

Preface

Thank you for purchasing EM100 series inverter.

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EM100 mini inverter is a compact, intuitive, reliable and performing AC variable speed drive for 3-phase induction motors.

This manual offers the general information of installation, wiring, function parameters, daily maintenance, and fault diagnosis of EM100 mini inverter.

It is the duty of any user to perform the appropriate, correct installation or configuration of the optional parameters of the devices. Neither SINEE nor its distributors shall be responsible or liable for misuse of the information contained herein or mismatching the inverter with the motor.

In the interests of commitment to a policy of continuous development and improvement, SINEE reserves the right to update the specification of the product or its performance, or the content herein without notice.

More updates and information available at www.sinee.cn .

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1. Safety Information



Danger: The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



Caution: This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or a risk of damage to the products or other devices.

1.1 Safety Precautions

Before Installation



Danger

1. Do not install the product if water in the package, missing component or broken component.
2. Do not install the product if the lable on the package is not identical to that on the inverter.



Danger

1. Be careful in carrying or transportation. Risk of devices damage.
2. Do not use damaged product or the inverters missing component. Risk of injury.
3. Do not touch the parts of control system with bare hands. Risk of ESD hazard.

Installation:



Danger

1. Installation base shall bemetalor other non-flammable material. Risk of fire.\
2. Do not unscrew the fixing bolts, especially the bolts with red mark.



Caution

1. Do not leave cable strips or screws in the inverter. Risk of inverter damge.
2. Install the product at the place with less vibration and no direct sunlight.
3. Be careful about the installation space for cooling purpose when the inverter is installed in a cabinet.

Wiring:



Danger

1. Wiring must be performed by authorized and qualified personnel. Risk of danger.
2. Circuit-breaker should be installed between inverter and the mains. Risk of fire.
3. Be sure that the power supply is off before wiring, and ground inverter as per standard wiring. Risk of electrical hazard.
4. Grounding terminal must be grounded. Risk of electrical hazard and fire.



Danger

1. Never connect input power supply cable to output terminals U, V, and W of inverter, and be careful about the terminal symbol. Risk of inverter damage.
2. Be sure that the wiring meets EMC requirements and local safety requirements. Cables should be in recommended sizes. Risk of accident.
3. Do not connect braking resistor to DC bus terminal $+$ & $-$. Risk of fire.
4. Tighten terminals with screw drivers of specified torque. Risk of fire.
5. Do not connect phase-shifting capacitor and LC/RC noise filter to output circuits.
6. Do not connect the solenoid switch and electromagnetic contactor to output circuits. Otherwise, it will trigger overcurrent protection, or damage inverter.
7. Do not disconnect internal wires of inverter. Risk of inverter damage.

Before Power-on



Caution

1. Verify that the input voltage is identical to the rated voltage of product, correct wiring of input terminals R, S, and T and output terminals U, V, and W, wiring of inverter and its peripheral circuits, and all wires should be in good connection. Risk of inverter damage.
2. Never perform voltage withstanding test on inverter, it has been done at ex-works. Risk of accident.



Danger

1. Inverter shall be power-on only after the front cover is assembled. Risk of electrical hazard.
2. Wiring of all peripherals should obey the guide of this manual. Risk of accident.

After Power-on



Danger

1. Do not touch the inverter and its peripheral circuit with wet hands. Risk of electrical hazard.
2. Do not touch any input/output terminals of inverter with bare hands. Risk of electrical hazard.
3. After power is on at the first time, inverter will detect external circuit automatically. Meanwhile, do not touch wiring terminals U, V, and W of inverter, or wiring terminal of motor with bare hands. Risk of electrical hazard.



Danger

1. If autotuning is required, be careful of personal injury when motor is running. Risk of accident.
2. Do not change the defaults of parameters. Risk of devices damage.

During Operation



Danger

1. Do not touch cooling fans or discharge resistor with bare hands. Risk of burning.
2. Non-professionals shall not detect signals during operation. Risk of personal injury or device damage.



Caution

1. Prevent any foreign items from being left in the devices during operation. Risk of device damage.
2. Do not control start/stop of inverter by on/off of contactor. Risk of device damage.

Maintenance



Danger

1. Maintain and inspect devices after power is off. Risk of electric hazard.
2. Maintain and inspect inverter only after the voltage is lower than DC 36V between DC bus terminals + & -, and power is off for 5 minutes. The residual charge on capacitor may cause personal injury.
3. Maintenance and inspection can only be performed by professionals. Risk of personal injury.
4. Parameter setting is required if inverter has been replaced. Plug-in & plug-out should be performed after power-off.

1.2 Precautions

■ **Motor Insulation Check**

When the motor is started for the first time, before re-use after standby for a long time and periodical check, motor insulation check should be conducted to prevent inverter from being damaged due to motor wiring insulation failure. Motor and inverter should be disconnected during insulation check. Voltage megameter (500V) is recommended, be sure that the insulation resistance measured $\geq 5M\Omega$.

■ **Motor Thermal Protection**

If motor is not applicable to the rated capacity of inverter, especially the inverter rated power > the motor rated power. Adjust motor protection parameters in the inverter or install thermal relay for motor protection.

■ **Operation above Grid Power Frequency(>50Hz)**

Output frequency of EM100 is 0Hz ~ 320Hz. If EM100 is required to operate above 50Hz, take the endurance of mechanical devices into consideration.

■ **Mechanical Vibrations**

Inverter may encounter mechanical resonance point of the load device at output frequency point, set jump frequency parameter to avoid mechanical vibration.

■ **Motor Heating and Noise**

The output voltage PWM wave of inverter contains a certain amount of harmonics wave, so that the temperature, noise and vibration of the motor will increase comparing with operating at working frequency.

■ **Piezosistor or the Capacitor on Output Side for Improving Power Factor**

The inverter outputs PWM wave, do not install capacitor to improve power factor or piezosistor for lightning protection on output side. Otherwise, it will trigger inverter instantaneous overcurrent or even damage inverter.

■ **Applied with the Rated Voltage**

Apply EM100 with the rated voltage. Failure to comply will damage inverter. If required, take a transformer to boost or step-down voltage.

■ **Do Not Apply a 3-Phase Input Inverter to 2-Phase Input Applications**

Do not apply a 3-phase input EM100 inverter to 2-phase input applications. Otherwise, it will result in faults or damage inverter.

■ **Lightning Protection**

Integrated lightning over-current protection device has certain ability to protect inverter in lightning. A protection device has to be installed between inverter and power supply in the area where lightning happens frequently.

■ **Altitude Derating**

In altitudes above 1000m above sea level, the derating is required because of poor cooling effect due to rare air. Contact SINEE for technical support.

■ **Cautions for Scrapped Inverters**

Electrolytic capacitors on the main circuit and PCBA may explode when burned. Plastic parts will produce toxic gases when burned. Deal with the scrapped inverters as industrial waste.

2. Overview

2.1 Verifying Product



Caution

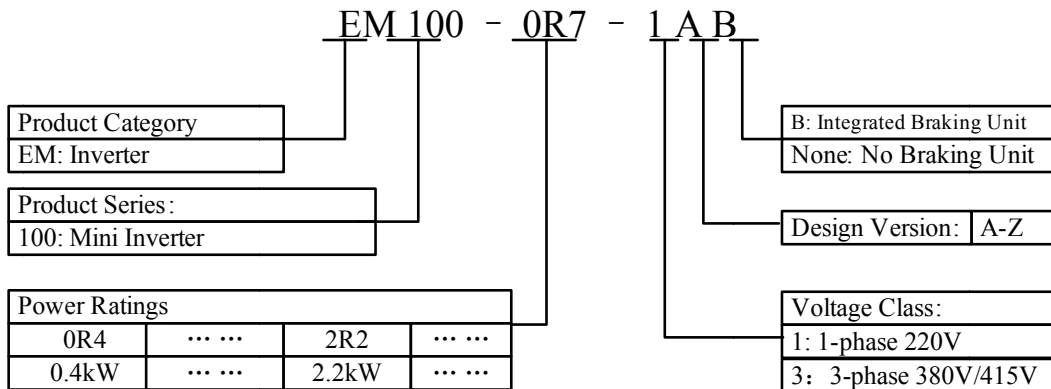
- Never install an inverter that is damaged or missing components. Otherwise, a risk of injury.

Refer to the following table, and check and verify the product.

Item	Action
If the goods are identical to the purchase order.	Check the devices reference marked on the label.
Any part damaged.	Check the outlook if any damages.
Any screw loosened.	Check with a screwdriver if necessary.

2.2 Model Numbering Scheme and Nameplate

■ Model Numbering Schemec



■ Nameplate

Model No. : EM100-0R7-1AB
 Rated Power : 0.75kW
 Input Voltage: AC220V
 Rated Current: 4.8A
 Serial No.:

Shenzhen Sine Electric Co, Ltd.

2.3 Model Number

Table 2-1 EM100 Model Number

Rated Input Voltage	Model No.	Motor Power(kW)	Rated Output Current(A)
1-phase AC220V	EM100-0R4-1AB	0.4	3.0
	EM100-0R7-1AB	0.75	4.8
	EM100-1R5-1AB	1.5	8.0
	EM100-2R2-1AB	2.2	10.0
3-phase AC380V/415V	EM100-0R7-3AB	0.75	2.8
	EM100-1R5-3AB	1.5	4.8
	EM100-2R2-3AB	2.2	6.2

2.4 Technical Specifications

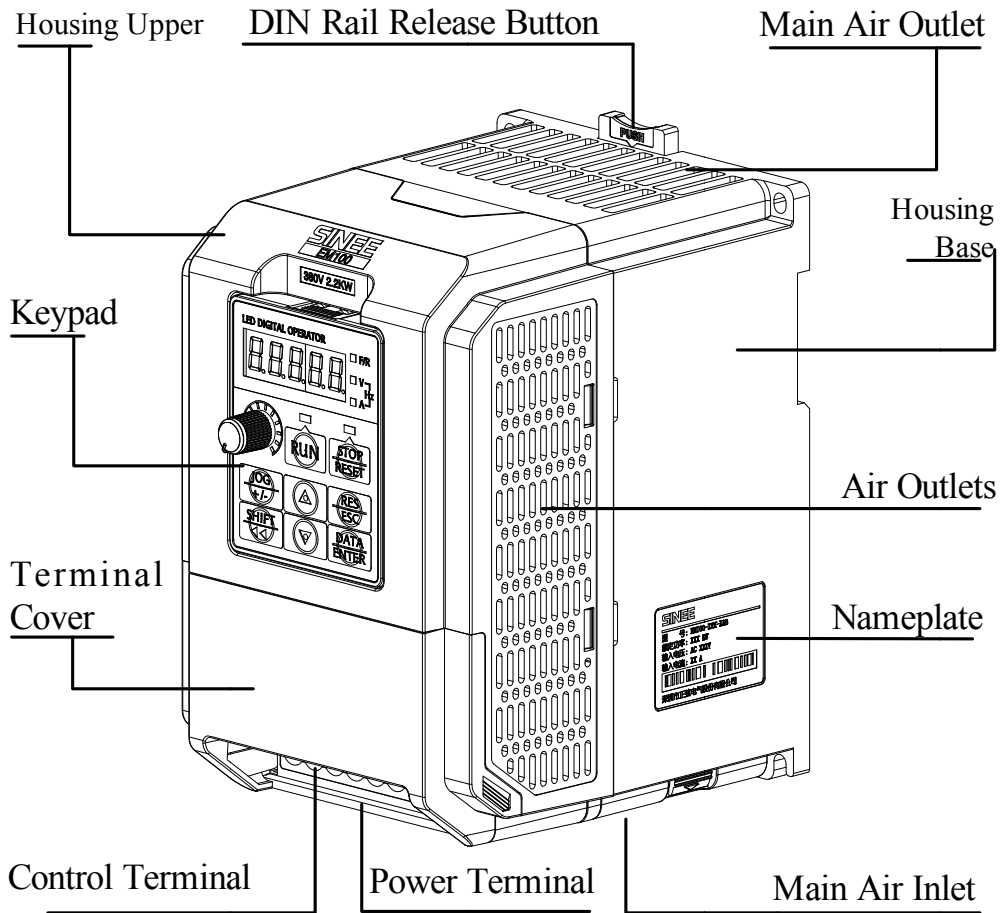
Table 2-2 EM100 Technical Specifications

Items		Specifications
Input		EM100-XRX-1AB: 1-phase 220V(±20%) 50~60Hz(±5%) EM100-XRX-3AB: 3-phase 380V/415V(±20%) 50~60Hz(±5%)
Output	Max. Output Voltage	3-phase, from 0 to U_{supply} .
	Rated Output Current	100% rated current non-stop output
	Max. Overload Current	150% rated current for 1 minutes, 180% rated current for 10 seconds, 200% rated current for 2 seconds
Basic Control Function	Control Mode	V/F, SVC
	Speed Setting Mode	Speed setting mode, analog setting, RS485 communications setting, terminal numeric setting, keypad
	Running Mode	Keypad, control terminals (2-wire sequence, 3-wire sequence), RS485
	Frequency Control Range	0.00~320.00Hz
	Input Frequency Resolution	Numeric input:0.01Hz, analog input: 0.1 Hz
	Governor Deflection	1:50
	Speed Control Accuracy	0.3%
	Acceleration/Deceleration Time	0.01~600.00 seconds
	V/F Features	Rated output voltage: 5%~100% adjustable, frequency base :20.0~320.0Hz adjustable
	Torque Boost	Automatic torque boost, fixed torque boost curve, customer defined V/F curve scaling
	Start Torque	150%/1Hz
AVR	AVR is active while output voltage remains unchanged if input voltage is varying.	

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		Accuracy: $\pm 10V$ at rated input voltage
	Automatic Current Limit	Automatically limit output current, avoid frequent overcurrent trip
	DC Brake	Brake time: 0~30S Brake current: 150% rated current
	Signal Input Source	Numeric, analog voltage, analog current, preset speed, simple PLC, MODBUS communications, wobbbulation frequency, PID. Primary frequency setting and auxiliary frequency integrated setting and terminal switch.
Input/ Output Function	Auxiliary Power Supply	10V/10mA for power supply of external potentiometer
	Numeric Input Terminal	Internal electrical impedance: 27K Ω
		Acceptable external Input: 0~20V
		Maximum Input Frequency: 1kHz
	Analog Input Terminals	6 numeric programmable input terminals, user can define terminal functions via function code
		1 voltage input: 0~10V, 1 current input: 0~20mA
		Input electrical impedance: voltage input: 1M Ω , current input: 250 Ω Accuracy: 0.2%
	Numeric Output Terminal	1 programmable OC output, max. load capacity: 200mA/24V, output frequency range: 0~1KHz
		1 programmable relay output, EA N/O, EB N/C, EC Common port, contact capacity: 3A/AC250V, power factor: >0.4 or 1A/DC30V
	Analog Output Terminal	1 programmable analog output terminal, output: 0~10V Max. oad capacity: 2mA max.
Accuracy: 0.1V		
Display	LED	5 bits display inverter message, 8 input keys
Protection	Protections	Overcurrent, overvoltage, input/output phase loss, output short-circuit, overheating, and etc.
Application Conditions	Installation Site	Indoor, with altitude less than 1,000 meters, free of dust and corrosive gas, and no direct sunlight
	Ambient Temperature	-10 $^{\circ}C$ ~ +40 $^{\circ}C$. In the temperature range +40 $^{\circ}C$...+50 $^{\circ}C$, the rated output current is decreased by 1% for every additional 1 $^{\circ}C$. 20% ~90%RH (no condensation)
	Vibration	< 0.5g
	Storage Temperature	-25 $^{\circ}C$ ~ +65 $^{\circ}C$
	Installation Method	Wall mounting
Protection Grade		IP20
Cooling Method		Forced air cooling
Safety Standard		IEC61800-5-1:2007
EMC Standard		IEC61800-3: 2004

2.5 EM100 Outlook

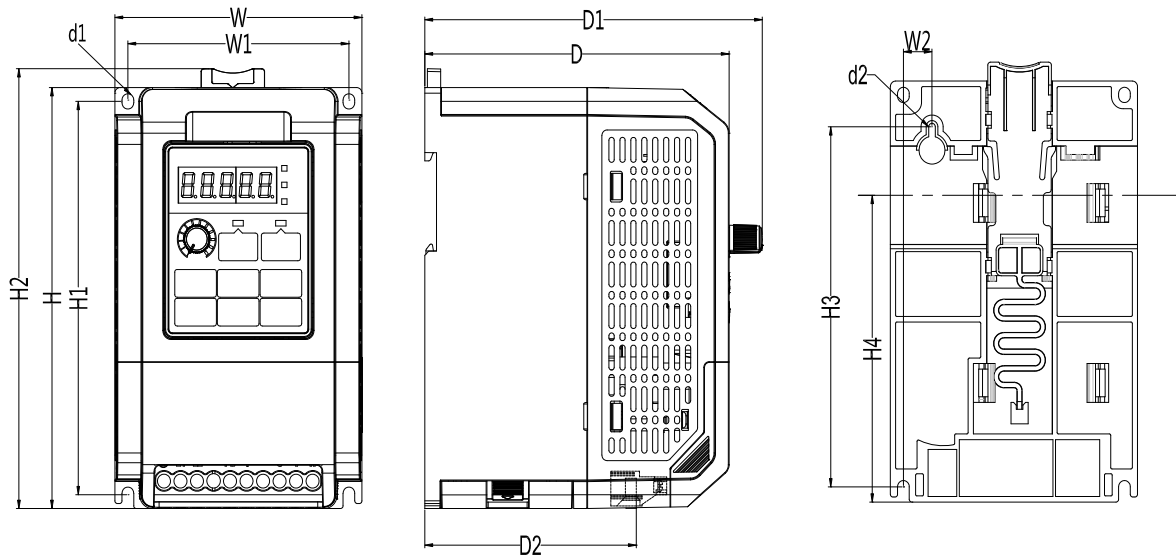


EM100 ID

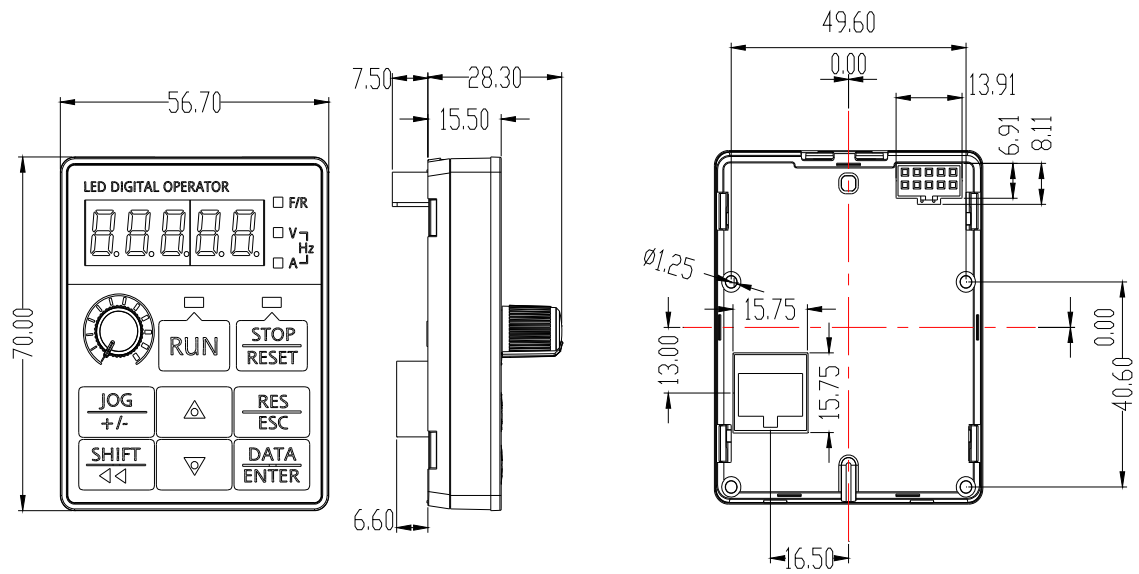
2.6 Overall and Installation Dimensions

2.6.1 Overall Dimensions

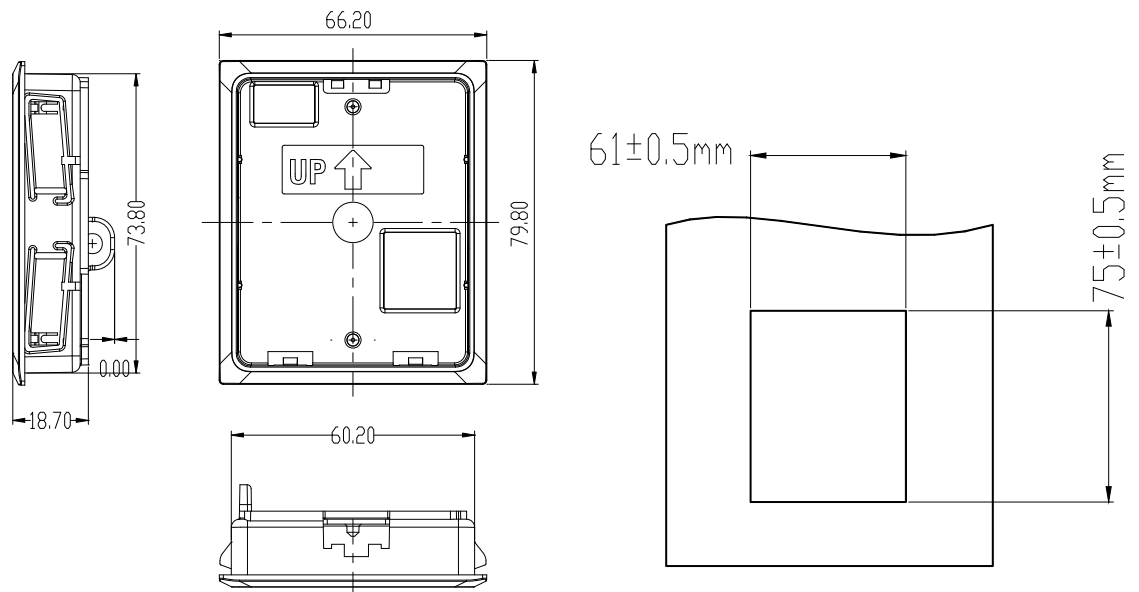
Model No.	EM100-0R4-1AB EM100-0R7-1AB	EM100-0R7-3AB EM100-1R5-1AB EM100-1R5-3AB EM100-2R2-1AB EM100-2R2-3AB
Dimensions (mm)		
W	95	110
W1	85	100
W2	11	11
H	152	163
H1	142	153
H2	159	170
H3	130.5	140.5
H4	110.5	121.5
D	117	132
D1	130	145
D2	74	84
d1	4.5	4.5
d2	4.5	5
G/Kg	1	1.5
Volume	SIZE1	SIZE2



2.6.2 Keypad Dimensions



2.6.3 Dimensions of Keypad Chassis (Accessories) and Holes on the Chassis



Keypad Chassis Dimensions

Dimensions of Holes on the Chassis

Remarks: Contact distributors or SINEE for keypad chassis if needed.

3. Installation

3.1 Mechanical Installation

3.1.1 Installation Recommendations



Caution

- 1. Always hold the case when carrying the inverter.**
Risk of injury if only holding the terminal cover.
- 2. Installation base shall be metal or other non-flammable material.**
Risk of fire if installing the inverter on inflammable materials.
- 3. Install a cooling fan when installing inverter in a cabinet, and keep temperature of the air at air inlet lower than 40°C.**
Overheating may result in fire or other accidents.

3.1 .2 Installation Site

Considerations for installation site:

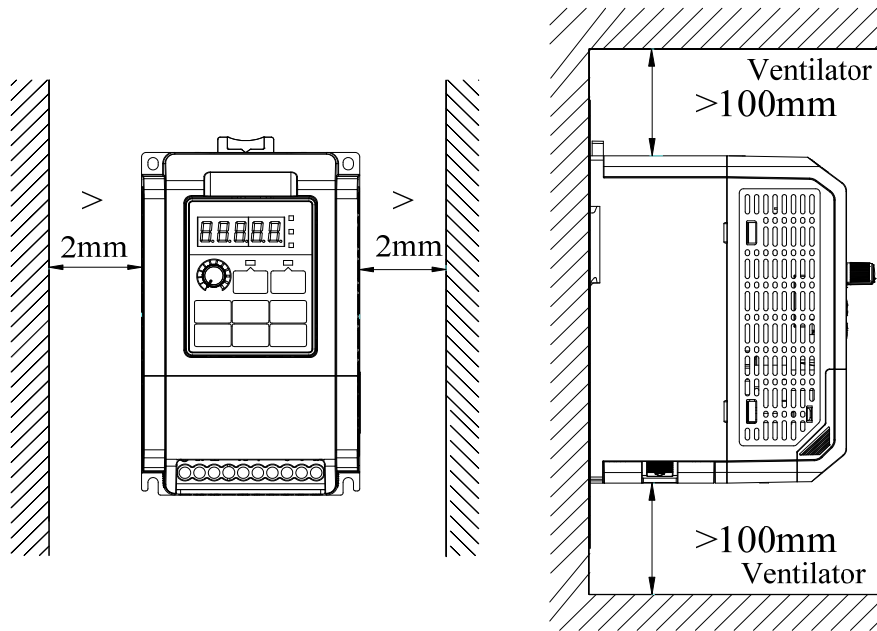
- Good ventilation indoor
- Ambient temperature: $-10^{\circ}\text{C}\sim+40^{\circ}\text{C}$, 20%~90%RH(No condensation)
- No high temperature and high moisture, humidity: $<90\%\text{RH}$, no water drops or any other liquid drops.
- Never install on flammable materials.
- No direct sunlight
- No flammable, corrosive gas or liquid.
- No dust, floating fiber or metal particles.
- Firm and steady installation base

3.1.3 Precatutions

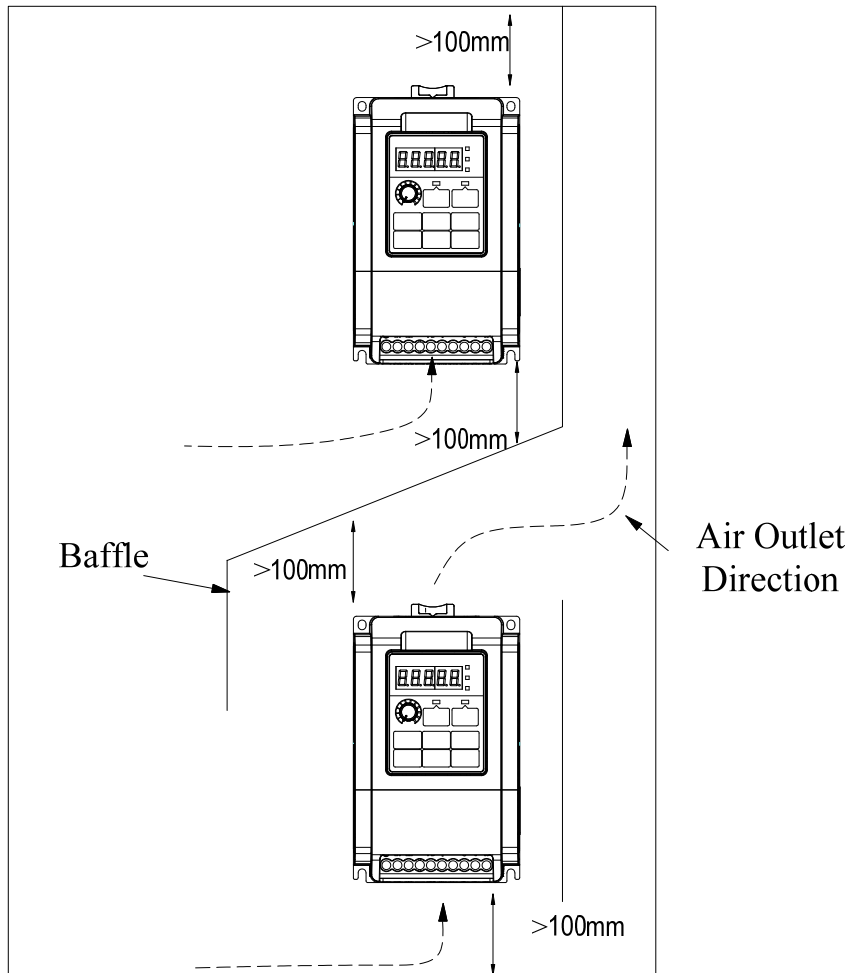
Take protective measures during installation to prevent foreign matters like metal particles or dust from entering the inverter when drilling. After installation, take off the protective object.

3.1.4 Installation Direction and Space

There is a fan installed in EM100 for forced air cooling. For a good cooling circulation, inverter has to be installed vertically, and sufficient spaces have to be left between inverter and the peripheral objects. Multi-EM100 can be installed in parallel horizontally and vertically. See following Figures.



3.1.5 Vertical Installation of Multi-inverter



3.1.6 Installing with Screws

a. 4-hole Installation

See *Overall and Installation Dimensions* for the dimensions of 4-hole (Hole a). Refer to Figure a, and punch 4 holes on the installation panel. Put the inverter against the panel and mate 4 holes, and then tighten screws in the 4 holes (Tighten any of the 2 screws in diagonal position, tighten 4 holes with screws for strengthened installation. Screw size: M4xL, L>12mm, tightening torque: 1N.m±10%).

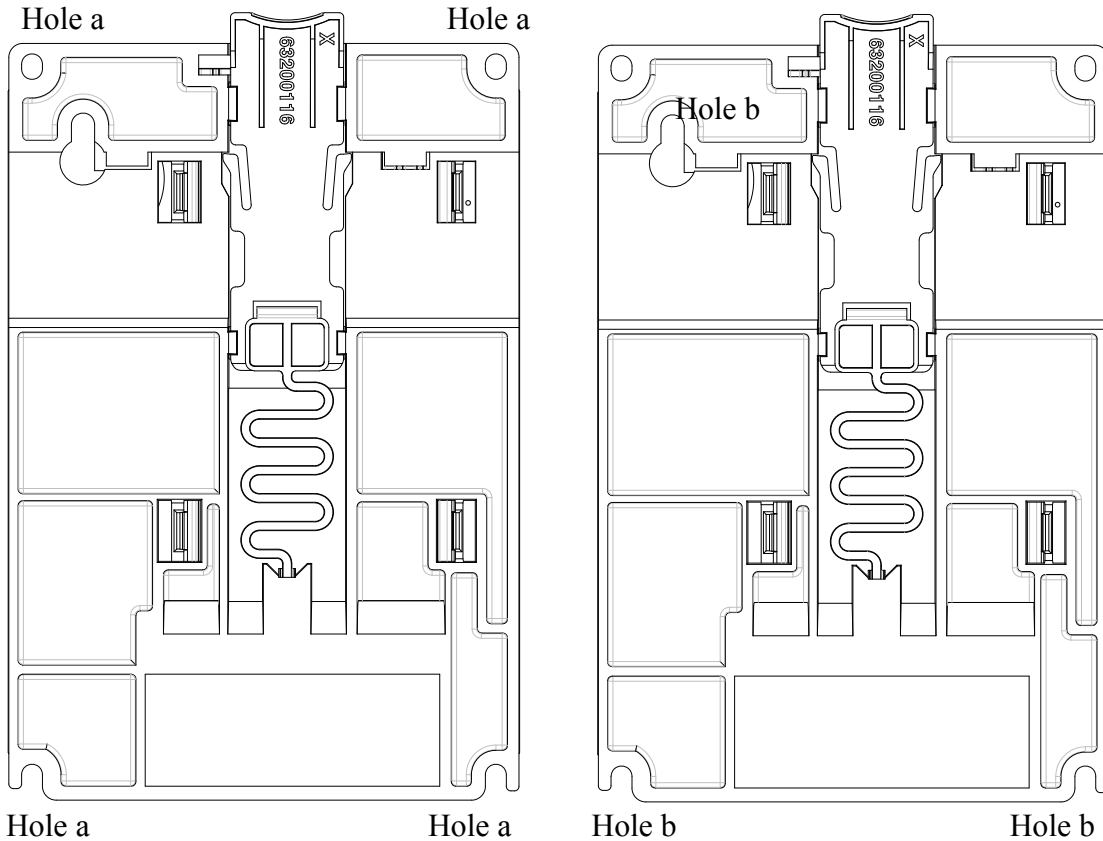


Figure a

Figure b



Do not take the sunk screw as shown in the picture. Otherwise, inverter may be damaged.



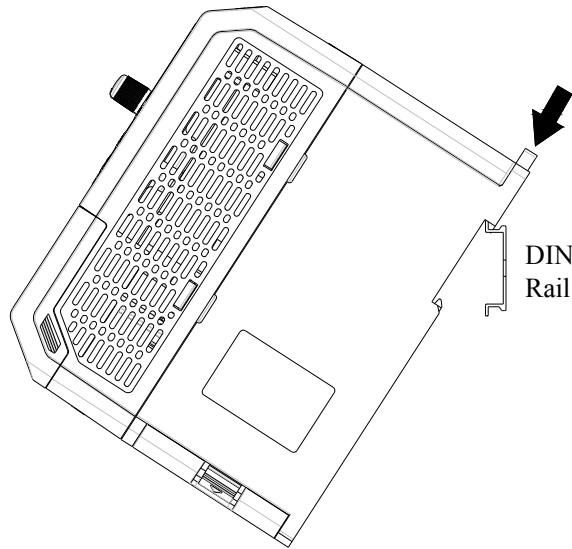
Take screws combined with spring and plain gaslets to install inverter.

b. 3-hole Installation

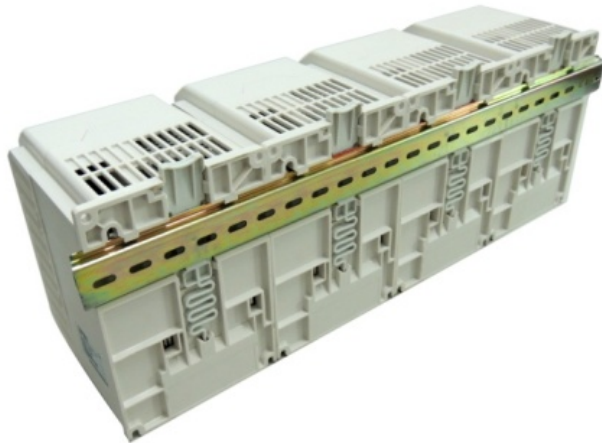
See *Overall and Installation Dimensions* for the dimensions of 3-hole (Hole b). Refer to Figure b, and punch 3 holes on the installation panel with screws in each of them. Do not tighten the screws, leave a distance of 7.5~9mm between the gaskets and installation panel, hung the inverter onto the 3 screws from top to bottom (Screw size: M4xL, L>16mm, tightening torque: 1N.m±10%), and then tighten the 2 screws at the bottom.

