

Foreword

Thank you very much for purchasing PR5300 soft starter.

This User's Manual provides the users with the instructions on the installation, parameter setting, error diagnosis, remote control software instruction, routine maintenance and necessary precautions. Please read the Manual carefully before the installation of the product in order to ensure that it can be correctly installed and operated.

Please contact Powtran's dealers or directly contact with the company if you have difficult questions during the use of the soft starter , our professional staff is willing to serve for you.

Please leave this manual to the end user and keep it in good condition for the future maintenance and other application occasions . Please fill in the warranty card then fax to the distributor or fax to Powtran if there is quality problem during the warranty period.

During this product updating period, some details may be changed without prior notice. If you want to get the latest information, please visit our website.

For other products' information, Please visit our homepage: <http://www.powtran.com>

Powtran

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Safety Precautions

Thank you very much for purchasing PR5300 soft starter.

Under the soft starter installation, using and maintenance of process must pay attention to the following.



Please be sure to read the instructions before installation.



the soft starter must be installed by the professional technical personnel.



The motor specification must match the soft starter.



It is prohibited to connect capacity in U.V.W terminal of soft starter



The bare terminals must be wrapped in electrical tape after installation.



Soft starter or other equipment should be grounding.



Must cut off the input power supply before maintenance.



Not allowed to rob the handling, modification and maintenance of this product.

Only the well-trained personnel can be allowed to operate this unit, please carefully read the instructions on safety, installation, operation and maintenance before use. The safe operation of this unit depends on proper transport, installation, operation and maintenance!

Chapter 1 The introduction of PR5300 soft starter

1-1.The feature of the PR5300 soft starter

PR5300 series intelligent motor soft starter is the integration of new equipment for the new motor control theory and specialized motor protection technology and advanced software technology, is early for starting motor star /delta conversion and self coupling voltage, magnetron step-down starting equipment, the ideal alternative products; its performance is currently on the market most without the use of intelligent control technology of ordinary soft starter incomparable starting. PR5300 series products are soft starting device for motor soft starting and on line operation control.

1-2.The main function of the PR5300 soft starter

- First: To reduce the motor starting current and reduce power distribution capacity, avoid investment of expansion of power capacity.
- The second: To reduce the starting stress of the motor and the load of the equipment ; extend lifespan of the motor and related equipment.
- Third: Its soft stop function can effectively solve the problem of parking vibration of the inertial system, which is unable to realize by traditional starting equipment.
- Fourth: To have six unique start-up modes adapts to the complex conditions of motor and load, to perfect start effect.
- Fifth: Has the perfect and reliable protection function; effectively protect the motor and the related production equipment use safety.
- Sixth: Motor soft starter intelligence, and network technology application makes motor control technology to adapt to the rapid development of the electric power automation technology in higher requirements.

1-3.The main features of the PR5300 soft starter

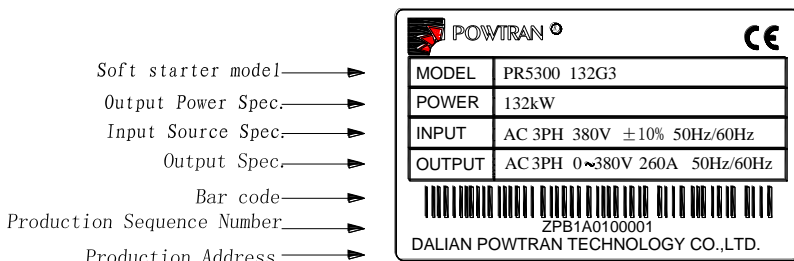
- **Perfect human nature design:**
 - Beautiful shape and reasonable structure
 - Perfect function and easy operation
 - Sturdy and reliable and compact structure
 - Industrial product excellence in the design of art.
- **Reliable quality assurance:**
 - Using the computer simulation design.
 - SMT placement production process.
 - Excellent electromagnetism compatibility.
 - The whole machine of aging, vibration test in high temperature before they leave the factory
- **Perfect and reliable protection function:**
 - Voltage lose, lower voltage and over-voltage protection.
 - Soft starter motor overheating, lower load, too long starting time protection.
 - Input phase lose, output phase lose, three-phase unbalance protection.
 - Start-up current, overload, short circuit protection.
- **Proprietary intellectual property products:**
 - Appearance design patent.
 - Independent software copyright.
 - Proprietary motor starting and protection technology.
 - Unique testing debugging equipment and process.
- **Swift thoughtful after-sales service:**

- Reliable performance and quality lay the foundation of excellent service.
- Provide excellent perfect supporting design scheme.
- Timely and thoughtful use consultation.
- Continuously improve product performance according to user opinion

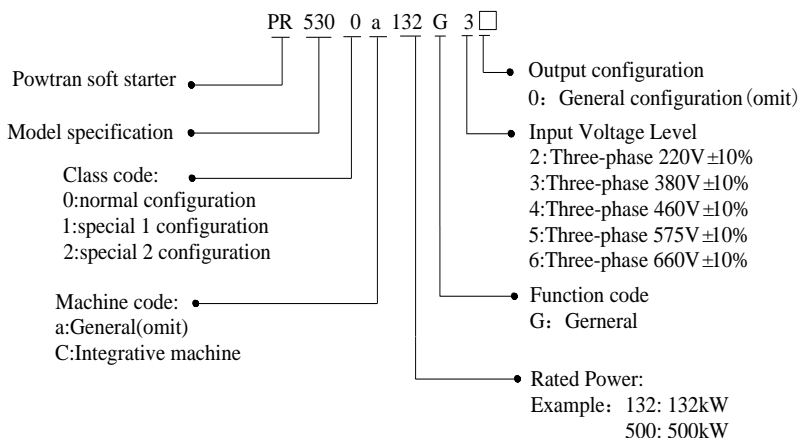
Chapter 2 Product model description and open - package inspection

2-1.Product model description

2-1-1. Instructions on nameplate



2-1-2.Model designation



2-2.The steps of open - package inspection

Each PR5300 series soft starter is under strict inspection and testing before they leave the factory. Users received the products and unpacked, please follow the inspection steps , if found problem, please contact the supplier promptly.

- ◆ Confirm the soft starter without any damage in transport process (machine body damage or gap).
- ◆ Check with the machine, the instruction manual, the warranty card
- ◆ Check the product of the specifications of the enclosure panels, ensure that the received goods match with you ordered products

Chapter 3 The conditions of use and installation requirements

PR5300 series soft starter should comply with the following conditions of use and installation requirements; otherwise, the performance will not guarantee, it can shorten life of soft starter even damage.

3-1.The conditions of use of the soft starter

3-1-1. Power supplies: The utility, self-power station, diesel generating sets three-phase AC 380 V plus or minus 10%, frequency 50 Hz or 60 Hz, the power supply capacity must meet soft starter motor starting to the requirement.

