Manufacturer:Zhejiang Ziri Electrical Technology Co.,Ltd.
Add.:No.62-70 Daqiao Road ,Liushi Town,Yueqing city,
325604,Wenzhou,Zhejiang,China.
Tel.:0086-577-27863300
Postal code: 325604
http://www.chziri.com

CHZIRI®

User's Manual

ZJR7 Series Soft Stater

ZHEJIANG ZIRI ELECTRICAL TECHNOLOGY CO.,LTD.

Table of Contests (V1.01-202412)

Chapter 1 Product Introduction

1.1 Safety Precautions

① The installation and wiring of the motor soft starter must be carried out by professional technicians. Please read this practical manual carefully before installation and wiring.

② When the motor soft starter is powered on, wiring is strictly prohibited and must be confirmed to be disconnected before proceeding, otherwise there is a risk of electric shock.

③ The optional motor must be matched with a motor soft starter. When installing and wiring, be sure to operate according to the requirements of the user manual.

④ When wiring, the three-phase input power supply must be connected to the R, S, and T terminals, and the output wire connected to the motor must be connected to the U, V, and W terminals. Otherwise, the motor soft starter will be seriously damaged.

⑤ Please do not install capacitors between the output U, V, and W terminals of the motor soft starter and the motor, otherwise the motor soft starter will be damaged

⑥ The electronic components inside the motor soft starter are particularly sensitive to static electricity. Do not touch the components on the circuit board with your hands unless anti-static measures are taken, otherwise it may cause the motor soft starter to malfunction.

⑦ Motor soft starter ground terminal (⏚,PE,G) Must be properly, reliably and individually grounded.

⑧ After the motor soft starter is installed, please wrap the copper wire lugs at the input and outputends with insulating sheaths or insulating tape.

⑨ When controlling the motor soft starter remotely, please lock the keyboard control to avoid accidents caused by misoperation.

⑩ When servicing the motor soft starter, be sure to disconnect the power supply first to ensure safety.

⑪ It is strictly forbidden to use a megger to check the insulation condition of the soft starter.

1.2 Overview

ZJR7 series motor soft starters are suitable for three-phase AC squirrel-cage asynchronous motors with AC 220-480V/50(60)Hz and rated current 1260A and below. This soft starter is a device type and needs to be equipped with a circuit breaker (short circuit protection) and AC contact (for bypass) in the cabinet, and cooperate with the switch to form a motor control circuit.

ZJR7 series products do not need to install thermal relays,and have complete electricalcircuits during motor starting and operation.

Motor protection function; closed-loop control is adopted,which greatly improves the

smoothness of soft torque starting and soft torque stopping of the motor.
performance and reliability,a bypass contactor is used during operation,and the operatingpower consumption is close to zero,which not only improves reliability but also reduces Smaller overall dimensions.

1.3 Arrival inspection

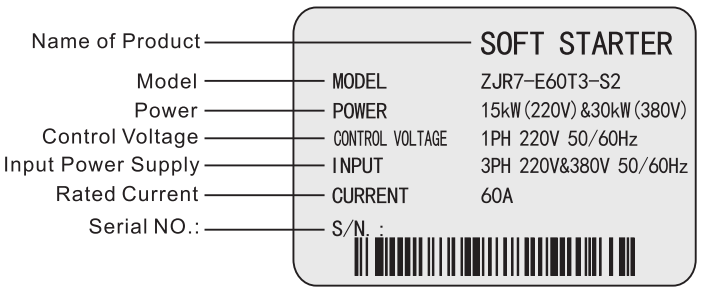
This product has undergone strict quality inspection before leaving the factory, and has been packaged in anti-collision and shock-proof packaging, but it may accidents may occur during transportation and handling, so please unpack and inspect the product immediately after you receive it.
The inspection items are as follows:

① Check whether the motor soft starter is damaged during transportation.
② Check the nameplate of the motor soft starter to ensure that the product you receive is the product you ordered.
③ The packaging box contains a motor soft starter, a user manual, and a certificate of conformity.

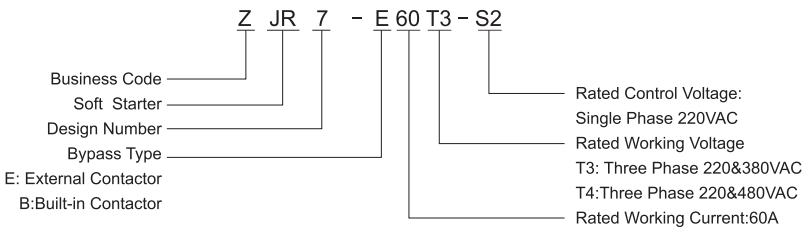
If you find any of the items listed above is missing or damaged, please contact the dealer or our company in time.

1.4 Nameplate and model description

1.4.1 Nameplate description



1.4.2 Model Description



1.5 Product Appearance

1.5.1 External bypass contactor type

Plastic case

Iron Shell Case

1.5.2 Built-in bypass contactor

Plastic case

Iron Shell Case

1.6 Model specifications

List of model specification

Product Model (ZJR7-) T3: 3Phase 220&380VAC T4:3Phase 220&480VAC	Rated Current (A)	Rated Voltage (V)	Adaptive motor power (kW)
E/B11T3-S2	11	380	5.5
E/B15T3-S2	15	380	7.5
E/B22T3-S2	22	380	11
E/B30T3-S2	30	380	15
E/B37T3-S2	37	380	18.5
E/B44T3-S2	44	380	22
E/B60T3-S2	60	380	30
E/B74T3-S2	74	380	37
E/B90T3-S2	90	380	45
E/B110T3-S2	110	380	55
E/B150T3-S2	150	380	75
E/B180T3-S2	180	380	90
E/B220T3-S2	220	380	110
E/B264T3-S2	264	380	132
E/B320T3-S2	320	380	160
E/B370T3-S2	370	380	185
E/B400T3-S2	400	380	200
E/B440T3-S2	440	380	220
E/B500T3-S2	500	380	250
E/B560T3-S2	560	380	280
E/B630T3-S2	630	380	315
E/B710T3-S2	710	380	355
E/B800T3-S2	800	380	400
E/B900T3-S2	900	380	450
E/B1000T3-S2	1000	380	500
E/B1120T3-S2	1120	380	560
E/B1260T3-S2	1260	380	630

1.7 Technical indicators

Item		Item Description	
Rated working voltage		Three Phase 220-480VAC±10%/50(60)Hz	
Rated limit short-circuit current		20kA（400A and Below）	30kA（400A and above）
Coordination type		Type I	
Use categories		AC-53b	
Rated control supply voltage		220VAC	
Rated insulation voltage		660V	
Applicable motors		Squirrel-cage three-phase asynchronous motors	
Number of starts		It's recommended that No more than 5 times per hour, the number of starts can be set in the parameters	
Control mode		(1) Operation panel control; (2) External terminal control; (3) Communication control	
Start Mode		⑴Voltage ramp starting; ⑵Torque Start; ⑶Kick start+Voltage ramp ⑷Kick start +torque start	
Stop Mode		⑴Soft Stop ；⑵ Free Stop	
Protection Function		⑴Instantaneous stop terminal open circuit fault; ⑵Soft starter overheating；⑶Motor overheating; ⑷Input Phase loss; (5)Output phase loss; ⑹Three phase unbalance;⑺Underload protection; ⑻Overload protection;⑼The power supply voltage is too low; ⑽The power supply voltage is too high; ⑾Error setting parameters; ⑿The load is shorted circuit ; ⒀frequency error;⒁External faults; ⒂The starting time is too long; ⒃Too many starting times and etc.	
Ambient	Place to be used	Indoor; no corrosive gases, no conductive dust; well ventilated.	
	Altitude	The altitude does not exceed 1000m, if it exceeds 1000m and is less than 3000m, the current is reduced by 1% for each additional 100m.	
	Ambient temperature	Ambient temperature should be between -10℃ ～ +40℃, +40℃～+50℃ should be derated, the current is derated by 2% for every 1℃ rise in temperature.	
	Ambient humidity	The relative humidity is no more than 90%, without dew condensation .	
	Vibration	Vibration force should be below 0.5G	
Structure	Protection Class	IP20	
	Cooling Mode	Natural air cooling	

Chapter 2 Installation and Wiring

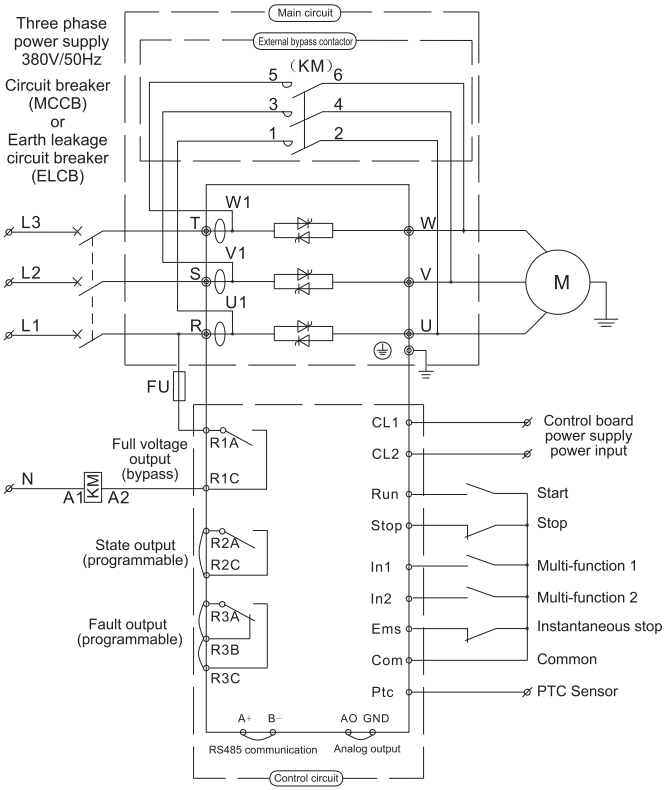
2.1 Wiring

The wiring of the motor soft starter should be performed by professionals who are familiar with high and low voltage electrical circuits.Read the instructions in this manual carefully Before wiring.