3.1.7 DIN Rail Installation (DIN Rail Width: 35mm)

See *Overall and Installation Dimensions* for the dimensions of DIN rail. Refer to the following Figure, install and remove the inverter by pushing the DIN rail release key.

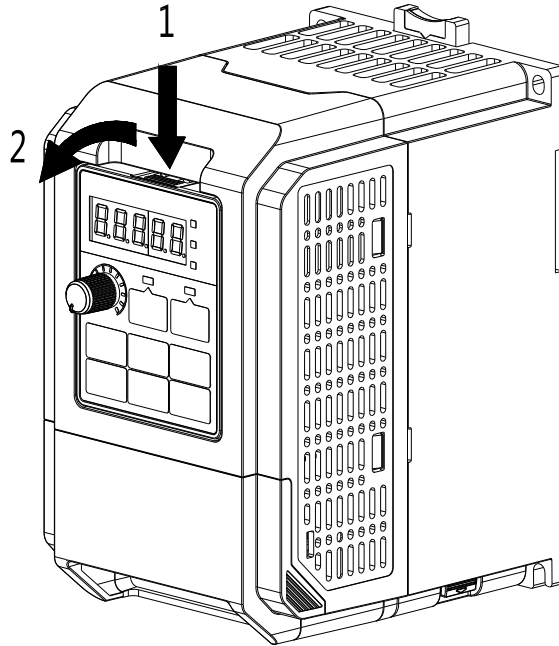


Mount multi-inverter in parallel with DIN rail:

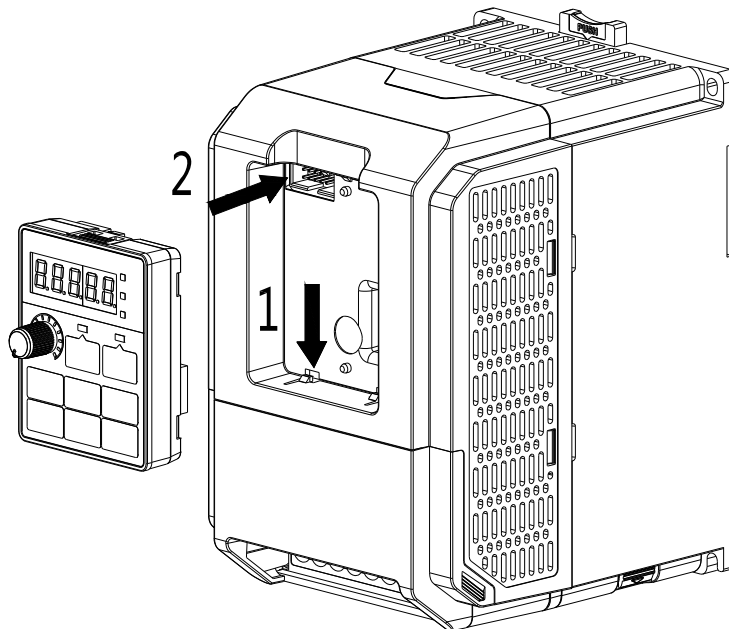


3.1.8 Disassembly and Assembly of Keypad

a. Disassemble keypad. See following Figure: Push the buckle on the keypad in direction 1 first, and then lift up the keypad in direction 2.

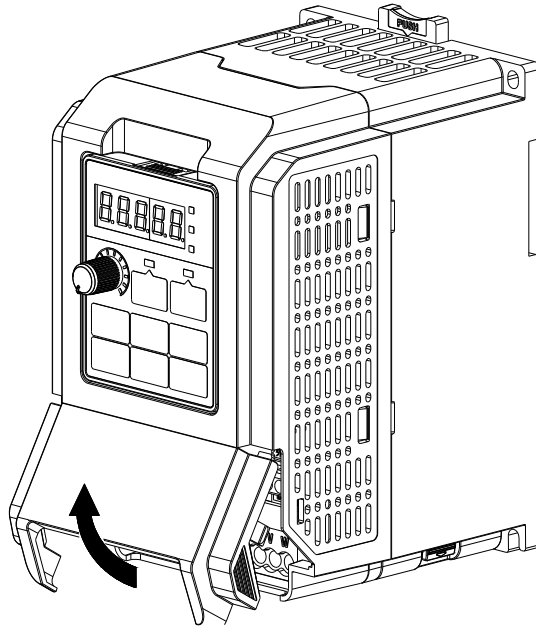


b. Assemble keypad. See following Figure: Place keypad in the slot in direction 1, and then press the keypad in direction 2 until it clicks into right place.

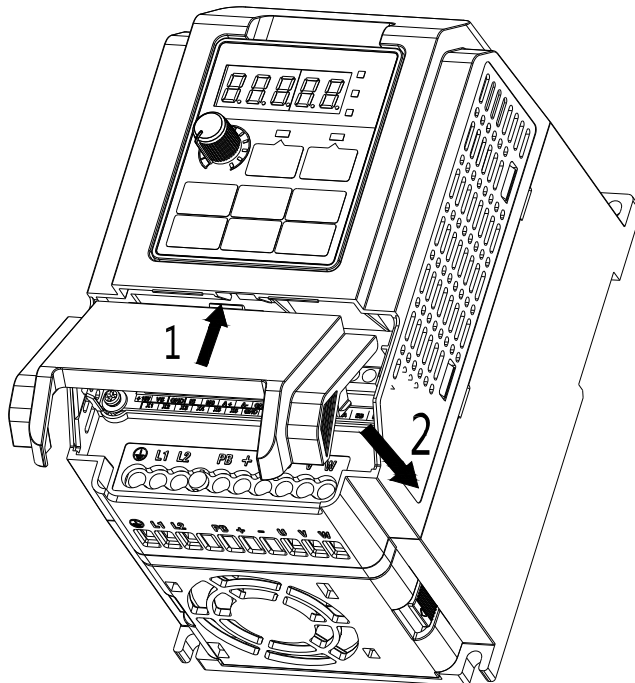


3.1.9 Disassembly and Assembly of Terminal Cover

a. Disassemble terminal cover: remove terminal cover in the direction as shown in the Figure below.

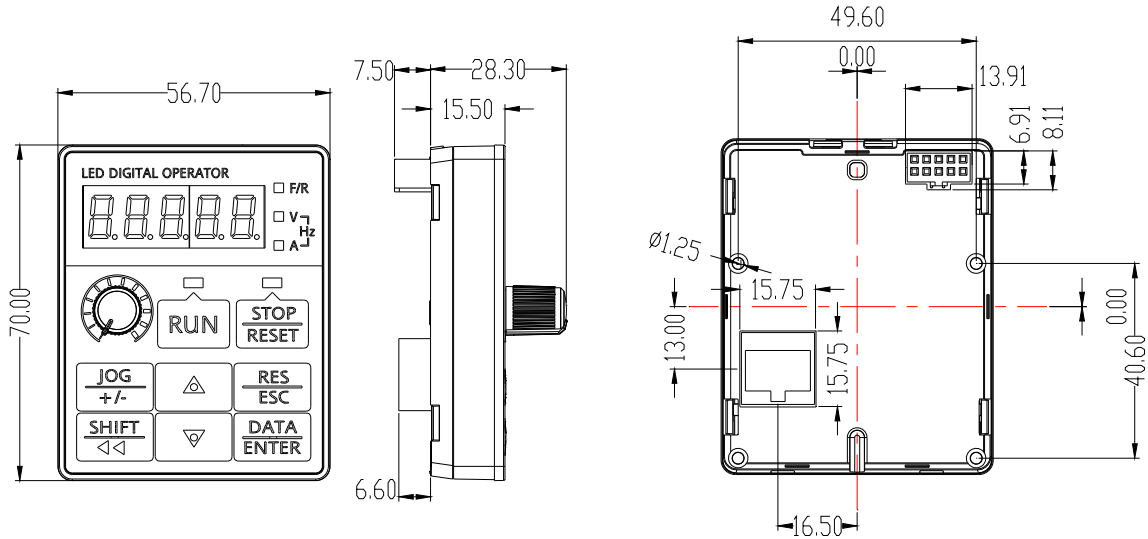


b. Assemble keypad. See following Figure: Place terminal cover in the slot in upper housing in direction 1, and then press the terminal cover in direction 2 until it clicks into place on upper housing.

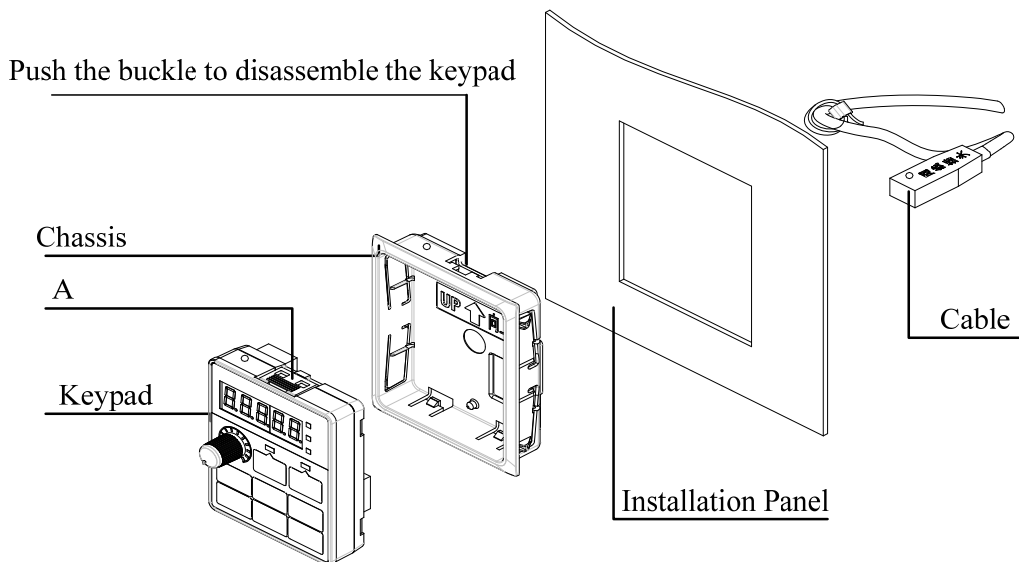


3.1.10 Mounting Keypad

a. Surface Mounting: Punch 4 holes(3.5±0.4mm) as per the overall dimensions of keypad, tighten the keypad on the installation panel with M3 tapping screw(For plastic materials, tightening torque:0.5N.m±10%, the maximum tightening depth in keypad: 11±1mm)





b. Flush Mounting: See 2.8 for chassis (Accessories) dimensions. Punch a square hole on the installation panel, press the chassis into the panel, and mount the keypad on the chassis referring to the following Figure. Disassemble keypad by pressing keypad buckle with a slot type screwdriver on the back of the panel (Refer to A in the Figure).



3.2 Wiring

Open the terminal cover, check the terminal block, main circuit and control terminals.
Considerations for wiring:

- Main circuit terminals R/L1, S/L2, and T/L3 are input terminals. Misconnection will result in inverter damage. Furthermore, check the power supply is within the rated voltage and rated current listed on the nameplate.
- Ground the grounding terminals to prevent electric shock or fire, and to lower noise interference.
- Tighten the screws between terminal and its cable in case of sparkle caused by loose screws.
- Do not connect control terminal before power-off.

 <p>Danger</p>	<ol style="list-style-type: none"> 1. Always turn off the input power supply before wiring. Risk of electric shock or fire. 2. Wiring must be performed by authorized and qualified personnel. Risk of electric shock or fire. 3. Be sure the ground terminals earthed. Risk of electric shock or fire. 4. Always verify the function of emergency stop terminal in work after connecting. Risk of injury. (User shall take the responsibilities of wiring). 5. Never touch the input or output terminals directly with bare hands, or connect the terminals of inverter to the housing, or connect the input terminals to output terminals. Risk of electric shock or short circuit may occur.
 <p>Caution</p>	<ol style="list-style-type: none"> 1. Always confirm if the voltage of AC input power supply satisfies the rated voltage of inverter.Risk injury or fire. 2. Never perform voltage withstanding test. Otherwise, semi-conductors and other devices can be damaged. 3. Connect braking resistor or braking unit according to required wiring.Risk of fire. 4. Tighten terminals with screw drivers of specified torque. Risk of fire. 5. Never connect input power supply cable to output terminals U, V, and W. The interior parts of inverter will be damaged if voltage is applied to the output terminals. 6. Never connect phase-shifting capacitor and LC/RC noise filter to output circuits. Otherwise, the interior parts of inverter will be damaged. 7. Never connect the solenoid switch and electromagnetic contactor to output circuits. When inverter is with load, surge current, which is produced by the operation of solenoid switch or electromagnetic contactor, will trigger the overcurrent protection circuit to act. Sometimes the interior parts of inverter will be damaged. 8. Never take off the interior wires of inverter. Otherwise, the interior parts of inverter will be damaged.

3.2.1 Connection to Peripherals

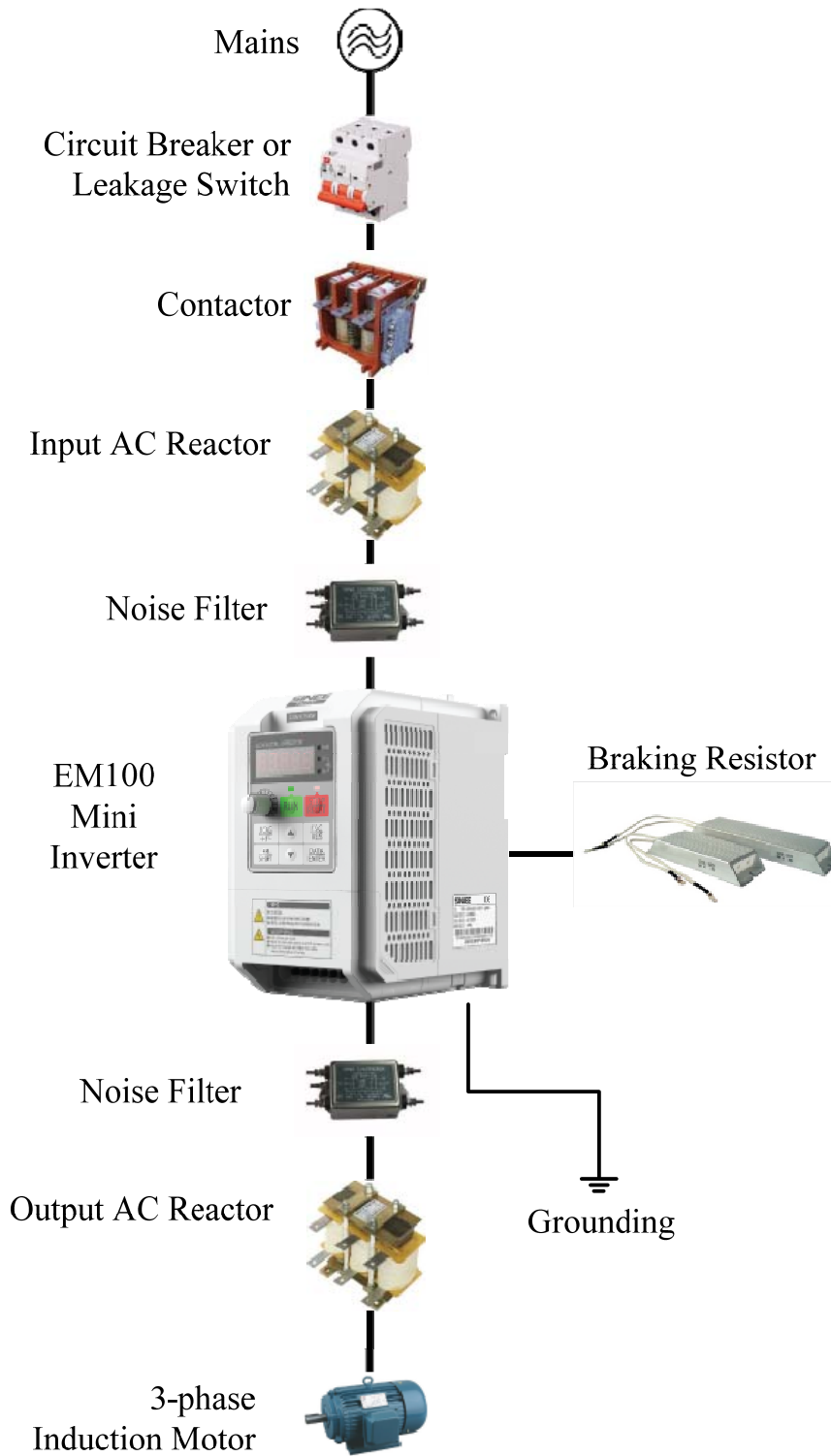


Figure 3-1 Connections between EM100 and Its Peripherals

3.2.2 Wiring Main Circuit and Control Circuit

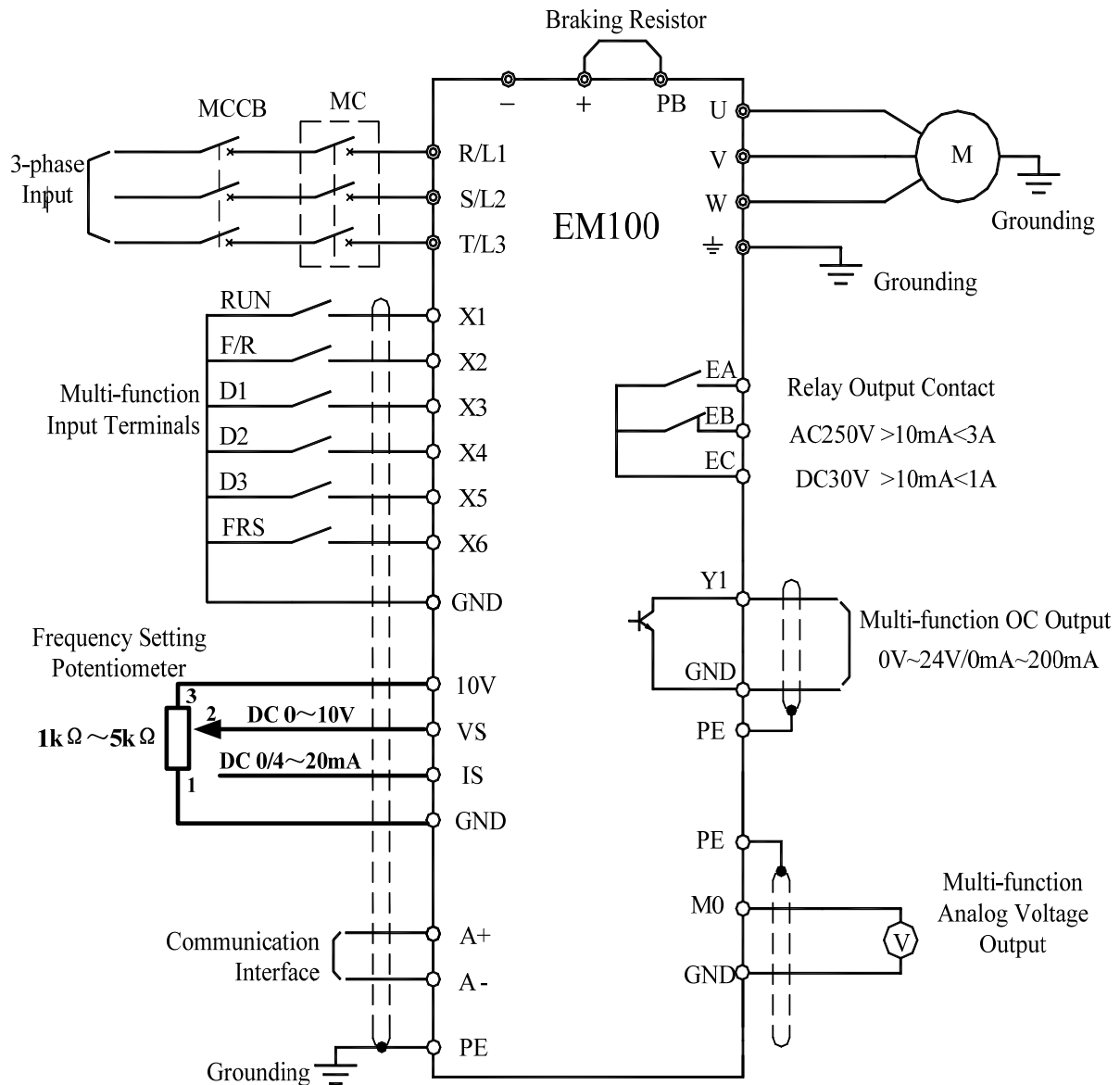




Figure 3-2 Wiring Main Circuit and Control Circuit

Remarks:

1. \odot refers to main circuit terminal. \circ refers to control circuit terminal.
2. User selects braking resistor based on real needs.
3. Signal cable and power cable should be separated. Try to cross control cable and power cable in 90° if needed.

3.2.3 Function of Main Circuit

	Danger
<ol style="list-style-type: none"> 1. Wiring only after the power supply is OFF. Risk of electric shock. 2. Only professionals shall conduct wiring. Risk of devices damage or personal injury. 3. Be sure that the grounding cable well earthed. Risk of electric shock and fire. 	

	Caution
<ol style="list-style-type: none"> 1. Input power supply shall be the same as the rated values. Risk of inverter damage. 2. Motor shall be applicable to the inverter. Risk of motor damage or inverter trips protection. 3. Do not connect power supply to U, V, and W. Risk of inverter damage. 4. Do not connect braking resistor to DC bus terminal + and - . Risk of fire. 	

See Figure 3-3 for EM100 main circuit terminal block.

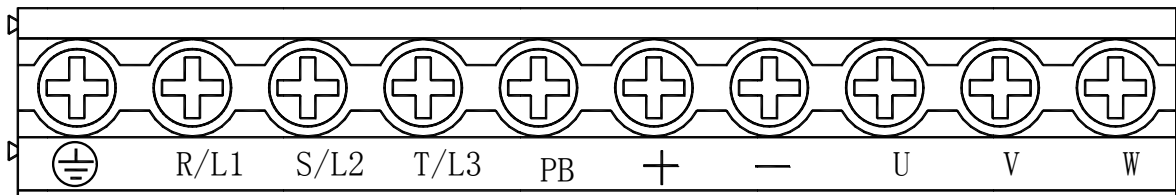


Figure 3-3 EM100 Main Circuit Terminal Block

Table 3-1 Function of EM100 Main Circuit Terminals

Terminal	Function
R/L1, S/L2, T/L3	AC power input terminals for connecting to 3-phase AC380V/415V power supply. (Terminal R/L1,S/L2 for 1-phase AC220V input inverter, do not connect T/L3.)
U, V, W	Inverter AC output terminals for connecting 3-phase induction motor.
+, -	Positive and negative terminals of internal DC bus.
PB	Connecting terminals of braking resistor. One end connected to + and the other to PB.
	Grounding terminal

Remarks: No phase sequence requirements on wiring of the input side of inverter.

3.2.4 Standard Wiring of Main Circuit

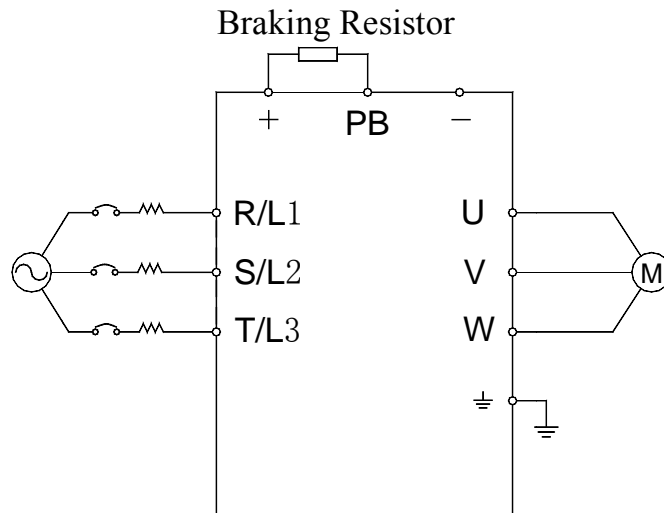


Figure 3-5 Standard Wiring of EM100 Main Circuit

3.2.5 Wiring Main Circuit on Input Side

■ Installing a Circuit Breaker

Install an air circuit breaker (MCCB) between the power supply and input terminals.

- Choose a MCCB with a capacity of 1.5-2 times of rated current of inverter.
- The time features of MCCB should meet that of overheating protection of inverter (150% rated current / 1 minute).
- If single MCCB is used for two or more inverters or other devices, the contact of fault output relay shall be connected to power contactor coil, so that the power supply will be turned off by the fault signals, as shown in Figure 3-6.

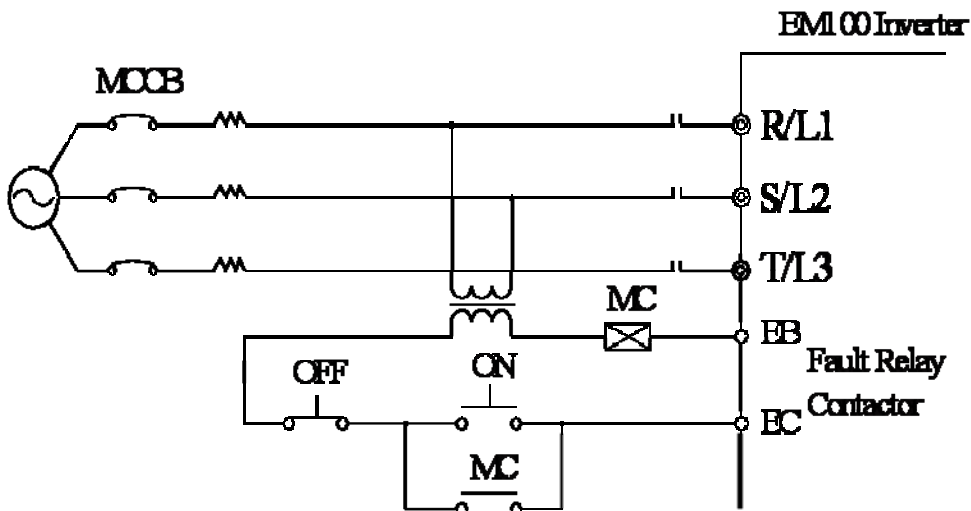


Figure 3-6 Connecting to Input Circuit Breaker

■ Installing a Leakage Circuit Breaker

High frequency leakage current is generated by high frequency PWM signal output of inverter. Select a special purpose leakage breaker with a trigger current $\geq 30\text{mA}$. For a regular leakage breaker, the trigger current: 200mA and the active time at 0.1S or above.

■ Installing an Electromagnetic Contactor

Install an electromagnetic contactor which is applicable to inverter power as shown in Figure 3-6.

- Start/stop of the inverter can be controlled by the electromagnetic contactor on input side. Inverter may break down if the electromagnetic contactor is on and off frequently. The operation interval between start and stop of the inverter shall ≥ 30 minutes, if electromagnetic contactor on input side must be used for controlling.
- The inverter will not automatically start if power is on after failure.

■ Connecting to the Terminal Block

Power input phase sequence is not related to the phase sequence of terminals R, S, and T on the terminal block, any two of them can be connected randomly.

■ Installing an AC Reactor

If power supply is connected to capacitive load, an excessive big surge current will occur and rectifier of inverter can be broken down. Install an optional 3-phase/1-phase AC reactor on input side of inverter to suppress peak current and voltage, and improve power factor of the system.

■ Installing a Surge Absorber

Install a surge absorber for inductive loads (electromagnetic contactors, solenoid valves, solenoid coils, or electromagnetic circuit breakers) nearby the inverter.

■ Installing a Noise Filter on Power Supply Side

To filter noise transmitted between power cable and the inverter, and the impact on power grid caused by the noise produced by the inverter.

- A special purpose noise filter is required for the inverter.
- Correct and incorrect installations of noise filters as shown in Figure 3-7 and Figure 3-8.

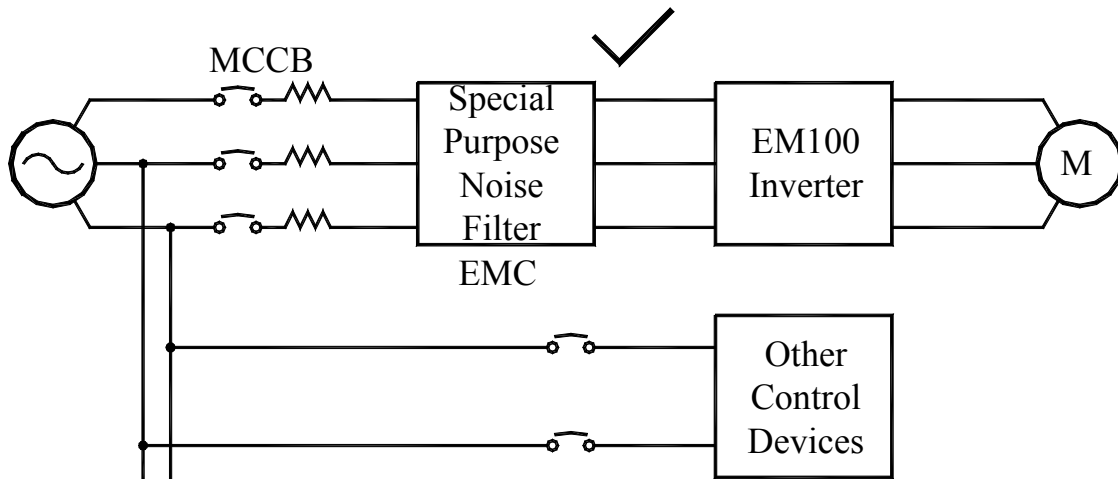


Figure 3-7 Correct Installation of Noise Filter

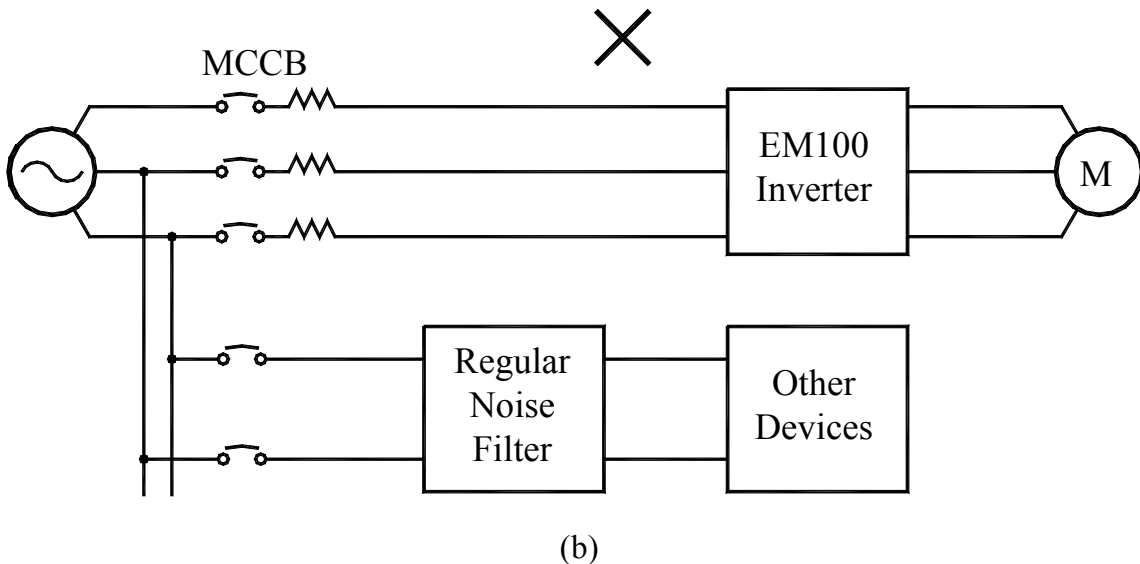
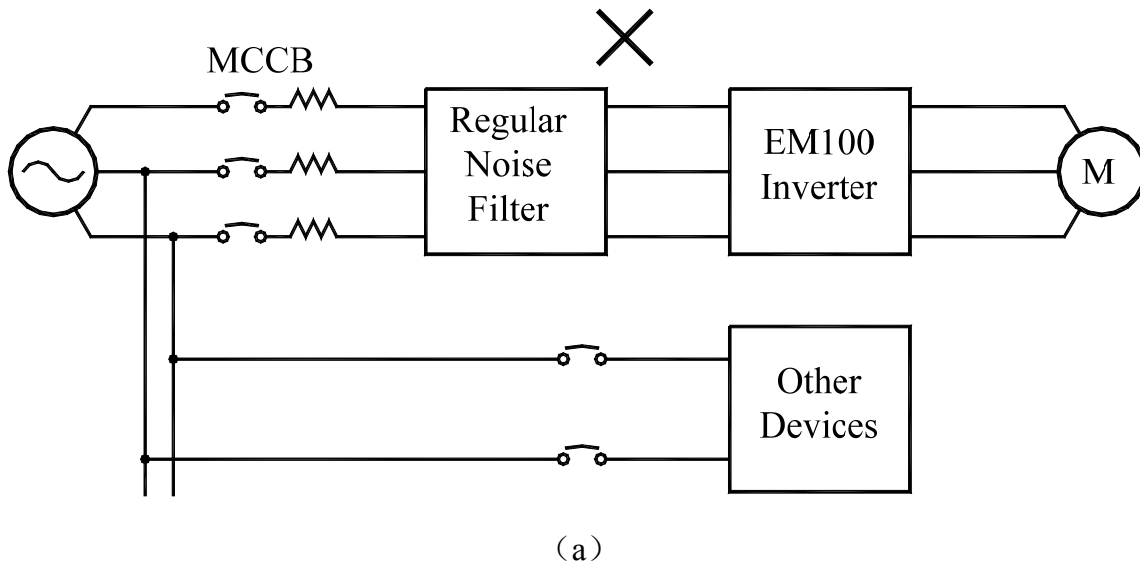


Figure 3-7 Incorrect Installation of Noise Filter

3.2.6 Wiring the Output Side of Main Circuit

■ Connecting the Inverter and Motor

Connect inverter output terminals U, V, and W to motor input terminals U, V and W. Check that the motor forwards with the Forward Command. Switch any 2 of the inverter output terminals U, V, or W to each other and reconnect if the motor reverses.

■ Never Connecting Power Supply Cable to Output Terminals

Never connect power supply cable to output terminals. If power is input to the output terminals, the inverter would be damaged.

