EMHEATER

User Manual

EM-GU Series Online Soft Starter

China EM Technology Limited

Preface

Thanks for your using EMHEATER EM-GU series motor soft starter, this product is used for three-phase squirrel cage induction motor soft starting and soft stopping control. Before using, please carefully read and understand the contents of this manual.

In the process of using the soft starter, please note the following Safety Clauses:

 Please check this user manual carefully before using the product.

 Only the technical person is allowed to install the product.

 To be sure that the motor is correctly matched with the soft starter.

 It is forbidden to connect capacitors to the output terminals (U V W).

 Please seal the terminal switch insulation glue after finishing connect them.

 The soft starter and its enclosures must be fixedly earthed.

 During the maintenance and repair, the input must be off-power.

 **PRODUCT UNPACKING INSPECTION**
Please check up the products before using, if in some problems; please do not hesitate to contact us with any request for additional information.
● Check-up the type of product whether it is the right one you order. ● Check any damage to the product because of the transport, such as the spare parts are apart from the main body or the shell be damage etc. ● Check others, including the user's manual.

This user manual content may be changed due to technical reasons or modified. We reserve the updating right.

Version 1.0.0

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1. Products Information

1.1 Motor Soft Starter

EM-GU motor soft starter, the use of intelligent digital control; It used to various squirrel-cage asynchronous motor control of load, the motor can smooth starting under any working conditions, protect the drag system, reduce the starting current impact on power grid, ensure reliable motor starting. Intelligent digital motor soft start equipment system with the complete protection function, extend the service life of the system, reduce the cost of system cost, improve the reliability of system and compatible with all the functions of starting equipment; It is a new ideal alternative for traditional star triangle starter and self-coupling decompression starter.

1.2 Technical Features

- A variety of start mode can be selected to allow the motor soft starter to start different types of motor loads;
- Multiple dynamic fault memory functions for easy fault finding;
- Multiple protection functions, such as overcurrent, overheat, phase loss and thermal overload;
- Humanized design, detachable operation panel, built-in Chinese and English display interface for flexible selection.
- Powerful software functions, rich hardware configuration, easily meet the needs of various industries.
- Compact design, easy to install and use.

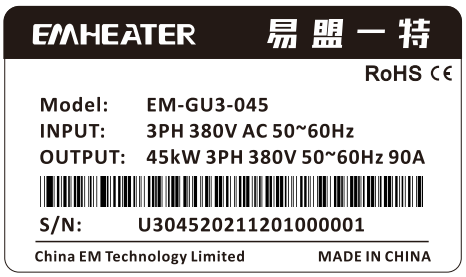
1.3 Technical Specification

Input&Output	● Input voltage: AC 220-380V±15% ● Input frequency: 50/60Hz ● Output voltage: AC 220/380V±15%
Technical function	● Start mode: voltage ramp start, current limit start, torque start ● Stop mode: Soft stop, Free stop ● Starting time: 1~120s ● Stopping time: 0~60s ● Starting current limiting multiplier: 0.5~6Ie ● Starting voltage: 0.3~0.8Ue ● Pump functions
External terminal	● Remote control input ● Relay output ● Analog output ● RS485 communication output
Ambient	● Indoor location with good ventilation free from corrosive gas and conductive dust. ● Altitude: Below 2000M. It has to rise the rate power when the altitude is more than 2000M ● Temperature: -10 +40 °C ● Humidity: 90%RH without dew condensation. ● Vibration: <0.5G ● Cooling mode: Fans cooling.

2. Product Description and Installation

2.1 Model Explanation

EM - GU 3 [I] - 045
❶ ❷ ❸ ❹ ❺



❶	Company code
❷	GU series online soft starter
❸	Rated voltage: 2: Three phase 220V 3: Three phase 380V
❹	I: Cabinet
❺	Matched motor: 045: 75kW; 160: 160kW

Diagram 2.1 Products model explanation

2.2 Products Model and Installation Dimension

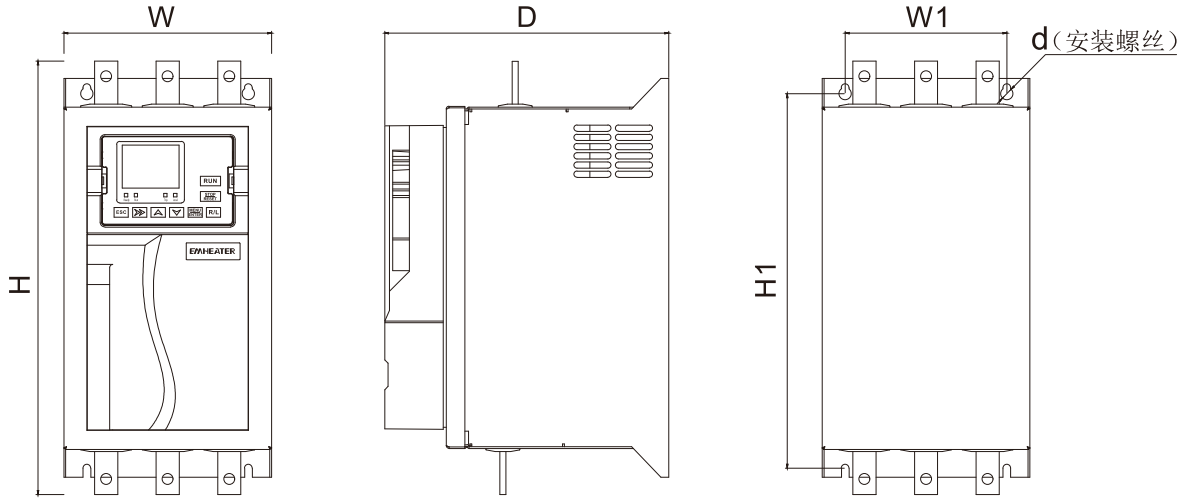


Diagram 2.2 EM-GU installation dimension and mounting holes

Model	Rated Power	Rated Current	External Dimensions (mm)			Installation Dimensions (mm)		
	(KW)	(A)	H	W	D	H1	W1	d
EM-GU3-011	11	23	240	105	169	211	75	M6
EM-GU3-015	15	30						
EM-GU3-018	18.5	37						
EM-GU3-022	22	45						
EM-GU3-030	30	60						
EM-GU3-037	37	75						
EM-GU3-045	45	90	283	135	185	244	105	M6
EM-GU3-055	55	110						
EM-GU3-075	75	150						
EM-GU3-090	90	180	371	190	245	322	150	M8
EM-GU3-115	115	230						
EM-GU3-132	132	260	393	225	226	340	170	M8
EM-GU3-160	160	320						

Model	Rated Power	Rated Current	External Dimensions (mm)			Installation Dimensions (mm)		
	(KW)	(A)	H	W	D	H1	W1	d
EM-GU3-200	200	400						
EM-GU3-250	250	500	586	483	296	498	340	M8
EM-GU3-280	280	560						
EM-GU3-315	315	630						

Note: The rated power of motor in the above form is the maximum rated value. Generally, the values of matched motor power capacity should not be more than this value.