2.1.1 Standard Wiring Diagram

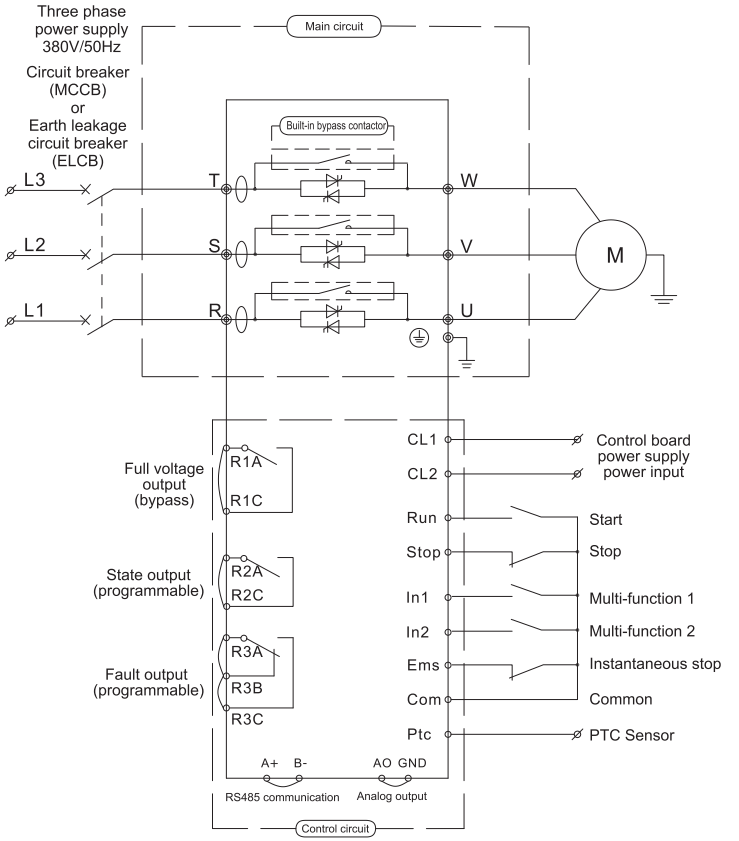
Standard Wiring Diagram for External Bypass Type

Basic wiring diagram



Standard wiring diagram for built-in bypass contactor type

Basic wiring diagram



2.1.2 Main circuit terminal description

Terminalmarking	Terminal name	Function Description
R、S、T	Main circuit input terminal	Connect with three-phase input power
U、V、W	Main circuit output terminal	Connect with three-phase motor
L21、L22、L23	Bypass connection terminal	Connect with the bypass contactor
⏚G	Ground terminal	Soft starter box ground terminal

(1) Input(R、S、T)

① The three-phase input power supply is connected to the R, S, and T input terminals of themotor soft starter through the circuit breaker. The three-phase power supply

There is no phase sequence distinction and can be connected and used at will.

② When wiring, the three-phase input power supply must be connected to the R, S, and T terminals, otherwise the motor soft starter will be seriously damaged.

③ It is recommended not to disconnect the main circuit power supply or install it between the input terminals R, S, T and the power supply.

The electromagnetic contactor controls the running and stopping of the motor soft starter. The start and stop buttons on the operation panel should be used.

Use the key or external control terminal to control the operation and stop of the motor soft starter.

(2) Output(U、V、W)

① Output terminalU、V、WConnect to three-phase motor，If it is found that the rotation direction of the motor is reversed, you can output.

Terminals U, V, and W can be exchanged for any two of the three phases.

② Do not install capacitors or surge absorbers between the output terminals U, V, W and the three-phase motor, otherwise it will cause.

The motor soft starter is faulty or has damaged components.

③ When the connection between the motor soft starter and the motor is very long, it may cause overcurrent tripping of the motor soft starter, increase in leakage current, and low current display accuracy. Therefore, it is recommended that the motor connection line should not exceed 50 meters.

(3) Bypass connection (built-in bypass type does not have this terminal)

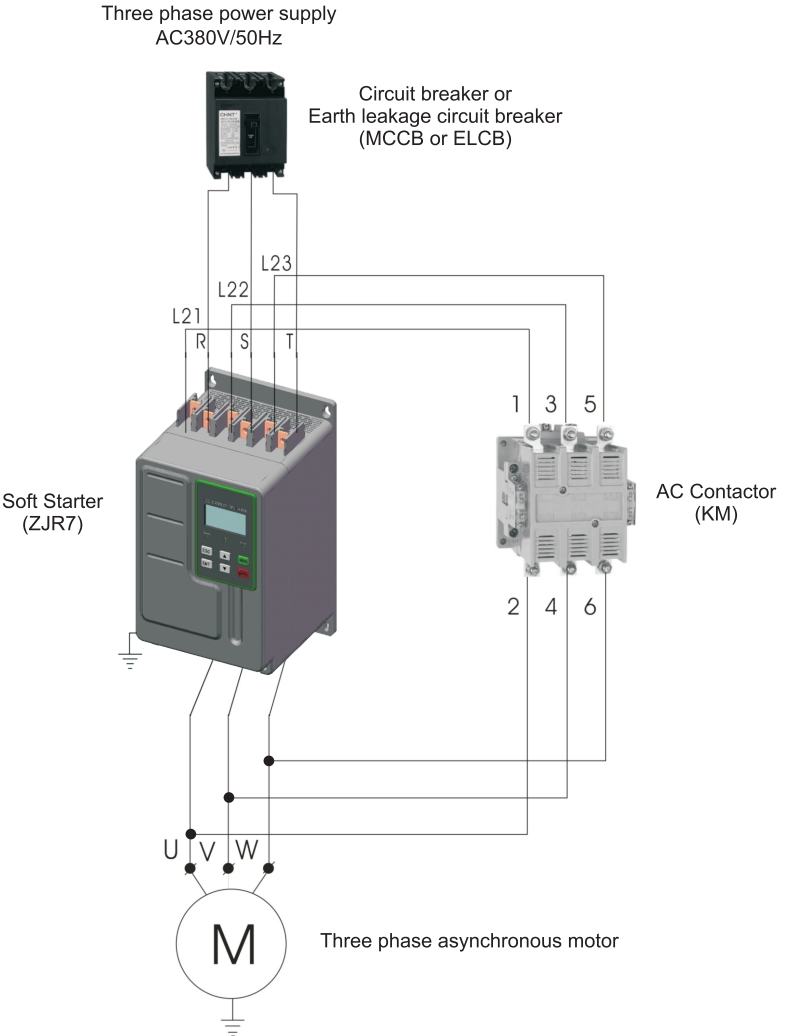
Bypass connections L21, L22, and L23 are connected to the electromagnetic contactor. The soft starter has started. The main circuit power device exits and the bypass electromagnetic contactor operates at the same time. At this time, the motor is put into normal operation. Note: The phase sequence cannot be wrong.

(4) **Ground terminal**（⏚,PE,G）

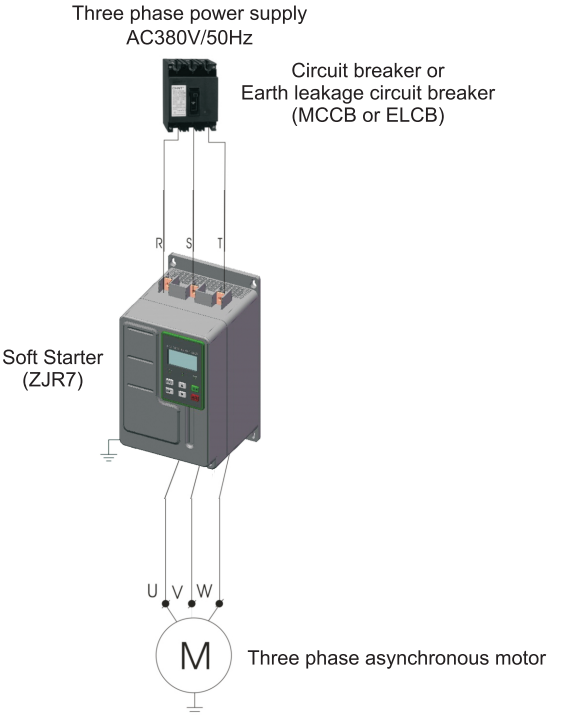
The ground terminal of the motor soft starter must be well grounded to prevent electric shock or fire accidents. The ground wire must not be in contact with the ground.

Other large current loads are grounded together and must be grounded separately. The ground wires that must be grounded separately should be as short as possible.

2.1.3 Main circuit connection diagram for external bypass contactor



2.1.4 Main circuit connection diagram for Built-in bypass contactor type



2.1.5 Control circuit terminal description

(1) Precautions for control circuit wiring:

① Control circuit wiring should use shielded wires or twisted pairs,and must be wired separately from the main circuit and high-power circuit.If the control circuit wires must pass through the main circuit,they should be routed vertically across each other.

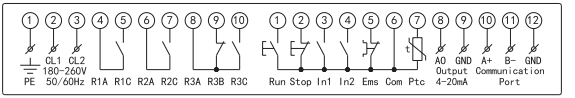
② The control circuit is susceptible to external interference,so the wire distance should be as short as possible,generally no more than 30 meters.

③ It is recommended to use 0.75mm^2 for the wiring diameter of the control circuit.

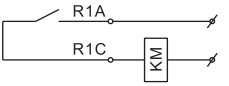
④ When using external terminals to control the soft starter and stop function,please set the code Pd to enable external control.

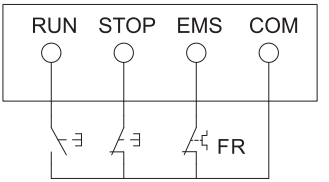
⑤ When remote control requirements are required,it is recommended to use the (two wire) control method.

