EMHEATER

EM9 High Performance Vector Inverter

User manual

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China EM Technology Limited

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China EM Technology Limited

Foreword

Thanks for using EMHEATER EM9 series inverter!

EM9 series inverter is China EM Technology Limited adopted the new concept to research and developed high-performance product; With unique control model, this inverter can realize sensor-less vector control, constant torque, high precision, wide variable speed and low noise drive; With more superior performance than similar products, EM9 inverters have practical PID regulation, simple PLC, flexible input and output terminals, parameter online modification, automatic identification signal transmission failure, parameter storage of power outages and stop, fixed length control, swing frequency control, main and auxiliary given control, field bus control and a series of practical operation, control function, which provide a highly integrated solution for equipment manufacturers and terminal customers, in speed, energy saving, protection, automatic control and other aspects. EM9 inverter has great value to reduce the purchase and operating costs, enhance the reliability of the customers' system.

Before installation, use and maintenance of this inverter, the relevant personnel please read the user manual carefully, to ensure the correct installation and operation of this product, make it play its best performance.

As for any query of frequency inverter application or having special requirements, you can feel free to contact my company's agents, but also can directly call my company after sale service department; we will make effort to service well for you.

Version：201201

Contents

1. INTRODUCTION

1.1 Technology Features

●Input & Output

◆Input Voltage Range**:** 380/220V±15%
◆Input Frequency Range**:** 47～63Hz
◆Output Voltage Range**:** 0～rated input voltage
◆Output Frequency Range**:** 0～600Hz

●I/O features

◆Programmable Digital Input**:** 6 ON-OFF input terminals
◆Programmable Analog Input**:** AI1：0～10V；AI2：0～10V or 0/4～20mA
◆Open Collector Output**:** Provide 2 output terminals
◆Relay Output**:** Provide 1 output terminal.
◆Analog Output**:** Provide 1 analog output terminal. Output scope can be AO1**:** 0～10V; AO2：0/4～20 mA or 0～10 V, as chosen.

●Main Control Function

◆ Control Mode**:** Sensorless Vector Control (SVC), V/F Control.
◆ Overload Capacity**:**60s with 150% of rated current, 10s with 180% of rated current.
◆Starting Torque**:** 150% of rated torque at 0.5Hz (SVC).
◆Speed Adjusting Range**:** 1**:**100 (SVC)
◆Speed Accuracy**:** Sensorless vector control ： ±0.5% of maximum speed (SVC)
◆Carrier Frequency**:** 0.5kHz ～15.0kHz.

●Function characteristics

◆ Reference Frequency Source**:** Keypad, analog input, serial communication, multi-step speed, PID , pulse input and so on.
◆ PID Control Function
◆ Programmable Timing Running（Simple PLC）
◆ Multi-Step Speed Control Function**:** 8 steps speed can be set.
◆ Traverse Control Function
◆ None-Stop when instantaneous power off.
◆ Speed trace Function**:** Start the running motor smoothly.
◆ QUICK/JOG Key**:** User defined shortcut key can be realized.
◆ Automatic Voltage Regulation (AVR) Function**:** Automatically keep the output voltage stable when input voltage fluctuating.
◆ Up to 25 fault protections**:** Protect from over current, over voltage, under voltage, over heat, phase failure, overload etc.

1.2 Description of Nameplate

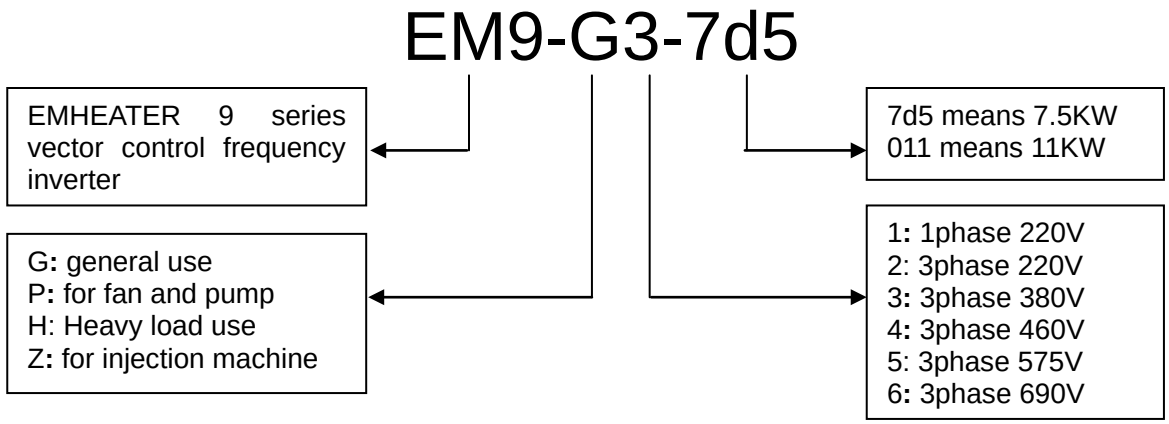


Figure 1-1 Nameplate explanation

1.3 EM9 Series Inverter Selection Guide

Model No	Voltage(V)	Power(kW)	Current(A)	G.W(KG)	Packing size H/W/D(mm)
EM9-G1-0d4	1AC220V Range: -15% ~ +15%	0.4	2.5	3	150*96*134
EM9-G1-d75		0.75	4		
EM9-G1-1d5		1.5	7		
EM9-G1-2d2		2.2	10	3.5	189*124*160
EM9-G1-004		4.0	16	4.5	236*149*180
EM9-G1-5d5		5.5	23		
EM9-G3-d75	3AC380V Range: -15% ~ +15%	0.75	2.5	3.5	189*124*160
EM9-G3-1d5		1.5	4		
EM9-G3-2d2		2.2	6		
EM9-G3-004		4.0	9	4.5	236*149*180
EM9-G3-5d5		5.5	13		
EM9-G3-7d5		7.5	17	7	275*194*207
EM9-G3-011		11	25		
EM9-G3-015		15	32	18	370*272*226
EM9-G3-018		18.5	37		
EM9-G3-022		22	45	25	465*302*241
EM9-G3-030		30	60		
EM9-G3-037		37	75	50	610*360*300
EM9-G3-045		45	90		
EM9-G3-055		55	110		
EM9-G3-075		75	150	90	684*424*324
EM9-G3-093		93	176		
EM9-G3-110		110	210	120	880*500*338
EM9-G3-132		132	250		
EM9-G3-160		160	300	180	1410*574*430
EM9-G3-185		185	340		
EM9-G3-200		200	380	250	1600*780*470
EM9-G3-220		220	420		
EM9-G3-250		250	470		
EM9-G3-280		280	520	350	1700*850*498
EM9-G3-315		315	600		
EM9-G3-350		350	640	400	1700*850*523
EM9-G3-400		400	690		
EM9-G3-450		450	750		
EM9-G3-500		500	860	500	2220*1200*550
EM9-G3-560		560	950		
EM9-G3-630		630	1100		
EM9-P3-1d5	3AC380V Range: -15% ~ +15%	1.5	4	3.5	189*124*160
EM9-P3-2d2		2.2	6		
EM9-P3-004		4.0	9		
EM9-P3-5d5		5.5	13	4.5	236*149*180
EM9-P3-7d5		7.5	17		
EM9-P3-011		11	25	7	275*194*207
EM9-P3-015		15	32		
EM9-P3-018		18.5	37	18	370*272*226
EM9-P3-022		22	45		
EM9-P3-030		30	60	25	465*302*241
EM9-P3-037		37	75		
EM9-P3-045		45	90	50	610*360*300
EM9-P3-055		55	110		
EM9-P3-075		75	150		

Model No	Voltage(V)	Power(kW)	Current(A)	G.W(KG)	Packing size H/W/D(mm)
EM9-P3-093		93	176	90	684*424*324
EM9-P3-110		110	210		
EM9-P3-132		132	250	120	880*500*338
EM9-P3-160		160	300		
EM9-P3-185		185	340	180	1410*574*430
EM9-P3-200		200	380		
EM9-P3-220		220	420	250	1600*780*470
EM9-P3-250		250	470		
EM9-P3-280		280	520		
EM9-P3-315		315	600	350	1700*850*498
EM9-P3-350		350	640		
EM9-P3-400		400	690	400	1700*850*523
EM9-P3-450		450	750		
EM9-P3-500		500	860		
EM9-P3-560		560	950	500	2220*1200*550
EM9-P3-630		630	1100		

1.4 External Dimension

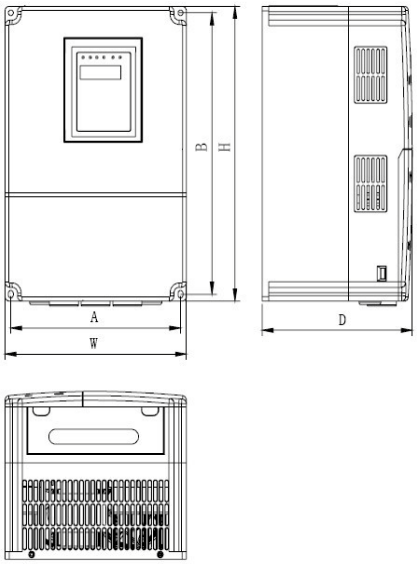


Figure 1-2 Dimensions (Power below 7.5kW)

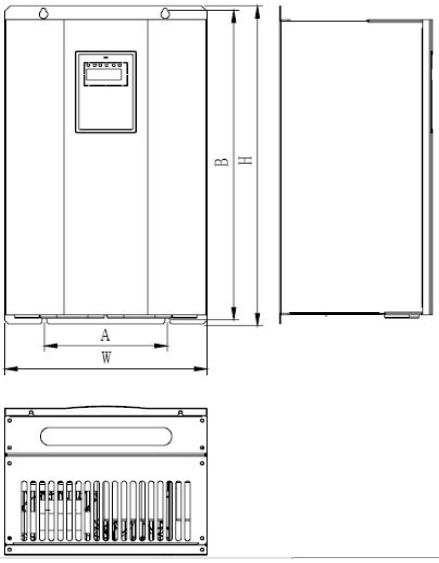


Figure 1-3 Dimension (11KW～132KW)

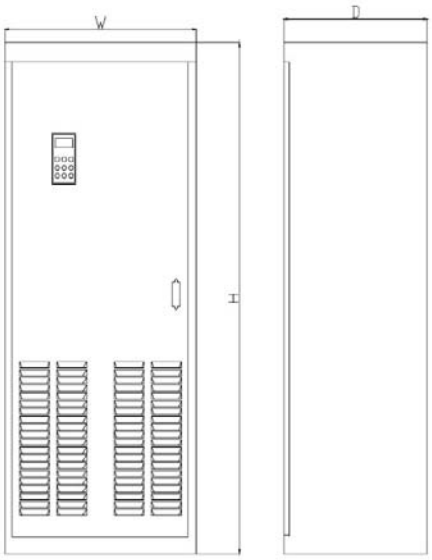


Figure 1-4 Dimension (160KW～400KW)

External size and mounting size:

Rated output power	Input voltage	A（mm）	B（mm）	H（mm）	W（mm）	D(mm)	Installation Hole（mm）
（KW）		Installation imension		External Dimension			
0.4～1.5	1AC220V Range: -15%～15%	79	132	140	85	125	4
2.2		111.5	156.5	170	125	162	5
0.75~2.2	3AC380V Range: -15％～+15%	111.5	156.5	170	125	162	5
3.7~5.5		136.5	205	220	150	175	5
7.5		202.5	287.5	300	216	212	6
11~18.5		170	350	370	274	226	9
22~30		200	444	465	300	235	9

Rated output power	Input voltage	A（mm）	B（mm）	H（mm）	W（mm）	D(mm)	Installation Hole（mm）
（KW）		Installation Dimension		External Dimension			
37~55		250	590	610	360	299	9
75~93		300	659	684	424	324	11
110~132		320	858	883.5	504	338	11
160~200		/	/	1400	574	430	/
220~250		/	/	1600	760	480	/
280~315		/	/	1700	850	480	/
350~450		/	/	1700	850	523	/
500~630		/	/	2200	1200	550	/

2. UNPACKING AND INSPECTION

CAUTION

●Don't install or use any inverter that is damaged or have fault part, otherwise it may cause injury.

Check the following items when unpacking the inverter**:**

1. Inspect the entire exterior of the Inverter to ensure there are no scratches or other damage caused by the transportation.
2. Ensure there is operation manual and warranty card in the packing box.
3. Inspect the nameplate and ensure it is what you ordered.
4. Ensure the optional parts are what you need if have ordered any optional parts. Please contact the local agent if there is any damage in the inverter or optional parts.

3 UNPACKING AND INSTALLATION

WARNING

- The person without passing the training to operate the device or any rule in the "warning" being violated, will cause severe injury or property loss. Only the person, who has passed the training on the design, installation, commissioning and operation of the device and got the certification, is permitted to operate this equipment.
- Input power cable must be connected tightly, and the equipment must be grounded securely.
- Even if the inverter is not running, the following terminals still have dangerous voltage**:**- Power Terminals**:** R, S, T - Motor Connection Terminals**:** U, V, W.
- When power off, should not install the inverter until 5 minutes after, which can ensure the device discharge completely.
- The section area of grounding conductor must be no less than that of power supply cable.

CAUTION

- When moving the inverter please lift by its base and don't lift by the panel. Otherwise may cause the main unit fall off which may result in personal injury.
- Install the inverter on the fireproofing material (such as metal) to prevent fire.
- When need install two or more inverters in one cabinet, cooling fan should be provided to make sure that the air temperature is lower than 45℃. Otherwise it could cause fire or damage the device.

3.1 Environmental Requirement

3.1.1 Temperature

Environment temperature range**:**-10℃～+40℃.Inverter will be derated if ambient temperature exceeds 40℃.

3.1.2 Humidity

Less than 95% RH without dewing.

3.1.3 Altitude

Inverter can output the rated power when installed with altitude of lower than 1000m.

It will be derated when the altitude is higher than 1000m. For details, please refer to the following figure**:**

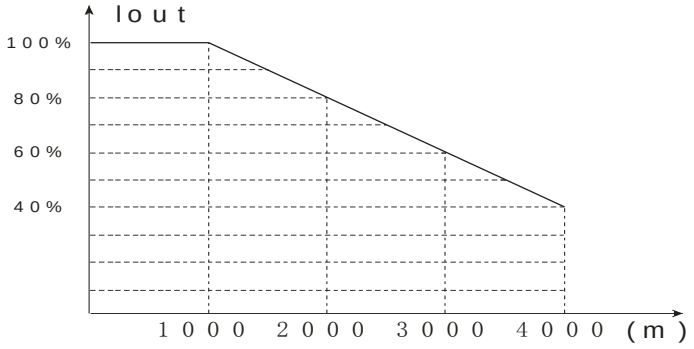


Figure 3-1 Relationship between output current and altitude.

3.1.4 Impact and Vibration

It is not allowed that the inverter falls down or suffers from fierce impact or the inverter installed at the place that vibration frequently.

3.1.5 Electromagnetic Radiation

Keep away from the electromagnetic radiation source.

3.1.6 Water

Do not install the inverter at the wringing or dewfall place.

3.1.7 Air Pollution

Keep away from air pollution such as dusty, corrosive gas.

3.1.8 Storage

Do not store the inverter in the environment with direct sunlight, vapor, oil fog and vibration.

3.2 Installation Space and Distance

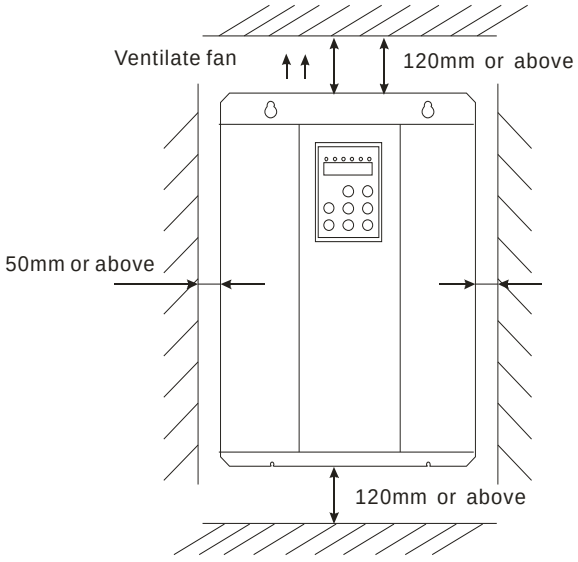


Figure 3-2 Safe space and distance

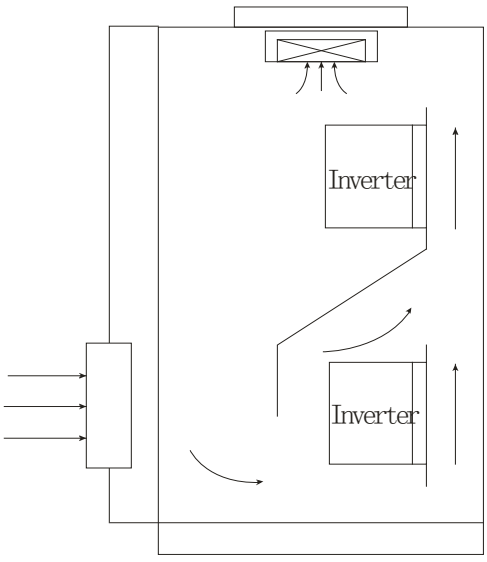


Figure 3-3 Installation of multiple inverters.

Notice: Add the air deflector when apply the up-down installation.

3.3 Dimension of External Keypad

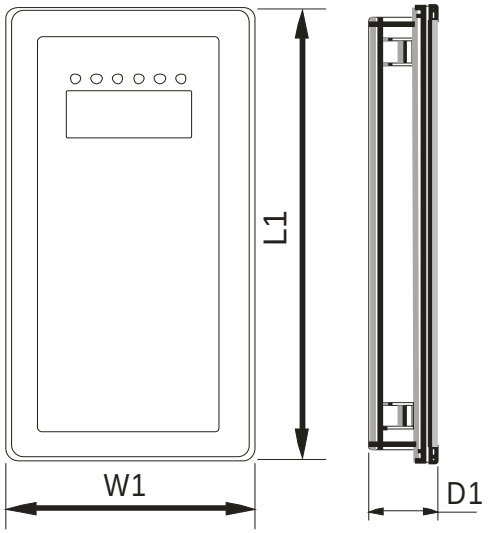


Figure 3-4 Dimension of keypad Installation

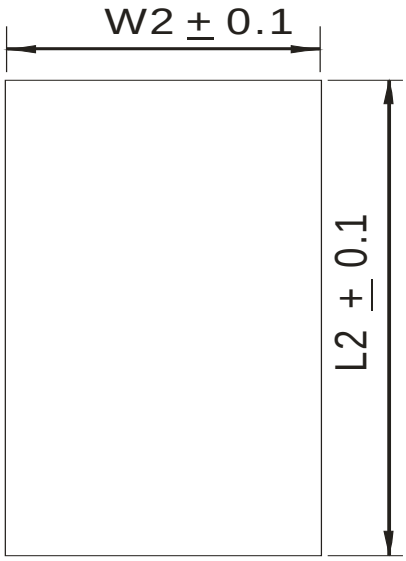


Figure 3-5 Dimension of keypad hole

Installation and Hole dimension of External keypad.

keypad	L1（mm）	W1（mm）	D1(mm)	L2(mm)	W2(mm)
	Installation			Hole	
Big(power above 7.5KW)	135.5	74.5	21.3	130.8	70.8
Small(power below 5.5KW)	76.2	55.2	16.2	94.2	61.2

4 WIRING

WARNING

- Wiring must be performed by the person certified in electrical work.
- Forbid testing the insulation of cable that connects the inverter with high-voltage insulation testing devices.
- Cannot install the inverter until discharged completely after the power supply is switched off for 5 minutes.
- Be sure to ground the ground terminal.
  (200V class**:** Ground resistance should be 100Ω or less,
  400V class**:** Ground resistance should be 10Ω or less,
  660V class**:** Ground resistance should be 5Ω or less).
  Otherwise, it might cause electric shock or fire.
- Connect input terminals (R, S, T) and output terminals (U, V, W) correctly. Otherwise it will cause damage the Inside part of inverter.
- Do not wire and operate the inverter with wet hands. Otherwise there is a risk of electric shock.

CAUTION

- Check to be sure that the voltage of the main AC power supply satisfies the rated
- Connect power supply cables and motor cables tightly.

4.1 Terminal Configuration

4.1.1 Main Circuit Terminals：

Figure 4-1 Main circuit terminals (1AC220V 0.4～2.2KW)

Figure 4-2 Main circuit terminals (3AC380V 0.75～18.5KW)

Figure 4-3 Main circuit terminals(22KW～132KW)

Figure 4-4 Main circuit terminals (160KW～400KW)

Main circuit terminal functions：

Terminal Symbol	Function Description
L1、L2	Terminals of single phase AC input
R、S、T	Terminals of 3 phase AC input
P or (+)、N or (-)	Spare terminals of external braking unit
P or (+)、B	Spare terminals of external braking resistor
P or (+)、P1	Spare terminals of external DC reactor
N or (-)	Terminal of negative DC bus
U、V、W	Terminals of 3 phase AC output
⏚ or E	Terminal of ground(PE)

4.1.2 **Control Circuit Terminals**：

Figure 4-5 Control circuit terminals (1AC220V 0.4~1.5Kw)

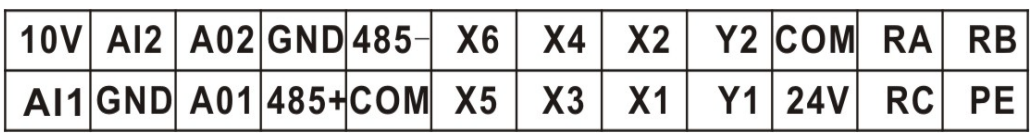


Figure 4-6 Control circuit terminals (1AC220V 2.2Kw or 3AC380V)

4.2 Wiring Connecting Diagram

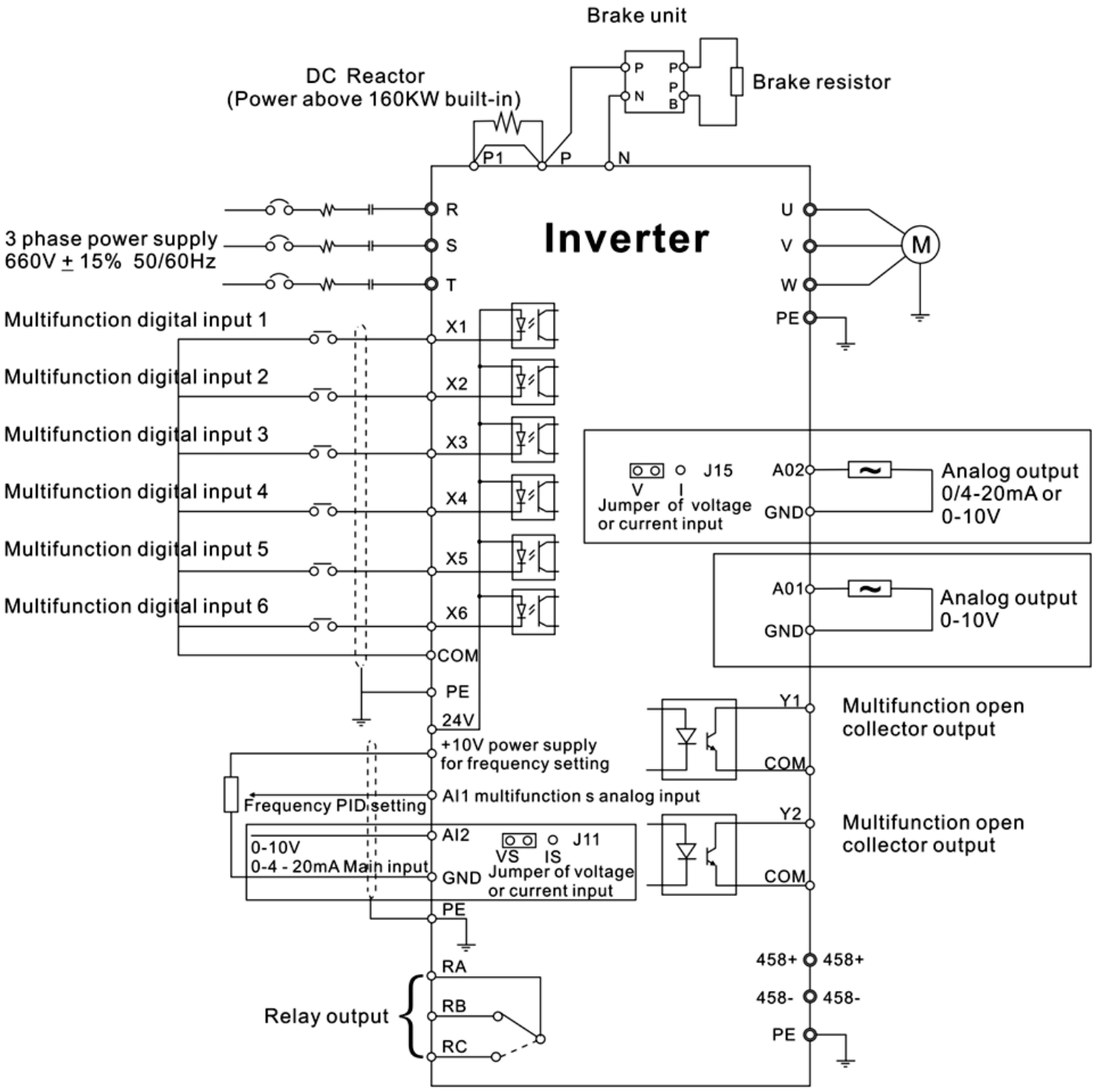


Figure 4-7 Wiring Connection Diagram

4.3 Specifications of Breaker, Cable, Contactor and Reactor

Model No.	Circuit Breaker (A)	Input/output Cable (copper cable)	Rated current of AC Contactor (A) (380VAC or 220V AC)
EM9-G1-0d4	16	2.5	10
EM9-G1-d75	16	2.5	10
EM9-G1-1d5	20	4	16
EM9-G1-2d2	32	6	20
EM9-G3-1d5	10	2.5	10
EM9-G3-2d2	16	2.5	10
EM9-G3-004	16	2.5	10
EM9-G3-5d5	25	4	16
EM9-G3-7d5	25	4	16
EM9-G3-011	40	6	25
EM9-G3-015	63	6	32
EM9-G3-018	63	6	50
EM9-G3-022	100	10	63
EM9-G3-030	100	16	80
EM9-G3-037	125	25	95
EM9-G3-045	160	25	120
EM9-G3-055	200	35	135
EM9-G3-075	200	35	170
EM9-G3-093	250	70	230
EM9-G3-110	315	70	280
EM9-G3-132	400	95	315
EM9-G3-160	400	150	380
EM9-G3-185	630	185	450
EM9-G3-200	630	185	500
EM9-G3-220	630	240	580
EM9-G3-250	800	150x2	630
EM9-G3-280	800	150x2	700
EM9-G3-315	1000	185x2	780
EM9-G3-350	1200	240x2	900

4.4 Wiring Main Circuits

4.4.1 Wiring at input side of main circuit

4.4.1.1 Circuit breaker

It is necessary to connect a circuit breaker which is compatible with the capacity of inverter between 3ph AC power supply and power input terminals (R, S, T). The capacity of breaker is 1.5～2 times to the rated current of inverter. For details, see<Specifications of Breaker, Cable, and Contactor>.

4.4.1.2 Electromagnetic Contactor

In order to cut off the input power effectively when something is wrong in the system, contactor should be installed at the input side to control the on/off of the main circuit 1 2 power supply.

