ZHYI

Easy to start

ZYR6 series Bypass type soft starter
Operation guide manual

Zhejiang Zhongyi Automation Technology Co., Ltd.

Foreword

Thank you for you purchase our company's Chinese language intelligent type motor soft starter. This product used in soft start and stop control of three phase asynchronous motor. Please read and understand the contents in this specification carefully before use, convenient to correctly use.

Content

Intelligent soft starter

1. The relate items before use

1-1 Cargo arrived inspection

Please unpack to check the below items after you received the purchased equipment, please contact the agent of your purchased equipment or after sales service department of our company if you found the product has problems or not accordance with you ordered specification.

```
ZY   R   6   □□
```
- Rated power
- Design serial number
- Soft starter
- Enterprise code
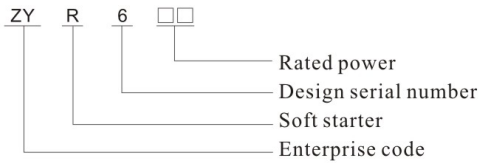
① Verify whether parameters on the data plate of soft starter accordance with you ordered specification.

② Check whether the appearance has any damage during transporting, example outer shell and machine shell bending and folding, parts and components damaged or fallen, etc.

③ Except the soft starter, we still configured operation specification and qualified certificate, each one set.

1-2 Product appearance

(L21、L22、L23)
Connect bypass contactor

(R、S、T)
Power supply wire inlet terminal

Machine base

Keyboard panel

Electric circuit plate control box

Control electric circuit terminal

Data plate
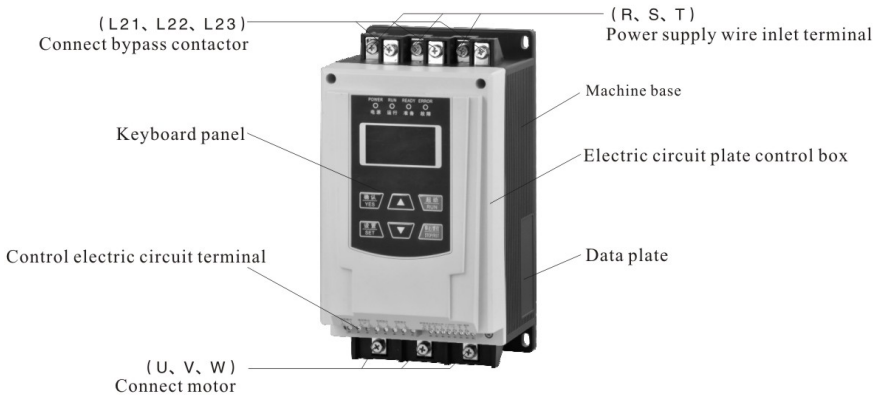
(U、V、W)
Connect motor

2．Installation and connection

2-1 Use environment

Install environment requirements

Table 2-1-1

Accordance standard	GB14048.6
Three phase power supply voltage	380 ±15%, 660 ±15%
Frequency	50Hz/60Hz
Suitable motor	Mouse cage type three phase asynchronous motor
Start frequency	Advise not exceed 20 times per one hour
Anti shock	15g/11ms
Anti vibration capacity	Altitude under 3000m, vibrate force device under 0.5G
Environment temperature	-30℃~55℃
Environment humidity	Under 95%, no condensation or water drips
The max working height	Not reduce capacity within 1000m (above 1000m, current reduce 0.5% when increase each 100m)
Cooling method	Natural air cooling

2-2 Install method

① The soft starter should be vertically install, please don't reversely install, incline install or horizontal install. Should use screws to firmly install on the firm structure.

②The soft starter will generate heat when running, need design to remain a certain space shown as figure 2-2-1 to make ensure smooth cooling air. The generated heat upward send out, so don't install it under the equipment which not anti heat.
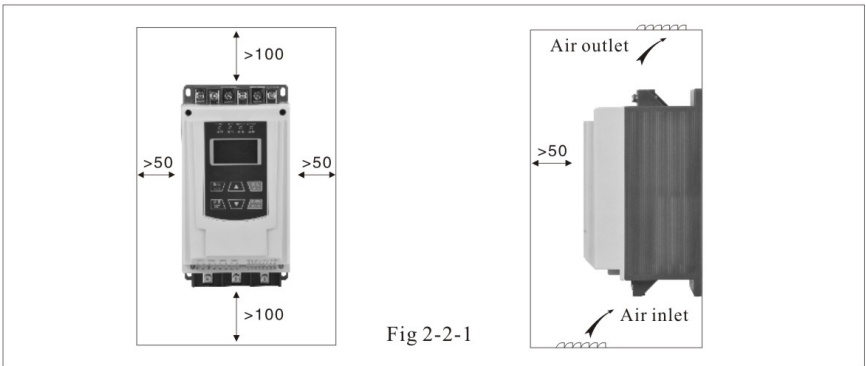
Fig 2-2-1

2−3 Connection

Must attention at the below each item instruction (shown as figure 2-3-2) when wiring:

① The power supply must be connected to the power supply terminal of main electric circuit, if error connect the power supply then will damage the soft starter. R, S and T no phase sequence requirements.

② Both end of wire must process that press connection treatment, guarantee the high reliability of connection.

Fig 2-3-1

Basic connect diagram

Main electric circuit part

Bypass contactor (KM)

5 6
3 4
1 2

Breaker (MCCB)

L23
L22
L21

Power supply
3 phase
380V~
50/60Hz

L3   T   W
L2   S   V
L1   R   U

M

FU

+DC12V

Full voltage output

N or L3   A1 [KM] A2

1
2

K3
Ue=
100%

9   Moment stop
10 Stop
11 Start
12 Public terminal

Delay output (programmable)

3
4

K2

Failure output

5
6

K1

13 −
14 +   Imitate output
          (DC 4-20mA)