3-1-2. Applicable motor: Mouse cage type three-phase asynchronous motor, ac motor rated power should be matching with soft starter rated power .

3-1-3. Start frequency: No demands, depending on the specific number load up.

3-1-4. Cooling way: Forced air cooling.

3-1-5. Protection level: Increasing non-standard parts can reach IP20.

3-1-6. Environmental conditions: Below elevation 3000 meters, the environment Temperature between $-25^{\circ}\text{C} \sim 40^{\circ}\text{C}$, relative humidity below 90% RH, no dewing, no inflammable, no explosive, no corrosive gas easily, have no electrical conductivity dust, indoor and ventilated good, vibration is less than 0.5 G place.

3-1-7. Ambient temperature: Storage, -25 to 70 degrees Celsius; online operation, 0 to 40 degrees Celsius, the maximum to 60 degrees Celsius, 40 degrees Celsius above 1 degrees Celsius by the current rating to reduce the use of 2% drop.

★We can offer under special conditions of use products, such as the explosion proof type, low temperature, high pressure type type soft starter, its use conditions will need further instructions.

3-2.The installation requirements of the soft starter

■The installation direction and distance: In order to ensure that the soft starter in use with good ventilation and heat dissipation conditions, the soft starter should be installed vertically, and around the equipment left enough space for heat dissipation, as shown in Figure 3.1, Figure 3.2, Figure 3.3, Figure 3.4the graph to allow the minimum distance.

■When the soft starter cabinet installation, in addition to the above requirements, must choose top, below ventilated cabinet.

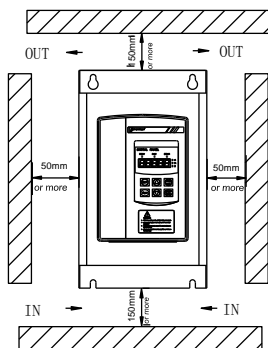


Figure 3.1

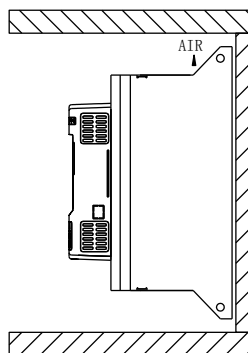


Figure 3.2

Installation requirement for PR5300G3 11-115kw

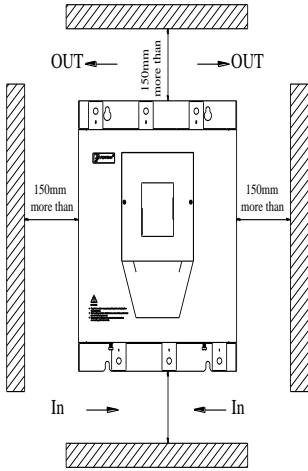


Figure 3.3
Installation requirement for PR5300G3 132-500kw

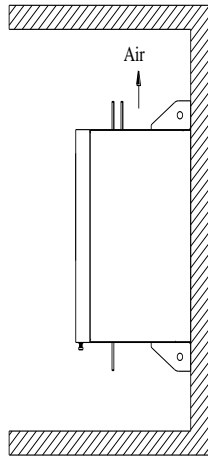
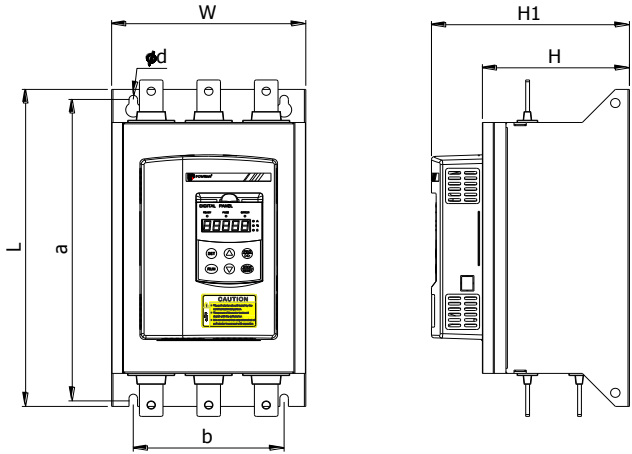


Figure 3.4

3-3.The appearance and installation dimension of the soft starter

PR5300 series 132kw-500kw soft starter appearance and installation dimensions are as follows. PR5300 series 132kw-500kw soft start, its factory standard configuration for three-six. The rated power and rated current is max rated value of soft starter. Usually, matching the corresponding parameter of motor shall not be more than this value.

Shape and mounting dimension for PR5300G3 11-115kw:

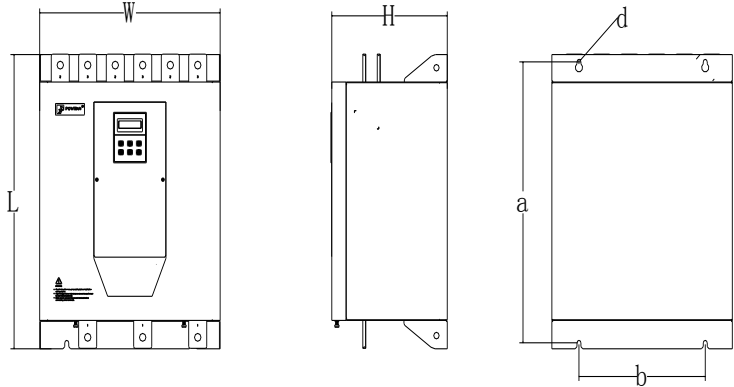


Model	Rated Power (KW)	Rated current (A)	Dimension(mm)				Installation(mm)			Net (kg)
			L	W	H1	H	A	B	D	
PR5300 011G3	11	23	344	156	242.5	188.5	324	125	9	<7.8

Chapter 3 The Conditions of use and installation requirements

PR5300 015G3	15	30	344	156	242.5	188.5	324	125	9	<7.8
PR5300 018G3	18.5	37	344	156	242.5	188.5	324	125	9	<7.8
PR5300 022G3	22	45	344	156	242.5	188.5	324	125	9	<7.8
PR5300 030G3	30	60	344	156	242.5	188.5	324	125	9	<7.8
PR5300 037G3	37	75	344	156	242.5	188.5	324	125	9	<7.8
PR5300 045G3	45	90	344	156	242.5	188.5	324	125	9	<7.8
PR5300 055G3	55	110	344	156	242.5	188.5	324	125	9	<7.8
PR5300 075G3	75	150	405	206	223	169	385	160	9	<12.8
PR5300 090G3	90	180	405	206	223	169	385	160	9	<12.8
PR5300 115G3	115	230	405	206	223	169	385	160	9	<12.8

