Contents

Foreword

Thank you for choosing the Senlan LSD 100 series soft starter.

The LSD 100 series soft starter is a new generation of low-noise and high-performance soft starter with extremely extensive scope of application independently developed by the Hope Senlan Science and Technology Holding Corp.,Ltd. Therefore, this enables it to provide a solution platform and integrated solutions for various industry needs, which has great value in reducing system costs and improving system reliability. Customers can also conduct secondary development according to their own needs.

This Manual provides users with installation guide, parameter setting, daily maintenance, fault diagnosis and troubleshooting, etc. Before installing, setting up, running and maintaining the soft starter, please be sure to read all the contents of the Manual of this product in detail, memorize the relevant knowledge and safety precautions of the soft starter, and ensure the correct use and give full play to its superior performance. Technical specification of this product may change without prior notice. The Manual of this product shall be properly kept until the soft starter is scrapped.

Precautions for Unpacking Inspection

When unpacking, please confirm the following items carefully. In case of any problem, please contact us or the Supplier directly.

Items to verify	How to verify
Is it in line with your order?	Confirm whether the nameplate content on the soft starter is consistent with your order
Is there any damage to the product?	Check the overall appearance of the product to confirm whether it is damaged during transportation.

Notes:

A. Before taking the LSD 100 series soft starter out from the packing material, please confirm that the packing carton has not been damaged during transportation. Damage to packing cartons is usually caused by improper transportation. If any damage is found, please notify the carrier and your representative of Hope Senlan.

B. Please verify that the nameplate and label of the LSD 100 series soft starter comply with the packing list and corresponding purchase list. If the LSD 100 series soft starter is not installed immediately, it should be stored in a clean and dry area with an ambient temperature between -25 ℃ and+70 ℃.

Model description of soft starter

LSD 100-380-640-E

Senlan soft starter	
100 Series	Option: E-digital display screen C - LCD display screen
Voltage level 380V	Main circuit working current: 640A
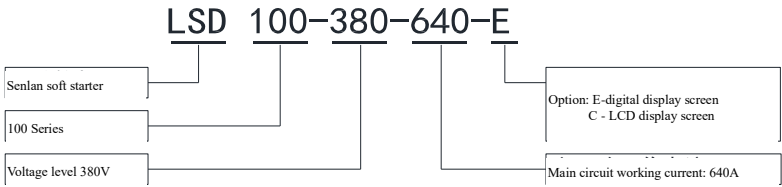
Explanation of the nameplate of the soft starter: (Taking LSD100-380-300-E as an example)

Motor Soft Starter	
Product model: LSD100-380-300E Rated current (Ie): 300A Applicable motor power (Pe): 160kW	Main circuit voltage (Ue): AC380V Control circuit voltage (Ue): AC220V Product No.: 1234567
Executive standard: GB/T 14048.6-2016/IEC 60947-4-2:2011 AC-53b	
SLANVERT	Hope Senlan Science & Technology Holding Co., Ltd.

Definition of Safety Signs

For safety-related contents in this manual, please use the following signs, and the contents with safety signs must be followed.

Danger: **: Incorrect use or failure of operation according to the requirements may cause damage to the soft starter or casualties.**

Attention: Operation against requirements may result in abnormal operation of the system. In serious cases, it may cause damages to soft starter or mechanical damages.

1. Safety and Precautions

1.1 Safety precautions

I. Installation

■ Please read and understand this Manual before installation or operation. Only professional personnel are allowed to install, test, repair and maintain the soft starter.

■ Installation and maintenance shall be carried out in strict accordance with the Manual, relevant national standards, and industry practices. Otherwise, the manufacturer will not be responsible for any adverse consequences caused by failure to follow the corresponding guidelines and specifications.

■ Do not install the soft starter at the place with or near combustible materials, or there will be a fire risk.

■ Do not install it in an environment containing combustible gas, or it may pose an explosion risk.

■ Soft starters shall not be installed in areas with or near flammable materials, as there is a risk of fire.

II. Wiring

■ The control part attached to this product (including the triggering unit and the central processing unit control part) carries dangerous voltage, among which the triggering unit carries high voltage similar to the main circuit. If touched in violation of regulations, it will be very dangerous and may cause electric shock accidents.

■ After connecting to the main power supply, even after disconnecting the control voltage or stopping the starter, a full voltage signal for sampling will still appear at the output end of the soft starter; thus it is necessary to confirm that the input power supply has been completely disconnected before conducting wiring operations; otherwise there is a risk of electric shock.

■ The voltage of the input power terminal shall not exceed the rated voltage range, otherwise the soft starter may be damaged.

■ The grounding terminal (PE) of the soft starter must be reliably and correctly grounded (ground resistance: ≤10Ω), otherwise it may cause electric shock.

■ It is prohibited to connect the power factor compensation capacitor to the output terminal of the soft starter.

■ Before maintaining the soft starter or motor, all power inputs must be disconnected.

III. Inspection before Power On

■ Before powering on, the cover plate of the soft starter must be covered properly; otherwise there is a risk of electric shock.

■ Before starting a soft starter, it is necessary to confirm whether the motor and mechanical device are able to withstand power frequency operation.

IV. Power on and Operation Precautions

■ Check whether the parameter setting is correct before test run.

- ■ The front cover plate cannot be opened when the input power is connected, there is high voltage inside and it may cause electric shock.
- ■ Do not operate the soft starter with wet hands; otherwise, it may cause electric shock.
- ■ Do not turn on or off the input power to control the operation and stop of soft starter.
- ■ When parameter initialization is performed, the parameters shall be reset.
- ■ When selecting the restart function (such as fault self-reset), do not approach the motor and mechanical load while the soft starter is waiting for start.

V. Transportation and Packing Precautions

- ■ Quantity of the stacked soft starter shall not exceed the value specified for packing case.
- ■ Do not place heavy objects on the soft starter.
- ■ Do not open the cover plate when transporting soft starter.
- ■ Operating panel and cover plate shall not be stressed during transport, otherwise personal injury or property loss may be caused.

VI. Scrapping

- ■ It shall be scrapped as industrial wastes.
- ■ Some components inside the soft starter may explode when being burned.
- ■ The plastic parts of the soft starter will produce toxic gas when being burned.

1.2 Precautions

I. About Motor and Mechanical Load

- ■ Motor overload protection

When the adaptive motor is selected, the soft starter can protect the motor from overload. If the motor does not match the rated capacity of the soft starter, the protection value must be adjusted or other protective measures must be taken to ensure the safe operation of the motor.

- ■ Lubrication for mechanical device

When the gearbox, gear and other mechanical devices needing to be lubricated are operated at low speed for a long time, they may be damaged due to poor lubrication effect, so they must be confirmed in advance.

- ■ Insulation inspection of the motor before connecting to the soft starter

When the motor is used for the first time and re-used after long time placement, insulation inspection for motor shall be carried out prevent the soft starter from damage due to insulation failure of the motor winding. Please use 2500V voltage megohmmeter for test, and it shall guarantee that the measured insulation resistance is not less than 5MΩ.

II. About Soft Starters

- ■ Low temperature environment

Due to the characteristics of thyristors, when the ambient temperature is too low (below -20 ℃), it may cause the thyristors to not trigger normally and Er.rHo (open circuit of thermistor) fault will be alarmed.

- ■ Use beyond rated voltage

Soft starters are not suitable for use outside the allowable input voltage range. If necessary, please contact the manufacturer.

■ Derating of soft starter

1) When the ambient temperature exceeds 40 ℃, the soft starter shall be derated by 2% for every 1 ℃ increase, and external forced heat dissipation must be added;

2) In areas with an altitude exceeding 1000m, the thin air will cause the cooling effect of the soft starter to deteriorate, thus, it is necessary to derate by 1% for every 100m above sea level.

2. Product Specification

2.1 General technical specification for LSD100 series soft starter

	Items	Item Description
Input	Rated voltage, frequency	Three-phase: 380V, 50Hz/60Hz
	Allowable range	Voltage fluctuation range: -15%~+10%, available for instantaneous -20%; frequency: ± 2%
	Control power supply	Single phase: 220V, allowable range: 160~250V
	Number of starting	≤ 8 times/hour
	Initial voltage	25~80%Ue
Basic specifications	Run command channel	Operation panel setting, control terminal setting, and communication setting
	Analog output	2-circuit analog signal outputs, 0/4-20mA programmable
	Digital input	3-circuit optional multifunctional digital input
	Digital output	3-circuit multifunctional relay output
	Communication	Internal RS485 communication interface supports Modbus-RTU protocol
Protection		Overcurrent, undervoltage, input/output phase loss, overheating, motor overload, external faults
Optional		LCD screen, Profibus-DP
Environment	Application site	With elevation below 1,000m, indoor, without direction sunshine, dust, corrosive gas, combustible gas, oil mist, water vapor, water drop, and salt mist, etc.
	Operating ambient temperature/humidity	-10~+40℃/20~90%RH, without condensation water drop
	Storage temperature	−20~+60℃
	Vibration	<5.9m/s^2 (0.6g)
Structure	Degree of protection	IP00
	Cooling mode	Natural cooling

2.2 Product Series Specification

See following table for rated value of LSD100 series soft starter:

Soft starter model	Rated current Ie (A)	Adaptive Motor (kW)	Soft starter model	Rated current Ie (A)	Adaptive Motor (kW)
LSD100-380-40-E	40	22	LSD100-380-200-E	200	110
LSD100-380-54-E	54	30	LSD100-380-250-E	250	132
LSD100-380-68-E	68	37	LSD100-380-300-E	300	160
LSD100-380-80-E	80	45	LSD100-380-360-E	360	200
LSD100-380-100-E	100	55	LSD100-380-500-E	500	250
LSD100-380-135-E	135	75	LSD100-380-640-E	640	320
LSD100-380-160-E	160	90			

2.3 Model selection considerations

■   The soft starter must be able to provide a torque greater than the load resistance moment to complete the start, especially for ordinary loads such as water pumps and centrifugal pumps. Single start constant load operation, such as cold state with a limit current of 3 times, is allowed to start for 40 seconds, and a maximum of 25 seconds is allowed when 4 times of the current.

■ During cyclic starting, start 8 times per hour, with 3 times the current allowed for 25 seconds and 4 times the current allowed for 15 seconds. In this case, the heat protection corresponds to level 10.

