Preface

Thank you for purchasing EM303A series inverter.

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EM303A is a general purpose inverter (Speed Sensorless Vector Control). It helps an induction motor to achieve not only the speed regulation standard of a DC motor, but also the control ability of a torque motor, and the motion control system is optimized with quick response, precise control and system stability.

The updates of EM303A:

1. Support Modbus RTU standard communication protocol.
2. Support RS485 master-slave communication control mode, numeric synchronized control achieved.
3. Numeric input terminals support F/R logic control, delay input control, and etc.
4. Numeric output terminals support PWL/pulse output, F/R logic output and delay output, and etc.
5. Analog input signals VS/IS/VF/IF can be programmed as numeric inputs, numeric terminals expansion control achieved.
6. With filtering, analog input signals VP/VS/IS/VF/IF can actively avoid analog signals interference and drift.
7. User can easily define the display of function code menus.
8. Run, stop and parameters setting status can program the displayed parameters independently.

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 are available at www.sinee.cn.

Safety Information

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.

This is the safety alert symbol. It is used to alert you to potential personal injury. Obey all safety messages that follow this symbol to avoid possible injury or death.

Safety Precautions

Read and understand these instructions before performing any procedure with this inverter.

- **Verifying Product upon Delivery**

 Caution
1. Never install an inverter that is damaged or missing components. Failure to comply can result in injury.

- **Installation**

 Caution
1. Always hold the case when carrying the inverter. If the inverter is only held by the front cover, the main body of the inverter may fall, possibly resulting in injury. **2. Installlation base shall be a metal plate or other non-flammable materials.** Installing the inverter on inflammable material may cause fire. **3. Install a cooling fan when installing more than one inverter in the same cabinet, the temperature of the air entering the inverter shall be lower than 40℃.** Overheating may result in fire or other accidents.

● **Wiring**

Danger

1. **Always turn off the input power supply before wiring.**
   Otherwise, an electric shock or fire may occur.
2. **Wiring must be performed by authorized and qualified personnel.**
   Otherwise, an electric shock or fire may occur.
3. **Be sure the ground terminals earthed.**
   Otherwise, an electric shock or fire may occur.
4. **Always verify the function of emergency stop terminal in work after connecting.**
   Otherwise, it may result in injury. (User takes 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.**
   Otherwise, an electric shock or short circuit may occur.

Caution

1. **Always confirm if the voltage of AC input power supply satisfies the rated voltage of inverter.**
   Otherwise, it may result in injury and 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.**
   Otherwise, a fire may occur.
4. **Tighten terminals with screw drivers of specified torque.**
   Otherwise, a fire may occur.
5. **Never connect input power supply cable to output terminals U, V, and W.**
   The 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 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 inverter will be damaged.
8. **Never take off the interior wires of inverter.**
   Otherwise, the inverter will be damaged.

- **Trial Operation**

Danger

1. **Only after the front cover is installed, power can be turned on. Never take off the front cover when power is on.**
   An electric shock may occur.
2. **Do not come close to the machine at power failure if fault reset function is active. The inverter will restart automatically when power is on.**
   An injury may occur.
3. **Install an emergency switch for a quick brake in case of abnormal conditions.**
   An injury may occur.

Caution

1. **Never touch braking resistor. It will be very hot and with high-voltage when running.**
   Otherwise, an electric shock and a burn injury may occur.
2. **Reconfirm the motor and machine are within the applicable ranges before starting operation.**
   Otherwise, an injury may occur.
3. **Do not check signals while the inverter is running.**
   Otherwise, the inverter will be damaged.
4. **Be careful when editing inverter settings. The inverter is in factory default.**
   Otherwise, the inverter will be damaged.

- **Maintenance and Inspection**

Danger

1. **Do not touch inverter's wiring terminals where high voltage exists.**
   Otherwise, an electric shock may occur.
2. **Always keep the front cover in place before power is supplied to the inverter. Turn off power before taking the front cover off.**
   Otherwise, an electric shock may occur.
3. **Maintenance and check must be performed only after the power supply of main circuit is turned off, and the indicator of CHARGE is off.**
   An electric shock may occur due to the residual voltage on electrolytic capacitor after power is off.
4. **Maintenance and inspection must be performed only by authorized professionals.**
   Otherwise, an electric shock may occur.
5. **Do not change the wiring and disconnect terminal wiring when power is on.**
   Otherwise, an electric shock may occur and the inverter will be damaged.

Caution

1. **CMOS ICs are installed on keypad, control circuit board and drive circuit board respectively. Handle those parts and CMOS ICs carefully.**
   The CMOS IC can be destroyed by ESD if touched directly with bare hands.
2. **Do not check signals while the inverter is running.**
   Otherwise, the inverter will be damaged.

● **Other**

Danger

1. **Never attempt to modify or alter the inverter.**
   Failure to comply can result in electric shock or injury.
2. **User shall take full responsibilities for the damages caused by wrong wiring, improper operation or modifying and altering, and etc.**

CONTENTS

Supplement for EM303A-XXX-1C, EM303A-XXX-2C

Except input voltage, applicable motor and power wire size, EM303A-XXX-1C and EM303A-XXX-2C are the same as EM303A-XXX-3C in terms of installation, wiring, operation and function codes, and etc.

1. Model and Specifications of EM303A-XXX-1C and EM303A-XXX-2C Inverter (Open Loop Vector Control)

- Rated voltage: 1-phase AC220V, 3-phase AC220V
- Applicable motor: 3-phase AC induction motor. Power ratings: 0.4~4.0 kW. Rated voltage: AC220V
- Output voltage: 3-phase, from 0 to U_{supply}.

Model and rated output current of EM303A-XXX-1C are shown in Table 0-1.

Table 0-1 Model List of EM303A-XXX-1C

Rated Input Voltage	Model No.	Motor Power(kW)	Rated Output Current (A)	Overall Dimensions	Wire Size (m^2)
1-Phase AC220V	EM303A-1R1-1CB	1.1	6.2	The same as EM303A-2R2G /3R0P-3CB	2.5
	EM303A-1R5-1CB	1.5	8.0		4
	EM303A-2R2-1CB	2.2	10.0		4
	EM303A-3R0-1CB	3.0	13	The same as EM303A-7R5G /9R0P-3CB	6
	EM303A-4R0-1CB	4.0	17		6

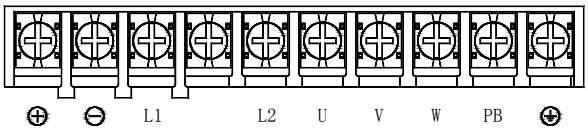
See Table 0-2 for model number and rated output current of EM303A-XXX-2C.

Table 0-2 Model List of EM303A-XXX-2C

Rated Input Voltage	Model No.	Motor Power (kW)	Rated Output Current (A)	Overall Dimensions	Wire Size (m^2)
3-Phase AC220V	EM303A-0R4-2CB	0.4	3.0	The same as EM303A-2R2G /3R0P-3CB	1.5
	EM303A-0R5-2CB	0.55	3.7		1.5
	EM303A-0R7-2CB	0.75	4.8		1.5
	EM303A-1R1-2CB	1.1	6.2		2.5
	EM303A-1R5-2CB	1.5	8.0		4
	EM303A-2R2-2CB	2.2	10.0		4
	EM303A-3R0-2CB	3.0	13	The same as EM303A-7R5G /9R0P-3CB	6
	EM303A-4R0-2CB	4.0	17		6

2. Terminal Block of EM303A-XXX-1C and EM303A-XXX-2C

Terminal block of EM303A-XXX-1A is shown as below.



Terminal block of EM303A-XXX-2C is the same as that of EM303A-XXX-1C.

1. Overview

1.1 EM303A Model List and Technical Specifications

- Rated voltage: 3-phase, AC380V/415V
- Applicable motor: 3-phase induction motor, power range: 0.75~400kW. Rated voltage: AC380V/415V
- Output voltage: 3-phase, from 0 to U_{supply}.

1.1.1 EM303A Model and Rated Output Current

Table 1-1 Model List of EM303A

Rated Voltage	Model No.	Motor Power(kW)	Rated Output Current(A)
3-phase, AC380V±20 %/415V±20%	EM303A-0R7G/1R1P-3CB	0.75	2.8
	EM303A-1R1G/1R5P-3CB	1.1	3.7
	EM303A-1R5G/2R2P-3CB	1.5	4.8
	EM303A-2R2G/3R0P-3CB	2.2	6.2
	EM303A-3R0G/4R0P-3CB	3.0	8
	EM303A-4R0G/5R5P-3CB	4.0	10
	EM303A-5R5G/7R5P-3CB	5.5	13
	EM303A-7R5G/9R0P-3CB	7.5	17
	EM303A-9R0G/011P-3CB	9.0	20
	EM303A-011G/015P-3CB	11	26
	EM303A-015G/018P-3CB	15	34
	EM303A-018G/022P-3C	18.5	41
	EM303A-022G/030P-3C	22	48
	EM303A-030G/037P-3C	30	60
	EM303A-037G/045P-3C	37	75
	EM303A-045G/055P-3C	45	90
	EM303A-055G/075P-3C	55	115
	EM303A-075G/090P-3C	75	150
	EM303A-090G/110P-3C	90	180
	EM303A-110G/132P-3C	110	220
	EM303A-132G/160P-3C	132	265
	EM303A-160G/185P-3C	160	310
	EM303A-185G/200P-3C	185	360
	EM303A-200G/220P-3C	200	380
	EM303A-220G/250P-3C	220	420
	EM303A-250G/280P-3C	250	470
	EM303A-280G/315P-3C	280	530
	EM303A-315G/355P-3C	315	600
	EM303A-355G/400P-3C	355	660
	EM303A-400G/450P-3C	400	740

Remarks:

1.EM303A is an integrated model with G (Fixed torque) and P (square torque) in one. The data listed above is of Model G. When applied to square torque like blower, water pump and etc., the power ratings of applicable motor can be one grade higher. See the details of inverter's nameplate.

2.See 2.1 for the model numbering scheme.

1.1.2 EM303A Technical Specifications

Table 1-2 EM303A Technical specifications

Items		Specifications
Input	Rated Voltage	3-phase AC380V~415V±20%, 50~60Hz±5%, voltage imbalance rate <3%
Output	Output Voltage	3-phase, from 0 to U_{supply}.
	Rated Output Current	100% rated current non-stop output
	Max. Overload Current	Model G: 150% rated current for 1 minutes, 180% rated current for 2 seconds Model P: 120% rated current for 1 minutes, 150% rated current for 2 seconds
Basic Control Functions	Control Mode	V/F, SVC
	Input Mode	Frequency (Speed) input, torque input
	Running Mode	Keypad, control terminals (2-wire sequence, 3-wire sequence), RS485
	Frequency Control Range	0.00～600.00Hz
	Input Frequency Resolution	Numeric input:0.01Hz, analog input: 0.1% of maximum frequency
	Governor Deflection	1:50(V/F), 1:100(SVC)
	Speed Control Accuracy	±0.5% rated synchronous speed
	Acceleration/Deceleration Time	0.01~600.00 seconds/minutes
	V/F Features	Rated output voltage: 20%~100% adjustable, frequency base :20Hz~600Hz adjustable
	Torque Boost	Automatic torque boost, fixed torque boost curve, customer defined V/F curve scaling
	Start Torque	150%/1Hz(V/F),150%/0.5Hz(SVC)
	Torque Control Accuracy	±15% rated torque (SVC1)
	AVR	AVR is active while output voltage remains unchanged if input voltage is varying.
	Automatic Current Limit	Automatically limit output current, avoid frequent overcurrent tripping
	DC Brake	Brake frequency:0.1~60Hz, brake time:0~30S, brake current:0~100% rated current
	Signal Input Source	Communication, analog voltage, analog current, preset speed, simple PLC and their combinations
Special Function Control	Textile Wobbulation	Realize textile wobbulation functions like wobbulation range, time and jump
	Droop Control	With increase of load, the speed droops, suitable for one machine driven by multi-motor
Function of Input and Output	Reference Power	10V/20mA
	Terminal Control Power	24V/150mA
	Numeric Input Terminals	7 programmable numeric input terminals
	Analog Input Terminals	4 analog inputs:2 voltage inputs (0~10V), and 2 current inputs(0~20mA)
	Numeric Output Terminals	2 OC outputs and 1 relay output are programmable. Maximum output current of OC: 50mA. Relay contact capacity: 250VAC/3A or 30VDC/1A. When relay acts, EA-EC is NO, and EB-EC is NC.
	Analog output Terminals	2 programmable analog output terminals can output 0~10V or 0~20mA
Keypad Display	LED	Human interactions with displays and control actuators
	Parameter Copy	Upload and download parameter information of the inverter, copy parameters rapidly.
Protections	Protections	Short circuit, overcurrent, overload, overvoltage, undervoltage, phase loss, overheating, external fault, and etc.
Applica-tion Conditions	Installation Site	Indoor, with altitude less than1,000 meters, free from dust,corrosive gas, and direct sunlight
	Ambient Temperature	-10℃～+40℃. In the temperature range +40 °C…+50 °C, the rated output current is decreased by 1% for every additional 1 °C. 20%～90%RH (no condensation)
	Vibration	＜0.5g
	Storage Temperature	-25℃～+65℃
	Installation Method	Wall mounting, or floor mounting
Degree of Protection		IP20
Cooling Method		Forced air cooling

1.2 Basic Functions of EM303A

1.2.1 Process PID Control

2 process PID control modes: Speed process PID control and torque process PID control. When output of process PID control is taken as inverter's speed input, it is speed process PID control. When output of process PID control is taken as inverter's torque input, it is torque process PID control. Speed process PID control is applicable to all drive modes, while torque process PID control is only active in SVC1.

Speed process PID control is used for:

- Pressure control: Regulate motor speed by taking pressure signal as a feedback to keep pressure constant.
- Flow control: Regulate motor speed by taking flow signal as a feedback to keep flow constant.
- Temperature control: Regular motor speed by taking temperature signal as a feedback, to keep temperature constant.

Torque process PID control is used for:

- Tension control: Regulate motor's torque current by taking tension signal as a feedback to keep tension constant.

1.2.2 Program Operation (Simple PLC)

Program operation is that inverter finishes specified control logic according to the mode and time set in the program. Program operation is categorized as speed program operation, torque program operation and process PID program operation (including speed and torque process PID program operation). The program operation mode can be further categorized as: Single-cycle (stop after completion), run at the 7^{th} preset speed after single-cycle, limited continuous cycle (stop after completion), and unlimited continuous cycle.

1.2.3 Wobbulation Operation (Textile only)

Wobbulation is applied to textile and chemical fiber industry that needs for traverse and winding.

1.2.4 Stepping Mode Operation

Provide 5 stepping input modes for speed, torque and process PID input control modes.

1.2.5 Droop Control

When the machine is driven by multi-motor, setting function of droop control can evenly assign the output power of each inverter.

1.2.6 Stop Control at Power-off

When driving load with big inertia, the inverter will automatically enter stop control status in case of power failure, and convert the rotational kinetic energy into electrical energy to stop the motor quickly. It prevents the system from free revolving with big inertia for a long time.

1.2.7 Low Noise Design

Due to the high frequency harmonic wave with the output of inverter, the motor generates the electromagnetic noise inevitably. Usually, electromagnetic noise can be lowered by increasing carrier frequency, which, however, in turn makes the inverter overheat, and the rated output current is required to be decreased by 5% for every additional 1 kHz in carrier frequency. EM303A achieves low noise operation with low carrier frequency by carrier frequency regulation.

1.2.8 Current Limit

When inverter is running, if acceleration/deceleration time is too short or the load becomes heavier, the output current of inverter may exceed the permitted limit. If current limit is enabled, inverter will automatically decrease its output frequency to keep the output current limit unchanged. When output current is less than the current limit, it runs as per regular input command. This function is applied to V/F control mode only. For other control modes, the current is automatically regulated.

1.2.9 Energy Autosaving

When motor is idling or with light load, EM303A will properly regulate its output voltage for energy saving purpose.

1.2.10 Constant Power Output

With the same load, output current will increase as the input voltage of inverter decreases. Meanwhile, if constant power output is active, the inverter will automatically calculate its real-time output power and work at maximum power permitted.

1.2.11 Automatic Voltage Regulation (AVR)

When the input voltage fluctuates, the output voltage remains unchanged basically, and V/F value keeps constant.

1.2.12 Dynamic Overvoltage Stall

Effectively avoid bus voltage accumulation by real-time detecting voltage of DC bus and regulate overvoltage points dynamically.

1.2.13 Dynamic Brake

When motor decelerates or runs with potential energy load, the voltage of DC bus will rise due to energy feedback, and such voltage is called as rebounding overvoltage. In order to make motor brake quickly within given deceleration time while the inverter will not perform overvoltage protection, and rebounding braking resistor or braking unit can be used to consume this energy, such brake is called as dynamic brake.

1.2.14 Fault Autoretry

During operation of inverter, faults such as undervoltage (instant power failure but resume immediately), overvoltage, overcurrent, and overload may occur. If faults autoretry is active, inverter will automatically try to restart after a setting

interval. Meanwhile, if speed search is active, inverter will automatically detect motor speed and direction to make it return the setting input frequency smoothly.

1.2.15 Multi-function Numeric Input Terminals

7 multi-function numeric input terminals X1～X7 of EM303A can be programmed based on real needs.

1.2.16 Multi-function Analog Output Terminals

Multi-function analog output terminals M0～M1 of EM303A can be defined as different information, or as signals of 0～10V or 0～20mA.

1.2.17 Multi-function Numeric Output Terminals

The output of multi-function numeric output terminals Y1 and Y2, and relays of EM303A can be programmed based on real needs.

1.2.18 Autotuning Motor Parameter

When autotuning motor parameters is enabled, the inverter will autotune and save the motor parameters. (Autotuning motor parameter is categorized as stationary autotuning and rotational autotuning. Please make motor in idling status by separating motor and load if taking rotational autotuning mode.)

1.2.19 Parameter Copy

All function parameters of EM303A can be copied through keypad.

1.2.20 Programmable Displayed Information

Monitoring codes C0-00～C0-31 of EM303A can be displayed by setting program.

1.2.21 RS-485 Interface

Through RS-485 interface and computer monitoring software, multi-inverter operation can be easily achieved with computer network.

1.2.22 User Password

User can set password to protect function codes from unauthorized editing.

1.2.23 Overmodulated Output

When the load is heavy, overmodulation can raise the output voltage of inverter and lower motor current, and then lower motor temperature rising.

1.2.24 Oscillation Suppression

Mechanical load may have mechanical resonance point, and motor may have electromagnetic resonance point. Oscillation suppression can eliminate resonance and enable system to operate stably and to be free from failures.

1.3 EM303A Operation Status Definition

1.3.1 Operation Status of Inverter

- **Parameters setting status:** After power is on, inverter finishes initialization enters standby status without fault or start-up command, and does not output.
- **Normal running status:** After receiving active start command through keypad, control terminal or RS485, the inverter drives motor in accordance

with the requirements of setting input.

- **JOG running status:** Set by keypad, external terminal or RS485 to make motor run per JOG input speed.
- **JOG stop status:** Refer to the process that the output frequency drops to zero in JOG deceleration time after JOG running command is not active.
- **Autotuning status:** Set by keypad to autotune motor's parameters in stationary or rotational autotuning.
- **Stop status:** Refer to the process that the output frequency drops to zero in given deceleration time after running command is not active.
- **Fault status:** Status of inverter at protections, all kinds of faults and failures.

1.3.2 Control Modes of Inverter

The control modes of inverter refer to that the inverter controls motor rotation as per required speed and torque with open loop or close-loop control mode. The control modes include:

- **General open loop space vector control——V/F control**
  Applicable to the applications of slow speed changes and low speed stability accuracy demand, and meet needs of most of AC motor drives.
- **SVC 0—— Open-loop vector control without PG feedback**
  Only estimate speed in real-time, but no feedback control. Output current is under real-time close-loop control, output of motor reaches 150% of rated torque at 0.5Hz, and inverter automatically traces load variables and limit output current to make it not exceed the maximum value. Even if there is sudden load change, quick acceleration or deceleration, inverter will not trip overcurrent, short-circuit, and etc., and keeps high performance and reliability.
- **SVC1—— Torque control(Close-loop vector control without PG feedback)**
  Not only estimate speed in real-time, but also conduct feedback control. Speed and current are under real-time close-loop control. Not only speed control but also torque control can be realized. A regular AC induction motor can be converted to AC variable speed motor and AC torque motor by adopting this control mode. It is a genuine speed sensorless vector control.

1.3.3 Setting Modes of Inverter

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

- Speed setting mode is to take motor speed as the control object
- Torque setting mode is to take motor torque as the control object.

Set through various and flexible methods such as numeric setting, analog voltage, and analog current or other mathematical combinations. Jog speed setting mode is prior to other setting modes, i.e. when pressing JOG button on keypad or making control terminals FJOG and RJOG on, no matter what the present setting mode is, the inverter will automatically switch to jog speed setting. See Figure 1-1 and Figure 1-2 for the details of all speed setting modes of EM303A.

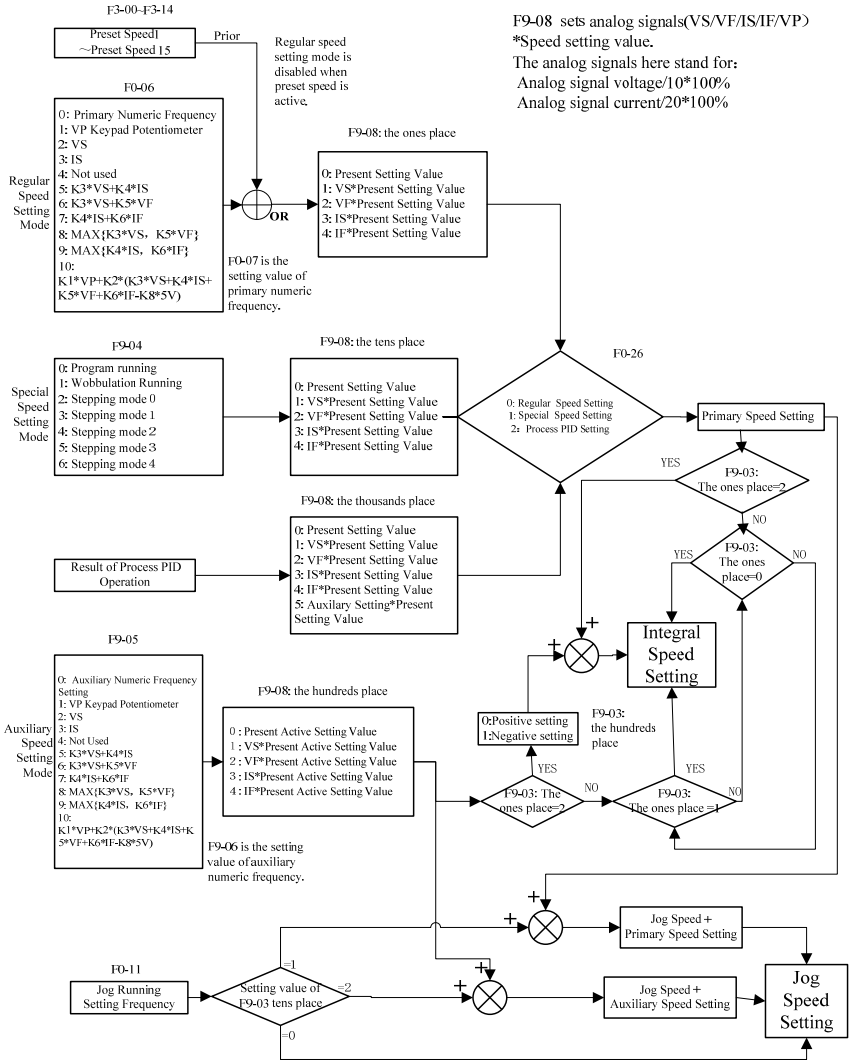


Figure 1-1 Speed Setting Modes

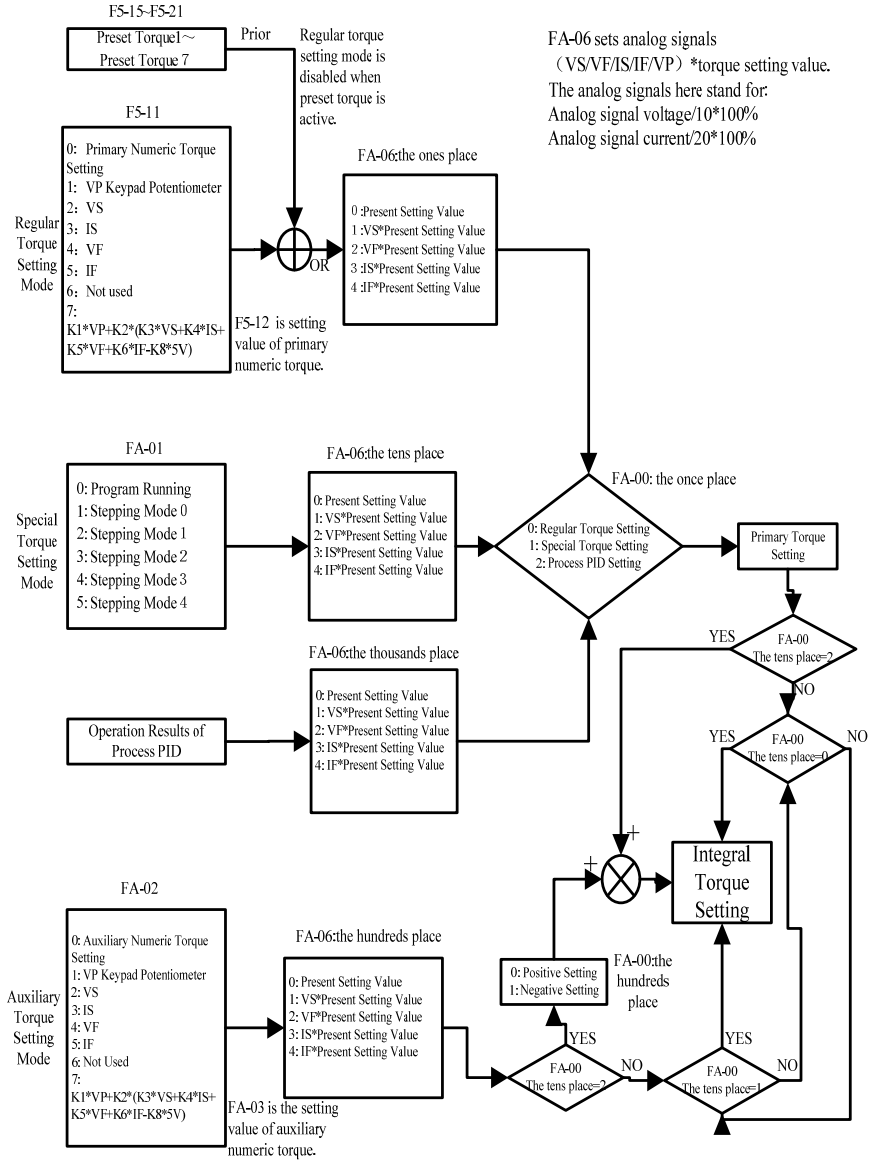


Figure 1-2 Torque Input Modes

1.3.4 Operation Control Mode of Inverter

The operation control mode of inverter refers to the action conditions when inverter enters operation status, which includes 3 modes as controlled by keypad operation, terminal operation, and RS485 communication. Terminal operation mode is categorized as 2-wire sequence, and 3-wire sequence. The setting details and control logic of these three modes are shown in the description of function parameters F0-04 and F0-05 in 7.1.

1.4 EM303A Outlook

See Figure 1-3 for the outlook of EM303A (Instance: EM303A- 4.0kW).

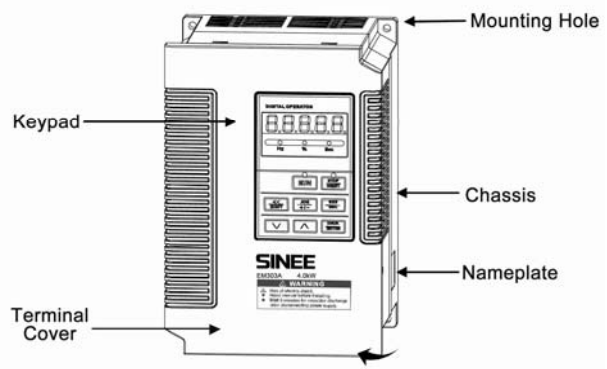
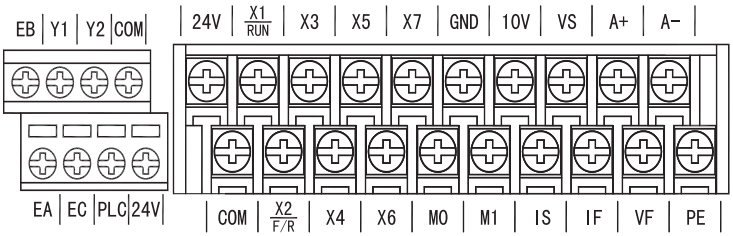
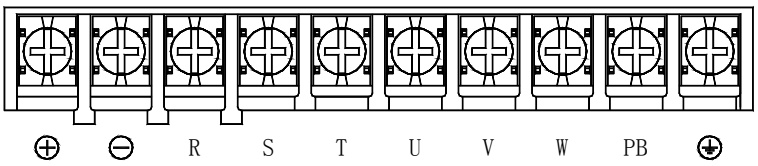


Figure1-3 EM303A Outlook

The face terminal cover can be taken away by following the arrow shown in Figure1-3. See Figure 1-4 for control circuit terminals and main circuit terminals.



a. Control Circuit Terminal Block



b. Main Circuit Terminal Block

Figure 1-4 Control Circuit Terminals and Main Circuit Terminals

2 Installation

2.1 Verifying Product

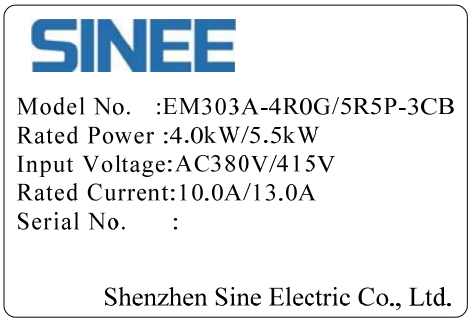
Refer to Table 2-1, and check and verify the EM303A.

Table 2-1 Check List

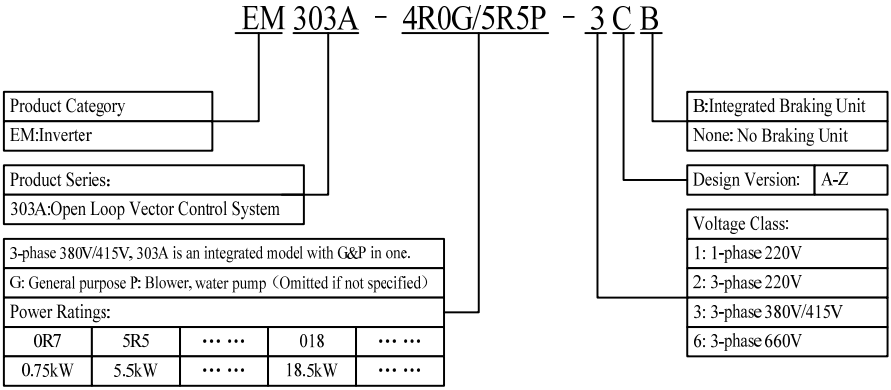
Item	Action
If the products are identical to the purchase order.	Check the devices reference marked on the label.
Any part damaged.	Check the outlook if any damages.
Any screw loosened.	Check with a screwdriver if necessary.

Contact the distributor or SINEE directly for quality issue.

