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**RNMV Medium Voltage Solid-State Soft  
Start Cabinet |  
USER'S MANUAL**



# RNMV Medium Voltage Solid-State Soft Start Cabinet

## **User's Manual**

Language Version: English

- Please carefully read the user's manual before operation for the sake of understanding correct installation, circuit connection, operation of the instrument and maintenance, etc.
- The technical specification of this products will be updated without notice.
- This manual should always be kept till this product is scrapped.
- This manual should be kept in the hands of the actual end-user.

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# SAFETY CAUTIONS

This instruction must be fully understood before installation, circuit connection (wiring), operation and maintenance inspection to ensure correct use. The condition of driving machine and all safety cautions must be understood very well during use.

## **SAFETY**

- Installation and maintenance operation shall be in strict accordance with this manual and related national standards and industrial practices. Otherwise, the manufacturer shall not be liable for any negative effect caused by the operation that fails to be performed according to relevant guide specifications.
- Before the maintenance of soft starter or motor, all power inputs must be disconnected.
- It should be carefully checked to make sure no parts or components(such as: screws/washers etc.) have fallen into the charged device parts after installation.

## **WARNING**

- This product attached the control section( including trigger unit and central processing control section) has a dangerous voltage. Since the trigger unit has a high voltage that is same with that of main circuit, if violation of operation will be very dangerous and may cause electric shock accident.
- After this product is connected to main power supply, the output of soft starter will still have high voltage even if the control voltage is disconnected or the start is stopped.
- This product must be well grounded in order to ensure the safety of normal operation and prevent electric shock accidents. It's prohibited to connect the power factor compensation capacitors to the starter output.

# 1 INTRODUCTION

## 1.1 Introduction

- Features of SOFT STARTER series medium voltage soft starter
- The operation interface with switchable Chinese/English languages is easy to learn.
- The trigger circuit with isolated fiber ensures the full isolation between high and low voltage.
- Several groups of SCR in series are connected into the high-voltage control components, each component comes with the equalizing circuit and real-time voltage protection circuit.
- Comprehensive and flexible motor protections for overload, over current, undervoltage, open-phase, stall rotation, etc. Which can be turned on and off separately with settable protected level.
- To ensure complete equipment protection for medium voltage soft starter, SCR over current, over temperature, power supply open phase protection, excessively long starting time protection and the setting of time interval between starts.
- The phase angle dynamic tracking feedback components to ensure that any load starts successfully.
- Modbus/Profibus is selectable for Field bus.
- 0-20mA/4-20mA programmable output.
- Programmable input/output can be used flexibly.
- Multiple sets of start parameters to meet different load use.

## 1.2 Design Structure

medium voltage (3300V—15000V) soft starter should be used together with inlet cabinet equipped with disconnect switch.

→ Load Switch:

The load switch on the inlet cabinet allows the motor with the load to start. This switch has the ability to start with on-load short-circuit and stop when load stop. Its maximum design value is: 5KV load switch is for 2300V-4160V starters, 7.2KV is for 6000V-7200V starters, while 15KV is for 10KV-14KV soft starting cabinet.

→ Soft Starting Cabinet:

The soft start section is composed of bypass vacuum contactor, SCR overvoltage protection, SCR high-voltage components, RC absorption network, trigger circuit and control components.

→ Bypass Vacuum Contactor

The contactor is closed after the soft starter starts the motor, the current through the bypass vacuum contactor. The selected voltage ratio of the contactor is: 5KV for 2300V—4160V; 7.2KV for 6000V-7200V, and 15KV for 10KV-15KV soft starters.

→ RC Absorption Circuit

To provide transient voltage protection circuit to reduce the dv/dt impulse voltage thus avoiding damage to thyristor.

→ Trigger Circuit

To provide high-power trigger pulse of up to more than 2A to ensure the dynamic voltage balance of SCR connected in series. Both trigger circuit and SCR are at high voltage and separated from control panel through fiber and transformer.

→ SCR high Voltage Components

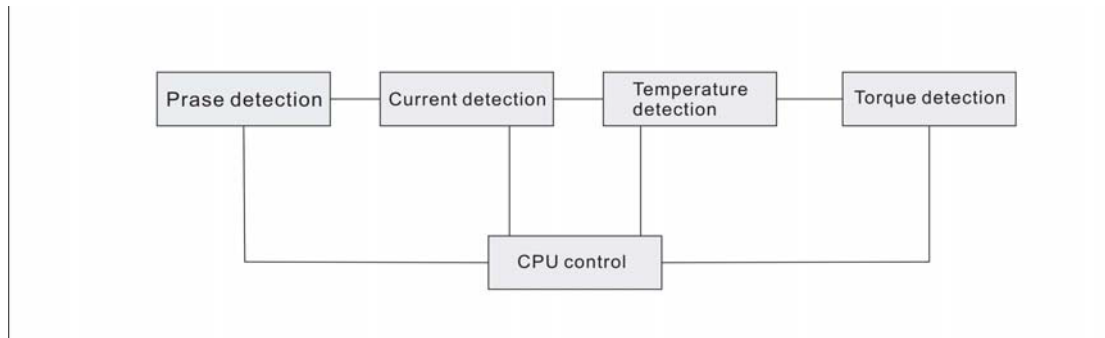
This consists of several SCR connected into series, see table 1.1 below:

Table1.1

| 0-1300A SOFT STARTER |                |                     |                    |
|----------------------|----------------|---------------------|--------------------|
| Voltage              | Pair of Series | Total number of SCR | Peak Voltage Ratio |
| 2300V                | 1              | 6                   | 6500               |
| 3300/4160V           | 2              | 12                  | 13000              |
| 6600V                | 3              | 18                  | 19500              |
| 10-15KV              | 5              | 30                  | 35000              |

### 1.3 → 1.3 Working Principle

The control core of soft starter is microprocessor CPU. This microprocessor control system can start and protect the motor. The CPU conducts phase angle triggering control over SCR to reduce the voltage to the motor, and then smoothly increase the motor's torque by slowly controlling the voltage and current applied to the motor, until the motor reaches full speed. This starting mode can low down the motor inrush current, and reduce the impact over power network and the motor. Meanwhile, minimizing the mechanical shock over load devices connected to the motor to prolong the service life of the equipment and reduce fault and stop.



→ Soft starter has two starting modes available

→ Voltage Ramp Start Mode

The factory settings for the voltage ramp can limit the current and also is the most reliable mode of starting, to meet most application requirements. The initial torque setting value is just for the motor drive to the load rotation value, then the voltage smoothly increase to make the motor achieve a full-speed operation within limited ramp time and range of start current.

→ Current Limiting Start Mode

When the motor is started, the current will increase to limit value rapidly, until the motor achieves full speed operation.

The above two methods can also be increased load constant pressure startup stages. For example, the loads with large inertia, such as Fan, Ball mill etc, may get better starting effect by using this function.

#### → 1.4 Motor and System Protection Function

Soft starter can protect the soft starter and the motor with the following functions:

→ Three-phase input open-phase protection: the motor can not be started unless a three-phase input power supply is connected to the main circuit.

→ Temperature is too high, means too frequent operation of soft starter keeps SCR at an excessively high temperature (up to more than 80 °C)

→ Too long starting time protection: since a too long starting time is harmful to both starter and motor, the maximum starting time is limited at 100 seconds.

→ The starter protects the motor by disconnecting SCR ( when motor is started) or by jumping the bypass contactor.

→ Current quick-breaking protection ( with the inlet circuit breaker to use). Heavy current protection is needed.

→ Inverse time limits of over-current protection, three-phase unbalanced protection, and stall rotation protection.

→ Over-voltage protection of low-voltage

→ Motor overheat protection, frequent motor starts making thermal melting too high, the starter will limit the start, and is allowed to be started only after the thermal melting value back to a safe area through a certain cooling time upon shut down.

## 2 QUICK USE

This chapter briefly introduces the soft starter in the most efficient way of connection, configuration and starting.

### → 2.1 Wiring

→ Please install soft starter according to the relevant standards of High-medium voltage cabinet.

→ Please pay attention on ambient temperature, when it is above 40℃ (104 degrees Fahrenheit), the starter shall be derated before using.

→ Connection of main circuit: terminal R-S-T shall be connected to the power supply.

Terminal U-V-W shall be connected to the motor.

→ Connection of control power supply: to be connected to P1 and P2 of JP10 terminal (110-220V, 50/60Hz)

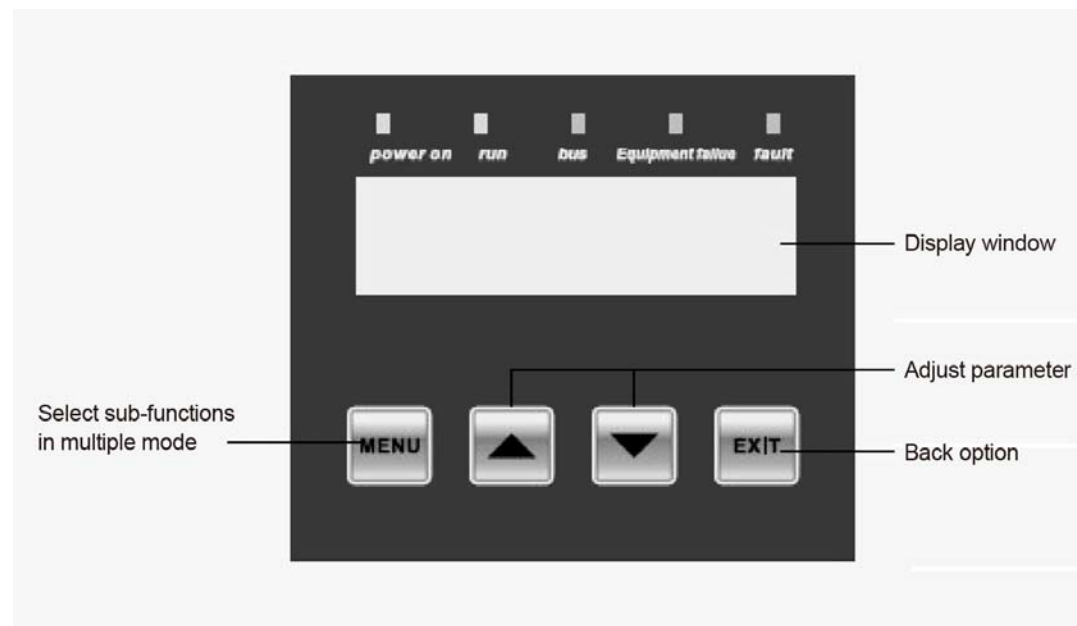
→ Grounding: The control terminals grounded and cabinet enclosure grounding. (Please see 3.3 for specific connection details)

→ Please check whether the main circuit voltage and control circuit voltage match the voltage level of the soft starter or not.

→ Turn on the control circuit power supply. (110V/220V)

→ The green LED lights 'Power on' , LED display as shown in figure 1.

Figure 1



## 2.2 CONFIGURATION

|                     |      |
|---------------------|------|
| Application Setting |      |
| Select              | Back |

Figure 4: select 'Application Setting'

|                  |      |
|------------------|------|
| Centrifugal Pump |      |
| Set Storage      | Back |

Figure 5: Centrifugal Pump

|                  |      |
|------------------|------|
| Centrifugal Pump |      |
| Next Step        | Back |

Figure 6: Storage of Centrifugal Pump

|            |       |
|------------|-------|
| Setting Ie | 99.0A |
|------------|-------|

Figure 7: Set Current

|            |        |
|------------|--------|
| Setting Ie | 99.0A  |
| Storage    | Cancel |

Figure 8: Set Current Storage

|            |      |
|------------|------|
| Setting Ie |      |
| Next Step  | Back |

Figure 9: Select Current Storage

|                         |        |
|-------------------------|--------|
| Motor Overload Class 10 |        |
| Storage                 | Cancel |

Figure 10: Motor Overload Class

1. Press MENU key for twice, select **Application Setting** menu, and then press MENU enter **Centrifugal Pump**

2. Press **Upper Key** and **Lower Key** to select your load.

3. Press **Set Storage** and **Next Step** to go on, or press Back to **return** to the previous set of parameters.

4. Press **Change** to go on, Press **Upper Key** and **Lower key** to set the Ie value, then press **Storage** to save the set motor rated current value.

5. Press **Storage** and **Next Step** to go on, or press **Back** to return to the previous state.

6. Press **Upper Key** and **Lower Key** to set the req overload degree.

7. Press **Storage** to save the settings, or press **Back** to return to the previous set of parameter

## 2.3 Motor Starting

Energizing the main circuit ( low-voltage powering on should be tested by manufacturers before the first installation using be done.)

Send a starting signal to the soft starter. (in case the soft starter is required to be started via soft starter keyboard, please enter **Menu-Setting-Local Control-Selection-Start/Stop-Start**). The motor must be stopped before exit from the menu.

# 3 DESCRIPTION

This Chapter will introduce the soft starter and its accessories and spare parts.

## 3.1 Introduction

The soft starter is designed based on the latest micro-processing technology for the soft starting and stopping of the squirrel cage motors. It comes with several advanced motor protection functions.

The motor could be directly started through the bypass contactor ( please pay attention on the rated current).

The keyboard can be operated easily as much as possible for the users, with clear text display, and two languages available for them to select.

