RSE-I Series Soft Starter

user's manual

Prior to use, please read this User's Manual carefully.
CAUTION: Please keep this User's Manual for future reference

RSE-I Serise Soft Starter

User Manual

V25.01

Contents

1. Foreword

Thank you very much for purchasing our soft starter.The product is used for soft start and soft stop control of squirrel-cage three-phase asynchronous motor. This user's manual provides the users with the instructions on the installation, parameter setting, error diagnosis, routine maintenance and necessary precautions. Please read the manual carefully before the installation of the product in order to ensure that it can be correctly installed and operated.
During this product updating period, some details may be changed without prior notice. If you want to get the latest information, please visit our website.

1.1 Precaution

- Must by professional technicians to install the soft starter.
- The specifications of the motor must match with the soft starter.
- Please be sure to read the operating instructions before installation.
- Prohibit to connect the capacitors in soft starter output terminal (U, V, W).
- It is forbidden to use a megohmmeter to measure the insulation resistance between the input and output terminals of the soft starter, otherwise the internal thyristor or the circuit board may be damaged. When using a megohmmeter to measure phase-to-phase or phase-to-ground insulation resistance, three short-circuit wires must be used to short-circuit the input and output terminals of the three phases in advance, and all plugs on the control board must be unplugged.
- The bare terminals must be wrapped by insulating tape after installation.
- When using model of 55kW and below, please turn on the control power first, and then turn on the main power.
- No more than 6 loaded starts per hour.
- Input power must be cut off when equipment maintenance.
- When moving, lift the body of the soft starter, not the circuit board, control box or copper bar, otherwise it may cause fall or personal injury.

1.2 Check the delivery

Please check as the following steps after getting and unpacking device:

(1) Check with the machine, the instruction manual, the product certification.

(2) Check that the starter reference printed on the label is the same as that on the delivery note corresponding to the purchase order.

(3) Remove the starter from its packaging and check that it has not been damaged in transit.

Please contact dealers or directly contact with the company if found problem, our professional staff is willing to serve for you.

2. Product description

2.1 Nameplate and Model designation

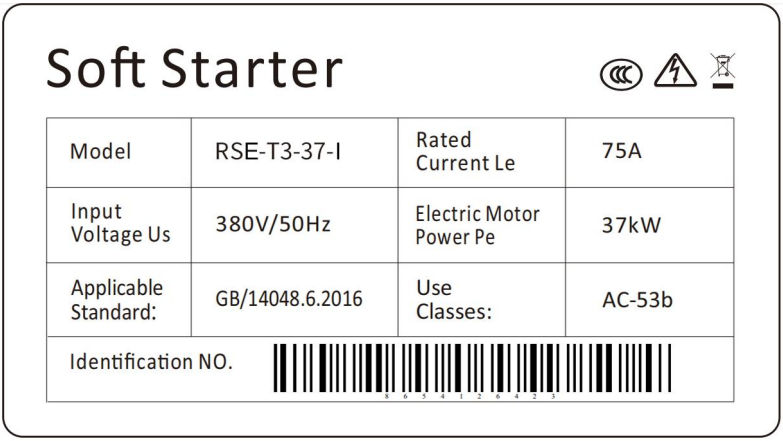


Figure 2.1 Nameplate

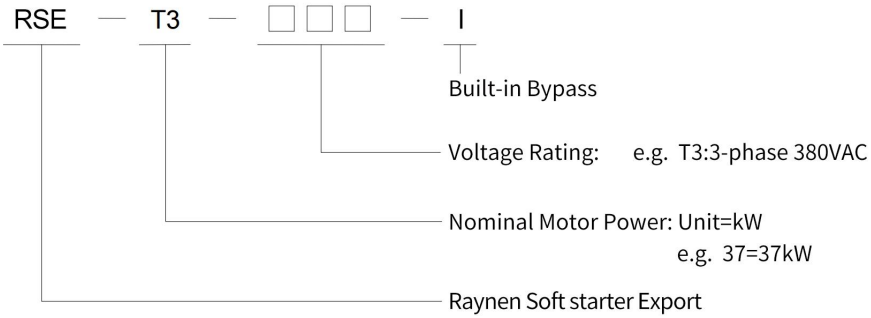


Figure 2.2 Model designation

2.2 model specifications

Table 2.1 RSE soft starter list (5.5KW-500KW)

Soft starter model	Rated current (A)	Adaptive motor power (kW)
RSE-T3-5-I	11	5.5
RSE-T3-7-I	15	7.5
RSE-T3-11-I	23	11
RSE-T3-15-I	30	15
RSE-T3-18-I	37	18.5
RSE-T3-22-I	45	22
RSE-T3-30-I	60	30
RSE-T3-37-I	75	37
RSE-T3-45-I	90	45
RSE-T3-55-I	110	55
RSE-T3-75-I	150	75
RSE-T3-90-I	180	90
RSE-T3-115-I	230	115
RSE-T3-132-I	264	132
RSE-T3-160-I	320	160
RSE-T3-185-I	370	185
RSE-T3-200-I	400	200
RSE-T3-250-I	500	250
RSE-T3-280-I	560	280
RSE-T3-320-I	640	320

2.3 The appearance and installation dimension

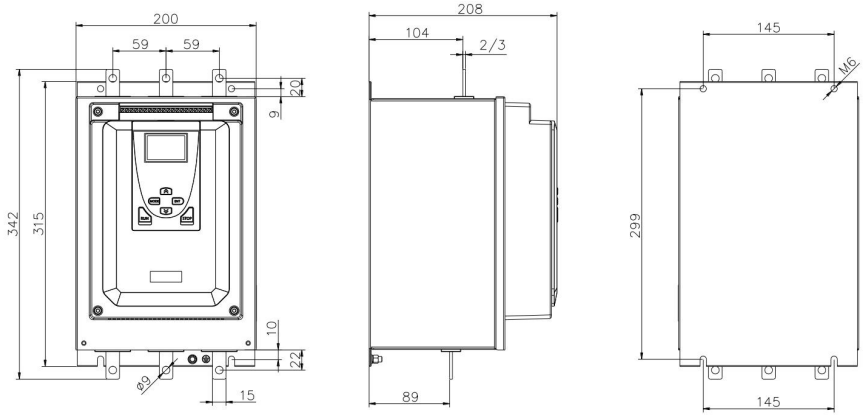


Figure 2.3 5.5kW~55kW 380V (Units:mm)

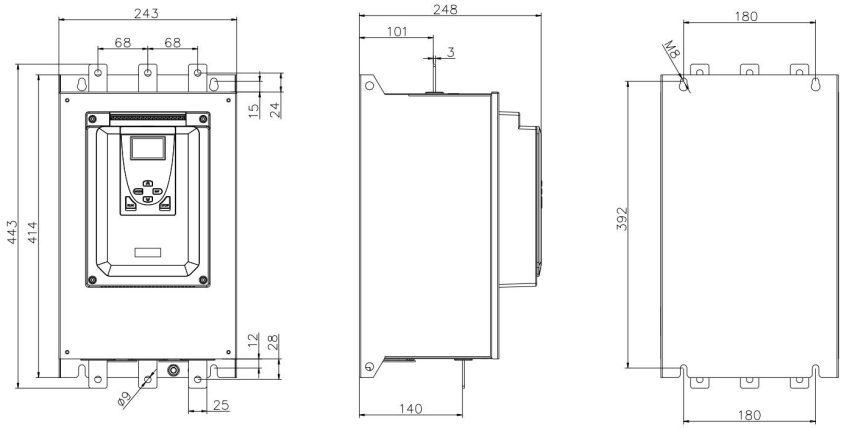


Figure 2.4 75kW~115kW 380V (Units:mm)

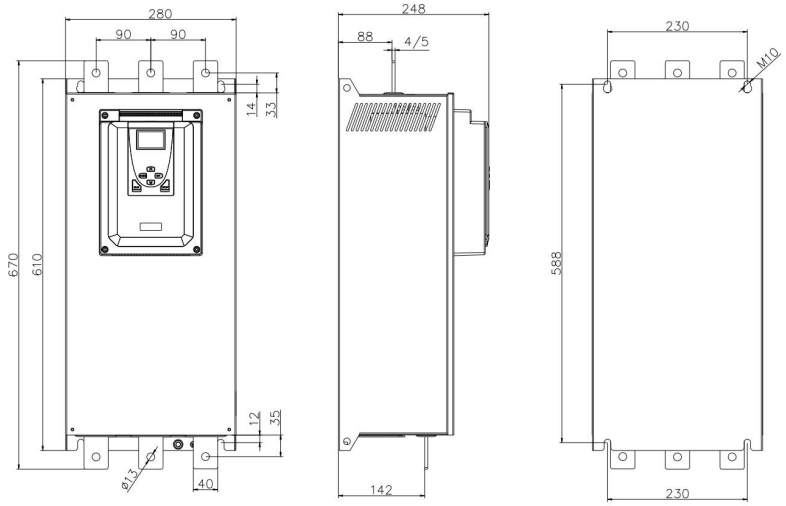


Figure 2.5 132kW~200kW 380V (Units:mm)

