



Soft Starter User's Manual ZJR2 Series



Manufacturer : Wenzhou ZiRi Electrical Technology Co.,Ltd.
Add: NO.62-70 ,Daqiao Road , Liushi Town ,Yueqing City ,
325604. Zhejiang ,China .
Tel: +86-577-27863300
[Http://www.chziri.com](http://www.chziri.com)

ZIRI ELECTRICAL TECHNOLOGY CO.,LTD

Foreword

- ☐ Thank you for your purchase of ZJR2 series of motor soft starter manufactured by Ziri Electrical Technology Co.,Ltd. (hereinafter referred to as ZIRI Company).
- ☐ This manual introduces the installation, operation, function setting, trouble shooting and etc. of ZJR2 motor soft starter.
- ☐ Incorrect installation or use may result in damage or other accidents.
- ☐ Do read all instructions in detail before installing, and follow this manual strictly during installing, wiring and operating.
- ☐ Please keep this manual handy for quick reference in the future.
- ☐ If there are any doubts or questions, please contact with the Technical Service Center of ZIRI Company.

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Chapter 1 Introduction to Product

1.1 Safety Instructions

- ① The installation and wiring of motor soft starter should be operated only by professional technicians who should read this manual in detail before installing and wiring.
- ② Do not perform wiring while the motor soft starter is POWER ON. Be sure to perform this step only after the power is disconnected. Otherwise, there is the danger of electric shock.
- ③ Be sure the motor chosen should be matched with the motor soft starter. Do follow this manual while installing and wiring.
- ④ While wiring, the three-phase input power supply should be connected to the terminals R, S and T. The output wire of the motor should be connected to the terminals U, V and W. Otherwise, it may cause severe damage to the motor soft starter.
- ⑤ Do not install any capacitor between the output terminals U, V and W and the motor. Otherwise, it may cause damage to the motor soft starter.
- ⑥ The electronic elements of inside of the motor soft starter are very sensitive to static. Do not touch the appliances on the circuit board by hand before anti-static measures are taken.
- ⑦ The ground terminal (\perp G) should be properly, solidly and separately grounded.
- ⑧ Once the motor soft starter is installed, please cover pigtails in the input and output ports with insulated sheath or tape.
- ⑨ When the motor soft starter is under remote control, do lock the keyboard control to avoid accident due to error operation.
- ⑩ Do cut off the power when the motor starter is in maintenance to guarantee safety.
- ⑪ Forbid to use the megohmmeter to check the insulation of the soft starter.

1.2 General description

ZJR2 Series motor soft starter, is suitable for three phase, AC squirrel cage induction asynchronous motor, the voltage is 320V~460V. 50(60)Hz, The rated current is 1200A and below. The soft starter is assembled type. need to add breakers (short-circuit protection) and AC contactor (Bypass) inside the cabinet. together with switches are made up of electric motor control circuit.

It's no need to install the thermal relay. there have perfect motor protection function while the motor start and running. adapt closed-loop control, improve the stationarity and reliability of the motor's soft torque start and soft torque stop. Use pass-by contactor when running. The running power is almost zero. It can improve the reliability of the soft starter and reduce the overall size.

1.3 Inspection upon Arrival

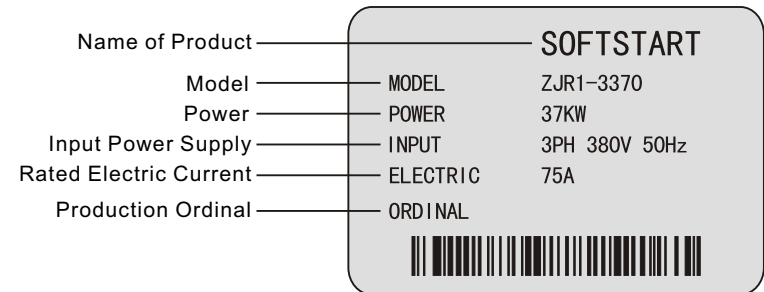
This product is guaranteed a high level of quality with strict outgoing inspection, crushproof and shockproof packaging. But there is the possibility of damage in transit by carelessness. So it is necessary to unpack the package upon receipt of the product and perform the following steps:

- ① Check the motor soft starter whether there is any damage caused during transit.
- ② Check the specifications label of the motor soft starter and make sure it matches the product part number you've ordered.
- ③ Check whether the items in the package are in readiness or not, which include 1 motor soft starter, 1 user manual and 1 conformity certificate.

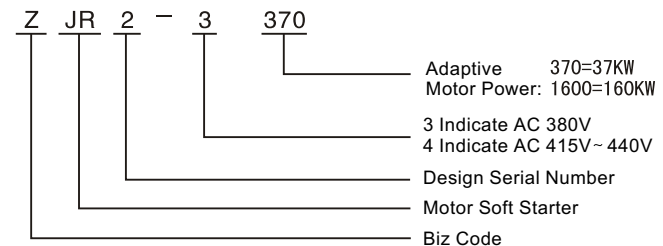
In case there is any problem with the above-mentioned contents, damage or deficiency, please contact with your dealer or Ziri Company immediately.

1.4 Demonstration of the Specifications Label and Model

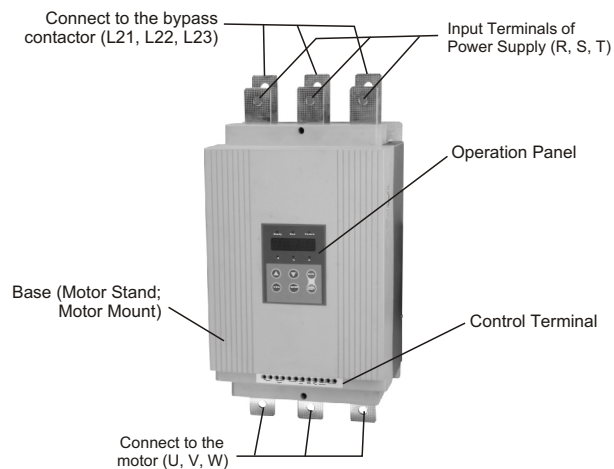
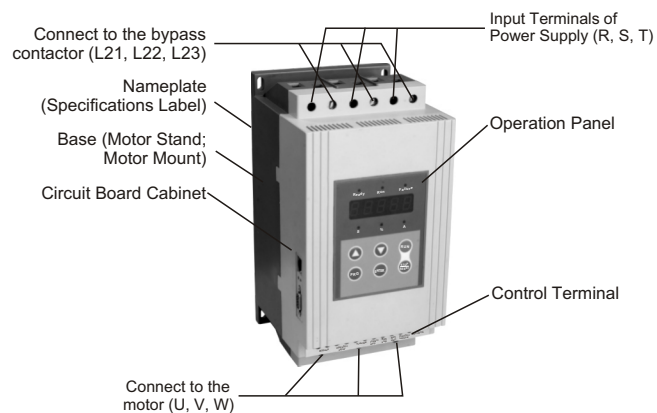
1.4.1 Demonstration of the Specifications Label



1.4.2 Demonstration of the Model



1.5 Outline of the Product



1.6 Models and Specifications

Schedule of Models & Specifications

Product Model	Max Adaptive Motor Power (KW)	Input Voltage (V)	Rated Current (A)	Weight of Type Z (Kg)
ZJR2-3055/4055	5.5	380	11	3.5
ZJR2-3075/4075	7.5	380	15	3.5
ZJR2-3110/4110	11	380	23	3.5
ZJR2-3150/4150	15	380	30	3.5
ZJR2-3185/4185	18.5	380	37	3.5
ZJR2-3220/4220	22	380	43	3.5
ZJR2-3300/4300	30	380	60	3.5
ZJR2-3370/4370	37	380	75	3.5
ZJR2-3450/4450	45	380	90	3.5
ZJR2-3550/4550	55	380	110	3.5
ZJR2-3750/4750	75	380	150	25
ZJR2-3900/4900	90	380	180	25
ZJR2-31150/41150	115	380	230	25
ZJR2-31320/41320	132	380	264	25
ZJR2-31600/41600	160	380	320	25
ZJR2-31850/41850	185	380	370	25
ZJR2-32000/42000	200	380	400	25
ZJR2-32500/42500	250	380	500	35
ZJR2-32800/42800	280	380	560	35
ZJR2-33200/43200	320	380	640	35
ZJR2-34000/44000	400	380	800	40
ZJR2-34500/44500	450	380	900	40
ZJR2-35000/45000	500	380	1000	45
ZJR2-36000/46000	600	380	1200	45