4.4.1.3 AC reactor

In order to prevent the rectifier damage resulted from the large current, AC reactor should be installed at the input side. It can also improve the input power factor.

4.4.1.4 Input EMC filter

When the inverter is working, the surrounding device may be disturbed by the cables.EMC filter can minimize the interference. Just like the following figure：

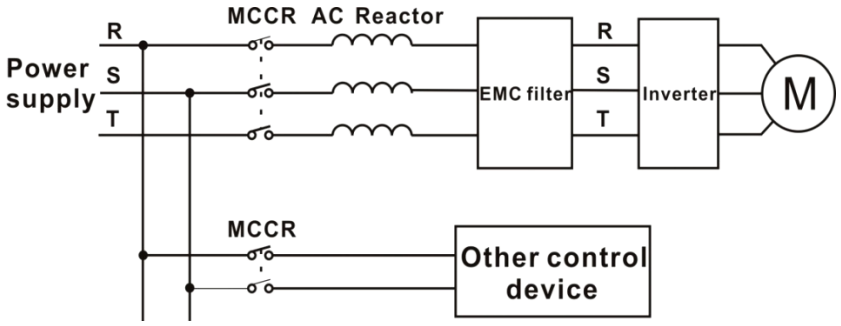


Figure 4-8 wiring at input side of main circuit

4.4.2 Wiring at inverter side of main circuit

4.4.2.1 DC reactor

The series of EM9 inverter from 22kW to 93kW have external DC reactor which can improve the power factor and avoid the three-phase rectify bridge damage when the inverter connects with a big capacity transformer and the input current is large. In addition, the DC reactor can avoid the three-phase rectify bridge damage caused the harmonic wave generated by the Sudden change of load or the mutually controlled load.

4.4.2.2 Braking unit and braking resistor

• Inverter of 18.5KW and below have built-in braking unit. In order to dissipate the regenerative energy generated by dynamic braking, the braking resistor should be installed at P and B terminals. The wire length of the braking resistor should be less than 5m.

• Inverter of 18.5KW and above need connect external braking unit which should be installed at (+) and (-) terminals. The cable between inverter and braking unit should be less than 5m. The cable between braking unit and braking resistor should be less than 10m.

• The temperature of braking resistor will increase because the regenerative energy will be transformed to heat. Safety protection and good ventilation is recommended. EM9 Inverters capacity above 22KW have external braking unit to dissipate the regenerative energy generated by dynamic braking. External braking unit should be installed at (P) and (N) terminals，and the braking resistor should be installed at(P) and (B) terminals。

The cable between terminal P and N of inverter and the braking unit and should be less than 5m. And the cable between terminal P and B of the braking unit and the braking resistor should be less than 10m.

Notice: Be sure that the electric polarity of (+) (-) terminals is right; it is not allowed to connect (+) with (-) terminals directly, otherwise damage or fire could occur。

4.4.3 Wiring at motor side of main circuit

4.4.3.1 Output Reactor

When the distance between inverter and motor is more than 50m, inverter may be tripped by over-current protection frequently because of the large leakage current resulted from the parasitic capacitance with ground. And the same time to avoid the damage of motor insulation, the output reactor should be installed.

4.4.3.2 Output EMC filter

EMC filter should be installed to minimize the leak current caused by the cable and minimize the radio noise caused by the cables between the inverter and cable. Just see the following figure.

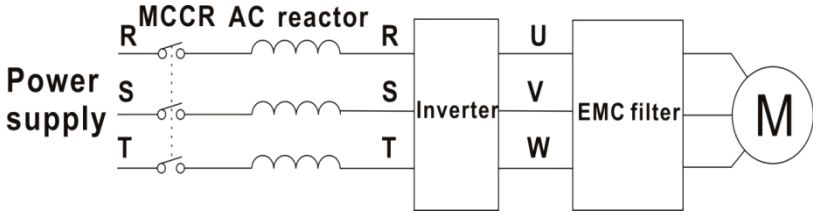


Figure 4-9 Wiring at motor side of main circuit

4.4.4 Wiring of regenerative unit

Regenerative unit is used for putting the electricity generated by braking of motor to the grid. Compared with traditional 3 phase inverse parallel bridge type rectifier unit, regenerative unit uses IGBT so that the total harmonic distortion (THD) is less than 4% and the inverter has little pollution to the power supply. Regenerative unit is widely used for oil pump, centrifugal and hoisting equipment

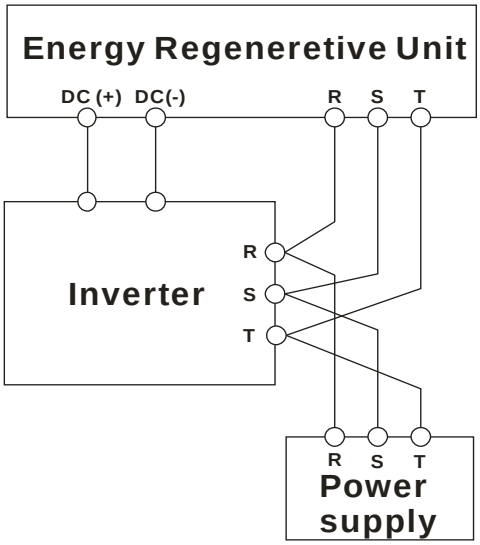


Figure 4-10 wiring of regenerative unit

4.4.5 Wiring of Common DC bus

Common DC bus method is widely used in the paper industry and chemical fiber industry which need multi-motor to coordinate. In these applications, some motors are in driving status while some others are in regenerative braking (generating electricity) status. The regenerated energy is automatically balanced through the common DC Bus, which means it can supply to motors in driving status. Therefore the power consumption of whole system will be less compared with the traditional method (one inverter drives one motor). When two motors are running at the same time (i.e. winding application), one is in driving status and the other is in regenerative status. In this case the DC buses of these two inverters can be connected in parallel so that the regenerated energy can be supplied to motors in driving status whenever it needs. Detailed wiring is shown in the following figure**:**

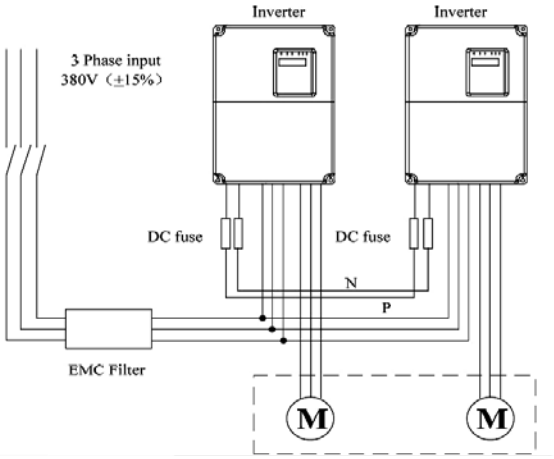


Figure 4-11 Wiring of common DC bus

Notice: Two inverters must be the same model when connected with Common DC bus method. Be sure they are powered on at the same time.

4.4.6 Ground Wiring (PE)

In order to ensure safety and prevent electrical shock and fire, PE must be well grounded with ground resistance (refer to Chapter 4 Wiring warning). The ground wire should be big and short, and it is better to use copper wire (>3.5mm2). When multiple inverters need to be grounded, avoid using one common ground; do not loop the ground wire.

4.5 Wiring Control Circuits

4.5.1 Precautions

Use shielded or twisted-pair cables to connect control terminals. Connect shield wire (the cable terminal near the inverter) with the ground terminal (PE) of inverter. The cable connected to the control terminal should leave away from the main circuit and heavy current circuits (including power supply cable, motor cable, relay and Contactor connecting cable) at least 20cm and parallel wiring should be avoided. It is suggested to apply perpendicular wiring to prevent inverter malfunction caused by external interference.

4.5.2 Control circuit terminals

Terminal Name	Terminal functions and description
X1～X6	ON-OFF signal input, optical coupling with PW and COM. Input voltage range: 9～30V Input impedance: 3.3kΩ
+24V	Provide output power supply of +24V.（Maximum output current：150mA）
COM	Common ground terminal of +24V
AI1	Analog input: 0～10V; Input impedance: 10kΩ
AI2	Analog input: 0～10V/ 0/4～20mA, switched by J11. Input impedance:10kΩ (voltage input) / 250Ω (current input） When choose current（0/4～20mA），20mA is corresponding to 5 V.
+10V GND	Supply +10V to inverter Common ground terminal of +10V (GND must be isolated from COM).
Y1 or Y2	Open collector output terminal, the corresponding common ground terminal is COM.
AO2	Analog output，output current。Output range：current（0/4～20mA）
AO1	Analog output， output voltage。Output range：voltage（0～10V）
RA、RB、RC	Relay output: ROA-common; ROB-NC, ROC-NO. Contact capacity: AC 250V/3A, DC 30V/1A

4.6 Installation Guideline to EMC Compliance

4.6.1 General description of EMC

EMC is the abbreviation of electromagnetic compatibility, which means the device or system has the ability to work normally in the electromagnetic environment and will not generate any electromagnetic interference to other equipments.EMC includes two subjects: electromagnetic interference and electromagnetic anti-jamming.

According to the transmission mode, Electromagnetic interference can be divided into two categories: conducted interference and radiated interference.

Conducted interference is the interference transmitted by conductor. Therefore, any conductors (such as wire, transmission line, inductor, capacitor and so on) are the transmission channels of the interference.

Radiated interference is the interference transmitted in electromagnetic wave, and the energy is inverse proportional to the square of distance.

Three necessary conditions or essentials of electromagnetic interference are: interference source, transmission channel and sensitive receiver. For customers, the solution of EMC problem is mainly in transmission channel because of the device attribute of disturbance source and receiver cannot be changed.

Different electric and electron devices perform different EMC standard or EMC classes .Also, their EMC capacity may be different.

4.6.2 EMC features of inverter

Like other electric or electronic devices, inverter is not only an electromagnetic interference source but also an electromagnetic receiver. The operating principle of inverter determines that it can produce certain electromagnetic interference noise. And the same time inverter should be designed with certain anti-jamming ability to ensure the smooth working in certain electromagnetic environment. The following is its EMC features:

4.6.2.1 Input current is non-sine wave. The input current includes large amount of high-harmonic waves that can cause electromagnetic interference, decrease the grid power factor and increase the line loss.

4.6.2.2 Output voltage is high frequency PMW wave, which can increase the temperature rise and shorten the life of motor. And the leakage current will also increase, which can lead to the leakage protection device malfunction and generate strong electromagnetic interference to influence the reliability of other electric devices.

4.6.2.3 As the electromagnetic receiver, too strong interference will damage the inverter and influence the normal using of customers.

4.6.2.4 In the system, EMS and EMI of inverter coexist. Decrease the EMI of inverter can increase its EMS ability.

4.6.3 EMC Installation Guideline

In order to ensure all electric devices in the same system to work smoothly, this section, based on EMC features

of inverter, introduces EMC installation process in several aspects of application (noise control, site wiring, grounding, leakage current and power supply filter). The good effective of EMC will depend on the good effective of all of these five aspects.

4.6.3.1 Noise control

All the connections to the control terminals must use shielded wire. And the shield layer of the wire must ground near the wire entrance of inverter. The ground mode is 360 degree annular connection formed by cable clips. It is strictly prohibitive to connect the twisted shielding layer to the ground of inverter, which greatly decreases or loses the shielding effect. Connect inverter and motor with the shielded wire or the separated cable tray. One side of shield layer of shielded wire or metal cover of separated cable tray should connect to ground, and the other side should connect to the motor cover. Installing an EMC filter can reduce the electromagnetic noise greatly.

4.6.3.2 Site wiring

Power supply wiring**:** the power should be separated supplied from electrical transformer.

Normally it is 5 core wires, three of which are fire wires, one of which is the neutral wire, and one of which is the ground wire. It is strictly prohibitive to use the same line to be both the neutral wire and the ground wire Device categorization**:** there are different electric devices contained in one control cabinet, such as inverter, filter, PLC and instrument etc, which have different ability of emitting and withstanding electromagnetic noise. Therefore, it needs to categorize these devices into strong noise device and noise sensitive device. The same kinds of device should be placed in the same area, and the distance between devices of different category should be more than 20cm.

Wire Arrangement inside the control cabinet**:** there are signal wire (light current) and power cable (strong current) in one cabinet. For the inverter, the power cables are categorized into input cable and output cable. Signal wires can be easily disturbed by power cables to make the equipment malfunction. Therefore， when wiring, signal cables and power cables should be arranged in different area. It is strictly prohibitive to arrange them in parallel or interlacement at a close distance (less than 20cm) or tie them together.

If the signal wires have to cross the power cables, they should be arranged in 90 angles.

Power input and output cables should not either be arranged in interlacement or tied together, especially when installed the EMC filter. Otherwise the distributed capacitances of its input and output power cable can be coupling each other to make the EMC filter out of function.

4.6.3.3 Ground

Inverter must be ground safely when in operation. Grounding enjoys priority in all EMC methods because it does not only ensure the safety of equipment and persons, but also is the simplest, most effective and lowest cost solution for EMC problems.

Grounding has three categories**:** special pole grounding, common pole grounding and series-wound grounding. Different control system should use special pole grounding, and different devices in the same control system should use common pole grounding, and different devices connected by same power cable should use series-wound grounding.

4.6.3.4 Leakage Current

Leakage current includes line-to-line leakage current and over-ground leakage current. Its value depends on distributed capacitances and carrier frequency of inverter. The over-ground leakage current, which is the current passing through the common ground wire, can not only flow into inverter system but also other devices. It also can make leakage current circuit breaker, relay or other devices malfunction. The value of line-to-line leakage current, which means the leakage current passing through distributed capacitors of input output wire, depends on the carrier frequency of inverter, the length and section areas of motor cables. The higher carrier frequency of inverter, the longer of the motor cable and/or the bigger cable section area, the larger leakage current will occur.

Countermeasure: Decreasing the carrier frequency can effectively decrease the leakage current. In the case of motor cable is relatively long (longer than 50m), it is necessary to install AC reactor or sinusoidal wave filter at the output side, and when it is even longer, it is necessary to install one reactor at every certain distance.

4.6.3.5 EMC Filter

EMC filter has a great effect of electromagnetic decoupling, so it is preferred for customer to install it. For inverter, noise filter has following categories**:**

1. Noise filter installed at the input side of inverter;
2. Install noise isolation for other equipment by means of isolation transformer or power filter.

5. Operations

5.1 Keypad Description

5.1.1 Keypad schematic diagram

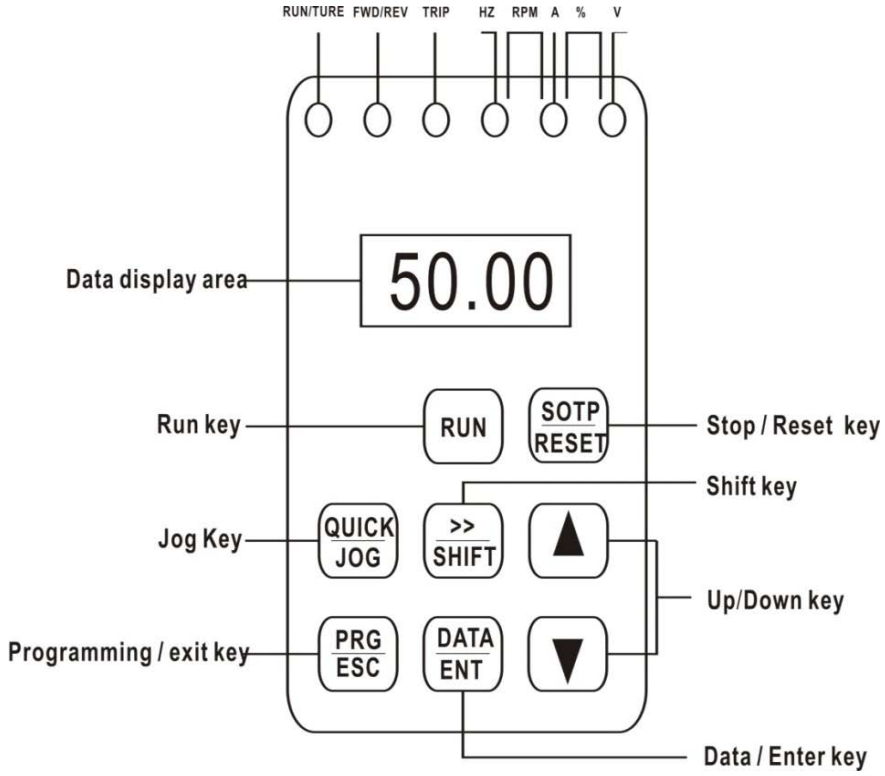


Figure 5-1 Keypad schematic diagram

5.1.2 Key function description

Button Symbol	Name	Function Description
PRG ESC	Programming and Esc key	Key Entry or escape of first-level menu. Shortcut Parameters delete.
DATA ENT	Enter Key	Progressively enter menu and confirm parameters.
▲	UP Increment Key	Progressively increase data or function codes.
▼	DOWN Decrement Key	Progressive decrease data or function codes.
DATA ENT + QUICK JOG	Combination Key	Cyclically displays parameters by left shift, In the stop or running status. Note that when operation should firstly press and hold the DATA/ENT key and then press the QUICK/JOG key.

Button Symbol	Name	Function Description
>> SHIFT	Shift Key	In stop status or In running status, cyclically displays parameters by right shift In parameter setting mode, press this button to select the bit to be modified.
RUN	Run Key	Start to run the inverter in keypad control mode.
STOP RESET	STOP/RESET Key	In running status, restricted by F7.04, can be used to stop the inverter. When fault alarm, can be used to reset the inverter without any restriction.
QUICK JOG	Shortcut Multifunction Key	Determined by function code F7.03**:** 0**:** Jog operation 1**:** Switch between forward and reverse 2**:** Clear the UP/DOWN settings.
RUN + STOP RESET	Combination Key	Pressing the RUN and STOP/RESET at the same time can achieve inverter coast to stop

5.1.3 Indicator light description

1）**Function Indicator Light Description**：

Indicator Light Name	Indicator Light Description
RUN/TUNE	Light Off**:** stop status Blinking**:** parameter auto tuning status Light on**:** operating status
FWD/REV	Light Off**:** forward operation .Light on**:** reverse operation.
TRIP	Light Off**:** normal operation status, Light on**:** Fault status

2）**Unit Indicator Light Description**：

Symbol	Description of Symbol content
Hz	Frequency
A	Current
V	Voltage
RPM	Rotation
%	Percentage

3）**Digital Display**：

Have 5 digit LED , which can display all kinds of monitoring data and alarm codes such as reference frequency, output frequency and so on.

5.2 Operation Process

5.2.1 Parameter setting

Three levels of menu are**:**

1. Function code group (1st level);
2. Function code (2nd level);
3. Function code value (3rd level).

Remarks:

Press both the PRG/ESC and the DATA/ENT can return to the 2nd class menu from the 3rd class menu. The difference is**:** pressing DATA/ENT will save the set parameters into the control panel, and then return to the 2nd class menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the 2nd menu without saving the parameters, and keep staying at the current function code.

Example：Change function code F1.01 from 00.00Hz to 02.00Hz**:**

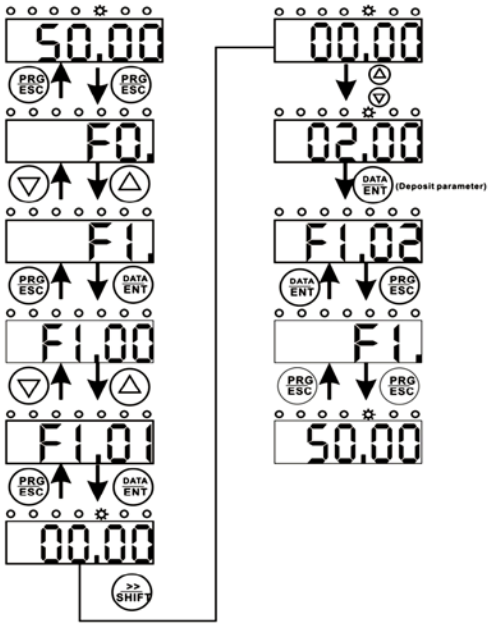


Figure 5-2 Flow chart of three-class menu operation

During the 3rd menu, if the parameter has no blinking spark, which means the function code cannot be modified. The possible reasons could be**:**

1. This function code cannot be modified, such as detected parameter, operation records and so on;
2. This function code cannot be modified during running status, but can be modified in stop status.

5.2.2 Fault reset

If the Drive has fault, it will prompt the related fault information. User can use STOP/RESET or according terminals (determined by F5 Group) to reset the fault. After fault reset, the inverter is in stand-by status. If user does not reset the inverter when it is in fault state, the Drive will be at operation protection status, and cannot run.

5.2.3 Parameter copy

Refer to LCD external Keypad description.

5.2.4 Motor parameter auto-tuning

If "Sensorless Vector Control"mode is chosen, motor nameplate parameters must be input correctly as the auto-tuning of EM9 inverter is based on it. The performance of vector control depends on the parameters of motor strongly, so to achieve excellent performance, firstly must obtain the parameter of motor exactly.

The procedure of motor parameter auto-tuning is as follows:

1. Choose keypad command channel as the operation command channel (F0.01).
2. Input following parameters according to the actual motor parameters**:**

F2.01**:** motor rated power.
F2.02**:** motor rated frequency;
F2.03**:** motor rated speed;
F2.04**:** motor rated voltage;
F2.05**:** motor rated current

Notice: the motor should be matched with its loading; otherwise, the motor parameters obtained by auto-tuning may be not correct.

Set F0.13 to be 1, and for the detail process of motor parameter auto tuning, please refer to the description of function code F0.13. And then press RUN on the keypad panel, the Drive will automatically calculate following parameter of the motor**:**

F2.06**:** motor stator resistance;
F2.07**:** motor rotor resistance;
F2.08**:** motor stator and rotor inductance;
F2.09**:** motor stator and rotor mutual inductance;
F2.10**:** motor current without load; then motor auto-tuning is finished.

5.2.5 Password setting：

EM9 series inverter offers user's password protection function. When F7.03 is set to non-zero, it will be the user's

password, and after exiting function code edit mode, it will become effective after 1 minute. If pressing the PRG/ESC again to try to access the function code edit mode, "0.0.0.0.0"will be displayed, and the operator must input correct user's password, otherwise will be unable to access it.

If it is necessary to cancel the password protection function, just set F7.03 to be zero.

5.3 Running State

5.3.1 Power-on initialization

Firstly the system initializes during the inverter power-on, and LED displays "8.8.8.8.8.". After the initialization is completed, the inverter is on stand-by status.

5.3.2 Stand-by

During stop or running modes, parameters of multi-modes can be displayed. Whether or not to display this parameter can be chosen through function code F7.04 (Running status display selection) and F7.05 (Stop status display selection) according to binary bits, the detailed description of each bit please refer the function code description of F7.04 and F7.05.

During stop modes, there are 9 parameters which can be chosen to display or not, which are reference frequency, DC bus voltage, ON-OFF input status, open collector output mode, PID setting, PID feedback, analog input AI1 voltage, analog input AI2 voltage, step number of multi-step speed. Whether or not to display can be decided by setting the corresponding binary bit of F7.05. Press the 》/SHIFT to scroll through the parameters in right order . Press DATA/ENT + QUICK/JOG to scroll through the parameters in left order.

5.3.3 Motor parameter auto-tuning

For details, please refer to the description of F0.13.

5.3.4 Operation

During running modes, there are 14 running parameters**:** output frequency, reference frequency, DC bus voltage, output voltage, output current, output power, output torque, PID setting, PID feedback, ON-OFF input status, open collector output status, length value, count value, step number of PLC and multi-step speed, voltage of AI1, voltage of AI2 and step number of multi-step speeds. Whether or not to display can be decided by the bit option of function code F7.04 (converted into binary system). Press the 》/SHIFT to scroll through the parameters in right order . Press QUICK/JOG to scroll through the parameters in left order.

5.3.5 Fault

EM9 series inverter offers a variety of fault information. For details, see inverter faults and their troubleshooting.

5.4 Quick Testing

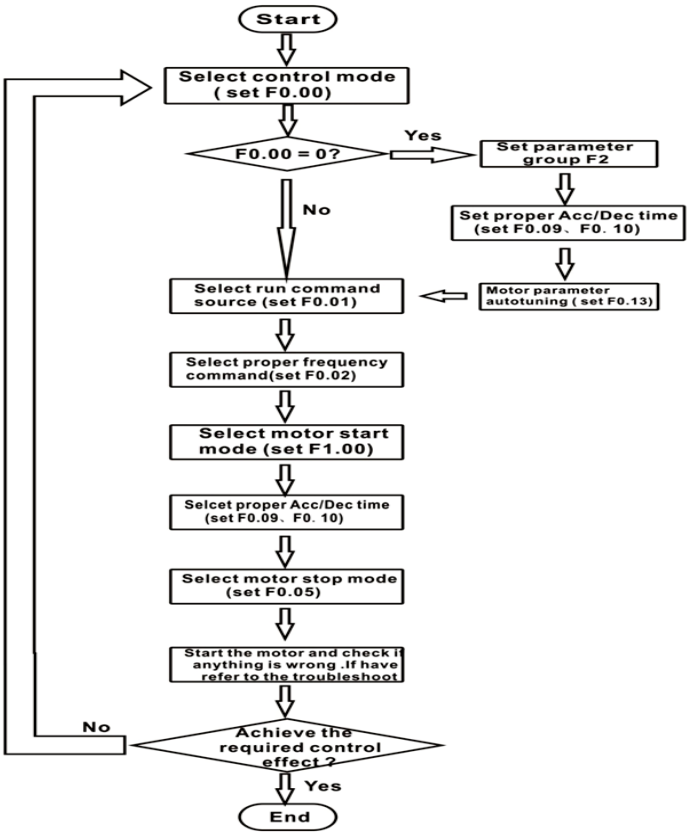


Figure:5-3 Quick testing diagram

6. EM9 series Variable Speed Drive Detailed Function Description

F0 Group- Basic Function

Code	Name	Description	Setting Range	Factory Defaults
F0.00	Speed control mode	0**:** Sensorless vector control 1**:** V/F control 2**:** Torque control	0～2	0

Select the operation modes of inverter.

0: Sensorless vector control: It is widely used for the application which requires high performance, such as wire-drawing machine, machine tool, centrifugal machine and injection molding machine, etc. Inverter can drive only one motor when F0.00 is set to 0.

1: V/F control: It is suitable for general purpose application which not requires high control accuracy, such as pumps, fans etc. One inverter can drive multi motors.

2: Torque control: It is suitable for the application not requiring high precision torque control, such as textile, and draw bench, etc. If torque control is applied, motor speed decides by load, not by Acc/Dec time of inverter.

Notice: The auto tuning of motor parameters must be accomplished properly when vector control is selected. Through adjusting the parameters of speed regulator (F3 Group), can achieve better control characteristic.

Code	Name	Description	Setting Range	Factory setting
F0.01	Run command source	0**:** Keypad 1**:** Terminal 2**:** Communication	0～2	0

Select the control command channels of inverter.

0: **Keypad**

Both RUN and STOP/RESET key are used for running command control. If Multifunction key QUICK/JOG is set as FWD/REV switching function (F7.00 is set to be 1), it will be used to change the rotating orientation. In running status, pressing RUN and RESET in the same time will cause the inverter coast to stop.

1: **Terminal**

The operation, including forward run, reverse run, forward jog, reverse jog etc. can be controlled by multifunctional input terminals.

2: **Communication**

The operation of inverter can be controlled by host through communication.