■ Never Short-Circuit or Grounding Output Terminals

Never touch output terminals directly with bare hands, or connect the output cable to the housing of inverter. Otherwise, an electric shock and short-circuit may occur. Furthermore, do not short-circuit the output cable.

■ Never Using a Phase-shifting Capacitor

Never connect phase-shifting electrolytic capacitor or LC/RC filter to the output circuit. Otherwise, inverter will be damaged.

■ Never Using an Electromagnetic Switch

Never connect electromagnetic switch or electromagnetic contactor to the output circuit. Otherwise, failure to comply will cause overcurrent or overvoltage protection. Even worse, inverter will be damaged.

■ **Installing a Noise Filter on the Output Side**

- Install a noise filter on the output side of inverter to reduce inductive interference and radio interference.
- Inductive interference: Electromagnetic induction generates noise on the signal line, so the control device may have malfunctions.
- Radio interference: The high frequency electromagnetic waves generated by inverter and cable cause radio devices nearby to make noise when receiving signals.
- See Figure 3-9 for installing a noise filter on the output side.

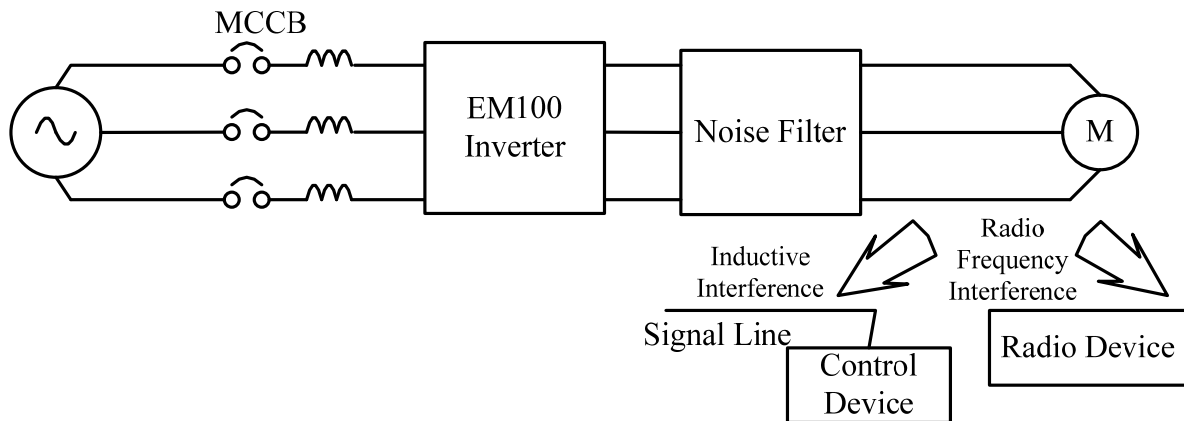


Figure 3-9 Installing a Noise Filter on the Output Side

■ **Countermeasures Against Inductive Interference**

As stated previously, except installing a noise filter, all output cables can be routed through a grounded metal pipe to prevent inductive interference on the output side. The distance between output cables and signal line should $> 30\text{cm}$, and the inductive interference will be reduced considerably, as shown in Figure 3-10.

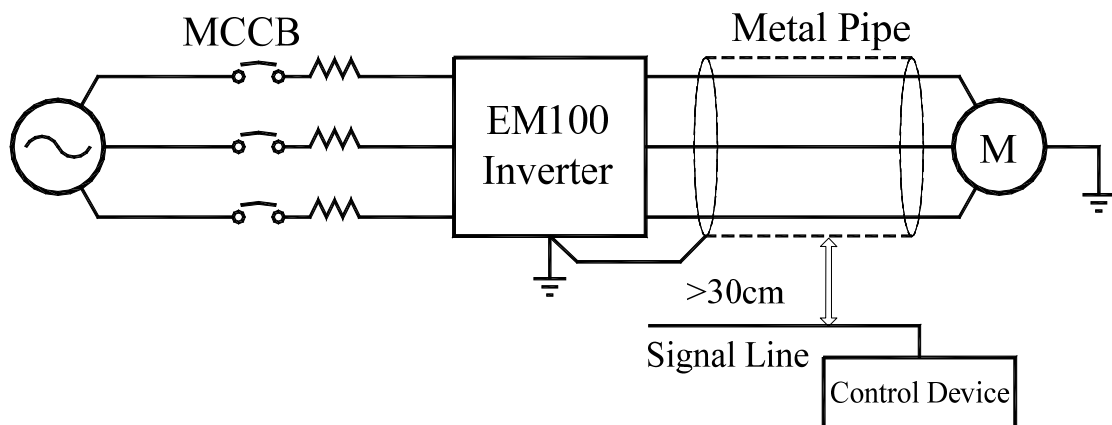


Figure 3-10 Countermeasures Against Inductive Interference

■ **Countermeasures Against Radio Frequency Interference(RFI)**

RFI will be generated from the inverter as well as the input cable and the output cable. Install noise filters on both input and output sides, and shield inverter with an iron case to reduce RFI. As shown in Figure 3-11.

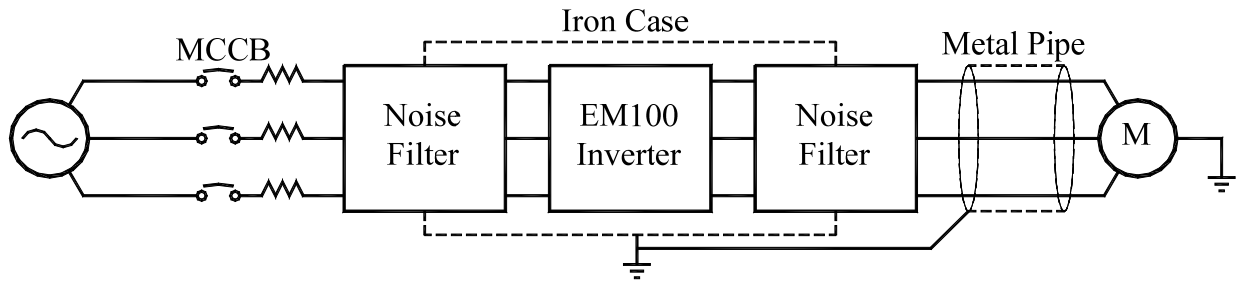


Figure 3-11 Countermeasures Against RFI

■ **Cable Length Between Inverter and Motor**

The longer cable between the inverter and motor is, the higher carrier frequency is, and the greater high-frequency harmonic leakage current on its cable is. All of which will affect inverter and its peripherals. See Table 3-2 to reduce the high-frequency harmonic leakage current by regulating carrier frequency.

When motor cable > 20m, connect a special 3-phase AC reactor of the same capacity as that of the inverter to the output terminals.

Table 3-2 Cable Length Between Inverter and Motor and Carrier Frequency

Cable Length	<50m	<100m	>100m
Carrier Frequency	<10kHz	<8kHz	<5kHz
F00.17 Function Parameter	10.000	8.000	5.000

3.2.7 Main Circuit Cable


Table 3-4 Cable Size and Screw Specifications

Model No. of Inverter	Terminal	Screw	Tightening Torque (N.m)	Cable Size (mm ²)	Cable Type
EM100-0R4-1AB	c, L1, L2, ,PB, +, -,U,V,W	M3	1.0~1.2	1.5	300V
EM100-0R7-1AB	(⊕), L1,L2, ,PB, +, -,U,V,W	M3	1.0~1.2	1.5	
EM100-1R5-1AB	(⊕),R/L1,S/L2,T/L3,PB,+ , -,U,V,W	M3	1.0~1.2	4	
EM100-2R2-1AB	(⊕),R/L1,S/L2,T/L3,PB,+ , -,U,V,W	M3	1.0~1.2	4	
EM100-0R7-3AB	(⊕),R/L1,S/L2,T/L3,PB,+ , -,U,V,W	M3	1.0~1.2	1.5	750V
EM100-1R5-3AB	(⊕),R/L1,S/L2,T/L3,PB,+ , -,U,V,W	M3	1.0~1.2	2.5	
EM100-2R2-3AB	(⊕),R/L1,S/L2,T/L3,PB,+ , -,U,V,W	M3	1.0~1.2	4	

Remarks:

1. Take the voltage drop into consideration for selecting cable. Generally the voltage drop should be < 5V and calculated according to following formula:
Voltage drop = $\sqrt{3} * \text{Cable resistance ratio } (\Omega/\text{km}) * \text{Cable length (m)} * \text{Rated current (A)} * 10^{-3}$
2. If placed in plastic slot, the cable should be one level upper.
3. The cable should be connected to the applicable cable and wiring terminal.
4. The size of grounding cable should be the same as that of power cable.

3.2.8 Grounding Wiring

- Make sure the ground terminal  grounded.
- Do not share the grounding cable with welding machine or power devices.
- The size of grounding cable should meet the technical standard of electrical appliances, and the distance to grounding point should be as short as possible.
- Do not form the grounding cable as a circuit whenever two or more inverters are used synchronously. See Figure 3-12 for the correct and incorrect grounding wirings.

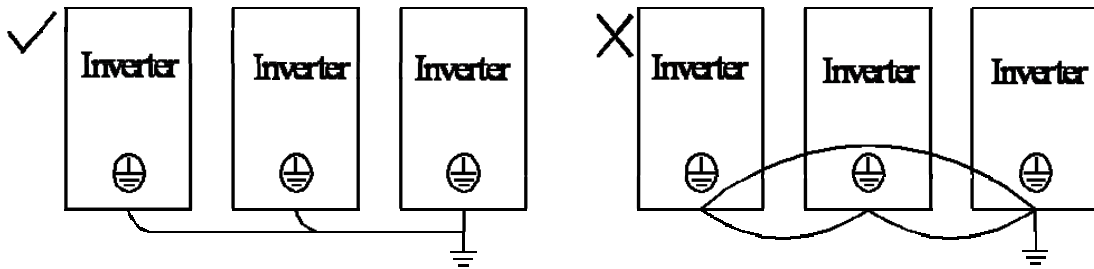


Figure 3-12 Grounding Wiring

3.2.9 Wiring Braking Resistor

Install a braking resistor in EM100 for quick brake of motor, and set the corresponding function code of inverter as dynamic braking active. Connect braking resistor to terminal +, PB, do no connect to other terminals. See Figure 3-13 for braking resistor installation. See the Appendix B for braking resistor selection.

Figure 3-13 Wiring Braking Resistor

3.2.10 Wiring Control Circuit Terminals

3.2.10.1 Control Circuit Terminals

The control circuit terminals of EM100 are located on the control PCBA, and consist of the following ports:

- Analog input terminals: Voltage input signals VS. Current input signals IS.
- Numeric input terminals: X1, X2, X3, X4, X5, X6
- Numeric output terminals: EA, EB, EC, Y1
- Analog output terminal: M0
- Auxiliary power supply terminals: 10V, GND
- RS485 communication interface: A+, A-
- GND is the signal common port of terminal VS, IS, X1, X2, X3, X4, X5, X6, M0, Y1

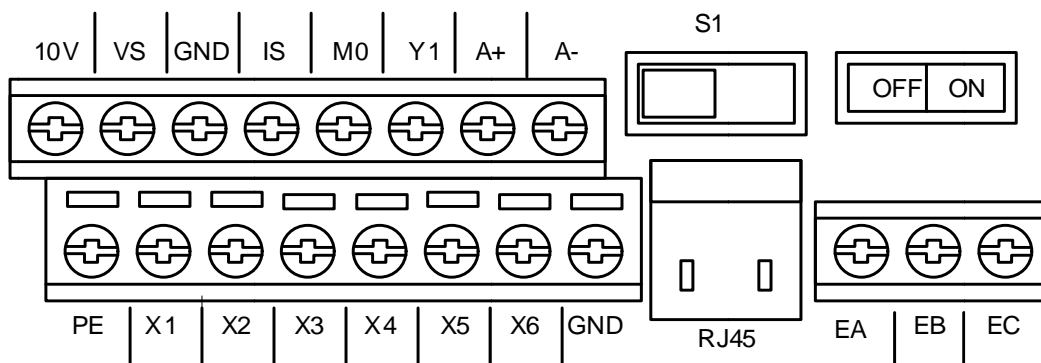
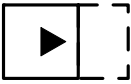


Figure 3-14 Control Circuit Terminal Block

3.2.10.2 Function of Control Circuit Terminals

Table 3-4 Function of Control Circuit Terminals

Mode	Terminal	Terminal Name	Terminal Function
Analog Input	10V	Power supply for analog terminal	10V power supply to external devices, max. output current. 10mA power supply for external potentiometer. Potentiometer resistance range: 1kΩ~5kΩ
	VS	VS Analog voltage input	0/2~10V, input impedance: 1MΩ, max. input voltage
	GND	Common port	Input/output signal common port
	IS	IS Analog current input	0/4~20mA
Analog Output	M0	Analog output terminal 0	0~10V, output accuracy: ±2%, max. output current: 2mA, impedance allowed: >10k
Multi-function Numeric Output	Y1	OC output terminal	Programmable multi-function output terminals as shown in F03.00
Communication	A+	RS485 communication interface terminal	485 differential signal positive terminal
	A-		485 differential signal negative terminal
Shield	PE	Shielded grounding	For shielded terminal cable grounding
Numeric Input	X1	Multi-function input terminal	Program the relevant terminals by setting F02.00~F02.05 to achieve the input control of setting function
	X2		
	X3		
	X4		
	X5		
	X6	Multi-function input	Multi-function input terminal
	GND	Common port	Common port for input/output signal
SPI Communication	RJ45	External keypad terminal	For connecting external operator
Relay Output	EA	Relay output terminal	EA-EC: N/O EB-EC: N/C
	EB		
	EC		
Jump	S1	Option for RS485 terminal applicable to resistor	<p>Set jump switch for RS485 terminal applicable to resistor</p> <p style="text-align: center;">S1</p> <p style="text-align: center;">OFF  ON</p> <p>OFF: No terminal resistor ON: With terminal resistor Default is no terminal resistor</p>

3.2.10.3 Wiring the Analog Input Terminals

See Figure 3-15 for wiring terminals VS through analog voltage signal:

When analog voltage input signal is as the external power supply, see Figure 3-15-a for wiring terminal VS. When analog voltage input signal is as the potentiometer, wire terminal VS as shown in Figure 3-15-b.

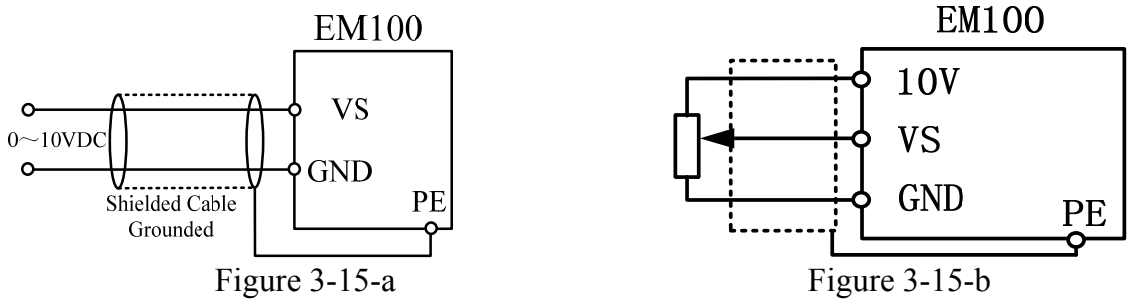


Figure 3-15 Wiring Terminal VS

See Figure 3-16 for wiring terminals IS through analog current signal:

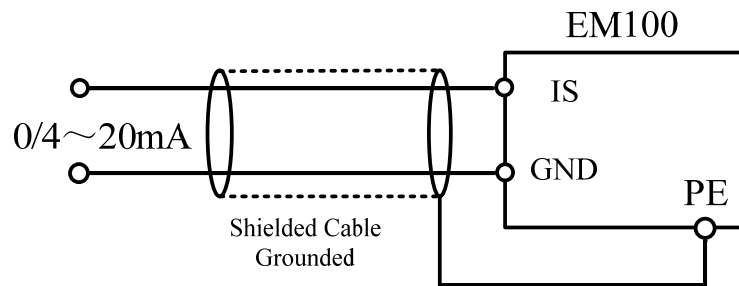


Figure 3-16 Wiring IS Terminal

3.2.10.4 Wiring Multi-function Input Terminals

Refer to the Figure on the right for wiring EM100 multi-function input terminals.

3.2.10.5 Wiring Multi-function Output Terminal

Multi-function output terminal Y1 outputs monitoring signal in OC mode. For instance, the signal of frequency reached overload indication in the operation. Details refer to F03.00, F03.01 multi-function output terminal function options. See Figure 3-17 for wiring of OC output terminal.

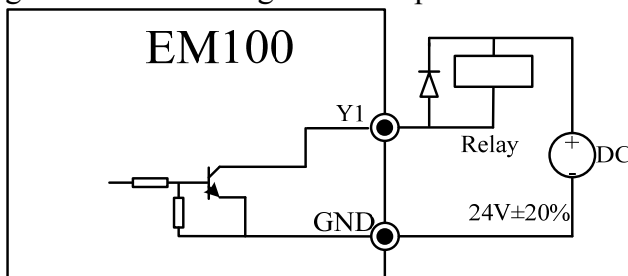
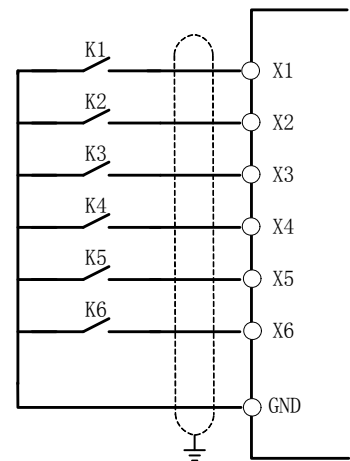
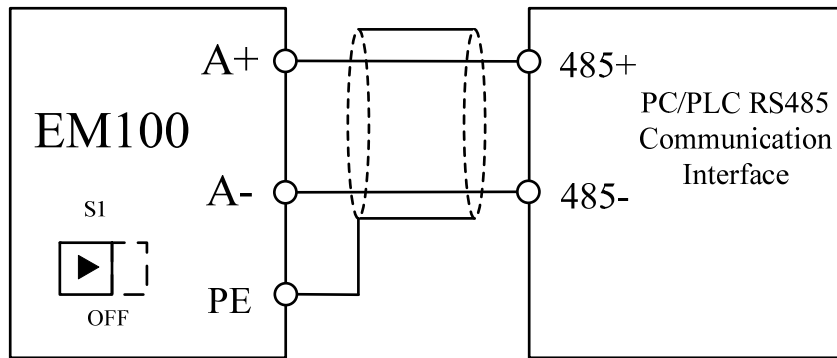


Figure 3-17 Wiring Multi-function Output Terminal with External Power Supply

Remarks: When connecting to inductive components (Like realy coil), connect fly-wheel diode in anti-parallel.

3.2.10.6 Wiring Communication Terminal

1. Refer to the Figure below for connecting single inverter to PC/PLC:



2. Refer to the Figure below for connecting multi-inverter to PC/PLC:

When PLC communicates with multi-inverter, connect the 485 communication interface A+ of inverters to A+, A- to A-. Only switch the terminal resistor S1 ON(S1 switch of the inverter on the far end), start internal 120 Ω terminal resistor. See Figure 3-19 for connecting multi-inverter to PC/PLC:

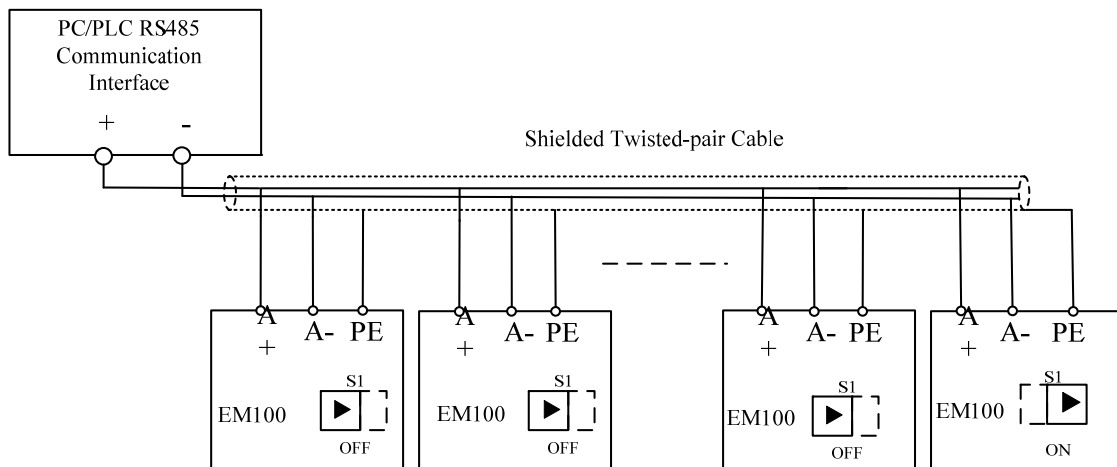
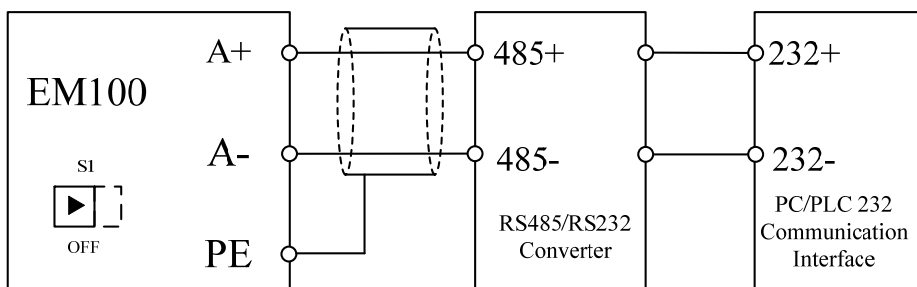


Figure 3-19 RS485 Multi-inverter Connection

3. Refer to the Figure below for connecting inverter to PC/PLC through RS485/RS232 converter



3.2.10.7 Size of Control Circuit Cable and Screw

To lower interference and attenuation of control signal, the wire length of control signal should be in a maximum of 50m, and the distance between the wire and the power cable should be in a minimum 30cm. Always use shielded twisted-pair cable when inputting analog signal externally.

Table 3-5 Control circuit terminal and cable size

Terminal	Screw Size	Tightening Torque (N.m)	Cable Diameter (mm ²)	Cable Type
VS,IS,X1,X2,X3,X4,X5,X6,EA,EB,EC,Y1,M0,10V,A+,A-	M3	0.5~0.8	0.5~1.25	Shielded Multi-core Cable
GND,PE	M3	0.5~0.8	0.5~2.0	

Remarks:

- Install with a PH0 cross-head screwdriver.
- Take pin terminal or cable strip length by 5~7mm for connection.
- Only after the terminal screw is fully loosened anticlockwise first, the cable can be inserted.

Remarks for wiring control circuit:

- Separate the control circuit cable from the other cables.
- Separate the cable on control circuit terminals EA, EB, EC, and Y1 from the other cables.
- Use shielded twisted-pair cables for control circuit to prevent malfunctions. The wiring distance should be in a maximum of 50m. Insulate the shield with tape to prevent from contacting with other signal cables and housing of other devices.

3.2.10.8 Extending Keypad Cable

1: RJ45 keypad interface and regular network cable extension (Interface abides by EIA/TIA568B standard)

2: See Figure 3-22 for wiring.

- The wiring mode eases installation.
- Keypad cable extension should be in a maximum of 3M.
- Extension can be as long as 15M if a CAT5 or a better cable used and under applicable electromagnetic environment.

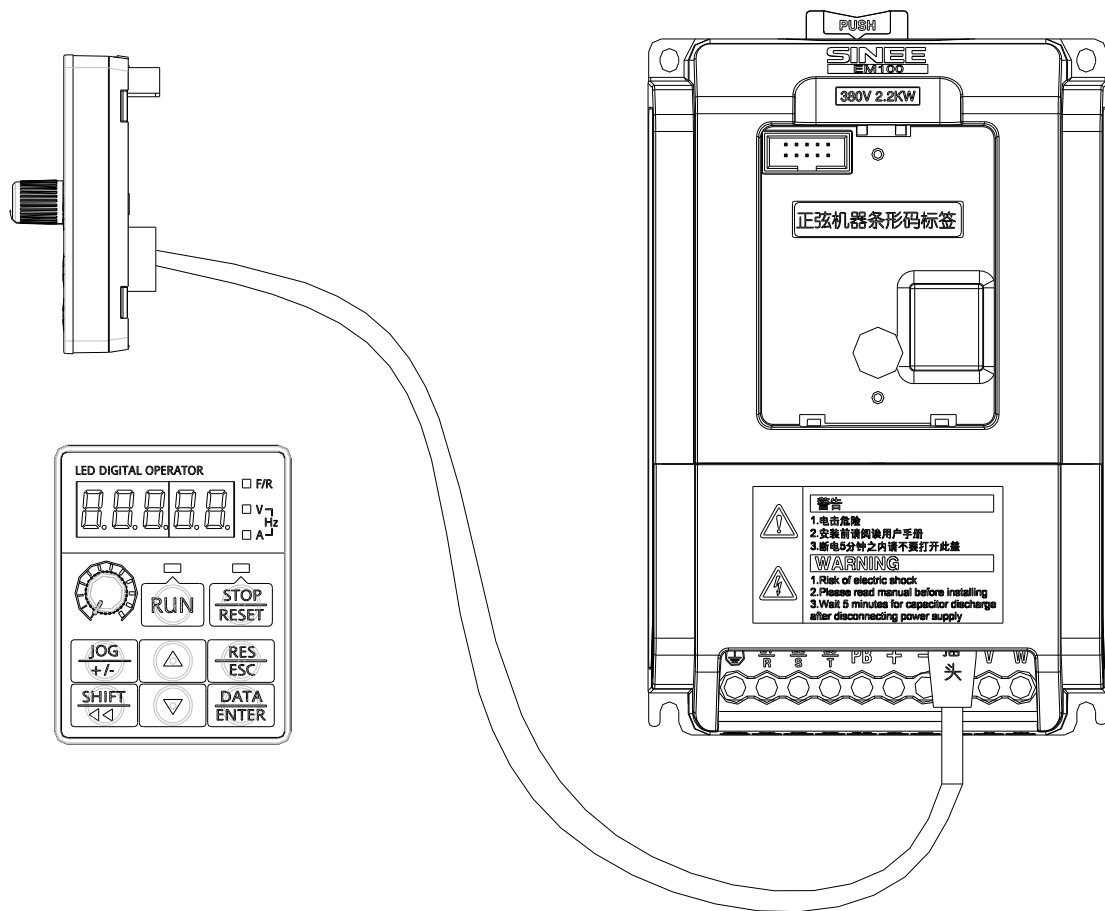


Figure 3-22 Disassemble the Keypad and Connect Extension Keypad Wire

3.2.10.9 Wiring Check

Perform the following checks after wiring has been completed:

- If anything is left in inverter like screw, or wire clippings.
- If the screw is loose.
- If the bare wire on one terminal connects to other terminals.

4. Keypad Operation

4.1 Keypad

EM100 keypad consists of LED display, keys, and potentiometer. See Figure 4-1. User can perform function setting, status monitor, fault monitor, start/stop control, and jog operation for EM100 through keypad.

LED Display

Potentiometer


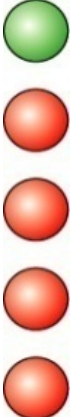
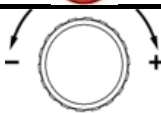
Keys



Figure 4-1 Keypad

Table 4-1 Name and function of each key on the keypad

Part	Name	Function
	Left Shift	Shift the bit of parameters when editing parameters. Shortcut key for selecting the monitor parameter in operation
	Reset/Escape	Reset previous status. Escape from editing the present parameter.
	Key for Multi-functional programming	For programmable JOG or +/- input function selection
	ENTER	Save edited parameter of present function parameter. For entering sub-menu.
	RUN	When keypad control is enabled, press the key to start inverter.
	STOP/RESET	When keypad control is enabled, press the key to stop inverter. Reset setting status from fault status.
	LED Display	Display function setting, running monitor, fault monitor parameter and parameters.
	UP	Increase function code, menu or the setting value of parameter.

	DOWN	Reduce function code, menu or the setting value of parameter.
	Status Indicator	<p>RUN:Green On: the inverter is running. Flashing: the inverter is stopping.</p> <p>STOP: Red On: the inverter fails.</p> <p>F/R : Red Off: Forward On: Reverse</p> <p>A:Red Present display data unit is A. V:Red Present display data unit is V. A and V on simultaneously if the unit is Hz. A and V off if other units displayed.</p>
	Analog Potentiometer	Regulate speed as per analog value.

4.2 Function Code Check and Editing Method

There are 5 keypad operation modes of EM100: function setting, operation monitor, fault monitor, jog operation, and start/stop. See Table 4-2 for keypad operation modes.

Table 4-2 Keypad Operation Modes

Keypad Operation Mode	Key Function
Function Setting	<ol style="list-style-type: none"> 1. Display, edit, save, reset and lock the function code and its parameter. 2. Reset default of the parameters. 3. Edit relevant parameter when the inverter is running.
Operation Monitor	Monitor function code C00.00-C00.17 when the inverter is running.
Fault Monitor	<ol style="list-style-type: none"> 1. Output frequency, DC bus voltage, output current, running direction, and running status when fault occurs. 2. The last 3 faults.
Jog Operation	In setting status, press JOG key, the inverter runs as per the jog numeric frequency. Release the JOG key, the inverter will stop.
Start/Stop	If in keypad start/stop mode, press RUN and then release, inverter starts to run. When in operation status, press STOP/RESET key, inverter stops.

Function setting, operation monitor and fault monitor are performed by menu setting. Start/stop, jog operation and keypad numeric potentiometer are operated by single key.

4.2.1 Main Menu Selection

3 main menu operations: Function setting, operation monitor, fault monitor. Function setting menu F00. __ __ , F01. __ __ , F02. __ __ , F03. __ __ , F04. __ __ , F05. __ __ , F06. __ __ , F07. __ __ , F08. __ __ , F09. __ __ , F10. __ __ , F11. __ __ , operation monitor menu C00. __ __ , fault monitor menu E00. __ __ .

Selecting main menus refers to the following method.

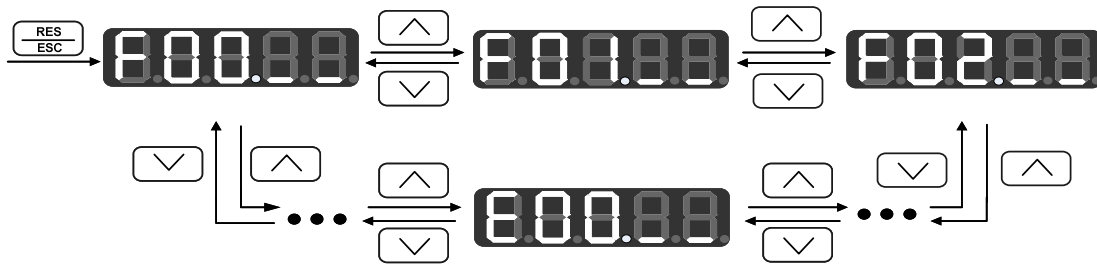


Figure 4-2 Main Menu Selection

4.2.2 Sub-menu Selection

Select 1 code in sub-menu selection. For Instance, in sub-menu of F01.____, select any code in F01.00~F01.22. See Figure 4-3 for selecting code.

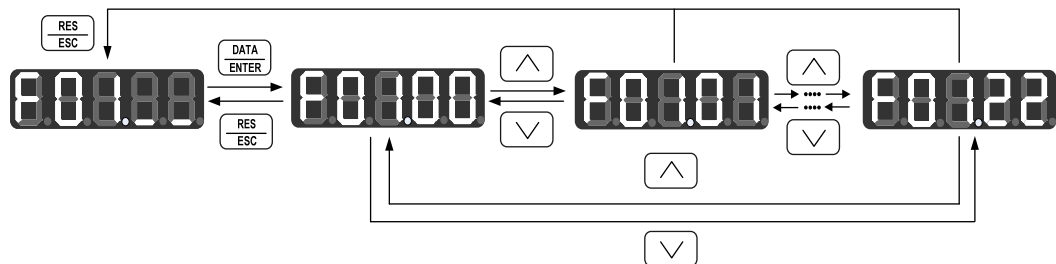


Figure 4-3 Sub-menu Selection

4.2.3 Function Setting

Inverter can display, edit, save and reset parameter in function setting status. Set parameter correctly before operation starts.

Selecting Parameter to View Value

- Select corresponding function code and view its parameter through selecting main menu and sub-menu. For instance: follow the operation procedures shown in Figure 4-4 to view parameter of F02.05.

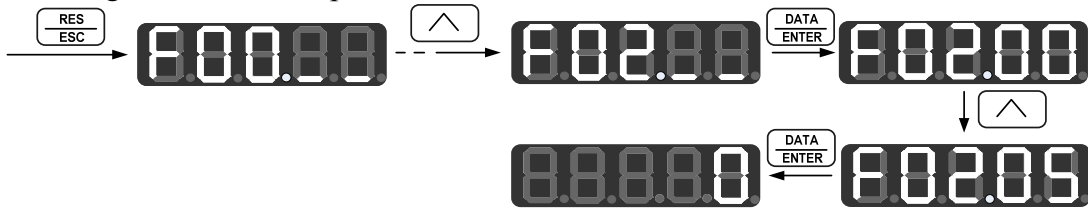





Figure 4-4 Procedures for Viewing Parameter

Editing Parameter

- Follow the viewing procedure to enter the function code, and then editing the parameter refers to the procedure shown in Figure 4-5.
- No matter it is in function setting status or operation status, after entering parameter editing status, LSB(on the right) flashing refers to the parameter is editable. If LSB does not flash, it indicates that the parameter editing is prohibited.
- Save and reset parameter.
- Press **DATA ENTER** to save the edited parameter, -END- display refers the parameter saved. Press **DATA ENTER** to return next code on previous menu.

- If there is an unexpected editing, press , and then LSB (on the right) flashing refers to the parameter reset previous value. Press  once more to return previous menu, and do not edit parameter. If pressing , the edited parameter will be saved.
- Take F00.03 for instance, its original parameter value is 0, save or reset the parameter as per the procedures shown in Figure 4-5.