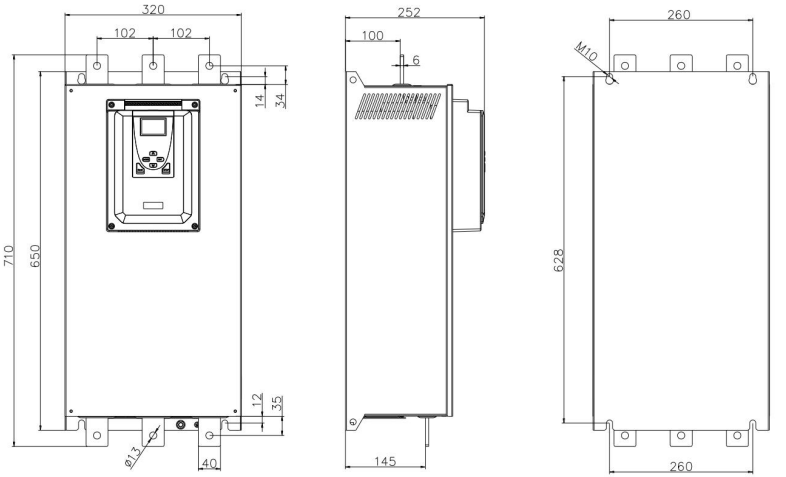
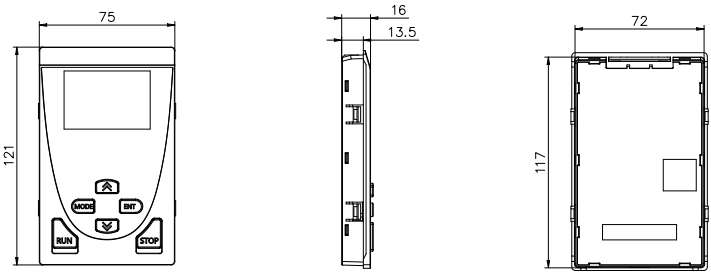
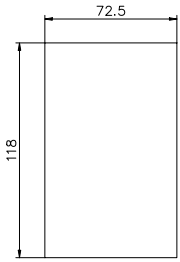


Figure 2.6 250kW~320kW 380V (Units:mm)



(a) Control panel dimensions



(b) Cut-out dimensions

Figure 2.7 Control panel and Cut-out dimensions (Units:mm)

Note: Correct dimensions depend on the actual model. All dimensions are subject to change without prior notice.

3. Installation and Connection

3.1 Installation

3.1.1 Environmental Conditions

Table 3.1 Environmental Specifications

Description	Specification
Control supply	single-phase 220V AC ±15%, 50Hz/60Hz
Power supply	3-phase 380VAC (-10% ~ +15%）, 50Hz or 60Hz
Type of load	3-phase squirrel cage induction motor
Start duty	It depands on load, normally no more than 10 times per hour, if heavy load no more than 6 times per hour.
Temperature	Operating: -10℃ ~ 40℃, if 40℃~60℃， it needs to derate for use. Storage: -25℃ ~ 70℃
Humidity	0% to 93% non-condensing
Altitude	1000m (3300ft) without derating
Shock resistance	15g，11ms
Vibration resistance	below 0.5g
Vibration-resistant	Below 3000m, Vibration below 0.5g
Mounting mode	Wall mount
Cooling	5.5KW~55KW : Natural convection 75KW and above: Forced air cooling
Others	Avoid installing in places with a lot of dust and metal powder; Avoid installing in places with corrosive and explosive gases and substances; Avoid installing around flammable objects.

3.1.2 Installation

In order to give full play to the heat dissipation effect of the soft starter, it must be installed in strict accordance with the specified direction and spacing.

(1) The soft starter should be installed vertically, do not install it upside down, obliquely or horizontally; it should be installed on a firm structure with screws.

(2) The soft starter will generate heat when it is running. In order to ensure the circulation of air, a certain space should be left as shown in Figure 3-1.

(3) The heat generated by the soft starter dissipates upwards, so the soft starter should not be installed under heat-resistant equipment.

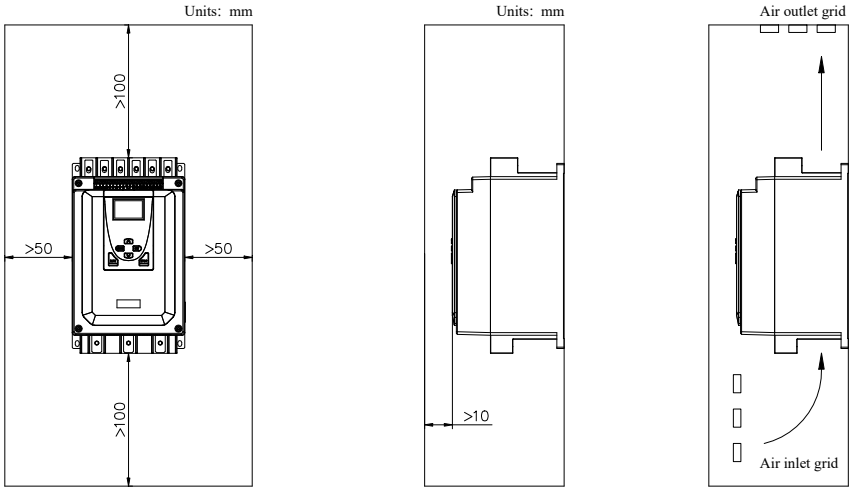


Figure 3.1 Diagram of Installation

★**Note:** Do not install the unit close to, especially above, heating elements.

3.2 Wiring

When making power and control connections, the following should be observed:

(1) Confirm that the phase number and voltage level of the input power are consistent with the specifications of the soft starter, and connected to the soft starter power input terminals R, S, T; if the wrong power supply is connected, the soft starter may be damaged.

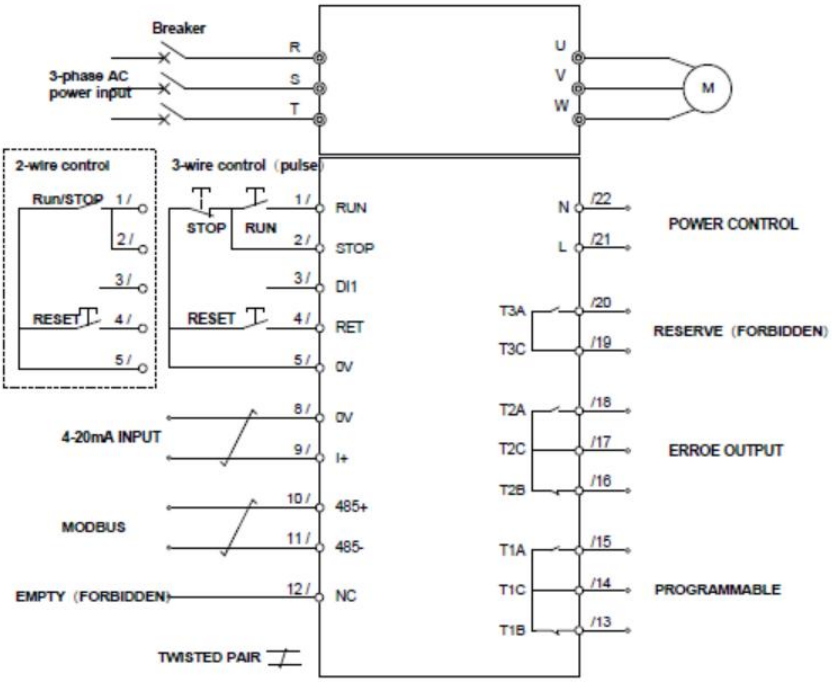
(2) The reactive power compensation capacitor used to improve the power factor must be connected to the input terminal of the soft starter.

(3) The external control terminals RUN, STOP, DI1, RET, and 0V must not be connected to an external power supply, otherwise the circuit board will be damaged.

(4) Both ends of the wire must be crimped to ensure high reliability of the connection.