■ For heavy loads such as ball mills and fans etc., it is allowed to start for 4 times per hour. The current limit is as above, and the protection level is set to 20. If the startup frequency is increased, it is required to select product of larger power.
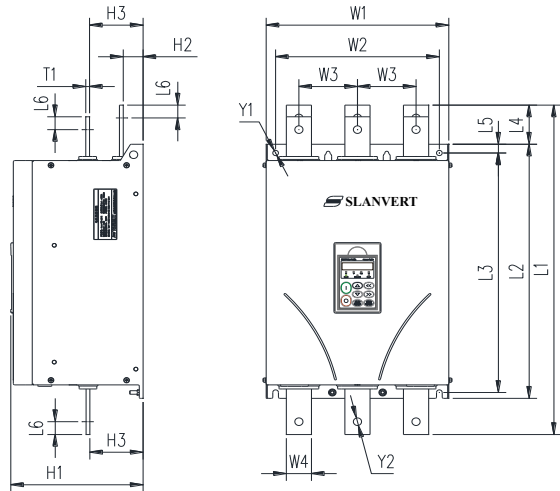
2.4 Overall dimensions

The exterior diagram of LSD100 series soft starter is as follows:

Plastic case:
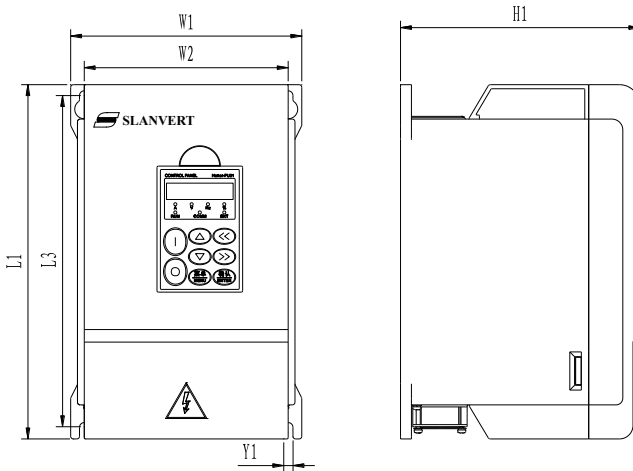
Iron shell case:

The overall dimensions and weight of the LSD100 series soft starter are shown in the table below: (Unit: mm)

Soft starter model	H1	H2	H3	L1	L2	L3	L4	L5	L6	W1	W2	W3	W4	T1	Y1	Y2	Structural form	Weight (kg)
LSD100-380-40-E	176	—	—	260	—	243.5	—	—	—	170	150	—	—	—	7	—	Plastic case	5.4
LSD100-380-54-E																		
LSD100-380-68-E																		
LSD100-380-80-E																		
LSD100-380-100-E																		
LSD100-380-40-E	178	77	100	276	260	243.5	15	7	8	163	150	50	20	3	6	6.5	Iron shell case	6.9
LSD100-380-54-E																		
LSD100-380-68-E																		
LSD100-380-80-E																		
LSD100-380-100-E																		
LSD100-380-135-E	200	31.5	85	530	405	380	61	15	20	260	230	80	40	5	9	13	Iron shell case	19.8
LSD100-380-160-E																		
LSD100-380-200-E																		
LSD100-380-250-E																		
LSD100-380-300-E																		
LSD100-380-360-E	210	31.5	85	564	435	410	67	15	22	290	180	90	40	6	9	13		25
LSD100-380-500-E																		
LSD100-380-640-E																		

3. Handling, Installation and Wiring

3.1 Handling and installation of soft starter

⚡ Danger:	**1. The soft starter can only be installed by trained professionals.** **2. Do not install or use the soft starter if it is damaged or its components are incomplete; otherwise it may result in fire and personal injury.** **3. The soft starter shall be installed at the place where it can withstand the weight of the soft starter, otherwise there is a risk of injury or damage to property when falling.** **4. Do not put operating panel and cover plate under heavy load during transportation, or it may fall to cause personal injury or property loss.**

The soft starter shall be installed in an indoor place with good ventilation. When selecting the installation environment, pay attention to the following conditions:

1. The ambient temperature is required to be in the range of -10 ~ 40 °C. The life of the soft starter is greatly affected by the ambient temperature. Make sure that the temperature of the surrounding environment does not exceed the allowable range. When the temperature exceeds 40 °C, the soft starter shall be derated by 2% for every 1 °C increase, and external forced heat dissipation must be added;

2. In areas with an altitude of more than 1000m, the thin air will cause the heat dissipation effect of the soft starter to deteriorate, and it is necessary to derate the use. For every 100m, the derating is 1%;

The humidity must be lower than 90% RH, without water condensation;

4. Be installed in a place where the vibration is less than $5.9m/s^2$ (0.6g);

5. Avoid to be installed in places exposed to direct sunlight;

The place of installation shall be free from dust and metal powder;

7. It is strictly forbidden to be installed in places with corrosive and flammable gases;

8. The soft starter shall be installed vertically. Do not install it upside down, diagonally, or horizontally. It shall be fixed on a firm structure using suitable bolts. To ensure good heat dissipation, there should be sufficient space for the installation of the soft starter, as shown in the following figure:

Distance between LSD 100 series plastic case soft starter and wall/front panel (A>100mm, B>20mm, C>20mm)
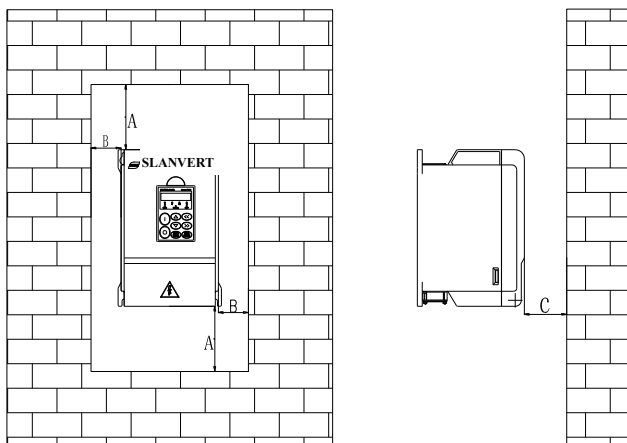
Distance between LSD 100 series iron shell case   soft starter and wall/front panel (A>100mm, B>20mm, C>20mm)
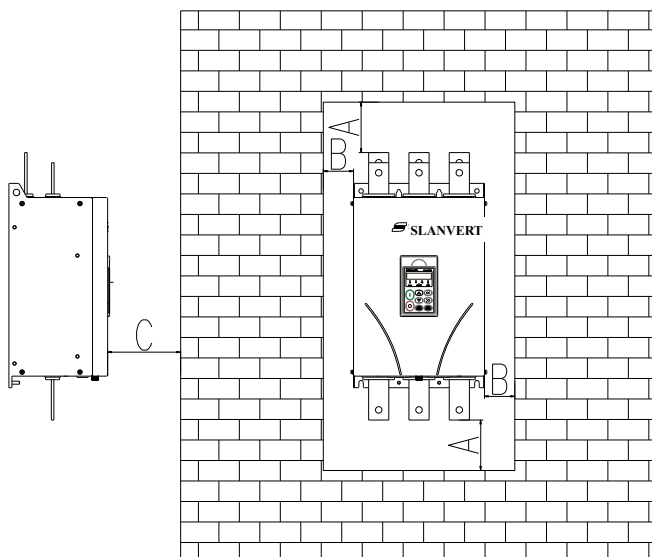
3.2 Removal and installation of soft starter components

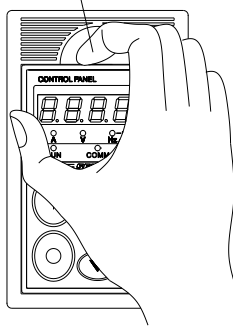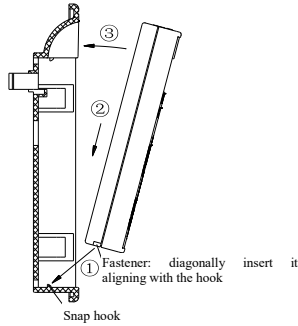### 3.2.1 Removal and installation of operating panel

Removal: Place your finger in the hemispherical hole above the operating panel and press and hold the leaf spring on top and pull it outward as shown in the following figure.

Installation: firstly, connect the bottom fixing bayonet of the operating panel to the bayonet hook under the installation slot of the operating panel, press and hold the upper part of the operating panel and push it inward with your finger, and then release it, as shown in the following figure:

Press and hold the flexible sheet of operating panel from the semi-spherical ball pit to pull it back

Operating panel loading method

③

②

① Fastener: diagonally insert it aligning with the hook
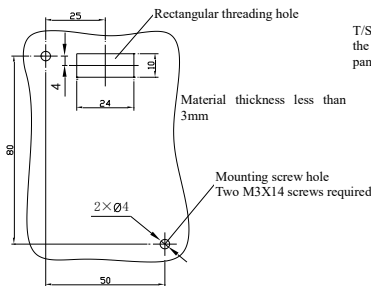
Snap hook

3.2.2 Installation of operating panel on cabinet panel

The operating panel of LSD100 series soft starter can be removed from the main body of the soft starter and installed on the rack. The operating panel and the soft starter body can be connected via an extension cable, and users can choose one of the two methods described below.

◆ Method 1, direct installation:

① Open and punch holes on the rack panel as shown in the following figure;

② Remove the operating panel and two screws on the diagonal of the operating panel ; secure the operating panel to the rack panel with the M3 x 14 screws received;

③ Insert the socket on one end of the extension cable into the operating panel and fasten it with the fastener received. Insert the other end into the corresponding socket on the circuit board of soft starter and lock it; put the rack cover carefully.

Hole opening diagram when installing the operating panel on the rack

25

10

4

24

Rectangular threading hole

Material thickness less than 3mm

80

2×Ø4

Mounting screw hole
Two M3X14 screws required

50

T/SL-23 fastener (standard accessory) used to prevent the extension cable plug from falling off the operating panel
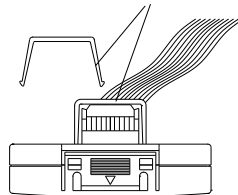
Method 2, install it through the operating panel mounting box:

①   Opening holes on the rack panel as shown in the following figure;

②   Install the operating panel mounting box (optional) on the rack panel;

③   Install the operating panel into the mounting box;

④   Insert the socket at the end of the extension cable into the operating panel. Insert the other end into the corresponding socket on the circuit board of soft starter and lock it: put the rack cover carefully.