This soft starter can be controlled in three ways:

- Terminal input control( local)
- Keyboard control ( limited to experiments)
- Field bus control

## 3.2 Functions

Soft starter has the functions of advanced control, integrated protection and warning. The protection, warning and control parameters are shown as follows:

### → **Start/Stop**

- Set current
- Start mode
- Voltage-rising time
- Voltage-reducing time
- Initial voltage
- Step-down voltage
- Current limiting multiple
- Constant voltage start
- Constant voltage
- Constant voltage time
- Delayed start
- Delayed time

### → **Protection Function**

- Motor overload protection
- Rotor stall protection
- Motor underload protection
- Heavy current protection
- Three-phase unbalanced protection

- Inverse protection
- Overload protection
- Motor temperature protection
- Motor open phase protection
- Motor overvoltage protection
- Motor overload protection
- Starting limit protection

→ **Warning Function**

- Motor underload warning
- Motor overload warning
- SCR overload warning

→ **Troubleshooting Functions**

- Overtime starting treatment
- Open-phase fault treatment
- Bus fault treatment
- Frequency fault treatment
- Internal overheating treatment

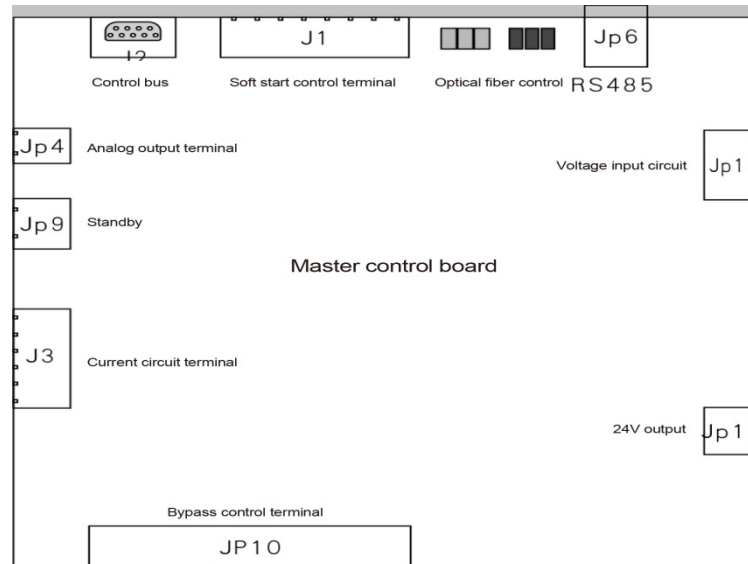
→ **Other Functions**

- Operating time
- Event record
- Keyboard password lock

### 3.3 Identification and Connecting mode

#### → Control Terminal

Description of connection and operation of the control terminal:



#### Wiring Preparation

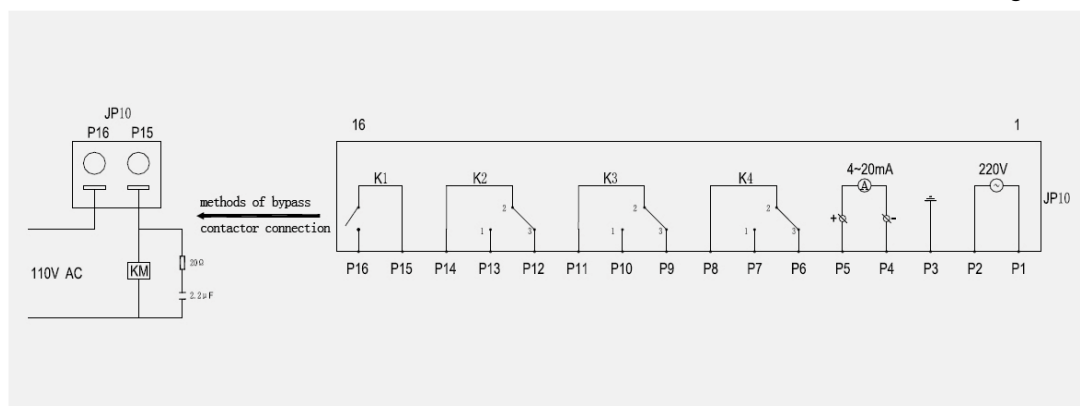
- When the user use the external terminals, the shielding control wire should draw forth from the terminal board, the outer layer of the shielding wire should be grounding.
- To avoid electromagnetic interference, the control wire should be isolated from motor cable and other inductive electrical devices connections.

#### Connection of External Control Terminal J10

- Bypass relay terminal P16, P15

After starting finished, K1 built-in contacts will be closed; then bypass contactor KM close. And executing the stop instruction, K1 built-in contacts will be opened. (see figure 3.1)

Figure 3.1



- Programmable relay K2

This programmable built-in contact can be used for events (including equipment failure and motor failure), time delay and operation etc. please see chapter 6 for details, the contact capacity is AC 250V 5A

- Programmable relay K3

This programmable built-in contact can be used for events ( including equipment failure and motor failure), time delay and operation etc. please see chapter 6 for details, the contact capacity is AC 250V 5A

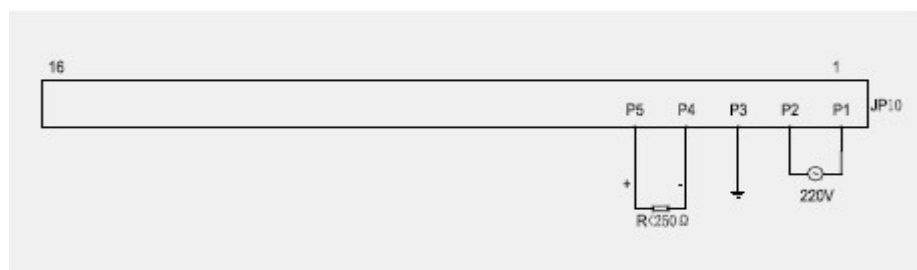
- Programmable relay K4

The soft starter will be closed when starting, and disconnected when operating ( include fault, stop).

- Analog current signal output ( 0~20mA/4-20mA) P4, P5

It is used for outputting 4-20mA(or0-20mA) current signal indicating the size of the current in the main circuit. The output method can be selected by programming, please see the following connection method. ( R is load resistance).

Figure 3.2



- Working power supply terminal P1, P2

Power supply for the control board AC/DC 110~220V(AC 50HZ).

External Control Terminal JP1

- Control terminal P37 ( start), P36 (stop), P30, P31( common terminal)

These three terminals are connected to ON/OFF button (see figure 3.3). In the following cases, the two-line connection method shall be adopted: (see figure 3.4)

→ When the user needs to control the ON/OFF of starter through a switch contact; for example, the control contact J of PC/PLC.

→ Using the delay function of the soft starter, when J is closed after a certain delay values, the soft starter begin to start, and the delay value is programmable.

- Programmable input 1 and 0, terminal P34, P35

Used as the second and third start control for external input reset event, external fault input and sequential start. See 6.60 for details.

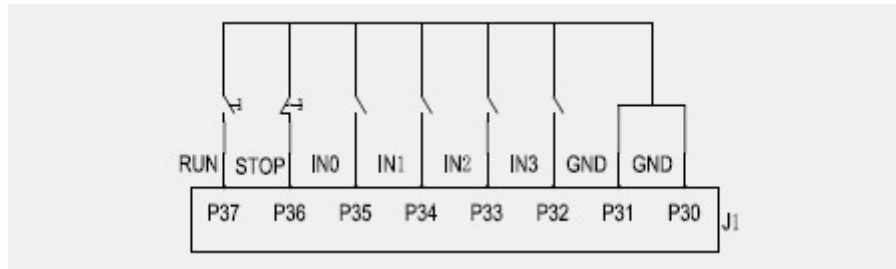


Figure 3.3 Three-line Wiring

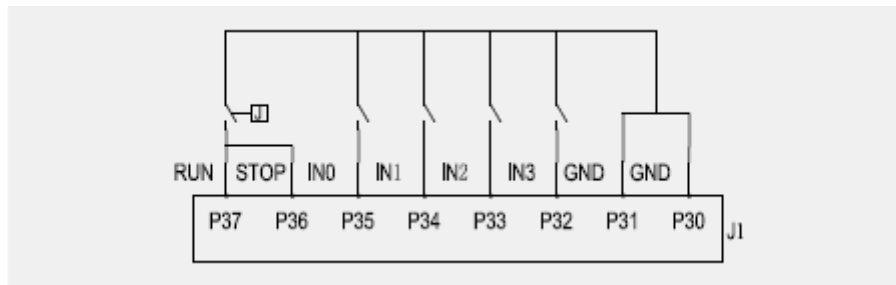


Figure 3.4 Two-line Wiring

Note:

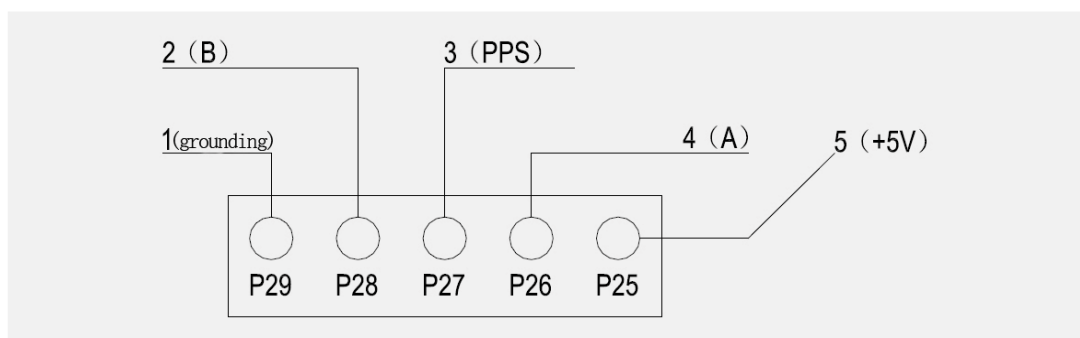
Please see 6.60 for details

- Contact P30 and P31 are common terminals.
- Contact P32 and P33 are standby terminals.
- Contact P34 and P35 are respectively programmable 0 input terminal and programmable 1 input terminal.
- Contact P36 disconnected is stop.
- Contact P37 connected is start.

Field Bus Terminal JP2

Modbus and Profibus share this terminal which shall be used under order agreement.

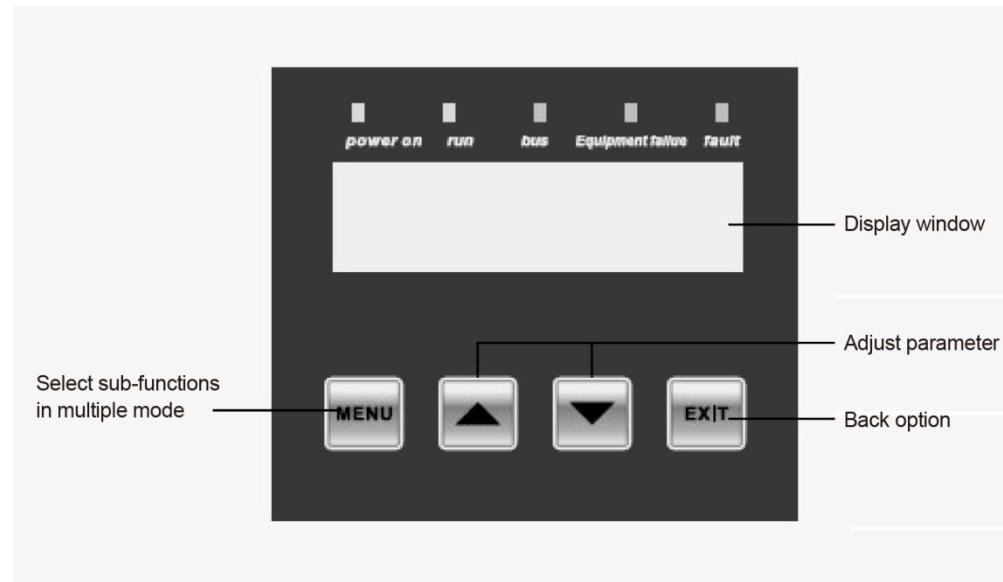
Figure 3.5



## 4 HUMAN-MACHINE INTERFACE

### 4.1 Description of Display and Keyboard

The green LED lights 'Power on' , LCD display screen as shown in the following figure:



The operation keyboard of soft starter is similar to the current mobile phone keyboard.

Description of keys:

MENU  $\longleftrightarrow$  Menu enter key for selecting set item to enter the submenu

$\uparrow\downarrow \longleftrightarrow$  Value change key, add-subtract key

EXIT  $\longleftrightarrow$  Exit key

### 4.2 Human-Machine Interface

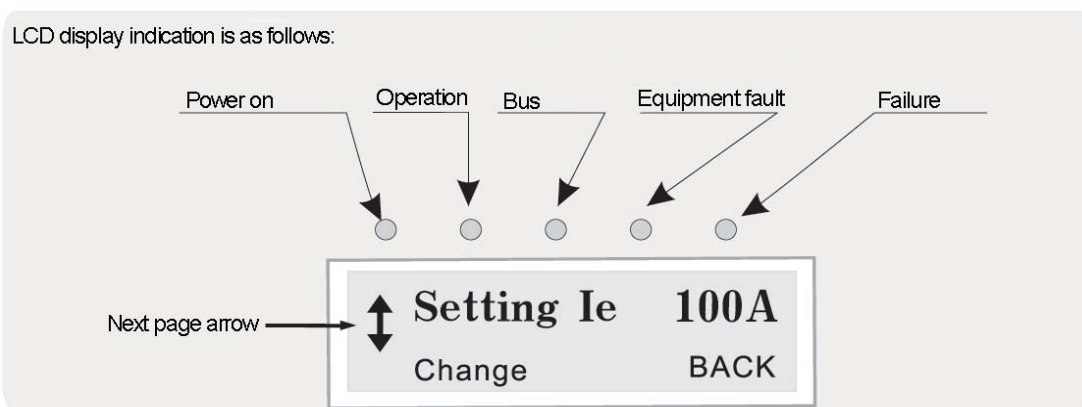
Human-machine interface consists of the following parts:

- LED status indication
- LCD display indication
- Keyboard operation

→ LED status indication is as follows:

| LED          | Color | Description                    |
|--------------|-------|--------------------------------|
| Power Supply | Green | Control power voltage on       |
| Fault        | Red   | Fault display                  |
| Protection   | Red   | Protection function effect     |
| Bus          | Green | Data transmission is available |

When the fault or protection LED lights on, LCD display will show the corresponding fault phenomenon.



- LCD displays two lines, 20 characters per line.
- The first line shows the information according to current status, and the second line displays the represent function of before selection key.
- Page-down arrows show the parameters and setted values that can be modified in current state.
- Selection keys in different menus have different functions. They can be used for modification and storage. Please read the characters in the second line of LCD screen.
- The operating buttons are used to complete the necessary settings in the menu. Select 'YES' in the list, the page turning will be cycled.

### 4.3 Settings

There are two methods available for settings:

- Keyboard
- Bus communication

When using keyboard, the parameters may either be setted seperately, or selected for various applications.

Preset parameters are stored in the unit, and the factory value selected to be inputted to the starter. When selecting the **Bus Communication**, most parameters could be modified through interface.

## Keyboard Setting

The functions of keyboard are illustrated by the following examples

|      |    |
|------|----|
| U=   | I= |
| Menu |    |

Change the rated current of motor (set current).

1. In the later chapter, you will find the simple explanation of setting and its route.

Figure 1: Menu

|                |
|----------------|
| Set            |
| Select    Back |

Route of menu:

### **Menu-setting-Function setting-Start/Stop-Set current**

2. Soft starter menu ( see Figure 1).  
Press **MENU** to enter the menu ( see Figure 2).

Figure 2: 'Set menu

|                     |
|---------------------|
| Application setting |
| Select        Back  |

3. Press **MENU** to select setting ( see Figure 3).

Figure 3: 'Application Setting' menu

|                  |
|------------------|
| Function Setting |
| Select    Back   |

4. Press **Upper Key** or **Lower Key** for twice until Figure 4 occurs.

Figure 4: 'Function Setting' menu

|                |
|----------------|
| Start/Stop     |
| Select    Back |

5. Press **MENU** to select **Start/Stop** (see Figure 5).

Figure 5: 'Start/Stop' menu

|                    |
|--------------------|
| Setting Ie    100A |
| Change        Back |

6. Press **MENU** to enter **Set Current** ( see Figure 6).  
Press **MENU** to display (see Figure 7).

Figure 6: 'Set Current' menu

|                       |
|-----------------------|
| Setting Ie    100A    |
| Storage        Cancel |

7. Set the rated current via upper or lower key. If you want to exit, please select **Cancel**, or press left selection key to select **Storage** to save the menu set value (see Figure 8).

Figure 7: 'Set Current' modify

|                     |
|---------------------|
| Setting Ie    99.5A |
| Change        Back  |

8. Continuously press **Back** key for four times to return to the main menu.

Figure 8: 'Set Current menu

# 5 MENU DESCRIPTION

## → 5.1 Main Menu

After power-on, without press the menu key, switching among the following interfaces directly is available by using add-subtract key.