2.3 Installation Environment

- **Power Supply:** City grid power, self-provided power, diesel oil dynamotor, 3-phase alternating current 380V±15%, 50Hz or 60Hz. The power capacity of the soft start must meet the motor starting requirement.
- **Matched Motor:** Motor should be three phase squirrel asynchronous motor, and its power capacity must be matched with soft starters.
- **Starting Frequency:** Not more than 4/hour when the motor is started with full load. The starting time is according to the loading equipment.
- **Cooling Mode:** Fan cooling.
- **Protective Grade: IP20**
- **Environment Conditions:** when altitude is less than 2000m, the temperature of the environment should be between -10ºC ~ 40 ºC, relative humidity should be less than 95% RH, no vapor, no flammable, volatile, corrosive gas. No electric dirt, indoor installation, ventilated, vibration is less 0.5G.

2.4 Installation requirement

he direction and distance of installation: In order to make sure that the soft starter be in good ventilation and heat dissipation, please install the product in vertical direction, and be sure the space around the product is enough. If the soft starter is installed in a box, please note that the ventilation is very good, as well as the above notes. (See the following diagram 2.3)

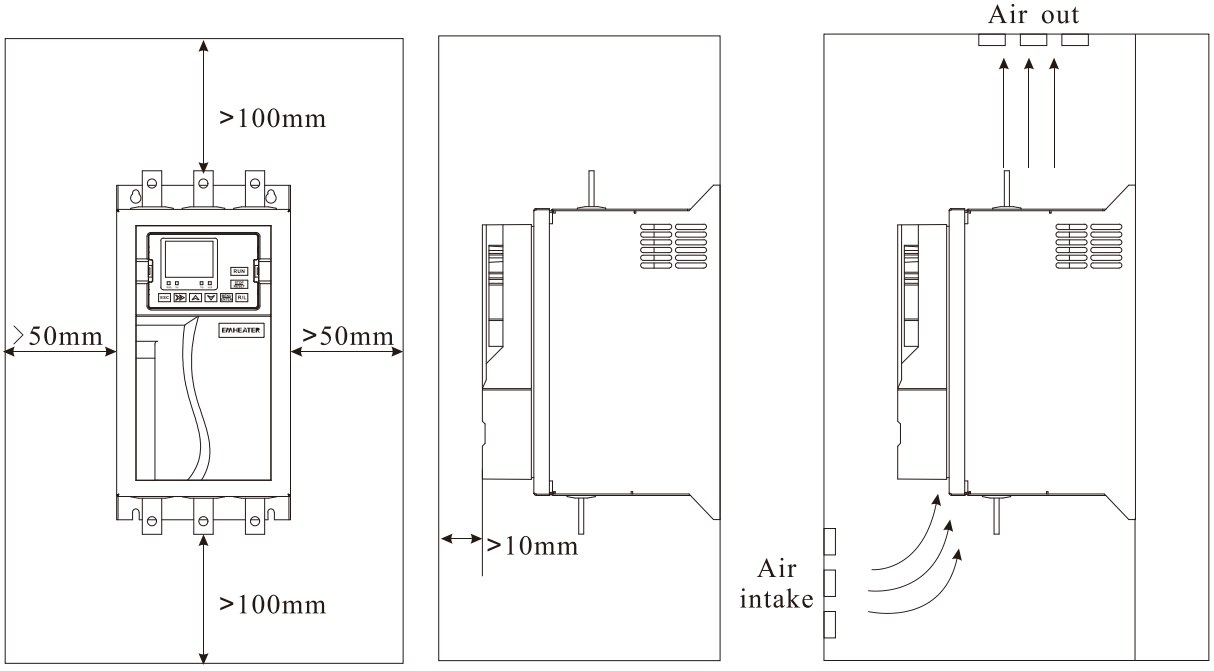


Diagram 2.3 Ventilating duct installation dimension diagram of soft starter

2.5 Peripheral Devices Connection Diagram

EM-GU series soft starters can be connected to the motor by line mode connection or delta mode connection.

Line Mode connection:

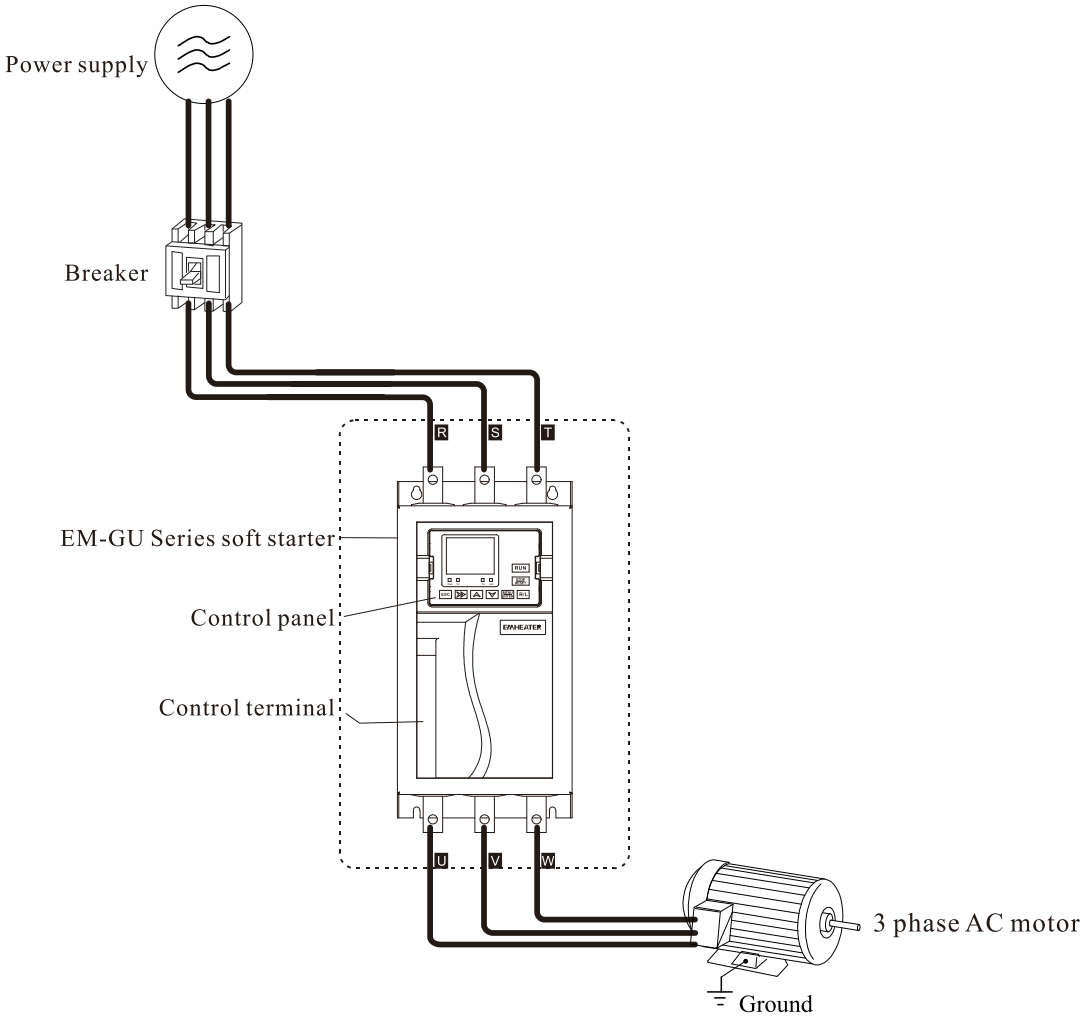


Diagram 2.4 EM-GU device connection diagram(Line mode)

Delta Mode connection:

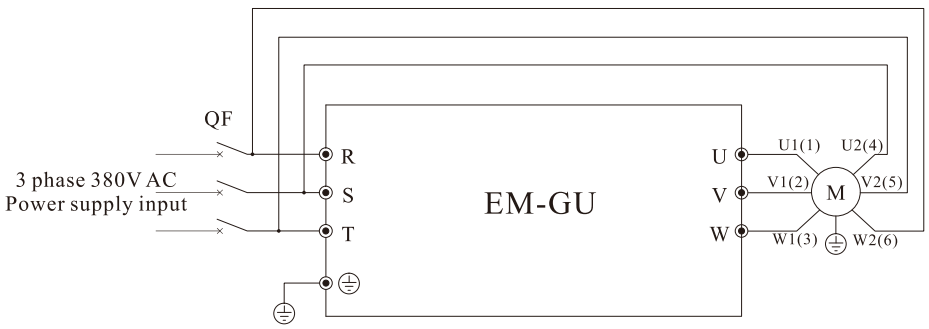


Diagram 2.5 EM-GU delta mode connection diagram

2.6 Description of control circuit terminals

Control terminal connection: That is the wire comes from 11 external terminals which including input and output control signal and analogue output or RS485 communication signal.

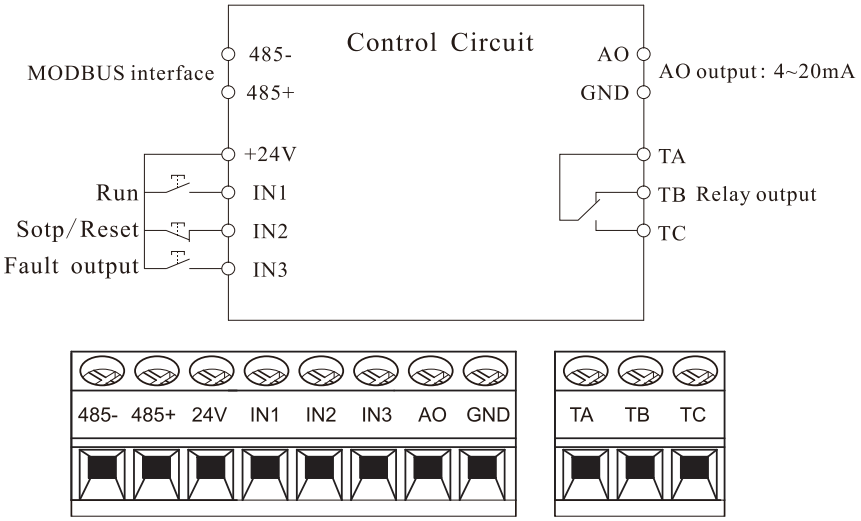
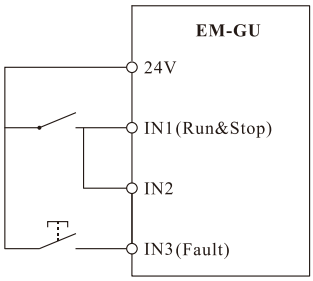
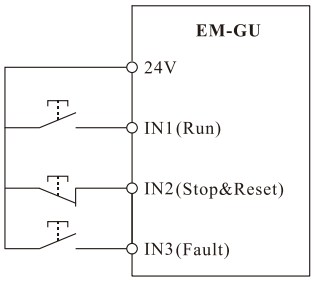


Diagram 2.6 Control circuit terminal

Type	Terminal Symbol	Terminal Name	Description
Communication	485+	Communication terminal	Input and output signal terminals for MODBUS-RTU protocol communication.
	485-		
Digital input	IN1-24V	Run	When F49=0, there are two ways of connections for your selection; those are 2-wire connection and 3-wire connection, as below: 2 wire connection  3 wire connection 
	IN2-24V	Stop/Reset	
	IN3-24V	Faul	
Analog output	AO-GND	4-20mA output	The output upper and lower current limits are set by parameter F15, default 2 times.
Relay output	TA-TB	NC terminal	Programmable relay output, the output method is set by the F13 parameter.
	TA-TC	NO terminal	

Note: Please make sure that external terminals are in right connection; otherwise, the product may be damaged.

3. Operation and Display

The motor soft starter has five kinds of working state: Ready, starting, Running, stopping and Fault, the showing parameter is easy to understand and modify.