Operating panel mounting box   Rack hole-opening size
Material thickness: 1~1.5m

110

67
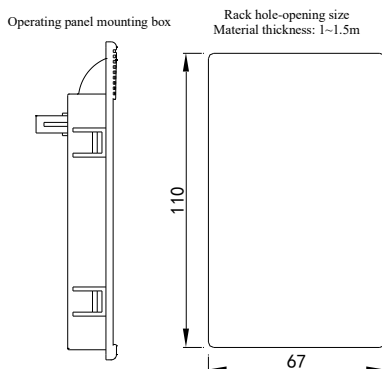
3.3 Wiring of soft starter

Danger:
1. **Wiring for soft starter can only be carried out by trained professionals.** 2. **The soft starter must be grounded reliably, otherwise an electric shock or fire may occur.** 3. **Before powering on, it shall be carefully verified that the rated input voltage of the soft starter is consistent with the voltage level of the AC power supply. Otherwise, it may cause personal injury and equipment damage.** 4. **The main circuit terminal and the wire cold press terminal must be firmly connected.** 5. **It is forbidden to connect a surge-absorbing capacitor to the output of the soft starter.**

3.3.1 Main circuit terminal wiring and configuration

The basic operation wiring connection is as follows:
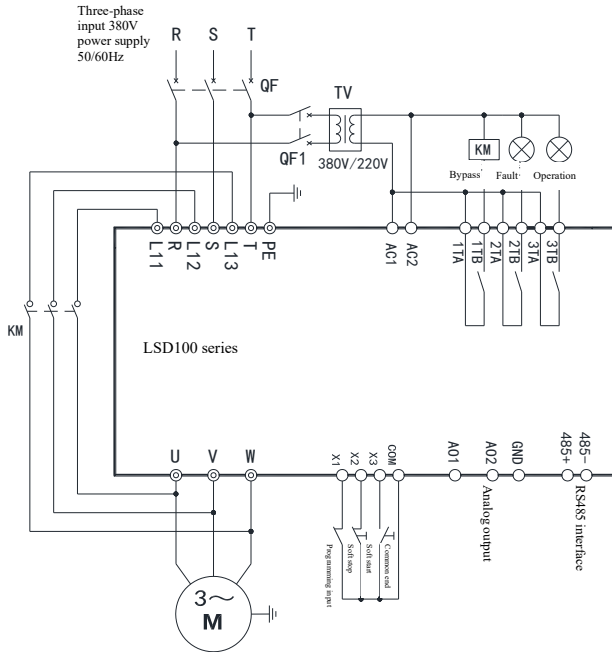
Description on main circuit terminal function:

Terminal symbol	Terminal name	Explanation
R, S, T	Input power terminal	Connect to three-phase power supply
L11, L12, L13	Bypass terminal	Connect one end of the contactor and the other end of the contactor to U, V, and W
U, V, W	Output terminal	Connect with three-phase motor
PE	Grounding terminal	The grounding terminal of the soft starter housing must be grounded

The recommended selection of the main circuit contactor capacity and copper core insulated wire cross-section is as follows:

Soft starter model	Contactor (220V$_{AC}$)	Main circuit wiring (mm)	Soft starter model	Contactor (220V$_{AC}$)	Main circuit wiring (mm)
LSD100-380-40-E	50A	10	LSD100-380-200-E	225A	90
LSD100-380-54-E	65A	16	LSD100-380-250-E	265A	90
LSD100-380-68-E	80A	25	LSD100-380-300-E	330A	120
LSD100-380-80-E	95A	35	LSD100-380-360-E	400A	180
LSD100-380-100-E	115A	35	LSD100-380-500-E	500A	240
LSD100-380-135-E	150A	60	LSD100-380-640-E	630A	270
LSD100-380-160-E	180A	60			

3.3.2 Control terminals and wiring

The user terminal functions of LSD100 series soft starter are shown in the table below:

Terminal symbol	Terminal name	Terminal Function & Description	Technical Specifications.
AC1	Control power supply	Control power input	AC220V/0.5A Voltage range: 160V~250V
AC2			
485＋	Positive terminal of 485 differential signal	RS485 communication interface	Can connect 1~32 RS485 sites Input impedance: >10kΩ
485－	Negative terminal of 485 differential signal		
GND	Ground	Grounding terminal for analog output	GND is internally isolated from COM
AO1I	Multifunctional analog output 1	Function selection: see description on parameters F2-14 and F2-18 for details.	Current type: 0 ~ 20mA, load ≤ 500Ω
AO2I	Multifunctional analog output 2		
X1	X1 digital input terminal	See F2 menus for function selection and configurations.	Opto-isolator One-way input Input impedance: >3k Ω
X2	X2 digital input terminal		
X3	X3 digital input terminal		
COM	Digital quantity common terminal	Common terminal of X1 to X3 terminals	Internally isolated from GND
1TA	Output terminal of relay 1	See F2 menus for function selection and configurations.	TA-TB: normally open Contact specifications: 250V AC/3A 24V DC/5A
1TB			
2TA	Output terminal of relay 2		
2TB			
3TA	Output terminal of relay 3		
3TB			

Note: All terminals must not be used beyond the scope.

1) Wiring of multifunctional input terminals X1 to X3

Try to separate the multi-functional input wiring from the analog output terminal wiring and power cord as much as possible. If a shield wire is used, of which, the shield layer shall be grounded reliably.

2) Wiring of relay output terminals TA, TB, TC

For driving inductive loads (such as electromagnetic relays, contactors, electromagnetic brakes), surge voltage absorbing circuits, varistor or freewheeling diodes (for DC electromagnetic circuits, must pay attention to polarity when installing) shall be installed. The components of the snubber circuit shall be installed close to the coils of the relay or contactor as shown below:
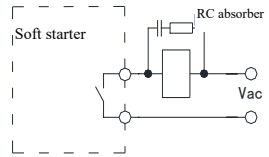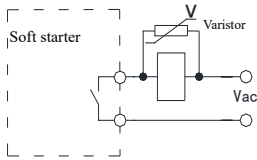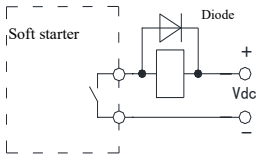
4 Operation of soft starter

4.1 Soft starter operation and display

4.1.1 Functions of operating panel

The operating panel features the functions such as setting and viewing parameters, implementing operation control, and displaying fault information. The standard configuration is Hope-PU05, and Hope-PU06 (LCD operating panel) is also available for selection. Outside view of operating panel is shown below:
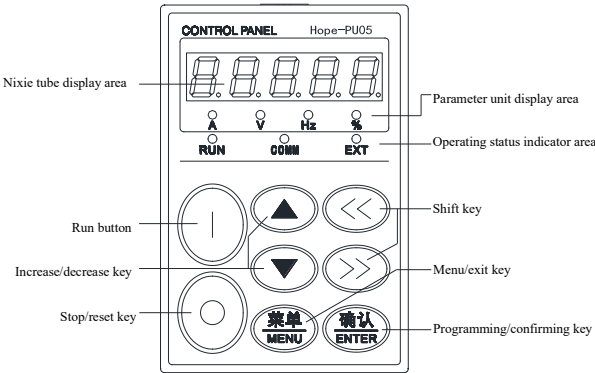

Functions of keys on Hope-PU05 operating panel are shown below:

Key Logo	Name of buttons	Function
菜单 MENU	Menu/exit key	Return to the previous menu; Enter/exit the monitoring state
确认 ENTER	Programming/confirming key	Enter the next-level menu; storage parameters; clear alarm information
▲	Increase key	The number increases progressively, and increases faster when long pressing it down
▼	Decrease key	The number decreases progressively, and decreases faster when long pressing it down
<<	Left shift key	Select the bit to be modified; switching monitoring parameters in monitoring state
>>	Right shift key	Select the bit to be modified; switching monitoring parameters in monitoring state
|	Run button	Run command
○	Stop/reset key	Shutdown, fault reset

Combinations of unit indicator lights indicate the units as follows:

Display				Unit	Explanation
● A	○ V	○ Hz	○ %	A	Ampere
○ A	● V	○ Hz	○ %	V	Volt
○ A	○ V	● Hz	○ %	Hz	Hertz
○ A	○ V	○ Hz	● %	%	Percentage
● A	● V	○ Hz	○ %	kW	Kilowatt (lights A and V are on at the same time)
○ A	● V	● Hz	● %	Time	H, min, s, ms (lights V, Hz and ％ are on at the same time)

The meanings of the three status indicator lights RUN, COMM, and EXT on the operating panel are shown in the table below:

Indicator light	Display Status	Indicates the current status of soft starter
RUN indicator	Off	Standby state
	On	Stable operation state
	Flash	Accelerating or decelerating
COMM indicator light	Off	There is no communication connection present
	On	There is communication connection present
	Flash	Communicating
EXT indicator light	Off	Operating panel control status
	On	Terminal control state
	Flash	Communication control state

4.1.2 Display status and operations on the operations panel

The display status of LSD series soft starter operating panel includes monitoring status (including standby monitoring status, running monitoring status), parameter editing status, fault status, and alarm status, etc. The conversion relationship of each state is shown below:

17
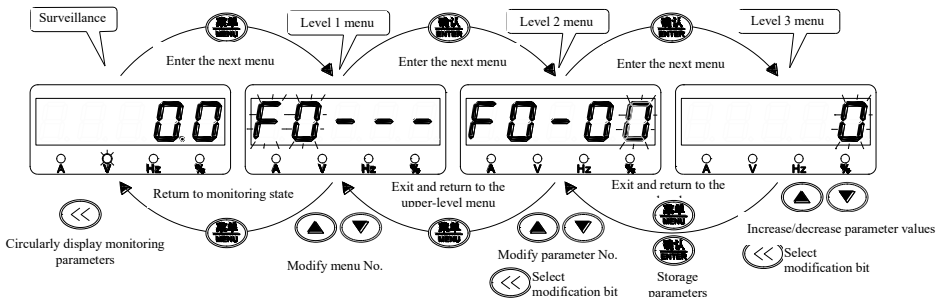
Standby monitoring state

Press (<<) and under the state to enable the operating panel to circularly display different standby state parameters (defined in F4-01 ~ F4-04).

Operation monitoring state

Press (<<) and under the state to circularly display different operating state parameters (defined in F4-05 ~ F4-08).

Parameter editing state

Press (MENU) under monitoring state to enter editing state that is displayed as a level 3 menu in sequence of parameter group number→parameter group serial number→parameter value. Press (ENTER) to enter next level and press (MENU) to return to previous menu (return to monitoring state if at level 1 menu). Change parameter group number, parameter group serial number or parameter value by pressing (▲) and (▼). Under level 3 menu, the bit that can be modified will flash, and the bit can be changed by pressing (<<), and the modification results can be saved by pressing (ENTER), and it will return to level 2 menu and point to next parameters.

Password verification status

If there is a user password (F0-15 is not zero), enter the password verification status before entering parameter editing. The device shows "————" at this time, and users can enter password by (▲), (▼), and (<<), during which the "————" will be displayed all the time. Then password protection can be released by pressing (ENTER). If the password is not correct, the keyboard will flash and display 'Err'. At the time, press (MENU) to return to the verification status and press (MENU) again to exit password verification status.

After the password protection is removed, the password protection automatically takes effect if pressing the (ENTER) + (<<) in the monitoring state or pressing no keys within 2min.

Fault display status

Once detecting fault signal, the soft starter will enter fault display status with fault code flashing. Faults can be reset by entering reset commands (○), control terminal or communication command on operating panel). If the fault still exists, the fault code will be still displayed, during which improper parameters can be modified and set to eliminate the fault.

Alarm display status

If the soft starter detects the alarm information, the Nixie tube will display flashing alarm code. In case of multiple

alarm signals, they will be displayed alternately, and the alarm display can be temporarily shielded by pressing 菜单 MENU

or ⟨⟨ . The soft starter automatically detects the alarm value, and automatically clears the alarm signal if it returns

to normal state. The soft starter does not stop during an alarm.