(2) Schematic diagram of control terminals

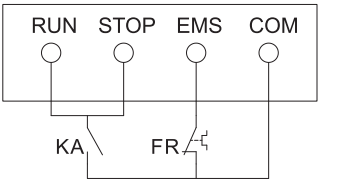


(3)Control terminal description

Terminal marking	Terminal name	Function Description
CL1,CL2	Control power	Control board and control circuit power input terminal 220VAC
R1A,R1C	Bypass output (Full voltage)	The soft starter is closed after starting and controls the bypass contactor working.R1 contact rated value:NO：3A 250VAC/30VDC. 
R2A,R2C	Status output (programmable)	R2A and R2C are programmable relay outputs. The output function is set by code C06 and is closed when the output is valid.R2 contact rated value: NO:3A 250VAC/30VDC
R3A,R3B R3C	Fault output (programmable)	R3A, R3B, and R3C are programmable fault relays output. The output function is set by code C05. It is closed when the output is valid. R3 contact rated value: NO:3A 250VAC/30VDC;NC:1A 250VAC/30VDC.
Run	Start input	There are two-wire and three-wire connections to control the start and stop of the first, second and third motors. And the software has the ability to automatically identify two-wires and three-wires.
Stop	Stop input	
In1	Multifunctional1	Multi-function input 1 terminal, the specific function is set by parameter C03
In2	Multifunctional 2	Multi-function input 2 terminal, the specific function is set by parameter C04
Ems	Momentary stop input	When disconnected, the motor stops immediately and an "instantaneous stop terminal open circuit" fault is reported.
Com	Digital ground	Common terminal for contact input signal
Ptc	Temperature control input	PTC temperature sensor input for thermal protection of motor
AO	Analog output	Taking GND as the reference point, the specific functions are set by parameters C01 and C02.
GND	Analog ground	Common terminal for analog signals
A+, B-	485 Communication	RS485 communication input terminal



Three-wire



Two-wire

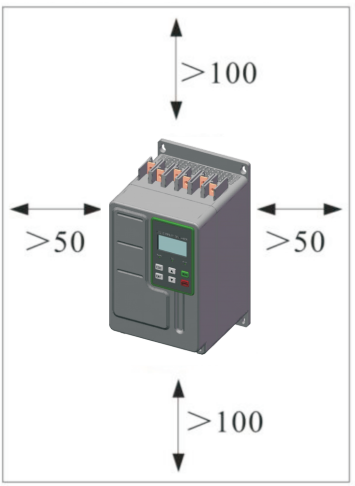
Note: When R1A and R1C output bypass AC contactor ≥ CJ20-400, an intermediate relay is required.

2.2 Installation requirements

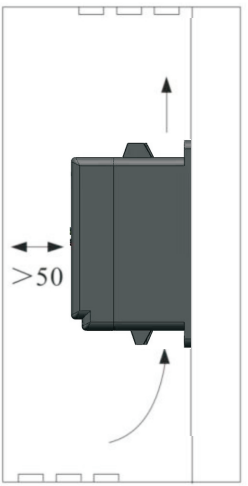
① The motor soft starter should be installed vertically. Do not install it upside down, tilted or horizontally. The installed base should be secure Solid and smooth.

② In order to ensure good heat dissipation and easy maintenance of the motor soft starter, sufficient space should be left around it during installation.

Unit in the figure: mm



Exhaust port

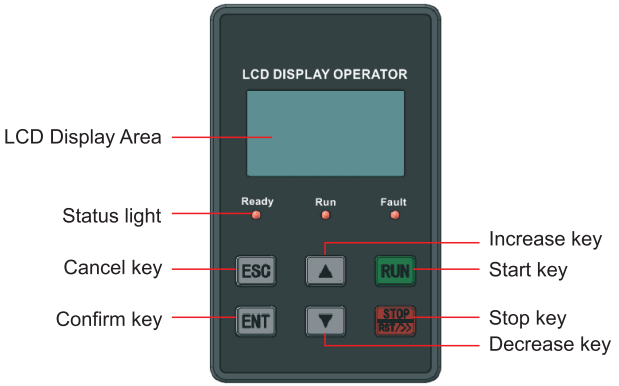


Air Inlet

Chapter 3 Operation Panel

3.1 Operation panel description

① Operation panel outline drawing

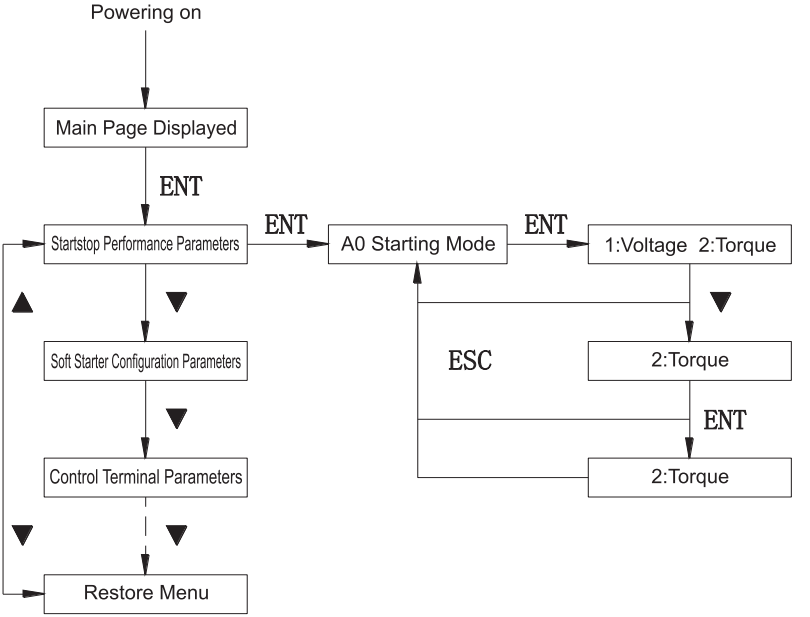


② Operation panel button description

Symbol	Button name	Function Description
RUN	Start button	When ready is displayed, press this button to start.
STOP RST/>>	Stop/Reset /Shift key	1. During normal operation, press this button to stop, and in case of failure, press these buttons to reset; 2. Press this key to shift data while modifying parameters.
ESC	Cancel key	Return to the previous menu and discard modified parameter values.
ENT	Enter	1. Enter the function parameter group, model, fault and other information query; 2. Confirm to save the data after modification.
▲	Increase key	1. In menu selection, it is used to turn pages to display menu content 2. Used to increase or decrease the required modification parameters when setting specific data; 3. In the main interface, it is used to switch specific options for displaying parameters.
▼	Decrease key	

3.2 Operation panel operation instructions

①Parameter modification examples



Parameter modification operation flow chart

Chapter 4 Operation and Function Parameter Description

4.1 Check before running

The following items should be checked and confirmed before running the motor soft starter:

① Confirm that the operating environment and input power supply comply with the requirements of this manual.

② Confirm that the wiring is correct, especially the power input is connected to the R, S, and T terminals, and the output terminals U, V, and W are connected.
Connected to the motor, the bypass electromagnetic contactor has been installed and connected correctly, and the ground terminal has been well grounded.

③ Confirm that there are no short circuits or short circuits between terminals and live parts, and that all terminals, connectors and screws are properly connected.
The wires are all tightened and there is no looseness.

④ For models ZJR7-B110 and below with soft starters, users should first disconnect the motor and supply power to the external control before installation and debugging.The source wiring terminals CL1 and CL2 are powered once to reset the built-in bypass switch (magnetic retention switch), which is used to prevent
The built-in bypass switch of the product may close due to transportation accidents.

4.2 Run

After the inspection and confirmation in 4.1, a trial run can be carried out. During operation, the motor will run with no load first. If everything is normal, it will then run with load.

Application requirements run to select the most appropriate operating method.

- When the product leaves the factory, it is set to the operation panel operation mode.
- The rated current values of the first, second and third motors must be consistent with the rated current values on the corresponding motor nameplates.
- Press the RUN key when running and the STOP key when stopping.
- Whether the motor rotates smoothly (no whistling or vibration).
- When the motor starting is not ideal enough, you can change the relevant parameter settings of the corresponding motor.
- Whether the motor rotation direction meets the requirements.

After confirming that there are no abnormalities, it can be officially put into operation.

Notice:

1) If the operation of the soft starter and motor is abnormal, or a fault code is displayed, stop operation immediately and handle according to the fault code.

2) If the rated current of the soft starter with an operating load less than 5% will report "output phase loss", this is normal.
Shield this fault during debugging. After debugging, power off and then on again to restore use.

3) When the on-site ambient temperature is lower than -10℃, the machine should be powered on and preheated for more than 10 minutes before starting.

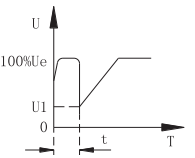
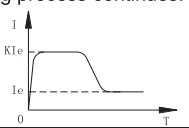
4.3 Function parameter description

- R: This parameter can only be read by both manufacturer and user permissions.
- RW: This parameter can be read and written by both manufacturer and user permissions.
- FRW: This parameter can only be read and written with manufacturer permissions, and can only be read with user permissions.
- The function code parameters in the preparation state, fault state and alarm state are readable and writable. In the soft start state, bypass operating state and soft stop state, they are only readable and cannot be written.

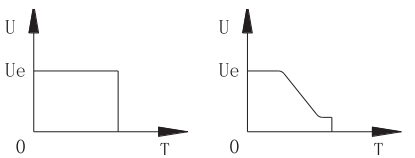
4.3.1 A start and stop performance parameters

Function code	Name	Parameter Description	Factory Value	Change
A01	Start mode	1: Voltage 2: Torque Voltage mode: The voltage rises quickly to the starting voltage, and then according to the set starting time, the output voltage gradually rises until the rated voltage of the power grid; Torque mode: The soft starter output voltage and current causes the electromagnetic torque generated by the motor to increase according to the load characteristics until starting is completed.	1	RW
A02	Run channel selection	1: External control start and stop terminal control 2: Panel control 3: Communication control External control start and stop terminal control: use the control terminal as the control command input signal; Panel control: Use the operation panel as the control signal input and parameter setting path; Remote communication: Use the 485 communication port to control the soft starter and set parameters through the host computer. These three channels can only be used independently and cannot be mixed.	2	RW

4.3.1 A start and stop performance parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
A03	Jump impact starting time	Setting range: 0.0~0.5s Note: In some heavy-load situations, when the motor cannot be started due to the influence of mechanical static friction, the sudden jump method can be used. When starting, a higher fixed voltage is first applied to the motor for a period of time to overcome the static friction of the motor load to make the motor rotate, and then it is started according to the current limiting or voltage ramp method. 0.0 means kick start is invalid 	0.0s	RW
A04	Start delay	Setting range: 1～999s After receiving the start signal, the voltage at the input terminal of the motor gradually increases after a delay of A04, and the motor accelerates.	1s	RW
A05	Number of sequential starts	1：1　2：2　3：3 When 1 is selected, the starting parameters of the second and third motors are invalid; Note: Need to be used in conjunction with C03, C04 parameters and external terminals In1, In2	1	RW
A06	First motor starting current limit multiple	Setting range: 0.5~5.0Ie When the first motor reaches the current limit value, the output voltage remains stable until the current value drops below the current limit value, and the voltage boosting process continues. 	3.5Ie	RW
A07	Rated current of the first motor	Predetermined area：1～1260A	By specification	RW

