

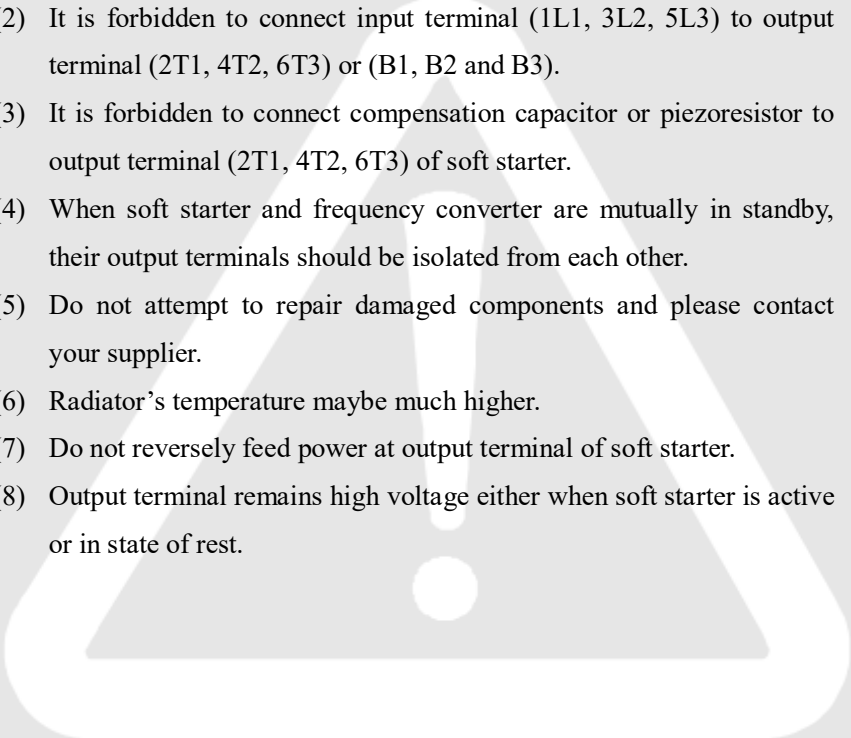


MR-H | Series Soft Starter

User's Manual

Shanghai Metallurgy General Electric Co. Ltd.

CAUTIONS

- (1) There is dangerous voltage when main circuit is energized.
 - (2) It is forbidden to connect input terminal (1L1, 3L2, 5L3) to output terminal (2T1, 4T2, 6T3) or (B1, B2 and B3).
 - (3) It is forbidden to connect compensation capacitor or piezoresistor to output terminal (2T1, 4T2, 6T3) of soft starter.
 - (4) When soft starter and frequency converter are mutually in standby, their output terminals should be isolated from each other.
 - (5) Do not attempt to repair damaged components and please contact your supplier.
 - (6) Radiator's temperature maybe much higher.
 - (7) Do not reversely feed power at output terminal of soft starter.
 - (8) Output terminal remains high voltage either when soft starter is active or in state of rest.
- 

Foreword

Thank you for choosing MR-H motor soft starter produced by Xi'an Spread Electric Co., Ltd. In order to make full use of this soft starter, please read through the User's Manual before starting operation. Please do operate this soft starter in accordance with the instructions for the purpose of ensuring the personal safety. When you have any problem to which the solution is not described in this manual, please contact our agents or dealers. We are always ready to provide perfect service for you.

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Chapter 1 Function and Characteristic

MR-H soft starter is a new intelligent asynchronous motor starting and protection device. It is a motor terminal control equipment that integrates start, display, protection, and data collection. With the fewer components, user can achieve more complex control functions. The Chinese and English interface display makes the operation much easier. As MR-H soft starter is inbuilt with a current transformer, the external one is not needed.

1.1 Functions

- Reduce the motor starting current, reduce the distribution capacity, and avoid capacity investment;
- Reduce the starting stress, extend the life of the motor and related equipment;
- Smooth start and soft stop avoid the surge problem and water hammer effect of traditional start-up equipment;
- A variety of starting mode and a wide range of current, voltage and other settings can adapt to a variety of load conditions;
- Perfect and reliable protective function protects motor and related equipment in a more effective manner.

1.2 Characteristics

Unique SCR triggering close-loop control algorithm

The unique SCR close-loop control is specially designed for standard load and heavy load. User can choose current-limit start or voltage ramp start according to load conditions so as to realize absolutely smooth start without torque oscillation.

Unique load application parameters

It is built-in ten kinds of load types for users to choose. It provides a unique start control curve for each type of load to make soft start match the load, so as to achieve the best start and stop.

Multiple start and stop modes

Voltage exponential curve start, voltage linear curve start, current exponential curve start, and current linear curve start. Programmable kick start torque and start current limit can be applied in each mode. According

to the different loads, you can choose the corresponding start curve to achieve the appropriate starting effect. The device is provided with a variety of stop modes including programmable soft stop, free stop, braking, and pump stop. Unique basic algorithm makes the motor start and stop accurately and smoothly.

Advanced communication function

Standard Modbus RTU communication. Optional Ethernet/GPRS communication module makes user's network connection control easier and improves the system's automation level and reliability.

Analog signal control

Users can input 4-20mA or 0-20mA standard signal, and conduct upper and lower limit setting of analog to achieve the start and stop control of motor and alarm. The data (pressure, temperature, flow, etc.) can also be transmitted via a soft starter. It is provided with 4-20mA or 0-20mA standard analog signal output function.

Fireproof material

The product of below 90KW is in plastic structure made with inflaming retarding ABS material; for the product of 90KW and above, the upper cover is in plastic structure and main frame is made of aluminium-zinc plate with features of heatproof and corrosion resistance.

Movable panel

The panel can be moved to equipment operating surface through machine interface for remote control.

Powerful anti-interference property

All external control signals are subject to optoelectronic isolation, and different anti-noise levels are set to adapt to the application in special industrial environments.

Dual parameter function

With two sets of basic parameters, it can control two motors with different power respectively.

Self-adaption of power frequency

Self-adaption of power frequency 50/60 makes user easy to use.

Dynamic fault memory

Up to 10 failures can be recorded, making it easy to find the cause of the malfunction.

Perfect protective function

It detects current and load parameters, having overcurrent, overload, underload, overheating, phase failure, short circuit, three-phase current imbalance, phase sequence detection, frequency error and other functions.

Friendly man-machine interface

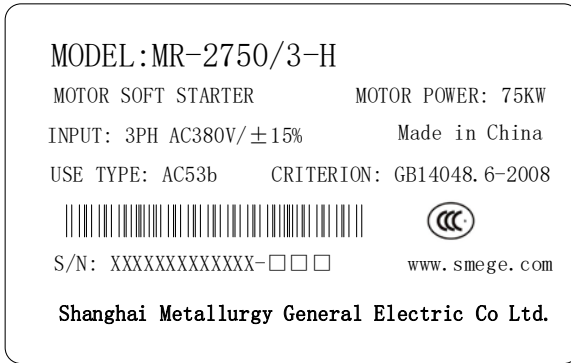
The use of LCD liquid crystal display panel, Chinese and English display interface makes programming and parameter adjustment more convenient.

Chapter 2 Goods Receiving and Inspection

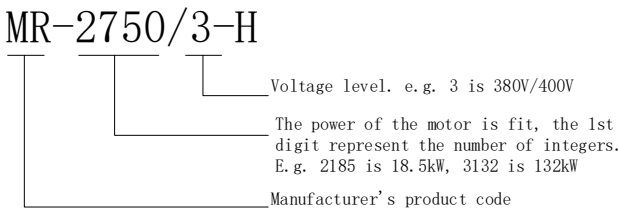
Each soft starter has been functionally tested for normal operation before delivery. After user receives the equipment, please carry out inspection as per the following procedures. For any problem found in inspection, please contact your supplier as soon as possible.

1. Check nameplate to confirm that the equipment you receive is consistent with the one you ordered.

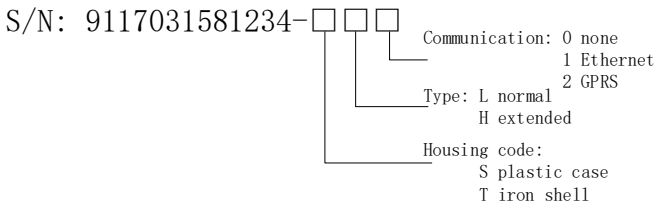
(1) Description of soft starter's nameplate



(2) Description of soft starter's model



(3) Description of soft starter's numbering



2. Check whether product is damaged during transport, such as housing sunken and deformed and inner wiring and connecting fittings are loose.
3. Check whether product certificate, warranty card, package list and user's manual are attached.
4. After delivered, the product's after-sale service shall be subject to warranty card. After receiving the product, please fill in warranty card and mail it back to Xi'an Spread Electric Co., Ltd. or your supplier.

Chapter 3 Service Conditions and Installation

3.1 Service conditions

Control power	AC110V--AC220V±15% 50/60Hz
Three-phase power	AC380V±15% Standard wiring AC380V, 660V, 1140V±15% Internal delta connection AC380V±15%
Nominal current	18A--1000A, 22 rated values in total
Applicable motor	Ordinary squirrel cage asynchronous motor
Starting mode	Voltage exponential curve, voltage linear curve, current exponential curve, current linear curve
Stop mode	Free stop, soft stop, brake, and pump stop
Logical input	Impedance 1.8 KΩ, power supply +24V
Start frequency	Frequent or infrequent start available, start is advised not to exceed 10 times each other
Protective function	Overcurrent, overload, underload, overheat, phase failure, three-phase current imbalance, phase sequence detection, overheat of motor and frequency error, etc.
Protection level	IP00, IP20
Cooling type	Natural cooling or forced air cooling
Installation type	Wall mounted
Environmental condition	When sea altitude is above 2,000m, soft starter should be derated for use. Ambient temperature: -25-+45°C Relative humidity: less than 95%(20°C±5°C) Free of flammable, explosive and corrosive gas or conductive dust. Good ventilation for indoor installation and vibration is less than 0.5G

3.2 Installation direction

To ensure that soft starter has good ventilation and heat dissipation conditions during operation, the soft starter should be vertically mounted.