(5) After wiring, please check the insulation distance between the input terminals and output terminals of the soft starter.

3.2.1 Basic Connection Diagram



Remarks: When the U090 is V1.10 or above, the STOP terminal in the two-wire control can be suspended (not short-circuited with the RUN).

Figure 3.2 Basic Connection Diagram

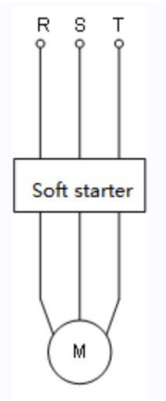
3.2.2 Power Terminal Block

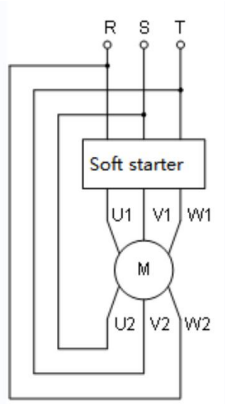
Table 3.2 Power Terminal Block Description

Terminal Block	Description
R, S, T	Terminals for connection of the power supply (380VAC, 50Hz/60Hz)
U, V, W	Motor terminals for connection of the induction motor

Note:When the rotation direction of the motor is wrong, please exchange the wiring of any two phases in R/S/T or U/V/W.

This series of soft starters supports internal and external connection of the motor, and the wiring method is shown in Figure 3.3.3.2.3 Control Terminal Block:





（a）external (b) internal

Figure3.3 motor internal & external connnect

3.2.3 Control Terminal

Layout of Control terminals as figure 3.4,function description as table 3.3

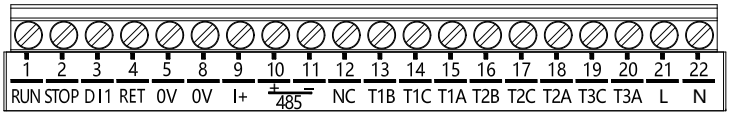


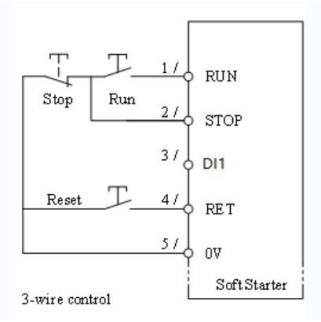
Figure 3.4 Layout of control terminals

Table 3.3 Control Terminal Block Description

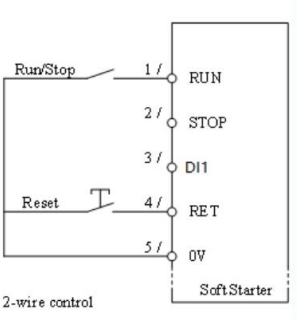
NO.	Name	Function&specification
1/ RUN	Run starter	2-wire control: RUN, STOP both short-circuit with 0V at the same time can be started by external control;
2/ STOP	Stop starter	RUN and STOP disconnect from 0V at the same time for external shutdown wire control: under the normal state STOP

		short-circuit with 0V: RUN short-circuit with 0V（pulse）can be starter by external control; STOP disconnect from 0V(pulse) can be stop by external control.
3/ DI1	Logic Programmable terminal	The function of terminal DI1 can be set as emergency stop or jog through parameter C06;
4/ RET	External control reset terminal	Short-circuit with RET and 0Vcan reset
5/ 0V	Control Signal common terminal	Control terminal circuit power supply reference point.
8/ 0V 9/ I+	DC 4-20mA output	DC output：4-20mA、≤400Ω， 20mA = 2* (Soft starter rated current)（can select through C07）Imotor=Imotorrated*（I4-20mA - 4）/ 8
10/ 485+ 11/ 485-	Modbus	RS485+：A RS485 -：B
12/ NC	Empty terminal（forbidden）	No function
13/ T1B 14/ T1C 15/ T1A	Programmable Output	T1A-T1C：Normally open contact，5A@250VAV，5A@30VDC T1B-T1C：Normally closed contact，3A@250VAV，3A@30VDC
16/ T2B 17/ T2C 18/ T2A	Fault relay	T2A-T2C：Normally open contact，5A@250VAV，5A@30VDC T2B-T2C：Normally closed contact，3A@250VAV，3A@30VDC
19/ T3C 20/ T3A	Reserve（forbidden）	Internal bypass relay control contact, forbidden
21/ L 22/ N	Auxiliary (control) power	220VAC input

Remark：When U090 is V1.10 and above, the STOP terminal in the two-wire control can be suspended (not shorted to RUN).



(a) 3-Wire Control Connection



b) 2-Wire Control Connection

Remark: When U090 is V1.10 and above, the STOP terminal in the two-wire control can be suspended (not shorted to RUN).

Figure 3.4 Comparison of 3-wire and 2-wire control

4. Operation

4.1 Human-Machine Interface (HMI)

The Starter utilizes a HMI that allows the user to operate the starter. The HMI allows the user to control the starter (run, stop, and reset), modify control parameters, enable or disable protections, set system variances, set communication variables, monitor system parameters,etc. Appearance&function as below figure 4.1 &table 4.1

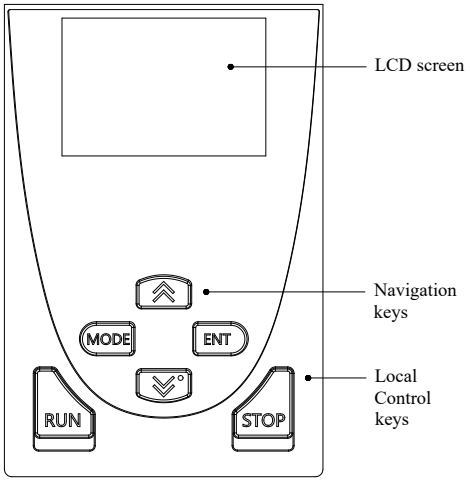


Figure 4.1 Human-Machine Interface (HMI) Front View

Table 4.1 Basic Functions of the screen and Keys

NO.	Name	Symbol	Function
1	Screen	——	Use LED/LCD display to display functional parameters and set values.
2	Set key	MODE	Selects the display between monitoring, setting and fault history.Exits the menu or parameter, or cancels a parameter change.
3	Up	▲	Scroll up the menu, parameters, or adjust the parameter Settings
4	Down	▼	Scroll down the menu, parameters, or adjust

			the parameter Settings.
5	Confirm	ENT	Enters a menu or parameter, or saves a parameter change.
6	Run Key	RUN	Start the soft starter and control it to start the motor.
7	Stop/reset	STOP	Stops the output of the soft starter and turns to the fault reset button when a fault is detected.

4.2 Operation

4.2.1 Display modes

There are three display modes: the monitoring mode, the programming mode, and the fault history mode. Press the [MODE] key to switch between the display modes.

As figure4.2..

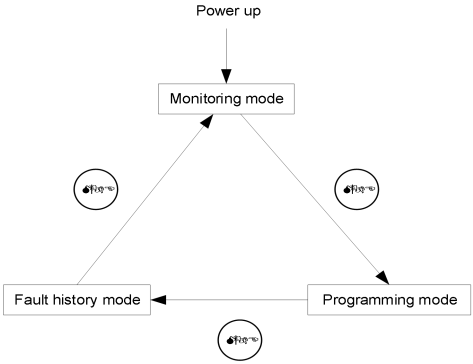


Figure 4.2 Display modes

4.2.2 Monitoring mode

Under normal circumstances, the soft starter is in the default state mode after power-on. In different states, the panel interface changes accordingly.

