mode

4 menu levels of LED keypad: monitoring (level 0), menu mode selection (level 1), function code selection (level 2) and parameter value (level 3). In the following parts, menu levels are represented by figures.

3 parameter display modes: all menu mode (--A--), displays all function codes; user-defined mode (--U--), only displays the function parameters selected by user through F11 group; non-factory defaults (--C--), only displays those function codes different from the factory setting.

When the keypad is powered, default display is the first monitoring parameter of level 0; press ESC to enter menu level 1, from which using ∧ and ∨ to select a menu mode. The operation procedure for menu mode selection is shown in Figure 4–2.

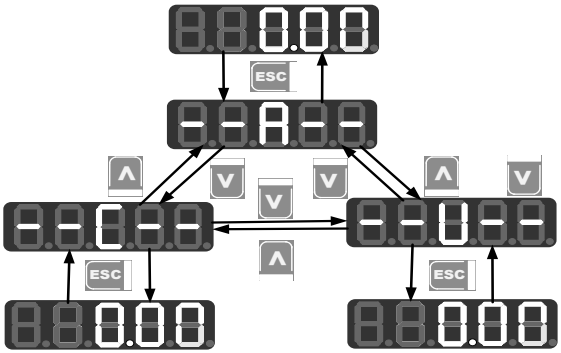


Figure 4–2 Operation Procedure of Menu Mode Selection

4.2.1 All menu mode (--A--)

Press ENTER under the all menu mode to enter the level 2 menu to select any function code. Press ENTER again to enter the level 3 menu to review or modify function parameters. Except some special function parameters, those function parameters needed by users can be modified.

Under the all menu mode, the whole operation procedure from power-on and initialization to changing the value of F03.28 to 5.28 is shown in Figure 4–3.

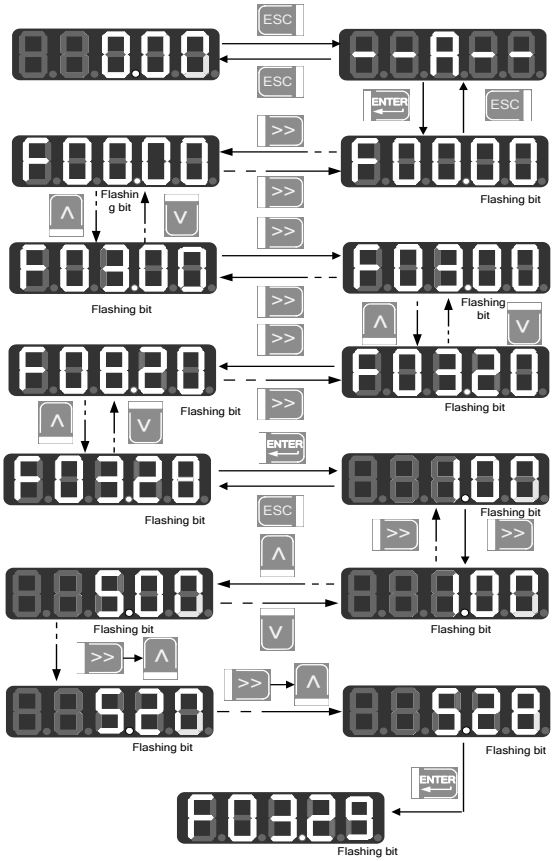


Figure 4–3 Operation Procedure from Power-on to Setting F03.28=5.28

Under all menu modes, press ENTER to save parameter change after having changed the parameter. The difference is that after having saved the parameter: it enters the next function code under all menu mode; it enters the next user-defined function code (as per the sequence in F11.00 - F11.31) under user-defined mode; it enters the next non-factory function code under non-factory defaults mode.

Press ESC to cancel parameter change under the level 3 menu; If the function code is changed to a value as it is, it will exit the level 3 menu and get back to level 2 menu; before completing the change, press ESC to cancel the change with the original parameter value displayed, and press ESC again to exit the level 3 menu and return to the level 2 menu. See Figure 4–4 for details.

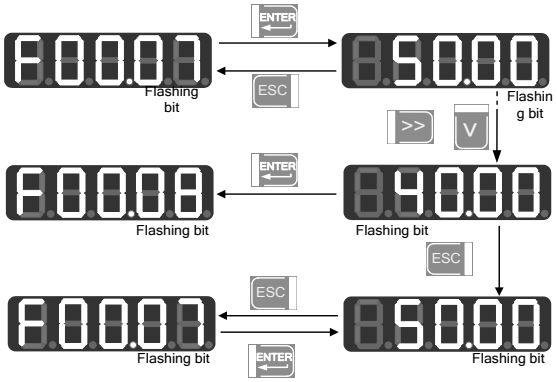


Figure 4–4 Procedure of Cancelling Parameter Change by Pressing ESC

4.2.2 User-Defined Mode (--U--)

When entering the function code group F11 from the all menu mode, the level 3 menu still displays function codes, which can be set as you please. The default display is U00.00 for the first time to enter F11.00, which means that the default function code of F11.00 is F00.00; at this time, the lowest cursor bit flashes and user may set any function parameter as in selecting a function code in the level 2 menu; press ENTER to save setting; when entering the user-defined mode, only corresponding function parameters will be shown.

For instance, we set F11.00 as U00.07 and set F11.01 as U00.09, i.e., F11.00 and F11.01 are respectively defined as F00.07 and F00.09. The letters U and F are used for distinguishing. U means that the function parameter is user defined. See Figure 4–5 for details.

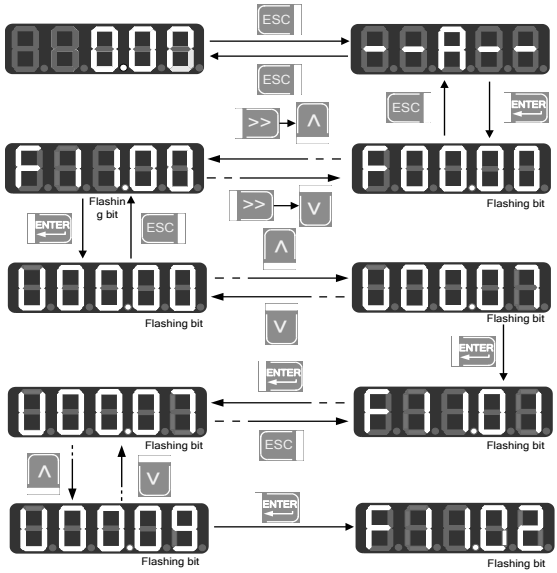


Figure 4–5 Example of User-Defined Mode Setting

Press ENTER under the user-defined mode to enter the level 2 menu, which only displays 32 user-defined codes of F11. Select the codes among these 32 function codes according to user needs; for those functions codes that need to be changed or viewed frequently, user may complete settings by entering F11 group under the all menu mode.

After the codes are defined in F11, we select and enter the user-defined mode again and we can see that the first function code is F00.07 defined by F11.00 and the second function code is F00.09 defined by F11.01 until F11.31. There are 32 function codes. Only 32 function parameters can be displayed by entering this mode. Changing the function parameters under the level 3 menu has the same effect as that under the all menu mode with the same methods. See Figure 4–6.

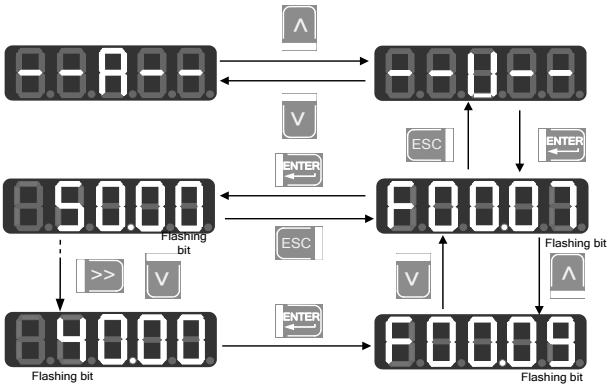


Figure 4–6 Changing Function Code under User-Defined Mode

Press ∧ or ∨ in the level 2 menu under the user-defined mode to switch to the parameters set by the previous or next user, because user can't add or remove any function parameter of the level 2 menu. Switch sequence: from the function parameter defined by F11.00 to the function parameter defined by F11.31.

Press >> in the level 2 menu and the cursor will not shift. After entering the level 3 menu by pressing ENTER, the lowest position of the cursor will flash if the current status of corresponding function code is permitted for change. The method of changing parameters is the same as that in the level 3 menu under all menu mode; after changing, press ENTER to save the change and enter the next user-defined parameter. Changing the parameter in the level 3 menu under different menu modes has the same effect.

4.2.3 Non-factory defaults (--C--)

Press ENTER under this mode to enter the level 2 menu, which displays the first parameter that starts from F00.00 and differs from the default setting of the inverter. No shifting works by pressing >> under this mode; no function group or function parameter may be changed arbitrarily by pressing ∧ or ∨, but one previous/next non-factory default of the function code will be displayed accordingly. The lowest position of the cursor will flash if the current function code is permitted for change. The method of changing parameters is the same as that in the level 3 menu under all menu mode; after changing, press ENTER to save the change and enter the next non-factory default parameter.

For instance, if we set F00.03 as 1 and set F00.07 as 40.00 under the all menu mode, which are not factory defaults, then when entering the non-factory defaults mode, the first displayed value is F00.03; press ∧ to switch to F00.07 and press ∨ to back to F00.03. The following figure will be shown:

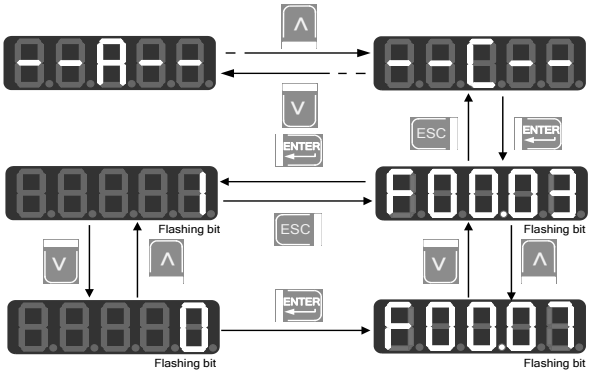


Figure 4–7 Changing Function Parameters under Non-Factory Defaults Mode

4.3 Fault Monitoring

When the inverter is in a fault state, press >> directly to switch among present fault type, fault output frequency, fault output current, fault output voltage, fault control mode and fault working time.

4.4 Operation Monitoring

When the menu displayed is the level 0 monitoring menu, press >> to switch the sequence of 8 monitoring parameters of each function code as per F12.04 - F12.08. If any bit of a function code is set as 1 and confirmed active, user may, through the button, display the value of corresponding monitoring parameter after returning to the monitoring menu; otherwise, if the bit is set as 0, the value of corresponding monitoring parameter will not be displayed.

4.5 Parameter Copy

The keypad could upload and download parameters, facilitating users for parameter setting in using inverters of the same function parameters. When setting the function code F12.03 as 1 and pressing ENTER for confirmation, relevant parameters of the inverter are uploaded to the keypad with the keypad displaying "UP" during uploading; after uploading, the function code will change to 0 automatically. Afterwards, the keypad can be inserted to other inverters that need the same

parameters; set the function code F12.03 as 2 for downloading the parameters saved in the keypad to the inverter, with the keypad displaying "DN" during downloading. After downloading, the function code will change to 0 automatically.

Special attentions are required for the following:

1. To download parameters from the keypad, user must upload parameters at first. Those parameters in the keypad without uploading are unknown; downloading such parameters may disorder the parameters in the inverter and as a result, the inverter may break down. Therefore, download parameters without parameter uploading would prompt "No DN", which indicates that parameters are not downloaded successfully; press ESC to exit, and upload and then download these parameters again.

2. If inverters adopt different CPUA software versions, the keypad prompts "go on" at the time of downloading parameters. Now, user needs to know whether the parameters are available for downloading at two different versions. If available, user may press ENTER for forced execution; if not, press ESC to cancel current operation. The uploading and downloading to/from the two incompatible inverters may easily cause the inverters to fail for operation. Be careful!

3. To use the function, user shall be aware that neither uploading nor downloading involves parameters of the motor parameter groups and after downloading, user needs to set those parameters before use.

4.6 Function of M.K

There are multiple action modes after pressing M.K. The default action is jog forward. When the function code F12.00 changes, the function of the button will change accordingly.

4.7 Run/Stop

Press RUN after setting parameters and the inverter can run normally; press STOP RESET to stop the inverter. By changing the function code F12.00 as 5, M.K will be defined as coast to stop and the inverter will stop running.

When the function code F01.34 is set as "autotuning" mode, it's required to press RUN to make the inverter enter the parameter autotuning status; "TUNE" will be shown during parameter autotuning; after completing autotuning, it will be back to the original display and the function code F01.34 will change to 0 automatically.

The motor may rotate when the inverter is under rotation parameter autotuning. In case of emergency, press STOP RESET to cancel the autotuning. 0

5 Trial Operation

5.1 Trial Operation Procedure

Follow the steps in Table 5–1 for trial operation of EM630 inverter.

Table 5–1 Steps of Trial Operation

Step	Description
Installation	Check the power of the inverter and install the inverter as per requirements in Chapter 2.
Inverter Wiring	Wiring as per the requirements in Chapter 3.
Check before Power-on	Verify that the input power is connected correctly and the input power supply circuit is already connected to the circuit breaker; the inverter is grounded; the power line is connected to the inverter power supply input terminals R, S and T; the motor is properly connected to the output terminals U, V and W of the inverter; the braking resistor is connected between + and PB; the control circuit is properly connected and all limit switches and braker control terminals are connected.
Power-on Check	Check whether there is abnormal sound, foreign odor, fume or the like condition of the inverter. Check whether the power indicator is on and whether the operation panel displays normally or there is no fault alarm. In case of abnormality, please cut the power and check it as per Chapter 9.
Parameter Setting	The F20.01 parameter can be used to set the industry application macro, for which the default setting is 0 (hoisting mechanism). Please check the function code F20.01 before using the inverter and confirm that it matches with the macro.
Correctly Input Motor Nameplate Parameter	Please input the nameplate parameters of the motor driven by the inverter and check the input carefully, or else serious problems may occur during running. Set the parameters of the motor 1 in F01 group. If two motors are used in parallel for a hoist, then either the rated power or the rated current should be the sum of that of the two motors.
Protection Parameter Setting of Motor and Inverter	Properly set the inverter and the motor limit parameters and protection parameters, mainly including maximum frequency, upper limit frequency and fault output. For hoisting equipment, the following protection settings shall be invalid: current limit protection and overvoltage stall protection.

Step		Description
Motor Parameter Autotuning		Before running for the first time, please conduct motor parameter autotuning, in order to obtain the correct electrical parameters of the controlled motor. If the motor load could not be removed, select the motor static autotuning (F01.34=1); afterwards, press ENTER of the keypad first and then press RUN. If the motor is still running, Do not conduct the motor parameter autotuning operation.
Operation Control Parameter Setting	General Parameter	Correctly set the rotational direction, forward/reverse control, acceleration/deceleration time, driving mode, start/stop mode, speed torque control mode and other parameters according to the working conditions of the driving system.
	V/F Control	Set function parameters including the V/F curve, stator voltage drop compensation and slip compensation, according to the load demands.
	Vector Control	Set the regulator parameters according to the load.
Idling Trial Operation Check		When the motor is idling, start the inverter at a low speed with the control handle, and check and confirm the running status of the driving system: Motor: the motor runs stably and rotates normally and correctly; the acceleration/deceleration process is normal, free of abnormal vibration, noise and foreign odor. Inverter: the operation panel displays data normally, the fan rotates normally and the relay acts normally, free from vibration and foreign odor. In case of abnormal condition, immediately stop it and cut the power for checking.
On-Load Trial Operation Check		If the inverter has passed the no-load operation check satisfactorily, conduct the on-load trial operation check. For a hoisting mechanism or an elevator, please correctly connect to the braking unit and the braking resistor. Check whether the inverter runs normally and whether the braking or vortex mechanism acts normally by switching the forward and reverse operation of the handle. Observe whether the inverter outputs corresponding frequency level by level through the master controller's sending of speed signals of all speed levels. The inverter shall stop timely without slip phenomena if the high-speed downward handle is returned to zero . Independent braking unit: please observe whether the braking unit work light flashes.

Step			Description
Normal Operation	Basic Operation		The inverter may realize basic operation functions normally like normal start, operation, stop and F/R. In case of any abnormality, please check whether the input and start/stop function codes are set correctly.
	Performance Setting	S Curve Acceleration/Deceleration	Often used for occasions of high-inertia drive system and occasions sensitive to acceleration to reduce mechanic shock and avoid system vibration.
		DC Braking	Input DC current to the motor before start or stop, in order to generate the braking torque and thus rapidly stop the rotating motor.
		Special Terminal Control	EM630 inverter offers multiple multi-function input/output ports, and offers all solutions together with an external controller.

1. It's strongly recommended to execute the trial operation at a position near the ground, when it is applied for hoisting.
2. The inverter can be used normally only after it has passed the idle trial operation and the full-load trial operation.

5.2 Attentions for Trial Operation

5.2.1 Turn on the Power Switch

Before turning on the power switch, please confirm the following items:

- Correct power voltage: 3-phase AC380V, 50 Hz
- Input power cables are connected to the inverter's output terminals R, S and T.
- The inverter's output terminals U, V and U are connected to the motor's input terminal.
- Control circuit terminals are correctly connected to the control devices and the terminals are disconnected.
- The load motor is idle.

Turn on the power switch when the settings above are correct. ⊕⊖ are the output ends of the inverter's DC bus voltage; ⏚ represents the protective grounding terminal and PB represents the cable end of the braking resistor. Damages of the inverter caused by the incorrect wiring of them are not covered in the warranty.

Confirm the Power-on Status

If the inverter works normally after power-on, the keypad will display the inverter's present status code and parameters. In case of other abnormal display phenomena, see Chapter 9 Troubleshooting.

- Running status observation:

1. Check whether the load runs at a correct direction.
2. At low-speed running, increase the set frequency only when the load machine stabilizes.
3. Change the input frequency or the rotational speed and observe whether the motor has any vibration or noise.
4. During operation, observe the parameters of the monitoring code F18.06 and confirm whether the inverter's output current is normal.

5.3 Attentions for Hoisting Application Operation

5.3.1 Hoist Performance Debugging

- Set F20.00 as 6 and reset.
- Check whether the output terminal controlling the braker is 28 (braker control).
- Control the hoist to go up and go down so as to feel the comfort level.
- Adjust parameters of F20.07, F20.08, F20.10 and F20.11 to obtain higher level of comfort. These parameter regulations should be validated at a position not high above the ground, and sufficiently tested (idle and full-load) before normal use, in order to avoid safety accident. Contact manufacturer whenever necessary.
- Conduct jog up and jog down respectively with the handle and check the hoist position is accurate.
- Swith the inverter to downward running with the handle during its upward running, in order to check whether the function is normal; switch the inverter to upward running with the handle during its downward running, in order to check whether the function is normal.

5.3.2 Tower Crane Hoisting Braker Check

- Set F20.00 as 0 and reset; the defaults of all terminals have been set.
- Set F20.31=80 and connect the terminal Y2 to the buzzer, so as to enable the braker check prompt function.
- After power-on, enable the terminals AI1 and 10V (special braker check button shall be provided) to start the braker check macro under conditions that the tower crane hook is empty and the braker is closed.

- Suppose the braker is loosened and the inverter's terminal Y1 has valid output, an acousto-optical alarm will be given.
- After tightening the braker, press the braker check button for checking the braker again.
- If the braker has an enough torque, the braker check job will automatically terminate within 10 seconds.
- After having been powered for a period (hours) set by F20.31, the inverter would prompt the braker check automatically; the braker prompt lamp is on; user may reset the prompt lamp (or buzzer) and conduct the braker check after completing current work.
- If F20.31 is set as 0, no prompt will be given for braker check, but tower crane driver is obliged to check the braker regularly and ensure the safety of equipment and himself/herself.

5.3.3 Hoisting Applications for Tower Crane

- Stress the necessity of checking the braker.

EM630 inverter has the braker check function, so as to start the braker check regularly by enabling the input terminals 10V and AI1 on the control panel when there is no load held by crane hook. The whole check works automatically and lasts for about 10 seconds.

A failure to check the braker regularly or confirm that there is enough braking force of the braker, will possibly result in slip accidents!

Note 1: It's strongly recommended to execute the trial operation only at a position near the ground.

Note 2. The inverter can be used normally only after it has passed the idle trial operation and the full-load trial operation.

Note 3: Check the braker regularly to ensure the safety of the hoisting process of the tower crane!

Note 4: Only by inputting the motor parameters could the braker check macro work correctly!

6 Function Parameter Table

6.1 Description of Function Codes

EM630 inverter has 22 groups of function codes as shown in Table 6–1, each group having multiple function codes. F18 is a monitoring parameter group and used for viewing the inverter status; F19 is a fault record group and used for viewing three latest faults; other groups are parameter setting groups and used for setting different functions.

Table 6–1 Introduction of Parameters of Function Code Groups

F00	Basic Function Parameter Group	P67; P101	**F01**	Motor 1 Parameter	P68; P109
F02	Input Terminal Function Group	P71; P113	**F03**	Output Terminal Function Group	P73; P120
F04	Start/Stop Control Parameter Group	P76; P129	**F05**	V/F Control Parameter Group	P78; P134
F06	Vector Control Parameter Group	P78; P136	**F07**	Protection Function Setting Group	P80; P140
F08	Preset Speed and Simple PLC	P81;P **错误! 未定义书签。**	**F09**	PID Function Group	P82; P148
F10	Communication Function Group	P82; P148	**F11**	User-Defined Parameter Group	P83; P151
F12	Keypad and Display Function Group	P85; P153	**F13**	Torque Control Parameter Group	P87; P159
F14	Motor 2 Parameter Group	P88; P161	**F15**	Auxiliary Function Group	P88; P161
F16	Customized Function Group	P90; P166	**F17**	Virtual I/O Function Group	P90; P168
F18	Monitoring Parameter Group	P90; P168	**F19**	Fault Record Group	P92; P171
F20	Basic Function Group for Hoist	P94; P174	**F21**	Advanced Function Group for Hoist	P96; P197

Note: If some parameters of EM630 are not used, 0 is returned after read; if user retains some options of some parameters, these options can be set, but may result in abnormal running of the inverter. Please prevent incorrect operation of these parameters.

The table below describes all items of the function code table:

<table>
<tr><td>Function Code</td><td>F00.00 - F99.99: numbering of function codes</td></tr>
<tr><td>Name of Function Code</td><td>Complete names of function codes. "Not Used" means that this function code will be retained temporarily, without actual meaning.</td></tr>
<tr><td>Parameter Description</td><td>Brief Description of Function Codes.
<table>
<tr><td>Entity</td><td>The value of the whole function code represents present parameter selection or meaning.</td></tr>
<tr><td>Decimal Digit</td><td>Represents some options or the present meaning of the present function code.</td></tr>
<tr><td>Binary digit</td><td>Each binary digit represents some options or present meaning of the present function codes</td></tr>
</table></td></tr>
<tr><td>Unit</td><td>Metric unit of function codes. Their units and abbreviations are as follows:
<table>
<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>˚C</td><td>Degree Celsius</td><td>m</td><td>Meter</td></tr>
</table>
★: %: its benchmark is different depending up different physical quantity; kWh: kilowatt-hour.</td></tr>
<tr><td>Default</td><td>Factory defaults of function codes or reset to the defaults (F12.14=1).
<table>
<tr><td>In figures (for example 50.00)</td><td>For various power segments, the present values of the function codes are the default values.</td></tr>
<tr><td>Model</td><td>For different power segments, the function codes have different defaults.</td></tr>
<tr><td>XXX</td><td>For different power segments or batches, the function codes have different defaults.</td></tr>
</table></td></tr>
<tr><td>Property</td><td>Property change of function codes (whether change is permitted and the conditions for change)
<table>
<tr><td>●</td><td>Can be changed while the inverter is running; the present function code can be changed regardless of the status of the inverter.</td></tr>
<tr><td>○</td><td>Can not be changed while the inverter is running; the present function code can be changed except the running status.</td></tr>
<tr><td>×</td><td>Read only: the property of the present function code can not be changed under any status.</td></tr>
</table></td></tr>
</table>

6.2 Function Parameter Table

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F00	**Basic Function Parameter Group**				
F00.00	Not Used				
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1. Not Used 2. Feedback Vector Control (FVC)		2	○
F00.02	Command Source Options	0: Keypad Control (LOC/REM indicator on) 1: Terminal Control (LOC/REM indicator off) 2: Communication Control (LOC/REM indicator flashes)		1	○
F00.03	Terminal Control Mode Options	0: Terminal RUN for running, Forward/Reverse (F/R) 1: Terminal RUN for forward, F/R reverse 2: Terminal RUN for forward, Xi stop, F/R reverse 3: Terminal RUN for running, Xi stop Forward/Reverse (F/R)		1	○
F00.04	Main Frequency Source A Options	0: numeric frequency setting F00.07		0	○
F00.05	Not Used				
F00.06	Frequency Source Options	0: Main Frequency Source A		0	○
F00.07	Numeric Frequency Setting	0.00 Hz - Maximum Frequency	Hz	10.00	●
F00.08 - F00.13	Not Used				
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	3.00	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F00.16	Maximum Frequency	20.00 - 600.00	Hz Hz	55.00	○
F00.17	Upper Limit Frequency Control Options	0: Set through F00.18		0	○
F00.18	Upper Limit Frequency	Lower Limit Frequency F00.19 - Maximum Frequency F00.16	Hz	55.00	●
F00.19	Lower Limit Frequency	0.00 - Upper Limit Frequency F00.18	Hz	0.00	●
F00.20	Not Used				
F00.21	Reverse Control	0: permit forward/reverse 1: prohibit reverse		0	○
F00.22	F/R Deadband Time	0.00 - 650.00	s	0.00	●
F00.23	Carrier Frequency	1.0 - 16.0 (inverter rated power 4 kW) 1.0 - 10.0 (inverter rated power 5.5 - 7.5 kW) 1.0 - 8.0 (inverter rated power 11.00 - 45.00 kW) 1.0 - 4.0 (inverter rated power 55.00 - 90.00 kW) 1.0 - 3.0 (inverter rated power 110.00 - 400.00 kW)	kHz	2.0	●
F00.24	Automatic Adjustment of Carrier Wave	0: Disabled 1: Enabled		1	○
F00.25 - F00.27	Not Used				
F00.28 F00.28	Motor Parameter Group Options	0: Motor 1 Parameter		0	
F00.29	User Password	0 – 65535		0	○
F01	**Motor 1 Parameter**				
F01.00	Motor Type	0: Induction Motor 1: Inverter Motor		0	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F01.01	Motor Rated Power	0.10 - 650.00	kW	Up To Specific Model	○
F01.02	Motor Rated Voltage	50 – 2000	V	Up To Specific Model	○
F01.03	Motor Rated Current	0.01 - 600.00 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	A	Up To Specific Model	○
F01.04	Motor Rated Frequency	0.01 - 600.00	Hz	Up To Specific Model	○
F01.05	Motor Rated Speed	50 – 60000	rpm	Up To Specific Model	○
F01.06	Motor Winding Connection	0: Y 0: Y 1: Δ 1: Δ		Up To Specific Model	○
F01.07	Motor Rated Power Factor	0.600 - 1.000		Up To Specific Model	○
F01.08	Motor Efficiency	30.0 - 100.0	%	Up To Specific Model	○
F01.09	Stator Resistor of Induction Motor	1 - 60000 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	mΩ	Up To Specific Model	○
F01.10	Rotor Resistor of Induction Motor	1 - 60000 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	mΩ	Up To Specific Model	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F01.11	Leakage Inductance of Induction Motor	0.01 - 600.00 (Motor Rated Power ≤ 75 kW) 0.001 - 60.000 (Motor Rated Power >75 kW)	mH	Up To Specific Model	○
F01.12	Mutual Inductance of Induction Motor	0.1 - 6000.0 (Motor Rated Power ≤ 75 kW) 0.01 - 600.00 (Motor Rated Power >75 kW)	mH	Up To Specific Model	○
F01.13	Idling Excitation Current of Induction Motor	0.01 - 600.00 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	A	Up To Specific Model	○
F01.14	Induction Motor Field Weakening Factor 1	10.00 - 100.00	%	87.00	○
F01.15	Induction Motor Field Weakening Factor 2	10.00 - 100.00	%	80.00	○
F01.16	Induction Motor Field Weakening Factor 3	10.00 - 100.00	%	75.00	○
F01.17	Induction Motor Field Weakening Factor 4	10.00 - 100.00	%	72.00	○
F01.18	Induction Motor Field Weakening Factor 5	10.00 - 100.00	%	70.00	○
F01.19 - F01.23	Not Used				
F01.24	Encoder Type	0: ABZ Incremental Encoder 1-3: Not Used 4: Rotary Transformer		0	○
F01.25	Encoder Line Number	1 – 65535		1000	○
F01.26	Not Used				
F01.27	AB Pulse Phase Sequence	0: Forward 1: Reverse		0	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F01.28 - F01.29	Not Used				
F01.30	Rotary Transformer Pole-Pairs	1 - 65535		1	○
F01.31	Not Used			0	○
F01.32	Speed Feedback Disconnection Detection Time	0.0 - 10.0 (0.0:Speed feedback detection invalid)	s	0.0	○
F01.33	Filter Time of Speed Feedback	0.000 - 30.000	s	0.002	○
F01.34	Motor Parameter Autotuning	0: No Autotuning 1: Stationary Autotuning 2: Rotational Autotuning		0	○
F02	**Input Terminal Function Group**				
F02.00	X1 Numeric Input Function	0: No Function 1: Run Terminal "RUN" 2: Direction R/F 3: 3-Wire Sequence Stop Control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6 - 8: Not Used 9: Coast to Stop 10: Fault Reset 11: Preset Speed Terminal 1 12: Preset Speed Terminal 2 13: Preset Speed Terminal 3 14: Preset Speed Terminal 4 15-18: Not Used 19: Acceleration/Deceleration Time Terminal 1 20: Acceleration/Deceleration Time Terminal 2 21: Acceleration/Deceleration Prohibited 22: Pause Operation		1	○
F02.01	X2 Numeric Input Function			2	○
F02.02	X3 Numeric Input Function			11	○
F02.03	X4 Numeric Input Function			12	○
F02.04	X5 Numeric Input Function			13	○
F02.05	X6 Numeric Input Function			14	○
F02.06	X7 Numeric Input Function			10	○
F02.07	AI1 Numeric Input Function			58	○
F02.08	AI2 Numeric Input Function			0	○
F02.09	AI3 Numeric Input Function			0	○
F02.10 - F02.14	Not Used			0	○

<table>
<tr><th>Function Code</th><th>Name of Function Code</th><th>Parameter Description</th><th>Unit</th><th>Default</th><th>Property</th></tr>
<tr><td></td><td></td><td>23: External Fault Input
24-32: Not Used
33: Zero Servo Command
34-44: Not Used
45: Stop and DC Brake
46: DC Brake at Stop
47: Immediate DC Brake
48-49: Not Used
50: External Stop
51-56: Not Used
57: Inverter Enabled
58: Braker Check
59: Braker Release Feedback
60: Braker Close Feedback
61-62: Not Used
63: Landing Deceleration Switch
64: Hoisting Deceleration Switch</td><td></td><td></td><td></td></tr>
<tr><td>F02.15</td><td>Positive/Negative Logic 1 of Numeric Input Terminal</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>X7</td><td>X6</td><td>X5</td><td>X4</td><td>X3</td><td>X2</td><td>X1</td></tr></table>0: Positive Logic, Enabled at On/Disabled at Off
1: Negative Logic, Disabled at On/Enabled at Off</td><td></td><td>00000000</td><td>○</td></tr>
<tr><td>F02.16</td><td>Positive/Negative Logic 2 of Numeric Input Terminal</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>AI3</td><td>AI2</td><td>AI1</td></tr></table>0: Positive Logic, Enabled at On/Disabled at Off
1: Negative Logic, Disabled at On/Enabled at Off</td><td></td><td>00000000</td><td>○</td></tr>
<tr><td>F02.17</td><td>Filter Times of Numeric Input Terminal</td><td>0-100, 0 for No Filter, n for sampling once every n ms</td><td></td><td>2</td><td>○</td></tr>
<tr><td>F02.18</td><td>X1 Effective Delay</td><td>0.000 - 30.000</td><td>s</td><td>0.000</td><td>●</td></tr>
</table>

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	Time				
F02.19	X1 Ineffective 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 Ineffective 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 Ineffective 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 Ineffective Delay Time	0.000 - 30.000	s	0.000	●
F02.26 - F02.30	Not Used				
F02.31	Analog Input Function	Ones place: AI1 0: Not Used 1: Numeric input (0 for less than 1V, 1 for over 3V, the same status as the last time for 1V-3V) Ten place: AI2 0: Not Used 1: Numeric input (the same as above) Hundreds place: AI3 0: Not Used 1: Numeric input (the same as above)		111B	○
F02.32 - F02.60	Not Used				
F03	**Output Terminal Function Group**				
F03.00	Y1 Output Function	0: No Output 1: Inverter Running (RUN) 2: Frequency Reach Range		33	○
F03.01	Y2 Output Function			29	○
F03.02	R1 Output Function			28	○

<table>
<tr><th>Function Code</th><th>Name of Function Code</th><th>Parameter Description</th><th>Unit</th><th>Default</th><th>Property</th></tr>
<tr><td>F03.03</td><td>R2 Output Function</td><td>(FAR)</td><td></td><td>7</td><td>○</td></tr>
<tr><td>F03.04</td><td>Not Used</td><td>3: Output Frequency Detection Range FDT1
4: Output Frequency Detection Range FDT2
5: Reverse running (REV)
6: Jogging
7: Inverter Fault
8: Inverter Ready
9: Upper Limit Frequency Reach
10: Lower Limit Frequency Reach
11: Current Limit Reach
12: Overvoltage Stall Voltage Reach
13-16: Not Used
17: Motor Overload Pre-alarming
18: Inverter Overheating Pre-Alarming
19-23: Not Used
24: Undervoltage Status
25-26: Not Used
27: Run at Zero Speed
28: Braker Control
29: Braker Check Prompt
30: Overload Protection Start
31: Low Voltage Protection Start
32: Not Used
33: Braker Failure</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">F03.05</td><td rowspan="3">Output Signal Type</td><td>D7 D6 D5 D4 D3 D2 D1 D0</td><td rowspan="3"></td><td rowspan="3">00000</td><td rowspan="3">○</td></tr>
<tr><td>* * * * R2 R1 Y2 Y1</td></tr>
<tr><td>0: Level</td></tr>
</table>