15 B
16 A   RS485 communication
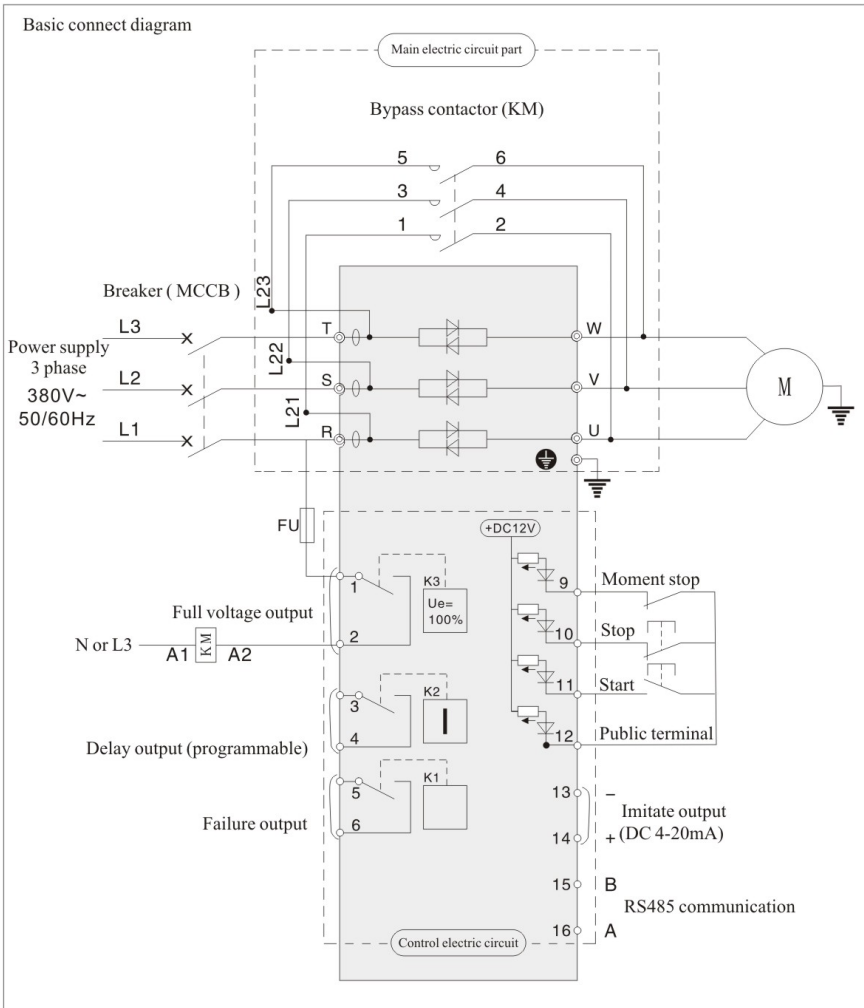
Control electric circuit

2-4　Main electric circuit connection

Table 2-4-1　Main electric circuit terminal function

Terminal marks	Terminal name	Instruction
R. S. T	Main electric circuit power supply input	Connect three phase power supply
U. V. W	Soft start output connection	Connect three phase motor
L21. L22. L23	Bypass connection	Connect bypass contactor

(1)Power supply input terminals of main electric circuit (R, S, T)

①Power supply terminals of main electric circuit R, S, T connected to three phase AC power supply through protection used breaker or breaker with electric leakage protection, needn't consider the connect phase sequence.

②Never adopt the method that main electric circuit power supply ON/FF method to control the soft starter run and stop, select and use the control terminal on soft starter or RUN key and STOP key on the keyboard panel to control soft starter run and stop after soft starter power on.

③Don't connect to single phase power supply.

(2) Soft start output terminals (U, V, W)

①Connect soft start output terminals to three phase motor according to correct phase sequence. If incorrect revolve direction of motor then can change wiring of any two phases of U, V, W.

②Output side of soft starter can't connect the in phase capacitor and surge absorb device.

③50m。The distribution electric capacity will generate more bigger high frequency current when very long wire between the soft starter and motor, this maybe caused soft start over current tripping, increased leakage current and bad current display precision, etc. So, advise the connect wire of motor not exceed 50m.

(3)Bypass connect (L21, L22 and L23)

Bypass connect terminals L21, L22 and L23 must connect the bypass contactor.

Soft starter finish start, main circuit power apparatus (controllable silicon) withdraw, at the same time, bypass contactor working, now the motor put into normally running.

⚠️ **Dangers**
- Confirm whether data plate parameters of soft starter accordance with actually selected model.
- AC power supply can't connect to output terminal (U, V, W).
- Must connect the bypass contactor, phase sequence connection be in accordance. **Otherwise, it maybe happen hurt accident.**

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Power supply three phase 380V ~ 50/60Hz

L1 L2 L3

Breaker (MCCB)

L23

L22

L21

R   S   T

1   3   5

Bypass contactor (KM)

2   4   6

Operation control panel

16 pieces outer connect control terminal

U   V   W

Note: in six pieces input copper rows,
R, S, T connect breaker,
L21, L22, L23 connect bypass
contactor.

Motor

Three phase asynchronous motor
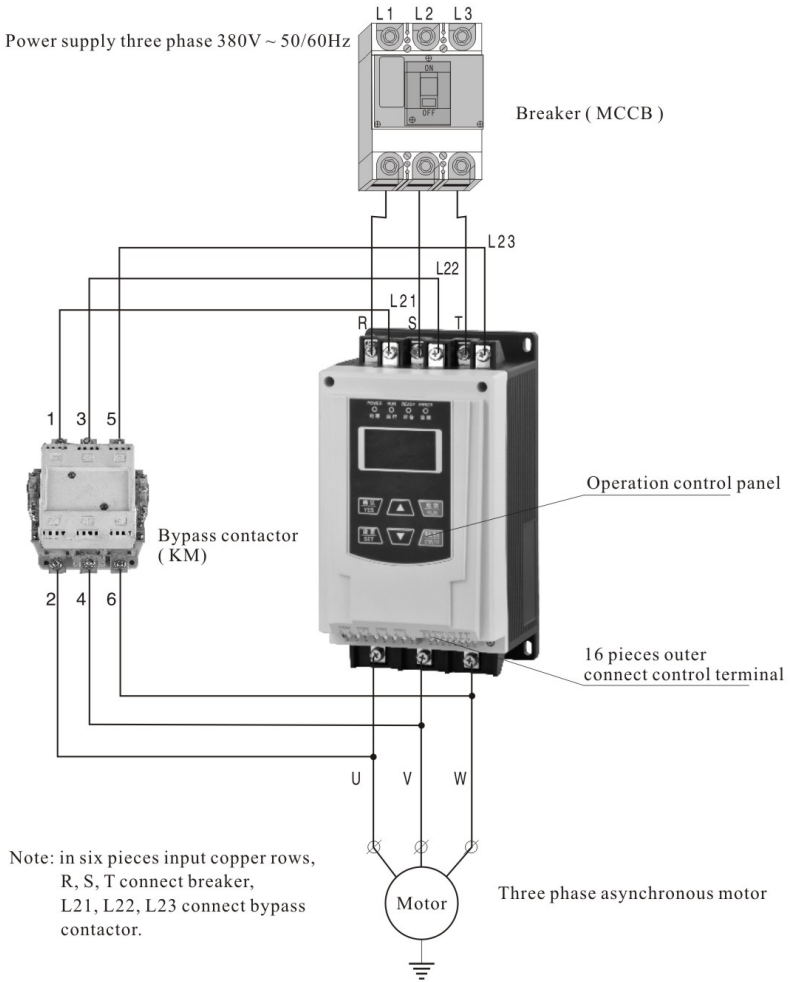
Main circuit wiring diagram

Intelligent soft starter

2-6 Terminal configuration diagram

(1) Main electric circuit terminal

5.5kW~55kW

Connect bypass contactor
(L21、L22、L23)

Power supply inlet terminal
(R、S、T)

Connect motor
(U、V、W)

G

75kW~630kW

Connect bypass contactor
(L21、L22、L23)

Power supply inlet terminal
(R、S、T)

Connect motor
(U、V、W)

(2) Control circuit terminal diagram

Bypass output | Program output | Failure output | Short circuit output | Moment stop | Stop | Start | Public | DC4-20mA output | RS485 communication

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯
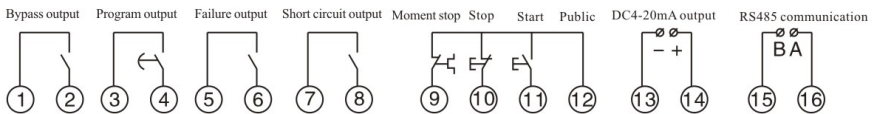
(3) Wiring terminal meanings instruction

| Terminal number	Terminal meanings	Input/ output	Detail instruction	Capacity and remark
① — ②	Bypass output	Output	Used to control bypass contactor, internal configured contact closed after start successfully. Internal configured contact open when send out stop order.	Normally open non source contact online type needn't contactor
③ — ④	Program output	Output	Output definition set by the parameter setting item FE, act when output validly.	Non source contact Able to define
⑤ — ⑥	Failure output	Output	Close when not power on, close when soft starter happen failure, open when start and running.	Non source contact
⑦ — ⑧	Short circuit output	Output	Open when not power on, close after soft starter power on and thyristor both ways happen short circuit failure, use to control breaker tripping.	Non source contact