3.1 Keypad and Operation

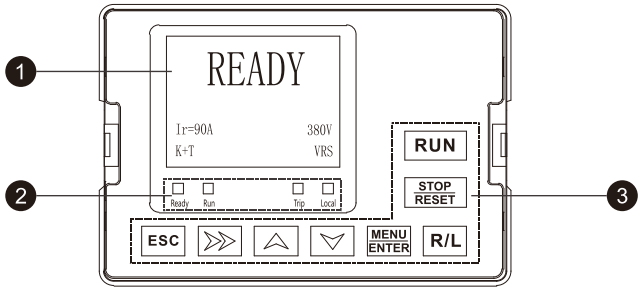
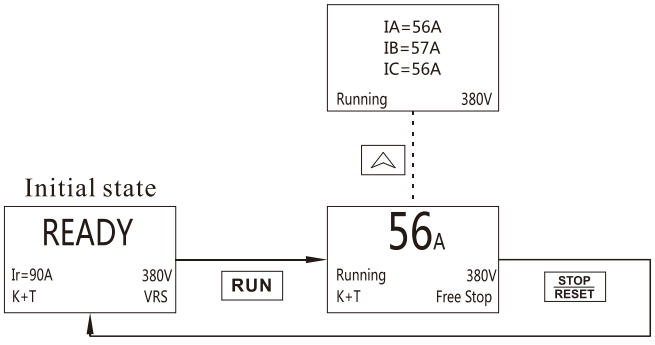


Diagram 3.1 Operation keypad

No.	Name	Function	
❶	LCD display area	LCD shows the parameter, monitoring data and Error codes.	
❷	Status indicator area	Ready	On indicates that the soft starter is ready.
		Run	On indicates that the motor is starting, running, soft stop state
		Trip	On indicates that the soft starter is in a fault state, flashing indicates that the soft starter is in warning state.
		Local	On indicates that the soft starter is in keypad control mode.
❸	Operation key area	ESC	Exit/Cancel key: Exit menu or cancel modification of parameters.
		≫	Shift key: The fault log can be cycled through while on the main display screen, and select the digit to be modified when modifying parameters.
		∧	UP key: Increase data or parameter code.
		∨	DOWN key: Decrease data or parameter code.
		MENU ENTER	Menu/Enter key: Enter menu and confirm the parameter setting.
		R/L	R/L key: For switching between keypad control and terminal control
		RUN	Running key: Start the soft starter in the keypad control mode.
		STOP RESET	Stop/Reset key: When in operation, press this key for stop operation; when in fault alarm, press this key for fault reset operation.

Start and stop operation:

The soft starter keypad screen shows "READY", and press RUN running key to start the motor. In the In the process of starting, the screen shows starting current "xxxA". When the starting is completed, can be press ∧ UP key to check three phase current information. And press STOP RESET Stop/Reset key to stop the motor.

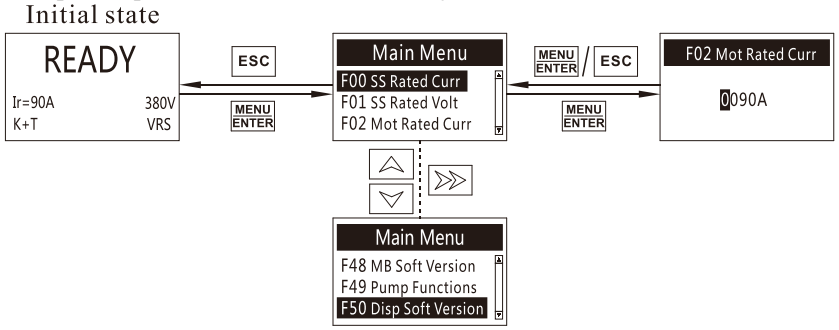


Prompt:

- Only when the "READY" is displayed, the motor can be started by pressing the RUN running key.
- When the external control terminal is wired in 3-wire mode, the external control start and stop buttons are functionally equivalent to the RUN running key and STOP RESET stop/reset key on the keypad respectively.
- During the start and stop process, you can not enter the Set Menu or Help Menu.。

Parameter modification operation:

In the "Ready" state, press MENU ENTER MENU/ENTER key can enter the main menu. And the parameter can be selected by UP key or DOWN key, and press MENU ENTER MENU/ENTER key again to enter the parameter that needs to be modified, select the option or modify the value by UP key or DOWN key, and then press MENU ENTER MENU/ENTER key again means that the new data has been saved and return to the menu. If you do not want to save, please press ESC Exit/Cancel key to return to the menu.

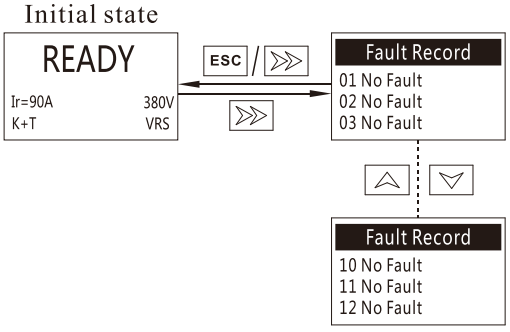


Prompt:

- Use the shift keys to quickly switch to the parameter to be modified.
- The keypad is designed to be super anti-interference, allowing an outward lead distance of more than 3m.

Fault enquiry operations:

The soft starter can record 12 fault logs for easy viewing, in the "Ready" state, press shift key to enter the fault record menu. Check the fault logs by UP key or DOWN key. If you want to exit fault record menu, please press shift key to exit the menu.



3.2 Description of Function Parameters

F00	Soft Starter Rated Current
	Description: The default value of the parameter depends on the model, this parameter is read only and can not be modified.
F01	Soft Starter Rated Voltage
	Description: The default value of the parameter depends on the model, this parameter is read only and can not be modified.
F02	Motor Rated Current
	Description: The default value of the parameter depends on the model. Match the starter to the rated current of the connected motor. Set the rated current is depend on the motor nameplate
F03	Control Mode
	Range: 0~7 (Default: 3) Option: 0: Disable 1: Keypad 2: Terminal 3: Key+Term (Both keypad control and terminal control are valid) 4: Communication 5: Key+Comm (Both keypad control and communication control are valid) 6: Term+Comm (Both terminal control and communication control are valid) 7: Key+Term+Comm (Keypad control, terminal control, communication control all valid)
F04	Start Mode
	Range: 0~2 (Default: 0) Option: 0: Voltage Ramp 1: Current Limit 2: Torque Start Select soft starter start mode.
F05	CLS Current Limited
	Range: 50%~600% (Default: 300%) Description: Set the current limit value for current-limited starting, as a percentage of motor rated current.
F06	Initial Start Voltage
	Range: 30%~80% (Default: 35%) Description: Set initial start voltage for Voltage ramp starting.
F07	VRS Start Time
	Range: 1s~120s (Default: 15s) Description: Set start time for voltage ramp starting(Invalid for current limit starting)
F08	Stay Voltage
	Range: 60%~85% (Default: 65%) Description: Set stay voltage, valid for torque starting.
F09	Initial Ramp Time
	Range: 1s~10s (Default: 5s) Description: Set initial acceleration time, valid for torque starting.
F10	Stay Time
	Range: 1s~120s (Default: 10s)

Description: Set F08 hold time, valid for torque starting.

F11 End Ramp Time

Range: 1s~10s (Default: 3s)

Description: Set end acceleration time, valid for torque starting.

F12 Soft Stop Time

Range: 0s~60s (Default: 0s)

Description: Set the time required to soft stop the motor, if the value is "0", the motor will free stop.

Note: One soft starter for 2 motor, this code should set "0".