3.3 Installation space

Leave enough space around the equipment for heat dissipation. For convenience of maintenance, please keep a certain distance between the equipment and wall (see attached table 3). To choose air blower, please log on our website www.xichi.cn to download air blower's size.

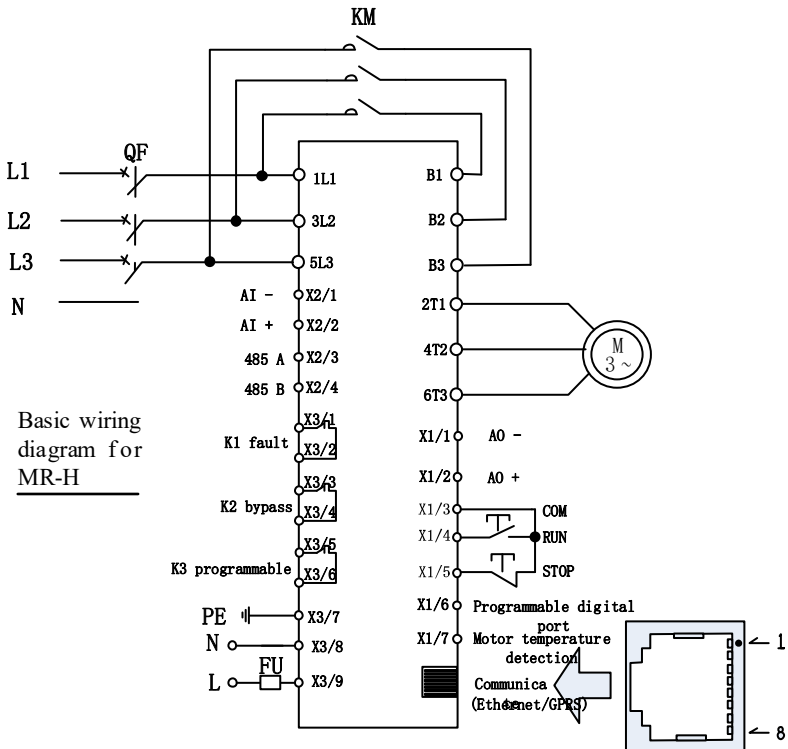
3.4 Circuit wiring

Main circuit uses up-in and down-out wiring and cable should be guaranteed to have enough current-carrying capacity. For selection of supportive fittings, please refer to attached table.

Chapter 4 Circuit Connection

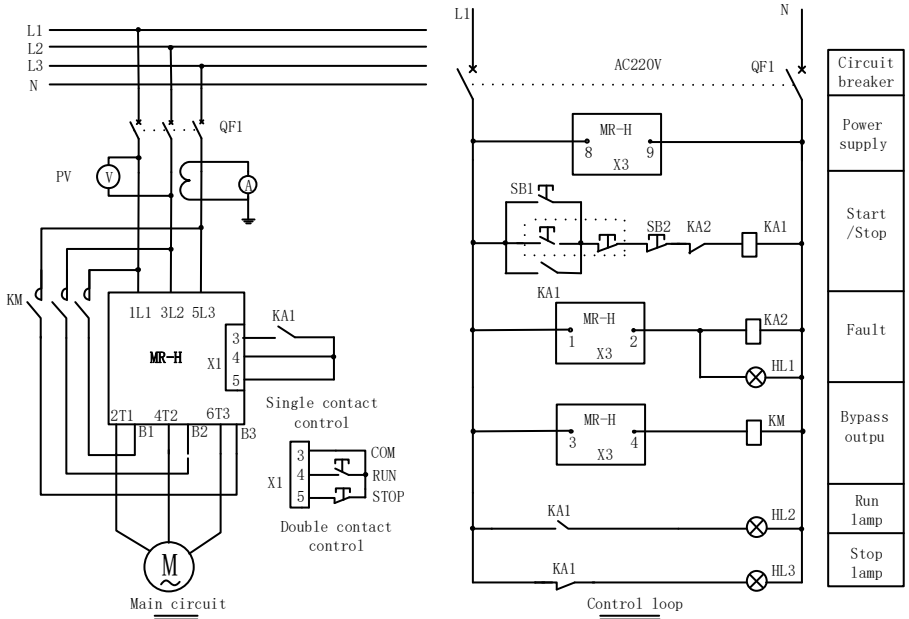
4.1 Basic wiring diagram

Soft starter's terminals 1L1, 3L2 and 5L3 are connected to three-phase power supply and terminals 2T1, 4T2 and 6T3 connected to electric motor. Soft starter's detection of phase sequence can be determined by parameter setting. When bypass contactor is used, one end of contactor is connected to terminals 1L1, 3L2, 5L3 of soft starter and the other end connected to terminals B1, B2, B3.



NOTE: Communication port is a functional interface using optical fiber crystal head connecting terminal. As is shown in the figure, pins 1-8 are arranged in order from up to down. For specific definition of terminal, please refer to definition of terminal.

4.2 Wiring diagram for typical application

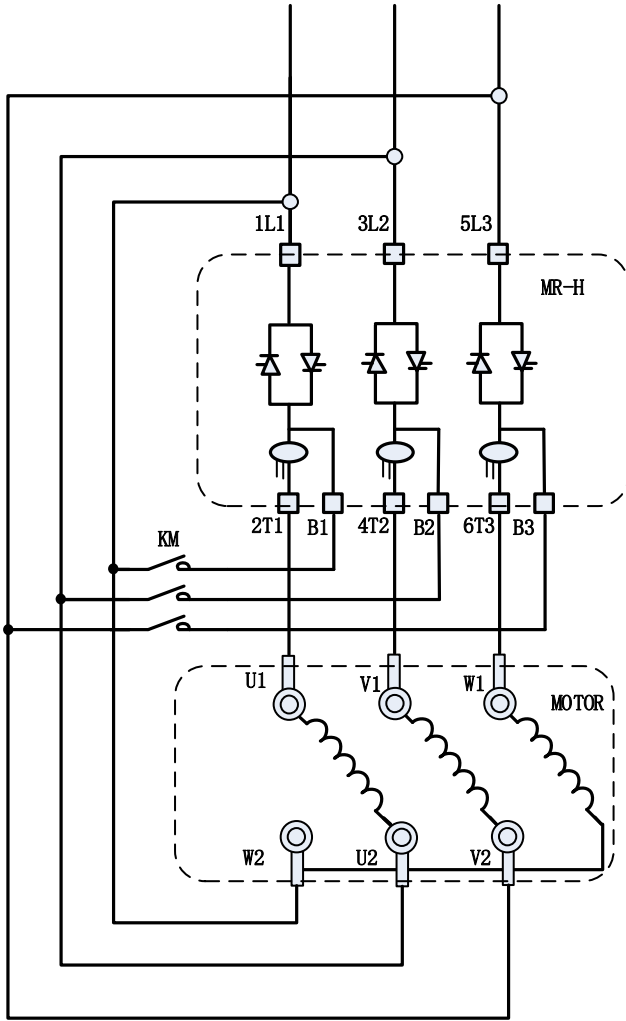


Notes:

1. The above diagram shows the single-node control mode. When contact closes, soft starter starts, otherwise, it stops. But it needs to be noted that LED panel's start is ineffective with this type of wiring. Terminals 3, 4 and 5 start and stop signal is a passive node.
2. PE grounding wire should be as short as possible. It should be connected to an earth connection point close to soft starter. The proper earth connection point should be on installation board and close to soft starter. Installation board should be grounded too. This earth connection is for function rather than protection.

4.3 Internal delta connection

When internal delta connection is adopted, please strictly follow the connection below.



Delta internal connection

4.4 Description of terminal

MR-H series soft starter has 20 external control terminals which help user realize external signal control, remote control and system control.

Terminal No.	Name of terminal	Description
Main circuit 1L1,3L2,5L3	AC power input terminal	Connected to three-phase AC power supply and bypass

				contactor
	2T1, 4T2, 6T3		Soft start output terminal	Connected to asynchronous motor
	B1、B2、B3		Bypass contactor terminal	Connected to bypass contactor
Control circuit	Analog output	X1/1	Analog current output -(AO-)	Set via parameter C04 and C05
		X1/2	Analog current output +(AO+)	
	Digital input	X1/3	COM	COM
		X1/4	Externally-controlled start terminal (RUN)	Start when X1/4 and X1/3 are short circuited
		X1/5	Externally-controlled stop terminal (STOP)	Stop when X1/5 and X1/3 break
		X1/6	Programmable digital interface	Set via parameter C03
		X1/7	Motor's temp. detection (PTC)	Stop or start via parameter M22
	Analog input	X2/1	External signal ground (AGND)	Reference ground of external input current
		X2/2	Analog input (NI)	Set via parameter C04
	RS 485-A	X2/3	RS485 Comm. positive (485-A)	
	RS 485-B	X2/4	RS485 Comm. negative (485-B)	
	Relay output K1	X3/1	Fault output relay (K11, K12)	Effective in case of fault, K11-K12 close, contact capacitor AC250V/5A, DC30V/5A
		X3/2		
	Relay output K2	X3/3	Bypass output relay (K21, K22)	Effective in case of bypass, K21-K22 close, contact capacitor AC250V/5A,
		X3/4		

				DC30V/5A
	Relay output K3	X3/5	Programmable output relay (K31, K32)	K21-K22 close when output is available and contact capacity AC250V/5A, DC30V/5A
		X3/6		
	Control power	X3/7	PE	Grounding
		X3/8	Control power (220VAC)	AC110V--AC220V±15% 50/60Hz
		X3/9		
Comm. Port (optional)	GPRS interface	GND 1/2	Power ground	Terminal definition cooperates the basic wiring diagram for use
		A+ 3/4	Communication terminal	
		B- 5/6		
		24V 7/8	Power positive	
	Ethernet interface	Use standard crystal plug to connect network port of upper computer, MODBUS TCP/IP communication protocol		

Chapter 5 Instruction to Display and Operation

The man-machine interface is used for soft starter programming input and output settings, protection functions, warnings, bus communication, parameter setting, local control and display of soft starter status information.