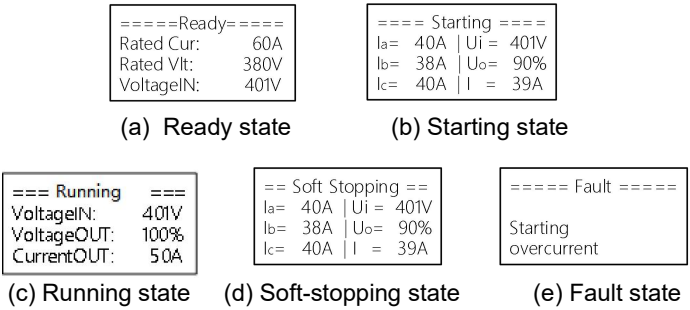
(1) The status interface in the ready state (that is, no fault when powered on and not started), as shown in Figure 4.3 (a);

(2) The status interface during startup, as shown in Figure 4.3(b);

(3) The status interface during start-up and normal operation, as shown in Figure 4.3(c);

(4) The status interface during soft shutdown, as shown in Figure 4.3(d);

(5) The status interface at the time of failure, as shown in Figure 4.3(e);



(a) Ready state (b) Starting state

(c) Running state (d) Soft-stopping state (e) Fault state

Figure 4.3 Monitoring mode screens

4.2.3 Programming mode

There are 4 groups of function parameters in the parameter setting mode, which are the basic parameter group, protection parameter group, function parameter group, and manufacturer parameter group. Set the value, or cancel the modification through the MODE key, as shown in Figure 4.4

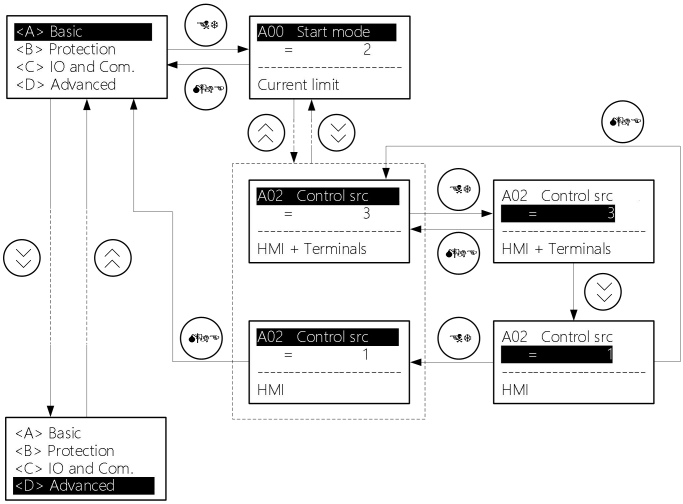


Figure 4.4 Menu Navigation

4.2.4 Status monitoring mode

The status monitoring mode is mainly used to display the input/output voltage, current, fault record and other information of the soft starter, as shown in Figure 4.6.

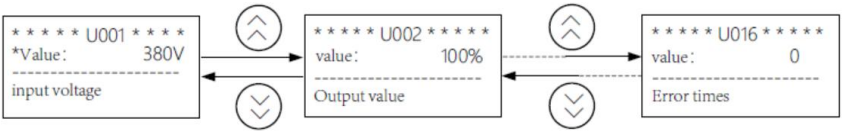


Figure 4.6 Fault history screen

4.3 Power on, Running & Maintance

4.3.1 Power on

Power-on safety tips:

(1) The product has been subjected to a withstand voltage test before leaving the factory, and there is no need to test the withstand voltage again before powering on, otherwise it may cause an accident.

(2) Do not touch the drive and peripheral circuits with wet hands before and after power-on. Otherwise there is a risk of electric shock.

(3) All covers must be installed and closed before power on, otherwise there is a danger of electric shock.

(4) When using a model of 55kW or below, please turn on the control power first, and then turn on the main power.

(5) Do not open the cover after power on, otherwise there is a risk of electric shock.

(6) Do not touch any input and output terminals of the soft starter after power on, otherwise there is a risk of electric shock.

(7) After the input terminal of the soft starter is powered on, when the load is open circuit or lack of phase, even in the stop state, the output terminal will still have a relatively high induced voltage; at this time, it is forbidden to touch the output terminal of the soft starter. Otherwise there is a risk of electric shock.

This induced voltage is caused by the leakage current of the thyristor, which is a normal phenomenon; after connecting the motor, the induced voltage will disappear.

Before powering on, please be sure to check and confirm item by item according to Table 4.2, otherwise it may cause danger

Table 4.2 Checting Item before Power on

Item	Instruction
Input voltage	The phase number and voltage level of the input power supply are consistent with the specifications of the soft starter; The power input terminals R, S, T are connected correctly and reliably.
Soft starter output terminal	Soft starter output terminal U, V, W wiring is safe and reliable
Control terminal	The connection between the control circuit terminal and other control devices is reliable; All control circuit terminals are in the OFF state, and the soft starter does not run when it is powered on.
Under load	Motor load status (connection to mechanical system).

After power-on, the soft starter enters the normal state monitoring mode (§4.2.2(a)) under normal conditions, and enters the fault state monitoring mode (§4.2.2(e)) when there is a fault.

4.3.2 Operation and maintenance

Run security tips:

(1) Before running, please confirm that the soft starter and the surroundings of the load have met the safe operating conditions.

(2) During operation, avoid debris falling into the equipment, otherwise it may cause equipment damage.

(3) Non-professional technicians should not detect the signal during operation, otherwise it may cause personal injury or equipment damage.

(4) At standard load, the soft starter can start up to 10 times per hour; at heavy load it is 6 times.

Operation and maintenance:

(1) After power on, set parameter B00 according to the rated current value on the motor nameplate;

(2) When the power is ready and there is no fault, the soft starter and the starter motor can be run;

(3) After starting, check whether the rotation direction of the motor is correct. If it needs to be reversed, please exchange any two phases of R/S/T or U/V/W;

(4) After starting, check whether the motor is running normally, and stop it as soon as possible or cut off the power supply if necessary;

(5) If the starting state of the motor is not ideal, you can refer to the adjustment of the starting mode or the control parameters related to the current starting mode;

(6) During the power-on operation, if abnormal phenomena are found, such as abnormal sound, smoke or peculiar smell, etc., the power supply should be cut off quickly and the cause should be found out;

(7) If a fault is indicated after power-on or when starting, the cause can be found according to the fault types shown in Table 6.1;

(8) The fault reset of the soft starter can be performed through the STOP key on the panel, the external control reset button, or bit5 of the communication control word;

(9) In the place where there is a lot of dust, the dust should be cleaned regularly; otherwise, the insulation performance and heat dissipation effect of the soft starter will be reduced, causing malfunction or damage to the soft starter;

(10) If the soft starter has not been used for a long time in a humid environment, it must be dehumidified (such as drying with a hair dryer or electric furnace) before it is used again, otherwise the insulation performance will be reduced due to moisture or condensation, resulting in damage to the soft starter;

(11) When the ambient temperature is lower than -10°C, it should be powered on and preheated for more than 30 minutes before starting.

5. Parameter listing and descriptions

5.1 Parameter List

【Basic menu】					
Code	Name	Range	Default	Remarks	Communication Address
A00	Start mode	1：Voltage ramp 2：Current limit 3：Jogging 4：Current ramp 5：Voltage ramp with current limit 6：Voltage kick start	1		0x1001
A01	Stop mode	1：Freewheel stop (Coast) 2：Voltage ramp	1		0x1002
A02	Control src/ Control source	1：HMI 2：Terminals 3：HMI + Terminals 4：Network 5：HMI + Network 6：Terminals + Network 7：HMI + Terminals + Network	7		0x1000
A03	Init voltage/ Initial voltage	25-80%	30%		0x1006
A04	VltRampTime/ Voltage ramp time	1-120 s	30 s		0x1007

A05	Cur limit Lv/ Current limit level	50-500%(500% DIRECT START)	320%		0x1005
A06	Jog voltage	25-80%	30%		0x1008
A07	Cur Ramp Lvl/ Current ramp level	10-400%	300%		0x100B
A08	CurRampTime/ Current ramp time	0-120 s	20 s		0x100C
A09	Kick level/ Kick start level	25-80%	50%		0x1009
A10	Kick time/ Kick start time	0-2000 ms	0 ms		0x100A
A11	Start delay	0-999 s	0 s		0x101A
A12	StopRampTime/ Stop ramp time	0-60 s	0 s		0x100D
A13	Bypass delay	0-10 s	0 s		0x1043
A20	Grid power frequency	1：50Hz 2：60Hz	1		0X101D
A21	Motor connect method	1：external 2：internal 3：internal force starter 内	1		0X101E
A98	Manufacturer's reservation	0：reserve (No) 1：reserve（A） 2：reserve (10)	0		

A99	Param Reset/ Reset to defaults	0：None 1：Reset to defaults1（Keep error record） 2：Reserved 3.Reset to defaults1（delete error record）	0		

【Protection menu】

Code	Name	Range	Default	Remarks	Communication address
B00	Motor FLA/ Motor rated current	(50%~100%) *IN	IN		0x1004
B01	OC Lvl (S)/ Starting overcurrent level	400-600%	450%		0x1011
B02	OC Lvl (R)/ Running overcurrent level	20-400%	200%		0x1012
B03	OL Class (S) Starting overload class	1：10A class 2：10 class 3：20 class 4：30 class 5：OFF 6：reserve	4		0x1013
B04	OL Class (R) Running overload class	1-6（as B03）	2		0x1014
B05	Cur Imbal Lvl/ Current imbalance level	5-100%	40%		0x1015
B06	Over Vlt Lvl/ Overvoltage level	200-1500 V	456V		0x1017
B07	Undr Vlt Lvl Undervoltage level	100-690 V	304V		0x1018