1.7 Technical Indications

Item		Item Description
Input Power Supply	Input Voltage	Three-phase 320V ~ 460VAC
	Frequency	50/60Hz
Adaptive Motor		Squirrel-cage three-phase asynchronous motor
Starting Times		It is recommended not to exceed 20 times per hour.
Control Mode		1) Operation panel control; 2) Operation panel + external control; 3) External control; 4) External control + COM control; 5) Operation panel + external + COM control; 6) Operation panel + COM control; 7) COM control; 8) No start or stop operation.
Start Mode		1) Current-limiting start; 2) Voltage ramp start; 3) Kick start + current-limiting start; 4) Kick start + voltage ramp start; 5) Current ramp start; 6) Voltage current-limiting double closed-loop start.
Stop Mode		1) Soft stop; 2) Free stop.
Protective Function		1) Open loop protection for external instantaneous stop terminals; 2) Over-heat protection for soft starter; 3) Protection for too long starting time; 4) Input open phase protection; 5) Output open phase protection; 6) Unbalanced three-phase protection; 7) starting overcurrent protection; 8) Running overload protection; 9) Undervoltage protection for power voltage; 10) Overvoltage protection for power voltage; 11) Protection for fault parameter setting; 12) Load short circuit protection; 13) Auto restart or incorrect wiring protection; 14) Incorrect wiring protection of external control stop terminals.
Ambient	Place to be used	Indoor location with good ventilation free from corrosive gas and conductive dust.
	Altitude	Below 3000M. It has to rise the rate power when the altitude is more than 3000M.
	Ambient Temperature	-30 ~ +55℃
	Ambient Humidity	≤90%RH without dew condensation.
	Vibration	<0.5G
Structure	Protection Class	IP20
	Cooling Pattern	Natural wind cooling.

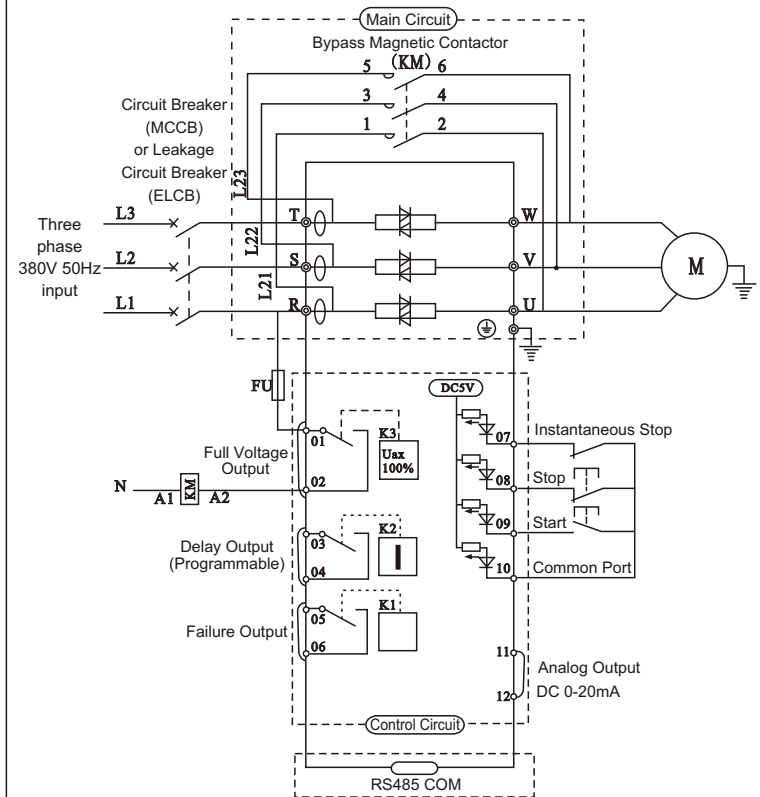
Chapter 2 Installation and Wiring

2.1 Wiring

The wiring of motor soft starter should be operated only by professionals experienced in high and low voltage electric circuit and should read this manual in detail before wiring.

2.1.1 Standard Wiring Diagram

Basic Wiring Diagram



2.1.2 Description of Main Circuit Terminals

R、S、T	Main Circuit Input Terminal	Connect to three-phase input power supply.
U、V、W	Main Circuit Output Terminal	Connect to three-phase electric motor.
L21、L22、L23	Bypass Connection	Connect to bypass contactor
\perp G	Ground Terminal	Soft starter cabinet ground terminal

1) Input Terminals (R, S, T)

- ① Three-phase input power supply should be connected to the input terminals R, S and T of the motor soft starter after it goes through the circuit breaker. Three-phase power supply does not differ on phase sequence and can be arbitrarily connected.
- ② While wiring, DO connect three-phase input power supply to the terminals R, S and T. Otherwise, it may result in severe damage to the motor soft starter.
- ③ It is recommended not to shut down the machine by disconnecting the main circuit power supply or install an electromagnetic contactor between the input terminals R, S, T and the power supply to run or stop the motor soft starter. Do select RUN or STOP keys on the operation panel or external control terminals to run or stop the motor soft starter.

2) Output Terminals (U, V, W)

- ① The output terminals U, V and W should be connected to the three-phase motor. If the motor counter rotates (reverses), just change arbitrarily two phases of U, V and W.
- ② Do not install a capacitor or surge absorber between the output terminals U, V, W and the three-phase motor. Otherwise, it may result in failure of the motor soft starter or damage to the devices.
- ③ Too long connecting line between the motor and the motor soft starter may result in overcurrent trip, increase of cutoff current, low accuracy of current display of the motor soft starter. So, it is suggested to use a line not exceeding 50m.

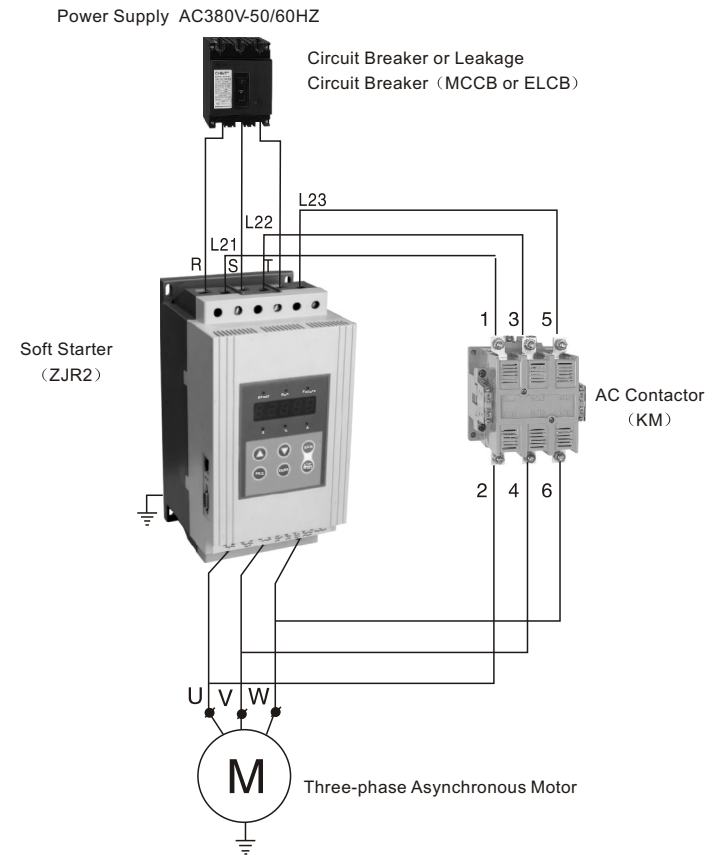
3) Bypass Connection

The bypass connection terminals L21, L22 and L23 should be connected to the electromagnetic contactor. No wrong connection or incorrect phase sequence! When the starting of the soft starter is finished, the main loop power device (SCR) will log out and the bypass electromagnetic contactor will run simultaneously. At this time, the motor is brought into normal service.

4) Ground Terminal (\perp G)

The ground terminal of motor soft starter should be properly connected to the ground to avoid electric shock or fire. The ground wire can not share a ground point with any other strong current load. They must be connected separately, and the ground wire is the shorter the better.