Code	Name	Description	Setting Range	Factory setting
F0.02	Main Frequency channel	0**:** Keypad digital 1**:** Keypad potentiometer 2**:** AI1 3**:** AI2 4**:** Multi-Step speed 5**:** PID 6**:** Communication 7**:** PLC 8**:** PUL 9**:** Program run length	0～9	1

0**: Keypad digital**

Through change the value of function code F0.05 (Keypad reference frequency) to set frequency by keypad.

1**: Keypad potentiometer**

Set frequency by keypad potentiometer.

2**: AI1**

3**: AI2**

4**: Multi-steps speed**

Inverters operate in multi-steps mode when this frequency command source is selected.It's need to set F5 group and FA group (Multi-step speed control) to confirm the relationship between the given percentage and reference frequency. The reference frequency is determined by FA group. The selection of steps is determined by combination of multi-step speed terminals.

5**: PID**

Inverters operate in PID control mode, and need to set F9 group (PID control), when select this frequency command source. The reference frequency is the result of PID adjustment. For detailed PID preset source, preset and feedback source, please refer to description of F9 group (PID function).

6**: Communication**

The reference frequency is set by host through communication. For details, please refer to communication protocol.

7: Program timing operation (Simple PLC)

User can set reference frequency, hold time, running direction of each step and acceleration/deceleration time between steps. For details, please refer to description of F8.19.

8: PUL (only for X1 Terminal)

The frequency command is set by input pulse from X1 terminal, setting range refer to parameter(F5.19～F5.23).

9: Program run length refer to parameter(F8.31～F8.32).

Code	Name	Description	Setting Range	Factory setting
F0.03	Auxiliary frequency channel	0**:** Keypad digital 1**:** Keypad potentiometer 2**:** AI1 3**:** AI2 4**:** Communication 5**:** PUL	0～5	1

0**: Keypad digital**

Through change the value of function code F0.05 (Keypad reference frequency) to set frequency by keypad.

1**: Keypad potentiometer**。

Set frequency by keypad potentiometer。

2**: AI1**

3**:** V**AI2**

4**: Communication**

The reference frequency is set by host through communication. For details, please refer to communication protocol.

5**: PUL(only for X1 terminal)**

Code	Name	Description	Setting Range	Factory setting
F0.04	Main-auxiliary Channel Combination	0**:** Main Channel Valid 1**:** Auxiliary Channel Valid 2**:** Main + Auxiliary 3**:** |Main – Auxiliary| 4**:** MAX(Main Auxiliary) 5**:** MIN(Main Auxiliary) 6**:** Terminal Switch	0～6	0

Select the frequency command input channels of inverters. There are 7 kinds frequency commands input channels for selection.

0**:** Main Channel Valid

1**:** Auxiliary Channel Valid

2**:** Main + Auxiliary

3**:** Main - Auxiliary

4**:** MAX(Main Auxiliary)

5**:** MIN(Main Auxiliary)

6**:** Terminal Switch**:** Select from the multi-function input terminal as the primary channel or secondary channel frequency for a given end.

Code	Name	Description	Setting Range	Factory setting
F0.05	keypad reference frequency	0.00 Hz～F0.06 (Maximum frequency)	0.00～F0.06	50.00H

When frequency command is set to "keypad digital", this function code value is the initial value of inverter reference frequency.

Code	Name	Description	Setting Range	Factory setting
F0.06	Maximum frequency	10.00～600.00Hz	10.00～600.00	50.00H

It's used to set the maximum output frequency of inverter. Pls. end-user note that this parameter set will effect the acceleration and deceleration.

Code	Name	Description	Setting Range	Factory setting
F0.07	Upper Frequency limit	F0.08～F0.06 (Maximum frequency)	F0.08～F0.06	50.00Hz

The upper limit of inverters output frequency. Upper frequency limit should not be greater than the maximum frequency.

Code	Name	Description	Setting Range	Factory setting
F0.08	Lower Frequency limit	F0.08～F0.06 (Upper frequency limit)	0.00～F0.07	0.00Hz

The lower limit of inverters output frequency. Action when running frequency is less than lower frequency limit**:** The inverter runs at the lower frequency limit when the running frequency is less than the lower frequency limit in startup or running status. Therein, Maximum frequency ≥Upper frequency limit ≥Lower frequency limit.

Code	Name	Description	Setting Range	Factory setting
F0.09	Acceleration time 1	0.1～3600.0s	0.1～3600.0	Depend on Model
F0.10	Deceleration time 1	0.1～3600.0s	0.1～3600.0	Depend on model

Acceleration time is the time (t1) of accelerating from 0Hz to maximum frequency (F0.06).Deceleration time is the time (t2) of decelerating from maximum frequency (F0.06) to 0Hz. Please refer to following figure.

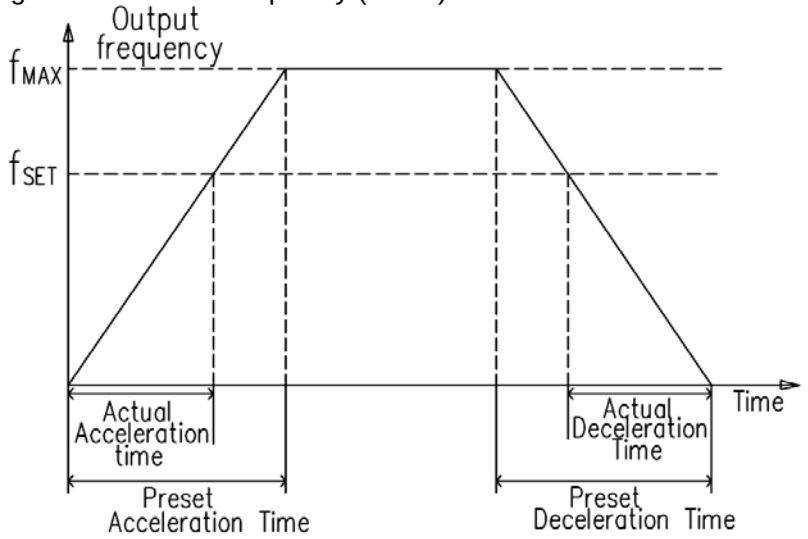


Figure6-1 Acceleration and Deceleration time

When the reference frequency is equal to the maximum frequency**,** the actual acceleration and deceleration time will be equal to the F0.09 and F0.10 respectively.

When the reference frequency is less than the maximum frequency, the actual acceleration and deceleration time will be less than the F0.09 and F0.10 respectively.

The actual acceleration (deceleration) time = F0.09 (F0.10) * reference frequency/F0.04.

EM9 series inverter has 2 groups of acceleration and deceleration time.

1st group：F0.09、F0.10；

2nd group：F8.05、F8.06。

The acceleration and deceleration time can be selected by combination of multifunctional ON-OFF input terminals determined by F5 Group. The factory setting of acceleration and deceleration time is as follow**:**

_ 5.5kW and below**:** 10.0s
_ 7.5kW~55kW**:** 20.0s
_ 75kW and above**:** 40.0s

Code	Name	Description	Setting Range	Factory setting
F0.11	Running direction selection	0**:** Forward 1**:** Reverse 2**:** Forbid reverse	0～2	0

0: Forward: inverter run at actual direction after power on.

1: Reverse: change the value of function code can change rotation direction of motor in any case. It is corresponding to adjust any two wiring of motor (U, V, W) to realize changing the rotation direction of motor.

Notice: When the factory setting is restored, the rotation direction of motor may be resumed. Please be cautious to use in the application which forbid changing rotation direction of motor after system debugs.

2: Forbid reverse

Forbid inverter running reverse. It is suitable for the specifically application which forbid running reverse.

Code	Name	Description	Setting Range	Factory setting
F0.12	Carrier frequency	1.0～15.0kHz	1.0～15.0	Depend on model

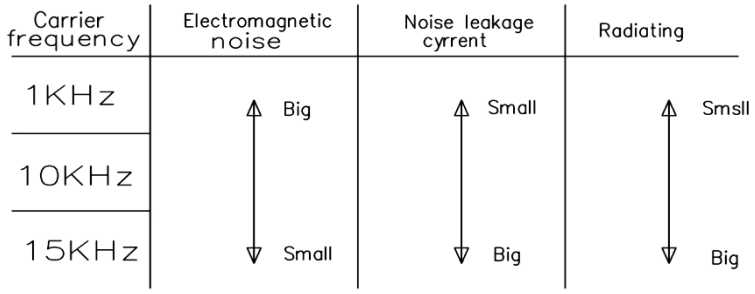


Figure 6-2 Effect of carrier frequency

Carrier frequency will affect the noise of motor and the EMI of inverter.

If the carrier frequency is increased, it will cause better current wave, less harmonic current and lower noise of motor.

If the carrier frequency exceeds the factory setting, the inverter must be derated because the higher carrier frequency will cause more switching loss, higher temperature rise of inverter, greater leakage current and stronger electromagnetic interference.

If the carrier frequency is lower than the factory setting, it is possible to cause less output torque of motor and more harmonic current. The factory setting is optimal in most cases. Modification of this parameter is not recommended.

Code	Name	Description	Setting Range	Factory setting
F0.13	Motor parameters auto-tuning	0**:** No action 1**:** Rotation auto-tuning 2**:** Static auto-tuning	0 ~ 2	0

0: No action: Forbidding auto-tuning.

1: Rotation auto-tuning:

Do not connect any load to the motor when performing auto-tuning and ensure the motor is in static status. Input the nameplate parameters of motor (F2.01－F2.05) correctly before performing auto-tuning. Otherwise the parameters detected by auto-tuning will be incorrect; it may influence the performance of inverter.

Set the proper acceleration and deceleration time (F0.09 and F0.10) according to the motor inertia before

performing auto-tuning. Otherwise it may cause over-current and over-voltage fault during auto-tuning. The operation process is as follow**:**

a. Set F0.13 to be 1 then press the DATA/ENT, LED will display "-TUN-" and flickers.

b. Press the RUN to start the auto-tuning, LED will display "TUN-0".

c. After a few seconds the motor will start to run. LED will display "TUN-1" and "RUN/TUNE" light will flicker.

d. After a few minutes, LED will display "-END-". That means the auto-tuning is finished and return to the stop status.

e. During the auto-tuning, press the STOP/RST will stop the auto-tuning.

Notice: Only keypad can control the auto-tuning. F0.13 will restore to 0 automatically when the auto-tuning is finished or cancelled.

2: Static auto-tuning:

_ If it is difficult to disconnect the load, static auto-tuning is recommended.

_ The operation process is the same as rotation auto-tuning except step c.

_ The stator resistance, rotor resistance and leakage inductance of motor can be detected after auto-tuning.

Notice: The Mutual inductance and current without load will not be detected by static auto-tuning, if needed user should input suitable value according to experience.

Code	Name	Description	Setting Range	Factory setting
F0.14	Restore parameters	0**:** No action 1**:** Restore factory setting 2**:** Clear fault records	0 ~ 2	0

0**:** No action

1**:** Inverter restores all parameters to factory setting except F2 group.

2**:** Inverter clear all fault records. This function code will restore to 0 automatically when complete the function operation.

Code	Name	Description	Setting Range	Factory setting
F0.15	AVR function	0**:** Disabled 1**:** Enabled all the time 2**:** Disabled during deceleration	0 ~ 2	1

AVR (Auto Voltage Regulation) function is output voltage auto-regulation. If the AVR function is disabled, the output voltage will change with the variety of input voltage. If AVR function is enabled, it will ensure the output voltage of inverter stable no matter how the DC bus voltage changes.

Notice: During deceleration, if AVR function is disabled, the deceleration time will be short and would not overvoltage.

F1 Group--Start and Stop Control

Code	Name	Description	Setting Range	Factory setting
F1.00	Start Mode	0**:**Start directly 1**:**DC braking and start 2**:**Speed tracking and start	0 ~ 2	0

0: Start directly: Start the motor at the starting frequency determined by F1.01.

1: DC braking and start: Inverter will output DC current firstly and then start the motor at the starting frequency. **Please refer to description of F1.03 and F1.04**. It is suitable for the motor which have small inertia load and may reverse rotation when start.

2: Speed tracking and start: Inverter detects the rotation speed and direction of motor, then start running to its reference frequency based on current speed. This can realize smooth start of rotating motor with big inertia load when instantaneous power off.

Code	Name	Description	Setting Range	Factory setting
F1.01	Starting frequency	0.00～10.00Hz	0.00～10.00	0.00Hz
F1.02	Hold time of starting frequency	0.0～50.0s	0.0～50.0	0.0s

Set proper starting frequency can increase the starting torque. During the hold time of starting frequency (F1.02), the output frequency is the starting frequency, and then starts at the starting frequency to reference frequency. If the reference; frequency is less than starting frequency, inverter will be at stand-by status. The starting frequency could be less than the lower frequency limits (F0.09).

Notice: F1.01 and F1.02 take no effect during FWD/REV switching.

Code	Name	Description	Setting Range	Factory setting
F1.03	DC Braking current before start	0.0～150.0%	0.0～150.0	0.0%
F1.04	DC Braking time before start	0.0～50.0s	0.0～50.0	0.0s

If start mode (F1.00) is set to1 (DC braking and start), when inverter starts, it performs DC braking according to F1.03 firstly, then start to accelerate after F1.04. DC braking is invalid when F1.04 (DC braking time) is set to 0. The bigger the DC braking current, the greater the braking torque. The value of F1.03 is the percentage of rated current of inverter.

Code	Name	Description	Setting Range	Factory setting
F1.05	Stop mode	0:Deceleration to stop 1:free stop	0～1	0

0: Deceleration to stop

When the stop command takes effect, the inverter decreases the output frequency according to F1.05 and the selected acceleration/deceleration time till stop.

1: Free stop

When the stop command takes effect, the inverter stops the output immediately. The motor free stops by its mechanical inertia.

Code	Name	Description	Setting Range	Factory setting
F1.06	Starting frequency of DC braking	0.00～10.00Hz	0.00~10.00	0.00Hz
F1.07	Waiting time before DC braking	0.0～50.0s	0.0～50.0	0.0s
F1.08	DC braking current	0.0～150.0%	0.0～150.0	0.0%
F1.09	DC braking time	0.0～50.0s	0.0～50.0	0.0s

Starting frequency of DC braking: Start the DC braking when output frequency reaches starting frequency determined by F1.06 at stop.

Waiting time before DC braking: Inverter blocks the output before starting the DC braking. After this waiting time, the DC braking will be started. It is used to prevent over-current fault caused by DC braking at high speed.

DC braking current: The value of F1.08 is the percentage of rated current of inverter. It's the DC braking value that inject in. The bigger the DC braking current, the greater the braking torque.

DC braking time: The time used to perform DC braking. If the time is 0, the DC braking will be invalid, and inverter decelerates according to the deceleration time.

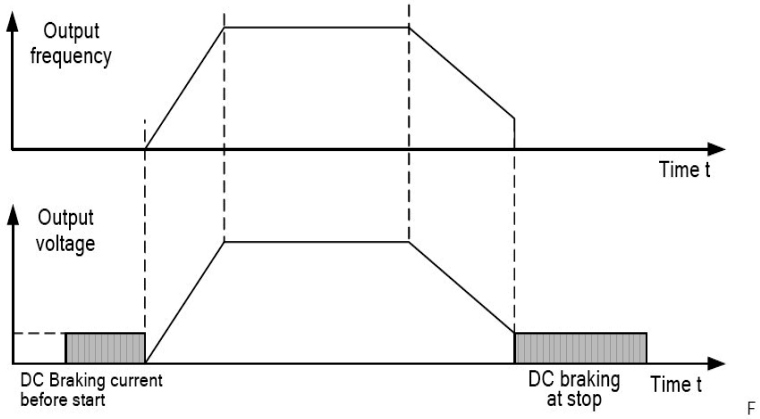


Figure 6-3 DC braking diagram

Code	Name	Description	Setting Range	Factory setting
F1.10	Dead time of FWD/REV	0.0～3600.0s	0.0～3600.0	0.0s

Set the hold time at zero frequency during switching between forward and reverse running.

It is shown as following figure

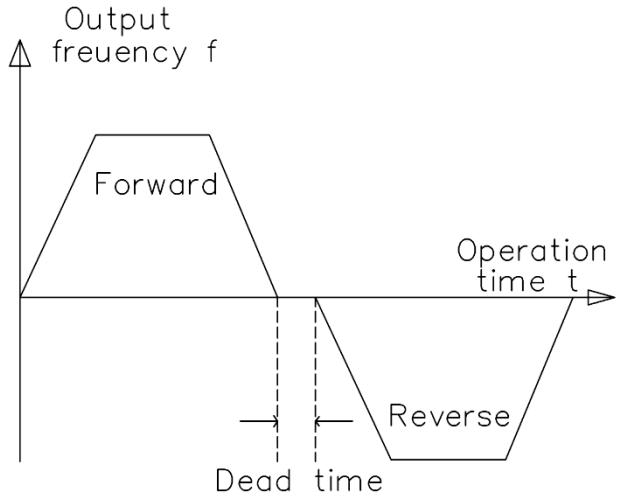


Figure 6-4 FWD/REV dead time diagram.

Code	Name	Description	Setting Range	Factory setting
F1.11	FWD/REV enable option when power on	0**:** Disabled 1**:** Enabled	0~1	0

When run command source is set to terminal control, inverter will detect the status of running terminal automatically. This function only takes effect if run command source is terminal control.

If F1.11 is set to be 0, when power on, inverter will not start even if FWD/REV terminal is active, until FWD/REV terminal disabled and enabled again.

If F1.11 is set to be 1, when power on and FWD/REV terminal is active, inverter will start automatically.

Notice: This function may cause the inverter restart automatically, please be cautious.

Code	Name	Description	Setting Range	Factory setting
F1.12	0Hz output selection	0**:** Disabled 1**:** Enabled	0~1	0

In operation, the output frequency is 0Hz; you can choose the output is valid.

F2 Group--Motor Parameters

Code	Name	Description	Setting Range	Factory setting
F2.00	G/P option	0**:** G model 1**:** P model	0~1	0

0: Applicable to constant torque load;

1: Applicable to variable torque load (i.e. fans, pumps).

EM9 series inverters provide the G/P integration function. The adaptive motor power used for constant torque load (G model) should be one grade less than that used for variable torque load (P model). To change from G model to P model, procedures are as follow**:**

1: Set F2.00 to be 1;

2: Input motor parameters in F2 group again..

Code	Name	Description	Setting Range	Factory setting
F2.01	Motor rated power	0.4～900.0kW	0.4～900.0	Depend on model
F2.02	Motor rated frequency	0.01Hz～F0.06 (Maximum frequency)	0.01～F0.06	50.00Hz

Code	Name	Description	Setting Range	Factory setting
F2.03	Motor rated speed	0～36000rpm	0～36000	Depend on model
F2.04	Motor rated voltage	0～460V	0～460	Depend on model
F2.05	Motor rated current	0.1～2000.0	0.1～2000.0	Depend on model

Notice: Please set these parameters according to motor nameplate. In order to achieve superior performance, need to set the motor parameters right.

EM9 series inverter offers the parameters auto-tuning function. Exactly auto-tuning perform needs to set these parameters (F2.01~F2.05) according to motor nameplate. The power rating of inverter should match the motor. If the bias is too big, the control performances of inverter will be deteriorated distinctly.

Notice: Reset F2.01 can initialize F2.02~F2.10 automatically.

Code	Name	Description	Setting Range	Factory setting
F2.06	Motor stator resistance	0.001 ～65.535Ω	0.001 ～65.535	Depend on model
F2.07	Motor rotor resistance	0.01Hz～F0.06 (Maximum frequency)	0.001 ～65.535	Depend on model
F2.08	Motor leakage inductance	0.1 ～6553.5mH	0.1～6553.5	Depend on model
F2.09	Motor mutual inductance	0.1 ～6553.5mH	0.1～6553.5	Depend on model
F2.10	Current without load	0.01 ～655.35A	0.01～55.35	Depend on model

After auto-tuning, the value of F2.06~F2.10 will be automatically updated. These parameters are the benchmark parameters of high-performance vector control, and have directly influence to control performance.

Notice: Do not change these parameters; otherwise it may deteriorate the control performance of inverter.

F3 Group—Vector Control

Code	Name	Description	Setting Range	Factory setting
F3.00	ASR proportional gain Kp1	0～100	0～100	20
F3.01	ASR integral time Ki1	0.01～10.00s	0.01～10.00	0.50s
F3.02	ASR switching point 1	0.00Hz～F3.05	0.00～F3.05	5.00Hz
F3.03	ASR proportional gain Kp2	0～100	0～100	25
F3.04	ASR integral time Ki2	0.01～10.00s	0.01～10.00	1.00s
F3.05	ASR switching point 2	F3.02 ～ F0.06 (Maximum equency)	F3.02 ～F0.06	10.00Hz

F3.00～F3.05 are only valid for vector control and torque control, and invalid for V/F control.

F3.00 and F3.01 only take effect when output frequency is less than F3.02. F3.03 and F3.04 only takes effect when output frequency is greater than F3.05. When output frequency is between F3.02 and F3.05, Kp and KI are proportional to the bias between F3.02 and F3.05. For details, please refer to following figure.

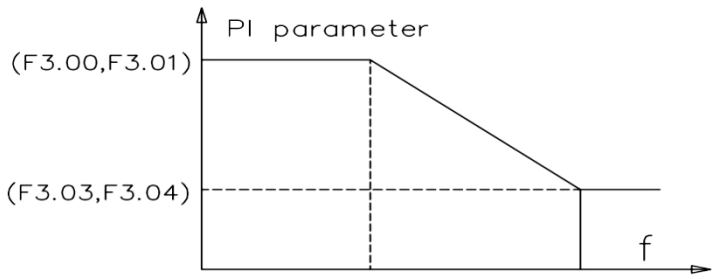


Figure 6-5 PI parameter diagram

Through F3.00～F3.05, user can set the proportional gain Kp and integral time Ki of speed regulator (ASR), so as to change the speed response characteristic of vector control. The system's dynamic response can be faster if the proportion gain Kp is increased; However, if Kp is too large, the system tends to oscillate. The system dynamic response can be faster if the integral time Ki is decreased; however, if Ki is too small, the system becomes overshoot and tends to oscillate. The ASR PI parameters are involved with inertia of motor system; please adjust these parameters according to different load characteristic to meet various demand of actual situation.

Code	Name	Description	Setting Range	Factory setting
F3.06	Slip compensation rate of VC	50%～200%	50～100	100%

The parameter is used to adjust the slip frequency of vector control and improve the precision of speed control. Properly adjusting this parameter can effectively restrain the static speed bias.

Code	Name	Description	Setting Range	Factory setting
F3.07	Torque limit	0.0～200.0% (inverter rated current)	0.0～200.0	200.0%

This parameter is used to limit the torque current output by speed regulator. Torque limit value 0.0-200% is the inverter's rated current percentage.

F4 V/F Group-- V/F Control

F4.00～F4.04 are only valid for V/F control (F0.00＝1), and invalid for vector control and torque control.

Code	Name	Description	Setting Range	Factory setting
F4.00	V/F curve selection	0**:**straight line 1**:** quadratic curve 2**:** multi points V/F curve	0～2	0

Such fan, water pumps, which can select 2.0 orders V/F curve control.

0**:** Linear curve. It is applicable for normal constant torque load.

1**:** Uadratic curve. It is applicable for variable torque load, such as blower, pump and so on. Please refer to following figure.

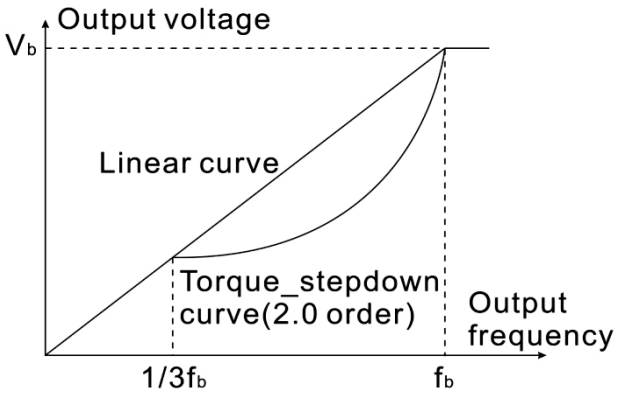


Figure 6-6 V/F curve diagram

Code	Name	Description	Setting Range	Factory setting
F4.01	Torque boost	0.0%**:** (auto) 0.1 ％ ～30.0％	0.0～30.0	3.0％
F4.02	Torque boost cut-off point	0.0% ～ 50.0% (motor rated frequency)	0.0～50.0	20.0%

Torque boost will take effect when output frequency is less than cut-off frequency of torque boost (F4.02). For details, please refer to following figure. Torque boost can improve the torque performance of V/F control at low speed. The value of torque boost should be determined by the load. The heavier the load is, the larger the value is.

Notice: F4.01 should not be too large, otherwise the motor would be over-heat or the inverter would be tripped by over-current or over-load.

If F4.01 is set to be 0.0%, the inverter will boost the output torque according to the load automatically.

Torque boost cut-off point: torque boost would be valid below this preset frequency and invalid over this value.

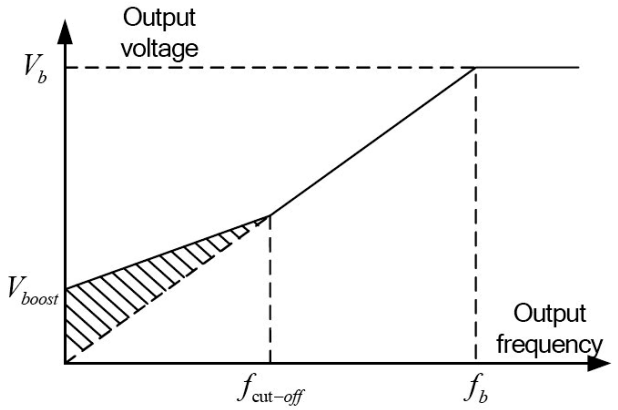


Figure 6-7

Code	Name	Description	Setting Range	Factory setting
F4.03	V/F Slip Compensation limit	0.0～200.0%	0.0～200.0	0.0%

The slip compensation function calculates the torque of motor according to the output current and compensates for output frequency. This function is used to improve speed accuracy when operating with a load, to improve the temper of mechanism characterical.F4.03 sets the slip compensation limit as a percentage of motor rated slip, with the motor rated slip taken as 100%.

Code	Name	Description	Setting Range	Factory setting
F4.04	Auto energy saving selection	0**:** Disabled 1**:** Enabled	0～1	0

When F4.04 is set to be 1, during constant running while there is a light load, it will reduce the inverter output voltage by detect the load current, to realize energy saving.

Notice: This function is applicable for load such as blower, pump and so on.

Code	Name	Description	Setting Range	Factory setting
F4.05	V/F frequency point 1	0.00～F4.07	0.00～F4.07	10.00Hz
F4.06	V/F voltage point 1	0.0～100.0%	0.0～100.0%	20.0%
F4.07	V/F frequency point 2	F4.05～F4.09	F4.05～F4.09	20.00Hz
F4.08	V/F voltage point 2	0.0～100.0%	0.0～100.0%	40.0%
F4.09	V/F frequency point 3	F4.07～F4.11	F4.07～F4.11	30.00Hz
F4.10	V/F voltage point 3	0.0～100.0%	0.0～100.0%	60.0%
F4.11	V/F frequency point 4	F4.09～F2.01	F4.09～F2.01	40.00Hz
F4.12	V/F voltage point 4	0.0～100.0%	0.0～100.0%	80.0%

F4.05 ~ F4.12 define multi-segment V / F curve. V / F curve setting is usually based on the load characteristics of the motor set. Note**:** F1 <F2 <F3 <F4. Set the voltage too high at low frequencies may cause overheating and even burning of the motor, the drive may be over the loss of speed or over-current protection.

