CHZIRI®

Soft Starter User's Manual
ZJR2 Series

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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Table of Contents

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 (⏚ 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 accidence 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.
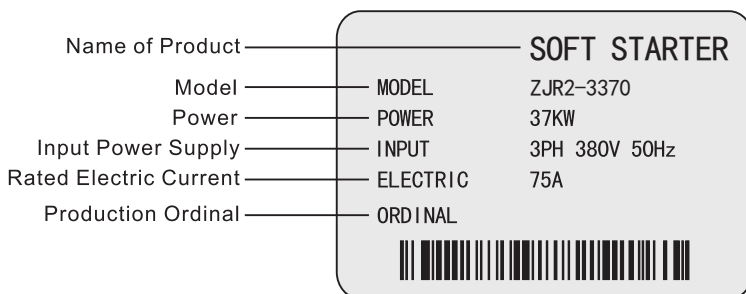
1.3 Inspection upon Arrival

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

Name of Product ——— SOFT STARTER
Model ——— MODEL   ZJR2-3370
Power ——— POWER   37KW
Input Power Supply ——— INPUT   3PH 380V 50Hz
Rated Electric Current ——— ELECTRIC   75A
Production Ordinal ——— ORDINAL

1.4.2 Demonstration of the Model

Z JR 2 — B 3 370

Adaptive Motor Power: 370=37KW
1600=160KW

3 Indicate AC 380V
4 Indicate AC 415V~440V

B Indicate Built-in Bypass Contactor

Design Serial Number

Motor Soft Starter

Biz Code

-2-
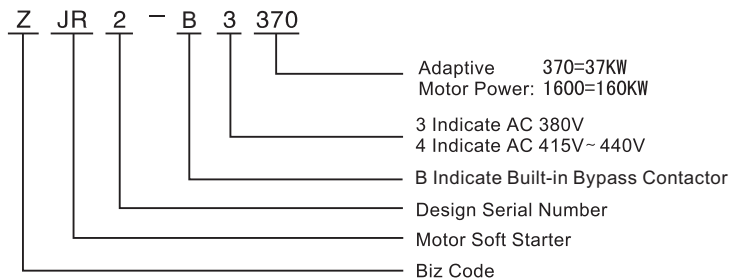
1.5 Outline of the Product

Connect to the bypass contactor (L21, L22, L23)

Nameplate (Specifications Label)

Base (Motor Stand; Motor Mount)

Circuit Board Cabinet

Input Terminals of Power Supply (R, S, T)

Operation Panel

Control Terminal

Connect to the motor (U, V, W)

Connect to the bypass contactor (L21, L22, L23)

Input Terminals of Power Supply (R, S, T)

Operation Panel

Base (Motor Stand; Motor Mount)

Control Terminal

Connect to the motor (U, V, W)