2.1.3 Main Circuit Connection Diagram

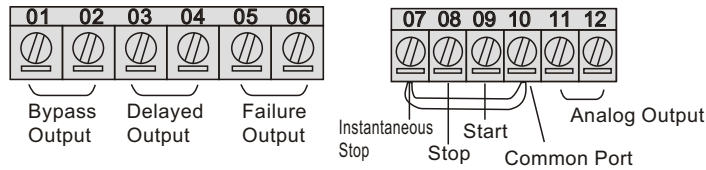


2.1.4 Description of Control Circuit Terminals

1) Cautions for Control Circuit Wiring:

- ① The connecting wire of the control circuit shall be shielded wire or twisted pair wire, which must be wired separately from the main circuit and the power circuit. If the connecting wire of the control circuit must crosscut the main circuit, they shall intersect at an angle of 90°.

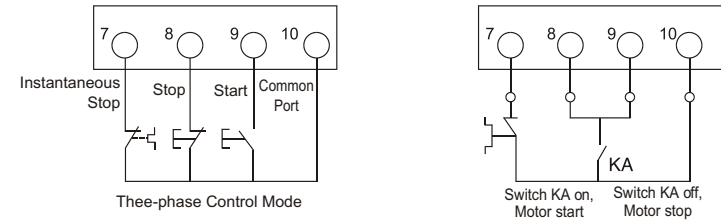
- ② The length of the wire shall be as short as possible (not exceed 30m generally) because the control circuit is easily influenced by external interference.
- ③ The recommended wire size of the control circuit connecting wire is 0.75mm^2 .
- ④ When external terminals are selected to control soft start and stop functions of the soft starter, please set the code Pd to “External Control Enabled”.
- ⑤ If there is a request for non-local control, the two-wire control mode is suggested.
- 2) Diagram of Control Terminals



3) Instruction of Control Terminals

Terminal Mark	Terminal Name	Functional Description
01, 02	Bypass Output	Switch on 01 and 02 after soft starter is completely started to control bypass contactor.
03, 04	Operation Output (Delayed)	03 and 04 indicate programmable relay output whose output functions are set by the code PJ. If they are set to be the make contacts (normally open) and output voltage of the soft starter is enabled to start the motor, then 03, 04 will be switched on. (Contact capacity: AC 250V/3A)
05, 06	Failure Output	05, 06 indicate programmable failure relay output which will be switched on if there is failure of the softer starter or power off, and switched off when energized.
07	Instantaneous Stop Input	If 07 is disconnected from 10 or connected to the break contact of any other protectors in series, the motor will stop immediately.
08	Soft Stop Input	When 08 and 10 are switched off, the motor will perform decelerated soft stop or free stop.
09	Start Input	09 and 10 are switched on, the motor begins starting and running.
10	Common Port	10 indicates common terminal of the contact input signal.

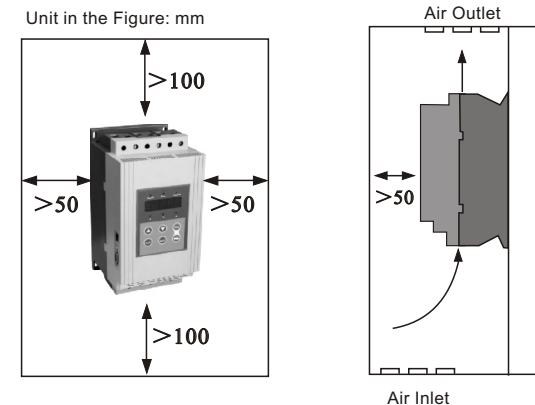
Terminal Mark	Terminal Name	Functional Description
11, 12	Analog Output	11 and 12 indicate DC (0~20mA) analog output used to monitor operating current of the motor. When the value is 20mA, which means the output current is 4 times as nominal current capacity of the motor, an external DC ammeter (0~20mA) can be connected, and the maximum value of output load resistance will be 300Ω .
DB9	RS485 COM	RS485 COM input/output terminal, used to connect multiple soft starters.



Note: It's necessary to add intermediate relay if the bypass contactor is bigger than CJ20-400.

2.2 Installation

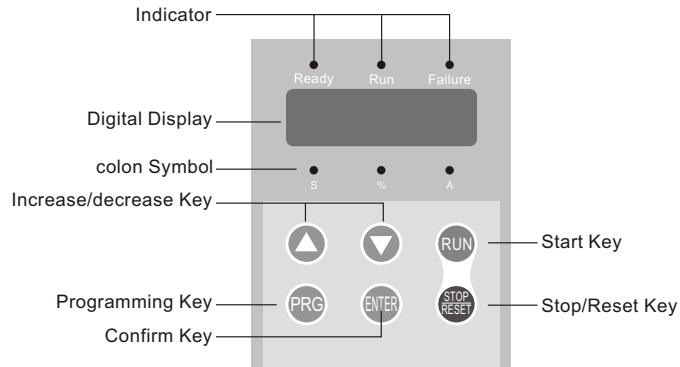
- ① The motor soft starter shall be installed vertically. DO NOT turn upside down, lay diagonally or horizontally while installing. Be sure the base is fixed solidly and evenly.
- ② To get better cooling effect and for the convenience of maintenance, the motor soft starter shall be installed with enough space left, refer to the figure below.



Chapter 3 Operation Panel

3.1 Description of Operation Panel

① Outline Drawing of Operation Panel



② Operation Panel Key Set Description

Symbols	Key Set Name	Functional Description
	Run Key	When "REAdy" is displayed, press this key to start the machine, and the starting state " - XXXX" will be displayed.
	Stop Key	1) When the machine is in normal operation, press this key to stop and " XXXX" will be displayed once the machine stops completely. 2) This key also performs the function of failure state resetting.
	Programming Key	When "REAdy" is displayed, press this key to set the manual. When "P0030" is displayed, repress this key. When ":" flashes, press to modify parameters.
	Confirm Key	1) After parameters are modified in programming, press this key to save. If there is the indication of "good" with 2 sounds, this indicates the data has been saved. Repress this key or press the stop key to exit. 2) Press this key when the machine is in operation, the voltage of input power supply will be displayed. 3) When the power is on, press and the parameters you've set will be restored to the factory default value.
	Increase Key	1) When entering into manual setting, press this key to modify parameters. (When the colon does not flicker, this key is used to modify the functional code; when the colon flickers, this key is used to modify the data value.) 2) When the machine is in operation, press this key to keep an eye on the display of current (A), power (P) and overload heat balance (H).
	Decrease Key	

- When the last decimal behind the three-figure data >999 is in light, then "0" shall be added behind the mantissa.
- The tone beeps while pressing any of these keys. Otherwise, this action is invalid.

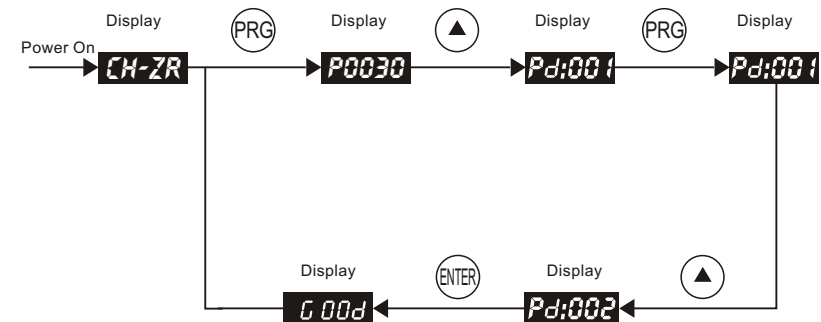
3.2 Panel Operation

① Parameter Modification Example

Eg. If the control mode is changed to external terminal control, just set the code Pd to 02.

Item	Action	Display	Description
1	Power on.	CH-ZR	Getting started.
2	Press	P0:030	Enter into the state of programming.
3	Press for 9 times.	Pd:001	Enter into functional selection mode of the code Pd.
4	Press	Pd:001	The range of setting can be modified when colon flashes.
5	Press twice.	Pd:002	02 indicates external terminal control.
6	Press	G 00d	The data modified has been saved. The action is escaped to the default state and "REAdy" is displayed.

Note: While pressing any of these keys, the beeper inside the soft starter will give out a beep tone.