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
		1: Monopulse			
F03.06	Positive/Negative Logic of Numeric Output	D7 D6 D5 D4 D3 D2 D1 D0 * * * * R2 R1 Y2 Y1 0: Positive Logic, Enabled at On/Disabled at Off 1: Negative Logic, Disabled at On/Enabled at Off		00000	○
F03.07	Y2 Output Type	0: Common Numeric Output		0	○
F03.08	Not Used				
F03.09	Y1 Effective Delay Time	0.000 - 30.000	s	0.000	●
F03.10	Y1 Ineffective 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 Ineffective 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 Ineffective 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 Ineffective Delay Time	0.000 - 30.000	s	0.000	●
F03.17	Y1 Monopulse Output Time	0.000 - 30.000	s	0.250	●
F03.18	Y2 Monopulse Output Time	0.000 - 30.000	s	0.250	●
F03.19	R1 Monopulse Output Time	0.000 - 30.000	s	0.250	●
F03.20	R2 Monopulse Output Time	0.000 - 30.000	s	0.250	●
F03.21	Analog Output M1	0: Running Frequency (absolute value)		0	○
F03.22	Analog Output M2			4	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F03.23	Not Used	1: Set Frequency (absolute value) 2: Output torque (absolute value) 3: Set Torque (absolute value) 4: Output Current 5: Output Voltage 6: Bus voltage 7: Output power 8-29: Not Used			
F03.24 - F03.26	Not Used				
F03.27	M1 Output Offset	-100.0 - 100.0	%	0.0	●
F03.28	M1 Output Gain	-10.00 - 10.00		1.00	●
F03.29	M2 Output Offset	-100.0 - 100.0	%	0.0	●
F03.30	M2 Output Gain	-10.00 - 10.00		1.00	●
F04	**Start/Stop Control Parameter Group**				
F04.00	Start Mode	0: Start Directly		0	○
F04.01	Start Frequency	0.00 - 10.00	Hz	0.00	○
F04.02	Start Frequency Holding Time	0.00 - 60.00, Disabled at 0.00	s	0.00	○
F04.03	DC Brake Current at Start	0.0 - 100.0 (100.0= Inverter Rated Frequency)	%	100.0	○
F04.04	DC Brake Time at Start	0.00 - 30.00	s	0.00	○
F04.05	DC Brake Field Weakening Time at Start	0.00 - 30.00	s	0.50	○
F04.06	Pre-Excitation Current	50.0 - 500.0 (100.0=Idling Current)	%	100.0	○
F04.07	Pre-Excitation	0.00 - 10.00	s	0.10	○
F04.08 - F04.13	Not Used				
F04.14	Acceleration/Deceleration Mode	0: Linear Acceleration/Deceleration 1: S Curve Acceleration/Deceleration		0	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F04.15	S Curve Start Section Time at Acceleration	0.00 - System acceleration time/2 (F15.13=0) 0.0 - System acceleration time/2 (F15.13=1) 0 - System acceleration time/2 (F15.13=2)	s	2.00	●
F04.16	S Curve End Section Time at Acceleration	0.00 - System acceleration time/2 (F15.13=0) 0.0 - System acceleration time/2 (F15.13=1) 0 - System acceleration time/2 (F15.13=2)	s	2.00	●
F04.17	S Curve Start Section Time at 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	1.00	●
F04.18	S Curve End Section Time at 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	1.00	●
F04.19	Stop Mode	0: Ramp-To-Stop 1: Coast-to-Stop		0	○
F04.20	DC Brake Start Frequency at Stop	0.00 - Maximum Frequency F00.16	Hz	0.00	○
F04.21	DC Brake Current at Stop	0.0 - 100.0 (100.0= Inverter Rated Current)	%	100.0	○
F04.22	DC Brake Time at Stop	0.00 - 30.00, Disabled at 0.00	s	0.00	○
F04.23	DC Brake Field Weakening Time at Stop	0.00 - 30.00	s	0.50	○
F04.24-F04.26	Not Used				

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F04.27	Terminal Start Command Reconfirmation	0: Not to Confirm 1: Confirm		1	○
F04.28 - F04.30	Not Used				
F05	**V/F Control Parameter Group**				
F05.00	V/F Curve Setting	0: Straight V/F 1: Multi-Dot Polyline V/F		1	○
F05.01	Multipoint VF Frequency Point F1	0.00 - F05.03	Hz	0.00	●
F05.02	Multipoint VF Voltage Point V1	0.0 - 100.0 (100.0= Motor Rated Voltage)	%	3.5	●
F05.03	Multipoint VF Frequency Point F2	F05.01 - F05.05	Hz	2.00	●
F05.04	Multipoint VF Voltage Point V2	0.0 - 100.0	%	7.5	●
F05.05	Multipoint VF Frequency Point F3	F05.03 - Motor Rated Frequency (Reference Frequency)	Hz	5.00	●
F05.06	Multipoint VF Voltage Point V3	0.0 - 100.0	%	14.0	●
F05.07 - F05.09	Not Used				
F05.10	V/F Rotor Voltage Drop Compensation Gain	0.00 - 200.00	%	0.00	●
F05.11	V/F Slip Compensation Gain	0.00 - 200.00	%	0.00	●
F05.12	V/F Slip Filter Time	0.00 - 10.00	s	1.00	●
F05.13	Oscillation suppression gain	0.00 - 200.00	%	0.00	●
F05.14	Oscillation suppression end frequency	0.00～600.00	Hz	45.00	●
F05.15 - F05.19	Not Used				
F06	**Vector Control Parameter Group**				

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F06.00	Speed Proportional Gain ASR_P1	0.00 - 100.00		15.00	●
F06.01	Speed Integral Time Constant ASR_T1	0.000 - 30.000 0.000: No Integral	s	0.050	●
F06.02	Speed Proportional Gain ASR_P2	0.00 - 100.00		15.00	●
F06.03	Speed Integral Time Constant ASR_T2	0.000 - 30.000 0.000: No Integral	s	0.080	●
F06.04	Switching Frequency 1	0.00 - Switching Frequency 2	Hz	5.00	●
F06.05	Switching Frequency 2	Switching Frequency 1 - Maximum Frequency F00.16	Hz	10.00	●
F06.06	Speed Loop anti-saturation coefficient	0.000～1.000		0.500	●
F06.07	Time Constant of Output Filter of Speed Loop	0.000 - 30.000	ms	0.000	●
F06.08	Vector Control Slip Gain	50.00 - 200.00	%	100.00	●
F06.09	Not Used				
F06.10	Upper Limit of Speed Control Runing Torque	80.0 - 250.0	%	200.0	●
F06.11	Upper Limit of Speed Control Braking Torque	80.0 - 250.0	%	200.0	●
F06.12	Excitation Current Proportional Gain ACR-P1	0.00 - 10.00		0.25	●
F06.13	Excitation Current Integral Time Constant	0.00 - 300.00 0.00: No Integral	ms	10.00	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	ACR-T1				
F06.14	Torque Current Proportional Gain ACR-P2	0.00 - 10.00		0.25	●
F06.15	Torque Current Integral Time Constant ACR-T2	0.00 - 300.00 0.00: No Integral	ms	10.00	●
F06.16 - F06.19	Not Used				
F06.20	Feedforward Voltage Gain	0～100	%	0	●
F06.21 - F06.40	Not Used				
F07	**Protection Function Setting Group**				
F07.00	Protection Shield	E22 E13 SIU SOU SOC IIP OIP 0: Valid Protection 1: Protection Shielded		0000000	○
F07.01	Motor Overload Protection Gain	0.20 - 10.00		1.00	●
F07.02	Motor Overload Pre-Alarming Factor	50 – 100	%	80	●
F07.03 - F07.05	Not Used				
F07.06	DC Bus Control	0: Invalid 1: Lacking Voltage , Enabled 2: Overvoltage Stall, Enabled 3: Lacking Voltage & Overvoltage Stall, Enabled		0	○
F07.07	Overvoltage Stall Control Voltage	120.0% - 150.0% (380V, 100.0%=537 V)	%	128.5 (690 V)	●
F07.08	Lacking Voltage Control Voltage	60.0 ~ power-off end judgment voltage (100.0 = standard DC bus voltage)	%	76. 0	●
F07. 09	Power-off End Judgment Voltage	F07.08 ~ 100.0	%	86. 0	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F07. 10	Power-off End Judgment delay time	0. 00～100. 00	s	5. 00	●
F07. 11	Current Limit Control	0: Disabled 1: Current Limit Control 1 2: Current Limit Control 2 3: Current Limit Control 3		0	○
F07. 12	Current Limit Level	100.0 - 180.0 (100.0= Motor Rated Current)	%	150.0	●
F07.13	Quick Current Limit Control	0: Disabled 1: Enable		0	○
F07.14 - F07.24	Not Used				
F07.25	Motor Overspeed Detection Level	0.0 - 50.0 (the reference frequency is Maximum Frequency F00.16)	%	20.0	●
F07.26	Motor Overspeed Detection Time	0.0 - 60.0, 0.0: cancel motor overspeed protection	s	0.5	●
F08	**Preset Speed and Simple PLC**				
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16	Hz	25.00	●
F08.01	Preset Speed 2	0.00 - Maximum Frequency F00.16	Hz	5.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16	Hz	35.00	●
F08.03	Preset Speed 4	0.00 - Maximum Frequency F00.16	Hz	15.00	●
F08.04	Preset Speed 5	0.00 - Maximum Frequency F00.16	Hz	20.00	●
F08.05	Preset Speed 6	0.00 - Maximum Frequency F00.16	Hz	25.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16	Hz	45.00	●
F08.07	Preset Speed 8	0.00 - Maximum Frequency F00.16	Hz	35.00	●
F08.08	Preset Speed 9	0.00 - Maximum Frequency F00.16	Hz	40.00	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F08.09	Preset Speed 10	0.00 - Maximum Frequency F00.16	Hz	45.00	●
F08.10	Preset Speed 11	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.11	Preset Speed 12	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.12	Preset Speed 13	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.13	Preset Speed 14	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16	Hz	55.00	●
F08.15 - F08.48	Not Used				
F09	**PID Function Group**				
F09.00 - F09.34	Not Used				
F10	**Communication Function Group**				
F10.00	Inverter Address	1 - 247, 0 as broadcasting address		1	○
F10.01	Modbus Communication Bit Rate	0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 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-N-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)		0	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
		5: 1-8-O-2 (1 start bit + 8 data bits + 1 odd parity + +2 stop bits)			
F10.03	Communication Overtime	0.0 - 60.0, 0.0: Disabled (also works for master - slave system)	s	0.0	●
F10.04	Modbus Response Delay	1 - 20	ms	2	●
F10.05 - F10.09	Not Used				
F10.10	Communication Protocol	0: Modbus-RTU Protocol		0	○
F10.11 - F10.48	Not Used				
F11	**User-Defined Parameter Group**				
F11.00	User-Defined Parameter 1	The content displays Uxx.xx, which means that Fxx.xx function code is selected. If the keypad displays U00.00 at the time of entering the function code F11.00, it means that the first user-defined parameter is F00.00.		U00.00	●
F11.01	User-Defined Parameter 2			U00.01	●
F11.02	User-Defined Parameter 3			U00.02	●
F11.03	User-Defined Parameter 4			U00.03	●
F11.04	User-Defined Parameter 5			U00.04	●
F11.05	User-Defined Parameter 6			U00.07	●
F11.06	User-Defined Parameter 7			U00.14	●
F11.07	User-Defined Parameter 8			U00.15	●
F11.08	User-Defined Parameter 9			U00.16	●
F11.09	User-Defined Parameter 10			U00.18	●
F11.10	User-Defined Parameter 11			U00.19	●
F11.11	User-Defined			U00.29	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	Parameter 12				
F11.12	User-Defined Parameter 13			U02.00	●
F11.13	User-Defined Parameter 14			U02.01	●
F11.14	User-Defined Parameter 15			U02.02	●
F11.15	User-Defined Parameter 16			U03.00	●
F11.16	User-Defined Parameter 17			U03.02	●
F11.17	User-Defined Parameter 18			U03.21	●
F11.18	User-Defined Parameter 19			U04.00	●
F11.19	User-Defined Parameter 20			U04.20	●
F11.20	User-Defined Parameter 21			U05.00	●
F11.21	User-Defined Parameter 22			U05.03	●
F11.22	User-Defined Parameter 23			U05.04	●
F11.23	User-Defined Parameter 24			U08.00	●
F11.24	User-Defined Parameter 25			U19.00	●
F11.25	User-Defined Parameter 26			U19.01	●
F11.26	User-Defined Parameter 27			U19.02	●
F11.27	User-Defined Parameter 28			U19.03	●
F11.28	User-Defined Parameter 29			U19.04	●
F11.29	User-Defined Parameter 30			U19.05	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F11.30	User-Defined Parameter 31			U19.06	●
F11.31	User-Defined Parameter 32			U19.12	●
F12	**Keypad and Display Function Group**				
F12.00	M.K	0: No Function 1: Forward JOG 2: Reverse JOG 3: Forward/Reverse Switch 4: Not Used 5: Coast to Stop		1	○
F12.01	STOP	0: Valid Only at Keypad Control 1: Valid at All Command Channels		1	○
F12.02	Parameter Locking	0: Unlocked 1: Reference Input, Unlocked 2: All Locked Except this Function Code		0	●
F12.03	Parameter Copy	0: No Operation 1: Upload Parameter to Keypad 2: Download Parameter to Inverter		0	○
F12.04	LED Display Parameter 1	00000000 - 11111111 (o for non-displaying, 1 for displaying) bit0: Output Frequency bit1: Set Frequency bit2: Output Current bit3: Output Voltage bit4: DC Bus Voltage bit5: Output Power bit6: Output Torque bit7: Torque Setting		00011111	●
F12.05	LED Display Parameter 2	00000000 - 01011101 (o for non-displaying, 1 for displaying) bit0: PG Feedback Frequency bit1: Not Used bit2: Load Speed		00000000	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
		bit3: Numeric Input Terminal Status 1 bit4: Numeric Input Terminal Status 2 bit5: Not Used bit6: Numeric Output Terminal Status 2 bit7: Not Used			
F12.06 - F12.08	Not Used				
F12.09	Load Speed Display Factor	0.01 - 600.00		30.00	●
F12.10 - F12.13	Not Used				
F12.14	Reset	0: No Operation 1: Reset (exclusive of motor parameter, inverter parameter, manufacturer parameter, running and power-on time record)		0	○
F12.15	Accumulated Power-On Time h	0 - 65535	h	0	×
F12.16	Accumulated Power-On Time min	0 - 59	min	0	×
F12.17	Accumulated Running Time h	0 - 65535	h	0	×
F12.18	Accumulated Running Time min	0 - 59	min	0	×
F12.19	Inverter Rated Power	0.40 - 650.00	kW	Up To Specific Model	×
F12.20	Inverter Rated Voltage	60 - 690	V	Up To Specific Model	×
F12.21	Inverter Rated Current	0.1 - 1500.0	A	Up To Specific Model	×

Function Code	Name of Function Code	Parameter Description	Unit	Default	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	Function Software Serial Number 1	XXX.XX		XXX.XX	×
F12.25	Function Software Serial Number 2	XX.XXX		XX.XXX	×
F12.26	Keypad Software Serial Number 1	XXX.XX		XXX.XX	×
F12.27	Keypad 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	0: Chinese 1: English 2: Not Used		0	●
F12.32	LCD First Line Display Parameters				●
F13	**Torque Control Parameter Group**				
F13.00	Speed/Torque Control	0: Speed Control 1: Torque Control		0	○
F13.01	Torque Setting	0: Numeric Torque Setting F13.02		0	○
F13.02	Numeric Torque Setting	-200.0 - 200.0 (100.0= Motor Rated Torque)	%	150.0	●
F13.03 - F13.05	Not Used				
F13.06	Torque Control Acceleration Time	0.00 - 120.00	s	0.00	●
F13.07	Not Used				

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F13.08	Upper Limit Frequency of Torque Control Choose	0: Set through F13.09		0	○
F13.09	Upper Limit Frequency of Torque Control	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F13.10	Upper Limit Frequency Offset	0.00 - Maximum Frequency F00.16	Hz	2.00	●
F13.11 - F13.17	Not Used				
F14	**Motor 2 Parameter Group**				
F14.00 - F14.57	Not Used				
F15	**Auxiliary Function Group**				
F15.00- F15.02	Not Used				
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	0: Maximum Frequency F00.16 1: 50 Hz		0	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	Reference Frequency				
F15.10 - F15.12	Not Used				
F15.13	Acceleration/Deceleration Time Unit	0: 0.01s 1: 0.1 s 2: 1s		0	○
F15.14 - F15.19	Not Used				
F15.20	FAR Detection Bandwidth	0.00 - 50.00	Hz	2.50	○
F15.21	Output Frequency Detection Range FDT1	0.00 - Maximum Frequency F00.16	Hz	30.00	○
F15.22	FDT1 Hysteresis	0.00 - F15.21 (Monotonic decreasing is active)	Hz	2.00	○
F15.23	Output Frequency Detection Range FDT2	0.00 - Maximum Frequency F00.16	Hz	20.00	○
F15.24	FDT2 Hysteresis	0.00 - F15.23 (Monotonic decreasing is active)	Hz	2.00	○
F15.25 - F15.29	Not Used				
F15.30	Resistance Brake Choose	0: Disable 1: Enable		1	○
F15.31	Operation Voltage of Resistance Brake	120.0 - 140.0 (380V, 100.0=537 V)	%	128.5 (690V)	●
F15.32	Brake Duty Ratio	20 - 100 (100 means that the duty ratio is 1)	%	100	●
F15.33	Control Mode of Set Frequency Lower Than Lower Limit Frequency	0: Run at Lower Limit Frequency 1: Stop		0	○
F15.34	Fan Control	0: Run at Energization 1: Run at Start 2: Run at Intelligent		1	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
		Temperature Control			
F15.35 - F15.37	Not Used				
F15.38	Deadband Compensation Mode	0: Disabled 1: Compensation Mode 1 2: Compensation Mode 2		1	○
F15.39	Terminal JOG Control Priority	0: Disabled 1: Enable		0	○
F15.40	Quick stop Deceleration time	0.00～650.00（F15.13=0） 0.0～6500.0（F15.13=1） 0～65000（F15.13=2）	s	1.00	●
F16	**Customized Function Group**				
F16.00 - F16.05	Not Used				
F16.06	Agent Password	0 - 65535		0	○
F16.07	Set Accumulated Power-On Time Reach	0 - 65535, 0: Power-on Reach Time Protection Disabled	h	0	○
F16.08	Set Accumulated Run Time Reach	0 - 65535, 0: Run Time Reach Protection Disabled	h	0	○
F16.09	Factory Password	0 - 65535		XXXXX	●
F17	**Virtual I/O Function Group**				
F17.00 - F17.36	Not Used				
F18	**Monitoring Parameter Group**				
F18.00	Output Frequency	0.00 - Upper Limit Frequency	Hz	0	×
F18.01	Set Frequency	0.00 - Maximum Frequency F00.16	Hz	0	×
F18.02	PG Feedback Frequency	0.00 - Upper Limit Frequency	Hz	0	×
F18.03	Estimate Feedback Frequency	0.00 - Upper Limit Frequency	Hz	0.00	×
F18.04	Output Torque	-200.0 - 200.0	%	0	×
F18.05	Torque Setting	-200.0 - 200.0	%	0	×
F18.06	Output Current	0.00 - 650.00 (Motor Rated Power ≤ 75 kW) 0.0 - 6500.0 (Motor Rated	A	0	×

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
		Power >75 kW)			
F18.07	Output Current Percentage	0.0 - 300.0 (100.0= Inverter Rated Current)	%	0	×
F18.08	Output Voltage	0.0 - 690.0	V	0	×
F18.09	DC bus Voltage	0 - 1200	V	0	×
F18.10 - F18.13	Not Used				
F18.14	Load Speed	0 - 65535	rpm	0	×
F18.15	UP/DOWN Shifting Frequency	0.00 – 2* Maximum Frequency F00.16	Hz	0.00	×
F18.16 - F18.19	Not Used				
F18.20	Output Power	0.00 - 650.00	kW	0	×
F18.21	Output Power Factor	-1.000 - 1.000		0	×
F18.22	Numeric Input Terminal Status 1	X5 X4 X3 X2 X1 0/1 0/1 0/1 0/1 0/1		00000	×
F18.23	Numeric Input Terminal Status 2	AI3 AI2 AI1 X7 X6 0/1 0/1 0/1 0/1 0/1		00000	×
F18.24	Not Used				
F18.25	Output Terminal Status	* R2 R1 Y2 Y1 0 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 - F18.41	Not Used				
F18.42	Braker Check Time Display	0 - 60000	h	0	×
F18.43	Zero-servo Position Deviation	0～65535		0	×

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F19	**Fault Record Group**				
F19.00	Last Fault Type	0: No Fault SC: Output Short Circuit Protection HOC: Instantaneous Overcurrent HOU: Instantaneous Overvoltage SOC: Stable Overcurrent SOU: Stable Overvoltage SIU: Stable Undervoltage IlP: Input Phase Loss OlP: Output Phase Lose Ol: Inverter Overload OH: Inverter Overheating Protect E11 - E12: Not Used E13: Motor Overload E14: External Fault E15: Inverter EEPROM Fault E16: Communication Abnormality E17: Temperature Sensor Abnormality E18: Soft Start Relay Off E19: Current Detection Circuit Abnormality E20: System Interference E21: Not Used E22: Encoder Fault E23: Keypad EEPROM Fault E24: Parameter Autotuning Abnormality E25: Motor Overspeed Protection E26: Not Used E27: Accumulated Power-On		0	×

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
		Time Reach E28: Accumulated Run Time Reach E29: Internal Communication Fault E30: Braker Sensor Abnormality E31: Joystick Not Cleared E32: Start Check Abnormality			
F19.01	Output Frequency at Fault	0.00 - Upper Limit Frequency	Hz	0.00	×
F19.02	Output Current at Fault	0.00 - 650.00 (Motor Rated Power ≤ 75 kW) 0.0 - 6500.0 (Motor Rated Power >75 kW)	A	0.00	×
F19.03	Bus Voltage at Fault	0 - 1200	V	0	×
F19.04	Running Mode at Fault	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 at Fault		h	0	×
F19.06	Last Fault Type	See F19.00 Parameter Description		0	×
F19.07	Output Frequency at Fault		Hz	0.00	×
F19.08	Output Current at Fault		A	0.00	×
F19.09	Bus Voltage at Fault		V	0	×
F19.10	Running Mode at Fault	See F19.04 Parameter Description		0	×
F19.11	Working Time at Fault		h	0	×
F19.12	Types of Last Two	See F19.00 Parameter		0	×

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	Faults	Description			
F19.13	Output Frequency at Fault		Hz	0.00	×
F19.14	Output Current at Fault		A	0.00	×
F19.15	Bus Voltage at Fault		V	0	×
F19.16	Running Mode at Fault	See F19.04 Parameter Description		0	×
F19.17	Working Time at Fault		h	0	×
F20	**Basic Function Group for Hoist**				
F20.00	Hoisting Mechanism	0: Closed Loop Hoisting Mechanism 1: Open Loop Hoisting Mechanism 2: Travel Mechanism (Trolley Travel) 3: Rotary Mechanism 4: Balanced Travel Mechanism 5: Unbalanced Travel Mechanism 6: Speed Feedback Construction Elevator 7: Non Speed Feedback Construction Elevator		0	○
F20.01	Brake Curve Type	0: Frequency & Current Reach at Same Time Brake Control 1: Frequency Reach Brake Control 2: No Brake Control		0	○
F20.02	Start Direction	0: Same Direction between Brake Release Frequency and Running 1: Brake Release Frequency Direction, Always Forward		1	○
F20.03	Stop Direction	0: Same Direction between Speed at Brake Closing and		1	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
		Running 1: Speed Direction at Brake Closing, Always Forward			
F20.04	Brake Release Current	20.0 - 100.0	%	20.0	●
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	0.40	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	0.40	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.0	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●
F20.09	Brake Release Current Abnormality Judgment Time	0.0 - 10.0	S	3.0	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	0.20	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	0.20	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.0	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●
F20.14	Reverse Control Command	0: Reverse Prohibited during Running 1: Reverse Permitted during Running		1	○
F20.15	Restart at Braking	0: Restart Prohibited at Braking 1: Restart Permitted at Braking		0	○
F20.16	Waiting Time at Restart	0.0 - 10.0	S	0.3	○

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F20.17	Braker Feedback	0: Disabled 1: Detection at Action 2: Full Journey Monitoring		0	○
F20.18	Acceleration/Deceleration Time Change with Speed	0: Disabled 1: Enabled		0	○
F20.19	DC Brake Current Rise Time	0.00 - 20.00	S	0.00	●
F20.20	Braker Fault Judgment Pulse Count at Stop	0 - 10000 (0: Braker Check and Protection Disabled)	Hz	1300	●
F20.21	Decline Speed at Braker Fault	Lower Limit Frequency - 20.00	Hz	0.00	●
F20.22 - F20.24	Not Used				
F20.25	Zero Servo Function	0: Disabled 1: Enabled 2: Automatic		2	●
F20.26	Braker Check Torque	0.0 - 180.0	%	150.0	●
F20.27	Braker Check Torque Holding Time	0.0 - 10.0	S	4.0	●
F20.28	Upper Limit Frequency of Braker Check	Lower Limit Frequency - Upper Limit Frequency Fup	Hz	2.00	●
F20.29	Forward Revolution Detection Delay of Braker Check	0.0 - 10.0	S	0.8	●
F20.30	Reverse Revolution Detection Delay of Braker Check	0.0 - 10.0	S	0.8	●
F20.31	Braker Check Interval	0 - 1000 (0: Disabled)	h	0	●
F21	**Advanced Function Group for Hoist**				
F21.00	Overload	0.0 - 150.0 (0.0: Protection	%	0.0	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	Protection Torque Threshold	Disabled)			
F21.01	Load Detection Time	0.0 - 5.0	S	0.5	●
F21.02	Load Detection Frequency	Brake Release Frequency at Hoisting - fup	Hz	10.00	●
F21.03	Allowing Load Torque	Releasing Rope Torque~100. 0	%	100. 0	○
F21.04	Light-load High-speed Ratio	100.0～200.0	%	100.0	○
F21. 05	Releasing Rope Torque	0. 0～50. 0	%	0. 0	●
F21.06	Absolute Distance Check position	-9999～9999		0	○
F21.07	Absolute Distance Correction Point1	-9999～9999		0	●
F21.08	Absolute Distance Correction Point2	-9999～9999		0	●
F21. 09	Absolute Distance Correction Unit	0：m 1：dm 2：cm		2	○
F21. 10	Rising / Forward Decelerate Position	-9999～9999		0	●
F21. 11	Landing / Reverse Decelerate Position	-9999～9999		0	●
F21.12	Speed Limit Frequency	Brake Release Frequency - Fup		50.00	●
F21.13	Positioning Control Function Selection	0：disable 1：Rising / Forward & Landing / Reverse Enable 2：Precise positioning Enable 3：Both Enable		0	○
F21.14	Goal Position	-9999～9999		0	●
F21.15	Low Voltage Protection	0: Disabled 1: Enabled		0	○
F21.16	Low Voltage Protection Point	70.0 - 100.0	%	90.0	●
F21.17	Low Voltage Filter	0. 000～60. 000	s	0. 500	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	Time				
F21.18	Power-on Parameter Autotuning	0: Disabled 1: Enabled		0	○
F21.19	Motor Fan Control Delay	0.0～600.0	s	100.0	●
F21.20	JOG Switch Judgment Time	0.0 - 20.0	s	5.0	○
F21.21	Special Acceleration	0: Disabled 1: Enabled		0	○
F21.22	Special Deceleration	0: Disabled 1: Enabled		0	○
F21.23	Acceleration Frequency Switching Point 1	0.00 - F21.25	Hz	10.00	●
F21.24	Deceleration Frequency Switching Point 1	0.00 - F21.26	Hz	10.00	●
F21.25	Acceleration Frequency Switching Point 2	F21.23 - F21.27	Hz	20.00	●
F21.26	Deceleration Frequency Switching Point 2	F21.24 - F21.28	Hz	20.00	●
F21.27	Acceleration Frequency Switching Point 3	F21.25 - 600.00	Hz	35.00	●
F21.28	Deceleration Frequency Switching Point 3	F21.26 - 600.00	Hz	35.00	●
F21.29	Not Used				
F21.30	Jog Frequency	0.00～Fmax	Hz	5.00	●
F21.31	Jog Acceleration Time	0.00～600.00	s	1.00	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F21.32	Jog Decelerate Time	0.00～600.00	s	1.00	●
F21.33	Jog Braking Release Type	0：Same as normal braking release frequency 1：Same as Jog Frequency		0	○
F21.34	Jog Braking Close Type	0：Same as normal braking close frequency 1：Same as Jog Frequency		0	○
F21.35	Precision Positioning of Limitation Frequency	0.00～Fmax(F00.16)	Hz	50.00	●
F21.36	Change Step of Acceleration & Deceleration	0.01~50.00	Hz/s	5.00	○
F21.37	Speed Storage Type	0:No Storage 1:Save until Power-off 2: Save anytime		0	○
F21.38	Deceleration Switch of Optimization Function	0:Disable 1:Enable		0	○
F21.39 - F21.43	Not Used				
F21.44	Absolute Distance Checking Point 1 Corresponding Pulse Number of High Bit	0～65535		0	×
F21.45	Absolute Distance Checking Point 1 Corresponding Pulse Number of Low Bit	0～65535		0	×
F21.46	Absolute Distance Checking Point 2 Corresponding Pulse Number of	0～65535		0	×

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	High Bit				
F21.47	Absolute Distance Checking Point 2 Corresponding Pulse Number of Low Bit	0～65535		0	×
F21.48	Current Absolute Distance of High Bit	-999.9～999.9	m	0	×
F21.49	Current Absolute Distance of Low Bit	-9～9	cm	0	×

7 Parameter Description

7.1 F00 Group: General Parameter

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		2	○

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

The inverter can be applied to one-for-multiple occasions and the speed adjustment occasions without high requirements on rapidity and accuracy.

F00.01=1: Not Used

This mode is retained temporarily for manufacturer test and not applicable to users.

F00.01=2: Feedback Vector Control (FVC)

For FVC, in addition to installing an encoder at the motor side, EM630 must equip a PG card matching with the encoder. It is suitable for high-accuracy speed control or torque control. An inverter can drive one motor only, for example high-speed papermaking machine, hoisting machine, elevator and other loads.

1. Before running in the vector control mode, the inverter needs to autotune motor parameters to obtain correct motor parameters and enhance the control performance.
2. While using the vector control mode, the inverter can only have one motor. The motor and the inverter shall not be different from each other in capacity greatly, otherwise the control performance may decrease or the system can not work normally.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.02	Command Source	0: Keypad Control (LOC/REM indicator on) 1: Terminal Control (LOC/REM indicator off) 2: Communication Control (LOC/REM indicator flashes)		1	○

F00.02=0: Keypad Control (LOC/REM indicator on)

The start and stop of the inverter will be controlled with RUN, STOP RESET and M.K of the keypad. Under a condition of no fault, press M.K to enter the jog running mode or press RUN to enter the running mode. When the green LED above the RUN button is always on, it means that the inverter is running; when the green LED above the RUN button flashes, it means that the inverter is in the ramp-to-stop status. No matter whether the reference input of the control mode is speed or torque, the inverter always runs at jog input speed control mode as long as jog is enabled.

F00.02=1: Terminal Control (LOC/REM indicator off)

The start/stop control terminal defined through F02.00 - F02.06 controls the start and stop of the inverter; the detailed configurations of the terminal control are defined through F00.03.

F00.02=2: Communication Control (LOC/REM indicator flashes)

The host controller controls the inverter to start and stop through RS485 communication interface. See 7000H in 12.3.4 Allocation of Register Address.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.03	Terminal Control Mode	0: Terminal RUN, Forward/Reverse (F/R) 1: Terminal RUN forward, F/R reverse 2: Terminal RUN forward, Xi stop, F/R reverse 3: Terminal RUN, Xi stop Forward/Reverse (F/R)		0	○

There are two terminal control modes, 2-wire sequence and 3-wire sequence.

2-Wire Sequence:

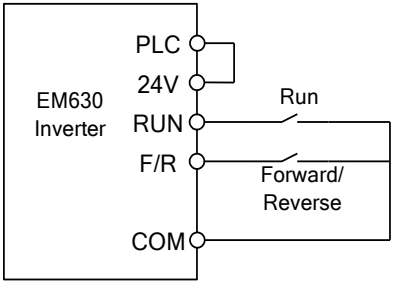
F00.03=0: Terminal RUN, Forward/Reverse (F/R)

ON/OFF of the terminal RUN controls the start and stop of the inverter and OFF/ON of the terminal F/R controls the forward/reverse of the inverter; if F00.21 is set as 1

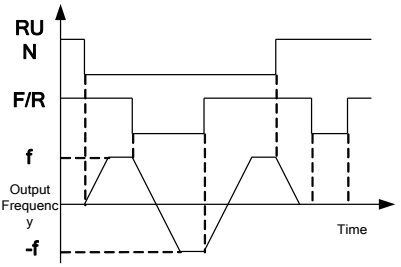
and reverse is prohibited, the terminal F/R is disabled. By selecting the ramp-to-stop for the stop mode, the logic diagram is shown in Figure 7–1 (b).

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

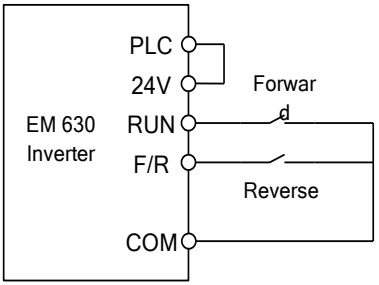
ON/OFF of the terminal RUN controls the start and stop of the inverter and ON/OFF of the terminal F/R controls the reverse/stop of the inverter. When the terminals RUN and F/R are on, the inverter maintains the original state. If reverse is prohibited, the terminal F/R is disabled. When selecting the ramp-to-stop, the control logic of inverter Forward/Reverse is shown in Figure 7–1 (d).



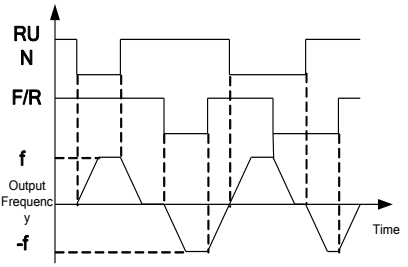
(a) F00.03=0 2-Wire Sequence Wiring Diagra



(b)F04.20=0, F00.03=0 Forward/Reverse Running Sequence



(c) F00.03=1 2-Wire Sequence Wiring Diagram



(d) F04.20=0, F00.03=1 Forward/Reverse Running Sequence

Figure 7–1 2-Wire Sequence

When setting F00.03 as 0 or 1, either pressing STOP RESET or using an external terminal stop command could stop the inverter, even if the terminal RUN is on. At this time, user needs to switch OFF the terminal RUN once again and switch it on, so as to enable the inverter into the running mode again

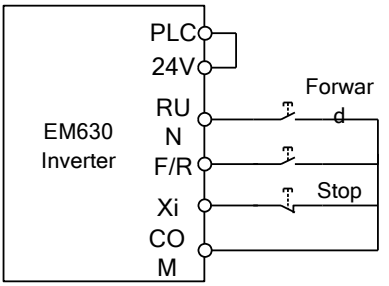
3-Wire Sequence:

F00.03=2: Terminal RUN forward, Xi stop, F/R reverse

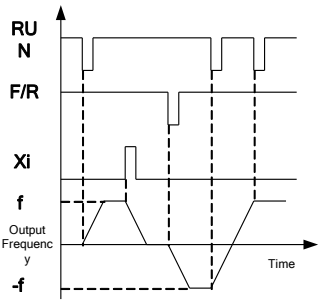
RUN is a NO forward running button and F/R is a NO reverse running button; both of them will be on at pulse edge. Xi is a NC stop button, which is on at the level. Under the running mode, pressing Xi can stop the inverter. By selecting the stop mode "ramp-to-stop" (F04.20=0), see Figure 7–2 (b) for the sequence diagram. Xi is a terminal among X1 - X7 and defined as 3-Wire Sequence Run/Stop Control.