Terminal number	Terminal meanings	Input/output	Detail instruction	Capacity and remark
⑨ — ⑫	Moment stop	Input	Outer protection device connect ⑨ – ⑫ in, short connect when no outer protection device connect in	Source terminal Non source input
⑩ — ⑫	Stop	Input	Break ⑩ – ⑫ after start and stop machine, open when at failure and reset	Source terminal Non source input
⑪ — ⑫	Start	Input	Crawl to close ⑪–⑫ when at ready status, soft starter start	Source terminal Non source input
⑬ — ⑭	DC4–20mA outpu	Output	4mA corresponding to 0A current of motor; 20mA corresponding to 2 times motor rated current.	DC output
⑮ — ⑯	communication	Input/output	The host computer able to process parameter setting and agreement operation through Modbus, transmit real time parameters, status and failure report.	Modbus Communication joggle

（4）Control electric circuit terminal wiring
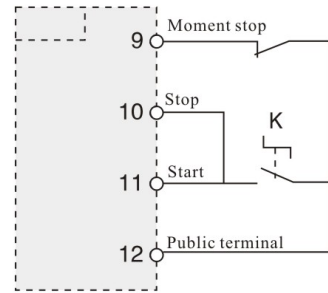
Three wire control method

Two wire control method

9 Moment stop

10 Stop

11 Start

12 Public terminal
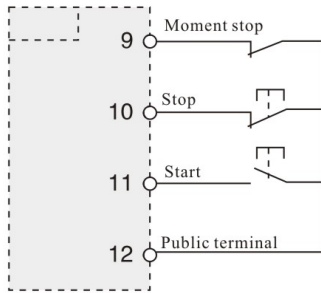
Wire of control terminal 0.75~1.25mm^2

9 Moment stop

10 Stop

11 Start

12 Public terminal

K

K close is start running, broken is stop

（5）Electric relay and different places control wiring diagram

Electric relay control method
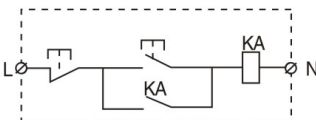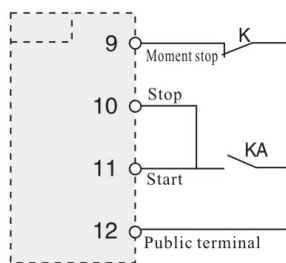
Different places control method

9 Moment stop   K

10 Stop

11 Start   KA

12 Public terminal

9 Moment stop   K

10 Stop

11 Start   KA

12 Public terminal

L   KA   N
    KA

L   KS   KA   N
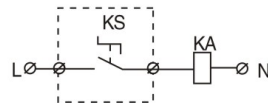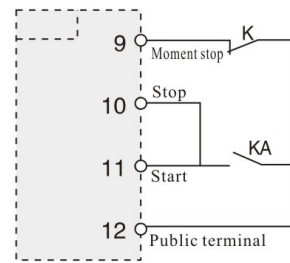
K is connect the normally close point of other protector (example thermal protector), short connect when leave factory.

3．Running

3-1　Check and preparation before running

Should check the below each item before running:
①Verify whether wiring correct. Especially that output terminal can't connect the power supply, whether connect bypass contactor well and confirm that grounding terminal grounded well.
②Confirm no short circuit or grounded short circuit situation among terminals or naked position with electric.
③The keyboard panel should display Ready start after connect in power supply.

3-2　Running method

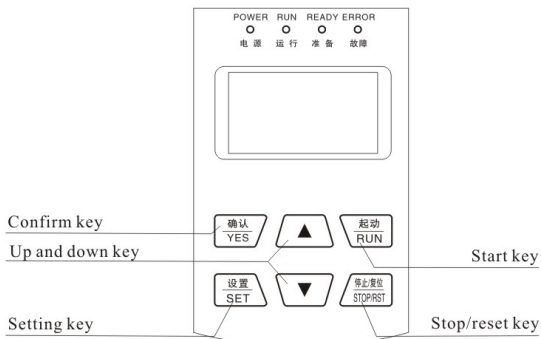Select the most suitable operating method according to the running stipulates in application requirements.
・Able to trial running after confirmed no abnormal situation. Setting value is keyboard panel plus outer control running method when product leave factory.
・Input the motor data plate parameters into soft starter, convenient to validly protect the motor.
・Press running key start RUN when running, press stop key stop/reset when stopping.
・Whether revolve direction of motor accordance with requirements.
・No enough motor start torque then can change the Start voltage (voltage mode valid), or limit current value to improve the torque of motor (current mode valid).
・Whether motor revolving steadily (no whistle sound and vibration).
・Confirm no any abnormal situation first then can put into running formally.
Attention:Should power on and preheat above 30minuts then start when field environment temperature lower than -10℃.

4．Keyboard panel

4-1　Keyboard panel appearance

The keyboard panel has rich operation functions, example the keyboard panel running and stop function, data confirmation and change, and various types status confirm functions, etc.

POWER RUN READY ERROR
电 源 运 行 准 备 故障

Confirm key — 确认 YES
Up and down key — ▲
Setting key — 设置 SET
Start key — 起动 RUN
Stop/reset key — 停止/复位 STOP/RST
▼

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Table 4-1-1 Functions of operation keys

Key name	Main functions
起动 RUN Start key	Display| ready start|press this key and start running, display the start status at the same time [Starting Currently current: 016.0A]
停止/复位 STOP/RST Stop/reset key	1.It will display the actual current value when normally running, press this key to stop. Stop finish display|Ready start| 2. This key has the function to reset failure status.
设置 SET Setting key	Display Ready status|Ready start|press this key and enter into menu setting, display [Setting: start voltage 30%] Press this key again, now can press up and down key ▲ ▼ to modify the parameters.
确认 YES Confirm key	1.Modify the parameters well, press this key to save, display [Parameters saved] and send two sound, means the data already saved, press this key or stop key again then withdraw. 2. Press this key 确认 YES then power on, able to make setting parameters recover the leave factory value.
▲ ▼ Up and down key	1. Enter into menu setting, press this key to modify parameters. 2. Press this key during running then can observe the A running current, P power, H overload thermal balance display.

・The final one byte decimal point lighting when data>999 three bytes number, means mantissa add 0.

・There will has remind sound in the soft starter when press the keys, otherwise, invalid to press this key.

・The keyboard panel able to be pick down, (place outside the cabinet body and use as operation)lead wire distance<3m.

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5．Operating steps

5－1 Modify setting parameters

| Power on | → | Press setting key | → | Press setting key | → | Press setting key | → | Press up/down key | → | Press confirm key |

Enter into code options　　Select code function　Confirm modify code　　Modify setting range　　Remain modify data (withdraw)
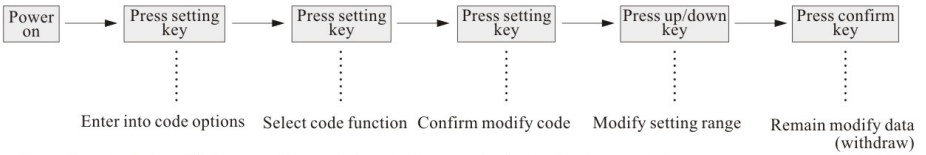
Example make that modify the operation control method as sample of outer terminal control.