- **Nameplate**



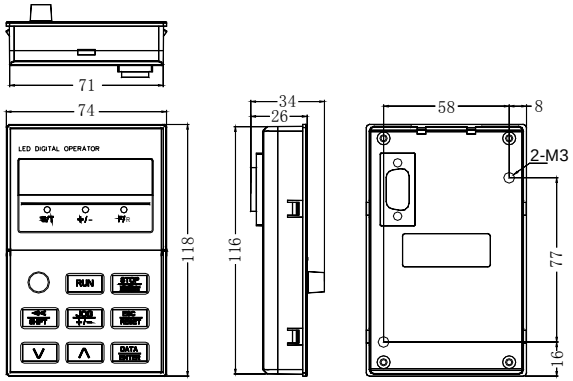
- **Model Numbering Scheme**



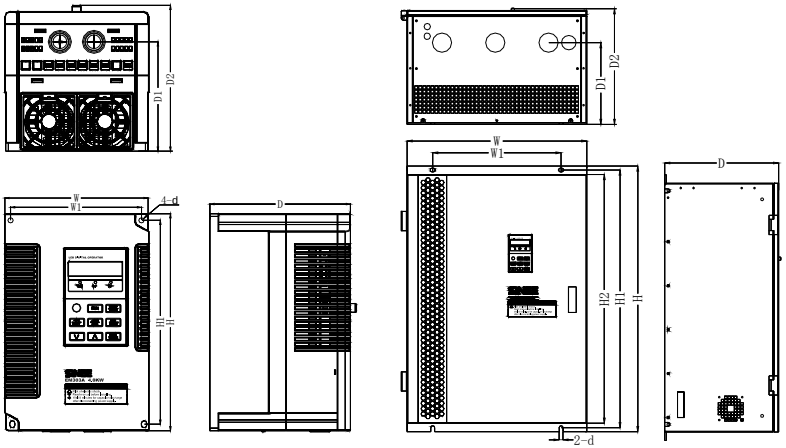
2.2 Overall and Installation Dimensions

Classified to 10 sizes for total 30 models of EM303A, installation dimensions as shown in Figure 2-1 and Table 2-2.

The keypad can be installed on the metal panel separately with a hole size of 116.5±0.1(L)*71.5±0.1 (W)mm, and applicable panel thickness:1.2～2.0mm



（a）Keypad Dimensions for Installation



(b) (c)

Figure 2-1 Overall and Keypad Dimensions of EM303A for Installation

Table 2-2 Overall and Installation Dimensions of EM303A

Model No.	W	W1	H	H1	H2	D	D1	D2	d	Frame
EM303A-0R7G/1R1P-3CB	140	125	220	205	--	152	120	161	6	(b)
EM303A-1R1G/1R5P-3CB										
EM303A-1R5G/2R2P-3CB										
EM303A-2R2G/3R0P-3CB										
EM303A-3R0G/4R0P-3CB										
EM303A-4R0G/5R5P-3CB										
EM303A-5R5G/7R5P-3CB	165	148	250	235	--	161	126	170	6	(b)
EM303A-7R5G/9R0P-3CB										
EM303A-9R0G/011P-3CB	215	150	352	335	317	215	172	224	7	(c)
EM303A-011G/015P-3CB										
EM303A-015G/018P-3CB										
EM303A-018G/022P-3C	270	200	470	450	424	245	187	254	10	(c)
EM303A-022G/030P-3C										
EM303A-030G/037P-3C										
EM303A-037G/045P-3C	335	240	550	530	500	245	190	254	10	(c)
EM303A-045G/055P-3C										
EM303A-055G/075P-3C	390	300	695	665	635	250	200	259	12	(c)
EM303A-075G/090P-3C										
EM303A-090G/110P-3C	560	400	828	803	775	355	255	364	12	(c)
EM303A-110G/132P-3C										
EM303A-132G/160P-3C										
EM303A-160G/185P-3C	650	400	1060	1034	1000	400	325	409	13	(c)
EM303A-185G/200P-3C										
EM303A-200G/220P-3C										
EM303A-220G/250P-3C	825	660	1200	1170	1137	400	320	409	13	(c)
EM303A-250G/280P-3C										
EM303A-280G/315P-3C										
EM303A-315G/355P-3C	1068	870	1213	1183	1150	410	330	419	13	(c)
EM303A-355G/400P-3C										
EM303A-400G/450P-3C										

Remarks:

- 5 models: EM303A-055~075, EM303A-090~132, EM303A-160~200, EM303A-220~280, and EM303A-315～400 can be floor-mounted with a chassis which is in the same width as the inverter. Heights of optional chassis: 120mm, 250mm, 300mm, 300mm and 350mm.
- EM303A-090 or above: power input terminals are on the top, and power output terminals are at the bottom of the inverter.

2.3 Considerations of Installation Site

2.3.1 Installation Site

Considerations for installation site:

- Good ventilation indoor
- Ambient temperature: -10°C～+40°C
- No high temperature and high moisture, humidity:＜90%RH, no water drops or any other condensation
- 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
- No electromagnetic interference, and keep away from interference source.

2.3.2 Ambient Temperature

Install inverter in a place with good ventilation to improve the reliability of inverter operation. When inverter is mounted inside a cabinet, cooling fan or air conditioner is a must. Keep the ambient temperature below +40°C.

2.3.3 Precautions

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

2.4 Direction and Space of Installation

Cooling fan(s) installed inside EM303A is for forced air cooling. For good cooling circulation, mount inverter vertically, and leave sufficient space between the inverter and wall or other objects. See Figure 2-2.

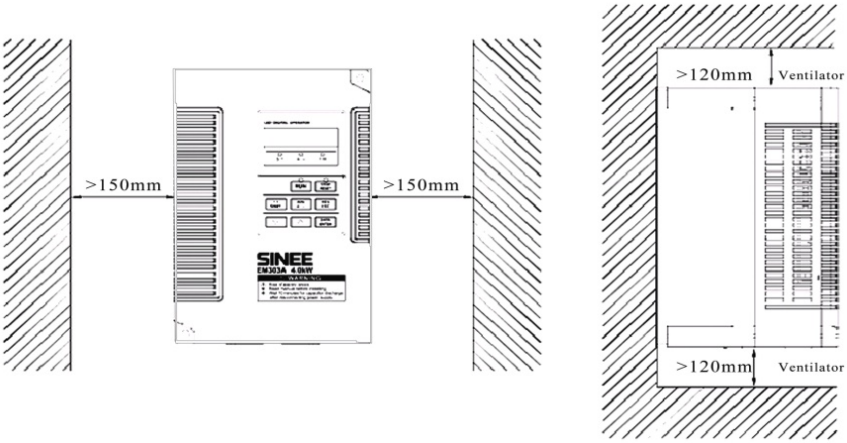


Figure 2-2 Installation Direction and Space

2.5 Disassembly and Assembly of Keypad

Under general circumstances, it is unnecessary to disassemble the keypad, and just remove the cover to assemble and wire. On special occasions, disassemble the keypad by following steps.

- Remove the front cover: For EM303A-7R5 or below, push the cover vertically from the bottom with two hands, and then lift up outwards. See Figure 2-3.

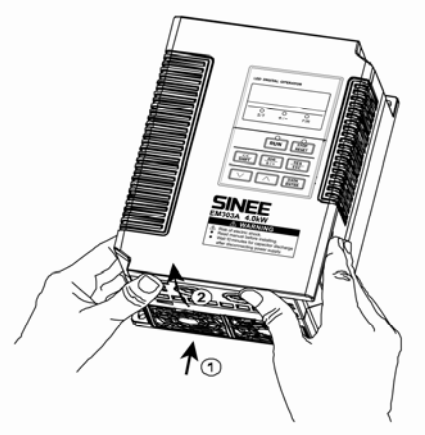


Figure2-3 Remove the Front Cover

- Disassemble the keypad: Put your figures in the insert on the top of keypad, press down slightly, and pull outwards, then the keypad can be removed. See Figure 2-4.

- Assemble the keypad: Place the bottom of keypad in the slot and then press the top to push until it clicks into right place. See Figure 2-5.

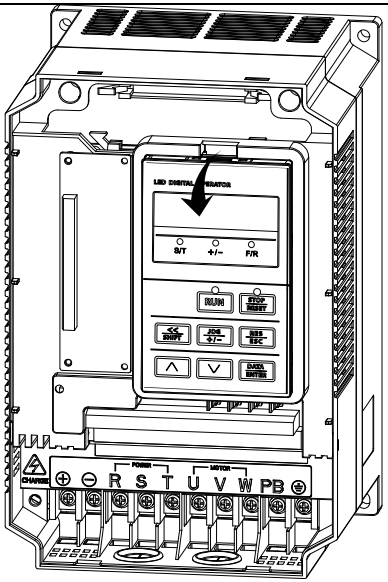


Figure 2-4 Disassemble the Keypad

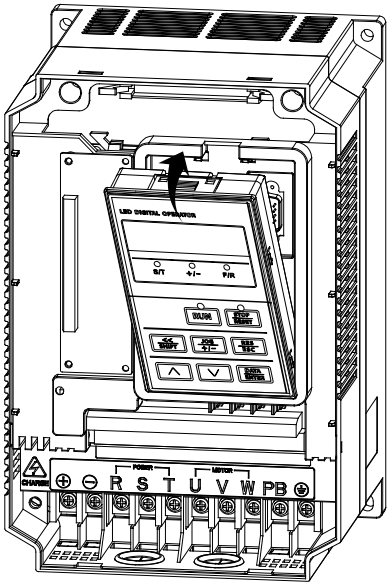


Figure 2-5 Assemble the Keypad

3 Wiring

3.1 Connections to Peripherals

Connections between EM303A and its peripherals are shown in Figure 3-1

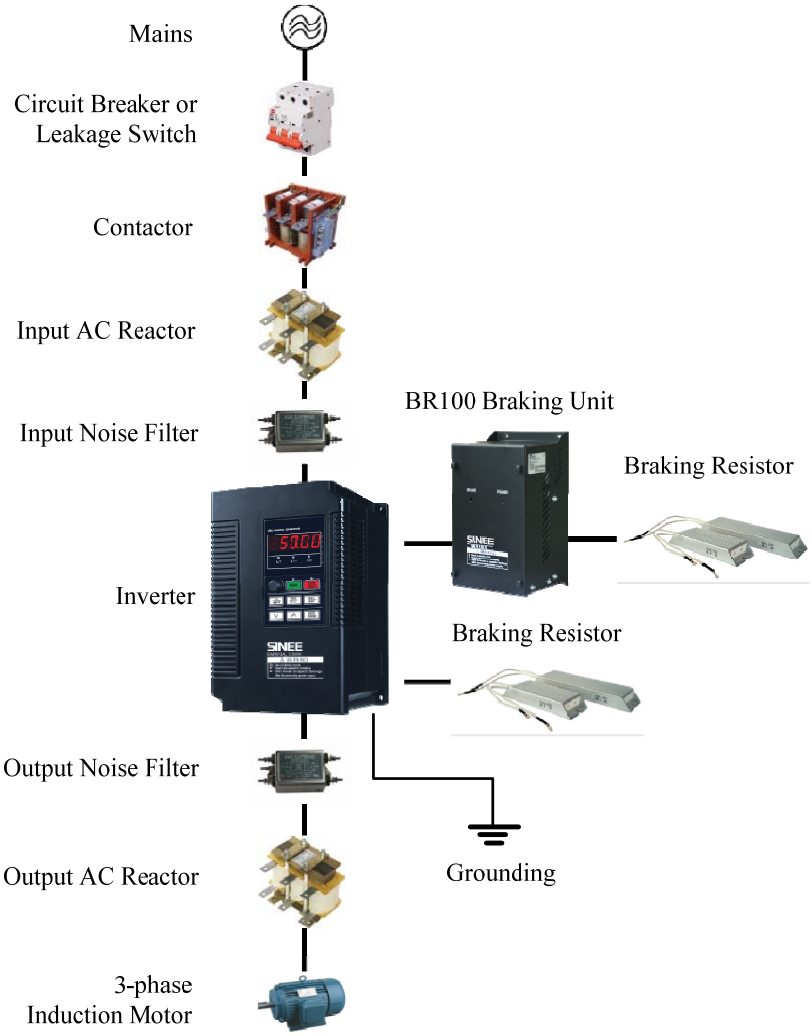
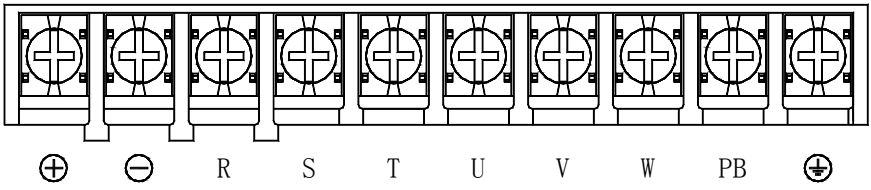


Figure 3-1 EM303A Peripherals Connections

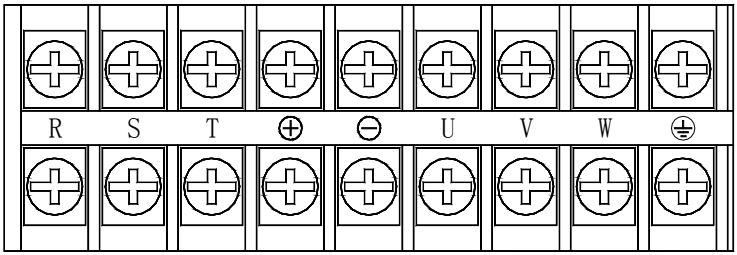
3.2 Wiring Main Circuit Terminals

3.2.1 Main Circuit Terminal Block

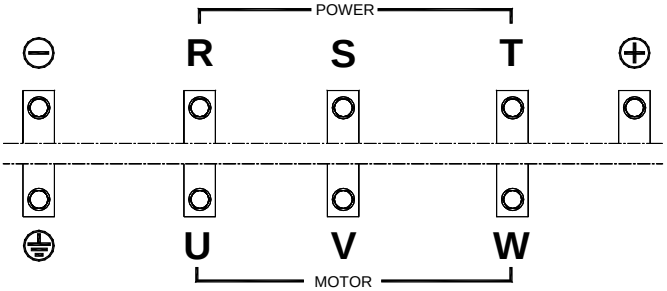
See Figure 3-2 for main circuit terminal block.



(a) Main Circuit Terminal Block of EM303A-015 or below



（b）Main Circuit Terminal Block of EM303A-018～075



(c) Main Circuit Terminals of EM303A-090 or above

Figure3-2 Main Circuit Terminal Block

Remarks:

1. EM303A-090 or above: Power input terminals R, S, and T are on the top, and power output terminals are at the bottom of the inverter.
2. EM303A-315 or above: There are 2 wiring screws for each terminal.

3.2.2 Main Circuit Terminal Functions

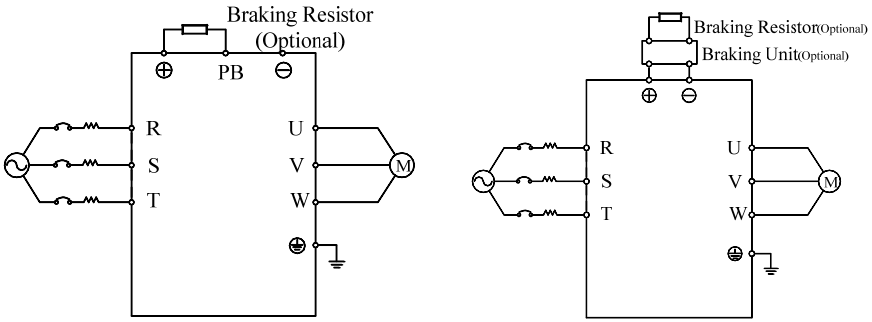
The main circuit terminal functions of EM303A are listed in Table 3-1. Wire the terminals correctly as per corresponding function.

Table 3-1 Main Circuit Terminal Functions

Terminal	Function
R, S, T	AC power input terminals for connecting to 3-phase AC power. (Terminal L1, L2 for AC220V 1-phase input inverter)
U, V, W	Inverter AC output terminals for connecting to 3-phase induction motor.
⊕⊖	Positive and negative terminals of internal DC bus for connecting to external braking unit.
⊕PB	Connecting terminals of braking resistor, one end connected to⊕and the other to PB.
⏚	Grounding terminals

3.2.3 Standard Wiring of Main Circuit

See Figure 3-3 for standard wiring of main circuit.



Terminal L1&L2 for inverters with 1-phase AC220V input

Figure 3-3 Standard Wiring of Main Circuit

3.2.4 Wiring Main Circuit on Input Side

Installing a Circuit Breaker

Always 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 the inverter's rated current.
- The time characteristics of MCCB should meet that of inverter's overheating protection (150% of rated current /1 minute).

- If single MCCB is shared by 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 3-4.

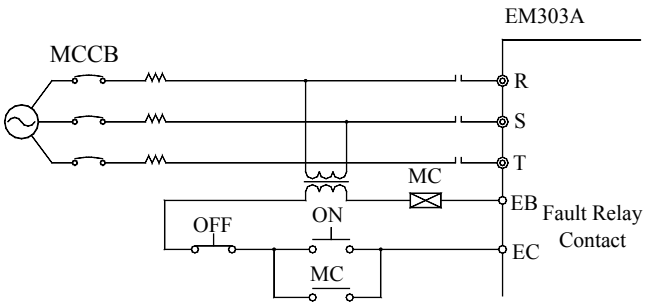


Figure 3-4 Connecting to Input Circuit Breaker

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≥30mA. 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 as shown in Figure 3-4.

- 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 the inverter is connected to a transformer with big-capacity (≥600kVA), or 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 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 vs incorrect installations of noise filters as shown in Figure 3-5 and Figure 3-6.

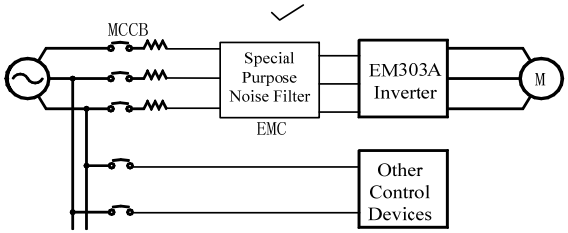
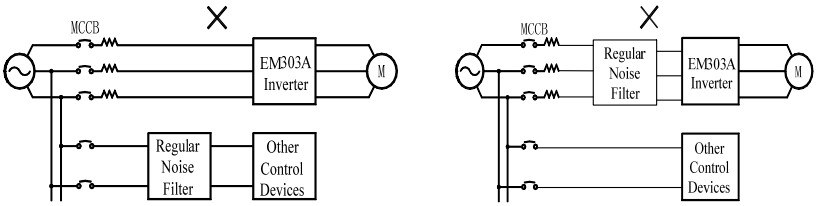


Figure 3-5 Correct Noise Filter Installation



(a) (b)

Figure 3-6 Incorrect Noise Filter Installation

3.2.5 Wiring the Output Side of Main Circuit

Connecting the Inverter to 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-Circuiting 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.

Make sure that the inverter stops before installing electromagnetic contactor to switch grid power supply.

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 which may cause the control device malfunction.
- Radio interference: The high frequency electromagnetic waves generated by inverter and cable cause radio devices nearby to make noise when receiving signals.

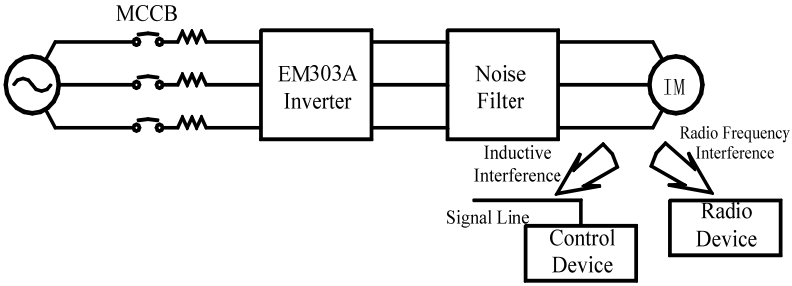


Figure 3-7 Installing a Noise Filter on the Output Side

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＞30cm, and the inductive interference will be reduced considerably, as shown in Figure 3-8.

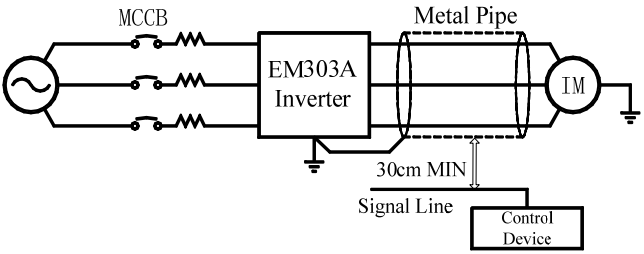


Figure 3-8 Countermeasures Against Inductive Interference

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 3-9.

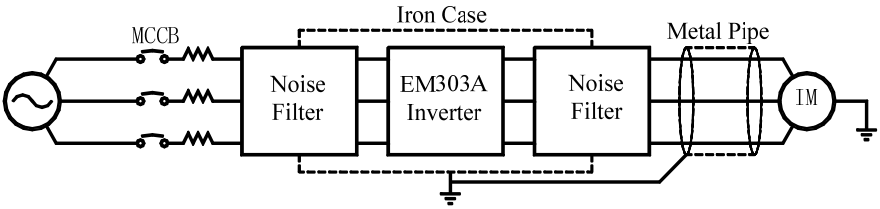


Figure 3-9 Countermeasures Against RFI

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 adjust carrier frequency for reducing the high-frequency harmonic leakage current.

When motor cable＞50m, 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 and Carrier Frequency Between Inverter and Motor

Cable Length	**＜50m**	**＜100m**	**＞100m**
Carrier Frequency	＜10kHz	＜5kHz	＜2kHz
F0-14 Function Parameter	10.000	5.000	2.000

3.2.6 Main Circuit Cable and Terminal Screw Size

See Table 3-3 for the specifications of main circuit cable and terminal screw.

Table 3-3 Main Circuit Cable and Terminal Screw Specifications

Model No. of Inverter	Terminals	Terminal Screw	Tightening Torque (N.m)	Cable Size (mm2)	Cable Type
EM303A-0R7G/1R1P-3CB	⊕,⊖, R, S, T, U, V, W, PB,⏚	M3.5	1.2～1.5	1.5	750V
EM303A-1R1G/1R5P-3CB		M3.5	1.2～1.5	2.5	
EM303A-1R5G/2R2P-3CB		M3.5	1.2～1.5	2.5	
EM303A-2R2G/3R0P-3CB		M3.5	1.2～1.5	4	
EM303A-3R0G/4R0P-3CB		M3.5	1.2～1.5	4	
EM303A-4R0G/5R5P-3CB		M3.5	1.2～1.5	4	
EM303A-5R5G/7R5P-3CB		M4	1.5～2.0	6	
EM303A-7R5G/9R0P-3CB		M4	1.5～2.0	6	
EM303A-9R0G/011P-3CB		M5	3.0～4.0	6	
EM303A-011G/015P-3CB		M5	3.0～4.0	10	
EM303A-015G/018P-3CB		M5	3.0～4.0	10	
EM303A-018G/022P-3C	R, S, T,⊕,⊖, U, V, W,⏚	M6	4.0～5.0	16	
EM303A-022G/030P-3C		M6	4.0～5.0	16	
EM303A-030G/037P-3C		M6	4.0～5.0	25	
EM303A-037G/045P-3C		M8	9.0～10.0	25	
EM303A-045G/055P-3C		M8	9.0～10.0	35	
EM303A-055G/075P-3C		M10	17.0～22.0	35	
EM303A-075G/090P-3C		M10	17.0～22.0	60	
EM303A-090G/110P-3C		M10	17.0～22.0	60	
EM303A-110G/132P-3C		M10	17.0～22.0	90	
EM303A-132G/160P-3C		M10	17.0～22.0	90	
EM303A-160G/185P-3C		M12	31.0～39.0	120	
EM303A-185G/200P-3C		M12	31.0～39.0	180	
EM303A-200G/220P-3C		M12	31.0～39.0	180	
EM303A-220G/250P-3C		M16	45.0～55.0	240	
EM303A-250G/280P-3C		M16	45.0～55.0	270	
EM303A-280G/315P-3C		M16	45.0～55.0	270	
EM303A-315G/355P-3C		2*M16	45.0～55.0	2*150	
EM303A-355G/400P-3C		2*M16	45.0～55.0	2*150	
EM303A-400G/450P-3C		2*M16	45.0～55.0	2*180	

Remarks:

1. See Table 0-1 and Table 0-2 for the terminals and cable selection of AC 220V input.
2. Take the voltagedrop into consideration for selecting cable. Generally the voltagedrop should be＜5V and calculated according to following formula:
   Voltagedrop=√3* Cable resistance ratio (Ω/KM)*Cable length (m)*Rated current (A)*10^{-3}
3. If placed in plastic duct, the cable should be uprated by one level.
4. The cable should be connected to the applicable cable and wiring terminal.
5. The size of grounding cable should be the same as that of power cable when the size of power cable is less than 16mm^2. However, when it is>16mm^2, the size of grounding cable should not be less than half of 16mm^2, but at least 16mm^2.

3.2.7 Ground Wiring

- Make sure the ground terminal ⏚ grounded.
- Do not share the grounding cable with welding machine or power equipment.
- 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 3-10 for the correct and incorrect grounding wirings.

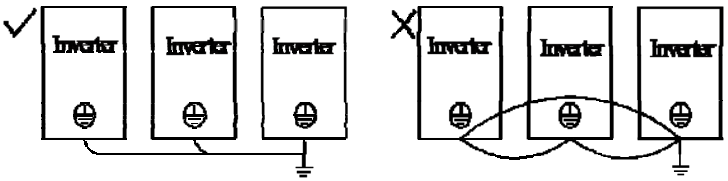


Figure 3-10 Ground Wiring

3.2.8 Wiring Braking Resistor and Braking Unit

See Chapter 11 for more details about the selection and wiring of braking resistor and braking unit.

3.3 Wiring Control Circuit Terminals

3.3.1 Control Circuit Terminals

The control circuit terminals of EM303A are located on the control PCBA:

- Analog input terminals: Voltage input signals VS,VF. Current input signals IS,IF.
- Numeric input terminals: X1, X2, X3, X4, X5, X6, X7, PLC
- Numeric output terminals: Y1, Y2, EA, EB, EC
- Analog output terminals: M0, M1
- Auxiliary power supply terminals: +24V, COM, +10V, GND.
- RS485 communication interface: A+，A-
- Grounding terminal: PE

See Figure 3-11 for control circuit terminal block.

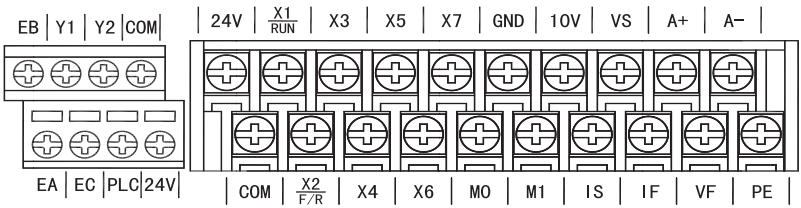


Figure 3-11 EM303A Control Circuit Terminal Block

3.3.2 Function and Wiring of Control Circuit Terminals

Function of control circuit terminals as shown in Table 3-4

Table 3-4 Function of Control Circuit Terminals

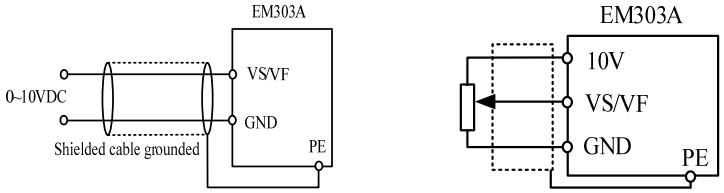
Mode	Terminal	Terminal Name	Terminal Function
Analog Input	VS	VS Analog voltage input	0/2~10V (Configured as numeric input terminal)
	VF	VF Analog voltage input	0/2~10V (Configured as numeric input terminal)
	IS	IS Analog current input	0/4~20mA (Configured as numeric input terminal)
	IF	IF Analog current input	0/4~20mA (Configured as numeric input terminal)
Numeric Input	X1/RUN	Multi-function input terminal	Program the relevant terminals by setting F2-00～F2-06 to achieve the input control of setting function(Common Terminal: PLC)
	X2/ F/R		
	X3~ X7		
	COM	Multi-function input common terminal	Switching value input/output signal common terminal(Ground of 24V power supply)
	PLC	Multi-function input common terminal	Common terminal for external connection with 24V The default is to connect with 24V supply
Relay Output	EA	Relay output terminal	EA-EC:NO EB-EC:NC
	EB		
	EC		
Multi-function Output	Y1	OC output terminal 1	Programmable multi-function output terminals as shown in F2-12, F2-13.
	Y2	OC output terminal 2	
Analog Output	M0	Analog output terminal 0	Analog output 0~10V or 0~20mA can be defined by setting of F2-16, F2-17 or F2-19, F2-20.
	M1	Analog output terminal 1	
Auxiliary Power Supply	10V	Analog terminal power supply	+10V/20mA
	GND	Common port of analog quantity	Common port of analog input and output signals(Ground of 10V power supply)
	24V	Auxiliary power supply	Output of DC24V/150mA between it and COM
	COM	Switching value common terminal	Common terminal of switching value input/output signal (Ground of 24V power supply)
Communica-tion	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

3.3.2.1 Wiring the Analog Input Terminals

Wiring terminals VS and VF through analog voltage signal:

When analog voltage input signal is as the external power supply, wire terminals VS and VF as per the method shown in Figure 3-12-a.

When analog voltage input signal is as the potentiometer, wire terminals VS and VF as per the method shown in Figure 3-12-b.



(a) (b)

Figure 3-12 Wiring of Terminals VS and VF

Wiring terminals IS and IF through analog current signal:

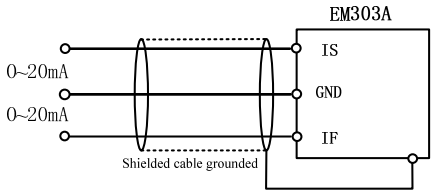
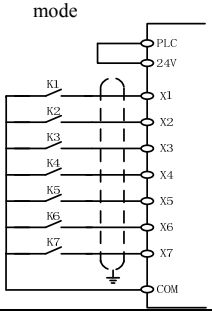
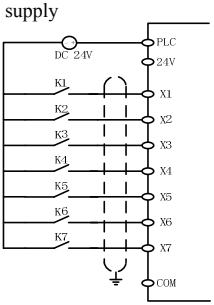
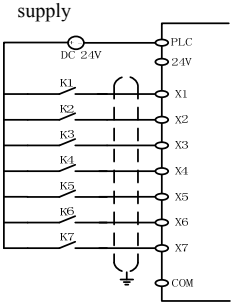


Figure 3-13 Wiring of Terminals IS and IF

3.3.2.2 Wiring Multi-function Input Terminal

The multi-function input terminals of EM303A adopt full bridge rectifier circuit. Terminal PLC is the common terminal of X1~X7. The current passed through the PLC terminal can be forward (NPN Mode) or reverse (PNP mode), so that it is flexible to connect terminals X1-X7 to external components. The typical wirings are as shown in the followings:

NPN and PNP wirings of multi-function numeric input terminals(X1～X7)
(See F2 Group for parameter setting)

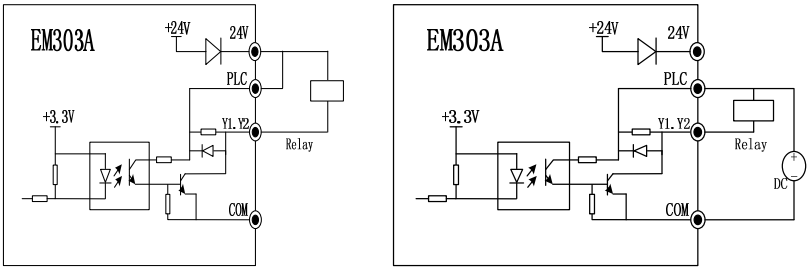
A. Dry contact wiring mode	B. NPN mode with external supply	C. PNP mode with external supply
		

3.3.2.3 Wiring Relay Output Terminal

The surge voltage absorbing circuit should be installed for inductive load like relay or contactor. For instance: RC absorbing circuit (please note that the leakage current should be less than the working current of contactor or relay being controlled), VDR or fly-wheel diode and etc. (For DC electromagnetic circuit, please pay attention to the polarity at installation). The component of absorbing circuit should be installed near the ends of relay coil or contactor.