F00.03=2: Terminal RUN, Xi stop, Forward/Reverse (F/R)

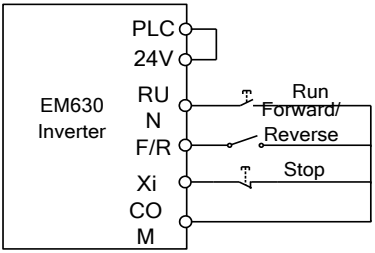
F/R is a forward/reverse switching button (the inverter forwards when F/R is off, and the inverter reverses when F/R is on). RUN is a NO running button, and will be on at pulse edge (F/R is on at level). Xi is a NC stop button, and on at the level. When the stop mode is selected as ramp-to-stop (F0-20=0), the sequence diagram is shown in Figure 7–2(d).



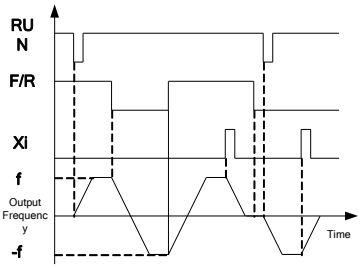
(a) F00.03=0 3-Wire Sequence Wiring Diagram



(b) F04.20=0, F00.03=2 Forward/Reverse Running Sequence



(c) F00.03=3 3-Wire Sequence Wiring Diagram



(d) F04.20=0, F00.03=3 Forward/Reverse Running Sequence

Figure 7–2 3-Wire Sequence

The 3-wire sequence of EM630 Inverter conforms to traditional electrical control method. Please use buttons and knobs correctly as shown in the diagram so as to avoid malfunctions.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.04	Main Frequency Source A	0: numeric frequency setting F00.07		0	○

F00.04=0: Main Frequency Source A

The main frequency is determined through the numeric frequency F00.07.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.06	Frequency Source	0: Main Frequency Source A		0	○

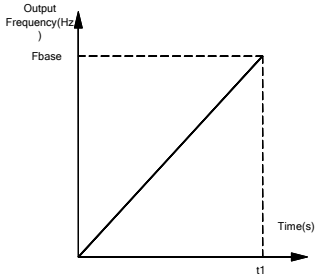
Total setting frequency is determined through the main frequency source A.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.07	Numeric frequency setting	0.00 Hz - Maximum Frequency	Hz	50.00	●

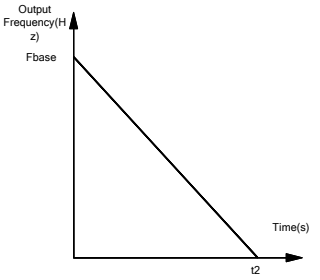
F00.07 is used to set the numeric frequency, with its maximum value limited by the maximum frequency (F00.16).

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	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	3.00	●

The acceleration time refers to the time required for the Output frequency to increase from 0 Hz to the acceleration/deceleration reference frequency Fbase, or the time required for the Output frequency to come down from the acceleration/deceleration reference frequency Fbase to 0 Hz; this has nothing to do with the forward/reverse of the inverter. See Figure 7–3.



(a)Acceleration Time 1



(b)Deceleration Time 1

Figure 7–3 Acceleration/Deceleration Time

Note: there are three acceleration/deceleration time units, 0.01s, 0.1 s and 1s, which are determined through F15.13.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.16	Maximum Frequency	20.00 - 600.00	Hz	50.00	○

F00.16 is the maximum operating frequency of the inverter and denoted by Fmax (range: 20.00 - 600.00 Hz).

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.17	Upper Limit Frequency Control	0: Set through 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 Limit Frequency F00.18	Hz	0.00	●

F00.17=0: Set through F00.18

The upper limit frequency is independently set through F00.18.

F00.18 is the maximum operating frequency after the inverter starts and denoted by Fup (range: Fdown - Fmax).

F00.19 is the minimum operating frequency after the inverter starts and denoted by Fdown (range: 0.00 Hz - Fup).

1. The upper limit frequency and the lower limit frequency shall be set carefully according to the nameplate parameters and working conditions of the controlled motor. Otherwise, the motor, after having worked for a long time at a low frequency, would lose its service life due to overheating.
2. The relationship among maximum frequency, upper limit frequency and lower limit frequency: 0.00 Hz≤Fdown≤Fup≤Fmax≤600.00 Hz.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.21	Reverse Control	0: Enabled 1: Disabled		0	○
F00.22	F/R Deadband Time	0.00 - 650.00	s	0.00	●

F00.21=0: Enabled

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

F00.21=1: Disabled

If the motor can run at one direction only, then the terminal F/R is disabled.

Select the status when the motor switches between forward and reverse.

If F00.22=0.00, the switch between forward and reverse completes smoothly.

If F00.22≠0, then the inverter runs for the time set through F00.22 at 0 Hz first and reverses until the set frequency is reached, after the rotation speed decreases to 0 Hz at the time of switch between forward and reverse. See Figure 7–4.

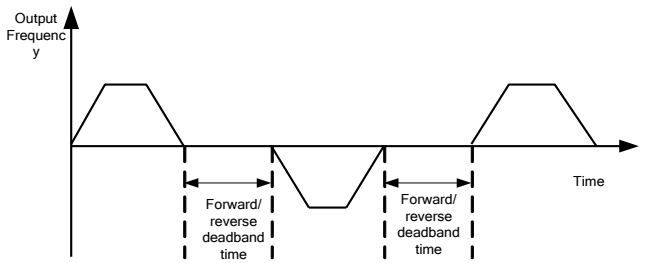


Figure 7–4 Forward/Reverse Deadband Time

1. If reverse is enabled, the inverter judges the direction according to the status of the terminal F/R. If the set forward direction is inconsistent with the wished motor direction, switch any two of the output terminals U, V and W of the inverter.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.23 F00.23	Carrier Frequency	1.0 - 16.0 (inverter rated power 4 kW) 1.0 - 10.0 (inverter rated power 5.5 - 7.5 kW) 1.0 - 8.0 (inverter rated power 11.00 - 45.00 kW) 1.0 - 4.0 (inverter rated power 55.00 - 90.00 kW) 1.0 - 3.0 (inverter rated power 110.00 - 400.00 kW)	kHz	2.0	●

Increasing the carrier wave could reduce the motor noise, but may result in the increase of the inverter heating. When the carrier frequency is higher than the default value, increasing of the carrier frequency by 1 kHz requires the load to decrease to some extent. Please set F00.24=1, and at this time, the inverter will automatically adjust the actual carrier frequency based upon the current.

It's recommend to set the relationship between the rated power and carrier frequency of the inverter as shown in Table 7–1.

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

Inverter Frequency Pe	4 kW	5.5 kW - 7.5 kW	11 kW – 45 kW	55 kW – 90 kW	110 kW – 400 kW
Rated Carrier	8.0 kHz	6.0 kHz	4.0 kHz	2.0 kHz	2.0 kHz
Maximum Allowed Carrier	16.0 kHz	10.0 kHz	8.0 kHz	4.0 kHz	3.0 kHz

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.24	Automatic Adjustment of Carrier Frequency	0: Disabled 1: Enabled		1	○

F00.24=0: Disabled

The carrier frequency is set through F00.23, limited by maximum carrier and will not change during running.

F00.24=1: Enabled

The carrier frequency set through F00.23 is affected by the inverter temperature and load level. If the inverter has an excessively high temperature or load, the carrier wave will be limited. When the set carrier frequency F00.23 is greater than the limit value, the limit value shall be used as the carrier frequency of the inverter.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.28	Motor Parameter Group	0: Motor 1 Parameter		0	○

F00.28=0: Motor 1 Parameter

The motor regulation parameters are F01 group and F06 group.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.29	User Password	0 - 65535		0	○

F00.29 is used to set a new password to enable the password protection function and avoid misoperation of the function codes of the inverter. If the new password is 0, then the password protection function is disabled.

7.2 F01 Group: Motor 1 Parameter

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.00	Motor Type	0: Induction Motor 1: Inverter Motor		0	○
F01.01	Motor Rated Power	0.10 - 650.00	kW	Up To Specific Model	○
F01.02	Motor Rated Voltage	50 - 2000	V	Up To Specific Model	○
F01.03	Motor Rated Current	0.01 - 600.00 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	A	Up To Specific Model	○
F01.04	Motor Rated Frequency	0.01 - 600.00	Hz	Up To Specific Model	○
F01.05	Motor Rated Speed	50 - 60000	rpm	Up To Specific Model	○

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.06	Motor Winding Connection	0: Y 0: Y 1: Δ 1: Δ		Up To Specific Model	○
F01.07	Motor Rated Power Factor	0.600 - 1.000		Up To Specific Model	○
F01.08	Motor Efficiency	30.0 - 100.0	%	Up To Specific Model	○

Note: For the first time when the inverter is wired to the motor, please set the parameters above as per the motor nameplate before inverter running.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.09	Stator Resistor of Induction Motor	1 - 60000 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	mΩ	Up To Specific Model	○
F01.10	Rotor Resistor of Induction Motor	1 - 60000 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	mΩ	Up To Specific Model	○
F01.11	Leakage Inductance of Induction Motor	0.01 - 600.00 (Motor Rated Power ≤ 75 kW) 0.01 - 60,000 (Motor Rated Power >75 kW)	mH	Up To Specific Model	○
F01.12	Mutual Inductance of Induction Motor	0.1 - 6000.0 (Motor Rated Power ≤ 75 kW) 0.01 - 600.00 (Motor Rated Power >75 kW)	mH	Up To Specific Model	○
F01.13	Idling Excitation Current of Induction Motor	0.01 - 600.00 (Motor Rated Power ≤ 75 kW) 0.1 - 6000.0 (Motor Rated Power >75 kW)	A	Up To Specific Model	○

F01.09 - F01.13 are motor parameters. However, user could not get these parameters generally. Please autotune the motor parameters.

Before autotuning the motor parameters, the inverter automatically sets the nameplate parameters of the motor defined through F01.00 - F01.08 as standard motor parameters.

Meanings of motor parameters are illustrated in Figure 7–5:

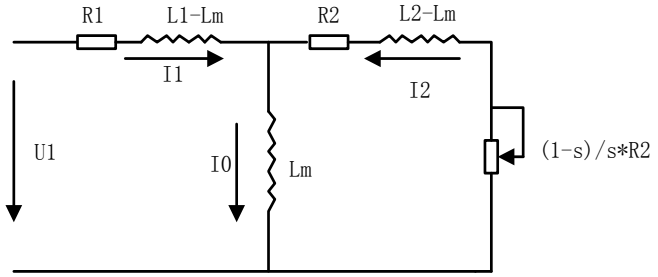


Figure 7–5 Stable Equivalent Model of Induction Motor

In the figure, R1, L1, R2, L2, Lm and I0 refer to stator resistor, stator inductance, rotor resistor, rotor inductance, stator & rotor mutual inductance, and idling excitation current respectively.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.14	Induction Motor Field Weakening Factor 1	10.00 - 100.00	%	87.00	○
F01.15	Induction Motor Field Weakening Factor 2	10.00 - 100.00	%	80.00	○
F01.16	Induction Motor Field Weakening Factor 3	10.00 - 100.00	%	75.00	○
F01.17	Induction Motor Field Weakening Factor 4	10.00 - 100.00	%	72.00	○
F01.18	Induction Motor Field Weakening Factor 5	10.00 - 100.00	%	70.00	○

The field weakening factors in F01.14 - F01.18 will be automatically set in motor parameter autotuning. Generally speaking, user does not set these factors.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.24	Encoder Type	0: ABZ Incremental Encoder 1 - 3: Not Used 4: Rotary Transformer		0	○

EM630 inverter supports multiple encoder types. Different encoders should be equipped with different PG cards, so please select a correct PG card. After installation, set F01.24 correctly according to specific conditions, otherwise the inverter may not run normally.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.25	Encoder Line Number	1 - 65535		1000	○

When the inverter is in the FVC control mode, user must set the encoder pulse count correctly, otherwise the motor will not run normally.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.27	AB Pulse Phase Sequence	0: Forward 1: Reverse		0	○

If the PG feedback frequency and the set frequency are found with opposite directions during debugging, set F01.27 as 1 when F01.27 = 0 and set F01.27 as 0 when F01.27 = 1.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.30	Rotary Transformer Pole-Pairs	1 - 65535		1	○

The rotary transformer has certain number of pole-pairs. While using this encoder, the parameters for pole-pairs must be set correctly .

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F01.32	Speed Feedback Disconnection Detection Time	0.0 - 10.0	s	0.0	○
F01.33	Filter Time of Speed Feedback	0.000 - 30.000	ms	1.000	○

When detecting the feedback disconnection, the inverter will report an encoder fault (22) after reaching the time set through F01.32.

F01.33 is the filter time of speed feedback. No need to adjust generally ,and default value could be used.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property

F01.34	Motor Parameter Autotuning	0: No Operation 1: Stationary Autotuning of Induction Motor 2: Rotational Autotuning of Induction Motor		0	○

F01.34=0: No Autotuning

F01.34=1: The motor remains stationary in parameter (F01.09 - F01.13) autotuning.

F01.34=2: The motor rotates in parameter (F01.09 - F01.13) autotuning .

- After parameters are autotuned, F01.34 will be set as 0 automatically.
- When the slip compensation is enabled, please autotune motor parameters, so as to enable the motor to obtain optimal operating performance.
- Valid only under the keypad start/stop control mode.

Note: Before setting the parameter autotuning, please set the start/stop control mode as keypad start/stop control (F00.02=0). Before using the drive control mode FVC, please perform the parameter autotuning for one time so as to have better control effects.

7.3 F02 Group: Input Terminal Parameter

EM630 inverter has 7 multi-functional input terminals and 3 analog quantity input terminals (fixed for numeric input, i.e., F02.31=111B, which can not be set.).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F02.00	X1 Numeric Input Function	See Table 7–2 Numeric Multi-Function Input Terminals		1	○
F02.01	X2 Numeric Input Function			2	○
F02.02	X3 Numeric Input Function			11	○
F02.03	X4 Numeric Input Function			12	○
F02.04	X5 Numeric Input Function			13	○
F02.05	X6 Numeric Input Function			14	○
F02.06	X7 Numeric Input Function			10	○
F02.07	AI1 Numeric Input Function			58	○
F02.08	AI2 Numeric Input Function			0	○
F02.09	AI3 Numeric Input Function			0	○

X1 - X7 and AI1 - AI3 are 10 numeric multi-function input terminals. By setting the function codes F02.00 - F02.09, user may define the functions of those input terminals respectively.

For example, if F02.00=1, X1 is "RUN". If the terminal control (F00.02=1) is selected as the command source, then the inverter starts the function RUN when X1 terminal input is valid. See Table 7–2 for specific function options.

Table 7–2 Numeric Multi-Function Input Terminals

Set Value	Function	Description
0	No Function	Set "0: No Function" for an unused or fault terminal to prevent false Output.
1	RUN	If the terminal control (F00.02=1) is selected as the command source, the inverter executes the function RUN as per the set value of F00.03 under the condition that the function terminal is enabled. (See F00.03 Function Code)
2	R/F	If the terminal control (F00.02=1) is selected as the command source, the inverter executes the function F/R according to the setting value of the terminal control mode F00.03 under the condition that the function terminal is enabled. (See F00.03 Function Code)
3	3-Wire Sequence Stop Control	If the terminal control (F00.02=1) is selected as the command source and the terminal control mode is 3-wire sequence control (F00.03=2/3), the inverter executes the stop command under the condition that the function terminal is enabled. (See F00.03 Function Code)
4	Forward JOG (FJOG)	If the terminal control (F00.02=1) is selected as the command source, the inverter runs forward under the condition that FJOG function terminal is enabled. The inverter reverses, if RJOG function terminal is enabled. If both FJOG and RJOG are enabled, the inverter will be in the ramp-to-stop status. See **错误!未找到引用源。**. ★ If reverse is prohibited, FJOG is disabled.
5	Reverse JOG (FJOG)	
6 - 8	Not Used	
9	Coast to Stop	The inverter will be blocked for Output and coast to stop, if this function terminal is enabled during the running. At this time, the inverter is not controlled by the inverter
10	Fault Reset	This terminal can be used for resetting the inverter, if the inverter fails and the failure is remedied after that. It has the same functions as the reset button on the keypad.

<table>
<tr><th>Set Value</th><th>Function</th><th>Description</th></tr>
<tr><td>11</td><td>Preset Speed Terminal 1</td><td rowspan="16">If the speed control and the main frequency source A are set, user can define 4 function input terminals as preset speed terminals. The combined code of the 4 terminals, and the setting of relevant function codes determine the present frequency setting of the inverter. As stated in the following table: (0/1: present function terminal disabled/enabled). See Table 7–5.
★ If no option has been selected for the input terminal of a function, the default value is 0 (disabled).
<table>
<tr><th>14</th><th>13</th><th>12</th><th>11</th><th>Inverter Setting Frequency</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>Determined by the main frequency sou A (F00.04)</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>Preset Speed 1 (F08.00)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>Preset Speed 2 (F08.01)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>Preset Speed 3 (F08.02)</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>Preset Speed 4 (F08.03)</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>Preset Speed 5 (F08.04)</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>Preset Speed 6 (F08.05)</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>Preset Speed 7 (F08.06)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>Preset Speed 8 (F08.07)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>Preset Speed 9 (F08.08)</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>Preset Speed 10 (F08.09)</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>Preset Speed 11 (F08.10)</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>Preset Speed 12 (F08.11)</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>Preset Speed 13 (F08.12)</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>Preset Speed 14 (F08.13)</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>Preset Speed 15 (F08.14)</td></tr>
</table></td></tr>
<tr><td>12</td><td>Preset Speed Terminal 2</td></tr>
<tr><td>13</td><td>Preset Speed Terminal 3</td></tr>
<tr><td>14</td><td>Preset Speed Terminal 4</td></tr>
<tr><td>15 - 18</td><td>Not Used</td></tr>
<tr><td>19</td><td>Acceleration/Deceleration Time Terminal 1</td><td>EM630 inverter has four groups of acceleration/deceleration terminals, each group having two input terminals for acceleration and deceleration. The setting of the combined code of the 4 terminals, and relevant functions determines the present acceleration/deceleration time. As stated in the following table: (0/1: present function terminal disabled/enabled). See function codes F15.03 - F15.13.</td></tr>
<tr><td>20</td><td>Acceleration/Deceleration Time</td><td>
<table>
<tr><th>20</th><th>19</th><th>Acceleration/Deceleration Time</th></tr>
<tr><td>0</td><td>0</td><td>Group 1 (Acceleration Time: F00.14, Deceleration Time: F00.15)</td></tr>
</table></td></tr>
</table>

Set Value	Function	Description		
	Terminal 2	0	1	Group 2 (Acceleration Time: F15.03, Deceleration Time: F15.04)
		1	0	Group 3 (Acceleration Time: F15.05, Deceleration Time: F15.06)
		1	1	Group 4 (Acceleration Time: F15.07, Deceleration Time: F15.08)
		If the acceleration/deceleration time terminal is disabled, the command for acceleration/deceleration is prohibited and the Output frequency of the inverter remains stable. If the inverter is under the overcurrent protection status, run the inverter as per the current limit mode.		
22	Pause	The inverter ramps to stop, but all running parameters are memorized, for example PLC parameter, wobbulation parameter and PID parameter. If the terminal is disabled, the inverter is reset to the pre-stop running status.		
23	External Fault Input	Input the fault signal of external devices through this terminal, so that the inverter monitors and protects peripherals for the faults. Upon receiving the external fault signal, the inverter displays "E14", and acts as per the action option 1 (F07.22 not used) at fault.		
24 - 32	Not Used			
33	Zero Servo Command	Under the control mode F00.01=2 or F20.25=5, the inverter enters the zero servo status if the terminal is enabled at stop status; it resets to the pre-start status after this terminal is disabled.		
34 - 44	Not Used			
45	Stop and DC Brake	Trigger the stop command, and start braking when the stop and DC brake start frequency (F04.21) is reached. The brake time shall be either terminal closing time or stop and DC brake time (F04.23), see whichever is longer.		
46	DC Brake at Stop	Not to trigger the stop command, and start braking when the start frequency of the DC brake at stop (F04.21) is reached. The brake time shall be either terminal closing time or the time of DC brake at stop (F04.23), see whichever is longer.		
47	Immediate DC Brake	After this terminal is enabled, the inverter stops and starts DC brake at the present frequency immediately. The brake current is determined by the stop and DC brake current (F04.22).		
48 - 49	Not Used			
50	External Stop	Stop as the set stop mode (F04.20) and acceleration/deceleration 4 (F15.07/F15.08)		

Set Value	Function	Description
51 - 56	Not Used	
57	Enable the Inverter	If the inverter meets other running conditions and this terminal is enabled, then the inverter meets the running conditions; otherwise, the inverter can not run even if the invert meets other running conditions but this terminal is disabled. ★ Enable the inverter: if no terminal option is selected, the default is enabled; if there is only one terminal option, the selected terminal status works; if there are more than one terminal, this terminal will be disabled as long as one of the selected terminals is disabled.
58	Braker Check Input	The inverter starts the braker check, if the rising edge of the present function is enabled.
59	Braker Release Feedback	Used to feed back the present release status of the braker; if the present terminal is enabled, the braker is off. If the present terminal is on when F20.17=1, the braker is on.
60	Braker Closing Feedback	This terminal works only when F20.17=2. If the present terminal is enabled, the braker is on.
61 - 62	Not Used	
63	Landing Deceleration Switch	If this function terminal is enabled in the process of going down, the motor speed will not exceed the speed limit frequency set through F21.12.
64	Hoisting Deceleration Switch	If this function terminal is enabled in the process of going down, the motor speed will not exceed the speed limit frequency set through F21.12.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F02.15	Positive/Negative Logic 1 of Numeric Input Terminal	D7 D6 D5 D4 D3 D2 D1 D0 * X7 X6 X5 X4 X3 X2 X1 0: Positive Logic, Enabled at On/Disabled at Off 1: Negative Logic, Disabled at On/Enabled at Off		00000000	○
F02.16	Positive/Negative Logic 2 of Numeric Input Terminal	D7 D6 D5 D4 D3 D2 D1 D0 * * * * * AI3 AI2 AI1 0: Positive Logic, Enabled at On/Disabled at Off 1: Negative Logic, Disabled at On/Enabled at Off		00000000	○

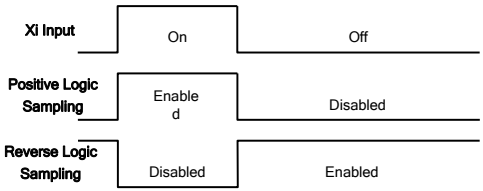


Figure 7–6 Terminal Positive and Negative Logic Sampling

0: enabled when the multi-function input terminal is on, disabled when the multi-function input terminal is off;

1: enabled when the multi-function input terminal is off, disabled when the multi-function input terminal is on;

★: This function is used for matching with other peripherals.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F02.17	Filter Times of Numeric Input Terminal	0 - 100, 0 for No Filter, n for sampling once every n ms		2	○

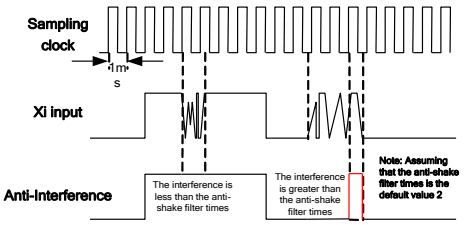


Figure 7–7 Terminal Filtering Sampling

Because multi-function input terminals adopt level triggered mode or pulse triggered mode, when the inverter is reading terminal status, the multi-function input terminal signals have to be processed by digital filtering in order to avoid interference.

★ This code does not need to be adjusted on general conditions. When adjustment is required, please note the relations between filter times and lasting time when terminal is on. It is to avoid that inverter is easy to be interfered with due to insufficient filter times, or slow response or command loss due to too many filter times.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F02.18	X1 Effective Delay Time	0.000 - 30.000	s	0.000	●
F02.19	X1 Ineffective 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 Ineffective 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 Ineffective 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 Ineffective Delay Time	0.000 - 30.000	s	0.000	●

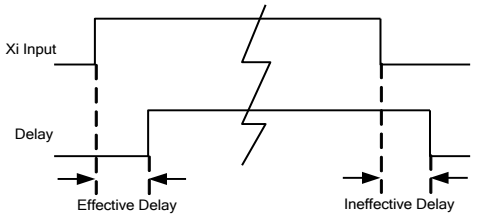


Figure 7–8 Terminal Delay Sampling

The terminal will delay to response according to the function code setting when the function terminal status changes. At present, the terminals X1 - X4 support this function. Specific actions: this function will be active after the function terminal changes from disabled status to enabled status and the effective delay time is reached; this function terminal becomes inactive after the function terminal changes from enabled status to disabled status and the ineffective delay time is reached.

★: If the function code is set as 0.000s, the delay is disabled accordingly.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F02.31	Analog Input Function	Ones place: AI1 0: Not Used 1: Numeric input (0 for less than 1V, 1 for over 3V, staying the same between 1V and 3V) Ten place: AI2 0: Not Used 1: Numeric input (the same as above) Hundreds place: AI3 0: Not Used 1: Numeric input (the same as above)		111B	○

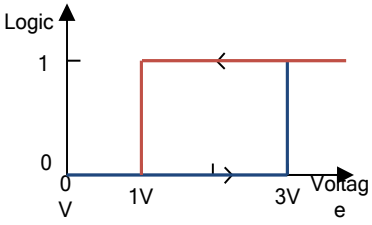


Figure 7–9 Analog Input Terminal Voltage and Present Logic Status Relationship Diagram

The analog input terminals AI1 - AI3 of EM630 inverter are only used as numeric input terminals (F02.31=111B, can not be modified):

- When the terminal input voltage <1V, the corresponding logic status is disabled;
- When the terminal input voltage >3V, the corresponding logic status is enable;
- When the terminal input voltage falls between 1V and 3V, corresponding logic remains the same.

7.4 F03 Group: Output Terminal Function Parameter

EM630 Inverter has 2 multi-function output terminals and 2 relay output terminals.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F03.00	Y1 Output Function	See Table 7–3 Numeric Multi-Function Output Terminals		33	○
F03.01	Y2 Output Function			29	○
F03.02	R1 Output Function			28	○
F03.03	R2 Output Function			7	○

Y1/Y2 and R1/R2 are 4 numeric multi-function output terminals. By setting the function codes F03.00 - F03.03, user may define the functions of output terminals respectively.

For example, if F03.02=28, the terminal R1 is for "braker control", reflecting the braker status. If the braker is in release status, R1 is active Output status; if the braker is on, R1 is in inactive Output status. Specific functions available are in Table 7–3.

Table 7–3 Numeric Multi-Function Output Terminals

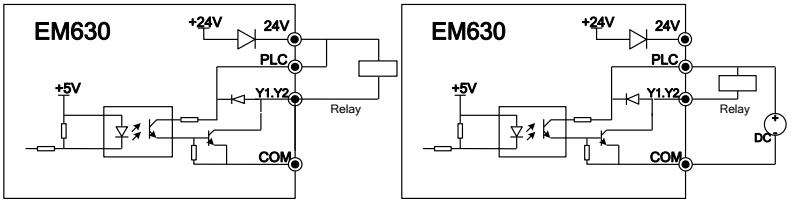
Set Value	Function	Description
0	No Output	Set "0: No Function" for an unused or fault terminal to prevent false Output.
1	Inverter Running (RUN)	When the inverter is in slave running, slave stop, JOG running or JOG stop status, the present Output is active; in other status, the present Output is inactive.
2	Frequency Reach Range (FAR)	When the inverter is in running status and the absolute value of "the Output frequency – the set frequency" ≤ frequency reach range (F15.20), the present Output is active; When the inverter is not in running status or the absolute value of "the Output frequency – the set frequency" > frequency reach range (F15.20), the present Output is inactive; See the Function Code F15.20.
3	Output Frequency Detection Range FDT1	When the inverter is in running status, and the Output frequency (absolute value) > the Output Frequency Detection Range FDT1 (F15.21), the present Output is active. When the inverter is not in running status, or the Output frequency (absolute value) ≤ the Output frequency detection

Set Value	Function	Description
		range FDT1 (F15.21) - FDT1 hysteresis (F15.22), the present Output is inactive. When the inverter is in other status except the two above, the present Output status remains the same. See the Function Codes F15.21 and F15.22.
4	Output Frequency Detection Range FDT2	When the inverter is in running status, and the Output frequency (absolute value) > the Output frequency detection range FDT2 (F15.23), the present Output is active. When the inverter is not running, or the Output frequency (absolute value) ≤ the Output frequency detection range FDT2 (F15.23) - FDT2 hysteresis (F15.24), the present Output is inactive. When the inverter is in other status except the two above, the present Output status remains the same. See the Function Codes F15.23 and F15.24.
5	Reverse Running (REV)	When the inverter's running direction and acceleration/deceleration status are reverse acceleration, reverse deceleration or reverse constant speed, the present Output is active. When the inverter is in other status except the two above, the present Output is inactive.
6	JOG Running	When the inverter is in JOG running or JOG stop status, the present Output is active; When the inverter is in other status, the present Output is inactive.
7	Inverter Fault	When the inverter is in fault status, the present Output is active; When the inverter is in other status, the present Output is inactive.
8	Ready	When the inverter is ready for running after it is powered on and finishes initialization without any abnormality, the present Output is active. If the inverter is not ready for running, the present Output is inactive.
9	Upper Limit Frequency Reach	When the inverter is in JOG or slave running status, the Output frequency (F18.00) ≥ the upper limit frequency (F00.17‖F00.18) and the set frequency (F18.01) ≥ the upper limit frequency (F00.17‖F00.18), the present Output is active. Otherwise, the present Output is inactive.

Set Value	Function	Description
10	Lower Limit Frequency Reach	When the inverter is in JOG or slave running status, the Output frequency (F18.00) ≤ the lower limit frequency (F00.19) and the set frequency (F18.01) ≤ the lower limit frequency (F00.19), the present Output is active. Otherwise, the present Output is inactive.
11	Current Limit Reach	When Output current (F18.06) ≥ current limit level (F07.12), the present Output is active. When Output current (F18.06) ≤ current limit level (F07.12) -5.0%, the present Output is inactive. When the current is the intermediate value, the present Output status remains the same.
12	Overvoltage Stall Voltage Reach	Output voltage (F18.07) ≥ Overvoltage stall control voltage (F07.07), the present Output is active. Output voltage (F18.07) ≤ Overvoltage stall control voltage (F07.07) -10V, the present Output is inactive. When the voltage is the intermediate value, the present Output status remains the same.
13 - 16	Not Used	Not Used
17	Motor Overload Pre-alarming	When present motor current ≥ motor pre-alarming factor (F07.02), the present Output is active. Otherwise, the present Output is inactive.
18	Inverter Overheating Pre-Alarming	When the inverter temperature ≥ overheat spot -25˚C, the pre-alarming Output is active, otherwise the pre-alarming Output is inactive.
19 - 23	Not Used	
24	Undervoltage Status	DC bus voltage (F18.08) ≤ judgment operation voltage at power failure (F07.31), the present Output is active. When DC bus voltage (F18.08) ≥ judgment operation voltage at power failure ending (F07.32), and maintenance time ≥ judgment delay time at power failure ending, the present Output is inactive.
25 - 26	Not Used	
27	Zero Speed Running	When the inverter is in JOG or slave running status, and Output frequency (F18.00) ≤ minimum effective Output frequency (F04.29), the present Output is active. Otherwise, the present Output is inactive.
28	Braker Control	When the braker is on, the present Output is inactive; when the braker is off, the present Output is active.

Set Value	Function	Description
29	Braker Check Prompt	After the set time from the last braker check is reached and the braker check shall be conducted again, the present Output is active, otherwise the present Output is inactive.
30	Overload Protection	Overload protection detection is required at hoisting. In case of overload, the present terminal Output is active, otherwise, inactive.
31	Low Voltage Protection	When the bus voltage drops to the threshold set through F21.16, and F21.15=1, the present terminal Output is active, otherwise, inactive.
32	Not Used	
33	Braker Failure	After detecting that the braker fails or the braker fails to pass the braker check, the present terminal Output is active, otherwise, inactive.

If the two multi-function Output ports are of OC Output type and the common terminal of the Output is COM. If the selected function is inactive, the electronic switch is OFF; if the selected function is active, the electronic switch is ON. OC can be powered by internal power supply, as shown in Figure 7–10 (a), or by external power supply, as shown in Figure 7–10 (b). For external power supply, the required voltage range is 12 – 30 V.



a) Internal Power Supply b) External Power Supply

Figure 7–10 Power Supply Mode of Multi-Function Terminal

The relay Output is provided by the inverter's internal relay; the relay has 1 group of NO contacts and 1 group of NC contacts; when the selected function is inactive, EB-EC is NC and EA-EC is NO; when the selected function is active, the internal relay coil is powered on, EB-EC is off and EA-EC is on. Refer to Figure 7–11.

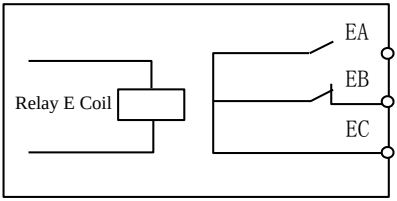


Figure 7–11 Relay Contact

Function Code	Name of Function Code	Parameter Description								Unit	Default	Property
F03.05	Output Signal Type	D7	D6	D5	D4	D3	D2	D1	D0		0000	○
		*	*	*	*	R2	R1	Y2	Y1			
		0: Level 1: Monopulse										

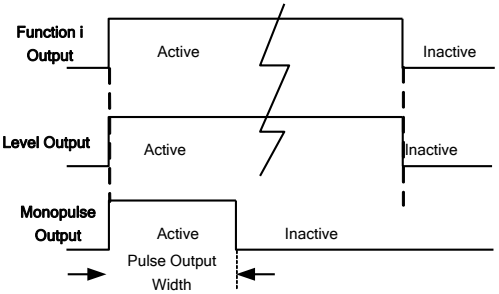


Figure 7–12 Numeric Output Terminal Level and Monopulse Output

Numeric output terminal and relay output terminal have two Output types, level and monopulse (see Figure 7–12). For level Output, the function terminal's Output status is consistent with its function status; for monopulse Output, the active level of certain pulse width can be Output only when the function is enabled.

Function Code	Name of Function Code	Parameter Description								Unit	Default	Property
F03.06	Positive/Negative Logic of Numeric Output	D7	D6	D5	D4	D3	D2	D1	D0		0000	○
		*	*	*	*	R2	R1	Y2	Y1			
		0: Positive Logic, Enabled at On/Disabled at Off 1: Negative Logic, Disabled at On/Enabled at Off										

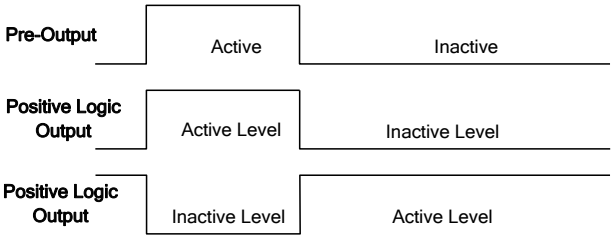


Figure 7–13 Positive and Negative Logic Output of Numeric Output Terminal

According to the design, numeric multi-function output terminal status has two Output logics:

0: Positive logic, if the function is on, the multi-function output terminal outputs active level; if the function is off, the multi-function output terminal outputs inactive level.