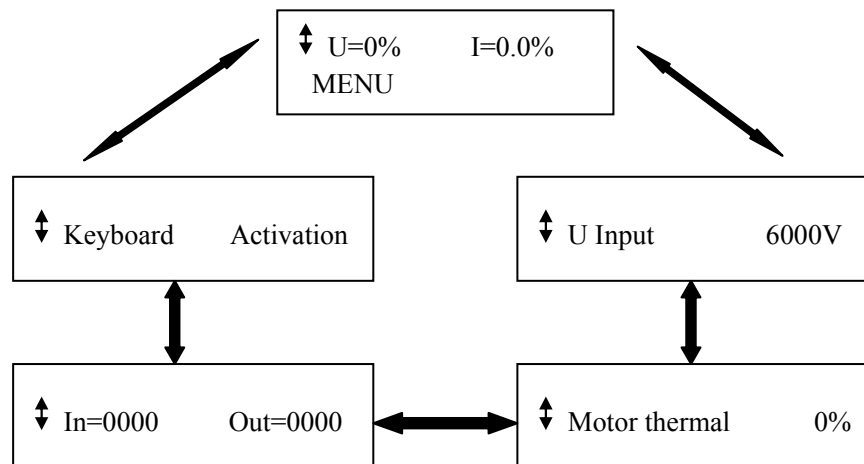


Figure 9: Main Menu Display

## → Locking /Unlocking of the Keyboard

Locking/unlocking of the keyboard

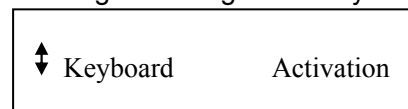


Figure 10: Keyboard activated menu

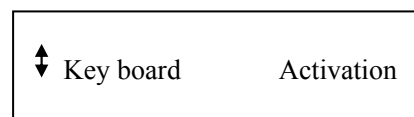


Figure 11: Keyboard storage menu

1. Press upper key to enter the keyboard for once (see Figure10). If the display appears in the upper-right corner is activated, the Keyboard is not locked.
2. Press **MENU** to enter keyboard storage (see Figure11). Press upper or lower key to select locking. Select storage and the keyboard is locked, select **BACK** to return to the main menu
3. Unlocking the keyboard  
The operation is same to that of locking.  
Once the keyboard is locked, the submenu is inaccessible.

→ **U input status**

The soft starter will test and display the size of input voltage (external). To display the actual voltage value of main circuit, it is required to set the voltage selection 6000V and 10000V in the service setting.

|         |       |
|---------|-------|
| U input | 5800V |
|         | BACK  |

Figure 12: Um status

→ **Motor thermal melting**

Thermal capacity of motor that is used will be displayed. 0% shows that the motor is in cold state, 50% shows that a half of temperature the capacity is used, etc. It is available only when the overload protection is opened.

|             |      |
|-------------|------|
| Motor Temp. | 0%   |
|             | BACK |

Figure 13: Motor

→ **Input/Output status**

The programmable input and output status is displayed as '0 and 1'. 0 indicates not activated, and 1 shows having been activated.

|         |          |
|---------|----------|
| In=0000 | Out=0000 |
|         | BACK     |

Figure 14: Input/Output

Numbers have the following functions:

- In=1000 Start signal
- In=0100 Stop signal
- In=0010 Programmable input 0
- In=0001 Programmable input 1
- Out=1000 Programmable relay K1 is activated
- Out=0100 Programmable relay K2 is activated
- Out=0010 Programmable relay K3 is activated
- Out=0001 Programmable relay K4 is activated

→ **5.2 Application Setting**

The preset parameters of the selected application in the application setting menu, that is available in the quick start. Only few parameters are required to be set before the motor start. The required inputted data will display automatically cycled.

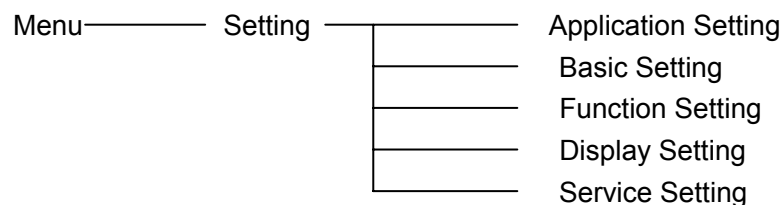


Figure 15: Application of Setting Menu

### → Enter Application Setting

Select **Application Setting** to enter the menu.

Select the application type of soft start by setting the storage. If all application types are not in the list, select the closest one, and then select adjustment setting for fine tuning. Listed below:

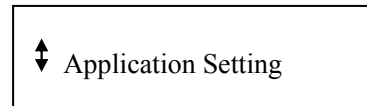


Figure 16: Setting of Current Menu

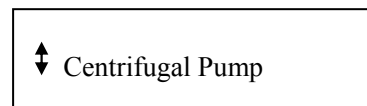


Figure 17: Current Storage Setting



Figure 18: Setting Current Menu

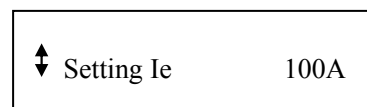


Figure 19: Setting Current Menu



Figure 20: Setting Current Menu

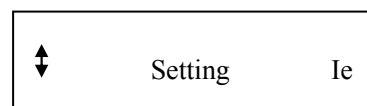


Figure 21: Motor Overload Classes

- Centrifugal Pump
- Hydraulic Pump
- Centrifugal Fan
- Axle Fan
- Compressor
- Belt Conveyor
- Ball Mill
- Mixer

Press **Next Step** to confirm the selection, if select wrong step, please press **BACK**, and then select correct **Application Setting**.

### → Setting Current

The set current of the soft starter is equal to the rated current of the motor.

Select the required overload class. Please see chapter 6 for details.

### → 5.3 Basic Setting

The basic setting in the menu includes the most common Start/Stop parameters required to be set, and each parameter can be adjusted separately. That is included in the function setting, please see the 'Function Description' in the next chapter for details.

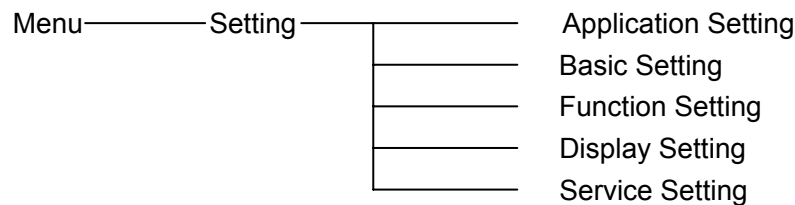


Figure 21: Application of the Basic Setting of the Menu

#### → Enter Basic Setting

Select the **Basic Setting** to enter the menu.

#### → Set Current

The setting current of soft starter is equal to the rated current of the motor.

#### → Start Mode

The start mode is set as voltage or current.

#### → Voltage-Rising Time

Set the voltage rising time of the start

#### → Voltage-Reducing Time

Voltage reducing time of setting stop (soft stop). Please note that this function only can be used at the occasion of the small flywheel quality, for example: Pump and Transmission belt.

#### → Initial Voltage

Set the initial voltage level.

#### → Step-Down Voltage

Set step-down voltage level, which is available after soft stop is selected, press the storage to save the selection.

#### → Current Limiting Multiple

Set the current limiting multiple of the starting.

## → 5.4 Function Setting

The function setting menu includes groups of parameters, which are arranged by functions, such as **Protection**, **Warning**, **Fault** and **Bus Communication** etc. This menu can be used for further settings. For the details of each parameter, please refer to chapter 6 'Function'.

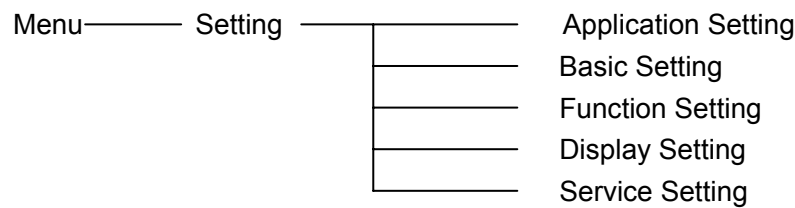
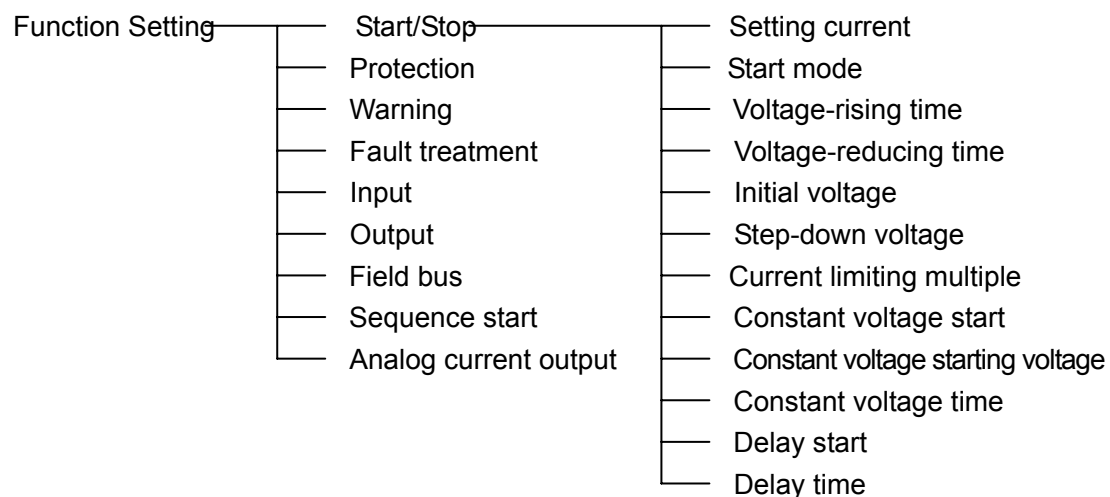


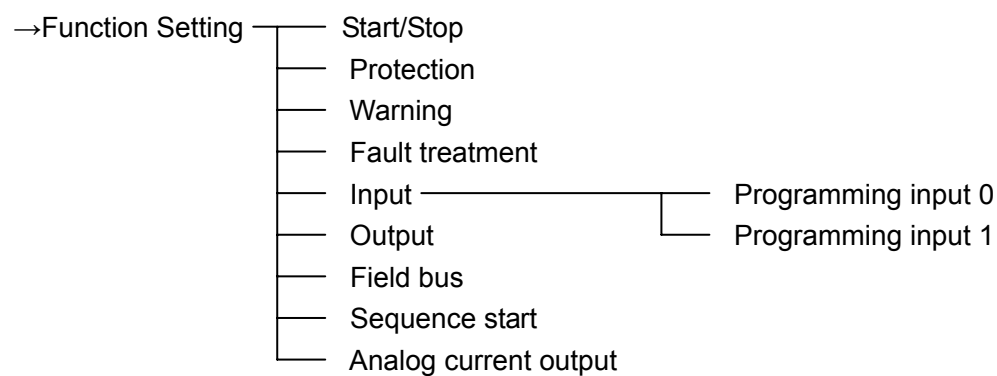
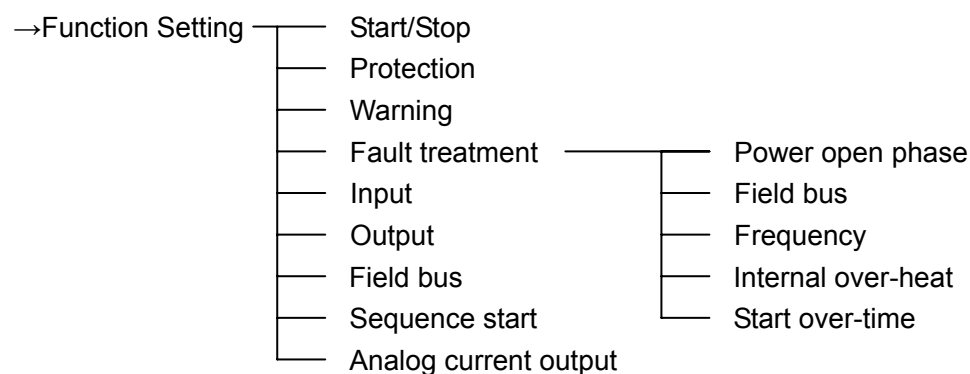
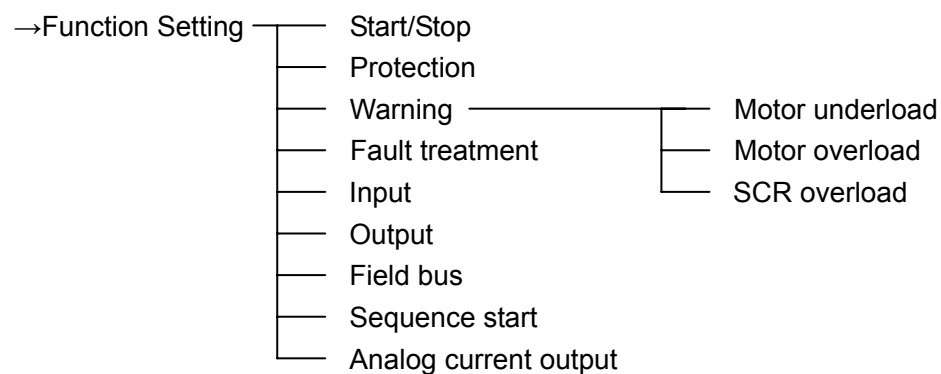
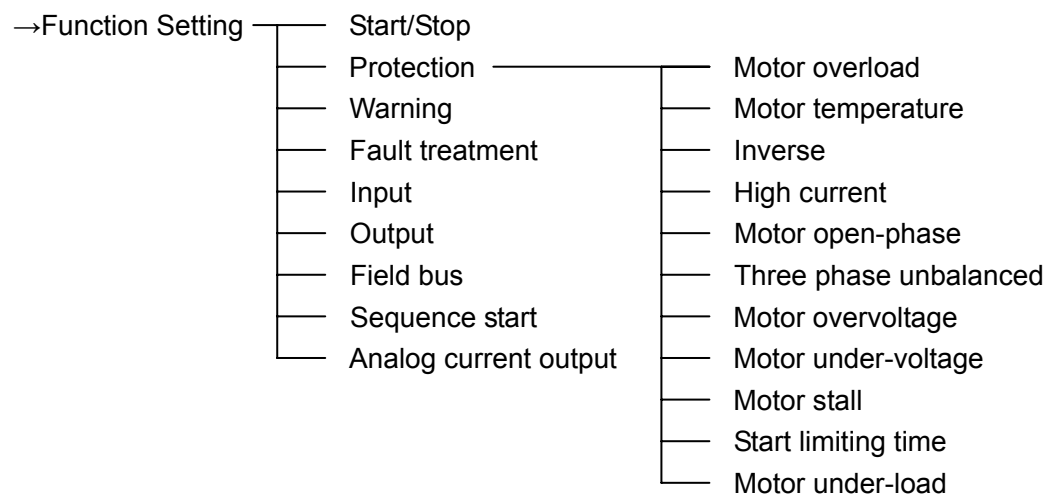
Figure 22: Application of Function Setting of the Menu