F13 Programmable Relay

Range: 0~7 (Default: 7)

Option: 0: Disable
1: Power on
2: Starting
3: Bypass
4: Stopping
5: Running
6: StandBy(Ready)
7: Fault

Select programmable relay output method.

F14 Programmable Delay Time

Range: 0~600s (Default: 0s)

Description: Set the programmable output relay closed delay time.

F15 4-20 mA Current Limit

Range: 50%~500% (Default: 200%)

Description: Set analog current upper limit.

F16 Motor Wiring Mode

Range: 0~1 (Default: 0)

Option: 0: Line Mode
1: Delta Mode

Select motor wiring mode.

F17 Modbus Address

Range: 1~127 (Default: 1)

Description: Set soft starter communication address.

F18 Modbus Baud rate

Range: 0~3 (Default: 2)

Option: 0:2400
1:4800
2:9600
3:19200

F19 Running Over Load(OL) Class

Range: 1~30 (Default: 10)

Description: Set different levels of overload protection。

The overload protection adopts anti-time protection control, and the formula as below:

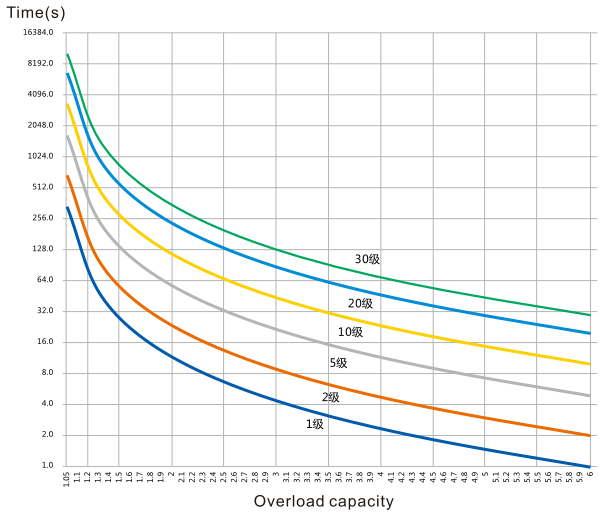
$$\text{Protection time } t = \frac{35 * Tp}{(I/Ip)2 - 1}$$

Note: t means action time, Tp means running OL class, I means running current， Ip means motor rated current.

The table of motor overload protection characteristics is as follows:

Overload Class	Overload capacity							
	1.05Ie	1.2Ie	1.5Ie	2Ie	3Ie	4Ie	5Ie	6Ie
1	∞	79.5s	28s	11.7s	4.4s	2.3s	1.5s	1s
2	∞	159s	56s	23.3s	8.8s	4.7s	2.9s	2s
5	∞	398s	140s	58.3s	22s	11.7s	7.3s	5s
10	∞	795.5s	280s	117s	43.8s	23.3s	14.6s	10s
20	∞	1591s	560s	233s	87.5s	46.7s	29.2s	20s
30	∞	2386s	840s	350s	131s	70s	43.8s	30s

Note: ∞ means no action.



Motor overload protection characteristic curve diagram

F20 Starting Over Current(OC) P.C.

Range: 50%-600% (Default: 500%)

Description: Set the multiple of overcurrent for soft starter starting.

F21 Starting Over Current(OC) Time

Range: 0s-120s (Default: 5s)

Description: Set the overcurrent protection trigger delay time when the soft starter starting.

F22 Running Over Current(OC) P.C.

Range: 50%-600% (Default: 200%)

Description: Set the multiple of overcurrent for soft starter running.

F23 Running Over Current(OC) Time

Range: 0s-6000s (Default: 5s)

Description: Set the overcurrent protection trigger delay time when the soft starter running.

F24 Over Voltage P.C.

Range: 100%~140% (Default: 120%)

Description: Set the multiple of overvoltage for soft starter.

F25 Over Voltage Time

Range: 0s~120s (Default: 5s)

Description: Set soft starter overvoltage protection trigger delay time.

F26 Under Voltage P.C.

Range: 50%-100% (Default: 80%)

Description: Set the multiple of undervoltage for soft starter.

F27 Under Voltage Time

Range: 0s~120s (Default: 5s)

Description: Set soft starter undervoltage protection trigger delay time.

F28 Current Unbalance P.C.

Range: 20%~100% (Default: 40%)

Description: Parameter setting for current three-phase unbalance.

F29 Current Unbalance Time

Range: 0s~120s (Default: 10s)

Description: Set soft starter three phase current unbalance protection trigger delay time.

F30 Under Load P.C.

Range: 10%~100% (Default: 50%)

Description: Set the multiple of under load for soft starter.

F31 Under Load Time

Range: 1s~120s (Default: 10s)

Description: Set soft starter under load protection trigger delay time.

F32 Phase Sequence

Range: 0~2 (Default: 0)

Option: 0: Any

1: Positive

2: Negative

F33 IA Calibration

Range: 10%~1000% (Default: 100%)

Description: Calibration of the soft starter's current monitoring circuit to match the external current measuring device.

The formula is as follows:

Calibration (%) = Current measured by an external device / Current displayed on the soft starter

For example: 102%=102A/100A

Note: This adjustment value affects all current-based functions and protections.

F34 IB Calibration

Range: 10%~1000% (Default: 100%)

Description: The function same as parameter F33.

F35 IC Calibration

Range: 10%~1000% (Default: 100%)

Description: The function same as parameter F33.

F36 Voltage Calibration

Range: 10%~1000% (Default: 100%)

Description: Calibration of the soft starter's voltage monitoring circuit to match the external voltage measuring device.

The formula is as follows:

Calibration (%) = Voltage measured by an external device / Voltage displayed on the soft starter

For example: 95%=380V/400V

F37 4-20mA Lower Calibration

Range: 0%~150.0% (Default: 20.0%)

Description: Analog output lower setting, default 4mA.

F38 4-20mA Upper Calibration

Range: 0%~150.0% (Default: 100.0%)

Description: Analog output upper setting, default 20mA.

F39 Running Over Load(OL)

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F40 Starting Over Current(OC)

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F41 Running Over Current(OC)

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F42 Over Voltage

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F43 Under Voltage

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F44 Current Unbalance

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F45 Under Load

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F46 Over Heat

Range: 0~1 (Default: 0)

Option: 0: Alarm & Stop

1: Ignore (The protection function is disabled)

F47 Language

Range: 0~1 (Default: 1)

Option: 0:English

1:中文

Select the language in which messages and feedback are displayed on the keypad.

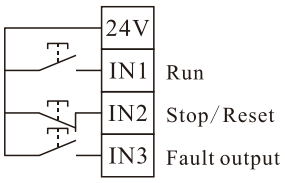
F48 MB Soft Version

Description: Displays the master board software version information. This parameter is read only and cannot be modified.