Shape and mounting dimension for PR5300G3 132-500kw:



Model	Rated Power (KW)	Rated current (A)	Dimension(mm)			Installation(mm)			Net (kg)
			L	W	H	A	B	D	
PR5300 132G3	132	260	563	440	290	526	280	11	<40
PR5300 160G3	160	320	563	440	290	526	280	11	<40
PR5300 185G3	185	370	563	440	290	526	280	11	<40
PR5300 200G3	200	400	563	440	290	526	280	11	<40
PR5300 250G3	250	500	563	440	290	526	280	11	<40
PR5300 280G3	280	560	563	440	320	530	280	11	<49
PR5300 320G3	320	630	563	440	320	530	280	11	<49
PR5300 400G3	400	800	670	500	320	640	350	11	<80
PR5300 450G3	450	900	670	500	320	640	350	11	<80
PR5300 500G3	500	998	670	500	320	640	350	11	<80

Chapter 4 Main circuit and terminal wiring

★ PR5300 series soft starter has two kinds of wiring:

The main circuit wiring: Three phase power input and output to the motor wiring and coil in line circuit breaker, bypass contactor wiring.

External terminal wiring: By 14 small terminals derivation, including input, output control lines and analog output signal lines.

4-1.The basic wiring diagram of the soft starter

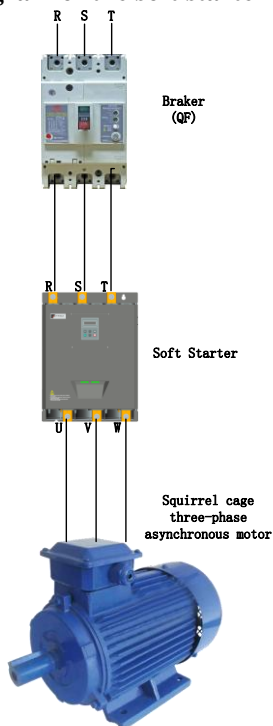


Figure 4- 1

4-2.Instruction of soft starter terminal wiring.

Output terminal like Figure 4.2 illustration:

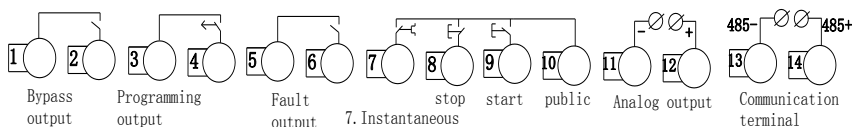


Figure 4- 2

Category	Terminal name	Description of functions
Bypass output	Terminal 1	Used to control bypass contactors, for the constant opening of passive contacts, closed when the start is successful. The contact capacity is: AC250V/5A.
	Terminal 2	
Programming output	Terminal 3	The output mode and function are set by the setting item PE and are often open passive contacts. The contact capacity is: AC250V/5A.
	Terminal 4	
Fault Output	Terminal 5	The soft starter is closed when it fails or loses power, and it is open when it is working properly. It is an passive contact. The contact capacity is: AC250V/5A.
	Terminal 6	
Halt	Terminal 7	When the soft starter is working properly, this Terminal must be short-connected to terminal 10. If this terminal and terminal 10 are open, the soft starter stops working unconditionally and is in failsafe state. This terminal can be controlled by the normally closed output point of the external protection device. When setting item PA to 0(primary protection), this terminal function is disabled.
STOP	Terminal 8	The terminals 8, 9, and 10 are external control start and stop buttons input junction terminals. There are two ways to connect, that is, 3 lines and 2 lines. Connections can be selected as needed, as shown in Figure 4.3.
Start	Terminal 9	
Common terminal	Terminal 10	
Simulated current output	Terminal 11	Terminal 11 and 12 are 0 to 20 ma, 4 to 20 ma DC analog output: For real-time monitoring of motor current, at a full degree of 20 ma, indicating that the motor current is 4 times the nominal current of the soft starter. Externally observed with 0 to 20 ma, 4 to 20 ma DC current meters, the maximum output load resistance is 300 Ω. (Note: The machine defaults to 4 to 20 ma output. If 0 to 20 ma output is required, please explain it at the time of ordering.)
	Terminal 12	
Communication terminal	Terminal 13	13 is the communication terminal "485-" and 14 is the communication terminal" 485 + ".
	Terminal 14	
Control board select jumper	J13	The fan is always running when 2-3 is short, and the fan is running when 1-2 is short(default).
Control board select jumper	J12	Switching between online and bypass operations is controlled by jumper J12, 2-3 short connections are online(default), and 1-2 short connections are bypass operations.

(Note: Do not misconnect the external terminal line, otherwise it may cause damage to the soft starter.)

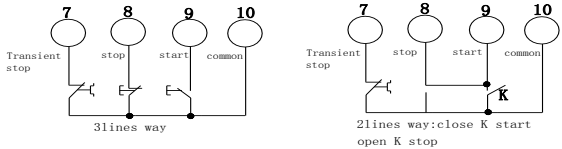


Figure 4- 3

◆The main circuit and secondary wiring diagram of PR5300 series soft starter are shown in Figure 4.4 below.

Soft starter terminals R, S and T are connected with three-phase power supply, and soft starter terminals U, V and W are connected with motor.