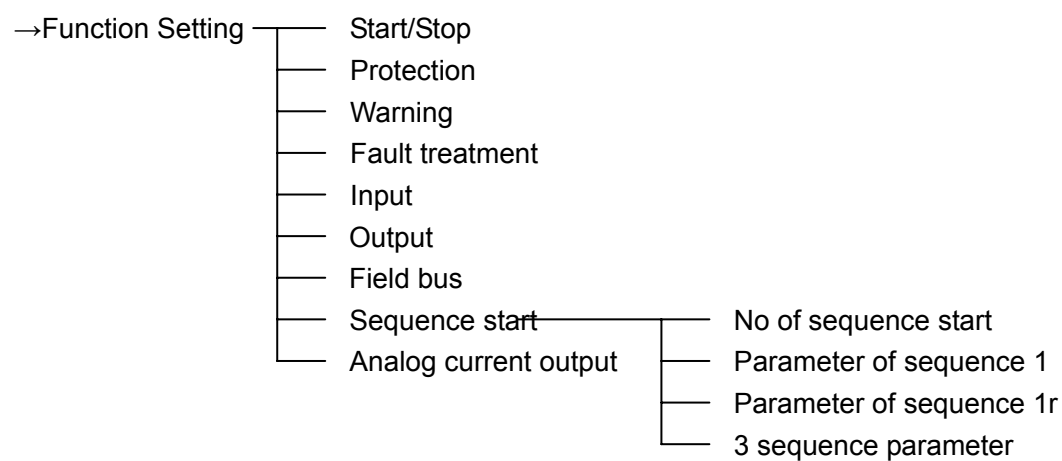
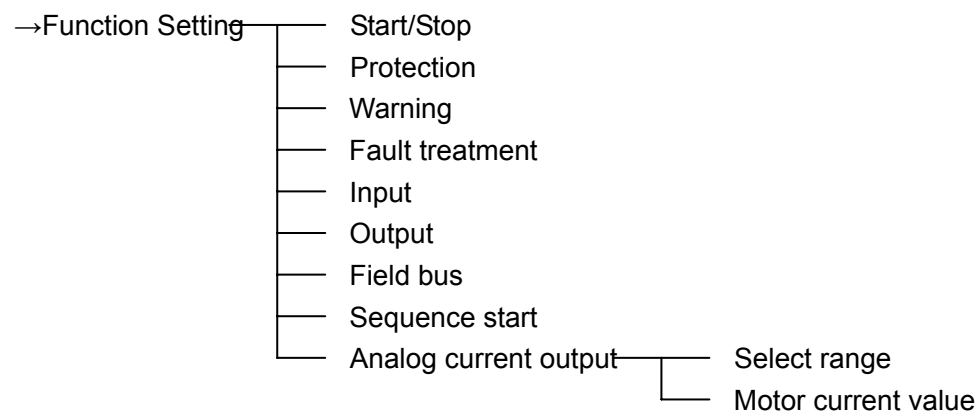
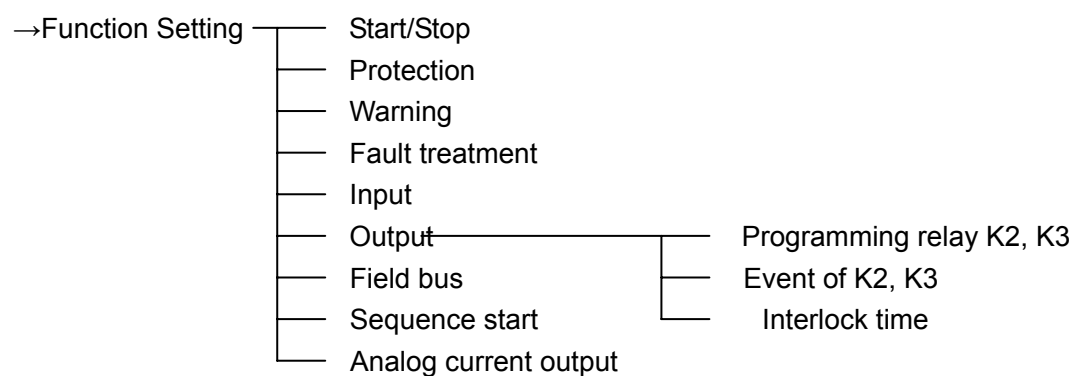
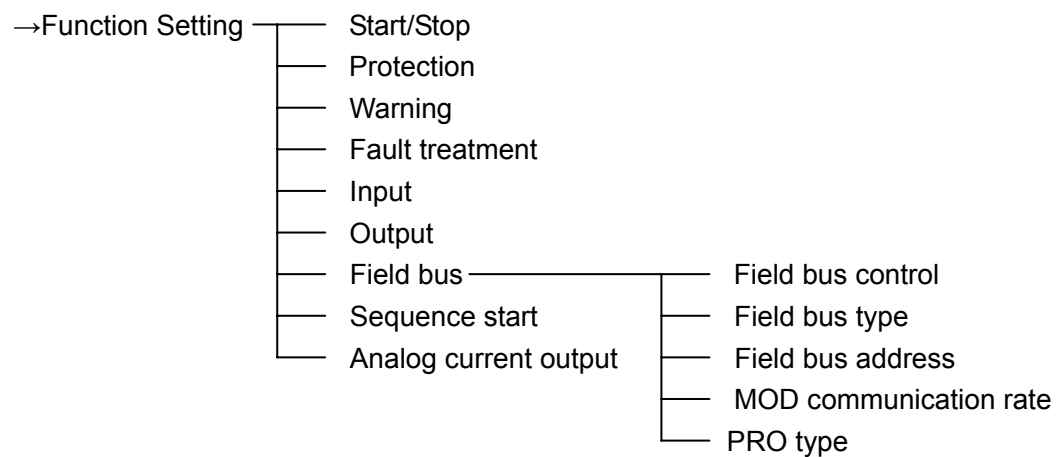
## → Enter Function Setting

Select Function Setting to enter the menu. The submenu of each section is introduced in the following:



It is used for setting some basic functions during soft start/stop.





## →5.5 Display setting

**Display Setting** menu includes the LCD parameter setting. **Language** includes two languages available for selection. The real-time clock of soft starter is also set in this menu.

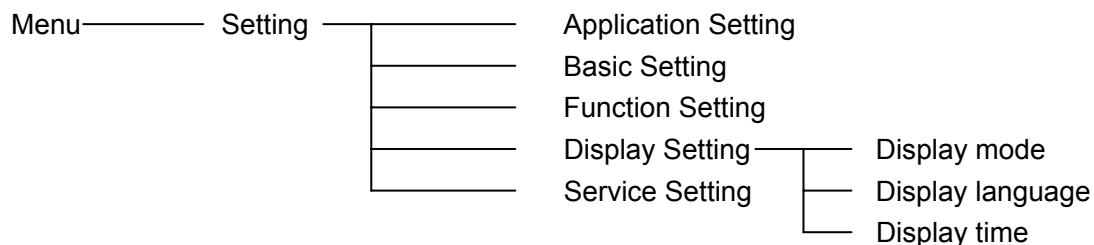


Figure 23: Application of Setting Menu

### → Display Language

Set the required display language at LCD, press change and storage, save the **language** selected.

Language available:

- English
- Chinese

Display closed automatically

LCD screen will be closed automatically according to the preset time (1-500 min)

## → 5.6 Service Setting

Service Setting menu includes maintenance and the parameter setting.

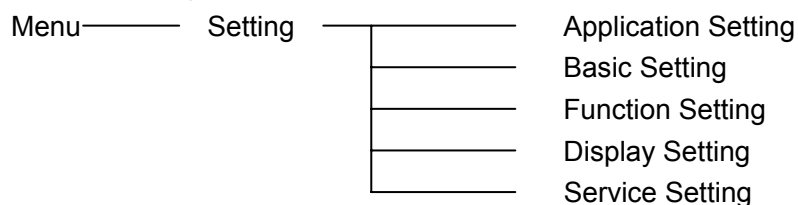


Figure 24: Application of Setting Menu

→ This setting menu includes the following parameters:

- Transformer ratio, set range: 1~800
- Current calibration, set range: 50%~150%
- Voltage calibration, set range: 50%~150%
- Voltage display selection, set range: 110, 3300, 6000, 6600, 10000, 11000, 13000, 15000.
- Bypass current limiting.
- 4mA current calibration.

- 20mA current calibration.
- Reset setting.



**This menu can be operated only by professional service personnel.**

In case the machine can't work normally or soft starter is damaged due to modification of parameters, the manufacturer warranty will be invalid.

## → 5.7 Local Control

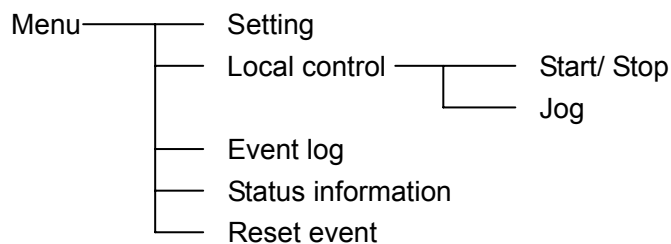


Figure 14: Local Control Menu

**Local Control** menu is used for controlling the start/stop of motor through keyboard. After Local Control type is selected, the soft starter is only controlled by the keyboard.

**i** After the local control exits, the soft starter remains the original control.

When **Sequence Start** is selected, it can not be entering into the **Local Control** menu.

Once this menu is used for starting the motor, do stop the motor prior to exit from the menu. If the motor has operated prior to entering the menu, immediate exit from the menu is allowed under the conditions that the motor is not stopped.

Two modes are available for selection ( see the following table)

| Function   | Description                                          |
|------------|------------------------------------------------------|
| Start/Stop | Start/Stop the motor through keyboard.               |
| Jog        | Press the <b>Jog</b> key and the motor will operate. |

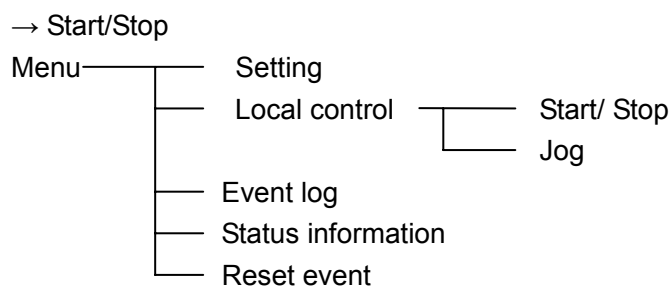


Figure 15: Start/Stop Menu

→ **Start**

Enter the **Start/Stop** menu (as shown in Figure 15). Select **Start** and the motor will start according to the set parameter.

→ **Stop**

Select **Stop**. And the motor will stop according to the set parameter. Press Stop will be workable during starting if necessary.

→ **Jog**

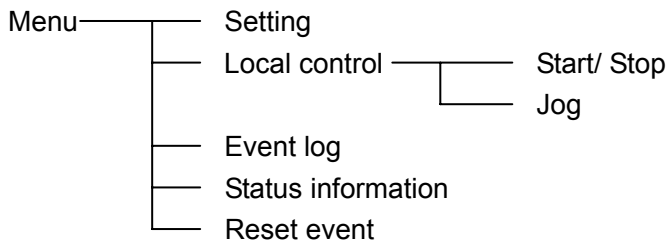


Figure 16: Jog Menu

Enter **Jog** menu(as shown in Figure 16). Select Jog. As long as keep the **Jog** command, the motor will start and accelerate to the rated speed according to the parameter settings. Once cancel the command, the motor will stop immediately.

→ **5.8 Even Log Menu**

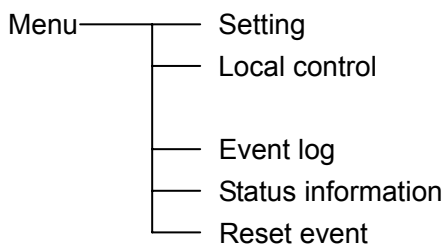


Figure 17: Secondary Menu

**Event Log** is used to check the event log of the soft starter. When entering this menu, the most recent events will be displayed according to time sequence, the top first, followed by the second, and so on.

Those events are displayed as **Event Type** with status and current when the event occurs. All items of event records can be viewed via operation key.

→ **5.9 Status Information Menu**

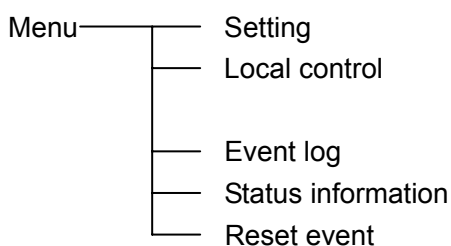


Figure 18: Secondary Menu

Status information menu is used to display different information. The information will be displayed from top row to rows followed by. Operation key can be used to display all the information.

| Display Text             | Function                        |
|--------------------------|---------------------------------|
| Frequency                | Frequency measured              |
| Phase L1 current         | Phase L1 current                |
| Phase L2 current         | Phase L2 current                |
| Phase L3 current         | Phase L3 current                |
| Running time             | Total running time of the motor |
| Times of started         | Start times                     |
| U12 line voltage         | U12 line voltage                |
| U23 line voltage         | U23 line voltage                |
| Maximum starting current | Maximum starting current        |
| Maximum running current  | Maximum running current         |

#### → 5.10 Event Reset Menu

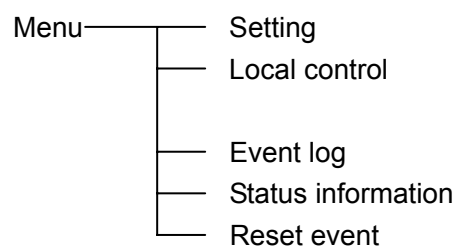


Figure 19: Secondary Menu

When failure occurs or it is under protection status, it will automatically enter the event reset menu and it can also be accessed from the main menu. If there are a number of events need to be reset, it can be viewed through operation key.

## 5 FUNCTION

This chapter introduces all settings and functions that may be used in soft starter, and the easiest operation method. The screen displays preset value respectively and the setting range and parameter text also have been described.

### → 1). Setting Current

Menu path: Menu→ Setting →Function Setting →Start/Stop →Setting Current

This parameter should be set according to the soft-starter current. It shall be set according to the rated current of the motor( please check the nameplate of the motor).

| Display Text | Preset Value                                         | Setting Range | Description            |
|--------------|------------------------------------------------------|---------------|------------------------|
| Setting Ie   | (Depending on the specification of the soft starter) | 0-1300A       | Rated current of motor |

### → 2). Start Mode

Menu path: Menu→ Setting →Function Setting →Start/Stop →Start Mode

This parameter is used to select from the two different modes of the soft starter.

| Display Text | Preset Value | Setting Range             | Description |
|--------------|--------------|---------------------------|-------------|
| Start mode   | Voltage      | Voltage, limiting current | Start mode  |

### →3). Voltage rising time

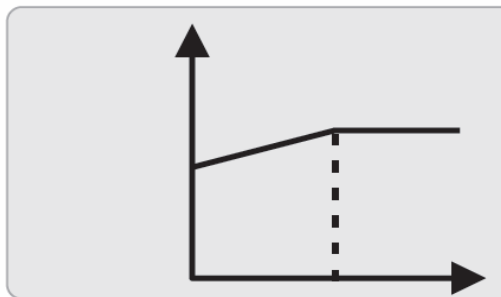


Figure 1: Voltage rise time

**Menu path:** Menu→ Setting →Function Setting →Start/Stop →Rising time

When a **start** signal to the soft starter, the output voltage of the load to the motor terminals will gradually increase so that the motor starts. The voltage will keep increasing until the motor to the full-voltage status.

| Display Text | Preset Value | Setting Range | Description            |
|--------------|--------------|---------------|------------------------|
| Rising time  | 10S          | 1-100S        | Influenced by the load |

Usually, the rise time shall be shorter than start limiting time.