1: Negative logic, if the function is on, the multi-function output terminal Outputs inactive level; if the function is off, the multi-function output terminal outputs active level.

★: This function is used for matching with the logic other peripherals.

Active level: Y1/Y2, the default active level is low level; R1/R2, the default active level is high level.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F03.07	Y2 Output Type	0: Common Numeric Output		0	○

For EM630 Inverter, the terminal Y2 can be only use as a common output terminal.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F03.09	Y1 Effective Delay Time	0.000 - 30.000	s	0.000	●
F03.10	Y1 Ineffective 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 Ineffective 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 Ineffective 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 Ineffective Delay Time	0.000 - 30.000	s	0.000	●

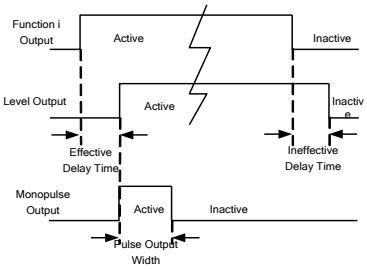


Figure 7–14 Numeric Output Terminal Level and Monopulse Output

The terminal will delay to response according to the function code setting when the function terminal changes. At present, the terminals Y1/Y2 and R1/R2 support this function. Specific actions: corresponding output terminal outputs active level only when the function terminal changes from disabled status to enabled status and the effective delay time is reached; corresponding output terminal outputs inactive level only when the function terminal changes from enabled status to disabled status and the ineffective delay time is reached.

★: If the function code is set as 0.000s, the delay is disabled accordingly.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F03.17	Y1 Output Monopulse Time	0.000 - 30.000	s	0.250	●
F03.18	Y2 Output Monopulse Time	0.000 - 30.000	s	0.250	●
F03.19	R1 Output Monopulse Time	0.000 - 30.000	s	0.250	●
F03.20	R2 Output Monopulse Time	0.000 - 30.000	s	0.250	●

When the output type of a function output terminal is monopulse output (see F03.05), user may control the active level pulse width by setting monopulse output time to meet various process or control requirements. See Figure 7–12 and Figure 7–14.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F03.21	Analog Output M1	See Table 7–4 Multi-Function Analog Output Terminals		0	○
F03.22	Analog Output M2			4	○

M1/M2 are 2 multi-function analog output terminals. By setting the function codes F03.21 - F03.22, user may define the functions of output terminals.

For example, if F03.21=0, the function of M1 terminal is to Output "Running frequency (absolute value)", and reflects the present value of "Running frequency" (absolute value)" by Outputting different voltage values. If the running frequency increases from 0.00 Hz to 50.00 Hz (assuming F00.16=50.00), then the default condition is that the M1 Output voltage increases from 0.00V to 10.00 V, with the same variation trend as that of the running frequency. Specific function options are shown in Table 7–4.

Table 7–4 Multi-Function Analog Output Terminals

Set Value	Function	Description
0	Running frequency (absolute value)	0.00 Hz - Fmax, corresponding Output 0.0% - 100.0%
1	Set frequency (absolute value)	0.00 Hz - Fmax, corresponding Output 0.0% - 100.0%
2	Output torque (absolute value)	0.0% - 200.0%, corresponding Output 0.0% - 100.0%
3	Set torque (absolute value)	0.0% - 200.0%, corresponding Output 0.0% - 100.0%
4	Output Current	0.0 A - 2*Ie, corresponding Output 0.0% - 100.0%
5	Output Voltage	0.0V - 1.5*Ue, corresponding Output 0.0% - 100.0%
6	Bus voltage	0 V – 1000 V, corresponding Output 0.0% - 100.0%
7	Output Power	0.00 kW - 2*Pe, corresponding Output 0.0% - 100.0%

★: Fmax, Maximum Frequency (F00.16)

Ie, Inverter Rated Current (F12.21)

Ue, Inverter Rated Voltage (F12.20)

Pe, Inverter Rated Power (F12.19)

The Output physical quantity of the analog Output terminal can be switched through DIP between the voltage signal 0.00V - 10.00 V and the current signal 0.00mA - 20.00mA. For voltage signal, 0.0% - 100.0% corresponds to the Output 0.00V - 10.00 V; for current signal, 0.0% - 100.0% corresponds to 0.00mA - 20.00mA. See 3.3.7 Analog Output Terminal Wiring.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F03.27	M1 Output Offset	-100.0 - 100.0	%	0.0	●
F03.28	M1 Output Gain	-10.00 - 10.00		1.00	●
F03.29	M2 Output Offset	-100.0 - 100.0	%	0.0	●
F03.30	M2 Output Gain	-10.00 - 10.00		1.00	●

These function codes are used to correct the zero shift and output amplitude deviation of the analog output generally, and they can be also used to define the desired AO output curve to meet different instrument or other requirements. If use "b" for offset, "k" for gain, "Y" for actual output, and "X" for standard output, then the actual output is: Y=kX + b.

1. In order to meet the requirements of various instruments or peripherals, the full-scale voltage of M1 and M2 is 10.9V actually and the full-scale current is 22mA actually.
2. The default settings of M1 and M2 are 0.00 - 10.00 V.
3. Please use a multimeter to test the idling Output of the terminals M1 and M2, if there is high requirement on the accuracy of the analog Output.

7.5 F04 Group: Start/Stop Control Parameter

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.00	Start Mode	0: Start Directly		0	○

F04.00=0: Start Directly

The inverter starts with DC brake (not available if F04.04=0), conducts the pre-excitation (not available if F04.07=0), starts at the start frequency, and enters the set frequency running after the holding time of the start frequency.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.01	Start Frequency	0.00 - 10.00	Hz	0.00	○
F04.02	Start Frequency Holding Time	0.00 - 60.00, Disabled at 0.00	s	0.00	○

Set an appropriate start frequency, in order to guarantee the motor torque at start. In order to enable the motor to make magnetic flux fully, it’s required to maintain the motor’s start frequency for certain time. The start frequency F04.01 is not limited by the lower limit frequency.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.03	DC Brake Current at Start	0.0 - 100.0 (100.0= Inverter Rated Current)	%	100.0	○
F04.04	DC Brake Time at Start	0.00 - 30.00 Disabled at 0.00	s	0.00	○
F04.05	DC Brake Field Weakening Time at Start	0.00 - 30.00	s	0.50	○

Before the inverter starts, the motor may run at low speed or reverse. Starting the inverter at this time immediately may result in overcurrent fault. In order to avoid such a fault, add the link of DC brake at first prior to inverter start to stop the motor, and then start the inverter to the set frequency according to the set direction.

Different values of F04.03 may realize different start DC brake torques.

By setting the action time of DC brake through F04.04, the inverter starts immediately after the set time is out. If F04.04=0.00, DC brake is disabled at start.

★ The procedure of starting DC brake is shown in Figure 7–16.

This function may be enabled when the single inverter serves multiple motors and the inverter is starting.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.06	Pre-Excitation Current	50.0 - 500.0 (100.0=Idling Current)	%	100.0	○
F04.07	Pre-Excitation Time	0.00 - 10.00	s	0.10	○

The inverter develops a magnetic field as the set pre-excitation current, and starts running after the set pre-excitation time F04.07 is out. If the set pre-excitation is 0, the inverter will start directly without the pre-excitation link.

F04.06 pre-excitation current is a percentage relative to the inverter's rated current.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.14	Acceleration/Deceleration Mode	0: Linear Acceleration/Deceleration 1: S Curve Acceleration/Deceleration		0	○

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.15	S Curve Start Section Time at Acceleration	0.00 - System acceleration time/2 (F15.13=0) 0.0 - System acceleration time/2 (F15.13=1) 0 - System acceleration time/2 (F15.13=2)	s	2.00	●
F04.16	S Curve End Section Time at Acceleration	0.00 - System acceleration time/2 (F15.13=0) 0.0 - System acceleration time/2 (F15.13=1) 0 - System acceleration time/2 (F15.13=2)	s	2.00	●
F04.17	S Curve Start Section Time at 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	1.00	●
F04.18	S Curve End Section Time at 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	1.00	●

F04.14=0: Linear Acceleration/Deceleration

The Output frequency increases or decreases by progress in a straight line and the default acceleration/deceleration time is set through the function codes F00.14 and F00.15.

F04.14=1: S curve acceleration/deceleration

The output frequency increases or decreases like a curve. S curve is generally applied to occasions of smooth start and stop, for example elevator and conveyor. At the acceleration section in Figure 7–15: t1 is a set value of F04.16 and t2 is a set value of F04.17; at the deceleration section: t3 is a set value of F04.18 and t47 is a set value of F04.19. During the time period of t1 and t2, and t3 and t4, the gradient for the Output frequency changes is fixed.

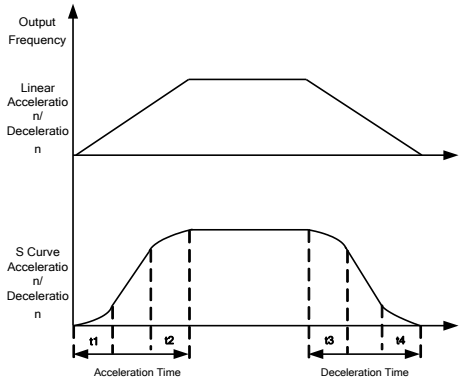


Figure 7–15 Acceleration/Deceleration Time Control

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.19	Stop Mode	0: Ramp-To-Stop 1: Coast-to-Stop		0	○

F04.19=0: Ramp-To-Stop

The motor ramps to stop after the set deceleration time is out [default setting is as per F00.15 (deceleration time 1)].

F04.19=1: Coast-to-Stop

After enabling the stop command, the inverter will stop Output immediately and the motor will coast to stop. Specific stop time depends upon the inertia of the motor and the load.

If the coast-to-stop terminal is set, the inverter coasts to stop immediately after the coast-to-stop terminal is enabled; the inverter will not run again even if the terminal is disabled unless a run command is inputted.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.20	DC Brake Start Frequency at Stop	0.00 - Maximum Frequency F00.16	Hz	0.00	○
F04.21	DC Brake Current at Stop	0.0 - 100.0 (100.0= Inverter Rated Current)	%	100.0	○
F04.22	DC Brake Time at Stop	0.00 - 30.00, Disabled at 0.00	s	0.00	○
F04.23	DC Brake Field Weakening Time at Stop	0.00 - 30.00	s	0.50	○

F04.20 is used to set the frequency of starting DC brake in ramp-to-stop. During ramp-to-stop, once the Output frequency is lower than this value, the inverter will start DC brake if the DC brake time at stop is not set as 0.

Different values of **F04.21** may realize different DC brake torques at stop.

F04.22 is used to set the action time of the DC brake at stop. If F04.22=0.00, the DC brake at stop will be disabled. If there is also a signal of DC brake from an external terminal, then the DC brake time at stop shall be the bigger of the following two: the action time of DC brake signal of an external terminal, and the time set through F04.22.

For 04.23, the inverter starts DC brake in ramp-to-stop when the Output frequency reaches the value set through F04.20 and the time set by F04.23 is reached.

The procedure of DC brake at stop is shown in Figure 7–17.

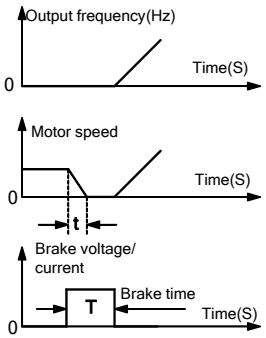


Figure 7–16 Start Procedure of DC Brake

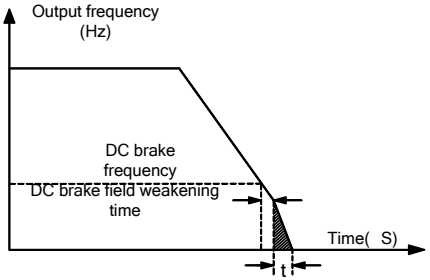


Figure 7–17 Procedure of DC Brake at Stop

Generally, for a heavy load, the deceleration operation may not stop the motor completely after the deceleration time is out due to inertia; extending the DC brake time at stop or increasing the DC brake current at stop could stop the motor.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F04.27	Terminal Start Command Reconfirmation	0: Not to Confirm 1: Confirm		1	○

F04.27=0: Not to Confirm

If the running terminal (RUN or F/R) is on and F00.03 is set as 0 or 1, the inverter is powered on while enabling or disabling the terminal, or the inverter runs directly while the start/stop mode is switched to the terminal.

F04.27=1: Confirm

If the running terminal is on and F00.03 is set as 0 or 1, the inverter is powered on while enabling or disabling the terminal, or the inverter could not run directly while the start/stop mode is switched to the terminal and could run only after the terminal is switched off and switched on again.

For F04 Group ,some parameter s of default value change according to the different power,and like the following table:

Motor rated power	4~7.5kW	11~30kW	45~50kW	75kW	90~110kW	132~400kW
F04.05	0.50	0.70	1.00	1.20	1.40	1.50
F04.06	100.0	150.0	200.0	300.0	400.0	500.0
F04.07	0.10	0.15	0.15	0.20	0.20	0.20
F04.23	0.50	0.70	1.00	1.20	1.40	1.50

7.6 F05 VF Control Parameter

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

V/F control applies to the general loads like fan and water pump, or to the occasion "one inverter shared by multiple motors" or the occasion where there is high difference between the inverter power and the motor power.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F05.00	V/F Curve Setting	0: Straight Line V/F 1: Multi-Dot Polyline V/F		1	○

F05.00=0: Straight Line V/F

Applies to general constant torque load

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

Applies to special loads like dewaterer, centrifuge and hoist. Now, any V/F curve can be obtained by setting parameters F05.01 - F05.06.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F05.01	Multipoint VF Frequency Point F1	0.00 - F05.07	Hz	0.00	●
F05.02	Multipoint VF Voltage Point V1	0.0 - 100.0 (100.0= Motor Rated Voltage)	%	3.5	●
F05.03	Multipoint VF Frequency Point F2	F05.05 - F05.09	Hz	2.00	●
F05.04	Multipoint VF Voltage Point V2	0.0 - 100.0	%	7.5	●
F05.05	Multipoint VF Frequency Point F3	F05.07 - Motor Rated Frequency (Reference Frequency)	Hz	5.00	●
F05.06	Multipoint VF Voltage Point V3	0.0 - 100.0	%	14.0	●

After setting F05.00=1, F05.01 - F05.06 will be enabled. A user-defined V/F curve is determined by the curve set with the input frequency percentage and the Output voltage percentage, and It is linearized at different segments in different input ranges. The motor rated frequency is the ultimate frequency reached by the V/F curve and also the frequency at maximum voltage Output. The input frequency percentage: if the motor rated frequency is the input frequency, the percentage is 100.0%; the Output voltage percentage: if the motor rated voltage is the Output voltage (U_e), the percentage is 100.0%.

An excessive slope of the V/F curve may result in an "overcurrent" fault.

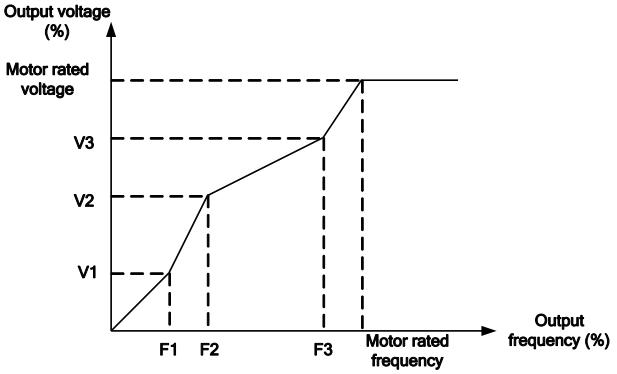


Figure 7–18 Multi-Dot Polyline V/F Curve

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F05.10	Compensation Gain for V/F Stator Voltage Drop	0.00 - 200.00	%	0.00	●

This function code is used to compensate for the voltage drop generated by the rotor resistor and cables, and promote the loading capacity at low frequency of the inverter

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F05.11	V/F Slip Compensation Gain	0.00 - 200.00	%	0.00	●
F05.12	V/F Slip Filter Time	0.00 - 10.00	s	1.00	●

When the speed of the motor rotor decreases as the load increases, user may enable the slip compensation so as to ensure that the rotor speed is close to the synchronous speed under a condition that the motor is under rated load. If the motor speed goes below the target value, increase the value set through F05.11.

★ F05.11=0, slip compensation disabled

When the inverter makes a quick start under large inertia, the slip is 100%; after reaching the set frequency, the slip is 0; quick decrease of the Output frequency

would result in overvoltage or overcurrent. F05.12 may mitigate the boost of voltage and current.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F05.13	Oscillation suppression gain	0.00 - 200.00	%	0.00	●
F05.14	Oscillation suppression end frequency	0.00～600.00	Hz	45.00	●

When the open-loop control (VVF), adjust the parameters for reducing motor oscillation. If the motor do not have oscillation phenomenon, not to adjust the parameters, or set a small value; if the motor has serious oscillation ,you could add the parameter step by step.

7.7 F06 Group: Vector Control Parameter

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F06.00	Speed Proportional Gain ASR_P1	0.00 - 100.00		15.00	●
F06.01	Speed Integral Time Constant ASR_T1	0.000 - 30.000 0.000: No Integral	s	0.050	●
F06.02	Speed Proportional Gain ASR_P2	0.00 - 100.00		15.00	●
F06.03	Speed Integral Time Constant ASR_T2	0.000 - 30.000 0.000: No Integral	s	0.080	●
F06.04	Switching Frequency 1	0.00 - Switching Frequency 2	Hz	5.00	●
F06.05	Switching Frequency 2	Switching Frequency 1 - Maximum Frequency F00.16	Hz	10.00	●

Under the FVC control mode, the inverter adjusts the dynamic speed response of the vector control by adjusting the speed proportional gain and speed integral time of PI regulator. Either increasing the speed proportional gain or reducing speed integral time would quicken the dynamic response of the speed loop. However, if the speed proportional gain is excessive or the speed integral time is insufficient or excessive, this will result in oscillation due to over regulation.

User shall adjust the aforesaid PI parameters according to actual load characteristics. Generally, user shall increase the proportional gain as possible and regulate the integral time, so as to enable the system to response quickly without over control.

To enable the system to have a quick dynamic response at both low speed and high speed, it's required to perform PI regulation at both speed modes. In actual running, the speed regulator would automatically calculate the present PI parameter according to the present frequency. If the present PI parameter is below the switching frequency 1, the speed PI parameter is P1, T1; if above the switching frequency 2, the speed parameter PI is P2, T2. If greater than the switching frequency 1(F06.04), but less than the switching frequency 2 (F06.05), the procedure from the switching frequency 1 to the switching frequency 2 presents a linear transition procedure. See Figure 7–19.

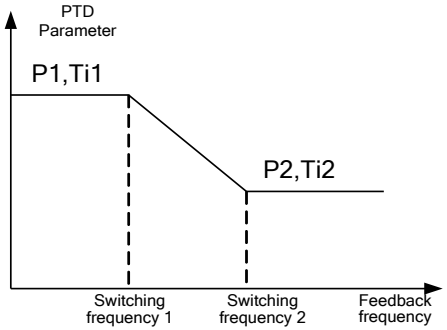


Figure 7–19 PI Parameter

1. Generally, user does not need to adjust F06.00 - F06.05 parameters, so please pay enough attention when you decide to adjust these parameters.
2. While setting the switching frequency, please note that the switching frequency 1 (F06.04) must be lower than or equivalent to the switching frequency 2 (F06.05).

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F06.06	Speed Loop anti-saturation coefficient	0. 000～1. 000		0. 500	●

When the speed has overshoot,user could add the value;If no overshoot,

set the parameter with a small value or factory default value.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property

F06.07	Time Constant of Output Filter of Speed Loop	0.000～0.100	s	0.001	●

The speed loop Output filter could reduce the impacts upon current loop, but better not to set a large value for F06.07, which may cause slow response. Generally, user may use the defaults.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F06.08	Vector Control Slip Gain	50.00 - 200.00	%	100.00	●

When the speed of the motor rotor decreases as the load increases, user may enable the slip compensation so as to ensure that the rotor speed is close to the synchronous speed under a condition that the motor is under rated load. If the motor speed goes below the target value, increase the value set through F06.08.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F06.10	Upper Limit of Speed Control Runing Torque	80.0 - 250.0	%	200.0	●
F06.11	Upper Limit of Speed Control Braking Torque	80.0 - 250.0	%	200.0	●

This function code is used to set the action condition of the torque limit during vector control, if the output torque is higher than the setting value F06.10 / F06.11, the torque limitation function is activated, so as to control the Output torque to be not higher than the upper limit of the speed control torque.

1.This code indicates the ratio between the Output torque at the torque limit and the inverter rated Output torque.
2. According to the actual needs, the user can set the torque upper limitation to protect the motor or to meet the running conditions;
3. Jog and braking mode must be set separately.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F06.12	Excitation Current Proportional Gain ACR-P1	0.00 - 10.00		0.25	●
F06.13	Excitation Current Integral Time Constant	0.00 - 300.00 0.00: No Integral	ms	10.00	●

F06.14	Torque Current Proportional Gain ACR-P2	0.00 - 10.00		0.25	●
F06.15	Torque Current Integral Time Constant ACR-T2	0.00 - 300.00 0.00: No Integral	ms	10.00	●

PID regulator parameters of the current loop will affect the system performance and stability directly. User does not need to change the defaults on general conditions.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F06.20	Feedforward Voltage Gain	0～100	%	0	●

Add voltage feedforward processor to help torque automatic upgrade during vector control ,namely stator drop compensation.

7.8 F07 Group: Fault Protection Parameter

Function Code	Name of Function Code	Description of Function Codes						Unit	Default	Property
F07.00	Protection Shield	E22	E13	SIU	SOU	SOC	IIP	OIP		0000000
		0: Valid Protection 1: Protection Shielded								

Bit setting value=0: After detecting the fault corresponding to the bit, inverter will stop Output and enter the fault status.

Bit setting value=1: After detecting the fault corresponding to the bit, inverter will not enable the protection and remains the previous status.

This code is bit operation. Only the corresponding bit has to be set as 0 or 1. See the table below.

Protection Code	*	E22	E13	SlU	SOU	SOC	IIP	OIP
Corresponding Bit	7	6	5	4	3	2	1	0
Set Value	*	*	0/1	0/1	0/1	0/1	0/1	0/1

For instance: for shielding IIP protection, only the first bit corresponding to IIP needs to be set as 1, i.e., F07.00=00000010.

For shielding OIP and E13 protection, only the 0 bit corresponding to OIP and the fifth bit corresponding to E13 need to be set as 1, i.e., F07.00=00100001.

Please do not shield any protection function unless specially required. Otherwise, the inverter may be damaged due to no protection in case of a fault.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F07.01	Motor Overload Protection Gain	0.20 - 10.00		1.00	●
F07.02	Motor Overload Pre-Alarming Factor	50 - 100	%	80	●

The inverse-time curve for the motor overload protection: 200%×(F07.01)×Motor Rated Current; for 2 seconds continuously, an alarm is given for motor overload fault; for 150%×(F07.01)×Motor Rated Current; for 2 minutes, an alarm is given for motor overload.

User must set F07.01 according to the actual overload capacity of the motor. An excessive value of F07.01 may easily pose a hazard to motor overheating without an alarm.

F07.02 pre-alarm factor is used to determine what degree prior to the motor overload protection will trigger an alarm. The higher this factor is, the smaller the advance time of the pre-alarm will be.

If the inverter's accumulative Output current is greater than the product of the overload inverse-time curve and F07.02, the inverter's multi-function numeric Do Outputs "motor overload pre-alarm" ON signal.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F07.06	DC Bus Control	0: Invalid 1: Lacking Voltage , Enabled 2: Overvoltage Stall, Enabled 3: Lacking Voltage & Overvoltage Stall, Enabled		0	○
F07.07	Overvoltage Stall Control Voltage	120.0% - 150.0% (380V, 100.0%=537 V)	%	128.5 (690 V)	●
F07.08	Lacking Voltage Control Voltage	60.0 ~ power-off end judgment voltage (100.0 = standard DC bus voltage)	%	76. 0	●

F07.06=0: Disabled

Overvoltage stall disabled; it's not recommended to set F07.06 as 0, if there is no external braking unit.

F07.06=1: Lacking Voltage , Enabled

If DC bus voltage is less than the value of F07.08,inverter speed will change into zero, and inverter will display lacking voltage faulty(SLU).

F07.06=2: Overvoltage Stall, Enabled

If the overvoltage stall is enabled, the stall voltage is set through F07.07 and the overvoltage stall adjustment gain is set through F07.08 and F07.09. User does not need to adjust these two parameters generally.

The DC bus overvoltage is generally caused by deceleration, because at the time of deceleration, DC bus voltage rises due to energy feedback. When the DC bus voltage is higher than the overvoltage threshold:

If the overvoltage stall is enabled (F07.06=2 or 3), the inverter pauses the deceleration and keeps the output frequency unchanged; as a result, the energy feedback stops; until the DC bus voltage drops to a value below the overvoltage stall dead voltage, the inverter starts deceleration again. During the deceleration, the overvoltage stall protection procedure is shown in Figure 7–20.

F07.06=3: Lacking Voltage & Overvoltage Stall, Enabled

Both enable.

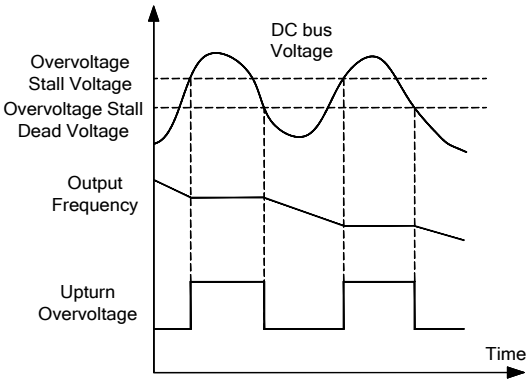


Figure 7–20 Overvoltage Stall Protection

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F07. 09	Power-off End Judgment Voltage	F07.08 ~ 100.0	%	86. 0	●
F07. 10	Power-off End Judgment delay time	0. 00～100. 00	s	5. 00	●

When the bus voltage is below lacking voltage control voltage(F07.08), the inverter goes into the power-off state; If DC bus voltage is higher than power-off end judgment voltage (F07.09), and the time is more long than power-off end judgment delay time (F07.10) ,inverter will resume normal state.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F07. 11	Current Limit Control	0: Disabled 1: Current Limit Control 1 2: Current Limit Control 2 3: Current Limit Control 3		0	○
F07. 12	Current Limit Level	100.0 - 180.0 (100.0= Motor Rated Current)	%	150.0	●

F07.11=0: Disabled

If F07.11=0, the current limit does not work

F07.11=1: Current Limit Control 1

F07.11=2: Current Limit Control 2

F07.11=3: Current Limit Control 3

During the inverter running and upon the reaching of the current of the load motor to the current limit action level (set by F07.12), if the current stall protection mode is enabled(set by F07.11 = 1), the system will enable the current limit function to limit the increase of the output current by reducing the output frequency until the inverter exits the current stall status. The inverter will return to the previous running status, when the Output current reduces to a value below the current limit action level. The current limit action procedure is shown in Figure 7–21.

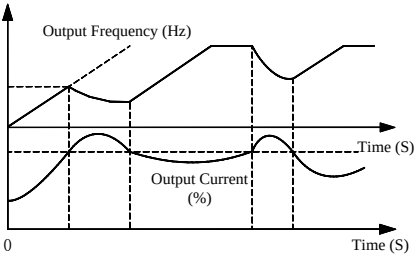


Figure 7–21 Current Limit Action Procedure

F07.12 is used to set the action conditions of the current limit. If the inverter output current exceeds the set value of this function code, the current limit function starts, so as to control the output current at a level not greater than the current limit.

The current limit only works for the inverter under the V/F control mode. It's recommended to use this function for occasions of large inertia, fan type load, and the occasion "one inverter shared by multiple motors".

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F07.13	Quick Current Limit Control	0: Disabled 1: Enable		0	○

F07.13=0: Disabled

If F07.06=0, the quick current limit function does not work.

F07.13=1: Enabled

The quick current limit could reduce the overcurrent fault.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F07.25	Motor Overspeed Detection Level	0.0 - 50.0 (the reference frequency is Maximum Frequency F00.16)	%	20.0	●
F07.26	Motor Overspeed Detection Time	0.0 - 60.0, 0.0: cancel motor overspeed protection	s	0.5	●

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

If F07.26 is not set as 0, and the motor speed detected is greater than the value set through F07.25, which status exceeds the time set by F07.26, an overspeed alarm will be given.

When EM630 inverter is applied to the hoist industry, then the value set through F07.25 × Maximum Frequency > Brake Release Frequency, or the time set through F07.26 > Delay before brake release + Delay after brake release .

7.9 F08 Group: Preset Speed and Simple PLC Parameter

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16	Hz	25.00	●
F08.01	Preset Speed 2	0.00 - Maximum Frequency F00.16	Hz	5.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16	Hz	35.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F08.03	Preset Speed 4	0.00 - Maximum Frequency F00.16	Hz	15.00	●
F08.04	Preset Speed 5	0.00 - Maximum Frequency F00.16	Hz	20.00	●
F08.05	Preset Speed 6	0.00 - Maximum Frequency F00.16	Hz	25.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16	Hz	45.00	●
F08.07	Preset Speed 8	0.00 - Maximum Frequency F00.16	Hz	35.00	●
F08.08	Preset Speed 9	0.00 - Maximum Frequency F00.16	Hz	40.00	●
F08.09	Preset Speed 10	0.00 - Maximum Frequency F00.16	Hz	45.00	●
F08.10	Preset Speed 11	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.11	Preset Speed 12	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.12	Preset Speed 13	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.13	Preset Speed 14	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16	Hz	55.00	●

EM630 inverter can offer 16 preset speeds through the control terminals of preset speed and 15 preset frequency commands, as well as numeric frequency setting F00.07.

Table 7–5 Preset Speed Commands and Preset Speed Terminals

Preset speed	Preset Speed Terminal 4	Preset Speed Terminal 3	Preset Speed Terminal 2	Preset Speed Terminal 1	Selected Frequency	Corresponding Function Code
1	OFF	OFF	OFF	OFF	Numeric Frequency Setting	Defined by F00.07
2	OFF	OFF	OFF	ON	Preset Speed	F08.00

Preset speed	Preset Speed Terminal 4	Preset Speed Terminal 3	Preset Speed Terminal 2	Preset Speed Terminal 1	Selected Frequency	Corresponding Function Code
					1	
3	OFF	OFF	ON	OFF	Preset Speed 2	F08.01
4	OFF	OFF	ON	ON	Preset Speed 3	F08.02
5	OFF	ON	OFF	OFF	Preset Speed 4	F08.03
6	OFF	ON	OFF	ON	Preset Speed 5	F08.04
7	OFF	ON	ON	OFF	Preset Speed 6	F08.05
8	OFF	ON	ON	ON	Preset Speed 7	F08.06
9	ON	OFF	OFF	OFF	Preset Speed 8	F08.07
10	ON	OFF	OFF	ON	Preset Speed 9	F08.08
11	ON	OFF	ON	OFF	Preset Speed 10	F08.09
12	ON	OFF	ON	ON	Preset Speed 11	F08.10
13	ON	ON	OFF	OFF	Preset Speed 12	F08.11
14	ON	ON	OFF	ON	Preset Speed 13	F08.12
15	ON	ON	ON	OFF	Preset Speed 14	F08.13
16	ON	ON	ON	ON	Preset Speed 15	F08.14

Attentions for setting:

★ At the preset speed running mode, the inverter start/stop is determined by the function code F00.02.

★ At the preset speed running mode, the inverter acceleration/deceleration time can be controlled by the external terminal set as the acceleration/deceleration time.

At the preset speed running, the inverter's direction is controlled by the terminals F/R and RUN.

7.10 F09 Group: PID Function Parameter

Not Used.

7.11 F10 Group: Communication Function Parameter

EM 630 inverter supports Modbus protocol of RTU format, and with the single-master and multi-slave communication network with RS485 bus (see Chapter 12).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F10.00	Inverter Address	1 - 247, 0 as broadcasting address		1	○

As a slave when connected to the whole communication network, the inverter must have an unique address, for which the setting scope is 1 to 247. That is to say, 247 inverters are supported by one network.

★ 0 is a broadcasting address, which can be recognized by all inverters and does not need to be set specifically.

All the masters and slaves connected to the same network must following the same transmission principles (for example bit rate, data format and protocol format) to ensure the normal communication. Therefore, the settings for F10.01 (bit rate), F10.02 (data format) and F10.10 (communication protocol; default: Modbus-RTU protocol for EM630) for all devices connected to the network are the same.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F10.01	Modbus Communication Bit Rate	0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 115200	bps	1	○

EM630 Inverter supports 6 bit rates (unit: bps, i.e., bit/s) when it is in Modbus-RTU communication. If F10.01=9600bps, it means that 9600bits will be transmitted for each second. Under default conditions, to transmit each byte of valid data (for example 0x01), the actual transmission is 10bits and the time needed is about 1.04ms (about 1.04167ms=10bit/9600bps).

Function	Name of	Parameter Description	Unit	Default	Property

Code	Function Code				
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 bit)		0	○

When UART transmits data, the data is composed of start bit, valid data (default 8bits), parity (optional) and stop bit. When transmitting data via Modbus protocol of RTU format, the inverter supports 6 different data formats according to data combinations.

Start bit	Valid data								Parity	Stop bit
1	7	6	5	4	3	2	1	0	N/O/E	1

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

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

The inverter also supports the functions of communication overtime and response delay, when it is networked for communication with Modbus protocol, in order to meet various requirements.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F10.03	Communication Overtime	0.0 - 60.0, 0.0: Disabled (also works for master - slave system)	S	0.0	●

As shown in Figure 7–22, the communication interval Δt refers to the period from the previous receipt of a valid data frame by the slave (inverter) to the receipt of a valid data frame again. If Δt is greater than the set time (see F10.03; this function is disabled if it is set as 0), this is called "communication overtime".

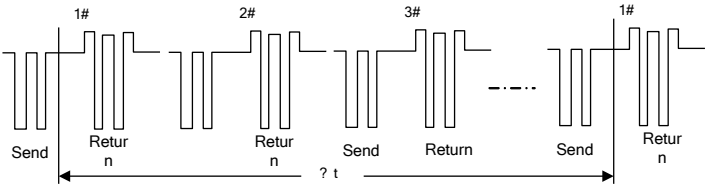


Figure 7–22 Communication Overtime

Application example: If the master must send data to a slave (for example #1) within a certain time T, then user may enable the communication overtime function for #1 slave by setting F10.03>T. No fault report for the communication overtime will be triggered during normal communication. However, if the master does not send data to #1 slave for a time period T and this condition is maintained for a time set by F10.03, then a communication abnormality fault (E16) will be reported to notify the personnel of "#1 slave communication fault", so that the personnel may conduct troubleshooting.