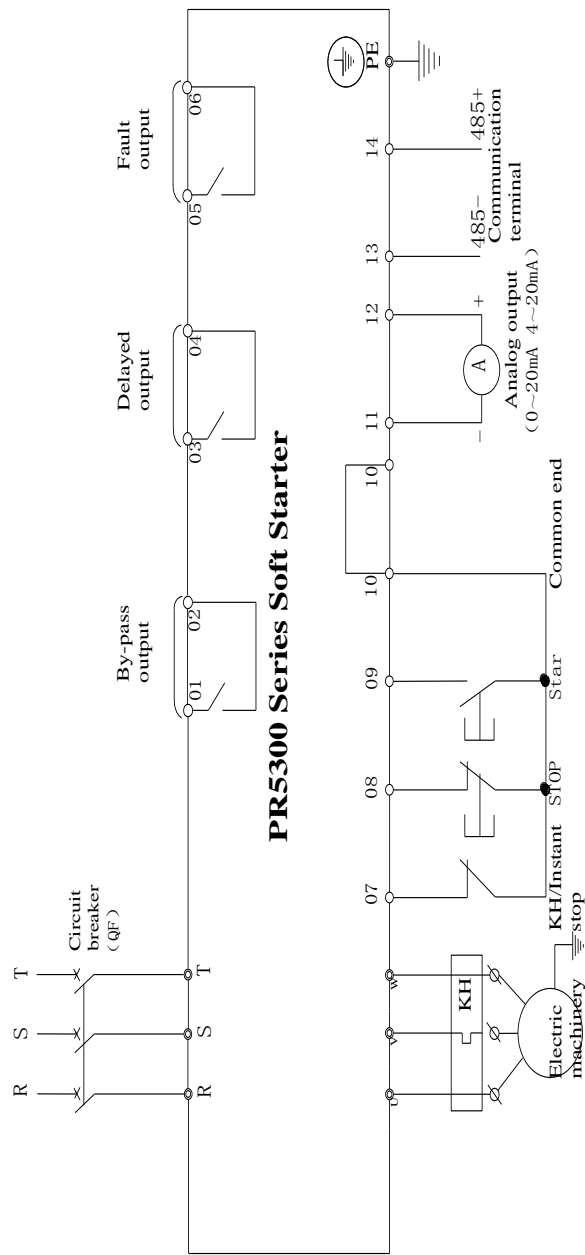


Figure 4- 4

Chapter 5 Control panel and operation

PR5300 series soft starter has 5 kinds of working state: Preparation, operation, fault, start and stop. Different indicate light show at preparation, operation and fault. When starting to show XXXX, soft stop display: -XXX, XXXXX means motor current.

5-1.Keyboard operational approach

JP3E5300 keyboard diagram

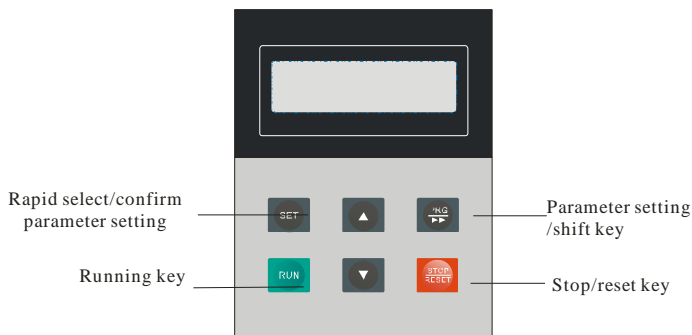


Figure 5- 1

5-1-1.Start and stop key:The role of the start key is to start keyboard, stop key has stop and reset function.

5-1-2.PRg Key , in the non-help mode, press the PRG Key to enter the setup menu,display PX: XXX,then press PRG key again, colon flashes, that means can modify the parameters after colon.Press the Set key when the colon flashes, if the data has been modified, it will display good and twice ring, indicating that new data has been saved, and then exit. If you do not want to save the new data, press the PRG key, colon will stop flashing and restoring the original data, then press Set key or Stop key to exit.

5-1-3.Set Key, in the non-setting state, press the Set key to enter the Help menu,display HX: XXX, press the Set key or Stop key to exit. In setting state, press the Set key to save the new setting of data and to exit the setting state.

5-1-4.Acceleration,deceleration key, in the setting menu, when the colon does not flash ,press the acceleration or deceleration key to change the function number; when colon flashes, press the acceleration or deceleration key to change the data, press on the acceleration or deceleration key for more than 1 second, the data will be increased or decreased continuously and quickly .In the help menu, press the acceleration or deceleration key to change the function number and the corresponding message.When the indicator light of bypass operation is on, and did not enter the setting and help menu, display AXXXX, that means the motor running current, then press the acceleration or deceleration key to select display PXXXX or HXXXX.PXXXX indicates motor apparent power;HXXXX indicates motor overloaded heat balance coefficient. When indication value of HXXXX is more than 100%,soft starter will be overload protection and display Err08.

5-2.Function parameters setting and description

- Function parameters code in the following table

Code Setting Description				
Code	Name	Range of set value	Factory setting	Explanation
P0	Starting voltage	30-70%	30%	Voltage slope model is effective, the starting voltage of current mode is 40%.
P1	Soft start time	2-60S	16S	Limiting current mode is invalid.
P2	Soft stop time	0-60S	0S	Setting 0 means free stopping, please set 0 for one with two connections.
P3	Start interval delay	0-999S	0S	The minimum time between two successive start, the function of protecting thyristor.
P4	Select Language	0 or 1	0	0:Chinese, 1:English.
P5	Starting to confine current	50-400%	280%	Limiting current mode is effective, the maximum current limit value of Voltage slope model is 400%.
P6	Load Regulation	50-200%	100%	The value of PP rated current.
P7	Under voltage protection	40-90%	80%	Protection when below the set value
P8	Over voltage protection	100-140%	120%	Protection when higher than the set value.
P9	Start mode	0-6	1	0 Limit current, 1 Voltage, 2 Sudden stop + limit current, 3 Sudden stop + voltage, 4 Current ramp, 5 Pairs of closed-loop. 6 Monitoring
PA	Level of protection	0-4	4	0 Primary, 1 Light load, 2 Standard, 3 Overloaded 4 Senior
PB	Control method	0-6	1	0 Keyboard; 1 Keyboard + external control; 2 External control; 3 External control+ communication; 4 Keyboard + external control + communication; 5 Keyboard + communication; 6 communication.
PC	Parameters modified allowed	0-3	1	See note 5.5 Other settings.
PD	Communication Address	0-64	0	Used to setting MODBUS slave address on the machine.
PE	Programming output	0-19	7	See note 5.3 programmable relay output.
PF	Soft stop the current limit	20-100%	80%	See note 7.3.1 soft stop mode.
PP	Motor rated current	11-998A	Rated	Used to input motor nominal is rated current.

			value	
PU	Bypass delay	0-40S	3S	Used to set the delay time of Bypass
PL	Allowed three-phase imbalance	0 or 1	1	0:Forbid, 1:Allow
PM	Current regulation rate	50-150%	100%	Used to adjust the display of current.
PN	Voltage regulation rate	50-150%	100%	Used to adjust the display of voltage.
Note: 1.The load regulation of P6 is based on PP calculated sustainable operation of the maximum current according to the light and heavy of the load, above this value will do inverse time thermal protection. 2.It will automatically exit the setting mode, if no key operation is more than 2 minutes during setting state. 3.It's not allowed to set parameters in the soft start and soft stop process.. 4.Pressing the Set key (PRG) when powered on the soft starter, can default the parameters to factory setting.				

5-3.Programmable relay output functions

There are two programmable relay output function, programmable timing output way and programmable state output way.

5-3-1.PE set from 0 to 4 items (10 ~ 14), programmable output work is timing output way, the setting of output starting time as tabled below:

PE setting value	0(10)	1(11)	2(12)	3(13)	4(14)
Programming output time	Initiate action command	Starting at the beginning	Bypass operation	Stop action command	Stopping is complete

5-3-2.PE is from 5 to 9 (15 ~ 19), the programmable output work is state output mode, the setting of the working state output as tabled below:

PE set value	5(15)	6(16)	7(17)	8(18)	9(19)
State of output indication	Motor fault conditions	Running	Preparation state	Start state	Bypass state

(1)Programmable state output to indicate the working state of the soft starter, the time set by P4 is invalid in this mode. The factory setting of PE is 7, which indicates the preparation state of soft starter, can start the motor in this state; programmable output is in the failure state, which indicates the fault of the motor (Err05, Err06, Err07, Err08, Err12, Err15), which is different from the function of ⑤, ⑥ fault output terminals; running state refers to non preparation or fault condition, which includes 3 process of start, bypass, soft-stop.