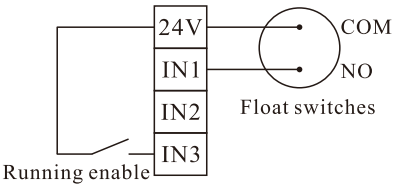
F49 Pump Functions

Range: 0~4 (Default: 0)

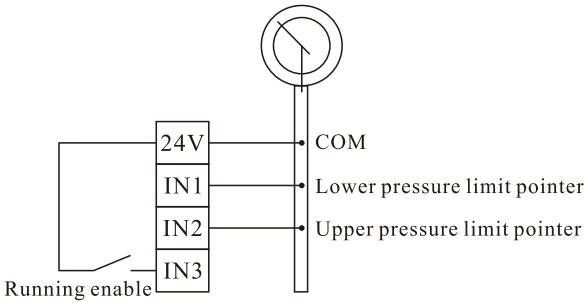
Option: 0: None (Soft starter standard functions)



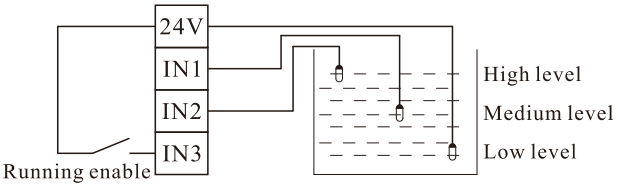
1: Float Ball (IN1 on: start; IN1 off: stop)



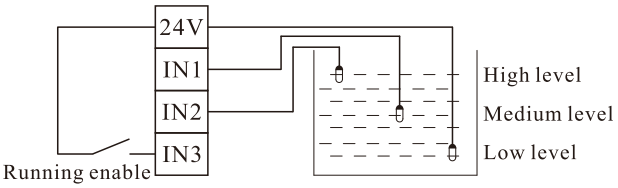
2: Electrical Pressure Gauge (IN1 on: start; IN2 on: stop)



3: Level relay Supply（IN1 off and IN2 off: start；IN1 on and IN2 on: stop）



4: Level relay Drain（IN1 off and IN2 off: stop；IN1 on and IN2 on: start）



Note:

When F49 = 0, the IN3 function is fault output.

When F49 = 1 to 4, the IN3 function is running enable, it must be on to perform the above operation.

F50 Display Soft Version

Description: Displays software version information. This parameter is read only and cannot be modified.

3.3 Fault Diagnosis and Solution

The soft start writes the protection condition into the program when it is detected and it may trip. The soft start response depends on the protection level.

Some of these protection responses cannot be adjusted by the user. These trips are usually caused by external events (e.g. phase loss) or may be caused by internal soft start faults. There are no parameters associated with these trips and they cannot be set to ignored.

If the soft start trips, you will need to identify and clear the conditions that triggered the trip and reset the soft start before it can be restarted. To reset the starter, press the (stop/reset) key on the keypad or activate the "stop/reset remote input".

The following table shows the protection mechanisms and possible causes of tripping of the soft start. Some of the settings can be adjusted using the protection level, while others are built-in system protections and cannot be set or adjusted.

Fault Name	Possible causes and solutions
Input phase loss	1. When the start command is issued, soft starter one phase or multiple phases are not powered. Check whether the main circuit is powered or whether the SCR or thyristor is damaged and whether the signal cable has poor contact. 2. Main board is faulty. Related parameters: No parameter adjustment.
Output phase loss	1. Check whether the SCR or thyristor is damaged. 2. Motor cable has one phase or multiple phases open circuit. Please check whether the motor cable is open circuit. 3. Main board is faulty.。 Related parameters: No parameter adjustment.
Running OL	1.The load is too heavy. Please replace the soft start with a more powerful one. 2. The parameters are not set correctly. Please adjust the parameters. Related parameters: F19, F39
Under Load	1.The load is too small. 2. The parameters are not set correctly. Please adjust the parameters. Related parameters: F30, F31, F45
Over Heat	1. Please check whether the temperature switch is faulty. 2. Fan not turning, please check whether the fan is working properly. 3. The soft start has been working for too long, stop the machine and let the soft start cool down. Related parameters: F46
Over Volt	1. Input voltage is too high, please check the power supply voltage. 2. The parameters are not set correctly. Please adjust the parameters. Related parameters: F24，F25，F42
Over Load	1. Input voltage is too low, please check the power supply voltage. 2. The parameters are not set correctly. Please adjust the parameters. Related parameters: F26，F27，F43
Running OC	1.The load is too heavy. Please replace the soft start with a more powerful one. 2. The parameters are not set correctly. Please adjust the parameters. Related parameters: F22，F23，F41
Starting OC	1.The load is too heavy. Please replace the soft start with a more powerful one.

Fault Name	Possible causes and solutions
	2. The parameters are not set correctly. Please adjust the parameters. Related parameters: F20，F21，F40
External Fault	1. External fault terminal has input. Please check external input terminal. Related parameters: No parameter adjustment.
Phase Sequence	1. The input power phase sequence is not the same as the setting, please change the power phase sequence or adjust the parameters. Related parameters: F32

4. Test Run and Application

Please do some examinations before test running as following:

- Whether the rated power of soft starter is matched with the Motor.
- Whether the insulation of motor meets requirement.
- Whether the main circuit connection of input and output is correct.
- Whether all the screws of terminals are twisted tightly.

4.1 Power on to Test Running

- The "Ready" state is displayed when power on, press RUN Running key to start the motor.
- Set **F02** be same as motor nameplate rated current.
- After started the motor, you should examine whether the motor running direction is correct, or whether runs normally. If not, you can press STOP RESET key or cut off the power to stop running.
- If the soft starter starting state is not satisfied, please select the appropriate starting mode and starting time.
- If the start torque is not enough, you can change start mode to torque start to improve start torque.
- Do not open the face cover in case of electric shock.
- If abnormal phenomena such as abnormal sound, smoke or odour are found during the trial operation of the soft starter, the power supply should be cut off at once and the cause investigated.
- If the Trip light on after power-up or at start-up, you can check chapter 3.3 to find out reason.
- Press STOP RESET key or external stop button can reset the error state.

Note: When ambient temperature is less than -10ºC, the starter should be power on to preheat for 30 minutes, and then to start.