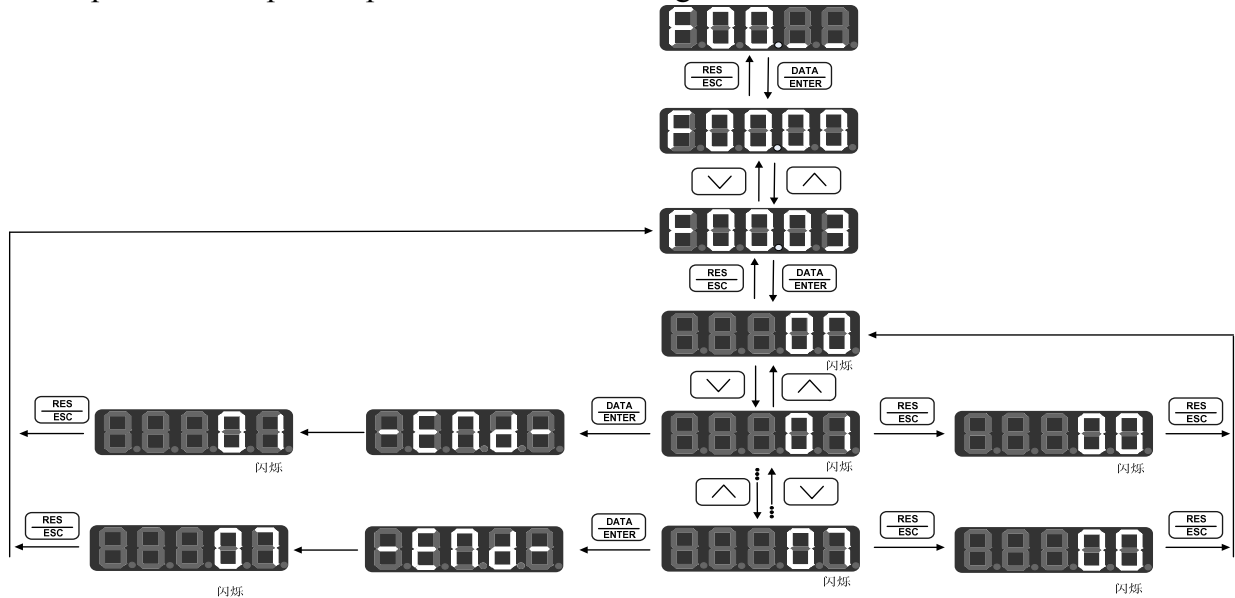


Figure 4-5 Parameter Saving and Resetting Procedures

4.2.4 Operation Status Monitor

Enter operation monitor code when inverter starts, monitor the operational status of inverter in real-time. Select a code from C00.00 ~C00.17 in operational monitor sub-menu, view and monitor its parameter. For instance, see Figure 4-6 for procedures to view code C00.01 (The actual value of output voltage) when inverter is running.






Figure 4-6 Procedures of Viewing and Editing Monitor Parameters

4.2.5 Keypad Potentiometer

If the speed setting mode of inverter is VP keypad potentiometer, when F00.03=1, adjust setting frequency value by regulating keypad potentiometer.

4.2.6 Shortcut Key Operation

Press , monitor display value displays in a cycle with output frequency (C00.00) ->Output voltage(C00.01)->Output Current(C00.02), ->DC bus voltage(C00.05).

When inverter is in operation or stop status, and keypad display is on the sub-menu of monitor code group, press  or , the keypad will display setting value of F00.07

(primary numeric frequency) which will ease user to edit setting frequency. If there is no operation with keypad for 5 seconds, keypad display will return the sub-menu of monitor code group.

Edit setting frequency by press \wedge or \vee in operation status or stop status.

4.2.7 Fault Reset/Monitor

Select a code from E00.00~E00.05 to view its parameter value on sub-menu of fault monitor. For instance, see Figure 4-7 for the procedures to view E00.02 parameter.

Referring to Figure 4-7, press \wedge or \vee in fault monitor status to view each fault status, and switch to fault code to view the last 3 faults status by pressing DATA ENTER .

Press STOP RESET to reset parameter setting status from fault status after clearing fault.

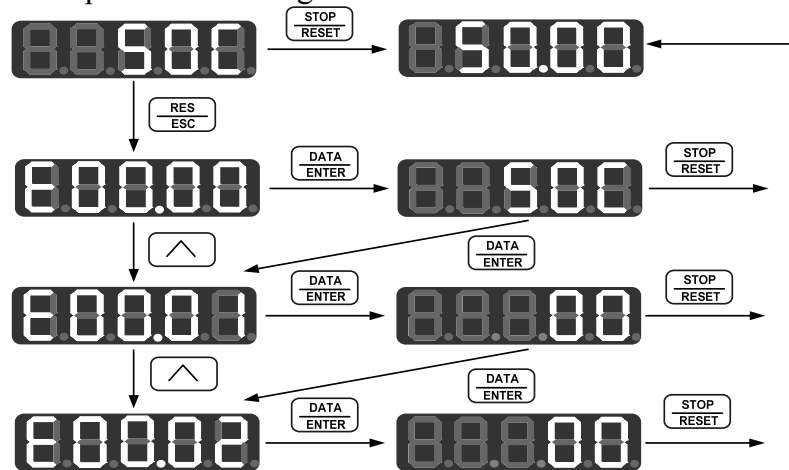


Figure 4-7 Procedures of Viewing Fault Monitor Code Parameter

4.2.8 Function of JOG Key

When F06.15=1, press JOG +/- , inverter runs as per setting jog frequency. Inverter will stop immediately when releasing JOG +/- .

When F06.15=2, press JOG +/- , running direction will switch forward with reverse once. F/R indicator: OFF refers to forward, ON refers to reverse.

4.2.9 Start/Stop

If F00.02 ones place=0, start/stop of inverter can be operated through keypad. Press RUN , inverter starts. When inverter is running, press STOP RESET , inverter will stop immediately.

4.2.10 Insufficient Operation Conditions

When soft-start relay is on, press RUN or JOG +/- (JOG +/- is for jog running), keypad displays P.OFF for 1 second, and inverter does not run and output. Give operation command again after the operation conditions can meet requirements, inverter will run.

4.2.11 Autotuning Motor Parameter via Keypad

After setting F01.13=1(Stationary Autotuning) or F01.13=2(Rotational Autotuning), press DATA ENTER and confirm, keypad displays rUN, then press RUN to start autotuning motor parameter. Keypad displays StUdy in the autotuning process, F01.13=0 after autotuning finished.

5. Parameter Tables

5.1 Format of Parameter Tables

14 groups of parameter of EM100: F00, F01, F02, F03, F04, F05, F06, F07, F08, F09, F10, F11, C00, and E00. F00-F11: Function codes, C00 group: Monitor codes, and E00 group: Fault monitor codes.

Items in the Table	Description
Number	Function code. For instance:F00.00
Function	Name of the code, explanation of code function.
Range	Parameter setting list and range
Unit and Abbreviation	<p>HOURL-Hour, min-Minute, S-Second, mS- Millisecond, %-Percentage (Rated value) .</p> <p>rpm- Revolutions per minute , V-Voltage, A- Ampere, °C-degree Celsius, kW- Kilowatt, mH- Millihenry, Ω-Ohm, Hz- Herz , kHz-Kilohera , bps- Bits per second ,Hz/S- Herz per second.</p> <p>SQRT- Square root, MAX-Maximum, MIN-Minimum.</p>
Default	Setting value after resetting defaults of function codes (F00.22)
Type	<p>● : The parameter is editable when the inverter is running.</p> <p>○ : The parameter is uneditable when the inverter is running.</p> <p>X : The parameter is read only.</p>

5.2 Parameter Tables

No.	Function	Range	Unit	Default	Type
F00 Group: General Parameters					
F00.00	Speed Reference Input Monitor	Frequency: 0.00~Fmax	Hz	xxxxxx	X
F00.01	Drive Control Mode	0:V/F open loop Control 1:SVC		1	○
F00.02	Start/Stop Control Options	<p>Ones place: Start/Stop control mode options</p> <p>0: Inverter keypad 1: Terminal 2: Communication</p> <p>Tens place: Terminal control mode options</p> <p>0:RUN-Run,F/R-Forward/Reverse 1: RUN-Run, F/R- Reverse 2: RUN-N/O forward, Xi-N/C stop,F/R-N/O reverse 3: RUN-N/O run, Xi-N/C stop,</p>		00	○

		F/R- Forward/Reverse			
F00.03	Primary Speed Setting Mode	0: Primary numeric frequency setting 1: VP keypad potentiometer 2: VS analog voltage input terminal 3: IS analog current input terminal		1	○
F00.04	Auxiliary Speed Setting Mode	0: Auxiliary numeric frequency setting 1: VP keypad potentiometer 2: VS analog voltage input terminal 3: IS analog current input terminal 4~9: Not Used 10: Process PID 11: Program Operation 12: Wobulation Control		0	○
F00.05	Integrated Frequency Setting Mode	0: Primary speed setting 1: Auxiliary speed setting 2: Primary speed setting + Auxiliary speed setting 3: Primary speed setting - Auxiliary speed setting 4: MAX{ Primary speed setting, Auxiliary speed setting } 5: MIN{ Primary Speed Setting, Auxiliary speed setting }		0	○
F00.06	Analog Integrated Frequency Setting Mode	0: Integrated frequency setting 1: VS* Integrated frequency setting 2: IS* Integrated frequency setting		0	○
F00.07	Primary Numeric Frequency Setting	0.00~Fmax	Hz	0.00	●
F00.08	Auxiliary Numeric Frequency Setting	0.00~Fmax	Hz	0.00	●
F00.09	Acceleration Time 1	0.01~600.00	S	15.00	●
F00.10	Deceleration Time1	0.01~600.00	S	15.00	●
F00.11	Maximum Frequency	Fmax: 20.00~320.00	Hz	50.00	○
F00.12	Upper Limit Frequency	Fup: Fdown~Fmax	Hz	50.00	○
F00.13	Lower Limit Frequency	Fdown: 0.00~Fup	Hz	0.00	○
F00.14	Motor Running	0: Forward 1: Reverse		0	●

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	Direction				
F00.15	Forward/Reverse Control Mode	0: Forward/Reverse Permitted 1: Reverse Prohibited		0	○
F00.16	F/R Deadband	0.00~600.00	S	0.00	○
F00.17	Carrier Frequency	2.000~12.000	kHz	4.000	●
F00.18	Random Carrier Mode	0: Disabled 1: Enabled		0	●
F00.19	Upper Carrier Frequency	2.000~12.000	kHz	8.000	●
F00.20	Lower Carrier Frequency	2.000~12.000	kHz	2.000	●
F00.21	Saving Setting Frequency Options	0: Do not save the frequency before power loss 1: Save the frequency before power loss		0	○
F00.22	Default Reset	0:Disabled 1:Reset default		0	○
F01Group: Motor Parameters					
F01.00	Motor Rated Power	0.40~22kW	kW	XXX X	○
F01.01	Motor Rated Voltage	60~480	V	XXX	○
F01.02	Motor Rated Current	0.1~100.0	A	XXXX X	○
F01.03	Motor Rated Currentcy	20.00~320.00	Hz	XXXX X	○
F01.04	Motor Rate Speed	1~20000	rpm	XXXX X	○
F01.05	Motor Wiring Mode	0: Y Wiring 1: Δ Wiring		X	○
F01.06	Motor Rated Power Factor	0.70~0.95		XXX	○
F01.07	Motor Efficiency	70.00~97.00	%	XXXXX	○
F01.08	Idling Excitation Current	0.1~100.0	A	XXXXX	○
F01.09	Stator Resistance R1	0.01~300.00	Ω	XXXXX	○
F01.10	Rotator Resistance R2	0.01~300.00	Ω	XXXXX	○
F01.11	Stator& Rotor Mutual Inductance L	0.1~3000.0	mH	XXXXX	○
F01.12	Leakage	0.001~1.000		XXXXX	○

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	Inductance Coefficient								
F01.13	Autotuning Parameters	0:No autotuning 1:Stationary autotuning 2: Rotational autotuning						0	○
F02 Group: Input Terminal Parameters									
F02.00	Multifunction Input X1-RUN	0: Not Used 1: RUN-Run 2: F/R Forward/Reverse						1	○
F02.01	Multifunction Input X2-F/R	3: Preset Speed Terminal 1 4: Preset Speed Terminal 2						2	○
F02.02	Multifunction Input X3-D1	5: Preset Speed Terminal 3 6: Switching terminal for acceleration/deceleration time 1&2						3	○
F02.03	Multifunction Input X4-D2	7: Coast-to-stop						4	○
F02.04	Multifunction Input X5-D3	8: FRS Inverter Fault Reset 9: FJOG Forward jog 10: RJOG Reverse						5	○
F02.05	Multifunction Input X6-FRS	11: Terminal UP 12: Terminal DOWN 13: UP/DOWN Clearing 14: Acceleration/Deceleration Prohibited 15: 3-wire sequence run/stop control(Pulse stop) 16: Stop DC brake input command 17: Switch run command terminal 18: Program running reset 19: Switch to auxiliary speed setting 20: External fault input 21: Start wobulation operation						8	○
F02.06	Multifunction Input Positive/Negative Logic	X6	X5	X4	X3	X2	X1	000000	○
		0	0	0	0	0	0		
		0: Positive Logic On at 0V/Off at 24V 1: Negative Logic Off at 0V/ On at 24V X1 is LSB, arrange in logical order, the 7 th and the 8 th bits are not used.							
F02.07	Multifunction Input Carrier Times	0~100						10	○
F02.08	X1 Input Delay Time	0.00~300.00					S	0.00	○
F02.09	X2 Input Delay Time	0.00~300.00					S	0.00	○

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F02.10	VP Filter Time	0.00~10.00	S	0.10	●
F02.11	0.00Hz Frequency Corresponding to VP Input Voltage	0.0~100.0	%	1.0	●
F02.12	Maximum Frequency Corresponding to VP Input Voltage	0.0~100.0	%	98.0	●
F02.13	VS Filter Time	0.00~10.00	S	0.10	●
F02.14	IS Filter Time	0.00~10.00	S	0.10	●
F02.15	VS Output Bias 0	-100.0~100.0	%	0.0	●
F02.16	VS Output Bias 1	-100.0~100.0	%	25.0	●
F02.17	VS Output Bias 2	-100.0~100.0	%	75.0	●
F02.18	VS Output Bias 3	-100.0~100.0	%	100.0	●
F02.19	VS Input Bias 0	0.0~VS Input Bias 1	%	0.0	●
F02.20	VS Input Bias 1	VS Input Bias 0~ VS Input Bias 2	%	25.0	●
F02.21	VS Input Bias 2	VS Input Bias 1~ VS Input Bias 3	%	75.0	●
F02.22	VS Input Bias 3	VS Input Bias 2~100.0	%	100.0	●
F02.23	IS Output Bias 0	-100.0~100.0	%	0.0	●
F02.24	IS Output Bias 1	-100.0~100.0	%	25.0	●
F02.25	IS Output Bias 2	-100.0~100.0	%	75.0	●
F02.26	IS Output Bias 3	-100.0~100.0	%	100.0	●
F02.27	IS Input Bias 0	0.0~IS Input Bias 1	%	20.0	●
F02.28	IS Input Bias 1	IS Input Bias 0~ IS Input Bias 2	%	40.0	●
F02.29	IS Input Bias 2	IS Input Bias 1~ IS Input Bias 3	%	80.0	●
F02.30	IS Input Bias 3	IS Input Bias 2~100.0	%	100.0	●

F03Group: Output Terminal Parameter					
F03.00	Multifunction Output Y1	0: Inverter is running 1: Frequency reach (FAR) 2: Frequency detection range (FDT) 3: Reverse running 4: Frequency reached upper limit 5: Frequency reached lower limit 6: Inverter fault 7: Inverter is ready to work		0	○
F03.01	Relay Output R1			6	○
F03.02	Analog Output M0	0: Output frequency 1: Input Frequency 2: Output Current 3: Output voltage 4:VS 5:IS 6:+10V 7:DC bus voltage		0	○
F03.03	M0 Output Lower Limit	0.00~100.00	%	0.00	●
F03.04	M0 Output Upper Limit	0.00~100.00	%	100.00	●
F03.05	M0 Output Gain	0.00~300.00	%	100.00	●
F04 Group: Start/Stop Control Parameters					
F04.00	DC Brake Current at Start	0.00~150.00	%	0.0	○
F04.01	DC Brake Time at Start	0.00~30.00	S	0.00	○
F04.02	Acceleration/Deceleration Mode	0: Linear mode 1: S curve mode		0	○
F04.03	S Curve Time	0.00~600.00	S	0.00	○
F04.04	Not Used				
F04.05	Stop Mode Options	0: Ramp-to-stop 1: Coast-to-stop		0	○
F04.06	DC Brake Start Frequency at Stop	0.10~60.00	Hz	2.00	○
F04.07	DC Brake Current at Stop	0.00~150.00	%	0.00	○
F04.08	DC Brake Waiting Time	0.00~30.00	S	0.00	○
F04.09	DC Brake Time at Stop	0.00~30.00	S	0.00	○

F05 Group: V/F Control Parameters					
F05.00	V/F Curve Scaling	0: Automatic torque boost 1~10: Fixed torque boost curve 11~20: Oil pump motor boost curve 21~30: Synchronous motor boost curve 31~34: Blower/water pump boost curve 35: Customer defined V/F curve scaling		35	●
F05.01	Frequency Base	Fbase: 20.00~320.00	Hz	50.00	○
F05.02	Voltage 1	0.00~100.00	%	1.00	●
F05.03	Voltage 2	0.00~100.00	%	4.00	●
F05.04	Voltage 3	0.00~100.00	%	10.00	●
F05.05	Voltage 4	0.00~100.00 Ue=100.0%	%	16.00	●
F05.06	Frequency 1	0.00~Frequency 2 Fbase=100.0%	%	1.00	●
F05.07	Frequency 2	Frequency 1~ Frequency 3	%	4.00	●
F05.08	Frequency 3	Frequency 2~ Frequency 4	%	10.00	●
F05.09	Frequency 4	Frequency 3~100.00	%	16.00	●
F05.10	Open Loop Slip Compensation	0.00~200.00	%	150.00	●
F05.11	Stator Voltagedrop Compensation Gain	0.00~100.00	%	80.00	●
F05.12	Excitation Boost Gain	0.00~300.00	%	180.00	●
F05.13	Oscillation Suppression	0.00~100.00	%	0.00	●
F05.14	Overmodulation Level	1.00~1.10		1.00	●
F05.15	AVR	0: Disabled 1: Enabled 2: Automatic(Disabled if over rated voltage)		0	○
F06 Group: Auxiliary Function Parameters					
F06.00	Jog Numeric Frequency	0.00~Fmax	Hz	5.00	●
F06.01	Jog Acceleration Time	0.01~600.00	S	15.00	●
F06.02	Jog Deceleration Time	0.01~600.00	S	15.00	●
F06.03	Acceleration	0.01~600.00	S	15.00	●

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	2				
F06.04	Deceleration 2	0.01~600.00	S	15.00	●
F06.05	UP/DOWN Frequency Rate	0.00~100.00 Unit:Hz/200mS, 0.00(Autorate,integral time)		1.00	●
F06.06	Frequency Reach Detection Range FAR	0.00~20.00	Hz	5.00	●
F06.07	FDT Increasing Threshold	0.00~Fmax	Hz	30.00	○
F06.08	FDT Decreasing Threshold	0.00~Fmax	Hz	30.00	○
F06.09	Output Voltage	5.00~100.00	%	100.00	●
F06.10	Dynamic Brake Control	0: Disabled 1: Enabled 2: Enabled at running 3: Enabled at deceleration		1	○
F06.11	Dynamic Brake Voltage	380V:500~800 220V:300~400	V	700 380	○
F06.12	Brake Duty Ratio	5.0~100.00	%	80.00	○
F06.13	Fan Control	0: Run at power-on 1: Smart mode		1	○
F06.14	Not used				
F06.15	JOG Key Function Setting	0: Disabled 1: Jog running function 2: F/R switching function		1	○
F06.16	Function of STOP Key	0: Enabled in keypad start/stop mode 1:Enabled in all start/stop modes 2: Enabled in keypad start/stop mode, external fault trips in other modes		0	○
F06.17	Customer Defined Scaling	0.01~200.00		30.00	●
F06.18	Wobulation Operation Mode	Ones place: Wobulation operation control 0: Auto-running (Preset wobulation time is up, wobulation starts.) 1: Terminal Control (Preset wobulation time is up, the terminal is on.)		00	○

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		Tens place: Wobulation input mode 0: Wobulation operation started after the mid-point reached 【(Wobulation upper limit + wobulation lower limit)/2】 1: Wobulation operation starts when its preset time is up			
F06.19	Preset Wobulation Frequency	0.00~Fmax	Hz	0.00	●
F06.20	Preset Wobulation Time	0.00~600.00	S	15.00	●
F06.21	Upper Limit Frequency of Wobulation	0.00~Fmax	Hz	40.00	●
F06.22	Lower Limit Frequency of Wobulation	0.00~Fmax	Hz	20.00	●
F06.23	Jump Frequency of Wobulation	0.00~Fmax	Hz	5.00	●
F06.24	Rising Time of Wobulation	0.00~600.00	S	15.00	●
F06.25	Dropping Time of Wobulation	0.00~600.00	S	5.00	●
F06.26	Lower Limit Frequency Control	0: Run as per lower limit frequency 1: Run at zero speed when lower limit frequency running time is up.		0	○
F06.27	Lower Limit Frequency Running Time	0.00~600.00	S	60.00	○
F06.28	Run/Stop Monitor Code Options	0: C00.00 1: C00.01 16: C00.16 17~99: Not Used 100: No change on keypad operation		0	○
F07 Group: Fault and Protection Function Parameters					
F07.00	Current limit Control	0: Current limit disabled 1: Current limit mode 1 2: Current limit mode 2		1	○
F07.01	Current Limit	50.00~180.00	%	150.00	●

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	Control Scaling				
F07.02	Constant Speed Limit Current Frequency Decreasing Time	0.00~600.00 Mode 1	S	5.00	●
F07.03	Current Limit Mode 2 Proportion Gain	0.01~10.00		0.30	●
F07.04	Current Limit Mode 2 Integral Time	0.00~300.00 0.00 Integration Disabled	S	10.00	●
F07.05	Overvoltage Stall Control	0: Overvoltage stall disabled 1: Overvoltage stall mode 1 2: Overvoltage stall mode 2		1	○
F07.06	Overvoltage Stall Voltage	380V:640~800 220V: 370~400	V	750 375	●
F07.07	Overvoltage Stall Mode 2 Proportion Gain	0.01~10.00		0.30	●
F07.08	Overvoltage Stall Mode 2 Integral Time	0.00~300.00 0.00: Integration Disabled	S	10.00	●
F07.09	Not Used	-	-	-	-
F07.10	Motor Overload Protection Options	0: Prohibited 1: Permitted		1	○
F07.11	Motor Overload Protection Gain	30~300	S	60	○
F07.12	Fault Retry Control	Ones place: Fault retry times 0: Fault retry prohibited 1~3: Fault retry for 1, 2, and 3 times 4: Unlimited fault retry Tens place: In fault retry, fault output terminals: 0: Off 1: On		00	○
F07.13	Fault Retry Timelag	0.01~30.00	S	0.50	○
F07.14	No Fault Timelag	0.01~30.00	S	10.00	○
F07.15	Fault Retry	OL ILP SLU SOU SOC		11111	○

	Options	1	1	1	1	1					
		0: Fault retry permitted 1: Fault retry prohibited SOC is LSB, arrange in logical order, the 6 th ~the 8 th bits are not used									
F07.16	Not Used										
F07.17	Disabled Trips	5~8 Bits						0000 0000	○		
		*	EEd	EHt	OL						
		0	0	0	0						
		1~4 Bits									
		*	OL P	ILP	SLU						
		0	0	0	0						
0: Enabled, 1: Disabled SLU is LSB, arrange in logical order, the 8 th bit is not used											
F08 Group: Preset Speed and PLC Parameters											
F08.00	Preset Speed 1	0.00~Fmax					Hz	0.00	●		
F08.01	Preset Speed 2	0.00~Fmax					Hz	5.00	●		
F08.02	Preset Speed 3	0.00~Fmax					Hz	10.00	●		
F08.03	Preset Speed 4	0.00~Fmax					Hz	15.00	●		
F08.04	Preset Speed 5	0.00~Fmax					Hz	20.00	●		
F08.05	Preset Speed 6	0.00~Fmax					Hz	25.00	●		
F08.06	Preset Speed 7	0.00~Fmax					Hz	30.00	●		
F08.07	Program Operation Mode	Ones place: Options of speed program operation mode 0: Monocycle 1: Operate as per Section 7 after monocycle 2: Limited times of continuous cycle 3: Continuous cycle Tens place: Options of stop and restart 0: Operate from the period when it stops 1: Operate from Section 1						00	○		
F08.08	Program Operation Direction Setting	T7	T6	T5	T4	T3	T2	T1		0000000	○
		0	0	0	0	0	0	0			
		0: Forward 1: Reverse T1 is LSB, arrange in order, the 8 th bit is									

		not used.			
F08.09	Program Operation Section T1	0~60000	S	30	●
F08.10	Program Operation Section T2	0~60000	S	30	●
F08.11	Program Operation Section T3	0~60000	S	30	●
F08.12	Program Operation Section T4	0~60000	S	30	●
F08.13	Program Operation Section T5	0~60000	S	30	●
F08.14	Program Operation Section T6	0~60000	S	30	●
F08.15	Program Operation Section T7	0~60000	S	30	●
F08.16	Speed Cycling Times	1~60000		1	●
F09 Group: PID Parameters					
F09.00	PID Regular Setting Mode	0: Numeric PID Setting 1: VS Terminal 2: IS Terminal		0	○
F09.01	PID Numeric Setting	0.0~100.0	%	50.0	●
F09.02	PID Feedback Options	0: VS Terminal 1: IS Terminal		0	○
F09.03	PID Setting Feedback Coefficient	0~60000		1000	●
F09.04	PID Regulator Positive/Negative Setting	0: Positive Setting 1: Negative Setting		0	○
F09.05	PID Output Gain	0.00~100.00	%	100.00	●
F09.06	Proportion Gain GP	0.00~100.00		0.40	●
F09.07	Integral Time GTi	0.00~300.00, 0.00: No Integration	S	10.00	●
F09.08	Differential Time GTd	0.00~300.00, 0.00: No Differentiation	mS	0.00	●

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F09.09	Integration Function Scale	0.00~100.00	%	100.00	●
F09.10	PID Positive Output Limit	0.00~100.00	%	100.00	●
F09.11	PID Negative Output Limit	0.00~100.00	%	100.00	●
F09.12	PID Feedback Loss Detection Value	0.0~100.0	%	0.0	●
F09.13	PID Feedback Loss Detection Time	0.0~3000.0	S	1.0	●
F10 Group: Communication Parameters					
F10.00	Inverter Address	1~247, 0: Broadcasting Address		1	○
F10.01	Communications Bits Rate	0: 4800 1: 9600 2: 19200 3: 38400	bps	1	○
F10.02	Communications Format	0:No parity 1+8+1 1:Even parity 1+8+1+1 2:Odd parity 1+8+1+1		0	○
F10.03	Communications Overtime	0.0~60.0 0.0 : Communications Overtime disabled	S	0.0	○
F10.04	Master-slave Communications Mode	0:The inverter is the master 1:The inverter is the slave		0	○
F10.05	Master Writes the Address of Slave Inverter	0:Primary Numeric Frequency 1:Auxiliary Numeric Frequency		0	○
F10.06	Inverter Receiving Proportion Coefficient	0.00~600.00	%	100.00	●
F10.07	The Master Communication Sendign Data	0: Input Frequency 1: Output Frequency 2:Primary Numeric Frequency 3:VP 4:VS 5:IS		0	○
F11 Group: User Parameters					

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F11.00	Parameter Setting Control	0:Parameter setting allowed 1: Parameter lock 0(Except F00.07 and F11.00, rest of the parameters cannot be edited.) 2: Parameter lock 1(Except F11.00, rest of the parameters cannot be edited.)		0	○
F11.01	User Password	0~65535		XXXX X	○
F11.02	Parameter Editing Mode	0:Editable through keypad and RS485 1:Editable through keypad 2:Editable through RS485		0	○
F11.03	Inverter Rated Power	0.40~22	kW	XXXX	×
F11.04	Inverter Rated Voltage	60~480	V	XXX	×
F11.05	Inverter Rated Current	0.1~100.0	A	XXXX X	×
F11.06	Inverter Running Time	0~65535 User Monitor	HOUR	XXXX X	×
F11.07	Inverter Running Time	0~60 User Monitor	min	XXXX X	×
F11.08	Runnign Time Control	0: Disabled 1: Enabled		0	○
F11.09	Setting Running Time	0~65535	HOUR	XXXX X	○
F11.10	Distributor Password	0~65535		XXXX X	○
F11.11	Factory Password	0~65535		XXXX X	○
F11.12	Software Version	0.00~600.00		XXXX X	×
C00 Group: Monitor Parameters					
C00.00	Output Frequency	0.00~Fup	Hz		×
C00.01	Actual Output Voltage	0~660	V		×
C00.02	Actual Output Current	0.0~300.0	A		×
C00.03	Output Power	0.0~50.0	kW		×
C00.04	Motor Estimated	0~20000	rpm		×

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	Speed				
C00.05	DC Bus Voltage	0~1200	V		×
C00.06	Input Frequency	0.00~Fmax	Hz		×
C00.07	Synchronous Frequency	0.00~Fup	Hz		×
C00.08	Program Operation Section	1~7			×
C00.09	Program Operation Time	0~60000	S		×
C00.10	PID Setting	0~60000			×
C00.11	PID Feedback	0~60000			×
C00.12	Input Terminal Status	** X6 X5 X4 X3 X2 X1 (Monitor external input terminal logic status)			×
C00.13	Output Terminal Status	***** R1 Y1 (Monitor output terminal logic status)			×
C00.14	VS Input Monitor	0.00~10.00	V		×
C00.15	IS Input Monitor	0.00~20.00	mA		×
C00.16	Inverter Heatsink Temperature	0~200	°C		×
C00.17	Vp Input Monitor	0~5.00	V		×
E00 Group: Fault Monitor Parameters					
E00.00	The Last Fault Record	00:No fault SC:Short circuit SOC:Stable overcurrent SOU:Stable overvoltage SLU:Stable undervoltage ILP:Input phase loss OL:Inverter overload OL1:Motor overload OH:Overheating OLP:Output Phase Loss EHT:External Fault EED:Inverter EEPROM failure StP:Autotuning cancelled SrE:Stator resistance error SIE:Idling current error InP:Internal failure PIde:PID feedback loss		00	×

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		COE:Communication overtime fault SOft: Inverter soft-start relay is off.			
E00.01	The Last 2 Faults Record	The same as the last fault record.		00	×
E00.02	The Last 3 Faults Record	The same as the last fault record.		00	×
E00.03	Output Frequency at Last Fault	0.00~320.00	Hz	0.00	×
E00.04	Output Current at Last Fault	0.0~300.0	A	0.0	×
E00.05	DC Bus Voltage at Last Fault	0~1200	V	0	×

6. Parameter Description

F00 Group: General Parameters

No.	Function	Range	Unit	Default	Type
F00.00	Speed Reference Input Monitor	Frequency 0.00~Fmax	Hz	XXXX X	X

F00.00 is only for reference. Its parameters are present frequency setting values. Symbol “-” will not be displayed if the value is negative, but user can check it via keypad indicator. See Chapter 4 for detail of keypad indicator description.

No.	Function	Range	Unit	Default	Type
F00.01	Drive Control Mode	0: V/F open loop Control 1: SVC		1	○






F00.01=0 V/F open loop Control: Applicable to single-inverter driving multi-motor, and speed governing with low requirements on rapidity, low frequency torque, and speed accuracy.

F00.01=1 SVC: In this control mode, output current process is under real-time close-loop control. Based on current feedback, inverter will conduct open-loop slip compensation and stator resistance voltage drop compensation on output. These 2 compensations are up to F05.10 and F05.11, or adjusted output frequency and torque slightly by adjusting F05.12(Excitation boost gain).

No.	Function	Range	Unit	Default	Type
F00.02	Start/Stop Control Options	Ones place: Start/Stop control mode options 0: Inverter keypad 1: Terminal 2: Communication Tens place: Terminal control mode options 0: RUN-Run, F/R-Forward/Reverse 1: RUN-Run, F/R- Reverse 2: RUN-N/O forward, Xi-N/C stop, F/R-N/O reverse 3: RUN-N/O run, Xi-N/C stop, F/R- Forward/Reverse		00	○

Start, stop, forward, reverse and jog of inverter control command are under control of F00.02.

F00.02 Ones Place=0 Inverter keypad control

, , and  keys control the start/stop of inverter. If there is fault, press  to enter jog running status. Press  to enter operation status. Green LED indicator on

RUN is on which refers to that inverter is in operation status, flashing refers to that inverter is in ramp-to-stop status.

F00.02 Ones Place=1 Terminal

Command controlled by multi-function input terminals RUN, F/R, FJOG, and RJOG. See the description of F00.02 tens place for detailed control logic.

F00.02 Ones Place=2 Communication control

Running command given by PC/PLC with communication mode. See F10 Group: Communication parameters for the parameters related to communications, and Appendix A: EM100 MODBUS Communication Protocol.

F00.02 tens place=0 Terminal RUN runs, F/R forwards/reverses (2-wire sequence control mode 1)

Terminal Xm is the running enabling terminal in this mode, and terminal Xn defines the running direction. See Table 6-1 for terminal function setting.

Table 6-1 Setting of 2-Wire Sequence Terminal Control Mode 1

Terminal	Setting Value	Description
Xm	1	RUN-run
Xn	2	F/R- forward/reverse

Xm and Xn are the multi-function terminals of X1 ~ X6(F02.00 ~ F02.05), and are on at PWL.(ON refers to the terminal is on. OFF refers to the terminal is off.)

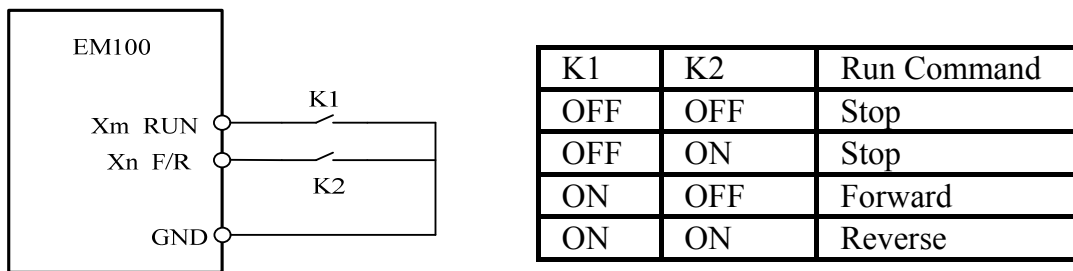


Figure 6-1 2-wire Sequence Terminal Control Mode 1

F00.02 tens place=1 Terminal RUN runs, F/R reverses (2-wire sequence control mode 2)

It is the most commonly used 2-wire sequence control mode. Terminal Xm and Xn define forward and reverse of motor. See Table 6-2 for terminal function setting.