(2)When PE> 9, the reset state of the programmable output (③, ④ No. External pin) changed from normally open to closed, that is inverted output. Flexible using the function of programmable relay output, which can effectively simplify the external control logic circuit.

5-4.The electrical terminal running protection functions

The functions divided into two states and they can be chosen by jumper mode

State 1:The electrical terminal running protection is valid: The external control terminal is on closed state before power on, soft starter will not respond the command , you must cancel the running command by one time ,then give it run command again to make the soft starter work.

When soft starter fault reset, continuous running command is valid. Soft starter will not respond the running command, you need to removed running command and then the running protection state is canceled.

State 2:The electrical terminal running protection is invalid: the motor will start automatically when the external control terminal in the closed state with power on , this is to say allow power on start.

State 1 is shorted the 2, 3 of J14; state 2 is shorted the 1, 2 of J14.

5-5.Other Settings description

PC is the selection of allowing to modify parameter, there are three options:

- (1) PC is set to 0, it is prohibited to modify any parameter .
- (2) PC is set to 1,it is prohibited to modify P4, P6, PD, PE, PP, PU parameters.
- (3) PC is set to 2, it is allowed to modify all the parameters.

5-6.Help and instructions

- Help information as following table:

Display	Explanation
AC:XXX	Three digital voltmeter, to monitor three-phase AC power supply voltage.
45A-380V	The specifications of soft starter is 45A/380V.
H1:E05	Last occurred fault information Err05.
H2:E01	There had been a fault information Err01.
H3:E06	There had been a fault information Err06.
H9:E00	There was no fault information.
Uer3.0	The software version of this product is Ver3.0. With the software upgrading, version with the increase.
LXXXX	Total number of successful starting.
RUNXX	The spending time (seconds) of last soft starting (starting successfully) .
Note: H1 ~ H9 with recursive way to storage newly happened nine fault information.	

- (1) In the non-soft start and non-soft stop state, and did not enter the setting mode, press the Set key, can enter into the Help menu, and then press the UP or DOWN key to select message.
- (2) In the help state, press the Set key or Stop button to exit help state.

Chapter 6 Protection and description

PR5300 series soft starter with complete protection to protect the safety of soft starter and motor. During the application, appropriate protection parameters and level should be set based on different situation.

6-1. Protection functions and their parameters

6-1-1. Soft starter over-temperature protection: The temperature rose to $80\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ over-temperature protection, when the temperature dropped to $55\text{ }^{\circ}\text{C}$ (the lowest), no over-temperature protection.

6-1-2. Input phase lose protection delay time : <3 seconds.

6-1-3. Input phase lose protection delay time: <3 seconds.

6-1-4. Three-phase unbalance protection delay time: <3 seconds. It is based on the deviation of all phase current greater than $50\% \pm 10\%$. When the load current is lower than 30% of the nominal rating of soft starter, the deviation will increase.

6-1-5. Over-current protection time during soft starting: Continuous 5 times greater than the maximum operating current of the protection time set by P6 in Table 6.1.

6-1-6. Time of running overload protection: Continues 5 times greater than the load regulation of the protection time set by P6 in Table 6.1 .

6-1-7. The protection lag time of much too low supply voltage, when the power supply voltage is lower than the 40% of limit, the protection time <0.5 seconds, or the protection time <3 seconds if it is lower than the setting value.

6-1-8. The protection lag time of much too high supply voltage : When the power supply voltage is lower than the 140% of limit, the protection time <0.5 seconds, or the protection time <3 seconds if it is higher than the setting value.

6-1-9. The protection delay time of load short-circuit : <0.1 seconds, the current is 10 times more than soft starter nominal rated current. This protection can not replace fuse short-circuit protection device.

6-1-10. Motor under load protection, the current range is 10% to 90% of motor rated current, the protection action delay from 5 to 90 seconds.

These time parameters are from tested effective signal to a tripping protection instructions, and the parameters just for reference. All the protection functions of PR5300 series soft starter can be verified through the actual or simulation method. If it can't meet the user's requirements, special protection device should be added to ensure safety.

6-2. Protection level setting description

6-2-1. In order to adapt to different applications, PR5300 series soft starter has five protection level, there are 0: Primary, 1: Light load, 2: Standard load, 3: Heavy load, 4: Advanced, it set by PA parameter. Among them:

1) Primary protection is against to the function of external terminal instantaneous stop, meanwhile only remains the overheating, short circuit and main circuit fault protection, it can be applied to needed emergency start in unconditional occasion, such as fire systems, etc.

2) The three protection level of light load, standard load and overload have the complete protection function. The difference is the time curves of motor overloaded thermal protection are not the same. The time parameters of motor thermal protection are as Table 6.1 and Figure 6.1.

3) High level of protection standards is stringent at start. Other protection features parameters keep the same with standard protection set.

6-2-2. Protection level and thermal protection time according to PA setting is as the diagram below:

Diagram 6.1

PA setting	0 (Primary)	1 (Light load)	2 (standard)	3 (heavy load)	4 (high grade)	Description
Running overload	No	2 level	10 level	20 level	10 level	According to

Level of rotection														IEC60947-4-2 Standard
Start over-current Protection time	No	3 seconds			15 seconds			30 seconds			15 seconds			Starting current for more than p6setting 5times calculation
Overload trip time running list	Current multiple (I/Ie)	3	4	5	3	4	5	3	4	5	3	4	5	Typical values for the table
	Trip time (seconds)	4.5	2.3	1.5	23	12	7.5	46	23	15	23	12	7.5	

6-2-3. According to IEC60947-4-2 standard curve of the motor thermal protection tripping time is as follows:

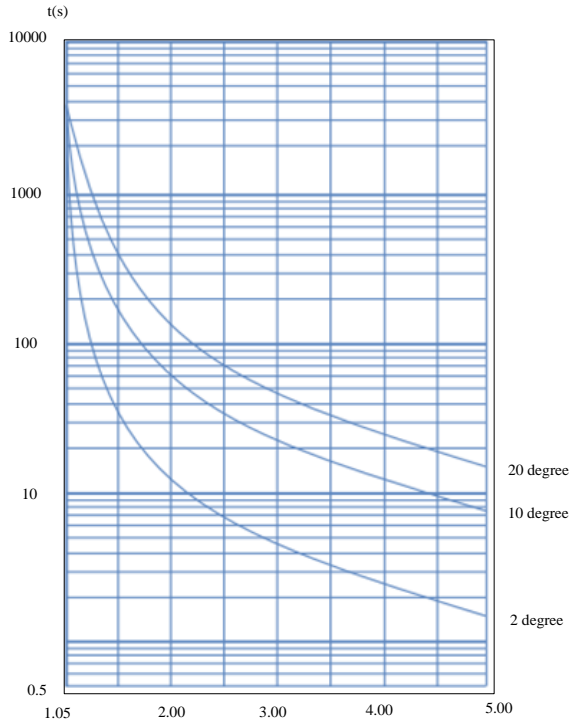


Figure 6- 1

Chapter 7 Test runing and application

- ★ Double-check before power running according to the following terms:
Whether the soft starter power match with the motor rated power.
Whether the motor insulation satisfy the requirements.
Whether the Input and output main circuit wiring is correct.
Whether all the terminal screws are tightened.

7-1.Power test running

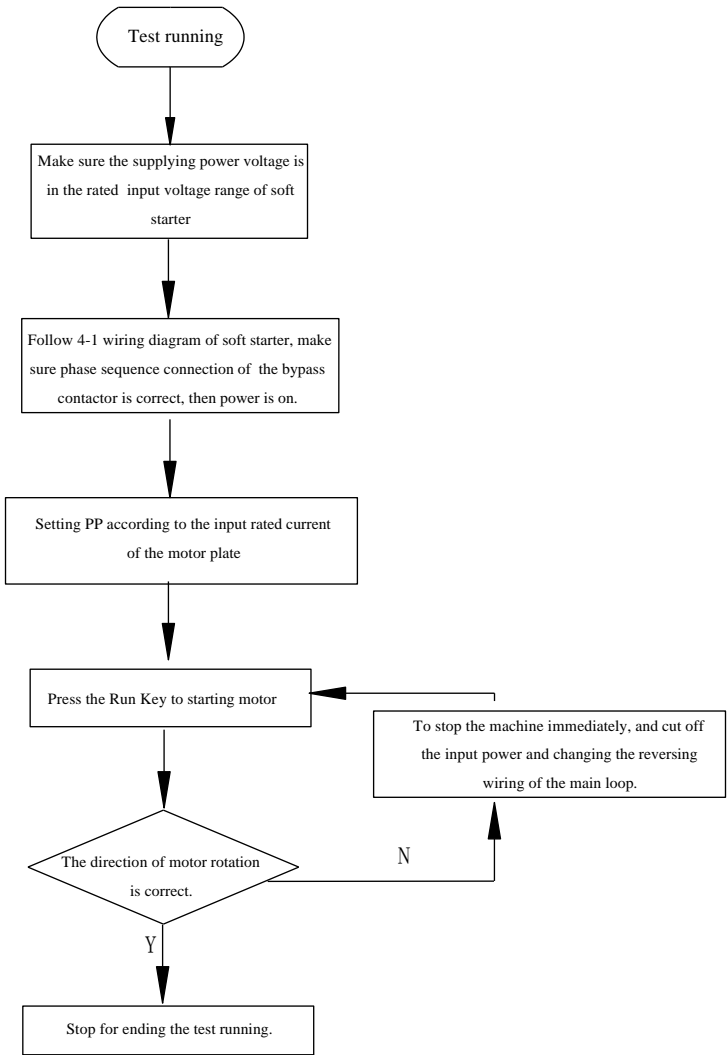


Figure 7- 1

7-1-1.If the motor starting status is not good, Refer to 7.2 of the soft starter starting mode and application to select appropriate starting model.

7-1-2.If the motor starting torque is not enough, you can change the starting voltage (voltage mode) or current-limiting value (current mode), to improve the motor starting torque.

7-1-3.When soft starter power on, do not open the cover, to avoid electric shock.

7-1-4.In the power test of running, if appearing unusual phenomena, such as abnormal noise, smoke or odor, etc., should be quickly cut off the power and make further investigation.

7-1-5.If power on or when starting, appearing failure light and display errxx, you can find the reason according to the displayed fault code and the corresponding chapter of the cause.

7-1-6.Press the stop button or external stop button to reset the fault status.

★ Note:

1) When the environment temperature is below -10°C , should power on for more than 30 minutes to warm-up before starting.

2) When the soft starter drive the motor successfully, the operation status indicator on the middle panel lights, that proves the bypass is in running status. If at this time, the motor stop by bypass contactor without actuation,you should check the bypass contactor and associated wiring connection.

7-2.PR5300 Series soft starter starting mode and application

PR5300 series soft starter has six models to suit a variety of complex starter motor and load conditions, the user can choose it as different application.

PR5300 series soft starter has six models to suit a variety of complex starter motor and load conditions, the user can choose it as different application.

7-2-1.Current limit starting mode

When settingp9to 0, Set the start mode for this mode.

Figure 7- 2 shows the current limit mode of the motor starting current waveform changes. I1 is starting current limit by setting, when the motor starts, the output voltage rapidly increases, Till the motor current reaches the current limit value I1, and maintain the motor current is not higher than this value, then gradually as the output voltage increased, gradually accelerate the motor, when the motor reaches the rated speed, the bypass contactor make actuation, output current rapidly dropped to or below the motor rated current I_e , starting process is complete.

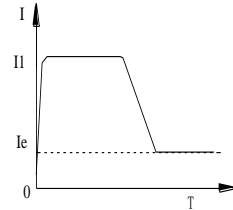


Figure 7- 2

When the motor is lightly loaded or seting the current limit high, the maximum starting current may not reach the set limit value is normal.Generally.

Current limit starting mode is used for a strictly limited starting current requirements of the occasion.

7-2-2.Voltage ramp start model

When p9setting item is 1, Start mode is for this mode.

Figure 7- 3 shows the output voltage waveform as voltage ramp start voltage waveform. U 1 is the initial starting voltage of starting, when the motor start, the motor current does not exceed 400% of rated range, the output voltage of soft starter quickly rise to U1, then the output voltage gradually increase by the start parameters setting, the motor is in smooth acceleration according to voltage continuously rise, when the voltage reach the rated voltage U_e , the rated motor speed, bypass contactor act, starting process is complete.

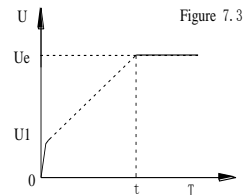


Figure 7- 3

Starting time t is based on standard load obtained in the standard experimental conditions,

control parameters, PR5300 series soft starter is based on this parameter benchmark, by controlling the output voltage, make the motor speed up in a smooth start-up process, not a mechanical control, regardless of time t . Acceleration is smooth. In view of this, when the load is light, set the start time often less than the starting time, as long as a smooth start is normal.