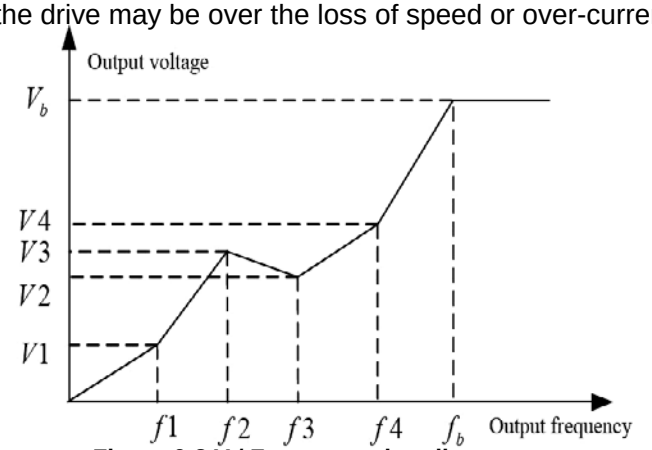


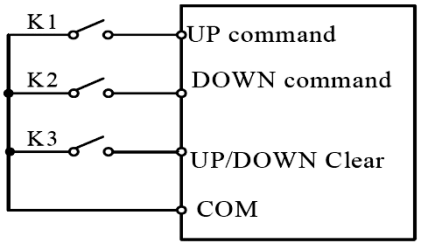
Figure 6-8 V / F curve setting diagram

F5 Group--Input Terminals

EM9 series inverters have 6 multi-functional input terminals and 2 analog input terminals.

Code	Name	Description	Setting Range	Factory setting
F5.00	X1 Terminal function	Programmable multifunctional terminal	0～26	1
F5.01	X2 Terminal function	Programmable multifunctional terminal	0～26	4
F5.02	X3 Terminal function	Programmable multifunctional terminal	0～26	7
F5.03	X4 Terminal function	Programmable multifunctional terminal	0～26	0
F5.04	X5 Terminal function	Programmable multifunctional terminal	0～26	0
F5.05	X6 Terminal function	Programmable multifunctional terminal	0～26	0

These parameters are used to set the function of multi-functional terminals as below (selectable)

Setting value	Function	Description
0	Invalid	Inverter wills not response to the terminal even if there have signals input. Please set unused terminals to be invalid to avoid malfunction.
1	Forward	Control the inverter running forward or reverse by exterior terminals
2	Reverse	
3	3-wire control	Set the inverter running mode to 3-wire control by this terminal. Please refer to description of F5.07 3-wire control for detail.
4	Jog forward	About jog reference, acceleration time and deceleration time please refer to the description of F8.02~F8.04 for details.
5	Jog reverse	
6	Coast to stop	The inverter blocks the output immediately. The motor Coasts to stop by its mechanical inertia. This function is often used for large-inertia load which have no demand with stop time. It has the same function as F1.05.
7	Reset fault	External faults resets function. It has the same function as STOP/RESET. With this function can realize remote faults reset.
8	External fault input	Stop the inverter and output a alarm when a fault occurs in a peripheral device.
9	Up command (UP)	UP/ Down command is to change the frequency when the frequency source is set external terminal. The reference frequency of inverter can be adjusted by UP/ DOWN command when the frequency source is set to digital.  Use this terminal to clear UP/DOWN setting. And resume the reference frequency to frequency command preset.
10	Down command (DOWN)	
11	Clear UP/DOWN	
12	Multi-step speed reference 1	8 steps speed control can be realized by the combination of these 3 terminals. Notice**:** Multi-step speed reference1 is the low speed, and Multi-step speed reference 3 is the high speed.
13	Multi-step speed reference 2	
14	Multi-step speed reference 3	

<table>
<tr><th>Setting value</th><th>Function</th><th>Description</th></tr>
<tr><td>15</td><td>ACC/DEC time selection</td><td>2 groups of ACC/DEC time can be selected by the combination of these 2 terminals.
<table>
<tr><th>Terminal</th><th>ACC/DEC time</th><th>Corresponding parameter</th></tr>
<tr><td>OFF</td><td>ACC/DEC time 0</td><td>F0.09、F0.10</td></tr>
<tr><td>ON</td><td>ACC/DEC time 1</td><td>F8.05、F8.06</td></tr>
</table></td></tr>
<tr><td>16</td><td>Pause PID</td><td>PID adjustment will be paused and inverter keeps output frequency unchanged.</td></tr>
<tr><td>17</td><td>Pause traverse operation</td><td>Inverter keeps output frequency unchanged. If this terminal is disabled, inverter will continue traverse operation from current frequency.</td></tr>
<tr><td>18</td><td>Reset traverse operation</td><td>Reference frequency of inverter will be returned back to central frequency of traverse operation.</td></tr>
<tr><td>19</td><td>ACC/DEC ramp hold</td><td>Pauses acceleration or deceleration and maintains output frequency in order to protect the inverter from the influence of external signals (except stop command)</td></tr>
<tr><td>20</td><td>Disable torque control</td><td>Torque control is disabled. Inverter will work in speed control mode.</td></tr>
<tr><td>21</td><td>UP/DOWN invalid temporarily</td><td>When this terminal is enabled, UP/DOWN setting will be cleared and reference frequency will be resumed to the value that set by frequency command source. When this terminal is disabled, UP/DOWN setting frequency return to pre-set value and be valid again.</td></tr>
<tr><td>22</td><td>Run counter cleared</td><td>Run counter cleared</td></tr>
<tr><td>23</td><td>Main, auxiliary channel selection</td><td>When the terminal is closed, select the secondary channel; off the selection of the main channel as a frequency reference</td></tr>
<tr><td>24</td><td>Given pulse PUL (Only X1terminal use)</td><td>When the terminal is closed, select the secondary channel; off the selection of the main channel as a frequency reference</td></tr>
<tr><td>25</td><td>Pulse count input</td><td></td></tr>
<tr><td>26</td><td>Clear pulse counter</td><td></td></tr>
</table>

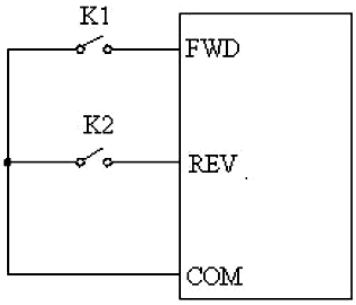
Code	Name	Description	Setting Range	Factory setting
F5.06	ON/OFF filter times	1～10	1～10	5

This parameter is used to set filter strength of terminals (x1~x6). When interference is

heavy, user should increase this value to prevent malfunction.

Code	Name	Description	Setting Range	Factory setting
F5.07	FWD/REV control mode	0**:** 2-wire control mode 1 1**:** 2-wire control mode 2 2**:** 3-wire control mode 1 3**:** 3-wire control mode 2	1～3	0

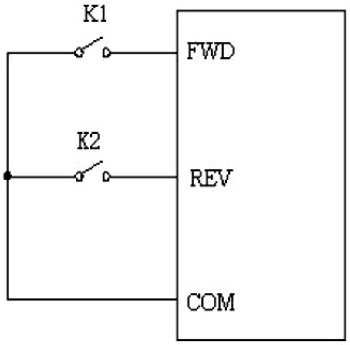
This parameter defines four different control modes that control the inverter operation through external terminals.
FWD is forwarder run functional terminals
REV is reverse run functional terminals
0: 2-wire control mode 1 this control mode is the one that most frequency to use. Run direction is determined by FWD and REV terminals.



K1	K2	Run command
OFF	OFF	Stop
ON	OFF	FWD
OFF	ON	REV
ON	ON	Stop

Figure 6-9 2-wire control mode1

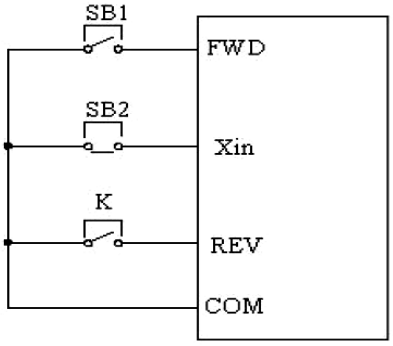
1: 2-wire control mode 2 START/STOP command is determined by FWD terminal. Run direction is determined by REV terminal.



K1	K2	Run command
OFF	OFF	Stop
OFF	ON	FWD
ON	OFF	Stop
ON	ON	REV

Figure 6-9 2-wire control mode 2.

2: 3-wire control mode 1 Terminal Xin is the enable terminal in this control mode. START/STOP command is determined by FWD terminal. Run direction is determined by REV terminal. Xin terminal is normally-closed input.



K	Run direction
OFF	Stop
ON	FWD

Figure 6-10 3-wire control mode 1.

K**:** Run direction button SB1**:** Start button SB2**:** Stop button Terminal Xin is the multi-functional input terminal of X1~X4. The terminal function should be set to be 3 (3-wire control).

3: 3-wire control mode 2 Terminal Xin is the enable terminal in this control mode. START command is determined by SB1 or SB3 terminal. Run direction is determined by SB1 or SB3 terminal too. STOP command is determined by normally-closed input terminal SB2.

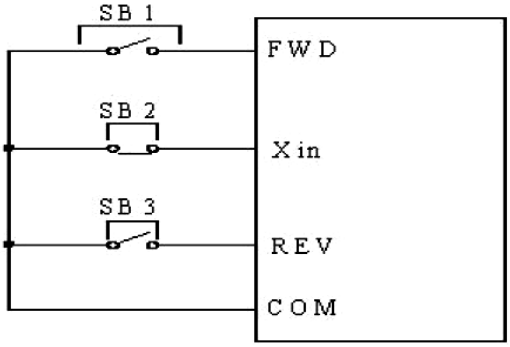


Figure 6-11 3-wire control mode 2

SB1**:** Forward run button SB2**:** Stop button SB3**:** Reverse run button Terminal Xin is the multifunctional input terminal of X1~X4. The terminal function should be set to be 3 (3-wire control).

Notice: If 2-wire control mode is active, the inverter will not run when the inverter stops due to receive stop command from other source and even if FWD/REV terminal is valid. And inverter will not run after stop command disappear, until trigger FWD/REV terminal again.

Code	Name	Description	Setting Range	Factory setting
F5.08	UP/DOWN setting change rate	0.01～50.00Hz/s	0.01～50.00	0.50Hz/s

Terminal UP/DOWN regulates the incremental rate of setting frequency.

Code	Name	Description	Setting Range	Factory setting
F5.09	AI1 lower limit	0.00V～10.00V	0.00～10.00	0.00V
F5.10	AI1 lower limit corresponding setting	-100.0%～100.0%	-100.0～100.0	0.0%
F5.11	AI1 upper limit	0.00V～10.00V	0.00～10.00	10.00V
F5.12	AI1 upper limit corresponding setting	-100.0%～100.0%	-100.0～100.0	100.0%
F5.13	AI1 filter time constant	0.00s～10.00s	0.00～10.00	0.10s

These parameters determine the relationship between analog input voltage and the corresponding setting value. When the analog input voltage exceeds the range between lower limit and upper limit, it will be regarded as the upper limit or lower limit. When AI1 is set to 0~20mA current input, the corresponding voltage range is 0~5V.For different applications, the corresponding value of 100.0% analog setting is different. For details, please refer to description of each application. Some applications setting is as shown in following figures.

Notice: AI1 lower limit must be less or equal to AI1 upper limit.

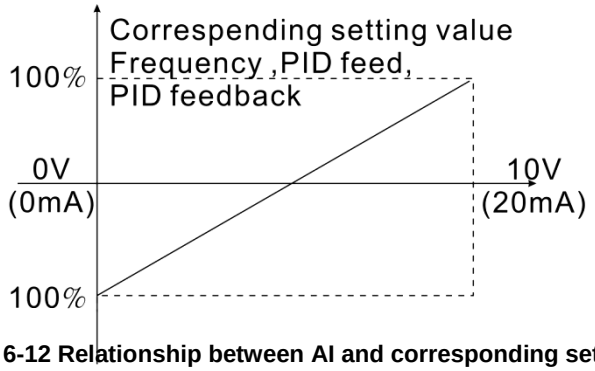


Figure 6-12 Relationship between AI and corresponding setting

AI1 filter time constant**:** This parameter determines the responsiveness of analog input signal. In order to avoid malfunction due to analog input signal be disturbed, please increase the setting value. The anti-interference ability improved as the setting increases. But it will decrease the responsiveness.

Code	Name	Description	Setting Range	Factory setting
F5.14	AI2 lower limit	0.00V～10.00V	0.00～10.00	0.00V
F5.15	AI2 lower limit corresponding setting	-100.0%～100.0%	-100.0～100.0	0.0%
F5.16	AI2 upper limit	0.00V～10.00V	0.00～10.00	10.00V
F5.17	AI2 upper limit corresponding setting	-100.0%～100.0%	-100.0～100.0	100.0%
F5.18	AI2 filter time constant	0.00s～10.00s	0.00～10.00	0.10s

Please refer to description of AI1. The analog input AI2 can provide voltage input (0~5V) and current (0~20mA) input. When AI2 terminal is set as 0~20mA current input, the corresponding voltage range is 0~5V.

Code	Name	Description	Setting Range	Factory setting
F5.19	Enter the minimum frequency of PUL	0.00～50.00kHz	0.00～ 50.00kHz	0kHz
F5.20	PUL set the minimum Frequency orresponds to	0.0～100.0%	0.0～100.0%	0.0%
F5.21	Enter the maximum frequency of PUL	0.00～50.00kHz	0.00～ 50.00kHz	50.00kHz
F5.22	Setting the maximum Frequency orresponds PUL	0.0～100.0%	0.0～100.0%	100.0%
F5.23	PUL input filter time	0.00s～10.00s	0.00～10.00	0.10s

The function code defines the input pulse frequency and pulse input frequency corresponding to the relationship between the settings, when the pulse input frequency exceeds the maximum or minimum input range of the input, other than some will enter the calculation of the maximum or minimum input.

PUL input filter time**:** to determine the sensitivity of pulse input mode. If the pulse input to prevent malfunction caused by interference can increase this parameter, the enhanced anti-jamming capability, but causes pulse input sensitivity.

Code	Name	Description	Setting Range	Factory setting
F5.24	Set the curve selection AI1	0**:** Linear curve 1**:** Optimization Curve	0～1	0
F5.25	AI1 input point A	0.0～10.00V	0.0～10.00V	0.66V
F5.26	A corresponding set point	0.0～100.0%	0.0～00.0%	20.0%
F5.27	AI1 input point B	0.0～10.00V	0.0～10.00V	1.32V
F5.28	Corresponding to set point B	0.0～100.0%	0.0～00.0%	40.0%
F5.29	AI1 input point C	0.0～10.00V	0.0～10.00V	1.98V
F5.30	Point correspondence set C	0.0～100.0%	0.0～00.0%	60.0%
F5.31	AI1 input point D	0.0～10.00V	0.0～10.00V	2.64V
F5.32	D point correspondence set	0.0～100.0%	0.0～00.0%	80.0%

Note: F5.09 <F5.25 <F5.27 <F5.29 <F5.31 <F5.11.

100.0% of the corresponding analog set maximum frequency (F0.06).

AI1 set curve choice:

0**:** linear curve. Operating frequency of the motor 1 at the endpoint (parameter F5.09, F5.10 set) and endpoint 2 (parameter F5.11, F5.12 set) between the input signal with the AI1 for linear trend.

1: Optimization curve. Motor operation frequency between endpoint 1 and endpoint 2 parameters F5.25 ~ F5.31 can be divided into 5 segments, each for the linear change.

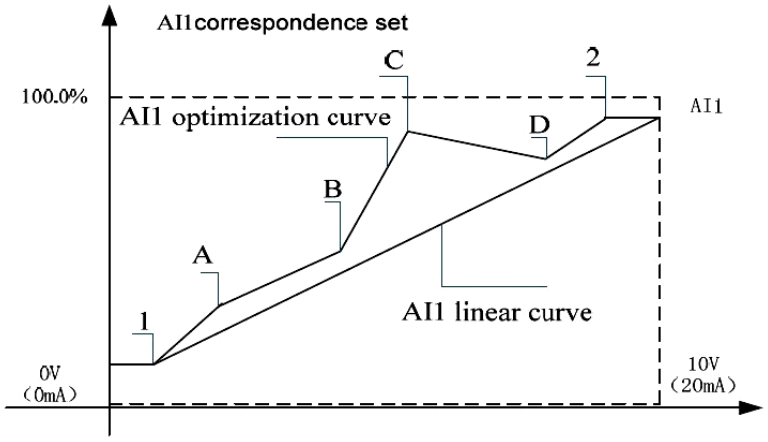


Figure 6-13 optimization curves for relationship between AI1 analog given value and preset value

F6 Group--Output Terminals

Standard cell inverter has two multi-function digital output terminals, a multi-function relay output terminal, and two multi-function analog output terminals.

Code	Name	Description	Setting Range	Factory setting
F6.00	Y1 output selection	Open-collector output	0～11	1
F6.01	Y2 output selection	Open-collector output	0～11	4
F6.02	Relay Function	Relay Output Function	0～11	3

OC/Relay output functions are indicated in the following table.

Setting value	Name	Description
0	No output	Output terminal has no function.
1	Run forward	ON: During forward run, output frequency being.
2	Run reverse	ON: During reverse run, output frequency being.
3	Fault output	ON: Inverter is in fault status.
4	FDT1 reached	Please refer to description of F 8.13 and F8.14.
5	Frequency reached	Please refer to description of F8.15.
6	Zero speed running	ON: The output frequency of inverter is lower than starting frequency.
7	Upper frequency limit reached	ON: Running frequency reaches the value of upper limit F0.05).
8	Lower frequency limit reached	ON: Running frequency reaches the value of lower limit (F0.06).
9	Inverter operation	Said inverter operation, with output frequency. At this point the signal output ON
10	FDT2 output	Please refer to description of F 8.28 and F8.29.
11	Frequency pump control	Water Supply no water supply substrate, one for two,the frequency pump control

Code	Name	Description	Setting Range	Factory setting
F6.03	AO1 selection	Multifunctional analog output	0～10	0
F6.04	AO2 selection	Multifunctional analog output	0～10	3

Analog output standard output is 0~20mA (or 0~10V). Current (0~20mA) or voltage (0~10V)output can be selected.
AO functions are indicated in the following table**:**

Setting value	Function	Range
0	Running frequency	0~Maximum frequency
1	Reference requency	0~Maximum frequency
2	Motor speed	0~2* rated synchronous speed of motor
3	Output current	0~2* inverter rated current
4	Output voltage	0~1.5* inverter rated voltage
5	Output power	0~2* rated power
6	Output torque	0~2*rated current
7	AI1 Input	0～10V
8	AI2 Input (Voltage/Current)	0～10V/0～20mA
9~10	Reserved	Reserved

Code	Name	Description	Setting Range	Factory setting
F6.05	AO1 lower limit	0.0%～100.0%	0.0～100.0	0.0%
F6.06	AO1 lower limit corresponding output	0.00V ～10.00V	0.00～10.00	0.00V
F6.07	AO1 upper limit	0.0%～100.0%	0.0～100.0	0.00V
F6.08	AO1 upper limit corresponding output	0.00V ～10.00V	0.00～10.00	0.00V
F6.09	AO2 lower limit	0.0%～100.0%	0.0～100.0	0.0%
F6.10	AO2 lower limit corresponding output	0.00V ～10.00V	0.00～10.00	0.00V
F6.11	AO2 upper limit	0.0%～100.0%	0.0～100.0	100.0%
F6.12	AO2 upper limit corresponding output	0.00V ～10.00V	0.00～10.00	10.00V

These parameters determine the relationship between analog output voltage/current and the corresponding output value. When the analog output value exceeds the range between lower limit and upper limit, it will output the upper limit or lower limit. When AO is current output, 1mA is corresponding to 0.5V.
For different applications, the corresponding value of 100.0% analog outputs is different. More details please refer to description of each application. Some applications setting is as shown in following figures.

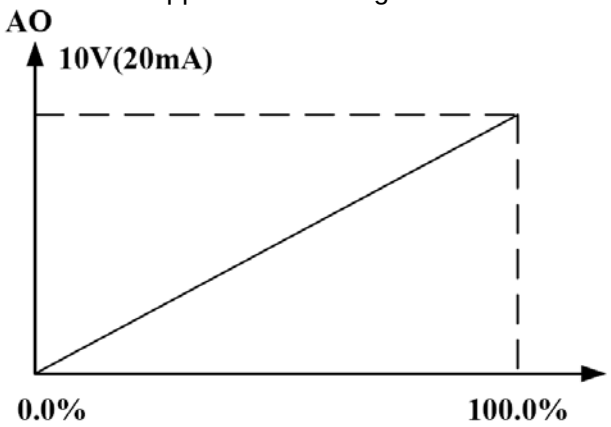


Figure 6-14 Relationship between AO and corresponding setting.

F7 Group--Display Interface

Code	Name	Description	Setting Range	Factory setting
F7.00	QUICK/JOG function selection	0**:** Jog 1**:** FDW/REV switching 2**:** Clear UP/DOWN setting	0～2	0

QUICK/JOG is a multifunctional key, whose function can be defined by the value of F7.00.
0: Jog: Press QUICK/JOG, the inverter will jog.
1: FWD/REV switching: Press QUICK/JOG, the running direction of inverter will reverse. It is only valid if *F0.01 is set to be 0.*
2: Clear UP/DOWN setting: Press QUICK/JOG, the UP/DOWN setting will be cleared.

Code	Name	Description	Setting Range	Factory setting
F7.01	STOP/RESET function option	0**:** Valid when keypad control 1**:** Valid when keypad or terminal control 2**:** Valid when keypad or communication control 3**:** Always valid	0～3	0

The value of F7.01 only determines the STOP function of STOP/RST. The RESET function of STOP/RST is always valid.

Code	Name	Description	Setting Range	Factory setting
F7.02	Keyboard and terminal UP / DOWN to set	0**:** valid, and the drive power off storage 1**:** effective, and the drive does not store power-down 2**:** Invalid 3**:** valid in running, shutdown is cleared	0～3	0

Drive through the keyboard's "∧" and "∨" and the terminal UP / DOWN (frequency setting increase / decrease the frequency set) function to set the frequency, the highest authority, the frequency can be set to any other channel combinations. Notably the completion of the process of debugging the control system, fine-tuning the inverter output frequency.

0**:** Valid, and the drive power down storage. Can set the frequency command, and, after the drive power down, store the set frequency value after the next power automatically set the frequency with the current portfolio.

1**:** Effective, and the drive power down are not stored. Can set the frequency command, but the drive powered off, the set frequency value is not stored.

2**:** Invalid, the keyboard and terminal UP / DOWN frequency setting function automatically cleared, and the keyboard and terminal UP / DOWN to set invalid.

3**:** Run-time Settings "∧" and "∨" and the terminal UP / DOWN function setting effective shutdown of the keyboard "∧" and "∨" and the terminal UP / DOWN to set clear. Note**:** When the user function of the drive to restore factory default operating parameters, the keyboard and terminal UP / DOWN frequency setting function automatically cleared

Code	Name	Description	Setting Range	Factory setting
F7.03	User password	0～65535	0～65535	0

The password protection function is used to prevent unauthorized user persons from checking and modifying the functional parameters. f the user's password is necessary, input a 5-digit none-zero figure, press DATA/ENT to confirm. If not pressing any key within 1 minute, the password will become effective automatic.

After the password has been set and becomes valid, the user can not access menu if the user's password is not correct. Only when a correct user's password is input, the user can see and modify the parameters. Please keep user's password in mind.

Exit the parameter edit state, the password will become effective after 1 minute. Then press PRG/ESC to access menu, it will display "0.0.0.0", and the user must input correct the correct user's password, otherwise the user can not access.

Set F7.03 to 0 if the user's password is unnecessary.

Code	Name	Description	Setting Range	Factory setting
F7.04	Running status display selection	0～0x7FFF	0～0x7FFF	0xFF

EM9 series inverters, F7.04 defines the parameters that can be displayed by LED in running status. That is of a 16 bits binary data**:** If Bit is 1, the parameter will be displayed. Press 》/SHIFT to scroll through these parameters; If Bit is 0, the parameter will not be displayed. The binary number needs to convert to hexadecimal number before set it as this parameter. The display content corresponding to each bit of F7.04 is described in the following table, Low 8 bits**:**

BIT7	BIT6	BIT5	BIT4	BI3	BIT2	BIT1	BIT0
Output torque	Output power	Rotation speed	Output current	Output voltage	DC bus voltage	Reference frequency	Operation frequency

High 8 bits**:**

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Step No. of multi-step	AI1	AI1	Output terminal status	Input terminal status	PID feed	PID preset

Notice**:** I/O terminal status is displayed in decimal. X1(Y1) corresponding to lowest bit. For example the input terminal status display 3, means that X1 and X2 are closed, others are open. For details, please refer to description of F7.19 and F7.20.

Code	Name	Description	Setting Range	Factory setting
F7.05	Stop status display selection	0～0x1FF	0～0xFF	0xFF

F7.05 Determines the display parameters in stop status. The setting method is similar with F7.04. The display content corresponding to each bit of F7.05 is described in the following table**:** Low 8 bits**:**

BIT7	BIT6	BIT5	BIT4	BI3	BIT2	BIT1	BIT0
Output torque	Output power	Rotation speed	Output current	Output voltage	DC bus voltage	Reference frequency	Operation frequency

High 8 bits**:**

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT9	BIT8
Reserved	Step No. of multi-step	AI1	AI1	Output terminal status	Input terminal status	PID feed	PID preset

RVD**:** Reserved

Code	Name	Description	Setting Range	Factory setting
F7.06	Keypad display selection	0**:** Preferential to external keypad 1**:** Both display, only external key valid. 2**:** Both display, only local key valid. 3**:** Both display and key valid.	0～3	0

This parameter set the logic relation of display key function between local key and external key.

Notice: This function should be used cautiously, otherwise it may cause malfunction.

Code	Name	Description	Setting Range	Factory setting
F7.08	Parameter copy (Reserved)	0**:** Invalid 1**:** Upload from inverter 2**:** Download to inverter	0～2	0

F7.08 determines the parameters copy method. It is inbuilt in the outer keypad.

1**:** All value of parameters will be uploaded from inverter to outer keypad.

2**:** All value of parameters will be downloaded from outer keypad to inverter.

Notice: When upload or download operation completes, F7.08 will be set to 0 automatically.

Code	Name	Description	Setting Range	Factory setting
F7.09	Rectifier module temperature	0～100.0℃	0～2	0
F7.10	IGBT module temperature	0～100.0℃		
F7.11	Software version			
F7.12	Accumulated running time	0～65535h		

These parameters are read only.

Rectify module temperature: Indicates the temperature of rectify module. Overheat Protection point of different inverter may be different.

IGBT module temperature: Indicates the temperature of IGBT module. Overheat Protection point of different inverter may be different.

Software version: Indicates current software version of DSP.

Accumulated running time: Displays accumulated running time of inverter.

Code	Name	Description	Setting Range	Factory setting
F7.13	Third latest fault type	0～25		
F7.14	Second latest fault type	0～25		
F7.15	Latest fault type	0～25		

These parameters record 3 recent fault types. 0 means there are no faults, and 1~25 corresponding to 25 types faults. For details, please refer to description of faults in chapter 7

Code	Name	Description	Setting Rang	Factory setting
F7.16	Output frequency at current fault	Output frequency at current fault.		
F7.17	Output frequency at current fault	Output current at current fault.		
F7.18	DC bus voltage at Current fault.	DC bus voltage at current fault.		
F7.19	Input terminal status at current fault	This value is displayed as decimal. This value records ON-OFF input terminal status at current fault. The meaning of each bit is as below**:** BI5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 X6 X5 X4 X3 X2 X1 1 indicates corresponding input terminal is ON, while 0 indicates OFF .Through this value we can understand the digital input signals status at that time.		
F7.20	Output Terminal status at current fault	This value is displayed as decimal. This value records ON-OFF output terminal status at current fault. The meaning of each bit is as below**:** BI3 | BIT2 | BIT1 | BIT0 R0 Y2 Y1 1 indicates corresponding output terminal is ON, while 0 indicates OFF. Through this value we can understand the digital output signals status at that time.		