Chapter 4 Operation and Function Sheet

4.1 Check before operation



The following steps should be inspected and confirmed before the soft starter is put into operation:

- ① Be sure that the application ambient and the input power supply comply with the requirements of this manual.
- ② Be sure that the main circuit is properly wired: The input power supply must be connected to the terminals R, S and T; the output terminals U, V and W must be connected to the motor; the bypass electromagnetic contactor is installed and properly connected; the ground terminal is reliably and properly grounded.
- ③ Be sure there is no short circuit or short to ground of all terminals and electrified parts. All terminals, connectors and screws are tightly fastened.

4.2 Operation

Now start a trial operation after all the inspection steps in 4.1 have been done. While in trial operation, it is suggested that the motor work without load. If everything is OK, then can run with load.

Be careful to select an optimum mode of operation in accordance with specific operational requirements. See the detail below:

- The factory default setting of the product operation mode is operation panel control.
- The value of rated power current PP should be set to the same as the one on the motor's specifications label.
- Press  to start the motor and press  to stop.
- Be sure the motor has a smooth running without whistler or vibration.
- If the motor starting is not good enough, just change settings of the basic functions of P1.
- If the motor's starting torque is not powerful enough, just change the inception voltage code P0 (voltage mode is valid) or the current-limiting value code P3 (current mode is valid) to raise the torque of the motor.
- Be sure the motor rotates in the correct direction.

Only after making sure there is no anomaly, can the motor be put into formal operation.

Notes:

- 1) If there is any anomaly of the soft starter or the motor, or there is a display of the fault code ErrXX, just stop running immediately and deal with in accordance with fault code.
- 2) If the on-spot ambient temperature is lower than -10°C, please restart the machine after it is energized and preheated more than 10 minutes.

4.3 Function sheet and Parameter

Function Code	Function Name	Setting Range	Default Value	Instruction
P0	Inception Voltage	30-70%	30%	Voltage ramp mode is valid The current mode initial voltage is 40%.
P1	The soft start time	2-60S	16S	The limit current mode is invalid.
P2	The Soft Stop time	0-60S	0S	Set 0 to free stop. Please set the value =0 while two-wire control mode
P3	Start time delay	0-999S	0S	Time delay by countdown. When the value is 0, No time delay, Start immediately.
P4	Programmable delay	0-999S	0S	Is used in programmable relay output
P5	Interval time delay	0-999S	0S	Time delay will be also on over heat relieve, The state indicator will flash at the time delay.
P6	The start current limiting	50-500%	280%	The current limiting mode is valid. The maximum of voltage ramp mode current limiting is 400%.
P7	The maximum working current	50-200%	100%	The input mode of the parameter P6, P7 are determined by P8.
P8	The input display method	0-3	1	For more details, Please see Page 17.
P9	Under voltage protection	40-90%	80%	Protection will be action when lower than the setting value.
PA	Overvoltage Protection	100-140%	Depend on the voltage specification	Protection will be action when higher than the setting value.
PB	Starting Modes	0-5	1	0: current limiting; 1: voltage ramp; 2: kick + current-limiting; 3: kick + voltage ramp; 4: current ramp; 5: voltage and current-limiting double closed loop

Function Code	Function Name	Setting Range	Default Value	Instruction
PC	The output protection permission	0-4	4	0: primary; 1: light load; 2: standard; 3: heavy load; 4: advanced
PD	The operation control mode	0-7	1	Forbid starting or stop operation when the value is 7
PE	Restart Permission	0-13	0	See Page 21 for more details
PF	Parameter modification permission	0-2	1	See Page 21 for more details
PH	The communication address	0-63	0	Use multiple soft starters
PJ	Programmable Output	0-19	7	See Page 21 for more details
PL	The soft stop current limiting	20-100%	80%	See Page 22 for more details
PP	Motor Rated Current		The rated value	The rated current shows on the input motor
PU	Motor under load Protection		Forbid	See Page 23 for more details

Note:

- 1) The Maximum of working current of Item P7 is calculated the maximum sustainable running current according to the load of the motor based on PP setting . If the value exceed the P7 , The inverse time limit heat protection will be action .
- 2) Idle keys for over 2 minutes, the machine will exit from the setting state automatically.
- 3) Do not set parameters during soft start or soft stop. Can be set them in other states.
- 4) Press **ENTER** Key to start the machine when the power is on , The setting parameter (Except PJ) can be return to factory default.

Chapter 5 Description of Function Parameters

5.1 Detailed Description of Function Parameters

Functional Code P0 Inception Voltage Setting Range: 30~70% Factory Default Setting: 30%

Functional description: This function is used to set the voltage value of motor soft starter when it is being started.

Note: Voltage ramp mode is valid ; Set the code P7 to "1", the value can be modified; Set P7 to "0", the inception voltage will be 40%.

Functional Code P1 Soft Starting Time Setting Range: 2~60S Factory Default Setting: 16S

Functional description: This function is used to set the time spent by the motor from inception voltage to rated voltage.

Note: Voltage ramp mode is enabled; Set the code PB to "1", the value can be modified.

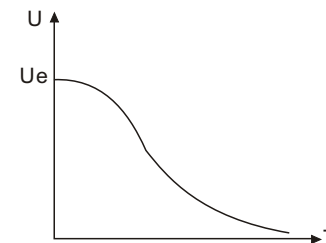
Functional Code P2 Soft Stop Time Setting Range: 0~60S Factory Default Setting: 00

Functional description: This function is used to set the time spent by the motor from being just stopped at rated speed to full stop. Set this value to "0", there is a free stop.

Note: There are two stop modes for motor soft starter: soft stop and free stop. If the machine has an one-to-multi system, then set the value to "0".

1) Soft Stop

- ① If the code P2 is not set to "0", then soft stop mode is selected. The figure below is the output current waveform in the mode of soft stop. Under this condition, the motor is powered by a thyristor shifted from a bypass contactor to a soft starter; the output voltage of this soft starter gradually decreased from full voltage till it stops completely, thus the motor decelerates smoothly and mechanical oscillation can be avoided. The output cut-off voltage of soft stop is equal to the Inception Voltage.
- ② In the mode of soft stop, surf of water pump loads can be reduced or even removed, and large current impulse caused by soft stop can be reduced. The current limitation value of soft stop is a percentage reckoned on the starting current-limiting value.



2) Free Stop

- ① If the code P2 is set to "0", then free stop mode is selected.

In this stop mode, once stop command is received, the soft starter will disconnect the bypass contactor and disable voltage output of the thyristor. Then the motor will gradually shutdown due to load inertia. To avoid open phase error report, P2 should be set to this mode if the soft starter adopts one-to-multi wiring method.

- ② To extend the service life of soft starter, free stop mode is generally preferred if there is no need to adopt soft stop mode. In free stop mode, instantaneous output is completely disabled, thus instantaneous impulse of heavy current can be avoided. ZJR2 series of soft starters provide 6 kinds of working modes applicable to various kinds of motors and loads. So users should choose a proper one according to different applications.

Functional Code P3 Starting Time Delay Setting Range: 0-999S Default Setting: 0S

Functional description: Time delay by countdown. When the value is 0, No time delay, Start immediately

Functional Code P4 Programmable Time Delay Setting Range: 0-999S Default Setting: 0S

Functional description: This function is used for programmable relay output.

Functional Code P5 Interval time delay Setting Range: 0-999S Default Setting: 0S

Functional description: Time delay will be also on over heat relieve, The state indicator will flash at the time delay.

Functional Code P6 Start limiting current Setting Range: 50%-500% Default Setting: 400%

Functional description: This function is used to set the peak output current value of a motor soft starter when it is starting. The formula is: set value \times motor rated current (Function PP) = peak current (unit: A) that is limited by a motor soft starter to be output. Note: Current limiting mode enabled; If the code PB is set to "0", the modification will be valid; If PB is set to "1", the current limiting value will be 400%.

Functional Code P7 Max. Working Current Setting Range: 50~200% Default Setting: 100%

Functional description: Maximum working current refers to maximum current performing sustainable operation whose value is reckoned on the basis of the set value in the functional code PP. If the current exceeds the max value, there will be an inverse-time thermal relief protection.

Note: Modification will be valid if the code PB is set to "0".

Functional Code P8 Input display mode Setting Range: 0-3% Default Setting: 1

- The setting item P8 is used to selected input and real mode, Please see the below sheet:

P8 setting value	0	1	2	3
P6、P7 input mode	Current Value	Percentage	Current Value	Percentage
Running display mode	Current Value	Current Value	Percentage	Percentage

- When the setting item P6, P7 are percentage input mode. Indicates the percentage of motor and the current refers to the setting item PP.