#### →4). Voltage drop time

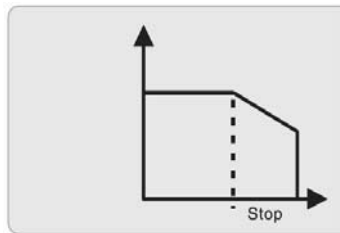


Figure 2: Voltage drop time

Menu path: Menu→ Setting →Function Setting →Start/Stop →drop time

When a **stop** signal to the soft starter, the output voltage of the load to the motor terminals will gradually decrease so that the motor stop. If voltage reducing time is setted to be 0, when the stop command is given, the soft starter will cut off the voltage directly.

| Display Text  | Preset Value | Setting Range | Description            |
|---------------|--------------|---------------|------------------------|
| Reducing time | 10S          | 1S to 60S     | Used for small inertia |

**i** If the motor is used with great flywheel, please set this parameter as 0.

#### → 5). Initial Voltage

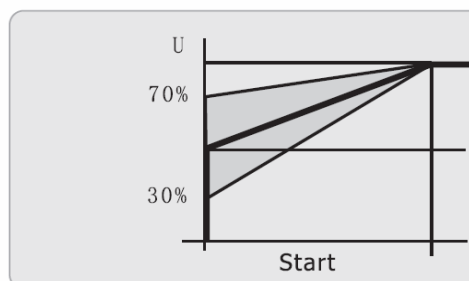


Figure3: Initial Voltage in Starting Process

Menu path: Menu→ Setting →Function Setting →Start/Stop →Initial Voltage

This parameter can be set at the level of **Initial Voltage** in starting process.

Excessively low initial voltage will prolong the start time and cause unnecessary heating of motor.

| Display Text    | Preset Value | Setting Range | Description                      |
|-----------------|--------------|---------------|----------------------------------|
| Initial voltage | 30%          | 30....80%     | Initial voltage for the starting |

## → 6). Step-Down Voltage

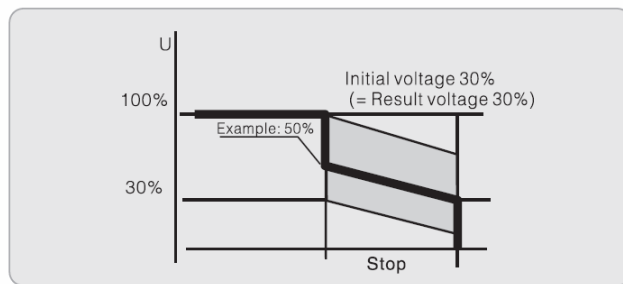


Figure4: Step-Down Voltage in Soft Stop Process

Menu path: Menu → Setting → Function Setting → Start/Stop → Step-Down Voltage

Motor speed will not decrease immediately when adopt soft stop. It will decrease the motor speed from the very beginning of soft stop through **Step-Down Voltage**. This function can realize a more optimized stop and is mainly used for pump load.

| Display Text      | Preset Value | Setting Range | Description        |
|-------------------|--------------|---------------|--------------------|
| Step Down Voltage | 0%           | 0....50%      | Used for pump load |

## → 7). Current Limiting Multiple

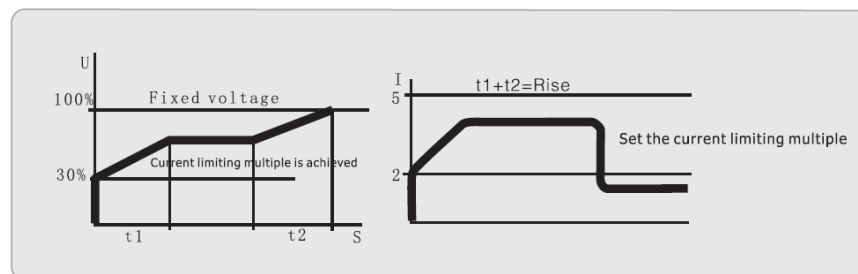


Figure 5: Current Limiting Multiple

Menu path: Menu → Setting → Function Setting → Start/Stop → Current Limiting Multiple

Use this function to limit the starting current, and when it reaches the current limit value, the output voltage will remain stable until the current falls below the limit value, the voltage build-up process will continue.

**i** Starting current must be heavy enough to use the motor to reach the rated speed. The allowable minimum starting current is determined by the motor and load characteristics.

| Display Text              | Preset Value     | Setting Range              | Description               |
|---------------------------|------------------|----------------------------|---------------------------|
| Current Limiting Multiple | $3.0 \times I_e$ | $1.5 \dots 5.0 \times I_e$ | Current Limiting Multiple |

### → 8). Constant Voltage Start

Menu path: Menu→ Setting →Function Setting →Start/Stop →Constant Voltage Start

In some super inertia loads occasions such as fans, ball mill, compressors and other applications, using the function of constant voltage start can get better start effect. That with a setted time, can provides a setted voltage.

| Display Text           | Preset Value | Setting Range | Description                   |
|------------------------|--------------|---------------|-------------------------------|
| Constant Voltage Start | No           | Yes/No        | Constant Voltage Start Option |

### → 9). Constant Voltage Starting Voltage

Menu path: Menu→ Setting →Function Setting →Start/Stop →Constant Voltage Starting Voltage

This parameter is for setting of **Constant Voltage Starting Voltage**, the function will be effected only after selecting the **Constant Voltage Start**.

| Display Text                     | Preset Value | Setting Range | Description                      |
|----------------------------------|--------------|---------------|----------------------------------|
| Constant Voltage Staring Voltage | 30%          | 25....80%     | Constant Voltage Staring Voltage |

### → 10). Constant Voltage Time

Menu path: Menu→ Setting →Function Setting →Start/Stop →Constant Voltage Time

This parameter is used for setting the constant voltage start time, only after selecting Constant Voltage Start, this function will be effected.

| Display Text                | Preset Value | Setting Range | Description                 |
|-----------------------------|--------------|---------------|-----------------------------|
| Constant Voltage Start Time | 15           | 1....60S      | Constant Voltage Start Time |

### → 11). Delay Start

Menu path: Menu→ Setting →Function Setting →Start/Stop →Delay Start

This parameter is used for setting the delay start function.

| Display Text | Preset Value | Setting Range | Description           |
|--------------|--------------|---------------|-----------------------|
| Delay Start  | No           | Yes/No        | Delay Start Selection |

### → 12). Delay Time

Menu path: Menu→ Setting →Function Setting →Start/Stop →Delay Time

Range of start delay time: 1....300S

| Display Text | Preset Value | Setting Range | Description                      |
|--------------|--------------|---------------|----------------------------------|
| Delay Time   | 2S           | 0....300S     | Selection of Range of Delay time |

### → 13). Overload Protection

Menu path: Menu→ Setting →Function Setting →Protection →Motor Overload Protection  
This parameter is used for setting the integrated motor overload protection function. Too high motor temperature will cause the motor trip, the reset operation must be carried out before re-start the motor.

Three modes of motor overload protection:

**None** Not activate the protection

**Conventional** Standard protection mode

**Double Protection** This protection mode has two overload classes, of which, one is used in starting, and the other in operation.

| Display Text        | Preset Value | Setting Range                         | Description              |
|---------------------|--------------|---------------------------------------|--------------------------|
| Overload Protection | None         | None, Conventional, Double Protection | Motor Overload Selection |

### → 14). Motor Overload Class

Menu path: Menu→ Setting →Function Setting →Protection →Motor Overload Class  
This parameter is used for setting of required motor overload protection classes. There are four classes ( See figure 6).

Class 5  
Class 10  
Class 15  
Class 20  
Class 25  
Class 30

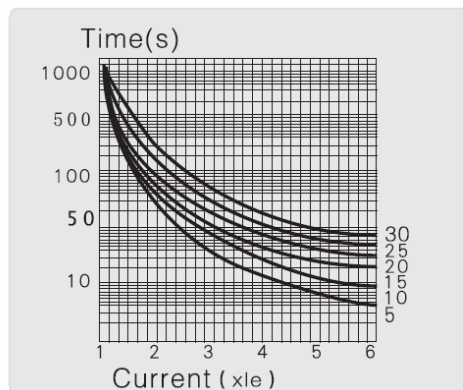


Figure 4.6: Tripping curve of electronic overload

| Display Text         | Preset Value | Setting Range         | Description    |
|----------------------|--------------|-----------------------|----------------|
| Motor Overload Class | 10           | 5, 10, 15, 20, 25, 30 | Overload Class |

### → 15). Start Overload Class

Menu path: Menu→ Setting →Function Setting →Protection →Motor Overload Class → Start Overload Class

This parameter is used for setting the overload class necessary for start. When a full voltage is realized, it will switch to operation overload class ( See below).

| Display Text         | Preset Value | Setting Range         | Description                             |
|----------------------|--------------|-----------------------|-----------------------------------------|
| Motor Overload Class | 10           | 5, 10, 15, 20, 25, 30 | Double protection, Start Overload Class |

### → 16). Operation Overload Class

Menu path: Menu→ Setting →Function Setting →Protection →Motor Overload Class → Start Overload Class

This parameter is used for setting the overload protection class necessary for continuous operation.

| Display Text         | Preset Value | Setting Range         | Description                             |
|----------------------|--------------|-----------------------|-----------------------------------------|
| Motor Overload Class | 10           | 5, 10, 15, 20, 25, 30 | Double protection, Start Overload Class |

### → 17). Overload Treatment Method

Menu path: Menu→ Setting →Function Setting →Protection →Motor Overload Protection → Treatment Method

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Motor Overload Protection** is selected, this function will be effected.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text               | Preset Value | Setting Range                             | Description                             |
|----------------------------|--------------|-------------------------------------------|-----------------------------------------|
| Overload Protection method | Manual Reset | Manual Reset, Self-reset, Indication Only | Operation Method of Overload Protection |

### → 18). Rotor Stall Protection

Menu path: Menu→ Setting →Function Setting →Protection →Rotor Stall Protection

During the operation of motor in a full-voltage state, if the current is still beyond the setted level after a period of time, the protection starts. In the full-voltage operation of motor, the protection starts to monitor.

| Display Text           | Preset Value | Setting Range | Description            |
|------------------------|--------------|---------------|------------------------|
| Rotor Stall Protection | No           | Yes/No        | Rotor Stall Protection |

### → 19). Stall Trip Level

Menu path: Menu→ Setting →Function Setting →Protection →Rotor Stall Protection –Stall Trip Level

This parameter is used to set stall trip level.

This function will be effected only after **Stall Trip Level** is selected.

| Display Text     | Preset Value | Setting Range  | Description                          |
|------------------|--------------|----------------|--------------------------------------|
| Stall Trip Level | 4.0×Ie       | 3.0....8.0 ×Ie | Trip Level of Rotor Stall Protection |

### → 20). Stall Trip Time

Menu path: Menu→ Setting →Function Setting →Protection →Rotor Stall Protection –Stall Trip Time

This parameter is used to set the delay time from testing to trip level to effective protection.

This function will be effected only after the **Rotor Stall Protection** is selected.

| Display Text    | Preset Value | Setting Range | Description                      |
|-----------------|--------------|---------------|----------------------------------|
| Stall Trip Time | 1.0S         | 0.2....10.0S  | Rotor Stall Protection Trip Time |

### → 21). Stall Protection Mode

Menu path: Menu→ Setting →Function Setting →Protection →Rotor Stall Protection –Stall Protection Mode

When the **protection** is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Rotor Stall Protection** is selected, this function will be effected.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text          | Preset Value | Setting Range                             | Description                                |
|-----------------------|--------------|-------------------------------------------|--------------------------------------------|
| Stall Protection Mode | Manual Reset | Manual Reset, Self-reset, Indication Only | Operation Method of Rotor Stall Protection |

### → 22). Motor Under-Load Protection

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-Load Protection

During the operation of motor in a full-voltage state, if the current is still under the settled level after a period of time, the **Protection** starts. In the full-voltage operation of motor, the protection starts to monitor.

| Display Text                | Preset Value | Setting Range | Description                 |
|-----------------------------|--------------|---------------|-----------------------------|
| Motor Under-Load Protection | No           | Yes/No        | Motor Under-Load Protection |

! The protection is used for cases such as avoiding the idling of pump and checking if the belt is torn.

### → 23). Under-load Tripping Level

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-Load Protection→Under-load Tripping Level

This parameter is used to set the **Under-load Tripping Level**.

This function will be effected only after the **Motor Under-load Protection** is selected.

| Display Text              | Preset Value     | Setting Range              | Description                                   |
|---------------------------|------------------|----------------------------|-----------------------------------------------|
| Under-load Tripping Level | $0.8 \times I_e$ | $0.4 \dots 0.8 \times I_e$ | Tripping level of motor under-load protection |

### → 24). Under-load Tripping Time

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-Load Protection→Under-load Tripping Time

This parameter is used to set the delay time from testing to tripping level to effect protection.

This function will be effected only after the **Motor Under-load Protection** is selected.

| Display Text              | Preset Value | Setting Range | Description                                  |
|---------------------------|--------------|---------------|----------------------------------------------|
| Under-load Tripping Level | 10S          | $1 \dots 30S$ | Tripping Time of Motor Under-load Protection |

### → 25). Under-Load Protection Mode

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-Load Protection→Under-load Treatment Method

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Motor Underload Protection** is selected, this function will be effected.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text                | Preset Value | Setting Range                             | Description                                    |
|-----------------------------|--------------|-------------------------------------------|------------------------------------------------|
| Underload Protection method | Manual Reset | Manual Reset, Self-reset, Indication Only | Treatment Method of Motor Underload Protection |

→ **26). Motor Under-Voltage Protection**

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-Voltage Protection

During the operation of motor in a full-voltage state, if the current is still under the settled level after a period of time, the **Protection** starts. In the full-voltage operation of motor, the protection starts to monitor.

| Display Text                   | Preset Value | Setting Range | Description                    |
|--------------------------------|--------------|---------------|--------------------------------|
| Motor Under-Voltage Protection | No           | Yes/No        | Motor Under-Voltage Protection |

→ **27). Under-Voltage Tripping Level**

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-Voltage Protection→ Under-Voltage Tripping Level

This parameter is used to set the **Under-Voltage Tripping Level**.

This function will be effected only after the Motor Under-load Protection is selected.

| Display Text                 | Preset Value | Setting Range | Description                                      |
|------------------------------|--------------|---------------|--------------------------------------------------|
| Under-Voltage Tripping Level | 80%          | 40....100%    | Tripping level of motor under-voltage protection |

→ **28). Under-Voltage Tripping Time**

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-Voltage Protection→ Under-Voltage Tripping Time

This parameter is used to set the delay time from testing to tripping level to effect protection.

This function will be effected only after the **Motor Under-Voltage Protection** is selected.

| Display Text                 | Preset Value | Setting Range | Description                                     |
|------------------------------|--------------|---------------|-------------------------------------------------|
| Under-voltage Tripping Level | 1S           | 0.1....20S    | Tripping Time of Motor Under-voltage Protection |

→ **29). Under-Voltage Protection Mode**

Menu path: Menu→ Setting →Function Setting →Protection →Motor Under-load Protection→ Under-Voltage Protection Mode

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Motor Undervoltage Protection** is selected, this function will be effected.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is

eliminated.