5.1 Description of keys

The man-machine interface consists of three parts which are LED indicator lamp, LCD and keyboard. See Figure 5-1.

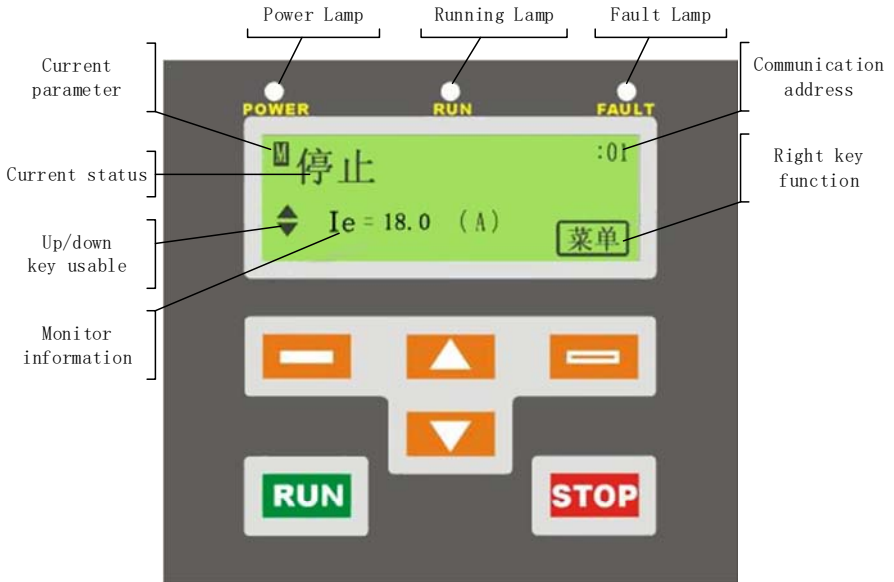








Fig. 5-1 Introduction to Panel

Note: Once the data is written, it will remain until the next modification, not subject to power failure.

Description of panel keys

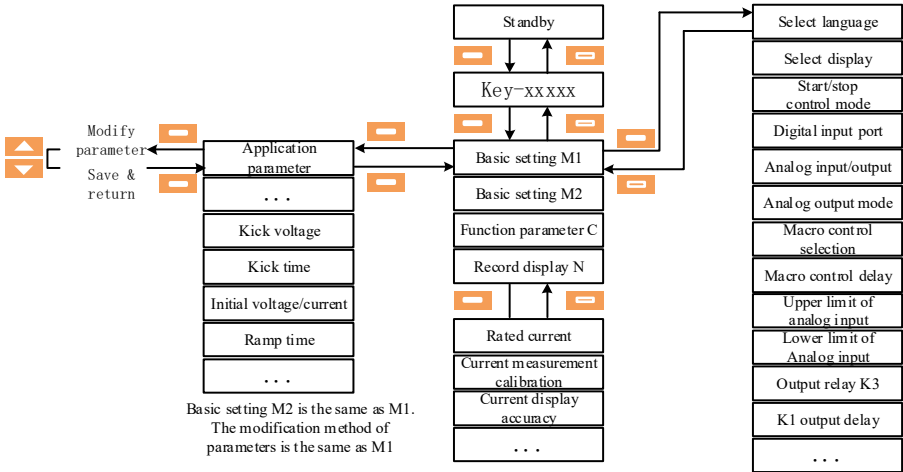
Symbol	Name	Functional description
	Left	Set parameters and save data. The button shown in the lower left corner of the LCD screen corresponds to the key

	Up	Add parameter value or data
	Down	Minus parameter value or data
	Right	Enter menu, exit menu or cancel selection. The button shown in the lower right corner of the LCD screen corresponds to the key.
	Run	Motor start, inching and macro start function, only the external terminal X1\3, X1\5 short and software enabled, the key can function
	Stop	Complete the stop function of the motor and stop mode is subject to software's parameter

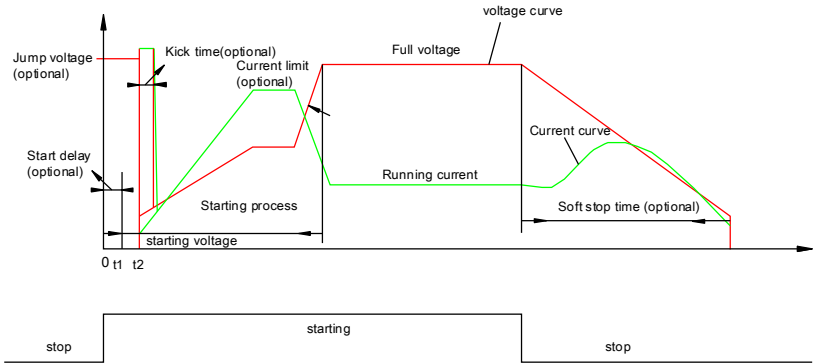
Description of information displayed on panel

Key	Function
Monitor information	Display the currently measured information. See functional parameter C01 for details
Up and down keys usable sign	With this sign, it is able to browse the real-time parameters by up and down keys
Current condition	It indicates the current condition of the motor
Current parameter	Display system is currently using the "M1" or "M2" parameters (the system has two sets of parameters available)
Power light	It goes on when the system control power is energized
Running light	It goes off in state of rest; it remains on in state of completing start; it flashes in other states
Fault light	When the system is in a protected or faulty state, the indicator is on; it goes off in the other states.
Communication address	Displays the machine's communication address, which is the address on the external terminal (X2- /4). It flashes when this terminal is used for communication.
Right key	Display the current function of the "right key" of keyboard

5.2 Flow of modifying parameters



Chapter 6 Control Mode of Soft Starter



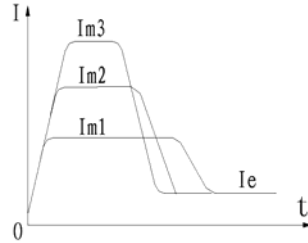
Characteristic curve of soft start/stop voltage (current)

The MR-H soft starter has a variety of starting modes: voltage linear curve start, voltage exponential curve start, current linear curve start, current exponential curve start; a variety of stop modes: free stop, soft stop,

braking, as well as inching function. Users can choose different starting and stop modes according to the different load and the specific use conditions.

6.1 Current ramp start

When current ramp starting mode is used, after soft starter receives command to start, its output current will increase as per the given curve until output current reaches limit value I_m of the given current, and output current will no longer increase. After electric motor runs and accelerates for a period of time, current starts to decrease and output voltage rapidly increases until total voltage output and start finishes.

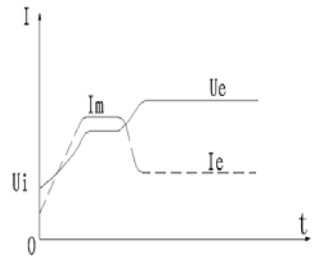


Parameter	Description	Range	Set value	Factory value
1M05	Ramp time	0~120S	---	10
1M06	Current-limiting times	100~500%Ie	---	350%

NOTE: “---” means that user can set value according to the need (the same below).

6.2 Voltage exponential curve

The output voltage increases according to the exponential characteristic within the preset ramp time, and in the mean time output current rises at a certain rate. When the starting current increases to the limit value I_m , the current remains constant until the start finishes. The ramp time and current limit times need to be set when this mode is used.

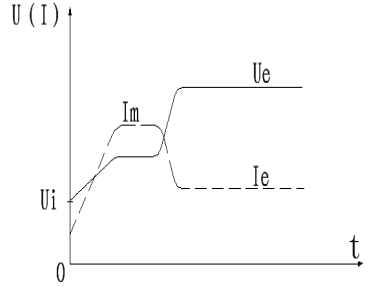


Parameter	Description	Range	Set value	Factory default
1M01	Starting mode	0~3	0	0
1M04	Initial	25~100%Ue\25~100%Ie	---	30%

	voltage/current			
1M05	Ramp time	0~120S	---	10
1M06	Current limit times	100~500%Ie	---	350%

6.3 Voltage linear curve

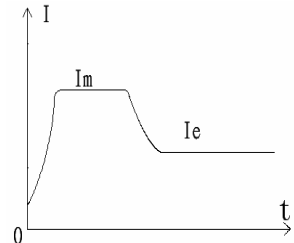
Output voltage increases according to linear characteristic within the preset ramp time and in the mean time output current rises at a certain rate. When the start current increases to the limit value I_m , the current remains constant until the start finishes.



Parameter	Description	Range	Set value	Factory default
1M01	Starting mode	0~3	1	0
1M04	Initial voltage/current	25~100%Ue\25~100%Ie	---	30%
1M05	Ramp time	0~120S	---	10
1M06	Current limit times	100~500%Ie	---	350%

6.4 Current exponential curve

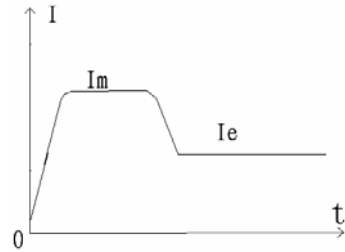
Output current increases according to exponential characteristic within the preset ramp time. When the start current increases to the limit value I_m , the current remains constant until the start finishes. The ramp time and current limit times need to be set when this mode is used.