3.3.2.4 Wiring Multi-function Output Terminal

Multi-function output terminals Y1 and Y2 can take 24V internal power supply of inverter or external power supply as shown in Figure 3-14.

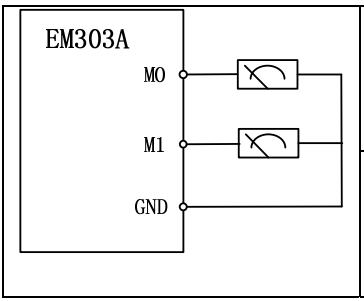


a: Internal power supply b: External power supply

Figure 3-14 Wiring of Multi-function Output Terminals

3.3.2.5 Wiring Analog Output Terminals

Analog output terminals M0 and M1 can represent various physical quantities when connected to external analog meter. The specifications of jumper are taken as: 0~20mA output current or 0~10V output voltage, here M0 and M1 correspond to JP1 and JP2 respectively. See the wiring of jumper and terminals in the following table.



JP1		M0: Analog voltage output
		M0: Analog current output
JP2		M1: Analog voltage output
		M1: Analog current output

3.3.2.6 Wiring Communication Terminal

Terminals A+ and A- are the RS485 communication interfaces of the inverter. The control network between PC or PLC and inverter can be achieved through connecting communication with PC or PLC. See Figure 3-15 and Figure 3-16 for connection of RS485, RS485/RS232 converter and EM303A.

- Connect to PC or PLC through RS485 terminal:

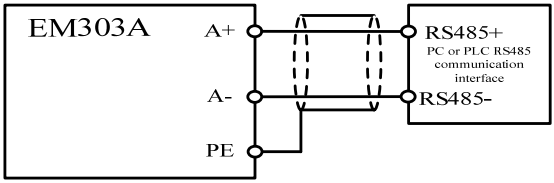


Figure 3-15 Wiring of Communication Terminals

- Connect to PC or PLC through RS485/RS232 interface converter:

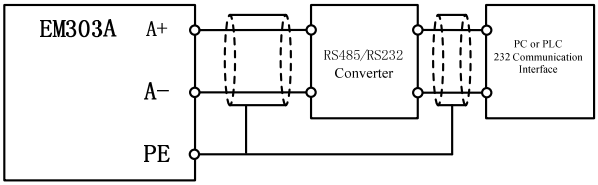


Figure 3-16 Wiring of Communication Terminals

3.3.3 Size of Control Circuit Cable and Screw

To lower interference and attenuation of control signal, the cable length of control signal should be in a maximum of 50m, and the distance should be in a minimum 30cm between the signal cable and the power cable. Twisted-pair cable or shielded cable shall be used when inputting analog signal externally. 0.5~1mm^2 cable as the control circuit cable should be the best.

There are two types of control circuit wiring terminals for EM303A: clamp terminal and barrier terminal, install them with a PH0 cross head screwdriver. The tightening torque of screw is 0.5N.m. Please pay attention to followings based on different features of these two terminals:

- Clamp wiring terminal
  - 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.
- Barrier wiring terminal
  - Take a circular or a U-type clamp terminal with holes of 3.5mm.

3.3.4 Control Circuit Wiring Precautions

- Separate the control circuit cable from the other cables.
- Separate the cables of control circuit terminals EA, EB, EC, Y1, and Y2 from the cables of other control circuit terminals.
- Use shielded twisted-pair cables for control circuit to prevent malfunctions. The wiring distance should be in a maximum of 50m.
- Wrap the shield net with insulating tape to prevent the shield net from contacting with other signal cables and housing of device.

3.3.5 Standard Control Circuit Wiring

See Figure 3-17 for standard control circuit wiring of EM303A.

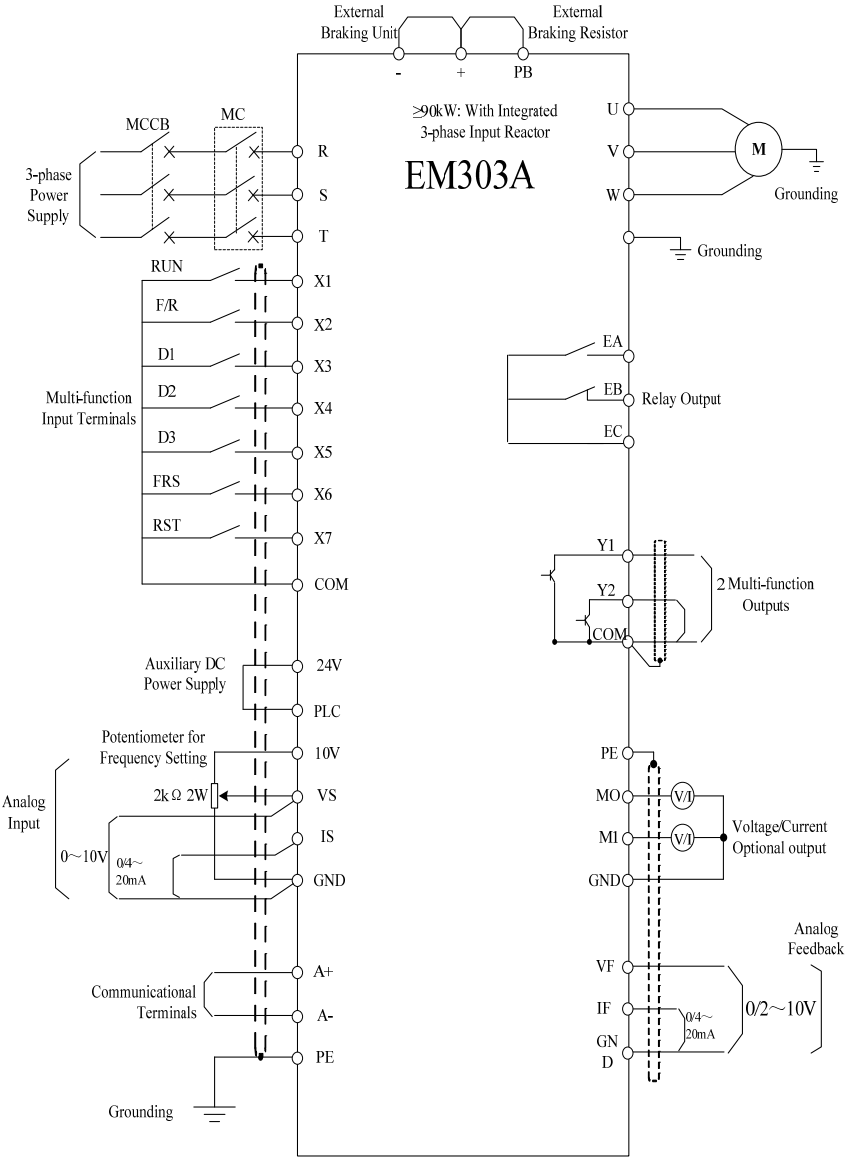


Figure 3-17 Standard Control Circuit Wiring of EM303A

Remarks: EM303A-055 or above: No PB terminal.

3.4 Extending Keypad Wire

Disassemble the keypad of EM303A as per the method shown in Figure 2-3, connect to an extension wire, and then assemble the keypad in a proper place and take it as a control panel. Disassemble the keypad and connect extension keypad wire by following the method as shown in Figure 3-18. If the extension wire exceeds 10m, a remote control keypad is required.

If the keypad wire is also a control circuit wire, wiring precautions as stated in 3.3.4.

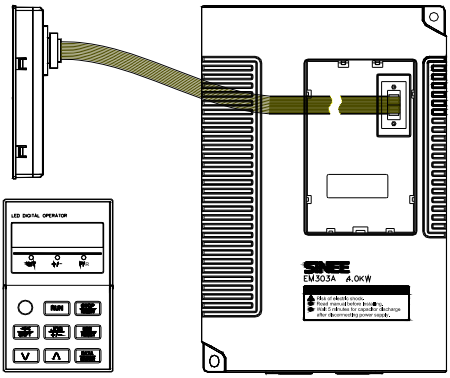


Figure 3-18 Disassemble the Keypad and Connect Extension Keypad Wire

3.5 Wiring Check

Perform the following checks after wiring has been completed:

- If wiring is correct.
- 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 Type and Function of Keypad

EM303A keypad consists of 5-bit LED display, operation buttons and analog potentiometer. As shown in Figure 4-1.

User can perform function setting, status monitoring, fault monitoring, start/stop control, and jog operation for EM303A through keypad.

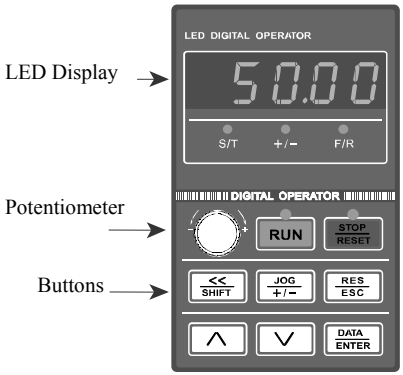
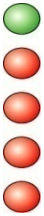


Figure4-1 LED Keypad

Name and function of each button on the keypad refer to Table 4-1.

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

Part	Name	Function
<< / SHIFT	Left Shift	Select the bit of setting parameters. Select the row of monitoring parameter in operation.
RES / ESC	Reset/Escape	Reset previous status. Escape from editing the present parameter.
JOG / + / −	Button for Multi-functional programming	For programmable JOG or forward/reverse selection
DATA / ENTER	ENTER	Save edited parameter of present function code. For entering sub-menu.
RUN	RUN	In keypad control mode, press the button to start inverter.
STOP / RESET	STOP/RESET	In keypad control mode, press the button to stop inverter. Reset setting status from fault status when faults trip.
50.00 S/T +/- F/R	LED	Display function setting, running monitoring, fault monitoring codes and parameters.

	UP	Select function parameter, menu or increase the value of setting parameters, and increase the present effective reference numeric input data.
	DOWN	Select function parameter, menu or reduce the value of setting parameter, and reduce the present effective reference numeric input data.
	Status Indicator	RUN:Green On: the inverter is running. Flashing: the inverter is stopping. STOP: Red On: the inverter fails. S/T: Red Off: in speed control mode On: in torque control mode +/-: Red Off: + positive input signal On: - negative input signal F/R: Red Off: output frequency≥0, forward On: output frequency<0, reverse.
	Analog Potentiometer	Regulate speed as per input analog value.

4.2 LED Keypad Operation Mode

There are 6 keypad operation modes of EM303A: function setting, parameter copy, operation monitoring, fault monitoring, jog running, and start/stop. Keypad operation modes are as shown in Table 4-2.

Table 4-2 Keypad Operation Modes

Keypad Operation Mode	Key Function
Function Setting	1. Display, edit, save, reset and lock the function code and its parameters. 2. Reset default of the parameters. 3. Select relevant parameter when the inverter is running.
Function Parameter Copy	1. Upload parameter: Upload the parameters saved in the inverter to keypad. 2. Download parameter: Download the parameters saved in the keypad to inverter. Combine those above two modes to easily and quickly copy parameters for multi-inverter.
Running Monitoring	1. Randomly select function parameters C0-00～C0-31 display when the inverter is running.
Fault Monitoring	1. Fault details. 2. Output frequency, DC bus voltage, output current, running direction, and running status when fault occurs. 3. The last 3 faults.
Jog	Press JOG button in setting status,, the inverter runs as per the setting frequency. Release the JOG button, the inverter will stop.
Start/Stop	Press RUN and then release in keypad start/stop mode, inverter starts to run. Press STOP/RESET button in operation status, inverter stops.

Function setting, operation monitoring and fault monitoring are operated by menu setting. Start/stop, jog and keypad numeric potentiometer are operated by single button.

5 Trial Operation

5.1 Trial Operation Procedures

Table 5-1 Procedures of Trial Operation

Procedure	Working Scope
Installation	Check inverter's rated power, and install the inverter as per the requirements stated in Chapter 2.
Wiring the Inverter	Wiring as per the requirements stated in Chapter 3.
Check Before Power-on	1. Be sure the input power supply is correct 2. The input power supply connects to a circuit breaker 3. The inverter is grounded. 4. Power supply cable is connected to input terminals R, S and T of the inverter correctly 5. Motor is connected to output terminals U, V, and W of the inverter correctly. 6. Correct control circuit wiring. 7. External switch is at right status. 8. Motor is disconnected to the mechanical system when idling.
Check at Power-on	1. Check if there is unexpected noise, odd smell, or smoke with inverter. 2. When power is on, normal display on control panel, no alarming. 3. Turn off the power immediately if any emergency, and check as per the instruction in Chapter 9.
Parameter Setting	After the initial operation of inverter, maintenance or motor replaced, reset the parameters as defaults, and then conduct following operations.
Input Correct Motor Nameplate Parameter	Input and confirm the parameters listed on motor nameplate. Otherwise, serious damage may occur in operation.
Setting Protection Parameter of Motor and Inverter	Set correct limit parameters, protection parameters and protection modes of inverter and motor, mainly as: maximum frequency, upper-limit frequency, lower-limit frequency, lower-limit frequency running time, fault retry control, relay fault output.
Autotuning Motor Parameter	1. Obtain correct motor parameters by autotuning motor parameter before the initial operation in selecting vector control mode. 2. Use stationary autotuning motor parameter if motor cannot disconnect the load. 3. Do not autotune motor parameters if the motor is running.

<table>
<tr><td colspan="3">Setting Operation Control Parameter</td><td>General Parameter</td><td>Set rotational direction, F/R control, acceleration/deceleration time, control mode, star/stop mode, and input mode directly based on driving system working conditions.</td></tr>
<tr><td colspan="3"></td><td>V/F Control</td><td>Set parameters of V/F curve scaling, torque boost, slip compensation, and AVR function based on load needs.</td></tr>
<tr><td colspan="3"></td><td>Vector Control</td><td>Set parameter of regulator and torque control, and setting parameters based on load conditions.</td></tr>
<tr><td colspan="4">Idling Trial Operation Check</td><td>When motor is idling, start inverter in keypad or terminal control mode, check and confirm the running status of drive system.
1. Motor: stable operation, normal rotation, correct rotational direction, normal acceleration/deceleration process, no unexpected vibration, noise or odd smell.
2. Inverter: correct data displayed on the control panel, fans and relays working stably, no unexpected vibration or odd smell.
3. Turn off the power immediately if anything unexpected.</td></tr>
<tr><td colspan="4">On-load Trial Operation Check</td><td>1. If idling check is normal, connect the drive system to load.
2. Turn on the inverter by terminal or keypad, increase load directly, and monitoring the operation of system when connected to load.
3. Turn off the power immediately if anything unexpected.</td></tr>
<tr><td rowspan="7">Normal Operation</td><td colspan="3">Basic Operation</td><td>Inverter can conduct basic operation such as normal start, operation, stop, forward/reverse, and etc. Otherwise, please check if input and start/stop function codes are accurately set.</td></tr>
<tr><td rowspan="3">Advanced Operation</td><td rowspan="2">Speed Control</td><td>Program Operation</td><td>After setting program operation codes, system can operate in monocycle or recycle mode. Please check program operation codes if anything unexpected.</td></tr>
<tr><td>PID Operation</td><td>Customer can set PID process control channel and PID regulator parameters to control industrial process according to the drive system demand.</td></tr>
<tr><td colspan="2">Torque Control</td><td>Control the output torque based on the input torque command value.</td></tr>
<tr><td rowspan="4">Performance Setting</td><td colspan="2">Speed Search</td><td>The inverter will automatically detect motor’s rotational status at start, and switch to operation smoothly to reduce start-up shock.</td></tr>
<tr><td colspan="2">S-Curve Acceleration/ Deceleration</td><td>Mainly used for the drive system with big inertia and the occasion which is sensitive to acceleration, to reduce mechanical shock and avoid system vibration.</td></tr>
<tr><td colspan="2">DC Brake</td><td>Input DC current to the running motor to generate brake torque before start-up or at stop, it makes the motor stop quickly.</td></tr>
<tr><td colspan="2">Special Terminal Control</td><td>EM303A provides multiple programmable input/output terminals which can connect external controller to satisfy various applications.</td></tr>
</table>

5.2 Trial Operation Precautions

5.2.1 Turn off the Power

Checks before power-off:

- Voltage of power supply:3-phase 380V/415V, 50Hz
- Connect the input power supply cable to the input terminals R,S, and T of inverter
- Connect the output terminals U, V, and W of inverter to the input terminals of motor
- All control circuit terminals are connected to correct control device, and terminals shall be off.
- Motor is idling.
- Turn the power off after all above setting have been confirmed.

■ ⊕.⊖ are the output terminals of inverter's DC bus voltage, ⏚ is grounding terminal, PB is wiring terminal of braking resistor. Any damage resulted from incorrect wiring shall not in warranty.

5.2.2 Check at Power-on

After the inverter starts up, the present working status and parameters will be displayed on the keypad. See Chapter 9 if anything unexpected displayed on keypad.

5.2.3 Idling Operation

When motor is idling without mechanical load, the inverter is in keypad or terminal control mode, try to run the motor. The idling trial operation procedures as shown in followings:

- **Setting Reference Frequency**

  The default of reference frequency is 0.00Hz. Before trial operation, confirm the setting frequency of F0-00, and set the expected frequency through F0-07.

- **Starting the Inverter**

  1.In function setting status, press JOG, inverter starts up as per setting frequency of F0-11(The default is 5.00Hz), and motor runs in the direction as presently set, monitoring if it runs in a correct direction.

  2.Press RUN on the keypad or turn the start terminal on, the motor runs to the setting frequency of F0-00 displayed.

  3.When reverse terminal is on, the motor reverses to setting frequency.

  4.Press UP/ DOWN to regulate the speed of motor during running process.

  5.Press STOP to enter ramp-to-stop status, the speed of motor decreases until the motor stops.

- **Operation Status Monitoring**
  1. Change input frequency or rotation direction, and monitor if there is vibration or unexpected noise with the motor or not.
  2. Check if inverter runs stably.

5.2.4 On-Load Operation

After idling operation of motor is succeeded, connect motor to the mechanical load for a trial operation.

- **Connecting Motor to Mechanical Load**
  1. After motor stops, turn off the power of inverter, and connect the motor to mechanical load.
  2. **Tighten up screw to locate the mechanical load onto the motor shaft.**

- **Starting up the Inverter**
  1. Start up the inverter in the same way as that in idling operation.
  2. Set the frequency about 1/10 of the normal running speed.

Get ready for pressing STOP in case of anything unexpected.

- **Operation Status Monitoring**
  1. Monitor that the motor runs in the correct direction,
  2. Increase frequency setting only after load mechanism is stable when running at a low speed.
  3. Change the input frequency or rotation direction of motor, and monitor whether there is vibration or unexpected noise with motor or not.
  4. Monitor the parameters of C0-12 or C0-13 in running, and confirm whether the output current of the inverter is normal.

6 Parameter Tables

6.1 Format of Parameter Tables

17 groups of parameter of EM303A: F0, F1, F2, F3, F4, F5, F6, F7, F8, F9, FA, Fb, FC, Fd, FE, C0, and E0, 32 items in each group.
F0~FE are function setting parameters which consist of two sections. The 1st section F0~F4 are general parameters, and the 2nd section F7~FE are advanced parameters.
Group C0 are status monitoring parameters.
Group E0 are fault monitoring parameters.

When F0-27=0, the inverter only displays the parameters of Group F0~F5, C0, and E0.
When F0-27=1, the inverter displays all parameters.

The 1st column is the number of the parameter.
The 2nd column is the function of parameter.
The 3rd column is the range of parameter.
The 4th column is the parameter unit.
The 5th column is the parameter default. For instance, XXX represents that the parameter default varies with the power ratings of inverter.
The 6th column is the type of parameter (whether the parameter is editable or not). Details shown as followings:
"●" : Parameter editing is permitted when the inverter is running.
"○" : Parameter editing is prohibited when the inverter is running.
"◇": The inverter can process automatically according to parameter type.
"X": The parameter is read only.

Unit and Its Abbreviation

HOUR	Hour	m	Meter	%	Percentage ★	SQRT	Square Root
min	Minute	mm	Millimeter	rpm	Revolutions per minute	A	Ampere
S	Second	Hz	Herz	MAX	Maximum	V	Voltage
mS	Millisecond	kHz	Kiloherz	MIN	Minimum	SECT	Program Section
mH	Millihenry	kW	Kilowatt	bps	Bits per second		

★ The basic value of percentage is the rated value.

6.2 Parameters

Section 1 General Parameters

6.2.1 Group F0: General Parameters

No.	Function	Range	Unit	Default	Type
F0-00 (L) F0-01 (H)	Speed Reference Input Monitoring Torque Reference Input Monitoring	Frequency: 0.00～Fmax/0.0～Fmax Speed: 0～F*Customer defined scaling Torque input: 0.00~Limited torque	Hz rpm %	0.00/0 0.0/0 0.00	X
F0-02	Drive Control Mode	0: V/F open loop Control 1: Not used 2: SVC0 3: SVC1		2	○
F0-03	Setting Input Control Mode	0: Speed input 1: Torque input		0	○
F0-04	Start/Stop Control Options	0: Keypad 1: Terminal 2: RS485		0	○
F0-05	Terminal Start/Stop Control Selection	0: RUN-Run, F/R-Forward/Reverse 1: RUN-Forward, F/R- Reverse 2: RUN-NO forward, Xi-NC stop, F/R-NO reverse 3: RUN-NO run, Xi-NC stop, F/R- Forward/Reverse		0	○
F0-06	Regular Speed Setting Mode	0: Primary Numeric Frequency 1: VP 2: VS 3: IS 4: Not Used 5: K3*VS+K4*IS 6: K3*VS+K5*VF 7: K4*IS+K6*IF 8: MAX{K3*VS,K5*VF} 9: MAX{K4*IS,K6*IF} 10: K1*VP+K2*(K3*VS+K4*IS+K5*VF+K6*IF-K8*5V)		1	○
F0-07	Primary Numeric Frequency Setting	0.00~Fmax/0.0~Fmax	Hz	0.00	●
F0-08	Motor Running Direction	0: Forward 1: Reverse		0	●
F0-09	Acceleration Time 1	0.00~600.00	S/min	15.00	●
F0-10	Deceleration Time 1	0.00~600.00	S/min	15.00	●
F0-11	Jog Numeric Frequency	0.00~Fmax/0.0~Fmax	Hz	5.00	●
F0-12	Jog Acceleration	0.00~600.00	S/min	15.00	●

	Time				
F0-13	Jog Deceleration Time	0.00~600.00	S/min	15.00	●
F0-14	Carrier Frequency	1.000~16.000	kHz	2.000	●
F0-15	Torque Boost	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	●
F0-16	Maximum Frequency	Fmax: 20.00~600.00/20.0~6000.0	Hz	50.00	○
F0-17	Upper Limit Frequency	Fup: Fdown~Fmax	Hz	50.00	○
F0-18	Lower Limit Frequency	Fdown: 0.00~Fup/0.0~Fup	Hz	0.00	○
F0-19	Start Mode Options	0: Normal start 1: Speed search start		0	○
F0-20	Stop Mode Options	0: Ramp to stop 1: Coast to stop		0	○
F0-21	Function Setting for JOG/+- button	0: Jog running 1: Positive/Negative input switching 2: Disabled		0	○
F0-22	Speed Monitoring Options	0: Frequency Hz 1: Speed rpm		0	●
F0-23	Customer Defined Scaling	0.01~600.00		30.00	●
F0-24	Forward/Reverse Control Mode	0: Forward/Reverse Permitted 1: Reverse Prohibited		0	○
F0-25	F/R Deadband	0.00~600.00	S	0.00	○
F0-26	Primary Speed Setting Mode	0: Regular speed setting mode 1: Special speed setting mode 2: Process PID input mode		0	○
F0-27	Menu Mode Options	0: Basic menu mode 1: Advanced menu mode		0	○
F0-28	Default Control	0: Disabled 1:Defaults Reset (Remarks: Defaults reset takes 8S.)		0	○
F0-29	Parameter Setting Control	0:Parameter setting permitted 1:Parameter lock 0 2: Parameter lock 1		0	○
F0-30	Inverter Model	0: Model G 1: Model P		0	○
F0-31	User Password	0~65535		XXXXX	○

6.2.2 Group F1: Motor Parameters

No.	Function	Range	Unit	Default	Type
F1-00	Motor Type	0: AC induction motor 1: Not used		0	○
F1-01	Motor Rated Power	0.40~480.00	kW	XXXX	○
F1-02	Motor Rated Voltage	60~660	V	XXX	○
F1-03	Motor Rated Current	0.1~1500.0	A	XXXX	○
F1-04	Motor Rated Frequency	20.00~600.00/20.0~6000.0	Hz	XXXX	○
F1-05	Motor Rated Speed	1~30000	rpm	XXXX	○
F1-06	Motor Wiring Mode	0: Y Wiring 1: Δ Wiring		X	○
F1-07	Motor Rated Power Factor	0.50~0.99		X	○
F1-08	Idling Excitation Current	0.1~1500.0	A	XXXX	○
F1-09	Rated Torque Current	0.1~1500.0	A	XXXX	○
F1-10	Stator Resistance R1	0.01~300.00	Ω	XXXX	○
F1-11	Rotator Resistance R2	0.01~300.00	Ω	XXXX	○
F1-12	Stator& Rotor Leakage Inductance Ls	0.1~3000.0	mH	XXXX	○
F1-13	Stator& Rotor Mutual Inductance Lm	0.1~3000.0	mH	XXXX	○
F1-14	Motor Efficiency	30.0~99.0	%	XXXX	○
F1-15	Autotuning Parameters	0:No autotuning 1:Staionary autotuning 2: Rotational autotuning		0	○
F1-16	Inverter Address	0～247, 0：Broadcasting Address		1	○
F1-17	Communication Bit Rate	0: 4800 1: 9600 2: 19200 3: 38400	bps	1	○
F1-18	Communication Parity Mode	0: No parity 1+8+1 1: Even parity 1+8+1+1 2: Odd parity 1+8+1+1		0	○
F1-19	Master-slave Communication Mode	0:The inverter is the slave 1:The inverter is the master		0	○
F1-20	Master Writes the Address of Slave Inverter	0:Primary Numeric Frequency F0-07 1:Auxiliary Numeric Frequency F9-06		0	○
F1-21	Inverter Receiving Proportion Coefficient	0.00~600.00	%	100.00	●
F1-22	Analog Input Gain K1	0.00~600.00	%	100.00	●
F1-23	Analog Input Gain K2	0.00~600.00	%	0.00	●
F1-24	Analog Input Gain K3	0.00~600.00	%	100.00	●
F1-25	Analog Input Gain K4	0.00~600.00	%	0.00	●
F1-26	Analog Input Gain K5	0.00~600.00	%	0.00	●
F1-27	Analog Input Gain K6	0.00~600.00	%	0.00	●
F1-28	Analog Input Gain K7	0.00~600.00	%	0.00	●
F1-29	Analog Input Gain K8	0.00~600.00	%	0.00	●
F1-30	Communication Overtime	0（Disabled） 0.1～60.0	S	0	●
F1-31	Not Used				

6.2.3 Group F2: Input/Output Terminal Parameters

No.	Function	Range	Unit	Default	Type
F2-00	Multi-function Input Terminal X1-RUN	See Table 6-1 Functions of Numeric Multi-function Input Terminals		1	○
F2-01	Multi-function Input Terminal X2-F/R			2	○
F2-02	Multi-function Input Terminal X3-D1			3	○
F2-03	Multi-function Input Terminal X4-D2			4	○
F2-04	Multi-function Input Terminal X5-D3			5	○
F2-05	Multi-function Input Terminal X6-FRS			9	○
F2-06	Multi-function Input Terminal X7-RST			10	○
F2-07	Not used				
F2-08	VS Input Function Defining			0	○
F2-09	IS Input Function Defining			0	○
F2-10	VF Input Function Defining			0	○
F2-11	IF Input Function Defining			0	○
F2-12	Multi-function Output Terminal Y1	See Table 6-2 Functions of Numeric Multi-function Output Terminals		0	○
F2-13	Multi-function Output Terminal Y2			1	○
F2-14	Relay Output Terminal R1			9	○
F2-15	Not Used				
F2-16	Analog Output Terminal M0	See Table 6-3 F2-16~F2-20 Analog Output Full Scale	%	0	○
F2-17	Analog Output Terminal M1		%	6	○
F2-18	Not Used				
F2-19	Jog Analog Output Terminal M0		%	0	○
F2-20	Jog Analog Output Terminal M1		%	6	○
F2-21	Not Used				
F2-22	M0 Output Lower Limit	0.00~100.00	%	0.00	●
F2-23	M0 Output Upper Limit	0.00~100.00	%	100.00	●
F2-24	M0 Output Gain	0.00~300.00	%	100.00	●
F2-25	M1 Output Lower Limit	0.00~100.00	%	0.00	●
F2-26	M1Output Upper Limit	0.00~100.00	%	100.00	●
F2-27	M1 Output Gain	0.00~300.00	%	100.00	●
F2-28～F2-31 Not used					

Table 6-1 Functions of Numeric Multi-function Input Terminals

No.	Function	No.	Function
0	Disabled	28	Switching Speed Input Setting to Auxiliary Speed Setting
1	RUN	29	Switching Primary Speed Setting to Regular Speed Setting
2	F/R Forward/Reverse Command	30	Switching Regular Speed Input Setting to Numeric Speed Input
3	Preset Speed Terminal 1	31	Switching Jog Input Setting to Jog Numeric Speed Input Setting
4	Preset Speed Terminal 2	32	Switching Torque Input Setting to Primary Torque Setting
5	Preset Speed Terminal 3	33	Switching Torque Input Setting to Auxiliary Torque Setting
6	Preset Speed Terminal 4	34	Switching Primary Torque Setting to Auxiliary Torque Setting
7	Acceleration Time Terminal 1	35	Switching Regular Torque Input Setting to Numeric Torque Input Setting
8	Acceleration Time Terminal 2	36	Switching Special PID Setting to Regular PID Setting
9	Coast to Stop	37	PID Positive/Negative Setting Switch
10	Inverter Fault Reset	38	Preset Process PID Terminal 1
11	Forward Jog FJOG	39	Preset Process PID Terminal 2
12	Reverse Jog RJOG	40	Preset Process PID Terminal 3
13	Terminal UP	41	Preset Torque Current Terminal 1
14	Terminal DOWN	42	Preset Torque Current Terminal 2
15	UP/DOWN Clearing	43	Preset Torque Current Terminal 3
16	Acceleration/Deceleration Prohibited	44	Preset Current Limit Terminal 1
17	Not Used	45	Preset Current Limit Terminal 2
18	3-wire Sequence Run/Stop Control (Pulse Stop)	46	Preset Current Limit Terminal 3
19	Stop DC Brake Command	47	Start Wobbulation Operation
20	Switching Drive Control Mode to V/F Control Mode	48	Not Used
21	Switching Run Command to Terminal Control Mode	49	Program Operation Reset
22	Run Command Channel 0	50	Alternate Motor Switching
23	Run Command Channel 1	51	External Fault Input
24	Switching Input Control Mode to Speed Control Mode	52	Not Used
25	Switching Input Control Mode to Torque Control Mode	53	Not Used
26	Not Used	54	Not Used
27	Switching Speed Input Setting to Primary Speed Setting		