★ The time set by F10.03 must be greater than T, but must not be excessive, otherwise the running of the inverter under a fault condition for a long time may result in adverse effects.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F10.04	Modbus Response Delay	1 - 20	ms	2	●

Define the time interval from the receipt of valid data frame 1 by the inverter, to data learning, and then to starting the data return, as the response delay (t_{w2}). To ensure that the protocol chip works stably, the response delay shall be set as 1 ms to 20 ms (no 0). If the communication data involves EEPROM, the actual response delay will be extended to "EEPROM action time + F10.04".

1. *valid data frame: sent by the external master to the inverter, and the function code, data length and CRC are correct.*

As shown in Figure 7–23, data sending section (t_s), sending end mark section (t_{w1}), 75176 forwarding waiting section (t_{w2}), data return section (tr) and 75176 receipt section (t_{w3}).

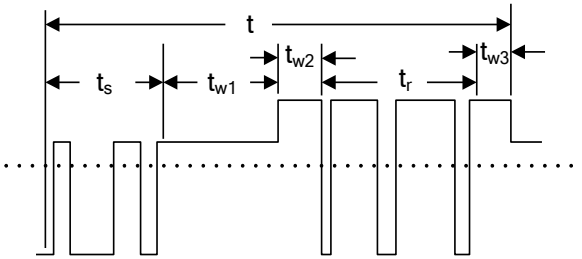


Figure 7–23 Complete Data Frame Time Sequence Translation

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F10.10	Communication Protocol	0: Modbus-RTU Protocol		0	○

EM630 only supports Modbus-RTU protocol. For any other protocol format, please select other proper inverter series.

7.12 F11 Group: User-Defined Parameter

The keypad of EM630 inverter supports the user-defined mode. First, by setting F11, user may select a function code and enter the user-defined mode (--U--, see 4.2.2).

Through ∧ and ∨, user may switch to the desired function code circularly. This function is mainly applied to occasions of less than 32 function codes so as to avoid troubles of too many function codes.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F11.00	User-Defined Parameter 1	The content displays Uxx.xx, which means that Fxx.xx function code is selected. If the keypad displays U00.00 at the time of entering the function code F11.00, it means that the first user-defined parameter is F00.00.		U00.00	●
F11.01	User-Defined Parameter 2			U00.01	●
F11.02	User-Defined Parameter 3			U00.02	●
F11.03	User-Defined Parameter 4			U00.03	●
F11.04	User-Defined Parameter 5			U00.04	●
F11.05	User-Defined Parameter 6			U00.07	●
F11.06	User-Defined Parameter 7			U00.14	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F11.07	User-Defined Parameter 8			U00.15	●
F11.08	User-Defined Parameter 9			U00.16	●
F11.09	User-Defined Parameter 10			U00.18	●
F11.10	User-Defined Parameter 11			U00.19	●
F11.11	User-Defined Parameter 12			U00.29	●
F11.12	User-Defined Parameter 13			U02.00	●
F11.13	User-Defined Parameter 14			U02.01	●
F11.14	User-Defined Parameter 15			U02.02	●
F11.15	User-Defined Parameter 16			U03.00	●
F11.16	User-Defined Parameter 17			U03.02	●
F11.17	User-Defined Parameter 18			U03.21	●
F11.18	User-Defined Parameter 19			U04.00	●
F11.19	User-Defined Parameter 20			U04.20	●
F11.20	User-Defined Parameter 21			U05.00	●
F11.21	User-Defined Parameter 22			U05.03	●
F11.22	User-Defined Parameter 23			U05.04	●
F11.23	User-Defined Parameter 24			U08.00	●
F11.24	User-Defined Parameter 25			U19.00	●
F11.25	User-Defined			U19.01	●

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
	Parameter 26				
F11.26	User-Defined Parameter 27			U19.02	●
F11.27	User-Defined Parameter 28			U19.03	●
F11.28	User-Defined Parameter 29			U19.04	●
F11.29	User-Defined Parameter 30			U19.05	●
F11.30	User-Defined Parameter 31			U19.06	●
F11.31	User-Defined Parameter 32			U19.12	●

F11.00=U00.00, means that the first user-defined parameter is the function code F00.00. The switching sequence of the function codes under the user-defined mode set by the keypad shall be the sequence set by the function codes F11.00 - F11.31.

7.13 F12 Group: Keypad and Display Parameter

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.00	M.K	0: No Function 1: Forward JOG 2: Reverse JOG 3: Forward/Reverse Switch 4: Not Used. 5: Coast to Stop		1	○

is a multifunction key. By setting the function code F12.00, its actual function will be realized. If F12.00=0, this function does not work; if F12.00=Any other value, press this key to realize corresponding function.

★ 4 for retaining. If F12.00=4, pressing this key will cause unexpected response. Please pay attention.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.01	STOP	0: Valid Only at Keypad Control 1: Valid at All Command Channels		1	○

According to the setting of the function code F00.02 (command source options), the command source has three control types, keypad control, terminal control and communication control, i.e., if the terminal control is selected as the command source, the buttons 

and 

of the keypad will be disabled. However, in emergency, user often uses 

of the keypad to stop the inverter for purpose of eliminating risks, which is the fastest way. However, during the normal running of the inverter, it is the most convenient way to stop the inverter through the keypad. Therefore, the function code F12.01 is added and the default setting is that the STOP button is always enabled.

★ It's not recommended to modify this function code. If necessary, please pay enough attention.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.02	Parameter Locking	0: Unlocked 1: Reference Input, Unlocked 2: All Locked Except this Function Code		0	●

In order to avoid unnecessary risks caused by misoperation or non-personnel operation of keypad, the keypad has the parameter locking function. If the default setting of this function code is "unlocked", you can set all function codes; after all the function codes are debugged according to the working conditions, user may lock parameters.

- 1: Reference Input, Unlocked

Under the parameter locking mode, no function code can be modified except the function codes with the reference input and this function code. Specific function codes with the inference input are indicated in **错误!未找到引用源。**:

Table 7–6 Function Codes with Reference Input

Function Code	Name of Function Code	Function Code	Name of Function Code
F00.07	Numeric Frequency Setting	F08.08	Preset Speed 9
F08.00	Preset Speed 1	F08.09	Preset Speed 10
F08.01	Preset Speed 2	F08.10	Preset Speed 11
F08.02	Preset Speed 3	F08.11	Preset Speed 12
F08.03	Preset Speed 4	F08.12	Preset Speed 13
F08.04	Preset Speed 5	F08.13	Preset Speed 14
F08.05	Preset Speed 6	F08.14	Preset Speed 15
F08.06	Preset Speed 7	F13.02	Numeric Torque Setting
F08.07	Preset Speed 8		

- 2: All Locked Except this Function Code

Under the parameter locking mode, no function code can be set except this function code. This mode is mostly applied to the working conditions that the parameters have been set and debugged and no parameter setting is required. Under this mode, user only run, stop and monitor the inverter.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.03	Parameter Copy	0: No Operation 1: Upload Parameter to Keypad 2: Download Parameter to Inverter		0	○

As for a working condition that multiple inverters shall run under the same parameter settings, user may debug one inverter; set F12.03=1 for it, and upload the set parameters to the keypad for temporary saving; then set F12.03=2 for the rest

inverters, and now download the parameter settings to them. By using this function, user may set parameters of multiple inverters quickly. User may set most function codes at first even if there are still individual parameters with different settings, and user may complete the setting of such individual parameter settings by other methods. (See 4.5 Parameter Copy)

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.04	LED Display Parameter 1	00000000 - 11111111 (o for non-displaying, 1 for displaying) bit0: Output Frequency bit1: Set Frequency bit2: Output Current bit3: Output Voltage bit4: DC Bus Voltage bit5: Output Power bit6: Output Torque bit7: Torque Setting		00011111	●
F12.05	LED Display Parameter 2	00000000 - 01011101 (o for non-displaying, 1 for displaying) bit0: PG Feedback Frequency bit1: Not Used bit2: Load Speed bit3: Numeric Input Terminal Status 1 bit4: Numeric Input Terminal Status 2 bit5: Not Used bit6: Numeric Output Terminal Status bit7: Not Used		00000000	●

User may press ESC to enable the inverter to enter the monitoring mode (see 4.4 Operation Monitoring); now, press >> to switch among parameters circularly. The function codes F12.04 - F12.05 are used to select which parameters are to be displayed, i.e., the parameters are in a circular display queue. The selected options correspond to the F18 Group: Monitoring Parameter, so user may enter F18 to view the present values of all parameters. This function is mainly for fast display, especially during the running period.

Under default conditions, the circular display queue only displays some commonly used options, respectively Output frequency (F18.00), set frequency (F18.01), Output current (F18.06), Output voltage (F18.07) and DC bus voltage (F18.08). If other parameters are required for display, please set these parameters as 1; if not, set them as 0.

★ Please pay enough attention when retaining some function codes.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.09	Load Speed Display Factor	0.01 - 600.00		30.00	●

The inverter Output is mostly displayed in frequency. To get to know the present load speed (F18.13), user may set the present parameter according to actual working conditions, so as to convert the frequency Output into the speed Output; as a result, F18.13 would be used to display the present load speed.

If F12.09=30.00 (this value is relative to pole-pairs, device transmission ratio, etc.), then the Output frequency 0.00 - 50.00 Hz corresponds to the load speed 0 - 1500 rpm.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.14	Reset	0: No Operation 1: Reset (exclusive of motor parameter, inverter parameter, manufacturer parameter, running and power-on time record)		0	○

By setting this parameter as 1, user may reset all parameters except motor parameter (F01 group), inverter parameter, manufacturer parameter, power-on time (F12.15/16) and running time (F12.17 and F12.18).

★: This operation is irreversible. Please pay enough attention while operating.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.15	Accumulated Power-On Time h	0 - 65535	h	0	×
F12.16	Accumulated Power-On Time min	0 - 59	min	0	×

F12.15 and F12.16 are used together to view the accumulated power-on time from the production of the inverter until now (as per the time that the inverter is powered on). This value will be accurate to 1 minute, and up to about 65,536 hours (about 7.5 years).

If F12.15=50 and F12.16=33, it means that the accumulated power-on time of the inverter is 2 days 2 hours and 33 minutes.

★ These parameters are used for viewing only and can not be operated or cleared.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.17	Accumulated Running Time h	0 - 65535	h	0	×
F12.18	Accumulated Running Time (min)	0 - 59	min	0	×

F12.17 and F12.18 are used together to view the accumulated power-on time from the production of the inverter until now (as per the time that the inverter runs). This value will be accurate to 1 minute, and up to about 65,536 hours (about 7.5 years).

If F12.17=47 and F12.18=39, it means that the accumulated power-on time of the inverter is 1 day 23 hours and 39 minutes.

★These parameters are used for viewing only and can not be operated or cleared.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.19	Inverter Rated Power	0.40 - 650.00	kW	Up To Specific Model	×
F12.20	Inverter Rated Voltage	60 - 690	V	Up To Specific Model	×
F12.21	Inverter Rated Current	0.1 - 1500.0	A	Up To Specific Model	×

These function codes are used to view the rated power, rated voltage and rated current of the inverter.

★These parameters are used for viewing only and can not be operated.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.22 F12.22	Performance Software Serial Number 1	XXX.XX		XXX.XX	×
F12.23	Performance Software Serial Number 2	XX.XXX		XX.XXX	×
F12.24	Function Software Serial Number 1	XXX.XX		XXX.XX	×
F12.25	Function Software Serial Number 2	XX.XXX		XX.XXX	×
F12.26	Keypad Software Serial Number 1	XXX.XX		XXX.XX	×
F12.27	Keypad Software Serial Number 2	XX.XXX		XX.XXX	×

These function codes are used to view the software version of the inverter.

★These parameters are used for viewing only and can not be operated.

Function Code	Name of Function Code	Parameter Description	Unit	Default	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	×

These function codes are used to view the type of the present product.

★These parameters are used for viewing only and can not be operated.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F12.31	LCD Language	0: Chinese 1: English 2: Not Used		0	●
F12.32	LCD First Line Display Parameters				●

Relevant parameters of LCD keypad, to be retained temporarily.

7.14 F13 Group: Torque Control Parameter

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F13.00	Speed/Torque Control	0: Speed Control 1: Torque Control		0	○

F13.00=0: Speed Control

The control mode is speed input, with the frequency as the input quantity.

F13.00=1: Torque Control

The input control mode is torque input, with the percentage of the motor rated torque current as the input quantity; it is only enabled when the inverter is in the FVC control mode, i.e., when F00.01=2; in the FVC control mode, the squirrel-cage induction motor can achieve the torque control to replace the AC induction torque motor directly.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F13.01	Torque Setting	0: Numeric Torque Setting F13.02		0	○
F13.02	Numeric Torque Setting	-200.0 - 200.0 (100.0= Motor Rated Torque)	%	100.0	●

F13.01=0: Numeric Torque Setting F13.02

The torque is set through F13.02.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F13.06	Torque Control Acceleration Time	0.00 - 120.00	s	0.00	●

Setting these function codes may enable the motor speed to change smoothly.

The value set by F13.06 refers to the time that the torque current increases from 0 to the rated torque current.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F13.08	Upper Limit Frequency of Torque Control Choose	0: Set through F13.09		0	○

F13.09	Upper Limit Frequency of Torque Control	0.00 - Maximum Frequency F00.16	Hz	50.00	●
F13.10	Upper Limit Frequency Offset	0.00 - Maximum Frequency F00.16	Hz	2.00	●

The upper limit frequency for torque control is used to set the forward or reverse maximum running frequency of the inverter under the torque control mode .

In the torque control mode, if the load torque is less than the motor Output torque, the motor speed will rise continuously. The maximum speed of the motor must be limited in this mode to prevent any runaway accident of the mechanical system.

When the inverter is in the torque control mode, maximum running frequency = upper limit frequency of torque + upper limit frequency offset, but the maximum running frequency is limited by the maximum frequency limit of F00.16.

7.15 F14 Group: Motor 2 Parameter

4: Not Used.

7.16 F15 Group: Auxiliary Function

Function Code	Name of Function Code	Parameter Description	Unit	Default	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)	s	15.00	●

		0 - 65000 (F15.13=2)			
F15.09	Acceleration/Deceleration Time Reference Frequency	0: Maximum Frequency F00.16 1: 50 Hz		0	○
F15.13	Acceleration/Deceleration Time Unit	0: 0.01s 1: 0.1 s 2: 1s		0	○

As for normal running (non jog running), the system offers 4 groups of acceleration/deceleration time options (first group F00.14 and F00.15) to meet different demands. After setting, user may switch between the numeric input mode "19: Acceleration/Deceleration Time Terminal 1" and "20: Acceleration/Deceleration Time Terminal 2". See Table 7–2 Numeric Multi-Function Input Terminals.

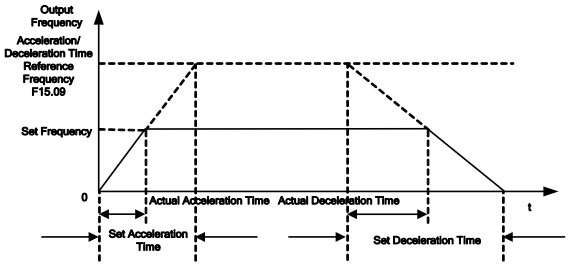


Figure 7–24 Acceleration/Deceleration Time

As indicated in Figure 7–24, the defined acceleration time refers to the time that the frequency increases from 0.00 Hz to the acceleration/deceleration time reference frequency; the deceleration time refers to the time that the frequency decreases from the acceleration/deceleration time reference frequency to 0.00 Hz. Actual acceleration/deceleration time depends upon the ratio of the set frequency to the reference frequency.

F15.09 is used to set the acceleration/deceleration time reference frequency. If F15.09=0, the reference frequency is set by F00.16 (maximum frequency). If also F00.16=100.00 Hz, the acceleration time refers to the time that the Output frequency increases from 0.00 Hz (100.00 Hz) to 100.00 Hz (0.00 Hz), and the deceleration time refers to the time that the Output frequency decreases from 100.00 Hz (0.00 Hz) to 0.00 Hz (100.00 Hz).

Probably, the acceleration/deceleration time can be a large figure depending upon different working conditions. The system offers 3 kinds of acceleration/deceleration

time units, which are set through F15.13. If F15.13=1, it means that the acceleration/deceleration time unit is "0.1 s". If the acceleration time 2 is enabled, then the time that the Output frequency increases from 0.00 Hz to 50.00 Hz (F00.16) is 1.500s (=15.00*0.1 s) under default conditions.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.20	FAR Detection Bandwidth	0.00 - 50.00	Hz	2.50	○

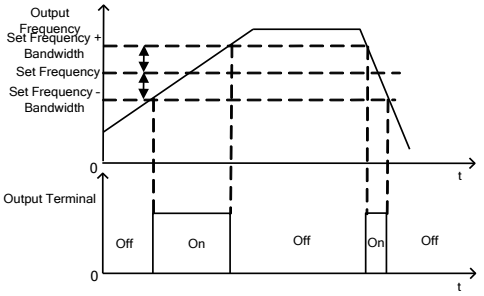


Figure 7–25 FAR Detection

As indicated in Figure 7–25, when the multi-function Output terminal or relay Output is set as "2: FAR", if the absolute value of the difference between the Output frequency and the set input frequency is less than or equal to FAR (F15.20) during the inverter running (non-autotuning), the multi-function output terminal outputs active level, otherwise the multi-function output terminal outputs inactive level.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.21	Output Frequency Detection Range FDT1	0.00 - Maximum Frequency F00.16	Hz	30.00	○
F15.22	FDT1 Hysteresis	0.00 - F15.21 (Monotonic decreasing is active)	Hz	2.00	○
F15.23	Output Frequency Detection Range FDT2	0.00 - Maximum Frequency F00.16	Hz	20.00	○
F15.24	FDT2 Hysteresis	0.00 - F15.23 (Monotonic decreasing is active)	Hz	2.00	○

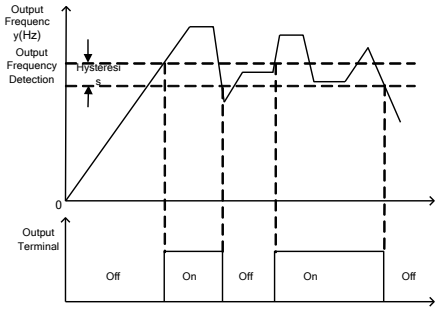


Figure 7–26 FDT Detection

As indicated in Figure 7–26, when the multi-function Output terminal or relay Output is set as "3: Output Frequency Detection Range FDT1" or "4: Output Frequency Detection Range FDT2", if the absolute value of the Output frequency is greater than the Output Frequency Detection Range FDT1/2 (F15.21/F15.23), the corresponding function terminal Outputs active level during the inverter running (non-autotuning); if the absolute value of the Output frequency drops to a value less than or equal to "Output Frequency Detection Range FDT1/2 (F15.21/F15.23) - FDT1/2 hysteresis", the corresponding function terminal Outputs inactive level; if the absolute value of the Output frequency falls between "Output Frequency Detection Range - Hysteresis" and "Output Frequency Detection Range", the Output level of the corresponding function terminal remains the same.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.30	Resistance Brake Choose	0: Disable 1: Enable		1	○
F15.31	Operation Voltage of Resistance Brake	120.0 - 140.0 (380V, 100.0=537 V)	%	128.5 (690V)	●
F15.32	Brake Duty Ratio	20 - 100 (100 means that the duty ratio is 1)	%	100	●

Resistance brake is a brake method by transforming the electric energy generated during the speed reduction into the heat energy of the braking resistor to realize rapid brake. It applies to the brake of large inertia or occasions requiring rapid brake and stop. User needs to choose proper braking resistor and braking unit. See 11.1 Braking Resistor and 11.2 Braking Unit.

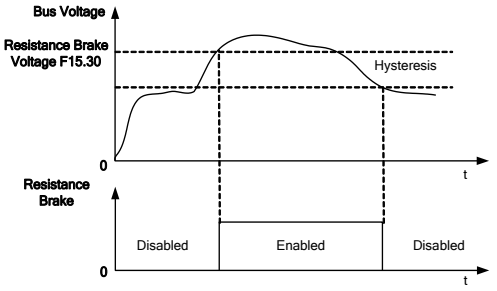


Figure 7–27 Resistance Brake

As indicated in Figure 7–2, when the resistance brake is enabled (F15.30=1) and the bus voltage is greater than the operation voltage of the resistance brake (F15.31), resistance brake starts; when the bus voltage drops below a certain value, the resistance brake is disabled.

When the inverter is in resistance brake, IGBT in the braking unit is on and the energy can be discharged rapidly through the braking resistor. The brake duty ratio (F15.32) describes the duty ratio when IGBT is on. The higher the duty ratio is, the higher the brake level will be.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.33	Control Mode of Set Frequency Lower Than Lower Limit Frequency	0: Run at Lower Limit Frequency 1: Stop		0	○

When the set frequency of the inverter is lower than the lower limit frequency (F00.19), the control mode can be set through F15.33.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.34	Fan Control	0: Run at Energization 1: Run at Start 2: Run at Intelligent Temperature Control		1	○

Three fan control modes are available to reasonably use the fan. It is controlled through F15.34. Seen Table 7– Control Modes of Fan.

Table 7–7 Control Modes of Fan

Fan Control	Description
0: Run at Energization	The fan runs immediately after the inverter is powered on.
1: Run at Start	The fan starts running after the inverter starts running; the fan stops running 1 minute after the inverter enters the parameter setting status.
2: Run at Intelligent Temperature Control	When the inverter temperature > 45˚C, the fan starts running; when the inverter temperature < 40 ˚C, the fan stops running; when the inverter temperature is not less than 40 ˚C, but not greater than 45 ˚C, the fan keeps running.

★ If "2: Run at Intelligent Temperature Control" is selected, make sure that the inverter temperature detection module works normally.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.38	Deadband Compensation Mode	0: Disabled 1: Compensation Mode 1 2: Compensation Mode 2		1	○

This code is used to select the Deadband Compensation Mode. Do not adjust this parameter when possible . If the motor has oscillate or has high voltage wave quality of requirement,the user could set the parameter.Normally,user could set F15.38 = 1,if inverter work under the VF and motor has oscillate,user could set F15.38 = 2.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.39	Terminal JOG Control Priority	0: Disabled 1: Enable		0	○

When Terminal control mode (F00.02 = 1), this function code is used to select JOG command priority level. If the terminal JOG control priority is valid (F15.39 = 1), when inverter is running, inverter will converted into JOG mode; If the terminal JOG control priority is valid (F15.39 = 1), can not directly converted inverter from running into JOG mode.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F15.40	Quick stop Deceleration time	0.00～650.00（F15.13=0） 0.0～6500.0（F15.13=1） 0～65000（F15.13=2）	s	1.00	●

When stop quickly, deceleration time settings

7.17 F16 Group: User Defined Function Parameter

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F16.06	Agent Password	0 – 65535		0	○

This function code is used to operate Agent Password.

★ By setting this password, the inverter may not be used normally. Please pay enough attention.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F16.07	Set Accumulated Power-on Reach Time	0 - 65535, 0: Power-on Reach Time Protection Disabled	h	0	○

These codes are used to set the accumulated power-on reach time. When the accumulated power-on time (F12.15/16) is equal to or greater than the accumulated power-on reach time (F16.07), the inverter can not be used.

★ By setting this parameter, the inverter may not be used normally. Please pay enough attention.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F16.08	Set Accumulated Run Reach Time	0 - 65535, 0: Run Time Reach Protection Disabled	h	0	○

This function is used to set the accumulated run reach time. When the accumulated run time (F12.17/18) is equal to or greater than the accumulated power-on reach time (F16.08), the inverter can not be used.

★ By setting this password, the inverter may not be used normally. Please pay enough attention.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F16.09	Factory Password	0 – 65535		XXXXX	●

This function code is used to set Factory Password.

★ By setting this password, the inverter may not be used normally. Please pay enough attention.

7.18 F17 Group: Virtual I/O Function Parameter

Not Used.

7.19 F18 Group: Monitoring Parameter

This group of parameters can be used for viewing the present status of the inverter, but can not be operated.

Function Code	Name of Function Code	Parameter Description	Unit
F18.00 F18.00	Output Frequency	This function code is used to display the present Output frequency. Range: 0.00 - Upper Limit Frequency ★ This parameter will be updated in real time only when the inverter is in the speed control mode.	Hz
F18.01	Set Frequency	This function code is used to display the present set frequency. Range: 0.00 - Maximum Frequency F00.16 ★ This parameter will be updated in real time only when the inverter is in the speed control mode.	Hz
F18.02	PG Feedback Frequency	This function is used to display the PG Feedback Frequency, when the inverter is under FVC control mode or other control modes with the feedback encoder. Range: 0.00 – Upper Limit Frequency.	Hz
F18.03	Estimate Feedback Frequency	0.00 - Upper Limit Frequency	Hz
F18.04	Output Torque	This function code is used to display the present Output torque. Range: -200.0 - 200.0. ★ This parameter will be updated in real time only when the inverter is under torque control mode.	%
F18.05	Torque Setting	This function code is used to display the present set torque. Range: -200.0 - 200.0. ★ This parameter will be updated in real time only when the inverter is under torque control mode.	%
F18.06	Output Current	This function code is used to display the present Output current. According to the motor rated power, the Output current range is as follows: 0.00 - 650.00 (Motor Rated Power ≤ 75 kW) 0.0 - 6500.0 (Motor Rated Power >75 kW)	A
F18.07	Output Current Percentage	This function code is used to display the present Output current in the form of percentage (relative to the inverter rated current). Range: 0.0 - 300.0.	D
F18.08	Output Voltage	This function code is used to display the present Output voltage. Range: 0.0 - 690.0.	V
F18.09	DC Bus Voltage	This function code is used to display the present bus voltage. Range: 0 - 1200.	V
F18.10 - F18.13	Not Used		
F18.14	Load Speed	This function code is used to display the present load	rpm

Function Code	Name of Function Code	Parameter Description	Unit
		peed. For normal display, please set the load speed display factor (F12.09). Range: 0 - 65535.	
F18.15	UP/DOWN Shifting Frequency	Display UP/DOWN Shifting Frequency	Hz
F18.16 - F18.19	Not Used		
F18.20	Output Power	This function code is used to display the present Output power. Range: 0.00 - 650.00.	kW
F18.21	Output Power Factor	This function code is used to display the present Output power factor. Range: -1.00 - 1.00.	
F18.22	Numeric Input Terminal Status 1	This function code is used to display the present active status of the input terminals X1 - X5. The five-digit nixie tube are as follows from left to right: X5 X4 X3 X2 X1 0/1 0/1 0/1 0/1 0/1 Actual display: 00001 ★ 0: disabled; 1: enabled.	
F18.23	Numeric Input Terminal Status 2	This function code is used to display the present active status of the input terminals X6/X7/AI1 - AI3. The five-digit nixie tube are as follows from left to right: AI3 AI2 AI1 X7 X6 0/1 0/1 0/1 0/1 0/1 Actual display: 00000 ★ EM630 inverter, the analog input terminals AI1 - AI3 can only be used for numeric input. ★ 0: disabled; 1: enabled.	
F18.24	Not Used		
F18.25	Output Terminal Status	This function code is used to display the present active status of the input terminals R1/R2/Y1/Y2. The five-digit nixie tube are as follows from left to right: *R2 R1Y2 Y1 0 0/1 0/1 0/1 0/1 Actual display: 01010 ★ 0: disabled; 1: enabled.	
F18.26	AI1	Displays the current analog input channel 1 (AI1) of percent value(relative to 100.0%). Range: 0.0 to 100.0.	%

Function Code	Name of Function Code	Parameter Description	Unit
F18.27	AI2	Displays the current analog input channel 2 (AI2) of percent value(relative to 100.0%). Range: 0.0 to 100.0.	%
F18.28	AI3	Displays the current analog input channel 3 (AI3) of percent value(relative to 100.0%). Range: 0.0 to 100.0.	%
F18.29 - F18.41	Not Used		
F18.42	Braker Check Time Display	This function code is used to display the braker check time and used for braker timing detection. If F18.42>braker check time interval (F20.31), then braker check is required. Range: 0 - 10000.	h
F18.43	Zero-servo Position Deviation	During Zero servo operation, real-time display the current position deviation. Range 0 - 65535.	

7.20 F19 Group: Fault Record Parameter

This group of parameters can be used for viewing the types of the last three faults and the status of the inverter at fault, but can not be operated.

- The function codes related to the information about the last fault:

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F19.00 F19.00	Last Fault Type	This function code is used to display the type of the last fault. See Table 7– Fault Types		0	×
F19.01	Output Frequency at Fault	Used to display the Output frequency at the last fault.	Hz	0.00	×
F19.02	Output Current at Fault	Used to display the Output current at the last fault.	A	0.00	×
F19.03	Bus Voltage at Fault	Used to display the last Output voltage at fault.	V	0	×
F19.04	Running Mode at Fault	Used to display the running status at the last fault. See Table 7– Running Modes at Fault		0	×
F19.05	Working Time at Fault	Used to display the working time at the last fault.	h	0	×

- The function codes related to the information about the last fault:

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F19.06	Last Fault Type	This function code is used to display the type of the last fault. See Table 7– Fault Types		0	×
F19.07	Output Frequency at Fault	This function code is used to display the Output frequency at the last fault.	Hz	0.00	×
F19.08	Output Current at Fault	This function code is used to display the Output current at the last fault.	A	0.00	×
F19.09	Bus Voltage at Fault	This function code is used to display the Output voltage at the last fault.	V	0	×
F19.10	Running Mode at Fault	Used to display the running status at the last fault. See Table 7– Running Modes at Fault		0	×
F19.11	Working Time at Fault	Used to display the working time at the last fault.	h	0	×

- The function codes related to the information about the last two faults:

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F19.12	Types of Last Two Faults	This function code is used to display the types of the last two faults . See Table 7– Fault Types		0	×
F19.13	Output Frequency at Fault	This function code is used to display the Output frequency at the last two faults.	Hz	0.00	×
F19.14	Output Current at Fault	This function code is used to display the Output current at the last two faults.	A	0.00	×
F19.15	Bus Voltage at Fault	This function code is used to display the Output voltage at the last two faults.	V	0	×
F19.16	Running Mode at Fault	Used to display the running statuses at the last two faults. See Table 7– Running Modes at Fault		0	×
F19.17	Working Time at	Used to display the working time	h	0	×

	Fault	at the last two faults.			

For various fault types of EM630, see Table 7– below:

Table 7–8 Fault Types

Fault type	Keypad display	Fault type	Keypad display
0: No Fault	0	E17: Temperature Sensor Abnormality	E17
SC: Output Short Circuit Protection	SC	E18: Soft Start Relay Off	E18
HOC: Instantaneous Overcurrent	HOC	E19: Current Detection Circuit Abnormality	E19
HOU: Instantaneous Overvoltage	HOU	E20: System Interference	E20
SOC: Stable Overcurrent	SOC	E21: Not Used	E21
SOU: Stable Overvoltage	SOU	E22: Encoder Fault	E22
SIU: Stable Undervoltage	SlU	E23: Keypad EEPROM Fault	E23
IlP: Input Phase Loss	IlP	E24: Parameter Autotuning Abnormality	E24
OlP: Output Phase Lose	OlP	E25: Motor Overspeed Protection	E25
Ol: Inverter Overload	Ol	E26: Not Used	E26
OH: Inverter Overheating Protect	OH	E27: Accumulated Power-On Time Reach	E27
E11: Not Used	E11	E28: Accumulated Run Time Reach	E28
E21: Not Used	E12	E29: Internal Communication Fault	E29
E13: Motor Overload	E13	E30: Braker Sensor Abnormality	E30
E14: External Fault	E14	E31: Joystick Not Cleared	E31
E15: Inverter EEPROM Fault	E15	E32: Start Check Abnormality	E32
E16: Communication Abnormality	E16		

For running modes of EM630 at fault, See Table 7–:

See Table 7–9 Running Modes at Fault

Keypad display	Running Mode
0	Not Running
1	Forward Acceleration
2	Reverse Acceleration
3	Forward Deceleration
4	Reverse Deceleration
5	Forward Constant Speed
6	Reverse Constant Speed

7.21 F20 Group: Basic Function Parameter for Hoist

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.00	Hoisting Mechanism Options	0: Closed Loop Hoisting Mechanism 1: Open Loop Hoisting Mechanism 2: Travel Mechanism (Trolley Travel) 3: Rotary Mechanism 4: Balanced Travel Mechanism 5: Unbalanced Travel Mechanism 6: Speed Feedback Construction Elevator 7: Non Speed Feedback Construction Elevator		0	○

F20.00=0: Closed Loop Hoisting Mechanism

When selecting this function code and resetting it, the defaults of related function codes will become the setting for hoisting of an optimized and closed loop tower crane (See Table 7–7).

Table 7–7 Defaults of Closed Loop Hoisting Mechanism Macro

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		2	○

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	10.00	●
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	3.00	●
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.03	X4 Input Function	0 - 64		12	○
F02.04	X5 Input Function	0 - 64		13	○
F02.05	X6 Input Function	0 - 64		14	○
F02.06	X7 Input Function	0 - 64		10	○
F02.07	AI1 Input Function	0 - 64		58	○
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		25.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16		35.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16		45.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16		55.00	●
F20.04	Brake Release Current	20.0 - 100.0	%	20.0	●
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	0.40	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	0.40	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.0	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	0.20	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	0.20	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.0	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●
F20.20	Braker Fault Judgment Pulse Count at Stop	0 - 10000 (0: Braker Check and Protection Disabled)	Hz	1300	●
F20.25	Zero Servo Function	0: Disabled 1: Enabled 2: Automatic		2	●

F20.00=1: Open Loop Hoisting Mechanism

When selecting this function code and resetting it, the defaults of related function codes will become the setting for hoisting of an optimized and open loop tower crane (See Figure 7–12).

Table 7–8 Open Loop Hoisting Mechanism Macro

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01 F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		0	○
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	10.00	●
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	3.00	●
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.03	X4 Input Function	0 - 64		12	○
F02.04	X5 Input Function	0 - 64		13	○
F02.05	X6 Input Function	0 - 64		14	○
F02.06	X7 Input Function	0 - 64		10	○

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F02.07	AI1 Input Function	0 - 64		58	○
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		25.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16		35.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16		45.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16		55.00	●
F20.04	Brake Release Current	20.0 - 100.0	%	70.0	●
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.3	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.3	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●
F20.20	Braker Fault Judgment Pulse Count at Stop	0 - 10000 (0: Braker Check and Protection Disabled)	Hz	1000	●
F20.25	Zero Servo Function	0: Disabled 1: Enabled 2: Automatic		2	●

F20.00=2: Travel Mechanism (Trolley Travel)

When selecting this function code and resetting it, the defaults of related function codes will become the setting for an optimized travel mechanism (See Table 7–9).

Table 7–9 Travel Mechanism Macro

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01 F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		0	○
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	10.00	●
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	3.00	●
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.03	X4 Input Function	0 - 64		12	○
F02.04	X5 Input Function	0 - 64		13	○
F02.05	X6 Input Function	0 - 64		14	○
F02.06	X7 Input Function	0 - 64		10	○
F02.07	AI1 Input Function	0 - 64		58	○
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		25.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16		35.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16		45.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16		55.00	●
F20.04	Brake Release Current	20.0 - 100.0	%	70.0	●
F20.05 F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.3	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.3	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●
F20.20	Braker Fault Judgment Pulse Count at Stop	0 - 10000 (0: Braker Check and Protection Disabled)	Hz	1000	●
F20.25	Zero Servo Function	0: Disabled 1: Enabled 2: Automatic		2	●

F20.00=3: Rotary Mechanism

When selecting this function code and resetting it, the defaults of related function codes will become the setting for an optimized rotary mechanism (See Table 7–10). The stop mode must be set as ramp-to-stop, if no votex auxiliary brake is used.