5.2 Special Application

- **In parallel the starting of the motors:** If the motors total power is less than 80% of soft starter, the motors can be parallel connection. But at this time should be also provides for each motor thermal protection device.
- **Double speed motor:** Motor soft starter can cooperate with double speed motor starting, must go through demagnetization delay period before change from low speed to high speed, to avoid anti-phase current generated between the lines and motor.
- **Too long cable:** f the cable is too long, the cable voltage drop will be high, and that will increase current loss and reduce starting torque, so please use big KW soft starter and motor.
- **Soft starter parallel connected with one power-line:** If several soft starters parallel installed in the one power line, the input line reactor should be installed in the middle of the transformer and the soft starter circuit. Reactor should be installed at each line input side between circuit breaker and soft starter.
- **The application of surge protection device (SPD):** The surge protection device should be considered to installed in the application case, where is easily caused trouble by lightning or other reasons, such as over voltage, over-current, surge interference. Please refer to SPD related documents for details.

5. Online Soft Starter Cabinet

EM-GU3I series online soft starter cabinet is suitable for squirrel cage asynchronous motor control with various loads to ensure reliable start of motor. It has a complete system protection function, extend the service life of the system, reduces the cost of the system, improves the reliability of the system and compatible with various functions of all devices. It is a new ideal alternative for traditional star triangle starter and self-coupling decompression starter.

5.1 Product Function

- Effectively reduce the starting current of the motor; Can reduce the distribution capacity, avoid grid expansion investment.
- Reduce the starting stress of motor and load equipment; Prolong the service life of the motor and related equipment.
- Soft stopping function can effectively solve the parking surge problem of inertial systems; That is a traditional starting equipment cannot be achieved.
- With six unique starting mode; To adapt to the complex motor and load, achieve perfect priming effect.
- With complete and reliable protection function; effectively protect the safety of motor and related production equipment.
- Intelligent motor soft starter, the application of network technology used motor control technology to adapt to the rapid development of electric power automation technology in the higher requirements.

Conditions of Use:

- **Power Supply:** City grid power, self-provided power, diesel oil dynamotor, 3-phase alternating current 380V±15%, 50Hz or 60Hz. The power capacity of the soft start must meet the motor starting requirement.
- **Matched Motor:** Motor should be three phase squirrel asynchronous motor, and its power capacity must be matched with soft starters.
- **Starting Frequency:** The starting time is according to the loading equipment.
- **Cooling Mode:** Naturally wind cooling.
- **Protective Grade: IP20**
- **Environment Conditions:** when altitude is less than 2000m, the temperature of the environment should be between -10ºC ~ 40 ºC, relative humidity should be less than 90% RH, no vapor, no flammable, volatile, corrosive gas. No electric dirt, indoor installation, ventilated, vibration is less 0.5G.

5.2 Products Structure and Installation

Installation:

The installation adopts floor vertical installation, which can be installed on the trench slot, the cabinet body is exposed, and the power cable and control cable are introduced into the control cabinet by the trench. The cabinet body is made of angle steel frame and painted, and the door is opened from the front of the control cabinet

Model	Rate Power	Rated Current	External Dimension(mm)		
	(KW)	(A)	W	H	(KW)
EM-GU3I-011	11	23	312	681	320
EM-GU3I-015	15	30			
EM-GU3I-018	18.5	37			
EM-GU3I-022	22	45			
EM-GU3I-030	30	60			
EM-GU3I-037	37	75			
EM-GU3I-045	45	90			
EM-GU3I-055	55	110			
EM-GU3I-075	75	150			
EM-GU3I-090	90	180	350	950	400
EM-GU3I-115	115	230			
EM-GU3I-132	132	260	400	1130	400
EM-GU3I-160	160	320			
EM-GU3I-200	200	400			
EM-GU3I-250	250	500	600	1350	470
EM-GU3I-280	280	560			
EM-GU3I-315	315	630			

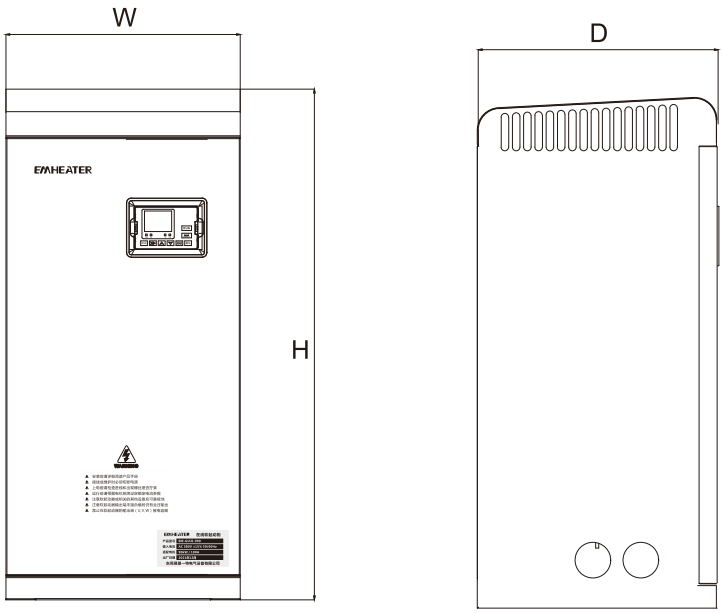


Diagram 6.1

5.3 Operation and Notice

Operation:

- Please read the manual, operation and notice carefully before using
- When power is on, you need open the front door of the cabinet, close the circuit breaker.

- Check the wiring and motor before starting the motor.
- After confirmation, press the RUN running key, and the motor starts to run.
- When the STOP RESET Stop/Reset key is pressed, the motor will stop freely (If the soft stop time is set, then soft stop).

Parameters setting:

The parameter settings are consistent with the online soft starter parameters, please refer to chapter 3.2.

Note:

- The main power circuit breaker must be closed before the online soft starting cabinet works.
- When the online soft starter cabinet is power on or operation, the trip light is on, it indicates that the online soft starter cabinet or load has a fault, it should stop and check, and restart after troubleshooting by the professionals.

6. Modbus Communication Protocol

6.1 About Modbus RTU protocol

series soft start provides RS485 communication interface and supports Modbus-RTU slave communication protocol, users can achieve centralized control through the computer or PLC.

Electrical interface: RS485 Half-Duplex Mode

Communication parameter: Baud rate:9600, 8 bits, No parity bit, 1 stop bit.

Communication data format:

Data format	Address	Function Code	Data Area	CRC Verify
Length of the Data	1 byte	1 byte	N bytes	2 bytes

6.2 Bus Structure

6.2.1 Support Code

Soft starter only supports following code, if other codes were used, there will feedback messy code 01.