Other display status

Prompt information	Content and Description
UP	Parameter uploading in progress
dn	Parameter downloading in progress
CP	Parameter comparison in progress
Ld	Factory value resetting in progress
yES	The parameter comparison results are consistent

4.2 Factory settings

Motor rated current Ie: The power of the starter varies, and the values also vary, which must be set according to

the actual situation

Starting rise time: 10 seconds

Soft stop: 2 seconds

Start mode: Current limiting

Start control source: Start by panel control

Programmable input: Set to none

Programmable output: Set to starter working closed

Communication rate: 9600bps

Analog current range: 4~20mA

5. List of Functional Parameters

Note: Change: "○" means that both standby and operation state can be changed, "×" means that only the operation state

cannot be changed, and "△" means read-only.

F0 basic parameters

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
F0-00	Selection for operation command channel	0: Operating panel 1: Terminal 2: Communication control	0	×	23
F0-01	Starting method selection	0: Voltage ramp start 1: Current limiting start	1	×	23
F0-02	Start time setting	1.0～120.0s	10.0s	○	23
F0-03	Starting delay time	0.0～3600.0s	0.0s	○	23
F0-04	Starting voltage setting	10~100% rated voltage (Ue)	20%	×	23
F0-05	Reserve	---	---	-	24
F0-06	Starting voltage holding time	0.00～10.00s	0.02s	○	24
F0-07	Shutdown method	0: Free shutdown 1: Soft shutdown	0	○	24
F0-08	Shutdown voltage	10~100% rated voltage (Ue)	20%	×	24
F0-09	Stop time	0.1～300.0s	2.0s	○	24
F0-10	Starting step voltage (reserved)	10~100% rated voltage (Ue)	20%	×	25
F0-11	Starting step time (reserved)	0.01～10.00s	0.02s	○	25
F0-12	Bypass interlocking time	0.5～1000.0s	5.0s	○	25
F0-13	Starting current limit rate	150.0~500.0% rated current (Ie)	200.0%	×	25
F0-14	User initialization	11: Initialization 22: Non-communication parameter initialization	00	×	25
F0-15	User Password	0000~9999, 0000 indicates that no password is set.	0000	○	25

F1 motor parameters

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
F1-00	Number of Motors	1～2	1	×	25
F1-01	Motor 1 power	1.0～1000.0kW	Model determination	×	25
F1-02	Motor 1 rated current	2.5～2000.0A	Model determination	×	25
F1-03	Motor 1 start time	1.0～120.0s	10.0s	○	25
F1-04	Reserve	---	---	-	25-
F1-05					
F1-06					

F2 terminal function

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
F2-00	X1 digital input terminal function	0: Not connected to the following signals 3: External control operation	0	×	25
F2-01	X2 digital input terminal function	1: External fault input (NO) 4: External control stop	0		
F2-02	X3 digital input terminal function	2: Fault reset 5: Free shutdown 6: Command channel selection	0		
F2-03	Shake elimination time of digital input terminal	0.000～2.000s	0.010s	○	26
F2-04	External terminal operating mode	0: Single line start and stop 1: Two-line start and stop 2: Two-line start and stop (single pulse)	0	×	26
F2-05	T1 relay output function	0: Operation is ready 4: Bypass output	4	×	26
F2-06	T2 relay output function	1: Running 5: Alarm output 2: Fault output 6: Power grid	2		
F2-07	T3 relay output function	3: Voltage reached undervoltage	1		
F2-08	T1 terminal closing delay	0.000～65.000s	0.000s	○	27
F2-09	T1 terminal opening delay	0.000～65.000s	0.000s	○	27
F2-10	T2 terminal closing delay	0.000～65.000s	0.000s	○	27
F2-11	T2 terminal opening delay	0.000～65.000s	0.000s	○	27
F2-12	T3 terminal closing delay	0.000～65.000s	0.000s	○	27
F2-13	T3 terminal opening delay	0.000～65.000s	0.000s	○	27
F2-14	AO1 function selection	1: Power grid voltage 6: U-phase current 2: Output voltage (reserved) 7: V-phase current 3: Output current 8: W-phase current 4: Load current percentage 9: Output power 5: Radiator temperature (reserved) 10: Reserved	1	○	27
F2-15	AO1 type selection	0：0～20mA 1：4～20mA 2: Centered on 10mA	1	○	27
F2-16	AO1 gain	0.0～1000.0%	100.0%	○	27
F2-17	AO1 bias	－99.99%～99.99%	0.00%	○	27
F2-18	AO2 function selection	Same as F2-14	3	○	27
F2-19	AO2 type selection	Same as F2-15	1	○	27
F2-20	AO2 gain	0.0～1000.0%	100.0%	○	27
F2-21	AO2 bias	－99.99%～99.99%	0.00%	○	27

F3 protection parameters

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
F3-00	Motor overload protection value	50.0~800.0%, at 100% rated current (Ie)	150.0%	○	28
F3-01	Motor overload protection action selection	0: No action, 1: Alarm, 2: Fault and free stop	0	○	28
F3-02	Phase loss protection	0: Off 1: On	0	○	28
F3-03	Grid anomaly detection	0: Off 1: Enable undervoltage 2: Enable overvoltage 3: Enable overvoltage and undervoltage	0	○	29
F3-04	Grid undervoltage detection	200～500V	325V	○	29

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
	threshold				
F3-05	Grid overvoltage detection threshold	200~500V	440V	○	29
F3-06	Abnormal start time detection	0: Off 1: On	0	○	29
F3-07	Detection value for excessively long start time	10~300s	60s	○	29
F3-08	Output imbalance detection	0: Off 1: On	0	○	29
F3-09	Output imbalance detection value	1.0~100.0%	30.0%	○	29
F3-10	Number of automatic restarts	0~5	0	○	29
F3-11	Automatic restart interval time	0~4000s	100s	○	29
F3-12	Reserve	---	---	-	29-
F3-13	Reserve	---	---	-	29-
F3-14	Reserve	---	---	-	29-
F3-15	Bypass fault detection	0: Off 1: On	1	○	29

F4 display parameters

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
F4-00	Display parameter selection	0: Display monitoring parameters 1: Display monitoring or operating parameters	1	○	30
F4-01	Monitoring parameter selection 1		0	○	30
F4-02	Monitoring parameter selection 2		−1	○	30
F4-03	Monitoring parameter selection 3		−1	○	30
F4-04	Monitoring parameter selection 4	−1~10 Note: Set values 0-10: Corresponding to FU-00-FU10 under menu FU; -1: None;	−1	○	30
F4-05	Operating parameter selection 1		2	○	30
F4-06	Operating parameter selection 2		0	○	30
F4-07	Operating parameter selection 3		6	○	30
F4-08	Operating parameter selection 4		−1	○	30

F5 communication parameter

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
F5-00	Communication data format	0：8,N,1 1：8,E,1 2：8,O,1 3：8,N,2	0	×	30
F5-01	Baud rate selection	0：1200bps 1：2400bps 2：4800bps	3	×	30

Parameters	Name	Setting Range and Description	Factory Default Value	Change	Page No.
		3：9600bps 4：19200bps 5：38400 bps			
F5-02	Local address	1～248	1	×	30
F5-03	Communication timeout detection time	0.001～6.000s	0.100s	○	30
F5-04	Communication timeout action	0: No action, 1: Alarm, 2: Fault and free stop 3: Fault and soft stop	0	○	30

FP Fault record

Parameters	Name	Content and Description	Page No.
FP-00	Last fault type	0: No fault 1: Reserved (er. ocA) 2: Reserved (er. ocd) 3: Input overvoltage (er. Aou) 4: Input undervoltage (er. ACL) 5: Input phase loss (er. PLI) 6: Output phase loss (er. PLo) 7: Overheating (Er. oHI) 8: Equipment overload (Er. oLI) 9: External fault (Er. EEF) 10: Communication fault (Er. CFE) 11: Current detection fault (Er. ccF) 12: Thermistor open circuit (Er. rho) 13: Reserved (Er. ocr) 14: Start time too long (Er. rol) 15: Motor overload (Er. OLL) 16: Bypass fault (Er.uLL) 17: Reserved (Er. nrc) 18: Unbalanced three-phase current (Er. cnb) 19: Missing parameter (Er. PCE) 20: Reserved (Er. IO1) 21: Reserved (Er. Io2) 22: Reserved (er. PNL)	33
FP-01	Output current in the latest fault	Min. unit: 0.1A	33
FP-02	Output voltage in the latest fault	Min. unit: 0.1V	33
FP-03	Grid voltage in the most recent failure	Min. unit: 0.1V	33
FP-04	Input terminal state in the latest fault	Hundred-digit: X3; ten-digit: X2; unit digit: X1	33
FP-05	Output terminal state in the latest fault	Hundred-digit: T3; ten-digit: T2; unit digit: T1	33
FP-06	Second last failure type	The same as that of FP-00	33
FP-07	Output current in second last fault	Min. unit: 0.1A	33
FP-08	Output voltage in second last fault	Min. unit: 0.1V	33
FP-09	Grid voltage in second last fault	Min. unit: 0.1V	33
FP-10	Input terminal state in second last fault	Hundred-digit: X3; ten-digit: X2; unit digit: X1	33
FP-11	Output terminal state in second last fault	Hundred-digit: T3; ten-digit: T2; unit digit: T1	33
FP-12	Third last failure type	The same as that of FP-00	33
FP-13	Output current in third last fault	Min. unit: 0.1A	33
FP-14	Output voltage in third last fault	Min. unit: 0.1V	34
FP-15	Grid voltage in third last fault	Min. unit: 0.1V	34
FP-16	Input terminal state in third last fault	Hundred-digit: X3; ten-digit: X2; unit digit: X1	34

Parameters	Name	Content and Description	Page No.
FP-17	Output terminal state in third last fault	Hundred-digit: T3; ten-digit: T2; unit digit: T1	34
FP-18	Fourth last failure type	The same as that of FP-00	34
FP-19	Output current in fourth last fault	Min. unit: 0.1A	34
FP-20	Output voltage in fourth last fault	Min. unit: 0.1V	34
FP-21	Grid voltage in fourth last fault	Min. unit: 0.1V	34
FP-22	Input terminal state in fourth last fault	Hundred-digit: X3; ten-digit: X2; unit digit: X1	34
FP-23	Output terminal state in fourth last fault	Hundred-digit: T3; ten-digit: T2; unit digit: T1	34
FP-24	Fifth last failure type	The same as that of FP-00	34
FP-25	Output current in fifth last fault	Min. unit: 0.1A	34
FP-26	Output voltage in fifth last fault	Min. unit: 0.1V	34
FP-27	Grid voltage in fifth last fault	Min. unit: 0.1V	34
FP-28	Input terminal state in fifth last fault	Hundred-digit: X3; ten-digit: X2; unit digit: X1	34
FP-29	Output terminal state in fifth last fault	Hundred-digit: T3; ten-digit: T2; unit digit: T1	34