Table 7–10 Rotary Mechanism Macro

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		0	○
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	10.00	●
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	1.00	●
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	40.00	●
F00.16	Maximum Frequency	20.00 - 600.00	Hz	50.00	●
F00.18	Upper Limit Frequency	Lower Limit Frequency	Hz	50.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
		F00.19 - Maximum Frequency F00.16			
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.03	X4 Input Function	0 - 64		12	○
F02.04	X5 Input Function	0 - 64		13	○
F02.05	X6 Input Function	0 - 64		19	○
F02.06	X7 Input Function	0 - 64		10	○
F02.07	AI1 Input Function	0 - 64		58	○
F04.20	Stop Mode	0: Ramp-To-Stop 1: Coast-to-Stop		1	○
F04.21	DC Brake Start Frequency at Stop	0.00 - Maximum Frequency F00.16	Hz	0.00	○
F04.22	DC Brake Current at Stop	0.0 - 100.0 (100.0= Inverter Rated Current)	%	100.0	○
F04.23	DC Brake Time at Stop	0.00 - 30.00, Disabled at 0.00	s	0.00	○
F05.06	Multipoint VF Voltage Point V1	0.0 - 100.0 (100.0= Rated Voltage)	%	2.0	●
F05.08	Multipoint VF Voltage Point V2	0.0 - 100.0 (100.0= Rated Voltage)	%	6.0	●
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		20.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16		35.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16		50.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16		50.00	●
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	20.00	●
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)	s	20.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
		0.0 - 6500.0 (F15.13=1) 0 - 65000 (F15.13=2)			
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	20.00	●
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	20.00	●
F20.01	Brake Curve Type	0: Frequency & Current Reach at Same Time Brake Control 1: Frequency Reach Brake Control 2: No Brake Control		0	○
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	0.00	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	0.00	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.0	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.0	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	10.00	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	10.00	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.0	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.0	●
F20.18	Acceleration/Deceleration Time Change with Speed	0: Disabled 1: Enabled		1	○
F20.19	DC Brake Current Rise Time	0.00 - 20.00		2.00	●

F20.00=4: Balanced Travel Mechanism

When selecting this function code and resetting it, the defaults of related function codes will become the setting for an optimized and balanced travel mechanism (See Table 7–11).

Table 7–11 Macro for Balanced Travel Mechanism

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		0	○
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	25.00	●
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	3.00	●
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	3.00	●
F00.16	Maximum Frequency	20.00 - 600.00	Hz	50.00	●
F00.18	Upper Limit Frequency	Lower Limit Frequency F00.19 - Maximum Frequency F00.16	Hz	50.00	●
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.03	X4 Input Function	0 - 64		12	○
F02.06	X7 Input Function	0 - 64		10	○
F05.08	Multipoint VF Voltage Point V1	0.0 - 100.0 (100.0= Rated Voltage)	%	9.0	●
F05.10	Multipoint VF Voltage Point V2	0.0 - 100.0 (100.0= Rated Voltage)	%	15.0	●
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		38.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16		50.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency		50.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
		F00.16			
F20.01	Brake Curve Type	0: Current Reach Brake Control 1: Time Reach Brake Control 2: No Brake Control		1	●
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.2	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.0	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.0	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●

F20.00=5: Unbalanced Travel Mechanism

When selecting this function code and resetting it, the defaults of related function codes will become the setting for an optimized and unbalanced travel mechanism (See Table 7–12).

Table 7–12 Macro for Unbalanced Travel Mechanism

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		0	○
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	10.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	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	3.00	●
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.03	X4 Input Function	0 - 64		12	○
F02.04	X5 Input Function	0 - 64		13	○
F02.05	X6 Input Function	0 - 64		14	○
F02.06	X7 Input Function	0 - 64		10	○
F02.07	AI1 Input Function	0 - 64		58	○
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		25.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16		35.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16		45.00	●
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16		55.00	●
F20.04	Brake Release Current	20.0 - 100.0	%	70.0	●
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.3	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.3	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●

F20.00=6: Speed Feedback Construction Elevator

When selecting this function code and resetting it, the defaults of related function codes will become the setting for a Speed Feedback Construction Elevator (See Table 7–).

Table 7–16Speed Feedback Construction Elevator Macro

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		2	○
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	10.00	●
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	3.00	●
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.03	X4 Input Function	0 - 64		12	○
F02.04	X5 Input Function	0 - 64		13	○
F02.05	X6 Input Function	0 - 64		14	○
F02.06	X7 Input Function	0 - 64		10	○
F02.07	AI1 Input Function	0 - 64		58	○
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		25.00	●
F08.02	Preset Speed 3	0.00 - Maximum Frequency F00.16		35.00	●
F08.06	Preset Speed 7	0.00 - Maximum Frequency F00.16		45.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F08.14	Preset Speed 15	0.00 - Maximum Frequency F00.16		55.00	●
F20.04	Brake Release Current	20.0 - 100.0	%	20.0	●
F20.05 F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	0.40	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	0.40	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.0	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	0.20	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	0.20	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.0	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●

F20.00=7: Non Speed Feedback Construction Elevator

When selecting this function code and resetting it, the defaults of related function codes will become the setting for an optimized non speed feedback construction elevator (See Table 7–13).

Table 7–13 Non Speed Feedback Construction Elevator Macro

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F00.01	Drive Control Mode of Motor 1	0: V/F control (VVF) 1: Not Used 2. Feedback Vector Control (FVC)		0	○
F00.07	Numeric Frequency Setting	0.00 - Maximum Frequency F00.16	Hz	15.00	●
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	6.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
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	2.00	●
F02.00	X1 Input Function	0 - 64		1	○
F02.01	X2 Input Function	0 - 64		2	○
F02.02	X3 Input Function	0 - 64		11	○
F02.06	X7 Input Function	0 - 64		10	○
F02.07	AI1 Input Function	0 - 64		58	○
F08.00	Preset Speed 1	0.00 - Maximum Frequency F00.16		50.00	●
F20.04	Brake Release Current	20.0 - 100.0	%	70.0	●
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.3	●
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	3.00	●
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.3	●
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●

Many industrial application macros can not meet the application requirements of all users. Therefore, after selecting one, user also need to fine-tune related parameters.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.01	Brake Curve Type	0: Frequency & Current Reach at Same Time Brake Control		0	○

		1: Frequency Reach Brake Control 2: No Brake Control			

F20.01=0: Frequency & Current Reach at Same Time Brake Control

At the same time of brake release, the inverter needs to judge whether the brake release current F20.04 is reached and the delay before the brake release F20.07 is reached. See Figure 7–28.

F20.01=1: Frequency Reach Brake Control

At the time of brake release, the inverter only judges whether the delay before brake release F20.07 is reached, but no current judgment is required as indicated in Figure 7–28.

F20.01=2: No Brake Control

Just a common application, no brake logic, mainly used for debugging.

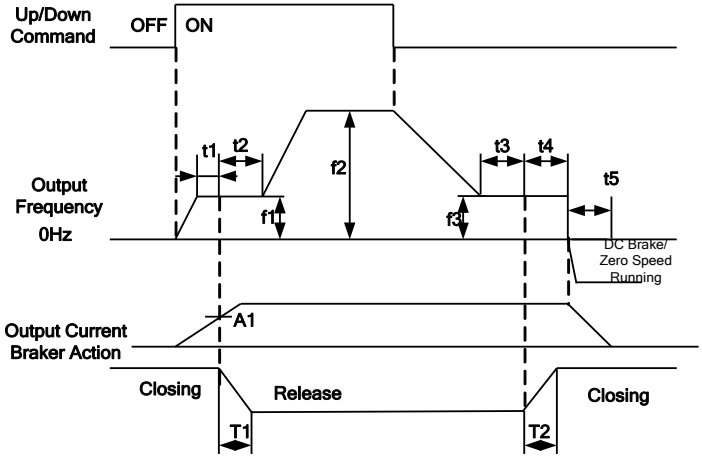


Figure 7–28 Brake Logic

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.02	Start Direction	0: Same Direction between Brake Release Frequency and Running 1: Brake Release Frequency Direction, Always Forward		1	○
F20.03	Stop	0: Same Direction between Speed at Brake		1	○

	Direction	Closing and Running 1: Speed Direction at Brake Closing, Always Forward			

The two function codes above mainly work for decline and do not affect the hoisting.

Inverter start-up:

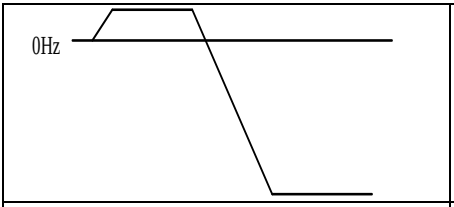


Figure 7–29 During decline, F20.02=1 start direction: the inverter controls the hoist to go up at first, and go down subsequent to the delay after brake release.

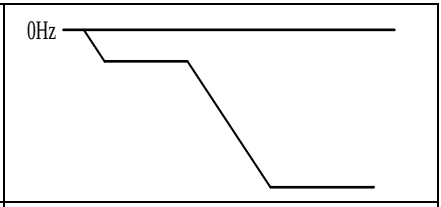


Figure 7–30 During decline, F20.02=0 start direction: the inverter controls the hoist to go down.

Stop:

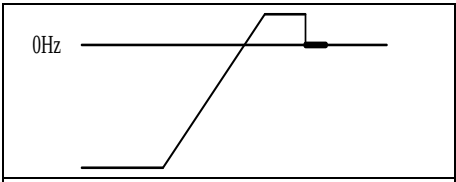


Figure 7–31 During decline, if F20.03=1, brake closing frequency is going up.

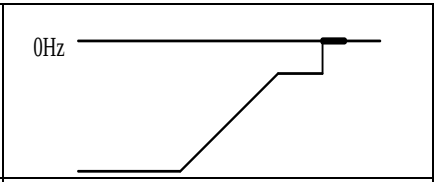


Figure 7–32 During decline, if F20.03=1, the brake closing frequency has the same direction as the running.

If both of the two parameters above are set as 1, user needs to confirm that the inverter controls the hoist for hoisting when the motor is in forward running, and that the running direction of the motor can not be regulated through parameters, which must be realized by switching two Output phase wires.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.04	Brake Release Current	20.0 - 100.0	%	20	●

If F20.01=0, the current set through F20.04 should be judged before brake release. The set value reference is either motor rated torque current under FVC control mode or motor rated current under VF mode.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.05	Brake Release Frequency at Hoisting $f1_{up}$	Lower Limit Frequency - 20.00	Hz	0.40	●
F20.06	Brake Release Frequency at Decline $f1_{down}$	Lower Limit Frequency - 20.00	Hz	0.40	●

f1 should be set as a proper value according to rated motor slip. If the motor slip is too large, but the value set through F20.05 (F20.06) is too small, then the Output torque will be small under VF control mode, producing a falling feel at the moment of brake release; if the motor slip is small, but the value set through F20.05 (F20.06) is too large, then overcurrent may be caused at start-up under VF control mode.

1. Neither F20.05 nor F20.06 is allowed to be set as 0 under VF control mode. They must be set as a value nearly equal to the motor rated slip.
2. Both F20.05 and F20.06 are allowed to be set as 0 under FVC control mode.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.07	Delay before Brake Release t1	0.0 - 10.0	S	0.0	●

After start-up, the braker release starts at t1 time later after the Output frequency of the inverter reaches the brake release frequency f1 (if F20.01=0, whether the value reaches F20.04 should be judged as well).

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.08	Delay after Brake Release t2	0.0 - 10.0	S	0.5	●

F20.08 needs to be set according to the mechanical release time upon the receipt of the release command by the braker. Generally, the set time is 0.1 - 0.2 seconds greater than the mechanical release time.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.09	Brake Release Current Abnormality Judgment Time	0.0 - 10.0	S	3.0	●

If the Output current does not reach the value set through F02.04 within the set time of F20.09 when F20.01=0, an start-up abnormality fault will be reported.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.10	Brake Closing Frequency at Hoisting $f3_{up}$	Lower Limit Frequency - 20.00	Hz	0.20	●
F20.11	Brake Closing Frequency at Decline $f3_{down}$	Lower Limit Frequency - 20.00	Hz	0.20	●

F3 should be set as a proper value according to rated motor slip. If the motor slip is large, but the value set through F20.10 (F20.11) is too small, then the Output torque will be small under VF control mode, producing a falling feel during brake closing; if the motor slip is small, but the value set through F20.10 (F20.11) is too large, then overcurrent may be caused during the brake closing under VF control mode.

1. Neither F20.10 nor F20.11 is allowed to be set as 0 under VF control mode. But they must be set as a value nearly equal to the motor rated slip.
2. Both F20.10 and F20.11 are allowed to be set as 0 under FVC control mode.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.12	Delay before Brake Closing t3	0.0 - 10.0	S	0.0	●

After the inverter gives a stop command, the braker is off after t3 time of the Output frequency of the inverter reaching the brake closing frequency f3.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.13	Delay after Brake Closing t4	0.0 - 10.0	S	0.3	●

F20.13 needs to be set according to the mechanical closing time upon the receipt of the closing command by the braker. Generally, the set time is 0.1 - 0.2 seconds greater than the mechanical release time.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.14	Reverse Control Command	0: Reverse Prohibited during Running 1: Reverse Permitted during Running		1	○

F20.14=0: Reverse Prohibited during Running

If a reverse control command is received during running, the inverter must be braked first before reverse start-up.

F20.14=1: Reverse Permitted during Running

The inverter reverses directly without having been braked at first.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.15	Restart at Braking	0: Restart Prohibited at Braking 1: Restart Permitted at Braking		0	○

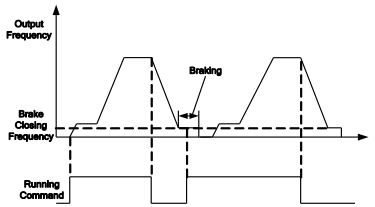


Figure 7–29 Restart Prohibited at Braking

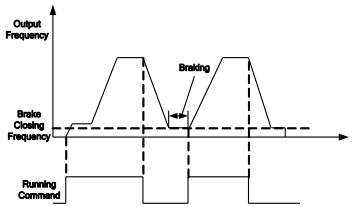


Figure 7–30 Restart Permitted at Braking

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.16	Waiting Time at Restart	0.0 - 10.0	S	0.3	○

F20.16 is the waiting time of restart after brake closing.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.17	Braker Feedback	0: Disabled 1: Detection at Action 2: Full Journey Monitoring		0	○

F20.17=0: Disabled

Whether to release or close the braker depends upon frequency, current and time.

F20.17=1: Detection at Action

If no feedback signal is detected within the time set through F20.08 subsequent to the release of a brake signal, it is deemed that the braker has a release fault; If no

feedback signal is detected within the time set through F20.13 subsequent to the release of a closing signal, it is deemed that the braker has a closing fault; no detection will be performed for other set time.

F20.17=2: Full Journey Monitoring

The inverter must have two feedback terminals, i.e., two feedback contacts for release and closing. Once the inverter is powered on, it will detect the feedback signals. Once a release feedback signal is received within the time set through F20.08, the inverter enters a control stage as per the set speed immediately, but if no feedback signal is received, "E32: Braker Abnormality Fault" will be reported; the inverter will enter the DC brake stage immediately upon the receipt of a closing feedback signal within the time set through F20.13, but if no feedback signal is received, "E32: Braker Abnormality Fault" will be reported

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.18	Acceleration/Deceleration Time Change with Speed	0: Disabled 1: Enabled		0	○

The acceleration/deceleration speed time depends upon different speed levels, with their relationships shown in Table 7–14.

Table 7–14 Speed Levels and Corresponding Set Frequency and Acceleration/ Deceleration Time

Speed	Corresponding set frequency	Corresponding acceleration/deceleration time
Speed-1	Numeric frequency setting F00.07	Acceleration/deceleration time 1 (F00.14/F00.15)
Speed-2	Preset Speed 1 (F08.00)	Acceleration/deceleration time 2 (F15.03/F15.04)
Speed-3	Preset Speed 3 (F08.02)	Acceleration/deceleration time 3 (F15.05/F15.06)
Speed-4	Preset Speed 7 (F08.06)	Acceleration/deceleration time 4 (F15.07/F15.08)

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.19	DC Brake Current Rise Time	0.00 - 20.00	S	0.00	●

The DC brake current rise time refers to the time that the current increases from 0 to the set DC brake time during DC brake.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.20	Braker Fault Judgment Pulse Count at Stop	0 - 10000 (0: Braker Check and Protection Disabled)	Hz	1300	●

If the feedback pulse count reaches the value set by F20.20 under the stop status, it is judged as braker invalidation. F20.20 also applies to the judgment threshold at braker check; if F20.20 is set as 0, the braker check and protection will be disabled.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.21	Decline Speed at Braker Fault	Lower Limit Frequency - 20.00	Hz	0.00	●

After the braker becomes invalid, the inverter controls the load to decline at a speed set through F20.21 until an external command is received (coast-to-stop terminal enabled). The braker detected with a fault by the braker torque check will not accept this decline speed.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.25	Zero Servo Function	0: Disabled 1: Enabled 2: Automatic		2	●

F20.25=0: Disabled

If the inverter under open loop control does not have an encoder, the zero servo function is disabled by setting F20.25=0, and neither both braker nor overspeed protection is available.

F20.25=1: Enabled

By setting this parameter as 1 and pressing 

, the inverter under stop status will enter the zero servo status. By setting this parameter as 0, press 

to exit the zero servo status.

F20.25=2: Automatic

In case of slip, the inverter under the open loop control mode will enable the zero servo function automatically, so as to prevent heavy objects from falling down.

1. Before setting F20.25 as 2 under open loop control mode, user needs to ensure that an encoder is connected; only after the encoder is properly set could the inverter prevent a heavy object from falling down in case of slip conditions due to braker invalidation.
2. No matter what a value is set for F20.25 under closed loop control, a slip condition due to braker invalidation may enable the zero servo function to prevent a heavy object from falling down.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.26	Braker Check Torque	0.0 - 180.0	%	150.0	●
F20.27	Braker Check Torque Holding Time	0.0 - 10.0	S	4.0	●
F20.28	Upper Limit Frequency of Braker Check	Lower Limit Frequency - Upper Limit Frequency Fup	Hz	2.00	●
F20.29	Forward Revolution Detection Delay of Braker Check	0.0 - 10.0	S	0.8	●
F20.30	Reverse Revolution Detection Delay of Braker Check	0.0 - 10.0	S	0.8	●

For braker check, user needs to set the input terminal function Xi as "Braker Check" of the No.58 function under the parameter setting function, and then turn on the terminal; as a result, the inverter will run forward at a torque set through F20.26 for the time set through F20.27 at first and reverse at a torque set through F20.26 for the time set through F20.27. To prevent a slip accident, user should set a proper value for F20.28; generally, the default is OK. See Figure 7–31:

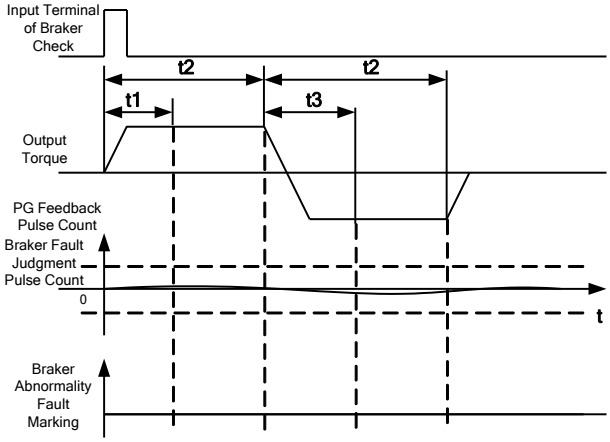


Figure 7–31 Braker Check Logic

In the figure, t1 indicates the Forward Revolution Detection Delay of Braker Check F20.29, t2 indicates the Braker Check Torque Holding Time F20.27 and t3 indicates the Reverse Revolution Detection Delay of Braker Check F20.30.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F20.31	Braker Check Interval	0 - 1000 (0: Disabled)	h	0	●

When the accumulated power-on time reaches the value set through F20.31, the braker check prompt that the Output terminal is enabled can be used to drive the external buzzer to alarm and warn the driver to perform braker check. Driver may deactivate the buzzer by the fault reset button. User shall conduct the braker check under proper conditions and only after the braker is checked normally and satisfactorily could the checking time be cleared, otherwise the braker check sends a prompt that the Output terminal is enabled and the buzzer acts when the inverter is powered on again.

1. No other command will response during the braker check.
2. To prevent the braker check button from being pressed by mistake when the braker is not on, the braker check can be carried out only under the parameter setting status, other than during running, stop, fault and other statuses.
3. No braker check prompt will be given if F20.31 is set as 0.

7.22 F21 Group: Advanced Function Parameter for Hoist

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.00	Overload Protection Torque Threshold	0.0 - 150.0 (0.0: Protection Disabled)	%	0.0	●
F21.01	Load Detection Time	0.0 - 5.0	S	0.5	●
F21.02	Load Detection Frequency	Brake Release Frequency at Hoisting - fup	Hz	10.00	●

If the inverter runs at a constant period after its Output frequency reaches the value set through F21.02 or a lower frequency, maintain the frequency for the detection time set through F21.01. After the set time is out, detect the Output torque (or Output current under VF control mode). If greater than the value set through F21.00, it means that the inverter is overloaded, otherwise the inverter runs normally.

If F21.00 is set as 0.0, it means that no overload protection function is enabled.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.03	Allowing Load Torque	Releasing Rope Torque~100. 0	%	100. 0	○
F21.04	Light-load High-speed Ratio	100.0～200.0	%	100.0	○
F21. 05	Releasing Rope Torque	0. 0～50. 0	%	0. 0	●

F21.03: Allowing Load Torque

100.0% corresponds to the motor torque with rated frequency. When VF mode, this parameter corresponds to the motor current.

F21.04: Light-load High-speed Ratio

Only when this parameter value is greater than 100.0%, the function is enabled. This parameter determines the maximum frequency of the high-speed light load.

Maximum frequency = F21.04 * rated motor frequency.

F21.05: Releasing Rope Torque

This parameter is target frequency of reference .As empty hook and steady speed run, detect output torque, and the test results is the value of this parameter. If this parameter is set to 0.0%, the function is invalid.

Above these function codes are used to set the high-speed light-load function, usually they are used in the FVC mode, and the factory is invalid.

Firstly, set Light-load High-speed Ratio a (F21.04), Releasing Rope Torque T1 (F21.05) ,Allowing Load Torque T2(F21.03) , Load Detection Frequency f1 (F21.02) and Load Detection Time t1 (F21.01). When the output frequency of the inverter reaches the

detection frequency f1, maintaining the frequency in t1.After this time finished, the detector inverter output torque T is calculated with the following graph, then get the target frequency F . If this given frequency is greater than F, then the runing frequency is changed to F.

Only when 0 <T1≤T≤T2, and Light-load High-speed Ratio a> 100.0%, li Light-load High-speed Ratio function is enabled.

Allowing Load Torque T2(F21.03) generally correspond motor rated torque; Releasing Rope Torque T1 (F21.05) should be below 50% of motor rated torque. Light-load High-speed Ratio a (F21.04) is set according to different motor.If the motor is normal motor and no frequency motor, the value generally should not be greater than 150%. When using this function under the VF mode, the output torque reference changes into output current.

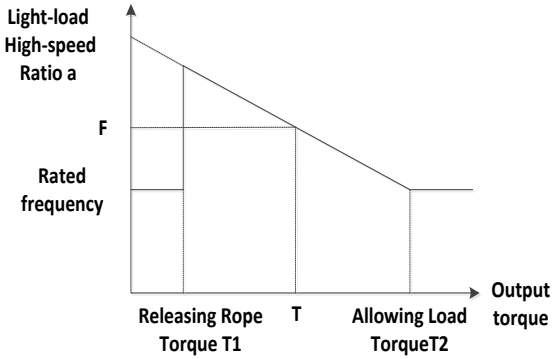


Figure 7–36 Output torque vs Frequency

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.06	Absolute Distance Check position	-9999～9999		0	○
F21.07	Absolute Distance Correction Point1	-9999～9999		0	●
F21.08	Absolute Distance Correction Point2	-9999～9999		0	●
F21. 09	Absolute Distance Correction Unit	0：m 1：dm 2：cm		2	○
F21. 10	Rising / Forward Decelerate Position	-9999～9999		0	●

F21. 11	Landing / Reverse Decelerate Position	-9999～9999		0	●
F21.12	Speed Limit Frequency	Brake Release Frequency - Fup		50.00	●

F21.06: Absolute Distance Check position

This parameter is used to store the external position of absolute distance.when "absolute position distance " of multi-function terminal is valid, the value of this parameter will be used instead of the values of the absolute distances in the register. If use for crane application,sometime need to extend height;If using for traveling,sometime,have the possibility of brake sliping.They will lead to absolute distance - encoder pulse curve (Figure 7-38) to shift.So user need to check absolute distance position.

Absolute distance check means horizontal moving absolute distance - encoder pulse curve .It need to set a fixed flag, for example, the upper limit of 1 m or tracking endpoint of 5 meters, inverter stores this distance by a parameter. When the equipment meet the point,then tell the inverter to check the position ,at the same time,the inverter will use the parameter to replace the value of absolute distance in the register.After that,the processor will be finished.

F21.07: Absolute Distance Correction Point1

F21.08: Absolute Distance Correction Point2

When the device arrive at one location, input the absolute distance in F21.07, inverter will store the point of absolute distance and the corresponding encoder pulse of data, and then when the device arrive at another location, input the absolute distance in F21.08, inverter will generate "absolute distance VS number of encoder pulses" curve (Figure 7-38).

Absolute distance unit is determined by the "Absolute Distance Correction Unit" F21.09.

F21.09: Absolute Distance Correction Unit

Unit of F21.07 and F21.08 could choose meter, decimeter, centimeter. According to the actual conditions, crane accuracy use meter, and travel application may use cm.

F21.10: Rising / Forward Decelerate Position

F21.11: Landing / Reverse Decelerate Position

F21.12: Speed Limit Frequency

when machine reaches the ground or the rising decelerate position ,inverter will decelerate to this frequency of F20.12 in deceleration time.

No positioning control, user could use an external terminal to tell t the ground or the rising decelerate position.

Rising / Forward Decelerate Position (F20.10) and Landing / Reverse Decelerate Position (F20.11) of these two points can also be use as slewing and traveling of

deceleration limit point. As slewing applications, the distance means the angle. If ground or rising deceleration of input terminal is valid ,the inverter will immediately decelerate to frequency of F21.12.

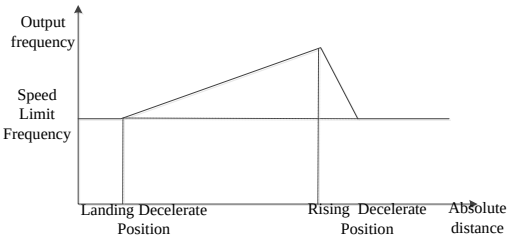


Figure 7–37 absolute distance VS number of encoder pulses

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.13	Positioning Control Function Selection	0：disable 1：Rising / Forward & Landing / Reverse Enable 2：Precise positioning Enable 3：Both Enable		0	○
F21.14	Goal Position	−9999～9999		0	●

F21.03 = 0: Positioning Control Function disable

Rising / Forward & Landing / Reverse disable

F21.03 =1: Rising / Forward & Landing / Reverse Enable

Can use the function code of F21.10～F21.12.

F21.03 =2: Precise positioning Enable

Could use the function code of F21.35.

F21.03 =3: Rising / Forward & Landing / Reverse & Precise positioning Enable

Rising / Forward & Landing / Reverse & Precise positioning Enable.

When F21.03 = 2 or = 3 with the terminal of " position control" be used,the position is valid.

F21.04: Goal Position

For input precise target location.

Positioning control function can be used with an external input device to provide positioning information.It only could be used in FVC mode. Using encoder feedback signals to calculate the running distance .To use this function, you need to set the parameter of F21.06 ~ F21.08 to get the absolute distance - number of encoder pulses curve.

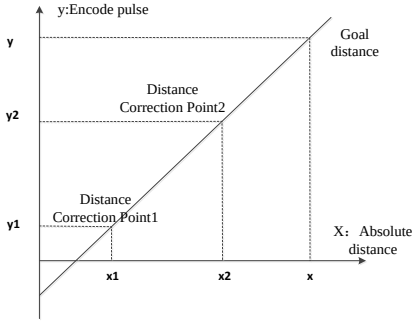


Figure 7–38 absolute distance - number of encoder pulses curve.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.15	Low Voltage Protection	0: Disabled 1: Enabled		0	○
F21.16	Low Voltage Protection Point	70.0 - 100.0	%	90.0	●
F21.17	Low Voltage Filter Time	0. 000～60. 000	s	0. 500	●

F21.15=0: Disabled

Low voltage protection is disabled.

F21.15=1: Enabled

If the bus voltage is lower than the value set through F21.16, the inverter will adjust the upper limit Output frequency according to the proportion of voltage drop to maintain the motor at full-torque Output. 100.0% of F21.16 corresponds to the rated DC bus voltage.

User may increase the value set through F21.17 to avoid oscillation, which may be caused by excessive adjustment when the Output frequency is close to the upper limit frequency.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.18	Power-on Parameter Autotuning	0: Disabled 1: Enabled		0	○

F21.18=0: Disabled

The inverter will not autotune motor parameters automatically after power-on.

F21.18=1: Enabled

The inverter will autotune the parameters of the motor in stationary autotuning after power-on.

.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.19	Motor Fan Control Delay	0. 0～600. 0	s	100. 0	●

If the motor works for long time and directly stop running, and no external cooling measures, the temperature continues to rise (rise may exceed 20K) and insulation will be damaged . So the motor of tail cooling fan will be useful. This fan needs to continue running after inverter stop running , in order to dissipate the heat in the motor core and coil.

If a terminal is defined as "motor fan control" function, this terminal will be valid as the inverter running.It also will be valid during the time of F21.19 (motor fan control delay time) after inverter stop running.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.20	JOG Switch Judgment Time	0.0 - 20.0	s	5.0	○

JOG switch judgment time refers to the switch judgment time between Jog running and normal running.

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.21	Special Acceleration	0: Disabled 1: Enabled		0	○
F21.22	Special Deceleration	0: Disabled 1: Enabled		0	○
F21.23	Acceleration Frequency Switching Point 1	0.00 - F21.25	Hz	10.00	●
F21.24	Deceleration Frequency Switching Point 1	0.00 - F21.26	Hz	10.00	●

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.25	Acceleration Frequency Switching Point 2	F21.23 - F21.27	Hz	20.00	●
F21.26	Deceleration Frequency Switching Point 2	F21.24 - F21.28	Hz	20.00	●
F21.27	Acceleration Frequency Switching Point 3	F21.25 - 600.00	Hz	35.00	●
F21.28	Deceleration Frequency Switching Point 3	F21.26 - 600.00	Hz	35.00	●

Special acceleration/deceleration: when enabled (F21.21 or F21.22 is set as 1), if Output frequency < switching point 1, then the accleration/deceleration time 1 is active; if switching point 1 < Output frequency < switching point 2, the acceleration/deceleration time 2 is active; if switching point 2 < Output frequency < switching point 3, the acceleration/deceleration time 3 is active; if switching point 3 < Output frequency, the acceleration/deceleration time 4 is active. See Figure 7– for details.

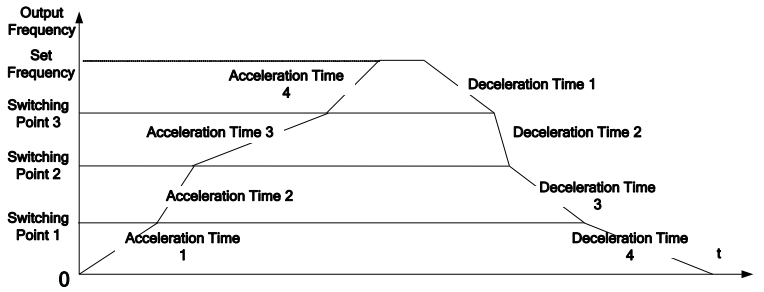


Figure 7–39 Switch between Special Acceleration and Deceleration

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.30	Jog Frequency	0.00～Fmax	Hz	5.00	●
F21.31	Jog Acceleration	0. 00～600. 00	s	1. 00	●

	Time				
F21.32	Jog Decelerate Time	0.00～600.00	s	1.00	●
F21.33	Jog Braking Release Type	0：Same as normal braking release frequency 1：Same as Jog Frequency		0	○
F21.34	Jog Braking Close Type	0：Same as normal braking close frequency 1：Same as Jog Frequency		0	○

set the above parameters for jog operation

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.35	Precision Positioning of Limitation Frequency	0.00～ Fmax(F00.16)	Hz	50.00	●

F21.35=0: Limitation the speed during Precision Positioning

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.36	Change Step of Acceleration & Deceleration	0.01~50.00	Hz/s	5.00	○
F21.37	Speed Storage Type	0:No Storage 1:Save until Power-off 2: Save anytime		0	○
F21.38	Deceleration Switch of Optimization Function	0:Disable 1:Enable		0	○

F21.36: Set the frequency of changing speed during UP/DOWN

F21.37=0: No Storage

After canceling the running command,if run again,the initial target frequency is F00.07 Numeric frequency setting

F21.37=1: Save until Power-off

when inverter is power –on,the initial frequency will be the setting value,but ,after canceling the running command,if run again,the initial target frequency will be the last running of frequency

F21.37=1: Save anytime

For anytime,after canceling the running command,if run again,the initial target frequency will be the last running of frequency

F21.38=0: No Optimization

Standard deceleration

F21.38=0: Deceleration Optimization

Save the time,like the following picture Figure 7–40.

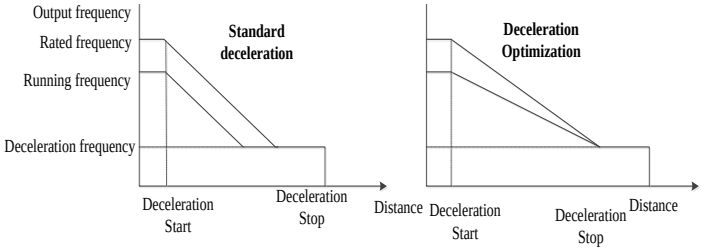


Figure 7–40 Deceleration Optimization function

Function Code	Name of Function Code	Description of Function Codes	Unit	Default	Property
F21.44	Absolute Distance Checking Point 1 Corresponding Pulse Number of High Bit	0～65535		0	×
F21.45	Absolute Distance Checking Point 1 Corresponding Pulse Number of Low Bit	0～65535		0	×
F21.46	Absolute Distance Checking Point	0～65535		0	×

	2 Corresponding Pulse Number of High Bit				
F21.47	Absolute Distance Checking Point 2 Corresponding Pulse Number of Low Bit	0～65535		0	×
F21.48	Current Absolute Distance of High Bit	-999.9～999.9	m	0	×
F21.49	Current Absolute Distance of Low Bit	-9～9	cm	0	×

The absolute distance of number of pulses corresponding to absolute distance of check point 1,2 in Figure 7-38 absolute distance - number of encoder pulses curve.