4.3.1 A start and stop performance parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
A08	The initial starting voltage of the first motor	Setting range: 30~70% The initial voltage level during the first motor starting process.	30%	RW
A09	The end voltage of the first motor	Setting range: 20~80% The voltage level at the end of the first motor's stopping process (A11 is valid only when the first motor's voltage reduction time is greater than 0).	30%	RW
A10	The boost time of the first motor	Setting range: 2～60s The first motor receives the starting signal, the voltage or torque at the input end of the motor gradually increases, and the voltage boosting process continues until the starting current limiting value point.	20s	RW
A11	The reduction voltage of the first motor	Setting range: 0～60s When the first motor receives the stop signal, the voltage or torque at the motor input end gradually decreases to stop the motor; if the voltage reduction time of the first motor is set to 0, the soft starter will coast to a stop. 	0s	RW
A12	The starting current limit multiplier of the second motor	Setting range: 0.5~5.0Ie When the second motor reaches the current limit value, the output voltage remains stable until the current value drops below the current limit value, and the voltage boosting process continues.	3.5Ie	RW
A13	The rated current of the second motor	Predetermined area：1～1260A	By specification	RW

4.3.1 A start and stop performance parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
A14	The initial starting voltage of the second motor	Setting range: 30~70% The initial voltage level during the starting process of the second motor.	30%	RW
A15	The end voltage of the second motor	Setting range: 20~80% The voltage level at the end of the second motor's stopping process (A17 is valid only when the second motor's voltage reduction time is greater than 0).	30%	RW
A16	The boost time of the second motor	Setting range: 2～60s The second motor receives the starting signal, the voltage or torque at the input end of the motor gradually increases, and the voltage boosting process continues until the starting current limiting value point	20s	RW
A17	The reduction voltage of the second motor	Setting range: 0～60s The second motor receives the stop signal, and the voltage or torque at the motor input terminal gradually decreases to stop the motor; if the voltage reduction time of the first motor is set to 0, the soft starter will coast to a stop.	0s	RW
A18	The starting current limit multiplier of the third motor	Setting range: 0.5~5.0Ie When the third motor reaches the current limit value, the output voltage remains stable until the current value drops below the current limit value, and the voltage boosting process continues.	3.5Ie	RW
A19	The rated current of the third motor	Predetermined area：1～1260A	By specification	RW

4.3.1 A start and stop performance parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
A20	The initial starting voltage of the third motor	Setting range: 30~70% The initial voltage level of the third motor during starting.	30%	RW
A21	The end voltage of the third motor	Setting range: 20~80% The voltage level at the end of the second motor's stopping process (A23 is valid only when the third motor's voltage reduction time is greater than 0).	30%	RW
A22	The boost time of the third motor	Setting range: 2～60s The third motor receives the starting signal, the voltage or torque at the input end of the motor gradually increases, and the voltage boosting process continues until the starting current limiting value point.	20s	RW
A23	The reduction voltage of the third motor	Setting range: 2～60s The third motor receives the stop signal, and the voltage or torque at the motor input terminal gradually decreases to stop the motor; if the voltage reduction time of the first motor is set to 0, the soft starter will coast to a stop.	0s	RW

4.3.2 B device configuration parameters

Function code	Name	Parameter Description	Factory Value	Change
B01	Parameter lock	1：Unlocked 2：Locked Allow or prohibit the modification of function code parameters on the operation panel (except manufacturer parameters). Parameter locking is invalid during communication control.	1	RW
B02	language settings	1：Chinese 2：English	1	RW

4.3.2 B device configuration parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
B03	Grid voltage level	1：220V 2：380V 3：480V 4：660V	2	FR W
B04	Soft starter rated current	1：11A 2：15A 3：22A …… 25：1260A	1	FR W
B05	Soft starter rated power	Automatically generated after setting B03 and B04	-	R
B06	Monitoring parameter selection	1：Phase current 2：Line voltage 3：Radiator temperature 4：Reserved 5：Grid frequency	1	RW
B07	Software version number	Setting range: 0.00～99.99	-	R
B08 ～ B12	Equipment factory code	10 digit Arabic numerals		FR W
B13	A Phase current coefficient	50-150	1	RW
B14	B Phase current coefficient	50-150	1	RW
B15	C Phase current coefficient	50-150	1	RW

4.3.2 B device configuration parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
B16	Fault protection shielding setting 1	manufacturer parameters, When manufacturer permission is given: readable and writable, any fault can be shielded; When user has permission: only the "output phase loss fault" protection can be read and written (can be blocked), other fault protection can only be read (cannot be blocked)	0	FR W
B17	Fault protection shielding setting 2		0	

4.3.3 C control terminal parameters

Function code	Name	Parameter Description	Factory Value	Change
C01	Programmable analog AO signal type	1：4mA～20mA 2：0mA～20mA	1	RW
C02	Programmable analog AO Signal channel	1: Motor current 2: Main circuit voltage Note: 20mA corresponds to 5 times the soft start rated current; corresponds to the main circuit voltage of 1000V.	1	RW
C03	Multi-function input In1	1: No function 2: External Fault NO 3: Second motor start enable 4: External Fault NC This parameter sets the function of the switch input In1 port.	1	RW
C04	Multi-function input In2	1: No function 2: External Fault NO 3: Third motor start enable 4: External Fault NC This parameter sets the function of the switch input In2 port.	1	RW

4.3.3 C control terminal parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
C05	Programmable fault relay R3	1: Ready state 2: Soft start state 3: Bypass operating status 4: Soft stop state 5: Fault status This parameter sets the current working status of the relay R3 output soft starter, and is closed when valid.	3	RW
C06	Programmable Status Relay R2	1: Running overload fault 2: Stalled rotor/short circuit fault 3: Start current limit timeout fault 4: Three-phase unbalanced fault 5: Output phase loss fault 6: Input phase loss fault 7: Frequency error fault 8: Thyristor short circuit fault 9: Soft start overheating fault 10: Motor overheating fault 11: Bypass switch failure 12: Main circuit overvoltage fault 13: Main circuit undervoltage fault 14: Reserved 15: Reserved 16: Communication failure 17: Instantaneous stop terminal open circuit fault 18: Too many starts fault 19: Too long starting time fault 20: Parameter error fault 21: External fault 22: Internal configuration error failure 23: Soft starter overheat alarm 24: Underload alarm 25: Any fault	25	RW
C07	Power up terminal operation protection	1:Protection 2:unprotected	-	-

4.3.3 C control terminal parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
C08	Ems Terminal Polarity	1:Ems positive polarity 2:Ems negative polarity	-	-

4.3.4 D fault protection and alarm parameters

Function code	Name	Parameter Description	Factory Value	Change
D01	Motor overload protection level	1: Class 2 2: Class 10A 3: Class 10 4: Class 20 5: Class 30 Note: See Table 1 for a typical schedule of decoupling	3	RW
D02	Main circuit under voltage protection value	Setting range: 60% ~ 90%Ue Note: Ue is the main circuit input terminal voltage, corresponding to the value of B03	80%Ue	RW
D03	Main circuit over voltage protection value	Setting range: 100% ~ 130%Ue Note: Ue is the main circuit input terminal voltage, corresponding to the value of B03	115% Ue	RW
D04 ~ D05	Reserved		-	-

4.3.4 D fault protection and alarm parameters (continued)

Function code	Name	Parameter Description	Factory Value	Change
D06	Blocking protection current	Setting range: 6.0~8.0Ie Set this protection parameter to prevent the motor from starting when stuck or overloaded.	7.0Ie	RW
D07	Blocking time	Setting range: 1.0～5.0s	3.0s	RW
D08	Underload alarm current	Setting range: 0.0~0.9Ie	0.0Ie	RW
D09	Soft starter overheat protection value	Setting range: 70~85℃ When it is detected that the temperature of the soft starter radiator exceeds the overheat protection setting value during soft start, soft stop or bypass operation, the "soft starter overheat" protection will be triggered and the machine will shut down at the same time;	75℃	RW
D10	Soft starter overheat alarm value	Setting range: 55～69℃ When it is detected that the temperature of the soft starter radiator exceeds the overheat alarm setting value during soft start, soft stop or bypass operation, a "soft starter overheat" alarm will occur, but the machine will not shut down.	65℃	RW
D11	Number of soft starts	Setting range: 0~10 The number of starts within an hour. If it exceeds the set value, "Too many starts" will be reported. When set to 0, it means there is no limit to the number of starts.	0	RW

4.3.5 E Communication parameters

Function code	Name	Parameter Description	Factory Value	Change
E01	Communication address	Setting range: 1～247 Indicates the communication address of this soft starter in the entire communication system	1	RW
E02	Communication baud rate	1：4800bps 2：9600bps 3：19200bps	2	RW
E03	Communication data format	1：8-1-N RTU 2：8-1-E RTU 3：8-1-O RTU 4：8-1-N ASCII 5：8-1-E ASCII 6：8-1-O ASCII	1	RW
E04	Serial port timeout setting	Setting range: 0.1～60.0s When the communication is not connected within the serial port timeout setting value or the communication CRC check error	2.0s	RW

4.3.6 F fault and alarm information query

Function code	Name	Parameter Description	Factory Value	Change
F01	Fault message 1	A fault information chain includes the fault type (2 bytes), fault time (6 bytes), fault current (2 bytes), and fault voltage (2 bytes) when the fault occurs. A total of 10 pieces of fault information are recorded. Note: Fault records cannot be initialized and can be cleared.	-	R
F02	Fault message 2			
F03	Fault message 3			
F04	Fault message 4			
F05	Fault message 5			
F06	Fault message 6			
F07	Fault message 7			
F08	Fault message 8			
F09	Fault message 9			
F10	Fault message 10			

4.3.7 G Advanced information query

Function code	Name	Parameter Description	Factory Value	Change
G01	U phase current	0.0～6500.0A	-	R
G02	V phase current	0.0～6500.0A	-	R
G03	W phase current	0.0～6500.0A	-	R
G04	UV phase voltage	0.0～1000.0V	-	R
G05	VW phase voltage	0.0～1000.0V	-	R
G06	UW phase voltage	0.0～1000.0V	-	R
G07	U phase radiator temperature	0.0～100.0℃	-	R
G08	V phase radiator temperature	0.0～100.0℃	-	R
G09	W phase radiator temperature	0.0～100.0℃	-	R
G10	Reserved		-	-
G11	Grid frequency	0～100Hz	-	R
G12～G16	Reserved		-	-
G17	Total running time	0～65535H	-	R

Chapter 5 Protection and Fault Description

5.1 Protection function

The ZJR7 series soft starter has complete protection functions to protect the safety of the soft starter and motor. During use, the protection level and protection parameters should be appropriately set according to different situations.