FU data monitoring

Parameters	Name	Content and Description	Page No.
FU-00	Grid voltage	Min. unit: 0.1V	34
FU-01	Output voltage (reserved)	Min. unit: 0.1V	34
FU-02	Output current	Min. unit: 0.1A	34
FU-03	Load current percentage	Min. unit: 0.1%	34
FU-04	Digital input terminal state	Hundred-digit: X3; ten-digit: X2; unit digit: X1 (0: open 1: close)	34
FU-05	Digital output terminal state	Hundred-digit: T3; ten-digit: T2; unit digit: T1 (0: open 1: close)	34
FU-06	Heat Sink Temperature	Min. unit: 0.1°C	34
FU-07	Output U-phase current	Min. unit: 0.1A	34
FU-08	Output V-phase current	Min. unit: 0.1A	34
FU-09	Output W-phase current	Min. unit: 0.1A	34
FU-10	Output power (reserved)	Min. unit: 0.1kW	34
FU-11	Output power factor (reserved)	Min. unit: 0.01	35
FU-12	Reserve	---	35
FU-13	Reserve	---	35
FU-14	Communication polling time	Min. unit: 0.001s	35
FU-15	Times of communication error	The min. unit: 1	35
FU-16	Software version display	Min. unit: 0.01	35
FU-17	Maintain maximum operating current	Min. unit: 0.1A	35
FU-18	Grid frequency	The min. unit: 0.01Hz	35

6. Detailed Explanation of Functional Parameters

6.1 F0 Basic parameters

| F0-00	Selection for operation command channel	Factory Default Value	0	Change	×
Setting range	0: Operating panel (EXT off) 1: Terminal (EXT on) 2: Communication control (EXT flashing)				
F0-01	Starting method selection	Factory Default Value	1	Change	×
Setting range	0: Voltage ramp start 1: Current limiting start				

Voltage ramp starting is achieved by setting the input voltage rise rate of the motor to complete the motor starting process. The initial output torque can be increased by setting the starting voltage.
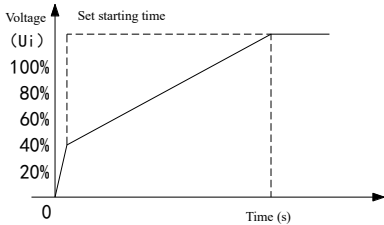
The current limiting starting starts with a fixed starting voltage. When the starting current reaches the limit current, the output voltage remains stable until the current drops below the limit value, and then the output voltage continues to rise. The set starting time is equal to t1+t2. The starting current must be large enough to achieve the rated speed of the motor, and the minimum allowable starting current is determined by the characteristics of the motor and load.
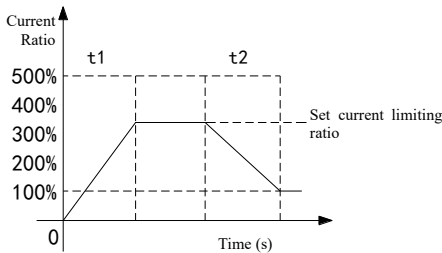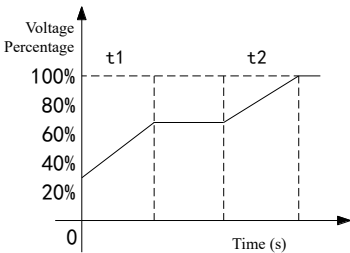
F0-02	Start time setting	Factory Default Value	10.0s	Change	○
Setting range	1.0～120.0s				

📖 The start rising time setting is valid for all start modes. If the motor starting time in the F1 motor parameter is less than this parameter, the F1 motor parameter setting shall prevail.

F0-03	Starting delay time	Factory Default Value	0.0s	Change	○
Setting range	0.0～3600.0s				
F0-04	Starting voltage setting	Factory Default Value	20%	Change	×
Setting range	10 ~ 80% rated voltage (Ue)				

F0-05	Starting current setting (reserved)	Factory Default Value	100%	Change	×
Setting range	10 ~ 300% rated current (Ie)				

The current limiting mode is effective.
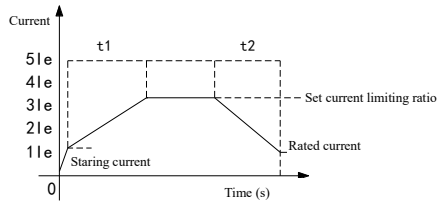
F0-06	Starting voltage holding time	Factory Default Value	0.02s	Change	○
Setting range	0.00～10.00s				
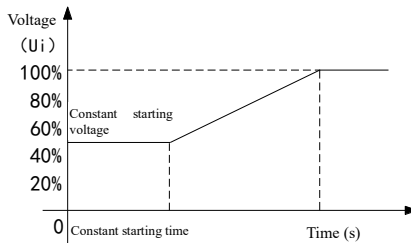
F0-07	Shutdown method	Factory Default Value	0	Change	○
Setting range	0: Free shutdown 1: Soft shutdown				

📖   In case of free shutdown, both the stop voltage and stop time settings are invalid

F0-08	Shutdown voltage	Factory Default Value	20%	Change	×
Setting range	10~100% rated voltage (Ue)				

📖   The soft shutdown mode is effective.

F0-09	Stop time	Factory Default Value	2.0s	Change	○
Setting range	0.1～300.0s				

The shutdown voltage and shutdown time are shown in the following figure:
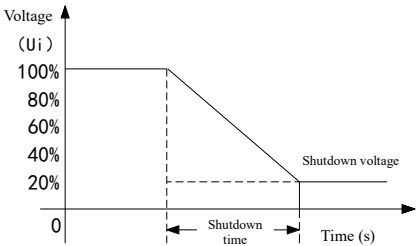
F0-10	Starting step voltage (reserved)	Factory Default Value	20%	Change	×
F0-11	Starting step time (reserved)	Factory Default Value	0.02s	Change	○

F0-12	Bypass interlocking time	Factory Default Value	5.0s	Change	○
Setting range	0.5～1000.0s				
F0-13	Starting current limit rate	Factory Default Value	200.0%	Change	×
Setting range	150.0 ~ 500.0%, relative to the rated current of the motor				
F0-14	User initialization	Factory Default Value	0	Change	×
Setting range	0 ~ 99; 11: Initialization 22: Non-communication parameter initialization (can clear fault records) Other: Invalid				
F0-15	User's password setting	Factory Default Value	0000	Change	○

Setting range	0000~9999, 0000 indicates that no password is set.

After setting password, the password will take effect if no keys pressed within 2min. Under monitoring state, the password will take effect immediately if pressing （确认 ENTER）+（<<） at the same time.

6.2 F1 motor parameters

F1-00	Number of Motors	Factory Default Value	1	Change	×
Setting range	1～2				

Currently, only one motor is supported.

F1-01	Motor 1 power	Factory Default Value	Model determination	Change	×
Setting range	1.0～1000.0kW				
F1-02	Motor 1 rated current	Factory Default Value	Model determination	Change	×
Setting range	2.5～2000.0A				

The rated current of the motor cannot be greater than the rated current of the soft starter.

F1-03	Motor 1 start time	Factory Default Value	10.0s	Change	○
Setting range	1.0～3000.0s				

This parameter is only valid if it is less than F0-02; otherwise, it shall be executed according to the F0-02 parameter.

F1-04~06	Reserve	---	---	--	-

6.3 F2 terminal function

F2-00	X1 digital input terminal function	Factory Default Value	0	Change	×
F2-01	X2 digital input terminal function	Factory Default Value	0	Change	×
F2-02	X3 digital input terminal function	Factory Default Value	0	Change	×
Setting range	-6～6				

📖 Digital input function definition (a same digital input function cannot be selected for any two digital input terminals at the same time):

0: Not connected to the following signals 1: External fault input (NO)   2: Fault reset

3: External control operation   4: External control stop 5: Free shutdown 6: Command channel selection

📖 **When set to a negative value, it represents anti-logic;**

📖 **1: External fault input.** Through this signal, abnormal or fault information of the peripheral equipment of the soft starter are input to the soft starter, causing the soft starter to stop and reporting external faults. The fault cannot be reset automatically and must be manually reset. If a normally closed input is required, it can be achieved by setting -1.

📖 2: Fault reset. The rising edge of the signal resets the fault, and the function is the same as the reset function of ⊙ of operating panel.

📖 **3: External control operation.** When the running command channel is a terminal, the signal is valid and the soft starter operates.

📖 **4: External control stop.** When this signal is valid, it will inhibit the operation of the soft starter, and the shutdown mode is determined by F0-07.

📖 **5: Free shutdown.** If the signal is valid in the operation of the soft starter, the output will be blocked immediately, and the motor will stop by inertia sliding.
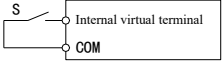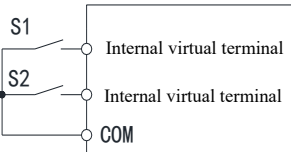
📖 **6: Command channel selection.** It is for switching command channels, in conjunction with F0-00. If F0-00=0, it switches between the panel and terminals; If F0-00=1, it switches between communication and terminals; If F0-00=0, it switches between the panel and communication.

F2-03	Shake elimination time of digital input terminal	Factory Default Value	0.010s	Change	○
Setting range	0.000～2.000s				

📖 Shake elimination time of digital input terminal: define the shake elimination time of digital input terminal, the signal with duration shorter than the Shake elimination time will be neglected.

F2-04	External terminal operating mode	Factory Default Value	0	Change	×
Setting range	0: Single line start and stop 1: Two-line start and stop 2: Two-line start and stop (single pulse)				

📖 The table below lists the logic and diagrams of various operating modes. In the table, S stands for valid level. B is valid edge:

F2-04	Mode name	Running logics	Illustration
0	Single-line type (start/stop)	S: Running switch, run when valid	
1	Two-line type (Start, stop)	S1: Run button (normally open) S2: Stop button (normally open)	

F2-04	Mode name	Running logics	Illustration
2	Two-line type (Monopulse start and stop)	B1: Run button (normally on) B2: Stop button (normally open)	B1 — Internal virtual terminal B2 — Internal virtual terminal COM

⌨ In terminal control mode, although single-line or two-line operating mode are of level valid, it is necessary to restart by giving the stop signal before operating signal when soft starter stops due to the stop command generated by other sources.