Parameter	Description	Range	Set value	Factory default
1M01	Starting mode	0~3	2	0
1M04	Initial voltage/current	25 ~ 100%Ue\25 ~ 100%Ie	---	30%
1M05	Ramp time	0~120S	---	10
1M06	Current limit times	100~500%Ie	---	350%

6.5 Current linear curve

Output current increases according to linear characteristic within the preset ramp time. When the start current increases to the limit value I_m , the current remains constant until the start finishes. The ramp time and current limit times need to be set when this mode is used.



Parameter	Description	Range	Set value	Factory default
1M01	Starting mode	0~3	3	0
1M04	Initial voltage/current	25~100%Ue\25~100%Ie	---	30%
1M05	Ramp time	0~120S	---	10
1M06	Current-limit times	100~500%Ie	---	350%

6.6 Kick torque soft start

Kick torque soft starting mode is mainly used for loaded motor with large stiction by applying an instant greater start torque to overcome the great stiction torque. In this mode, output voltage rapidly reaches the preset kick voltage. After it reaches the preset kick time, it smoothly starts according to preset initial voltage and ramp time until start finishes.

Parameter	Description	Range	Set value	Factory default
1M04	Initial voltage\current	(25~100%)Ue\ (25~100%)Ie	---	30%
1M02	Step voltage	20~100%Ue	---	20%
1M03	Kick time	0~2000mS	---	0



Kick torque starting mode must be used together with other soft starting modes and it is required to set step voltage and kick time.

6.7 Free stop

Motor will stop freely when the stop mode (1M07) is set zero. After the soft starter receives the stop command, it first disconnects the control relay of bypass contactor and blocks the output of thyristor on main circuit consequently. The motor will stop freely by the load inertia.

Parameter	Description	Range	Set value	Factory default
1M07	Stop mode	0. Free stop 1. Soft stop 2. Pump stop 3. Braking	0	0
1M08	Stop time	0~120S	0	10

6.8 Soft stop/pump stop

When soft stop and pump stop are selected, stop in the full voltage state will be soft stop/pump stop. To stop in this mode, the soft starter will first disconnect the bypass contactor, the soft starter's output voltage gradually reduces to the preset soft stop voltage value within the preset soft stop time. After the soft stop finishes, the starter turns to braking state (braking time is not zero) or free stop.

Parameter	Description	Range	Set value	Factory default
1M07	Stop mode	0. Free stop 1. Soft stop 2. Pump stop 3. Braking	1、2	0

1M08	Stop time	0~120S	---	10
1M09	Stop voltage	20-80%Ue	---	30%

6.9 Braking

When the stop mode (1M07) is set to the value 3, it is for braking. The braking time (1M10) is not set to 0 and the braking time relay output is selected. When the soft starter stops freely, the braking time relay output signal remains active during the stop time. Use the K3 time relay output signal to control the external brake unit or the mechanical-brake electrical control unit.

Parameter	Description	Range	Set value	Factory value
1M07	Stop mode	0. Free stop 1. Soft stop 2. Pump stop 3. Braking	3	0
1M10	Braking time	0~250S	---	10
C10	Function of relay K3	0~6	4	3

Chapter 7 Parameters and Description

User may inquire or modify a parameter by scrolling through the main menu and four submenus which including all parameter settings. Chinese and English displaying languages are available for user to choose.

7.1 Primary parameters

MR-H has two different sets of basic parameters, which can respectively control two sets of motor of different powers. Basic setting M2 parameter is used to set the second set of basic functions. The parameter setting method is the same as the basic setting M1. The M2 parameter group is selected via the digital port D1 external control contact.

The function setting is valid in the stop state.

List of parameters

Parameter	Description	Range	Factory default
1M00	Application parameter	0. No application 1. Centrifugal pump 2. Hydraulic pump 3. Axial flow fan 4. Centrifugal fan 5. Belt conveyor 6. Compressor 7. Crusher 8. Mixer 9. Ball crusher 10. Propeller	0
1M01	Starting ramp mode	0. Voltage exponential curve 1. Voltage linear curve 2. Current exponential curve 3. Current linear curve	1
1M02	Step voltage	20~100%Ue	20%
1M03	Kick time	0~2000mS	0
1M04	Initial voltage\current	(25~100%)Ue\ (25~100%)Ie	30%
1M05	Ramp time	0~120S	10
1M06	Current-limit times	100~500%Ie	350%
1M07	Stop mode	0. Free stop 1. Soft stop 2. Pump stop 3. Braking	0
1M08	Stop time	0~120S	10
1M09	Stop final voltage	20~80%Ue	30%
1M10	Braking time	0~250S	10
1M11	Second run permit	0~60S	0
1M12	Second current- limit times	100%~500%	400%
1M13	Rated current of motor	15~9999	---
1M14	Overload protection	10A、10、15、20、25、30、Off	20

	class		
1M15	Current imbalance protection	0~100%	70%
1M16	Current imbalance delay	0~10S	2
1M17	Overcurrent protection during running	100~500%I _e	150%
1M18	Overcurrent protection delay	0~10S	2
1M19	Underload level	0~99%	0
1M20	Underload time	0~10S	2
1M21	Phase sequence detection	0. Stop 1. Start	0
1M22	Motor's temp. detection	0. Stop 1. Start	0
1M23	Motor's temp. time	0~10S	2
1M24	Start interval /min	0~60	0
1M25~29	Undefined	0~9999	0

Description of basic parameters

◆ **Start/stop control parameter 1M01---1M12 (for description of start control mode, go to Chapter 6)**

User may select the starting curve by parameter 1M01 to make the starting curve match the actual load so as to achieve the best starting effect. If the step voltage and step time are set, a momentarily large starting torque will be applied at the beginning of the start, and then it starts at the set starting voltage\current and ramp time. When the current limit times (1M06) is set to 500, it is started according to the preset curve and it does not enter the current limiting state. When a second start permit 1M11 is set, if the start does not finish yet after the time set for the second start, the second start will be enabled at the starting voltage, starting current and

ramp time. During the second start, the starting current is limited to the value of parameter 1M12. When 1M12 is set to 500%, the starting current during the second start is unrestricted.

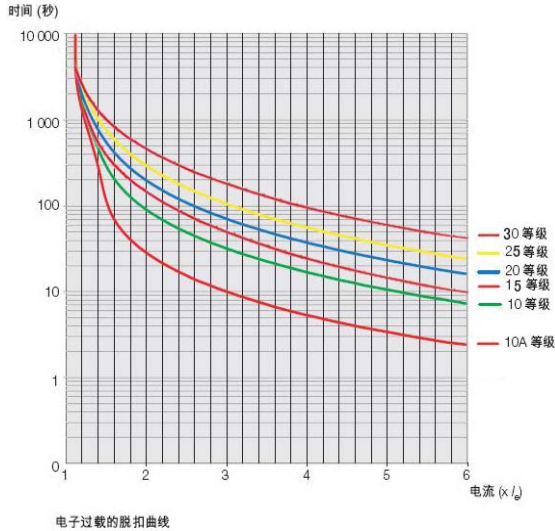
Note: When the starting mode is set the voltage ramp start, the parameter 1M04 represents the starting voltage; when the starting mode set the current ramp start, the parameter 1M04 represents the starting current. If there is a stop command made during motor starting, it can only be free stop; if there is a stop command made after the start finishes, it can be free stop, soft stop or braking.

Parameter 1M05 ramp time determines the time at which the starting torque is up to final torque. If ramp time is longer, smaller accelerating torque shall be generated in starting process of motor, in this way, the motor shall be subject to soft acceleration in longer time, thus, ramp time shall be properly selected to make motor able to be subject to soft acceleration till its rated speed is achieved. If acceleration time is over before completion of motor acceleration, the torque shall be limited to the set ultimate torque in specified time. Accordingly, the ramp time indicates rate of change of rotary speed, it is not completely equal to starting time of motor.

◆ **Protection parameter 1M13---1M24**

User can set the rated current of the 1M13 motor according to the motor power so that the soft starter matches the motor well to protect the motor. The soft starter will enable the overcurrent protection when the current during operation exceeds the overcurrent protection value set by parameter 1M17 and the duration exceeds the overcurrent operation time set by parameter 1M18. The soft starter will enable the overload protection when the load exceeds the electronic thermal overload rating and trip time set by parameter 1M14. The soft starter will also enable the underload protection according to the parameters 1M19 and 1M20. At the same time the soft starter also detects three-phase current and it will enable the phase current imbalance protection when the three-phase current exceeds the imbalance set by parameter 1M15, and the time reaches the value set by parameter 1M16. At the time of protection, the corresponding fault

information will be displayed for user to check. If the power phase sequence is not required during use, set parameter 1M21 to zero to turn off phase sequence detection; otherwise set it to 1 to turn on phase sequence detection.