B08	MaxStartTime/ Excessive starting time	5-200 s	70 s		0x1016
B10	High current protection	5-10 （5invalid）	5		0X1021
B11	Phase sequence protection	1: disabled 2: enable	1		0X1024
B12	Thyristor Protection	1: disabled 2: enable	1		0X1026
B20	Overcurrent delay	0-10 s	2 s		0X1022
B21	Current imbalance delay	0-10 s	2 s		0X1023
B22	Input phase loss delay	0-5 s	1 s		0X1025
B23	Start time interval	0-30 min	6 min		0x1044
B97	Password setting	0-9999 （0invaild）	0		
B98	Password aging	0-9999 min （0 always vaild ）	5 min		
B99	Password verification	0-9999	0		

【I/O and Communication menu】					
Code	Name	Range	Default	Remarks	Communication address
C01	Programmable relay output (T1A-T1B-T1C)	1：stop vaild 2：Fault 3：Reserved 4：Starting 5：start vaild 6：Soft stopping 7：Start to stop vaild 8：Power-on 9：Thyristor fault output	7		
C03	Modbus Addr. / Modbus address	1-63	1		
C04	Mdbus BdRate/ Modbus baud rate	1：1200 2：2400 3：4800 4：9600 5：19200	4		
C05	RS485 data version	1：8-N-1 2：8-E-1 3：8-O-1 4：8-N-2 5：8-E-2 6：8-O-2 After the modification, it needs to be powered off to take effect	1		0x1046

C06	DI1 function selection	1：reset 2：Emergency stop (disconnect valid) 3：Jog ruuning	1		0X101F
C07	Analog output range selection	1: 2 times the rated current of the motor 2: 4 times the rated current of the motor 3: 2 times the rated current of the soft starter 4: 4 times the rated current of the soft starter	1		0x1045
C08	Analog output correction factor	100~2000	1000		0x103D

【Advanced menu】					
Code	Name	Range	Default	Remarks	Communication address
D00	Reserved			Read	
D01	Starter FLA/ Soft starter rated current	Immutable/Only Read	Model dependant	Read	0x1003
D02	Current CAL. / Current calibration	5-500% (Only Read)		Read	0x100F
D03	Voltage CAL. / Voltage calibration	5-500% (Only Read)		Read	0x1010
D04	Reserved	-	2	Read	
D05	Reserved	-	-		
D06	Reserved	-	-		

D07	Reserved	LCD contrast	-		
D08	Reserved	1：Reserved（W） 2：Reserved（N） 3：Reserved（Z）	2		
D09	Rated voltage	220~1500V	380V	Read	0x103C
D10	Current blanking	1~20%	5%		0x1042
D11	Reserved	0~9999	-		
D98	Reserved	-	-		
D99	Version	-	-		

【Status monitoring parameter】			
Code	Instruction	Remarks	Communication Address
U001	Soft starter input voltage	unit：V	0x102F
U002	Soft starter output voltage	unit：V	0x1039
U003	Three-phase average current	unit：A	0x102B
U004	R phase current	unit：A	0x102C
U005	S phase current	unit：A	0x102D
U006	T phase current	unit：A	0x102E
U007	Recent first failure	0：NO FAILURE； 1: input phase missing; 2: run out of phase; 3: Start overcurrent; 4: Run over current; 5: start overload; 6: operation overload; 7: current imbalance; 8: Overheat protection; 9: Overvoltage protection; 10: undervoltage protection; 11: Start timeout; 14: Thyristor breakdown 15: Internal fault;	0x1034
U008	Recent second failure		0x1035
U009	Recent thrid failure		0x1036
U010	Recent fourth failure		0x1037
U011	Recent fifth failure		0x1038

		16: high current fault; 17: parameters are lost. 18: start overfrequency; 19: Wiring error (internal connection); 20: output phase missing; 21: Reverse power sequence.	
U012	Rated current	unit：A	0x1003
U013	Start delay countdown	unit：second（s）	0x1031
U014	Start Interval Countdown	unit：second（s）	0x1032
U015	Factory reserve		
U016	Fault times		0x103A
U090	POWER version	-	0x1047
U091	Display software version	-	

【Communication control word and status word description】			
Code	Instruction	Remarks	Communication Address
-	control word	Bit0-bit4：reserve； Bit5：reset command； Bit6：Run command； Bit7：Stop command； Bit8-bit15：Reserve. Each bit is valid when it is "1", and is invalid when it is cleared to "0".	0x1028
-	Soft starter state	0：Standby/stopped state； 1：starting state; 2: bypass/running status; 3: soft shutdown state; 4: reserved state; 5: Fault state. 6: start delay state; 7: emergency stop state; 8: indicates a fault. Contact the supplier.	0x102A

5.2 Basic parameter

NO.	Name	Range	Default
A00	Start method	1~6	1

1: Voltage ramp start, see parameters A03 and A04 for details.

2: Start with current limit, see parameter A05 for details.

3: Jog start, see parameter A06 for details.

4: Current ramp start, see parameters A07 and A08 for details.

5: Ramp + current limit start, see parameter A05 for details.

6: Jump start + ramp start, see parameters A09 and A10 for details.

NO.	Name	Range	Default
A01	Stop method	1~2	1

1：Free stop

After the soft starter receives the stop command, it immediately disconnects the bypass contactor and blocks the voltage output of the internal thyristor, so that the motor will gradually stop depending on the load inertia.

2：Soft stop。

After receiving the shutdown command, the power supply of the motor is switched from the bypass contactor to the output of the internal thyristor, and the output voltage is controlled to gradually decrease, so that the motor can decelerate smoothly

NO.	Name	Range	Default
A02	Control method	0~8	7

1：Display control

2：Terminal control

3：Display+terminal control

4：Communication Control

5：Display+communication Control

6：Terminal+communication control

7：Display+terminal +communication control

Remarks: In addition to the two-wire control of the terminal, when other control methods are valid, various control methods can start and stop each other.

No.	Name	Range	Default
A03	Voltage ramp initial voltage	25~80%	30%
A04	Voltage ramp time	1-120 s	16 s

A03、A04 are the common control parameter of <Voltage ramp start>、<Voltage ramp+current limit start>、<Jump+Ramp start>

【Voltage ramp】

After receiving the starting command, the soft starter controls the output voltage to rise rapidly to <voltage ramp initial voltage (A03)>, and then the output voltage gradually increases according to <voltage ramp time (A04)>; when the output voltage and current meet the specified requirements, the bypass contactor is closed, and the starting process is completed, as shown in Figure 5.1. During the whole starting process, the current is limited by A05.

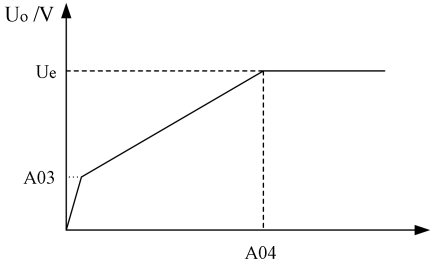


Figure 5.1 Voltage ramp

The voltage ramp starting mode is suitable for large inertia loads, or the occasions where the requirements for the starting current are not strict, but the starting stability is high. This starting method can greatly reduce the starting impact and mechanical stress; the greater the initial voltage (A03), the greater the initial starting torque, but the greater the impact at the moment of starting. The length of the voltage ramp start process is related to the ramp time (A04), the current limit start multiple (A05) and the weight of the load.

NO.	Name	Range	Default
A05	Current limit start multiple	50~500%	320%

A05 is common control parameter of <current limit start>、<Voltage ramp start>&<voltage ramp+current limit start>.

Press and hold A05 for 5 seconds at any value, and it will be automatically set to 500%, which is the straight-up mode.

【Current limit】

The control mode of current limit start is shown in Figure 5.2.

After receiving the starting command, the soft starter controls the output voltage to increase rapidly until the output current reaches the current limiting value set by <Current Limiting Starting Multiple (A05)>, and keep the output current not greater than this value; as the motor gradually accelerates, the soft starter output voltage rises until it reaches the rated voltage of the soft starter; finally when the motor is close to the rated speed, the output current begins to drop, and when it falls to a certain value, the bypass contactor is closed, and the output current continues to drop to the rated current Ie or below, and the starting process is completed.