Table 6-2 Setting 2-wire Sequence Terminal Control Mode 2

Terminal	Setting Value	Description
Xm	1	RUN-run
Xn	2	F/R-forward/reverse

Xm and Xn are the multi-function terminals of X1 ~ X6(F02.00 ~ F02.05), and are on at PWL.(ON: the terminal is on. OFF: the terminal is off.)

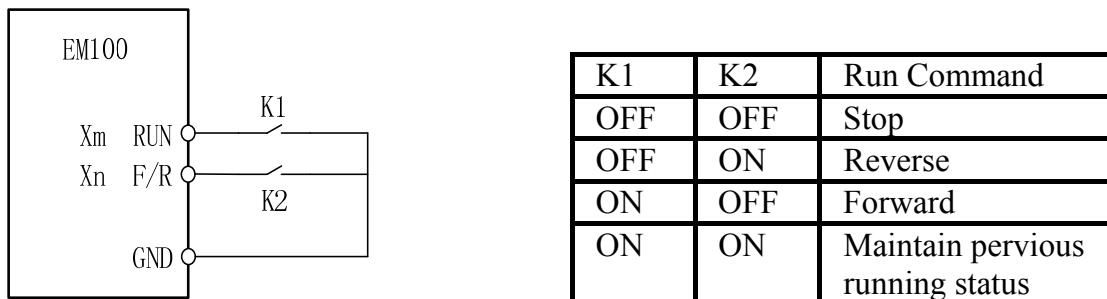


Figure 6-2 2-wire Sequence Terminal Control Mode 2



F00.02 start/stop selected as 2-wire sequence terminal control (F00.02=01 or 11), when terminal RUN or F/R is on, inverter stops with PLC section cycling stop command. Even control terminal RUN or F/R is on, the inverter will not run after stop command cancelled. If inverter needs to run, retrigger terminal RUN or F/R.

F00.02 Tens place=2 RUN-N/O forward, Xi-N/C stop, and F/R-N/O reverse (3-wire sequence control mode 1)

Xi is the enabling terminal in this mode. Xm and Xn control direction. See Table 6-3 for terminal function setting.

Table 6-3 Setting 3-wire Sequence Terminal Control Mode 1

Terminal	Setting Value	Description
Xm	1	RUN-run
Xn	2	F/R-forward/reverse
Xi	15	3-wire sequence run/stop control

Terminal Xi shall be on first if inverter has to run. Forward or reverse of motor is controlled by the pulse edge of Xm or Xn.

Terminal Xi shall be off if inverter has to stop.

Xm, Xn, and Xi are the multi-function terminals of X1 ~ X6(F02.00 ~ F02.05).

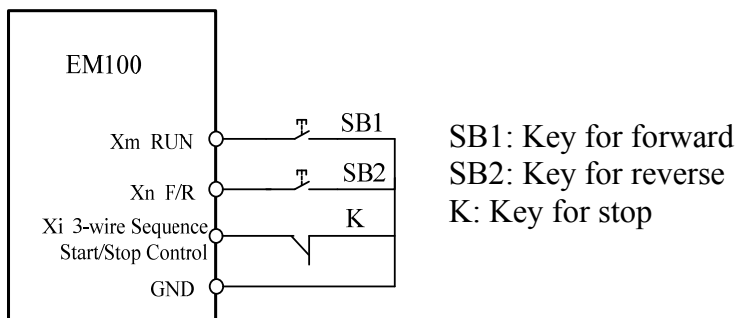


Figure 6-3 3-wire Terminal Control Mode 1

F00.02 Tens place=3 terminal RUN-N/O run, Xi-N/C stop, F/R-Forward/ Reverse (3-wire control mode 2)

Xi is the enabling terminal in this mode. Xm give run command, and Xn defines direction. See Table 6-4 for terminal function setting.

Table 6-4 Setting 3-wire Terminal Control Mode 2

Terminal	Setting Value	Description
Xm	1	RUN-run
Xn	2	F/R-forward/reverse
Xi	15	3-wire sequence run/stop control

Terminal Xi shall be on first if inverter has to run. Pulse increasing edge of Xm sends motor running signal, and Xn defines motor direction signal.

Terminal Xi shall be off if inverter has to stop.

Xm, Xn, and Xi are the multi-function terminals of X1 ~ X6(F02.00 ~ F02.05). Xm is on with pulse, and Xi and Xn are on at PWL.

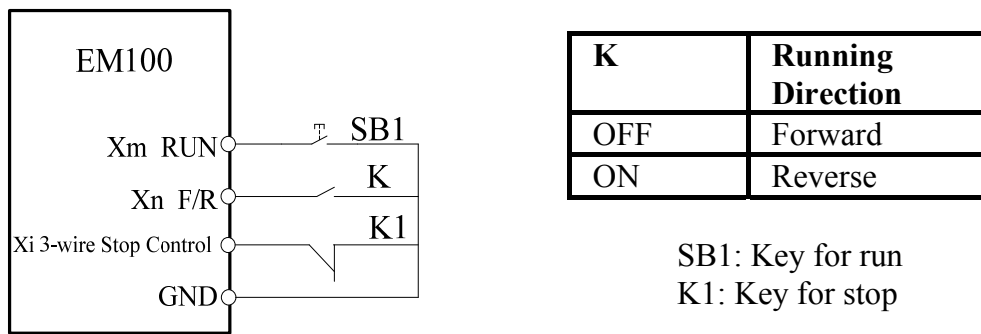


Figure 6-4 3-wire Terminal Control Mode 2

When inverter is in speed setting mode, it can be set by numeric setting, analog voltage, and analog current. Jog speed setting mode is prior to the other setting mode, i.e. press key or control terminal FJOG and RJOG are on, inverter will switch to jog speed setting mode automatically regardless of the present setting mode. See Figure 6-6 for detail of EM100 setting modes. See parameters description of F00.03, F00.04, and F00.05 for function codes of speed setting mode.

No.	Function	Range	Unit	Default	Type
F00.03	Primary Speed Setting Mode	0: Primary numeric frequency setting 1: VP keypad potentiometer 2: VS analog voltage input terminal 3: IS analog current input terminal		1	○

F00.03 For selecting primary speed setting modes:

F00.03=0 Primary numeric frequency setting mode, defined by F00.07 parameters

F00.03=1 VP keypad potentiometer defines setting frequency.

F00.03=2 Analog terminal VS voltage defines setting frequency.

F00.03=3 Analog terminal IS current defines setting frequency.

	<ol style="list-style-type: none"> 1. Default voltage of analog voltage input terminal VS: 0~10V. 2. Default current of analog current input terminal IS: 4~20mA. 3. Preset speed setting mode is prior to primary speed setting mode.
--	---

No.	Function	Range	Unit	Default	Type
F00.04	Auxiliary Speed Setting Mode	0: Auxiliary numeric frequency setting 1: VP keypad potentiometer 2: VS analog voltage input terminal 3: IS analog current input terminal 4~9: Not Used 10: Process PID 11: Program Operation 12: Wobulation Control		0	○

F00.04 For selecting primary speed setting modes:

F00.04=0 Auxiliary numeric frequency setting mode, defined by F00.08 parameters

- F00.04=1** VP keypad potentiometer defines setting frequency.
F00.04=2 Analog terminal VS voltage defines setting frequency.
F00.04=3 Analog terminal IS current defines setting frequency.
F00.04=4~9 Not used
F00.04=10 Process PID setting frequency defines setting frequency. See F09 Group for process PID setting parameters.
F00.04=11 Program operation setting frequency defines setting frequency. See F08 Group for program operation parameters.
F00.04=12 Wobulation operation setting frequency defines setting frequency. See F06 Group for Wobulation operation parameters.

No.	Function	Range	Unit	Default	Type
F00.05	Integrated Frequency Setting Mode	0: Primary speed setting 1: Auxiliary speed setting 2: Primary speed setting + Auxiliary speed setting 3: Primary speed setting - Auxiliary speed setting 4: MAX{ Primary speed setting, Auxiliary speed setting } 5: MIN{ Primary speed setting, Auxiliary speed setting }		0	○

- F00.05** For selecting integrated speed setting modes:
F00.05=0 Primary speed setting mode
F00.05=1 Auxiliary speed setting mode
F00.05=2 Primary speed setting + Auxiliary speed setting mode
F00.05=3 Primary speed setting - Auxiliary speed setting mode
F00.05=4 MAX{ Primary speed setting, Auxiliary speed setting }
F00.05=5 MIN{ Primary speed setting, Auxiliary speed setting }

No.	Function	Range	Unit	Default	Type
F00.06	Analog Integrated Frequency Setting Mode	0: Integrated frequency setting 1: VS* Integrated frequency setting 2: IS* Integrated frequency setting		0	○


- F00.06** For selecting analog integrated speed setting modes:
F00.06=0 Integrated speed setting: The final significant speed value of F00.05 integrated speed.
F00.06=1 Defined by VS* Integrated frequency setting
F00.06=2 Defined by IS* Integrated frequency setting

No.	Function	Range	Unit	Default	Type
F00.07	Primary Numeric Frequency Setting	0.00~ Fmax	Hz	0.00	●
F00.08	Auxiliary Numeric Frequency Setting	0.00~ Fmax	Hz	0.00	●

F00.07 Operation frequency primary numeric setting value.

The parameter range: 0.00~Fmax upper limit frequency.

F00.08 Operation frequency auxiliary numeric setting value, the parameter range: 0.00~Fmax upper limit frequency.



1. Press \uparrow/\downarrow to edit F00.07 value directly. See Chapter 4 for the shortcut key description.

2. In primary numeric frequency setting mode, edit F00.07 value by terminal UP and DOWN directly.

No.	Function	Range	Unit	Default	Type
F00.09	Acceleration Time 1	0.01~600.00	S	15.00	●
F00.10	Deceleration Time1	0.01~600.00	S	15.00	●

Acceleration time is the time taken for the output frequency to rise from 0Hz up to maximum frequency Fmax (F00.11). Deceleration time is the time taken for the output frequency to drop from Fmax (F00.11) down to 0Hz, which is not relevant to forward and reverse. As shown in Figure 6-5.

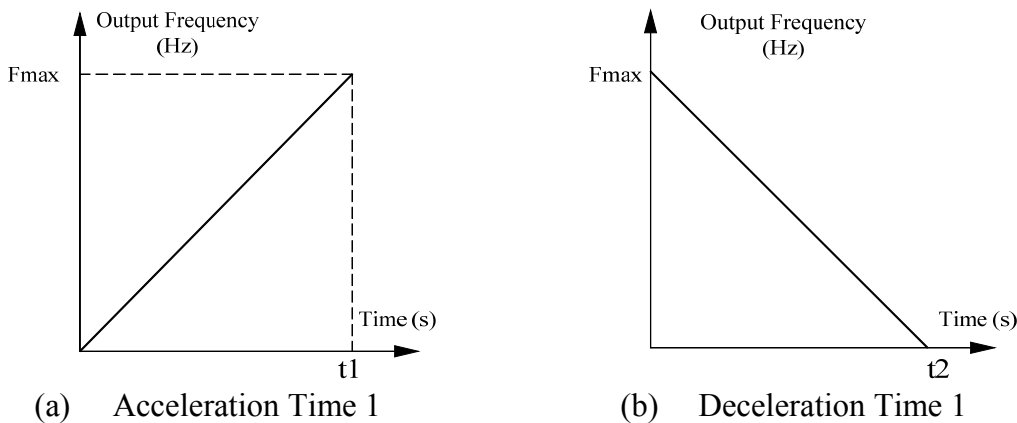


Figure 6-5 Acceleration/ Deceleration Time

2 groups of acceleration/ deceleration times of Em100 can be set as *Switching Terminal of Acceleration/ deceleration Time 1/Time 2* by multi-function input terminal. Different terminal statuses are corresponding to relevant acceleration/ deceleration time. See the Table below for the correlation.

Table 6-5 Correlation between acceleration/ deceleration time and its switching terminal

Acceleration/ Deceleration Terminal Status	Acceleration/ Deceleration Time Option
OFF	Acceleration/ deceleration time group 1(F00.09, F00.10)
ON	Acceleration/ deceleration time group 2(F06.03, F06.04)

EM100 Speed Setting Input Modes

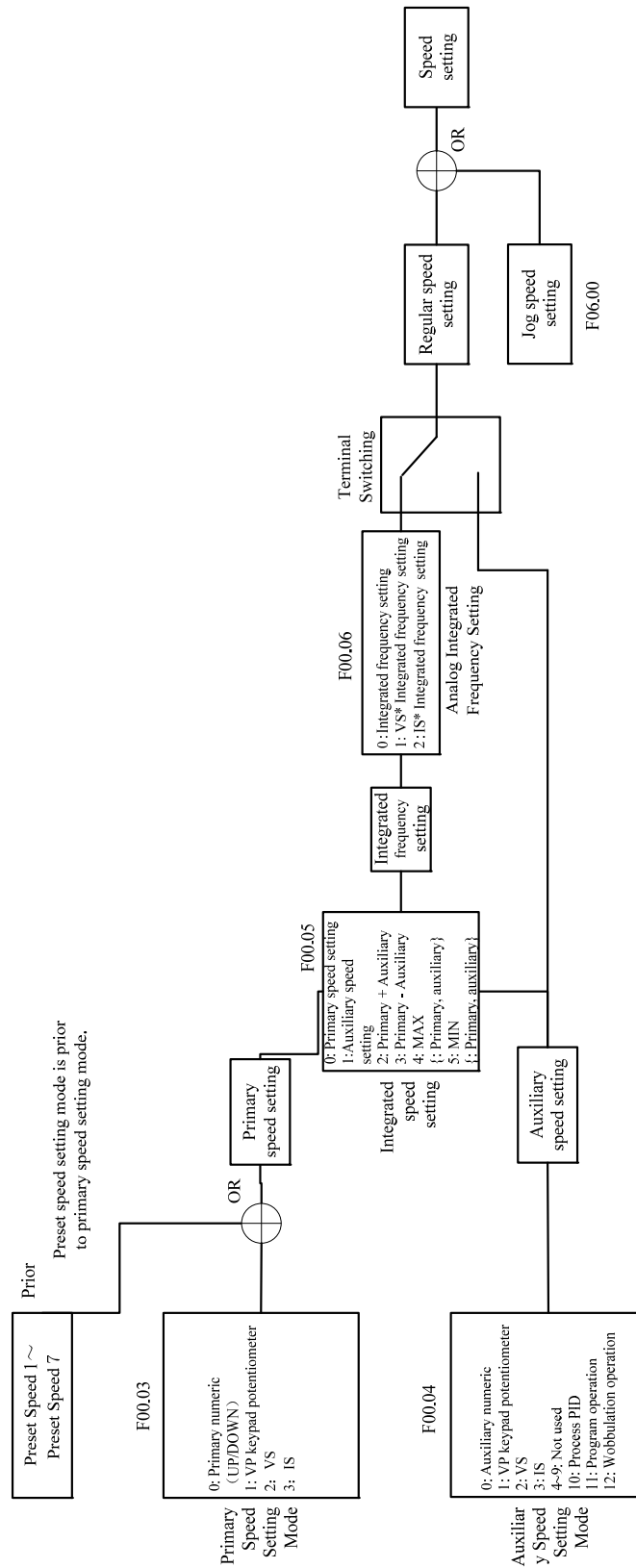



Figure 6-6 Speed Setting Input Mode

No.	Function	Range	Unit	Default	Type
F00.11	Maximum Frequency	Fmax:20.00~320.00	Hz	50.00	○
F00.12	Upper Limit Frequency	Fup:Fdown~Fmax	Hz	50.00	○
F00.13	Lower Limit Frequency	Fdown:0.00~Fup	Hz	0.00	○

F00.11: Maximum frequency (Fmax) can be set by inverter, Fmax range: 20.00~320.00Hz.

F00.12: The upper limit frequency (Fup) can be run after inverter starts, Fup range: Fdown~ Fmax.

F00.13: The lower limit frequency (Fdown) can be run after inverter starts, Fdown range: 0.00~Fup.

	<p>1. Fup and Fdown shall be set as per motor nameplate parameters and working conditions. Motor shall not work in low frequency for a long time. Otherwise, motor service lifespan will be shortened due to overheating.</p> <p>2. Correlation of Fmax, Fup and Fdown: $0.00\text{Hz} \leq \text{Fdown} \leq \text{Fup} \leq \text{Fmax} \leq 320.00\text{Hz}$</p>
---	--

No.	Function	Range	Unit	Default	Type
F00.14	Motor Running Direction	0: Forward 1: Reverse		0	●

Change function code to change the rotating direction of motor without changing the wiring of motor, it serves like to switch motor rotating direction by switching any two wires of U, V, or W.

Remarks: After parameters are reset as defaults, motor running direction will return previous status. Do not edit F00.14 if the applications are that changing motor running direction is prohibited after system debugging finished.

No.	Function	Range	Unit	Default	Type
F00.15	Forward/Reverse Control Mode	0:Forward/Reverse Permitted 1:Reverse Prohibited		0	○
F00.16	F/R Deadband	0.00~600.00	S	0.00	○

Motor Reverse Permission

F00.15=0 Reverse permitted: Motor running direction is set by F00.14, or controlled by terminal F/R.

F00.15=1 Reverse prohibited: Motor can only forward, F00.14 parameters are disabled, and terminal F/R is off.

Selecting Motor Status at Switching Forward/Reverse

If setting F00.16=0, forward/reverse is in smooth transition.

If setting F00.16≠0, when switching forward/reverse, and when motor speed drops to 0Hz, the inverter runs at 0Hz in F00.16 setting time, and then runs in opposite direction to setting frequency. As shown in Figure 6-7.

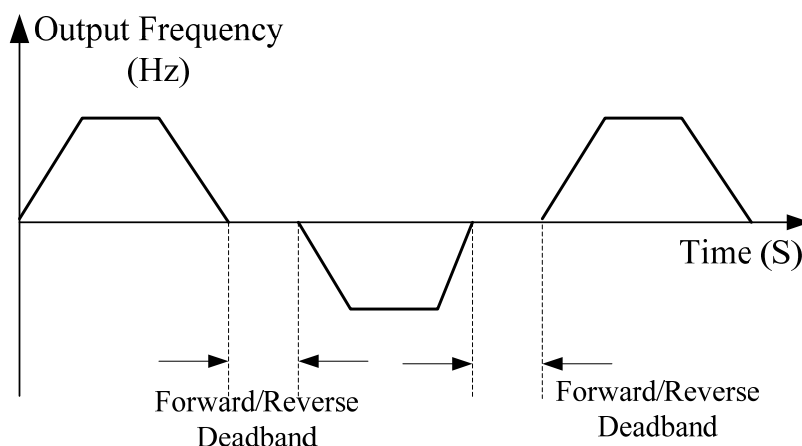


Figure 6-7 Forward/Reverse Deadband

No.	Function	Range	Unit	Default	Type
F00.17	Carrier Frequency	2.000~12.000	kHz	4.000	●
F00.18	Random Carrier Mode	0: Disabled 1: Enabled		0	●
F00.19	Upper Carrier Frequency	2.000~12.000	kHz	8.000	●
F00.20	Lower Carrier Frequency	2.000~12.000	kHz	2.000	●

F00.18=0 Random carrier is disabled.

Carrier frequency of inverter is a fixed value set by F00.17.

Increasing carrier frequency can reduce motor noise and heating, but it will increase temperature of inverter. When the carrier frequency is higher than the default, inverter rated power shall be decreased by 5% for every additional 1kHz carrier frequency.

F00.18=1 Random carrier is enabled.

Inverter carrier will vary with output frequency in linear variation. Upper carrier frequency and lower carrier frequency are controlled by F00.19 and F00.20.

No.	Function	Range	Unit	Default	Type
F00.21	Saving Setting Frequency Options	0: Do not save the frequency before power loss 1: Save the frequency before power loss		0	○
F00.22	Default Reset	0: Disabled 1: Reset default		0	○

Saving Setting Frequency Options

F00.21=0 Do not save the frequency before power loss

F00.21=1 Save the frequency before power loss: When power loss occurs, inverter will save primary numeric frequency, auxiliary numeric frequency, and program operation setions/time/cycling times.

Default Reset

F00.22=1 Reset default: Reset all parameters defaults of F00, F02~F10 Group, F00.22=0 automatically after resetting completed.

Remarks: Motor parameters(F01 Group) and user parameters(F11.03~F11.12 Group) will not be reset to defaults if conducting default reset.

F01 Group: Motor Parameters

No.	Function	Range	Unit	Default	Type
F01.00	Motor Rated Power	0.40~22kW	kW	XXXX	○
F01.01	Motor Rated Voltage	60~480	V	XXX	○
F01.02	Motor Rated Current	0.1~100.0	A	XXXXX	○
F01.03	Motor Rated Currentcy	20.00~320.00	Hz	XXXXX	○
F01.04	Motor Rate Speed	1~20000	rpm	XXXXX	○
F01.05	Motor Wiring Mode	0: Y Wiring 1: Δ Wiring		X	○
F01.06	Motor Rated Power Factor	0.70~0.95		XXX	○
F01.07	Motor Efficiency	70.00~97.00	%	XXXX	○

Remarks: When inverter connects to motor at the first time, set all parameters as per motor nameplate before operation starts.

No.	Function	Range	Unit	Default	Type
F01.08	Idling Excitation Current	0.1~50.0	A	XXXXX	○
F01.09	Stator Resistance R1	0.01~300.00	Ω	XXXXX	○
F01.10	Rotator Resistance R2	0.01~300.00	Ω	XXXXX	○
F01.11	Stator& Rotor Mutual Inductance L	0.1~3000.0	mH	XXXX	○
F01.12	Leakage Inductance Coefficient	0.001~1.000		XXXX	○

User cannot know motor parameters F01.08~F01.12, obtain these parameters by autotuning.

Before autotuning motor parameters, inverter will set motor nameplate parameters (Set by F01.00~F01.07) as the standard motor parameters. See Figure 6-8 for the implication of motor parameters.

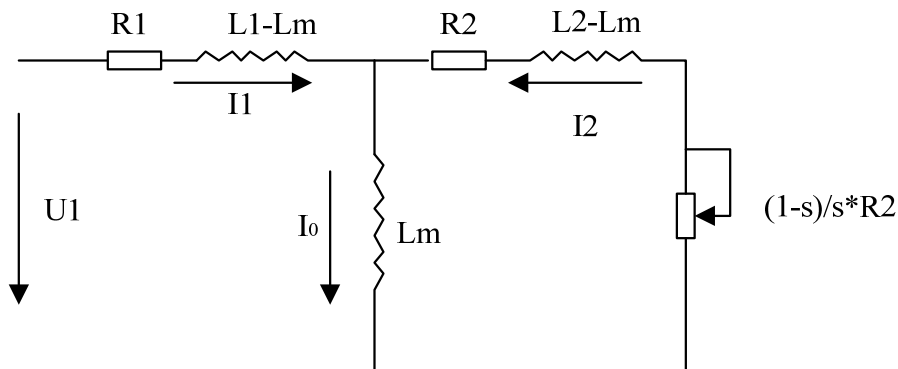


Figure 6-8 T Equivalent Model of 3-phase AC Induction Motor

R1, L1, R2, L2, Lm, and I₀ in Figure 6-8 refers to stator resistance, stator inductance, rotor resistance, rotor inductance, stator and rotor mutual inductance, and idling excitation current respectively.

Remarks: When editing motor rated power (F01.00) or motor rated voltage (F01.01), other corresponding motor parameters(F01.05~F01.12) will change automatically.

No.	Function	Range	Unit	Default	Type
F01.13	Autotuning Parameters	0:No autotuning 1:Stationary autotuning 2: Rotational autotuning(After setting mode 1 and 2, press RUN key.)		0	○

F01.13=0 No autotuning

F01.13=1 Motor remains motionless in the process of autotuning parameters(F01.10~F01.14).

F01.13=2 Motor is rotating in the process of autotuning parameters(F01.10~F01.14).

In stationary autotuning or rotational autotuning mode, set F01.13=1 or F01.13=2, and then press to start autotuning. After autotuning completed, F01.13=0 will be set automatically. When slip compensation is active, autotune motor parameter first, so that the motor will obtain the optimum performance.

F02 Group: Input Terminal Function Terminals

No.	Function	Range	Unit	Default	Type
F02.00	Multi-function Input X1-RUN	See Table 6-6		1	○
F02.01	Multi-function Input X2-F/R			2	○
F02.02	Multi-function Input X3-D1			3	○
F02.03	Multi-function Input X4-D2			4	○
F02.04	Multi-function Input X5-D3			5	○
F02.05	Multi-function Input X6-FRS			8	○

Table 6-6 Function Multi-function Input Terminal

Setting Value	Function	Description
0	Not Used	To block terminal if terminal hardware does not function well.
1	RUN -run	If start/stop control mode is in terminal control mode (F00.02=1~4), and if the terminal is on, the inverter will perform RUN functions as per setting value of terminal control mode.

2	F/R Forward/Reverse	If start/stop control mode is in terminal control mode (F00.02=1~4), and if the terminal is on, the inverter will perform F/R functions as per setting value of terminal control mode.
3	Preset Speed Terminal 1	Define 3 function input terminals as preset speed terminals in preset speed control mode. Select a corresponding preset frequency in F08.00~F08.06 as present setting frequency via the integrated code of these 3 terminals.
4	Preset Speed Terminal 2	
5	Preset Speed Terminal 3	
6	Switching terminal for acceleration/dece leration time 1&2	Acceleration/deceleration time 1/2 set by F00.09/F00.10, F06.03/F06.04. Select corresponding acceleration/ deceleration time 1/2 via acceleration/ deceleration terminal status, select acceleration/ deceleration time 1 if terminal is off, and acceleration/ deceleration time 2 if terminal is on.
7	Coast-to-stop	If the terminal is on when inverter is running, block PWM output, motor will coast to stop.
8	Inverter Fault Reset	After fault cleared, inverter can be reset through fault reset terminal.
9	FJOG Forward jog	If terminal FJOG is on, motor forwards. If RJOG terminal is on, motor reverses. Motor will remain previous working status if two terminals are on simultaneously. ★ When reverse is prohibited, RJOG is off.
10	RJOG Reverse	
11	Terminal UP	If input frequency is primary numeric frequency, its rate can be set by time integration of the key or stepping rate (F06.05).
12	Terminal DOWN	
13	UP/DOWN Clearing	Clear terminal UP/DOWN increasing or decreasing value.
14	Acceleration/ Deceleration Prohibition	If acceleration/deceleration prohibition terminal is on, performing acceleration/deceleration command is prohibited. The output frequency of inverter will keep unchanged, and will not be controlled by input frequency.
15	3-wire sequence run/stop control(Pulse stop)	It is the key for 3-wire sequence terminal control.
16	DC brake input command at Stop	When inverter is in the process of ramp-to-stop, and running frequency < DC brake frequency at stop (Set by F04.06), if the terminal is on, DC brake starts, until the terminal is off, DC brake stops. If the terminal is on, and there is a DC brake setting time, take the bigger value between time when terminal is on and DC brake setting time at stop.
17	Switch run	If the terminal is on, no matter what running command

	command terminal	mode F00.02 status is, it is in terminal control mode which has the highest priority. Terminal control mode is set by F00.02.
18	Program running reset	In program operation mode (PLC), if the input signal of the terminal is active, then program operation time will be cleared, cycling time cleared, and program operation starts from Section 1.
19	Switch to auxiliary speed setting	In speed control mode, if the terminal is on, switch integrated setting mode to auxiliary speed setting mode, as set F00.05=1. If the terminal is off, return previous setting mode automatically.
20	External fault input	When inverter receives the external fault signals, it trips fault and coasts to stop.
21	Start wobble operation	Terminal controls wobble running, as F06.18 ones place=1.

Table 6-7 Correlation between Preset Speed Terminal and Preset Speed Setting

Preset Speed	Terminal 3	Terminal 2	Terminal 1	Selected Frequency	Corresponding Setting Code
1	OFF	OFF	OFF	Keypad or Analog Setting	Defined by F00.03
2	OFF	OFF	ON	Preset Speed 1	F08.00
3	OFF	ON	OFF	Preset Speed 2	F08.01
4	OFF	ON	ON	Preset Speed 3	F08.02
5	ON	OFF	OFF	Preset Speed 4	F08.03
6	ON	OFF	ON	Preset Speed 5	F08.04
7	ON	ON	OFF	Preset Speed 6	F08.05
8	ON	ON	ON	Preset Speed 7	F08.06



1. Start/Stop of preset speed running is defined by F00.02.
2. When multi-function input terminal setting value is 6, acceleration/deceleration time of preset speed running is controlled and selected by the terminal.
3. Preset speed running will be affected by whether terminal F/R or RUN is ON (in terminal start/stop control mode). If terminal F/R is ON, the preset speed is reverse speed.
4. If forward/reverse is required in the process of preset speed, set that start/stop of inverter is in terminal control mode, and set F00.15=0 (Forward/ Reverse permitted).


No.	Function	Range						Unit	Default	Type
F02.06	Multifunction Input Positive/Negative Logic	X6	X5	X4	X3	X2	X1		000000	○
		0	0	0	0	0	0			
		0: Positive Logic On at 0V/Off at 24V 1: Negative Logic Off at 0V/ On at 24V								

		X1 is LSB, arrange in logical order, the 7 th and the 8 th bits are not used.			
F02.07	Multi-function Input Filter Times	0~100		10	○
F02.08	X1 Input Delay Time	0.00~300.00	S	0.00	○
F02.09	X2 Input Delay Time	0.00~300.00	S	0.00	○

F02.06 Terminal Input Positive/Negative Logic

0: Positive logic—On at 0V/Off at 24V

1: Negative Logic—Off at 0V/ On at 24V

For codes displayed in binary system, if the 6th~8th bits require to be edited, press  to shift to the following 6~8 bits. Codes (displayed in binary system) require to be edited in communication, see the following table for the value and corresponding decimal digit and hexadecimal digit.

Displayed Binary Value of F02.06	Corresponding Decimal Digit	Corresponding Hexadecimal Digit
00000000	0	0
00000001	1	1
00000010	2	2
.....
11111110	254	FE
11111111	255	FF

F02.07 Numeric Input Filter Times

Since multi-function input terminals take PWL trigger or pulse trigger mode, in order to avoid interference, numeric filter processing is required for reading terminal status. Filter times 1=0.50mS

Generally, parameters of F02.07 rarely need adjustment. If adjustment is needed, note the correlation between the filter time and terminal active time to avoid interferences due to less filter times, or slow response and missing command due to more filter times.

F02.08 /F02.09 X1/X2 Input Delay Time

Refer to set the time how long the inverter delays to respond after the arrival of external signals.

No.	Function	Range	Unit	Default	Type
F02.10	VP Filter Time	0.00~10.00	S	0.10	●
F02.13	VVS Filter Time	0.00~10.00	S	0.10	●
F02.14	IS Filter Time	0.00~10.00	S	0.10	●

Set filter time to filter process analog input signals for eliminating the effect of anti-interference signals. But excessively long filter time will reduce the response speed of analog signals. Generally, parameters of F02.08 /F02.09 rarely need adjustment.

No.	Function	Range	Unit	Default	Type
F02.11	0.00Hz Frequency Corresponding to VP Input Voltage	0.0~100.0	%	1.0	●
F02.12	Maximum Frequency Corresponding to VP Input Voltage	0.0~100.0	%	98.0	●

Set values of F02.11 and F02.12 to achieve bias output of keypad potentiometer. See Figure 6-9 for principles of bias.

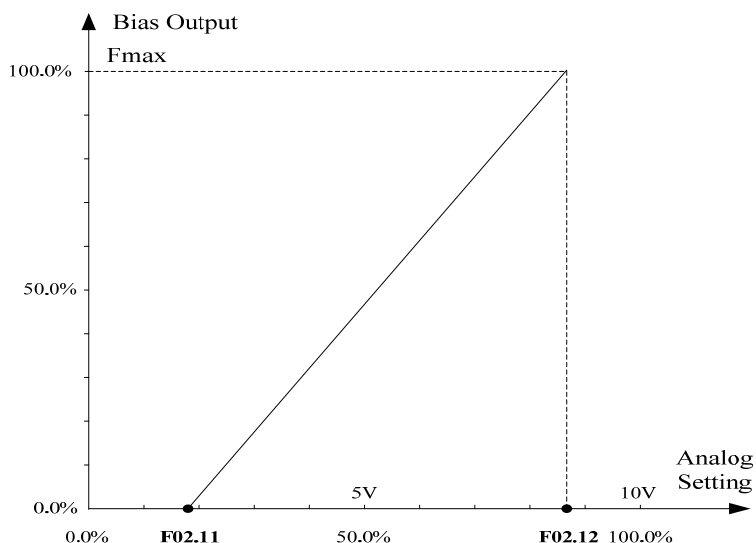


Figure 6-9 VP Input/Output Bias

No.	Function	Range	Unit	Default	Type
F02.15	VS Output Bias 0	-100.0~100.0	%	0.0	●
F02.16	VS Output Bias 1	-100.0~100.0	%	25.0	●
F02.17	VS Output Bias 2	-100.0~100.0	%	75.0	●
F02.18	VS Output Bias 3	-100.0~100.0	%	100.0	●
F02.19	VS Input Bias 0	0.0~VS Input Bias 1	%	0.0	●
F02.20	VS Input Bias 1	VS Input Bias 0~ VS Input Bias 2	%	25.0	●
F02.21	VS Input Bias 2	VS Input Bias 1~ VS Input Bias 3	%	75.0	●
F02.22	VS Input Bias 3	VS Input Bias 2~ 100.0	%	100.0	●

Output bias frequency of 4 points in the middle of VS bias curve are defined by F02.15, F02.16, F02.17, and F02.18 respectively, range: -100.0% ~ 100.0%. 100.0% is corresponding to Fmax.

Analog input of 4 points in the middle of VS bias curve are defined by F02.19, F02.20, F02.21, and F02.22 respectively, range: 0.0%~100.0%. They can be set in succession as $0 \leq F02.19 \leq F02.20 \leq F02.21 \leq F02.22$. Refer to the Figure 6-10 for the logic relations.