Table 6-2 Functions of Numeric Multi-function Output Terminals

No.	Function	No.	Function
0	Inverter Runs(Enabled at running)	17	Overload Alarming Output
1	Frequency Reach Signal FAR (Enabled at running)	18	Overvoltage Stall
2	Output Frequency Detection Range FDT1(Enabled at running)	19	Current Limit
3	Output Frequency Detection Range FDT2(Enabled at running)	20	Frequency Zero Speed Detection (Output Frequency Detection)
4	Output Frequency Detection Range FDT1(Disabled at JOG)	21	Motor Zero Speed Detection (Residual Voltage Frequency Detection)
5	Output Frequency Detection Range FDT2(Disabled at JOG)	22	Motor 2 Enabled
6	Forward/Reverse(Enabled at running)	23	Setting running time is up
7	Frequency Input/Output Balance (Enabled at running)	24	Not Used
8	JOG	25	Not Used
9	Inverter Fault	26	Inverter is ready for running
10	Upper Limit Frequency Reach	27	Not Used
11	Lower Limit Frequency Reach	28	FDT1 Lower Limit (Pulse)
12	PID Feedback Upper Limit	29	FDT2 Lower Limit (Pulse)
13	PID Feedback Lower Limit	30	FDT1 Lower Limit (Disabled at JOG, Pulse)
14	Analog Variables Detection Range ADT1	31	FDT2 Lower Limit (Disabled at JOG, Pulse)
15	Analog Variables Detection Range ADT2	32	ILP Fault
16	Analog Variables Detection Range ADT3		

Table 6-3 Analog Outputs Full Scales

No.	Signal	Full Scale (100.0%)	No.	Signal	Full Scale (100.0%)
0	Output Frequency	Fmax	11	IS	20mA
1	Input Frequency	Fmax	12	IF	20mA
2	Synchronous Frequency	Fmax	13	Not Used	
3	PG Feedback Frequency	Fmax	14	+10V	+10V
4	Estimated Feedback Frequency	Fmax	15	PID Input	10.00V
5	Estimated Slip Frequency	Fmax	16	PID Feedback	10.00V
6	Output Current	Inverter Rated Current	17	Torque Current Input I_q^*	Rated Torque Current
7	Output Voltage	Inverter Rated Voltage	18	Torque Current Feedback Iq	Rated Torque Current
8	VP	10.00V	19	DC Bus Voltage	DC Bus Voltage at Rated Input Voltage
9	VS	10.00V	20	Output Power	Inverter Rated Frequency
10	VF	10.00V			

6.2.4 Group F3: Preset Speed Operation Parameters

No.	Function	Range	Unit	Default	Type
F3-00	Preset Speed 1	0.00~Fmax/0.0~Fmax	Hz	0.00	●
F3-01	Preset Speed 2	0.00~Fmax/0.0~Fmax	Hz	5.00	●
F3-02	Preset Speed 3	0.00~Fmax/0.0~Fmax	Hz	10.00	●
F3-03	Preset Speed 4	0.00~Fmax/0.0~Fmax	Hz	15.00	●
F3-04	Preset Speed 5	0.00~Fmax/0.0~Fmax	Hz	20.00	●
F3-05	Preset Speed 6	0.00~Fmax/0.0~Fmax	Hz	25.00	●
F3-06	Preset Speed 7	0.00~Fmax/0.0~Fmax	Hz	30.00	●
F3-07	Preset Speed 8	0.00~Fmax/0.0~Fmax	Hz	35.00	●
F3-08	Preset Speed 9	0.00~Fmax/0.0~Fmax	Hz	40.00	●
F3-09	Preset Speed 10	0.00~Fmax/0.0~Fmax	Hz	45.00	●
F3-10	Preset Speed 11	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-11	Preset Speed 12	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-12	Preset Speed 13	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-13	Preset Speed 14	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-14	Preset Speed 15	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-15	Acceleration Time 2	0.00~600.00	S/min	15.00	●
F3-16	Deceleration Time 2	0.00~600.00	S/min	15.00	●
F3-17	Acceleration Time 3	0.00~600.00	S/min	15.00	●
F3-18	Deceleration Time 3	0.00~600.00	S/min	15.00	●
F3-19	Acceleration Time 4	0.00~600.00	S/min	15.00	●
F3-20	Deceleration Time 4	0.00~600.00	S/min	15.00	●
F3-21	Acceleration/Deceleration Time Unit	0: S 1: min		0	○
F3-22	DC Brake Propotion at Start	0.00~30.00 , 30.01~150.00	%	35.00	○
F3-23	DC Brake Time at Start	0.00~30.00	S	0.00	○
F3-24	DC Brake Start Frequency at Stop	0.10~60.00/0.1~60.0	Hz	2.00	○
F3-25	DC Brake Propotion at Stop	0.00~30.00, 30.01~150.00	%	35.00	○
F3-26	DC Brake Waiting Time	0.00~30.00	S	0.00	○
F3-27	DC Brake Time at Stop	0.00~30.00	S	0.00	○
F3-28	Lower Limit Frequency Control	0: Run as per Lower Limit Frequency 1: Run at zero speed after lower limit frequency operation time is up.		0	○
F3-29	Lower Limit Frequency Running Time	0.00~600.00	S	60.00	○
F3-30	Open Loop Slip Compensation	0.00~200.00	%	0.00	●
F3-31	Parameter Copy	0: No Copy 1: Upload Parameter (From Inverter to Keypad) 2:Download Parameter (From Keypad to Inverter)		0	○

6.2.5 Group F4: General Parameters of PID

No.	Function	Range	Unit	Default	Type
F4-00	PID Regular Setting Mode	0: Numeric PID Setting 1: VS 2: IS 3: VF 4: IF 5: VP		0	○
F4-01	PID Numeric Setting	0.00~10.00	V	5.00	●
F4-02	PID Feedback Channel	0: VF 1: IF 2: VS 3: IS		0	○
F4-03	PID Monitoring Options	0: Voltage-V 1: Actual Physical Quantity (V*Display Coefficient)		0	○
F4-04	PID Display Coefficient	0.01~100.00		1.00	●
F4-05	PID Positive/ Negative Setting	0: Positive Setting 1: Negative Setting		0	○
F4-06	PID Output Gain	0.00~100.00	%	100.00	●
F4-07	Proportion Gain GP	0.00~100.00		0.40	●
F4-08	Integration Time GTi	0.000~30.000 0.000:No Integration	S	10.000	●
F4-09	Differentiation Time GTd	0.000~10.000	S	0.000	●
F4-10	Integration Function Scale	0.00~100.00	%	100.00	●
F4-11	PID Positive Output Limit	0.00~100.00	%	100.00	●
F4-12	PID Negative Output Limit	0.00~100.00	%	0.00	●
F4-13	Menu Display Control 1	Fd. FC. Fb. FA. F9. F8. F7. F6. 1 1 1 1 1 1 1 1 0：No Display， 1：Display		11111111	●
F4-14	Menu Display Control 2	*. *. *. *. *. *. FF. FE. 0 0 0 0 0 0 1 1 0：No Display， 1：Display		00000011	●
F4-15	Monitoring Reference Selection	* * Estimated Slip Estimated Speed * Sync-Freq. Inp. Freq. Outp. Freq. 0 0 1 1 1 1 1 1 0：Absolute Value， 1：+/-		11111111	○

F4-16	LCD Language Options	0: Chinese, 1: English		0	○
F4-17	Not Used				
F4-18	If Parameters Change with inverter's working status	0: Unchanged 1: Changed		1	○
F4-19	Parameter Setting Display	0~831		0	●
F4-20	Parameters displayed in the 1st row in operation	0~831		512	●
F4-21	Parameters displayed in the 2nd row in operation	0~831		514	●
F4-22	Parameters displayed in the 3rd row in operation	0~831		524	●
F4-23	Parameters displayed in the 4th row in operation	0~831		525	●
F4-24	Parameters displayed in the 1st row at stop	0~831		512	●
F4-25	Parameters displayed in the 2nd row at stop	0~831		514	●
F4-26	Parameters displayed in the 3rd row at stop	0~831		524	●
F4-27	Parameters displayed in the 4th row at stop	0~831		528	●
F4-28～F4-31		Not Used			

6.2.6 Group F5: General Parameters of Vector Control

No.	Function	Range	Unit	Default	Type
F5-00	Speed Proportion Gain ASR_P1	0.00~100.00	%	15.00	●
F5-01	Speed Integration Time ASR_Ti1	0.000~30.000 0.000: No Integration	S	0.200	●
F5-02	Speed Differentiation Time ASR_Td1	0.000~10.000	S	0.000	●
F5-03	Speed Proportion Gain ASR_P2	0.00~100.00	%	15.00	●
F5-04	Speed Integration Time ASR_Ti2	0.000~30.000 0.000：No Integration	S	0.200	●
F5-05	Switching Frequency 0	0.00~Switching Frequency 1	Hz	5.00	○
F5-06	Switching Frequency 1	Switching Frequency 0~Fmax	Hz	5.00	○
F5-07	Torque Current Acceleration Time	0.000~30.000	S	0.040	●
F5-08	Torque Current Deceleration Time	0.000~30.000	S	0.040	●
F5-09	Power Torque Current Limit	80.00~180.00	%	165.00	●
F5-10	Brake Torque Current Limit	80.00~180.00	%	120.00	●
F5-11	Regular Torque Setting	0:Primary Numeric Torque Setting 1: VP 2: VS 3: IS 4: VF 5: IF 6: Not Used 7: K1*VP+K2*(K3*VS+K4*IS+K5*VF+K6*IF-K8*5V)		0	○
F5-12	Primary Numeric Torque Current	0.00~150.00	%	0.00	●

F5-13	Torque Direction	0: Positive Torque 1:Negative Torque		0	●
F5-14	Upper Limit Frequency Limiting of Torque Control	0: Upper Limit Frequency 1: VS* Upper Limit Frequency 2: IS*Upper Limit Frequency 3: VF*Upper Limit Frequency 4: IF*Upper Limit Frequency		0	○
F5-15	Preset Torque Current 1	0.00~150.00	%	10.00	●
F5-16	Preset Torque Current 2	0.00~150.00	%	20.00	●
F5-17	Preset Torque Current 3	0.00~150.00	%	30.00	●
F5-18	Preset Torque Current 4	0.00~150.00	%	70.00	●
F5-19	Preset Torque Current 5	0.00~150.00	%	80.00	●
F5-20	Preset Torque Current 6	0.00~150.00	%	90.00	●
F5-21	Preset Torque Current 7	0.00~150.00	%	100.00	●
F5-22	Positive/Negative Torque Control	0: Positive/Negative Torque Permitted 1: Negative Torque Prohibited		0	○
F5-23	Positive/Negative Torque Deadband	0.00~600.00	S	0.00	○
F5-24	Torque Current Gain TP1	0.00~10.00	%	0.60	●
F5-25	Torque Current Integration TTi1	0.000~30.000	S	0.020	●
F5-26	Excitation Current Input	0.00~200.00	%	100.00	●
F5-27	Excitation Proportion Gain MP1	0.00~10.00	%	0.20	●
F5-28	Excitation Integration Time MTi1	0.000~10.000	S	0.200	●
F5-29	Excitation Boost Gain Kd	0.00~400.00	%	100.00	●
F5-30	Excitation Current Forming Time	0.00～10.00	S	0.10	○
F5-31	Not Used				

6.2.7 Group C0: Monitoring Parameters

No.	Function	Range	Unit	Default	Type
C0-00 C0-01	Output Frequency	0.00~Fup/0.0~Fup	Hz	512	×
C0-02 C0-03	Output Frequency Torque Upper Limit Frequency	0.00~Fmax/0.0~Fmax	Hz	514	×
C0-04 C0-05	Synchronous Frequency	0.00~Fup/0.0~Fup	Hz	516	×
C0-06~ C0-07 Not Used					
C0-08 C0-09	Estimated Feedback Frequency	0.00~Fup/0.0~Fup	Hz	520	×
C0-10 C0-11	Estimated Slip Frequency	0.00~Fup/0.0~Fup	Hz	522	×
C0-12	Output Current Percentage	0.00~100.00	%	524	×
C0-13	Effective Output Current Value	0.0~3000.0	A	525	×
C0-14	Output Voltage Percentage	0.00~100.00	%	526	×
C0-15	Effective Output Voltage Value	0.0~660.0	V	527	×
C0-16	DC Bus Voltage	0~1200	V	528	×
C0-17	Overload Count	0.00~100.00	%	529	×
C0-18	Not Used				
C0-19	Program Operation Section	1~7	SECT	531	×
C0-20	Running Time of Present Section of Program Operation	0.0~6000.0	S/min	532	×
C0-21	Output Power	0.0~3000.0	kW	533	×
C0-22	PID Input	0.00~10.00	V	534	×
C0-23	PID Calculation Feedback	0.00~10.00	V	535	×
C0-24	Torque Current Input I_q^*	0.00~200.00	%	536	×
C0-25	Torque Current Feedback I_q	0.00~200.00	%	537	×
C0-26	Input Terminal Status	X7 X6 X5 X4 X3 X2 X1 0 0 0 0 0 0 0		538	×
C0-27	Output Terminal Status	* * * * R1 Y2 Y2 0 0 0 0 0 0 0		539	×
C0-28	VS Input Monitoring	0-10000		540	×
C0-29	IS Input Monitoring	0-10000		541	×
C0-30	VF Input Monitoring	0-10000		542	×
C0-31	IF Input Monitoring	0-10000		543	×

6.2.8 Group E0: Fault Parameters

No.	Function	Trip and Parameter Description	Unit	Default	Type
E0-00	Fault Trips	00: No fault SC: Short circuit HOC: Instantaneous overcurrent HOU: Instantaneous overvoltage SOC: Stable overcurrent SOU: Stable overvoltage SLU: Stable undervoltage ILP: Input phase loss OL: Overload OH: Heatsink overheating OLP: Not used EXT: External failure PUP: PID upper limit PdN: PID lower limit EEd: Inverter EEPROM failure EEU:Keypad EEPROM failure STP:Autotuning cancelled SFE:Autotuning coast-to-stop SrE:Stator resistance error SIE:Idling current error INP:Internal failure		0	◇
E0-01	Output Frequency at Fault	XX.XX/XX.X	Hz	0.00	◇
E0-02	Output Current at Fault	XXX.X	A	0.0	◇
E0-03	DC Bus Voltage at Fault	XXXX	V	0.0	◇
E0-04	Running Direction at Fault	For: Forward, rEV: Reverse		0	◇
E0-05	Running Status at Fault	ACC: Acceleration CON: Constant speed dEC: Deceleration		0	◇
E0-06	Stall Status at Fault	0：Normal UL：Overvoltage stall CL：Overcurrent stall		0	◇
E0-07	Working Time at Fault		HOUR	0	◇
E0-08	Last Fault	Fault trips		0	◇
E0-09	Output Frequency at Fault	XX.XX/XX.X	Hz	0.00	◇
E0-10	Output Current at Fault	XXX.X	A	0.0	◇

E0-11	DC Bus Voltage at Fault	XXXX	V	0.0	◇
E0-12	Running Direction at Fault	FOr：Forward, rEV：Reverse		0	◇
E0-13	Running Status at Fault	ACC：Acceleration CON：Constant speed dEC：Deceleration		0	◇
E0-14	Stalling Status at Fault	0：Normal UL：Overvoltage stall CL：Overcurrent stall		0	◇
E0-15	Working Time at Fault		HOUR	0	◇
E0-16	Last Two Faults	Fault trips			
E0-17	Output Frequency at Fault	XX.XX/XX.X	Hz	0.00	◇
E0-18	Output Current at Fault	XXX.X	A	0.0	◇
E0-19	DC Bus Voltage at Fault	XXXX	V	0.0	◇
E0-20	Running Direction at Fault	FOr：Forward, rEV：Reverse		0	◇
E0-21	Running Status at Fault	ACC：Acceleration CON：Constant Speed dEC：Deceleration		0	◇
E0-22	Stall Status at Fault	0：Normal UL：Overvoltage stall CL：Overcurrent stall		0	◇
E0-23	Working Time at Fault		HOUR	0	◇
E0-24	Last Three Faults	Fault trips			
E0-25	Output Frequency at Fault	XX.XX/XX.X	Hz	0.00	◇
E0-26	Output Current at Fault	XXX.X	A	0.0	◇
E0-27	DC Bus Voltage at Fault	XXXX	V	0.0	◇
E0-28	Running Direction at Fault	FOr：Forward, rEV：Reverse		0	◇
E0-29	Running Status at Fault	ACC：Acceleration CON：Constant Speed dEC：Deceleration		0	◇
E0-30	Stall Status at Fault	0：Normal UL：Overvoltage stall CL：Overcurrent stall		0	◇
E0-31	Working Time at Fault		HOUR	0	◇

Section 2 Advanced Parameters

6.2.9 Group F6: Program Operation Control (PLC)

No.	Function	Range	Unit	Default	Type
F6-00	Program Operation Mode	Ones place: Options of speed program operation mode 0: Monocycle 1: Operate as per Preset Speed 7 after monocycle 2: Limited times of continuous cycle 3: Continuous cycle Tens place: Options of close-loop PID program operation mode 0: Monocycle 1: Operate as per Preset Speed 7 after monocycle 2: Limited times of continuous cycle 3: Continuous cycle Hundreds place: Options of torque program operation mode 0: Monocycle 1: Operate as per Preset Speed 7 after monocycle 2: Limited times of continuous cycle 3: Continuous cycle Thousands place: Options of restart after operation stopped 0: Restart from the section when it stops 1: Restart from Preset Speed 1 Ten thousands place: Program operation time unit 0: S 1: min		00000	○
F6-01	Preset Program Operation Section 1	Ones place: Options of positive / negative input 0: Positive input 1: Negative input Tens place: Options of acceleration / deceleration time 0: Acceleration / Deceleration time 1 1: Acceleration / Deceleration time 2 2: Acceleration / Deceleration time 3 3: Acceleration / Deceleration time 4 Hundreds place: Saving options at power failure in program operation 0: Not Saved 1: Saved		000	○
F6-02	Preset Program Operation Section 2			000	○
F6-03	Preset Program Operation Section 3			000	○
F6-04	Preset Program Operation Section 4			000	○
F6-05	Preset Program Operation Section 5			000	○
F6-06	Preset Program Operation Section 6			000	○
F6-07	Preset Program Operation Section 7			000	○

F6-08	Operation Time T1	0.0~6000.0	S/min	30.0	●
F6-09	Operation Time T2	0.0~6000.0	S/min	30.0	●
F6-10	Operation Time T3	0.0~6000.0	S/min	30.0	●
F6-11	Operation Time T4	0.0~6000.0	S/min	30.0	●
F6-12	Operation Time T5	0.0~6000.0	S/min	30.0	●
F6-13	Operation Time T6	0.0~6000.0	S/min	30.0	●
F6-14	Operation Time T7	0.0~6000.0	S/min	30.0	●
F6-15	Speed Cycling Times	1~10000		1	●
F6-16	Skip Frequency Point1	0.00~600.00/0.0~6000.0	Hz	600.00	●
F6-17	Skip Range 1	0.00~20.00/0.0~20.0 0.00/0.00: Disabled	Hz	0.00	●
F6-18	Skip Frequency Point 2	0.00~600.00/0.0~6000.0	Hz	600.00	●
F6-19	Skip Range 2	0.00~20.00/0.0~20.0 0.00/0.0: Disabled	Hz	0.00	●
F6-20	Skip Frequency Point 3	0.00~600.00/0.0~6000.0	Hz	600.00	●
F6-21	Skip Range 3	0.00~20.00/0.0~20.0 0.00/0.0: Disabled	Hz	0.00	●
F6-22~ F6-23 Not used					
F6-24	Wobbulation Operation Mode	Ones place: Wobbulation operation control 0:Auto-operation 1:Terminal Control Tens place: Wobbulation input mode 0:Wobbulation operation started after the mid-point reached 1:Start wobbulation operation when its preset time is up		0	○
F6-25	Preset Wobbulation Frequency	0.00~Fmax/0.0~Fmax	Hz	0.00	●
F6-26	Preset Wobbulation Time	0.00~600.00	S	0.00	●
F6-27	Upper Limit Frequency of Wobbulation	0.00~Fmax/0.0~Fmax	Hz	40.00	●
F6-28	Lower Limit Frequency of Wobbulation	0.00~Fmax/0.0~Fmax	Hz	20.00	●
F6-29	Jump Frequency of Wobbulation	0.00~Fmax/0.0~Fmax	Hz	5.00	●
F6-30	Rising Time of Wobbulation	0.00~600.00	S/min	0.00	●
F6-31	Dropping Time of Wobbulation	0.00~600.00	S/min	5.00	●

6.2.10 Group F7: Advanced Parameters of Operation

No.	Function	Range	Unit	Default	Type
F7-00	Overload Alarm Control	Ones place: Overload alarm detection 0: Detect all the time 1: Detect at constant speed Tens place: Stop if alarming 0: No alarm, run continuously 1: Delayed stop after alarm		00	○
F7-01	Overload Alarm Detection Time	0.00~60.00	S	5.00	●
F7-02	Overload Alarm Detection Scaling	0.00~600.00	%	200.00	●
F7-03	Overload Alarm Stop Delay Time	0.00~600.00	S	5.00	●
F7-04	Analog ADT Options	0: VS 0.00~10.00V 1: IS 0.00~10.00V 2: VF 0.00~10.00V 3: IF 0.00~10.00V		2	○
F7-05	Analog ADT1	0.00~100.00	%	20.00	●
F7-06	Analog ADT1 Hysteresis	0.00~100.00 (Monotonic decreasing is active)	%	5.00	●
F7-07	Analog ADT2	0.00~100.00	%	50.00	●
F7-08	Analog ADT2 Hysteresis	0.00~100.00(Monotonic decreasing is active)	%	5.00	●
F7-09	Analog ADT3	0.00~100.00	%	80.00	●
F7-10	Analog ADT3 Hysteresis	0.00~100.00(Monotonic decreasing is active)	%	5.00	●
F7-11	Jog M0 Output Lower Limit	0.00~100.00	%	0.00	●
F7-12	Jog M0 Output Upper Limit	0.00~100.00	%	100.00	●
F7-13	Jog M0 Output Gain	0.00~300.00	%	300.00	●
F7-14	Jog M1 Output Lower Limit	0.00~100.00	%	0.00	●
F7-15	Jog M1 Output Upper Limit	0.00~100.00	%	100.00	●
F7-16	Jog M1 Output Gain	0.00~300.00	%	300.00	●
F7-17～F7-19 Not Used					
F7-20	Automatic PMW	0：Disabled 1：Enabled		0	●
F7-21	Lower Limit Carrier Frequency	1.000~16.000	kHz	2.000	●
F7-22	Upper Limit Carrier Frequency	F7-21~16.000	kHz	8.000	●
F7-23 Not Used					
F7-24	Slip Filter Time	0.01~20.00	S	0.30	●
F7-25	Stator Voltagedrop Compensation Gain	0.00~200.00	%	60.00	●
F7-26	Deadband Compensation Gain	0.00~100.00	%	100.00	●
F7-27	Current Limit at Constant Power Region	0.00~100.00	%	40.00	○
F7-28	Speed Search Timelag	0.05~30.00	S	0.50	○
F7-29	MIN Effective Output Frequency	0.00~Fmax/0.0~Fmax	Hz	0.00	○
F7-30	MIN Acceleration/Deceleration Time	0.05~30.00	S	0.05	○
F7-31	AVR Base	20.00~180.00（Udc_e）	%	100.00	○

6.2.11 Group F8: Input/Output Bias

No.	Function	Range	Unit	Default	Type
F8-00	Voltage /Current Input Options	Ones place: VS voltage options 0: 0~10V 1: 2~10V Tens place: VF voltage options 0: 0~10V 1: 2~10V Hundreds place: IS current options 0: 4~20mA 1: 0~20mA Thousands place: IF current options 0: 4~20mA 1: 0~20mA		0000	○
F8-01	Voltage/Current Bias Options	Ones place: VS voltage bias options 0: Input / output bias 0 1: Input / output bias 1 2: Input / output bias 2 Tens place: VF voltage bias options 0: Input / output bias 0 1: Input / output bias 1 2: Input / output bias 2 Hundreds place: IS current bias options 0: Input / output bias 0 1: Input / output bias 1 2: Input / output bias 2 Thousands place: IF current bias options 0: Input / output bias 0 1: Input / output bias 1 2: Input / output bias 2		2210	○

F8-02	VP Bias Options	0: Input / output bias 0 1: Input / output bias 1 2: Input / output bias 2		2	○
F8-03	VP Filter Time	0.00~60.00	S	0.10	●
F8-04	VS Filter Time	0.00~60.00	S	0.10	●
F8-05	IS Filter Time	0.00~60.00	S	0.10	●
F8-06	VF Filter Time	0.00~60.00	S	0.10	●
F8-07	IF Filter Time	0.00~60.00	S	0.10	●
Input/Output Bias 0					
F8-08	Output Bias 0_0	0.00~100.00	%	0.00	●
F8-09	Output Bias 0_1	0.00~100.00	%	25.00	●
F8-10	Output Bias 0_2	0.00~100.00	%	75.00	●
F8-11	Output Bias 0_3	0.00~100.00 100.00=Fmax	%	100.00	●
F8-12	Input Bias 0_0	0.00~ Input Bias 0_1	%	0.5	●
F8-13	Input Bias 0_1	Input Bias 0_0~ Input Bias 0_2	%	25.00	●
F8-14	Input Bias 0_2	Input Bias 0_1~ Input Bias 0_3	%	75.00	●
F8-15	Input Bias 0_3	Input Bias 0_2~100.00	%	100.00	●
Input/Output Bias 1					
F8-16	Output Bias 1_0	0.00~100.00	%	0.00	●
F8-17	Output Bias 1_1	0.00~100.00	%	25.00	●
F8-18	Output Bias 1_2	0.00~100.00	%	75.00	●
F8-19	Output Bias 1_3	0.00~100.00 100.00=Fmax	%	100.00	●
F8-20	Input Bias 1_0	0.00~ Input Bias 1_1	%	1.00	●
F8-21	Input Bias 1_1	Input Bias 1_0~ Input Bias 1_2	%	25.00	●
F8-22	Input Bias 1_2	Input Bias 1_1~ Input Bias 1_3	%	75.00	●
F8-23	Input Bias 1_3	Input Bias 1_2~100.00	%	99.00	●
Input/Output Bias 2					
F8-24	Output Bias 2_0	0.00~100.00	%	0.00	●
F8-25	Output Bias 2_1	0.00~100.00	%	25.00	●
F8-26	Output Bias 2_2	0.00~100.00	%	75.00	●
F8-27	Output Bias 2_3	0.00~100.00 100.00=Fmax	%	100.00	●
F8-28	Input Bias 2_0	0.00~ Input Bias 2_1	%	1.00	●
F8-29	Input Bias 2_1	Input Bias 2_0~ Input Bias 2_2	%	25.00	●
F8-30	Input Bias 2_2	Input Bias 2_1~ Input Bias 2_3	%	75.00	●
F8-31	Input Bias 2_3	Input Bias 2_2~100.00	%	99.00	●

6.2.12 Group F9: Speed Setting Options

No.	Function	Range	Unit	Default	Type
F9-00	Function of STOP Button	0: Stop in keypad start/stop mode 1: Stop in all start/stop modes 2: Stop in keypad start/stop mode, external fault trips in other modes		0	○
F9-01	Parameter Editing Mode	0:Editable through keypad and RS485 1:Editable through keypad 2:Editable through RS485		0	○
F9-02	Numeric Input Control Mode	Ones place: Numeric reference input control mode 0: Auto-save the change in RAM (Press DATA/ENTER to save) 1: Auto-save the change in EEPROM (Memory function at power failure) Tens place: Numeric reference input edit mode 0:Editable through UP/DOWN button on keypad 1: Editable through UP/DOWN terminals 2: Interrelate with start/stop mode(F0-04=0，editable through UP/DOWN button on keypad F0-04=1, editable through UP/DOWN terminals) 3: Editable in both modes 4: Not editable in both modes Hundreds place: Keypad UP/DOWN button rate control 0: Automatic rate control (UP/DOWN acting time integration) 1: Correspond to the setting UP/DOWN rate Thousands place: Terminal UP/DOWN rate control 0: Automatic rate control 1: Correspond to the setting UP/DOWN rate Ten thousands place: Stepping mode setting options(primary+ auxiliary setting mode) 0: Special speed setting 1: Auxiliary speed setting		1000	○
F9-03	Speed Setting Mode	Ones place: Integrated speed input mode 0: Primary speed setting mode 1: Auxiliary speed setting mode 2:Primary speed setting mode + auxiliary speed setting mode Tens place: Speed setting mode under jog control 0: Jog numeric speed setting mode		000	○

		1: Jog numeric speed setting mode + primary speed setting mode 2:Jog numeric speed setting mode + auxiliary speed setting mode Hundreds place: Auxiliary speed setting direction 0: Primary speed + auxiliary speed 1: Primary speed - auxiliary speed			
F9-04	Special Speed Setting Mode	0: Program Operation 1: Wobbulation Mode 2: Stepping Mode 0 3: Stepping Mode 1 4: Stepping Mode 2 5: Stepping Mode 3 6: Stepping Mode 4 7: Specail mode for Factory only		0	○
F9-05	Auxiliary Speed Setting Mode	0：Auxiliary numeric frequency 1：VP 2：VS 3：IS 4：Not used 5：K3*VS+K4*IS 6：K3*VS+K5*VF 7：K4*IS+K6*IF 8：MAX{K3*VS,K5*VF} 9：MAX{K4*IS,K6*IF} 10: K1*VP+K2*(K3*VS+K4*IS +K5*VF+K6*IF-K8*5V)		0	○
F9-06	Auxiliary Numeric Frequency Setting	0.00~ Fmax/0.0~Fmax	Hz	0.00	●
F9-07	UP/DOWN Frequency Rate	0.00~100.00/0.0~100.0	Hz/S	1.00	●
F9-08	Regular Speed Setting Mode Special Speed Setting Mode Auxiliary Speed Setting Mode Process PID Output	Ones place: Regular speed setting mode options 0: Regular frequency input 1: VS* Regular frequency input 2: VF* Regular frequency input 3: IS* Regular frequency input 4: IF* Regular frequency input Tens place: Special speed setting mode options 0: Special frequency input 1: VS* Special frequency input 2: VF* Special frequency input 3: IS* Special frequency input 4: IF* Special frequency input Hundreds place: Auxiliary speed setting mode options 0: Auxiliary frequency input 1: VS* Auxiliary frequency input 2: VF* Auxiliary frequency input 3: IS* Auxiliary frequency input 4: IF* Auxiliary frequency input		0000	○

		Thousands place: Process PID Output mode options 0: PID output 1: VS* PID output 2: VF* PID output 3: IS* PID output 4: IF* PID output 5: Auxiliary frequency* PID output			
F9-09	Detecting Frequency at Zero Speed	0.00～50.00/0.0～50.0	Hz	0.00	○
F9-10	Detecting Output Delay at Zero Speed	0.00～600.00	S	1.00	○
F9-11	Frequency Reach Signal FAR	0.00～50.00/0.0～50.0	Hz	2.50	○
F9-12	FDT1 Increasing Threshold	0.00～Fmax /0.0～Fmax	Hz	30.00	○
F9-13	FDT1 Decreasing Threshold	0.00～Fmax /0.0～Fmax	Hz	30.00	○
F9-14	FDT2 Increasing Threshold	0.00～Fmax /0.0～Fmax	Hz	30.00	○
F9-15	FDT2 Decreasing Threshold	0.00～Fmax /0.0～Fmax	Hz	30.00	○
F9-16	Not Used				
F9-17	Power Failure Stop Control Options	0: Disabled, not stop at power failure 1: Enabled, stop at running		0	○
F9-18~F9-20 Not Used					
F9-21	Deceleration Time 0 at Power Failure	0.00～10.00	S	0.50	○
F9-22	Deceleration Time 1 at Power Failure	0.00～10.00	S	1.50	○
F9-23	Stop at Power Failure	10～30000	mS	100	○
F9-24	Start Delay Time After Power-on	0.00～10.00 (The time for inverter to wait for the initial operation after power-on)	S	1.00	○
F9-25	Not Used				
F9-26	Magnetic Field Compensation Coefficient	0.00~200.00	%	0.00	●
F9-27	Oscillation Suppression Gain	0~20000		0	●
F9-28	Frequency Droop Control	0.00～60.00/0.0～60.0	Hz	0.00	○
F9-29	Iqs Filter Time	0.00～10.00	S	0.00	○
F9-30	Undervoltage Detection Scaling	0.00~100.00（Udc_e）	%	74.48	○
F9-31	Undervoltage Detection Time	0.00~30.00	S	0.50	○