Code	**03**	**06**
Function description	Read register	Write in one register

代码03 只能用单字（WORD）读取

6.2.2 Address Definition

Addresses corresponding to parameters:

Parameter Code	**Address**
F00~F50	0x0000~0x0032

Control command input:

Address	**Command function**
0x0196	0001: Start 0002: Reserved 0003: Stop 0004: Fault reset

Read soft starter state:

Address	**Command function**
0x0050	0000: Ready state 0001: Starting state 0002: Running state 0003: Stopping state 0005: Fault state

Read soft starter fault state:

Address	**Name**	**Soft starter fault information**	
0x0051	Current fault record	0: No fault	8A: Over heat
0x012C	1st fault record	80: No fault	8B: Over voltage
0x012D	2nd fault record	81: Input phase failure	8C: Under voltage
0x012E	3rd fault record	82: Input phase failure	8D: Reserved
0x012F	4th fault record	83: Output phase failure	8E: Reserved
0x0130	5th fault record	84: Output phase failure	8F: Reserved

0x0131	6th fault record	85: Running over load 86: Starting over load 87: Under load 88: Over current 89: Current Unbalance	90: Running over current 91: Starting over current 99: Phase Sequence failure 9A: Reserved 9B: Reserved
0x0132	7th fault record		
0x0133	8th fault record		
0x0134	9th fault record		
0x0135	10th fault record		
0x0136	11th fault record		
0x0137	12th fault record		

Read other state:

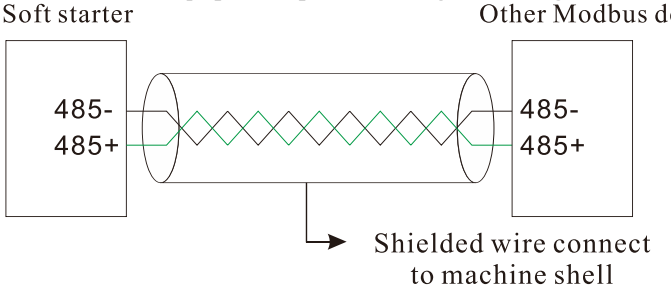
Command address	Name
0x0052	Output current
0x0053	Input current
0x0054	A phase current
0x0055	B phase current
0x0056	C phase current
0x0057	Percentage of starts completed
0x0058	Current unbalance P.C.
0x005D	Input terminal state(1:On，0:Off) Bit0 IN1 Start Bit1 IN2 Stop Bit2 IN3 Fault

6.3 Abnormal Feedback

Code	Name	Explanation
01	Illegal function	Soft starter does not support this function code
02	Illegal data address	Illegal address, can not implement
03	Illegal data value	Can not implement received value 1. Parameter out of range 2. Parameter can not revise 3. Parameter can not revise during running

Remarks

- The communication address, communication rate and check mode of the soft starter must be the same as the communication settings of the controller.
- If no response data is received, check that the above parameters are set and that the terminal connections are correct.
- When communicating with multiple soft starters, a 120 ohm resistor should be connected to the R485+ and 485- terminals of the last soft starter.
- Connect with MODBUS of other equipment, please wiring according to following diagram:



Appendix I Function Code Table

Note: Parameters with "*" are read-only parameters and cannot be changed.

Code	Parameter Name	Functional description	Default
*F00	Soft Starter Rated Current	-	Model dependent
*F01	Soft Starter Rated Voltage	-	Model dependent
F02	Mot Rated Current	-	Model dependent
F03	Control Mode	0: Disable 1: Keypad 2: Terminal 3: Key+Term 4: Communication 5: Key+Comm 6: Term+Comm 7: Key+Term+Comm	3
F04	Start Mode	0: Voltage Ramp 1: Current Limit 2: Torque Start	0
F05	CLS Current Limited	50%~600%	300%
F06	Initial Start Voltage	30%~80%	35%
F07	VRS Start Time	1s~120s	15s
F08	Stay Voltage	60%~85%	65%
F09	Initial Ramp Time	1s~10s	5s
F10	Stay Time	1s~120s	10s
F11	End Ramp Time	1s~10s	3s
F12	Soft Stop Time	0s~60s	0s
F13	Programmable Relay	0: Disable 1: Power on 2: Starting 3: Bypass 4: Stopping 5: Running 6: StandBy(Ready) 7: Fault	7
F14	Programmable Delay Time	0~600s	0s
F15	4-20 mA Current Limit	50%~500%	200%
F16	Motor Wiring Mode	0: Line Mode 1: Delta Mode	0
F17	Modbus Address	1~127	1
F18	Modbus Baud rate	0:2400 1:4800 2:9600 3:19200	2
F19	Running overload(OL) Class	1~30	10
F20	Starting Overcurrent(OC) P.C.	50%-600%	500%
F21	Starting Overcurrent(OC) Time	0s-120s	5s

Code	Parameter Name	Functional description	Default
F22	Running Overcurrent(OC) P.C.	50%-600%	200%
F23	Running Overcurrent(OC) Time	0s-6000s	5s
F24	Over Voltage P.C.	100%~140%	120%
F25	Over Voltage Time	0s~120s	5s
F26	Under Voltage P.C.	50%-100%	80%
F27	Under Voltage Time	0s~120s	5s
F28	Current Unbalance P.C.	20%~100%	40%
F29	Current Unbalance Time	0s~120s	10s
F30	Under Load P.C.	10%~100%	50%
F31	Under Load Time	1s~120s	10s
F32	Phase Sequence	0: Any 1: Positive 2: Negative	0
F33	IA Calibration	10%~1000%	100%
F34	IB Calibration	10%~1000%	100%
F35	IC Calibration	10%~1000%	100%
F36	Voltage Calibration	10%~1000%	100%
F37	4-20mA Lower Calibration	0%~150.0%	20.0%
F38	4-20mA Upper Calibration	0%~150.0%	100.0%
F39	Running Over Load(OL)	0: Alarm & Stop 1: Ignore	0
F40	Starting Over Current(OC)	0: Alarm & Stop 1: Ignore	0
F41	Running Over Current(OC)	0: Alarm & Stop 1: Ignore	0
F42	Over Voltage	0: Alarm & Stop 1: Ignore	0
F43	Under Voltage	0: Alarm & Stop 1: Ignore	0
F44	Current Unbalance	0: Alarm & Stop 1: Ignore	0
F45	Under Load	0: Alarm & Stop 1: Ignore	0
F46	Over Heat	0: Alarm & Stop 1: Ignore	0
F47	Language	0:English 1:中文	1
*F48	MB Soft Version	-	-
F49	Pump Functions	0:None 1: Float Ball 2: Electrical Pressure Gauge 3: Level relay Supply 4: Level relay Drain	0
*F50	Display Soft Version	-	-

EMHEATER

China EM Technology Limited

Address: No.80, Baomin 2 road, Xixiang, Bao'an District,Shenzhen ,China
Phone: 86-0755-29985851
Fax: 86-0755-29970305
Zip code: 518101
Website : Http://www.emheater.com