No.	Function	Range	Unit	Default	Type
F02.23	IS Output Bias 0	-100.0~100.0	%	0.0	●
F02.24	IS Output Bias 1	-100.0~100.0	%	25.0	●
F02.25	IS Output Bias 2	-100.0~100.0	%	75.0	●
F02.26	IS Output Bias 3	-100.0~100.0	%	100.0	●
F02.27	IS Input Bias 0	0.0~IS Input Bias 1	%	20.0	●
F02.28	IS Input Bias 1	IS Input Bias 0~ IS Input Bias 2	%	40.0	●
F02.29	IS Input Bias 2	IS Input Bias 1~ IS Input Bias 3	%	80.0	●
F02.30	IS Input Bias 3	IS Input Bias 2~100.0	%	100.0	●

Output bias frequency of 4 points in the middle of IS bias curve are defined by F02.23, F02.24, F02.25, and F02.26 respectively, range: -100.0%~100.0%. 100.0% is corresponding to Fmax.

Analog input of 4 points in the middle of IS bias curve are defined by F02.27, F02.28, F02.29, and F02.30 respectively, range: 0.0%~100.0%. They can be set in succession as $0 \leq F02.27 \leq F02.28 \leq F02.29 \leq F02.30$.

For Instance:

Bias principles of VS and IS are identical. Following description is taken VS as the instance.

(1) Parameter setting

Table 6-8-1 Parameter setting 1

Code	Setting Value	Code	Setting Value
F02.15	-100%	F02.19	0.0%
F02.16	-50%	F02.20	25.0%
F02.17	70%	F02.21	75.0%
F02.18	100%	F02.22	100.0%

Table 6-8-2 Parameter setting 2

Code	Setting Value	Code	Setting Value
F02.15	100%	F02.19	0%
F02.16	70%	F02.20	40%
F02.17	-50%	F02.21	75%
F02.18	-100%	F02.22	100%

(2) Diagram of output bias

See Figure 6-10-1 and Figure 6-10-2 for input/output bias of Table 6-8-1 and Table 6-8-2 respectively.

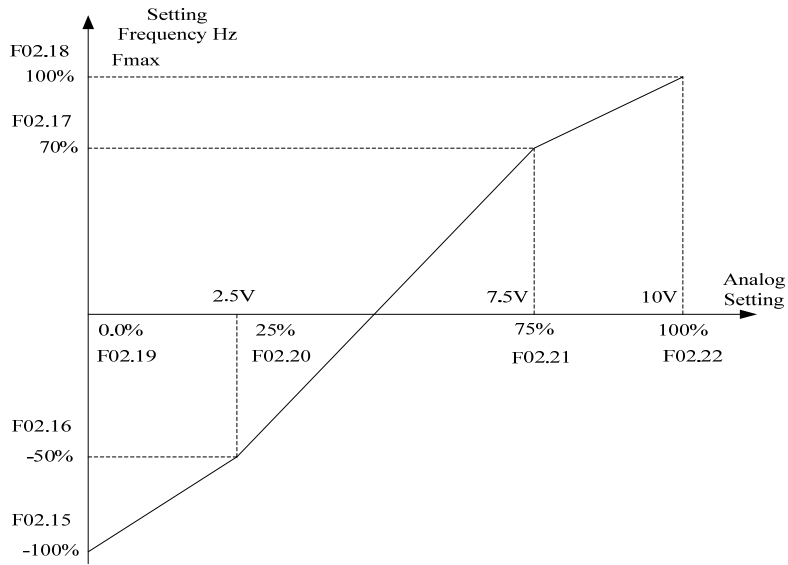


Figure 6-10-1 Input/Output Bias 1

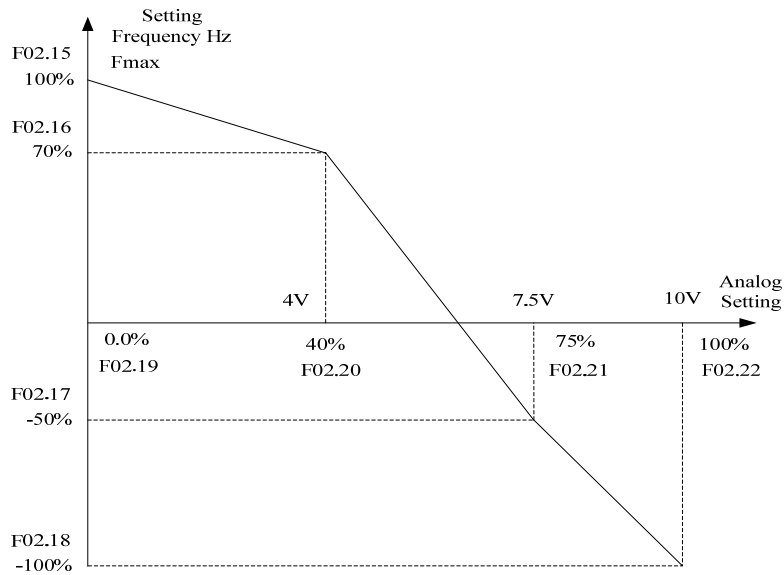


Figure 6-10-2 Input/Output Bias 2

F03 Group: Output Terminal Function Parameters

No.	Function	Range	Unit	Default	Type
F03.00	Multi-function Output Y1	0: Inverter is running 1: Frequency reach (FAR) 2: Frequency detection range (FDT)		0	○
F03.01	Relay Output R1	3: Reverse running 4: Frequency reached upper limit 5: Frequency reached lower limit 6: Inverter fault 7: Inverter is ready to work		6	○

EM100 provides 2 programmable numeric output terminals: 1 multi-function output terminal and 1 relay output terminal. 0~7 programming codes available, user can define the output quantity of output terminals.

- 0: Inverter is running: When the inverter is running, Y1 or R1 is on.
- 1: Frequency reach (FAR): When the deviation between the output frequency and setting frequency of inverter in the frequency reach detection range, Y1 or R1 is on. Refer to description of F06.06.
- 2: Frequency detection range (FDT): When output frequency of inverter > FDT increasing threshold, Y1 or R1 is on. When output frequency of inverter returns the FDT decreasing threshold, Y1 or R1 is off. Refer to description of F06.07/F06.08.
- 3: Reverse running: When output frequency of inverter is reversing, Y1 or R1 is on. When it is forwarding, Y1 or R1 is off.
- 4: Frequency reached upper limit: When the output frequency reached the upper limit (F00.12), Y1 or R1 is on.
- 5: Frequency reached lower limit: When the output frequency reached the lower limit (F00.13), Y1 or R1 is on.
- 6: Frequency fault: When inverter is in fault status, Y1 or R1 is on.
- 7: Inverter is ready to work: When power is on, inverter has no fault, soft-starter runs normally, Y1 or R1 is on.

No.	Function	Range	Unit	Default	Type
F03.02	Analog Output M0	See the Table below for M0 Programming Code		0	○
F03.03	M0 Output Lower Limit	0.00~100.00	%	0.00	●
F03.04	M0 Output Upper Limit	0.00~100.00	%	100.00	●
F03.05	M0 Output Gain	0.00~300.00	%	100.00	●

EM100 provides 1 programmable analog output terminal M0. Analog output terminal outputs voltage signals(0~10V).See Table 6-9 for the signals and meanings of full scale corresponding to paramets

Table 6-9 M0 Output Programming Table

Setting Value	Function	Description
0	Output Frequency	0~Fmax corresponding to 0~10V
1	Input Frequency	0~Fmax corresponding to 0~10V
2	Output Current	0~2.0 times of inverter rated current corresponding to 0~10V
3	Output Voltage	0~1.5 times of inverter rated voltage corresponding to 0~10V
4	VS	0~10V
5	IS	0~20mA corresponding to 0~10V
6	+10V	10V
7	DC Bus	0~1.5 times of inverter rated DC bus voltage corresponding to 0~10V

Analog output sets upper limit and lower limit to meet various needs.

$M0 \text{ Output Percentage} = M0 \text{ Lower Limit} + M0 \text{ Input Percentage} * M0 \text{ Output Gain} * (M0 \text{ Upper Limit} - M0 \text{ Lower Limit})$;

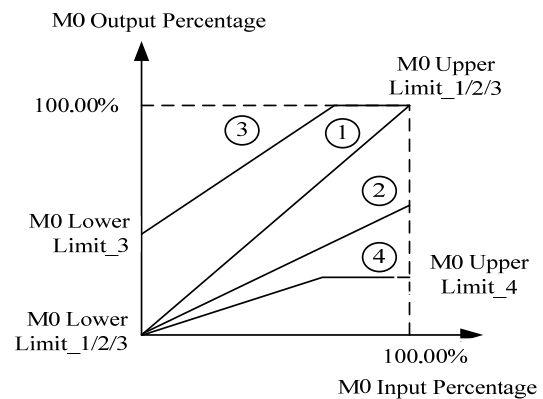


Figure 6-11 M0 Output Percentage Curves

4 curves obtained by set relevant M0 output parameters as shown in Figure 6-11:

Curve 1: Set as per the default.

Curve 2: Take curve 1 as the base to regulate M0 output gain.

Curve 3: Take curve 1 as the base to regulate M0 output gain and output lower limit.

Curve 4: Take curve 1 as the base to regulate M0 output gain and output upper limit.

F04 Group:Start/Stop Control Parameters

No.	Function	Range	Unit	Default	Type
F04.00	DC Brake Current at Start	0.00~150.00	%	0.00	○
F04.01	DC Brake Time at Start	0.00~30.00	S	0.00	○

F04.00 Set different value to achieve various DC brake torques at start.

F04.01 Set DC brake active time at start, inverter starts to run immediately when the time is up. If F04.01=0.00, DC brake is disabled at start. See Figure 6-12 for DC brake at start.

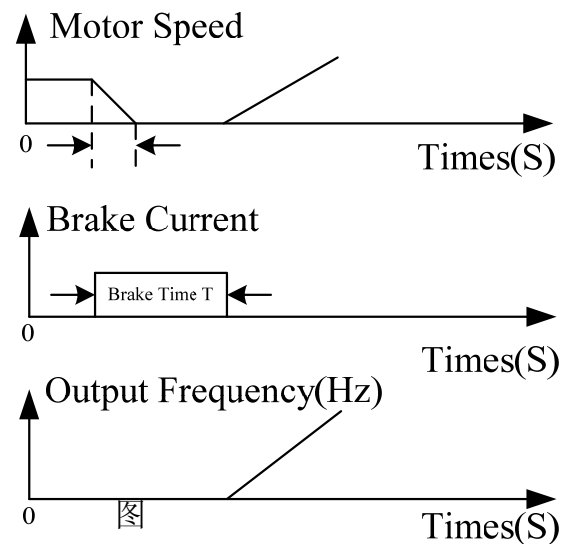


Figure 6-12 DC Brake Process at Start

No.	Function	Range	Unit	Default	Type
F04.02	Acceleration/ Deceleration Mode	0:Linear mode 1:S curve mode		0	○
F04.03	S Curve Time	0.00~600.00	S	0.00	○
F04.04	Not Used			-	-

Linear Acceleration/Deceleration

F04.02=0 Acceleration/Deceleration is in linear mode.

S Curve Acceleration/Deceleration

F04.02=1 Acceleration/Deceleration is in S curve mode. The 1st section and the last section in accelerating or decelerating are in smooth transition. The acceleration/deceleration curve is similar to S curve. When it is S curve, the final acceleration/deceleration time= S curve time+ Linear acceleration/deceleration time. See Figure 6-13 for 2 acceleration/deceleration modes.

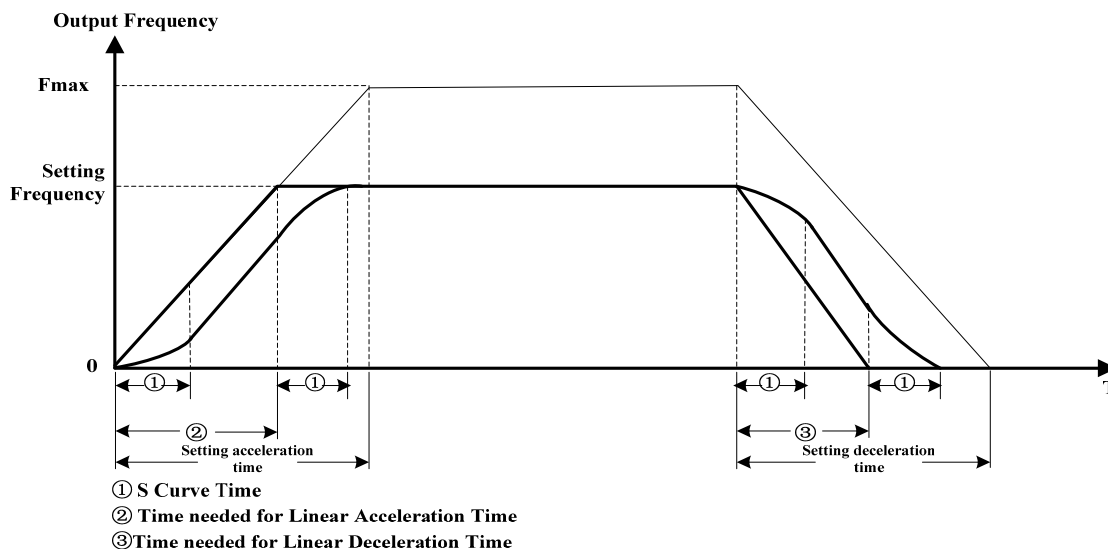


Figure6-13 Linear and S Curve Acceleration/Deceleration

No.	Function	Range	Unit	Default	Type
F04.05	Stop Mode Options	0: Ramp-to-stop 1: Coast-to-stop		0	○

Ramp-to-stop

Set F04.05=0, motor ramps to stop as per setting deceleration time 【Default is as per F00.10 deceleration 1)】

Coast-to-stop

Set F04.05=1, inverter will block PWM output while inputting stop command, motor will coast to stop. Stop time is up to the motor and the load inertia. If settin a coast-to-stop terminal, when the coast-to-stop terminal is on, the inverter will enter coast-to-stop status immediately, and will not run again if the terminal is off. Input the run command again to restart inverter.

No.	Function	Range	Unit	Default	Type
F04.06	DC Brake Start Frequency at Stop	0.10~60.00	Hz	2.00	○
F04.07	DC Brake Current at Stop	0.00~150.00	%	2.00	○
F04.08	DC Brake Waiting Time	0.00~30.00	S	0.00	○
F04.09	DC Brake Time at Stop	0.00~30.00	S	0.00	○

- F04.06** Set the frequency for DC brake to start in the process of ramp-to-stop. Once the output frequency is lower than this frequency in the process of ramp-to-stop, if DC brake time $\neq 0$ at stop, then DC brake enabled.
- F04.07** Different setting values can define different DC brake torques at stop.
- F04.08** When DC brake command given by the terminal is active at stop or the output frequency reaches the setting value of F04.06 in the process of ramp-to-stop. DC brake enabled after the time set by F04.06 is up.
- F04.09** Set DC brake time at stop. If F04.09=0.00, the DC brake is disabled at stop. If there is a DC brake signal of external terminal at stop, then the DC brake time takes the bigger between the active time of the terminal and the setting time of F04.09. See Figure 6-14 for DC brake process at stop.

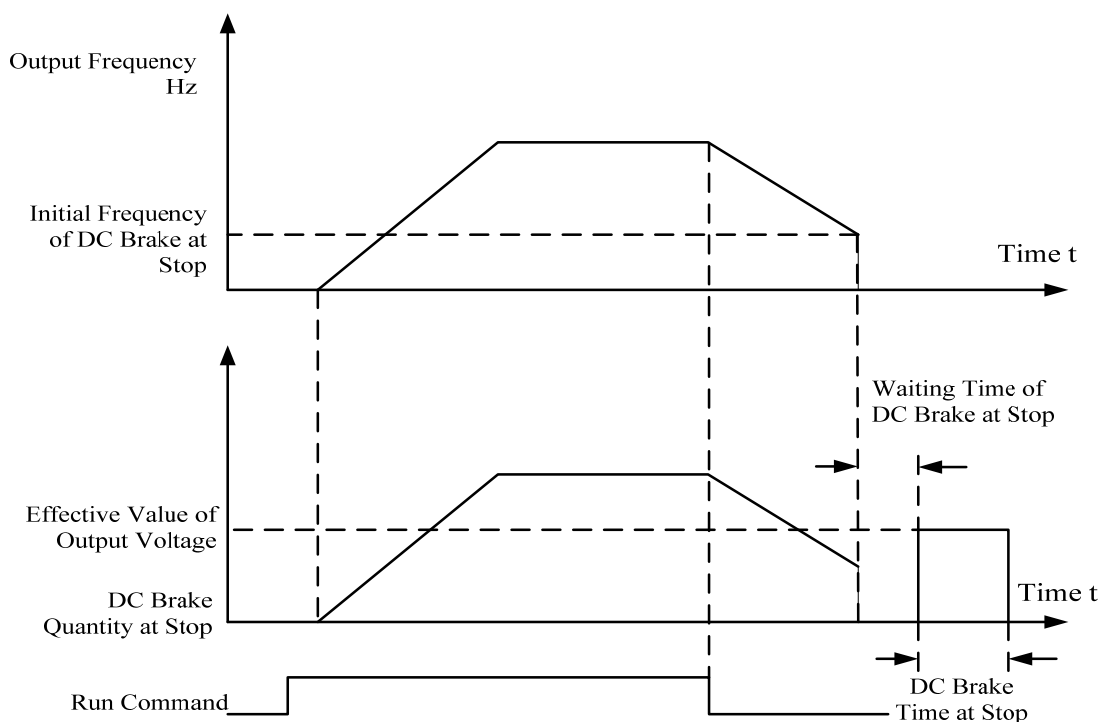


Figure 6-14 DC Brake Process at Stop

F05 Group: V/F Control Parameters

No.	Function	Range	Unit	Default	Type
F05.00	V/F Curve Scaling	See Table 6-15		35	●
F05.01	Frequency Base	Fbase:20.00~320.00	Hz	50.00	○

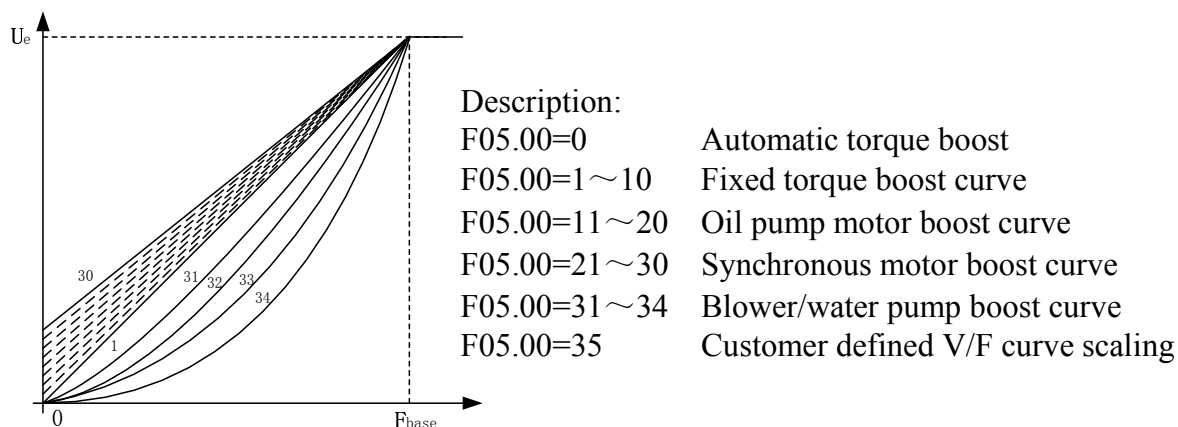


Figure 6-15 V/F Curves

F05.00≠35 Select a fixed V/F boost curve, Ue corresponding output is reaching the frequency base set by F05.01.

No.	Function	Range	Unit	Default	Type
F05.02	Voltage 1	0.00~100.00	%	1.00	●
F05.03	Voltage 2	0.00~100.00	%	4.00	●
F05.04	Voltage 3	0.00~100.00	%	10.00	●
F05.05	Voltage 4	0.00~100.00	%	16.00	●
F05.06	Frequency 1	0.00~Frequency 2 Fbase=100.0%	%	1.00	●
F05.07	Frequency 2	Frequency 1~ Frequency 3	%	4.00	●
F05.08	Frequency 3	Frequency 2~ Frequency 4	%	10.00	●
F05.09	Frequency 4	Frequency 3~100.00	%	16.00	●

F05.00=35 Customer defined V/F curve scaling, user can set frequency and voltage points in F05.02~F05.09.

No.	Function	Range	Unit	Default	Type
F05.10	Open Loop Slip Compensation	0.00~200.00	%	150.00	●

Motor rotor speed will reduce as load increases. Start slip compensation to ensure motor rotor speed close to synchronous speed with the rated load, and increase setting value of F05.10 appropriately when motor speed is lower than target value. F05.10=0, slip compensation is disabled.

No.	Function	Range	Unit	Default	Type
F05.11	Stator Voltage drop Compensation Gain	0.00~100.00	%	80.00	●
F05.12	Excitation Boost Gain	0.00~300.00	%	180.00	●

Stator voltage drop compensation is to compensate stator resistance and voltage drop produced by connecting cable.

No.	Function	Range	Unit	Default	Type
F05.13	Oscillation Suppression	0.00~100.00	%	0.00	●

If output current is not stable, oscillation suppression is applied to limit current oscillation and to avoid overcurrent triggered by current oscillation when motor starts. It is also used to reduce vibration of motor and mechanical devices

No.	Function	Range	Unit	Default	Type
F05.14	Overmodulation Level	1.00~1.10	%	1.00	●

Overmodulation level: If grid voltage is too low, in order to help the output voltage reach the rated voltage, the output voltage could be 1.1 times of present grid voltage after modulation.

No.	Function	Range	Unit	Default	Type
F05.15	AVR	0: Disabled 1: Enabled 2: Automatic (Disabled if over rated voltage)		0	○


Automatic voltage regulation is applied to the occasions when input voltage varies, output voltage remains unchanged basically, and V/F value keeps constant.

F06 Group:Auxiliary Function Parameters

No.	Function	Range	Unit	Default	Type
F06.00	Jog Numeric Frequency	0.00~ Fmax	Hz	5.00	●
F06.01	Jog Acceleration Time	0.01~600.00	S	15.00	●
F06.02	Jog Deceleration Time	0.01~600.00	S	15.00	●

In jog running mode, inverter runs per the setting frequency of F06.00, and runs to the acceleration/deceleration time of Fmax set by F06.01/F06.02.

Jog acceleration time (F06.01) is the time taken for the output frequency to rise from 0Hz up to Fmax. Jog deceleration time (F06.02) is the time taken for the output frequency to drop from Fmax down to 0Hz.

 key should be active and terminal JOG should be on in jog running mode. Otherwise, jog command will be considered as cancelled.

No.	Function	Range	Unit	Default	Type
F06.03	Acceleration 2	0.01~600.00	S	15.00	●
F06.04	Deceleration 2	0.01~600.00	S	15.00	●

Details refer to the description of F00.09 and F00.10.

No.	Function	Range	Unit	Default	Type
F06.05	UP/DOWN Frequency Rate	0.00~100.00 Unit:Hz/200mS, 0.00(Autorate,integral time)	Hz/S	1.00	●

In primary speed setting mode, edit primary primary speed setting (F00.07) through multi-function terminal UP/DOWN. Unit: Hz/200mS

F06.05=0.00: In auto-rate integration mode, edit F00.07 value slowly at beginning and then faster later based on the lasting time when terminal UP/DOWN is on.

F06.05≠0.00: Edit numeric setting value as per UP/DOWN rate set by F06.05 based on the lasting time when terminal UP/DOWN is on, calculate by second, only round-up, no round-off.

No.	Function	Range	Unit	Default	Type
F06.06	Frequency Reach Detection Range FAR	0.00~20.00	Hz	5.00	●

If multi-function output or relay output is set as 1(FAR), if absolute value of the difference between output frequency and input frequency of inverter is less than the setting value of F06.06, the corresponding output terminal is on. See Figure 6-16.

No.	Function	Range	Unit	Default	Type
F06.07	FDT Increasing Threshold	0.00~Fmax	Hz	30.00	○
F06.08	FDT Decreasing Threshold	0.00~Fmax	Hz	30.00	○

If multi-function output or relay output is set as 2(FDT), when the output frequency of inverter rises to the FDT increasing threshold (F06.07), the corresponding output terminal is on, and will be off when the output frequency drops to the FDT decreasing threshold (F06.08). See Figure 6-17.

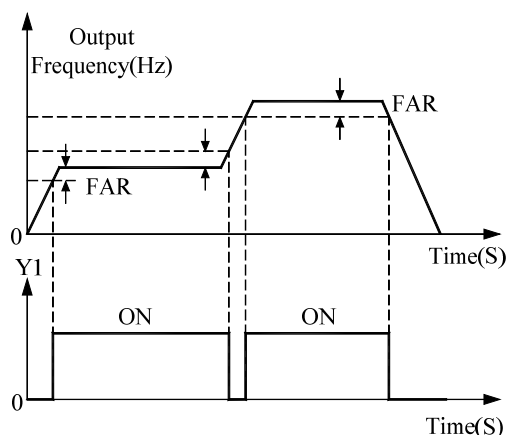


Figure 6-16 Frequency Reach Range FAR

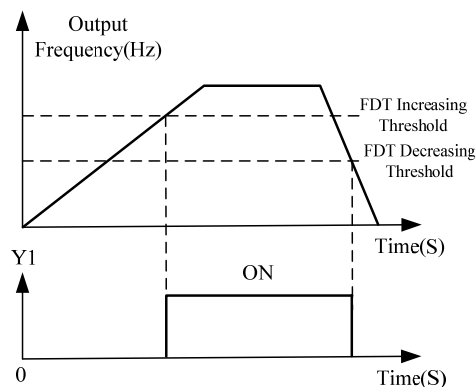


Figure 6-17 Frequency Detection Range FDT

No.	Function	Range	Unit	Default	Type
F06.09	Output Voltage	5.00~100.00	%	100.00	●

Output voltage: If the inverter is not required to output the present voltage value, regulate the percentage of output voltage to input voltage.

No.	Function	Range	Unit	Default	Type
F06.10	Dynamic Brake Control	0: Disabled 1: Enabled 2: Enabled at running 3: Enabled at deceleration	%	1	○

F06.11	Dynamic Brake Voltage	380V:500~800	V	700	○
		220V:300~400		380	
F06.12	Brake Duty Ratio	5.0~100.00	%	80.00	○

F06.10 Set the enabling range of dynamic brake. When F06.10=0, dynamic brake disabled. If F06.11≠0, dynamic brake enabled when meeting the setting value of F06.11.

F06.11 Set the voltage point of dynamic brake. If the present status meets the setting range of F06.10, DC bus voltage > setting voltage of F06.11, then dynamic brake is enabled.
380V: Inverter rated voltage is 380V. 220V: Inverter rated voltage is 220V.

F06.12 Set the duty ratio of voltage brake when dynamic brake is enabled.

No.	Function	Range	Unit	Default	Type
F06.13	Fan Control	0: Run at power-on 1: Smart mode		1	○

After power is on, the fan runs per the control mode after running for 2min regardless of the working status of inverter.


F06.13=0 The fan runs directly after inverter is power-on.

F06.13=1 Smart mode: Fan runs if the temperature of heatsinks >45°C. If the temperature of heatsinks <35°C and fan is in running status, fan will delay its operation, and would not run after 30S. When the temperature of heatsinks is between 35°C~45°C, fan remains its previous status.

No.	Function	Range	Unit	Default	Type
F06.15	JOG Key Function Setting	0: Disabled 1: Jog running function 2: F/R switching function		1	○

F06.15=0  key is disabled.

F06.15=1  key is for jog running.

F06.15=2  key is for switching forward and reverse.

No.	Function	Range	Unit	Default	Type
F06.16	Function of STOP Key	0: Enabled in keypad start/stop mode 1: Enabled in all start/stop modes 2: Enabled in keypad start/stop mode, external fault trips in other modes		0	○

F06.16=0 Enabled in keypad start/stop mode1, and disabled in other start/stop modes

F06.16=1 Enabled in all start/stop modes.

F06.16=2 Enabled in keypad start/stop mode, external fault trips in other modes

No.	Function	Range	Unit	Default	Type
F06.17	Customer Defined Scaling	0.01~200.00		30.00	●

F06.17 Customer Defined Scaling: Mechanical speed= Customer defined speed scaling*Output frequency. Adjust the scaling to match the display speed value with the actual speed.

No.	Function	Range	Unit	Default	Type
F06.18	Wobulation Operation Mode	Ones place: Wobulation operation control 0: Auto-running (Preset wobulation time is up, wobulation starts.) 1: Terminal Control (Preset wobulation time is up, the terminal is on.) Tens place: Wobulation input mode 0:Wobulation operation started after the mid-point reached 【(Wobulation upper limit + wobulation lower limit)/2】 1: Wobulation operation starts when its preset time is up		00	○
F06.19	Preset Wobulation Frequency	0.00~Fmax	Hz	0.00	●
F06.20	Preset Wobulation Time	0.00~600.00	S	15.00	●
F06.21	Upper Limit Frequency of Wobulation	0.00~Fmax	Hz	40.00	●
F06.22	Lower Limit Frequency of Wobulation	0.00~Fmax	Hz	20.00	●
F06.23	Jump Frequency of Wobulation	0.00~Fmax	Hz	5.00	●
F06.24	Rising Time of Wobulation	0.00~600.00	S	15.00	●
F06.25	Dropping Time of Wobulation	0.00~600.00	S	5.00	●

Wobulation operation is a special program operation mode for the devices as textile machines which need to reciprocate.

Wobulation Operation Control Mode

F06.18 Ones place=0 Autorunning

Wobulation operation starts when the preset wobulation time is up.

F06.18 Ones place=1 Terminal control

Wobulation operation starts by function input terminal when the preset wobulation time is up. If selecting terminal control mode, set any terminal among X1~X6=21.

Wobulation Input Mode

F06.18 Tens place=0 Wobulation operation starts after reaching middle frequency.

Middle frequency = (Wobulation upper limit frequency+ Wobulation lower limit frequency) /2.

F06.18 Tens place=1 Wobulation operation starts when the preset wobulation time is up.

See Figure 6-18 for wobulation operation logic diagram.

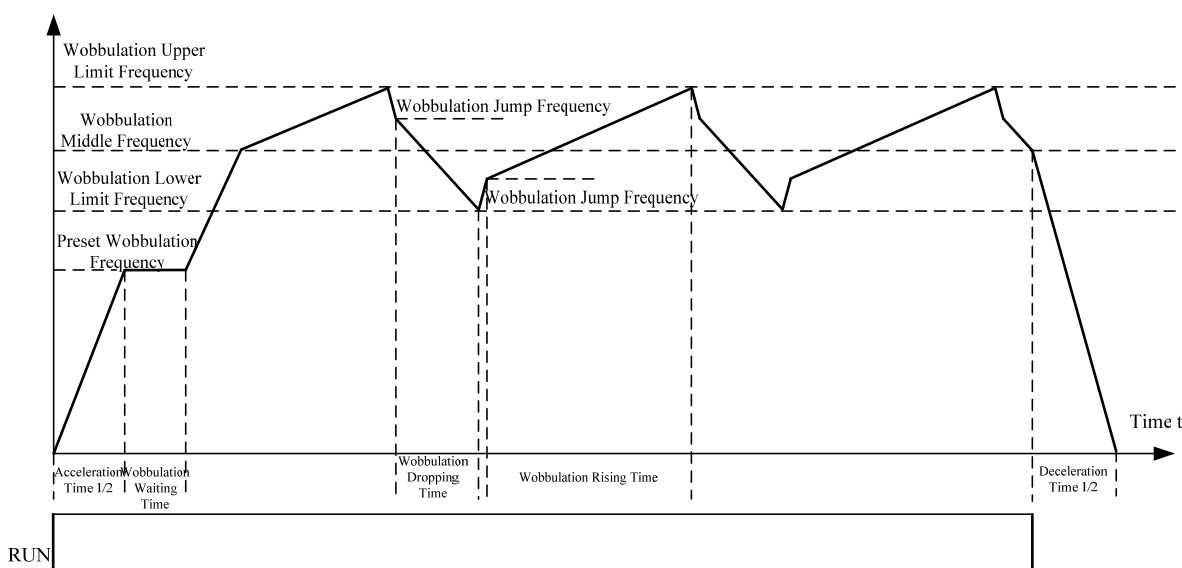


Figure 6-18 Wobulation Operation Logic Diagram

Wobulation operation start/ stop acceleration/ deceleration time can be selected by terminal as acceleration/ deceleration time 1 or 2.

Setting upper limit frequency of wobulation \geq Lower limit frequency of wobulation

Wobulation upper limit frequency-Jump frequency and lower limit frequency of wobulation+ Jump frequency are set in the range of 0.00~Fmax.

Acceleration/ deceleration time of wobulation jump frequency is wobulation acceleration/ deceleration time/2.

Starting process of wobulation operation: Select F00.04 auxiliary speed setting mode as wobulation, and integrated frequency setting mode is selected as auxiliary speed setting mode of other options including auxiliary speed setting mode.

No.	Function	Range	Unit	Default	Type
F06.26	Lower Limit Frequency Control	0: Run as per lower limit frequency 1: Run at zero speed when lower limit frequency running		0	○

		time is up.			
F06.27	Lower Limit Frequency Running Time	0.00~600.00	S	60.00	○

F6.26=0 If output frequency of inverter < Limit frequency, inverter will always run as per lower limit frequency. F00.13 defines the lower limit frequency.

F6.26=1 If output frequency of inverter < Limit frequency, inverter runs as per lower limit first, and runs in zero speed after lower limit running time reached setting value of F06.27. This function is for process PID control like constant pressure water supply and air compressor.