6.2.13 Group FA: Advanced Parameters of Vector Control

No.	Function	Range	Unit	Default	Type
FA-00	Torque Current Setting Mode	Ones place: Primary torque setting mode 0: Regular torque setting mode 1: Special torque setting mode 2: Process PID torque setting mode Tens place: Integrated torque setting mode 0: Primary torque setting mode 1: Auxiliary torque setting mode 2: Primary torque setting mode + Auxiliary torque setting mode Hundreds place: Auxiliary positive/negative torque options 0: Positive torque 1: Negative torque		000	○
FA-01	Special Mode	0: Program operation 1: Stepping mode 0 2: Stepping mode 1 3: Stepping mode 2 4: Stepping mode 3 5: Stepping mode 4		0	○
FA-02	Auxiliary Torque Current Setting	0: Auxiliary Numeric Torque Current Setting 1：VP 2：VS 3：IS 4：VF 5：IF 6：Not Used 7：K1*VP+K2*(K3*VS+K4*IS+K5*VF+K6*IF-K8*5V)		0	○
FA-03	Auxiliary Numeric Torque Current	0.00~150.00	%	0.00	●
FA-04	UP/DOWN Torque Rate	0.00~100.00	%/S	1.00	●
FA-05	Torque Cycling Times	1~10000		1	○

FA-06	Regular Torque Options Special Torque Options Auxiliary Torque Options	Ones place: Regular torque options 0: Regular torque input 1: VS* Regular torque input 2: VF* Regular torque input 3: IS* Regular torque input 4: IF* Regular torque input Tens place: Special torque options 0: Special torque input 1: VS* Special torque input 2: VF* Special torque input 3: IS* Special torque input 4: IF* Special torque input Hundreds place: Auxiliary torque options 0: Auxiliary torque input 1: VS* Auxiliary torque input 2: VF* Auxiliary torque input 3: IS* Auxiliary torque input 4: IF* Auxiliary torque input Thousands place: PID torque options 0: PID output 1: VS* PID output 2: VF* PID output 3: IS* PID output 4: IF* PID output		0000	○
FA-07	Preset Current Limit 1	0.00~180.00	%	165.00	●
FA-08	Preset Current Limit 2	0.00~180.00	%	165.00	●
FA-09	Preset Current Limit 3	0.00~180.00	%	165.00	●
FA-10	Preset Current Limit 4	0.00~180.00	%	165.00	●
FA-11	Preset Current Limit 5	0.00~180.00	%	165.00	●
FA-12	Preset Current Limit 6	0.00~180.00	%	165.00	●
FA-13	Preset Current Limit 7	0.00~180.00	%	165.00	●
FA-14	Motor 2 Rated Power	0.40~480.00	kW	XXXX	○
FA-15	Motor 2 Rated Voltage	60~660	V	XXX	○
FA-16	Motor 2 Rated Current	0.1~1500.0	A	XXXX	○
FA-17	Motor 2 Rated Frequency	20.00~600.00/20.0~6000.0	Hz	XXXX	○
FA-18	Motor 2 Rated Speed	1~60000	rpm	XXXX	○
FA-19	Motor 2 Wiring Mode	0:Y 1:Δ		X	○
FA-20	Motor 2 Rated Power Factor	0.50~0.99		X	○
FA-21	Motor 2 Idling Excitation Current	0.1~1500.0	A	XXXX	○
FA-22	Motor 2 Rated Torque Current	0.1~1500.0	A	XXXX	○
FA-23	Motor 2 Stator Resistance R1	0.01~300.00	Ω	XXXX	○
FA-24	Motor 2 Rotator Resistance R2	0.01~300.00	Ω	XXXX	○
FA-25	Motor 2 Stator& Rotor Leakage Inductance Ls	0.1~3000.0	mH	XXXX	○
FA-26	Motor 2 Stator& Rotor Mutual Inductance Lm	0.1~3000.0	mH	XXXX	○
FA-27	Motor 2 Efficiency	30.0~99.0	%	XXXX	○
FA-28～FA-31 Not Used					

6.2.14 Group Fb: Advanced Parameters of PID

No.	Function	Range	Unit	Default	Type
Fb-00	PID Setting Mode	0: General mode 1: Special mode		0	○
Fb-01	Special Mode	0: Program operation 1: Stepping mode 0 2: Stepping mode 1 3: Stepping mode 2 4: Stepping mode 3 5: Stepping mode 4		0	○
Fb-02	PID UP/DOWN Rate	0.00~10.00	V/S	1.00	●
Fb-03	PID Regulator Output	0: PID Regulator output 1:PID Regulator output + Feedforward output		0	○
Fb-04	PID Integration Control	0: Active after PID starts deadband time 1:Active after PID outputs soft start time		0	○
Fb-05	Feedforward Gain Soft Start	0: Within PID output deadband time, linear to feedforward input gain 1: Feedforward input gain		0	○
Fb-06	PID Output Soft Start	0: Within PID output soft-start time, linear to PID output gain 1: PID output gain		0	○
Fb-07	Feedforward Input Mode	0: GFK*VS 1: GFK*IS 2: Not Used 3: GFK*+10V 4:GFK* Primary numeric frequency setting		0	○
Fb-08	Feedforward Gain Upper Limit	100.00~300.00	%	200.00	●
Fb-09	Feedforward Initial Gain GFK	0.00~Feedforward input gain upper limit	%	40.00	●
Fb-10	PID Output Deadband Time	0.00~100.00	S	0.00	●
Fb-11	PID Soft-start Time	0.00~120.00	S	5.00	●
Fb-12	PID Upper/Lower Limits Output Control	Ones place: PID upper limit output control 0: Enabled when PID soft-start time is up 1: Enabled when PID output deadband is up 2: Enabled after operation 3: Enabled after power is on Tens place: PID lower limit output control 0: Enabled when PID soft-start time is up 1: Enabled when PID outputs deadband is up 2: Enabled after operation 3: Enabled after power is on		00	○
Fb-13	Lower Limit Control Voltage	0.00~10.00	V	0.50	●
Fb-14	Upper Limit Control Voltage	0.00~10.00	V	9.50	●
Fb-15	PID Continuous Circulation Times	1~10000		1	●
Fb-16～Fb-19 Not Used					
Fb-20	Preset PID Setting 1	0.00~10.00	V	1.00	●
Fb-21	Preset PID Setting 2	0.00~10.00	V	2.00	●
Fb-22	Preset PID Setting 3	0.00~10.00	V	3.00	●
Fb-23	Preset PID Setting 4	0.00~10.00	V	5.00	●
Fb-24	Preset PID Setting 5	0.00~10.00	V	8.00	●
Fb-25	Preset PID Setting 6	0.00~10.00	V	9.00	●
Fb-26	Preset PID Setting 7	0.00~10.00	V	10.00	●
Fb-27～Fb-31 Not Used					

6.2.15 Group FC: Operation Control Parameters

No.	Function	Range	Unit	Default	Type
FC-00	Acceleration/ Deceleration Mode	0：Linear Mode 1：Not Used		0	○
FC-01~FC-02 Not Used					
FC-03	Fan Control	0: Run at power-on 1: Run at start-up		1	○
FC-04	Fan Delay Time	0.00~600.00	S	30.00	●
FC-05	Not Used				
FC-06	Reset previous working status at power-on	0: Not Reset 1: Reset		0	○
FC-07	Current Limit Control	0：Current limit disabled 1：Current limit enabled		1	○
FC-08	Current Limit	50.00~180.00	%	165.00	○
FC-09	Electronic Thermal Overload Coefficient	5.00~100.00	%	100.00	○
FC-10	Energy Saving Operation Options	0: Energy saving operation disabled 1: Energy saving operation enabled		0	○
FC-11	Energy Saving Running Initial Frequency	10.00~600.00/10.0~600.0	Hz	20.00	○
FC-12	Energy Current Detecting Range	20.00~80.00	%	40.00	○
FC-13	Energy Saving Delay Start Time	0.01~60.00	S	0.50	○
FC-14	Energy Saving Permitted Range	60.00~100.00	%	80.00	○
FC-15	Output Voltage	5.00~100.00	%	100.00	●
FC-16	Brake Duty Ratio	5.00~100.00	%	80.00	○
FC-17	Constant Power Output Control	0: Constant power output control disabled 1: Constant power output control enabled		0	○
FC-18	Voltage Control	Ones place: AVR 0：Disabled 1：Enabled 2：Disabled if exceeding rated voltage Tens place: Voltage regulation limiting control 0：Limiting Disabled 1：Limiting Enabled Hundreds place: Overmodultaion control 0：Disabled 1：Enabled		000	○
FC-19	Overvoltage	Ones place: Overvoltage stall options		0100	○

<table>
<tr><td></td><td>Stall Control</td><td>0：Dynamic brake+Stall protection
1：Dynamic brake
Tens place: Dynamic brake options
0：Enabled at power-on
1：Enabled at running
2：Enabled at deceleration
Hundreds place：Overvoltage stall mode
0：Always enabled
1：Disabled at acceleration, enabled at deceleration
Thousands place：Overvoltage stall mode
0: Fixed overvoltage thresholds enabled
1: Auto-overvoltage thresholds enabled</td><td></td><td></td><td></td></tr>
<tr><td>FC-20</td><td>Stall Voltage at Overvoltage</td><td>120.00%~135.00%</td><td>%</td><td>128.00</td><td>○</td></tr>
<tr><td>FC-21</td><td>Stall Voltage Hysteresis</td><td>2.00%~30.00%（Monotonic decreasing is active.）</td><td>%</td><td>6.00</td><td>○</td></tr>
<tr><td>FC-22</td><td>Overvoltage Proportion Gain VKp</td><td>0.00~100.00</td><td>%</td><td>1.00</td><td>○</td></tr>
<tr><td>FC-23</td><td>Overvoltage Integration Time VTi</td><td>0.000~30.000　0.000: No integration</td><td>S</td><td>0.200</td><td>○</td></tr>
<tr><td>FC-24</td><td>Fault Retry Control</td><td>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</td><td></td><td>00</td><td>○</td></tr>
<tr><td>FC-25</td><td>Fault Retry Timelag</td><td>0.01~30.00</td><td>S</td><td>0.50</td><td>○</td></tr>
<tr><td>FC-26</td><td>No Fault Timelag</td><td>0.01~30.00</td><td>S</td><td>10.00</td><td>○</td></tr>
<tr><td>FC-27</td><td>Fault Retry Options</td><td>EST | OL | ILP | SLU | SOU | SOC | HOU | HOC
1 | 1 | 1 | 1 | 1 | 1 | 1 | 1
0：Fault retry permitted　1：Fault retry prohibited</td><td></td><td>11111111</td><td>○</td></tr>
<tr><td>FC-28</td><td>Disabled Trips 1</td><td>OL | ILP | SLU | SOU | SOC | HOU | HOC | SC
0 | 0 | 0 | 0 | 0 | 0 | 0 | 0
0：Enabled，1: Disabled</td><td></td><td>00000000</td><td>○</td></tr>
<tr><td>FC-29</td><td>Disabled Trips 2</td><td>EEd | EST | PdN | PUP | EPC | EXT | * | OH
0 | 0 | 0 | 0 | 0 | 0 | 1 | 0
0：Enabled，1: Disabled</td><td></td><td>00000010</td><td>○</td></tr>
<tr><td>FC-30</td><td>Disabled Trips 3</td><td>SIE | SrE | SFE | STP | EEU
0 | 0 | 0 | 0 | 0
0：Enabled，1: Disabled</td><td></td><td>00000000</td><td>○</td></tr>
<tr><td>FC-31</td><td colspan="5">Not used</td></tr>
</table>

6.2.16 Group Fd: Auxiliary Parameters

No.	Function	Range	Unit	Default	Type
Fd-00	Frequency Base	Fbase:20.00~600.00/20.0~6000.0	Hz	50.00	○
Fd-01	Voltage 1	0.00~100.00	%	1.00	●
Fd-02	Voltage 2	0.00~100.00	%	4.00	●
Fd-03	Voltage 3	0.00~100.00	%	10.00	●
Fd-04	Voltage 4	0.00~100.00 Ue=100.0%	%	16.00	●
Fd-05	Frequency 1	0.00～Frequency 2 Fbase=100.0%	%	1.00	●
Fd-06	Frequency 2	Frequency 1~ Frequency 3	%	4.00	●
Fd-07	Frequency 3	Frequency 2～Frequency 4	%	10.00	●
Fd-08	Frequency 4	Frequency 3～100.00	%	16.00	●
Fd-09～Fd-20 Not Used					
Fd-21	Inverter Rated Power	0.40~480.00	kW	XXXX	X
Fd-22	Inverter Rated Voltage	60~660	V	XXX	X
Fd-23	Inverter Rated Current	0.1~1500.0	A	XXXX	X
Fd-24	Inverter Running Time	User monitoring	HOUR	XXXX	X
Fd-25	Inverter Running Time	User monitoring	min	XXXX	X
Fd-26	Running Time Control	0:Disabled 1:Enabled		0	-
Fd-27	Set Running Time	0~65535	HOUR	0	-
Fd-28	Not Used				
Fd-29	Not Used				
Fd-30	Keypad Software Version	X.XX		X.XX	X
Fd-31	DSP Software Version	X.XX		X.XX	X

6.2.17 Group FE: Terminal Function User Defined Parameters

No.	Function	Range	Unit	Default	Type
FE-00	Numeric Input Filter Times	0~100； 1=0.50mS		5	○
FE-01	Terminal Input Positive/Negative Logic	X7 X6 X5 X4 X3 X2 X1 0 0 0 0 0 0 0 0:Positive Logic On at 0V/Off at 24V 1: Negative Logic Off at 0V/ On at 24V		00000000	○
FE-02	X1 Input Delay Time	0.00~300.00	S	0.00	○
FE-03	X2 Input Delay Time	0.00~300.00	S	0.00	○
FE-04	Analog Input Signal Options	Ones place: VS input signal options 0: Analog signal input 1: Numeric signal input Tens place:IS input Signal options 0: Analog signal input 1: Numeric signal input Hundreds place: VF input signal options 0: Analog signal input 1: Numeric signal input Thousands place: IF input signal options 0: Analog signal input 1: Numeric signal input		0000	○
FE-05	Analog Terminal Input Logic	Ones place: Input terminal VS 0：VS is on at high level input 1：VS is off at low level input Tens place: Input terminal IS 0：IS is on at high level input 1：IS is off at low level input Hundreds place: Input terminal VF 0：VF is on at high level input 1：VF is off at low level input Thousands place: Input terminal IF 0: IF is on at high level input 1: IF is off at low level input		0000	○
FE-06	Output Signal Type	Ones place: Y1 output type 0: Level signal 1: Pulse signal Tens place: Y2 output type 0: Level signal 1: Pulse signal		000	○

		Hundreds place: R1 output type 0: Level signal 1: Pulse signal			
FE-07	Terminal Output Logic Control	Ones place: Y1 output logic control 0: Y1 is on in positive logic 1: Y1 is off at negative logic Tens place: Y2 output logic control 0: Y2 is on in positive logic 1: Y2 is off in negative logic Hundreds place: R1 output logic control 0: R1 is on in positive logic 1: R1 is off in negative logic		000	○
FE-08	Virtual Terminal Options	Ones place: Terminals Y1/Y2/R1 0: Actual output terminal on 1: Virtual output terminal on Tens place: Multi-function Input Terminal Xi 0: Actual output terminal on 1: Virtual output terminal on Hundreds place: Numeric terminal VS/IS/VF/IF 0: Actual output terminal on 1: Virtual output terminal on		000	○
FE-09	Y1 Terminal Delay Time	0.0~600.0	S	0.0	○
FE-10	Y1 Terminal Pulse Width	0.0~600.0	S	0.0	○
FE-11	Y2 Terminal Delay Time	0.0~600.0	S	0.0	○
FE-12	Y2 Terminal Pulse Width	0.0~600.0	S	0.0	○
FE-13	R1Terminal Delay Time	0.0~600.0	S	0.0	○
FE-14	R1 Terminal Pulse Width	0.0~600.0	S	0.0	○
FE-15～FE-31 Not Used					

7 Parameter Description

7.1 Group F0: General Parameters

No.	Function	Range	Unit	Default	Type
F0-00	Speed Reference Input Monitoring	Frequency:0.00～Fmax/0.0～Fmax	Hz	0.00	×
		Speed: 0～F*Customer defined scaling	rpm	0.0	
F0-01	Torque Reference Input Monitoring	Torque input:0.00~Limited Torque	%	0.00	

F0-00 and F0-01 are optional, and only for reference. Their parameters are the setting values in present control mode. Symbol "-" shall be displayed if the value is negative. When the reference input control mode is different, the unit indicated by F0-00/F0-01 is also different.

Speed Reference Input Monitoring

The unit of F0-00/F0-01 is Hz or rpm which indicates that the present control object is the speed of motor, its value is the present setting objective value of speed. When objective value is reverse input, then "-" shall be displayed.

Torque Reference Input Monitoring

The unit of F0-00/F0-01 is % which indicates that the present control object is the torque of motor. The value is the percentage of present objective torque current in motor rated torque current. If the objective value is negative torque, then the "-"sign appears. The setting mode of torque reference input is active only in SVC1.

No.	Function	Range	Unit	Default	Type
F0-02	Drive Control Mode	0: V/F open loop control 1: Not used 2: SVC0 3: SVC1		2	○

F0-02=0 V/F Open Loop Control: Applicable to the occasions when one inverter drives multi-motor, and speed regulations without high requirements for speed and accuracy.

▲**F0-02=2 SVC0**: Vector control mode 0 (without speed feedback). It only estimates real-time speed, but no feedback control. The whole process of output current is under real-time close-loop control. Motor 0.5 Hz output reaches 150% rated torque, inverter will autosearch the load variables, and autolimit the output current to make it not exceed the permitted maximum current. Even if load varies suddenly, or there is a quick acceleration or deceleration, inverter will trip overcurrent, so that a general inverter can achieve high performance and reliability.

Remarks:
This mode is only applied to speed control mode, not for torque control.

▲ **F0-02=3 SVC1**: Vector control mode 1 without speed feedback (torque control). It not only estimates speed in real-time, but also controls feedback. Speed and current are under real-time close-loop control all the time. The speed control and torque control can be achieved at the same time. A regular AC induction motor can be turn into an AC speed variable motor or AC torque motor in this drive mode. It is a genuine speed sensorless vector control.
Remarks: This mode can be applied to torque / speed control.

1. Before running in vector control mode, inverter needs to autotune motor parameters for obtaining the correct motor parameters.
2. In vector control mode, the inverter only applies to one motor. The capacity gap between motor and inverter cannot be excessively big. Otherwise, it may lower control standard or the system cannot function normally.
3. The section with ▲ mark is switchable control mode. When running in this mode, V/F open loop control status can be switched to meet different drive needs through multi-function input terminals X1~X7. See 7.3 for program mode of multi-function input terminals. For example, set F2-02=20, and when terminal X3=ON, the drive mode is switched to V/F mode, and when X3=OFF, it returns to the previous drive mode.

No.	Function	Range	Unit	Default	Type
F0-03	Setting Input Control Mode	0: Speed input 1: Torque input		0	○

F0-03=0 Input control mode is speed input, the input is frequency.

▲**F0-03=1** Input control mode is torque input. The input is percentage of motor rated torque current. It is active only when the control mode is SVC1, F0-02=3. In SVC1 mode, squirrel cage induction motor can achieve torque control to replace the AC induction torque motor.

The section with ▲ mark is switchable parameter input control mode. When running in this mode, terminal can be switched to the status of F0-03=0. When setting one programmable terminal (in F2) =24, the reference input control mode is switched to speed input mode when selecting this terminal. It returns when the terminal is off. For example, set F2-02=24, when X3 is on, the reference input control mode is switched to speed input mode, it will return to previous input mode when it is off.

No.	Function	Range	Unit	Default	Type
F0-04	Start/Stop Control Options	0: Keypad 1: Terminal 2: RS485		0	○
F0-05	Terminal Start/Stop Control Options	0:RUN-Run，F/R-Forward/Reverse 1: RUN- Forward,F/R-Reverse 2: RUN-NO forward, Xi-NC stop, F/R-NO reverse 3: RUN-NO run, Xi-NC stop，F/R- Forward/Reverse		0	○

F0-04=0 Keypad Control Mode：

Control start/stop of inverter through RUN, STOP/RESET, JOG/+- buttons on the keypad. When there is no fault, press JOG/+- to enter jog status, and RUN to enter running status. When the green LED indicator on the RUN button is on, the inverter is in running status, but when it flashes, the inverter is in ramp-to-stop status. No matter the setting input control mode is speed or torque, JOG is always running in jog speed input control mode.

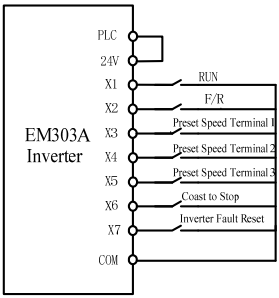


Figure 7-1 Wiring of Terminal Control

F0-04=1 Terminal Control Mode：

Start/Stop of inverter controlled by Start/Stop control terminals defined by F2-00～F2-06. When multi-function terminals are set as defaults, the terminal control wiring is as shown in Figure 7-1.

Specific setting of terminal control is determined by F0-05.

F0-04=2 RS485 Control Mode：

Start/Stop of inverter is under PC or PLC control through RS485 communication interface.

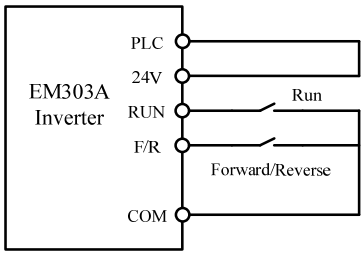
1. The terminal set as JOG can control inverter to run in jog speed setting mode in all start/stop modes.
2. No matter in what drive control mode, JOG always runs in jog speed setting control mode.

Two terminal control modes: 2-wire sequence and 3-wire sequence

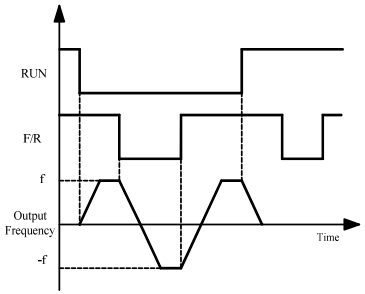
2-wire sequence:

F0-05=0 ON/OFF of terminal RUN controls start/stop of inverter, and OFF/ON of terminal F/R controls forward/reverse. If F0-24=1, when reverse is prohibited, terminal F/R is off. When stop mode is selected as ramp-to-stop, the sequence diagram is as shown in Figure 7-2 (b).

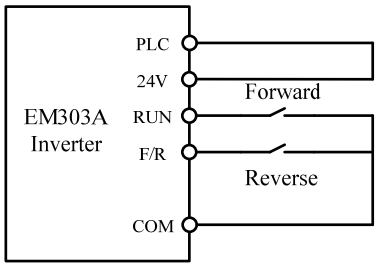
F0-05=1 ON/OFF of terminal RUN controls forward/stop of inverter, and ON/OFF of terminal F/R controls reverse/stop. If terminals F/R and RUN are ON simultaneously, the inverter stops according to the setting mode. When reverse is prohibited, terminal F/R is off. When stop mode is selected as ramp-to-stop, the sequence diagram is as shown in Figure 7-2 (d).



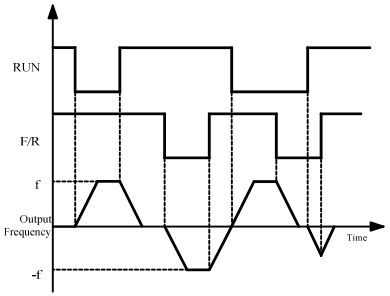
(a)F0-05=0 2-wire sequence



(b)F0-20=0, F0-05=0
Forward/Reverse running sequence



(c)F0-05=1 2-wire sequence



(d)F0-20=0, F0-05=1
Forward/Reverse running sequence

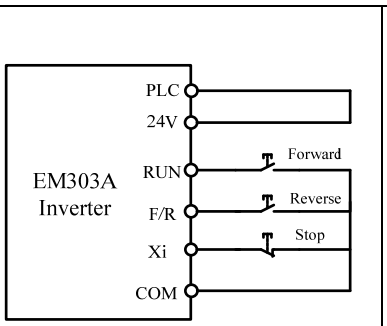
Figure 7-2 2-Wire Sequence

When F0-05 start/stop is selected as 0 or 1, even if terminal RUN is ON, and monocyclic time of PLC is up, pressing STOP button or external stop command of terminal can stop inverter. Meanwhile, inverter reenters running status only after terminal RUN is required to be OFF once and then ON again.

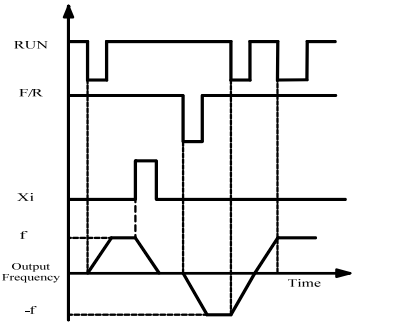
3-wire sequence：

F0-05=2 RUN is NO forward running button, F/R is NO reverse running button, Xi is NC stop button, all of them will be on at pulse edge. In running status, press Xi button, the inverter stops. When stop mode is selected as ramp-to-stop (F0-20=0), the sequence diagram refers to Figure 7-3 (b). Xi among X1~X7 is defined as the terminal of 3-Wire Sequence Run/Stop Control by F2-00～F2-06.

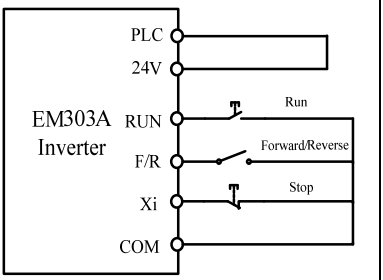
F0-05=3 F/R is forward/reverse switching button (Forward when F/R is off, and reverse when F/R is on.) RUN is NO running button, and Xi is NC stop button, all of them will be on at pulse edge. When stop mode is selected as ramp-to-stop (F0-20=0), the sequence diagram is as shown in Figure 7-3(d).



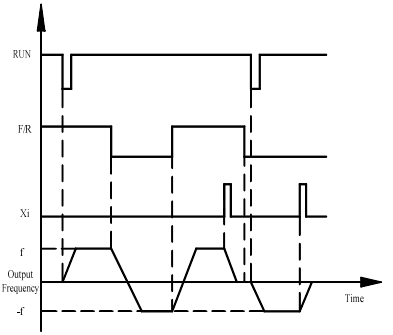
（a）F0-05=2 3-wire sequence



（b）F0-20=0，F0-05=2
Forward/Reverse running sequence



（c）F0-05=3 3-wire sequence



（d）F0-20=0, F0-05=3
Forward/Reverse running sequence

Figure 7-3 3-Wire Sequence

Use the buttons and switches correctly by following the mode illustrated in the above diagrams of EM303A 3-wire sequences, otherwise, malfunctions may occur.

No.	Function	Range	Unit	Default	Type
F0-06	Regular Speed Setting Mode	0：Primary numeric frequency 1：VP 2：VS 3：IS 4：Not used 5：K3*VS+K4*IS 6：K3*VS+K5*VF 7：K4*IS+K6*IF 8：MAX{K3*VS,K5*VF} 9：MAX{K4*IS,K6*IF} 10:K1*VP+K2*(K3*VS+K4*IS+K5*VF+K6*IF-K8*5V)		0	○

F0-06 For selecting the source of regular speed setting signal.

F0-06=0 Primary numeric frequency setting mode is defined by the value of F0-07.

F0-06=1 Setting frequency is set by VP keypad potentiometer.

F0-06=2 Setting frequency is set by the voltage of analog terminal VS.

F0-06=3 Setting frequency is set by the current of analog terminal IS.

F0-06=4 Not used

F0-06=5 Setting frequency is set by: K3*VS+K4*IS (Input signals VS and IS)

F0-06=6 Setting frequency is set by:
K3*VS+K5*VF (Input voltage signals VS and VF)

F0-06=7 Setting frequency is set by: K4*IS+K6*IF (Input current signals IS and IF)

F0-06=8 Setting frequency is set by the greater value between K3*VS and K5*VF (Inputs of 2 terminals)

F0-06=9 Setting frequency is set by the greater value between K4*IS and K6*IF (Inputs of 2 terminals)

F0-06=10 Setting frequency is set by:
K1*VP+K2*(K3*VS+K4*IS+K5*VF+K6*IF-K8*5V) (All input signals)

★ The combination of analog voltage signal and analog current signal can be considered as that the current signal linearly switched to voltage signal of 0-10V first, and then calculate.

1. The default of analog voltage input VS, VF is 0～10V.
2. The default of analog current input is 4～20mA.
3. K1～K8 are analog signal gains which can be set by F1-22～F1-29.

No.	Function	Range	Unit	Default	Type
F0-07	Primary Numeric Frequency Setting	0.00～Fmax/0.0～Fmax	Hz	0.00	●
F0-08	Motor Running Direction	0：Forward 1：Reverse		0	●

F0-07 The primary numeric frequency setting value is set by F0-07, and its range: 0.00～Fmax/0.0～Fmax.

F0-08 Motor running direction: F0-08=0 is forward. Reverse is allowed when F0-24=0, the running direction will be switched as reverse when F0-08=1.

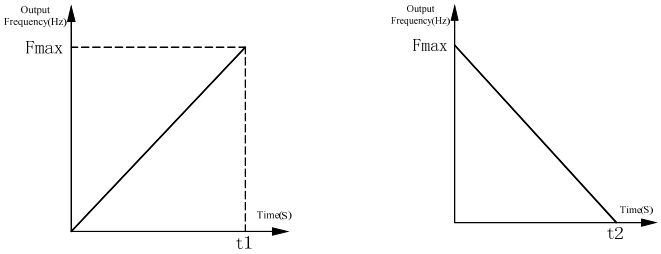
★ Press UP/DOWN button to define the value of F0-07 in running preparation, and running status.

1. When reverse is permitted, inverter will judge present running direction based on the setting of F0-08 and the status of terminal F/R. If F0-08=1, and terminal F/R is on, then inverter runs forward.

2. Switch any two of output cables (U, V, and W) of inverter to make the inverter forwards in the same direction as the expected running direction of motor, or set F0-08=1.

No.	Function	Range	Unit	Default	Type
F0-09	Acceleration Time 1	0.00～600.00	S/min	15.00	●
F0-10	Deceleration Time 1	0.00～600.00	S/min	15.00	●

Acceleration time is the time taken for the output frequency to rise from 0Hz up to maximum frequency Fmax set by F0-16. Deceleration time is the time taken for the output frequency to drop from Fmax down to 0Hz, which are not relevant to forward and reverse. As shown in Figure 7-4.



（a）Acceleration Time 1　　（b）Deceleration Time 1

Figure 7-4 Acceleration/Deceleration Time

No.	Function	Range	Unit	Default	Type
F0-11	Jog Numeric Frequency	0.00～Fmax/0.0～Fmax	Hz	5.00	●
F0-12	Jog Acceleration Time	0.00～600.00	S/min	15.00	●
F0-13	Jog Deceleration Time	0.00～600.00	S/min	15.00	●

In JOG running mode, inverter runs at the frequency set by F0-11, the acceleration/deceleration time taken for running to Fmax is set by F0-12/F0-13.