Functional Code P9 Under voltage Protection Setting Range: 60~90% Default Setting: 80%

Functional description: When the actual working voltage is lower than the set value, then protection for motor soft starter is disabled and the LED display Err09.

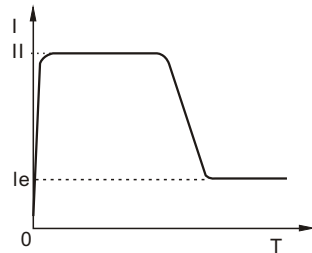
Functional Code PA Over voltage Protection Setting Range: 100~130% Default Setting: 120%

Functional description: When the actual working voltage is higher than the set value, then protection for the motor soft starter is disabled and the LED display Err10.

Functional Code PB Starting Mode Setting Range: 00~05 Default Setting: 01

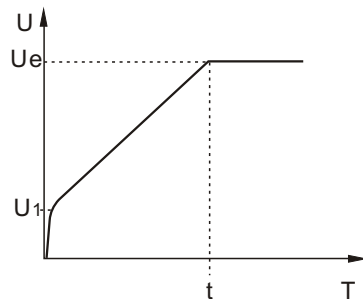
1) Current-limiting Start

- ① If the code PB is set to "0" (indicating current limiting), then current starting mode is selected. The figure below is a current change waveform of a motor in the mode of current-limiting start. "I1" in the figure refers to the set value of starting current-limiting. When the motor starts, the output voltage will rise rapidly till the motor current reaches the set current-limiting value "I1" and will not go up any more. Then, with gradual raise of output value, the motor will accelerate gradually. When the motor speed reaches the rated speed of rotation, the bypass contactor will attract (kick on) and the output current will go down rapidly to the motor rated current "Ie" or below. Thus the starting process is finished.
- ② Even if the motor has a light load or the set value of current-limiting is big, there is still the possibility that the maximum current of the motor during start can not reach the set value of current-limiting. Current-limiting start mode is usually applied on the occasion where strict limitation of current is required.



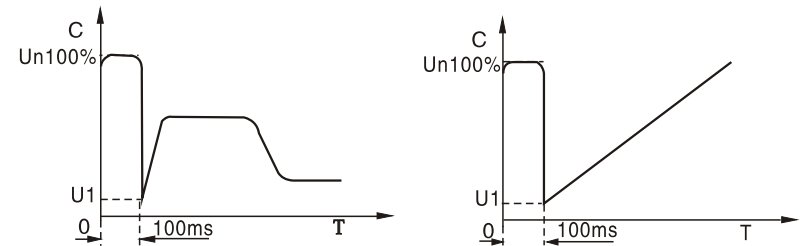
2) Voltage Ramp Start

- ① When the code PB is set to "1" (voltage), then voltage start mode is selected. The figure below is a waveform of output voltage during voltage limiting ramp start. U_1 in the figure is the starting inception voltage. When the motor is started and its current does not exceed 400% of its rated value, the output voltage of soft starter will jump up to U_1 , then the output voltage will rise gradually as the set starting parameter, and the motor will accelerate with voltage rise. When the voltage reaches the rated voltage U_e , the motor will run at rated rotation speed and the bypass contactor will pickup, thus the start-up procedure will be completed.
- ② Starting Time: T is the control parameter derived by standard load under standard experimental conditions, based on which the soft starter is able to accelerate the motor smoothly to complete starting process through the control over output voltage but not through the mechanical control over time (t) regardless of whether the motor is accelerated steadily. Therefore, if there is a light load, the starting time will tend to be less than the set starting time. It is normal if the machine can be started smoothly. Generally speaking, voltage ramp start mode is applicable to the occasion where there is no strict requirement on starting current but a high requirement on the stability of starting.



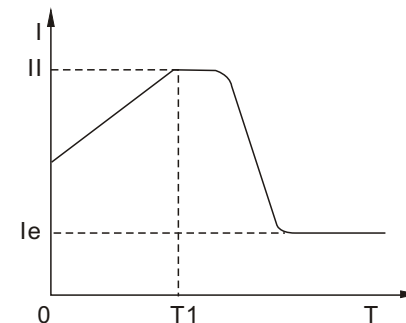
3) Kick Start

- ① When the code PB is set to "2" (kick + current-limiting) or "3" (kick + voltage), then kick start mode is selected. The figure below is the change waveform of output in kick start mode. This start mode can be selected in case there is a failure start of the motor due to influence of the machine's static friction force on the occasion of heavy loads. While the machine is just started, DO feed a fixed higher voltage to the motor and keep it for a short period of time so as to smooth away static friction force of motor loads and enable the motor rotate, and then select a start mode of current-limiting or voltage ramp.
- ② Before selecting this mode, it is strongly recommended to start the motor by non-kick starting. Then select this mode ONLY AFTER the motor failed to start. DO keep clear of kick start as possible to reduce unnecessary impulse of strong current.



4) Current Ramp Start

- ① When the code PB is set to "4" (current ramp), then current ramp start mode is selected. The figure below is a waveform of output current in the mode of current ramp start. " I_1 " in this figure stands for current-limiting value set by the code P3, and T_1 stands for time set by the code P1.
- ② Current ramp start mode is applicable to bipolar motor owing to its strong accelerating capacity. This mode can also shorten the starting period of time within a certain range.



5) Voltage and Current-limiting Double-closed Loop Start

- ① When the code PB is set to "5" (double closed-loop), then this start mode is selected. Voltage and current-limiting double-closed loop start mode, with adoption of voltage ramp and current-limiting double-closed loop control, is a kind of comprehensive start mode that both steady start and strict current-limiting are required. It uses a pre-reckoning method for estimating the working state of the motor.
- ② The waveform of output voltage in this mode always fluctuates according to different conditions of the motor and loads.

Functional Code PC Output protective permission Setting Range: 00~04 Factory Default Setting: 04

To adapt to different applications, this motor soft starter provides 5 protection classes, namely, 0: primary class; 1: light load; 2: standard, 3 heavy load; 4: advanced, which are set by the code PC.

Primary protection, disabling the function of external instantaneous terminals and only remaining overheat protection, shortcut protection and input open phase protection while starting, is applied to some emergency occasions, i.e., fire pump etc..

Light load, standard and heavy load protection classes have full protection functions. Their distinguish lies in different time curves of motor's overload heat protection. Refer to the table below and the figure in page 24 to see time parameters for motor heat protection. The protection standard for advanced protection is even stricter. Functional parameters for the rest protection classes are set the same as the standard protection. See the table below for different protection classes and heat protection set by the code PC.

PC Setting	0 (Primary Class)	1 (Light Load)			2 (Standard)			3 (Heavy Load)			4 (Advanced)			Description
Overload Running Protection Classes	/	Class 2			Class 10			Class 20			Class 10			In accordance with IEC60947-4-2 standard.
Overcurrent Starting Protection Time	/	3S			15S			30 S			15S			Based on that the starting current is more than 5 times the set value.
Overload Running Trip Time List	Current Multiple	3	4	5	3	4	5	3	4	5	3	4	5	Numerical values in this table are typical ones.
	Trip Time (S)	4.5	2.3	1.5	23	12	7.5	46	23	15	23	12	7.5	

Functional Code PD Operate Control Modes Setting Range: 00~07 Factory Default Setting: 01

- 00: operation panel control; 01: operation panel + external control;
 02: external control; 03: external control + COM control;
 04: operation panel + external + COM control; 05: operation panel + COM control;
 06: COM control; 07: start/stop disabled

Functional Code PE Restart permission Setting Range: 0-13 Factory Default Setting: 0

- Automatic restart function is permitted when PE is 1-9. This function is valid when the external control with two wires. Didn't affect controlled by the external control setting PD. Please connect with two wires when switched on and start status.
- Time delay for 60 S to automatic start after power is on.
- Time delay for 60 S to automatic restart after the machine stop with fault. But the setting time of P5 is more than 60S. Please refer to P5 to set time delay. The indicator flash on time delay period status.
- Can automatic start for n times, includes start when power on and restart after failure. n times can be PE setting value.
- Automatic restart mode have to be power on and save again.
- Forbid protection function when PE is 10. Can be start automatically if the external start terminals switched on when the power is on. That is to say. Starting the motor when power on is permission.
- Restart after failure when PE is 11. Can start the motor again. No need to reset in the following situation. When the instantaneous stop terminal don't forbid. (PC>0), Or return to normal after stopping immediately, overheat, overvoltage, under voltage and other fault.
- When PE is 12, Power failure protection is forbidden and restart after failure.
- Move Status memory recovery when PE is 13. When the Power is off and then power is on under the bypass running status. The soft start will recover automatically to the bypass running status.
- Warnings: The soft starter have voltage loss protection. It will not start automatically and Avoid caused by damage accident when the external terminal stay any position after power is offer and then power on. But when the Automatic restart function permit forbidding power failure permit running status memory recovery function. Power failure function will be failure.