F2-05	T1 relay output function	Factory Default Value	4	Change	×
F2-06	T2 relay output function	Factory Default Value	2	Change	×
F2-07	T3 relay output function	Factory Default Value	1	Change	×
Setting range	-6～6				

📖　The relay output function is defined as follows:

    0: Ready for operation 1: Running 2: Fault output 3: Voltage reached

    4: Bypass output 5: Alarm output 6: Grid undervoltage

📖　**When set to a negative value, it represents anti-logic;**

F2-08	T1 relay closing delay	Factory Default Value	0.000s	Change	○
F2-09	T1 relay breaking delay	Factory Default Value	0.000s	Change	○
F2-10	T2 relay closing delay	Factory Default Value	0.000s	Change	○
F2-11	T2 relay breaking delay	Factory Default Value	0.000s	Change	○
F2-12	T3 relay closing delay	Factory Default Value	0.000s	Change	○
F2-13	T3 relay breaking delay	Factory Default Value	0.000s	Change	○
Setting range	0.000～65.000s				

⌨ If the relay selects the bypass output function, the closing delay and breaking delay are invalid, and the interlocking time is controlled by F0-12;

📖 Digital output delay is shown below:
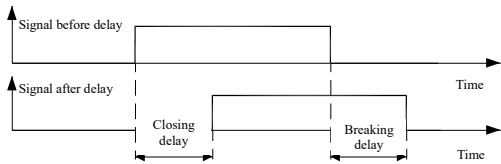
F2-14	AO1 function selection	Factory Default Value	1	Change	○
Setting range	See the analog output definition in the table below.				
F2-15	AO1 type selection	Factory Default Value	1	Change	○
Setting range	0: 0 ~ 20mA 1: 4 ~ 20mA 2: centered by 10mA				
F2-16	AO1 gain	Factory Default Value	100.0％	Change	○
Setting range	0.0～1000.0％				
F2-17	AO1 bias	Factory Default Value	0.00%	Change	○
Setting range	-99.99 ~ 99.99%, taking 20mA as 100%				
F2-18	AO2 function selection	Factory Default Value	3	Change	○
F2-19	AO2 type selection	Factory Default Value	1	Change	○
F2-20	AO2 gain	Factory Default Value	100.0％	Change	○
F2-21	AO2 bias	Factory Default Value	0.00%	Change	○
Setting range	All settings for AO2 are the same as that of AO1.				

📖 Analog Output Definition

1: Power grid voltage	5: Radiator temperature	9: Output power (reserved)
2: Output voltage (reserved)	6: U-phase current	10: Reserved
3: Output current	7: V-phase current	
4: Load current percentage	8: W-phase current	

 Three types of analog output are shown below:
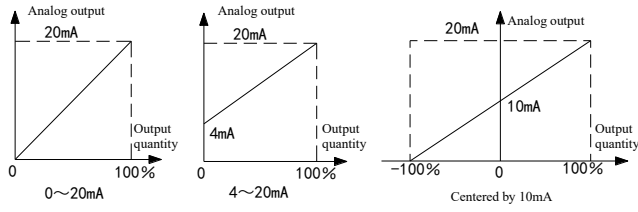
Current: 5 times the rated current for full scale; voltage: 2 times the rated voltage for full scale.

 Range can be changed and zero point can be corrected by adjusting gain and bias. Calculation formula: output = output x gain + bias.

6.4 F3 protection parameters

F3-00	Motor overload protection value	Factory Default Value	150.0%	Change	○
Setting range	50.0～800.0%				

 F3-00 "Motor Overload Protection Value": The multiple of the allowable overload rated current (Ie). Protection time curve is shown as follows:
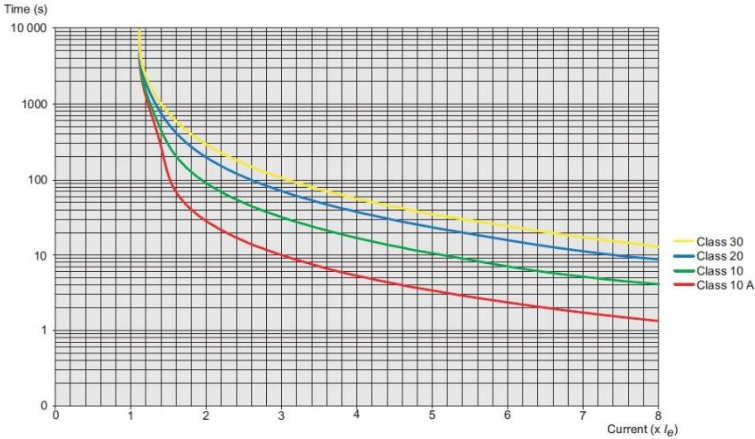
 Set the protection level of Class 10 A to 160.0% for this parameter; set the protection level of Class 10 to 220.0% for this parameter; set the protection level of Class 20 to 322.0% for this parameter; the protection level of Class 30 is set to 392.0% for this parameter.

F3-01	Motor overload protection action selection	Factory Default Value	0	Change	○
Setting range	0: No action, 1: Alarm, still in operation, 2: Fault and free shutdown				

 In case of motor overload protection, it is necessary to wait for a period of time to cool the motor before continuing

to run it.

⚠ Attention: Motor overload protection is only applicable to the occasion with one soft starter driving one motor. When one soft starter drives multiple motors at the same time, install thermal protection devices on each motor separately.

F3-02	Phase loss protection	Factory Default Value	1	Change	○
Setting range	0: Off 1: On				

📖 In the event of output phase loss, the motor operates in single phase and the current and torque pulsations increase. The output phase loss protection can avoid damaging the motor and mechanical loads; therefore, it is necessary to check whether the input power supply is experiencing phase loss.

📖 Both input phase loss detection and output phase loss detection are turned on or off by this setting.

F3-03	Grid anomaly detection	Factory Default Value	3	Change	○
Setting range	0: Off 1: Enable undervoltage 2: Enable overvoltage 3: Enable overvoltage and undervoltage				
F3-04	Grid undervoltage detection threshold	Factory Default Value	325V	Change	○
F3-05	Grid overvoltage detection threshold	Factory Default Value	440V	Change	○
Setting range	200～500V				

📖 F3-05 must be greater than F3-04.

F3-06	Abnormal start time detection	Factory Default Value	1	Change	○
Setting range	0: Off 1: On				
F3-07	Detection value for excessively long start time	Factory Default Value	60s	Change	○
Setting range	10～300s				

📖 If the starting time is greater than the set value of F3-07, the starter will trip.

F3-08	Output imbalance detection	Factory Default Value	1	Change	○
Setting range	0: Off 1: On				
F3-09	Output imbalance detection value	Factory Default Value	30.0%	Change	○
Setting range	1.0～100.0%				

📖   The allowable deviation range for three-phase output current imbalance.

F3-10	Number of automatic restarts	Factory Default Value	0	Change	○
Setting range	0～5				
F3-11	Automatic restart interval time	Factory Default Value	100s	Change	○
Setting range	60～4000s				

📖   After the soft starter fault protection, F3-11 will automatically reset the fault after setting the time. If the start command is not released, execute the startup operation again. There is no automatic reset and restart function for external faults and thyristor overheating faults.

📖   After determining the activation of the fault or protection, the soft starter should automatically restart the motor to ensure uninterrupted operation.

📖   The event will only be reset after the automatic reset delay time has ended. If automatic restart is enabled, the soft starter will not directly activate the fault relay, as the fault relay may sometimes be associated with the higher-level circuit breaker.

📖   The soft starter attempts to restart multiple times, with a fixed interval between each attempt and ignoring the digital input signal during this period.

📖   If the fault persists after restarting, indicating the failure of restart attempt.

📖   The fault relay will only activate when the number of failed restarts exceeds the specified number.

📖   After issuing a stop signal, the automatic restart sequence will be interrupted and the faulty relay will be closed.

⚠️Danger: Use the automatic reset function with caution. Otherwise, personal injury or property loss may occur.

F3-12~14	Reserve	---	---	--	-
F3-15	Bypass fault detection	Factory Default Value	1	Change	○
Setting range	0: Off 1: On				

📖   During bypass operation, when the output current is less than 25% of the current value when the bypass signal is issued, a bypass fault occurs.

6.5 F4 display parameters

F4-00	Display parameter selection	Factory Default Value	0	Change	○
Setting range	0: Display monitoring parameters 1: Display monitoring parameters or operating parameters				
F4-01	Monitoring parameter selection 1	Factory Default Value	0	Change	○

F4-02	**Monitoring parameter selection 2**	Factory Default Value	－1	Change	○
F4-03	**Monitoring parameter selection 3**	Factory Default Value	－1	Change	○
F4-04	**Monitoring parameter selection 4**	Factory Default Value	－1	Change	○
F4-05	**Operating parameter selection 1**	Factory Default Value	1	Change	○
F4-06	**Operating parameter selection 2**	Factory Default Value	2	Change	○
F4-07	**Operating parameter selection 3**	Factory Default Value	3	Change	○
F4-08	**Operating parameter selection 4**	Factory Default Value	－1	Change	○
Setting range	－1～10				

☙   Set values 0-10; corresponding to FU00 to FU10 under item FU; set to -1 not to select.

☙   Only when F4-00=1 and the equipment is in running state can the operating parameters be displayed; otherwise, all monitoring parameters will be displayed.

6.6 F5 communication parameter

F5-00	**Communication data format**	Factory Default Value	0	Change	×
Setting range	0:8,N,1 (1 start bit, 8 data bits, no odd-even check, 1 stop bit) 1:8,E,1 (1 start bit, 8 data bits, even parity check, 1 stop bit) 2:8,O,1 (1 start bit, 8 data bits, odd parity check, 1 stop bit) 3:8,N,2 (1 start bit, 8 data bits, no odd-even check, 2 stop bits)				
F5-01	**Baud rate selection**	Factory Default Value	3	Change	×
Setting range	0：1200bps 1：2400bps 2：4800bps 3：9600bps 4：19200bps 5：38400bps				
F5-02	**Local address**	Factory Default Value	1	Change	×
Setting range	1～248				
F5-03	**Communication exception detection time**	Factory Default Value	0.1s	Change	○
Setting range	0.001～6.000s				

F5-04	Communication timeout action	Factory Default Value	0	Change	○
Setting range	0: No action 1: Alarm 2: Fault and free shutdown 3: Fault and soft shutdown				

    The RS485 Modbus RTU protocol of Senlan soft starter consists of three layers: physical layer, data link layer, and application layer. The physical layer and data link layer adopt Modbus protocol based on RS485, and the application layer controls soft starter operation, stop, parameter reading and writing and other operations.

    The Modbus-RTU protocol is a master-slave protocol. The communication between the host and the slave has two types, i.e., the host requests, the slave replies, or hole is broadcasting, and slave is not answering. Only one device can transmit on the bus at any time, and the host polls the slave. The slave cannot send messages without receiving the command from the host. The host can send the command repeatedly if the communication is not correct. If no response is received within a given period of time, the polled slave is considered lost. If the slave cannot execute a certain message, it sends an exception message to the host.

    Communication writes to the soft starter parameters only by modifying the values in RAM. If it is required to write RAM parameters to EEPROM, it is necessary to rewrite the communication variable "EEP write command" (Modbus address 3209H) to 1.

    Soft starter parameter addressing method: the high 8 bits of 16-bit Modbus parameter address are the group number of parameters, and the lower 8 bits are the number in the group of the parameter, all of them are addressed in hexadecimal way. For example, the address of parameter F2-17 is 0211H. For communication variables (control words, status words, etc.), the parameter group number is 50 (32H). Note: Communication variables include soft starter parameters that can be accessed by communication, special instruction variables for communication and special state variables for communication. Corresponding communication parameter group number of menu code is shown in the table below:

Menu code	Parameter group number	Menu code	Parameter group number	Menu code	Parameter group number	Menu code	Parameter group number
F0	0(00H)	F2	2(02H)	F4	4(04H)	FP	7(07H)
F1	1(01H)	F3	3(03H)	F5	5(05H)	FU	8(08H)

    Data type in communication: The data transmitted in communication is a 16-bit integer. The smallest unit can be seen from the decimal point position of the parameter in the parameter list. For instance, the minimum unit for F0-02 "start time setting" is 0.1s, so for the Modubus RTU protocol, communication transmission 50 represents 5.0s.