S/N	Operation	Display	Instruction
1	Power on	Ready start	Ready status
2	设置 SET Press setting key	Setting: start voltage 30%	Enter into function code option status
3	▲ 10 times press the up key	Setting: control method Keyboard+outer control	Enter into control method function option status
4	设置 SET Press setting key	Setting: control method Keyboard+outer control	Means that able to modify the setting range
5	▲ One time press up key	Setting: control method outer control	Means outer terminals control
6	确认 YES Press confirm key	Parameters already saved	Already remain modified data (withdraw), ready to start

Buzzer in soft starter has sound reminding when operating keyboard.

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6．Profile and installation size

6-1 5.5kW~55kW

Front	Side	Base

6-2 75kW~200kW

Front	Side	Base

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Front   Side   Base
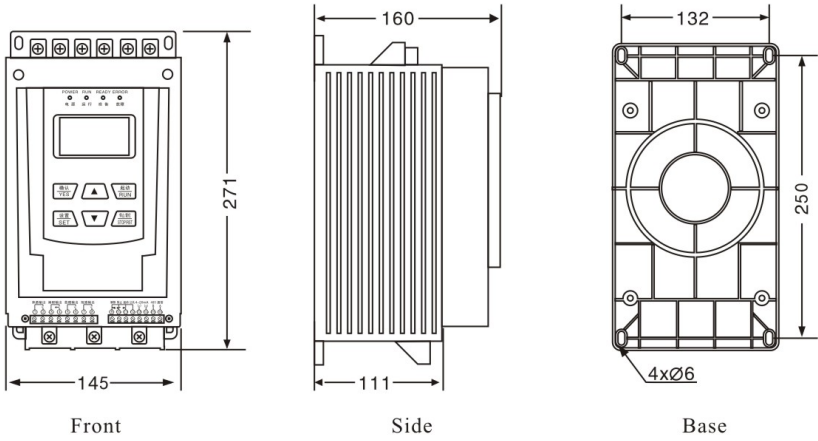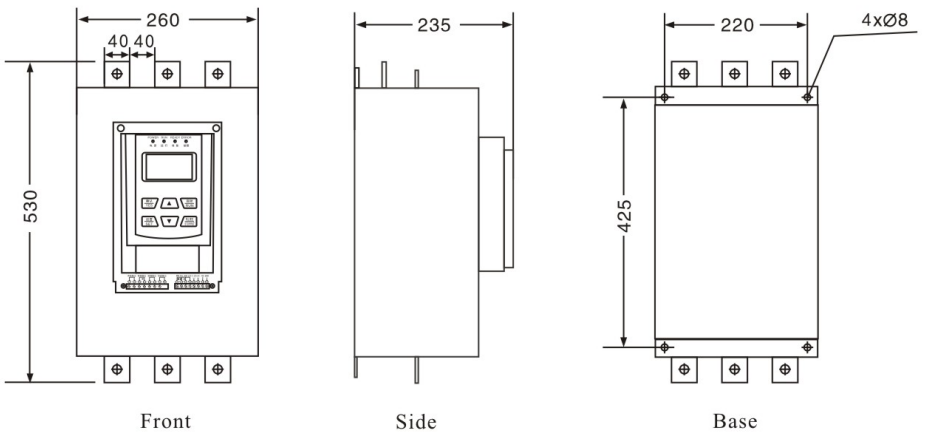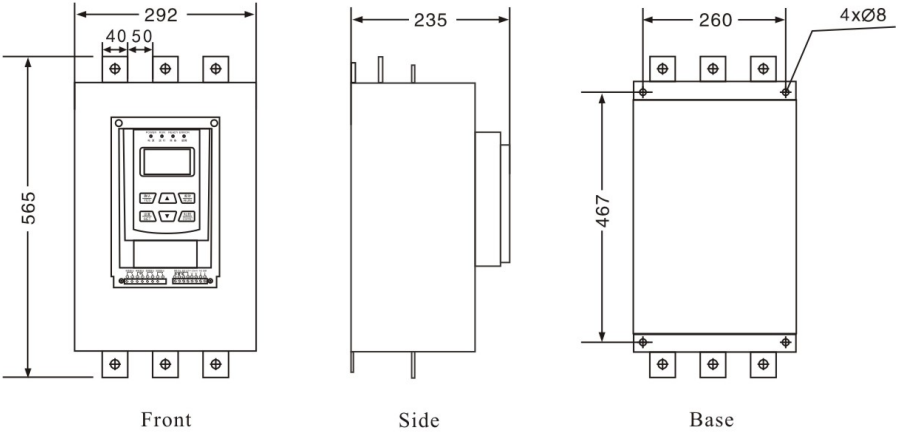
Note:
①If has changes at size, please subject to the entity;
②The profile size of soft starter at 300kW and above subject to the drawings which provided by our company.
③Attention at the interval distance of copper rows when installing.

7. Basic functions

7-1 Parameters setting functions

Function code	Name	Setting range	Leave factory value	Instruction
F0	Start voltage	30%–80%	40%	Voltage incline mode valid; Current mode start voltage is 40%
F1	Soft start time	02–60S	16S	Voltage mode valid
F2	Soft stop time	00–60S	0S	Freely stop when set at 0
F3	Start current Protect time	00–60S	00S	Start over current protection during start motor and the time of 3 times of rated current exceed this parameter setting value
F4	Program delay	00–999S	00S	Used into programmable electric relay output
F5	Start limit current	50–500%	400%	Limit current mode valid; The max limit current value of voltage incline mode is 400%
F6	The max working current	50–200%	100%	Opposite to value of rated current FP
F7	Lack voltage protection	49–90%	70%	Lack voltage protection when lower than setting value, close this function when set at 49%
F8	Over voltage protection	100–131%	120%	Over voltage protection when higher than setting value, close this function when set at 131%
F9	Start mode	00–06	01	00 limit current; 01 voltage; 02 step+limit current 03 step+voltage; 04 current incline; 05 double close ring; 06 full voltage
FA	Protection level	00–05	04	00 initial level; 01 light loading; 02 standard; 03 heavy load; 04 senior
FB	Control method	00–06	01	00 keyboard; 01 keyboard+outer control; 02 outer control; 03 outer control+communication; 04 keyboard + outer control +communication; 05 keyboard + communication; 06 communication
FC	Parameters modification allowed	00–02	01	00: forbid to modify any parameters except setting item FC; 01: forbid modify parameters of F4. F5. F6. FD. FE. FU. FL. FM. FN; 02: allow to modify
FD	Communication address	0–64	00	Used to set MODBUS local sub station address
FE	Program output	00–19	06	Used to define ③-④terminals output, the details check instructions in section 7-2
FF	Soft stop limit current	30–100%	80%	No detail instruction
FP	Motor rated current value		Rated value	Used to input the nominal rated current value of this motor
FU	Bypass delay	1–40S	5S	Used to set delay time of bypass
FL	Three phase unbalance	00–01	01	00: three phase unbalance protection forbid, 01: allow three phase unbalance protection
FM	Current ratio	50–150%	100%	Used to adjust and debug display current value
FN	Voltage ratio	50–150%	104%	Used to adjust and debug display volt

Remark: the max working current of setting item F6 means that calculated continue running max current of motor based on FP setting value, will process reverse time limit thermal protection when exceed this value.