Electronic thermal overload trip time curve

7.2 Functional parameters

List of parameters

Para.	Description	Range	Factory default
C00	Select language	0. Chinese 1. English	0
C01	Display selection	0. Motor's rated current (Ie) 1. Average current (Ip) 2. L1 phase current (Ia) 3. L2 phase current (Ib) 4. L3 phase current (Ic) 5. Analog input % (Ai) 6. Output voltage % (Uo) 7. Start countdown time (Ss)	1

		8. Brake countdown time (Bs) 9. Start remaining time (Ts)	
C02	Start/stop control mode	0. Keyboard control 1. 485 comm. control 2. Keyboard+485 permitted 3. Keyboard+485 forbidden 4. Keyboard inching Note: The above is valid only when terminal has two contacts	0
C03	Digital input port	0. M2 parameter selection 1. Fault clearing 2. Inching 3. Close contact macro control 4. Break contact macro control	1
C04	Analog input/output	0. 0~20mA input, output (positive logic) 1. 4~20mA input, output (positive logic) 2. 0 ~ 20mA input, 4~20mA output (positive logic) 3. 4~20mA input, 0~20mA output (positive logic) 4. 0~20mA input, output (negative logic) 5. 4~20mA input, output (negative logic) 6. 0~20mA input, 4~20mA output (negative logic) 7. 4~20mA input, 0~20mA output (negative logic)	1
C05	Analog output mode	0. Average current output 1(0~200Ie)% 1. Average current output 2(0~400Ie)%	0
C06	Macro control selection function	0. No macro control 2. Digital port contact's macro control 3. Analog input macro control	0
C07	Start delay	0~250S	0

C08	Analog input upper limit	0~100%	80
C09	Analog input lower limit	0~100%	20
C10	Output relay K3	0. Full voltage output 1. Start process output 2. Soft start process output 3. Output in case of failure 4. Output in braking 5. Running process output 6. Programmable delay output	3
C11	K1 output delay	0~250S	0
C12	K2 output delay	0~250S	0
C13	K3 output delay	0~250S	0
C14	Programmable timing stop time	0~999.9h (effective when running stop)	0
C15	Starting time limit	10~120S	80
C16	Motor's connection mode	0. External connection 1. Internal connection 2. Undefined (for internal connection, do not conduct connection judgment, start directly with internal connection)	0
C17	Communication address	1~32	1
C18	Baud rate	0. - (1200) 1. - (2400) 2. - (4800) 3. - (9600) 4. - (19200)	3
C19	Frequency selection	0. 50HZ 1. 60HZ 2. Self-adaption	0
C20	Password setting	0~9999	0
C21	Undefined parameter	0~9999	0
C22	External	0. Ethernet module	0

	communication module selection	1. GPRS	
C23	IP address	0.0.0.0~255.255.255.255	192.168.1.10
C24	Subnet mask	0.0.0.0~255.255.255.255	255.255.255.0
C25	Default gateway	0.0.0.0~255.255.255.255	192.168.1.1
C26	Analog output calibration coefficient	1~1000	500
C27	External communication control selection	0. Stop 1. Start	1
C28 ~ C36	Undefined	0~9999	0

Description of functional parameters

◆ Display and start/stop control parameters C00—C02

Users can select language by setting parameter C00 according to the actual needs. There are Chinese and English display interfaces. In the process of stopping and running, users can check the actual measurement (rated current I_e , average current I_p , L1 phase current, L2 phase current, L3 phase current, analog input A_i (%), output voltage U_o (%), start countdown time S_s , brake countdown time B_s , and start remaining time T_s by pressing \wedge / \vee keys, and also let the soft starter always display a certain measurement by setting parameter C01. Parameter C02 is used to select the soft starter's start/stop control mode. Provided that the communication is disabled, it is not possible to start or stop the soft starter via communication. In any of the start/stop control mode, users can conduct start/stop control via the terminal.

◆ C03 Digital port functional selection parameter C03

- M2 parameter selection: MR-H soft starter has two basic function parameters. Users can achieve the selection of the second basic function items by closing the digital port and the COM terminal (the digital port is set to M2 parameter selection). It is M1 basic parameters when it is disconnected.
- Fault clearing: If the start command remains after the fault is cleared, the soft starter starts again.
- Inching: The soft starter's inching function can help to achieve inching control through the keyboard control (set parameter C02 to the keyboard inching). After RUN key is pressed, the soft starter begins inching operation; when RUN key is released, the soft starter stops. The inching control can also be achieved through the digital port. When the digital port closes, the soft starter begins inching operation, otherwise, the soft starter stops.
- Emergency stop control input: When the digital port is set to emergency stop control input, the soft starter's emergency stop will be achieved by disconnecting the digital port and COM terminal and LCD panel shows the emergency stop display interface.
- Delay relay control input: When the digital port is set to the delay relay control input, the corresponding programmable relay output should be set to programmable delay output. When the digital port is closed, the corresponding relay will have output (relay output delay time expires).

Note: Closing the contact macro control and disconnecting the contact macro control relate to macro control function. See description of macro control function for details.

◆ Analog input/output selection parameters C04—C05

Users can choose the range and mode of the analog input/output according to the actual needs. Analog output in any state can transmit motor's current in accordance with settings of C04, C05.

◆ Macro control selection parameters C06—C09

Users can make the soft starter automatically start and stop through

the selection of macro (need to press the RUN key on the panel to open the macro). The parameter C06 is analyzed as follows:

- No macro control: The soft start's start\stop is not subject to macro and only relates to the setting of parameter C02 and control terminal.
- Digital port contact macro control: Control the starter's macro start/stop (after the start command is effective). According to the setting of parameter C03, set as close contact macro control: when the digital port is closed, and the delay time set by C07 runs out, the soft starter starts. If the digital port is disconnected in this process, the soft start stops, and it will display macro stop on the interface. Disconnect the contact macro control: when the digital port is disconnected and the delay time set by C07 runs out, the soft starter starts. If the digital port is closed in this process, the soft start stops, and it will display macro stop on the interface. It is able to start again by disconnecting the digital port.
- Analog input macro control: Use the analog port macro control function to set the analog input upper limit and lower limit according to the parameters C08, C09. When it is higher than the upper limit, the macro stop is enabled, when lower than the lower limit, the macro start is enabled. (Only when the start command is effective and the delay time set by C07 runs out. When macro conditions are not satisfied, the interface will show the macro stop).

◆ **Relay output parameters C12—C16**

MR-H soft starter is provided with three relays on the main control board, two of which are for fixed function output. K1 relay output is used to control the bypass contactor, K2 output is used as a fault signal, and the last one is a programmable control relay. Users can set the corresponding output according to the actual needs. Parameters C10, C11, C12, C13 are used to set the relay's output mode and delay.

- Full voltage output: When the soft starter's output voltage reaches the rated voltage, the output closes (the specified delay time runs out).
- Output in the process of start-up: The soft starter is in the start-up process, output closes (the specified the delay time runs out). In case of full voltage when the delay time does not run out, there is no output.

- Output in the process of soft stop: When the soft starter is in soft stop, it outputs. (the specified delay time runs out and its value must be less than the stop time set by parameter 1M08).
- Output in failure: Output closes when the soft starter detects fault (the specified delay time runs out)
- Output in braking: It outputs when the soft starter is braking (the specified delay time runs out and its value must be less than the stop time set by parameter 1M10)
- Output in running: It outputs in the whole process of start and running (the specified delay time runs out. The whole process includes start and stop)
- Programmable delay output: Parameter C03 must be set as delay relay control input, which is equivalent to a built-in delay relay.

◆ **Timing stop parameter C14**

When this parameter is to be set, the minimum setting is 0.1h, that is, when the soft starter is running, it stopped by the preset stopping mode after the specified time runs out (valid when using double contact wiring control mode).

◆ **Communication and password protection parameters C17—C18, C20**

In the Modbus RTU communication, it is allowed to connect 32 devices and check the current communication address through the LCD display. Parameter C20 is for the password setting to achieve the password protection.

◆ **C19 Frequency selection C19**

When power frequency is 50HZ, please set C19 to zero;

When power frequency is 60HZ, please set C19 to 1;

When automatic detection of power frequency is required, please set C19 to 2.

◆ **C16 Motor's connection mode**

When the motor is externally connected, please set parameter C16 to zero;

When the motor is internally connected, please set parameter C16 to 1. If the motor needs to be internally connected, please make connection as per

Chapter 4.3.

◆ **Communication control C22-C25, C27**

See Chapter 10 Communication for details.

◆ **C26 Analog output calibration C26**

In the shutdown state, enter the parameter C26 and adjust the value of C26 to make the analog output equal to 20mA ($\pm 5\%$).

Note: If you change the parameters when calibrating, the new value will take effect only after the parameters are saved.

7.3 Display record parameters

Parameter	Description	Range	Factory default
N00	Soft start rated current	Non-modifiable	---
N01	Current measurement calibration	Non-modifiable	---
N02	Current display accuracy	Non-modifiable	---
N03- N18	Undefined parameters	Non-modifiable	---
N19	Fault number record	Non-modifiable	---
N20-N29	Fault history	Non-modifiable	---



Displaying record parameter is to record the soft starter's work and status information. This function cannot be modified.

Chapter 8 Fault detection and Clearing**8.1 Fault code table**

MR-H soft starter is provided with 15 kinds of protection function. When the soft starter's protection function acts, the soft starter immediately shut down and LCD shows the current fault. User can analyze the fault according to the fault information.

Code	Fault	Cause	Clearing method
01	Phase loss of	Phase loss during start	Check three phase power supply to

	main power	or running	ensure it is reliable
02	Phase sequence error	Reverse phase sequence	Adjust phase sequence or set not to check phase sequence
03	Loss of parameter	Parameter setting is lost	Check functions and reset
04	Frequency failure	Power frequency goes beyond the range	Check three-phase input power frequency at input terminal
05	Overcurrent protection	Load increases suddenly or load fluctuation is too large	Adjust the load running condition or check whether 1M17 or 1M18 are less set
06	Frequent start	Start is too frequent	The start-up interval is less than the specified start interval 1M24
07	Phase current imbalance	Phase loss/phase voltage imbalance	Adjust load running condition Check whether the actual imbalance exceeds the preset current imbalance protection 1M15
08	Thyristor is overheated	Internal radiator is overheated. Poor ventilation	Check whether the fan works normally. Reduce the start frequency and check whether the control power voltage is too low.
09	Inner forbidden	Violation of operating procedures	Contact manufacturer immediately
10	Start timeout	Overloaded and ramp time is too short or current limiting range is too small	Check whether ramp time 1M05 is too short Check whether current limit times 1M06 is too small
12	Electronic thermal overload	High current lasts too long, whether it is overloaded	Check whether the motor current is set incorrectly and overloaded?
13	SCR abnormal	SCR works abnormally Phase loss of soft	Check whether SCR is damaged. Check whether the input and output of the soft starter loses

		starter output Internal connection error	phase
14	Motor connection failure	Motor connection is wrong	Check whether the motor connection
15	Underload protection	Motor's running current is lower than rated current	Check the cause of underload and make correction. Check whether the setting is based on running condition.