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

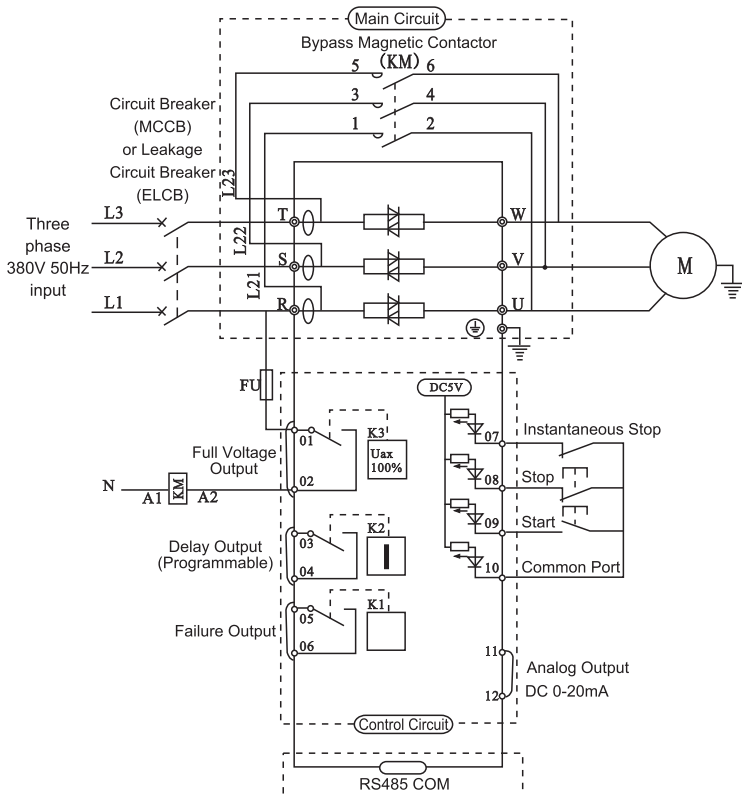| Item		Item Description
Input Power Supply	Input Voltage	Three-phase 320V ～ 460VAC
	Frequency	50/60Hz
Adaptive Motor		Squirrel-cage three-phase asynchronous motor
Starting Times		It is recommended not to exceed 20 times per hour.
Control Mode		1) Operation panel control; 2) Operation panel + external 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 have 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
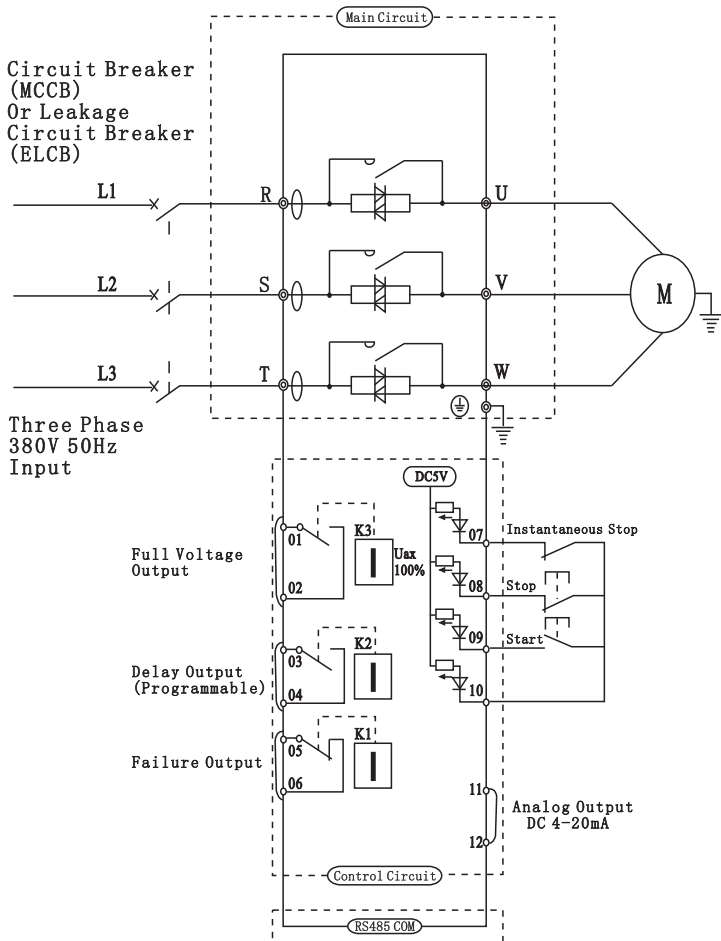
2.1 Wiring

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 ZJR2 soft starter external contactor

Basic Wiring Diagram –ZJR2-B soft starter built-in bypass.

Main Circuit

Circuit Breaker
(MCCB)
Or Leakage
Circuit Breaker
(ELCB)