2. If no key operation exceed 2 minutes under setting status then will automatically withdraw setting status.

3. Can't set the parameters during soft start and soft stop, all can set the parameters under other status.

4. Press [Confirm] key power on and start machine, then can make the setting parameters recover leave factory value.

7-2 Function selection and instruction

7-2-1 Code FE (program output)

Programmable electric relay output function has two working methods:

①Means the programmable time sequence output method and programmable status output method

②Programmable output working is time sequence output method when set item FE is 0~4 (10-14), set the start time of output as the below table:

FE set value	0(10)	1(11)	2(12)	3(13)	4(14)
Program output time	When send order	When start	When bypass running	When sent stop order	When stop machine finished

Note:

●This working method include one 999s timer, set by setting item F4. If F4 not be 0 then start timing according to the set start time of setting item FE. Output change status when timing arrived, if setting item F4 is 0 then change the output status immediately. The reset time of this output is press F4 to set time, delay to finish is maintain 1s again under prepare status.

●Output when programmable is make one time start process as control period, if start motor again then automatically break the last one time program output process and restart this process.

③Programmable output (FE) working at status output method when setting time FE are 5~9 (15-19), set the working status output, shown as the below table:

FE set value	5(15)	6(16)	7(17)	8(18)	9(19)
Output indicate status	Motor failure status	Running status	Prepare status	Start status	Bypass status

・Programmablestatus output method used to indicate the working status of soft starter, the setting time of setting item F4 (program delay) under this method invalid. Programmable output at failure status means the electric failure (Failure number 05, failure number 06, failure number 07, failure number 08, failure number 12, failure number 15), it different to functions of ⑤, ⑥failure output terminal, running status means non prepare or failure status, it include three processes at start, bypass and soft stop.

・Programmable output fix position status of #③, ④ outer connect terminals when FE>9, change to be normally close from normally open, means reverse phase output. Flexibly use programmable electric relay output function able to validly simplify the periphery control logic circuit.

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7-2-2 Code F0 (start voltage) F1 (Rising time)

They are start control parameters under voltage mode, rise start voltage favour to overcome the static friction when load start; but more bigger load inertia more longer rising time (shown as fig 7.1)
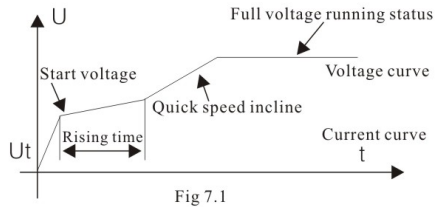
Fig 7.1

7-2-3 Code F2 (soft stop time)

Freely stop when stop machine time set at 0, too long stop time will bring unstable system (shown as fig 7.2).
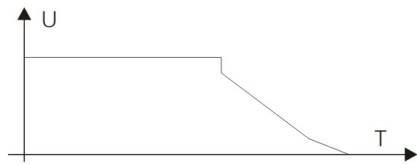
Fig 7.2

7-2-4 Code F5 (start limit current)
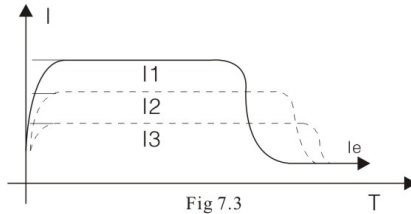
Fig 7.3

Code F9 must set at 0 or 2 or 4 when use this function, the start current of starter will running under setting value (50%-500%). The current will reduce to under rated value after start finished, more bigger setting value more shorter start time. Attention this value setting can't be too small, too small then will occur the "Too long start time" failure (shown as fig 7.3).

7-2-5 Code F6 (load adjustment ratio)

Should set the load adjust ratio again when user selected and used soft start rated parameters not match the actual motor, and to make protect function and display parameters correct.

Load adjust ratio define $KT = \dfrac{Ps}{Pr} \% Ps$ as actual motor rated current, Pr is soft starter rated current

Example: user motor is 200A, selected and used start rate current is 400A, then setting value of code F6 change to be 50%.

7-2-6 Code F9 (start mode)

Soft starter has 7 types start modes to suit various complex motor and load situation, the user able to select according to different application situation.

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Limit current start mode:

Set the start mode is this mode when set item F9 is 0.

Fig 7.3 provide the motor current change wave of limit current start mode. Among, I1 us the set start limit current value, output voltage rapidly rising when motor start, till motor current achieved the set limit current value |1, and keep the motor current not bigger than this value, then motor gradually accelerating along with output voltage gradually rising, output current rapidly reduce to motor rated current 1e or below when motor arrived the rated speed, start process finished.

The max current when starting also maybe unable to achieved the set limit current value are belong to normal when more light motor load or set limit current value more bigger.

Generally, the limit current start mode used in the place where has strict limit requirements at current.

01 Voltage incline start mode:

Set start mode is this mode when setting item F9 is 1.

Fig 7.1 provide the output voltage wave of voltage incline start. The output voltage of soft starter rapidly rise to start voltage value when motor start and motor current not exceed the range within 400% rated value, then output voltage gradually rising according to the set start parameters, motor continue steadily accelerating along with voltage rising, motor achieved rated speed when voltage achieved rated voltage Ue, start process finished.

Start time is the obtained control parameters under the standard condition according to standard load, the controller based on this parameter, make motor steadily accelerate to finish the start process through control the output voltage, not mechanically control the start time value, no matter whether motor acceleration is stable. Herein, the start time always less than setting start time when more light load, able to smoothly start then belong to normal.

02 or 03 step start mode:

Setting start mode is this mode when setting item F9 is 2 or 3.

Fig 7.4 and 7.5 provide the output change wave of step start mode. Able to select this mode under some heavy load field when unable to start motor because mechanical friction affection. Able to add one more higher fix voltage and continue a limit period time first when starting, to overcome the static friction of motor load and make motor rotating, then start according to the limit current (fig 7.4) or voltage mode (fig 7.5) methods.

Should firstly use non step mode to start motor before use this mode, select this mode if motor unable to rotate because too big static friction; otherwise, should avoid to adopt this mode to start to reduce unnecessary big current shock.
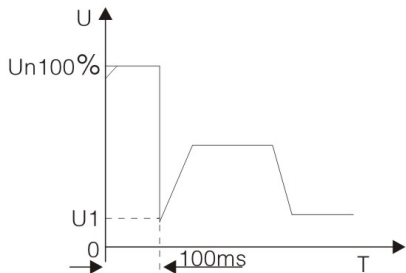
Fig 7.4
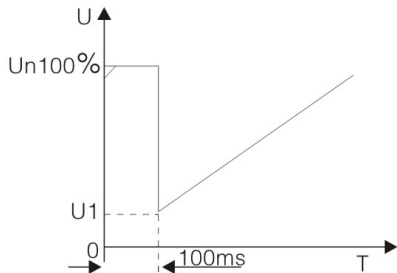
Fig 7.5

04 Current incline start mode:

Set start mode is this mode when setting item F9 is 4. Fig 7.6 is the output current wave if current incline start mode, among, 1 is the limit current value which set by F5, T1 is the time value which set by F1.

Current incline start mode has more stronger accelerate capacity, suitable to two poles motor, also able to shorten the start time in a certain range.
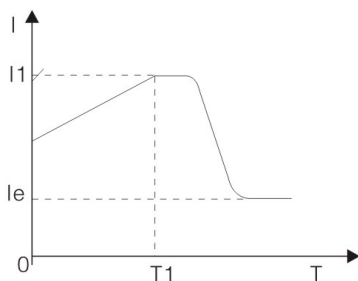
Fig 7.6

05   Voltage limit current double close ring start mode:

Set the start mode is this mode when setting item F9 is 5.