List of fault detection time

*Note: Tick in corresponding state which is detected

No	Fault	initializing	Stop state	Ready to start	Start process	Running process	Condition
01	Phase loss of main power			√	√	√	-
02	Phase sequence error			√			-
03	Loss of parameter	√					-
04	Overload protection					√	-
05	Overcurrent protection					√	-
06	Undercurrent protection					√	-
07	Phase current imbalance					√	-
08	Phase voltage				√	√	-

	imbalance protection						
09	SCR abnormal			√			
10	Start timeout protection				√		-
11	SCR overheated			√	√	√	-
12	Motor's temp. protection				√	√	-
13	Frequent start			√			-
14	Frequency failure			√			-

8.2 Fault records

MR-H soft starter can record up to 10 faults for later use by the user, and the N20-N29 is the last fault — the latest 10th fault.

8.3 Fault displaying

User may read fault records by pressing key \wedge when soft starter is in failure state. Code E0 represents the latest fault. User can read the latest three faults (E0, E1, E2) on LCD panel and read record history through displaying and recording parameter (N20-N29).

8.4 Fault clearing

As MR-H soft starter memorizes fault information, user, after fault is cleared, needs to reset fault record through reset key displayed on LCD or external fault clearing input digital port to make the soft starter restore to the state ready to start.

Chapter 9 Daily Maintenance

1. Dust: Too much dust is likely to reduce insulation level of soft starter and make soft starter unable to properly operate.

(1) Use clean and dry brush to brush over the dust.

(2) Use compressed air to blow dust away.

2. Dewing: Dewing is likely to reduce insulation level of soft starter and make soft starter unable to properly operate.

(1) Use an electric drier or electric heater to blow dry.

(2) Dehumidification of distribution room

3. Check the elements so as to confirm whether they are in good condition and whether they are able to properly operate.

4. Check the cooling channel of soft starter to prevent it from being blocked by dirt and dust.

Maintenance inspection shall be carried out after all powers on the side of the incoming line of soft starter are cut off!

Chapter 10 Communication

MR-H motor soft starter is equipped with RS485 communication port, adopting international standard Modbus communication protocol for master-slave communication. User may implement centralized control by PC/PLC and upper computer control to satisfy requirement of application in special condition. Ethernet/GPRS communication can be chosen to achieve Modbus TCP/IP communication/wireless network communication.

10.1 Modbus communication

1. Protocol

Modbus serial communication protocol defines frame content and slave response frame format of asynchronous transmission in serial communication, frame content of master includes: slave address, command of execution, data and error checkout etc. slave response also adopts the same architecture, including: operational qualification, returning data and error checkout. If slave has an error in receiving frames or fails to complete task required by master, it shall organize an error frame as response and feedback to master.

2. Bus structure

(1) Interface mode

RS485 hardware interface

(2) Transmission mode

Asynchronous serial, half-duplex transmission mode: at the same time, one sends data while the other receives data for master and slave machines. Data in serial asynchronous communication shall be transmitted in the form of message frame by frames.

(3) Topological structure

Single-master multi-slave system: Setting range of slave address is from 1 to 32, every slave in network has unique address, which shall be the base for ModBus serial communication.

3. Description of protocol

Communication protocol for MR-H soft starter is asynchronous

serial master-slave ModBus communication protocol. There is only one device able to set up protocol in network. The other devices shall only respond to “Inquiry/order” of master by data or function by “Inquiry/order” of master. Master means personal computer (PC), industrial control equipment or programmable logical control (PLC). Slave means MR-H soft starter or other control equipment having the same communication protocol.

4. Communication frame structure

Data format of ModBus protocol for MR-LX soft starter is RTU (Remote terminal unit) mode. Each byte in RTU mode is as follows:

Coding system: 8-digit binary system, hexadecimal system 0—9 and A—F, each 8-digit frame domain contains two hexadecimal characters.

In this mode, new one is always silent in transmission time of no less than 3.5 bytes as start. In network to calculate transmission rate based on baud rate, it is easy to control in transmission time of 3.5 bytes. The next data domain in transmission: slave address, operating command code, data and CRC check word, byte in transmission in every domain is hexadecimal 0...9, A...F.

Network device is always monitoring the operation of communication bus even in silent interval time. When receiving first domain (Address information), each network device shall affirm the byte, with completion of transmission of the last byte, there is another similar transmission time interval of 3.5 bytes to identify completion of the frame, later, a new frame transmission starts.

A frame information shall be transmitted in a continuous data stream, if interval time before completion of entire frame transmission exceeds 1.5 bytes, receiving device shall remove these incomplete information.

5. Explanation to state control byte of soft starter

State control byte reflects the state of soft starter and it is expressed by a byte.

Bit	Major state	Sub-state	Description
-----	-------------	-----------	-------------

function	7	6	5	4	3	2	1	0	
Stop	0			0					Normal stop
				1					Emergency stop
Edit	1			0					Enter editing (0x20)
				1					User's parameter modification permitted
				2					Management parameter modification permitted
Runnin g	2 (0x40)			0					Enter start state (0x40)
				1					Start delay
				3					Kick
				4					Ramp process
				5					Current limiting process
				6					Start finished
				7					Soft start
				9					External braking
				10					Brake countdown
				11					Macro stop
				12					Free stop
				14					Pump stop
				15					Full voltage (judge the start is finished)
Inching	3 (0x60)			0					Enter inching state (0x60)
				0					Inching running
Fault	4(0x80)			0					(0x80)
				1					Phase loss of main power
				2					Phase sequence error
				3					Parameter lost
				4					Frequency failure
				5					Overcurrent protection
				6					Frequent start
				7					Phase current imbalance

		8	SCR overheated
		9	Internal forbidden
		10	Start timeout protection
		11	Motor temperature protection
		12	Thermal overload protection
		13	SCR abnormal
		14	Underload protection
		15	Connection error

Definition of state byte high eight bit:

Function \ Byte	Main state								Description
	7	6	5	4	3	2	1	0	
Display accuracy								0	Do not display decimal
								1	Display decimal
M1\M2 parameter								0	M1 parameter
								1	M2 parameter
Communication state								0	Communication normal
								1	Communication failure
Bus								0	Bus permitted
								1	Bus forbidden
Key control								0	Key control permitted
								1	Key control forbidden (0x10)
Internal forbidden								0	Unforbidden
								1	Forbidden (deciphering) (0x20)
Password locked								0	Locked
								1	Unlocked

6. Address explanation

The register address starts at 0, so if the start address of the host computer starts from 1, it is necessary to note that the register address is incremented by one. If the initial address of the host computer is 0, it is no need to add 1.

Basic parameters 1M

Description	Variable type	Register No.	Data type	R/W feature
Application parameter	I/O integer	0000	Uint16	R/W
Start ramp mode	I/O integer	0001	Uint16	R/W
Step voltage	I/O integer	0002	Uint16	R/W
Kick time	I/O integer	0003	Uint16	R/W
Initial voltage/current	I/O integer	0004	Uint16	R/W
Ramp time	I/O integer	0005	Uint16	R/W
Current limit times	I/O integer	0006	Uint16	R/W
Stop mode	I/O integer	0007	Uint16	R/W
Stop time	I/O integer	0008	Uint16	R/W
Stop final voltage	I/O integer	0009	Uint16	R/W
Braking time	I/O integer	0010	Uint16	R/W
Second start permit	I/O integer	0011	Uint16	R/W
Second current limit times	I/O integer	0012	Uint16	R/W
Motor's rated current	I/O integer	0013	Uint16	R/W
Overload protection level	I/O integer	0014	Uint16	R/W
Current imbalance protection	I/O integer	0015	Uint16	R/W
Current imbalance delay	I/O integer	0016	Uint16	R/W
Overcurrent protection during running	I/O integer	0017	Uint16	R/W

Overcurrent time during running	I/O integer	0018	Uint16	R/W
Underload level	I/O integer	0019	Uint16	R/W
Underload time	I/O integer	0020	Uint16	R/W
Phase sequence detection	I/O integer	0021	Uint16	R/W
Motor's temp. detection	I/O integer	0022	Uint16	R/W
Motor's temp. time	I/O integer	0023	Uint16	R/W
Start interval (min)	I/O integer	0024	Uint16	R/W
Undefined	----	0025~0029	----	----