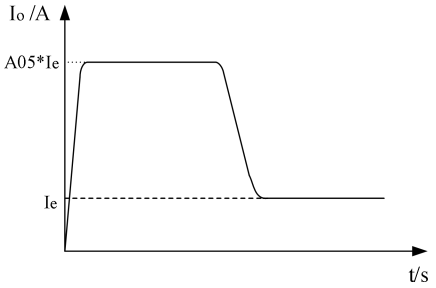


Figure 5.2 Current limit

The current-limited starting mode is generally used in occasions that have strict requirements on the starting current. The grid capacity is relatively small, and when the starting capacity needs to be limited, the current limiting multiple can be set according to the requirements; generally between (2.5~3) times the rated current, if the setting is too small, it may not be able to start normally. When starting with current limiting, the starting time is related to the multiple of current

limiting. The larger the current limiting multiple, the shorter the starting time; the smaller the current limiting multiple, the longer the starting time.

【Voltage ramp+current limit 】

The control mode of voltage ramp + current limit start is shown in Figure 5.3. When starting in this mode, the soft starter controls the output voltage to rise rapidly to <voltage ramp initial voltage (A03)>, and then the output voltage gradually increases according to <voltage ramp time (A04)>; but if the output current reaches or If it exceeds the current limiting value set by <current-limiting starting multiple (A05)>, the voltage boost will be suspended and the output voltage will remain unchanged; then as the motor speed rises, the output current will gradually drop below <current-limiting starting multiple (A05) > After the set current limit value, the output voltage will gradually increase according to <voltage ramp time (A04)>; this will repeat until the output voltage and current meet the specified requirements, the bypass contactor will be closed, and the starting process will be completed.

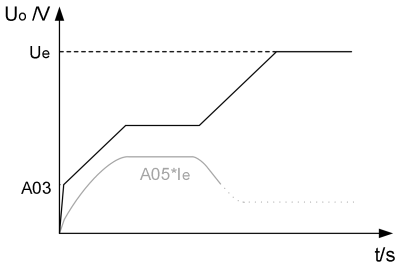


Figure 5.3 Voltage ramp+ Current limit

The voltage ramp + current limiting starting mode is mainly used for loads with small power supply capacity and small starting impact.

NO.	Name	Range	Default
A06	Jog voltage	0~80%	30%

A06 is the control parameter of <Jog start>. When under Jog start, it can be control by RUN key or DI1 terminal.

【Jogging】

The control mode of jog start is shown in Figure 5.4.

When jogging, the output voltage of the soft starter increases rapidly to <jogging voltage (A06)> and remains unchanged; changing the setting value of A06 can adjust the output torque of the motor.

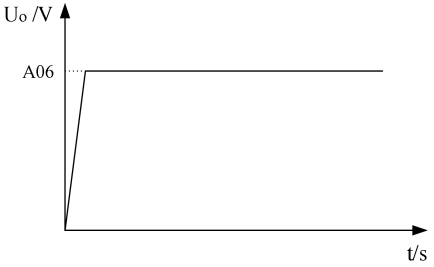


Figure 5.4 Jogging

Jog start is generally used for test run or positioning of certain loads

NO.	Name	Range	Default
A07	Current ramp multiple	10~400%	300%
A08	Current ramp time	1-120 s	20 s

A07 and A08 is the control parameter of <current ramp start>

【Current ramp】

The control mode of current ramp start is shown in Figure 5.5.

When starting in this mode, the soft starter controls the output current to gradually increase according to the set current slope until the start is completed. If the output current reaches the set <current ramp multiple (A07)> during this process, the output current will remain unchanged until the start is completed.

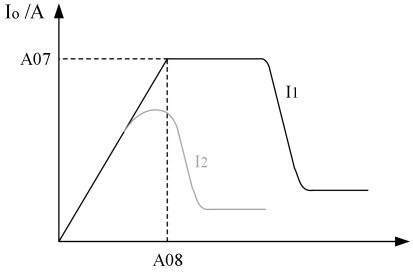


Figure 5.5 Current ramp

The current ramp starting mode has a strong acceleration capability and can shorten the starting time within a certain range; it is generally used for loads with fast speed-up requirements or motors with high synchronous speed.

NO.	Name	Range	Default
A09	Pulse kick voltage	0~80%	50%
A10	Pulse kick time	0-2000 ms	0 ms

A09、A10 are control parameter of <Kick+ramp start>.

【kick+ramp start】

The control mode of sudden jump + ramp start is shown in Figure 5.6.

When starting in this mode, the soft starter first applies a high and fixed <pulse kick voltage (A09)> to the motor for a limited period of time (pulse kick time-A10) to overcome the static load of the motor. Friction turns the motor; then starts in voltage ramp start mode until cranking is complete.

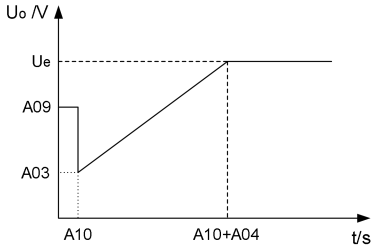


Figure 5.5 Kick+ramp

In some heavy-duty occasions, when the motor cannot be started due to the influence of mechanical static friction, this starting mode can be selected. In other occasions, you should avoid starting in this mode to reduce unnecessary high current impact.

NO.	Name	Range	Default
A11	Delay start time	0~999 s	0 s

When A11=0, the soft starter immediately supplies power to the motor and starts the motor after receiving the start command;

When A11≠0, the soft starter will not start the motor immediately after receiving the start command; instead, it will supply power to the motor and start the motor after the start delay time set by A11.

NO.	Name	Range	Default
A12	Soft stop time	0~60 s	0 s

When A01=2, Soft stop mode;

During soft stop, the power supply of the motor is switched from the bypass contactor to the internal thyristor output, and the soft starter controls the output voltage to gradually decrease according to the setting of A12, so that the motor decelerates smoothly.

NO.	Name	Range	Default
A13	旁路延时	0~10S	0 s

When A14=0，After the soft starter starts, the bypass contactor acts immediately;

When A1≠0，After the soft starter starts, the bypass contactor will act after the delay set by A13

NO.	Name	Range	Default
A20	grid frequency	1~2	1

1：50HZ　　2：60HZ

NO.	Name	Range	Default
A21	Motor wiring method	1~3	1

1：external　　2：internal　　3：Forced internal

When the wiring mode is selected as internal connection (A21=2), after the soft starter receives a valid start command, it will first perform wiring inspection; if the wiring is wrong, it will report a "wiring error" fault.

NO.	Name	Range	Default
A98	Factory reserve	0~2	0

0：reserve（none）　　1：reserve（A）　　2：reservee（10）

NO.	Name	Range	Default
A99	Parameter reset	0~3	0

0：None operation　　1：reset 1（Keep fault record）

2：reserve　　3：reset 2（delete fault record）

5.3 Protection Parameter

NO.	Name	Range	Default
B00	Motor rated current	As model	Soft start rated current（A）

B00 is used to set the rated current Ie of the controlled motor, please set it according to the nameplate data of the motor; the setting range is (50%~100%) corresponding to the rated current of the soft starter）

NO.	Name	Range	Default
B01	Start overcurrent	400~600%	450%
B02	Run overcurrent	20~400%	200%

B01, B02 cooperate with B20 to carry out overcurrent protection during starting and running respectively, and the reference value is the rated current of the motor B00.

When B01=400%，The starting overcurrent protection function fails；When B02=100%, the running overcurrent protection function is invalid.

NO.	Name	Range	Default
B03	Start overload class	1~6	4
B04	Run overload class	1~6	2

B03 and B04 are the overload protection level settings during starting and running respectively.

The starting overload protection level adopts the same standard as the running overload protection level. This standard is divided into levels 1-6, as following:

1：10A class；

2：10 class；

3：20 calss；

4：30 class；

5：OFF；

6：reserve

The protection characteristics of each level are shown in Figure 5.7.

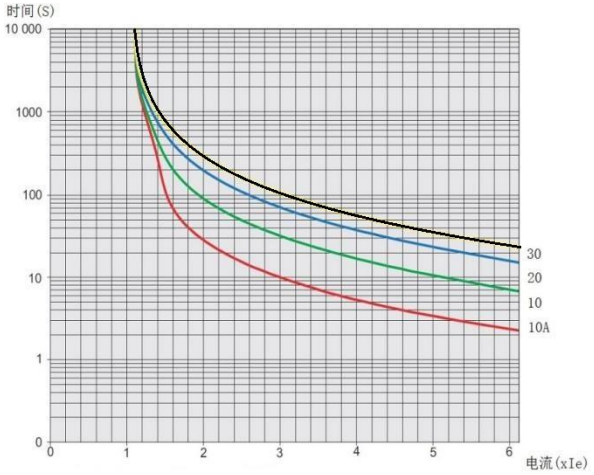


Figure 5.7 Motor overload protection characteristics

NO.	Name	Range	Default
B05	Current unbalance degree	5~100%	40%

B05 with B21 to fulfill current unbalanced protection .