Voltage limit current double close hoops start mode adopt voltage incline and limit current double close hoops circuit control, this is one syn start mode not only required steadily start but also required strictly limit current, it adopted the predict algorithm at estimate motor working status.

The output voltage wave of this starting mode will has changes according to different motor and load situation.

06 Monitor start mode:

Start under this mode will running at the direct starting method. Able to process parameters monitor at the motor running current, failure output 5.6 terminals broken output when running overload, over voltage or lack voltage, display the corresponding failure information at the same time.

7－2－7 Code FA (protection level)

The protector set five protection level to suit different application areas, they are 00: initial level, 01: light load, 02: standard, 03: heavy load, o4: senior, setting by the setting item FA. Among:

● Initial level protection only remained the input lack phase protection when overheating, short circuit and starting, suitable to the field where need unconditionally emergency start.

●Light load, standard and heavy load three protection level have complete protection function, the difference is different motor overload protection time curve. The motor thermal protection time parameters check the below table and fig 7.7.

● More strict protection standard when senior protection starting, other protection functional parameters same to the standard protection setting time.

●According to the different protection level and thermal protection time which set by setting item FA, shown as the below table:

FA setting	0(Initial level)	1(Light load)		2(Standard)		3(Heavy load)		3(Senior)			4(Instruction)
Running overload level protection	Non	Level 2		Level 10		Level 20		Level 10			According to standard IEC60947-4-2
Start over current protection time	Non	3s		15s		30s		15s			Count according to start current 5 times exceed F6 setting
Running overload trip time	Current times(l/le)	3	4	5	3	4	5	3	4	5	3	4	5	Value in table is typical value
	Trip time(s)	4.5	2.3	1.5	23	12	7.5	48	23	15	23	12	7.5	

Should set the specification of soft start according to requirements of motor rated current and rated voltage.

● The curve of motor thermal protection trip time according to standard IEC60947-4-2 as below:
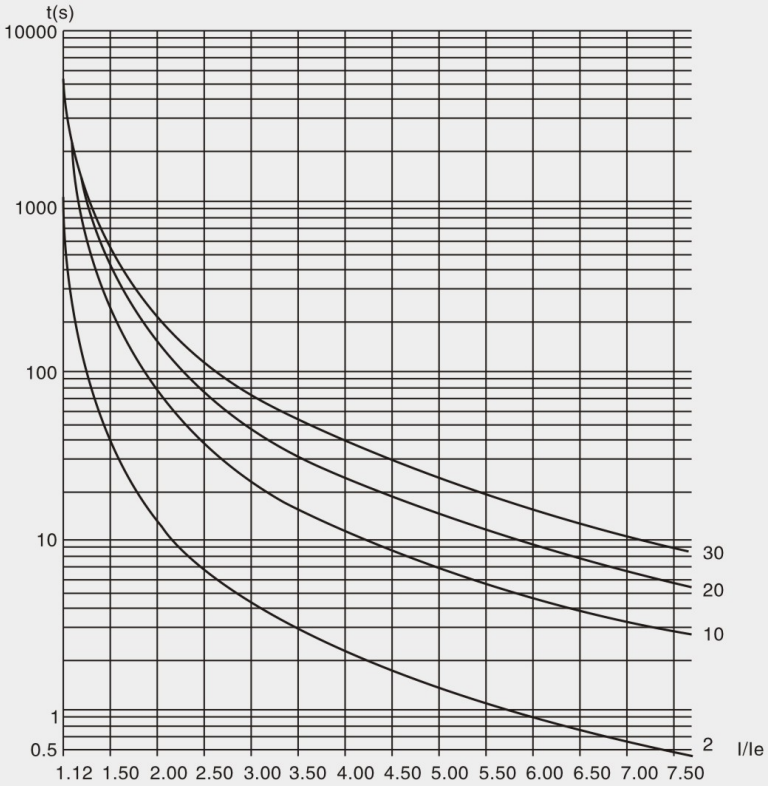

Fig 7.7

Intelligent soft starter

8. Failure code table and treatment method

Protection function act when soft starter happen abnormal, trip immediately, LCD display alarm name.

Display and instruction	Problem and treatment method
Failure code 00 Failure released	Just happened the failure such as lack voltage, over voltage or overheat, abnormal now, able to start motor after reset.
Failure code 01 Outer connect moment stop terminal open circuit	Short circuit connect the outer control moment stop terminal ⑨ and public terminal 12, or connect to the normally close contact of other protection device.
Failure code 02 Soft starter overheat	Too frequent start or motor power not match with soft starter.
Failure code 03 Too long soft start time	Too low limit current value make start time too long (bigger than 60s)Start parameter setting unsuitable or too heavy load, no enough current capacity, etc.
Failure code 04 Input lack phase	Check whether input or main circuit failure, bypass contactor block at close position and whether controllable silicon are open circuit, etc.
Failure code 05 Input lack phase	
Failure code 06 Three phase unbalance	Check whether input three phase power supply and load motor are normal.
Failure code 07 Start over current	Whether too heavy load or motor power not match with soft starter.
Failure code 08 Running overload protection	When starting: ①Check and correct the reason caused overload, check whether set too low limit current times; ②Check rising voltage time not be too long when starting; ③Check whether use the suitable motor overload category; ④Check whether parameter setting current are correct; When connect running: Check and correct the reason caused overload
Failure code 09 Tow low power supply voltage	Check whether input power supply voltage or parameter setting of setting item F7 are incorrect
Failure code 10 Tow high power supply voltage	Check whether input power supply voltage or parameter setting of setting item F8 are incorrect
Failure code 11 Setting parameter error	Modify setting parameter or press [Confirm] key, power on to start machine and recover leave factory value
Failure code 12 Load short circuit failure	Check whether load or controllable silicon short circuit or too big load
Failure code 13 Thyristor tube short circuit failure	Check whether thyristor tube short circuit or whether temperature control switch damaged
Failure code 14 Stop terminal wiring error	Outer control stop terminal be at open circuit status when allow outer connect method, thus unable to start motor.
Failure code 15 Motor load failure	Check the lack load reason and process correction Check whether setting according to running condition

Remark:

1. some failure appearance are mutually linked, example failure code 02 soft starter overheating maybe relate to start over current or load short circuit, so, should syn and completely consider when checking failure, accurately judge the failure point.

2.When soft starter start motor successfully then means it already be at running status, now display "Running..."

9. Common problems and policies

Abnormal appearance	Check content	Adopted policies
Motor not revolving	Whether wiring has abnormal, Whether power supply wire connect to input terminals (R, S, T)	Please wiring correctly Connect power supply Cut off power supply then connect again
	Whether bypass contact working when select bypass running method Whether 01, 02 terminals connected	Check bypass contactor connection Check bypass contactor coil connection
	Whether keyboard has abnormal display	Please check function application and failure treatment instruction table
	Whether motor been locked (whether load too heavy)	Please unlock motor (lighten load)
Keyboard can't start	Whether keyboard display 09, whether terminal 12 open circuit, whether code FB setting normal	No: whether power supply lack phase, check wire inlet power supply Yes: whether 12 and 09, 10 at open loop, Check terminal outer wiring, correctly set FB code.
Outer control can't start	Whether code FB set at outer control	Terminal 12 and 09,10 have open circuit, Check terminal outer wiring, Correctly set FB, whether at outer control position
Though motor revolving but speed no change	Whether too heavy load;	Please lighten load Rise start voltage, amplify soft start power; Adjust and debug the display current
Too long start time	Too heavy load Not set code well Whether motor specification normal	Please lighten load Please set F0 (start voltage), F5 (start limit current), F1 (soft start time) Please check specification and label
Too short start time	Light load Too short start time	Light load start time always less than setting value, start balance belong to normal setting code F1 start time (current mode invalid)
Suddenly stop during running	Check outer input terminal	Check whether 09, 12 terminal connection are loosen If has outer connect protector then please check whether normally close point act Check whether outer stop button connect wire are loosen.
Motor has WENG sound, no start signal, but motor	•Controllable silicon short circuit and been breakdown •Start button abnormal	Check and renewal Check and correct the reason caused accident
Abnormal motor sound during start and running	•Motor lack phase	Trial use different reduce voltage time (able to process several times adjustment to obtain ideal effect)
Motor unable to start if use outer control to start	•Control connection incorrect •Start and stop signal send out at the same time •Keyboard be at local control menu	Check connect wire of start and stop Check whether signal of start and stop sending at the same time Check whether keyboard be at local control menu Check whether wire control in parameter not be activated
Motor not start when use bus line communication input start information	•Bus line parameter setting	Check whether already activated bus line control Check whether use it Check whether programmable input set correctly