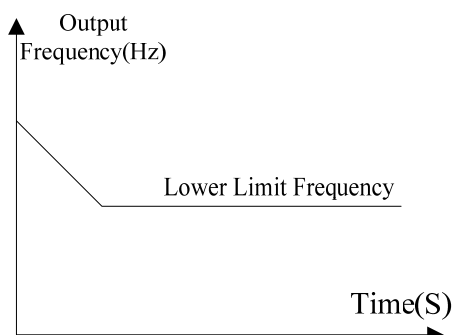


Figure 6-19-a F6.26=0

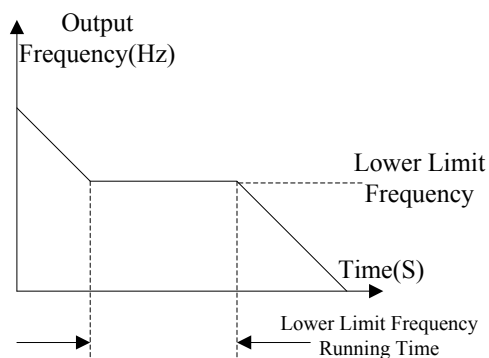


Figure 6-19-b F6.26=1

Figure 6-19 Lower Limit Frequency Control

No.	Function	Range	Unit	Default	Type
F06.28	Run/Stop Monitor Code Options	0: C00.00 1: C00.01 16: C00.16 17~99: Not Used 100: No change on keypad operation		0	○

In operation, jog running, stop, jog stop, and autotuning status, if F06.28=0~99, parameter setting status will change as the above mentioned statuses, inverter will display corresponding monitor code value. If the status is changed from the above mentioned statuses to parameter setting status, keypad will display F00.00 code value. (Fault status will jump to E00.00)

If F06.28=100, present keypad display will remain unchanged regardless of status change (Except the change is fault status.)

F07 Group: Fault and Protection Parameters

No.	Function	Range	Unit	Default	Type
F07.00	Current Limit Control	0: Current limit disabled 1: Current limit mode 1 2: Current limit mode 2		1	○
F07.01	Current Limit Control Scaling	50.00~180.00	%	150.00	○

F07.02	Constant Speed Limit Current Frequency Decreasing Time	0.00~600.00 Mode 1	S	5.00	●
F07.03	Current Limit Mode 2 Proportion Gain	0.01~10.00		0.30	●
F07.04	Current Limit Mode 2 Integral Time	0.00~300.00 0.00 Integration Disabled	S	10. 00	●

F07.00=0 Current Limit Control Disabled

F07.00=1 Current Limit Mode 1

In the process of acceleration and deceleration, if output current exceeds current limit scaling (F07.01), inverter remains present running frequency in the stop acceleration/deceleration process, and will accelerates/decelerates as per previous acceleration/deceleration time after output current decreased.

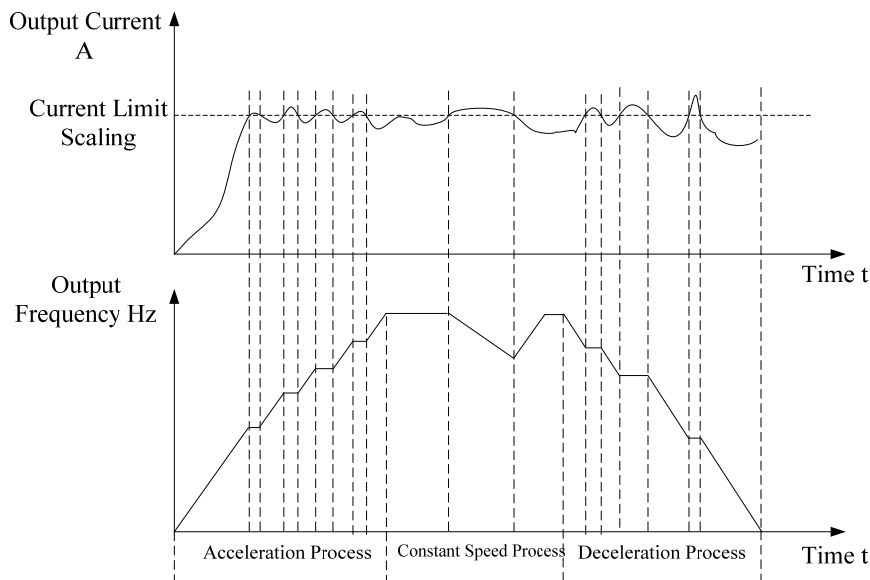


Figure 6-20 Current Limit Mode 1

In the constant speed process, after output current exceeds current limit scaling (F07.01), inverter decelerates as per constant speed current frequency decreasing time (F07.02), the minimum deceleration could reach lower limit frequency (F00.13). After output current decreases, inverter will accelerate to setting frequency as per setting acceleration time, see Figure 6-20.

F07.00=2 Current Limit Mode 2

Current limit mode 2 is applied to the applications which are sensitive to acceleration/deceleration time. Current limit mode 1 will prolong the acceleration/deceleration time.

For the load with big inertia, when overcurrent occurs in acceleration, the proportion gain (F07.03) of current limit mode 2 is better to be big. If overcurrent occurs in deceleration, F07.03 is better to be small. Otherwise, if the suppression is not perfect, inverter may trip overcurrent. For the load with small inertia, F07.03 is better to be small. Otherwise,

dynamic response of system will be slow, and the integral time (F07.04) of current limit mode 2 always remains default value.

No.	Function	Range	Unit	Default	Type
F07.05	Overvoltage Stall Control	0: Overvoltage stall disabled 1: Overvoltage stall mode 1 2: Overvoltage stall mode 2		1	○
F07.06	Overvoltage Stall Voltage	380V: 640~800 220V: 370~400	V	750 375	○
F07.07	Overvoltage Stall Mode 2 Proportion Gain	0.01~10.00		0.30	●
F07.08	Overvoltage Stall Mode 2 Integral Time	0.00~300.00 0.00: Integration Disabled	S	10.00	●

F07.05=1 Overvoltage Stall Disabled.

F07.05=1 Overvoltage Stall Mode 1

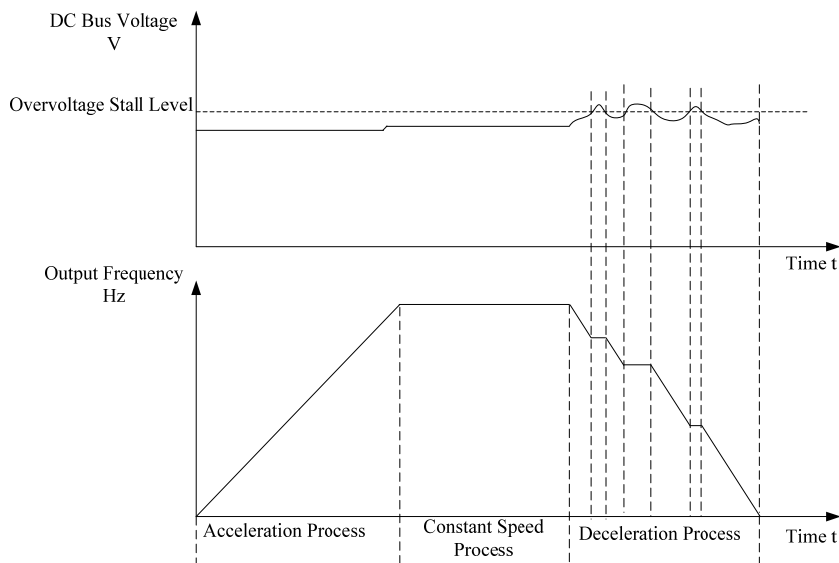


Figure 6-21 Overvoltage Stall Mode 1

In deceleration process, after DC bus voltage exceeds overvoltage stall voltage (F07.06), inverter stops deceleration process, and remains at present running frequency. After DC bus voltage decreases, inverter will decelerate as per previous deceleration time, see Figure 6-21.

F07.05=2 Overvoltage Stall Mode 2

Overvoltage stall mode 2 is applied to the applications which are sensitive to acceleration/ deceleration time. Overvoltage stall mode 1 will prolong the acceleration/ deceleration time.

For the load with big inertia, when overvoltage occurs in deceleration, proportion gain (F07.07) of overvoltage stall mode 2 is better to be big. Otherwise, if the suppression is not perfect, inverter may trip overvoltage fault. For the load with small inertia, F07.07 is better to be small. Otherwise, dynamic response of system will be slow, and the integral time (F07.08) of overvoltage stall mode 2 always remains default value.

No.	Function	Range	Unit	Default	Type
F07.10	Motor Overload Protection Options	0: Prohibited 1: Permitted		1	○
F07.11	电机过载保护增益 Motor Overload Protection Gain	30~300	S	60	○

F07.10=0 No overload protection for motor, motor is in danger of overheating damage. A relay for overheating protection is suggested to be installed between motor and inverter.

F07.10=1 Inverter will judge whether motor is overload or not based on the inverse curve of motor overload protection.

F07.11 Motor Overload Protection Time

Default time is that inverter trips OL1 fault if 150% overload lasts for 1 minute at hot start, see Figure 6-22 for motor overload protection time. During normal operation, motor overload protection operates in the area between a cold start and a hot start.

Cold start: Motor protection operation time in response to an overload situation that was suddenly reached when starting a stationary motor.

Hot start: Motor protection operation time in response to an overload situation that occurred during sustained operation at rated current.

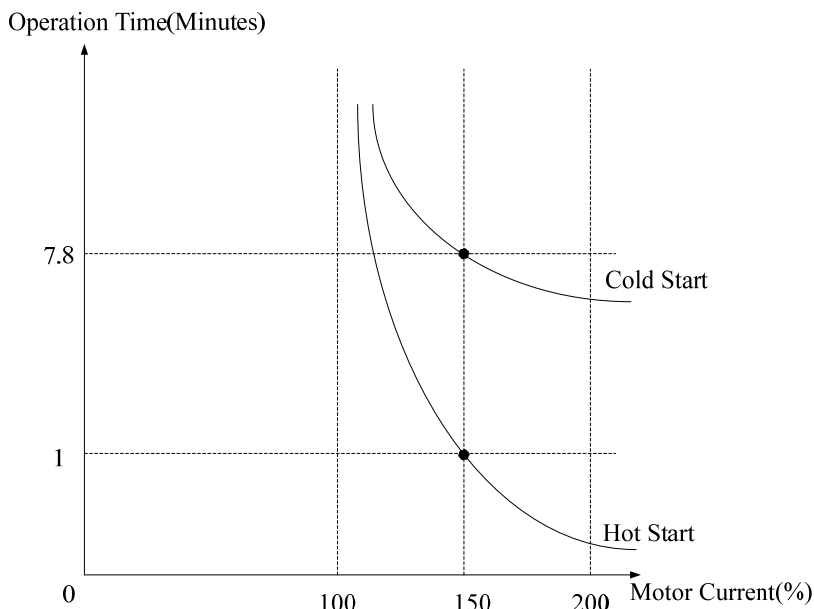


Figure 6-22 Motor Overload Protection Operation Time

No.	Function	Range	Unit	Default	Type
F07.12	Fault Retry Control	Ones place: Fault retry times 0: Fault retry prohibited 1~3: Fault retry for 1, 2, and 3 times 4: Unlimited fault retry Tens place: In fault retry, fault output terminals: 0: Off 1: On		00	○
F07.13	Fault Retry Timelag	0.01~30.00	S	0.50	○
F07.14	No Fault Timelag	0.01~30.00	S	10.00	○

Fault Retry Times

F07.12 Ones Place=0

Fault occurs in the process of operation, inverter will not reset automatically, it requires manual reset.

F07.12 Ones Place=1/2/3

Fault occurs in the process of operation, inverter stops output. After fault cleared, inverter resets fault automatically and restarts operation 1/2/3 times. The time that inverter takes to run without fault is over the no fault timelag (F07.14), fault retry times resets to the setting value of F07.12 ones palce. If fault retry is over 1/2/3 times, fault still occurs, and then there is no automatic fault reset.

F07.12 Ones Place=4

Fault occurs in the process of operation, inverter stops output. After fault cleared, inverter resets fault automatically and restarts operation until operating normally.

External Output at Fault Retry

F07.12 Tens place=0 During the period of fault retry, fault output terminal and fault relay are disabled.

F07.12 Tens place=1 During the period of fault retry, fault output terminal and fault relay are enabled.

Fault Retry Timelag

F07.13 controls the timelag of fault retry. Fault retry timelag refers to the period from no fault output to resetting fault automatically. Parameter value is in the range of 0.01~30.00 and can be set in succession.

No Fault Timelag

F07.14 controls the time for inverter resetting fault retry times. Fault occurs in operation process, after reset and restarted, inverter will record the fault reset times. If no fault occurs in the setting time of this code, the inverter will autoclear the fault reset times. No fault timelag: 0.01~30.00 seconds and can be set in succession.



1. In the process of operation, start features of mechanic devices should be taken into consideration. For the applications which cannot start with load, or the applications requires alarm immediately after inverter does not output, and cannot take fault reset.

2. In auto-reset timelag, inverter blocks PWM output, and motor is in coast-to-stop status.

No.	Function	Range					Unit	Default	Type
		OL	ILP	SLU	SOU	SOC			
F07.15	Fault Retry Options	1	1	1	1	1		11111	○
		0: Fault retry permitted 1: Fault retry prohibited SOC is LSB, arrange in logical order, the 6 th ~the 8 th bits are not used							

Fault retry is bit operation. Set the corresponding bit of fault as 0 or 1.

For instance: SOU and OL fault retry are permitted, other fault retries are prohibited. Set the first corresponding bit of SOU=0 and the 4th corresponding bit of OL=0, other bits=1, i.e. F07.15=11101101

No.	Function	Range				Unit	Default	Type
F07.17	Disabled Trips	5~8 Bits					0000 0000	○
		*	EED	Eht	OL			
		0	0	0	0			
		1~4 Bits						
		*	OLP	ILP	SLU			
		0	0	0	0			
		0: Enabled 1: Disabled SLU is LSB, arrange in logical order, the 8 th bit is not used						

Bit setting value=0 After detecting the fault corresponding to the bit, inverter stops output and then enters fault status.

Bit setting value=1 After detecting the fault corresponding to the bit, inverter remains previous status without protection.

F07.17 is bit operation, only set corresponding bit of protection= 0/1. As shown in the following table, for instance: Only set the 2nd bit corresponding to ILP=1 to disable ILP protection, i.e. F07.17=00000010. Set the 3rd bit corresponding to OLP=1 and the 7th bit corresponding to Eht=1 to disable OLP and Eht, i.e. F07.17=01000100.



1. Never disable any trip protection function unless special requirement, in case of inverter damaged if there is no protection trip after fault occurs.
2. Refer to binary system parameter setting description of F02.06.

F08 Group: Preset Speed and PLC Parameters

No.	Function	Range	Unit	Default	Type														
F08.00	Preset Speed 1	0.00~ Fmax	Hz	0.00	●														
F08.01	Preset Speed 2	0.00~ Fmax	Hz	5.00	●														
F08.02	Preset Speed 3	0.00~ Fmax	Hz	10.00	●														
F08.03	Preset Speed 4	0.00~ Fmax	Hz	15.00	●														
F08.04	Preset Speed 5	0.00~ Fmax	Hz	20.00	●														
F08.05	Preset Speed 6	0.00~ Fmax	Hz	25.00	●														
F08.06	Preset Speed 7	0.00~ Fmax	Hz	30.00	●														
F08.07	Program Operation Mode	<p>Ones place: Options of speed program operation mode</p> <p>0: Monocycle</p> <p>1: Operate as per Section 7 after monocycle</p> <p>2: Limited times of continuous cycle</p> <p>3: Continuous cycle</p> <p>Tens place: Options of stop and restart</p> <p>0: Operate from the period when it stops</p> <p>1: Operate from Section 1</p>		00	○														
F08.08	Program Operation Direction Setting	<table border="1" style="display: inline-table; vertical-align: top;"> <tr> <td>T7</td><td>T6</td><td>T5</td><td>T4</td><td>T3</td><td>T2</td><td>T1</td> </tr> <tr> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> </table> <p>0: Forward 1: Reverse T1 is LSB, arrange in order, the 8th bit is not used.</p>	T7	T6	T5	T4	T3	T2	T1	0	0	0	0	0	0	0		0000000	○
T7	T6	T5	T4	T3	T2	T1													
0	0	0	0	0	0	0													
F08.09	Program Operation Section T1	0~60000	S	30	●														
F08.10	Program Operation Section T2	0~60000	S	30	●														
F08.11	Program Operation Section T3	0~60000	S	30	●														
F08.12	Program Operation Section T4	0~60000	S	30	●														
F08.13	Program Operation Section T5	0~60000	S	30	●														
F08.14	Program Operation Section T6	0~60000	S	30	●														
F08.15	Program Operation Section T7	0~60000	S	30	●														
F08.16	Speed Cycling Times	1~60000		1	●														

Speed Program Operation Mode Options

F08.07 Ones place=0 Inverter stops after 7 program operation sections finished as per the time and direction.

F08.07 Ones place=1 Inverter runs as per the speed of Section 7 after 7 program operation sections finished as per the time and direction.

F08.07 Ones place=2 After 7 program operation sections finished as per the time and direction, inverter returns Section 1 in cycling operation. When the cycling operation times reaches the setting value, inverter will stop. F08.16 defines the cycling times

F08.07 Ones place=3 After 7 program operation sections finished as per the time and direction, inverter returns Section1 in cycling operation, and will cycle continuously unless giving a stop command.

Operation Stopped and Restart Options

F08.07 Hundreds place=0 If external fault terminal is on in the process of program operation, after power loss or fault, then enter operation status to run as per the section at stop(including the section at stop, the remaining running time and setting operation frequency).

F08.07 Hundreds place=1 If external fault terminal is on in the process of program operation, after power loss or fault, then enter operation status, program operation starts from Section 1.

Running Direction Options

F08.08 All Bits=0 Positive input, motor forwards, output positive torque.

F08.08 All Bits=1 Negative input, motor reverses, output negative torque.

Set F00.15 as reverse permitted, reverse disabled in program operation. If the 0th bit of F08.08 set as 1 or function terminal setting is reverse command. Inverter will run at 0Hz in program operation Section 1. Operation of each section will follow the same pattern.

Operation Section

F08.09~F08.15 define the operation time of each section in program operation, range: 0~60000 seconds and can be set in succession.

If program operation section is 0 second, program operation will skip this section.

See Figure 6-23 for program operation diagram.

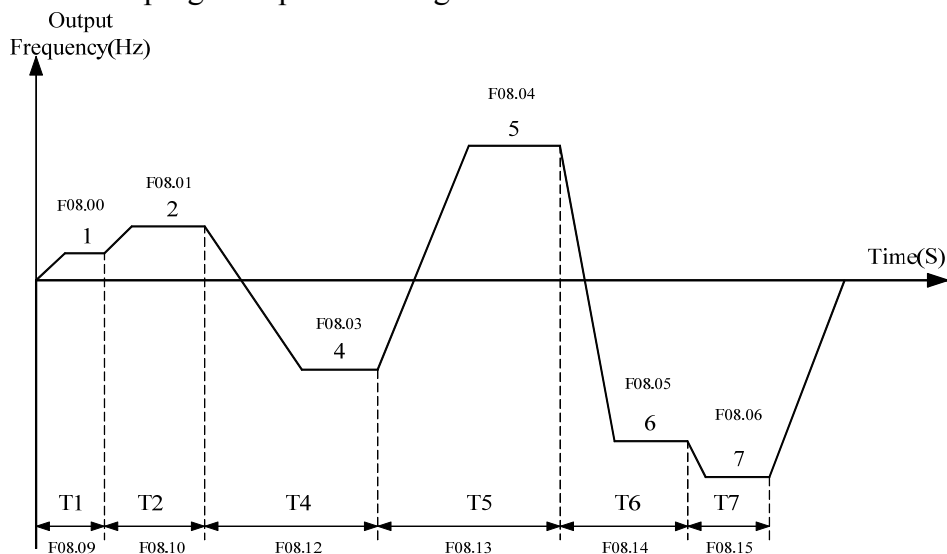


Figure 6-23 Program Operation Diagram

In the above figure, set the operation time of Section 3 as 0, therefore, Section 3 does not operate.

In program operation, operation frequency, operation time, and positive/negative input can be set.

Inverter runs as per the operation frequency of preset speed 1-7 set by F08.00-F08.06.

Start process of EM100 program operation: Select F00.04 auxiliary speed setting mode as program operation, select integrated frequency setting mode as auxiliary speed setting mode or other options including auxiliary speed setting mode.

F09 Group: Process PID Parameters

PID control is a close-loop control mode which feedbacks the output signal of control object in the system to PID controller, and then form close-loop by regulating the output of controller after PID calculation. PID control is to make the output value of control object in the system identical to the setting target value.

Based on the error between system setting target and feedback signal, PID controller computes the control variables with proportion, integration and differentiation. The characteristics of each computing factor are as follows:

Proportion (P):

Proportional control is a simplest control mode. The output and input error signal of its controller is in proportional relation. The stable errors of system output exist in proportional control mode only. The stable error refers to the difference between expected output of system and actual output after system response is stable.

Integration (I):

In integration control mode, the output and input error signal integration of controller is in direct ratio. It can eliminate stable error and keep the system away from stable errors after entering stable status, but sharp changes cannot be tracked.

Differentiation (D):

In differentiation control mode, the output and input error signal differentiation (i.e. the change ratio of error) of controller is in direct ratio. It can forecast the trend of error change with quick response, and improve the dynamic performance of system in the process of regulation.

See Figure 6-25 for logic control diagram of EM100 internal process PID. EM100 and its control object can form an inverse feedback control system through PID close-loop control function.

Start process of EM100 process PID: Select F00.04 auxiliary speed setting mode as process PID, select integrated frequency setting mode as auxiliary speed setting mode or other options including auxiliary speed setting mode.

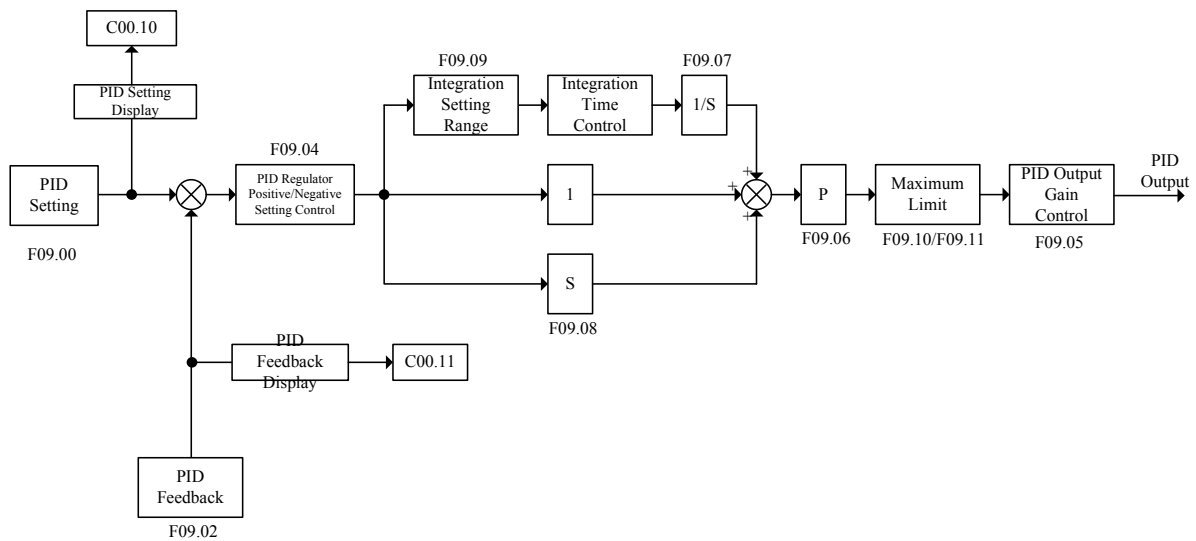


Figure 6-25 Control Logic Diagram of EM100 Internal Process PID

No.	Function	Range	Unit	Default	Type
F09.00	PID Regular Setting Mode	0: Numeric PID Setting 1: VS Terminal 2: IS Terminal		0	○
F09.01	PID Numeric Setting	0.0~100.0	%	50.0	●

F09.00=0

Numeric PID setting. Input PID setting value by editing F09.01 parameters with keypad.

F09.00=1

Take the input voltage percentage of analog input terminal VS as PID setting value.

F09.00=2

Take the voltage percentage converted from input current of analog input terminal IS as PID setting value.

No.	Function	Range	Unit	Default	Type
F09.02	PID Feedback Options	0: VS Terminal 1: IS Terminal		0	○

PID feedback signal is input by analog input terminal. The feedback value can be operated mathematically based on real needs.

F09.02=0 The input voltage percentage of analog input terminal VS is PID feedback value.

F09.02=1 The input current percentage of analog input terminal IS is PID feedback value.

No.	Function	Range	Unit	Default	Type
F09.03	PID Setting Feedback Coefficient	0~60000		1000	●

The percentage of PID setting to feedback * F09.03= Unit of corresponding physical quantity (Temperature, pressure, and flow rate.) will be displayed in C00.10 (PID setting value) and C00.11 (PID feedback value)

No.	Function	Range	Unit	Default	Type
F09.04	PID Regulator Positive/Negative Setting	0: Positive Setting 1: Negative Setting		0	○

F09.04=0 Positive setting: Error and output are positive.

F09.04=1 Negative setting: Error is positive, output is negative.

If PID setting value increases, the output frequency of inverter is required to rise, for instance: if controlling flow rate or pressure, PID regulator should be under positive setting control.

If PID setting value increases, the output frequency of inverter is required to drop, for instance: if controlling temperature, PID regulator should be under negative setting control.

No.	Function	Range	Unit	Default	Type
F09.05	PID Output Gain	0.00~100.00	%	100.00	●

F09.05 Output gain is for adjusting PID output. Unit: %

No.	Function	Range	Unit	Default	Type
F09.06	Proportion Gain GP	0.00~100.00		0.40	●
F09.07	Integral Time GTi	0.00~300.00, 0.00: No Integration	S	10.00	●
F09.08	Differential Time GTd	0.00~300.00, 0.00: No Differentiation	mS	0.00	●

F09.06 Proportion gain GP is the proportion gain of PID close-loop control algorithm.

F09.07 Integration time constant GTi is the integral time constant of PID close-loop control algorithm. When integral time constant is 0, integration function is disabled.

F09.08 Differentiation time GTd is the differentiation time constant of PID close-loop control algorithm. When integral time constant is 0, differentiation function is disabled.

No.	Function	Range	Unit	Default	Type
F09.09	Integration Function Scale	0.00~100.00	%	100.00	●

F09.09 Integration function scale: When error between PID setting value and feedback is bigger than the setting value, there is no integral operation. The setting value is the integration function scale

Setting value of F09.09= |(PID setting value - Feedback)/Setting value|

Set inverter in the process PID close-loop control mode, and adjust the parameters of PID controller based on the output waveforms through the output of feedback signal monitoring system. Generally, adjustment follows the rules:

Increase the proportional gain GP within the range of non-oscillation output.

Reduce integration time constant GT_i within the range of non-oscillation output.
Increase differentiation time constant GT_d within the range of non-oscillation output.

After all PID parameters set, all of them can be slightly edited by following steps:
Suppress output overshoot: Shorten the differentiation time GT_d , and prolong the integration time GT_i , as shown in Figure 6-26.

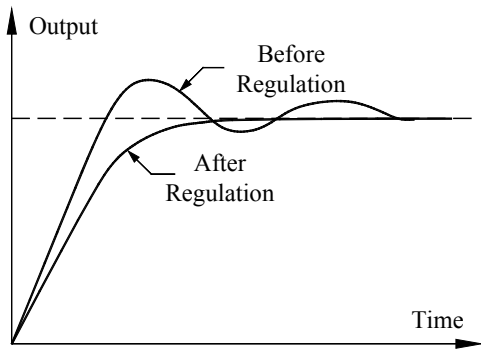


Figure 6-26
Suppress Output Overshoot

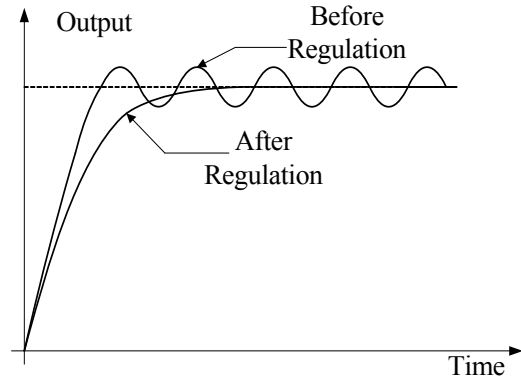


Figure 6-27
Suppress Output Periodic Oscillation

Suppress output periodic oscillation: Shorten the differentiation time GT_d or set it as zero, and reduce proportion gain GP , as shown in Figure 6-27.

No.	Function	Range	Unit	Default	Type
F09.10	PID Positive Output Limit	0.00~100.00	%	100.00	●
F09.11	PID Negative Output Limit	0.00~100.00	%	100.00	●

Set PID output percentage within the range of [-F09.11, F09.10]

No.	Function	Range	Unit	Default	Type
F09.12	PID Feedback Loss Detection Value	0.0~100.0 0.0: No detection on feedback loss	%	0.0	●
F09.13	PID Feedback Loss Detection Time	0.0~3000.0	S	1.0	●

F09.12/F09.13 are for PID feedback loss detection.

If $\text{PID feedback} < \text{PID feedback loss detection value F09.12}$, and $\text{lasting time} > \text{PID feedback loss detection time F09.13}$, inverter trips PIDE (PID feedback loss) and will deal with it based on selected troubleshooting. Do not set $F09.12=0.1/0.2$.

F10 Group: Communication Parameters

EM100 supports Modbus protocol, RTU format, and processes single-master-to-multislave communication network of RS485 bus.

No.	Function	Range	Unit	Default	Type
F10.00	Inverter Address	1~247, 0: Broadcasting Address		1	○

Inverter address code is the address code allocated to each inverter when the inverter is connected to the PC/PLC network. Each address code is unique in this network. The maximum number of inverter is 247 which are permitted to connect to the PC/PLC in one network.

F10.00=0 Address code is broadcasting address. When setting broadcasting address, inverter would not respond signals to PC/PLC.

No.	Function	Range	Unit	Default	Type
F10.01	Communications Bits Rate	0: 4800 1: 9600 2: 19200 3: 38400	bps	1	○

F10.01=0: Communications Bits Rate: 4800bit/s;

F10.01=1: Communications Bits Rate: 9600bit/s;

F10.01=2: Communications Bits Rate: 19200bit/s;

F10.01=3: Communications Bits Rate: 38400bit/s.

No.	Function	Range	Unit	Default	Type
F10.02	Communications Format	0:No parity 1+8+1 1:Even parity 1+8+1+1 2:Odd parity 1+8+1+1		0	○

F10.02=0: No parity

F10.02=1: Even parity

F10.02=2: Odd parity

No.	Function	Range	Unit	Default	Type
F10.03	Communications Overtime	0.0~60.0 0.0: Communications Overtime disabled	S	0.0	○

If set F10.03=0.0, communications overtime disabled. If set F10.03≠0.0, and if the interval between giving order and communication response is over communications overtime, inverter will trips COE (RS485 Communications Overtime Fault). Generally, it will be set as disabled, only set as enabled if F10.04=1(The inverter is the master).

No.	Function	Range	Unit	Default	Type
F10.04	Master-slave Communications Mode	0:The inverter is the master 1:The inverter is the slave		0	○
F10.05	Master Writes the Address of Slave Inverter	0:Primary Numeric Frequency 1:Auxiliary Numeric Frequency		0	○
F10.06	Inverter Receiving Proportion Coefficient	0.00~600.00	%	100.00	●

F10.04 Master-slave communications mode: Select the present inverter as the master or the slave.

F10.05 Master writes the address of slave inverter

Select master inverter to send the frequency setting to the slave, and select to edit primary numeric frequency (F00.07) and auxiliary numeric frequency(F00.08) of the slave. F10.05 is only enabled if F10.04=1 (The inverter is the master).

F10.06 Inverter receiving proportion coefficient

This function defines the numeric frequency (received by the slave from the master)* the proportion coefficient of F10.06, that is the actual frequency setting received by the slave.

No.	Function	Range	Unit	Default	Type
F10.07	The Master Communication Sendign Data	0:Input frequency 1:Output frequency 2:Primary numeric frequency 3:VP 4:VS 5:IS		0	○

If setting F10.04=1, the inverter is the master, select frequency source sending from the master to the slave.

F10.07=0 The master sends input frequency.

F10.07=1 The master sends output frequency.

F10.07=2: The master sends primary numeric frequency.

F10.07=3: The master sends VP input voltage percentage*Fmax

F10.07=4: The master sends VS input voltage percentage*Fmax

F10.07=5: The master sends IS input current percentage*Fmax

F11 Group: User Parameters

No.	Function	Range	Unit	Default	Type
F11.00	Parameter Setting Control	0:Parameter setting allowed 1: Parameter lock 02: Parameter lock 1		0	○
F11.01	User Password	0~65535		XXXXXX	○
F11.02	Parameter Editing Mode	0:Editable through keypad and RS485 1:Editable through keypad 2:Editable through RS485		0	○

Parameter Setting Control

F11.00=0: Parameter setting allowed

F11.00=1: Parameter lock 0(Except F00.07 and F11.00, rest of the parameters cannot be edited.)

Parameter lock 1(Except F11.00, rest of the parameters cannot be edited.)

User Password

F11.01 is for setting a password to start password protection function to prevent parmeters from being edited by non-professionals.

Parameter Editing Mode

F11.02=0: Editabled through keypad and RS485

F11.02=1: Editabled through keypad

F11.02=2: Editabled through RS485.

No.	Function	Range	Unit	Default	Type
F11.03	Inverter Rated Power	0.40~22.00	kW	XXXX	X
F11.04	Inverter Rated Voltage	60~480	V	XXX	X
F11.05	Inverter Rated Current	0.1~100.0	A	XXXX X	X

The parameters are only for reference and cannot be edited, and verify the parameters with the nameplate before operation.

No.	Function	Range	Unit	Default	Type
F11.06	Inverter Running Time	User Monitor	HOUR	XXXX X	X
F11.07	Inverter Running Time	User Monitor	min	XXXX X	X
F11.08	Running Time Control	0: Disabled 1: Enabled		0	○
F11.09	Setting Running Time	0~65535	HOUR	00000	○

F11.06: Hours that inverter has run. The parameters are only for reference and cannot be edited. Running time is the time accumulation of operation status.

F11.07: Minutes within 1 hour that inverter has run. The parameters are only for reference and cannot be edited.

F11.08=0: Running time control disabled.

F11.08=1: Running time control enabled, if the setting operation time is up, inverter trips InP(Internal fault), and cannot run.

F11.09: For controlling the operation time of inverter.
The permitted operation time = F11.09 -F11.06

No.	Function	Range	Unit	Default	Type
F11.10	Distributor Password	0~65535		XXXX X	○
F11.11	Factory Password	0~65535		XXXX X	○

In order to prevent the key parameters from being edited and resulting in faults, the parameters are only for professionals.