In general, the voltage ramp start mode is suit to not strict starting current requirement and strict demanding of a smooth start of the occasion.

7-2-3.Kickstart mode

P9 setting item set to 2 or 3, starter model is for this mode.

Figure 7- 4 and Figure 7- 5 shows the kickstart mode waveform of the output. In some heavy load situations, due to mechanical effects of static friction, when it can not start the motor, you can use this start mode. At the start, imposing a high fixed voltage to the motor first and last for a limited period of time, to overcome the static friction of the load of the motor to rotate, then to start at the method of the current limit (Figure 7- 4) or the voltage ramp (Figure 7-5)

Before using this model, start motor with non-sudden jump model, if the motor can not move due to static friction, then use this model; otherwise avoid to start this mode to reduce the unnecessary high current impact..

7-2-4.Current ramp start mode

P9 items set 4, start mode is for this mode.

Figure 7- 6 shows the Current Ramp start mode output current waveform, which I_1 is the current limit set P5, T_1 value is the time set by P1.

Current ramp start mode has a strong acceleration ability, for bipolar motors, can also shorten the start-up time within a certain range.

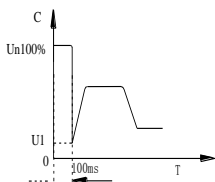


Figure 7- 4

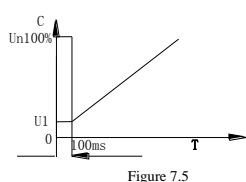


Figure 7- 5

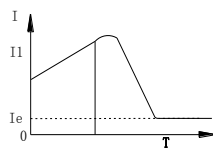


Figure 7- 6

7-2-5.The voltage limiting double loop start mode

P9 Set PB as 5 to set start mode for this mode.

Double loop starting voltage limiting mode adopt voltage ramp and current limit dual closed-loop control model, is both stable requires and strict current limiting demanding, the integrated starter-limiting mode, it uses the prediction algorithm to estimate the work status of the motor.

In this start mode, output voltage waveform will be based on the motor and load conditions vary.

7-2-6.Monitoring start mode

In this mode, it will start at direct startup method, can monitor the working current parameters of the motors. When overload, overvoltage or undervoltage, the fault output terminal 5 and 6 will be disconnect and stop output, also shows the corresponding fault information.

7-3.PR5300 series soft starter's stop mode and application

PR5300 series soft starters, there are two stop modes, soft-stop mode and free stop mode.

7-3-1.Soft stop mode

When Setting item P2 is not zero, set the stop mode for this mode.

In this stop mode, the motor power start from the bypass contactor and switch to the output of soft starter thyristor, soft starter output voltage decrease steadily from the total pressure, reducing the motor speed steady in order to avoid mechanical shock, till the motor stops running. Soft stop output cut-off voltage equal to the initial voltage of starting.

Soft stop mode can reduce and eliminate the surge of pump type load.

Soft stop mode can use setting item PF to set the soft stop current limit, in soft stop, reduce the impact of high current. Note, this soft start current limit is a percentage calculated on the basis of starting current limit value.

7-3-2.Free stop mode

Item P2 is set to 0, set stop mode for this mode.

In this stop mode, when the soft starter receive the stop command, immediately disconnect the bypass contactor and ban soft starter thyristors voltage output, motor gradually stop as load inertia. In the situation of one drive two(more) wiring, should set soft starter stop mode as this, in order to avoid of the phase fault reporting when output switching.

Under normal circumstances, if not necessary soft stop, stop mode should be free stop model, to extend the life of the soft starter.

As stop model completely ban the instantaneous output, can avoid an instantaneous high-current impact in special applications.

7-4.Special application

7-4-1.Motors in parallel Start:

If not over the rated power limit of the soft starter, the motor can be connected in parallel (motors sum current can not exceed the power of soft starter, the type selected depending on the application rated current), but at this should provide additional thermal protection devices for each motor.

7-4-2.Two-speed motor start:

PR5300 series soft starter can start with two-speed motor, before changing from low speed to high speed, must be solved by delayed magnetic period, to avoid a very large reverse current between the line and the motor.

7-4-3.Long cable:

As the resistance of the cable causes, a very long motor cables could cause voltage landing, if the voltage drop is very obvious, it will affect the current consumption and starting torque, when choosing motor and soft starter, must consider this.

7-4-4.Soft starters paralleled with the same one power line:

If in a power line, installed several soft starters, should install the input reactor between the wiring of the soft starter and transformer, to the middle of the line should be . Reactor should be installed between each feeder circuit breaker and soft starter.

7-4-5.Surge protection Device (SPD) application:

In the applications which may suffer from lightning or other causes that lead to overvoltage, overcurrent, surge interference, should consider installing a surge protector, detailed application methods instructions, refer to POWTRAN company "surge protector (SPD)" Product Sample or other relevant data.

7-5.Application examples

Under different load conditions, parameter settings for example shown in Table 7.1

Table 7.1

Type of load	Start time (seconds)	The initial voltage	Voltage starting (maximum current limit)	Limit Start
Ball	30	60%	4	4.5
Fans	26	30%	4	3.5
Centrifugal pump	16	40%	4	2.5
Piston compressor	16	40%	4	3
Enhancethe mechanical	16	60%	4	3.5

Chapter 7 Test runing and application

Mixer	16	50%	4	3
Crusher	16	50%	4	3.5
Screw compressor	16	40%	4	3
Screw conveyor	20	40%	4	2
Light load motor	16	30%	4	3
Belt conveyors	20	40%	4	2.5
Heat pump	16	40%	4	3

Chapter 8 RS485 communication

Powtran PR5300 series soft starter with built-in RS485 standard interface which can be communicated with the PC and PLC host .

It Can be controlled by the host command of soft starter run/stop, monitoring the running state of soft starter and modify its function data, and so on.

8-1.Summary of the modbus RTU communication protocol

Modbus is a kind of serial asynchronous communication protocol. The physical interface RS485.Modbus is designed to modicon PLC, has the structure characteristic of PLC. Modbus in network control, the soft starter can be compared to a PLC to read and write on it. Start-stop control and status information (current, fault, etc.) And the function parameter mapping to keep register area XXX.

8-1-1.Communication parameters

Baud rate:9600;8 Data bits;No parity bit;1 stop bit.

8-1-2.Communication data format

The data format:

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

8-2.The soft starter associated settings

8-2-1.Register address

Register address	Operation code	Register function description
0001	06	Control word
0002	03	Status word
0003	03	The average current
Exceptional 0004	03	Fault code
0256-0274	03&06	Soft starter function code

Register is not listed above is illegal, cannot read and write, otherwise it will report to the controller an exceptional code from the station.