5.1.1 Operation overload protection

After bypass operation, according to the standard overheating protection curve requirements specified in IEC60947-4-2 (see Figure 5.1)

Table 5.1 Standard thermal overload protection curve

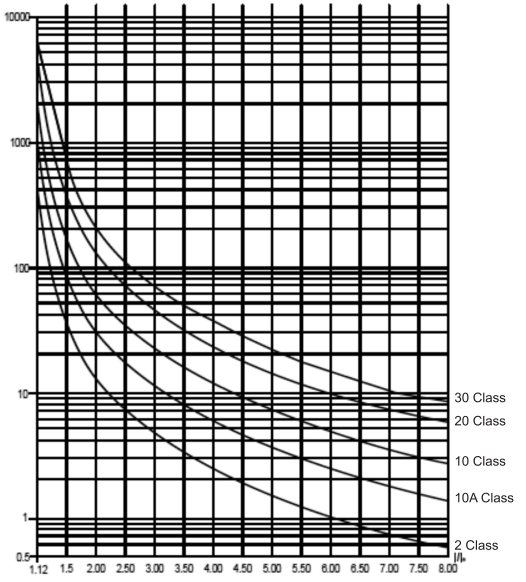


Figure 5.1 Standard thermal overload protection curve

Table 5.1 Typical trip schedule

Item	Trip times for standard applications (Class 10)		Trip time for heavy duty applications (Class 20)	
Current	3.0Ie	5.0Ie	3.5Ie	5Ie
Time	23s	8s	32s	15s

The software continuously calculates the integral value of $\int X^2 \cdot T \cdot K$(Where X represents the ratio of current current to motor rated current;Because the sampling period is 10ms.So T=10, K is the motor overload protection coefficient.Relevant to parameter D01 motor overload protection level value.The higher the D01 value,the smaller the K value.K=1 at level 30, K=1.5 at level 20,K=3 at level 10,K=6 at level 10A,K=15 at level 2.)When $\int X^2 \cdot T \cdot K \geqslant 570$, "operation overload fault" will be reported.

5.1.2 Stall/short circuit protection

Soft start,soft stop or motor stall or motor stall detected during bypass operation or load phase short circuit or short circuit to ground.When the load is blocked.The current instantaneous current is greater than the stall protection current setting value(6.0Ie～8.0Ie,Ie is the rated current of the motor flow).And if the maintenance time is greater than the stall time setting value (1.0s~5.0s), a stall/short circuit fault will be reported.When the load is short circuited,It is detected that the current instantaneous current is greater than (8~10)Icl.(Icl represents the rated model current of the soft starter) A blocked rotor/short circuit fault is reported.

5.1.3 Start current limit timeout protection

During the soft start and soft stop process,continuously calculate the integral value of $\int X^2 \cdot T$,when $\int X^2 \bullet T \geq 570$,"Start current limit timeout" will be reported.When the starting time is less than 2.0 times and exceeds 80s,protection against excessive starting time.where Ir is the actual current value.Ie is the rated current value of the motor.See Table 5.2

D01 setting value / Actual current	Level 2	Level10A	Level10	Level20	Level30
4.75Ie≤Ir≤5.0Ie	23s	23s	23s	23s	23s
4.25Ie≤Ir<4.75Ie	30s	30s	30s	30s	30s
3.75Ie≤Ir<4.25Ie	35s	35s	35s	35s	35s
3.25Ie≤Ir<3.75Ie	47s	47s	47s	47s	47s
2.75Ie≤Ir<3.25Ie	63s	63s	63s	63s	63s
2.25Ie≤Ir<2.75Ie	92s	92s	92s	92s	92s

5.1.4 Three-phase unbalance protection

Under the condition that the current value of each phase current is greater than 5%·Icl,and the deviation of the effective value of each phase current is greater than 30% ,a "three-phase unbalanced fault" will be reported.

5.1.5 Output phase loss protection

Before pre-start or during soft start, bypass or soft stop processes, if it is detected that one or several phases of the motor are not connected to the output of the soft starter or the thyristor in the soft starter is broken , it will report "Output phase loss fault" protection .

5.1.6 Input phase loss protection

When no input voltage is detected in one or several phases within 1 second of soft start, bypass or soft stop, "Input phase failure' will be reported.

5.1.7 Frequency error protection

A 'frequency error fault' is reported when the continuous grid frequency exceeds 5% of the rated frequency in any state.

5.1.8 Thyristor short circuit protection

If a thyristor short circuit is detected within 1 second before pre-starting, a "thyristor short circuit fault" will be reported.

5.1.9 Soft starter overheating protection

In any state, if it is detected that the current temperature of the soft starter exceeds the soft starter setting overheat protection value within 2 seconds, a soft starter overheat protection fault will be reported.

5.1.10 Motor overheating protection

The total resistance of the motor temperature sensor loop: 200Ω~750Ω at 25°C. When the total resistance value is greater than 3.1kΩ, a "motor overheating fault" will be reported. When the total resistance value is less than 1.5kΩ, the motor overheating is relieved and the soft starter returns to the ready state.

5.1.11 Bypass switch protection

If during bypass operation , it is detected that the bypass switch is not closed or the closing is unreliable,a "bypass switch fault"will be reported.

5.1.12 Main circuit overvoltage protection

If the line voltage is continuously detected to be greater than the main circuit overvoltage protection value in any state, "Main circuit overvoltage" will be reported.

5.1.13 Main circuit undervoltage protection

If the line voltage is continuously detected to be less than the main circuit undervoltage protection value in any state, "main circuit undervoltage" will be reported.

5.1.14 Reserved

5.1.15 Reserved

5.1.16 Communication failure

If the communication timeout or communication data error is detected, or if the data sent from the host computer is not the required data for 10 consecutive times, “communication failure” is reported.

5.1.17 Instantaneous stop terminal open circuit fault

The terminals Ems and Com are normally closed, but when they are disconnected, an “Instantaneous stop terminal open circuit fault” fault is reported.

5.1.18 Too many starts protection

If the number of starts per hour exceeds the number of starts set in parameter D11, the fault “Too many starts fault” is reported.

5.1.19 Long start-up time protection

If the accumulated time during startup exceeds 80 s, the “Too long starting time fault” is reported.

5.1.20 Parameter error fault

A “parameter error” is also reported when the set value of a functional parameter exceeds the set range.

5.1.21 External fault

When C03=1, “external fault” is reported when In1 and Com are shorted; when C04=1, “external fault” is reported when In2 and Com are shorted.

5.1.22 Internal configuration error failure

When the rated model current of soft starter does not match with the hardware circuit board, it reports “internal configuration error”.

5.1.23 Soft starter overheating alarm

If the temperature is detected to be higher than the soft starter overheat alarm value within 2s in a row under any state, “Soft starter overheat alarm” is reported, but no shutdown is performed. If the soft start overheat alarm has been reported in the preparation state, no soft start is allowed.

5.1.24 Underload alarm

When the current of the soft starter is detected to be lower than the underload current alarm setting value (0.0 Ie~0.9 Ie) during bypass operation for 1s, the soft starter will report underload. (Underload alarm, but no shutdown).

5.2 Fault code and solutions

Panel Display	Actions & Treatment
Operation overload	1 Check whether the load is too heavy (for fans and pumps, the opening of the channel valve can be adjusted to adjust the load size), and check whether the current after bypass operation exceeds the rated current value of the motor set by parameters A07, A13 or A19; 2 Check whether the value of parameter A07, A13 or A19 is set too low; 3 Check whether parameter D01 is set too low; 4 Check whether there is a large deviation between the soft starter current value and the actual current value.
Stalled rotor/short circuit	1 Check whether the motor is stalled; 2 Check whether the load is short-circuited between phases or to ground; 3 Check whether the product display current is within the range of parameters D06 and D07.
Start current limit timeout	1 Check whether the load is too heavy (for fans and pumps, the opening of the channel valve can be adjusted to adjust the load size); 2 Check whether the value of parameter A07, A13 or A19 is set too low; 3. Check whether there is a large deviation between the soft starter current value and the actual current value.
Three-phase unbalance	1 Check whether the three-phase input power supply and load motor are normal or the wiring is poor; 2 Check whether the motor winding impedance is consistent or the insulation to ground has deteriorated; 3 Check whether the product display current is balanced
Output phase loss	1 Check whether the three-phase input power supply and load motor are normal; 2. Check whether the input and output wiring of the soft starter is reliable. If there are circuit breakers and contactors in the main circuit, check whether the circuit breakers and contactors close or pull in normally and reliably;

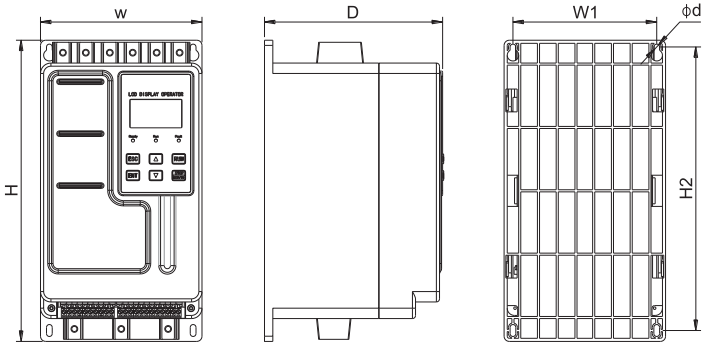
Panel Display	Actions & Treatment
Output phase loss	3. Check whether the motor load current is less than 5% of the soft starter's rated model current during operation. This situation occurs when the complete cabinet is debugged with a light-loaded small motor. At this time, the output phase loss can be shielded (Note: Re-power on the rear output phase loss protection is automatically opened and not shielded); 4. Check whether the thyristor is short-circuited and whether the thyristor control line is in good contact.
Input phase loss	1 Check whether the three-phase input power supply is normal or the wiring is poor; 2 Check whether the grid frequency is within the normal range; 3. Check whether there are strong interference loads such as intermediate frequency furnaces and frequency converters in the power grid system, and they are placed very close to the soft starter.
Frequency error	Check whether the grid frequency is out of range
Thyristor short circuit	1 Check whether the thyristor is short circuited; 2. Whether the load motor is connected to the soft starter normally or the wiring is poor.
Soft starter overheating	1 Check whether the load is too heavy (for fans and pumps, the opening of the channel valve can be adjusted to adjust the load size); 2 Check whether the number of starts is too many; 3 Check whether the parameters of the soft starter and the load motor match; 4. Check whether the overheat protection value of the soft starter is set appropriately. You can set a larger value.
Motor overheating	1 Check whether the connection between the PTC temperature sensor and the motor winding is normal; 2 Check whether the motor winding temperature exceeds the detection temperature range of the PTC temperature sensor; 3. Check whether the load is too heavy (for fans and pumps, the opening of the channel valve can be adjusted to adjust the load size).
Bypass switch failure	1 Check whether the control circuit power supply voltage is within the normal range; 2 Check whether the connection wire of the internal bypass switch has good contact.