    Communication command variable:

Name	Modbus address	Change	Explanation
Main control word	3200H	○	Bit 0: ON/OFF1 (operate when it is 1, stop when it is 0) Bit 1: OFF2 (operation is prohibited when it is 0) Bit 7: Fault reset (fault reset on rising edge) Other unused
EEPROM write-in	3209H	○	When writing 1 in the address, the parameters in RAM will be written in EEPROM

    Communication state variables:

Name	Modbus Address	Change	Explanation
Main status word	3210H	△	Bit 0: Ready Bit 1: Operational readiness Bit 2: Operating Bit 3: Fault Bit 4: OFF2 is effective (effective when it is 0) Bit 5: Command channel selection Bit 7: Alarm Other reserved
Output current	3211H	△	Unit 0.1A
Load rate	3212H	△	0.1%
Output voltage	3213H	△	Unit 0.1V (reserved)
Fault code	3214H	△	See page 36 for faults and solutions
Alarm field 1	3215H	△	See page 35 for faults and solutions

📖 The LSD100 soft starter supports Modbus protocol in RTU (remote terminal unit) mode. The supported functions are: function 3 (read multiple parameters, the maximum number of words is 50), function 6 (write a single parameter), function 8 (loop test), and function 16 (write multiple parameters, the maximum number of words is 10). Among them, functions 6 and 16 support broadcasting (the address of the broadcast message is 0). The start and end of an RTU frame are marked by at least 3.5 character intervals (Baud rate of 19200bit/s and 38400bit/s: 2ms).

📖 The format of RTU frames is as follows:

Slave address (1 byte)	Modbus function number (1 byte)	Data (multiple bytes)	CRC16 (2 bytes)

📖 Function 3: multi-reading The range of the word to be read is 1-50. The format of message is as follows.

Example: Read the main status word and output current of slave 1 (2 words starting from address 3210H):

The host sends out:

Slave address	01H
Modbus function number	03H
Initial address (high byte)	32H
Initial address (low byte)	10H
Number read (high byte)	00H
Number read (low byte)	02H
CRC (low byte)	CBH
CRC (high byte)	76H

The slave responds:

Slave address	01H
Modbus function number	03H
Returning bytes	04H
High byte of 3210H contents	00H
Low byte of 3210H contents	17H
High byte of 3211H contents	07H
Low byte of 3211H contents	D0H
CRC (low byte)	49H
CRC (high byte)	9BH

📖 Function 6: one writing The number of words written is fixed as 1, and the content returned by slave is consistent with that issued by the host. Format of report is shown below.

Example: Run slave 1, the content of address 3200H can be rewritten as 0003H:

The host sends out:

Slave address	01H
Modbus function number	06H
Initial address (high byte)	32H
Initial address (low byte)	00H
Write data high bytes	00H
Write data low bytes	03H

The slave responds:

Slave address	01H
Modbus function number	06H
Initial address (high byte)	32H
Initial address (low byte)	00H
Write data high bytes	00H
Write data low bytes	03H

CRC (low byte)	C7H			CRC (low byte)	C7H
CRC (high byte)	73H			CRC (high byte)	73H

☐ Function 16: multi-writing The number written ranges from 1 to 10. The format of report is shown below.

Example: Modify two consecutive parameters of F1-01 and F1-02 on slave 1, F1-01=160.0 (0640H), F1-02=300.0 (0BB8H):

The host sends out:

Slave address	01H
Modbus function number	10H
Initial address (high byte)	01H
Initial address (low byte)	01H
Number written (high byte)	00H
Number written (low byte)	02H
Number of bytes written	04H
High byte of the first number	06H
Low byte of the first number	40H
High byte of the second number	0BH
Low byte of the second number	B8H
CRC (low byte)	39H
CRC (high byte)	EDH

The slave responds:

Slave address	01H
Modbus function number	10H
Initial address (high byte)	01H
Initial address (low byte)	01H
Number written (high byte)	00H
Number written (low byte)	02H
CRC (low byte)	11H
CRC (high byte)	F4H

☐ Function 8: Loop test, the test function number is 0000H, and the frame is required to be returned as it is, as shown in the following example.

☐ Abnormal response: When the slave station cannot complete the request sent by the master station, it returns an abnormal response message, as shown in the following example.

Example of loop test:

Slave address	01H
Modbus function number	08H
Test function number higher byte	00H
Test function number lower byte	00H
Test data higher byte	37H
test data lower byte	DAH
CRC (low byte)	77H
CRC (high byte)	A0H

Example of abnormal response:

Slave address	1 byte
Response code	1 byte (Modbus function number + 80H)
Error code	1 byte, meaning as follows: 1: Modbus function number that cannot be processed 2: Unreasonable data address 3: Data value out of range 4: Operation failed (write read-only parameters, change parameters that cannot be changed during operation, etc.)
CRC (low byte)	—
CRC (high byte)	—

6.7 FP fault record

FP-00	**Last fault type**	Minimum unit	1	Change	△
Content description	See list of faults below				

0: No fault	6: Output phase loss (er. PLo)	12: Thermistor open circuit (Er. rho)	18: Unbalanced three-phase current (Er. cnb)
1: Reserved (er. ocA)	7: Overheating (Er. oHI)	13: Reserved (Er. ocr)	19: Missing parameter (Er. PCE)
2: Reserved (er. ocd)	8: Equipment overload (Er. oLI)	14: Start time too long (Er. rol)	20: Retain er.IO1
3: Input overvoltage (er. Aou)	9: External fault (Er. EEF)	15: Motor overload (Er. OLL)	21: Retain er.IO2
4: Input undervoltage (er. ACL)	10: Communication fault (Er. CFE)	16: Bypass fault (Er.uLL)	22: Retain er.PNL
5: Input phase loss (er. PLI)	11: Current detection fault (Er. ccF)	17: Reserved (Er. nrc)	

FP-01	**Output current in the most recent failure**	Minimum value	0.1A	Change	△
FP-02	**Output voltage in the latest fault (reserved)**	Minimum value	0.1V	Change	△
FP-03	**Grid voltage in the most recent failure**	Minimum value	0.1V	Change	△
FP-04	**Input terminal state in the latest fault**	Minimum value	1	Change	△
Content description	Hundred-digit: X3; ten-digit: X2; unit digit: X1 (0: invalid state 1: valid state)				
FP-05	**Output terminal state in the latest fault**	Minimum value	1	Change	△
Content description	Hundred-digit: T3; ten-digit: T2; unit digit: T1 (0: open 1: close)				
FP-06	**Second last failure type**	Minimum value	1	Change	△
FP-07	**Output current in second last failure**	Minimum value	0.1A	Change	△
FP-08	**Output voltage in second last fault (reserved)**	Minimum value	0.1V	Change	△
FP-09	**Grid voltage in second last fault**	Minimum value	0.1V	Change	△
FP-10	**Input terminal state in second last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: X3; ten-digit: X2; unit digit: X1 (0: invalid state 1: valid state)				
FP-11	**Output terminal state in second last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: T3; ten-digit: T2; unit digit: T1 (0: open 1: close)				
FP-12	**Third last failure type**	Minimum value	1	Change	△
FP-13	**Output current in third last failure**	Minimum value	0.1A	Change	△
FP-14	**Output voltage in third last fault (reserved)**	Minimum value	0.1V	Change	△
FP-15	**Grid voltage in third last fault**	Minimum value	0.1V	Change	△
FP-16	**Input terminal state in third last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: X3; ten-digit: X2; unit digit: X1 (0: invalid state 1: valid state)				
FP-17	**Output terminal state in third last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: T3; ten-digit: T2; unit digit: T1 (0: open 1: close)				

FP-18	**Fourth last failure type**	Minimum value	1	Change	△
FP-19	**Output current in fourth last failure**	Minimum value	0.1A	Change	△
FP-20	**Output voltage in fourth last fault (reserved)**	Minimum value	0.1V	Change	△
FP-21	**Grid voltage in fourth last fault**	Minimum value	0.1V	Change	△
FP-22	**Input terminal state in fourth last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: X3; ten-digit: X2; unit digit: X1　(0: invalid state 1: valid state)				
FP-23	**Output terminal state in fourth last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: T3; ten-digit: T2; unit digit: T1 (0: open 1: close)				
FP-24	**Fifth last failure type**	Minimum value	1	Change	△
FP-25	**Output current in fifth last failure**	Minimum value	0.1A	Change	△
FP-26	**Output voltage in fifth last fault (reserved)**	Minimum value	0.1V	Change	△
FP-27	**Grid voltage in fifth last fault**	Minimum value	0.1V	Change	△
FP-28	**Input terminal state in fifth last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: X3; ten-digit: X2; unit digit: X1　(0: invalid state 1: valid state)				
FP-29	**Output terminal state in fifth last fault**	Minimum value	1	Change	△
Content description	Hundred-digit: T3; ten-digit: T2; unit digit: T1 (0: open 1: close)				

6.8 FU data monitoring

FU-00	**Grid voltage**	Minimum value	0.1V	Change	△
FU-01	**Output voltage (reserved)**	Minimum value	0.1V	Change	△
FU-02	**Output current**	Minimum value	0.1A	Change	△
FU-03	**Load current percentage**	Minimum value	0.1%	Change	△
FU-04	**Digital input terminal state**	Minimum value	1	Change	△
Content description	Hundred-digit: X3; ten-digit: X2; unit digit: X1　(0: invalid state 1: valid state)				
FU-05	**Digital output terminal state**	Minimum value	1	Change	△
Content description	Hundred-digit: T3; ten-digit: T2; unit digit: T1 (0: open 1: close)				
FU-06	**Heat Sink Temperature**	Minimum value	0.1℃	Change	△

FU-07	Output U-phase current	Minimum value	0.1A	Change	△
FU-08	Output V-phase current	Minimum value	0.1A	Change	△
FU-09	Output W-phase current	Minimum value	0.1A	Change	△
FU-10	Output power (reserved)	Minimum value	0.1kW	Change	△
FU-11	Reserved	Minimum value	---	Change	△
FU-12	Reserved	Minimum value	---	Change	△
FU-13	Reserved	Minimum value	---	Change	△
FU-14	Communication polling time	Minimum value	0.001s	Change	△
FU-15	Times of communication error	Minimum value	1	Change	△
FU-16	Software version display	Minimum value	0.01	Change	△
FU-17	Maintain maximum operating current	Minimum value	0.1A	Change	△
FU-18	Grid frequency	Minimum value	0.01Hz	Change	△

7. Troubleshooting and Exception Handling

7.1 Overview

When the soft starter or application fails, the soft starter uses the LED indicator light and fault code on the display panel for fault indication and preliminary judgment of fault type.