F8 Group--Enhanced Function

Code	Name	Description	Setting Rang	Factory setting
F8.00	Auto reset times	0～10	0～10	0
F8.01	Reset interval	0.1～100.0s	0.1～100.0	1.0s

Auto reset times: this parameter is used to set the times of auto reset when the inverter selection to reset faults automatic. If the actual reset times exceed this value, inverter faults stand-by, waiting for restore.
Reset interval: set the interval time of auto reset action after faults occur.

Code	Name	Description	Setting Range	Factory setting
F8.02	Jog reference	0.00～Maximum frequency (F0.06)	0.00～F0.06	5.00Hz
F8.03	Jog acceleration time	0.1～3600.0s	0.1～3600.0	Depend on model
F8.04	Jog acceleration time	0.1～3600.0s	0.1～3600.0	Depend on model

Define the reference frequency and Acc/Dec time of jog operation. Jog will start as start directly mode and stop as deceleration to stop mode.
Jog acceleration time is the time of accelerating from 0Hz to maximum frequency (F0.06).

Jog deceleration time is the time of decelerating from maximum frequency (F0.06) to 0Hz.
The factory setting of acceleration and deceleration time is as follow**:**
5.5kW and below**:** 10.0s
7.5kW~55kW**:** 20.0s
75kW and above**:** 40.0s

Code	Name	Description	Setting Range	Factory setting
F8.05	Acceleration time 2	0.1～3600.0s	1.0～3600.0	Depend on model
F8.06	Deceleration time 2	0.1～3600.0s	0.1～3600.0	Depend on model

Acc/Dec time can select F0.09 and F0.10 or above three. They have same meaning. For details, please refer to description of F0.09 and F0.10.
The factory setting of acceleration and deceleration time is as follow**:**
5.5kW and below**:** 10.0s
7.5kW~55kW**:** 20.0s
75kW and above**:** 40.0s
The acceleration and deceleration time can be selected by combination of multifunctional ON-OFF input terminals determined by F5 Group.

Code	Name	Description	Setting Range	Factory setting
F8.07	Skip frequency	0.00～F0.06 (maximum frequency)	0.00～F0.06	0.00Hz
F8.08	Skip frequency bandwidth	0.00～F0.06 (maximum frequency)	0.00～F0.06	0.00Hz

When the reference frequency is in the skip frequency range, the actual operation frequency will be the nearby skip frequency boundary of the reference frequency. By means of setting skip frequency, the inverter can keep away from the mechanical resonance with the load. F8.07 is centre value of frequency to be skipped. This inverter can set one skip frequency point. If Skip frequency is set to 0, the skip function is invalid.
The relation between output frequency and reference frequency is shown in following figure.

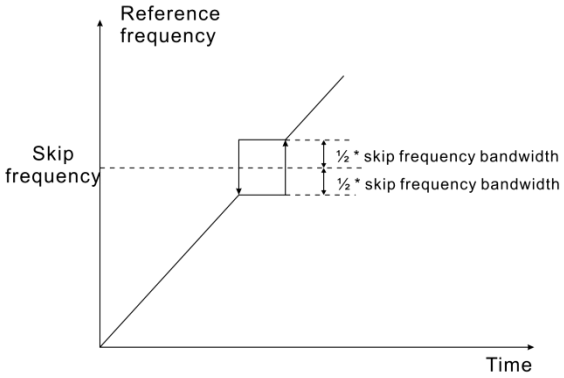


Figure 6-15 Skip frequency diagram.

Code	Name	Description	Setting Range	Factory setting
F8.09	Traverse amplitude	0.0～100.0%(reference frequency)	0.0～100.0	0.0%
F8.10	Jitter frequency	0.0～50.0% (traverse amplitude)	0.0～50.0	0.0%
F8.11	Rise time of traverse	0.1～3600.0s	0.1～3600.0	5.0s
F8.12	Fall time of traverse	0.1～3600.0s	0.1～3600.0	5.0s

Traverse operation is widely used in textile and chemical fiber industry. Traverse operation is the output frequency of inverter traverse to reference frequency as center. The output frequency change track is shown in following figure. Traverse amplitude set by F8.09. When F8.09 is set to 0, that is traverse amplitude is 0, the traverse operation is disabled.

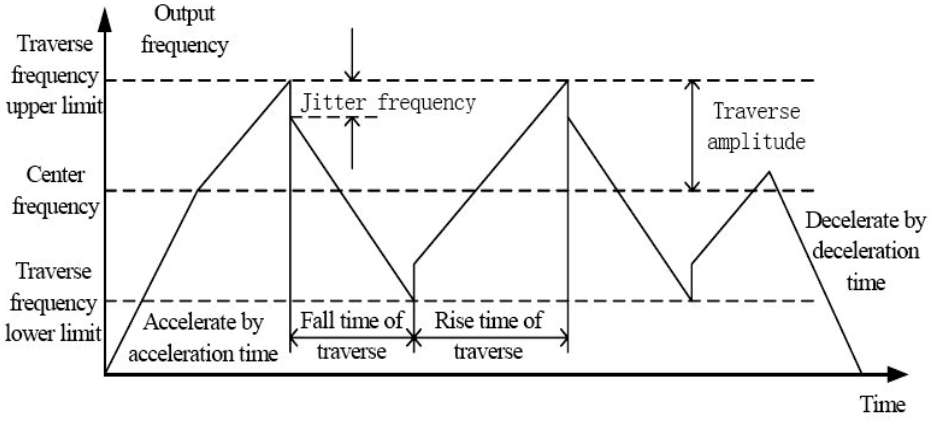


Figure 6-16 Traverse operation diagram.

Center frequency (CF) is reference frequency.

Traverse amplitude**:** The output frequency of traverse is limited by upper frequency limit (F0.05) and lower frequency limit (F0.06).

Traverse amplitude relative to center frequency**:**

Traverse amplitude (AW) =center frequency * F8.09.

Jitter frequency = traverse amplitude (AW) * F8.10. That is the value of jitter frequency relative to traverse amplitude in traverse operation.

Rise time of traverse**:** Indicates the time rising from the lowest traverse frequency to the highest traverse frequency.

Fall time of traverse**:** Indicates the time falling from the highest traverse frequency to the lowest traverse frequency.

Code	Name	Description	Setting Range	Factory setting
F8.13	FDT1 level	0.00～ F0.06 (maximum frequency)	0.00～ F0.06	50.00Hz
F8.14	FDT1 lag	0.0～100.0%(FDT1 level)	0.0～100.0	5.0%

These parameters set the detect level of output frequency and lag value of free output action. As shown in following figure**:**

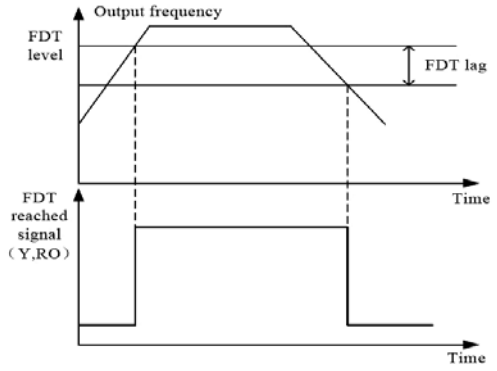


Figure 6-17 FDT level and lag diagram.

Code	Name	Description	Setting Range	Factory setting
F8.15	Frequency arrive detecting range	0.0～100.0% (maximum frequency)	0.0～100.0	0.0%

When output frequency reached the reference frequency, this function can adjust its detecting range. As shown in following figure**:**

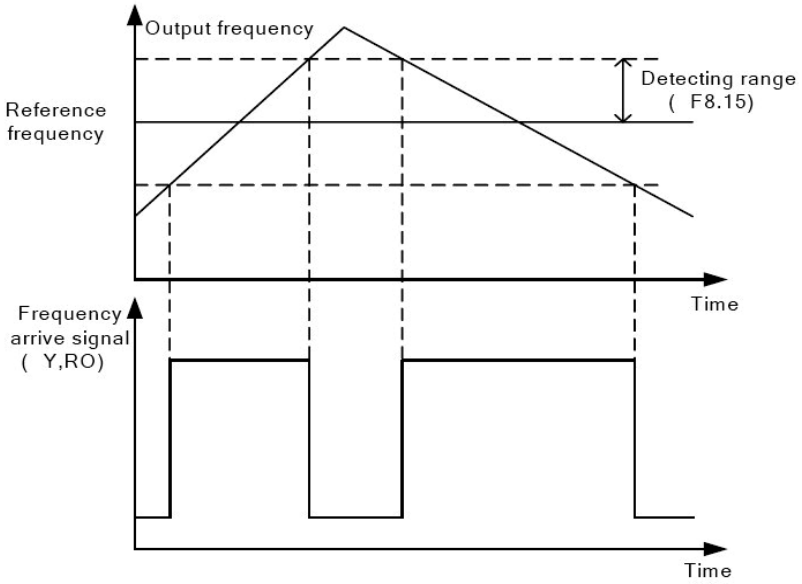


Figure 6-18 Frequency arriving signal diagram.

Code	Name	Description	Setting Range	Factory setting
F8.16	Brake threshold voltage	115.0～140.0% (DC bus voltage) (380V series)	115.0～140.0	130.0%
		115.0～140.0% (DC bus voltage) (220V series)	115.0～140.0	120.0%

This parameter is used to set the starting DC bus voltage of dynamic braking. Appropriate adjustments of this value can effective brake the load.

Code	Name	Description	Setting Range	Factory setting
F8.17	Coefficient of rotation speed	0.1～999.9%	0.1～999.9%	100.0%

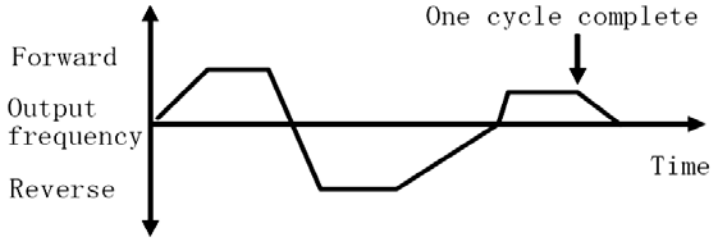
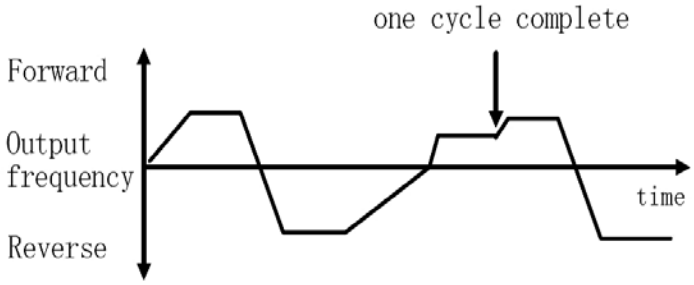
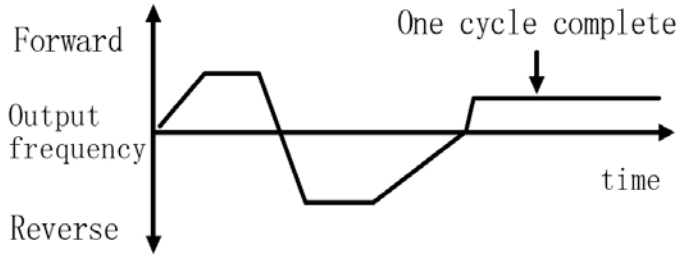
This parameter is used to calibrate the bias between actual mechanical speed and rotation speed. The formula is as below**:**

Actual mechanical speed = 60 * output frequency *F8.17 / Number of poles of motor

Code	Name	Description	Setting Range	Factory setting
F8.18	Time unit	0**:** S (second) 1**:** M(minute) 2**:** H(hour)	0～2	0

This parameter determines the unit of x step running time (F8.20~F8.26).

Code	Name	Description	Setting Range	Factory setting
F8.19	Simple PLC mode	0**:** Stop after one cycle 1**:** Circular run 2**:** Hold last frequency after one cycle	0～2	0

0: single cycle 1: Stop after one cycle:	Inverter start from first step, after preset running time arrives, turn to next step running. After completes 7 steps running, inverter output 0 and stop. If some step running time is set to 0,it will be skip. (Running frequency and time of each step are set by FA.01 ～ FA.07 and F8.20～ F8.26)	 stop after complete one cycle
1: Circular run	Inverter continues to run cycle by cycle until receive a stop command.	 Circular run
2: Hold last frequency after one cycle	Inverter holds frequency and direction of last step after one cycle.	 Hold last frequency after one cycle

Code	Name	Description	Setting Range	Factory setting
F8.20	1st Step running time	0.0～6000.0	0.0～6000.0	0.0
F8.21	2st Step running time	0.0～6000.0	0.0～6000.0	0.0
F8.22	3st Step running time	0.0～6000.0	0.0～6000.0	0.0
F8.23	4st Step running time	0.0～6000.0	0.0～6000.0	0.0
F8.24	5st Step running time	0.0～6000.0	0.0～6000.0	0.0
F8.25	6st Step running time	0.0～6000.0	0.0～6000.0	0.0
F8.26	7st Step running time	0.0～6000.0	0.0～6000.0	0.0

F8.20~F8.34 Defines the running time of each step in PLC running. The range of them is 0.0～6000.0, and the unit is determined byF8.18. When the running time is set to zero, .the corresponding step will be skip, and the inverter go to run at next step.

Code	Name	Description	Setting Range	Factory setting
F8.35	FDT1 Detection delay	0.0～600.0s	0.0～600.0	0.0
F8.36	FDT2 Level detection value	0.00~F0.06(MAX frequency)	0.00～ 0.06	50.00Hz
F8.37	FDT2 Hysteresis test values	0.0～100.0%（FDT2 level）	0.0～100.0	5.0%
F8.38	FDT2 Detection delay	0.0～600.0s	0.0～600.0	0.0

Set the output frequency detection value 2 and the lag value of the output action to lift.

Code	Name	Description	Setting Range	Factory setting
F8.39	Pulse feedback disconnection detection time	0.0～6000.0s	0.0～6000.0s	0.0
F8.40	Pulse count per meter	0～60000	0～60000	10
F8.42	Run length 1	0～60000m	0～60000m	1000
F8.42	Run length 2	0～60000m	0～60000m	8000
F8.43	Run length 3	0～60000m	0～60000m	1000
F8.44	Run length 4	0～60000m	0～60000m	0
F8.45	Run length 5	0～60000m	0～60000m	0
F8.46	Run length 6	0～60000m	0～60000m	0
F8.47	Run length 7	0～60000m	0～60000m	0

Fixed length control program (F0.02 = 9), F8.40 for the pulse input terminal input pulse number per meter, the parameters F8.41 ~ F8.47 run the program length to define the length of each segment。

F9 Group: Process Control PID Function

PID control is a common method for process control, by which the proportion, integration and the differential calculation are performed on the differentia quantity between the feedback signal and the aim quantity signal of the controlled quantity, so as to adjust the output frequency of the inverter to form an REV feedback system, stabilizing the controlled quantity at the aim quantity. This method is applicable to the process control such as the flow control, pressure control and temperature control. The basic control principle is described as the following figure.

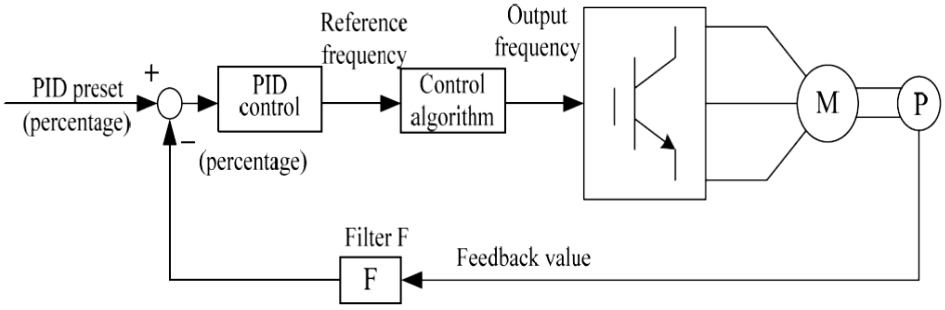


Figure 6-19 Process PID Principle Drawing

Code	Name	Description	Setting Range	Factory setting
F9.00	PID preset source selection	0**:** Keypad 1**:** AI1 2**:** AI2 3**:** Communication 4**:** Multi-step	0～4	0

When PID is selected as the frequency source, F0.02 will be selected as 5, then the group works. This parameter decides the reference channel of the aim quantity in the PID process. The set aim quantity of process PID is a relative value. The set 100% shall be corresponding to the 100% of the feedback signal. The system performs the calculation based on the relative value (0~100%).

Notice: Multi-step speed can be set by parameters in group FA.

Code	Name	Description	Setting Range	Factory setting
F9.01	Keypad PID Preset	0.0%～100.0%	0.0～100.0	0.0%

When F9.00=0 is selected, the aim source is the keyboard reference. This parameter is required to be set. The reference value of the parameter is the system feedback quantity.

Code	Name	Description	Setting Range	Factory setting
F9.02	PID feedback Source selection	0**:** AI1 1**:** AI2 2**:** AI1+AI2 3**:** Communication 4**:** Reserve	0～4	0

PID feedback channel is selected via this parameter.

Notice: The PID feedback source selection should not be the same as PID preset source selection, otherwise PID function will not work effectively.

Code	Name	Description	Setting Range	Factory setting
F9.03	PID output characteristics	0**:** Positive 1**:** Negative	0～1	0

Positive action: If the feedback signal is larger than the PID reference, the output frequency of the inverter is required to reduce to balance the PID. For example, the folding tensions PID control.

Negative action: If the feedback signal is larger than the PID reference, the output frequency of the inverter is required to increase to balance the PID. For example, the unfolding tensions PID control.

Code	Name	Description	Setting Range	Factory setting
F9.04	Proportional gain (Kp)	0.00～100.00	0.00～100.00	0.10
F9.05	Integral time (Ti)	0.01～10.00s	0.01～10.00	0.10s
F9.06	Differential time (Td)	0.00～10.00s	0.00～10.00	0.00s

Proportion gain (KP): Decide the regulation strength of the entire PID regulator. The bigger is P, the stronger is the regulation. That the parameter is 100 means when the difference between the PID feedback and reference quantity is 100%, the regulation amplitude of the output frequency command issued by PID regulator is maximum
frequency (the integration and differential function are neglected).

Integration time (Ti): Decide the speed of the integration regulation performed by PID regulator to the difference between PID feedback and reference quantity. Integration time means that when the difference between PID feedback and reference quantity is 100%, the regulation quantity of the integration regulator (the proportion and differential function are neglected) reaches maximum frequency (F0.06) through the continuous regulation during
the time period. The short the integration time is, the stronger the regulation strength is.

Differential time (Td): Decide the strength of the regulation preformed by PID regulator to PID feedback quantity and the variation rate of the reference deviation. The differential time means if the feedback varies by 100% within the time period, the regulation quantity of the differential regulator is maximum frequency (F0.06) (the proportion and differential function are neglected). The stronger the regulation strength is, the longer the differential time is.

PID control is a method which is usually used in process control. Each part of PID functions has different effect. The principle and the adjust method are introduced as the following**:**

Proportion gain: When the bias between feedback and preset value occurs, the inverter output an adjust value proportional to bias. If the bias is constant, the regulation will be constant. The proportion gain function can make the inverter respond to changes of feedback quickly, but simply adjust by this function can not realize no-difference control. The bigger the proportional gain is, the faster the system response and the easier the oscillation may occur. The adjust process of proportion gain is**:** firstly, set the integral time to long, and set the differential time to zero, just use proportion gain function to startup the system; then, change the preset value, observe constant bias (static difference) between feedback signal and preset value. If the static difference is in the change direction of preset value (for example, increased preset value, and after the stableness of inverter, feedback value is still less than preset value), keep on increase proportion gain. On the contrary, decrease the value. Repeat the above process until the static difference is smaller (difficult to reduce to no static difference).

Integration time: When the bias between feedback and preset value occurs, the inverter will output adjust value accumulate continuous. If the bias exists continuously, the adjust value will continue increasing until there is no bias. Integration regulator can eliminate the static difference and improve control precision. However, if the integration regulator is too strong, the adjustment will continue repeat. Thus, the system will not come into a stable state and oscillation will happen. The characteristics of oscillation due to integration strong action are that the feedback signal swing up and down around the preset value, the amplitude increases gradually until

the oscillation happens. So the adjustment of integration time is general from the big to the small, gradually adjusted. Observe the effect of system adjusting, until the system steady speed is complied with the requirements.

Differential time: When the bias between feedback and preset value changes, the inverter will output an adjust value proportional to the change rate of bias. The value just related to the changing direction and rate of bias, and has nothing to do with the direction and value of the bias itself. The function of differential regulator is active when the feedback signal change and regulated according to the changing trends, in order to restrain the change of feedback signal. Please be caution to use differential regulator, because of differential regulator is easy to enlarge the system interference, especially the interference with higher change frequency.

Code	Name	Description	Setting Range	Factory setting
F9.07	Sampling cycle (T)	0.01～100.00s	0.01～100.00	0.10s
F9.08	PID control motor reversal	0**:** Invalid 1**:** Valid	0～1	0

Sampling cycle (T)**:** The sampling cycle for the feedback quantity, during which the regulator performs the calculation once. The longer the sampling cycle is, the slower the response is.

Code	Name	Description	Setting Range	Factory setting
F9.09	PID control deviation limit	0.0～100.0%	0.0～100.0	0.0%

Deviation limit**:** the largest deviation quantity allowed of PID system output relative to the close loop reference value. As shown in figure below, the PID regulator stops regulating within the deviation limit. An appropriate function code setting may regulate the accuracy and stability of PID system.

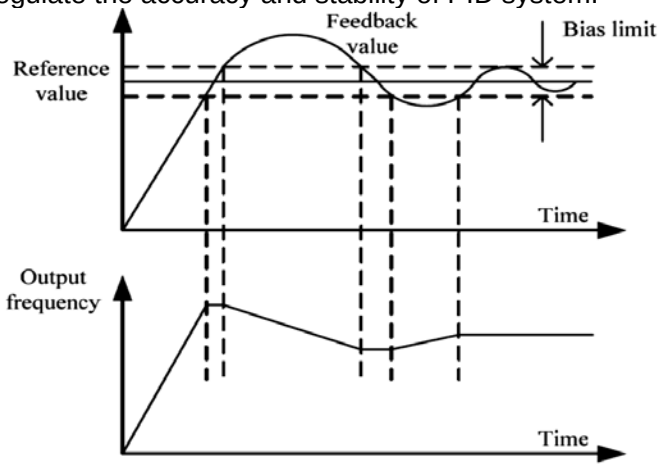


Figure 6-20 Corresponding Relationship between Deviation restrictions and Output Frequency

Code	Name	Description	Setting Range	Factory setting
F9.10	Feedback lost detecting value	0.0～100.0%	0.0～100.0	0.0%
F9.11	Feedback lost detecting time	0.0～3600.0s	0.0～3600.0	10.0s

Feedback lost detecting value**:** 100% of F9.10 is the same as 100% of F9.01.When feedback value is less than F9.10 continuously for the period determined by P9.11,the inverter will alarm feedback lost failure (PIDE).

Code	Name	Description	Setting Range	Factory setting
F9.12	Wake-up threshold	0.0%～Sleep Threshold	0.0%～Sleep Threshold	0.0%
F9.13	Threshold of sleep	Wake-up threshold~100.0%	Wake-up threshold～100.0%	100.0% F9.14
F9.14	Sleep latency	0.0～3600.0s	0.0～3600.0	60.0s

This feature is only valid when using the constant PID control.

Wake-up threshold: the drive to sleep after, PID feedback amount must be less than wake-up threshold, the drive to re-start; wake-up threshold is set too high may result in frequent start and stop the drive, set too low may result in insufficient pressure; This parameter is defined as the PID feedback sensor accounts for the largest

percentage range.

Threshold of sleep: for adjusting the system does not use standard sleep. For example, there is no water supply system, when detected, was higher than or equal to the PID feedback PID settings and set the value in the vicinity for a period of time after the sleep test drive started. Sleep test process, if the feedback is higher than the threshold of sleep, the drive gradually reduced to a lower output frequency, frequency of maintenance of sleep in the waiting time limit, the inverter output to 0, go to sleep. In the process, if the feedback is lower than the threshold of sleep, sleep test end, the drive back to PID regulation state. The smaller this parameter, the system is easier to sleep. This parameter is defined as the PID feedback sensor accounts for the largest percentage range.

Code	Name	Description	Setting Range	Factory setting
F9.15	upper frequency delay	0.0～600.0s	0.0～600.0s	60.0s
F9.16	Lower frequency of delay	0.0～600.0s	0.0～600.0s	60.0s
F9.17	Water Supply Model	0**:** No water supply board 1**:** Fixed pump mode 2**:** Circulation pump mode	0～2	0
F9.18	The number of pumps	1～8	1～8	1
F9.19	Electromagnetic switching time	0.1～30.0s	0.1～30.0s	5.0

Special machines in use constant pressure water supply, F9.17 defines the water supply mode,0**:** no water supply substrate, all the way through the output terminal fixed pump control can be achieved. 1**:** There is a fixed water supply pump control board, can achieve a seven stationary trailer pump, fixed the pump by RT1 to RT7 order of access. 2**::** a water circulation pump control board, can achieve a delay of four pump control, RT1 and RT2 corresponding to the pump 1, RT3 and RT4 corresponding to the pump 2, RT5 and RT6 corresponding to the pump 3, RT7 and RT8 corresponding to the pump 4.

FA Group-- Multi-step Speed Control

Code	Name	Description	Setting Range	Factory setting
FA.00	Multi-step speed 0	-100.0～100.0%	-100.0～100.0	0.0%
FA.01	Multi-step speed 1	-100.0～100.0%	-100.0～100.0	0.0%
FA.02	Multi-step speed 2	-100.0～100.0%	-100.0～100.0	0.0%
FA.03	Multi-step speed 3	-100.0～100.0%	-100.0～100.0	0.0%
FA.04	Multi-step speed 4	-100.0～100.0%	-100.0～100.0	0.0%
FA.05	Multi-step speed 5	-100.0～100.0%	-100.0～100.0	0.0%
FA.06	-100.0～100.0%	-100.0～100.0%	-100.0～100.0	0.0%
FA.07	Multi-step speed 7	-100.0～100.0%	-100.0～100.0	0.0%

The sign of multi-step speed determine the running direction. If the value of multi-step speed x is negative, the direction of this step will be reverse, otherwise it will be forward. 100% of multi-step speed x corresponds to the maximum frequency (F0.06). If X1=X2=X3=OFF, frequency command source selected by F0.04. If X1, X2, X3 are not all set to 0, multi-step speed running. Multi-step speed function has highest priority. Through combination of multi-step terminals, 8 step speed most can be selected.

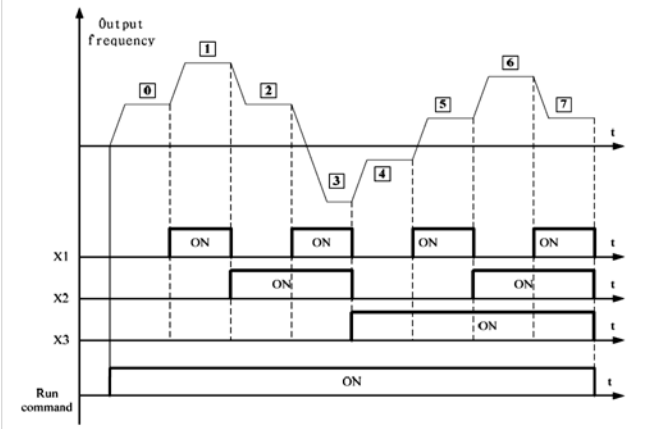


Figure 6-21 Multi-steps speed operating diagram.