★ Jog acceleration time is the time taken for the output frequency to rise from 0Hz up to maximum frequency Fmax. Deceleration time is the time taken for the output frequency to drop from Fmax down to 0Hz.

★ In jog running mode, keep pressing the JOG button or terminal JOG is on. Otherwise, it will be considered as the jog command cancelled.

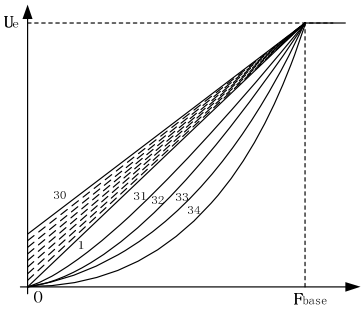
Note that the unit of acceleration /deceleration time is second or minute, defined by F3-21.

No.	Function	Range	Unit	Default	Type
F0-14	Carrier Frequency	1.000～16.000	kHz	2.000	●

Increasing carrier frequency could reduce motor noise, but it will result in inverter heating up. When carrier frequency is higher than the default, the rated power of inverter should decrease 5% as each increment of 1 kHz carrier frequency.

Correlation between motor rated power and carrier frequency is suggested as following:

Motor Rated Power Pe	≤15kW	≤30kW	≤75kW	≤132kW	＞132KW
Carrier Frequency F_c	≤10.0kHz	≤8.0kHz	≤6.0kHz	≤4.0kHz	≤2.5kHz

No.	Function	Range	Unit	Default	Type
F0-15	Torque Boost			35	●

F0-15=0 Automatic torque boost
F0-15=1～10 Fixed torque boost curve
F0-15=11～20 Oil pump motor boost curve
F0-15=21～30 Synchronous motor boost curve
F0-15=31～34 Blower/water pump boost curve
F0-15=35 Customer defined V/F curve scaling (Defined via Fd-01～Fd-08)

No.	Function	Range	Unit	Default	Type
F0-16	Maximum Frequency	Fmax: 20.00～600.00/20.0～6000.0	Hz	50.00	○
F0-17	Upper Limit Frequency	Fup: Fdown ～Fmax	Hz	50.00	○
F0-18	Lower Limit Frequency	Fdown:0.00～Fmax/0.0～Fmax	Hz	0.00	○

F0-16 Fmax indicates the maximum setting frequency permitted by inverter. Range of Fmax: 20.00～600.00/20.0～6000.0Hz.

F0-17 Fup indicates the maximum permitted running frequency after inverter start-up. Range of Fup: Fdown~Fmax.

F0-18 Fdown indicates the minimum permitted running frequency after inverter start-up. Range of Fdown: 0.00Hz~Fup/0.0Hz~Fup.

1. Upper limit frequency and lower limit frequency should be prudently set as per the actual parameters listed on controlled motor nameplate and operational status. Do not make the motor run for a long time in the lower frequency status. Otherwise, the service lifespan of motor will be reduced due to overheating.
2. Correlation of maximum frequency, upper limit frequency, and lower limit frequency: 0.00Hz≤Fdown≤Fup≤Fmax≤600.00Hz

No.	Function	Range	Unit	Default	Type
F0-19	Start Mode Options	0: Normal start 1: Speed search start		0	○

F0-19=0 Start as per setting mode: Zero speed start, or DC brake first, and then zero speed start.

F0-19=1 Speed search start: Before inverter starts, the motor may be rotating. Detecting motor speed and direction when inverter starts running, the speed and direction of motor can be directly searched base on the detection result. Smooth start can be applied to the motor which is rotating. The process of speed search is as shown on Figure 7-5.

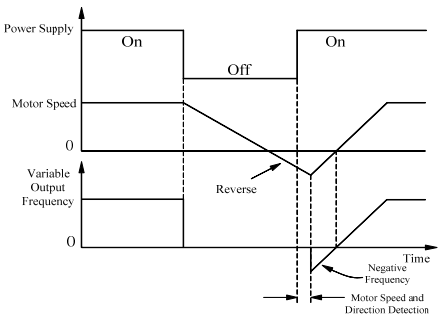


Figure7-5 Speed Search Start

1. Load inertia shall be taken into consideration when increasing the setting value of acceleration/deceleration time in speed search start mode.
2. Speed search start mode is applicable to the occasion when one inverter drives one motor, especially practical for industrial dryer. Due to the grid power outage or accidental fault of inverter, the industrial dryer will rotate freely for a long time. Speed search start can ensure that the industrial dryer returns normal work as short as possible.

Before inverter starts, the motor may be running at low speed or in opposite rotation status. If inverter starts immediately at mean time, overcurrent may occur. In order to avoid such fault, before inverter starts, please start DC brake to stop motor, and then the inverter runs to setting frequency as per setting direction. See F3-22，F3-23 for the setting method of starting DC brake.

No.	Function	Range	Unit	Default	Type
F0-20	Stop Mode Options	0: Ramp to stop 1: Coast to Stop		0	○

Stop Mode Setting:

Ramp to Stop

F0-20=0 Motor is ramp-to-stop in setting deceleration time.

【Default is F0-10 Deceleration Time 1】

Coast to Stop

F0-20=1 While the stop command is input, inverter stops output immediately, and the motor coasts to stop. The stop time is up to load inertia.

If there is a coast-to-stop terminal, when it is on, the inverter enters coast-to-stop status immediately, and when it is off, the inverter will not restart only if regiving the run command.

No.	Function	Range	Unit	Default	Type
F0-21	Function Setting for JOG/+- button	0: Jog running 1: Positive/Negative input switching 2: Disabled		0	○

F0-21=0 JOG/+- button on keypad is for jog function.

F0-21=1 JOG/+- button on keypad is for positive/negative input switching function, i.e. when the settings are positive speed, positive PID, and positive torque JOG/+- button is for switching to negative speed, negative PID, and negative torque.

F0-21=2 JOG/+- button on keypad is disabled.

No.	Function	Range	Unit	Default	Type
F0-22	Speed Monitoring Options	0: Frequency Hz 1: Speed rpm		0	X
F0-23	Customer Defined Scaling	0.01～600.00		30.00	●

F0-22 For setting speed display. If F0-22=0, then the reference input value displayed on keypad is the target output frequency of inverter. If F0-22=1, then the reference input value is the target output speed of inverter.

F0-23 Customer defined scaling. Mechanical speed = Mechanical speed coefficient (Customer defined scaling) * Output frequency. When the unit of setting speed is rpm, adjsut the parameter to make the displayed value of motor speed match the actual value.

No.	Function	Range	Unit	Default	Type
F0-24	Forward/Reverse Control	0: Forward/Reverse Permitted 1: Forward/Reverse Prohibited		0	○
F0-25	F/R Deadband	0.00～600.00	S	0.00	●

Permission of Motor Forward/Reverse

F0-24=0 Reverse permitted: Motor's running direction is set by F0-08, or controlled by terminal F/R.

F0-24=1 Reverse prohibited: Motor can only run in one direction. F0-08 parameters are disabled, and terminal F/R is off.

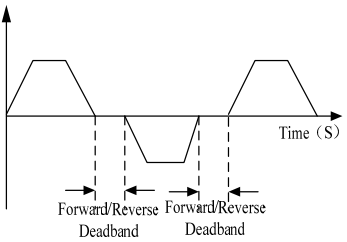


Figure 7-6 Forward/Reverse Deadband

Deadband of Switching the Forward/ Reverse of Motor

If F0-25=0.00, there is no deadband of forward/reverse.

If F0-25≠0, when forward/reverse switches, the inverter runs at 0Hz in the time set by F0-25 as the motor speed drops to 0Hz, and then runs to setting frequency in opposite direction. As shown in Figure7-6.

No.	Function	Range	Unit	Default	Type
F0-26	Primary Speed Setting Mode	0: Regular Speed Setting Mode 1: Special Speed Setting Mode 2: Process PID Input Mode		0	○

F0-26=0 Primary speed setting mode is regular speed setting mode. Primary numeric speed setting mode or analog signal setting mode can be set by selecting parameter of F0-06.

F0-26=1 Primary speed setting mode is special speed setting mode. Special speed setting mode can be selected as program running or stepping speed setting mode by advanced running mode.

F0-26=2 Primary speed setting mode is process PID input mode. Numeric PID setting mode or analog signal setting mode can be selected via F4-00.

No.	Function	Range	Unit	Default	Type
F0-27	Menu Mode Options	0: Basic Menu Mode 1: Advanced Menu Mode		0	○

F0-27=0 Keypad only displays the basic setting parameters of F0~F5. (6-group parameters could meet the needs of most of applications.)

F0-27=1 Keypad displays 17-group parameters of F0~FF for users to set parameters.

No.	Function	Range	Unit	Default	Type
F0-28	Default Control	0: Disabled 1: Defaults Reset		0	○
F0-29	Parameter Setting Control	0: Parameter setting permitted 1: Parameter lock 0 2: Parameter lock 1		0	●

Reset Default

F0-28=1 Reset Default: Except motor parameters in Group F1 and FA, inverter parameter in Group Fd, and F4-28 application macros, the parameters will reset to default. After reset completed, F0-28=0.

Parameter Lock

F0-29=0 All parameters are allowed to be edited.

F0-29=1Parameter lock 0:

Lock parameters except numeric settings. The numeric settings are primary numeric frequency setting F0-07, auxiliary numeric frequency setting F9-06, jog running frequency F0-11, preset speed 1~15(F3-00～F3-14), PID numeric setting F4-01, preset PID setting 1~7(Fb-20～Fb-26), numeric torque current F5-12, and preset torque setting 1~7(F5-15～F5-21).

F0-29=2Parameter locked 1:

Lock all parameters except F0-29. Inverter will remain the setting before unlocked.

No.	Function	Range	Unit	Default	Type
F0-30	Inverter Model	0: Model G 1: Model P		0	○

F0-30=0 Set inverter as Model G which is applicable to mechanical or constant torque load.

F0-30=1 Set inverter as Model P which is applicable to square or cubic torque load like blower, and water pump.

★ Set inverter as Model P, applicable motor power detailed on the Nameplate.

Note: The constant torque load is not applicable to Model P.

No.	Function	Range	Unit	Default	Type
F0-31	User Password	0～65535		XXXX	○

F0-31 Set a new password to start password protection and prevent unqualified personnel from editing the inverter parameters incorrectly. When password is 0, the password function is disabled.

7.2 Group F1: Motor Parameters

No.	Function	Range	Unit	Default	Type
F1-00	Motor Type	0: AC induction motor 1: Not used		0	○
F1-01	Motor Rated Power	0.40～480.00	kW	XXXX	○
F1-02	Motor Rated Voltage	60～660	V	XXX	○

F1-03	Motor Rated Current	0.1～1500.0	A	XXXX	○
F1-04	Motor Rated Frequency	20.00～600.00	Hz	XXXX	○
F1-05	Motor Rated Speed	1～30000	rpm	XXXX	○
F1-06	Motor Wiring Mode	0：Y Wiring 1：Δ Wiring		X	○
F1-07	Motor Rated Power Factor	0.50～0.99		X	
F1-14	Motor Efficiency	30.0～99.00	%	XXX	○

Remarks:

When connecting the inverter to the motor at the first time, set the above parameters as per the motor nameplate before operation.

No.	Function	Range	Unit	Default	Type
F1-08	Idling Excitation Current	0.1～1500.0	A	XXXX	○
F1-09	Rated Torque Current	0.1～1500.0	A	XXXX	○
F1-10	Stator Resistance R1	0.01～300.00	Ω	XXXX	○
F1-11	Rotator Resistance R2	0.01～300.00	Ω	XXXX	○
F1-12	Stator& Rotor Leakage Inductance Ls	0.1～3000.0	mH	XXXX	○
F1-13	Stator& Rotor Mutual Inductance Lm	0.1～3000.0	mH	XXXX	○

F1-08～F1-13 are motor parameters, autotune motor parameter to obtain the above parameters.

Before autotuning motor parameter, inverter will set the nameplate parameters(set by F1-00～F1-07) as the standard motor parameters automatically.

The T Equivalent Model of motor is as shown in Figure7-7.

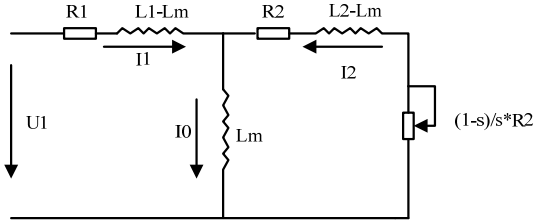


Figure 7-7 T Equivalent Model of Induction Motor

R1, L1, R2, L2, Lm, and I0 in Figure 7-7 refers to stator resistance, stator inductance, rotor resistance, rotor inductance, stator and rotor mutual inductance, and idling excitation current respectively.

No.	Function	Range	Unit	Default	Type
F1-15	Autotuning	0: No autotuning 1: Staionary autotuning (R_1,R_2,Ls,Lm,I_0) 2: Rotational autotuning (R_1,R_2,Ls,Lm,I_0)		0	○

F1-15=0 No autotuning

F1-15=1 Motor remains motionless in the process of autotuning parameters F1-07 and F1-10～F1-14.

F1-15=2 Motor is rotating in the process of autotuning parameters F1-07 and F1-10～F1-14.

- After parameters autotuning completed, F9-15=0 will be set automatically.
- When slip compensation is active, autotune motor parameter first, so that the motor will obtain the optimum performance.

EM303A supports ModBus protocol, RTU format, and single-master and multi-slave communication network with RS485 bus.

No.	Function	Range	Unit	Default	Type
F1-16	Inverter Address	0～247, 0:Broadcasting Address		1	○

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

F1-16=0 Address code is broadcasting address.

No.	Function	Range	Unit	Default	Type
F1-17	Communication Bit Rate	0: 4800 1: 9600 2: 19200 3: 38400	bps	1	○

F1-17=0 Communication Bit Rate: 4800bps
F1-17=1 Communication Bit Rate: 9600bps
F1-17=2 Communication Bit Rate: 19200bps
F1-17=3 Communication Bit Rate: 38400bps

No.	Function	Range	Unit	Default	Type
F1-18	Communication Parity Mode	0: No parity 1+8+1 1: Even parity 1+8+1+1 2: Odd parity 1+8+1+1		0	○

F1-18=0 No parity
F1-18=1 Even parity
F1-18=2 Odd parity

No.	Function	Range	Unit	Default	Type
F1-19	Master-slave Communication Mode	0: The inverter is the slave 1: The inverter is the master		0	○
F1-20	Master Write the Address of Slave Inverter	0: Primary Numeric Frequency F0-07 1:Auxiliary Numeric Frequency F9-06		0	○
F1-21	Inverter Receiving Proportion Coefficient	0.00~600.00	%	100.00	•

F1-19 Select the present inverter as the master or the slave.

F1-20 Set on the master inverter. Select the frequency setting command of slave inverter sent by master inverter, and then send F0-07 or F9-06 to the slave inverter.

F1-21 Set on the slave inverter. The parameter or the product of numeric frequency

sent by master inverter received through F0-07 or F9-06 will be the setting numeric frequency of slave inverter.

Remarks:

See the Appendix for EM303A ModBus communication protocol and examples.

No.	Function	Range	Unit	Default	Type
F1-22	Analog Input Gain K1	0.00～600.00	%	100.00	●
F1-23	Analog Input Gain K2	0.00～600.00	%	100.00	●
F1-24	Analog Input Gain K3	0.00～600.00	%	0.00	●
F1-25	Analog Input Gain K4	0.00～600.00	%	100.00	●
F1-26	Analog Input Gain K5	0.00～600.00	%	0.00	●
F1-27	Analog Input Gain K6	0.00～600.00	%	0.00	●
F1-28	Analog Input Gain K7	0.00～600.00	%	0.00	●
F1-29	Analog Input Gain K8	0.00～200.00	%	0.00	●

Set analog input gain Ki for proportional zooming of analog signals. The setting analog value of inverter: Analog input*Analog input gain Ki（i=1～8）. The description of F0-06, F5-11, F9-05 shows the correlation of 8 analog gain coefficients Ki and VP, VS, VF, IS, IF.

No.	Function	Range	Unit	Default	Type
F1-30	Communication Overtime	0（Disabled） 0.1～60.0	S	0	•

When exceeding the setting time of F1-30, inverter will stop if it does not receive the communication command from PC/PLC. Keypad displays fault EXT. It can be defined as the multi-function output terminal action of inverter fault.

7.3 Group F2: Input/Output Terminal Parameters

The multi-function input terminals of EM303A are also called as numeric input terminals because of working in PWL or pulse mode.

No.	Function	Range	Unit	Default	Type
F2-00	Multi-function Input Terminal X1-RUN	See Table 6-1 Functions of Numeric Multi-function Input Terminals		1	○
F2-01	Multi-function Input Terminal X2-F/R			2	○
F2-02	Multi-function Input Terminal X3-D1			3	○
F2-03	Multi-function Input Terminal X4-D2			4	○
F2-04	Multi-function Input Terminal X5-D3			5	○
F2-05	Multi-function Input Terminal X6-FRS			9	○
F2-06	Multi-function Input Terminal X7-RST			10	○

Multi-function input terminals X1～X7 are 7 programmable numeric input terminals. The function of X1~X7 can be defined by the setting value of F2-00～F2-06.

For example, set F2-00=1, then the function of terminal X1 is RUN. If start/stop

control mode is in terminal control mode, when terminal X1 is on, inverter runs.

Xi=0 No function

This function can be used to block the terminal when its hardware breaks down.

Xi=1 RUN

When start/stop control mode is terminal control (F0-04=1), if the function terminal is on, the inverter will run as per the setting value of F0-05.

Xi=2 F/R Forward/Reverse

When start/stop control mode is in terminal control mode (F0-04=1), if the function terminal is on, the inverter will forward/reverse as per the setting value of F0-05.

Xi=3 Preset Speed Terminal 1

Xi=4 Preset Speed Terminal 2

Xi=5 Preset Speed Terminal 3

Xi=6 Preset Speed Terminal 4

In preset speed control mode, 4 function input terminals can be defined as the preset speed terminals. A preset speed set in F3-00～F3-14 is selected as the present setting frequency of inverter by the programming coding of these 4 terminals. See 7.4 for preset speed options setting.

Xi=7 Acceleration/Deceleration Time Terminal 1

Xi=8 Acceleration/Deceleration Time Terminal 2

F0-09，F0-10，F3-15～F3-20 set acceleration/deceleration time 1～4, and select corresponding acceleration/deceleration time 1~4 through programming acceleration/deceleration terminals. See 7.4 for the correlation of acceleration/deceleration time and its terminal.

Xi=9 Coast to stop

Inverter is running, if the function terminal is on, PWM output is locked immediately, and then motor coasts to stop.

Xi=10 Inverter fault reset input

Inverter can be reset through fault reset terminal after inverter fault is cleared.

Xi=11 Forward Jog FJOG

Xi=12 Reverse Jog RJOG

Inverter will forward when terminal FJOG is on, reverse when terminal RJOG is on, and will stop when FJOG and RJOG are on simultaneously. See 7.1 for detail of Jog operation.

★ Reverse jog is disabled when reverse is prohibited.

Xi=13 UP: Terminal controls numeric frequency, stepping frequency rises.

Xi=14 DOWN: Terminal controls numeric frequency, stepping frequency drops.

During operation, if input frequency is in numeric frequency input mode, set Xi=13, or Xi=14, its function changes the numeric frequency, its speed rate can be set by UP/DOWN frequency and speed rate setting of F9-07. If it is in stepping mode, the terminals are hot keys for stepping frequency. Its speed rate can be set as acceleration /deceleration time.

Xi=15 UP/DOWN clearing

If taking stepping mode in operation, UP or DOWN is enabled and UP/DOWN clearing is active, input frequency returns the value of F0-07.

Xi=16 Acceleration/Deceleration prohibited

When acceleration/deceleration prohibiting terminal is on, acceleration/ deceleration command is prohibited, and the output frequency of inverter remains unchanged and is beyond control of input frequency, and output frequency = input frequency. When current is higher than the limit, the output frequency drops as per setting mode, meanwhile, output frequency= input frequency until current is lower than the limit, inverter keeps present output frequency.

Xi=18 3-wire sequence run/stop control

The function is NC stop button of 3-wire sequence. See F0-05 for details of terminal start/stop options.

Xi=19 DC brake command at stop

When inverter is in ramp-to-stop and the running frequency is smaller than the frequency of DC brake set in F3-24, DC brake enabled. DC brake ends until the terminal is off. If the terminal is on and the setting time of DC brake is active, select the greater value between them to perform DC brake command at stop. See F3-24～F3-27 for detail of DC brake setting at stop(See 7.4).

Xi=20 Switch drive control mode to V/F control mode

No matter what drive mode F0-02 is in, if the terminal is on, the drive control mode will be switched to V/F control mode, and its function is equivalent to F0-02=0. When the terminal is off, it returns the previous control mode automatically.

Xi=21 Switch run command control mode to terminal control mode

When the terminal is on, no matter what run command mode F0-04 is in, and what status of the run command input 0 or input 1is, it is always in terminal control mode which is placed in the highest priority. The terminal control mode is set by F0-05.

Xi=22 Run command input 0

Xi=23 Run command input 1

The run command control modes can be selected through programming the run command inputs. See Table 7-1 for the correlation between run command control mode and run command input.

Table 7-1 Correlation between run command control mode and run command input

Run Command Input 0	Run Command Input 1	Run Command Control Mode
OFF	OFF	Unchanged
OFF	ON	Keypad
ON	OFF	RS485
ON	ON	External Terminal

Programming mode of run command inputs is prior to F0-04 run command mode

selection.

Xi=24 Switch input control mode to speed control mode

When the terminal is on, the present input control mode is switched to the speed control mode, and its function is equivalent to F0-03=0. After it is off, it returns the previous input control mode automatically.

Xi=25 Switch input control mode to torque control mode

When the terminal is on, the present control mode is switched to torque control mode. Its function is equivalent to F0-03=1. After it is off, it returns the previous input control mode automatically.

When the corresponding function terminals of Xi=24/25 are on simultaneously, terminal of Xi=24 is prior to terminal of Xi=25. If it is not set as SVC1, F0-02≠3，it cannot be switched to torque control.

Xi=26 Not Used

Xi=27 Switch speed input setting mode to primary speed setting mode

In speed control mode, if the terminal is on, and then integrated speed input mode is switched to primary speed setting mode. After it is off, it returns the previous input mode automatically. It is equivalent to setting the ones place of F9-03=0 when it is on.

Xi=28 Switch speed input setting mode to auxiliary speed setting mode

In speed control mode, if the terminal is on, then the speed input setting mode is switched to auxiliary speed setting mode. Its function is equivalent to setting the ones place of F9-03 =1. After the terminal is off, it returns the previous setting mode automatically.

Xi=29 Switch primary speed setting mode to regular speed setting mode

In speed control mode, if the terminal is on, then the primary speed setting mode is switched to regular speed setting mode. Its function is equivalent to F0-26=0. After the terminal is off, it returns the previous setting mode automatically.

Xi=30 Switch regular speed input setting mode to numeric speed input setting mode

In regular speed control mode, if the terminal is on, then the present regular speed setting mode of F0-06 is switched to the numeric speed input setting mode. Its function is equivalent to F0-06=0. After the terminal is off, it returns the previous setting mode automatically.

Xi=31 Switch jog input setting mode to jog numeric speed input setting mode

In regular speed control mode, if the terminal is on, then the present jog speed setting mode is switched to jog numeric speed input setting mode. Its function is equivalent to setting the tens place of F9-03=0. After the terminal is off, it returns the previous setting mode automatically.

Xi=32 Switch torque input to primary torque setting

In torque control mode, if the function terminal is on, then the resultant torque input mode is switched to the primary torque setting active. After the terminal is off, return the previous setting mode automatically.

Xi=33 Switch torque input to auxiliary torque setting

In torque control mode, if the function terminal is on, then the special torque setting is switched to auxiliary torque setting mode. Its function is equivalent to setting the one's placeof FA-00=1. After the terminal is off, it returns the previous setting mode automatically.

Xi=34 Switch primary torque setting to regular setting

In torque control mode, if the function terminal is on, then the special torque setting is switched to the primary torque regular setting mode. Its function is equivalent to setting the ones place of FA-00=0. After the terminal is off, it returns the previous setting mode automatically.

Xi=35 Switch regular torque input to numeric torque input

In regular speed control mode, if the function terminal is on, then the present regular torque setting mode is switched to the numeric torque input. Its function is equivalent to F5-11=0. After the terminal is off, it returns the previous setting mode automatically.

Xi=36 Switch special PID to regular PID

In special PID control mode, if the function terminal is on, then the PID setting mode is switched from special mode to regular mode. After it is off, it returns the previous setting mode automatically. Its function is equivalent to Fb-00=0.

Xi=37 PID positive/negative function switch

In the process of process PID control operation, if the input signal of the function terminal is on, then the function of PID regulator conducts positive/negative function switch. Its function is equivalent to adjusting parameters of F4-05.

Xi=38 Preset process PID terminal 1

Xi=39 Preset process PID terminal 2

Xi=40 Preset process PID terminal 3

In preset process PID control mode, 3 function input terminals need to be defined as preset process PID terminals. A preset PID setting voltage set in Fb-20～Fb-26 is selected correspondingly as the present setting frequency of inverter through the state combination of these three terminals. Correlation between preset process PID terminals and preset process PID setting is as shown in Table 7-2.

Table 7-2 Correlation between preset process PID terminals and preset process PID setting

Terminal 3	Terminal 2	Terminal 1	PID Given Voltage Setting	Corresponding PID Setting Code
OFF	OFF	OFF	Non-preset PID Setting	Defined by F4-00
OFF	OFF	ON	Preset PID Setting 1	Fb-20
OFF	ON	OFF	Preset PID Setting 2	Fb-21
OFF	ON	ON	Preset PID Setting 3	Fb-22
ON	OFF	OFF	Preset PID Setting 4	Fb-23
ON	OFF	ON	Preset PID Setting 5	Fb-24

ON	ON	OFF	Preset PID Setting 6	Fb-25
ON	ON	ON	Preset PID Setting 7	Fb-26

Xi=41 Preset torque current terminal 1

Xi=42 Preset torque current terminal 2

Xi=43 Preset torque current terminal 3

In preset torque current control mode, 3 function input terminals need to be defined as the preset torque current terminal. A preset torque current set in F5-15~F5-21 is selected correspondingly through the state combination of these 3 terminals. Correlation between preset torque current and the corresponding terminals is as shown on Table 7-3.

Table 7-3 Correlation between preset torque current and the corresponding terminals

Terminal 3	Terminal 2	Terminal 1	Preset Torque Current Setting	Corresponding Torque Current Code
OFF	OFF	OFF	Non-preset Torque Current	Defined by F5-11
OFF	OFF	ON	Preset Torque Current 1	F5-15
OFF	ON	OFF	Preset Torque Current 2	F5-16
OFF	ON	ON	Preset Torque Current 3	F5-17
ON	OFF	OFF	Preset Torque Current 4	F5-18
ON	OFF	ON	Preset Torque Current 5	F5-19
ON	ON	OFF	Preset Torque Current 6	F5-20
ON	ON	ON	Preset Torque Current 7	F5-21

Xi=44 Preset current limit terminal 1

Xi=45 Preset current limit terminal 2

Xi=46 Preset current limit terminal 3

When selecting preset current limit, 3 input terminals can be defined as the preset current limit terminals. A preset current limit set in FA-07～FA-13 is selected correspondingly through programming these 3 terminals. See Table 7-4 for correlation between preset current limit and the corresponding terminals.

Table 7-4 Correlation between preset current limit and the corresponding terminals

Terminal 3	Terminal 2	Terminal 1	Preset Torque Current Setting	Corresponding Torque Current Code
OFF	OFF	OFF	Non-preset Current Limit	Defined by FC-08
OFF	OFF	ON	Preset Current Limit 1	FA-07
OFF	ON	OFF	Preset Current Limit 2	FA-08
OFF	ON	ON	Preset Current Limit 3	FA-09
ON	OFF	OFF	Preset Current Limit 4	FA-10
ON	OFF	ON	Preset Current Limit 5	FA-11
ON	ON	OFF	Preset Current Limit 6	FA-12
ON	ON	ON	Preset Current Limit 7	FA-13

Xi=47 Start wobbulation operation

Wobbulation operation mode starts.

Xi=48 Not used

Xi=49 Program operation reset

When program operation (PLC) is active, if the input signal of this terminal is on, and then program operation time is cleared, and program operation starts from Section 1.

Xi=50 Alternate motor switching

During running, if input signal of the terminal is on, the inverter regulates the output according to the parameters of Motor 2.

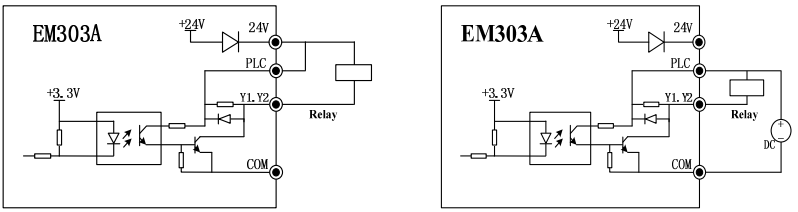
Xi=51 External fault input

During running, after the terminal receives external device fault signal, inverter stops and enters fault status. The default is NO input of external fault, and it can be set as NC input by FE-01(Terminal positive/negative logic).

No.	Function	Range	Unit	Default	Type
F2-12	Multi-function Output Terminal Y1	See Table 6-2 Functions of Numeric Multi-function Output Terminals		0	○
F2-13	Multi-function Output Terminal Y2			1	○
F2-14	Relay Output Terminal R1			9	○

EM303A provides 3 programmable output terminals including 2 multi-function output terminals and 1 relay output terminal. There are 0～32 program codes, user can define output variables of terminals.

Two multi-function output terminals are in OC output mode. Output common port is connected to COM. When selected program code is enabled, the electronic switch is ON, and when it is disabled, the electronic switch is OFF. OC can be powered either internally or externally, as shown in Figure 7-8(a) and 7-8(b) respectively. If it is externally powered, the voltage range is required to be within 8~24V.



（a）Internal Power supply　　（b）External Power supply

Figure 7-8 Power Supply Modes of Programmable Terminals

Relay output is provided by the internal relay of inverter. Relay has 1 set of NO contacts and 1 set of NC contacts. When selected program code is disabled, EB-EC is NC, and EA-EC is NO. When selected program code is enabled, the coil of internal relay is power-on, EB-EC is off, and EA-EC is on, as shown in Figure 7-9.

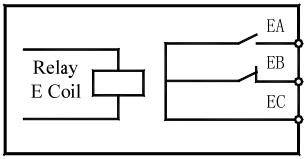


Figure7-9 Relay Contacts

No.	Function	Range	Unit	Default	Type
F2-16	Analog Output Terminal M0	See Table 6-3		0	●
F2-17	Analog Output Terminal M1	Analog Output Full Scale		6	●

EM303A provides 2 programmable analog output terminals: M0 and M1 which can output 0～10V voltage signal or 0-20mA current signal by jump line selection.

No.	Function	Range	Unit	Default	Type
F2-19	Jog Analog Output M0	See Table 6-3		0	○
F2-20	Jog Analog Output M1	Analog Output Full Scale		6	○

In jog running mode, outputs of M0 and M1 can be defined differently from what they are in normal operation mode.

No.	Function	Range	Unit	Default	Type
F2-22	M0 Output Lower Limit	0.00～100.00	%	0.00	●
F2-23	M0 Output Upper Limit	0.00～100.00	%	100.00	●
F2-24	M0 Output Gain	0.00～300.00	%	100.00	●
F2-25	M1 Output Lower Limit	0.00～100.00	%	0.00	●
F2-26	M1 Output Upper Limit	0.00～100.00	%	100.00	●
F2-27	M1 Output Gain	0.00～300.00	%	100.00	●

Upper limit/lower limit of analog output can be set to meet different requirements.
Final analog output signal=Output gain*analog output
Analog output gain and its upper/lower limit F2-22~F2-27 are for terminal M0 and M1, and irrelevant to the current running status.