8 Motor Parameter Autotuning

8.1 Motor Parameter Autotuning

When the inverter is in vector control mode, motor parameter autotuning is required. However, if the inverter is not in vector control mode, parameter autotuning is also suggested for acquiring higher control precision at initial operation.

Generally, it is not easy for user to obtain the motor parameters that are needed for calculation in vector control mode such as stator resistance R1, rotor resistance R2, stator and rotor inductance L, stator and rotor leakage inductance 1, and idling excitation current. EM303B provides the function of motor parameter autotuning. After the function is enabled, the inverter autotunes the relevant parameters of the motor connected and saves them to the internal EEPROM. For definitions of motor parameters of the 3-Phase Induction Motor, please refer to Figure 8–1 .

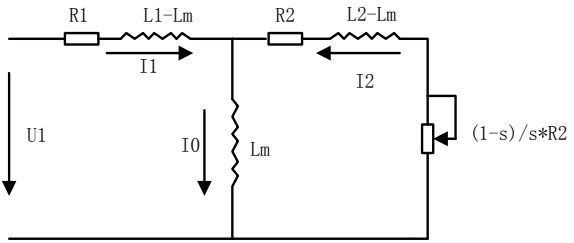


Figure 8–1 Equivalent Circuit of 3-Phase Induction Motor

In the figure, meanings of R1, R2, L1, L2, Lm and I0: stator resistor, rotor resistor, stator inductance, rotor inductance, stator & rotor mutual inductance, and idling excitation current respectively; leakage inductance Ls=L-Lm.

8.2 Precautions Before Autotuning

- Autotuning is a process of autotuning motor parameters. EM303B can autotune motor parameters in 2 modes: stationary autotuning and rotational autotuning.
  - Stationary autotuning is applied to the occasions when the motor cannot be disconnected from the load, the inverter can obtain motor parameters.
  - Rotational autotuning is applied to the occasions when the motor can be disconnected from the load. Before autotuning, the motor should be disconnected from the load. Never perform rotational autotuning for a motor with load.

- Make sure that the motor is in stop status before autotuning, otherwise, autotuning cannot be performed normally.
- Autotuning is only enabled when the inverter is in keypad control mode(F00.02=0) .
- To ensure smooth autotuning, set all motor parameters as per the values listed on motor nameplate correctly: F01.00: Motor model, 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 wiring method and F01.07: Motor rated power factor. Based on the rated power of the inverter, match inverter with an applicable Y-series motor, and the defaults of motor can meet most of needs.
- To ensure the control performance, the motor and the inverter should match in terms of the power rating. Usually, the power rating of motor is only allowed to be one level lower than that of the inverter.
- After autotuning is over normally, the setting value of F01.09 - F01.13 will be updated and auto-saved.
- When F12.14=1 reset the default, the parameters of F01.00 - F01.13 remains unchanged.

8.3 Steps of Autotuning

- In parameter setting status, set F0-04=0, and disconnect the motor from the load.
- Set all motor parameters as per the values listed on nameplate correctly: F01.00: Motor model, 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 wiring method and F01.07: Motor rated power factor.
- By setting F01.34=1, and pressing 

, the inverter starts stationary autotuning for the motor.

  Or by setting F01.34=2, and pressing 

, the inverter starts rotational autotuning for the motor.
- It takes about 2 minutes to complete the autotuning and keypad returns to the initial power-on status.
- By pressing 

in autotuning, it will display "E24" parameter autotuning abnormality. By pressing 

, the inverter will return to the parameter setting status.

  If autotuning fails, the inverter will display "E24" parameter autotuning abnormality . By pressing 

, the inverter will return to parameter setting status.

9 Troubleshooting

9.1 Faults

When something abnormal happens to the inverter, the keypad will display the corresponding fault code and parameter; the fault relay is on, the fault Output terminal is on, the inverter Output stops. If the motor is still running when a fault occurs, it will coast to stop. For EM630 faults and countermeasures, see Table 9–1.

Table 9–1 EM303B Faults and Troubleshooting

Fault Code	Fault type	Cause	Troubleshooting
SC	Short Circuit/EMC Fault	1. Short circuit between inverter Output phases, or between Output phase and ground 2. IGBT damaged 3. Field interference	1. Check if there is any short circuit phenomenon in wiring. 2. Investigate the causes and reset after taking appropriate measures. 3. Seek for technical support.
HOC	Instantaneous Overcurrent	1. Short circuit between inverter Output phases, or between Output phase and ground 2. The acceleration/deceleration time is too short. 3. Under V/F control mode, V/F curve has been set irrationally. 4. The motor is running when the inverter starts. 5. The motor exceeds the capacity of the inverter or the load is too heavy.	1. Check if there is any short circuit phenomenon in wiring. 2. Extend the acceleration/deceleration time. 3. Set the VF curve rationally. 4. Enable the revolution track or start DC brake. 5. Replace with an appropriate motor or inverter.
SOC	Stable Overcurrent		
HOU	Instantaneous Overcurrent	1. The deceleration time is too short and the regenerated energy is too large. 2. The input voltage is too high.	1. Extend the deceleration time. 2. Select an appropriate braking unit/braking resistor.

Fault Code	Fault type	Cause	Troubleshooting
			3. Lower the input voltage to the specified range.
SOU	Stable Overvoltage	1. The power grid voltage is too high.	1. Lower the voltage to the specified range.
SlU	Stable Undervoltage/ Soft Fault	1. Input voltage phase loss. 2. Wiring terminals of the input voltage are loosened 3. Input voltage drops too much. 4. Aging of the switch contact on input power supply.	1. Check the input voltage and its wiring. 2. Tighten the screws of the input wiring terminal. 3. Check the air switch and the contactor.
IlP	Input Phase Loss	1. Input voltage phase loss.	1. Check the input voltage. 2. Check the input voltage wiring. 3. Check whether the connection terminals are loosened.
Ol	Long Overload/Overvoltage Stall Time	1. The acceleration/deceleration time is too short. 2. Under V/F control mode, V/F curve has been set irrationally. 3. The load is too heavy. 4. In the overvoltage stall status for a long time.	1. Extend the acceleration/ deceleration time. 2. Set the VF curve rationally. 3. Replace the inverter with another one that matches with the load. 4. Check whether the motor is driven by any other load and it can not be stopped therefore.
OH	Radiator overheating	1. Ambient temperature is too high. 2. The inverter is in poor ventilation. 3. Cooling fan fault.	1. The running conditions of inverter shall comply with the specification requirements. 2. Improve the ventilation environment and check whether the air duct is blocked. 3. Replace the cooling fan.

Fault Code	Fault type	Cause	Troubleshooting
E13	Motor Overload	1. The acceleration/deceleration time is too short. 2. Under V/F control mode, V/F curve has been set irrationally. 3. The load is too heavy. 4. In the overvoltage stall status for a long time.	1. Extend the acceleration/deceleration time. 2. Set the VF curve rationally. 3. Replace the inverter with another one that matches with the load. 4. Check whether the motor is driven by any other load and it can not be stopped therefore.
E14	External Fault	1. Peripheral fault terminal acts.	1. Check peripherals.
E15	Inverter EEPROM Fault	1. The interference results in reading and writing errors of the EEPROM. 2. EEPROM damaged.	1. Press STOP/RESET to reset and then try it again. 2. Seek for technical support.
E16	Communication Abnormality	1. SCI communication failure	1. Check whether the communication cable is disconnected. 2. Adjust the communication overtime (F10.03).
E17	Temperature Sensor Abnormality	1. The temperature sensor of the inverter is off or short-circuited.	1. Check whether the temperature sensor of the inverter is properly wired. 2. Check if there is any iron object.
E18	Soft Start Relay Off	1. Input voltage phase loss. 2. Wiring terminals of the input voltage are loosened 3. Input voltage drops too much. 4. Aging of the switch contact on input power supply.	1. Check the input voltage and its wiring. 2. Tighten the screws of the input wiring terminal. 3. Check the air switch and the contactor.

Fault Code	Fault type	Cause	Troubleshooting
E19	Current Detection Circuit Abnormality	1. The detection circuit of the drive board or the control board is damaged.	1. Seek for technical support.
E20	System Interference	1. Field interference	1. Seek for technical support.
E22	Encoder Fault	1. The encoder and the PG card are not properly connected. 2. PG card is not installed properly.	1. Check whether the PG card is properly inserted. 2. Check whether the PG card and the encoder are wired correctly. 3. Replace the PG card with another one and try it again.
E23	Keypad EEPROM Fault	1. The interference results in reading and writing errors of the EEPROM. 2. EEPROM damaged.	1. Press STOP/RESET to reset and then try it again. 2. Seek for technical support.
E24	Autotuning Abnormality	1. Press STOP/RESET in the parameter autotuning. 2. In the process of autotuning, the external coast-to-stop terminal FRS=ON. 3. The motor is not connected to the Output terminal of the inverter. 4. The motor is not disconnected from the load. 5. Motor fault.	1. Press STOP/RESET to reset. 2. Check the connection between the inverter and the motor. 3. The motor is not disconnected from the load. 4. Check the motor.
E25	Motor Overspeed Protection	1. No PG card is connected. 2. Encoder Line Number (F01.25) is not set correctly. 3. AB Phase Sequence (F01.27) is incorrect. 4. The actual speed of the	1. Connect to PG card or replace the control mode with VF control mode. 1. . 2. Set the encoder line number as per the user manual of the encoder.

Fault Code	Fault type	Cause	Troubleshooting
		motor is lager than the set speed of the inverter or the load pulls the motor in an opposite way due to excessive load.	3. Reduce the load or select another inverter and motor that are one speed level higher.
E27	Accumulated Power-On Time Reach	1. Set the power-on time reach.	1. Contact the dealer.
E28	Accumulated Run Time Reach	1. Set the run time reach.	1. Contact the dealer.
E29	Internal Communication Fault	1. Internal SPI communication fault	1. Power-on after power cut. 2. Seek for technical support.
E30	Braker Sensor Abnormality	1. Sensor signal abnormality when a braker feedback sensor is adopted.	1. Check the wiring of the braker feedback sensor.
E31	Joystick Not Cleared	1. Joystick gets stuck.	1. Have the joystick cleared.
E32	Start Check Abnormality	1. The set release frequency is too small.	1. Increase the release frequency at hoisting and decline.

When the inverter has any fault above, press 

to reset or use the fault reset terminal to exit the fault status; after the fault is cleared, the inverter returns to the function setting status; if the fault fails to be cleared, LED will continue to display the present fault data.

Check List of Capitalized English Letters Displayed

a	**b**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**l**
A	B	C	D	E	F	G	H	I	L

N	**O**	**P**	**Q**	**r**	**S**	**T**	**U**	**x**	**Y**
N	O	P	Q	R	S	T	U	X	Y

Check List of Figures Displayed

1	2	3	4	5	6	7	8	9	0
1	2	3	4	5	6	7	8	9	0

9.2 Fault Analysis

After power is on, due to improper function setting and incorrect wiring between the inverter and external control terminals, the motor can not meet the expected working requirements. Fault analysis as described in this chapter can be taken as the reference to take the corrective actions. If trip codes appear, see 9.1 for the corrective actions to clear the trips.

9.2.1 Parameter Setting Failure

- When pressing  and  , the parameter display remains unchanged.

  Some parameters can only be edited when the inverter stopped.

- When pressing  and  , the parameter display remains unchanged, but they cannot be saved.

  Some parameters cannot be edited since they are locked.

9.2.2 Abnormal Motor Operation

- After pressing  , the motor does not run.
  - Start/Stop is in terminal control mode: Check the setting of F00.02.
  - Coast-to-stop terminals FRS is connected to COM: Disconnect FRS from COM.
  - When the terminal (Run Command Switched to Terminal) is on and the run command is only in terminal control mode: Switch the terminal off.
  - Status combination of run command input is in terminal control mode: Change it to keypad control mode.
  - Setting reference input frequency= 0: Increase reference input frequency.
  - Power supply is abnormal or control circuit fails.

- When control terminals RUN and F/R are ON, the motor does not run.
  - The external terminal start/stop setting is disabled: Check the setting of F00.02.
  - Coast-to-stop terminal FRS=ON: Switch FRS=OFF.
  - Control switch is disabled: Check control switch.
  - Setting reference input frequency= 0: Increase reference input frequency.
- Motor can only run in one direction.

  Reverse prohibited: When F0-24=1, the inverter reverse is prohibited.
- Motor reverses

  The Output phase sequence of inverter is not identical to that of motor input: When power is off, the running direction of motor can be changed by switching any of the two connection wires on the Output side of inverter.

9.2.3 Excessively Long Acceleration Time

- Excessively low setting of current limit

  When the setting of current limit is enabled, if the Output current of the inverter reaches its set current limit, then the Output frequency will remain unchanged in the process of acceleration, and it will rise continuously only until Output current is lower than the setting current limit. In this case, the acceleration time of the motor is longer than the set time. Check if the set current limit of the inverter is excessively low.
- If the set acceleration time is too long, confirm its parameters.

9.2.4 Excessively Long Acceleration Time

- When the resistance brake is enabled
  - The brake resistance is too big. The resistance brake power is too small, so the deceleration time is prolonged.
  - The set value of brake duty ratio (F15.32) is too small, and the deceleration time is prolonged. Please increase the set value of brake duty ratio.
  - If the set acceleration time is too long, confirm its parameters.
- When the overvoltage stall protection is enabled

- Overvoltage stall protection is enabled, when DC bus voltage exceeds the overvoltage stall voltage (F07.07); the Output frequency remains unchanged. When DC bus voltage is lower than the set value of F07.07, the Output frequency drops continuously and therefore the deceleration time is prolonged. If the set acceleration time is too long, confirm its parameters.

9.2.5 Inverter Overheating

- Excessively heavy load
  - Excessively heavy load makes inverter work beyond its rated current for a long time. The power of inverter shall match that of the motor.
  - The motor is blocked due to the failure of motor or load fault.
- Excessively high ambient temperature

  When the ambient temperature of the inverter exceeds the permitted value, the temperature under the rated working status may exceed the maximum temperature permitted by the inverter.

9.2.6 Electromagnetic Interference (EMI) and Radio-Frequency Interference (RFI)

- When inverter runs in high frequency switch status, it will generate EMI and RFI on the control devices. Take following countermeasures:
  - Lower the carrier frequency of the inverter (F00.23).
  - Install a noise filter on the input side of the inverter.
  - Install a noise filter on the Output side of the inverter.
  - Shield the cable with a metal tube, and place the inverter in a metal case.
  - The inverter and the motor must be grounded reliably.
  - The main circuit and the control circuit should be wired separately. Control circuit should adopt the shielded wire, and see Chapter 3 for wiring.

9.2.7 Leakage Current Circuit Breaker for Leakage Protection

- When the inverter runs, the leakage current circuit breaker is triggered for leakage protection.

  The inverter Outputs high-frequency PWM signals, which generate high-frequency leakage current. Please select a leakage circuit breaker with a trigger current ≥ 30mA. For a regular circuit breaker, the trigger current ≥ 200mA and the active time at 0.1S or above.

9.2.8 Mechanical Vibration

- The fixed frequency of the mechanical system resonates with the carrier frequency of inverter.

  The motor has no problem, but the sharp noises generated by the mechanical system resonate between the fixed frequency of mechanical system and the carrier frequency of inverter. Please adjust the carrier frequency F0-14 to avoid resonant frequency.

- The fixed frequency of the mechanical system resonates with the Output frequency of the inverter.

  The fixed frequency of the mechanical system resonates with the Output frequency of the inverter. Please use oscillation suppression function (F15.37), or install the shake-proof rubber on the chassis of motor or any other shake-proof measures.

- PID Control Oscillation

  The regulation parameters P, Ti and Td of the PID controller are not set properly. Please reset PID parameters.

9.2.9 Inverter Stops Output While Motor Still Rotates

- Insufficient DC Brake at Stop
  - The DC brake torque at stop is too small. Please increase the set value of the DC brake current at stop (F04.22).
  - DC Brake Time at Stop is too short. Please increase the DC brake time at stop (F04.23). Generally speaking, please increase the DC brake current at stop first.

9.2.10 Output Frequency Not As Per the Set Frequency

- The set frequency exceeds the upper limit frequency.

  If the set frequency exceeds the set value of the upper limit frequency, then Output frequency should be the upper limit frequency. Reset the set frequency within the upper limit frequency; or check whether F00.16, F00.17 and F00.18 are appropriate.

10 Maintenance and Inspection

10.1 Routine Maintenance and Inspection of the Inverter

Changes of the working environment of the inverter, such as temperature, humidity, smog, dust and so on, as well as aging of the inner parts of the inverter inner, may cause various faults of the inverter. Therefore, routine inspection and regular maintenance should be performed during the process of storage and use.

- Before using the inverter, user shall check if the components are broken or the screws are loose during transportation.
- While using the inverter, user shall regularly clean the dust and check whether the screws are loosened.
- If the inverter is left unused for a long term, user is recommended to power on the inverter every half year during the storage. Every time, the inverter shall be powered on for half a hour. This will prevent the electronic device from invalidation.
- Keep the inverter away from heavy humidity and metal particles. If necessary, put it in an electric cabinet or a small room with protective measures.
- When the inverter is in normal running, please check the items below:
- Whether the motor has an abnormal sound and vibration.
- Whether the inverter and the motor are overheated abnormally.
- Whether the ambient temperature is too high.
- Whether the Output current value is normal.
- Whether the cooling fan of the inverter runs normally.

According to the service condition, clients shall regularly inspect the inverter for clearing faults and potential safety hazards. Cut off the power supply before checking, and start checking after the keypad LED goes out. The items to be checked are shown in Table 10–1.

Table 10–1 Items for Routine Check

Items	Inspection content	Countermeasures
Screws of main circuit terminal and control circuit terminal.	Whether the screws are loosened.	Tighten the screws with a screwdriver.
Cooling fin	Whether there are dust or foreign object.	Clean up the dust and foreign objects with dry-compressed air of 4-6kg/cm^2 pressure.
PCB(Printed circuit board)		
Cooling fan	Whether there are abnormal sound or vibration. Whether the accumulated run time has reached to 20,000 hours.	Replace the cooling fan.
Power module	Whether there are dust.	Clean up the dust and foreign objects with dry-compressed air of 4-6kg/cm^2 pressure.
Electrolytic Capacitor	If there are phenomena of changing color, foreign odor and blister.	Replace the electrolytic capacitor.

In order to make the inverter operate normally, regular maintenance and change must be performed for purpose of the service life of the inner components of the inverter. The service lives of the inverter components vary with the service environment and conditions. In Table 10–2, the replacement terms of the components of the interver are for user reference.

Table 10–2 Replacement Terms of the Components of the Inverter

Component	Standard replacement years
Cooling fan	2 – 3 years
Electrolytic capacitor	4 – 5 years
PCB(Printed circuit board)	5 – 8 years

In the table above, the replacement terms are based upon the service conditions for the components of the inverter below:

Ambient temperature: annual average 30 ˚C.

Load factor: below 80%.

Running time: below 12 hours per day.

10.2 Warranty Instruction for Inverter

SINEE will offer the warranty service if the inverter has the following conditions:

Warranty is only for the inverter; the warranty service will be provided to the inverter that has a fault or is damaged within 12 months during normal use; if the inverter has a fault or is damaged outside the 12-month period during normal use, reasonable maintenance charge is required.

There is a maintenance charge for any following damage occurred in 12 months:

- Due to improper operation.
- Due to floods, fires, or abnormal voltage fluctuations.
- Due to the incorrect wiring.
- Due to unauthorized modifying or altering.
- The service fees are subject to the actual fees.
- If there is an another agreement, the agreement shall apply.

11 Options

11.1 Braking Resistor

If the motor speed falls too fast or motor load shakes too frequently in the running process of the inverter, then its electric potential energy will charge the inner capacitor through the inverter in a reverse way, leading to the voltage pump up at the both ends of the power module, which easily causes the inverter to be damaged. Internal control of the inverter can suppress this situation based on the load condition and when the braking feature can not meet the user demands, external braking resistor is required to release energy timely. External braking resistor functions for resistance brake, which will dissipate all the energy to the power braking resistor. So, select reasonable and effective power and resistance for the braking resistor.

The power and resistance of the braking resistor (power is 50% of the inverter power) below are recommended for EM630 inverter for hoisting. Based on the load condition, user can make proper changes to these values but these values shall have to meet the required range.

Inverter model	Motor (kW)	Resistance (Ω)	Resistor power (W)	Cable connected to the resistor (mm)
EM630-4R0-3B	4	≥90	≥2000	2.5
EM630-5R5-3B	5.5	≥60	≥3000	4
EM630-7R5-3B	7.5	≥60	≥4000	4
EM630-011-3B	11	≥30	≥6000	6
EM630-015-3B	15	≥30	≥7500	6
EM630-018-3B	18.5	≥30	≥9000	6
EM630-022-3/3B	22	≥15	≥11000	10
EM630-030-3/3B	30	≥15	≥15000	10
EM630-037-3/3B	37	≥10	≥18500	16
EM630-045-3/3B	45	≥10	≥23000	16
EM630-055-3/3B	55	≥7.5	≥28000	25
EM630-075-3/3B	75	≥6	≥38500	35

Note: The cable listed above refers to outgoing line of individual resistor. When the resistor is connected in parallel, the bus should be amplified accordingly.
Signal-phase inverter uses the voltage withstand type cable of AC300 V, 3-phase inverter uses over AC450V and temperature resistance 105 ˚C cable.

11.2 Braking Unit

If EM630 inverter is over 18.5 kW in specification and has no built-in braking unit, then user shall select our BR100 braking units (power range: 18.5 - 315 kW). The models of the braking units are listed below:

Model No.	Application	Minimum resistance (Ω)	Average braking current I_{av} (A)	Peak current I_{max} (A)	Inverter power (kW)
BR100-045	Resistance brake	10	45	75	18.5 - 45
BR100-160	Resistance brake	6	75	150	55 - 160
BR100-315	Resistance brake	3	120	300	185 - 315

Note: When BR100-106 is at the minimum resistance, if the braking frequency of braking unit D=33%, it can continue to work. If D>33%, it needs to work intermittently, otherwise, overheat protection fault will occurred.

11.3 Options of Cable

Because all the braking units and braking resistors wok at high voltage (>400VDC) discontinuously, please select the appropriate cable. See Table 11–1 for specification of the cable of the main circuit. During wiring, only those cables with the insulation grade and the section meeting standards should be used.

Table 11–1 Cable for Braking Unit and Braking Resistor

Model No.	Average braking current I_{av} (A)	Peak current I_{max} (A)	Section of copper core cable (mm^2)
BR100-045	45	75	10
BR100-160	75	150	16
BR100-315	120	300	25

Flexible cable has better flexibility. Since the cable may contact high-temperature device during use, it’s better to use copper core or heat-proof flexible cable or fire-retardant cable. Braking unit and the inverter should be as close as possible to each other, and it’s better to keep their distance no more than 2m, otherwise the DC side cable should be twisted and sheathed with magnetic ring to reduce radiation and inductance.

The lengths of the cables among braking unit, braking resistor and inverter are illustrated in Figure 11–1:

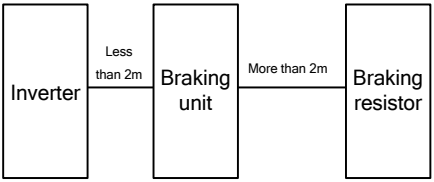


Figure 11–1 Cable Length

Note: For details of 11.1 – 11.3, please refer to *User Manual of BR100 Braking Unit* published by SINEE.

11.4 Option Card

11.4.1 PG Card Configuration

EM630 inverter is equipped with various general PG cards. User should select a PG card based on the encoder Output form. Models of PG cards are listed in Table 11–2.

Table 11–2 Model List of PG Card

Model No.	Description	Encoder interface
EC-PG-O1	OC input PG card	6PIN connection terminal
EC-PG-D1	Differential input PG card	9PIN connection terminal
EC-PG-U1	UVW Differential input PG card	DB15 female
EC-PG-R1	Rotary transformer PG card	DB9 female

11.5 Copper Row for Incoming and Outgoing Cable

The two specifications of EM630 may have a copper row for incoming and outgoing cable switchover. They can be wired outside the case (see Figure 11–2). If required, please indicate it while ordering and install it by yourself.

Model No.	List of options
EM630-220 - 280	Switchover copper row, installation bolt and insulator for incoming and outgoing cable
EM630-315 - 400	Switchover copper row, installation bolt and insulator for incoming and outgoing cable

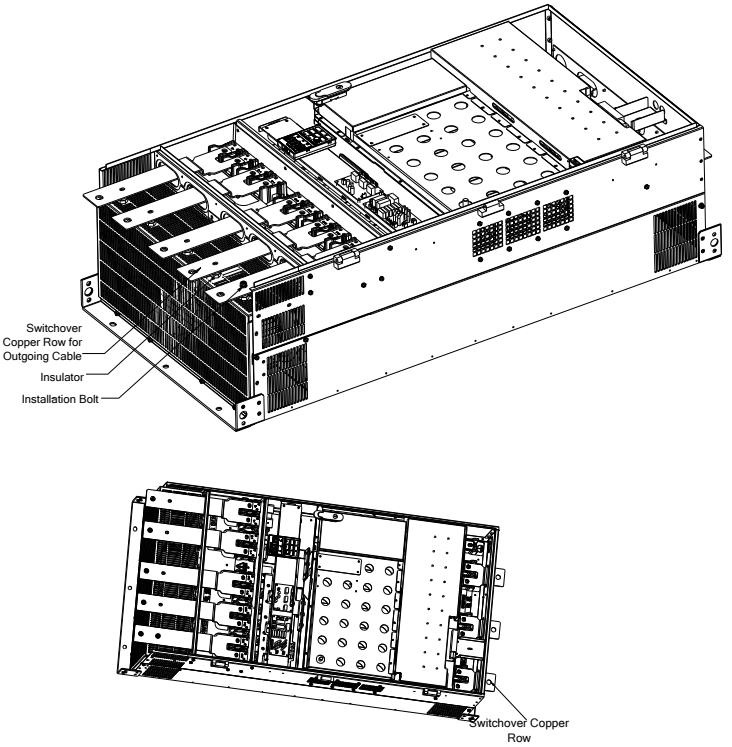
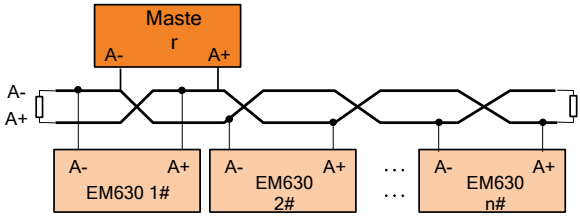


Figure 11–2 Installation of Switchover Copper Row of Outgoing Cable

12 MODBUS Communication Protocol

12.1 Application Scope

1. Applicable series: EM630
2. Applicable network: Support MODBUS-RTU protocol, with the single-master/multi-slave Communication Network of RS-485 bus.



12.2 Physical Interface

RS-485 asynchronous half-duplex communication mode, with the least significant bit given the priority for transmittance.

RS-485 network address: 1 – 247 available for setting, 0 is the broadcast address;

RS-485 terminal default data format: 1-8-N-1[2] (1-8-E-1, 1-8-O-1, 1-8-N-2, 1-8-E-2 and 1-8-O-2 optional).

Default bit rate of RS-485 terminal: 9600bps (4800bps, 19200bps, 38400bps, 57600bps and 115200bps optional);

It's recommended to use the shielded twisted cable as the communication cable so as to reduce the impacts of the external disturbance upon the communication.

[2]: *1-8-N-1*, 1 start bit – 8 characters per byte data – non-parity 1 – stop bit. E, even parity; o, odd parity.

12.3 Protocol Format

12.3.1 Message Format

As shown in Figure 12–1, one standard MODBUS message includes start mark, RTU message (Remote Terminal Unit) and end mark.

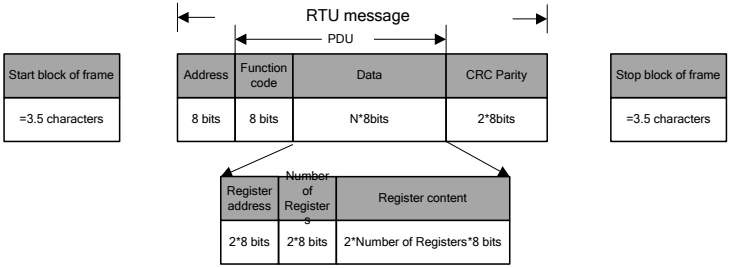


Figure 12–1 RTU Message Frame

RTU message includes address code, PDU (Protocol DataUnit) and CRC 错误!书签自引用无效。[1] Parity. PDU includes the function code and data (mainly including register address, Number of Registers and register content; all function codes have different definitions, see the function code 错误!未找到引用源。)

[3]: CRC parity, with the low byte in the front and the high byte in the back.

12.3.2 Address Code

Address Scope	Purpose
1 – 247	Slave
0	Broadcast

12.3.3 Function Code

MODBUS function code classification is shown in Figure 12–2.

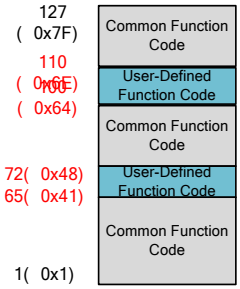


Figure 12–2 MODBUS Function Code Classification

As shown in Table 12–1, EM630 inverters mainly involve common function codes, for example 0x03 read multiple registers or status byte function codes, 0x06 write single register or command function code, 0x08 diagnosis function code, and 0x10 write multiple registers or command function codes.

Besides, to perform some special functions, for example register RAM and EEPROM, user should define the 0x41/0x42 as RAM and EEPROM in the user-defined function code area.

After receiving the abnormal valid data from the device, relevant abnormal information (see 12.3.7 Abnormal Information Response) will be returned. For distinguishing it from the normal communication data, abnormal function codes are defined. Similar to the normal request function code, **the abnormal function code = request function code + 0x80**.

Table 12–1 EM630 Defined Function Code

Function Code	Abnormal Function Code	Function
0x03	0x 83	Read multiple registers or status byte function codes.
0x06	0x 86	Write single register or command function code (save while power failure)
0x08	0x 88	Diagnosis function code
0x10	0x 90	Write multiple registers or command function codes (save while power failure)
0x41	0x C1	See 0x06, but only rewrite the register value (RAM), not to save (EEPROM).
0x42	0x C2	See 0x10, but only rewrite the register value RAM, not to save EEPROM.

In the following sections, those PDU parts that are different due to functions shall be explained in detail.

12.3.3.1 0x03 Function Code: Read Multiple Registers or Status bytes

In a remote device, the inverter uses this function code to read the content keeping the register continuous. The request PDU indicates the start register address and the Number of Registers.

Divide the register data corresponding to the message into two bytes for each register. For each register, each register, each byte includes high bit and the second byte includes low bit.

- Request PDU

Function Code	1 byte	0x03
Initial Address	2 bytes	0x0000 - 0xFFFF
Number of Registers	2 bytes	1 - 16

- Response PDU

Function Code	1 byte	0x03
Number of Bytes	1 byte	2×N*
Register Value	N*×2 bytes	

N*=Number of Registers

- Incorrect PDU

Error Code	1 byte	0x83
Exceptional Code	1 byte	01, 02, 03 or 04

The following is an example of requesting to read the register F19.00 - F19.05 (relevant information about the last fault)

Request		Response			
Field Name	(0x)	Field Name (normal)	(0x)	Field Name (normal)	(0x)
Function Code	03	Function Code	03	Function	83
Initial Address Hi	13	Number of Bytes	0C	Exceptional Code	01, 02, 03 or 04
Initial Address Lo	00	Register Value Hi (F19.00)	00		
Number of Registers	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		

Telling from the returned data, the inverter has suffered 17(0011H): abnormal failure of the temperature sensor. At the time, there are Output frequency 0.00 Hz, Output current 0.00 A, bus voltage 300 V (012CH), acceleration/deceleration status (standby) and working hours 0 hour.

★ **The present function code 0x03 of MODBUS protocol supports "cross-group read of multiple function codes"; but user is not recommended to do cross-group read, so that the user's application does not need to upgrade after the upgrading of our products.**

12.3.3.2 Function Code 0x06 Write Single Register or Command

This function code can be used to write single register in a remote device.

The request PDU describes the address of the written register.

The normal response is the response to the request and returned after writing the register.

- 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

- Incorrect PDU

Error Code	1 byte	0x86
Exceptional Code	1 byte	01, 02, 03 or 04

The following is an example of requesting to change the motor 1 drive control mode (F00.01) to 2: FVC:

Request		Response			
Field Name	(0x)	Field Name (normal)	(0x)	Field Name (abnormal)	(0x)
Function	06	Function	06	Function	86
Register Address Hi	00	Register Address Hi	00	Exceptional Code	01, 02, 03 or 04
Register Address Lo	01	Register Address Lo	01		
Register Value Hi	00	Register Value Hi	00		
Register Value Lo	02	Register Value Lo	02		

12.3.3.3 Diagnosis Function Code 0x08

The function code 08 of Modbus offers a series of tests for checking the communication system between the client end (master) and the server (slave) or checking various internal error status in the server.

This function uses the 2-byte sub-function code field in the inquiry to define the executed test type. The servo will copy the function code and the sub-function code in normal response. Some diagnoses could cause a remote device to return corresponding data through the normal response data field.

Generally, sending the diagnosis function command to a remote device will not affect the user program in the remote device. The diagnosis function could not have access to the user logic, for example discrete magnitude and register. Some functions can be used to reset the error counter in the resent device.

The diagnosis function of our products is mainly line diagnosis and used for testing the normal communication of the master and slaves. The normal response to the inquiry data request should be returning the same data and copying the function code and the sub-function code.

- 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

- Incorrect PDU

Error Code	1 byte	0x88
Exceptional Code	1 byte	01, 03 or 04

- Sub-Function Code

Sub-Function	Indication	Data Field (Request)	Data Field (Request)
0000	Return Inquiry Data	Any	Copy the request data
…			

0000: return the data transmitted in the request data field in response. All messages should be request messages.

The following is an example of requesting the remote device to return the inquiry data. It uses the sub-function code 0000. Using the 2-byte data field to return the data.

Request		Response			
Field Name	(0x)	Field Name (normal)	(0x)	Field Name (abnormal)	(0x)
Function	08	Function	08	Function	88
Sub-Function Code Hi	00	Sub-Function Code Hi	00	Exceptional Code	01, 03 or 04
Sub-Function Code Lo	00	Sub-Function Code Lo	00		
Data Hi	A5 A5	Data Hi	A5 A5		
Data Lo	37	Data Lo	37		

12.3.3.4 Function Code 0x10 Write Multiple Registers or Commands

This function code is used to write continuous register blocks (1 to 16 registers) in a remote device.

The value requested for writing is described in the request data field. Each register divides the data into two bytes.

The normal response is to return the function code, the initial address and the number of registers written.

- Request PDU

Function Code	1 byte	0x10
Initial Address	2 bytes	0x0000 - 0xFFFF
Number of Registers	2 bytes	1 - 16
Number of Bytes	1 byte	2 ×N*
Register Value	N* ×2 bytes	

N*=Number of Registers

- Response PDU

Function Code	1 byte	0x10
Initial Address	2 bytes	0x0000 - 0xFFFF
Number of Registers	2 bytes	1 - 16

- Incorrect PDU

Error Code	1 byte	0x90
Exceptional Code	1 byte	01, 02, 03 or 04

The following is an example of requesting to write 00 01 and 00 03 in the two registers starting from F03.00, i.e., setting the functions of the Output terminals Y1 and Y2.