The running command source of multi-steps speed running is also selected by F0.01. And the multi-steps speed running as shown in figure -21. And the relation between multi-steps speed and X1, X2, X3 terminals please refer to following figure and table. Relation between multi-steps speed and X1, X2, X3 terminals

X1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
X2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
X3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Steps	0	1	2	3	4	5	6	7

FB Group-- Protection Function

Code	Name	Description	Setting Range	Factory setting
Fb.00	Motor overload protection	0**:** Disabled 1**:** Normal motor 2**:** Variable frequency motor (without low speed compensation)	0～2	1

0: Disabled: the motor overload protection function is disabled (caution to use). In that case the inverter will not protect the motor when overload occurs.

1: Normal motor (with low speed compensation)**:** For normal motor, the lower the speed, the poorer the cooling effect and the electronic thermal protection value will be adjusted appropriately. Based on this reason, if output frequency is lower than 30Hz, inverter will reduce the motor overload protection threshold to prevent normal motor from overheat, which is called low speed compensation.

2: Variable frequency motor (without low speed compensation) As the cooling effect of variable frequency motor has nothing to do with running speed, it is not required to adjust the motor overload protection threshold.

Code	Name	Description	Setting Range	Factory setting
Fb.01	Motor overload Protection current	20.0%～120.0%	20.0～120.0	100.0%

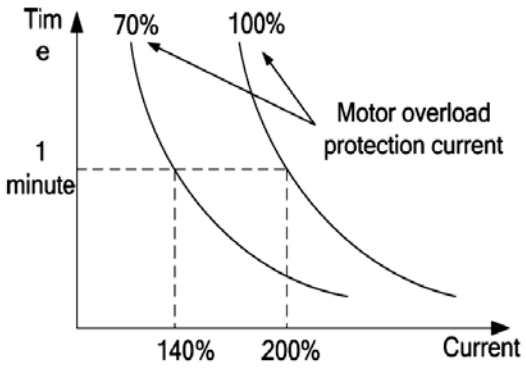


Figure 6-22 Motor overload protection curves.

The value can be determined by the following formula**:** Motor overload protection current = (maximum allowed load current / inverter rated current)* 100% usually define the motor rated current as the maximum allowed load current. When motor rated current is not matching the inverter rated current, through setting Fb.00 and Fb.01 can realize protect the motor when overload occurs.

Code	Name	Description	Setting Range	Factory setting
Fb.02	Threshold of trip-free	70.0～110.0%(DC bus voltage)	70.0～110.0	80.0%
Fb.03	Decrease rate of trip-free	0.00Hz～F0.06 (Maximum frequency)	0.00～F0.06	0.00Hz

If Fb.03 is set to be 0, the trip-free function is invalid. Trip-free function enables the inverter to perform low-voltage compensation when DC bus voltage drops below Fb.02. The inverter can continue to run without tripping by reducing its output frequency and feedback energy via motor.

Notice: appropriate adjustment of these two parameters can realize electric network switching. And not cause produce stop due to inverter protective.

Code	Name	Description	Setting Range	Factory setting
Fb.04	Over-voltage stall protection	0**:** Disabled 1**:** Enabled	0～1	1
Fb.05	Over-voltage stall protection point	110～140% (DC bus voltage) (380V series)	110～150	120%
		110～140% (DC bus voltage) (220V series)	110～150	115%

During deceleration, the motor's decelerating rate may be lower than that of inverter's output frequency due to the load inertia. At this time, the motor will feed the energy back to the inverter, resulting in DC bus voltage rise. If no measures taken, the inverter will trip due to over voltage. During deceleration, the inverter detects DC bus voltage and compares it with over-voltage stall protection point. If DC bus voltage exceeds Fb.05, the inverter will stop reducing its output frequency. When DC bus voltage become lower than Fb.05, the deceleration continues, as shown in following figure.

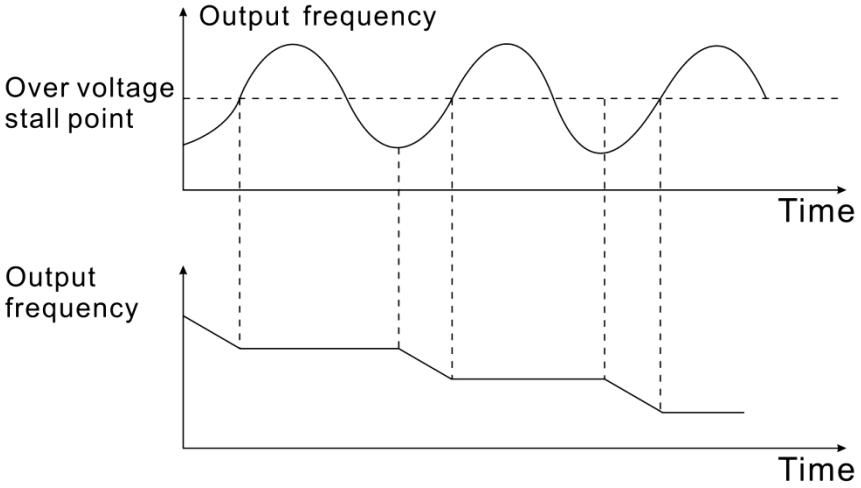


Figure 6-23 Over-voltage stall function.

Code	Name	Description	Setting Range	Factory setting
Fb.06	limited mobility selection	0**:**Limit has been effective 1**:**Constant speed limit when the invalid	0～1	1

Automatic limiting feature is always valid under acceleration and deceleration, constant speed automatically limiting the effectiveness of a choice by the automatic flow limit (Fb.06) decision. Fb.06 = 0 that constant speed, automatically limiting the effective; Fb.06 = 1, said constant speed, the automatic limit is invalid. Restricted flow for the automatic, the output frequency may change, so the required constant output frequency when running more stable situation, should not use the automatic current limiting function. When the automatic current limiting effective, due to the lower limit level setting, it may affect the inverter overload.

Code	Name	Description	Setting Range	Factory setting
Fb.07	Auto current limiting threshold	100～200%	100～200	G model**:** 160% P model **:**120%
Fb.08	Frequency decrease rate when current limiting	0.00～50.00Hz/s	0.00～50.00	10.00Hz/s

During acceleration, the motor's accelerating rate may be lower than that of inverter's output frequency due to the load inertia. If no measures taken, the inverter will trip due to Acc over current. With auto current limiting function, during acceleration, the inverter detects output current and compares it with auto current limiting threshold set by Fb.07. If output current exceeds Fb.07, the inverter will decrease its output frequency according to the decrease

rate set by Fb.08. When outputs current become lower than Fb.07, resume to normal accelerating. As shown in following figure.

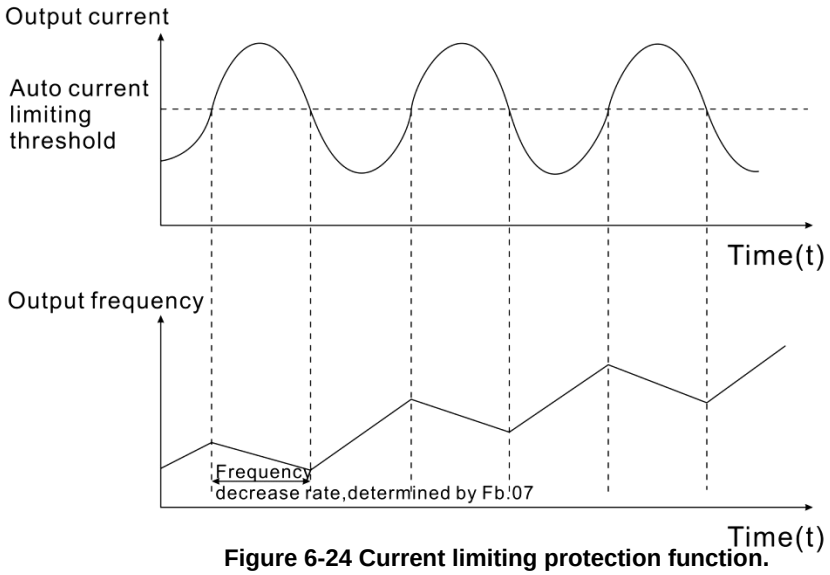


Figure 6-24 Current limiting protection function.

Code	Name	Description	Setting Range	Factory setting
Fb.09	Protection time	0～65535h	0～65535h	0
Fb.10	Input lack phase protection selection	0**:** Invalid 1**:** Valid	0～1	1

Enter the lack phase three-phase power protection selection.

0**:** Invalid. When the input lack phase three-phase power, does not protect.

1**:** valid. Enter the lack phase three-phase power, the drive shows phase protection fault.

FC Group--Serial Communication

Code	Name	Description	Setting Range	Factory setting
FC.00	Local address	0～247, 0**:** broadcast address	0～247	1

If the slave communication address in communication frame send by master is set to zero, that is the broadcast address, all slave on this MODBUS bus will receive this frame, but no response. And the slave address cannot set to zero. The local address is unique among its communication network; this is the base to realize point-to-point communication between master and inverter.

Code	Name	Description	Setting Range	Factory setting
FC.01	Baud rate selection	0**:** 1200BPS 1**:** 2400BPS 2**:** 4800BPS 3**:** 9600BPS 4**:** 19200BPS 5**:** 38400BPS	0～5	3

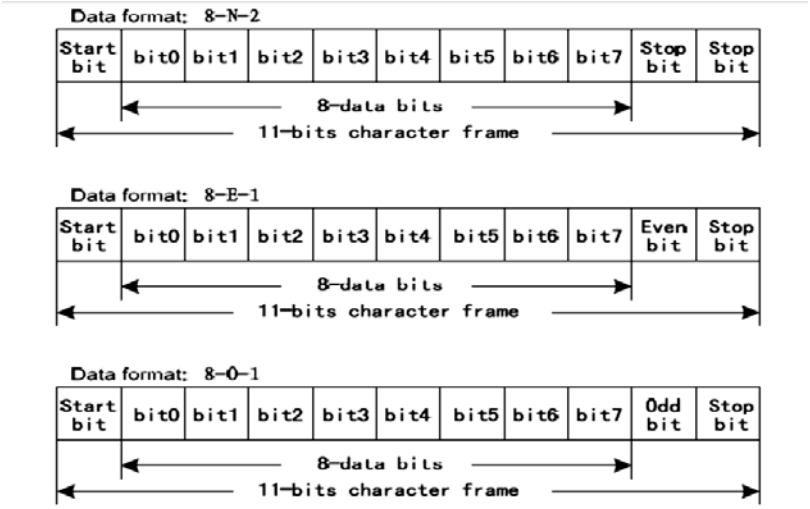
This parameter can set the data transmission rate during serial communication. The baud rate of master and slave must be the same, otherwise communication cannot establish. The larger baud rate we choice, the fast communicating speed we get.

Code	Name	Description	Setting Range	Factory setting
FC.02	Data format	0: No parity check (N, 8, 1) for RTU 1: Even parity check (E, 8, 1)for RTU 2: Odd parity check (O, 8, 1)for RTU 3: No parity check (N, 8, 2)for RTU 4: Even parity check (E, 8, 2)for RTU 5: Odd parity check (O, 8, 2)for RTU 6: No parity check (N, 7, 1)for ASCII 7: Even parity check (E, 7, 1)for ASCII 8: Odd parity check (O, 7, 1)for ASCII 9: No parity check (N, 7, 2)for ASCII 10: Even parity check(E, 7, 2)for ASCII 11: Odd parity check (O, 7, 2)for ASCII 12: No parity check (N, 8, 1)for ASCII 13: Even parity check (E, 8, 1)for ASCII 14: Odd parity check (O, 8, 1)for ASCII 15: No parity check (N, 8, 2)for ASCII 16: Even parity check (E, 8, 2)for ASCII 17: Odd parity check (O, 8, 2)for ASCII	0～17	0

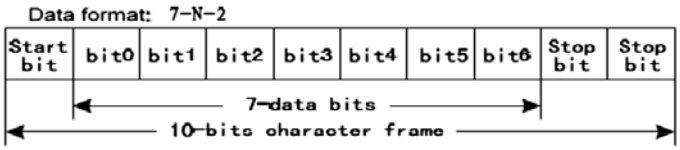
This parameter defines the data format used in serial communication protocol.

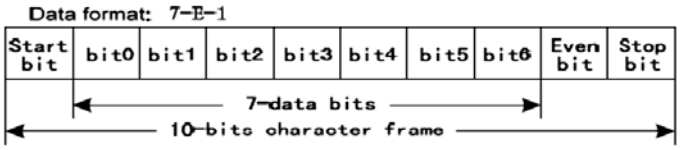
Notice: The format of master and slave must be the same.

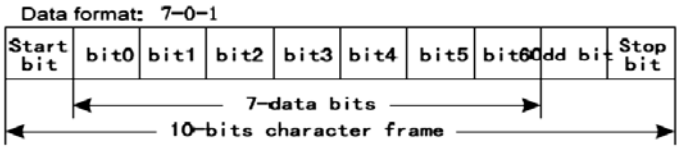
11-bits (for RTU)



10-bits (for ASCII)







s

Code	Name	Description	Setting Range	Factory setting
FC.03	Communication delay time	0～200ms	0～200	5ms

This parameter can be used to set the response delay in communication in order to adapt to the MODBUS master. In RTU mode, the actual communication delay should be no less than 3.5 characters' interval; in ASCII mode, 1ms.

Code	Name	Description	Setting Range	Factory setting
FC.04	Communication timeout	0.0 s(invalid), 0.1～100.0s	0～100.0	0.0 s

When the value is zero, this function disabled.

If the value is set to virtual value, when communication interruption is longer than the non-zero value of FC.04, the drive will alarm communication error (CE)

Usually, it will be set to invalid. And in continuously communications system, set this parameter can monitor the communication status.

Code	Name	Description	Setting Range	Factory setting
FC.05	Communication error action	0**:** Alarm and coast to stop 1**:** No alarm and continue to run 2**:** No alarm but stop according to F1.05 (if F0.01=2) 3**:** No alarm but stop according to F1.05	0～3	1

When communication error occurs, the Drive can set protective function to omit fault, warning, stop, and continue to run.

Code	Name	Description	Setting Range	Factory
FC.06	Response action	0**:** Response to writing 1**:** No response to writing	0～1	0～1

If this parameter is set to 0, the Drive will both responses to r/w command of master;

If this parameter is set to 1, inverter only response to read command of master but would not response to write command.

Use this function can improve communication efficiency

FD Group—Supplementary Function

Code	Name	Description	Setting Range	Factory setting
Fd.00	PWM selection 0**:**	0**:** PWM Mode 1 1**:** PWM Mode 2 2**:** PWM Mode 3	0～2	0

0: PWM mode 1**:** the normal mode. Motor noise is lower when frequency is low, and motor noise is larger when frequency is high.

1: PWM mode 2**:** in this mode, the noise is lower but temperature rise is high. So need to be put down use rated power of inverter in this mode.

2: PWM mode 3**:** Lower temperature

Code	Name	Description	Setting Range	Factory setting
Fd.01	Low-frequency threshold of restraining oscillation	0～500	0～500	5
Fd.02	High-frequency threshold of restraining oscillation	0～500	0～500	100

Most motor may have current oscillation at some frequency point. Please be caution to adjust these parameters to make oscillation weak. This function is valid only when Fd.05 is set to be 0. The smaller the value of Fd.01 and Fd.02, the stronger the restraining effect.

Code	Name	Description	Setting Range	Factory setting
Fd.03	Amplitude of restraining oscillation	0～10000	0～10000	5000

This parameter is used to limit the strength of restraining oscillation.

Code	Name	Description	Setting Range	Factory setting
Fd.04	Boundary of Restraining oscillation	0.00～F0.06 (maximum frequency)	0.00Hz～F0.06	12.50Hz

Fd.04 is the demarcated point of Fd.01 and Fd.02.

Code	Name	Description	Setting Range	Factory setting
Fd.05	Restrain oscillation	0**:** Enabled 1**:** Disabled	0～1	1

0: Enabled

1: Disabled

Restrain oscillation function is used for V/F control. Motor always has current oscillation when its load is light. This will cause abnormal operation even over-current. When Fd.05 is set to zero, restrain oscillation will be enabled, and inverter will run according to Fd.01 ~Fd.04. For details, please refer to description of Fd.01~Fd.04.

Code	Name	Description	Setting Range	Factory setting
Fd.06	Torque setting source	0**:** Keypad (Fd.07) (100% relative to F3.07) 1**:** AI1 (100% relative to F3.07) 2**:** AI2 (100% relative to F3.07) 3**:** AI1+AI2 (100% relative to F3.07) 4**:** Multi-step (100% relative to F3.07) 5**:** Communication (100% relative to F3.07)	0～5	0
Fd.07	Keypad Torque setting	-100.0%～100.0%	-100.0%~100.0%	50%

If F0.00 is set to 2, torque control is valid, when the drive is in proceed of torque control. The drive output the torque as per the set torque command. the output frequency is limited by preset upper frequency. If load speed bigger than upper limit frequency, the drive output frequency will be limited, and the output torque and preset torque are different.

If set to torque control, the torque set by Fd.06 is torque command. When torque command is keypad (Fd.06=0), we can set Fd.07 to get torque command, If torque setting is positive, inverter will run forward; otherwise it will run reverse.

Torque control and speed control could be switched by multi-function input terminals

If set torque > load torque, output frequency will increase continuously until it reaches upper frequency limit.

If set torque < load torque, output frequency will decrease continuously until it reaches lower frequency limit.

The drive can run at any frequency between upper and lower frequency limit only when set torque = load torque.

The 100% of torque setting is corresponding to 100% of F3.07 (Torque limit). Adjust Fd.06 and F3.07 also can change torque preset value.

Notice: When running at torque control mode, press STOP/RESET, it will switch to speed control automatically.

Code	Name	Description	Setting Range	Factory setting
Fd.08	Upper frequency limit selection	0: Keypad (F0.07) 1: AI1 (100% relative to F0.06) 3: Multi-step (100% relative to F0.06) 4: Communication (100% relative to F0.06)	0～4	0

Through Fd.08, multi-upper frequency limit sources selection can be realized. When running at torque control mode, output frequency can be adjusted by changing upper frequency limit.

FE Group –Factory Setting

This group is the factory-set parameter group. It is prohibited for user to access. Otherwise, serious faults and major property loss may result.

7 TROUBLES SHOOTING

7.1 Fault and Trouble shooting

Fault Code	Fault Type	Reason	Solution
OUT1	IGBT Ph-U fault	1. Acc/Dec time is too short. 2. IGBT module fault. 3. Malfunction caused by interference. 4. Ground is not properly.	1. Increase Acc/Dec time. 2. Ask for support. 3. Inspect external equipment and eliminate interference.
OUT2	IGBT Ph-V fault		
OUT3	IGBT Ph-W fault		
OC1	Over-current when acceleration	1. Acc time is too short 2. Input voltage is too low 3.Capacity of inverter is too small	1. Increase Acc time. 2. Check the power supply. 3. Select bigger capacity inverter.
OC2	Over-current when deceleration	1. Dec time is too short. 2. Load is too heavy. 3. Capacity of inverter is too small.	1.Increase Dec time 2. Install proper external braking unit. 3. Select bigger capacity inverter.
OC3	Over-current when constant speed Running	1. Sudden change of load or abnormal. 2. Input voltage is too low 3. Capacity of inverter is too small.	1.Check the load or reduce Sudden change of load. 2. Check the power supply. 3. Select bigger capacity inverter.
OV1	Over-voltage when acceleration	1. Input voltage abnormal. 2. After instant power off, restart the rotating motor.	1. Check the power supply. 2.Avoid restart after power off
OV2	Over-voltage when deceleration	1. Dec time is too short. 2. Load is too heavy. 3. Input voltage abnormal	1. Increase Dec time. 2. Increase braking resistance/unit. 3. Check the power supply.
OV3	Over-voltage when constant speed running	1. Input voltage abnormal 2. Load is too heavy.	1. Install input DC reactor/ 2. Install proper external braking unit.
UV	DC bus Under-voltage	1. Input voltage is too low	1. Inspect the input power supply.
OL1	Motor overload	1. Input voltage is too low 2. Improper motor's overload protection threshold. 3. Motor block or sudden change of load. 4. Motor drive heavy load at low speed for a long time.	1. Inspect the input power supply. 2. Set proper motor rated current. 3. Check the load and adjust torque boost. 4. Select variable frequency motor.

Fault Code	Fault Type	Reason	Solution
OL2	Inverter overload	1. Acc time is too short	1. Decrease acceleration.
		2. Restart the rotating motor. 3. Input voltage is too low 4. Load is too heavy	2. Avoid restart after power off. 3. Check the power supply 4. Select bigger capacity inverter.
SPI	Input phase failure	Phase loss of R,S,T input	1. Check power supply. 2. Check the wiring installation.
SPO	Output phase failure	1.Phase loss of U，V，W output (or a serious unbalance in 3phase input) 2. connection loose	1. Check the wiring installation of output. 2. Check the motor and wiring.
OH1	Rectify overheat	1. Instant over current of inverter. 2. Short-circuit or ground fault occurred at inverter output. 3. Obstruction of ventilation channel or Cooling fans of inverter stop or damaged. 4. Ambient temperature is too high. 5. Control board wire or plug-ins loss. 6. Auxiliary power damaged or under voltage of driver voltage. 7. Power module bridge short 8. control board abnormal	1. Refer to over current solution. 2. Check the wiring and install again. 3. Clear the ventilation Channel or Replace cooling fan. 4. Reduce Ambient temperature. 5. Check the wiring and Installation. 6. Ask for support. 7. Ask for support. 8. Ask for support.
OH2	IGBT overheat		
EF	External fault	1. SI External fault input terminal take effect.	1. Inspect input of external equipment.
CE	Communication fault	1. Improper baud rate setting. 2. Receive wrong data. 3. Communication is interrupted for long time.	1. Set proper baud rate. 2. Press STOP/RESET to reset. Ask for support. 3. Check wiring of communication interface.
ITE	Current detection fault	1. Wires or connectors of control boards are loose. 2. Auxiliary power damaged 3. Hall sensor is damaged. 4. Amplifying circuit is abnormal.	1. Check the signal linker and insert it again. 2. Ask for support. 3. Ask for support. 4. Ask for support.
TE	Motor Auto tuning fault	1.Capacity of motor is not meet that of inverter 2. Improper setting of motor rated parameters. 3.The motor parameter auto-tuning are warped with the standard parameter 4. Overtime of auto-tuning.	1. Change the model of inverter. 2.Set rated parameters according to motor nameplate. 3. Run the motor without load and do auto-tuning again. 4.Check motor's wiring and
EEP	EEPROM fault	1. R/W fault of control parameters 2. EEPROM damaged	1. Press STOP/RESET to Reset. Ask for support. 2. Ask for support.
PIDE	PID feedback fault	1. PID feedback disconnect 2. PID feedback source disappears.	1. Inspect PID feedback signal wire. 2. Inspect PID feedback source.
BCE	Brake unit fault	1. Braking circuit failure or brake tube damaged. 2. Too low resistance of Externally connected braking resistor.	1. Inspect braking unit, replace braking tube. 2. Increased braking resistance.
	Reserved		

7.2 Common Faults and Solutions

The drive may have following faults or malfunctions during operation, please refer to the following solutions.

No display after power on:

Inspect whether the voltage of power supply is same as the inverter rated voltage or not with multi-meter. If the power supply has problem, inspect and solve it. Inspect whether the 3 phase rectify bridge is in good condition or not. If the rectification bridge is burst out, ask for support.

Check the CHARGE light. If the light is off, the fault is mainly in the rectify bridge or the buffer resistor. If the light is on, the fault may be lies in the switching power supply. Please ask for support.

Power supply air switch trips off when power on:

Inspect whether the input power supply is grounded or short circuit. Please solve the problem.

Inspect whether the rectify bridge has been burnt or not. If it is damaged, ask for support.

Motor doesn't move after inverter running:

Inspect if there is balanced three-phase output among U, V, W. If yes, then motor could be damaged, or mechanically locked. Please solve it.

If the output is unbalanced or lost, the inverter drive board or the output module may be damaged, ask for support.

If there is not output voltage, the drive board or the output module may be damaged. Ask for support.

Inverter displays normally when power on, but switch at the input side trips when running:

8. MAINTENANCE

WARNING

- ●Maintenance must be performed according to designated maintenance methods.
- ●Maintenance, inspection and replacement of parts must be performed only by authorized personnel.
- ●After turning off the main circuit power supply, waiting for 10 minutes before performance maintenance or inspection.
- ●DO NOT directly touch components or devices of PCB board. Otherwise, the drive can be damaged by lectrostatic.
- ●After maintenance, all screws must be tightened.

8.1 Daily Maintenance

In order to prevent the fault of inverter to make it operate smoothly in high-performance for a long time, user must inspect the inverter periodically (within half year). The following table indicates the inspection content.

Items to be checked	Inspection content
Temperature humidity	The ambient temperature range should be in 0℃～50℃ and humidity 20～90% .
Dust/vapor/gases	Make sure that there are no oil gases, dust and vapor in the inverter.
Inverter	Check whether there is abnormal exothermal and abnormal vibration in the inverter.
Cooling fan	Rotate normally and flexibly
Power input	Check whether the voltage and frequency of power input is in the permission range.
Motor	Check vibration, exothermal, abnormal sound and phase loss of the motor.

8.2 Periodic Maintenance

To prevent kinds of faults and for long time ,high performance ,secure operation of the Inverter, Customer should check the inverter periodical (Every 3 or 6 months) according to the actual environment.

Items to be checked	Inspection content	Corrective Action
the screws of control terminals	Whether the screws of control terminals are loose.	If so, tighten them with a screwdriver;
PCBs	Accumulation of dust and dirt	Clean the dust on PCBs and air ducts with a vacuum cleaner;
Cooling fan	For abnormal noise and vibration. Total operation time is up to 20000 hours or not	1. keep clean 2. Replace the cooling fan.
Electrolytic capacitor	Discoloration or odor	Replace the capacitor

Items to be checked	Inspection content	Corrective Action
Radiator	Accumulation of dust and dirt	Blow with dry, compressed air
Power Components	Accumulation of dust and dirt	Blow with dry, compressed air

8.3 Replacement of wearing parts

Fans and electrolytic capacitors are wearing part; please make periodic replacement to ensure long term, safety and failure-free operation. The replacement periods are as follows**:**

◆Fan**:** Must be replaced when using up to 20,000 hours;

◆Electrolytic Capacitor**:** Must be replaced when using up to 30,000～40, 000 hours.

8.4 Warranty

The manufacturer warrants its products (EM9 series of inverter) for a period of 15 months from the date of purchase. If the damaged of frequency inverters are caused by end-user, the manufacturer do not supply any warranty service.

9 LIST OF FUNCTION PARAMETERS

EM9 series inverter's parameters are divided into 15 groups (F0~FE) according to their functions. Each group has several parameters that are identified by "Group No. + Function Code. ". For example, "F6.06" belongs to group 6 and its function code is 6. FE group is factory reserved, users are forbidden to access these parameters. For the convenience of setting, parameter group number corresponds to the first level menu, function code corresponds to the second level menu and parameter value corresponds to the third level menu, when use keypad operation.