B05 specifies the ratio threshold of <difference between any phase current and three-phase average current> compared to <three-phase average current>.

If (I - Iaverage)/Iaverage>B05, and Iaverage>D10 (minimum 5A), and the above two conditions are continuously maintained for the set value of B21, the "current imbalance" fault will be triggered. (I represents any phase current in the three-phase current)

When B05=100%, the current unbalance protection function fails.

NO.	Name	Range	Default
B06	Overvoltage threshold	380~1500 V	456V
B07	Undervoltage threshold	100~690 V	304 V

B06 specifies the overvoltage protection threshold, and B07 specifies the undervoltage protection threshold.

NO.	Name	Range	Default
B08	Start overtime	5~200 s	70 s

B08 specifies the starting time protection threshold. If the actual starting time > B08, the "starting time overtime" fault will be triggered.

NO.	Name	Range	Default
B10	High current protection	5~10	5

If the motor current ≥ B10, the "high current fault" will be triggered immediately; when B10=5, the high current protection is invalid.

NO.	Name	Range	Default
B11	Phase protection	1~ 2	1

1：Off 2：On

When B11=2, after an effective start command, first check whether the phase sequence of the power supply is correct; if it is abnormal, it will trigger a "power reverse sequence" fault.

NO.	Name	Range	Default
B12	Thyristor Protection	1~ 2	1

1：Off 2：On

When B12=2, if the motor current is detected before the start command is valid, the "thyristor abnormal" fault will be triggered.

NO.	Name	Range	Default
B20	Overcurrent delay	0~10 s	2 s

During starting or running, when the motor current is greater than B01 or B02 and lasts for the time set by B20, the "starting overcurrent" or "running overcurrent" fault will be triggered;

NO.	Name	Range	Default
B21	Current unbalanced delay	0~10 s	2 s

Function details as B05.

NO.	Name	Range	Default
B22	Input phase missing delay	0~5 s	1 s

After the motor starts, when the continuous phase loss time of the grid exceeds the time set by B22, the "input phase loss" fault will be triggered.

B22 is mainly aimed at sites with poor power grid quality; when B22=0, it is equivalent to turning off the protection against electric shock.

NO.	Name	Range	Default
B23	Starting time interval	0~30min	6 min

After the motor is started and switched to the bypass, the soft starter starts the countdown of the start time interval (B23); during this countdown process, if the soft starter starts again after stopping, it will trigger the "starting overfrequency" fault; only after the countdown is over, can the next start be performed. The remaining countdown time of the starting time interval can be viewed through U014 (unit: second).

NO.	Name	Range	Default
B97	Password setting	0-9999	0
B98	Password aging	0-9999 min	5 min
B99	Password validation	0-9999	0

1. When B97=0，password protection is invalid：Regardless of the value of B99, any parameter can be modified;

2. When B97≠0，password protection is valid：

（1）If B99≠B97，then only B99 itself can be modified；

（2）If B99 = B97，you can modify any parameter; but after the time set by B98, B99 is automatically reset to 0, and the protection parameter is modified; if you want to continue to modify the parameter, you need to enter the password through B99 again.

3.When B97≠0 and B99 = B97，if B98 = 0，B99 is always valid and will not reset automatically.

5.4 Function Parameter

Code	Name	Range	Default
C01	Programable relay output(T1A-T1B-T1C)	0~9	7
C02	Programable relay delay（T1A-T1B-T1C）	0~30 s	0 s

（a）Relay OFF state　　（b）Relay ON state

Figure 5.8 Relay states

Table 5.2 T1 configuration options

C01 setting	Relay action	Soft starter states
1：Stop	OFF	Starting, Running/Bypassing, Soft stopping, Fault
	ON	Standby/Stop
2：Fault	OFF	No Fault
	ON	Fault
4：Starting	OFF	Standby/Stop, Running/Bypassing, Soft stopping, Fault
	ON	Starting
5：Start complete	OFF	Standby/Stop, Starting, Soft stopping, Fault
	ON	Running/Bypassing
6：Soft stopping	OFF	Standby/Stop, Starting, Running/Bypassing, Fault
	ON	Soft stopping
7：Running (Motor powered)	OFF	Standby/Stop, Fault
	ON	Starting, Running/Bypassing, Soft stopping
8：Power-on	OFF	Power-off
	ON	Power-on (including Fault)
9. Thyristor faulty	OFF	OFF: Thyristor is ok
	ON	ON: Thyristor is fault

NO.	Name	Range	Default
C03	Modbus 从机地址	1~63	1

NO.	Name	Range	Default
C04	Modbus/RS485 波特率	1~5	4

1：1200 bps；　　2：2400 bps；　　3：4800 bps；
4：9600 bps；　　5：19200 bps。

NO.	Name	Range	Default
C05	RS485 data format	1~6	1

1：8-N-1　　2：8-E-1　　3：8-O-1
4：8-N-2　　5：8-E-2　　6：8-O-2
Note：If change C05，It needs to be powered off and on again to take effect.

NO.	Name	Range	Default
C06	DI1 function selection	1~3	1

1：Reset；DI1short circuit connect with 0V, it can reset；

2：Emergency stop；DI1disconnect with 0V，Immediately cut off the drive of the thyristor；

3：Jog；When A00=3（Jog mode），DI1 shortsircuit connect with 0V，Jog control of the motor can be realized.

NO.	Name	Range	Default
C07	Analog output range selection	1~4	1

1: 2 times the rated current of the motor (2*B00)
2: 4 times the rated current of the motor (4*B00)
3: 2 times the rated current of the soft starter (2*D01)
4: 4 times the rated current of the soft starter (4*D01)
C07 is used to set the corresponding output current of the soft starter when the analog output terminal (I+, 0V) outputs a maximum signal of 20mA.

NO.	Name	Range	Default
C08	Analog output correction factor	100~2000	1000

When the output signal of the analog output terminal (I+, 0V) deviates greatly from the theoretical value, it can be corrected by C08.

5.5 Advanced Parameter

NO.	Name	Range	Default
D00	Factory reserve	-	-
D01	Soft start rated current	As model	As model

D01 is a read-only parameter, which specifies the rated current of the soft starter.

NO.	Name	Range	Default
D02	Current calibration value	5~1200%	value
D03	Voltage calibration value	5~500%	value

D02 and D03 are read-only parameters, which are used for factory calibration of current and voltage display values.

NO.	Name	Range	Default
D04-D06	Factory reserve	-	-
D07	Factory reserve （LCDContrast setting）	-	-

NO.	Name	Range	Default
D08	Factory reserve	1-3	2

1：reserve（W）　　2：reserve（N）　　3：reserve（Z）

NO.	Name	Range	Default
D09	Rated voltage	220~1500V	Series setting

D09 is a read-only parameter, which specifies the rated input voltage of the soft starter.

NO.	Name	Range	Default
D10	Current blanking	1~20%	5%

D10 is used to set the minimum value of soft starter current display. When the actual current < (soft starter rated current * D10), the panel displays 0A; the minimum effective current that can be displayed on the panel is 5A.

NO.	Name	Range	Default
D11	Factory reserve	0~9999	0
D98	Factory reserve	-	-

D99	Factory reserve	-	-

5.6 Status Monitoring Paramete

NO	Instruction	Remarkes
U001	Soft start input voltage	Unit：V
U002	Soft start output voltage	Unit：V
U003	Three-phase average current	Unit：A
U004	R phase current	Unit：A
U005	S phase current	Unit：A
U006	T phase current	Unit：A
U007	Recent first failure	
U008	Recent second failure	
U009	Recent thrid failure	
U010	Recent fourth failure	
U011	Recent fifth failure	
U012	Rated current	Unit：A
U013	Start delay countdown	Unit：second（s）
U014	Start Interval Countdown	Unit：second（s）
U015	Factory reserve	
U016	Fault times	
U090	POWER version	
U091	Display software version	

6. Troubleshooting

This guide is intended to provide the information necessary to successfully troubleshoot issues that may occur during the operation, See Table 6.1.