10. Modbus communication agreement

10-1 Summary relate to ModbusRTU communication agreement

Modbus is one series asynchronous communication agreement. The physical joggle RS485. Modbus designed for modicom PLC, it has the structure characteristic of PLC. Modbus able to make this soft starter as one set PLC to read and write it in network control. This soft starter project the start-stop control, status information (current and failure) and function parameter into remain register area (4XXX). Process read and write control it through PLC main station when using.

10-1-1 Electric joggle

Rs485 semi duplex

Communication parameters: Baud rate: 9600; 8 bytes data bit; no check bit; 1 byte stop bit.

10-1-2 Communication data format

Address code	Function code	Data area	CRC check
1 byte	1 byte	N byte	2 bytes

10-2 Relate setting of soft starter

10-2-1 Register address

Register address	Operating code	Register function instruction
40001	06	Control word
40002	03	Status word
40003	03	Current average value
40004	03	Failure code
40256–40273	03&06	Soft starter function code
40274	03	Rated current specification
40275	03	Rated voltage specification
40290	03	Power supply voltage value

(1)Above registers not be listed out are illegal, unable to write and read. Otherwise, sub station will report one additional situation code to controller.

(2)All data address are refer to 40000. Means the address of coil electric relay 40001 is 0001, address of 402567 is 0100 (hexadecimal).

10-2-2 Support code

Soft start only support the below code, if use other code then will give additional situation code 01.

Code	03	06
Function description	Read register	Write single register

Code 03 only use single word (WORD) read

10-2-3 Register instruction

● 40001 order register

Bit	Value	Description
0	1	Starter start
	0	Remain status
1	1	Starter stop
	0	Remain status
2	0-1	Make starter reset
3-15	0	Not use

Example: make the soft starter with sub station address 02 and controller send out 02 06 00 01 00 01, is order executed normally then return code 02 06 00 01 00 01. Whether starter able to normally start still need check status register. If has failure existing then should send 02 06 00 01 00 04 to reply.

● Register address 40002 status register

Status register represent the status of soft starter, represent by one word.

Bit	Value	Description
0	1	Starting status
	0	Parking status
1	1	running state
	0	Parking status
2	1	Soft stop state
	0	Parking status
3	1	Fault status
	0	Normal state
4-15		Not used

Example: read status register code 02 03 00 02 00 01

If starter starting then return code 02 03 02 00 01

If starter occur failure then return code 02 03 02 00 08, and able to read failure type according to 4.

● 40003 current average value (hexadecimal)

This value project the three phase actual current average value of motor (include one decimal)

Example: read current size

02 03 00 02 00 01 Send code 02 03 00 02 00 01

If current is 235A, then return 02 03 02 09 2E (return value is actual current value)

● 40004 failure code (hexadecimal)

When byte 3 of status register 40002 is 1, it represent soft start be at failure status. Failure code accordance with 6.1.

Example: send code 02 03 00 04 0001If return 02 03 02 00 04 then means currently lack phase (failure code 04).

Function parameter register 40XXX of soft starter

40256- 40274 are function register, corresponding address is 0X0100-0X0112, high byte address is 01, low byte address is 0X00-0X12, corresponding function code F0-FL, accordance with function code table 4.2. Example address 0X109 corresponding to function code F9 (start mode). Able to read and write these codes. The below sampling to introduce the use respectively:

Sample 1: read size of function code F5 (limit current value)

Send code 02 03 01 05 00 01

Return to read the value of F5 function code 0203 02 015E, means limit current value is 350% Sample 2: read function code FA (Protection level)

Send code 02 03 01 0A 00 01

Return to read value of FA function code 02 03 02 00 0, read protection level is 3Sample 1: modify the soft starter function code 05 (start current) to be 250%

Main machine send code 0206 0105 00 FA, soft start return code 0206 0105 00 FA; if return 02 86 03 then means unable to write in, maybe starter running.

10−3 Abnormal applying

Code	Name	Instruction
01	Illegal function	Function code unable to execute, soft starter not support
02	Illegal data address	Received data unable to execute, address overflow
03	Illegal data	Received data unable to execute 1. Parameters out of limit range 2. Parameters unable to modify 3. Parameter unable to modify when running

10−3−1   IIlegal function code 01

Main station inquiry text format:

Sub station address	Function code	Start address high byte	Start address low byte	Register quantity high byte	Register quantity low byte	CRC check
0x01	0x08	0x00	0x80	0x00	0x0D	

This agreement not used 0x08 function code, so sub station apply:

Sub station address	Function code	Abnormal code	CRC check
0x01	0x88	0x01	

10-3-2 Illegal data address 02

Main station inquiry text format:

Sub station address	Function code	Start address high byte	Start address low byte	Register quantity high byte	Register quantity low byte	CRC check
0x01	0x04	0x01	0x80	0x00	0x07	

Function code register quantity error, so sub station apply:

Sub station address	Function code	Abnormal code	CRC check
0x01	0x84	0x02	

## 10-3-3 Illegal data value 03

Main station inquiry text format:

Sub station address	Function code	Start address high byte	Start address low byte	Register quantity high byte	Register quantity low byte	CRC check
0x01	0x04	0x00	0x80	0x01	0x80	

Function code register quantity error, so sub station apply:

	Function code	Abnormal code	CRC check
	0x84	0x03	

10-4 Operation notices

(1)Communication address of soft starter: communication speed rate and check mode must be same as the communication setting of controller.

(2)If can't receive the responding data then should check the above parameter setting, whether wiring of 485 terminal are correct, whether CRC check is correct.

(3)Should connect 120Ωelectric resistance at both AB end of the final one set when multiply sets soft starter communication.

(4)Should connect according to the below picture when connect with other Modbus equipment:
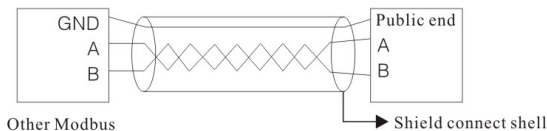
11.　Operation notices and daily maintenance

11-1　Operation notices

● Anti electric shock

The output end still has more related higher response voltage even though at stop status after input end of soft starter connected power supply and when load open circuit or lack phase. Forbid to touch the output end of soft starter, otherwise, it will has electric shock danger.

● Response voltage

The response voltage of output end when soft starter idle is normal appearance, not affect to use. Response voltage generated by controllable silicon electric leakage (controllable silicon, GTR, IGBT and other solidify semi conductor parts all have different degree electric leakage) and dv/dt resistance capacitance filtered back AC circuit. Use voltmeter measure zero, about 100~220V (relate to internal resistance of voltmeter), very small load capacity of this response voltage, disappear after output end connected load.