1. In order to meet different needs, the actual full scale voltage of M0/M1 is 10.9V, and the actual full scale current is 22mA.
2. Default of M0 and M1 is 0～10V.
3. If there is high demand for accuracy of analog output in application, check idling output of M0 and M1 with multimeter.

7.4 Group F3: Preset Speed Parameters

No.	Function	Range	Unit	Default	Type
F3-00	Preset Speed 1	0.00~Fmax/0.0~Fmax	Hz	0.00	●
F3-01	Preset Speed 2	0.00~Fmax/0.0~Fmax	Hz	5.00	●
F3-02	Preset Speed 3	0.00~Fmax/0.0~Fmax	Hz	10.00	●
F3-03	Preset Speed 4	0.00~Fmax/0.0~Fmax	Hz	15.00	●
F3-04	Preset Speed 5	0.00~Fmax/0.0~Fmax	Hz	20.00	●
F3-05	Preset Speed 6	0.00~Fmax/0.0~Fmax	Hz	25.00	●
F3-06	Preset Speed 7	0.00~Fmax/0.0~Fmax	Hz	30.00	●
F3-07	Preset Speed 8	0.00~Fmax/0.0~Fmax	Hz	35.00	●
F3-08	Preset Speed 9	0.00~Fmax/0.0~Fmax	Hz	40.00	●
F3-09	Preset Speed 10	0.00~Fmax/0.0~Fmax	Hz	45.00	●
F3-10	Preset Speed 11	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-11	Preset Speed 12	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-12	Preset Speed 13	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-13	Preset Speed 14	0.00~Fmax/0.0~Fmax	Hz	50.00	●
F3-14	Preset Speed 15	0.00~Fmax/0.0~Fmax	Hz	50.00	●

Through preset speed control terminals and 15 preset frequency commands, EM330 can provide 16 preset speeds by combining keypad numeric setting mode and analog setting mode. Furthermore, it can be adjusted at any time through repeated addition analog input.

Setting Preset Speed Terminals

Terminal	No.	Default	Function
X3	F2-02	3	Preset Speed Terminal 1
X4	F2-03	4	Preset Speed Terminal 2
X5	F2-04	5	Preset Speed Terminal 3
X6	F2-05	6	Preset Speed Terminal 4
X7	F2-06	10	Inverter Fault Reset

Preset Speed Commands and Preset Speed Terminals

Speed	Preset Speed Terminal 4	Preset Speed Terminal 3	Preset Speed Terminal 2	Preset Speed Terminal 1	Selected Frequency	No.
1	OFF	OFF	OFF	OFF	Keypad or Analog Setting	Defined by F0-06
2	OFF	OFF	OFF	ON	Preset Speed 1	F3-00
3	OFF	OFF	ON	OFF	Preset Speed 2	F3-01
4	OFF	OFF	ON	ON	Preset Speed 3	F3-02
5	OFF	ON	OFF	OFF	Preset Speed 4	F3-03
6	OFF	ON	OFF	ON	Preset Speed 5	F3-04
7	OFF	ON	ON	OFF	Preset Speed 6	F3-05
8	OFF	ON	ON	ON	Preset Speed 7	F3-06

9	ON	OFF	OFF	OFF	Preset Speed 8	F3-07
10	ON	OFF	OFF	ON	Preset Speed 9	F3-08
11	ON	OFF	ON	OFF	Preset Speed 10	F3-09
12	ON	OFF	ON	ON	Preset Speed 11	F3-10
13	ON	ON	OFF	OFF	Preset Speed 12	F3-11
14	ON	ON	OFF	ON	Preset Speed 13	F3-12
15	ON	ON	ON	OFF	Preset Speed 14	F3-13
16	ON	ON	ON	ON	Preset Speed 15	F3-14

Precautions for setting:

★ F0-04 defines start/stop of inverter in preset speed operation mode.

★ External terminals set the acceleration/deceleration time in preset speed operation mode.

★ Terminals F/R and RUN determines the running direction of motor in preset speed operation mode.

No.	Function	Range	Unit	Default	Type
F3-15	Acceleration Time 2	0.00～600.00	S/min	15.00	●
F3-16	Deceleration Time 2	0.00～600.00	S/min	15.00	●
F3-17	Acceleration Time 3	0.00～600.00	S/min	15.00	●
F3-18	Deceleration Time 3	0.00～600.00	S/min	15.00	●
F3-19	Acceleration Time 4	0.00～600.00	S/min	15.00	●
F3-20	Deceleration Time 4	0.00～600.00	S/min	15.00	●

Acceleration time is the time taken for output frequency to rise from 0Hz up to the maximum frequency Fmax set by F0-16. Deceleration time is the time taken for output frequency to drop from Fmax down to 0Hz. Both of them are not related to forward/reverse.

EM303A provides 4 kinds of acceleration times and 4 kinds of deceleration times. Each of them is set by independent parameter. There are 2 multi-function input terminals which can be set as acceleration/deceleration time terminal 1 and 2. They are programmable when inverter is running, and acceleration/deceleration time can be changed immediately. See Table 7-5 for the programming mode of acceleration/deceleration time terminal 1 and 2.

Table 7-5 Programming mode of acceleration/deceleration time terminals

Acceleration/Deceleration Time Terminal 1	Acceleration/Deceleration Time Terminal 2	Acceleration Time/No.	Deceleration Time/No.
OFF	OFF	1 F0-09	1 F0-10
ON	OFF	2 F3-15	2 F3-16
OFF	ON	3 F3-17	3 F3-18
ON	ON	4 F3-19	4 F3-20

As shown in Table 7-5, acceleration/deceleration time refers to acceleration time 1 and deceleration time 1 in regular operation mode (without using

acceleration/deceleration terminal).

No.	Function	Range	Unit	Default	Type
F3-21	Acceleration/Deceleration Time Unit	0: S 1: min		0	○

F3-21=0 The unit of acceleration/deceleration time is second. The acceleration/deceleration time can be set continuously in the range of 0.00～600.00 seconds.

F3-21=1 The unit of acceleration/deceleration time is minute. The acceleration/deceleration time is can be set continuously in the range of 0.00～600.00 minutes.

No.	Function	Range	Unit	Default	Type
F3-22	DC Brake Propotion at Start	0.00～30.00 30.01～150.00	%	35.00	○
F3-23	DC Brake Time at Start	0.00～30.00	S	0.00	○

Before inverter starts, the motor may run in low speed or in reverse rotating status. If inverter starts immediately at mean time, overcurrent may occur. In order to avoid such faults, start DC brake to stop motor before inverter starts, and then the inverter runs to setting frequency as per setting direction.

F3-22 Different setting values can define different DC brake torques at start.

★ When the parameter≤30.00, the percentage base is the rated output voltage of inverter. While, the DC brake controls the DC voltage generated by motor windings.

★ When the parameter≥30.01, the percentage base is the rated output current of inverter. While, the DC brake controls the DC current generated by motor windings.

F3-23 Set the DC brake time at start. Inverter runs immediately when the time is up.

If F3-23=0.00, DC brake is disabled at start.

★ The DC brake process at start is as shown in Figure 7-10.

The function is applied to that one inverter drives multi-motors.

No.	Function	Range	Unit	Default	Type
F3-24	DC Brake Start Frequency at Stop	0.10～60.00	Hz	2.00	○
F3-25	DC Brake Propotion at Stop	0.00～30.00 30.01～150.00	%	35.00	○
F3-26	DC Brake Waiting Time	0.00～30.00	S	0.00	○
F3-27	DC Brake Time at Stop	0.00～30.00	S	0.00	○

F3-24 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≠0, then DC brake enabled.

F3-25 Different setting values can define different DC brake torques at stop.

★ When the parameter≤30.00, the percentage base is the rated output voltage of inverter. While, the DC brake controls the DC voltage generated by motor windings.

★ When the parameter≥30.01, the percentage base is the rated output current of inverter. While, the DC brake controls the DC current generated by motor windings.

F3-26 when DC brake command given by the terminal is active at stop or the output frequency reaches the setting value of F3-24 in the process of ramp to stop. DC brake enabled after the time set by F3-26 is up.

F3-27 Set DC brake time at stop. If F3-27=0.00, the DC brake is disabled at stop.

1.If there is a stop DC brake signal of external terminal, then the stop DC brake time takes the greater between the active time of the DC brake signal of external terminal at stop and the setting time in F3-27.

2.DC brake process at stop is as shown in Figure 7-11.

- For heavy load, regular deceleration cannot stop motor fully due to inertia, and motor could stop by prolonging the DC brake time or increasing DC brake current at stop.
- For potential energy load, DC brake current control mode cannot be applied due to the rising time of current.

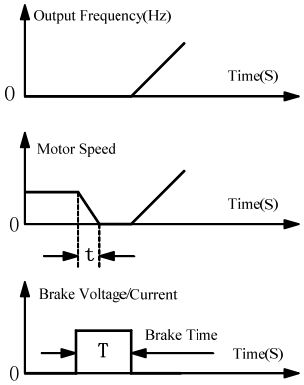


Figure 7-10 DC Brake Process at Start

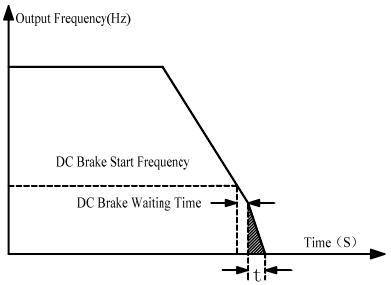


Figure 7-11 DC Brake Process at Stop

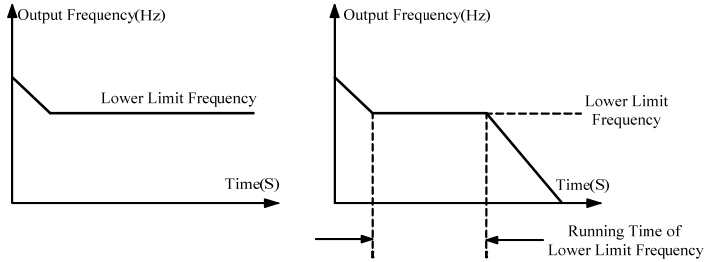
No.	Function	Range	Unit	Default	Type
F3-28	Lower Limit Frequency	0: Run as per lower limit frequency		0000	○

	Control	1: Run at zero speed after lower limit frequency running time is up			
F3-29	Lower Limit Frequency Running Time	0.00～600.00	S	60.00	○

F3-28=0 When the output frequency is lower than the lower limit frequency, the inverter will always run as per lower limit frequency. The lower limit frequency is set by F0-18.

F3-28=1 When the output frequency is lower than the lower limit frequency, the inverter runs per lower limit frequency first, and then runs at zero speed after the lower limit frequency running time reaches the setting value of F3-29. The function is applicable to process PID control like constant pressure water supply, air compressor, and etc.

See Figure 7-12 for lower limit frequency control.



F3-28=0 F3-28=1

Figure 7-12 Lower Limit Frequency Control

No.	Function	Range	Unit	Default	Type
F3-30	Open Loop Slip Compensation	0.00～200.00	%	0.00	●

The speed of motor rotor decreases as load increases. In order to ensure that the speed of rotor is close to synchronous speed, motor could start slip frequency when motor is on rated load. When the speed of motor is lower than the objective value, increase the setting value of F3-30.

★ F3-30=0 Slip compensation is disabled.

No.	Function	Range	Unit	Default	Type
F3-31	Parameter Copy	0: No Copy 1: Upload Parameter (From inverter to keypad, F3-31=0 upon completion) 2: Download Parameter (From keypad to inverter, F3-31=0 upon completion)		0	○

F3-31=0 No copy.

F3-31=1 Upload the parameters from the control panel of inverter to the EEPROM on

keypad. Upon the completion of uploading, F3-31=0 is set automatically.

F3-31=2 Download the parameters from the EEPROM on keypad to the control panel of inverter. Upon the completion of downloading, F3-31=0 is set automatically.

The function may be applied to the setting parameter copy between different inverters, and to save the initial parameters defined by user. When the parameters are edited by mistake, the inverter cannot work normally, please download the parameter to reset user parameters.

7.5 Group F4: General Parameters of PID

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 one or more close-loops 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.

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.

★ Stable error refers to the difference between the expected output of system and the actual output after system response is stable.

See Figure 7-13 for the function of three computing factors in PID control mode.

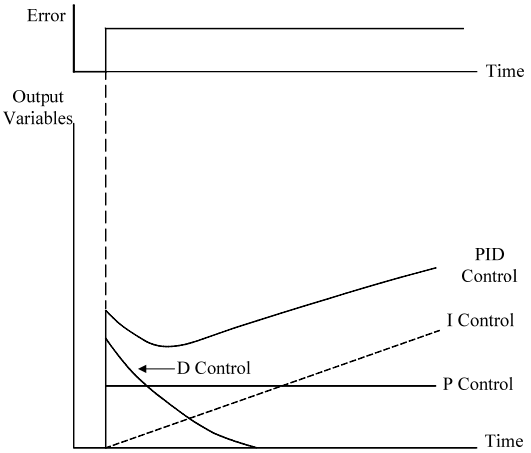


Figure 7-13 Function of PID Control

EM303A PID Control Logic

Control logic of internal process PID of EM303A is as shown in Figure 7-14. Through PID close-loop control, an inverse feedback control system is formed between EM303A and control object.

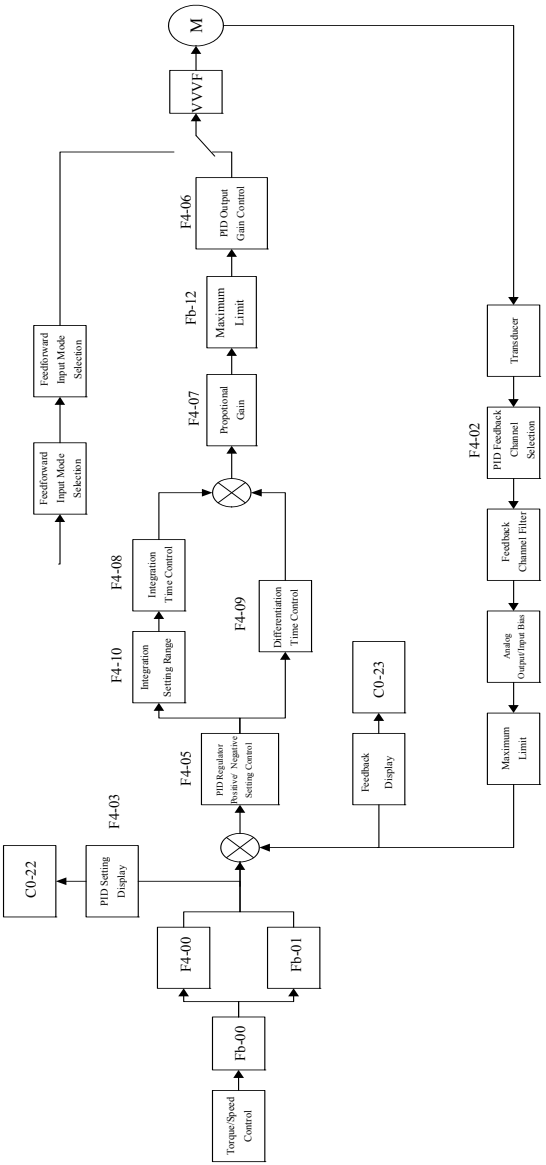


Figure 7-14 Internal Process PID Control Logic of EM303A

Process PID control can form speed PID close-loop control (taking speed as control object) and torque PID close-loop control system (taking torque current as control object).

Set F0-03=0, and F0-26=2, i.e. the inverter can be set as speed process PID control mode. The control object is the speed of motor.

Set F0-03=1, and FA-00 ones place=2 in advanced operation mode, i.e. the inverter can be set as torque process PID control mode. The control object is the output torque of motor.

Torque control mode (SVC1 without PG) is active only when F0-02=3.

No.	Function	Range	Unit	Default	Type
F4-00	PID Regular Setting Mode	0: Numeric PID Setting 1: VS 2: IS 3: VF 4: IF 5: VP		0	○
F4-01	PID Numeric Setting	0.00~10.00	V	5.000	●

Setting Channel Options

F4-00=0 Numeric PID setting. Input PID setting value by editing F4-01 parameters through keypad.

F4-00=1 Take input voltage of analog input terminal VS as PID setting value.

F4-00=2 Convert the input current of analog input terminal IS to voltage, and then take the voltage as PID setting value.

F4-00=3 Take input voltage of analog input terminal VF as PID setting value.

F4-00=4 Convert the input current of analog input terminal IF to voltage, and then take the voltage as PID setting value.

F4-00=5 Take VP input voltage set by keypad potentiometer as PID setting value.

PID Numeric Setting

The detail of F4-01 can be directly input by keypad as PID setting voltage.

No.	Function	Range	Unit	Default	Type
F4-02	PID Feedback Channel	0: VF 1: IF 2: VS 3: IS		0	○

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

F4-02=0 VF input voltage is PID feedback.

F4-02=1 IF input current is PID feedback.

F4-02=2 VS input voltage is PID feedback.

F4-02=3 IS input current is PID feedback.

No.	Function	Range	Unit	Default	Type
F4-03	PID Monitoring Options	0: Voltage-V 1: Actual Physical Quantity （V*Display Coefficient）		0	○
F4-04	PID Display Coefficient	0.01~100.00		1.00	●

Setting object and feedback of PID can directly monitor its actual voltage signal (0.000V~10.000V), and the voltage signal can be converted as the physical quantity signal through editing the F4-04 parameters.

F4-03 Confirm the display unit of PID setting signal and feedback signal.

F4-04 PID display coefficient is a magnification of actual physical quantity displayed value against setting and feedback value. Corresponding physical quantity values (Like temperature, pressure, flow, and etc.) will be displayed on keypad. The physical quantity value =PID setting/feedback value (0~10.00V) * display coefficient

1. Only when F4-03 is set as the displayed actual physical quantity, i.e. F4-03 =1, F4-04 enables.
2. PID setting signal is displayed by monitoring code C0-22. PID feedback signal is displayed by monitoring code C0-23.

No.	Function	Range	Unit	Default	Type
F4-05	PID Positive/Negative Setting	0：Positive Setting 1：Negative Setting		0	○

F4-05=0 Positive setting, i.e. error and output are positive.

F4-05=1 Negative setting, i.e. error is positive, output is negative.

- When feedback signal is greater than the setting value of PID, the output frequency of inverter is required to drop in order to reach PID balance. Take water supply as an example. If the pressure increases, the feedback of pressure increases. The output frequency of inverter needs to drop for reducing pressure and keeping pressure constant. PID should be in positive setting at mean time.
- When feedback signal is greater than the setting value of PID, the output frequency of inverter is required to rise in order to reach PID balance. Take temperature control as an example, PID regulator should be under negative setting control.

No.	Function	Range	Unit	Default	Type
F4-06	PID Output Gain	0.00～100.00	%	100	●

F4-06 Output gain is to regulate the PID output function range. The unit is %.

No.	Function	Range	Unit	Default	Type
F4-07	Proportion Gain GP	0.00~100.00		0.40	●
F4-08	Integration Time GTi	0.000~30.000 0.000: No Integration	S	10.000	●
F4-09	Differentiation Time GTd	0.000~10.000	S	0.000	●

F4-07 Proportion gain GP is the proportion gain of PID close-loop control algorithm.

F4-08 Integration time constant GTi is the integration time constant of PID close-loop control algorithm. When integration time constant is 0, integration function is disabled.

F4-09 Differentiation time GTd is the differentiation time constant of PID close-loop control algorithm.

No.	Function	Range	Unit	Default	Type
F4-10	Integration Function Scale	0.00～100.00	%	100.00	●

F4-10 Integration function scale: When error between PID setting value and feedback is greater than the setting value, there is no integral operation.

★ Setting value of F4-10= (PID setting value - Feedback)/Setting value

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

- Increase the proportional gain GP within the range of non-oscillation output.
- Decrease integration time constant GTi within the range of non-oscillation output.
- Increase differentiation time constant GTd within the range of non-oscillation output.

After all PID parameters set, all of them can be slightly adjusted by following steps:

Output overshoot suppression: Shorten the differentiation time GTd, and prolong the integration time GTi, as shown in Figure 7-15.

Output periodic oscillation suppression: Shorten the differentiation time GTd or set it as zero, and reduce proportion gain GP, as shown in Figure 7-16.

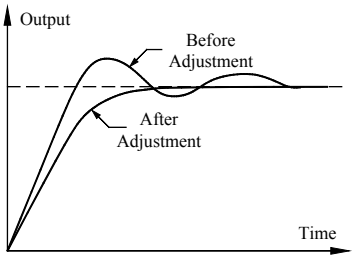


Figure 7-15
Output overshoot Suppression

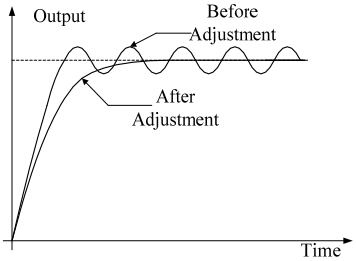


Figure7-16
Output periodic oscillation suppression

No.	Function	Range	Unit	Default	Type
F4-11	PID Positive Output Limit	0.00~100.00	%	100.00	●
F4-12	PID Negative Output Limit	0.00~100.00	%	0.00	●

F4-11 Limiting the range of positive PID output. If consecutive positive feedback occurs, PID operation will not proceed when reached the limit.

F4-11 Limiting the range of negative PID output. If consecutive negative feedback occurs, PID calculation will not proceed when reached the limit.

No.	Function	Range								Unit	Default	Type
F4-15	Monitoring Reference Selection	*	*	Estimated Slip	Estimated Speed	*	Sync-Freq.	Inp. Freq.	Outp. Freq.		1111 1111	○
		0	0	1	1	1	1	1	1			
		0：Absolute Value， 1：+/-										

Bit setting value=0
Monitoring frequency shows absolute value when motor forwards/reverses.
Bit setting value=1
Monitoring frequency shows positive/negative value when motor forwards/ reverses.

F4-15 is bit operation, only set corresponding bit of monitoring frequency = 0/1.
For instance: when motor forwards/reverses, the monitoring output frequency and estimated slip frequency shows positive/negative value respectively, but monitoring the other frequency shows absolute value, only set the 0^{th} bit=1 (corresponding to the output frequency) and the 5^{th} bit=1 (corresponding to the estimated slip), and set other bits = 0, i.e. F4-15=XX10X001.

No.	Function	Range	Unit	Default	Type
F4-16	LCD Language Options	0: Chinese 1: English		0	○

F4-16=0 Chinese displayed on LCD keypad.
F4-16=1 English displayed on LCD keypad.

No.	Function	Range	Unit	Default	Type
F4-18	If parameters change with inverter's working status	0: Unchanged 1: Changed		1	○
F4-19	Parameters Setting Display	0～831		0	●

F4-18=0 When setting parameters, press RUN/JOG button on keypad, the one which remains unchanged is the monitoring parameter. For example, set F0-07=50Hz, and press JOG key, the setting value F0-07 displays as 50Hz, then it shows monitoring parameter of JOG.

F4-18=1 When setting parameters, press RUN/JOG button on keypad, the present display changes as the monitoring parameter.

F4-19 For setting the parameter displayed on keypad, when inverter does not run in parameter setting status. For example: when inverter stops, the parameter displayed on keypad. The setting value is corresponding to the value in Group C0.

No.	Function	Range	Unit	Default	Type
F4-20	Parameters displayed in the 1st row in operation	0～831		512	●
F4-21	Parameters displayed in the 2nd row in operation	0～831		514	●
F4-22	Parameters displayed in the 3rd row in operation	0～831		524	●
F4-23	Parameters displayed in the 4th row in operation	0～831		525	●
F4-24	Parameters displayed in the 1st row at stop	0～831		512	●
F4-25	Parameters displayed in the 2nd row at stop	0～831		514	●
F4-26	Parameters displayed in the 3rd row at stop	0～831		524	●
F4-27	Parameters displayed in the 4th row at stop	0～831		528	●

Selecting the parameters need to be displayed in running and at stop

1. Default selection displays C0-00, C0-02, C0-12, C0-13, and C0-16.
2. See *EM303A Technical Manual* for the number and setting method of relevant codes.

7.6 Group F5: General Parameters of Vector Control

No.	Function	Range	Unit	Default	Type
F5-00	Speed Proportion Gain ASR_P1	0.00~100.00		15.00	●
F5-01	Speed Integration Time ASR_Ti1	0.000~30.000 0.000: No Integration	S	0.200	●
F5-02	Speed Differentiation Time ASR_Td1	0.000~10.000	S	0.000	●
F5-03	Speed Proportion Gain ASR_P2	0.00~100.00		15.00	●
F5-04	Speed Integration Time ASR_Ti2	0.000~30.000 0.000: No Integration	S	0.200	●
F5-05	Switching Frequency 0	0.00~Switching Frequency 1	Hz	5.00	●
F5-06	Switching Frequency 1	Switching Frequency 0~Fmax	Hz	5.00	●

In SVC1, inverter adjusts the speed dynamic response of vector control through regulating speed proportional gain, speed integration time and speed differentiation time of PID regulator. The dynamic response of speed loop can be accelerated by increasing speed proportion gain, reducing speed integration time or increasing speed differentiation time. However, if speed proportional gain is too big, speed integration time is too little, or speed differentiation time is too much, all of which will result in big system overshoot so that oscillation occurs.

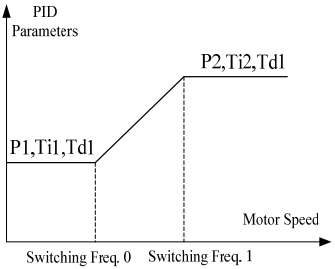


Figure7-17
Illustration of PID parameter

User should regulate above speed PID parameters according to real load features. Usually, on the premise of no system oscillation, proportion gain can be increased as much as possible, and then adjust integration time and differentiation time to enable the system to have quick response with small overshoot.

To ensure quick response of system at both low speed and high speed, PID regulation needs to be conducted at low speed and high speed respectively. Below switching frequency 0, the parameters of speed PID: P1, Ti1 and Td1, and above switching frequency 1, the parameters of speed PID: P2, Ti2 and Td1. If switching frequency 1(F5-06)＞switching frequency 0 (F5-05), then the process is linear transition process from switching frequency 0 to switching frequency 1, as shown in Figure 7-17.

1. Be cautious to edit the parameters of F5-00～F5-06.
2. When setting switching frequency, switching frequency 0(F5-05) ≤ switching frequency 1(F5-06).

Torque control (SVC1)

EM303A could be under torque control in SVC1.

In SVC1, torque control function refers to the occasions when the excitation current of motor is in close-loop, the actual motor speed can be estimated in real time through the internal motor magnetic flux and the speed estimation function of inverter, thus motor torque current can be actively controlled. Furthermore, the output torque of output motor can be controlled.

When EM303A runs in SVC1, the maximum output frequency is limited by torque control upper limit frequency (F5-14). When the setting torque of inverter is bigger than the load torque, the output frequency rises. When the output frequency reaches the upper limit frequency of torque control, inverter always runs as per upper limit frequency, and when the setting torque of inverter is less than the load torque, the output frequency drops.

No.	Function	Range	Unit	Default	Type
F5-07	Torque Current Acceleration Time	0.000～30.000	S	0.040	●
F5-08	Torque Current Deceleration Time	0.000～30.000	S	0.040	●

F5-07 Time taken for torque current to rise from 0 up to rated current.

F5-08 Time taken for torque current to drop from rated current down to 0.

No.	Function	Range	Unit	Default	Type
F5-09	Power Torque Current Limit	80.00～180.00	%	165.00	●
F5-10	Brake Torque Current Limit	80.00～180.00	%	120.00	●

For setting the current limit condition. If the output current (inverter)＞the setting value (F5-09 and F5-10), current limit is enabled, thus the output current can be controlled within current limit.

★ The parameters refer to the ratio of the output current (at current limit) to the rated output current of inverter.

★ Customer can set the current limit based on actual needs to protect motor or meet the working requirements.

F5-09 and F5-10 limit the torque limiting current in power-driven and brake status respectively. See Figure 7-18.

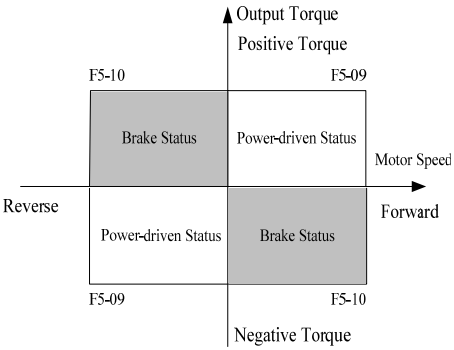


Figure 7-18 Current Limit of Power /Braking Torque

1. If the setting torque current and rotation of motor are in the same direction, the torque current is the power torque current.
2. If the setting torque current and rotation of motor are opposite, the torque current is the brake torque current.

No.	Function	Range	Unit	Default	Type
F5-11	Regular Torque Setting	0: Primary Numeric Torque Setting 1: VP 2: VS 3: IS 4: VF 5: IF 6: Not Used 7:K1*VP+K2*(K3*VS+K4*IS+K5 *VF+K6*IF-K8*5V)		0	○
F5-12	Primary Numeric Torque Current	0.00~150.00	%	0.00	●
F5-13	Torque Direction	0: Positive Torque 1: Negative Torque		0	●

Torque Setting Channel Options

F5-11=0 Numeric torque current setting. Input the setting value of torque current through editing F5-12 parameters through keypad.

F5-11=1 Keypad potentiometer sets the VP input voltage as the setting value of torque current.

F5-11=2 Input voltage of analog input terminal VS is the setting value of torque current.

F5-11=3 Input current of analog input terminal IS is the setting value of torque current.

F5-11=4 Input voltage of analog input terminal VF is the setting value of torque current.

F5-11=5 Input current of analog input terminal IF is the setting value of torque current.

F5-11=7 Combine all analog values as the setting value of torque current, and then adjust corresponding proportion according to each coefficient.

F5-12 Input as the setting value of torque current by keypad directly. The setting value refers to the percentage of torque current output and the rated torque current of motor.

F5-13=0 Torque is positive which is in the same direction of motor rotation.

F5-13=1 Torque is negative which is opposite to the direction of motor rotation.

No.	Function	Range	Unit	Default	Type
F5-14	Upper Limit Frequency Limiting of Torque Control	0: Upper Limit Frequency 1: VS* Upper Limit Frequency 2: IS*Upper Limit Frequency 3: VF*Upper Limit Frequency 4: IF*Upper Limit Frequency		0	○

In torque control mode, the inverter controls the torque current of motor, so the motor speed is beyond control. If the input torque command does not match the load, the motor may accelerate or accelerate in opposite direction continuously. F5-14 is to limit the motor speed threshold in torque control mode. When the motor reaches the speed threshold, torque current is determined by the load torque, but beyond control of the torque current setting value, i.e. the speed will not rise and keep in the threshold. If motor speed drops, the torque current will be recontrolled by setting value.

F5-14=0 Defined by upper limit frequency (F0-17).

F5-14=1 Defined by VS* upper limit frequency.

F5-14=2 Defined by IS *upper limit frequency.

F5-14=3 Defined by VF*upper limit frequency.

F5-14=4 Defined by IF*upper limit frequency.

The analog signal here means gain. Gain value= Voltage/10*100% or current/20*100%.

No.	Function	Range	Unit	Default	Type
F5-15	Preset Torque Current 1	0.00～150.00	%	10.00	●
F5-16	Preset Torque Current 2	0.00～150.00	%	20.00	●
F5-17	Preset Torque Current 3	0.00～150.00	%	30.00	●
F5-18	Preset Torque Current 4	0.00～150.00	%	70.00	●
F5-19	Preset Torque Current 5	0.00～150.00	%	80.00	●
F5-20	Preset Torque Current 6	0.00～150.00	%	90.00	●
F5-21	Preset Torque Current 7	0.00～150.00	%	100.00	●

F5-15～F5-21 set each preset torque current in program operation mode respectively. Those parameters are also applicable to preset torque operation. Please note the definitions of multi-function input terminals in preset torque operation mode (See Group F2: multi-function input/output terminals).