1. Contents of function table**:**

Column 1 "Function code"**:** function group and serial number of function parameters

Column 2 "Name"**:** complete name of function parameters

Column 3 "Description"**:** detailed description of function parameters

Column 4 "Setting range"**:** function parameters' valid setting range, displayed on the LCD of keypad;

Column 5 "Factory setting"**:** function parameters' primary setting value before delivery;

Column 6 "Modify"**:** function parameters' modify characteristic (that is whether the function parameter can be modified)**:**

"○" indicates that this parameter can be modified all the time. "◎"indicates that this parameter cannot be modified during the inverter is running.

"●" indicates that this parameter is read only.

When you try to modify some parameters, the system will check their modification property automatically to avoid miss-modification.

Column 7 "PROFIBUS parameter No."**:** parameters serial number used by PROFIBUS;

2. The setting of parameter is expressed in decimal (DEC) format. If it is expressed in hexadecimal (HEX) format, each bit of the setting is independent to one another. And the value of some bits can be 0~F.

3. "Factory setting" indicates the value of each parameter while restoring the factory parameters, but those actual detected parameters or record values cannot be restored.

4. The parameters can be protected against unauthorized modifications by password. After the user's password is set up (F7.03 is not set to zero), you are required to input right password when you press PRG/ESC to enter menu, and displaying "0.0.0.0.0." , otherwise you cannot enter in. (Factory reserved parameters include some important inverter manufacturer parameters. Users are not allowed to revise them randomly. Otherwise, serious faults and major property loss may result.) When the password protection is not locked, you can modify the password at any time. The last input password is valid. The user's password can be disabled by setting F7.03 to 0.

5. The above rules should be observed when changing the password or setting the parameters via the serial port.

EM9 Parameter List

Code	Name	Description	Factory Setting	Modify	Serial No.
F0 Group: Basic Function					
F0.00	Control mode	0**:** Sensorless vector control 1**:** V/F control 2**:** Torque control	0	◎	0

Code	Name	Description	Factory Setting	Modify	Serial No.
F0.01	Run command source	0: Keypad 1: Terminal 2: Communication	0	◎	1
F0.02	Main Frequency channel	0: Keypad digital 1: Keypad potentiometer 2: AI1 3: AI2 4: Multi-Step speed 5: PID 6: Communication 7: PLC 8: PUL 9: Program length run	1	○	2
F0.03	Auxiliary frequency channel	0: Keypad digital 1: Keypad potentiometer 2: AI1 3: AI2 4: Communication 5: PUL	1	○	3
F0.04	Main, Auxiliary Channel combinations	0: the main channel and effective 1: The auxiliary channel is active 2: The main channel + auxiliary channel 3: Main Channel – Auxiliary channel 4: MAX (the main channel, auxiliary channel) 5: MIN (main channel, auxiliary channel) 6: Terminal switch	0	○	4
F0.05	Keypad reference frequency	0.00 Hz～F0.06 (Maximum frequency)	50.00Hz	○	5
F0.06	Maximum frequency	Maximum frequency	50.00Hz	◎	6
F0.07	Upper frequency limit	F0.08～F0.06 (Maximum frequency)	50.00Hz	○	7
F0.08	Lower frequency limit	0.00 Hz ～ F0.07 (Upper frequency limit)	0.00Hz	○	8
F0.09	Acceleration time 1	0.1～3600.0s	Depend on model	○	9
F0.10	Deceleration time 1	0.1～3600.0s	Depend on model	○	10
F0.11	Running direction selection	0: Forward 1: Reverse 2: Forbid reverse	0	◎	11
F0.12	Carrier frequency	1.0～15.0kHz	Depend on model	○	12
F0.13	Motor parameters auto tuning	0: No action 1: Rotation auto tuning 2: Static auto tuning	0	◎	13

Code	Name	Description	Factory Setting	Modify	Serial No.
F0.14	Restore parameters	0: No action 1: Restore factory setting 2: Clear fault records	0	◎	14
F0.15	AVR function	0: Disabled 1: Enabled all the time 2: Disabled during deceleration	0	○	15
F1 Group: Start and Stop Control					
F1.00	Start Mode	0: Start directly 1: DC braking and start 2: Speed tracking and start	0	◎	16
F1.01	Starting frequency	0.00～10.00Hz	0.00Hz	○	17
F1.02	Hold time of Starting frequency	0.0～50.0s	0.0s	○	18
F1.03	DC Braking current before start	0.0～150.0%	0.0%	○	19
F1.04	DC Braking time before start	0.0～50.0s	0.0s	○	20
F1.05	Stop Mode	0: Deceleration to stop 1: Coast to stop	0	○	21
F1.06	Starting frequency of DC braking at stop	0.00～ F0.06(The max frequency)	0.00Hz	○	23
F1.08	DC braking current	0.0～150.0%	0.0～150.0%	○	24
F1.09	DC braking time	0.0～50.0s	0.0s	○	25
F1.10	Dead time of FWD/REV	0.0～3600.0s	0.0s	○	26
F1.11	FWD/REV enable option when power on	0: Disabled 1: Enabled	0	0	27
F1.12	0Hz output selection	0: Invalid 1: Valid	0	◎	28
F2 Group: Motor Parameters					
F2.00	Inverter model	0: G model 1: P model	Depend on model	◎	29
F2.01	Motor rated power	0.4～900.0kW	Depend on model	◎	30
F2.02	Motor rated frequency	0.01Hz～F0.06 (Maximum frequency)	50.00Hz	◎	31
F2.03	0～36000rpm	0～36000rpm	Depend on model	◎	32
F2.04	Motor rated voltage	0～460V	Depend on model	◎	33
F2.05	Motor rated current	0.1～1000.0A	Depend on model	◎	34
F2.06	Motor stator resistance	0.001～65.535Ω	Depend on model	○	35
F2.07	Motor rotor resistance	0.001～65.535Ω	Depend on model	○	36
F2.08	Motor leakage inductance	0.1～6553.5mH	Depend on model	○	37
F2.09	Motor mutual inductance	0.1～6553.5mH	Depend on model	○	38
F2.10	Current without load	0.01～655.35A	Depend on model	○	39

Code	Name	Description	Factory Setting	Modify	Serial No.
F3 Group: Vector Control					
F3.00	ASR proportional gain Kp1	0～100	20	○	40
F3.01	ASR integral time Ki1	0.01～10.00s	0.50s	○	41
F3.02	ASR switching point 1	0.00Hz～F3.05	5.00Hz	○	42
F3.03	ASR proportional gain Kp1	0～100	25	○	43
F3.04	ASR integral time Ki2	0.01～10.00s	1.00	○	44
F3.05	ASR switching point 2	F3.02～F0.06 (Maximum frequency)	10.00Hz	○	45
F3.06	Slip compensation rate of VC	50%～200%	100%	○	46
F3.07	Torque limit	0.0～200.0% (rated current of inverter)	150.0%	○	47
F4 Group: V/F Control					
F4.00	V/F curve selection	**0:** Linear V/F curve **1:** quadratic curve(2.0 order) **2:** Multi-point V / F curve	0	◎	48
F4.01	Torque boost	0.0%**:**(auto),0.1％～30.0％	3.0％	○	49
F4.02	Torque boost cut-off	0.0%～50.0% (motor rated frequency)	20.0%	◎	50
F4.03	V/F slip compensation	0.0～200.0%	0.0%	○	51
F4.04	Auto energy saving selection	**0:** Disabled **1:** Enabled	0	◎	52
F4.05	V/F frequency 1	0.50～F4.07(V/F frequency 2)	10.00Hz	◎	53
F4.06	V/ F voltage point 1	0.0～100.0%	20.0%	◎	54
F4.07	V/F frequency 2	F4.05～F4.09(V/F frequency 3)	20.00Hz	◎	55
F4.08	V/F voltage point 2	0.0～100.0%	40.0%	◎	56
F4.09	V/F frequency 3		30.00Hz	◎	57
F4.10	V/F voltage point 3	0.0～100.0%	60.0%	◎	58
F4.11	V/F frequency 4	F4.09～F2.02 (rated motor frequency)	40.00Hz	◎	59
F4.12	V/F voltage point 4	0.0～100.0%	80.0%	◎	60
F5 Group: Input Terminals					
F5.00	X1 Terminal function	**0:** Invalid **1:** Forward **2:** Reverse **3:** 3-wire control **4:** Jog forward **5:** Jog reverse **6:** Coast to stop **7:** Reset fault **8:** External fault input **9:** UP command **10:** DOWN command **11:** Clear UP/DOWN **12:** Multi-step speed reference1 **13:** Multi-step speed reference2 **14:** Multi-step speed reference3 **15:** ACC/DEC time selection **16:** Pause PID **17:** Pause traverse operation	1	◎	61
F5.01	X2 Terminal function		4	◎	62
F5.02	X3 Terminal function		7	◎	63

Code	Name	Description	Factory Setting	Modify	Serial No.
F5.02	X3 Terminal function	18: Reset traverse operation 19: ACC/DEC ramp hold 20: Disable torque control 21: UP/DOWN invalid temporarily 22: Programmable run counter cleared 23:Main, auxiliary channel selection 24: Pulse PUL given (only X1 terminal use) 25: Pulse count input 26: Clear pulse counter	7	◎	63
F5.03	X4 Terminal function		0	◎	64
F5.04	X5 Terminal function		0	◎	65
F5.05	X6 Terminal function		0	◎	66
F5.06	ON-OFF filter times	1～10	5	○	67
F5.07	FWD/REV control mode	0: 2-wire control mode 1 1: 2-wire control mode 2 2: 3-wire control mode 1 3: 3-wire control mode 2	0	◎	68
F5.08	UP/DOWN setting change rate	0.01～50.00Hz/s	0.50Hz/s	○	69
F5.09	AI1 lower limit	0.00V～10.00V	0.00V	○	71
F5.11	AI1 upper limit	0.00V～10.00V	10.00V	○	72
F5.12	AI1 upper limit Corresponding setting	-100.0%～100.0%	100.0%	○	73
F5.13	AI1 Input filter time	0.00s～10.00s	0.10s	○	74
F5.14	AI2 lower limit	0.00V～10.00V	0.00V	○	75
F5.15	AI2 lower limit corresponding setting	-100.0%～100.0%	0.0%	○	76
F5.16	AI2 upper limit	0.00V～10.00V	10.00V	○	77
F5.17	AI2 upper limit corresponding setting	-100.0%～100.0%	100.0%	○	78
F5.18	AI2 Input filter time	0.00s～10.00s	0.10s	○	79
F5.19	PUL minimum input frequency	0.00～50.00kHz	0kHz	○	80
F5.20	PUL minimum frequency Corresponding setting	0.0～100.0%	0.0%	○	81
F5.21	PUL maximum input frequency	0.00～50.00kHz	50.00kHz	○	82
F5.22	PUL maximum frequency Corresponding setting	0.0～100.0%	100.0%	○	83
F5.23	PUL Input filter time	0.00s～10.00s	0.10s	0	85
F5.25	AI1 input A	0.0～10.00V	0.66V	○	86
F5.26	A corresponding setting	0.0～100.0%	20.0%	○	87
F5.27	AI1 input B	0.0～10.00V	1.32V	○	88
F5.28	B corresponding setting	0.0～100.0%	40.0%	○	89
F5.29	AI1 input C	0.0～10.00V	1.98V	○	90

Code	Name	Description	Factory Setting	Modify	Serial No.
F5.30	C corresponding setting	0.0～100.0%	60.0%	○	91
F5.31	AI1 input D	0.0～10.00V	2.64V	○	92
F5.32	D corresponding setting	0.0～100.0%	80.0%	○	93
F6 Group: Output Terminals					
F6.00	Y1 output selection	0: NO output 1: Run forward 2: Run reverse 3: Fault output 4: Frequency level detection output FDT 5: Frequency arrival 6: Zero-speed operation 7: The maximum frequency reached 8: lower frequency arrival 9: Motor running 10: Frequency level detection FDT2 output 11: Water Supply no water supply substrate, one for two, the frequency pump control	1	○	94
F6.01	Y2 output selection		4	○	95
F6.02	Relay output selection		3	○	96
F6.03	AO1 function selection	0: Running frequency 1: Reference frequency 2: Motor speed 3: Output current 4: Output voltage 5: Output power 6: Output torque 7: AI1 voltage 8: AI2 voltage/current 9～10: Reserved	0	○	97
F6.04	AO2 function selection		3		98
F6.05	AO1 lower limit	0.0%～100.0%	0.0%	○	99
F6.06	Lower limit corresponding output AO1	0.00V ～10.00V	0.00V	○	100
F6.07	AO1 upper limit	0.0%～100.0%	100.0%	○	101
F6.08	upper limit corresponding output AO1	0.00V ～10.00V	10.00V	○	102
F6.09	AO2 lower limit	0.0%～100.0%	0.0%	○	103
F6.10	lower limit corresponding output AO2	0.00V ～10.00V	0.00V	○	104
F6.11	AO2 upper limit	0.0%～100.0%	100.0%	○	105
F6.12	upper limit corresponding output AO2	0.00V ～10.00V	10.00V	○	106
F7Group: Display Interface					
F7.00	QUICK/JOG function selection	0: Jog 1: FDW/REV switching 2: Clear UP/DOWN setting	0	◎	107

Code	Name	Description	Factory setting	Modify	Serial No.
F7.01	STOP/RESET function selection	0**:** Valid when keypad control 1**:** Valid when keypad or terminal control 2**:** Valid when keypad or communication control 3**:** Always valid	0	○	108
F7.02	Keyboard and terminal up/down setting	0**:** Valid, and the drive power down storage 1**:** Effective, and the drive does not store power-down 2**:** Invalid 3**:** Set the effective run-time, shutdown is cleared	0	○	109
F7.03	User password	0～65535	0	○	110
F7.04	Running status display selection	0～0x7FFF BIT0**:** Output frequency BIT1**:** Reference frequency BIT2: DC bus voltage BI4: Output voltage BIT4: Output current BIT5: Rotation speed BIT6: Output power BIT7: Output torque BIT8: PID preset BIT9: PID feedback BIT10: Input terminal status BIT11: Output terminal status BIT12: AI1 BIT13: AI2 BIT14: Step No. of PLC BIT15: Reserved	0xFF	○	111
F7.05	Stop status display selection	1～0x1FF BIT0: Reference frequency BIT1: DC bus voltage BIT2: Input terminal status BI4: Output terminal status BIT4: PID preset BIT5: PID feedback BIT6: AI1 BIT7: AI2 BIT8: Step No. of PLC BIT9～ BIT15: Reserved	0xFF	○	112
F7.06	Keypad display selection	0**:** Preferential to external keypad 1**:** Both display, only external key valid. 2**:** Both display, only local key valid. 3**:** Both display and key valid.	0	○	113
F7.07	LCD language selection	0**:** Chinese 1**:** English	0	○	114

Code	Name	Description	Factory Setting	Modify	Serial No.
F7.08	Parameter copy	0: No action 1: From the keyboard of the machine parameters 2: Keyboard function parameters downloaded to the machine Note: 1 ~ 2 operation has been executed, the parameter automatically returns to 0	0	◎	115
F7.09	Rectifier module temperature	0～100.0℃		●	116
F7.10	IGBT module temperature	0～100.0℃		●	118
F7.12	Accumulated running time	0～65535h	0		119
F7.13	Third latest fault type	0～24 0: Not fault 1: IGBT Ph-U fault(OUT1) 2: IGBT Ph-V fault(OUT2) 3: IGBT Ph-W fault(OU4) 4: Over-current when acceleration(OC1) 5: Over-current when deceleration(OC2)		●	120
F7.15	Latest fault type	0～24 0: Not fault 1: IGBT Ph-U fault(OUT1) 2: IGBT Ph-V fault(OUT2) 3: IGBT Ph-W fault(OU4) 4: Over-current when acceleration(OC1) 5: Over-current when deceleration(OC2) 6: Over-current when constant speed running (OC3) 7: Over-voltage when acceleration(OV1) 8: Over-voltage when deceleration(OV2) 9: Over-voltage when constant speed running(OV3) 10: DC bus Under-voltage(UV) 11: Motor overload (OL1) 12: Inverter overload (OL2) 13: Input phase failure (SPI) 14: Output phase failure (SPO) 15: Rectify overheat (OH1) 16: IGBT overheat (OH2) 17: External fault (EF) 18: Communication fault (CE) 19: Current detection fault (ITE) 20: self study fault (TE) 21: EEPROM fault (EEP) 22: PID feedback fault (PIDE) 23: Brake unit fault (bCE) 24: Reserved 25: program length run feedback fault PLE)		●	121 122 122
F7.16	Output frequency at current fault		0.00Hz	●	123
F7.17	Output current at current fault		0.0A	●	124
F7.18	DC bus voltage at current fault		0.0V	●	125

Code	Name	Description	Factory Setting	Modify	Serial No.
F7.19	Input terminal status at current fault		0	●	125
F7.20	Output terminal status at current fault		0	●	127
F8 Group: Enhanced Function					
F8.00	Auto reset times	0～10	0	○	128
F8.01	Fault relay action	0.1～100.0s	1.0s	○	129
F8.02	Jog reference	0.00～F0.06 (Maximum frequency)	5.00Hz	○	130
F8.03	Jog Acc time	0.1～3600.0s	Depend on model	○	131
F8.04	Jog Dec time	0.1～3600.0s	Depend on model	○	132
F8.05	Acc time 2	0.1～3600.0s	Depend on model	○	133
F8.06	Dec time 2	0.1～3600.0s	Depend on model	○	134
F8.07	Skip frequency	0.00～F0.06 (Maximum frequency)	0.00Hz	○	135
F8.08	Skip frequency bandwidth	0.00～F0.06 (Maximum frequency)	0.00Hz	○	136
F8.09	Traverse amplitude	0.0～100.0%(with reference to reference frequency)	0.0%	○	137
F8.10	Jitter frequency	0.0～50.0%(with reference to F8.09)	0.0%	○	138
F8.11	Rise time of traverse	0.1～3600.0s	5.0s	○	139
F8.12	Fall time of traverse	0.1～3600.0s	5.0s	○	141
F8.14	FDT1 lag	0.0～100.0%(FDT1 level)	5.0%	○	142
F8.15	Frequency arrive detecting range	0.0～100.0% (Maximum frequency)	0.0%	○	143
F8.16	Brake threshold voltage	115.0～140.0% (DC bus voltage)(380V series)	130.0%	○	144
F8.17	Rotating speed Display coefficient	0.1～999.9% Rotate speed=60×Operating Frequency * F8.17 / Motor polarity umber	100.0%	○	145
F8.18	Program run time unit	0～2 0: S(Second) 1: M(Minute) 2: H(Hour)	0	○	146
F8.19	Program run mode	0～2 0: Stop after one cycle 1: Circular run 2: Hold last frequency after one cycle	0	○	147
F8.21	1st Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	148
F8.21	2nd Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	149

Code	Name	Description	Factory setting	Modify	Serial No.
F8.22	3rd Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	150
F8.23	4th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	151
F8.24	5th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	152
F8.25	6th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	153
F8.26	7th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	154
F8.27	8th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	155
F8.28	9th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	156
F8.29	10th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	157
F8.30	11th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	158
F8.31	12th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	159
F8.32	13th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	160
F8.33	14th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	161
F8.34	15th Step running time	0.0～6000.0 (The unit set by F8.18)	0.0	○	162
F8.35	FDT1 level detection delay	0.0～600.0s	0.0	○	163
F8.36	FDT2 level detection value	0.00～ F0.06 (Max Frequency)	50.00Hz	○	164
F8.37	FDT2 lag detection value	0.0～100.0%（FDT2）	5.0%	○	165
F8.38	FDT2 level detection delay	0.0～600.0s	0.0	○	166
F8.39	pul feedback disconnection detection time	0～6000.0s	0.0	○	167
F8.40	Pulse count per meter	0～60000	10	○	168
F8.41	Run length 1	0～60000m	1000	○	169
F8.42	Run length 2	0～60000m	8000	○	170
F8.43	Run length 3	0～60000m	1000	○	171
F8.44	Run length 4	0～60000m	0	○	172
F8.45	Run length 5	0～60000m	0	○	173
F8.46	Run length 6	0～60000m	0	○	174
F8.47	Run length 7	0～60000m	0	○	175
F9 Group: PID Control					
F9.00	PID preset source selection	0**:** Keypad（F9.01） 1**:** AI1 2**:** AI2 3**:** Communication 4**:** Multi-step 5**:** Reserve	0	○	176
F9.01	Keypad PID preset	0.0%～100.0%	0.0%	○	177

Code	Name	Description	Factory setting	Modify	Serial No.
F9.02	PID feedback source selection	0: AI1 1: AI2 2: AI1 + AI2 3: AI4 4: Communication	0	○	178
F9.03	PID output characteristics	0: Negative(water supply) 1: Positive	0	○	179
F9.04	Proportional gain (Kp)	0.00～100.00	0.10	○	180
F9.05	Integral time (Ti)	0.01～10.00s	0.10s	○	181
F9.06	Differential time (Td)	0.00～10.00s	0.00s	○	182
F9.07	Sampling cycle (T)	0.01～100.00s	0.10s	○	183
F9.08	Bias limit	0: Invalid 1: Valid	0	○	184
F9.09	PID output filter time	0.0～100.0%	0.0%	○	185
F9.10	Feedback lost detecting value	0.0～100.0%	0.0%	○	186
F9.11	Feedback disconnection detection time	0.0～3600.0s	1.0s	○	187
F9.12	Wake-up threshold	0.0%～Sleep Threshold	0.0%	○	188
F9.13	Sleep threshold value	Wake-up threshold～100.0%	100.0%	○	189
F9.14	Sleep waiting time	0.0～3600.0s	60.0s	○	190
F9.15	Upper frequency delay	0.0～600.0s	60.0s	○	191
F9.16	Lower frequency of delay	0.0～600.0s	60.0s	○	192
F9.17	Water supply Model	0: No water supply board 1: Fixed pump mode 2: The way of circulating pump		0	193
F9.18	The number of pumps	1～8	1		194
F9.19	Electromagnetic switching time	0.1～30.0s	5.0		195
FA Group Multi-step speed Control					
FA.00	Multi-step speed 0	-100.0～100.0%	0.0%	○	196
FA.01	Multi-step speed 1	-100.0～100.0%	0.0%	○	197
FA.02	Multi-step speed 2	-100.0～100.0%	0.0%	○	198
FA.03	Multi-step speed 3	-100.0～100.0%	0.0%	○	199
FA.04	Multi-step speed 4	-100.0～100.0%	0.0%	○	200
FA.05	Multi-step speed 5	-100.0～100.0%	0.0%	○	201
FA.06	Multi-step speed 6	-100.0～100.0%	0.0%	○	202
FA.07	Multi-step speed 7	-100.0～100.0%	0.0%	○	203
FA.08	Multi-step speed 8	-100.0～100.0%	0.0%	○	204
FA.09	Multi-step speed 9	-100.0～100.0%	0.0%	○	205
FA.10	Multi-step speed10	-100.0～100.0%	0.0%	○	206
FA.11	Multi-step speed11	-100.0～100.0%	0.0%	○	207
FA.12	Multi-step speed12	-100.0～100.0%	0.0%	○	208
FA.13	Multi-step speed13	-100.0～100.0%	0.0%	○	209
FA.14	Multi-step speed14	-100.0～100.0%	0.0%	○	210
FA.15	Multi-step speed15	-100.0～100.0%	0.0%	○	211

Code	Name	Description	Factory Setting	Modify	Serial No.
FB Group: Protection Function					
Fb.00	Motor overload protection	0: Disabled 1: Normal motor(low compensation) 2: Variable frequency motor(without low compensation)	2	◎	212
Fb.01	Motor overload Protection current	20.0%～120.0% (Motor rated current)	100.0%	◎	213
Fb.02	Threshold of trip-free	Threshold of trip-free	80.0%	◎	214
Fb.03	Decrease rate of trip-free	0.00Hz～F0.06 (Maximum frequency)	0.00Hz	◎	215
Fb.04	Over-voltage stall protection	0: Disabled 1: Enabled	1	○	216
Fb.05	Over-voltage stall protection point	110～150% (380V series)	120%	○	217
		110～150% (220V series)	115%		
Fb.06	Limited current selection	0: The limit has been effective 1: Invalid when limiting constant	1	○	218
Fb.07	Auto current limiting level	100～200%	G Model：160% P Model：120%	○	219
Fb.08	Frequency decrease rate in current limiting	0.00～50.00Hz/s	10.00Hz/s	○	220
Fb.09	Protection time	0～65535h	0	○	221
Fb.10	Lake phase selection	0: Invalid 1: Valid	1	○	222
FC Group: Serial Communication					
FC.00	Local address	1～247, 0: broadcast address	1	○	223
FC.01	Baud rate selection	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	3	○	224
FC.02	Data format	0: No parity check (N, 8, 1) for RTU 1: Even parity check (E, 8, 1)for RTU 2: Odd parity check (O, 8, 1)for RTU 3: No parity check (N, 8, 2)for RTU 4: Even parity check (E, 8, 2)for RTU 5: Odd parity check (O, 8, 2)for RTU 6: No parity check (N, 7, 1)for ASCII 7: Even parity check (E, 7, 1)for ASCII	0	○	225

Code	Name	Description	Factory Setting	Modify	Serial No.
FC.02	Data format	8: Odd parity check (O, 7, 1)for ASCII 9: No parity check (N, 7, 2)for ASCII 10: Even parity check (E, 7, 2)for ASCII 11: Odd parity check (O, 7, 2)for ASCII 12: No parity check (N, 8, 1)for ASCII 13: Even parity check (E, 8, 1)for ASCII 14: Odd parity check (O, 8, 1)for ASCII 15: No parity check (N, 8, 2)for ASCII 16: Even parity check (E, 8, 2)for ASCII 17: Odd parity check (O, 8, 2)for ASCII	0	○	225
FC.03	Communication delay time	0～200ms	5ms	○	226
FC.04	Communication timeout delay	0.0(Disabled), 0.1～100.0s	0.0s	○	227
FC.05	Communication fault action	0: Alarm and coast to stop 1: Not alarm and keep running 2: Not alarm and stop if command source is communication 3: Not alarm and stop in any command source	1	○	228
FC.06	Response action	0: Enabled 1: Disabled	0	○	229
FD Group: Supplementary Function					
Fd.00	PWM selection	0: PWM Mode 1 1: PWM Mode 2 2: PWM Mode 3	0	○	230
Fd.01	Low-frequency threshold of restraining oscillation	0～500	5	○	231
Fd.02	High-frequency threshold of restraining oscillation	0～500	100	○	232
Fd.03	Amplitude of Restraining oscillation	0～10000	5000	○	233
Fd.04	Boundary of Restraining oscillation	0.00Hz～F0.06 (Maximum frequency)	12.50Hz	○	234
Fd.05	Oscillation suppression	0: Valid 1: Invalid	1	○	235

Code	Name	Description	Factory Setting	Modify	Serial No.
Fd.06	Torque setting source	0: Keypad (Fd.07) (100% relative toF3.07) 1: AI1 (100% relative to F3.07) 2: AI2 (100% relative to F3.07) 3: AI1+AI2 (100% relative to F3.07) 4: Multi-step (100% relative to F3.07) 5: Communication (100% relative toF3.07)	0	○	236
Fd.07	Keypad torque setting	-100.0%～100.0%	50.0%	○	237
Fd.08	Upper frequency limit selection	0: Keypad (F0.07) 1: AI1 (100% relative to F0.06) 3: Multi-step (100% relative to F0.06) 4: Communication (100% relative to F0.06)	0	○	238
Fd.09	Running command assistant channel	0: keypad command 1: Terminal command 2: communication command	2	○	239
Fd.10	Droop control	0.00～10.00Hz	0.00Hz	○	240
FE Group: Factory Setting Parameter					
FE.00	Factory Password	0～65535	*****	●	241

10 OPTIONS

10.1 Braking resistor/Braking unit selection

When the controlling device drive by the inverter needs fast braking, a braking unit should be installed to dissipate the regenerative energy generated by dynamic braking. Built-in braking unit has been mounted in EM9 series inverter power between 0.4 to 18.5KW，If users want to increase their brake torque, the only thing to do is to mount external braking resistor. For EM9 series inverter, power above 22KW, external brake unit should be mounted.