Panel Display	Actions & Treatment
Main circuit overvoltage	1. Check whether the voltage of the three-phase input grid is too high; 2 Check whether parameter D03 is set too low; 3. Check whether there are super interfering loads such as intermediate frequency furnaces around the product.
Main circuit undervoltage	1. Check whether the voltage of the three-phase input grid is too low; 2 Check whether parameter D02 is set too high; 3. Check whether there are super interfering loads such as intermediate frequency furnaces around the product.
Communication Failure	1.Check if the communication parameters of Group E are set correctly. 2.Check if the external terminals A+and B - are connected correctly.
Instantaneous power failure terminal disconnection	1 Check whether the external terminal Ems is disconnected from the COM terminal; 2 Check whether the normally closed contacts of other protection devices connected to this terminal are reliably closed
Too many starts	1 Whether the number of starts within one hour exceeds the setting value of parameter D11; 2 Check whether parameter D11 is set too small
The starting time is too long	1 Check whether the start and stop performance parameter settings are reasonable; 2. Whether the load is too heavy (for fans and pumps, the opening of the channel valve can be adjusted to adjust the load size); 3. Check the three-phase input grid capacity too small
Parameter error	1 Check whether parameters A05, C03 and C04 are set correctly; 2 Check whether the external terminals In1 and In2 are connected correctly; 3 Check whether the function parameters exceed the setting range.
External fault	1 Check whether parameters C03 and C04 are set correctly; 2 Check whether the external terminals In1 and In2 are connected correctly
Internal configuration error	Check whether parameter B04 is consistent with the product model.

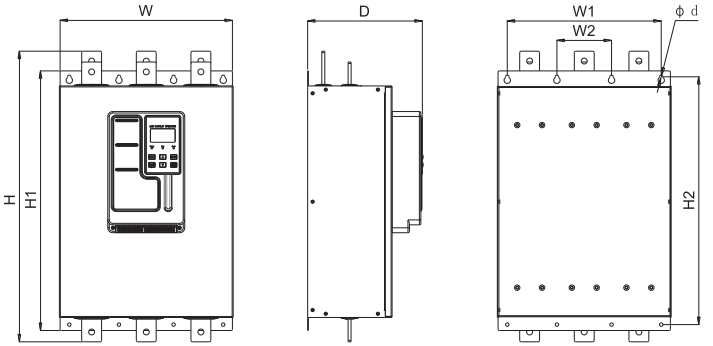
Panel Display	Actions & Treatment
Soft starter overheat alarm	1 Check whether the load is too heavy (for fans and pumps, the opening of the channel valve can be adjusted to adjust the load size); 2 Check whether the number of starts is too many; 3 Check whether the parameters of the soft starter and the load motor match; 4. Check whether the overheat alarm value of the soft starter is set appropriately. You can set a larger value.
Underload	1 Check whether the load is too light; 2 Check whether the setting of parameter D08 is too small (0 means this function is blocked).
Sudden stop during operation	1 Check whether the external Stop terminal is in reliable contact; 2 Check whether the contacts used to control the closing of Stop and Com are reliably closed.
Remote communication cannot be started	1 Check whether the communication parameters are consistent with those of the host computer; 2 Check that the 485 communication line is connected incorrectly or poorly; 3 Check whether parameter A02 is set correctly.
The external control cannot be started.	1 Check whether the external control Stop and Run lines are connected normally and reliably; 2 Check whether parameter A02 is set correctly.
The panel cannot be started	1 Check whether the display box connection wire is in reliable contact; 2 Check whether parameter A02 is set correctly
The motor speed cannot rise during soft start.	1. Check whether the load is too heavy (for fans and water pumps, the opening of the channel valve can be adjusted to adjust the load size); 2 Check whether the parameters of the soft starter and the load motor match; 3 Increase the motor starting current limit multiple (A06 or A12 or A18); 4. Increase the initial starting voltage value of the motor (A08 or A14 or A20); 5 Increase the motor voltage boost time (A10 or A16 or A22); 6. Change the starting mode to sudden jump mode, and set the sudden jump impact starting time parameter A03 to greater than 0. It is mainly suitable for loads such as ball mills.

Chapter 6 Outline Dimension and Mounting Dimensions

6.1 Outline Dimensions and Mounting Dimensions for External Bypass Contactor Type

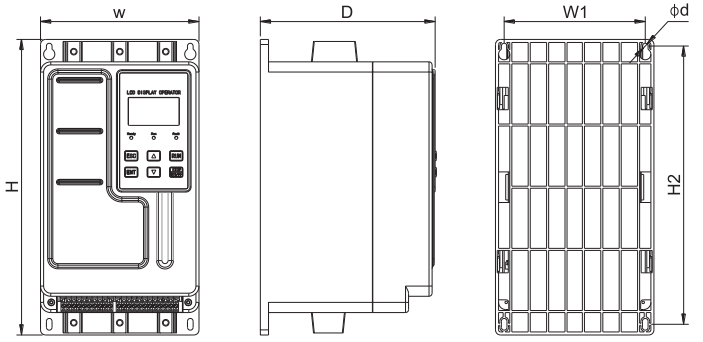


Model	Power (kW)	Rated Current (A)	Outline Size(mm)				Installation Size (mm)			
			H	H1	W	D	H2	W1	W2	Φd
ZJR7-E11	5.5kW	11A	290	-	155	170	272	138	-	5.5
ZJR7-E15	7.5kW	15A	290	-	155	170	272	138	-	5.5
ZJR7-E22	11kW	22A	290	-	155	170	272	138	-	5.5
ZJR7-E30	15kW	30A	290	-	155	170	272	138	-	5.5
ZJR7-E37	18.5kW	37A	290	-	155	170	272	138	-	5.5
ZJR7-E44	22kW	44A	290	-	155	170	272	138	-	5.5
ZJR7-E60	30kW	60A	290	-	155	170	272	138	-	5.5
ZJR7-E74	37kW	74A	290	-	155	170	272	138	-	5.5
ZJR7-E90	45kW	90A	290	-	155	170	272	138	-	5.5
ZJR7-E110	55kW	110A	290	-	155	170	272	138	-	5.5

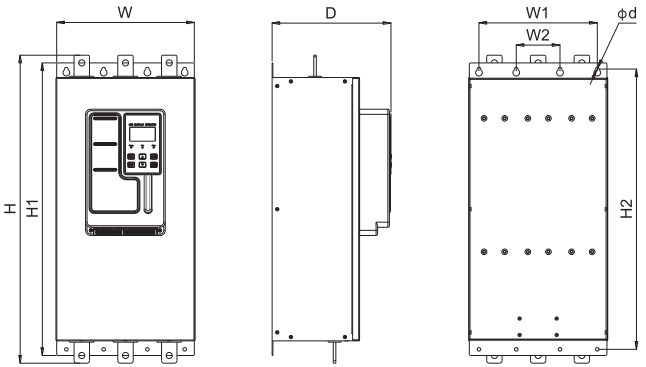


Model	Power (kW)	Rated Current (A)	Outline Size(mm)				Installation Size (mm)			
			H	H1	W	D	H2	W1	W2	Φd
ZJR7-E150	75kW	150A	380	360	220	230	340	180	-	7
ZJR7-E180	90kW	180A	380	360	220	230	340	180	-	7
ZJR7-E220	110kW	220A	380	360	220	230	340	180	-	7
ZJR7-E264	132kW	264A	490	447	270	230	422	230	-	7
ZJR7-E320	160kW	320A	490	447	270	230	422	230	-	7
ZJR7-E370	185kW	370A	490	447	270	230	422	230	-	7
ZJR7-E400	200kW	400A	490	447	270	230	422	230	-	7
ZJR7-E440	220kW	440A	490	447	270	230	422	230	-	7
ZJR7-E500	250kW	500A	560	497	310	230	472	270	100	7
ZJR7-E560	280kW	560A	560	497	310	230	472	270	100	7
ZJR7-E630	315kW	630A	560	497	310	230	472	270	100	7
ZJR7-E710	355kW	710A	590	527	350	230	502	300	110	9
ZJR7-E800	400kW	800A	590	527	350	230	502	300	110	9
ZJR7-E900	450kW	900A	590	527	350	230	502	300	110	9
ZJR7-E1000	500kW	1000A	660	577	420	230	552	370	135	9
ZJR7-E1120	560kW	1120A	660	577	420	230	552	370	135	9
ZJR7-E1260	630kW	1260A	660	577	420	230	552	370	135	9

6.2 Outline Dimensions and Mounting Dimensions for Built-in Bypass Contactor Type



Model	Power (kW)	Rated Current (A)	Outline Size(mm)				Installation Size (mm)			
			H	H1	W	D	H2	W1	W2	Φd
ZJR7-B11	5.5kW	11A	290	-	155	170	272	138	-	5.5
ZJR7-B15	7.5kW	15A	290	-	155	170	272	138	-	5.5
ZJR7-B22	11kW	22A	290	-	155	170	272	138	-	5.5
ZJR7-B30	15kW	30A	290	-	155	170	272	138	-	5.5
ZJR7-B37	18.5kW	37A	290	-	155	170	272	138	-	5.5
ZJR7-B44	22kW	44A	290	-	155	170	272	138	-	5.5
ZJR7-B60	30kW	60A	290	-	155	170	272	138	-	5.5
ZJR7-B74	37kW	74A	290	-	155	170	272	138	-	5.5
ZJR7-B90	45kW	90A	290	-	155	170	272	138	-	5.5
ZJR7-B110	55kW	110A	290	-	155	170	272	138	-	5.5