**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text                   | Preset Value | Setting Range                             | Description                                       |
|--------------------------------|--------------|-------------------------------------------|---------------------------------------------------|
| Undervoltage Protection method | Manual Reset | Manual Reset, Self-reset, Indication Only | Operating Method of Motor Undervoltage Protection |

### → 30). Motor Over-Voltage Protection

Menu path: Menu→ Setting →Function Setting →Protection →Motor Over-voltage Protection

During the operation of motor in a full-voltage state, if the current is still beyond the settled level after a period of time, the **Protection** starts. In the full-voltage operation of motor, the protection starts to monitor.

| Display Text                  | Preset Value | Setting Range | Description                   |
|-------------------------------|--------------|---------------|-------------------------------|
| Motor Over-voltage Protection | No           | Yes/No        | Motor Over-voltage Protection |

### → 31). Over-Voltage Tripping Time

Menu path: Menu→ Setting →Function Setting →Protection →Motor Over-voltage Protection

This parameter is used to set the Over-voltage Tripping Level.

This function will be effected only after the **Motor Under-Load Protection** is selected.

| Display Text                | Preset Value | Setting Range | Description                                     |
|-----------------------------|--------------|---------------|-------------------------------------------------|
| Over-Voltage Tripping Level | 120%         | 80....150%    | Tripping Level of Motor Over-Voltage Protection |

### → 32). Over-Voltage Tripping Time

Menu path: Menu→ Setting →Function Setting →Protection →Motor Over-voltage Protection→Over-Voltage Tripping Time

This parameter is used to set the delay time from testing to tripping level to effect protection.

This function will be effected only after the **Motor Over-Voltage Protection** is selected.

| Display Text                 | Preset Value | Setting Range | Description                                    |
|------------------------------|--------------|---------------|------------------------------------------------|
| Under-voltage Tripping Level | 1S           | 0.1....20S    | Tripping Time of Motor Over-voltage Protection |

### → 33). Over-Voltage Protection Mode

Menu path: Menu→ Setting →Function Setting →Protection →Motor Over-voltage Protection→Over-Voltage Treatment Mode

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Motor Over-Voltage Protection** is selected, this function will be effected.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text                   | Preset Value | Setting Range                             | Description                                       |
|--------------------------------|--------------|-------------------------------------------|---------------------------------------------------|
| Over-Voltage Protection method | Manual Reset | Manual Reset, Self-reset, Indication Only | Operating Method of Motor Over-Voltage Protection |

### → 34). Three-phase Unbalanced Protection

Menu path: Menu→ Setting →Function Setting →Protection →Three-phase Unbalanced Protection

If the difference between the current of one phase and other currents is higher than the setted level, this protection is effected, and the protection will work in 30 seconds after the full-voltage is achieved.

| Display Text                      | Preset Value | Setting Range | Description                       |
|-----------------------------------|--------------|---------------|-----------------------------------|
| Three-phase Unbalanced Protection | No           | Yes/No        | Three-phase Unbalanced Protection |

### → 35). Three-phase Unbalanced Level

Menu path: Menu→ Setting →Function Setting →Protection →Three-phase Unbalanced Protection→ Three-phase Unbalanced Level

This parameter is used to set the three-phase unbalanced level..

This function will be effected only after the **Motor Under-Load Protection** is selected.

| Display Text                 | Preset Value | Setting Range | Description                                         |
|------------------------------|--------------|---------------|-----------------------------------------------------|
| Three-phase Unbalanced Level | 60%          | 10....80%     | Tripping Level of Three-phase Unbalanced Protection |

### → 36). Unbalanced Protection Mode

Menu path: Menu→ Setting →Function Setting →Protection →Three-phase Unbalanced Protection→ Unbalanced Treatment Mode

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Three-Phase Unbalanced**

**Protection** is selected, this function will be effected.

- Manual Reset** if the motor stops, manual reset shall be carried out before re-start.
- Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.
- Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text               | Preset Value | Setting Range                             | Description                       |
|----------------------------|--------------|-------------------------------------------|-----------------------------------|
| Unbalanced Protection Mode | Manual Reset | Manual Reset, Self-reset, Indication Only | Three-Phase Unbalanced Protection |

### → 37).Heavy Current Protection

Menu path: Menu→ Setting →Function Setting →Protection →Heavy Current Protection

This is a current protection, when the detected load current is higher than the setted value, the **protection** will be activated after the specified delay time.

| Display Text             | Preset Value | Setting Range | Description              |
|--------------------------|--------------|---------------|--------------------------|
| Heavy Current Protection | No           | Yes/No        | Heavy Current Protection |

### → 38). Heavy Current Level

Menu path: Menu→ Setting →Function Setting →Protection →Heavy Current Protection→Heavy Current Level

This parameter is used to set the **Havy Current Level..**

This function will be effected only after the **Heavy Current Protection** is selected.

| Display Text        | Preset Value | Setting Range | Description                       |
|---------------------|--------------|---------------|-----------------------------------|
| Heavy Current Level | 6xle         | 5...8xle      | Protection Level of Heavy Current |

### → 39). Heavy Current Time

Menu path: Menu→ Setting →Function Setting →Protection →Heavy Current Protection→Heavy Current Time

This parameter is used to set the delay time from testing to tripping level to effect protection.

This function will be effected only after the **Heavy Current Protection** is selected.

| Display Text       | Preset Value | Setting Range | Description    |
|--------------------|--------------|---------------|----------------|
| Heavy Current Time | 10           | 0-10          | 20ms as a unit |

→ **40). Heavy Current Treatment**

Menu path: Menu→ Setting →Function Setting →Protection →Heavy Current Protection→**Heavy Current Treatment**

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Heavy Current Protection** is selected, this function will be effected.

- Manual Reset** if the motor stops, manual reset shall be carried out before re-start.  
**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.  
**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text            | Preset Value | Setting Range                             | Description                                   |
|-------------------------|--------------|-------------------------------------------|-----------------------------------------------|
| Heavy Current Treatment | Manual Reset | Manual Reset, Self-reset, Indication Only | Treatment Methods of Heavy Current Protection |

→ **41). Inverse-Phase Protection**

Menu path: Menu→ Setting →Function Setting →Protection →Inverse-Phase Protection  
Soft starter can accept any phase sequence, but if this protection function is selected, the positive phase sequence must be setted as L1-L2-L3 and the negative phase sequence must be L1-L3-L2, or the protection will be activated.

| Display Text             | Preset Value | Setting Range                            | Description              |
|--------------------------|--------------|------------------------------------------|--------------------------|
| Inverse-Phase Protection | No           | No, Positive Sequence, Negative Sequence | Inverse-Phase Protection |

→ **42). Inverse-Phase Treatment Mode**

Menu path: Menu→ Setting →Function Setting →Protection →Inverse-Phase Protection→Treatment Mode

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Inverse-Phase Protection** is selected, this function will be effected.

- Manual Reset** if the motor stops, manual reset shall be carried out before re-start.  
**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.  
**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text                 | Preset Value | Setting Range                             | Description                                   |
|------------------------------|--------------|-------------------------------------------|-----------------------------------------------|
| Inverse-Phase Treatment Mode | Manual Reset | Manual Reset, Self-reset, Indication Only | Treatment Methods of Inverse-Phase Protection |

#### → 43). Open-Phase Protection

Menu path: Menu→ Setting →Function Setting →Protection →Open-Phase Protection

It is used to set the **Open-Phase Protection** function. If the current of any phase is 5% lower than the rated value, the protection shall be activated after 4 seconds. This function will be effected only after **Open-Phase Protection** is selected.

| Display Text          | Preset Value | Setting Range | Description           |
|-----------------------|--------------|---------------|-----------------------|
| Open-Phase Protection | No           | No/Yes        | Open-Phase Protection |

#### → 44). Open-Phase Treatment Mode

Menu path: Menu→ Setting →Function Setting →Protection →Open-Phase **Protection→Treatment Mode**

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Open-Phase Protection** is selected, this function will be effected.

|                        |                                                                                   |
|------------------------|-----------------------------------------------------------------------------------|
| <b>Manual Reset</b>    | if the motor stops, manual reset shall be carried out before re-start.            |
| <b>Self-resetting</b>  | If the motor stops, it will be automatically reset after the fault is eliminated. |
| <b>Indication only</b> | The motor continues to operate, and only sends out fault indication.              |

| Display Text              | Preset Value | Setting Range                             | Description                                |
|---------------------------|--------------|-------------------------------------------|--------------------------------------------|
| Open-Phase Treatment Mode | Manual Reset | Manual Reset, Self-reset, Indication Only | Treatment Methods of Open-Phase Protection |

#### → 45). Start Limiting Time

Menu path: Menu→ Setting →Function Setting →Protection→Start Limiting Time

This parameter is used to set the time limit for the start.

| Display Text        | Preset Value | Setting Range | Description         |
|---------------------|--------------|---------------|---------------------|
| Start Limiting Time | 30S          | 30S....200S   | Start Limiting Time |

#### → 46). Start Limiting Treatment Mode

Menu path: Menu→ Setting →Function Setting →Protection→Start Limiting **Time→Treatment Mode**

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Start Limiting** is selected, this function will be effected.

|                     |                                                                        |
|---------------------|------------------------------------------------------------------------|
| <b>Manual Reset</b> | if the motor stops, manual reset shall be carried out before re-start. |
|---------------------|------------------------------------------------------------------------|

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text                  | Preset Value | Setting Range                             | Description                         |
|-------------------------------|--------------|-------------------------------------------|-------------------------------------|
| Start Limiting Treatment Mode | Manual Reset | Manual Reset, Self-reset, Indication Only | Treatment Methods of Start Limiting |

#### → 47). Thermal Melting Limit

Menu path: Menu→ Setting →Function Setting →Protection→Thermal Melting Limit

This parameter is used to limit the thermal melting when starting the motor. The motor could be started only when the thermal melting value is lower than the setted value.

| Display Text                     | Preset Value | Setting Range | Description                            |
|----------------------------------|--------------|---------------|----------------------------------------|
| Thermal Melting Limit Protection | No           | No/Yes        | Over-Load Protection must be turned on |

#### → 48). Thermal Melting Treatment Mode

Menu path: Menu→ Setting →Function Setting →Protection→Thermal Melting Protection →Treatment Mode

When the protection is activated, the parameters are applied in three different operating modes of the soft starter has to be selected, and only after the **Thermal Melting Protection** is selected, this function will be effected.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

**Indication only** The motor continues to operate, and only sends out fault indication.

| Display Text                   | Preset Value | Setting Range                             | Description                                     |
|--------------------------------|--------------|-------------------------------------------|-------------------------------------------------|
| Thermal Melting Treatment Mode | Manual Reset | Manual Reset, Self-reset, Indication Only | Treatment Methods of Thermal Melting Protection |

#### → 49). Thermal Melting Protection Level

Menu path: Menu→ Setting →Function Setting →Protection→Motor Thermal Melting Protection

Motor as thermal model identification heating degree, 100% identification motor heat saturation.

| Display Text          | Preset Value | Setting Range | Description                      |
|-----------------------|--------------|---------------|----------------------------------|
| Thermal Melting Level | 100%         | 0%-100%       | Motor Thermal Melting Protection |

→ 50). Motor Cooling Time

Menu path: Menu→ Setting →Function Setting →Protection→Motor Cooling Time

The longer the cooling time is, the slower the thermal melting recovery will be. It is used to limit the time interval between starts.

| Display Text          | Preset Value | Setting Range | Description                      |
|-----------------------|--------------|---------------|----------------------------------|
| Thermal Melting Level | 100S         | 0-3600S       | Motor Thermal Melting Protection |

→ **51). Motor Under-Load Warning**

Menu path: Menu→ Setting →Function Setting →Warning →Motor Under-Load Warning

If the function is selected, once the current in full voltage state is lower than setted value, the warning signal will be sent out. After 30 seconds when achieve full voltage, The monitoring will be started.

| Display Text             | Preset Value | Setting Range | Description              |
|--------------------------|--------------|---------------|--------------------------|
| Motor Under-Load Warning | No           | Yes/No        | Motor Under-Load Warning |

→ **52). Motor Under-Load Alarm Value**

Menu path: Menu→ Setting →Function Setting →Warning →Motor Under-Load Warning→Under-Load Alarm Value

This parameter is used to set under-load alarm value.

| Display Text           | Preset Value | Setting Range | Description                  |
|------------------------|--------------|---------------|------------------------------|
| Under-Load Alarm Value | 0.5xle       | 0.3....1.0xle | Motor Under-Load Alarm Value |

→ **53). Motor Over-Load Warning**

Menu path: Menu→ Setting →Function Setting →Warning →Motor Over-Load Warning

When this function is selected, if the motor load exceeds the setted value causes an overload alarm is activated, the alarm signal will be sent out.

| Display Text            | Preset Value | Setting Range | Description      |
|-------------------------|--------------|---------------|------------------|
| Motor Over-load Warning | No           | Yes/No        | Overload Warning |

→ **54). Motor Over-Load Alarm Value**

Menu path: Menu→ Setting →Function Setting →Warning →Motor Over-Load Warning→Over-Load Alarm Value

This parameter is used to set overload alarm value, which is different from the overload trip value.

| Display Text          | Preset Value | Setting Range | Description                 |
|-----------------------|--------------|---------------|-----------------------------|
| Over-Load Alarm Value | 1.2xle       | 1.2...2.0xle  | Motor Over-Load Alarm Value |

→ **55). Power Supply Open-Phase Fault Handling**

Menu path: Menu→ Setting →Function Setting → Fault →Open-Phase Fault Handling

When power supply open-phase fault occurs, this parameter is used to select from the two different operation modes of soft starter.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

| Display Text              | Preset Value | Setting Range             | Description                        |
|---------------------------|--------------|---------------------------|------------------------------------|
| Open-Phase Fault Handling | Manual Reset | Manual Reset, Self-reset, | Operation Mode of Open-phase Fault |

→ **56). Bus Fault Treatment**

Menu path: Menu→ Setting →Function Setting → Fault →Bus Fault Treatment

When Bus fault occurs, this parameter is used to select from the two different operation modes of soft starter.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.

**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

| Display Text        | Preset Value | Setting Range             | Description                 |
|---------------------|--------------|---------------------------|-----------------------------|
| Bus Fault Treatment | Manual Reset | Manual Reset, Self-reset, | Operation Mode of Bus Fault |

→ **57). Frequency Fault Treatment**

Menu path: Menu→ Setting →Function Setting → Fault →Frequency Fault Treatment

When Frequency is out of range( frequency fault), this parameter is used to select from the two different operation modes of soft starter.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.  
**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

| Display Text              | Preset Value | Setting Range             | Description                       |
|---------------------------|--------------|---------------------------|-----------------------------------|
| Frequency Fault Treatment | Manual Reset | Manual Reset, Self-reset, | Operation Mode of Frequency Fault |

#### → 58). Internal Overheat Treatment

Menu path: Menu→ Setting →Function Setting → Fault →Internal Overheat Treatment

When soft starters inside the cooler temperature is too high, this parameter is used to select from the two different operation modes of soft starter.