400V inverter braking resistor/braking unit selection

Capacity of inverter KW（HP）	braking unit		braking resistor（100% braking torque）	
	type	Number（PCS）	type	Number(PCS）
0.4（0.5）	Built-in	1	750Ω/80W	1
0.75（1）		1	750Ω/80W	1
1.5（2）		1	400Ω/260W	1
2.2（3）		1	250Ω/260W	1
4（5）		1	150Ω/390W	1
5.5（7.5）		1	100Ω/520W	1
7.5（11）		1	75Ω/780W	1
11（15）		1	50Ω/1040W	1
15（20）		1	40Ω/1560W	1
18.5（25）	External	1	32Ω/4800W	1
22（30）		1	27.2Ω/4800W	1
30（40）		1	20Ω/6000W	1

Capacity of inverter KW（HP）	braking unit		braking resistor（100% braking torque）	
	type	Number（PCS）	type	Number(PCS）
37（45）		1	16Ω/4800W	1
45（55）		1	13.6Ω/9600W	1
55（75）		1	10Ω/12000W	1
75（100）		1	6.8Ω/12000W	1
93（120）		1	6.8Ω/12000W	1
110（150）		1	6Ω/20000W	1
132（180）		1	6Ω/20000W	1
160（215）		2	5Ω/25000W	2
185（250）		3	4Ω/30000W	3
200（270）		3	4Ω/30000W	3
220（300）		3	4Ω/30000W	3
250（340）		4	3Ω/40000W	4
280（380）		5	3Ω/40000W	5
315（430）		5	3Ω/40000W	5

AC200V inverter braking resistor/braking unit selection

Capacity of inverter KW（HP）	Brake unit		brake resistor（100% braking torque）	
	Model	Number(PCS)	Model	Number(PCS)
0.4（0.5）	Built-in	1	200Ω/80W	1
0.75（1）		1	200Ω/80W	1
1.5（2）		1	100Ω/260W	1
2.2（3）		1	70Ω/260W	1
4（5）		1	40Ω/390W	1
5.5（7.5）		1	30Ω/520W	1
7.5（11）		1	20Ω/780W	1
11（15）		1	13.6Ω/2400W	1
15（20）		1	10Ω/3000W	1
18.5（25）		1	8Ω/4000W	1
22（30）		1	6.8Ω/4800W	1
30（40）		1	5Ω/6000W	1
37（50）		1	4Ω/9600W	1
45（60）		1	3.4Ω/9600W	1

10.2 Selection of AC reactor

Using ac reactor can restrain higher harmonic wave and improve power factor obviously. In the following situation, users are advised to use ac reactor.

- Ratio of capacity**:** power supply source**:** Inverter >10**:**1
- Silicon controlled load or switching controlled power factor compensator is mounted in the same power source.
- Degree of three-phase voltage unbalance is more than 3%.

Type of AC reactors

Voltage (V)	Power (kW)	Current (A)	Inductance (mH)	Voltage (V)	Power (kW)	Current (A)	Inductance (mH)
220	0.4	2.4	4.6	380	0.75	2.5	7.6
	0.75	4.5	2.4		1.5	4	4.8
	1.5	7	1.6		2	6	3.2
	2.2	11	1.0		4	9	2.0
	4	18	0.6		5.5	13	1.5
	5.5	22	0.5		7.5	17	1.2
	7.5	30	0.4		11	25	0.8
	11	42	0.27		15	32	0.6
	15	55	0.2		18.5	38	0.5
	18.5	70	0.16		22	45	0.42
	22	80	0.14		30	60	0.32
	30	110	0.1		37	75	0.26
	37	145	0.08		45	90	0.21
	45	180	0.06		55	110	0.18
	55	215	0.05		75	150	0.13
	75	285	0.04		93	170	0.11
	93	350	0.03		110	210	0.09
	110	415	0.03		132	250	0.08
					160	300	0.06
					200	380	380
					220	415	0.05
					250	480	0.04
					280	280	0.04

10.3 DC reactor

DC reactor should be mounted in the following cases**:**

1. Capacity of power network larger than that of inverter;
2. Capacity of power supply more than 1000KVA;
3. Strict requirements in improving power factor.

AC reactor can be used at the same time. They can decrease input higher harmonic wave obviously.

In this series inverter, DC reactor is supported when power above 160 KW. If users want tomount DC reactor when power below 132KW, please specify the demand in order for P1 terminal configuration alteration.

Type of DC reactor

Voltage (V)	Power (KW)	Current (A)	Inductance μH	Voltage (V)	Power (KW)	Current (A)	Inductance (μH)
220	11～15	75	450	380	11～15	11～15	1500
	1500	150	200		18.5～30	75	600
	37～55	37～55	100		37～55	150	300
	75～93	420	40		75～93	220	200
	110	560	25		110～132	280	140
					160～200	370	110
					220	560	70
					250～280	740	55

10.4 Radio noise filter

Radio noise filter is used to restrain transmit of Electro-Magnetic Interference (EMI) and external radio interference; include that of instant impulsion and surge.

3 phase 3-wire system radio noise filter

Voltage (V)	Motor power (kW)	Voltage (V)	Motor power (kW)	Filter type	Primary parameter of filter					
					Common-mode input loss dB			Common-mode input loss dB		
					0.1MHz	1MHz	30MHz	0.1MHz	1MHz	30MHz
	0.4～0.75		0.75～1.5	DL-5EBT1	75	85	55	55	80	60
	1.5～2.2		2.2～4	DL-10EBT1	70	85	55	45	80	60
	4～5.5		5.5～7.5	DL-20EBT1	70	85	55	45	80	60
	7.5		11～15	DL-35EBT1	70	85	50	40	80	60
220	11～15	380	18.5～22	DL-50EBT1	65	85	50	40	80	50
	18.5～22		30～37	DL-80EBT1	50	75	45	60	80	50
	30		45	DL-100EBK1	50	70	50	60	80	50
	37		55～75	DL-150EBK1	50	70	50	60	70	50
	45～55		93～110	DL-200EBK1	50	70	60	60	70	50

When a high level of EMI is expected and CE, UL, CSA standards are required for application, or when weak noise resistance equipment is installed around the inverter, please fit noise filter in the system.

The wiring cables should be cut as short as it can be and the filter should be closer to the inverter.

10.5 Rated current for different specifications

G/P/H/Z/ Type						
Inverter (V)	220V 1Φ	220V (240V)	380V (415V)	460V (440)	575V	690V
(KW)	(A)	(A)	(A)	(A)	(A)	(A)
0.4	2.5	2.5	-	-	-	-
0.75	4	4	2.5	2.5	1.7	-
1.5	7	7	3.7	3.7	2.5	-
2.2	10	10	5	5	4	-
4	16	16	8.5	8	6.5	5.5
5.5	20	20	13	11	8.5	7.5
7.5	30	30	16	15	10.5	9
11	42	42	25	22	17	15
15	55	55	32	27	22	18
18.5		70	38	34	26	22
22		80	45	40	33	28
30		110	60	55	41	35
37		130	75	65	52	45
45		160	90	80	62	52
55		200	110	100	76	63
75		260	150	130	104	86
93		320	170	147	117	98
110		380	210	180	145	121
132		420	250	216	173	150

G/P/H/Z/ Type						
Inverter (V)	**220V 1Φ**	**220V (240V)**	**380V (415V)**	**460V (440)**	**575V**	**690V**
(KW)	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**
160		550	300	259	207	175
187		600	340	300	230	198
200		660	380	328	263	218
220		720	415	358	287	240
250		-	470	400	325	270
280		-	520	449	360	330
315		-	600	516	415	345
375		-	680	600	450	390
400		-	750	650	520	430
500		-	920	800	650	540
630			1100	1000	820	680

11 COMMUNICATION PROTOCOL

EM9 series inverter provides RS485 communication ports, and adopts the standard ModBus communication protocol for master/slave communications. The user can use PC/PLC or upper control computer to implement centralized control (setting control command of inverter, operating frequency, modification of related functional code parameters, working status of inverter and fault message monitoring), to meet special application requirement.

11.1 Protocol Content

The Modbus serial communication protocol defines frame content and using format of asynchronous transmission in serial communications, including**:** polling and broadcast frame of the master, and reply frame format of the slave. The frame content of the master includes**:** address (broadcast address) of the slave, execution command, data, error check, and so on. The response of the slave also adopts the same structure, including**:** action confirmation, data return, error check, and so on. If an error occurs when the slave is receiving a frame or cannot complete the action required by the master, the slave will organize a fault frame and send it to the master as a response message.

11.2 Application Mode

EM9 series inverters can be connected with the "single-master multi-slave" control network with RS232/RS485 bus.

11.3 Bus Structure

(1) Interface mode

RS485 hardware interface

(2) Transmission mode

Asynchronous serial and half-duplex transmission mode. At the same time, only one of the master and slave sends data, while the other receives data. Data is sent frame by frame in form of packets during asynchronous serial communications.

(3)Topology

" Single master multi-slave" system. The setting range of slaves address is 1~247, where "0" is the broadcast communication address. In network, the unique character of each slave address is the basis to ensure ModBus serial.

11.4 Protocol Description

The communication protocol of EM9 inverters is asynchronous serial master/slave ModBus communication protocol. Only one device (the master) can establish protocol (called "query/command") over the entire network. Other devices (the slave) can only provide data to make response to the "query/command" of the master or take the corresponding actions according to the "query/command" of the master. Here the master refers to PC, industrial

control device or programmable logic controller (PLC), and the slave refers to EM9 inverters or other control devices with the same communication protocol. The master can conduct independent communications with slave and can send broadcast messages to all slaves. For the "query/command" of the master who makes independent access, the slave should return a message (called response); for the broadcast messages sent by the master, the slave does not need to make a response to the master.

11.5 Protocol Format

The communication data format of the ModBus protocol of EM9 series inverter is RTU (Remote Terminal Unit) mode and ASCII (American Standard Code for Information International Interchange) mode.

In the RTU mode, the format of each byte is as follows**:** Coding system**:** Eight-bit binary notation, hexadecimal 0-9, A~F, and each 8-bit frame field includes two hexadecimal characters.

In ASCII Mode，the format of each byte is as follows：Coding system：The ASCII protocol is belong to hexadecimal notation，ASCII information Symbol means："0"…"9"，"A"…"F" every hexadecimal character stands for an ASCII code.，

For example**:**

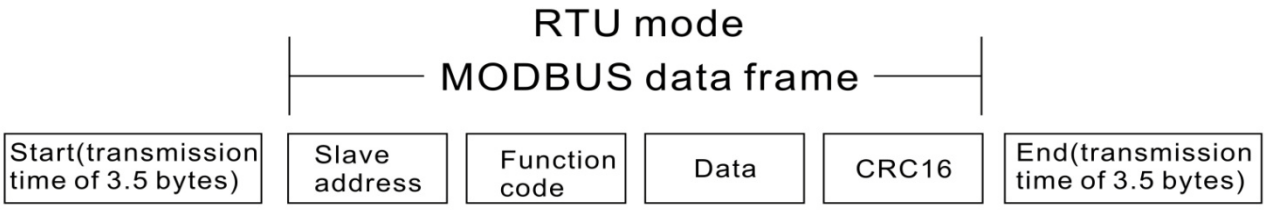
Symbol	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'
ASCII CODE	0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39
Symbol	'A'	'B'	'C'	'D'	'D'	'F'				
ASCII CODE	0x41	0x42	0x43	0x44	0x45	0x46				

Byte bit**:** Includes start bits, seven or eight data bits, parity check bits and stop bits. The description of the byte bits is as follows**:** 11-bit frame：

Start bit	Bit1	Bit2	Bit2	Bit4	Bit5	Bit6	Bit7	Bit8	No parity Even parity Odd partiy	Stop bit

10-bit frame：

Start bit	Bit1	Bit2	Bi4	Bit4	Bit5	Bit6	Bit7	No parity Even parity Odd parity	Stop bit



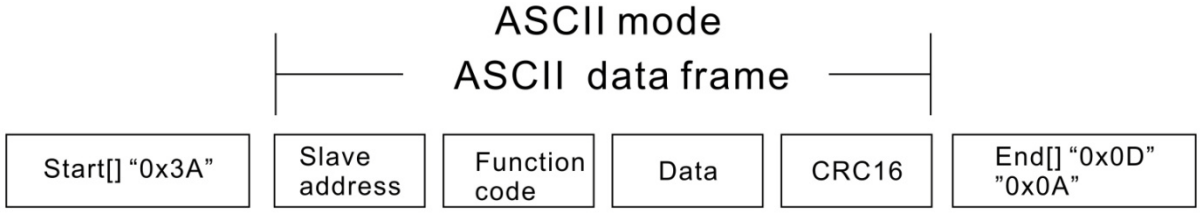
In RTU mode, new frames always have the transmission hold time of at least 3.5 bytes, as the start. Over a network using baud rate to calculate the transmission rate, the transmission time of 3.5 bytes can be controlled easily. The subsequently transmitted data fields are in turn**:** slave address, operation command code, data and CRC check word. The transmission bytes of each field are 0…9, A…F in hexadecimal notation. The network device monitors the activities of the communication bus all the time, even during the silent delay interval. When receiving the first field (address message), each network device will confirm the byte. After the completion of the transmission of the last byte, another transmission time interval similar to that of 3.5 bytes is used to indicate the

end of the frame. After that, the transmission f a new frame starts.

The information of a frame should be transmitted in consecutive data streams. If there is an interval over 1.5 bytes before completion of the entire frame transmission, the receiving device will clear the incomplete information, and mistake the last byte to be the address field part of new frame. Likewise, if the interval between the start of a new frame and the previous frame is less than 3.5 bytes, the receiving device will regard it as the subsequent part of the previous frame. Due to frame disorder, the final CRC value is incorrect, which will lead to communication failure. Standard Structure of RTU Frame**:**

Frame head(START)	T1-T2-T3-T4（transmission time of 3.5 bytes）
Slave address(ADDR)	Communication address：0～247（decimal） （"0" stands for the broadcast address）
Function field (CMD)	03H：Read slave parameters; 06H：Write slave parameters;
Data field**:** DATA（N-1） DATA（0）	Data of 2*N bytes**:** this part is the main content of communications, and is also the data exchange core in communications.
CRC CHK lower bit	Detection value**:** CRC value (16BIT).
CRC CHK higher bit	
Frame tail**:** END	T1-T2-T3-T4（transmission time of 3.5 bytes）

In ASCII mode, the frame head is "**:**"("0x3A"), and default frame tail is "CRLF" ("0x0D" or "0x0A"). The frame tail can also be configured by users. Except frame head and tail, other bytes will be sent as two ASCII characters, first sending higher nibble and then lower nibble. The data have 7/8 bits. "A"~"F" corresponds to the ASCII code of respective capital letter. LRC check is used. LRC is calculated by adding all the successive bytes of the message



except the head and tail(discarding any carriers)and then two's complementing the result.

Standard Structure of ASCII Frame**:**

START	（0x3A）
（0x3A）	Node address： 8-bit address includes 2 ASCII code
Address Lo	
Function Hi	8-bit address includes 2 ASCII code
Function Hi	
DATA（N-1） DATA（0）	Data contents：nx8-bit data contents include 2n ASCII code n<=16，the max number is 32 ASCII code
LRC CHK Lo	LRC CHK：8-bit CHK include 2 ASCII code
LRC CHK Hi	
END Hi	End symbol：END Hi=CR（0x0D），END Lo=LF（0x0A）
END Lo	

11.6 Command Codes and Communication Data

11.6.1 Command Code: 03H (0000 0011), read N words (can read a maximum of consecutive 16 words)

For example**:** for an inverter with the slave address of 01H, the start address of memory is 0004, read two words

consecutively, the structure of the frame is as follows**:**

RTU mode**:** Command Message of the Master

START	T1-T2-4-T4（transmission time of 3.5 bytes）
ADDR	01H
CMD	03H
Higher bits of start address	00H
Lower bits of start address	04H
Higher bits of data number	00H
Lower bits of data number	02H
CRC CHK lower bit	85H
CRC CHK higher bit	CAH
CAH	T1-T2-T3-T4（transmission time of 3.5 bytes）

RTU mode**:** Response Message of the Slave

START	T1-T2-T3-T4（transmission time of 3.5 bytes）
ADDR	01H
CMD	03H
Bits of byte number	04H
Higher bits of data address 0004H	13H
Lower bits of data address 0004H	88H
Higher bits of data address 0005H	13H
Lower bits of data address 0005H	88H
CRC CHK lower bit	73H
CRC CHK higher bit	CBH
END	T1-T2-T3-T4（transmission time of 3.5 bytes

ASCII mode**:** Command message of the master

START	‘**:**’
ADDR	‘0’
	‘1’
CMD	‘0’
	‘3’
Higher bits of start address	‘0’
	‘0’
Lower bits of start address	‘0’
	‘4’
Higher bits of data number	‘0’
	‘0’
Lower bits of data number	‘0’
	‘2’
LRC CHK Hi	‘F’
LRC CHK Lo	‘6’
END Hi	CR
END Lo	LF

ASCII mode**:** Response Message of the Slave

START	‘**:**’
ADDR	‘0’
	‘1’
CMD	‘0’
	‘3’
	‘0’
Bits of byte number	‘0’
	‘4’

Higher bits of data address 0005H	'1'
	'3'
Lower bits of data address 0004H	'8'
	'8'
Higher bits of data address 0005H	'1'
	'3'
Lower bits of data address 0005H	'8'
	'8'
LRC CHK Hi	'C'
LRC CHK Lo	'2'
END Hi	CR
END Lo	LF

11.6.2 Command code: 06H (0000 0110), write one word

For example, write 5000 (1388H) into the address 0008H of the inverter with the slave address of 02H, the structure of the frame is as follows**:**

RTU mode**:** Command Message of the Master

START	T1-T2-T3-T4（transmission time of 3.5 bytes）
ADDR	02H
CMD	06H
High bits of data address	00H
Low bits of data address	08H
High bits of data content	13H
Low bits of data content	88H
CRC CHK lower bit	05H
CRC CHK higher bit	6DH
END	T1-T2-T3-T4（transmission time of 3.5 bytes

RTU mode**:** Response Message of the Slave

START	T1-T2-T3-T4（transmission time of 3.5 bytes）
ADDR	02H
CMD	06H
High bits of data address	00H
Low bits of data address	08H
High bits of data content	13H
Low bits of data content	88H
CRC CHK lower bit	05H
CRC CHK higher bit	6DH
END	T1-T2-T3-T4（transmission time of 3.5 bytes

ASCII mode**:** Command Message of the Master

START	':'
ADDR	'0'
	'2'
CMD	'0'
	'6'
Higher bits of start address	'0'
	'0'
Lower bits of start address	'0'
	'8'
High bits of data content	'1'
	'3'
Low bits of data content	'3'
	'3'

LRC CHK Hi	'5'
LRC CHK Lo	'5'
END Hi	CR
END Lo	LF

ASCII mode**:** Response Message of the Slave

START	'**:**'
ADDR	'0'
	'2'
CMD	'0'
	'6'
Higher bits of start address	'0'
	'0'
Lower bits of start address	'0'
	'8'
Higher bits of data number	'1'
	'3'
Lower bits of data number	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'5'
END Hi	CR
END Lo	LF

11.6.3 Communication frame error check

Frame error check includes two parts**:** byte bit check (odd/even parity check) and entire frame data check (CRC or LRC check)

11.6.3.1Parity Checking

Users can configure controllers for Even or Odd Parity checking, or for No Parity. This will determine how the parity bit will be set in each character.

Even parity means**:** before data transmission, an even parity will be added to the character frame for odd or even representation of the quantity of 1 bits. If the counted number of 1s in the character frame is even, the parity bit will be set as "0"; if the number is odd, the parity bit will be set as "1". In this way, the odd or even of the data will be invariable.

Odd parity means**:** before data transmission, an odd parity will be added to the character frame for odd or even representation of the quantity of 1 bits. If the counted number of 1s in the character frame is odd, the parity bit will be set as "0"; if the number is even, the parity bit will be set as "1".In this way ,the odd or even of the data will be invariable.

For example, these eight data bits are contained in an RTU character frame**:** "11001110"， The total quantity of 1 bits in the frame is five. If Even Parity is used, the frame's parity bit will be a "1", If Odd Parity is used, the parity bit will be a "0". When the message is transmitted, the parity bit is calculated and applied to the frame parity bit place of each character. The receiving device counts the quantity of 1 bits and sets an error if they are not the same as configured for that device.

11.6.3.2 Cyclical Redundancy Check (CRC):

Using RTU frame format**:** The frame includes frame error detection field calculated on the basis of CRC. The CRC field detects the entire content of frame. The CRC field has two bytes, including 16 bits of binary values. It is added to the frame after calculation of the transmission device. The receiving device recalculates the CRC of frame, and compares it with the value in the received CRC field. If the two CRC values are not equal, it indicates a transmission error. CRC is first stored in 0xFFFF, and then a process is called to process over six consecutive bytes in the frame and the value in the current register. Only the 8-bit data in each character is valid for CRC. The

start bit, stop bit and parity check bit are invalid.

During CRC generation, each 8-bit character independently conducts "XOR" with the content of register. The result moves to the least significant bit (LSB) direction, and the most valid bit (MSB) is filled in with 0. LSB is extracted for detection. If LSB is 1, the register independently conducts "XOR" with the preset value; if LSB is 0, the operation will not be conducted. The entire process will be repeated for eight times. After the completion of the last bit (the eight bit), the next 8-bit byte will independently conduct "XOR" with the current value of register. The final value of register is the CRC value after the execution of all bytes in the frame The calculation method of CRC adopts the CRC principle with international standard.

When editing CRC algorithm, the user can refer to the CRC algorithm in related standard to write a CRC calculation program that really meets requirement.

A simple function for CRC calculation is provided for reference (programmed in C language)**:**

```
unsigned int crc_cal_value(unsigned char *data_value,unsigned char data_length)
{ int i;unsigned int crc_value=0xffff;while(data_length--)
{crc_value^=*data_value++;for(i=0;i<8;i++)
{if(crc_value&0x0001)crc_value=(crc_value>>1)^0xa001;
else crc_value=crc_value>>1;
return(crc_value;)
```

In ladder logic, CKSM calculates the CRC value according to the frame content in tale

loop-up method. This method has several features**:** simple program, fast operation speed, but wider ROM space of program. Please use this method prudently in occasions with certain program space requirement

11.6.3.3 ASCII Mode check（LRC Check）

LRC is calculated by adding all the successive bytes of the message except the head and tail, discarding any carriers, and then two's complementing the result. In other word, in ASCII mode, LRC checksum is the sum of Address to Data Content. The complement of LRC checksum will be the final LRC Check result.

For example, in the above 11.6.2 samples, the LRC Check result 0x55 is the complement of 0x02+0x06+0x00+0x08+0x13+0x88=0xAB（LRC Checksum）.

11.6.4 Definition of Communication Data Address

This part is the definition of communication data address, can be used to control inverter operation, and obtain status information and settings of related functional parameters of the inverter.

(1) Functional code parameter expression rule.

To use a functional code serial number as a parameter to correspond to the register address, but needs to conversion in hexadecimal notation. For example, the serial number of F5.05 is 58, the address of the functional address in hexadecimal notation is 003AH. Ranges of higher/lower bytes are respectively**:** higher-bit bytes**:** 00~11; lower-bit bytes**:** 00~FF.

Notice:

FE group**:** factory setting do not read or change the parameters in the group. Some parameters should not be changed during operation of the inverter. Some parameters should not be changed no matter in which state the inverter is. To change functional code parameters, pay attention to the setting range, unit and related description of parameters. In addition, frequency storage of EEPROM may reduce the service life of the EEPROM. For users, some functional codes do not need storage in communication mode, only need to change the value in RAM to meet the user requirement. Changing the highest bit of the corresponding functional code address from 0 to 1 can implement this function. For example, functional code F0.07 is not stored in EEPROM. Modify the value in RAM only can set the address to 8007H. This address can only be used in writing RAM, cannot be used for reading. It will be an invalid address if it is used for reading.

(2)The data address of other function please refer to the following table.

Function Description	Address Definition	Data Meaning	R/W Feature
Communication control command	1000H	0001H: Forward running	W/R
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H：Free stop (emergency stop)	
		0007H: Fault reset	
		0008H: Stop jogging	
Inverter state	Inverter state	Inverter state	R
		0002H: Reverse running	
		0003H: Inverter standby	
		0004H: Fault	
Communication setting address	2000H	Communication setting range (-10000～10000) Note: the communication setting is the percentage of the relative value (-100.00% ～100.00%), which can conduct communication wiring operation. If it is set as frequency source, it	W/R
Communication setting address	2000H	Corresponds to the percentage of the maximum frequency (F0.07); If it is set or fed back as PID, it corresponds to the percentage of PID. Where PID setting value and PID feedback value go through PID calculation in form of percentage.	W/R
Run/stop parameter address	3000H	Operating frequency	R
	3001H	Set frequency	R
	3002H	Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Rotation speed upon running	R
	3006H	Output power	R
	3007H	Output torque	R
	3008H	PID setting value	R
	3009H	PID feedback value	R
	300AH	Terminal input sign input	R
	300BH	Terminal output sign input	R
	300CH	Analog input AI1	R
	300DH	Analog input AI2	R
	300EH	Reserved	R
	300FH	Reserved	R
	3010H	Reserved	R
	3011H	Reserved	R
	3012H	Multi-step and current steps of PLC	R
Inverter fault address	5000H	Fault message codes should be consistent with fault types in the functional code menu. The difference is that here hexadecimal data is returned to the upper computer, instead of fault characters.	R

Function Description	Address Definition	Data Meaning	R/W Feature
ModBus communication fault address	5001H	0000H: Not fault 0001H: Password error 0002H: Command code error 0003H: CRC error 0004H: Illegal address 0005H: Illegal data 0006H: Parameter change invalid	R
		0007H: System locked 0008H: Inverter busy (EEPROM is storing)	R

11.6.5 Additional Response of Communication Error

If the operation fails in the communication of inverter，the inverter will reply a message formatted by failure command .The error code will in format the host control system what error has happened .The response CMD will be "06",not mater that of the command message is "03"or"06"，and the fixed error code response address is 0x5001 For example：

RTU mode: Slave Response Error Code Message

START	T1-T2-T3-T4（transmission time of 3.5 bytes）
ADDR	01H
CMD	06H
High byte of Error code response address	50H
Low byte of Error code response address	01H
Error code Hi	00H
Error code Lo	05H
CRC CHK Lo	09H
CRC CHK Hi	09DH
END	T1-T2-T3-T4（transmission time of 3.5 bytes）

ASCII mode: Slave Response Error Code Message

START	':'
ADDR	'0'
	'1'
CMD	'0'
	'6'
High byte of Error code response address	'5'
	'0'
Low byte of Error code response address	'0'
	'1'
High byte of error code	'0'
	'0'
Low byte of error code	'0'
	'5'
LRC CHK Hi	'A'
LRC CHK Lo	'3'
END Hi	CR
END Lo	LF

11.6.6 The error code means：

Value	Mean
1	Password error

Value	Mean
2	Command code error
3	CRC error
4	Illegal address
5	Illegal data
6	Parameter change invalid
7	System locked
8	System locked
9	Inverter busy (EEPROM is storing)