No.	Function	Range	Unit	Default	Type
F11.12	Software Version	-		XXXX X	X

The parameters are only for reference and cannot be edited.

C00 Group: Monitor Parameters

When EM100 is running, operation parameters can be acquired by checking monitor parameters in Group C00. Details of all monitor parameters are read only.

No.	Function	Range	Unit
C00.00	Output Frequency	Present output frequency of inverter	Hz
C00.01	Actual Output Voltage	Present actual output voltage of inverter	V
C00.02	Actual Output Current	Present actual output current of inverter	A
C00.03	Output Power	Inverter calculates present output power based on output voltage and output current	kW
C00.04	Motor Estimated Speed	Estimated motor speed	rpm
C00.05	DC Bus Voltage	Present DC bus voltage of inverter.	V
C00.06	Input Frequency	Present setting frequency value of inverter	Hz
C00.07	Synchronous Frequency	Inverter estimated motor synchronous frequency	Hz
C00.08	Program Operation Section	Section of monitoring inverter program operation	
C00.09	Program Operation Time	Operation time in present operation section when monitoring inverter program operation	S
C00.10	PID Setting	Present PID setting value	
C00.11	PID Feedback	Present PID feedback value	
C00.12	Input Terminal Status	* X6 X5 X4 X3 X2 X1	
		0 0 0 0 0 0 0	
		(Monitor external input terminal logic status)	
C00.13	Output Terminal Status	* * * * * * R1 Y1	
		0 0 0 0 0 0 0 0	
		(Monitor output terminal logic status)	
C00.14	VS Input Monitor	0.00~10.00	V
C00.15	IS Input Monitor	0.00~20mA	mA
C00.16	Inverter Heatsink Temperature	Present detected temperature of inverter heatsink	°C
C00.17	Vp Input Monitor	0.00~15.00	V

7. Troubleshooting

7.1 Fault and Corrective Action

When anything unexpected happened, the corresponding trip code and parameters will be displayed on the keypad. Fault relay is enabled, and fault output terminal is on, and inverter output stops. When fault occurs, if the motor is running, and it will coast to stop until stopped. See Table 7-1 for EM100 fault trips and troubleshootings.

Table 7-1 EM100 Fault Trips and Troubleshootings

Trip Code	Trip	Cause	Corrective Action
SC	Short Circuit	<ol style="list-style-type: none"> Short circuit between inverter output phases, or between the output phases and ground. IGBT is damaged. 	<ol style="list-style-type: none"> Check, take corrective actions, and then reset. Technical support required.
SOC	Stable Overcurrent	<ol style="list-style-type: none"> Short circuit between inverter output phases or between the output phases and ground. When load is too heavy, the acceleration/deceleration time is too short. In V/F control mode, the setting value of torque boost is too big. The motor is rotating when inverter starts. The capacity of motor exceeds that of inverter. 	<ol style="list-style-type: none"> Check, take corrective actions, and then reset. Prolong acceleration/deceleration time Reduce setting value of torque boost. Setting speed search enabled or start DC brake. Replace with applicable motor or inverter.
SOU	Stable Overvoltage	<ol style="list-style-type: none"> Voltage of power grid is too high. 	<ol style="list-style-type: none"> Lower voltage to the rated voltage.
SLU	Stable Undervoltage	<ol style="list-style-type: none"> Input power phase loss. Wire terminal of input power is loose. Voltage fluctuation of input power is too big. Switch contact of input power is aging. 	<ol style="list-style-type: none"> Check input power supply. Tighten screws on input terminals. Check air switch and contactor.
ILP	Input Phase Loss	<ol style="list-style-type: none"> Input power phase loss. 	<ol style="list-style-type: none"> Check input power supply. Check wiring of input power supply.

			3. Check if wiring terminal is loose.
OL	Inverter Overload	<ol style="list-style-type: none"> 1. Acceleration/ deceleration time is too short. 2. In V/F control mode, the setting value of torque boost is too big. 3. Load is too heavy. 	<ol style="list-style-type: none"> 1. Prolong acceleration/ deceleration time. 2. Reduce setting value of torque boost. <p>Replace with the inverter which is applicable to the load.</p>
OL1	Motor Overload	<ol style="list-style-type: none"> 1. If motor protection parameter(F07.11) setting is proper 2. If load is too heavy or motor stall occurs 3. Inverter is not applicable. 	<ol style="list-style-type: none"> 1. Set the parameter correctly. 2. Reduce load and check mechanical conditions of motor. 3. Select inverter in high power rating.
OH	Heatsink Overheating	<ol style="list-style-type: none"> 1. Ambient temperature is too high. 2. Poor ventilation. 3. Cooling fans are broken down. 	<ol style="list-style-type: none"> 1. The service environment of inverter should meet requirement. 2. Improve environmental ventilation, and check if the vent of inverter is blocked. <p>Replace air cooling fan.</p>
OLP	Input Phase Loss	<ol style="list-style-type: none"> 1. Input phase U, V, or W loss 	<ol style="list-style-type: none"> 1. Check the connection between the inverter and the motor 2. Check if motor wiring is broken 3. Check if the output terminal is loose.
Ext	External Fault	<ol style="list-style-type: none"> 1. External device fault terminal acts. 	<ol style="list-style-type: none"> 1. Check external device.
EEF	Inverter EEPROM Failure	<ol style="list-style-type: none"> 1. Interference makes EEPROM read-write mistakes. 	<ol style="list-style-type: none"> 1. Press STOP/RESET button to reset, and then retry.

		2. EEPROM is damaged.	2. Technical support required.
StP	Autotuning Cancelled	1. During autotuning, press STOP/RESET key.	1. Press STOP/RESET button to reset.
StE	Stator Resistance Error	1. Motor is not connected to the output terminals of inverter.	1. Check connection between inverter and motor.
StE	Idling Current Error	2. Motor is on load. 3. Motor fails.	2. Motor is offloaded. 3. Check motor.
Pi dE	PID Feedback Loss	1. PID feedback < Setting value of F09.12	1. Check PID feedback signal or set a proper value for F09.12.
COE	Communication Overtime Fault	1. Improper bits rate setting. 2. Communication cable failure.	Check if the setting of communication overtime is proper, and verify the applying program communication setting.
INP	Internal Fault	1. Scheduled stop function enabled when the setting time is up.	Contact distributors or SINEE.
SOFT	Inverter Soft-Starter Realy Loss	1. Grid voltage is too low. 2. Rectifier of inverter is damaged.	1. Check Grid Voltage 2. Contact distributors or SINEE.

When inverter trips any above fault, and if it is required to exit from fault status, press STOP/RESET key to reset and clear the fault. If the fault is cleared, inverter will return function setting status. But if the fault is not clear, LED keypad will display present fault information.

7.2 Common Fault and Troubleshooting

After power is on, due to improper function setting and incorrect wiring between inverter and external control terminals, motor cannot meet the expected working requirement. Fault analysis as described in this chapter can be taken as the reference to take as the corrective actions. If trip codes appear, see 9.1 for the corrective actions to clear the trips.

7.2.1 Parameter Setting Failures

- Press \wedge or \vee , the parameters remain unchanged.

Some parameters can only be edited when the inverter stopped.

- Press \wedge or \vee , the parameters change, but they cannot be saved.

Some parameters cannot be edited since they are locked.

7.2.2 Abnormal Motor Operation

- Press RUN key, the motor does not run.
 - Start/Stop is terminal controlled: Check the setting of F00.02.
 - Coast-to-stop terminals FRS and COM are off: Disconnect FRS to COM.

- When the terminal (Run Command Switched to Terminal) is on, the run command is only controlled by terminal at mean time: Make the terminal off.
- Status combination of run command channel is terminal controlled: Change it to keypad control.
- Setting reference input frequency= 0: Increase reference input frequency.
- Power supply is abnormal or control circuit fails.
- **Control terminals RUN, F/R=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: Make FRS=OFF.
- Control switch is disabled: Check control switch.
- Setting reference input frequency=0: Increase reference input frequency.
- In 3-wire sequence control mode, 3-wire sequence run/stop control terminal is off, make it on.

- **Motor can run in one direction only.**

Reverse prohibited: When F00.15=1, inverter is prohibited to reverse.

- **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, or editing F00.14 when power is on.

7.2.3 Excessively Long Acceleration Time

- **Excessively low current limit control scaling**

When setting overcurrent limit is enabled, if the output current of inverter reaches its setting current limit control scaling (F07.01), then the output frequency will remain unchanged in the process of acceleration, and it will rise continuously only until it is lower than the setting current limit control scaling. Therefore, the acceleration time of motor is longer than the setting time. Check if the setting current limit control scaling of inverter is excessively low.

- **If the setting acceleration time is too long, confirm its parameters.**

7.2.4 Excessively Long Deceleration Time

- **When dynamic brake enabled**

- The brake resistance is too big. The dynamic brake power is too small, so the deceleration time is prolonged.
- The setting value (F06.12) of brake duty ratio is too small, and the deceleration time is prolonged. Increase the setting value of brake duty ratio.
- The setting deceleration time is too long, confirm its parameters.

- **When overvoltage stall protection enabled**

- Overvoltage stall protection acts, when DC bus voltage exceeds overvoltage stall point (F07.06), the output frequency remains unchanged. When it is below overvoltage stall point (F07.06), the output frequency drops continuously, therefore the deceleration time is prolonged.
- The setting deceleration time is too long, check its parameters.

7.2.5 Inverter Overheating

- **Excessively heavy load**

- Heavy load makes inverter work beyond its rated current for a long time. The power of inverter shall be applicable to that of motor.
- The motor rotor is blocked due to the failure of motor or load.

- **Excessively high ambient temperature**

When the ambient temperature of inverter exceeds the permitted value, the temperature might exceed the permitted highest value of inverter when it works in the rated status.

7.2.6 EMI and 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 (F00.17) of inverter.
- Install noise filter on input and output side of inverter.
- Shield cable with a metal tube, and place the inverter in a metal case.
- Inverter and motor shall be grounded reliably. The main circuit and the control circuit should be separated in terms of wiring. Control circuit should take shielded wire, and see Chapter 3 for wiring.

7.2.7 Leakage Circuit Breaker Actions

● **When inverter runs, the leakage circuit breaker acts.**

Since inverter outputs high frequency PWM signal, it will generate high frequency leakage current. Select a special leakage circuit breaker with a trigger current $\geq 30\text{mA}$, or a regular leakage circuit breaker with a trigger current $\geq 200\text{mA}$ and the action time $\geq 0.1\text{S}$.

7.2.8 Mechanical Vibration

● **The fixed frequency of mechanical system resonates with the carrier frequency of inverter.**

The machine resonates sharp noise due to the resonance between the fixed frequency of mechanical system and the carrier frequency of inverter. Adjust the carrier frequency F00.17 to avoid resonant frequency.

● **The fixed frequency of mechanical system resonates with the output frequency of inverter.**

- The fixed frequency of mechanic system resonates with the output frequency of inverter which will generate mechanical noise.
- Adjust F05.13 oscillation suppression parameters to clear mechanical vibration.
- Install the shake-proof rubber on the chassis of motor or any other shake-proof measures.

●PID Control Oscillation

Improper setting of adjusting parameters P, Ti and Td of PID controller, reset PID parameters.

7.2.9 Inverter Stops Output While Motor Keeps Running

● **Insufficient DC brake at stop**

- DC brake torque at stop is too small, increase setting value of DC brake current at stop (F04.07).
- DC brake time is too short at stop, increase setting value of DC brake time (F04.09).

7.3.10 Output Frequency Does Not Output as per the Setting Frequency

● **Setting frequency exceeds the upper limit frequency**

When the setting frequency exceeds the setting value of upper limit frequency, output frequency outputs as per the upper limit frequency. Reset the setting frequency to make it within the range of upper limit frequency, or check whether F00.11 and F00.12 are proper.

8. EMC(Electromagnetic Compatibility)

8.1 Definition

Electromagnetic compatibility is the ability of the electric equipment to run in the electromagnetic interference environment and implement its function stably without interferences on the electromagnetic environment.

8.2 EMC Standard Description

In accordance with the requirements of the national standard GB/T12668.3, the inverter needs to comply with electromagnetic interference and anti- electromagnetic interference requirements. EM100 applies the latest international standard — IEC/EN61800-3: 2004 (Adjustable speed electrical power drive systems part 3: EMC requirements and specific test methods), which is equivalent to the national standard GB/T12668.3.

IEC/EN61800-3 assesses the inverter in terms of electromagnetic interference and antielectronic interference. Electromagnetic interference mainly tests the radiation interference, conduction interference and harmonics interference on the inverter (required for the inverter for civil use). Anti-electromagnetic interference mainly tests the conduction interference rejection, radiation interference rejection, surge interference rejection, fast and mutable pulse group interference rejection, ESD interference rejection and power low frequency end interference rejection.

The tests shall be conducted strictly in accordance with the above requirements of IEC/EN61800-3, and EM100 shall be installed and used in accordance with the instruction in 8.3 and has good electromagnetic compatibility in general industry environment.

8.3 EMC Guide

8.3.1 Harmonic Effect

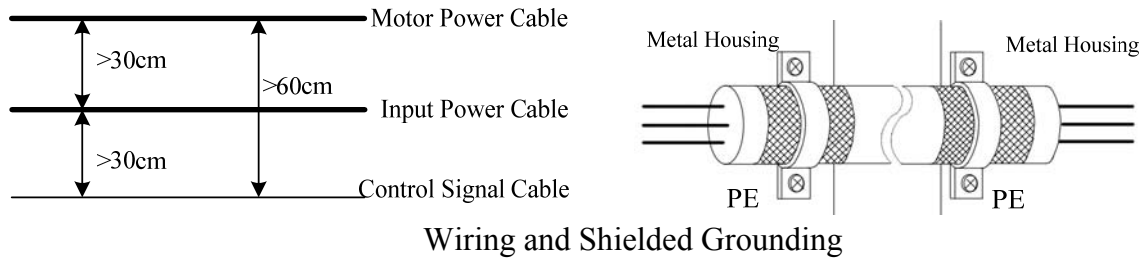
Higher harmonics of power supply may damage the inverter. Thus, at some places where mains quality is rather poor, it is recommended to install AC input reactor or current harmonic filter.

Due to impact of harmonics, see 3.6 wiring of main circuit on input side for selecting input leakage breaker.

8.3.2 Electromagnetic Interference and Installation Precautions

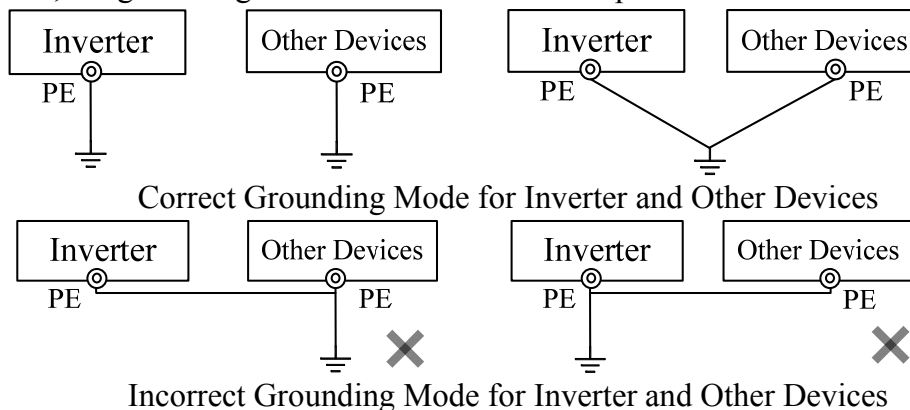
1. The earth wires of the inverter and other electric products shall be well grounded.
2. The power input and output power cables of the inverter and weak current signal cables (e.g. control signal cable) shall not be arranged in parallel and vertical arrangement is preferable.
3. It is recommended that the output power cables of the inverter employ shield cables or steel pipe shielded cables and that the shielding layer be grounded reliably. The signal cables are recommended to employ twisted-pair shielded control cables, and the shielding layer shall be grounded reliably.

4. When the length of motor cable is longer than 100 meters, it needs to install output filter or reactor.



8.3.3 Grounding

1. Inverter and other devices shall be grounded. If a common grounding point required, single point grounding is suggested. Common grounding cable is not recommended.
2. A grounding cable with large cross-section shall be taken for ensuring low grounding impedance. For the cables with the same cross-sectional area, high frequency impedance of flat conductor is smaller than that of a round conductor. Therefore it is better to take flat cable. The grounding cable should be as short as possible, and the grounding point should be as close as possible to the inverter.
3. If motor power cable is the 4-wire cable, the grounding wire of 4-wire cable must be grounded in the inverter side, and the other side is connected to the grounding terminal of the motor. The best grounding effect could be obtained if the motor and inverter have their separated grounding points.
4. If the grounding terminals of all parts are connected together in the control system, the noise source formed by the ground leakage current would affect the other peripherals in the control system except inverter. Therefore, in the same control system, the grounding of the inverter and electrical devices such as computers, sensors or audio shall be separated.
5. In order to obtain lower HF impedance, take the fixing bolts as the HF terminal connected to the cabinet back panel. Remove the insulating paint on fixed point at installation.
6. Laying grounding cables should be kept away from the wiring of noise-sensitive device I/O part, while, the grounding cable should be as short as possible.



8.3.4 Handling the EMI of the peripherals on the inverter:

The electromagnetic interference on the inverter is generated because of relays, contactors and electromagnetic brakes installed near the inverter. When the inverter has malfunction due to EMI, the following measures can be taken:

1. Install surge absorber on the devices generating interference.

2. Install EMC filter on the input power cable of inverter, refer to 8.3.7 for specific operations.
3. The control signal cable of the inverter and the detection line employ shielded cable or twisted-pair cable, and the shielding layer shall be earthed reliably.

8.3.5 Handling the EMI of the Inverter on the Peripherals:

These interferences include two types: one is radiation interference of the inverter, and the other is conduction interference of the inverter. Refer to the following methods for handling different interferences:

1. For the measuring meters, receivers and sensors, their signals are generally weak. If they are placed nearby the inverter or together with the inverter in the same control cabinet, they are easy to suffer interference and thus generate error actions. It is recommended to handle with the following methods: Put in places far away from the interference source; do not arrange the signal cables with the power cables in parallel and never bind them together; both the signal cables and power cables employ shielded cables and are well earthed; install ferrite magnetic ring (with suppressing frequency of 30 to 1,000MHz) at the output side of the inverter and wind it 2 to 3 cycles; install EMC output filter in more severe conditions.
2. When the devices iterfered and the inverter shall the same power supply, it may cause conduction interference, install EMC filter between the inverter and the power supply. Refer to 8.3.7 for specific operations).
3. The peripheral is separately grounded, which can lower common-mode interference caused by common-ground impedance.

8.3.6 Leakage Current and Handling

Distributed capacitance exists in power cable and the earth. The longer the power cable is, the bigger distributed capacitance to the earth is, and the bigger the leakage current is. The higher the carrier frequency is, and the bigger the leakage current is. Reduce leakage current by shortening power cable and lowering carrier frequency.

8.3.7 Precautions for Installing EMC Filter at the Input of Power Supply

1. Since the filter belongs to Classification I electric appliances, the metal housing of the filter shall be well connected to the metal ground of the installing cabinet. It is required to have good conduction continuity. Otherwise, there may be danger of electric shock and the EMC effect may be greatly affected.
2. Through the EMC test, it is found that the filter ground must be connected with the PE end of the inverter at the same common earth. Otherwise the EMC effect may be greatly affected.
3. The filter shall be installed at a place as close as possible to the input of the power supply.
4. If the input and output lines of the filter is too close, the HF interference will by-pass the filter, and couple the input and output lines of the filter directly. The power supply filter will be functionless.
5. Typically there is a special grounding terminal on the filter housing. However, if the filter is connected to the control cabinet housing with a wire, it cannot prevent HF interference. It is because the long cable has big high frequency impedance, the filter would not play a role as a bypassing device. The correct installation method is to connect a large area of the filter housing to the conductive plane of the metal housing, clear the insulating paint to ensure a reliable connection.

9. Maintenance and Inspection

9.1 Maintenance and Inspection

Due to the service environmental changes such as temperature, humidity, smoke, frost, dust, or the factors as aging of inverter' s internal components, various failures of inverter may occur. Therefore, it is required to have daily check and keep regular maintenance on inverter during use and storage.

- Check if the components are broken or the screws are loose during transportation.
- Clean the inverter and periodically check if the screws are loose.
- Power-on the sleeping inverters for 30 minutes once semiannually to prevent electronic components from being disabled.
- Keep inverter away from heavy humidity and metal particles. If necessary, put it in an electric cabinet or a small room with protective measures.

Check the following items with the inverter in operation:

- The motor should not be vibrating or making unusual sound.
- Inverter and motor should not be overheating.
- The ambient temperature should not be too high.
- The output current value shown on the monitor displays should not be higher than normal value.
- The cooling fan at the bottom of the inverter should be in normal operation.

Periodic maintenance ensures that the inverter receives the proper care to maintain overall performance. Always turn the power supply off before inspection, and the inspection starts only after LED indicator is off.

Table 9-1 Periodic Maintenances

Items	Checks	Corrective Action
Main circuit terminals, screws on control circuit terminals	Are all screws tight?	Tighten loose screws firmly.
Heatsink	Are there dirty or dusty?	Clean any dirt and dust off with an air gun using dry air at a pressure of 4~6kg/cm ²
PCBA		
Cooling fan	Is there any unusual noise or vibration or has the total operating time exceeded 20,000 hours?	Replace the cooling fan.
Power Components	Is there dusty?	Clean any dirt and dust off with an air gun using dry air at a pressure of 4~6kg/cm ²
Electrolytic Capacitor	Are there any irregularities such as discoloration or odor?	Replace the capacitor.

In order to keep the inverter operating normally over a long period of time, periodic maintenance and replacement are required for the internal parts according to their service lives. Periodic maintenance standards vary from the inverter's service environment and applications. See Table 10-2 for the part replacement guidelines.

Table 9-2 Part Replacement Guidelines

Parts	Standard Replacement Period
Cooling Fan	2~3 Years
Electrolytic Capacitor	4~5 Years
PCBA	5~8 Years

The standard replacement period is based on the following application conditions:

- Ambient temperature: Yearly average of 30°C
- Load factor: 80% maximum
- Operation rate: 12 hours maximum per day

9.2 Outline of Warranty

SINEE will provide warranty service under following circumstances:

1. Warranty is only for inverter.
2. Authorized distributors of SINEE will take responsibilities for local services within 12 months warranty period.
3. There is a maintenance charge for any following damage occurred in 12 months.
 - Due to improper operation.
 - Due to unauthorized installation environment.
 - Due to floods, fires, or abnormal voltage fluctuations.
 - Due to the incorrect wiring.
 - Due to unauthorized modifying or altering.

Appendix A: EM100 MODBUS Communicational Protocol

1. Application Scope

- Applicable series: EM100
- Applicable network: Support ModBus protocol, RTU format, with single-master/multi-slave communication network of RS485 bus.

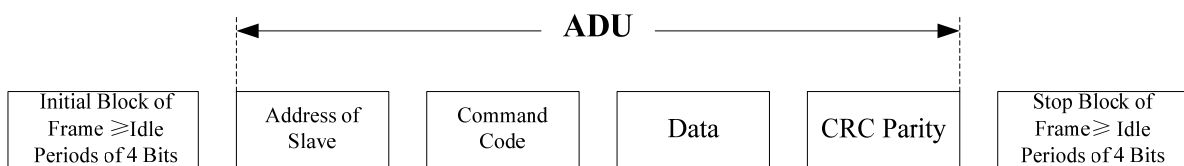
The typical RTU message frame format:

Start Bit	Device Address	Function Code	Data	CRC	Stop Bit
T1-T2-T3-T4	8Bit	8Bit	n*8Bit	16Bit	T1-T2-T3-T4

2. Physical Interface

1. RS485 asynchronous half-duplex communication mode, LSB has sending priority
2. Default data format of RS485 terminal: 1-8-N-1, bits rate:9600bps.
3. Data format 1-8-N-1, 1-8-O-1, 1-8-E-1, optional bits rates: 4800bps, 9600bps, 19200bps, and 38400bps
4. Shielded twisted-pair cable is recommended commnunicational cable to lower external interferencece.

3. Protocol Fromat



Appendix Figure 1 Communication Format

The parity in ADU (Application Data Unit) is obtained via the CRC16 parity of the 1st three parts of ADU and switching the low bytes and high bytes. Low bytes of CRC partiry go first, and high bytes of it follow in the communication protocol.

4. Explanation of Command

Command code 0x03: Read parameter and status of inverter.

ADU Item	Byte No.	Range
Master requests:		
Address of slave	1	0 ~ 127
Command Code	1	0x03
Register start address	2	0x0000 ~ 0xFFFF
Register number	2	0x0000 ~ 0x0008
CRC parity(Low bytes go first)	2	
Slave responds		
Address of slave	1	Local IP address
Command code	1	0x03

Byte number reading	1	2* Register number
Data details	2* Register number	
CRC parity	2	

Remarks: Consecutive read maximum 8 function codes

Command code 0x06: Write single function code or control parameter of inverter

ADU Item	Byte No.	Range
Master requests:		
Address of slave	1	0~127
Command Code	1	0x06
Register address	2	0x0000~0xFFFF
Register data	2	0x0000~0xFFFF
CRC parity	2	
Slave responds:		
Address of slave	1	Local IP address
Command code	1	0x06
Register address	2	0x0000~0xFFFF
Register data	2	0x0000~0xFFFF
CRC parity	2	

Command code 0x10: Write several function codes or control parameters of inverter

ADU Item	Byte No.	Range
Master requests:		
Address of slave	1	0~127
Command code	1	0x10
Register start address	2	0x0000~0xFFFF
Register number	2	0x0000~0x0008
Byte number of register detail	1	2*Register number
Register detail	2* Register number	
CRC parity	2	
Slave responds:		
Address of slave	1	Local IP address
Command code	1	0x10
Register start address	2	0x0000~0xFFFF
Register number	2	0x0000~0x0008
CRC parity	2	

Remarks: Consecutive write maximum 8 function codes

Command code 0x08: Circuit Diagnosis and Setting

ADU Item	Byte No.	Range
Master requests:		
Address of slave	1	0~127
Command code	1	0x08
Sub-function code	2	0x0000~0xFFFF
Data	2	
CRC parity	2	
Slave responds:		
Address of slave	1	Local IP address
Command code	1	0x08
Sub-function code	2	0x0000~0xFFFF
Data	2	
CRC parity	2	

Remarks: Command code 0x08 is only for circuit check.

5. Description of Protocol Format

5.1 Address Code

Address of slave inverter. The setting range: 1~247, 0 is broadcast address.

5.2 Command Code

Command Code	Function
03H	Read parameters and status byte of inverter
06H	Write single function code or control parameter of inverter
10H	Write several function codes or control parameters of inverter
08H	Circuit diagnosis and setting

5.3 Allocation of Register Addresses

Name	Address	Description
Function Code	0000H~1F1FH (Saving Address)	High byte is the function code group number. F00~F11, C0, E0, P0, and P1 corresponding to high bytes: 00H~0BH, 10H, 11H, 12H, and 13H respectively. Low byte is serial number of function code group. 0~31 corresponding to low bytes 00H~1FH. For example: the corresponding saving address of F0-07 is 0007H.
	2000H~3F1FH (Temporary Saving Address)	Frequent modification of EEPROM will reduce its lifespan. If only editing the value of function code without temporary saving, and then only edit the value of RAM. Complete the operation by the address of function code+2000H. For example, the temporary saving address of F0-07 is 2007H.
Control Command	4000H	Refers to Appendix 1
Working Status	4100H	Refers to Appendix 1

5.4 CRC Parity

Sending equipment calculates CRC parity value first, and then attaches it to the sending message. Upon receipt of the message, receiving equipment will calculate CRC parity value again, and compare the operation result with received CRC parity value. If the two values are different, it indicates that there is error during transmission.

Calculation process of CRC parity:

1. Define a CRC parity register, and initialize it as FFFFH.
2. Conduct XOR calculation between the 1st byte of sending message and the value of CRC parity register, and then upload the result to CRC parity register. Start from address code, the start bit and stop bit will not be calculated.
3. Collect and check LSB (the least significant bit of CRC parity register).
4. If LSB is 1, shift each bit of CRC parity register rightwards by 1 bit, the highest bit filled with 0. Conduct XOR calculation between the value of CRC register and A001H, and then upload the result to CRC parity register.
5. If LSB is 0, shift each bit of CRC parity register rightwards by 1 bit, the highest bit filled with 0.
6. Repeat steps 3, 4 and 5 until completing 8 rounds of shifting.
7. Repeat steps 2, 3, 4, 5 and 6, and process the next bit of sending message. Repeat above process continuously until each bit of sending message is processed.
8. The detail of CRC parity register is CRC parity value after calculation.
9. LUT(Look-up table) method is to obtain CRC parity in the system with limited time resources.

Simple CRC functions shown as following (C language 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);
}
```


5.5 Error Message Response

Inverter will send an error message report when the master sends error data or inverter receives the error data due to the external interference.

When communication error occurs, slave combines the highest bit 1 of command code and error code as the response to the master.

Responding data frame format when errors happened in communication:

ADU Item	Byte No.	Range
Error response:		
Address of slave	1	0~127
Error command code	1	The highest bit 1 of command code
Error code	1	0x01~0x13
CRC parity(Low bytes go first)	2	

Responding command code at normal communication and error communication

Responding Command Code at Normal Communication	Responding Command Code at Error Communication
03H	83H
06H	86H
10H	90H
08H	88H

Description of Error Code

Error Code	Description	Error Code	Description
01H	Exceptional command code	06H	Slave is busy
02H	Exceptional data address	10H	Frame error: Frame length error, parity error
03H	Exceptional data	11H	Parameter read only
04H	Slave operation failure	12H	Parameter is uneditable in operation.
05H	Command enabled, in the process	13H	Parameter is protected by password

For instance: Master sends data frame in hexadecimal format for F00.00 to write 50.00HZ frequency.

01H	06H	00H	00H	13H	88H	84H	9CH
-----	-----	-----	-----	-----	-----	-----	-----

Because F00.00 is read only, inverter responds error message. Inverter responds data frame in hexadecimal format

01H	86H	11H	82H	6CH
-----	-----	-----	-----	-----

Command code is 86H in error message, the highest bit 1 of 06H. If error code detail is 11H, it means the parameter is read only.

After responding to the error data receipt, master can revise the responding program via resending data frame or based on the error message responded by the inverter.

5.6 Details of 0x08 circuit diagnosis and setting

Sub-function Code	Data Requested	Response Data	Indication of Sub-function
0000H	#data16	The same as the data requested	Circuit Diagnosis

6. Example

6.1 Read the setting value of primary numeric frequency F0-07 of inverter No.1, return 5000(50Hz).

Transmit Sequence	0	1	2	3	4	5	6	7	8	9
Transmit Details		01H	03H	20H	07H	00H	01H	3EH	0BH	

Receive Sequence	0	1	2	3	4	5	6	7	8
Receive Details		01H	03H	02H	13H	88H	B5H	12H	

6.2 Write F0-07=30.00Hz

(The setting value of primary numeric frequency of inverter No.1)

Transmit Sequence	0	1	2	3	4	5	6	7	8	9
Transmit Details		01H	06H	00H	07H	0BH	B8H	3FH	49H	

Receive Sequence	0	1	2	3	4	5	6	7	8	9
Receive Details		01H	06H	00H	07H	0BH	B8H	3FH	49H	

6.3 Start inverter operation, and write control command for 4000H address.

Transmit Sequence	0	1	2	3	4	5	6	7	8	9
Transmit Details		01H	06H	40H	00H	00H	01H	5DH	CAH	

Receive Sequence	0	1	2	3	4	5	6	7	8	9
Receive Details		01H	06H	40H	00H	00H	01H	5DH	CAH	

6.4 Inverter stops

Transmit Sequence	0	1	2	3	4	5	6	7	8	9
Transmit Details		01H	06H	40H	00H	00H	05H	5CH	09H	

Receive Sequence	0	1	2	3	4	5	6	7	8	9
Receive Details		01H	06H	40H	00H	00H	05H	5CH	09H	

Appendix Table 1

Control Command 1 (4000H)

Detail	Implication	Detail	Implication
0000H	Inactive Command	0006H	Ram to Stop
0001H	Forward Running	0007H	Coast to Stop
0002H	Reverse Running	0008H	Fault Reset
0003H	JOG Forward	0009H	+/- Input Switch
0004H	JOG Reverse	000AH	Not Used
0005H	Slave-inverter Stops	000BH	Not Used

Inverter Status 1(4100H):

Detail	Implication	Detail	Implication
0000H	Parameter Setting	0004H	Slave-inverter Stops
0001H	Slave-inverter Runs	0005H	JOG Stop
0002H	JOG Running	0006H	Fault Status
0003H	Autotuning	0007H	Factory Check

Appendix B: Accesories

Selecting Braking Resistor

When inverter is in the process of operation, if motor speed decreases too fast or motor load vibrates too fast, the electric potential energy of motor will charge the internal capacitor of inverter through inverter, so that inverter would be damaged due to the voltage increase of IGBT. The inverter will control such situation internally based on real load condition. An external resistor is needed for energy release when brake performance could not meet the working requirements. External braking resistor is in dynamic braking mode, and the function is to consume the energy. Therefore, its power rating and resistance shall be selected appropriately. See following table for selecting the power rating and resistance of resistor recommended for EM100.

Inverter Model No.	Motor Power (kW)	Resistor Resistance(Ω)	Resistor power (W)	Cable Size (mm^2)
EM100-0R4-1AB	0.4	$\cong 360$	$\cong 100$	1
EM100-0R7-1AB	0.75	$\cong 180$	$\cong 200$	1.5
EM100-1R5-1AB	1.5	$\cong 180$	$\cong 200$	1.5
EM100-2R2-1AB	2.2	$\cong 90$	$\cong 400$	2.5
EM100-0R7-3AB	0.75	$\cong 360$	$\cong 200$	1
EM100-1R5-3AB	1.5	$\cong 180$	$\cong 400$	1.5
EM100-2R2-3AB	2.2	$\cong 180$	$\cong 400$	1.5

Remarks:

Cables listed in above table refer to the lead cable of single resistor. The DC bus should be uprated if the resistors are in parallel connection. Cable should withstand voltage above AC300V when connecting to 1-phase inverter, or above \geq AC450V when connecting to 3-phase inverter, and temperature resistance: 105°C.