**Manual Reset** if the motor stops, manual reset shall be carried out before re-start.  
**Self-resetting** If the motor stops, it will be automatically reset after the fault is eliminated.

| Display Text                | Preset Value | Setting Range             | Description                                              |
|-----------------------------|--------------|---------------------------|----------------------------------------------------------|
| Internal Overheat Treatment | Manual Reset | Manual Reset, Self-reset, | Operation Mode of Internal Cooler Over-temperature fault |

#### → 59). Programmable Input (0/1)

Menu path: Menu→ Setting →Function Setting → Input →Programmable Input(0/1)

Soft starter has two programmable inputs(0/1). Based on the function selected, these two inputs can be used for different purposes independently.

| Display Text         | Preset Value | Setting Range                                         | Description                      |
|----------------------|--------------|-------------------------------------------------------|----------------------------------|
| Programmable Input 0 | Reset        | No, Reset, Allow, External Fault, Hard Start, Start 2 | Function of programmable input 0 |
| Programmable Input 1 | Reset        | No, Reset, Allow, External Fault, Hard Start, Start 3 | Function of programmable input 1 |

#### → 60). Programmable Output Relay (K2, K3)

Menu path: Menu→ Setting →Function Setting → Output →Programmable Output Relay (K2, K3) Transfer Relay

Soft starter has two programmable output relays(K2, K3). They are used for different

purposes independently according to the function selected.

| Display Text                 | Preset Value | Setting Range                         | Description                               |
|------------------------------|--------------|---------------------------------------|-------------------------------------------|
| Programmable output Relay K2 | Operation    | Operation, Event, Delay, Full-voltage | Functions of Programmable output Relay K2 |

During the process of step-up, operation, step-down, the operation signal will be sent out. Operation indication can be selected from the following operations:

- Operation
- Event
- Time Delay
- Full Voltage

Even function has several selections and can be switched as required.

Event indication. One of the following events can be selected:

- Full Fault
- Alarm
- Equipment Fault
- Motor Fault

#### →61). Interlock Time

| Display Text   | Preset Value | Setting Range | Description                                          |
|----------------|--------------|---------------|------------------------------------------------------|
| Interlock Time | 0            | 0-500S        | Programmable Relay must to be setted with delay time |

Interlock time: Set the period from start of soft starter to closing of K2K3. K2K3 must be setted with delay time.

#### → 62). Bus Control

Menu path: Menu→ Setting →Function Setting → Bus →Bus Control

If the soft starter is to be controlled through bus communication, bus control must be setted for the bus or external control.

Bus: The soft starter can only be controlled through bus.

External control: External terminal is used for controlling the soft starter.

| Display Text | Preset Value | Setting Range             | Description                       |
|--------------|--------------|---------------------------|-----------------------------------|
| Bus Control  | No           | No, Bus, External Control | Control the soft starter with bus |

#### → 63). Bus Type

Menu path: Menu→ Setting →Function Setting → Bus →Bus Control →Bus Type

If using **Bus Control**, the **Bus Type** must be selected.

It can be selected from the following bus types:

- MOD
- PRO

If Device Net is to be used, then the parameter shall be set as the other.

| Display Text | Preset Value | Setting Range | Description |
|--------------|--------------|---------------|-------------|
| Bus Type     | MOD          | MOD, PRO      | Bus Type    |

#### → 64). Bus Address

Menu path: Menu→ Setting →Function Setting → Bus →Bus Control →Bus Address

This parameter is used for soft starter to select an unused appropriate number as the **Bus Address**.

| Display Text | Preset Value | Setting Range | Description |
|--------------|--------------|---------------|-------------|
| Bus Address  | 2            | 0....247      | Bus Address |

#### → 65). MODBUS Communication Rate

Menu path: Menu→ Setting →Function Setting → Bus →Bus Control →MOD Communication Rate

Select a compatible communication rate for starter by using MODBUS.

| Display Text       | Preset Value | Setting Range                 | Description |
|--------------------|--------------|-------------------------------|-------------|
| Communication Rate | 9600         | 1200, 2400, 4800, 9600, 19200 | Baud Rate   |

#### → 66). PRO Type

Menu path: Menu→ Setting →Function Setting → Bus →Bus Control →PRO Type

Select the control type of PROBUS: type III for read-only state, and type I for parameter modification.

| Display Text | Preset Value | Setting Range | Description |
|--------------|--------------|---------------|-------------|
| PRO Type     | III          | I III         |             |

#### → 67). Sequence Start

Menu path: Menu→ Setting →Function Setting → Sequence Start →Quantity of

### Sequence Start

The soft starter is able to start the motor with a maximum of three groups of different parameter settings( parameter setting group the first, the second and the third). This function is used for the sequence start ( one by one ) of two or three motors, and for the start of two-speed or three-speed motors, of which, each speed level requires different start parameters.

| Display Text   | Preset Value | Setting Range | Description                |
|----------------|--------------|---------------|----------------------------|
| Sequence Start | No           | No, 2, 3      | Quantity of Sequence Start |

**i** When sequence start is selected, it is not allowed to enter into local control menu.

### → 68). No.1 Voltage-Rising Time

Menu path: Menu→ Setting →Function Setting → Sequence Start →Sequence 1 Parameter →No.1 Voltage-Rising Time

This parameter is used to set the voltage-rising time of the first parameter group.

| Display Text            | Preset Value | Setting Range | Description                                                |
|-------------------------|--------------|---------------|------------------------------------------------------------|
| No1 Voltage-Rising Time | 10S          | 0....100S     | Voltage-Rising Time Parameter of the First Parameter Group |

### → 69). No.1 Initial Voltage

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 1 Parameter →No.1 Initial Voltage

This parameter is used to set the initial voltage of the first parameter group.

| Display Text         | Preset Value | Setting Range | Description                                            |
|----------------------|--------------|---------------|--------------------------------------------------------|
| No.1 Initial Voltage | 30%          | 30....80%     | Initial Voltage Parameter of the first Parameter Group |

### → 70). No.1 Current Limiting Multiple

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 1 Parameter →No.1 Current Limiting Multiple

This parameter is used to set the current limiting multiple of the first parameter group.

| Display Text                   | Preset Value | Setting Range | Description                                            |
|--------------------------------|--------------|---------------|--------------------------------------------------------|
| No.1 Current Limiting Multiple | 4.0xle       | 1.5....5.0xle | current limiting multiple of the first parameter group |

→ **71). No.1 Set Current**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 1  
Parameter →No.1 Setted Current

This parameter is used to set the setted current of the first parameter group.

| Display Text        | Preset Value | Setting Range | Description                                 |
|---------------------|--------------|---------------|---------------------------------------------|
| No.1 Setted Current | 100A         | 0A....1300A   | Setted current of the first parameter group |

→ **72). No.1 Start Mode**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 1  
Parameter →No.1 Start Mode

This parameter is used to set the start mode of the first parameter group.

| Display Text    | Preset Value | Setting Range               | Description                                       |
|-----------------|--------------|-----------------------------|---------------------------------------------------|
| No.1 Start Mode | Voltage      | Current limitation, Voltage | Start mode parameter of the first parameter group |

→ **73). No.2 Voltage-Rising Time**

Menu path: Menu→ Setting →Function Setting → Sequence Start →Sequence 2  
Parameter →No.2 Voltage-Rising Time

This parameter is used to set the voltage-rising time of the second parameter group.

| Display Text            | Preset Value | Setting Range | Description                                                 |
|-------------------------|--------------|---------------|-------------------------------------------------------------|
| No2 Voltage-Rising Time | 10S          | 0....100S     | Voltage-Rising Time Parameter of the Second Parameter Group |

→ **74). No.2 Initial Voltage**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 2  
Parameter →No.2 Initial Voltage

This parameter is used to set the initial voltage of the second parameter group.

| Display Text         | Preset Value | Setting Range | Description                                             |
|----------------------|--------------|---------------|---------------------------------------------------------|
| No.2 Initial Voltage | 30%          | 30....80%     | Initial Voltage Parameter of the Second Parameter Group |

→ **75). No.2 Current Limiting Multiple**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 2 Parameter →No.2 Current Limiting Multiple

This parameter is used to set the current limiting multiple of the second parameter group.

| Display Text                   | Preset Value | Setting Range | Description                                             |
|--------------------------------|--------------|---------------|---------------------------------------------------------|
| No.2 Current Limiting Multiple | 4.0xle       | 1.5....5.0xle | current limiting multiple of the second parameter group |

→ **76). No.2 Setted Current**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 2 Parameter →No.2 Setted Current

This parameter is used to set the setted current of the second parameter group.

| Display Text        | Preset Value | Setting Range | Description                               |
|---------------------|--------------|---------------|-------------------------------------------|
| No.2 Setted Current | 100A         | 0A....1300A   | Set current of the second parameter group |

→ **77). No.2 Start Mode**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 2 Parameter →No.2Start Mode

This parameter is used to set the start mode of the second parameter group.

| Display Text    | Preset Value | Setting Range               | Description                                        |
|-----------------|--------------|-----------------------------|----------------------------------------------------|
| No.2 Start Mode | Voltage      | Current limitation, Voltage | Start mode parameter of the second parameter group |

→ **78). No.3 Voltage-Rising Time**

Menu path: Menu→ Setting →Function Setting → Sequence Start →Sequence 3 Parameter →No.3 Voltage-Rising Time

This parameter is used to set the voltage-rising time of the third parameter group.

| Display Text            | Preset Value | Setting Range | Description                                                |
|-------------------------|--------------|---------------|------------------------------------------------------------|
| No3 Voltage-Rising Time | 10S          | 0....100S     | Voltage-Rising Time Parameter of the Third Parameter Group |

→ **79). No.3 Initial Voltage**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 3 Parameter →No.3 Initial Voltage

This parameter is used to set the initial voltage of the third parameter group.

| Display Text         | Preset Value | Setting Range | Description                                            |
|----------------------|--------------|---------------|--------------------------------------------------------|
| No.3 Initial Voltage | 30%          | 30....80%     | Initial Voltage Parameter of the Third Parameter Group |

→ **80). No.3 Current Limiting Multiple**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 3 Parameter →No.3 Current Limiting Multiple

This parameter is used to set the current limiting multiple of the third parameter group.

| Display Text                   | Preset Value | Setting Range | Description                                            |
|--------------------------------|--------------|---------------|--------------------------------------------------------|
| No.3 Current Limiting Multiple | 4.0xle       | 1.5....5.0xle | current limiting multiple of the third parameter group |

→ **81). No.3 Setted Current**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 3 Parameter →No.3 Setted Current

This parameter is used to set the setted current of the third parameter group.

| Display Text        | Preset Value | Setting Range | Description                                 |
|---------------------|--------------|---------------|---------------------------------------------|
| No.3 Setted Current | 100A         | 0A....1300A   | Setted current of the third parameter group |

→ **82). No.3 Start Mode**

Menu path: Menu→ Setting →Function Setting → Sequence Start→Sequence 3 Parameter →No.3 Start Mode

This parameter is used to set the start mode of the third parameter group.

| Display Text    | Preset Value | Setting Range               | Description                                       |
|-----------------|--------------|-----------------------------|---------------------------------------------------|
| No.3 Start Mode | Voltage      | Current limitation, Voltage | Start mode parameter of the third parameter group |

→ **83). Analog Current Output**

Menu path: Menu→ Setting →Function Setting → Analog Current Output

Analog output of motor current can be reflected. Load resistance is lower than 200 ohm.

| Display Text          | Preset Value | Setting Range | Description                |
|-----------------------|--------------|---------------|----------------------------|
| Analog Current Output | 4-20mA       | 0-20mA/4-20mA | The selection of the range |

→ **84). Motor Current Value**

Menu path: Menu→ Setting →Function Setting → Motor Current Value

The motor current corresponding to analog output shall be set as 5.0X for detection and start, and 1.2X for operation monitoring.

| Display Text        | Preset Value | Setting Range | Description                    |
|---------------------|--------------|---------------|--------------------------------|
| Motor Current Value | 1.0          | 0.5-5.0xle    | Setting of motor current value |

# 8. COMMUNICATION PROTOCOL

Users can choose according to needs to order the types of Modbus or Profibus.

## → 7.1 Profibus Protocol

This equipment realizes the communication protocol through Profibus-DP, the standard of protocol is specified in EN50170. Features of the Profibus communication interface:

- Cycle communication can be quickly realized by through Profibus bus
- Profibus supports the baud rate of maximum up to 12MHZ
- A maximum of 125 soft starters can be controlled
- The use of dedicated Profibus debugging tools, system configuration is very convenient
- The wiring of built-in Profibus communication module is very convenient
- All control parameters of soft starter can be set and modified through the serial bus.
- Response time for data processing is 5MS.

## → Application Protocol

Principle for quick setting Profibus:

- The bus cables must be correctly connected between the master station and soft starter, including the necessary termination resistors (when communication rate is 12M).
- Bus cable must be shielded cable which must be grounded.
- The bus must be in operation.
- The soft starter must be connected to power supply.
- The slave address (function code) of soft starter must be correctly set and be the same with the slave station address that matched master station. The address of soft start defined on the bus must be unique.
- When the soft starter indicates a connection failure, please check if the wire between master station and starter is connected, if end A and B of Profibus are connected inversely, if the slave address is correct, and if the setting of parameter is correct.
- When Being used, terminal A and B shall be connected to 220 ohm resistor. If several machines are connected, only one of them needs to be connected to the resistor.

Profibus controls soft starter through a group of data blocks which are divided into two data areas: the parameter identification area PKW and process control PZD, occupying two digits of input/output respectively. The former is used to read and modify the functional parameters of the starter; the later is used to control and monitor the state current; the settings of master station is provided by GSD file. ( see figure 5)

| Parameter Identification PKE |     | Process Control PZD |     |
|------------------------------|-----|---------------------|-----|
| IND<br>INDH INDL             | PWE | STW<br>ZSW          | ACT |
| 1                            | 2   | 3                   | 4   |

### → Parameter Description

PPO1 is a functional parameter that can read and modify soft starter; the high byte (INDH) of parameter index (digit) IND is task request; and the lower byte (INDL) stands for parameter address that corresponds to the function code address. PWE is a value of the parameter being accessed. The value appeared are all hexadecimal system.

Table 7.1 Task Request

| INDH | Significance                                                                     |
|------|----------------------------------------------------------------------------------|
| 0    | No task                                                                          |
| 1    | Read a parameter; the address is INDL (see figure 7.9)                           |
| 2    | Modify a parameter; the address is INDL, write values into PWE, (see figure 7.9) |
| 3    | To read status parameter address shown in table 7.4                              |

Table 7.2 Task Response

| INDH | Significance                                             |
|------|----------------------------------------------------------|
| 0    | No response                                              |
| 1    | Send a parameter; the value is in PWE.                   |
| 2    | No right to modify                                       |
| 3    | Task can not be performed, see table 8.3 for error type. |

When the response to 3 that means task can not be performed, the operating parameters can not be read or written;

Table 7.3 shows the error type, of which, the values are read from PWE.

Table 7.3 Task Response Marked 3

| PWE | Significance                             |
|-----|------------------------------------------|
| 0   | Parameter can not be used                |
| 1   | Parameter value can not be modified      |
| 2   | Value exceeds the upper and lower limits |
| 3   | In operation, can not be modified        |
| 4   | This service is not supported            |

### → 7.2 Overview of Modbus

Modbus is a kind of non-synchronous serial communication protocol, and its physical interface is RS485. Modbus designed for modicon PLC, and has the structural feature of PLC. During the network control, Modbus can put soft starter as a PLC on the reading and writing. On-off control, status information (current, fault etc.) and functional parameter of soft starter map to the holding register (4XXX). It is performed through PLC master to

control the reading and writing.