7.2 Common issues and faults

Phenomenon	Possible Causes	Solutions
The soft starter does not start, No fault code display	The control power supply is not connected	Check the control power supply to verify if the circuit connection is correct
The soft starter does not start, Screen displaying fault codes	Refer to "Fault Codes and Solutions"	Refer to "Fault Codes and Solutions";
The motor emits a buzzing sound, Motor starts without starting signal	The thyristor module may be damaged due to breakdown Bonding of bypass contactor by electric shock	Check the thyristor/module and make replacement; Check and correct the cause of the accident;
During startup and operation, Motor has abnormal sound	Motor phase loss	Check wiring and motor interior
Abnormal sound during motor shutdown	Incorrect voltage reduction time	Try different voltage reduction times (multiple adjustments may be necessary to achieve ideal results);
When using a hard input start signal, Motor doesn't start	Incorrect control connection Start and stop signals are sent simultaneously Keyboard in local control menu	Check the wire connections for start and stop; Check whether the start and stop signals are sent simultaneously; Check if the keyboard is in the local control menu; Check if the parameter centerline control is activated;
The motor does not start when using bus communication to input a start signal	Bus parameter setting error	Check if online control has been activated; Check whether it is allowed to be used; Check if the programmable input is set correctly;

7.3 Fault codes and solutions

Fault code	Fault	Possible Causes	General solutions
Er.Aou	Input overvoltage	Grid voltage is too high	Check input power voltage and overvoltage protection parameters
		Voltage detection circuit exception	Seek for service
Er. ACL	Input undervoltage	Grid voltage is too high	Check input power voltage and undervoltage protection parameters
		Voltage detection circuit exception	Seek for service
Er.PLI	Input phase loss	Main circuit contactor or circuit breaker is disconnected; Fuse is blown; Thyristor failure;	Check and close the contactor/circuit breaker or any external switchgear; check and replace the three-phase fuse; check the quality of the thyristor;
Er. PLo	Output phase loss	The output line is not connected properly or the load is damaged or the input line is not connected properly	Check if the output lines U, V, and W and load wiring are correct and in good contact; check if the input lines R, S and T have good contact with the power supply; Check the quality of the thyristor; and check if the motor is damaged;

Fault code	Fault	Possible Causes	General solutions
Er. oHI	Overheating	The equipment is started too frequently	Reduce the starting frequency and wait for the temperature of the power component to drop before starting
Er. oLI	Equipment overload	Inappropriate model selected	Check if the soft starter is compatible with the motor
		Heavy load	Check the load
Er. EEF	External fault	External fault terminal is closed	Solve the external fault
Er.CFE	Communication exception	Communication parameters are not properly set	Check communication parameter settings
		There is severe communication interference	Check the wiring and grounding of communication loop
		Upper computer is not working	Check the upper computer and grounding
Er.ccF	Current detection fault	Loose internal wiring or plug-in of the soft starter Current sensor or circuit abnormality	Check connect again Seek for service
Er.rHo	Thermistor is open-circuit	Thermistor is disconnected	Check thermistor connections or seek service
Er.roL	Start timeout	The low current limit value leads to a long starting time	Modify the set parameters
Er.oLL	Motor overload	After running for a period of time, the current is still too high, causing the motor overloaded; The load on the motor bearing is too high;	During startup: Check and correct the cause of overload, check if the current limiting factor is set too low; Check if the step-up time is too long during startup; Check if the set current parameters are correct; During continuous operation: Check and correct the cause of overload;
Er.uLL	Bypass fault	The motor current is below a certain value after the bypass signal is sent	Check if normal settings have been made according to operating conditions; Check if the bypass contactor can be closed correctly;
Er.cnb	Unbalanced three-phase current	Three-phase voltage unbalance Abnormality of motor	Check three-phase power supply Check the motor

7.4 Alarm codes and solutions

Alarm display	Alarm name	Content and Description	Solutions
$AL.oLL$ AL.oLL	Motor overload	Too high temperature rise of motor is detected by the thermal model	Refer to solutions to corresponding faults
$AL.CFE$ AL.CFE	Communication exception	Communication timeout	Refer to solutions to corresponding faults
$AL.EEP$ AL.EEP	Parameter storage failure	Parameter write failure	Refer to solutions to corresponding faults Press (ENTER) to clear
$AL.PcE$ AL.PcE	Parameter check error	Improper parameter setting	Correct parameter settings or restore factory defaults, press (ENTER) to clear
$AL.PLI$ AL.PLI	Input phase loss	Input phase is lost or three phases are imbalanced	Refer to solutions to corresponding faults

8. Maintenance and After-sales Service

 Danger

1. Only professionally trained personnel can disassemble components, perform maintenance and replace components;

2. Before inspection and maintenance, please confirm that the power supply of the soft starter has been cut off and wait for a few minutes for a full internal discharge of the soft starter; otherwise, there may be a risk of electric shock;

3. Do not leave screw, washer and other metal parts in the machine, otherwise equipment may be damaged and there will be fire risks;

4. After replacing the control board,   relevant parameters must be set before operation, otherwise equipment may be damaged.

8.1 Precautions for use

A. Protection against electric shock

After the input terminal of the soft starter is connected to the power supply, when the load is open or has phase loss, even in the stopped state, its output terminal will still carry a relatively high induced voltage. Do not touch the output end of the soft starter; otherwise, there will be a risk of electric shock.

B. Induced voltage

The induced voltage at the output end of a soft starter during no-load operation is a normal phenomenon and does not affect its use. The induced voltage is generated by the AC path of the thyristor leakage (solid-state semiconductor devices such as thyristors, GTRs, and IGBTs, etc. have varying degrees of leakage) and the dv/dt resistance capacitance filtering circuit. By conducting zero measurement with a voltmeter, it is approximately 100-220V (related to the internal resistance of the voltmeter). This induced voltage load capacity is very small and will disappears after the output terminal is connected to the load.

C. Compensating capacitor

The reactive power compensating capacitor used to improve power factor must be connected to the input end of the soft starter; it is prohibited to connect to the output end; otherwise it will damage the soft starter.

D. Megohmmeter

It is prohibited to use a megohmmeter to measure the insulation resistance of the input and output terminals of the soft starter; otherwise it may damage the thyristor and control circuit board of the soft starter due to overvoltage

The megohmmeter is allowed to be used to check the insulation resistance between phases and phase to ground of the soft starter, but three short circuits should be used in advance to short circuit the input and output terminals of the three phases, and all plugs on the control circuit board must be unplugged.

When measuring motor insulation, the above principles shall also be followed.

E. Input and output

It is prohibited to reverse connect the input and output terminals of the main circuit of the soft starter; otherwise it will cause unexpected action of the soft starter and may damage the soft starter and motor.

F. Bypass phase sequence

When a bypass contactor is used, the phase sequence of the starting circuit must be consistent with the phase sequence of the bypass circuit; otherwise, interphase short circuit will occur during bypass switching, causing the air circuit breaker to trip or even damage the equipment.

G. Operating voltage class of soft starter

External AC110V~240V working voltage can be applied to the AC1 and AC2 terminals. It is prohibited to connect power supplies of other voltage classes to these terminals; otherwise, the internal circuit of soft starter will be damaged.

8.2 Daily maintenance of soft starter

A. Dust

If there is too much dust, the insulation level of the soft starter will be reduced, which may prevent the soft starter from working properly;

Primary circuit creepage and arcing, which will endanger the equipment;

Secondary circuit leakage and short circuit, which may lead to control failure;

The thermal resistance of the radiator increases, and the temperature rise of the thyristor increases.

B. Dust cleaning

Gently brush away dust with a clean and dry brush;

Blow dust away with compressed air.

C. Moisture condensation

In the event of moisture condensation, the insulation level of the soft starter will be reduced, which may prevent the soft starter from working properly;

Primary circuit creepage and arcing, which will endanger the equipment;

Secondary circuit leakage and short circuit, which may lead to control failure;

Accelerate the corrosion of metal components.

D. Drying

Dry with a hair dryer or electric stove;

Dehumidify the distribution room.

8.3 Storage of soft starter

After the user purchases the soft starter, the following aspects must be paid attention to for temporary storage and long-term storage:

1. Avoid storage in places with high temperature, high humidity, and dust and metal dust;

2. Long-time storage will lead to deterioration of electrolytic capacitor, it must be guaranteed to be powered once within 2 years.

8.4 After-sales service

The warranty period of the product is 12 months from the date of purchase, but repair is paid even within the warranty period in the following cases.

Damage caused by failure to operate and use according to user's manual;

Man-made damage caused by self-modification;

Damage caused by use beyond the requirements of standard specifications;

Damage caused by falling down after purchase or damage caused in transport;

Damage caused by fire, flood, abnormal voltage, strong lightning strike, etc.

In case of abnormal working conditions of the soft starter, check and adjust according to the Manual. In case of fault, please contact the supplier or the local electric company of SENLAN or the company headquarters in time. Within the warranty period, the Company will provide free repair service for any fault due to the product manufacturing and design defects, and any defect beyond the warranty period will be repaired by the Company after being paid according to customer requirements.

Micro-breaker
Control power supply
Start and stop
Bypass control
Fault indication
Running indication
Stop indication

Note: The components in the dashed box are remote control components. If there is no remote control, the closed point of the remote control will be short circuited.

XR-Y001

Schematic Diagram of LSD100 One-to-one Controlled Soft Start

Phase Mark | Weight | Proportion

Sheet 1 | of 1

Hope Senlan Science & Technology Holding Co., Ltd.

Size: A3

Change Mark	Qty.	Partition	Changed File No.	SIG.	Date
DSGN			STD.		
CHKD					
REWD					
Process			APPR		

Control circuit

Operation

Fault

Output signal

KA1
KM
KA
HY
HG
HR

AC220V

AC1 LSD AC2
J9

KA

SB2

1A LSD 1B
15

2A LSD 2B
15

SB2'

SB1 SB1' KA1

KM

KA1

QF2

L1
N

KM

KA

Main circuit

XR-Y001

L1
L2
L3
N

QF1

RL1
RL2

PV

CT

S1
S2

A PA

LSD100

KA1

KM

M
U
V
W

Contact No.
Project Name
Version No. V1.0
Original Base Drawing No.
Base Drawing No.
SIG.
Date

Recommended Selection Table:

Model	Motor power	Fuse	MCCB
LSD100-380-40	22kW	125A	150A
LSD100-380-54	30kW	160A	150A
LSD100-380-68	37kW	250A	250A
LSD100-380-80	45kW	315A	300A
LSD100-380-100	55kW	400A	300A
LSD100-380-135	75kW	450A	400A
LSD100-380-160	90kW	500A	400A
LSD100-380-200	110kW	630A	600A
LSD100-380-250	132kW	700A	600A
LSD100-380-300	160kW	800A	800A
LSD100-380-360	200kW	900A	800A
LSD100-380-500	250kW	1000A	1000A
LSD100-380-640	315kW	1250A	1250A
LSD100-380-800	400kW	1600A	1600A