L1   R   U

L2   S   V   M

L3   T   W

Three Phase
380V 50Hz
Input

DC5V

Full Voltage
Output   01   K3   Uax 100%   07   Instantaneous Stop

02   08   Stop

09   Start

Delay Output
(Programmable)   03   K2   10

04

Failure Output   05   K1

06

11   Analog Output
DC 4~20mA

12

Control Circuit

RS485 COM

-7-

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
⏚ 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.
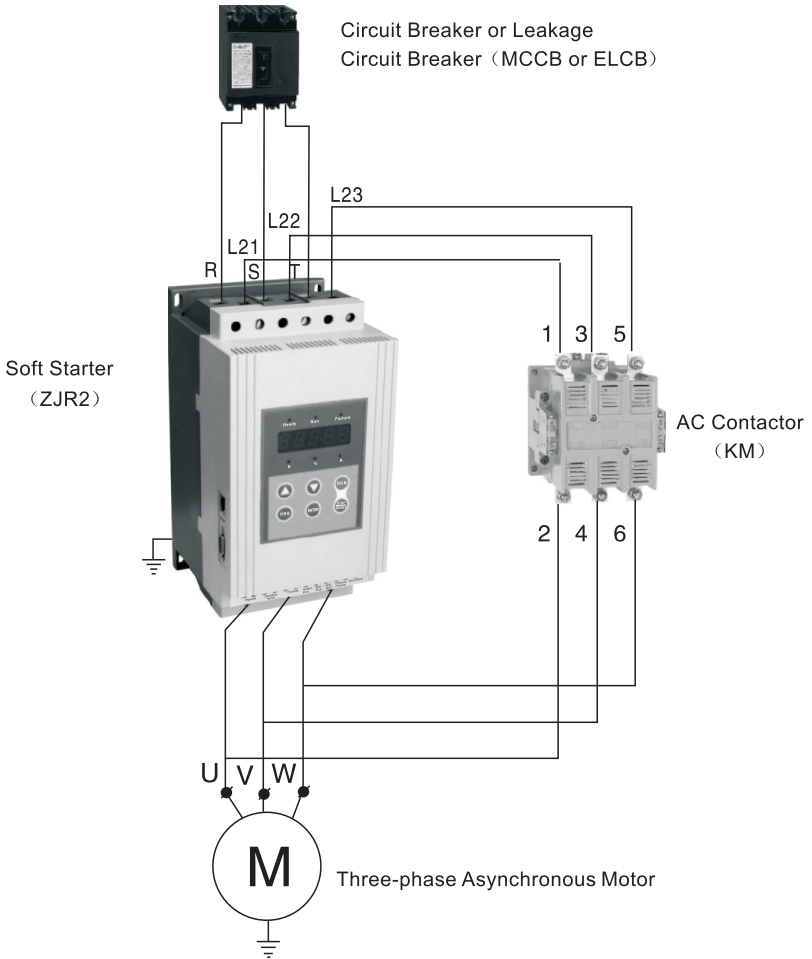
3) Bypass Connection

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.
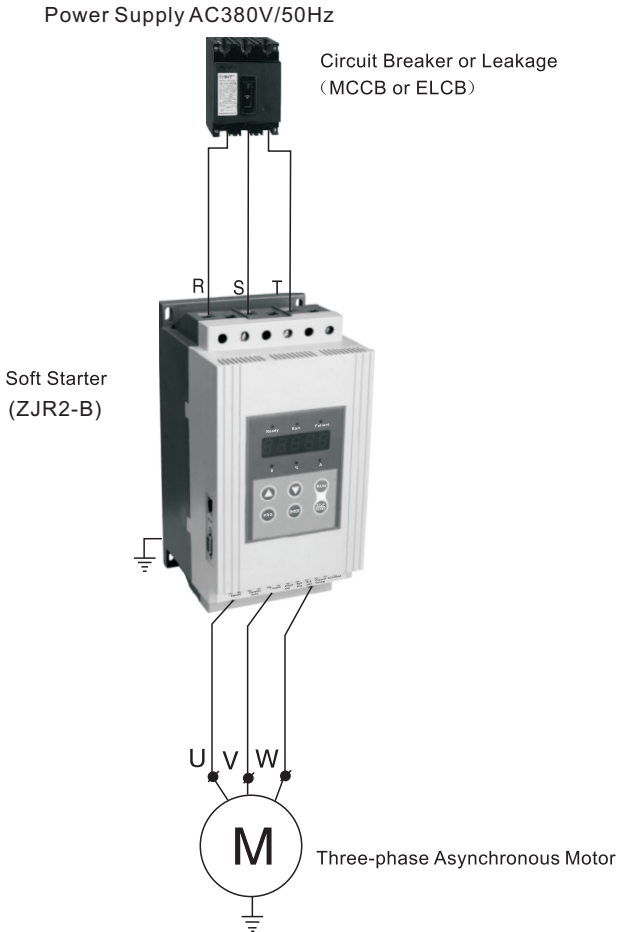
4) Ground Terminal (⏚ G)