Table 7.4

| Register Address | Address Parameter | Operation Code | Register Function Description |
|------------------|-------------------|----------------|-------------------------------|
| 4001             | 00                | 06             | Control Word                  |
| 4002             | 01                | 03             | Status Word                   |
| 4003             | 02                | 03             | Phase A Current               |
| 4004             | 03                | 03             | Phase B Current               |
| 4005             | 04                | 03             | Phase C Current               |
| 4006             | 05                | 03             | Uac Line Voltage              |
| 4007             | 06                | 03             | Uab Line Voltage              |
| 4008             | 07                | 03             | Thermal Melting Value         |
| 4009             | 08                |                | Input/Output                  |
| 400a             | 09                | 06             | Reserve                       |
| 400b             | 0a                | 06             | Maximum Starting Current      |
| 400c             | 0b                | 06             | Maximum Operating Current     |
| 400e             |                   |                | Number of Start               |
| 400f             |                   |                |                               |
| 4010             | 0f                |                |                               |
| 401X-1           | 1X-1              |                | The Latest One Fault Code     |
| 401Y-1           | 1Y-1              |                | The Latest One Fault Current  |
| 401X             | 1X                |                | The Latest X Fault Codes      |
| 401Y             | 1Y                |                | The Latest X Fault Currents   |
| ...              | ...               |                |                               |
| ...              | ...               |                |                               |
| 4021             | 19                |                | The Latest 19 Fault Codes     |
| 4022             | 20                |                | The Latest 20 Fault Currents  |

1. The above not listed register is illegal, can not read and write. Otherwise, the soft starter will report to the controller one exception coding.
2. All data addresses take 0 as a reference. In other words, 0000 for the coil relay 40001 address, 0100 for 40257 address (in hexadecimal system).

→ **Exceptional Case Code**

soft starter supports standard Modbus exceptional case code. ( See table 7.5)

Table 7.5

| Code | Name                 | Description                                                                                                         |
|------|----------------------|---------------------------------------------------------------------------------------------------------------------|
| 01   | Illegal Function     | Function code can not be executed; Soft starter does not support it.                                                |
| 02   | Illegal Data Address | The data address received can not be executed; address out of range                                                 |
| 03   | Illegal Data Value   | The data received can not be executed<br>1. The parameter exceeds the limit<br>2. The parameter can not be modified |

Soft starter only supports the function codes of Modbus listed in table7.6. If other codes are used, an exceptional case code 01 will be given. The code 03 will be read only with WORD.

Table 7.6

| Code                 | 03                    | 06                     |
|----------------------|-----------------------|------------------------|
| Function Description | Read Storage Register | Preset Single Register |

→ **Command Words Supported by SOFT STARTER are Shown in Table 7.7**

Table 7.7

| Bit  | Name             | Value | Description           |
|------|------------------|-------|-----------------------|
| 0    | Start            | 1     | Start via Starter     |
|      | Stop             | 0     | Soft Stop via Starter |
| 1    | Work             | 1     | Continuous Work       |
|      | Free Parking     | 0     | Free Parking          |
| 2    | Reset            | 0-1   | Reset via Starter     |
|      | Normal Operation | 0     |                       |
| 3    | PLC Control      | 1     | Bus Control           |
|      | No Operation     | 0     |                       |
| 4-15 | No Operation     | 0     |                       |

→ **Description of Status Word**

Table 7.7

| Bit     | Value | Significance                                   | Description                             |
|---------|-------|------------------------------------------------|-----------------------------------------|
| D15     | 1     | Starter Failure                                | Troubleshooting based on 0-5 fault code |
|         | 0     | Starter Normal                                 |                                         |
| D11-D14 |       | No Operation                                   |                                         |
|         | 1     |                                                |                                         |
|         | 0     |                                                |                                         |
| D10     | 1     | Soft Stop Status                               | ACT display phase A                     |
|         | 0     | Stop Status                                    |                                         |
| D9      | 1     | Operation Status                               |                                         |
|         | 0     | Stop Status                                    | ACT display phase A                     |
| D8      | 1     | Soft Start Status                              |                                         |
|         | 0     | Stop Status                                    |                                         |
|         | 1     | No Operation                                   |                                         |
| D0-D7   | 0     | When bit 15 is 1, which stands for fault code. | See table 7.8 for fault code            |

Profibus: stands for ZSW    Modbus: corresponding register address 4002

→ **Fault Code Number and Description**

Table 7.8

| No. | Fault                         | No | Fault                         |
|-----|-------------------------------|----|-------------------------------|
| 01  | Power Supply Open-phase       | 10 | Three-phase Imbalance         |
| 02  | Overheat                      | 11 | Motor Open-phase              |
| 03  | Faulty Frequency              | 12 | Motor Under-load              |
| 04  | Over-long Starting Time       | 13 | Thyristor Over-temperature    |
| 05  | External Fault                | 14 | Tripping due to Over-voltage  |
| 06  | Overload of Motor             | 15 | Tripping due to Under-voltage |
| 07  | Motor Stalled                 | 16 | Bypass Fault                  |
| 08  | Tripping due to Heavy Current | 17 | Parameter Error               |
| 09  | Reverse Sequence of Power     |    |                               |
| 10  | Three-phase imbalance         |    |                               |
| 11  | Motor Open-phase              |    |                               |
| 12  | Motor Under-load              |    |                               |
| 13  | Thyristor Over-temperature    |    |                               |
| 14  | Tripping due to Over-voltage  |    |                               |
| 15  | Tripping due to Under-voltage |    |                               |
| 16  | External Fault 2              |    |                               |
| 17  | Bypass Fault                  |    |                               |
| 18  | Parameter Error               |    |                               |

→ **Set Parameter Description**

Table7.9

| Address | Parameter Item                       | Range                                              |
|---------|--------------------------------------|----------------------------------------------------|
| 0       | Rated Current of Motor (A)           | 0~1300                                             |
| 1       | Reserved                             |                                                    |
| 2       | Start Mode                           | 0: Current Limiting 1: Voltage                     |
| 3       | Rising Time                          | 0~120S                                             |
| 4       | Soft Stop Time                       | 0~100S                                             |
| 5       | Initial Voltage                      | 30%~80%                                            |
| 6       | Step-down Voltage                    | 0~50%                                              |
| 7       | Current Limiting Times               | 1.5~5.0 times                                      |
| 8       | Constant Voltage Starting            | No: 0 Yes: 1                                       |
| 9       | Constant Voltage                     | 25%~80%                                            |
| 10      | Constant Time                        | 1~120S                                             |
| 11      | Start Delay                          | No: 0 Yes: 1                                       |
| 12      | Delay Time                           | 0~100S                                             |
| 13      | Reserved                             |                                                    |
| 14      | Over-load Protection of Motor        | No: 0 Yes: 1                                       |
| 15      | Over-load Type of Motor              | 5 10 15 20 25 30                                   |
| 16      | Starting Over-load Type              | 5 10 15 20 25 30                                   |
| 17      | Operation Over-load Type             | 5 10 15 20 25 30                                   |
| 18      | Over-load Protection Mode            | 0: Manual 1: Auto 2: Indicate Only                 |
| 19      | Reserved                             |                                                    |
| 20      | Reserved                             |                                                    |
| 21      | Reverse Phase Protection             | No: 0 Negative Sequence: 1<br>Positive Sequence: 2 |
| 22      | Reserve Phase Protection Mode        | 0: Manual 1: Auto 2: Indicate Only                 |
| 23      | Heavy Current Protection             | No: 0 Yes: 1                                       |
| 24      | Heavy Current Treatment              | 0: Manual 1: Auto 2: Indicate Only                 |
| 25      | Three-phase Loss Constant Protection | No: 0 Yes: 1                                       |
| 26      | Three-phase Loss Constant Degree     | 10%~80%                                            |
| 27      | Loss Constant Treatment              | 0: Manual 1: Auto 2: Indicate Only                 |
| 28      | Over-voltage Protection of Motor     | Open Close                                         |
| 29      | Voltage Protection Degree            | 80%~150%                                           |
| 30      | Tripping Time                        | 0.1~20S                                            |

| Address | Parameter Item                    | Range                              |
|---------|-----------------------------------|------------------------------------|
| 31      | Over-voltage Protection Mode      | 0: Manual 1: Auto 2: Indicate Only |
| 32      | Under-voltage Protection of Motor | Open Close                         |
| 33      | Under-voltage Tripping Degree     | 40%~100%                           |
| 34      | Tripping Time                     | 0.1~20S                            |
| 35      | Under-voltage Protection Mode     | 0: Manual 1: Auto 2: Indicate Only |
| 36      | Under-load Protection of Motor    | No: 0 Yes: 1                       |
| 37      | Under-load Tripping Degree        | 0.4X~0.8X                          |
| 38      | Under-load Tripping Time          | 1~30S                              |
| 39      | Under-load Treatment              | 0: Manual 1: Auto 2: Indicate Only |
| 40      | Motor Stall Protection            | No: 0 Yes: 1                       |
| 41      | Stall Rotation Tripping Degree    | 3.0X~8.0X                          |
| 42      | Stall Rotation Tripping Time      | 0.2S~10S                           |
| 43      | Stall Rotation Tripping Mode      | 0: Manual 1: Auto 2: Indicate Only |
| 44      | Thermal Capacity Limit            | No: 0 Yes: 1                       |
| 45      | Thermal Capacity Degree           | 0%~100%                            |
| 46      | Cooling Time                      | 0~3600S                            |
| 47      | Reserved                          |                                    |
| 48      | Heavy Current Time                | 20ms~200ms                         |
| 49      | Heavy Current Treatment           | 0: Manual 1: Auto 2: Indicate Only |
| 50      | Start Limiting Time               | 30~240S                            |
| 51      | Motor Under-load Alarm            | No: 0 Yes: 1                       |
| 52      | Under-load Alarming Value         | 0.3~1.0                            |
| 53      | Motor Over-load Alarm             | No: 0 Yes: 1                       |
| 54      | Over-load Alarming Value          | 1.2~2.0                            |
| 55      | SCR Over-load Alarm               | No: 0 Yes: 1                       |
| 56      | Open-phase Fault Treatment        | 1: Auto Reset 0: Manual Reset      |
| 57      | Reserved                          |                                    |
| 58      | Bus Failure Treatment             | 1: Auto Reset 0: Manual Reset      |
| 59      | Frequency Failure Treatment       | 1: Auto Reset 0: Manual Reset      |
| 60      | Internal Overheat Treatment       | 1: Auto Reset 0: Manual Reset      |
| 61      | Start Too Long Failure Treatment  | 1: Auto Reset 0: Manual Reset      |

| Address | Parameter Item              | Range                                          |
|---------|-----------------------------|------------------------------------------------|
| 62      | Programming Input 0         | 0: No 1: Reset 2: Allowed 3: Jog 4: Hard Start |
| 63      | Programming Input 1         | 0: No 1: Reset 2: Allowed 3: Jog 4: Hard Start |
| 64      | Reserved                    |                                                |
| 65      | Reserved                    |                                                |
| 66      | Bus Control                 | No: 0 Yes: 1 External Control: 2               |
| 67      | Bus Type                    | 0 modbus 1 profibus                            |
| 68      | Bus Address                 | 0~247                                          |
| 69      | Baud Rate                   | Modbus Baud Rate                               |
| 70      | PRO Mode                    | 0: I 1: III                                    |
| 71-75   | Reserved                    |                                                |
| 76      | Programming Relay K2        | 0: Run 1: Full-voltage 2: Delay 3: Event       |
| 77      | Event                       | 0 All Fault 1: Motor Fault 2: Equipment Fault  |
| 78      | Interlocking Time           | 0~200S                                         |
|         |                             |                                                |
| 80      | Programming Relay K3        | 0: Run 1: Full-voltage 2: Delay 3: Event       |
| 81      | Event                       | 0 All Fault 1: Motor Fault 2: Equipment Fault  |
| 82      | Interlocking Time           | 0~200S                                         |
| 88      | Analog Range Selection      | 0: 0~20mA 1: 4~20mA                            |
| 90      | Current Size Multiple       | 50%~500% Ie Corresponding Value                |
| 92      | LCD Closing Time            | 0~500M                                         |
|         |                             |                                                |
| 94      | Language                    | 0: English 1: Chinese                          |
| 100     | Sequence Starting Number    | 0 1 2 3                                        |
| 101     | 1 Setting Current           | 0~800A                                         |
| 102     | Starting Mode               | 0: Voltage 1: Current                          |
| 103     | Voltage Increasing Time     | 1~100S                                         |
| 104     | Initial Voltage             | 30%~80%                                        |
| 105     | Current-limiting Multiple   | 1.5X~5.0X                                      |
| 106     | 2 Setting Current           | 0~800A                                         |
| 107     | Starting Mode               | 0: Voltage 1: Current                          |
| 108     | Voltage Increasing Time     | 1~100S                                         |
| 109     | 2 Initial Voltage           | 30%~80%                                        |
| 110     | 2 Current-limiting Multiple | 1.5X~5.0X                                      |
| 111     | 3 Set Current               | 0~800A                                         |
| 112     | Start Mode                  | 0: Voltage 1: Current                          |
| 113     | Rising Time                 | 1~100S                                         |
| 114     | Initial Voltage             | 30%~80%                                        |
| 115     | Current-limiting Multiple   | 1.5X~5.0X                                      |

## → 7.4 Control Example

### **Start the soft Starter by the Bus.**

MARSTER: PC or Primary station of upper computer; SLAVE: Secondary stands for soft start Address is set to be 02

PZD control under Profibus:

MARSTER - - → SLAVE 00 0B 00 00

SLAVE - - → MARSTER

Normal Return 09 00 03 c0 Indicates the start state, the current value is 96A

Failure Return 81 01 05 64 Open-phase fault the state is started and the current is 138A

### **→ 1. Reading function code 01 value (rising time).**

MARSTER→ SLAVE 01 01 00 00

SLAVE→ MARSTER 01 01 00 0C

It indicates that the rise time of reading is 12 seconds.

### **→ 2. Modification function code 04 is 350% (Limiting Current), and 15E in hexadecimal.**

MARSTER→ SLAVE 02 01 01 5E

SLAVE→ MARSTER 01 01 01 5E

In case that the response code is 03 01 00 03, it means that the starter is not allowed to modify when it is running.

4XXX control under Modbus:

Starting 4001 example:

MARSTER- - →SLAVE 02 06 00 00 00 01

SLAVE- - →MARSTER 02 06 00 00 00 01

Reading status, operation on 4002:

MARSTER- - →SLAVE 02 03 00 01 00 01

SLAVE- - → MARSTER 02 03 02 08 00

It indicates that soft starting is in the state of starting

In case that SLAVE- - → MARSTER 02 03 02 88 06

It indicates that the motor over-load during starting

Read the current value, Register 4003

MARSTER- - →SLAVE 02 03 00 02 00 01

SLAVE- - →MARSTER 02 03 02 09 60

The current value is 235A

### ● Functional parameter register of soft starter 40XXX

(XXX-1) can be used hexadecimal system as 1YY, and YY is corresponding with the table 3.1 code value; For example, 108 is corresponding with function code 08(start mode). These function codes can be read and written, its usage is illustrated in the followings:

Example 1: Read the current limiting value

Search out parameter address is 7 in the table 7.9:

MARSTER- - →SLAVE 02 03 01 07 00 01

SLAVE- - →MARSTER 02 03 02 01 5E means that current limiting value is 350%

Example 2: Modifying the rising time value is : 20S

The address in the table 7.9 is 3

MARSTER- - →SLAVE 02 06 01 03 00 14

SLAVE- - →MARSTER 02 06 02 00 14