Functional Code PF Parameter modification permission Setting Range: 00~01 Factory Default Setting: 01

Functional Description: This function is used to set the internal parameter of the soft starter can be modified or not.

00 Can modify the parameter without permission. 01: Can modify the parameter with permission.

Functional Code PH The communication address Setting Range: 0~63 Factory Default Setting: 0

Functional Description: Use multiple soft starters.

Functional Code PJ Programmable Output Setting Range: 00~19 Factory Default Setting: 07

Code PJ is used to set the action time for operation output relay.

- The output function of programmable relay provides 2 working modes: programmable sequential output and programmable status output.
- When PJ is set to 0~4 (10~14), programmable output works in the mode of time output. The set starting moment of this output is seen in the table as follow:

Values set by PJ	0(10)	1(11)	2(12)	3(13)	4(14)
Moment of Programmable Output	When ordering the command of start	When being started	When bypass runs	When ordering the command of stop	When shutdown is completed

- This working mode is used in an immediate state and the relay acts at the moment when the state set by PJ just begins. The reset moment of this output will be completed 1 second's later after this state ends up. Eg.: The factory default setting value of PJ is 7, which means the soft starter is in a "hold" mode when energized and the relay attracts at the same time. If the soft starter receives start command at this moment, then the relay will be disconnected.
- Programmable sequential output mode takes the whole process of a start as its control cycle. If the motor is restarted, the previous programming output will automatically be interrupted and this procedure shall be preceded again.
- If PJ is set to 5~9(15~19), the programmable output working and state output mode, and the set working state output will be shown in the table below:

Values set by PJ	5(15)	6(16)	7(17)	8(18)	9(19)
Moment of Programmable Output	Fault State	Operation State	Ready State	Starting State	Bypass State

- Programmable state output is used to indicate the working state of soft starter. The factory default setting value of PJ is 7, which indicates hold mode of soft starter. In this state, the motor can be started. When programmable output is in fault state, it indicates motor failure (Err05, Err06, Err07, Err08, Err12), which is different from the function of failure output terminals. Operation state refers to non-hold or non-fault state, including such three procedures as start, bypass and soft stop.
- If PJ > 9, the reset state of programmable output (③ ④ external terminals) changes from open to close, that is, reversed phase output. Flexible use of programmable relay output functions can simplify external control logic circuit.

Functional Code PL Soft stop limiting current Setting Range: 20~100 Factory Default Setting: 80%

Function Description: To make the motor balance and stable stop when the soft start stop.

Functional Code PP Motor Rated Current Setting Range: 11~1200
Factory Default Setting: Set according to the specifications

Function Description: This parameter should be set in conformity with rated current

value displayed on specifications label of the motor. Otherwise, it may cause big deviation between starting current and protective current. The motor rated current set by PP should not be 20% lower than the nominal current of soft starter. The flexibility tolerance of protective trip action will increase if there is less motor rated current set by PP.

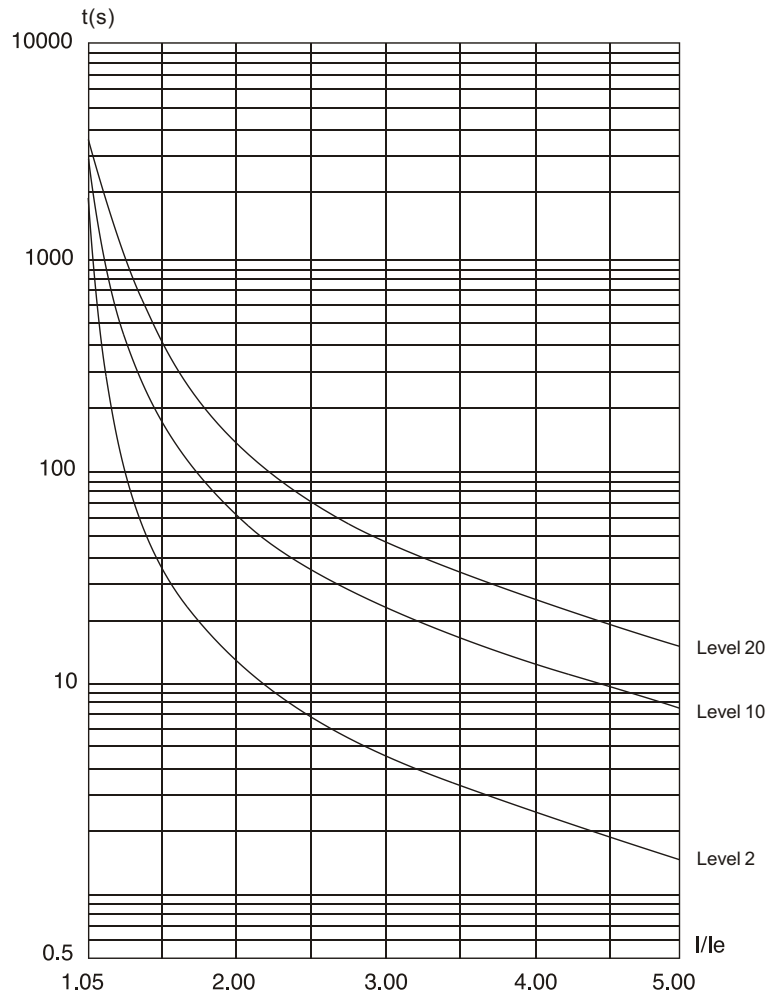
Functional Code PU Motor Protection Setting Range: 00~90 Factory Default Setting: 00

1) Descriptions of Protective Functions

This motor soft starter has perfect protective functions to guarantee safety while using soft starter and motor. While in use, DO set proper protection classes and protection parameters according to different circumstances.

- Soft Starter Overheat Protection: Overheat protection enabled when temperature rises to $90 \pm 5^\circ\text{C}$ and disabled when temperature falls to 60°C (lowest).
- Input open phase protection lag time: <3S
- Output open phase protection lag time: <3S
- Three-phase Unbalance Protection Time: <3S. Based on the rule that all phases of current deviation is larger than $50 \pm 10\%$, when load current is 30% lower than the nominal rated value of soft starter, the decision datum deviation will be enhanced.
- Overcurrent Starting Protection Time: This refers to the protection time that is successively 5 times longer than the maximum working current set by the code P4. See protection Time Table in Page 20.
- Overload Running Protection Time: This refers to the inverse time thermal relief protection based on the maximum working current set by the code P4. See the curve of trip protection time in the figure on page 24.
- Power Supply Undervoltage Protection Lag Time: When power supply voltage is 40% lower than limit value, the protection time will be less than 0.5 second; when the power supply voltage is lower than the set value, the protection time will be less than 3 seconds.
- Power Supply Overvoltage Protection Lag Time: When power supply voltage is 130% higher than limit value, the protection time will be less than 0.5 second; when the power supply voltage is higher than the set value, the protection time will be less than 3 seconds.
- Load Shortcircuit Protection Retarding Time: <01 second. If the current is 10 times or more as nominal rated current of the soft starter, than a fuse or shortcircuit device shall be used.
- The above time parameters are set for the period from valid signals are detected to trip protection command is given. They are for reference only.
- If protective functions of this soft starter do not comply with users' needs, then special protective devices shall be used to insure safety.

2) Protective Trip Curve



5.2 Help Information Indicate

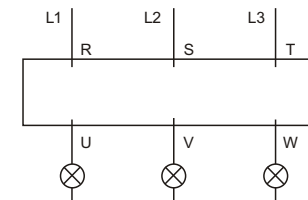
Display	Description
AC:XXX	3 stand for digital Voltmeter, to monitor and measure three phase AC voltage.
022-3	Indicate the soft start is 22KW-380/50HZ.
H1:E05	Indicate the latest fault data Err05.
H2:E01	Indicate the ever fault date Err01.
H3:E06	Indicate the ever fault date Err06.
...	...
...	...
H9:E00	Indicate no fault
UEr3.0	The soft ware of the production is Ver3.0.
LXXXX	The total number of successful start times
RUNXX	The time (Seconds) for the last starting

Note: H1-H9 save the latest ninth of fault data by recursion.