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
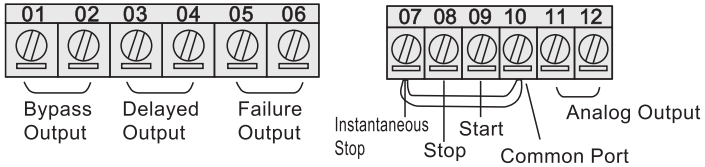
Power Supply AC380V-50/60HZ

Circuit Breaker or Leakage
Circuit Breaker（MCCB or ELCB）

L23

L22

L21

R S T

1 3 5

Soft Starter
（ZJR2）

AC Contactor
（KM）

2 4 6

U V W

M

Three-phase Asynchronous Motor

Power Supply AC380V/50Hz

Circuit Breaker or Leakage
（MCCB or ELCB）

R   S   T

Soft Starter
(ZJR2-B)

U V W

M   Three-phase Asynchronous Motor

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

| 01 | 02 | 03 | 04 | 05 | 06 |

Bypass Output   Delayed Output   Failure Output

| 07 | 08 | 09 | 10 | 11 | 12 |

Instantaneous Stop   Start   Stop   Common Port   Analog Output

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 PP. 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 (4-20mA) 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 (4-20mA) can be connected, and the maximum value of output load resistance will be 300 Ω .
DB9	RS485 COM	RS485 COM input/output terminal, used to connect multiple soft starters.

Three-phase Control Mode

Switch KA on, Motor start   Switch KA off, Motor stop
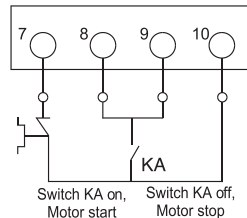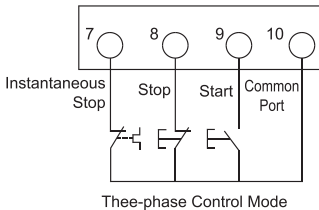
Note: ① It's necessary to add internediate relay if the bypass contactor is bigger than CJ20-400.

② The standard soft starter don't have RS485 port . Please inform us once you need the soft starter with RS485 Port if you place the order.
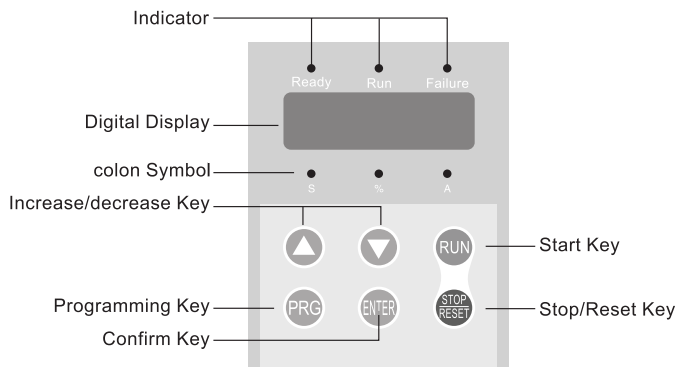
2.2 Installation

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.

Unit in the Figure: mm   Air Outlet

>100

>50   >50

>50

>100

Air Inlet
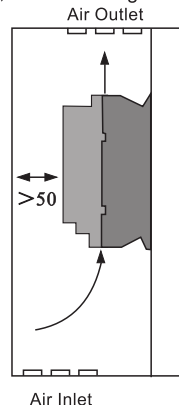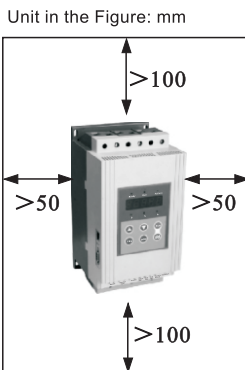
Chapter 3 Operation Panel