Table 6.1 Fault indication

Fault Diaplay	Possible Causes	Solution
Input phase Loss	Input power phase loss	Check the three-phase power supply and isolation circuit breaker after power failure
Output Phase Loss	• The motor is not reliably connected • thyristor open circuit • The bypass contactor is not reliably closed	• Check the soft starter output wiring and the motor • Check thyristor or trigger circuit • Check bypass contactor
Starting OC/ Starting Overcurrent	• Starting/protection parameters are not matched to the application • Insufficient power capacity	• Adjust the starting parameters or protect parameter • Check the power voltage during start
Running OC/ Running Overcurrent	•Inappropriate parameter setting • load suddenly increases or fluctuates too much	• Adjust the running current protect parameter • check the load
Starting OL/ Starting Overload	• Inappropriate parameter setting • Overload	• Adjust the starting parameters or protect parameter • Check if it can reduce the load
Running OL/ Running Overload		
Cur Imbal/ Current Imbalance	• Inappropriate parameter setting • Thyristor not working reliably • Motor failure • Unbalanced input power	• Adjust current imbalance protect parameter • Check trigger signal or thyristor connections and motor windings • Check the motor and its wiring

		• Check the balance of the power supply itself
Overheat protection	• frequent start •startup time too long overloaded	• Reduce starting frequency • Adjust related parameters •Check the matching degree of soft starter and load
Over voltage	• Inappropriate parameter setting • Inaccurate voltage detection	•Properly adjust the relevant parameters of voltage protection •Check whether the voltage display value is consistent with the measured voltage
Undervoltage		
StartTimeout/ Excess Start Time	• Inappropriate parameter setting • Motor overloaded • Insufficient power capacity	• Adjust the starting parameters • Check the load if it is match the soft starter • Increase the power capacity
Thyristor breakdown	• Thyristor or bypass relay damaged	• Contact suppliers or manufacturers
Internal Fault	• Soft starter inner fault	• Contact suppliers or manufacturers
High current fault	• Load-locked ,etc to cause motor locked • Soft starter output short circuit or ground connect	• Check motor&load system • Check soft starter output
Parameter Loss	• Large interference on site The internal chip of the soft starter is abnormal	• After power off, power on again • Contact suppliers or manufacturers
Frequent start	• The start interval is less than the set value	• Check whether the starting time interval setting is reasonable
Wiring error	• Abnormal motor wiring	• Check wiring
Power reverse sequence	• Input power phase sequence error	• Adjust any two phases of the incoming line

APPENDIX A：Modbus services

The starter provides only a Modbus RTU to support remote communication，

The default setting is 9600bps, 8-N-1 (8 Data bits, No Parity, 1 Stop bit), Slave address， baud rate & data format can be set in parameters C03~ C05..

A1 Modbus-RTU Frame

The so-called "RTU" is the combination of communication data. When communicating in Modbus-RTU mode, the message is directly represented by hexadecimal codes (1-9, A-F), two hexadecimal codes form a byte.

It is defined as follows:

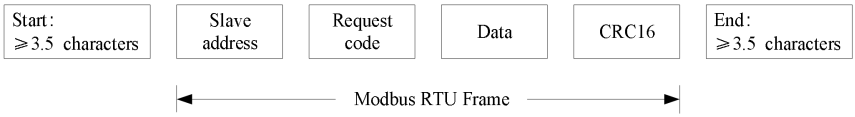


Figure A.1 Modbus RTU frame

As shown in Figure A.1, during the communication process, the master and the slave judge the start and end of the Modbus message at an interval of at least 3.5 characters. The Modbus message contains the complete data information to be sent, followed by the slave address, command code, data, and CRC check code, and its length changes with the change of the command code

No.	Name	Description
1	Slave address	• The Modbus address can be configured from 1 to 63. • When the host inquires, if the slave address is set to 0, the dialogue is in broadcast mode, and all slaves execute commands but do not feedback information; if the slave address is set to 1-63, the dialogue is in point-to-point mode, and only the slaves with matching addresses execute commands and feedback information. • In point-to-point mode, when the matching slave responds, it returns its own slave address.
2	Request	• The starter supports the following Modbus functions.

	code	(1) 03H: Read N output words.(2*N byte) (2) 10H: Write N output words.(2*N byte) When responding incorrectly, the slave feedback command code is: (master query command code+80H)
3	Data	•This part is the main content of communication and the core of data exchange. Its content and length vary with the command code, please refer to the specific explanation of each subsequent command code for details.
4	CRC check code	• The CRC (Cyclical Redundancy Check) check code is used by the receiving device to detect errors in the received data and determine whether the received data is correct.

Table A.1 Modbus RTU Frame

A2 Modbus functions available

A2.1 Read N output words(2*N byte): function code 03H

1．Request

Table A.2 function code 03H master request RTU format

Slave address	Function code	Communication address		Number of words		CRC check code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		Hi	Lo	Hi	Lo	Lo	Hi
	03H			N			

(1) Slave address, CRC check code: see Table A.1.

(2) Function code: 03H, request to read N words (2*N bytes) of the slave.

(3) Communication address: the starting address of the data to be read. This address is not the real physical address where the data is stored, but a number corresponding to the data. The control and monitoring parameters of the soft starter correspond to a communication address, see §5.1 for details.

(4) Number of read words: the length of the read data, with words (2 bytes) as the counting unit.

2．Response

Table A.3 function code 03H Slave response RTU format

Slave address	Function code	Number of bytes read	word value					CRC check code	
1 byte	1 byte	1 byte	2*N bytes					2 bytes	
			1st		…	Last		Lo	Hi
	03H	2*N	Hi	Lo	…	Hi	Lo		

(1) Slave address, CRC check code: see Table A.1.

(2) Function code: 03H, consistent with the request command code of the host.

(3) Number of read bytes: the length of the read data, in bytes.

Note: The counting unit of the read data length here is different from the counting unit in the query message.

(4) Read data: query the data corresponding to the communication address in the message.

2．Error response

Table A.4 function code 03H Erroe response RTU format

Slave address	Function code	Error code	CRC check code	
1 byte	1 byte	1 byte	2 bytes	
			Lo	Hi
	83H			

(1) Slave address, CRC check code: see Table A.1.

(2) Function code: 83H, which is the sum of 03H and 80H.

(3) Error code: It indicates the reason why the slave cannot execute the command of the master.

4．Example： read soft-starter status

Request: 01 03 10 2A 00 01 A1 02

Response: 01 03 02 00 01 79 84 (status = soft starting)

Error response: 01 83 02 C0 F1(if communication address change from 102A to 002A）

A2.2 Write N output words: Function code 10H

1．Request

Table A.5 function code 10H request RTU format

Slave add.	Function code	Communication address		Number of words		Number of bytes	1st word		…	Last word		CRC check code	
1 byte	1 byte	2 bytes		2 bytes		1 byte	2 bytes		…	2 bytes		2 bytes	
		Hi	Lo	Hi	Lo		Hi	Lo	…	Hi	Lo	Lo	Hi
	10H								…				

1) Slave address, CRC check code: see Table A.1.

(2) Function code: 10H, request to write N words (2*N bytes) of the slave.

(3) Communication address: the starting address of the data to be written. This address is not the real physical address where the data is stored, but a number corresponding to the data. The control and monitoring parameters of the soft starter correspond to a communication address, see §5.1 for details.

(4) Number of written words: the length of the written data, with words (2 bytes) as the counting unit.

(5) Number of bytes written (in): the length of the written data, in bytes.

(6) Data 1~Data N: Request to write N data to the slave.

2．Response

Table A.6 function code 10H response RTU format

Slave address	Function code	Communication address		Number of words		CRC check code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		Hi	Lo	Hi	Lo	Lo	Hi
	10H						

(1) Slave address, CRC check code: see Table A.1.

(2) Function code: 10H, consistent with the request command code of the host.

(3) Communication address: It is consistent with the communication initial address of the host.

(4) Number of written words: the length of the written data, with words (2 bytes) as the counting unit; it is consistent with the number of written words of the host.

2．Error response

Table A.7 function code 10H error response RTU format

Slave address	Function code	Exception code	CRC check code	
1 byte	1 byte	1 byte	2 bytes	
			Lo	Hi
	90H			

(1) Slave address, CRC check code: see Table A.1.

(2) Function code: 90H, which is the sum of 10H and 80H.

(3) Error code: It indicates the reason why the slave cannot execute the command of the master.

4．Example: Write start commend

Request: 01 10 10 28 00 01 02 00 40 B0 49 (Control soft starter start)

Response: 01 10 10 28 00 01 85 01

Error response: 01 90 02 CD C1 (if communication address change from 1028 to 0028)