Request		Response			
Field Name	(0x)	Field Name (normal)	(0x)	Field Name (abnormal)	(0x)
Function	10	Function	10	Function	90
Initial Address Hi	03	Initial Address Hi	03	Exceptional Code	01, 02, 03 or 04
Initial Address Lo	00	Initial Address Lo	00		
Number of Registers Hi	00	Number of Registers Hi	00		
Number of Registers Lo	02	Number of Registers Lo	02		
Number of Bytes	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				

12.3.3.5 Function Code 0x41/0x42 RAM & EEPROM

0x41 and 0x42 RAM & EEPROM, the user-defined function codes, correspond to standard common function codes 0x06 and 0x10; The definitions of these function codes are the same as corresponding function codes (in request, response and error PDU). The only difference is that when these function codes are enabled, only the corresponding value of RAM is modified, without being saved to EEPROM (holding register).

The following is an example of taking 0x41 and 0x06 as a group for description. The condition is similar to the group 0x42 and 0x10.

Request		Response	
Field Name	(0x)	Field Name	(0x)
Function	06	Function	06
Register Address Hi (F00.07)	00	Output Address Hi (F00.07)	00
Register Address Lo (F00.07)	07	Output Address Lo (F00.07)	07
Register Value Hi	13	Output Value Hi	13
Register Value Lo	88	Output Value Lo	88

The data above indicates that the frequency (F00.07) is set as 50.00 Hz, and both RAM and EEPROM will change. **For the function code of F00.07, it's not recommended to use the function code 0x06 so as to avoid damaging EEPROM by excessive rewriting.** Then, please use the function code 0x41 to complete this function.

Request		Response	
Field Name	(0x)	Field Name	(0x)
Function	41	Function	41
Register Address Hi (F00.07)	00	Output Address Hi (F00.07)	00
Register Address Lo (F00.07)	07	Output Address Lo (F00.07)	07
Register Value Hi	13	Output Value Hi	13
Register Value Lo	88	Output Value Lo	88

The data above indicates that this will change the setting of the frequency (F00.07) to 50.00 Hz; the difference from the function code 0x06 is to rewrite the RAM register relative to F00.07, without being saved to corresponding EEPROM memory space. That is to say, after rewriting, the inverter runs at a frequency above 50.00 Hz, which will be returned to the previous value after power-on again.

★ **This function code can not be used to change the parameters of "○" property (unavailable to be modified during the inverter running), i.e., user may operate the parameters of "●" property (available to be modified during the inverter running). If user tries to modify the "○" property, an error code will be returned.**

12.3.4 Allocation of Register Address

Table 12–2 MODBUS Protocol Register Address Definitions

Address Space		Description	
Function Code 0000H - 6F63H		For the function codes FXX.YY, their high addresses are in hexadecimal format for XX and their low address are in hexadecimal format of YY. For example F12.03, its address is 0C03H (12D=0CH, 03D=03H).	
Control Command 7000H - 71FFH	7000H Control Word	0000H	Disabled Command
		0001H	Forward Running
		0002H	Reverse Running
		0003H	Forward JOG
		0004H	Reverse JOG
		0005H	Ramp-To-Stop
		0006H	Not Used

Address Space		Description		
		0007H	Coast-to-Stop	
		0008H	Fault Reset	
		0009H	+/-Input Switch	
		000AH - 00FFH	Not Used	
	7001H	Main Channel Frequency A Communication Setting	-100.00% - 100.00% (Numeric Setting Reference)	
	7002H	Auxiliary Channel Frequency B Communication Setting	-100.00% - 100.00% (Numeric Setting Reference)	
	7003H	Torque Communication Setting	-200.00% - 200.00% (Numeric Setting Reference)	
	7004H - 7005H	Not Used		
	7006H	VF separation mode voltage setting	0.00% - 100.00% (Numeric Setting Reference)	
	7004H - 7005H	Not Used		
	700AH	Upper Limit Communication Setting	0.00% - 200.00% (Numeric Setting Reference)	
	700BH	Upper Limit Frequency Setting of Torque Control	0.00% - 200.00% (Numeric Setting Reference)	
	700CH - 71FFH	Not Used		
Working Condition 7200H - 73FFH	7000H, status byte 1	Bit7 - 0 Running Status	00H	Parameter Setting
			01H	Slave Running
			02H	JOG Running
			03H	Autotuning Status
			04H	Slave Stop
			05H	JOG Stop
			06H	Fault Status
			07H	Factory Inspection
			08H - 0FFH	Not Used
		Bit7 - 8 Fault Information	00H	Inverter runs normally.
			xxH	Fault status of the inverter, "xx" is the fault code.
	7201H	Bit0	1	-: Valid Setting

Address Space		Description									
	Status byte 2	Set Direction			0	+: Valid Setting					
		Bit1 Running Direction			1	Frequency Output, Reverse					
					0	Frequency Output, Forward					
		Bit3 - 2 Control Mode			00	Speed Control Mode					
					01	Torque Control Mode					
					10	Servo Control Mode					
					11	Not Used					
		Bit4 Parameter Protection			1	Enabled					
					0	Disabled					
		Bit6 - 5			Not Used						
		Bit8 - 7 Set Direction			00	Keypad Control					
					01	Terminal Control					
					10	Communication Control					
					11	Not used					
		Bit9			Not Used						
		Bit15 - 10			Not Used						
	7202H Monitoring frequency +/- status byte 1 (1: -; 0: +)	Bit0			Output Frequency						
		Bit1			Input Frequency						
		Bit2			Synchronous frequency						
		Bit3			PG Feedback Frequency						
		Bit4			Not Used						
		Bit5			Estimated slip Frequency						
		Bit6			Load Speed						
		Bit15 - 7			Not Used						
	7203H	Output Frequency									
	7204H	Output Voltage									
	7205H	Output Power									
	7206H	Running Speed									
	7207H	Bus Voltage									
	7208H	Output Torque									
	7209H	Switch Quantity Input 1	15	14	13	12	11	10	9	8	
			*	*	*	*	*	*	*	*	
			7	6	5	4	3	2	1	0	
			*	X7	X6	X5	X4	X3	X2	X1	
	720AH	Switch	15	14	13	12	11	10	9	8	

Address Space		Description								
		Quantity Input 2	*	*	*	*	*	*	*	*
			7	6	5	4	3	2	1	0
			*	*	*	*	*	AI3	AI2	AI1
	720BH	Switch Quantity Input 1	15	14	13	12	11	10	9	8
			*	*	*	*	*	*	*	*
			7	6	5	4	3	2	1	0
			*	*	*	*	Y2	Y1	R2	R1
	720CH	Switch Quantity Input 2	15	14	13	12	11	10	9	8
			*	*	*	*	*	*	*	*
			7	6	5	4	3	2	1	0
			*	*	*	*	*	*	*	*
	720DH	Last Two Faults								
	720EH	Last Three Faults								
	720FH	Last Fault								
	7210H	Last Fault Output Frequency								
	7211H	Last Fault Output Current								
	7212H	Last Fault Bus Voltage								
	7213H	Last Fault Running Status								
	7214H	Last Fault Working Time								
	7215H	Set Acceleration Time								
	7216H	Set Deceleration Time								
	7217H - 73FFH	Not Used								
Product Information 7500H - 75FFH	7500H	Performance Software Serial Number 1	Correspond to F12.22							
	7501H	Performance Software Serial Number 2	Correspond to F12.23							
	7502H	Function Software Serial Number 1	Correspond to F12.24							
	7503H	Function Software Serial Number 2	Correspond to F12.25							
	7504H	Keypad Software Serial Number 1	Correspond to F12.26							
	7505H	Keypad Software Serial Number 2	Correspond to F12.27							
	7506H	Product Serial Number 1	Correspond to F12.28							
	7507H	Product Serial Number 2	Correspond to F12.29							

Address Space		Description	
	7508H	Product Serial Number 3	Correspond to F12.30
	7509H - 75FFH	Not Used	
Other	Not Used		

12.3.5 Data Frame Length

The number of read/write registers for PDU of RTU frame of MODBUS message falls into the scope between 1 and 16. As for different function codes, the actual lengths of RTU frames are different. See Table 12–3 for details.

Table 12–3 RTU Length and Function Codes

Function Code (0x)	RTU frame length (byte)			Maximum Length (Byte)
	Request	Normal response	Abnormal response	
03	8	$5+2N_r$[4]*: $N_r \leq 16$, indicates the number of registers requested to read;*]	5	37
06 (41)	8	8	5	8
08	8	8	5	8
10 (42)	$9+2N_w$[4]*: $N_r \leq 16$, indicates the number of registers requested to read;*]	8	5	41

[4]: $N_r \leq 16$, indicates the number of registers requested to read;

[5]: $N_w \leq 16$, indicates the number of registers requested to write;

[6]: $N_w+N_r \leq 16$;

12.3.6 CRC Parity

CRC parity, with low byte in the front and the high byte in the back.

The transmitting equipment calculates CRC value at first and attaches it in the sent

message. The receiving equipment will, upon receipt of the CRC value, calculate it again and compare the calculated value with the received CRC value. If they are not equal, it means that an error has occurred in the transmitting process.

Calculation of CRC parity:

(1) Define a CRC register and assign an initial value FFFFH.

(2) Perform the xor calculation for the first byte of the sent message, and the value of CRC register, and put the result into CRC register. This starts from the address code, without involving start bit and stop bit.

(3) Draw and check LSB (the least significant bit of CRC register).

(4) If LSB is 1, all bits of CRC register will be shifted right by one bit and the most significant bit will be supplemented by 0. Perform xor calculation for the value of CRC register and A001H, and put the results in CRC register.

(5) If LSB is 0, all bits of CRC register will be shifted right by one bit and the most significant bit will be supplemented by 0.

(6) Repeat steps 3, 4 and 5, until 8 times of shifts have been completed.

(7) Repeat steps 2, 3, 4, 5 and 6, and process the next byte of the sent message, until all bytes of the sent message are processed.

(8) Calculation completed. The content of CRC register is the value for CRC parity.

(9) In a system where the time and the resources are limited, better to use the look-up table method to realize CRC parity.

CRC simple function is as follows (use C language for programming):

```
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 contents above illustrate the CRC parity theory. It takes a long time with this method, especially when the parity data is long. Therefore, use the following two loop-up table methods for 16-bit and 8-bit controllers.

- CRC16 look-up table for 8-bit processor: the finally returned result of this program is with high byte in the front, so please reverse it while sending.

```
const Uint8 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
};
const Uint8 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,0xC9,0x09,0x08,0xC
8,
0xD8,0x18,0x19,0xD9,0x1B,0xDB,0xDA,0x1A,0x1E,0xDE,0xDF,0x1F,0xDD,0x1D,0x1C,0xD
C,
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,0x69,0xA9,0xA8,0x
68,
0x78,0xB8,0xB9,0x79,0xBB,0x7B,0x7A,0xBA,0xBE,0x7E,0x7F,0xBF,0x7D,0xBD,0xBC,0x7
C,
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;

        }
```

- CRC16 look-up table for 16-bit processor: the finally returned result of this program is with high byte in the front, so please reverse it while 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

The master wants to receive a normal response after it sends a request to the slave. Inquiry of the master may results in the following four response situations:

- If the slave has received a request without communication error and can handle the inquiry normally, the slave will return a normal response;

- If the slave has not received the request due to communication error, the slave can not return information. The slave will be seen as overtime;
- If the slave has received the request but detected a communication error (parity, address, length, CRC, etc.), it will not return a response. The slave will be seemed as overtime;
- If the slave has received the request without communication error but can not handle it (example: request to read a register which does not exist), it will return an abnormal response to report the actual situation of the error to the master.

An abnormal response message has two fields that are different from the normal response:

- Function code field: in the normal response, the slave copies the original request function code from the appropriate function code field. MSB of all the function code is zero. In the abnormal response, MSB of slave function code is 1. Abnormal response function code = normal function code +0x80.
- Data Field: A slave can return data in the data field in normal response and return abnormal code in the abnormal response. See Table 12–4 for Definitions of Exceptional Codes.

Table 12–4 Definitions of Exceptional Codes

Exceptional Code	Name	Definitions
01H	Illegal function	The function code received by the slave exceeds the configured scope (refer to 12.3.3 Function Code).
02H	Illegal data address	The data address received by the slave (inverter) is not a permitted address; especially, the combination of the start address and transmission length of the register is invalid (refer to 12.3.4 Allocation of Register Address).
03H	Illegal data frame	As detected by the slave (inverter), the inquiry data frame length or CRC parity is incorrect.
04H	Slave fault	Unrecoverable mistake happened when the slave (inverter) tries to execute require operation. The cause may include logic error or failure to write EEPROM.
05H	Data exceeding the range	Data received by the slave (inverter) exceeds the scope of corresponding register: minimum - maximum.
06H	Parameter: read only	The present register is read only and can not be written.
07H	Parameter: not modified during	The inverter is in running status. The present register can not be written. If necessary, please stop the inverter at first.

	running	
08H	Parameter: password protection	The present register is password-protected.

12.4 Protocol Description

12.4.1 Definitions of Time Interval of Interframe and Intraframe Time Interval

A complete MODBUS message includes not only the required data unit, but also start and end marks. Therefore, as indicated in Figure 12–1 and Figure 12–3, an idle level with the transmission time equal to or greater than 3.5 characters is defined as the start mark, and the transmission will be deemed as abnormal if there is an idle level with transmission time greater than 1.5 characters during the message transmission.

Specific start-end and abnormal interval time have something to do with bit rate (refer to Table 12–5). If the bit rate is 9600bps, with sampling period of 1ms, then the start-end interval is an idle level greater than or equal to 4ms (3.5×10/9600=3.64≈4), the interval of exceptional data is the idle level with interval time among bits of one data frame greater than or equal to 2ms (1.5×10/9600=1.56≈2) but smaller than 4ms (idle level between normal data bits less than or equal to 1ms).

Table 12–5 Checklist of Time Interval and Bit Rate (when t_{modify}=1ms)

Bit rate (bps)	Start-end interval $T_{interval}$ (t_{modify})	Abnormal interval $T_{abnormal}$ (t_{modify})	Remarks
4800	8	4	Normal frame permits the idle point level ≤3ms; when an idle level≥8ms, it means the end of a data frame.
9600	4	2	Normal frame permits the idle point level ≤1ms; when an idle level≥4ms, it means the end of a data frame.
19200	2	1	Normal frame permits the idle point level<1ms; when an idle level≥2ms, it means the end of a data frame.
Higher	**1**	**1**	**When an idle level (1ms), it means the end of a data frame.**

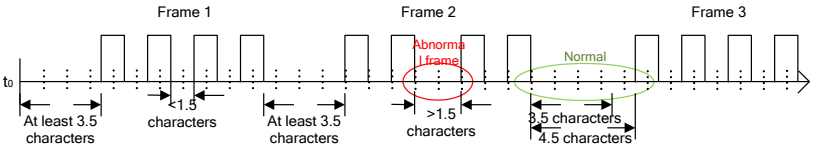


Figure 12–3 Correct and Incorrect Data Frames

12.4.2 Data Frame Processing

After receiving a data frame, the system should process it first to judge whether it is a legal frame sent to the inverter. Then, check whether the data is correct and perform corresponding processing. If the received frame is illegal, it will not turn data; if the received frame is legal but incorrect, it will turn corresponding abnormality information frame.

Legal frame: meet address (inverter or broadcast) and length (not less than 3) conditions.

Correct frame: a correct frame is a legal frame, of which corresponding memory address is corrected, memory content is as defined and can be processed for the time being.

12.4.3 Modbus Response Delay

Define the time interval from its receipt of a valid data frame[7]*: Valid data frame: sent by the external master (other than the keypad) to the inverter, and the function code, data length and CRC are correct.*

[1] (data on RS-485 network, different from the command sent by the keyboard), to data learning, and then to starting the data return, as the response delay (set through F10.04). Since a standard protocol has defined the start and end marks, there must be response delay, at least 3.5 character time interval +1ms (485 protocol chip stable time, t_{w2}), and the specific minimum time interval has something to do with the bit rate. If bit rate is 9600bps, the minimum response delay shall be 5ms (3.5×10/9600+1=4.64≈5).

If the communication data involves the EEPROM operation, the actual time interval will be extended.

[7]: Valid data frame: sent by the external master (other than the keypad) to the inverter, and the function code, data length and CRC are correct.

As shown in Figure 7–23, data sending section (t_s), sending end mark section (t_{w1}), 75176 forwarding waiting section (t_{w2}), data return section (t_r) and 75176 receipt

section- (t_{w3}).

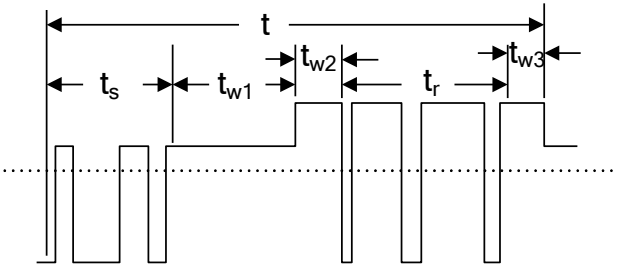


Figure 12–4 Time Sequence Translation of Complete Data Frame

12.4.4 Communication Overtime

The communication interval ∆t refers to the period from the previous receipt of a valid data frame by the slave (inverter) to the receipt of a valid data frame again. If ∆t is greater than the set time (see F10.03; this function is disabled if it is set as 0), this is called "communication overtime".

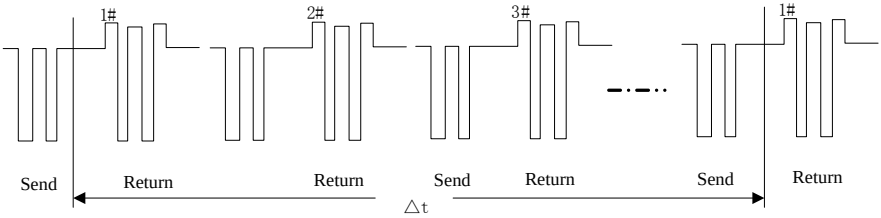


Figure 12–5 485 Network Link Data

12.5 Example

1) Forward Running of the Inverter

Send: 01 41 70 0000 01 E6 C5

Return: 01 41 70 0000 01 E6 C5 (Normal)

Return: 01 C1 04 70 53 (When abnormal, assuming that the slave fails)

	Send		Normal return		Abnormal return	
*	Frame header	≥3.5 idle characters				
1	Address	01	Address	01	Address	01
2	Function Code	41	Function Code	41	Function	C1

					Code	
3	Register Address Hi	70	Register Address Hi	70	Exceptional Code	04 (assumption)
4	Register Address Lo	00	Register Address Lo	00	CRC Parity Lo	70
5	Register Value Hi	00	Register Value Hi	00	CRC Parity Hi	53
6	Register Value Lo	01	Register Value Lo	01		
7	CRC Parity Lo	E6	CRC Parity Lo	E6		
8	CRC Parity Hi	C5	CRC Parity Hi	C5		
*	Frame End	≥3.5 idle characters				

2) Inverter stop

Send: 01 41 70 0000 07 66 C7

Return: 01 41 70 0000 07 66 C7 (Normal)

Return: 01 C1 04 70 53 (When abnormal, assuming that the slave fails)

	Send		Normal return		Abnormal return	
*	Frame header	≥3.5 idle characters				
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	Exceptional Code	04 (assumption)
4	Register Address Lo	00	Register Address Lo	00	CRC Parity Lo	70
5	Register Value Hi	00	Register Value Hi	00	CRC Parity Hi	53
6	Register Value Lo	07	Register Value Lo	07		
7	CRC Parity Lo	66	CRC Parity Lo	66		
8	CRC Parity Hi	C7	CRC Parity Hi	C7		
*	Frame End	≥3.5 idle characters				

3) Change the running frequency (for example 50.00Hz/1388H)

Send: 01 41 00 07 13 88 81 52

Return: 01 41 00 07 13 88 81 52 (Normal)

Return: 01 C1 04 70 53 (When abnormal, assuming that the slave fails)

	Send		Normal return		Abnormal return	
*	Frame header	≥3.5 idle characters				
1	Address	01	Address	01	Address	01
2	Function Code	41	Function Code	41	Function Code	C1 C1
3	Register Address Hi	00	Register Address Hi	00	Exceptional Code	04 (assumption)
4	Register Address Lo	07	Register Address Lo	07	CRC Parity Lo	70
5	Register Value Hi	13	Register Value Hi	13	CRC Parity Hi	53
6	Register Value Lo	88	Register Value Lo	88		
7	CRC Parity Lo	81	CRC Parity Lo	81		
8	CRC Parity Hi	52	CRC Parity Hi	52		
*	Frame End	≥3.5 idle characters				

4) Read the last fault information (read F19.00 - F19.05)

Send: 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)

Return: 01 83 04 40 F3 (When abnormal, assuming that the slave fails)

	Send		Normal return		Abnormal return	
*	Frame header	≥3.5 idle characters				
1	Address	01	Address	01	Address	01
2	Function Code	03	Function Code	03	Function Code	83
3	Initial Address Hi	13	Number of Bytes	0C	Exceptional Code	04 (assumption)
4	Initial Address Lo	00	Register Value Hi (F19.00)	00	CRC Parity Lo	40
5	Number of Registers Hi	00	Register Value Lo (F19.00)	11	CRC Parity Hi	F3 F3
6	Number of Registers Lo	06	Register Value Hi (F19.01)	00		
7	CRC Parity Lo	C1 C1	Register Value Lo (F19.01)	00		
8	CRC Parity Hi	4C	Register Value Hi	00		

			(F19.02)		
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 Parity Lo	53	
17			CRC Parity Hi	5B	
*	Frame End	≥3.5 idle characters			

5) Check whether the lines work

Send: 01 08 00 00 AA 55 5E 94

Return: 01 08 00 00 AA 55 5E 94 (Normal)

Return: 01 88 04 47 C3 (When abnormal, assuming that the slave fails)

	Send		Normal return		Abnormal return	
*	Frame header	≥3.5 idle characters				
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	Exceptional Code	04 (assumption)
4	Sub-Function Code Lo	00	Sub-Function Code Lo	00	CRC Parity Lo	47
5	Data Hi	AA	Data Hi	AA	CRC Parity Hi	C3 C3
6	Data Lo	55	Data Lo	55		
7	CRC Parity Lo	5E	CRC Parity Lo	5E		
8	CRC Parity Hi	94	CRC Parity Hi	94		
*	Frame End	≥3.5 idle characters				

6) Change the carrier frequency (F00.23) to 4.0 kHz. (use the function code 0x06, because such function code is expected to be saved to EEPROM).

Send: 01 06 00 17 00 28 39 D0

Return: 01 06 00 17 00 28 39 D0 (Normal)

Return: 01 86 04 43 A3 (When abnormal, assuming that the slave fails)

	Send		Normal return		Abnormal return	
*	Frame header	≥3.5 idle characters				
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	Exceptional Code	04 (assumption)
4	Register Address Lo	17	Register Address Lo	17	CRC Parity Lo	43
5	Register Value Hi	00	Register Value Hi	00	CRC Parity Hi	A3
6	Register Value Lo	28	Register Value Lo	28		
7	CRC Parity Lo	39	CRC Parity Lo	39		
8	CRC Parity Hi	D0	CRC Parity Hi	D0		
*	Frame End	≥3.5 idle characters				

13 Electrical Wiring Diagram of Typical Application

13.1 Wiring Diagram of EM630 Inverters for Hoisting Application of Tower Crane

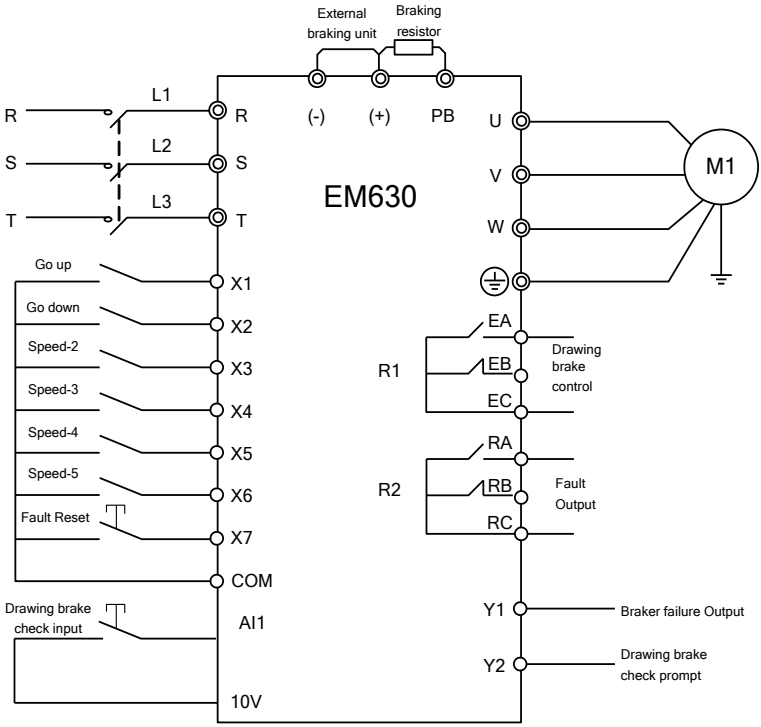


Figure 13–1 Wiring Diagram of EM630 Inverters for Hoisting Application of Tower Crane

Note: 1. Running logic control circuit can be added to X1 and X2 control circuits.

2. If F20.00=0 is selected for EM630 inverter for tower crane hoisting application, then functions of Xi, Y1, R1 and R2 shall be configured as per Figure 13–1.

13.2 Wiring of EM630 Inverters for Elevator Application

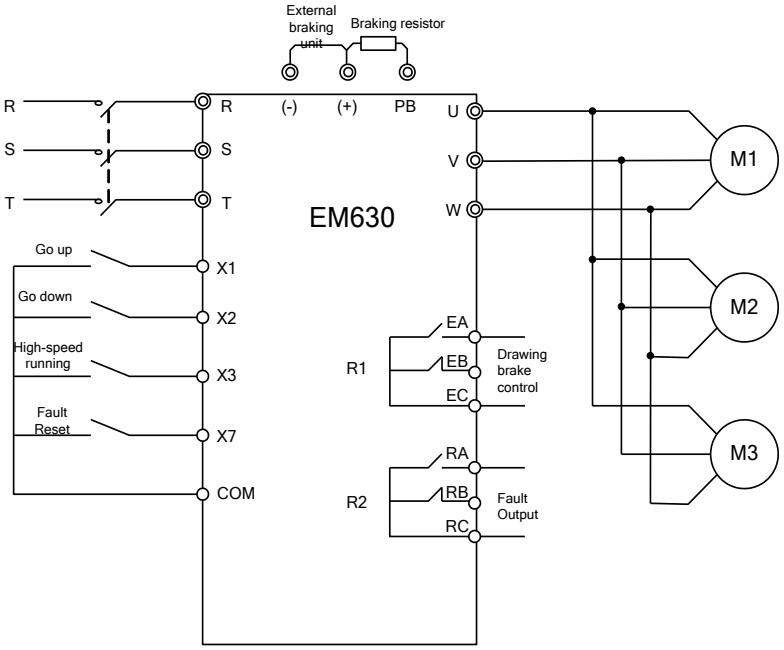


Figure 13–2 Wiring Diagram of EM630 Inverters for Elevator Application

Note: 1. Running logic control circuit can be added to X1 and X2 control circuits.

2. If F20.00=5 or 6 is selected for EM630 inverter for elevator application, then functions of Xi, R1 and R2 shall be configured as per Figure 13–2.

13.3 Wiring Diagram of EM630 Inverters for Slewing Application of Tower Crane

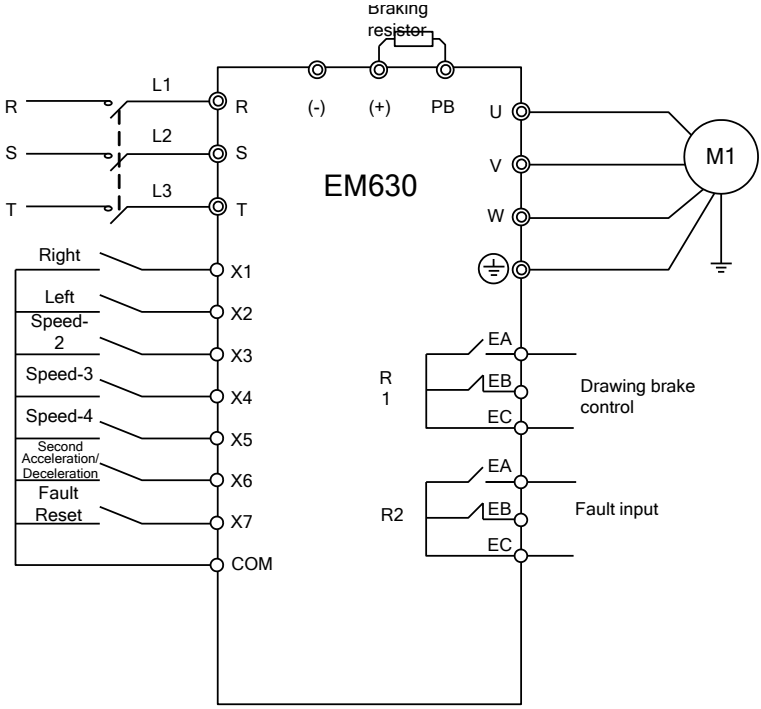


Figure 13–3 Wiring Diagram of EM630 Inverters for Slewing Application of Tower Crane

Note: 1. Running logic control circuit can be added to X1 and X2 control circuits.

2. If F20.00=3 is selected for EM630 inverter for tower crane slewing applicationV, then functions of Xi, R1 and R2 shall be configured as per Figure 13–3.

13.4 Wiring Diagram of EM630 Inverters for Travel Application of Tower Crane

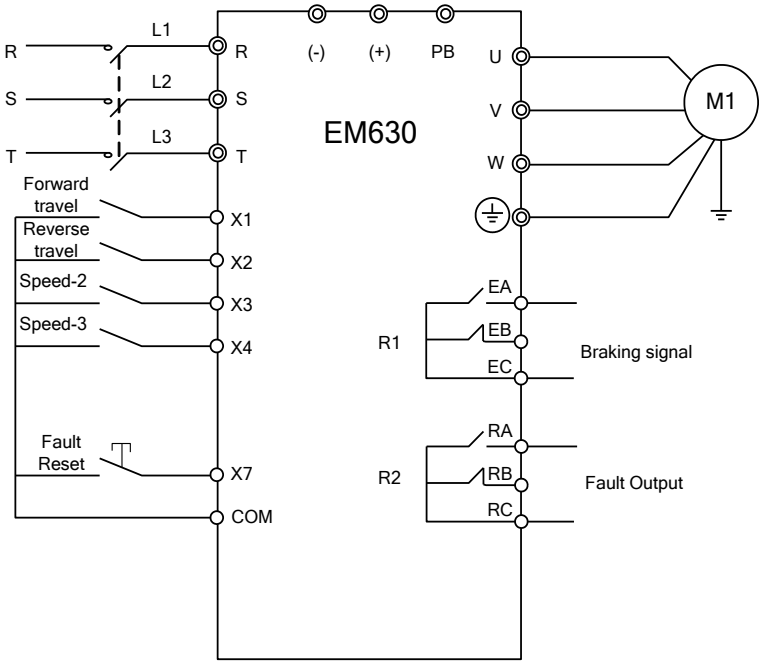


Figure 13–4 Wiring Diagram of EM630 Inverter for Travel Application of Tower Crane

Note: 1. Running logic control circuit can be added to X1 and X2 control circuits.

2. If F20.00=4 or 5 is selected for EM630 inverter for tower crane travel macro, then functions of Xi, R1 and R2 shall be configured as per Figure 13–4.

Appendix I General Encoder Expansion Card (PG Card)

I.1 General

User shall purchase an appropriate PG card from SINEE when using the vector control.

- Configuration:

EM630 inverter is equipped with multiple general PG cards. User should select a PG card based on the encoder Output form. Models of PG cards are listed in the table below:

Model No.	Description	Encoder interface
EC-PG-O1	OC input PG card	6PIN connection terminal
EC-PG-D1	Differential input PG card	9PIN connection terminal
EC-PG-U1	UVW Differential input PG card	DB15 female
EC-PG-R1	Rotary transformer PG card	DB9 female

I.2 Installation Instructions

- Install the PG card into the expansion slot EC-A (make sure it is installed and buckled properly).
- Disassemble PG card only after the inverter is powered off.

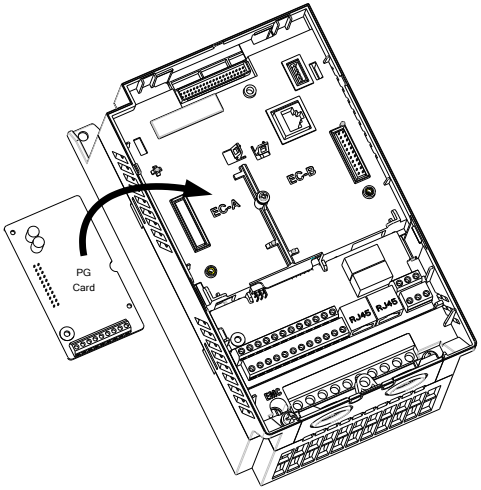


Figure 1 PG Card Installation

- Figures of real objects are as follows:

EC-PG-O1 EC-PG-D1 EC-PG-U1 EC-PG-R1

I.3 Definition and Instruction of Specification and Wiring Terminal Signal

Table 1 Instructions of Terminal Signal of OC Input PG Card (EC-PG-O1)

No.	Terminal Signal	Description
1	PE	Shielded wiring terminal
2	12V	Power Output voltage: 12V±5% Maximum Output current: 200mA
3	COM	Common terminal of input power and signal
4	A	Encoder signal input, single end input Maximum response frequency 80kHz
5	B	
6	Z	

Table 2 Instruction of Terminal Signal of Differential Input PG Card (EC-PG-D1)

No.	Terminal Signal	Description
1		
2	5V	Power Output voltage: 12V±5% Maximum Output current: 300mA
3	COM	Common terminal of input power and signal
4	Z	Encoder signal input, differential input Differential signal amplitude ≤7V, maximum response frequency 300kHz
5	/Z	
6	B	
7	/B	
8	A	
9	/A	

Table 3 Instruction of Terminal Signal of UVW Differential Input PG Card (EC-PG-U1)

No.	Terminal Signal	Description
1	A	Encoder signal input, differential input Differential signal amplitude ≤7V, maximum response frequency 300kHz
2	/A	
3	B	
4	/B	
5	Z	
6	/Z	
7	U	Encoder signal input, differential input Differential signal amplitude ≤7V
8	/U	
9	V	
10	/V	
11	W	
12	/W	
13	5V	Power Output voltage: 5V±5% Maximum Output current: 300mA
14	COM	Input power and signal common terminal
15	-	

Table 4 Instruction of Terminal Signal of Rotary Transformer PG Card (EC-PG-R1)

No.	Terminal Signal	Description
1	EXCLO	Rotary transformer excitation signal 7Vrms, 10kHz
2	EXC	
3	SIN	Rotary transformer feedback signal 3.5±0.175Vrms, 10kHz
4	SINLO	
5	COS	
6	-	
7	-	
8	-	
9	COSLO	