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	Run Key	When "REAdy" is displayed, press this key to start the machine, and the starting state "‾ XXXX" will be displayed.
STOP RESET	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.
PRG	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.
ENTER	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 mac hine 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 (PRG)	P0:030	Enter into the state of programming.
3	Press (▲) for 13 times.	Pd:001	Enter into functional selection mode of the code Pd.
4	Press (PRG)	Pd:001	The range of setting can be modified when colon flashes.
5	Press (▲) twice.	Pd:002	02 indicates external terminal control.
6	Press (ENTER)	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.
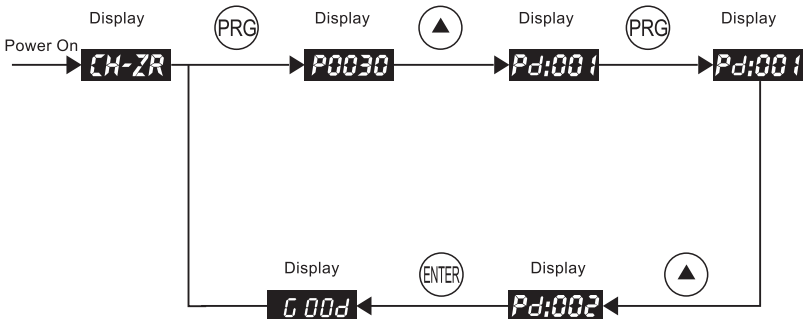
Chapter 4 Operation and Function Sheet

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 defaul t setting of the product operation mode is operation panel control.

● The value of rated power current Po should be set to the same as the one on the motor's specifications label.

● Press 🔘RUN to start the motor and press 🔘STOP/RESET 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 P6 (current mode is valid)to raise the torque of the motor .

● Be sure the motor rotates in the correct direction.

Only after mak ing sure there i s 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℃, please restart the machine after it is energized and preheated more than 10minutes.

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 dalay 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%	400%	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 20 .
P9	Under voltage protection	40-90%	80%	Protection will be action when lower than the setting value.
PA	Overvoltage Protection	100-140%	120%	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	2	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 24 for more details
PF	Parameter modification permission	0-2	1	See Page 24 for more details
PH	The communication address	0-63	1	Use multiple soft starters
PJ	Baud rate	0-5	3	See Appendix
PL	Verification settings	0-5	1	See Appendix
PP	Programmable Output	0-19	7	See Page for 25 for more details
PU	The soft stop current limiting	20-100%	80%	See Page for 26 for more details
Po	Motor Rated Current	11-1200	Rated Value	Current Value for input motor
Pr	Motor under load protection	0-99	0	See Page 26 for more details.

Note:

1) The Maximum of workin g current of Item P7 is calculated the maximum sustainable running current according to the load of the motor based on Po 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) Pres s (ENTER) Key to start the machin e when the power is on , The setting parameter (Except PP) 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 PB 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: 0S

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 ou tput 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 re duced or e ven remove d, 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.
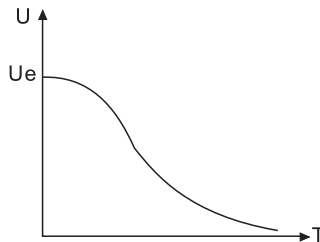
2）Free Stop

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 Po)= peak current (unit: A) that is limited by a motor softer 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 Po . 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 Po.

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. "11" 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.
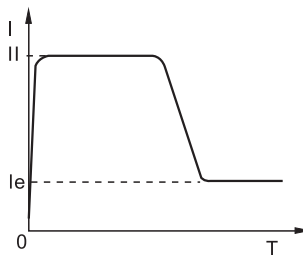
2) Voltage Ramp Start

① When the code PB is set to "1" (voltage), then voltage start mode is sele cted. The figure below is a waveform of output voltage during voltage limiting ramp start. U1 in the figure is the starting inception voltage. When the motor is started and its current does not excess 400% of its rated value, the output voltage of soft starter will jump up to U1, then the output voltage will rise gradually as the set starting parameter, and the motor will acc elerate with voltage rise. When the voltage reaches the rated voltage Ue, 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 s mooth ly to com plete sta rting process thro ugh the control over output voltage but not t hroug h the mec hanic al control over tim e (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 oc casion where there is no strict requirement on starting curre nt but a high requ irement on the stability of starting.