Model	Power (kW)	Rated Current (A)	Outline Size(mm)				Installation Size (mm)			
			H	H1	W	D	H2	W1	W2	Φd
ZJR7-B150	75kW	150A	370	360	220	230	340	180	-	7
ZJR7-B180	90kW	180A	370	360	220	230	340	180	-	7
ZJR7-B220	110kW	220A	370	360	220	230	340	180	-	7
ZJR7-B264	132kW	264A	585	560	270	230	535	230	-	7
ZJR7-B320	160kW	320A	585	560	270	230	535	230	-	7
ZJR7-B370	185kW	370A	585	560	270	230	535	230	-	7
ZJR7-B400	200kW	400A	585	560	270	230	535	230	-	7
ZJR7-B440	220kW	440A	585	560	270	230	535	230	-	7
ZJR7-B500	250kW	500A	660	620	310	230	595	270	100	7
ZJR7-B560	280kW	560A	660	620	310	230	595	270	100	7
ZJR7-B630	315kW	630A	660	620	310	230	595	270	100	7
ZJR7-B710	355kW	710A	690	650	350	230	625	300	110	9
ZJR7-B800	400kW	800A	690	650	350	230	625	300	110	9
ZJR7-B900	450kW	900A	690	650	350	230	625	300	110	9
ZJR7-B1000	500kW	1000A	740	700	420	230	675	370	135	9
ZJR7-B1120	560kW	1120A	740	700	420	230	675	370	135	9
ZJR7-B1260	630kW	1260A	740	700	420	230	675	370	135	9

Appendix 1 Model Selection of peripheral accessories(A)

List of specifications for motor soft starter (5.5kW-110kW) peripheral accessories for reference

Soft Starter Mode (ZJR7-E)	Rated Power (kW)	Rated Current (A)	Circuit Breaker Mode (QF)	Quick fuse (FUSE)	Bypass Contactor Model(KM)
11T3-S2	5.5	11	NM1-63S/3300 25A	40A	CJ20-16A
15T3-S2	7.5	15	NM1-63S/330025A	40A	CJ20-16A
22T3-S2	11	22	NM1-63S/330032A	50A	CJ20-16A
30T3-S2	15	30	NM1-63S/330040A	80A	CJ20-25A
37T3-S2	18.5	37	NM1-63S/330050A	100A	CJ20-40A
44T3-S2	22	44	NM1-63S/330063A	125A	CJ20-40A
60T3-S2	30	60	NM1-125S/330080A	160A	CJ20-63A
74T3-S2	37	74	NM1-125S/3300100A	250A	CJ20-63A
90T3-S2	45	90	NM1-125S/3300125A	315A	CJ20-80A
110T3-S2	55	110	NM1-225S/3300160A	400A	CJ20-100A
150T3-S2	74	150	NM1-225S/3300225A	450A	CJ20-160A
180T3-S2	90	180	NM1-400S/3300250A	500A	CJ20-160A
220T3-S2	110	220	NM1-400S/3300315A	630A	CJ20-200A

Appendix 1 Model Selection of peripheral accessories(B)

List of specifications for motor soft starter (132kW-450kW) peripheral accessories for reference

Soft Starter Mode (ZJR7-E)	Rated Power (kW)	Rated Current (A)	Circuit Breaker Mode (QF)	Quick fuse (FUSE)	Bypass Contactor Model(KM)
264T3-S2	132	264	NM1-400S/3300350A	700A	CJ20-250A
320T3-S2	160	320	NM1-400S/3300400A	800A	CJ20-315A
370T3-S2	185	370	NM1-630S/3300500A	900A	CJ20-400A
400T3-S2	200	400	NM1-630S/3300500A	900A	CJ20-400A
440T3-S2	220	440	NM1-630S/3300500A	900A	CJ20-500A
500T3-S2	250	500	NM1-630S/3300630A	1000A	CJ20-500A
560T3-S2	280	560	NM1-630S/3300630A	1000A	CJ20-630A
630T3-S2	315	630	NM1-800S/3300700A	1250A	CJ20-630A
710T3-S2	355	710	NM1-800S/3300800A	1250A	CJ40-800A
800T3-S2	400	800	NM1-800S/3300800A	1500A	CJ40-800A
900T3-S2	450	900	NM1-1250H/33001000A	1500A	CJ40-1000A
1000T3-S2	500	1000	NM1-1250H/33001000A	1800A	CJ40-1000A
1120T3-S2	560	1120	NM1-1250H/33001250A	1800A	CJ40-1200A
1260T3-S2	630	1260	NM1-1250H/33001250A	2000A	CJ40-1200A

Appendix 2 RS485 Communication Protocol

ZJR7 series soft starter adopts the popular MODBUS communication protocol for RS485 communication control, The address, baud rate, and data format of the soft starter must be set manually before using RS485 communication, and these parameters cannot be modified during the communication process.

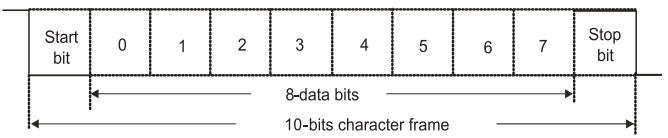
MODBUS the communication protocol uses two encoding formats：ASCII (American Standard Code for Information Interchange)or RTU(Remote Terminal Unit). ASCII code is used to convert the data to be transmitted into the corresponding ASCII code before transmitting, while RTU transmits the data directly without conversion.

ASCII encoding format Each Byte data is composed of two ASCII codes, for example: 0x1F, ASCII is represented by '1F',Which is composed of '1' (31Hex), 'F' (46Hex) respectively. The following are the ASCII codes for 0-9,A-F.

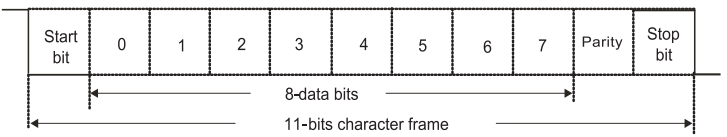
Character	‘0’	‘1’	‘2’	‘3’	‘4’	‘5’	‘6’	‘7’
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

RTU encoding format, each Byte data is composed of two 4-bit hexadecimal characters, e.g. 0x1F RTU representation is '1FH' with the following character structure:

10-bit character frame (8, N, 1 for 8-bit characters without parity bit):



11-bit character frame (8, E/O, 1 for 8-bit characters with parity bits):



Communication data structure
Communication data format Box:

ASCII Mode：

STX	Start character ':' (3AH)
ADR 1	Comminication address： 8-bit address contains 2 ASCII codes
ADR 0	
CMD 1	Command code： 8-bit command contains 2 ASCII codes
CMD 0	
DATA (n-1)	Data content： n×8-bit The profile contains 2n ASCII codes n<=16，Up to 32 ASCII codes
…….	
DATA 0	
LRC CHK 1	Checksum value： 8-bit The checksum contains 2 ASCII codes
LRC CHK 0	
END 1	End character： END1= CR (0DH), END0= LF(0AH)
END 0	

RTU Mode：

START	More than 10 ms static time or 3.5 bytes transmssion time
ADR	Communication address：8-bit address
CMD	Command code：8-bit command
DATA (n-1)	Data content： N×8-bit data， n<=32
…….	
DATA 0	
CRC CHK Low	CRC check value: 16-bit The checksum consists of two 8-bit characters
CRC CHK High	
END	More than 10 ms static time or 3.5 bytes transmssion time

ADR（Communication address）
The legal commuinication addresses range is from 1 to 247. If this range is exceeded,the soft starter will not respond.

For example, to communicate with a soft starter with a communication address of 08 (decimal):
ASCII Mode：(ADR 1, ADR 0) = '0','8' => '1'=30H, '0'=38H
RTU Mode：(ADR) = 08H
Function code and data content（Data Characters）
03：Read single or multiple slave parameter register values (single byte, hexadecimal)

04：Read single or multiple slave parameter attribute register values (single byte, hexadecimal, number of registers is an integer multiple of 5)
06：Write a single slave parameter register value (single byte, hexadecimal)
10：Write multiple slave parameter register values (single byte, hexadecimal)
Command code：03H，Read the contents of the register.

For example, 2 words are read consecutively from the address 01H from the start address A01 of the soft starter.（A01=1，A02=1）

RTU Mode:

Command message:

Address	01H
Function	03H
Starting address	00H
	01H
Number of data (count by word)	00H
	02H
CRC CHK Low	95H
CRC CHK High	CBH

Response message:

Address	01H
Function	03H
Number of data (count by byte)	04H
Content of data address 0001H	00H
	01H
Content of data address 0002H	00H
	01H
CRC CHK Low	6AH
CRC CHK High	33H

ASCII mode:

Command message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'3'
Starting address	'0'
	'0'
	'0'
	'1'
Number of data (count by word)	'0'
	'0'
	'0'
	'2'
LRC Check	'F'
	'9'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'3'
Number of data (count by byte)	'0'
	'4'
Content of starting address 2102H	'0'
	'0'
	'0'
	'1'
Content of address 2103H	'0'
	'0'
	'0'
	'1'
LRC Check	'F'
	'6'
END	CR
	LF

Command code: 04H, read the attribute of this parameter, the number of readings must be a multiple of 5, the attribute contains a total of 5 16-bit data, the definition is shown in the following table.

Slave register value attributes	Description	
The first attribute word	The maximum value of the register parameter	
The second attribute word	The minimum value of the register parameter	
The third attribute word	The current value of the register parameter	
The fourth attribute word	Tags	Description
	Bits 14-15	
	Bits 11-13	Modify the attributes 0x00：It means that it can be read and written, and the general functional parameters are such situatio. 0x02：Indicates read-only, such as the current temperatur display . 0x04：Themanufacturer authority can be written, such asthe soft statyrt rated current.
The fourth attribute word	Bits 8-10	0x01：8-bit unsigned integer data. 0x02：16-bit unsigned integer data
	Bits 5-7	Magnify the Multiple 0x00：multiply 1 0x01：multiply 0.1 0x02：multiply.0.01 0x03：multiply0.001 0x04：multiply0.0001 0x05：Multiply0.00001
	Bits 0-4	Unit 0x00：0x01：Voltge（V） 0x02：Current（A） 0x03：Power（kW） 0x04：Frequency（Hz） 0x05：Time（Second） 0x06： Time（hour) 0x07：Percentage（%） 0x08：Temperature（℃） 0x09：Time（Microsecond） 0x0a：% Ie 0x0b：%Ue, Ue = 380VAC 0x0c：%Us, Us = 220VAC
The fifth attribute word	Tags	Description
	Bits 5-15	Reserved
	Bits 0-4	0x02：Represents two bytes Show two bytes

For example: Read 1 word from the address 01H from the start address A01 of the soft starter (A01=2)

RTU Mode:

Command message:

Address	01H
Function	04H
Starting address	00H
	01H
Number of data (count by word)	00H
	05H
CRC CHK Low	61H
CRC CHK High	C9H

Response message:

Address	01H
Function	03H
Number of data (count by byte)	0AH
The first attribute word	00H
	02H
The second attribute word	00H
	01H
The third attribute word	00H
	02H
The fourth attribute word	01H
	00H
The fifth attribute word	00H
	02H
CRC CHK Low	21H
CRC CHK High	20H

ASCII Mode:

Command message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'4'
Starting address	'0'
	'0'
	'0'
	'1'
Number of data (count by word)	'0'
	'0'
	'0'
	'5'
LRC Check	'F'
	'5'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'4'
Number of data (count by byte)	'0'
	'A'
The first attribute word	'0'
	'0'
	'0'
	'2'
The second attribute word	'0'
	'0'
	'0'
	'1'
The third attribute word	'0'
	'0'
	'0'
	'2'
The fourth attribute word	'0'
	'1'
	'0'
	'0'
The fifth attribute word	'0'
	'0'
	'0'
	'2'
LRC Check	'E'
	'9'
END	CR
	LF

Command code: 06H, write a word to the soft starter register
For example:write 02 to the A01 address of the 01H soft starter

RTU Mode:

Command message:

Address	01H
Function	06H
Data address	00H
	01H
Data content	00H
	02H
CRC CHK Low	59H
CRC CHK High	CBH

Response message:

Address	01H
Function	06H
Data address	00H
	01H
Data content	00H
	02H
CRC CHK Low	59H
CRC CHK High	CBH

ASCII Mode:

Command message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'0'
	'0'
	'1'
Data content	'0'
	'0'
	'0'
	'2'
LRC Check	'F'
	'6'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'0'
	'0'
	'1'
Data content	'0'
	'0'
	'0'
	'2'
LRC Check	'F'
	'6'
END	CR
	LF

Command code: 10H, write multiple words to the soft starter register.
For example, write 02 to the A01 and A02 addresses of the 01H soft starter.

RTU Mode

Command message:

Address	01H
Function	10H
Data address	00H
	01H
Number of data (count by word)	00H
	02H
Number of data (count by byte)	04H
The first data content	00H
	02H
The second data content	00H
	02H
CRC CHK Low	12H
CRC CHK High	62H

Response message:

Address	01H
Function	10H
Starting data address	00H
	01H
Number of data (count by word)	00H
	02H
CRC CHK Low	10H
CRC CHK High	08H

ASCII Mode.

Command message:

STX	':'
Address	'0'
	'1'
Function	'1'
	'0'
Starting data address	'0'
	'0'
	'0'
	'1'
Number of data (count by world)	'0'
	'0'
	'0'
	'2'
Number of data (count by byte)	'0'
	'4'
The first data content	'0'
	'0'
	'0'
	'2'
The second data content	'0'
	'0'
	'0'
	'2'
LRC Check	'E'
	'4'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'1'
	'0'
Data address	'0'
	'0'
	'0'
	'1'
Number of data (count by world)	'0'
	'0'
	'0'
	'2'
LRC Check	'E'
	'C'
END	CR
	LF

CHK (check sum：checksums)

ASCII Mode：

ASCII mode use LRC (Longitudinal Redundancy Checksum) Checksums**.**The LRC checksum is the sum of ADR1 to the last data content.The result is obtained in units of 256, and the excess is removed (e.g., if the result is obtained in hexadecimal 128H, only 28H is taken).Then the result after calculating the second complement is the LRC checksum.

For example, the first example asks for the checksum of the message: 01H+03H+21H+02H+00H+02H = 29H, then takes 2's complement = D7H.

RTU Mode：

RTU mode uses the CRC (Cyclical Redundancy Check) checksum, which is calculated in the following steps:

Step 1: Load a 16-bit buffer with the contents of FFFFH (called a CRC buffer)**.**

Step 2: XOR the first byte of the command message with the low byte of the 16-bit CRC buffer and store the result back into the CRC buffer.

Step 3: Shift the content of the CRC buffer to the right by 1 bit and fill the leftmost bit with 0.

Step 4: Check the right-shifted value, if it is 0 store the new value from step 3 back to the CRC buffer; otherwise XOR the CRC buffer with A001H and store the result to the CRC buffer.

Step 5: Repeat Step 3 and Step 4 until the CRC buffer content has been shifted right by 8 bit. at this point, the byte has been processed.

Step 6: Repeat steps 2 to 5 for the next byte of the command message until all bytes have been processed and the final content of the CRC buffer is the CRC value. When passing a CRC value in an command message, the lower byte must be exchanged in order with the higher byte, i.e., the lower byte will be transmitted first.Example:

The following example generates a CRC value in C. This function takes two parameters:

Unsigned char* data ← Pointer to the message buffer

Unsigned char length ← Number of bytes in the message buffer

This function returns an unsigned int-type CRC checksum.

```
unsigned int crc_chk(unsigned char* data, unsigned char length)
{
        int j;
      unsigned int reg_crc=0xFFFF;
      while(length--)
      {
            reg_crc ^= *data++;
            for(j=0;j<8;j++)
            {
```

```
                if(reg_crc & 0x01)     /* LSB(b0)=1 */
                {
                        reg_crc=(reg_crc>>1) ^ 0xA001;
                }
                        else
                        {
                                reg_crc=reg_crc >>1;
                        }
        }
    }
        return reg_crc;
}
```

Definition of communication data address

This section is the communication data address definition, which is used to control the soft starter operation, to obtain the soft starter status information and to set the related function parameters.

Function code parameter address representation rules.

Function code serial number for the parameter corresponding to the register address, group A-G by 0-6, the parameter number to be converted to hexadecimal, such as B10, then use hexadecimal to indicate that the function code address is 010AH.

Parameter address definition of the communication protocol：

Definition	Parameter address	Function Description		Attribute
Control command	3201H	00AAH	Start	W
		0055H	Stop	
	3202H	00AAH	Restore factory values	
		0055H	Factory values are not restored	
	3203H	00AAH	The fault is cleared	
		0055H	The fault is not cleared	
	3204H	-	Reserved	

Definition	Parameter address	Function Description		Attribute
Read the current work status	4201H	0001H	Preparation status	R
		0002H	Soft start state	
		0004H	Bypass operation status	
		0008H	Soft stop state	
		0010H	Fault status	
Read the current fault or alarm	4202H	0000H	No malfunction	
		0001H	Overload fault	
		0002H	Blockage fault	
		0003H	Start current limiting timeout fault	
		0004H	Three phase unbalance fault	
		0005H	Output phase loss fault	
		0006H	Input phase loss fault	
		0007H	Frequency error fault	
		0008H	Short circuit fault of thyristor	
		0009H	Soft start overheating fault	
		000AH	Motor overheating fault	
		000BH	Bypass switch malfunction	
		000CH	Main circuit overvoltage fault	
		000DH	Main circuit undervoltage fault	
		000EH	Reserved	
		000FH	Reserved	
		0010H	Reserved	
		0011H	Instant stop terminal open circuit fault	
		0012H	Fault caused by excessive startup times	
		0013H	Long startup time fault	
		0014H	Reserve	
		0015H	External malfunction	
		0016H	Communication timeout fault	
		0017H	Overheating alarm	
		0018H	Undervoltage alarm	

Additional responses in the error communication.

When the soft starter is connected to communication, if an error is generated, the soft starter will respond to the error code and set the highest digit of the command code (bit7) to 1 (i.e., Function code and 80H) to the host, so that the host knows that an error is generated.

ASCII Mode

Address	01H
Function	86H
Fault code	01H
CRC CHK Low	83H
CRC CHK High	A0H

RTU Mode

STX	':'
Address	'0'
	'1'
Function	'8'
	'6'
Fault code	'0'
	'1'
LRC Check	'7'
	'8'
END	CR
	LF

Communication Fault Code Description

Fault Code	Fault contents	Fault Description
00H	No fault	No fault occurred
01H	Illegal feature codes	The soft starter receives a function code that it does not support on its own.
02H	Illegal data addresses	The soft starter receives a data address that is not allowed to be a data address.
03H	Illegal data values	The data value you set is an invalid data value.
10H	the checksum is wrong	The soft starter received an error in the data check code.
11H	Parameters rejected for modification	Parameters cannot be written during soft start, soft stop or bypass operation.
12H	Data out of range	The set parameter takes a value that exceeds the range allowed by the parameter.
15H	Factory password privileges	Requires manufacturer's password to read and write.

Appendix 3 Application Settings

As load conditions change,parameters often need to be adjusted.The following table is for reference only.

Application	Starting boost time(s)	Stop depressurization time(s)	Starting voltage (%)	Voltage starting (current limit value)
Centrifugal Pump	16	20	40	4
Ball Mill	20	6	60	4
Fan	26	4	30	4
Piston Compressor	16	4	40	3
Light Load Motor	16	2	30	3
Lifting Machinery	6	10	60	3.5
Mixer	16	2	50	4
Crusher	16	10	50	4
Screw Compressor	16	2	40	3
Spiral Conveyor Belt	20	10	40	4
Belt Conveyor Belt	20	10	40	3
Heat Pump	16	20	40	3

Appendix 4 Quality Warranty

The quality warranty of this product is handled in accordance with the following regulations

(1) Specific contents of quality assurance:

① This product is guaranteed to be returned, replaced and repaired within 1 month of use.

②This product is guaranteed to be replaced and repaired within 3 months of use.

③This product is guaranteed to be repaired within 12 months of use or up to 18 months from the date of manufacture.

(2) No matter when and where the company's motor soft starter is used, it enjoys lifetime paid service.

(3) If the malfunction is caused by the following reasons, it will be repaired for a fee even within the warranty period:

①Problems caused by incorrect operation (subject to this user manual) or unauthorized repairs and modifications

② Problems caused by using the motor soft starter beyond the standard specifications.

③Damage caused by improper handling or storage after purchase.

④Device aging or failure caused by poor environment.

⑤ Damage caused by earthquakes, fires, floods, lightning strikes, voltage abnormalities or other natural disasters.

⑥ When the nameplate, logo, production serial number, etc. of the motor soft starter are intentionally damaged, making it impossible to directly identify it.

⑦ When the payment for goods is not paid on time as per the purchase agreement.

⑧When the usage conditions such as installation, wiring, operation and maintenance cannot be objectively and realistically described.

(4) For guaranteed return, replacement and repair services, the product must be returned to the company, and the product can only be returned, exchanged or repaired after the responsibility has been confirmed.

(5) If there is a quality problem or product accident with this product, our company will only bear the responsibilities mentioned in the specific content of the quality assurance in this chapter. If the user needs more liability guarantee, please insure it with the insurance company yourself.