- Please press confirm to enter the help screen when non-soft start and soft stop status and before entering the setting status. Then press increase ;Decrease to choose the helpful information.
- Press confirm or stop to exit the help status.

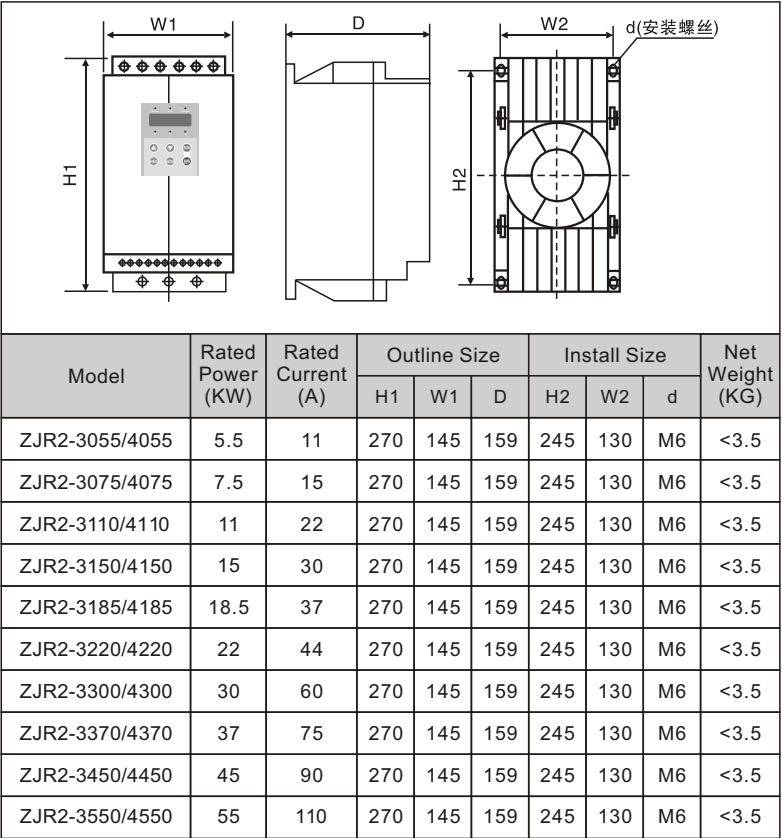
5.3 Factory adjustment project for the complete set factory

The complete factory install the machine or trial test for end users. There have not the matching motor to start for rest. We can use three pieces 100W or 200W bulbs to connect to star type. Can replace of motor as for starttest (Can also use small motor for trial test). The soft starter couldn't detect and show output open phase fault because the output current of the main circuit is too small, and the soft start couldn't trial run. The solution is the output protection permission PC change to 0 (without permission). NO show the open phase fault. The three bulb will get brighter when running. And then bypass bulbs will get bright completely.

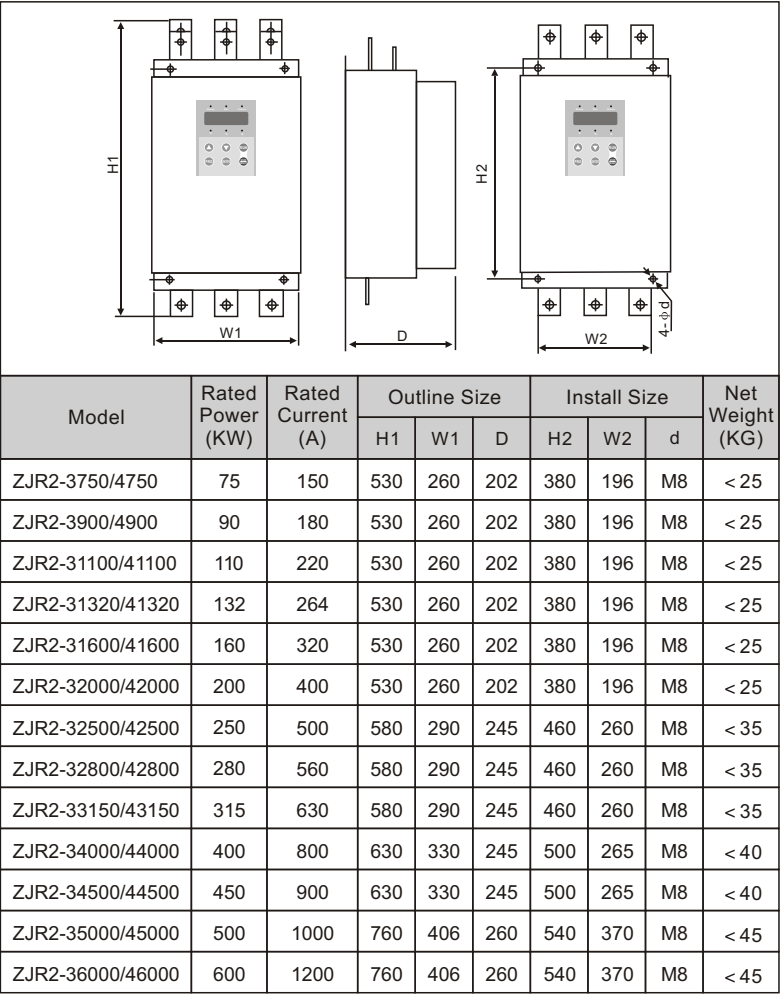


Chapter 6 Structure and Sizes

6.1 Outline Sizes & Install Sizes



NOTE:
The rated power r and rated current in the table above are the maximum values of a soft starter. Generally, rated current matching the motor that has same power should not excess the rated current values listed in this table.
If outline sizes differ from the values above, please refer to actual sizes.



NOTE:
The rated power r and rated current in the table above are the maximum values of a soft starter. Generally, rated current matching the motor that has same power should not excess the rated current values listed in this table.
If outline sizes differ from the values above, please refer to actual sizes.

Appendix I (A)

The soft start (7.5KW~55KW) Selection List of Peripheral Appliances are as follows:

Model	Rated Power (KW)	Rated Current (A)	Breaker Specification (A)	Bypass contactor Specification(A)	Cable Size (mm ²)
ZJR2-3055/4055	5.5	11	16	16	4mm ²
ZJR2-3075/4075	7.5	15	20	16	4mm ²
ZJR2-3110/4110	11	23	32	25	6mm ²
ZJR2-3150/4150	15	30	40	40	10mm ²
ZJR2-3185/4185	18.5	37	50	40	10mm ²
ZJR2-3220/4220	22	43	63	40	16mm ²
ZJR2-3300/4300	30	60	80	63	25mm ²
ZJR2-3370/4370	37	75	100	100	35mm ²
ZJR2-3450/4450	45	90	125	100	35mm ²
ZJR2-3550/4550	55	110	160	160	35mm ²

Appendix I (B)

The soft start (75KW~500KW) Selection List of Peripheral Appliances are as follows:

Model	Rated Power (KW)	Rated Current (A)	Breaker Specification	Bypass contactor Specification(A)	Cable Size (mm ²)
ZJR2-3750/4750	75	150	180	160	30X3mm ²
ZJR2-3900/4900	90	180	225	250	30X3mm ²
ZJR2-31150/41150	115	220	315	250	30X3mm ²
ZJR2-31320/41320	132	264	315	400	30X4mm ²
ZJR2-31600/41600	160	320	350	400	30X4mm ²
ZJR2-31850/41850	185	370	400	400	30X4mm ²
ZJR2-32000/42000	200	400	400	400	50x5mm ²
ZJR2-32500/42500	250	500	630	630	50x5mm ²
ZJR2-32800/42800	280	560	630	630	50x5mm ²
ZJR2-33200/43200	320	630	630	630	50X5mm ²
ZJR2-34000/44000	400	800	1000	1000	60X6mm ²
ZJR2-34500/44500	450	900	1000	1000	60X6mm ²
ZJR2-35000/45000	500	1000	1250	1000	80x6mm ²
ZJR2-36000/46000	600	1200	1600	1600	80x6mm ²

Note: The rated power and rated current indicate the maximum rated value of the soft start .

The matching specification of breakers and bypass contactors should match with the motor.