● Compensate capacitor

The reactive power compensate capacitor which used to improve power factor must connect at input terminal of soft starter, forbid to connect at output terminal, otherwise, it will damage the soft starter.

● Megohm meter

Forbid to use megohm meter measure insulation electric resistance at input/output terminal of soft starter, otherwise, maybe damage controllable silicon and control circuit panel of soft starter.

Able to use megohm meter measure the insulation electric resistance among phase and phase to ground of soft starter, but should use three pieces short circuit wire to short connect the input terminal and output terminal of three phase in advance, and plug off all plugs on the control electric circuit panel.

Also should follow the above principles when measure motor insulation.

● Input and output

Forbid to reversely connect the input and output terminals of main circuit of soft starter, otherwise, it will caused soft starter non predicted actions, maybe damage the soft starter and motor.

● Bypass phase sequence

The start circuit phase sequence and bypass circuit phase sequence phase sequence accordance when use bypass contactor, otherwise, it will happen short circuit among phases when bypass shifting, make air breaker tripping, even though damage equipment.

● Low voltage degree

Terminals 9, 10, 11 and 12 use internal working voltage, forbid to connect other outer power supply on these terminals, otherwise, it will caused soft starter internal apparatus damaged.

11-2 Soft starter daily maintenance

Dust

·If too much dust then will reduce the insulation degree of soft starter, maybe make soft starter unable to normally work;

·Primary circuit creeping, arcing, damage equipment;

·Secondary circuit electric leakage and short circuit, control not working;

·Heat radiator thermal resistance increasing, controllable silicon temperature rising increased.

Clean dust

·Use clean and dry hair brush lightly sweep the dust;

·Use compressed air blow off the dust.

Dew

·If dew then will reduce the insulation grade of soft starter, maybe caused soft starter unable to normally work;

·Primary circuit creeping, arcing, damage equipment;

·Secondary circuit electric leakage and short circuit, control not working;

·Quicken metal components corrosion.

Dry

·Use hair drier or electric stove dry it;

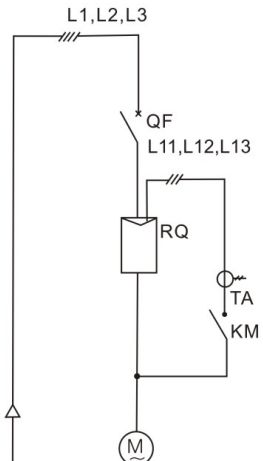·Drying in electric distribution room.

Daily inspection

· Whether screws loosen;

· Whether has plug in components not on position;

· Whether wire elements has too high temperature appearance.

12. Appendix 1:

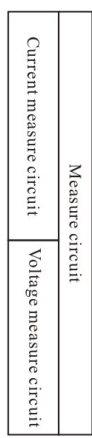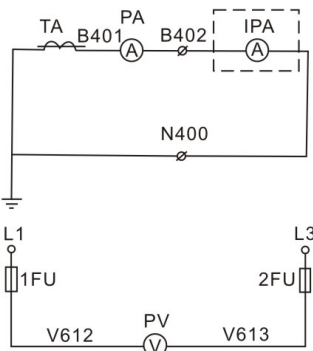### One drag one manual/automatic principle wiring diagram

Primary circuit diagram

Soft starter control terminal instruction:

Bypass electric relay output terminals;   Programmable output terminals;

Failure output terminals;   Moment stop input terminals;

Soft stop input terminals;   Soft start input terminals;

Public joints input terminals;

L1,L2,L3

QF
L11,L12,L13

RQ

TA

KM

M

Primary circuit diagram

TA   PA
B401 Ⓐ B402   IPA
                    Ⓐ

N400

L1   L3

1FU   2FU

PV
V612   Ⓥ   V613

Current measure circuit
Voltage measure circuit
Measure circuit

Go machine beside control diagram

1-1 KM   1-3   1-5 KM   1-7

S/N		Model	Name	Technical	Qty	Remark
13	SA	LW5-16D/2	Shift switch			
12	JX	JF5-2.5	Wiring terminal			
11	1-4FU	LA38-11/20S	Fuse	Fuse core：4A		
10	SB,SS	AD11-22/21-GCZ	Button	Red(SS) Green (SB)		
9	HG,HG	6L2-V	Signal lamp	−220V Red(RR) Green(RG)		
8	PV	6L2-V	Voltage meter	0−450V		
7	IPA		Current meter			User self prepare
6	PA	LMX3-0.66	Current meter	□/5A		
5	PA	LZC1-31	Current transformer	□/5A		Change along with motor power meter
4	BA	17C1-31	Middle electric relay	−220V		
3	BX	CJ2U-□	AC contactor	−220V		Change along with motor power meter
2	RQ		Soft starter	Power：□KW		
1	QF	CM1-□/3300	Breaker	10：□A		

Mark	Qty	Modify document No.	Signature	Date			Drawing rattle mark	Qty	Scale
Design		Standardization			One drag one manual/automatic principle wiring diagram		Total		Page
Check		Check and decide							
Audit		Approve							
Technology		Date							

Secondary circuit diagram

JX		
3FU	1	101
88-1		107
KA-1		109
KA-2		111
	5	N
PA-2		H402
TA-2		H406
KM		1-1
KM		1-3
KM	10	1-5
KM		1-7
SB-T		111
SA		112

Secondary circuit diagram

Go machine beside control diagram

12. Appendix 2

Warrant period and after sales service

Thank you for you purchase our company's soft starter. This product manufactured under complete quality management system. We hereby specially process the below instruction at warrant period, after sales service and service promise to convenient for your use:

1.Warrant period
The warrant period of the product is 12 months from the delivery day of our company, but, if the failure caused by the below reasons then need repair with cost even though in warrant period:
1)The reason of error use, self rebuild, unsuitable maintain and others.
2)Use exceed the standard specification requirements.
3)The reason of fallen and damage during transporting after purchased.
4)The element abnormal caused by bad environment or cased failure.
5)The reason of earthquake, fire, wind and water disaster, thunder shock, abnormal voltage, other natural disaster and secondary disaster, etc.

2.After sales service
Please check according to the operation specification when production unable to normally use.
2)Please contact the office or company when occur failure.
3)Repair in the warrant period: freely repair if the failure caused by the problems of our company manufacture.
4)Repair exceed warrant period: repair with cost under the premise that able to maintain each item application function after repaired.

3.Service promise
Warrant within one year if damage caused by non artificial reason, provide technical service with cost if exceed one year time limit.
2)Our company provide 24 hours phone communication technology support service at customer use and operation at soft starter.
3)After customer debugging requirements confirmed by our company, if has bus directly arrived the customer city then will arrive the field within 48hours; arrive the field within 72 hours where inconvenient traffic. （Domestic market only）.

13. Warrant card, product qualified certificate

Warrant Card

Customer name:	
Detail address:	
Zip code:	Contact:
Phone:	Fax:
Soft starter number:	Soft starter model:
Used equipment name:	Match motor power:
Purchase date:	Happen failure time:
Whether has abnormal sound when failed ☐Yes ☐No	Whether has smoke when failed ☐Yes ☐No
Failure instruction:	

Product Qualified Certificate

Inspector ——————

This product pass through our quality control and inspection of quality inspection department, the performance parameters accordance with leave factory test standard, approve to leave factory.

ZHYI

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