No.	Function	Range	Unit	Default	Type
F5-22	Positive/Negative Torque Control	0: Positive/Negative Torque Permitted 1: Negative Torque prohibited		0	○
F5-23	Positive/Negative Torque Deadband	0.00~600.00	S	0.00	●

F5-22=1 Negative torque prohibited. F5-13 and F5-23 will be blocked.

F5-22=0 Negative torque permitted. F5-13 defines the torque output direction.

F5-23 Set the transit time at zero output torque for the inverter in the process of switching positive and negative torque. See Figure 7-19.

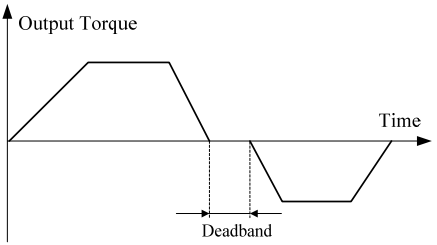


Figure 7-19 Deadband of Positive/Negative Torque

★ The torque direction refers to the setting direction of torque current, but not the rotational direction of motor.

- The default forward direction of motor is the positive torque direction.
- If positive/negative torque switching is applied in torque program operation mode, it cannot be switched by terminals.

No.	Function	Range	Unit	Default	Type
F5-24	Torque Current Gain TP1	0.00～10.00	%	0.60	●
F5-25	Torque Current Integration TTi1	0.000～30.000	S	0.020	●

PID regulator parameter of torque current influences the performance and stability of system directly. User does not need to change the defaults under general conditions.

No.	Function	Range	Unit	Default	Type
F5-26	Excitation Current Input	0.00～200.00	%	100.00	●
F5-27	Excitation Proportion Gain MP1	0.00～10.00	%	0.20	●
F5-28	Excitation Integration Time MTi1	0.000～10.000	S	0.200	●
F5-29	Excitation Boost Gain Kd	0.00～400.00	%	100.00	●
F5-30	Excitation Current Forming Time	0.00～10.00	S	0.10	○

The above 5 parameters are to regulate the motor excitation current. Generally, there is no regulation required.

7.7 Group C0: Monitoring Parameters

When EM303A is running, operation parameters can be acquired by checking monitoring parameters in Group C0. All monitoring parameters are read only.

When inverter is running, F4-20 defines the default of displayed monitoring parameter.

No.	Function	Range and Description	Serial No.	Unit
C0-00 C0-01	Output Frequency	Present output frequency of inverter	512	Hz
C0-02 C0-03	Output Frequency Torque Upper Limit Frequency	Present setting frequency of inverter	514	Hz
C0-04 C0-05	Synchronous Frequency	Synchronous frequency of motor estimated by inverter	516	Hz
C0-06 C0-07	Not Used			
C0-08 C0-09	Estimated Feedback Frequency	Present output frequency is calculated by inverter based on the output voltage and output current.	520	Hz
C0-10 C0-11	Estimated Slip Frequency	Inverter calculates present slip frequency based on the output voltage and output current.	522	Hz
C0-12	Output Current Percentage	The percentage of inverter's present output current and rated output current	524	%
C0-13	Effective Output Current Value	Effective value of inverter's present output current	525	A
C0-14	Output Voltage Percentage	Percentage of inverter's present output voltage and rated output voltage	526	%
C0-15	Effective Output Voltage Value	Effective value of inverter's present output voltage	527	V
C0-16	DC Bus Voltage	Present DC bus voltage of inverter	528	V
C0-17	Overload Count	When the output current exceeds the rated current, count based on the current variables, overload fault trips until count value reaches 100%.	529	%
C0-18	Not Used			
C0-19	Program Operation Section	Monitoring the present program operation section of inverter.	531	SECT

<table>
<tr><td>C0-20</td><td>Running Time of Present Section of Program Operation</td><td colspan="7">In program operation, the unit of running time at present operation section is up to the ten thousand's place of F6-00.</td><td>532</td><td>S/min</td></tr>
<tr><td>C0-21</td><td>Output Power</td><td colspan="7">Output power calculated by inverter</td><td>533</td><td>kW</td></tr>
<tr><td>C0-22</td><td>PID Input</td><td colspan="7">Present PID setting voltage value(Controlled by F4-00)</td><td>534</td><td>V</td></tr>
<tr><td>C0-23</td><td>PID Calculation Feedback</td><td colspan="7">Present PID feedback voltage value(Controlled by F4-02)</td><td>535</td><td>V</td></tr>
<tr><td>C0-24</td><td>Torque Current Input I_q^*</td><td colspan="7">Present torque current input setting value</td><td>536</td><td>%</td></tr>
<tr><td>C0-25</td><td>Torque Current Feedback I_q</td><td colspan="7">Present output torque current value</td><td>537</td><td>%</td></tr>
<tr><td rowspan="3">C0-26</td><td rowspan="3">Input Terminal Status</td><td>X7</td><td>X6</td><td>X5</td><td>X4</td><td>X3</td><td>X2</td><td>X1</td><td rowspan="3">538</td><td rowspan="3"></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>
<tr><td colspan="7">X1 is the LSB. (Monitoring the logic status of external input terminals)</td></tr>
<tr><td rowspan="3">C0-27</td><td rowspan="3">Output Terminal Status</td><td colspan="2">R1</td><td colspan="2">Y2</td><td colspan="2">Y1</td><td rowspan="3">539</td><td rowspan="3"></td></tr>
<tr><td colspan="2">0</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="7">Y1 is the LSB. (Monitoring the logic status of output terminals)</td></tr>
<tr><td>C0-28</td><td>VS Input Monitoring</td><td colspan="7">0~10000</td><td>540</td><td></td></tr>
<tr><td>C0-29</td><td>IS Input Monitoring</td><td colspan="7">0~10000</td><td>541</td><td></td></tr>
<tr><td>C0-30</td><td>VF Input Monitoring</td><td colspan="7">0~10000</td><td>542</td><td></td></tr>
<tr><td>C0-31</td><td>IF Input Monitoring</td><td colspan="7">0~10000</td><td>543</td><td></td></tr>
</table>

The displayed rotational speed of motor can be set when monitoring the frequency.

Remarks:

See *EM303A Technical Manual* for the description of parameters in Group F6~F9, FA, Fb, FC, Fd and FE.

8 Autotuning Motor Parameters

8.1 Autotuning Motor Parameters

Autotuning motor parameter is required when the inverter is in vector control mode. However, if the inverter is not in vector control mode, autotuning is also suggested for acquiring higher control precision at initial operation.

Generally, it is not easy for user to obtain the motor parameters that are needed for calculation in vector control mode such as stator resistance R1, rotor resistance R2, stator and rotor inductance L, stator and rotor leakage inductance Ls, idling excitation current. EM303A provides autotuning function. After the function start-up, inverter automatically tests the relevant parameters of connected motor and saves them to the EEPROM.

The T equivalent model of motor is as shown in Figure 8-1.

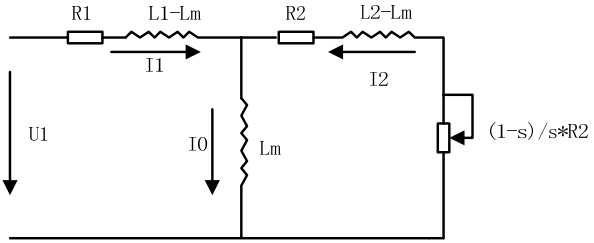


Figure 8-1 T Equivalent Model of 3-phase AC Induction Motor

R1, L1, R2, L2, Lm, and I0 in Figure 8-1 refers to stator resistance, stator inductance, rotor resistance, rotor inductance, stator and rotor mutual inductance, and idling excitation current respectively. Leakage inductance Ls=L-Lm.

8.2 Precautions Before Autotuning

- Autotuning is a process of autotuning motor parameters. EM303A can autotune motor parameters in 2 modes: stationary autotuning and rotational and rotational autotuning.
  - Stationary autotuning is applied to the occasions when the motor cannot be disconnected from the load, inverter can obtain motor parameters.
  - Rotational autotuning is applied to the occasions when the motor can be disconnected from the load. Before autotuning, the motor should be disconnected from the load. Never perform rotational autotuning for a motor with load.

- Make sure that the motor stops before autotuning, otherwise, autotuning cannot be performed.
- Autotuning is only enabled when the inverter is in keypad control mode. (F0-04=0)
- If overcurrent or overvoltage trips in the process of autotuning, acceleration/deceleration time 1 can be adjusted (F0-09 and F0-10) appropriately.
- To ensure a smooth autotuning, set all motor parameters as per the values listed on motor nameplate correctly:
  F1-00: Motor model
  F1-01: Motor rated power
  F1-02: Motor rated voltage
  F1-03: Motor rated current
  F1-04: Motor rated frequency
  F1-05: Motor rated speed
  F1-06: Motor wiring method
  F1-07: Motor rated power factor
  Configure the inverter with an applicable Y-series motor, and the defaults of inverter can meet most of needs.
- To ensure control performance, the motor and the inverter should match in terms of the power rating. Usually the power rating of motor is only allowed to be one level lower than that of the inverter.
- After autotuning is over normally, the setting value of F1-08～F1-13 will be updated and autosaved.
- When F0-28=1 reset the default, the parameters of F1-00～F1-13 remains unchanged.

8.3 Autotuning Procedure

- In parameter setting status, set F0-04=0, and make motor offload.
- Set all motor parameters as per the values listed on nameplate correctly:
  F1-00: Motor model
  F1-01: Motor rated power
  F1-02: Motor rated voltage
  F1-03: Motor rated current
  F1-04: Motor rated frequency
  F1-05: Motor rated speed
  F1-06: Motor wiring method
  F1-07: Motor rated power factor

- Set F1-15=1, inverter performs stationary autotuning.
- Set F1-15=2, inverter performs rotational autotuning.
- It takes about 2 minutes to finish autotuning motor parameters, and the keypad displays returns the initial power-on status.
- In autotuning, press STOP/RESET button to cancel autotuning, and inverter will return parameter setting status.
- If autotuning fails, SrE (Stator Resistance Error) or SIE (Idling Current Error) will trip, and then press STOP/RESET button, inverter will return to parameter setting state.

8.4 Automatic Torque Boost and Slip Compensation

If the load increases, then the motor slippage increases, and motor speed drops. Motor can keep constant speed with help of slip compensation and automatic torque boost.

8.4.1 Automatic Torque Boost

Automatic torque boost F0-15=0, boost the output voltage automatically through detecting load current. The scale of automatic torque boost is up to the voltagedrop of motor stator resistance (F1-10) acquired by motor parameter autotuning. See Figure 8-2 for the scale of automatic torque boost.

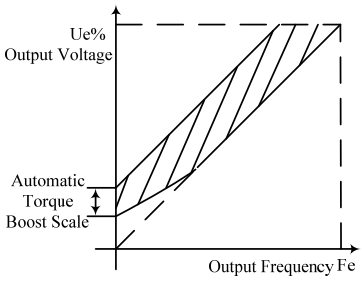


Figure 8-2 Automatic Torque Boost Scale

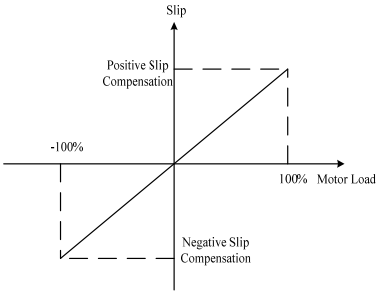


Figure 8-3 Slip Compensation

8.4.2 Slip Compensation

In V/F control mode, the speed of motor rotor drops down as the load increases. To ensure the speed of motor stator is closer to idling speed when motor is with rated load. Slip compensation can be started, set it as per F3-30. Usually slip compensation is not needed in vector control mode.

Motor rated slippage is related to the idling current and pole numbers of motor, and it can be calculated by the following formula:

★ Motor rated slippage [Hz] =

Motor rated frequency [Hz] – Rated rotational speed [rpm] *Motor pole numbers/120.

Correct motor rated slippage is required when inverter calculates slip compensation. Input nameplate parameters of motor correctly in F0-00～F1-07 for autotuning or the inverter will calculate the rated slippage of motor automatically after the user inputs motor parameters manually by knowing the motor parameters correctly.

Based on operation needs, slip compensation may need to be adjusted according to the following methods:

- F3-30=0.00～200.00, the slip compensation intensity can be continuously set within 0.00～200.00% of the motor rated slippage scale. 0.00% indicates motor slip compensation disabled, i.e. the rated torque current corresponds to the rated slip frequency at mean time. Set F3-30=X, i.e. slip compensation=X% *motor rated slippage, and meanwhile the rated torque current corresponds to (1+X %) * rated slip frequency. The bigger the setting value is, the bigger the compensation is. Therefore:
- When the actual motor speed is below the objective value, increase the setting value of F3-30. When it is much higher than the objective value, reduce the setting value of F3-30. It is advised to adjust gradually by unit of 0.10.

Positive slip compensation is applied to motoring mode, and negative slip compensation is applied to regenerating mode, as shown in Figure 8-3.

9 Troubleshooting

9.1 Faults

When anything unexpected happens, the corresponding trip code and parameters will be displayed on the keypad, fault relay acts, fault output terminal is on, and inverter output stops. When fault occurs, if the motor is running, it will coast to stop. See Table 9-1 for EM303A fault trips and troubleshootings.

Table 9-1 EM303A Fault Trips and Troubleshootings

Trip Code	Trip	Cause	Corrective Action
SC	Short Circuit	1. Short circuit between inverter output phases, or between the output phases and ground. 2. IGBT is damaged.	1. Check, take corrective actions, and then reset. 2. Technical support is required.
HOC	Instantaneous Overcurrent	1. Short circuit between inverter output phases or between the output phases and ground. 2. When load is too heavy, the acceleration/deceleration time is too short. 3. In V/F control mode, the setting value of torque boost is too big. 4. The motor is rotating when inverter starts. 5. The capacity of motor exceeds that of inverter.	1. Check, take corrective actions, and then reset. 2.Prolong acceleration/deceleration time 3. Reduce setting value of torque boost. 4. Set speed search start enabled or start DC brake. 5. Replace with applicable motor or inverter.
SOC	Stable Overcurrent		
HOU	Instantaneous Overvoltage	1. Deceleration time is too short. The motor regenerative energy is too much. 2. Power supply voltage is too high.	1. Prolong deceleration time. 2. Lower the power supply voltage to the rated voltage.
SOU	Stable Overvoltage	1. Voltage of power grid is too high.	1. Lower voltage to the rated voltage.
SLU	Stable Undervoltage	1. Input power phase loss. 2. Wiring terminal of input power is loose. 3. Voltage fluctuation of input power is too big. 4. Switch contact of input power is aging.	1. Check input power supply. 2. Tighten screws on input terminals. 3. Check air switch and contactor.
ILP	Input Phase Loss	1. Input power phase loss.	1. Check input power supply. 2. Check wiring of input power supply. 3. Check if wiring terminal is loose.

OL	Overload	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.	1.Prolong acceleration/deceleration time. 2.Reduce setting value of torque boost. 3.Replace with the inverter which is applicable to the load.
OH	Heatsink Overheating	1. Ambient temperature is too high. 2. Poor ventilation. 3. Cooling fans are broken down.	1.The service environment of inverter should meet requirement. 2.Improve environmental ventilation, and check if the vent of inverter is blocked. 3.Replace air cooling fan.
EHt	External Fault	1. External device fault terminal is on.	1. Check external device.
PUP	PID Upper Limit	1. Process PID feedback signal exceeds the setting upper limit.	1. Check PID signal and device.
PdN	PID Lower Limit	1. Process PID feedback signal exceeds the setting lower limit.	1. Check PID signal and device.
EEd	Inverter EEPROM Failure	1. Interference makes EEPROM read-write mistakes. 2. EEPROM is damaged.	1. Press STOP/RESET button to reset, and then retry. 2. Technical support is required.
EEU	Keypad EEPROM Failure		
StP	Autotuning Cancelled	1. During autotuning, press STOP/RESET button.	1. Press STOP/RESET button to reset.
SFE	Autotuning Coast-to-stop	1. When FRS=ON, the external terminal is off during autotuning.	1. Press STOP/RESET button to reset.
SrE	Stator Resistance Error	1. Motor is not connected to the output terminals of inverter. 2. Motor is on load. 3. Motor fails.	1. Check connection between inverter and motor. 2. Motor is offloaded. 3. Check motor.
SIE	Idling Current Error		

When inverter trips faults as stated above, press STOP/RESET button or use reset terminal to clear fault. If the fault is cleared, inverter will return the function setting state. Otherwise, the trip code will be displayed on LED continuously.

When faults trip in operation, if fault retry (set by FC-24) is enabled, the inverter will reset fault automatically and try to run after certain setting interval time (set by FC-25). FC-24 sets the retry times of fault reset. If the fault times exceeds the setting value within 30 seconds, and then the inverter stops retry and keeps in fault status.

9.2 Fault Analysis

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.

9.2.1 Parameter Setting Failures

- Press UP/DOWN button, the parameters remain unchanged.
  Some parameters can only be edited when the inverter stopped.
- Press UP/DOWN button, parameter changes, but they cannot be saved.
  Some parameters cannot be edited since they are locked.

9.2.2 Abnormal Motor Operation

- Press RUN button, the motor does not run.
  - ■ Start/Stop is in terminal control mode: Check the setting of F0-04.
  - ■ Coast-to-stop terminals FRS is connected to COM: Disconnect FRS from COM.
  - ■ When the terminal (Run Command Switched to Terminal) is on, the run command is only in terminal control mode at mean time: Switch the terminal off.
  - ■ Status combination of run command input is in terminal control mode: Change it to keypad control mode.
  - ■ Setting reference input frequency= 0: Increase reference input frequency.
  - ■ Power supply is abnormal or control circuit fails.
- Control terminals RUN, F/R=ON, the motor does not run.
  - ■ The external terminal start/stop setting is disabled: Check the setting of F0-04.
  - ■ Coast-to-stop terminal FRS=ON: Switch FRS=OFF.
  - ■ Control switch is disabled: Check control switch.
  - ■ Setting reference input frequency=0: Increase reference input frequency.
- Motor can only run in one direction.
  Reverse prohibited: When F0-24=1, the reverse is prohibited.
- Motor reverses
  The output phase sequence of inverter is not identical to that of motor input: When power is off, the running direction of motor can be changed by switching any of the two connection wires, or editing F0-08 when power is on.

9.2.3 Excessively Long Acceleration Time

- Excessively low setting of current limit
  When setting current limit is enabled, if the output current of inverter reaches its setting current limit (FC-08), then, the output frequency will remain unchanged in the process of acceleration, and it will rise continuously only until output current is lower than the setting current limit. In this case, the

acceleration time of motor is longer than the setting time. Check if the setting current limit of inverter is excessively low.

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

9.2.4 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 (FC-16) 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 DC690V, the output frequency remains unchanged. When it is below DC660V, the output frequency drops continuously, therefore the deceleration time is prolonged.
  - The setting deceleration time is too long, please check its parameters.

9.2.5 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.

9.2.6 Electromagnetic Interference (EMI) and Radio-frequency Interference (RFI)

- When inverter runs in high frequency switch status, it will generate EMI and RFI on the control devices. Take following countermeasures:
  - Lower the carrier frequency (F0-14) of inverter.
  - Install noise filter on input side of inverter.
  - Install noise filter on output side of inverter.
  - Shield cable with a metal tube, and place the inverter in a metal case.
  - Reliable grounding for the inverter and motor.
  - 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.

9.2.7 Leakage Current Circuit Breaker for Leakage Protection

- **When inverter runs, the leakage current circuit breaker is triggered for leakage protection.**

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

9.2.8 Mechanical Vibration

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

  If there is no problem with the motor, but 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 F0-14, and F7-20~F7-22 of inverter 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. Please use skip frequency F6-16~F6-21 and its range to avoid resonant frequency, or use oscillation suppression function (F9-27), or install the shake-proof rubber on the chassis of motor or any other shake-proof measures.
- PID Control Oscillation

  Improper setting of PID controller's regulation parameters P, Ti and Td, please reset PID parameters.

9.2.9 Inverter Stops Output While Motor Runs

- Insufficient DC brake at stop
  - DC brake torque at stop is too small. Please increase setting value of DC brake current at stop (F3-25).
  - DC braking time is too short at stop. Please increase setting value of DC brake time (F3-27). Generally, please increase the DC brake current at stop first.

9.2.10 Output Frequency Does Not Output as per the Setting Frequency

- The setting frequency is within the range of skip frequency

  The function of skip frequency is to forbid the inverter to output within the skip frequency range. Please check if the skip frequency of F6-16~F6-21 and its range are proper.
- The 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 F0-16 and F0-17 are proper.

10 Maintenance and Inspection

10.1 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.

10.2 Daily Inspection

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 monitoring displays should not be higher than normal value.
- The cooling fan at the bottom of the inverter should be in normal operation.

10.3 Periodic Maintenance

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 the indicator CHARGE on main circuit power supply is off.

Table 10-1 Periodic Maintenances

Item	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	Are they 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.

10.4 Periodic Maintenance and Replacement of Parts

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 10-2 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℃
- Load factor: 80% maximum
- Operation rate: 12 hours maximum per day

10.5 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.

11 Accessories

11.1 Keypad Extension Wire

Optional keypad extension wires available in the table below, select based on real needs.

Parameter Name	Specifications	Remarks
Keypad Extension Wire	EM303A-3 m	
Keypad Extension Wire	EM303A-4 m	
Keypad Extension Wire	EM303A-5 m	
Keypad Extension Wire	EM303A-6 m	
Keypad Extension Wire	EM303A-8 m	
Keypad Extension Wire	EM303A-10 m	
Keypad Extension Wire	EM303A-12 m	Special Remote Control Keypad Required
Keypad Extension Wire	EM303A-15 m	Special Remote Control Keypad Required
Keypad Extension Wire	EM303A-20 m	Special Remote Control Keypad Required
Keypad Extension Wire	EM303A-30 m	Special Remote Control Keypad Required

- When keypad extension wire exceeds 10 meters, it is required to use the special remote operation keypad in case of signal disorder caused by line loss.
- When keypad extension wire exceeds 10 meters, please take anti-interference measures to maintain inverter in normal work status.
- The external terminal control is suggested if the inverter needs to be operated beyond 20 meters.

11.2 Remote Operation Case

The remote operation case is applicable to the occasions when inverter needs to be simply controlled in a distance.

The functions of remote operation case:

- Start / stop control and emergency stop of inverter.
- Display speed or other information through the analog voltage output of inverter.
- Regulate speed by the analog input terminals of inverter.
- Regulate speed in stepping mode through the multi-function input terminals of inverter.

Set the terminal functions of inverter correspondingly for the functions stated above.

See Figure 11-1 for the overall and installation dimensions of remote operation case.

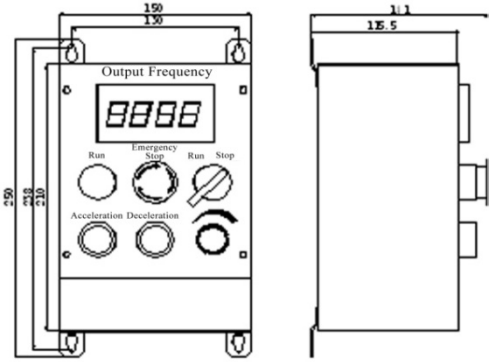


Figure 11-1 Outlook and Installation Dimensions of Remote Operation Case

11.3 Braking Resistor

EM303A (0.75～15KW) with an integrated braking unit can be connected to braking resistor directly for quick stop. Refer to Table 11-1, and select braking resistor for EM303A.

Table 11-1 Braking Resistor Selection

Inverter Model No.	Motor Power (kW)	MIN Resistor Resistance(Ω)	Resistor power (W)	Cable Size (mm^2)
EM303A-0R7-3CB	0.75	≥360	≥200	1
EM303A-1R1-3CB	1.1	≥360	≥200	1
EM303A-1R5-3CB	1.5	≥180	≥400	1.5
EM303A-2R2-3CB	2.2	≥180	≥400	1.5
EM303A-3R0-3CB	3.0	≥180	≥400	1.5
EM303A-4R0-3CB	4.0	≥90	≥800	2.5
EM303A-5R5-3CB	5.5	≥60	≥1000	4
EM303A-7R5-3CB	7.5	≥60	≥1000	4
EM303A-9R0-3CB	9.0	≥60	≥1000	4
EM303A-011-3CB	11	≥30	≥2000	6
EM303A-015-3CB	15	≥30	≥2000	6

Remarks:

1.See *User Manual of BR100 Braking Unit* for selecting braking resistor for EM303A-018 or above.

2.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.

3.Cable should withstand voltage≥AC450V, temperature resistance :105℃.

4.Because there is a resistor limit of power consumption, the longest operation time for 10%ED is 10S (On: 10S/ Off:90S).

11.4 Braking Unit

Separate BR100 braking unit is available for EM303A-018 or above which are without an integrated braking unit, power rang of BR100: 18.5～315kW.

SINEE-make BR100 models are as shown in the following table.

Model No.	Application	Minimum Resistance (Ω)	Average Brake Current I_{av}(A)	Peak Brake Current I_{max}(A)	Inverter Power Range（kW）
BR100-045	Dynamic Brake	10	45	75	18.5～45
BR100-160	Dynamic Brake	6	75	150	55～160
BR100-315	Dynamic Brake	3	120	300	185～315

Remarks:

When BR100-160 is in minimum resistance, when brake duty ratio D≤33%, braking unit can work continuously, and it needs to work non-continuously when brake duty ratio D>33%. Otherwise, braking unit will trip over-heating.

11.5 Connecting Cable

Since all braking unit and braking resistors work at a high voltage (>400VDC) in a non-continuous working status, please select applicable cable. See Table 11-2 for specifications of main circuit cable, and take the cable which meets the insulation and cross-section requirements.

Table 11-2 Cable for Braking Unit and Braking Resistor

Model No.	Average Brake Current I_{av}(A)	Peak Brake Current I_{max}(A)	Cross-section of Copper Cable (mm^2)
BR100-045	45	75	6
BR100-160	75	150	10
BR100-315	120	300	16

Soft cable possesses a better flexibility, so copper cable, soft heat-proof cable or flame-proof cable is suggested because the cable may contact the equipment with high temperature.The distance between braking unit and inverter shall within 2m. Otherwise, the cable on DC side shall be twisted and shielded with magnetic ring to reduce radiation and induction.

Refer to *User Manual of BR100 Braking Unit* for 11.3, 11.4 and 11.5.

12 Communication Protocol of EM303A

12.1 Application Scope

1. Applicable series: EM303A
2. Applicable network: Support ModBus protocol, RTU format, with single-master and multiple-slaves communication network of RS485 bus.

The typical RTU message frame format:

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

Remarks:

It takes 8S for inverter to reset the default of F0-28, the high bytes first, then the low bytes. The inverter would not response to communicational command in those 8S.

12.2 Physical Interface

RS485 asynchronous half-duplex communication mode

Default data format of keypad communication interface: 1-8-N-1, bits rate: 9600bps.

Default data format of RS485 terminal: 1-8-N-1，bits rate:9600bps.

Data format 1-8-N-1, 1-8-O-1, 1-8-E-1, bits rates: 4800bps, 9600bps, 19200bps, and 38400 bps.

12.3 Protocol Format

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

Frame Structure of Sending Message

Transmit Sequence		Bytes Sent
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Register start address（H）	2
4	Register start address（L）	
5	Register number（H）	2
6	Register number（L）	
7	CRC parity（L）	2
8	CRC parity（H）	
9	≥Idle periods of 4 bits	

Frame Structure of Receiving Message

Receive Sequence		Bytes Received
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Byte Length	1
4	High byte	2*Register number
5	Low byte	
6	CRC parity（L）	2
7	CRC parity（H）	
8	≥Idle periods of 4 bits	

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

Frame Structure of Sending Message

Transmit Sequence		Bytes Sent
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Register address（H）	2
4	Register address（L）	
5	Register data （H）	2
6	Register data （L）	
7	CRC parity（L）	2
8	CRC parity（H）	
9	≥Idle periods of 4 bits	

Frame Structure of Receiving Message

Receive Sequence		Bytes Received
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Register address（H）	2
4	Register address（L）	
5	Register data （H）	2
6	Register data （L）	
7	CRC parity（L）	2
8	CRC parity（H）	
9	≥Idle periods of 4 bits	

Command Code 0x10： Edit function codes or control parameters of inverter

Frame Structure of Sending Message

Transmit Sequence		Bytes Sent
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Register start address（H）	2
4	Register start address（L）	
5	Register number（H）	2
6	Register number（L）	
7	Byte Length	1
8	Register data （H）	2* Register number
9	Register data （L）	
10	CRC parity（L）	2
11	CRC parity（H）	
12	≥Idle periods of 4 bits	

Frame Structure of Receiving Message

Receive Sequence		Bytes Received
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Register start address（H）	2
4	Register start address（L）	
5	Register number（H）	2
6	Register number（L）	
7	CRC parity（L）	2
8	CRC parity（H）	
9	≥Idle periods of 4 bits	

Command Code 0x08: Circuit Diagnosis and Setting

Frame Structure of Sending Message

Transmit Sequence		Bytes Sent
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Sub-function code（H）	2
4	Sub-function code（L）	
5	Data（H）	2
6	Data（L）	
7	CRC parity（L）	2
8	CRC parity（H）	
9	≥Idle periods of 4 bits	

Frame Structure of Receiving Message

Receive Sequence		Bytes Received
0	≥Idle periods of 4 bits	
1	Address code	1
2	Function code	1
3	Sub-function code（H）	2
4	Sub-function code（L）	
5	Data（H）	2
6	Data（L）	
7	CRC parity（L）	2
8	CRC parity（H）	
9	≥Idle periods of 4 bits	

12.4 Description of Protocol Format

12.4.1 Address Code

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

12.4.2 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

12.4.3 Allocation of Register's Addresses

Name	Address	Description
Function Code	0000H～1F1FH (Saving Address）	High byte is the function code group number.F0～FF, C0, E0 is corresponding to high bytes 00H～0FH, 10H, 11H respectively. Low byte is serial number of function code group. 0~31 are 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 service lifespan. If only editing the value of function code without temporary saving, and then only the value of RAM need to be edited. Complete the operation by the address of function code+2000H. For example, the temporary saving address of F0-07 is 2007H.
Control Command	40xx	Refer to Appendix 1
Working Status	41xx	Refer to Appendix 1

12.4.4 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 operating 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 byte of sending message. Repeat above process continuously until each byte of sending message is processed.
8. CRC parity date will be saved in CRC parity register after calculation.
9. LUT (Look-up table) method is to obtain CRC parity in the system with limited time resources.

12.4.5 Details of 0x08 Circuit Diagnoses and Setting

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

12.5 Example

12.5.1 Read the setting value of primary numeric frequency F0-07 of inverter No.1, return 50Hz.

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

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

12.5.2 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
Data		01H	06H	00H	07H	0BH	B8H	3FH	49H	

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

12.5.3 Start Inverter Operation

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

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

12.5.4 Inverter Stops

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

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

Appendix 1

Control Command 1（4000H）

Data	Meaning	Data	Meaning
0000H	Inactive Command	0006H	Ramp 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	Parameter Reset
0005H	Slave-inverter Stops	000BH	Not Used

Control Command 2（4001H）:

Virtual Terminals from LSB to MSB are:

X1, X2, X3, X4, X5, X6, X7, VS, VF, IS, IF, Y1, Y2, R1.

Virtual Terminals		R1	Y2	Y1	IF	IS	VF	VS		X7	X6	X5	X4	X3	X2	X1
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Inverter Status 1(4100H):

Data	Meaning	Data	Meaning
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