Appendix II (A)

The solutions of fault code are in the following sheet.

Panel Display	Warnings	Actions & Treatment
-Err00	Fault cleared!	Faults such as undervoltage, overvoltage, overcurrent, instantaneous terminal open etc. have been eliminated. Everything turns to normal and now the LED "ready" lights up, indicating the motor can be started after reset.
-Err01	External instantaneous terminals open	Check the short circuit connection between terminal ⑦ and COM terminal ⑩, or check break contacts of other protective devices.
-Err02	Soft starter overheat	Check if starting is too frequently operated or the power of power doesn't match with the soft starter.
-Err03	Starting time too long (more than 60S)	Check if starting parameters are improperly set; the load is too heavy or the power capacity is not enough.
-Err04	Input open phase	Check if there is something wrong with input and main circuit. the bypass contactor is blocked on the closed position, the SCR is open loop.
-Err05	Output open phase	Check if connecting wires of output loop and the motor is firm, the bypass contactor is chucked on the closed position, the SCR is shortcut and the ground wire (G) is properly connected.
-Err06	Three phases unbalanced	Check if there is anomaly of input three-phase power supply or the load motor.
-Err07	Starting over current	Check if the load is too heavy or the power of motor doesn't match with the soft starter.
-Err08	Operation overload protection	Check if there is any too heavy load or improper parameter set by the code P7 and PP.
-Err09	Power voltage is too low	Check if there is error input power voltage or improper parameter set by the code P9.
-Err10	Power voltage is too high	Check if there is error input power voltage or improper parameter set by the code PA.

Panel Display	Warnings	Actions & Treatment
-Err11	Parameter setting error	Modify settings or press to restore to the default settings of soft starter when it is energized.
-Err12	Load shortcut	Check the load or the motor; check if the SCR is shortcut or over load.
-Err13	Auto restart wiring error	Check the external control start and stop terminals if they are in two-wire control mode.
-Err14	External control stop terminal wiring error	When external control mode is enabled, external control stop terminals will open, which lead to failure start of the motor.
-Err15	Motor under load	Check the main shaft of the motor and overload fault.

Note:

- 1) Some faults are correlative, i.e., if there is a report of Err02 (soft starter overheat), this may be concerned with starting overcurrent or load shortcut. Therefore, full considerations should be taken to have an exact judge on faults during troubleshooting.
- 2) When the soft starter starts the motor, the operation LED in the middle of the panel lights up, which indicates the machine is in the state of bypass operation. If bypass contactor fails to pickup at this time, which results in stop of the motor, check if there is any error or bad contact of the bypass contactor and relevant connecting wires.

Appendix II (B)

The solutions of fault code are in the following sheet.

Function Code	Function Name	Setting Range	Default Value	Instruction
P0	Inception Voltage	30-70%	30%	Voltage ramp mode is valid The current mode initial voltage is 40%.
P1	The soft start time	2-60S	16S	The limiting current mode is invalid.
P2	The Soft Stop time	0-60S	0S	Set 0 to free stop .Please set the value =0 while two-wire control mode.
P3	Start time delay	0-999S	0S	Time delay by countdown When the value is 0 , No time delay , Start immediately.
P4	Programmable delay	0-999S	0S	Is used in programmable relay output
P5	Interval time delay	0-999S	0S	Time delay will be also on over heat relieve , The state indicator will flash at the time delay .
P6	The start current limiting	50-500%	280%	The current limiting mode is valid . The maximum of voltage ramp mode current limiting is 400%.
P7	The maximum working current	50-200%	100%	The input mode of the parameter P6 , P7 are determined by P8.
P8	The input display method	0-3	1	For more details ,Please see Page 17.
P9	Under voltage protection	40-90%	80%	Protection will be action when lower than the setting value.

Function Code	Function Name	Setting Range	Default Value	Instruction
PA	Overvoltage Protection	100-140%	Depend on the voltage specification	Protection will be action when higher than the setting value.
PB	Starting Modes	0-5	1	0: current limiting; 1: voltage ramp; 2: kick + current-limiting; 3: kick + voltage ramp; 4: current ramp; 5: voltage and current-limiting double closed loop
PC	The output protection permission	0-4	4	0: primary; 1: light load; 2: standard; 3: heavy load; 4: advanced
PD	The operation control mode	0-7	1	Forbid starting or stop operation when the value is 7
PE	Restart Permission	0-13	0	See Page 21 for more details
PF	Parameter modification permission	0-2	1	See Page 21 for more details
PH	The communication address	0-63	0	Use multiple soft starters
PJ	Programmable Output	0-19	7	See Page 21 for more details
PL	The soft stop current limiting	20-100%	80%	See Page 22 for more details
PP	Motor Rated Current		The rated value	The rated current shows on the input motor
PU	Motor under load Protection		Forbid	See Page for 23 more details

Note:

- 1) The Maximum of working current of Item P7 is calculated the maximum sustainable running current according to the load of the motor based on PP setting . If the value exceed the P7 , The inverse time limit heat protection will be action .
- 2) Idle keys for over 2 minutes, the machine will exit from the setting state automatically.
- 3) Do not set parameters during soft start or soft stop. Can be set them in other states.
- 4) Press CONFIRM Key to start the machine when the power is on , The setting parameter (Except PJ) can be return to factory default.

Appendix III

1) Varieties of Application Load

This soft start can meet the requirements of most heavy loads. The table below is for reference only.

Varieties of Application Loads	Start Ramp Time (S)	Stop Ramp Time (S)	Inception Voltage (%)	Voltage Start (Maximum Current-limiting Value)	Current-limiting Start
Centrifugal Pump	16	20	40	4	2.5
Ball Grinder	20	6	60	4	3.5
Fan	26	4	30	4	3.5
Piston Type Compressor	16	4	40	4	3
Light Load Motor	16	2	30	4	3
Elevating Mechanism	6	10	60	4	3.5
Mixer	16	2	50	4	3
Crusher	16	10	50	4	3.5
Screw Compressor	16	2	40	4	3
Spiral Conveyor	20	10	40	4	2
Leather Belt Conveyor	20	10	40	4	2.5
Heat Pump	16	20	40	4	3

2) RS485 Communication

This soft starter can be connected to PC, PLC or other hosts through a built-in RS485 standard port to perform serial communication (COM). The host can give a command to start or stop the soft starter, monitor the operation state of the soft starter and modify its functional parameters. For details of this communication, please refer to RS485 Operating Manual. By using RS485 COM of the soft starter, remote operation can be realized via a computer such as input of run command, management on operation state, and one-step writing of functional codes for multiple soft starters to realize simplified operation while inputting functional codes.

Main Functions of RS485 COM:

- ① Inputting start or stop command;
 - ② Monitoring operation status;
 - ③ Real-time tracing (i.e., table display of running information);
 - ④ Once-step reading and writing of functional codes, and saving to the file;
- A separate agreement shall be signed between the two parties of us for communication software.

Quality Warranty

The warranty of the soft starter are as follows:

1) Warranty Period Under Normal Conditions

- ① We provide guarantees for repair, replacement and return of the purchase in 1 month from the date of use.
 - ② We provide guarantees for repair and replacement in 3 months from the date of use.
 - ③ We provide guarantee for repair in 12 months from the date of use or 18 months from the date of ex-factory.
- 2) The purchaser enjoys life-long paid service whenever and wherever he uses a motor soft starter made in our company.
- 3) Service in the following cases, even within the warranty period, shall be charged to the purchaser:
- ① Problems caused by mal-operation in violation of this manual, or caused by unauthorized repair or renovation.
 - ② Problems caused by improper use of soft starter that is off standard and requirement;
 - ③ Malfunction or damage caused by improper transit or storage after purchase;
 - ④ Induced failure or aging of the device due to poor ambient;
 - ⑤ Malfunction or damage caused by fire, flood, thunder, earthquake, abnormal voltage or other natural disasters;
 - ⑥ Unidentifiable nameplate, mark and ORD number due to intentional spoilage;
 - ⑦ Delayed or unsatisfied payment in violation of purchase appointment;
 - ⑧ Fail to give an objective description on the use of installation, wiring, operation, maintenance or else;
- 4) Defective products should be sent to us for repair, replacement and return, which can be proceeded only after verifying the burden of liability.
- 5) In case there is any quality problem or accident, we merely promise to bear the above-mentioned responsibilities. If a user needs more guarantees for liabilities, please assure on the insurance company voluntarily.