2M Basic parameters 2M

Description	Variable type	Register No.	Data type	R/W feature
Application parameter	I/O integer	0030	Uint16	R/W
Start ramp mode	I/O integer	0031	Uint16	R/W
Step voltage	I/O integer	0032	Uint16	R/W
Kick time	I/O integer	0033	Uint16	R/W
Initial voltage\current	I/O integer	0034	Uint16	R/W
Ramp time	I/O integer	0035	Uint16	R/W
Current limit times	I/O integer	0036	Uint16	R/W
Stop mode	I/O integer	0037	Uint16	R/W
Stop time	I/O integer	0038	Uint16	R/W
Stop final voltage	I/O integer	0039	Uint16	R/W
Braking time	I/O integer	0040	Uint16	R/W
Second start permit	I/O integer	0041	Uint16	R/W
Second current limit times	I/O integer	0042	Uint16	R/W
Motor's rated current	I/O integer	0043	Uint16	R/W
Overload protection level	I/O integer	0044	Uint16	R/W
Current imbalance	I/O integer	0045	Uint16	R/W

protection				
Current imbalance delay	I/O integer	0046	Uint16	R/W
Overcurrent protection during running	I/O integer	0047	Uint16	R/W
Overcurrent time during running	I/O integer	0048	Uint16	R/W
Underload level	I/O integer	0049	Uint16	R/W
Underload time	I/O integer	0050	Uint16	R/W
Phase sequence detection	I/O integer	0051	Uint16	R/W
Motor's temp. detection	I/O integer	0052	Uint16	R/W
Motor's temp. time	I/O integer	0053	Uint16	R/W
Start interval (min)	I/O integer	0053	Uint16	R/W
Undefined	----	0055~0059	----	----

Functional parameter C

Description	Variable type	Register No.	Data type	R/W feature
Language selection	I/O integer	0060	Uint16	R/W
Display selection	I/O integer	0061	Uint16	R/W
Start/stop control mode	I/O integer	0062	Uint16	R/W
Digital input port	I/O integer	0063	Uint16	R/W
Analog input/output	I/O integer	0064	Uint16	R/W
Analog output mode	I/O integer	0065	Uint16	R/W
Macro control function selection	I/O integer	0066	Uint16	R/W
Start delay	I/O integer	0067	Uint16	R/W
Upper limit value of analog input	I/O integer	0068	Uint16	R/W

Lower limit value of analog input	I/O integer	0069	Uint16	R/W
Output relay K3	I/O integer	0070	Uint16	R/W
K1 output delay	I/O integer	0071	Uint16	R/W
K2 output delay	I/O integer	0072	Uint16	R/W
K3 output delay	I/O integer	0073	Uint16	R/W
Programmable timing stop time	I/O integer	0074	Uint16	R/W
Starting time limit	I/O integer	0075	Uint16	R/W
Motor wiring mode	I/O integer	0076	Uint16	R/W
Communication address	I/O integer	0077	Uint16	R/W
Communicate baud rate	I/O integer	0078	Uint16	R/W
Frequency selection	I/O integer	0079	Uint16	R/W
Password setting	I/O integer	0080	Uint16	R/W
Undefined parameter	I/O integer	0081	Uint16	R/W
External communication module selection	I/O integer	0082	Uint16	R/W
IP address	I/O integer	0083~0084	Uint32	R/W
Subnet mask	I/O integer	0085~0086	Uint32	R/W
Default gateway	I/O integer	0087~0088	Uint32	R/W
Analog output calibration coefficient	I/O integer	0089	Uint16	R/W
External communication control selection	I/O integer	0090	Uint16	R/W
Undefined parameter	----	0091~0099	----	----

Recording item N

Description	Variable	Register No.	Data type	R/W
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	type			feature
Soft start rated current	I/O integer	0100	Uint16	R
Current measurement calibration	I/O integer	0101	Uint16	R
Current display accuracy	I/O integer	0102	Uint16	R
Undefined parameter	I/O integer	0103~0118	Uint16	R
Record of fault times	I/O integer	0119	Uint16	R
Fault history 1	I/O integer	0120	Uint16	R
Fault history 2	I/O integer	0121	Uint16	R
Fault history 3	I/O integer	0122	Uint16	R
Fault history 4	I/O integer	0123	Uint16	R
Fault history 5	I/O integer	0124	Uint16	R
Fault history 6	I/O integer	0125	Uint16	R
Fault history 7	I/O integer	0126	Uint16	R
Fault history 8	I/O integer	0127	Uint16	R
Fault history 9	I/O integer	0128	Uint16	R
Fault history10	I/O integer	0129	Uint16	R

Real-time measured data

Description	Variable type	Register No.	Data type	R/W feature
Running state of main control board	I/O integer	140	Uint	R
Current fault 1	I/O integer	141	Uint	R
Current fault 2	I/O integer	142	Uint	R
Current fault 3	I/O integer	143	Uint	R
Ie— motor’s rated current	I/O integer	144	Uint	R
I _p — average current	I/O integer	145	Uint	R
I _a phase current	I/O integer	146	Uint	R

Lb phase current	I/O integer	147	Uint	R
Lc phase current	I/O integer	148	Uint	R
Analog input Ai%	I/O integer	149	Uint	R
Output voltage Uo%	I/O integer	150	Uint	R
Start countdown time Ss	I/O integer	151	Uint	R
Braking countdown time Bs	I/O integer	152	Uint	R
Start interval countdown time Ts	I/O integer	153	UinR	R

Control command data

Stop	Variable type	Register no.	Data type	R/W feature
Start	06	200	129	W
Reset	06	202	131	W
Stop	06	203	132	W

Note: if control command is invalid, check parameter L200, whether communication control function is activated, check whether terminal X1/3 and X1/5 are in short circuit.

7. Description of function code

(1) Function code "03" (Read multiple registers)

Data sent by host	Number of byte	Routine	Slave return data	Number of byte	Routine
Slave address	1	01	Slave address	1	01
Function code	1	03	Function code	1	03
Initial address	2	006D	Number of return byte	1	02
Data length	2	0001	Data	2	4100
CRC	2	15D7	CRC	2	8814

Note: It reads a maximum of 50 registers each time.

(2) Function code "04" (Read multiple input register)

Sending data	Number of byte	Routine	Slave return data	Number of byte	Routine
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Slave address	1	01	Slave address	1	01
Function code	1	04	Function code	1	04
Initial address	2	006D	Number of return byte	1	02
Data length	2	0001	Data 1	2	4100
CRC	2	A017	CRC	2	78DD

Note: It reads a maximum of 50 registers each time.

(3) Function code “06” (Write single register)

Sending data	Number of byte	Routine	Slave return data	Number of byte	Routine
Slave address	1	01	Slave address	1	01
Function code	1	06	Function code	1	06
Initial address	2	0001	Number of return byte	2	0001
Write data	2	001E	Data 1	2	001E
CRC	2	5802	CRC	2	5802

Note: When 06 command is adopted to modify parameter for soft starter, soft starter shall be in stop or edit state, other states are not available for modification. In case of modification of a parameter, the parameter to be modified shall be within the range defined in the specification, parameter beyond the range of specification shall not be modified.

8. Communication time interval

(1) “03” command service time interval:

Time interval=(17+number of register *2)*8/baud rate*1000*1.2ms;

Example: 9600 baud rate, read 1 register value, time interval = (17+1*2) *8/9600*1000*1.2=19ms.

(2) “06” command service time interval:

Time interval=20*8/baud rate*1000*1.2ms;

Example: 9600 baud rate, time interval =20*8/9600*1000*1.2=20ms.

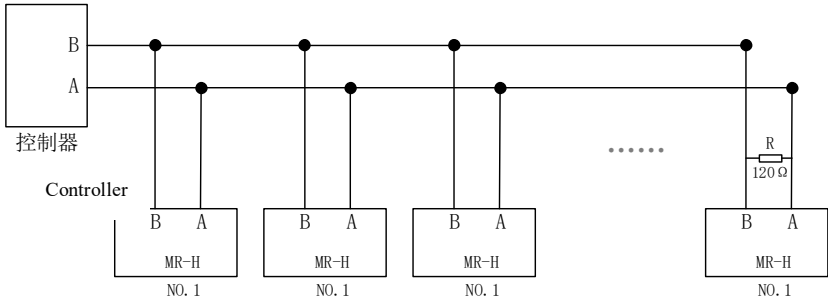
9. Attention

(1) Multi-computer communication, MR-H soft starter address is unique,

any two soft starters shall not be identical in address (To be set by parameter C17).

(2) Communication baud rate for MR-LX soft starter shall be identical to that of control (To be set by parameter L205)

(3) In case of multiple MR-LX soft starters are in communication, 120 Ω resistor shall be connected to both ends of AB on the final soft starter.



10. Analysis of communication fault code

(1) Error in address: device address +0x86+0x02+CRC

- a. Address is in excess of 140
- b. Other than the defined writable register
- c. Other than stop or edit state
- d. Communication control start/stop fails to open in writing control command.

(2) Error in writing data: Device address +0x86+0x03+CRC

- a. Data written in specified writable register is beyond the defined range of data
- b. Command data is wrong in sending start command.

(3) Error in reading address: device address +0x83+0x02+CRC

- a. Read address is in excess of 140.

(4) Function code error: device address +(0x80+erroneous function code)+0x01+CRC

- a. Function code is not the function code defined for soft starter.

10.2 Ethernet communication

1. Protocol content

The use of TCP-IP protocol is the most common communication

protocol standard adopted by existing local area network.

2. Operating method

Ethernet communication module shall be selected when this communication mode is adopted. The soft starter’s relative setting is as follows:

Parameter	Description	Range	Set value	Factory default
C22	Selection of external communication module	0. Ethernet 1.GPRS	1	0
C27	Selection of external communication control	0. Shut 1. Enable	1	1

IP address C23, subnet mask C24, and default gateway C25 settings should be consistent with the device connected to the local area network. For example, if the IP address of the device connected to the soft starter is 192.168.1.13, the setting of the soft starter should be C23 = 192.168.1.XX ($\neq 0,1$), C24 = 255.255.255.0, C25 = 192.168.1.1. The connected device software’s IP should be consistent with the soft starter’s IP, and the port number is set to 502.

10.3 GPRS Communication

GPRS communication module shall be selected when GPRS communication mode is adopted. The soft starter’s relative setting is as follows:

Parameter	Description	Range	Set value	Factory default
C22	Selection of external communication module	0. Ethernet 1.GPRS	1	0

C27	Selection of external communication control	0. Shut 1. Enable	1	1
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See *User's Manual for DTU Module* for usage in details.

Chapter 11 Attached table

Attached table 1: Specification and Accessories Selection

Motor (KW)	Model of soft starter	Rated current (A)	Model of bypass contactor	Specification of primary line (copper line)
7.5	MR-1750/3-H	18	GSC1-25	4 mm ²
11	MR-2110/3-H	24	GSC1-32	6 mm ²
15	MR-2150/3-H	30	GSC1-40	10 mm ²
18.5	MR-2180/3-H	39	GSC1-50	10 mm ²
22	MR-2220/3-H	45	GSC1-63	16 mm ²
30	MR-2300/3-H	60	GSC1-70	25 mm ²
37	MR-2370/3-H	76	GSC1-95	35 mm ²
45	MR-2450/3-H	90	GSC2-115F	35 mm ²
55	MR-2550/3-H	110	GSC2-150F	35 mm ²
75	MR-2750/3-H	150	GSC2-185F	50 mm ²
90	MR-2900/3-H	180	GSC2-225F	30×3 copper bar
110	MR-3110/3-H	218	GSC2-265F	30×3 copper bar
132	MR-3132/3-H	260	GSC2-330F	30×4 copper bar
160	MR-3160/3-H	320	GSC2-384F	30×4 copper bar
185	MR-3185/3-H	370	GSC2-500F	40×4 copper bar
220	MR-3220/3-H	440	GSC2-550F	40×4 copper bar
250	MR-3250/3-H	500	GSC2-630F	40×4 copper bar
280	MR-3280/3-H	560	GSC2-630F	40×4 copper bar
315	MR-3315/3-H	630	CDC8-800	40×5 copper bar
400	MR-3400/3-H	780	CDC8-1000	50×5 copper bar
470	MR-3470/3-H	920	CDC8-1250	50×6 copper bar
530	MR-3530/3-H	1000	CDC8-1250	50×6 copper bar

Attached table 2: Internal Delta Connection Specification and Accessories Selection for Soft Starter (with 380V as an example)

NOTE: Standard wiring means delta or star connection in motor

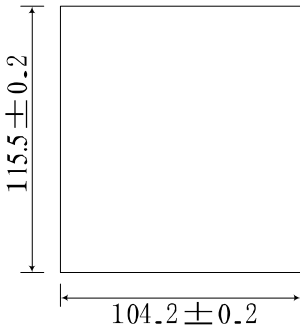
winding, thyristor is connected between power supply and motor.

Internal delta connection means the motor winding delta-thyristor and winding are in series in motor winding. The advantage of internal delta control is the ability to derate in selection of soft starter. In internal delta connection, the current flowing through soft starter and motor is $1/1.732$ of line current. Soft starter is selected according to rated current of line current/1.5 times in the above mentioned list. User may further derate in selection of soft starter according to practical situation.

Instruction to ordering







- ◆ To place an order, please provide product model, specification, load and application condition to your supplier;

Special note: If client needs keyboard box to be externally placed, it is necessary to order the mounting fittings from manufacturer. When keyboard box is externally placed, it needs to lock the mounting fittings of external keyboard box onto door panel with its hole size of $115.5(H) \times 104.2(W)$, which is as shown in the following figure. For specific installation steps, please refer to Attached table 2.



- ◆ As the standard configuration of soft starter contains built-in current transformer, user does not need to externally connect the both.
- ◆ Accessories shown in above table are only for reference.

Attached table 3: Instructions to Installation of Accessories of Soft Starter

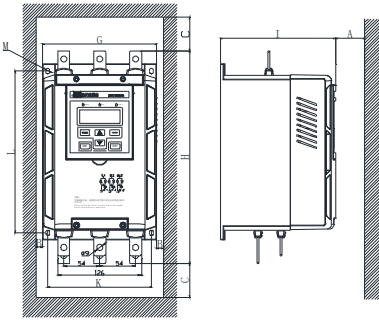
		<p>The steps for mounting accessories of MR-H soft starter are as follows:</p> <ol style="list-style-type: none"> 1. Lock keyboard box's fixing accessory onto door panel, as is shown in figure 1. 2. Remove keyboard box from soft starter and dismount tapping screws at the back of keyboard box, as shown in figure 2.
<p>Fig. 1</p>	<p>Fig. 2</p>	
		<ol style="list-style-type: none"> 3. Insert keyboard box into fixing accessory as shown in figure 1, which is shown in figure 3. 4. Use M3X15 tapping screws to fix keyboard box at the back of door panel, as shown in figure 4.
<p>Fig. 3</p>	<p>Fig. 4</p>	
		<ol style="list-style-type: none"> 5. Screw hex screws into DB9 female head of keyboard box, as shown in figure 5. 6. Insert connection line of keyboard box into DB9 female head, as shown in figure 6. 7. The installation of MR-LX soft starter's accessories is completed.
<p>Fig. 5</p>	<p>Fig. 6</p>	<p>Note: Accessories for installation are as follows:</p> <p>Fixing accessory of keyboard box-1 pc</p> <p>Cross round head tapping screw M3X15—2 pcs</p> <p>Hex screw M3×5+5—2 pcs</p> <p>External keyboard connection line—1 pc</p> <p>All accessories are enclosed in packing bag. Please check the number before installation.</p>

Attached table 4: Basic Setting of Different Applications (for reference)

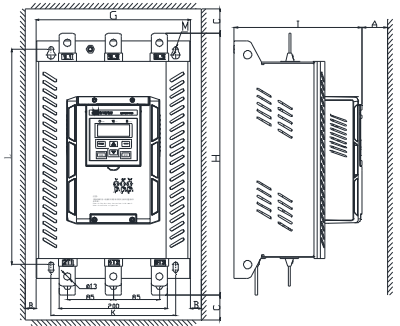
Load type	Initial voltage (%)	Starting ramp time sec	Stop ramp time sec	Current limit ILIM
Propeller	30	10	0	2.5
Centrifugal fan	50	20	0	3.5
Centrifugal pump	30	6	6	3
Piston compressor	40	15	0	3
Lifting device	30	15	6	3.5
Mixer	40	15	0	3.5
Crusher	50	15	6	3.5
Screw compressor	40	15	0	3.5
Spiral conveyer belt	40	10	6	3.5
Idling motor	25	10	0	2.5
Belt conveyor	50	15	10	3.5
Heat pump	30	15	6	3
Elevator	30	10	0	3
Gas pump	30	10	0	2.5

Attached table 5: Appearance of Soft Starter and Opening Size (Unit: mm, with 380V as example)

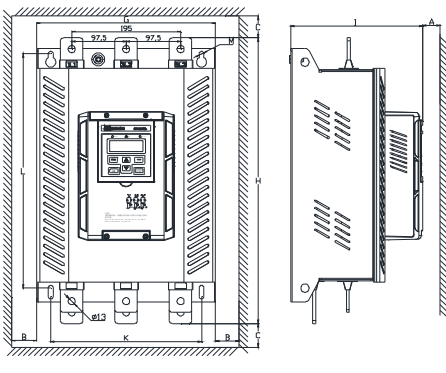
Model	Number	G	H	I	K	L	M	A	B	C	GW(kg)
MR-1750~2220/3-H	F005	172	320	172	156	240	6	20	10	100	4.5
MR-2300~2450/3-H	F005	172	320	172	156	240	6	20	10	100	4.7
MR-2550~2750/3-H	F005	172	320	172	156	240	6	20	10	100	5.1
MR-2900~3185/3-H	F006	285	474	235	230	390	9	20	10	100	20.6
MR-3220~3315/3-H	F007	320	512	235	270	415	9	20	10	100	25.6
MR-3400~3530/3-H	F008	400	647	235	330	495	9	20	10	100	37.6



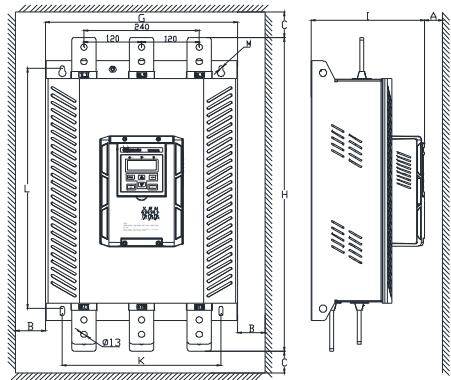
75KW product



90KW-185KW product



220KW-315KW product



400KW-530KW product

Attached table 6 Model Selection for Soft Starter

No.	Rated current (A)	380V		660V		1140V	
		Power (KW)	Size(mm)	Power (KW)	Size (mm)	Power (KW)	Size (mm)
1	18	7.5	F005	15	F005	22	F005
2	24	11		22		33	
3	30	15		30		45	
4	39	18.5		37		55	
5	45	22		45		65	
6	60	30		55		90	
7	76	37		75		110	
8	90	45		90		135	
9	110	55		110		165	
10	150	75		132		F006	
11	180	90	160	280			
12	218	110	200	344			
13	260	132	250	400			
14	320	160	300	505			
15	370	185	350	584	F007		
16	440	220	400	695			
17	500	250	456	789			
18	560	280	500	F008	884	F008	
19	630	315	560		995		
20	780	400	700				
21	920	470	F008				
22	1000	530					

Note: Size F005:172×320×172, F006:285×474×235, F007:320×512×235,

F008:400×647×235(W×H×T)

2017.1.0. The contents are subject to change without notice.
Please visit www.smes.com for the latest product information.



Shanghai Metallurgy General Electrical Co Ltd.