All data address is 0000 for reference.

8-2-2.Support code

Soft start only supports the following code, if you use other code, will give exceptions to the code.

Code	03	06
Function description	Read the register	Write a single register

Code 03 only WORD (WORD) to read.

8-2-3.The register description

0001 The command register

Digit	Value	Description
0	1	Starter starting
	0	Keep the mold
1	1	Starter stop

	0	Keep the mold
2	0-1	To reset the starter
3-15	0	Unused

Example: Starting from the soft starter of standing 02, the controller sends 02 06 00 01 00 01, such as command execution, normal return 02 06 00 01 00 01. Starter can normal starting to view the status register, if there is a failure, should send 02 06 00 01 00 04 to reset

0002 Status register

Digit	Value	Description
0	1	Starting state
	0	Stop state
1	1	Running state
	0	Stop state
2	1	Soft stop state
	0	Stop state
3	1	Failure state
	0	The normal state
4-15		Unused

For example: Read the status register code, send 02 03 00 02 00 01, if the starter is starting to return to the 02 03 02 00 01. If the starter fails, it returns 02 03 02 00 08.

0003 current average (sixteen decimal)

The average *10 value of the value to the actual current of motor phase (including a decimal).

For example: Read the current size, send 02 03 00 03 00 01, if the current 235A, then return 02 03 02 09 2E (return value /10 for actual current value).

0004 fault code (sixteen hex)

When the state register 0002 3 to 1, on behalf of the soft starter in fault state.

For example: Send 02 03 00 04 00 01, if returned 02 03 02 00 04, explain the current input missing phase (fault code 04).

Function parameter register 40XXX 5300 soft starter

0256-0274 for the function register, corresponding to the address is 0x0100-0x0112, the high byte address is 01, the status byte address is 0x00-0x12, corresponding to the function code P0-PL. For example, address P9 and function code 0x109 (starting mode). Can read and write the code.

The following examples illustrate their usage:

Example 1: Read the size of the function code P1, send 02 03 01 01 00 01.

Example 2: Read the function code PA (protection level), send 02 03 01 0A 00 01, if return 02 03 02 00 03, the reading of the protection level is 3.

Example 3: Soft starter will rewrite the function code P7 70%, send 02 03 01 07 00 01.

8-3.Exception reponse

Code	Name	Description
01	Illegal function	Unable to perform function code, the soft starter is not supported
02	Illegal data address	The received data address cannot execute, overflow
03	Illegal data values	Received data cannot execute 1. The parameters beyond the limit 2. Parameters cannot be modified 3.The runtime parameters cannot be modified

8-3-1. Illegal function code 01

The main inquiry message format:

Sub station address	Function code	Start address low byte	Start address low byte	Register number high	Register number low	CRC check
0x01	0x08	0x00	0x80	0x00	0x0d	

This agreement is not used 0 x08 function code, so the subordinate standing response:

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

8-3-2. Illegal data address 02

Master query message format:

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

5300 04 function code register address error, so the sub station response:

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

8-3-3. Illegal data values 03

The main inquiry message format:

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

Function code register address errors, so the child standing response:

Sub station address	Function code	Abnormal code	CRC check
0x01	0x84	0x03	

8-4. Using the matters need attention

1. Soft start device address, communication rate, calibration model must be the same with the controller communication Settings.

2. If not receive response data, should check the above parameters, to 485 terminal connection is correct, check CRC is correct or not.

3. When several soft starter communicate, should add 120 ohm resistor in the last soft starter's AB terminal.

4. The P5, P6, PL, PM and PN can't read and write operations through communication.

Chapter 9 Fault causes and treatment

Fault codes and treatment as following table:

Display	Description	Problems and treatment methods
Err00	Failure has been solved	Just happened undervoltage, overvoltage or overheating, instantaneous stop terminals are open, such failures, now has been normal, this time to prepare lights, reset to start the motor.
Err01	External terminal momentary Open circuit	Short-circuit connection with the external Instantaneous stop terminal⑦and public terminal⑩, or connecting to other protective devices normally closed contact.
Err02	Soft starter over-heat	Start too often or the motor power do not match with the soft starter.
Err03	Starting times too longer than 60 seconds	Starting parameter settings is inadequate or the load is too heavy, the power capacity is not enough, etc.
Err04	Input phase lost	Check the input or main circuit failure, whether the bypass contactor is stuck in the closed position and whether the SCR is in open circuit and so on.
Err05	Output phase lost	Check the input or main circuit failure, whether the bypass contactor is stuck in the closed position and whether the SCR is in open circuit and so on.
Err06	Three-phase unbalanced	Check whether the input three-phase power supply and the load motor is normal.
Err07	Start over-current	Whether the load is too heavy or motor power does not match with soft starter.
Err08	Running overload protection	Whether the load is too heavy or setting items P7, PP parameters set incorrectly.
Err09	Supply voltage is too low	Check the input voltage or setting item P9 parameter set incorrectly.
Err10	Supply voltage is too high	Check the input voltage or setting item PA parameter set incorrectly.
Err11	Incorrect parameter Setting	Modify the settings, or pressing the Enter key on power to restore the factory values.
Err12	Load short-circuit	Check whether overloading or thyristor short circuit.
Err13	Automatic re-start wiring error	Check whether the outside the control start and stop terminal is connected to 2-wire mode.
Err14	External Stop terminal wiring error	When you allow external control mode, the external control stop terminal is in the open state, which can not start the motor.
Err15	Motor under-load	Check the motor shaft and load faults.

Note: Some fault phenomena are interrelated, as the report Err02, may be related with soft starter overheating or load short current, so when checking fails, consideration should be comprehensive, accurately determine the point of failure.

Chapter 10 Soft starting model specifications and options

PR5300 soft starter list of external accessories specifications reference:

Model	Rated power (KW)	Rated current(A)	MCCB model (QF)	By-pass contactor model (KM)	A line size
PR5300 011G3	11	23	32A	40A	6mm ² Cable
PR5300 015G3	15	30	40A	63A	10mm ² Cable
PR5300 018G3	18.5	37	50A	63A	10mm ² Cable
PR5300 022G3	22	45	63A	63A	16mm ² Cable
PR5300 030G3	30	60	80A	100A	25mm ² Cable
PR5300 037G3	37	75	100A	160A	35mm ² Cable
PR5300 045G3	45	90	125A	160A	35mm ² Cable
PR5300 055G3	55	110	160A	160A	35mm ² Cable
PR5300 075G3	75	150	180A	250A	25*4mm ² Copper bar
PR5300 090G3	90	180	225A	250A	25*4mm ² Copper bar
PR5300 115G3	115	230	315A	400A	25*4mm ² Copper bar
PR5300 132G3	132	260	315A	400A	40*4mm ² Copper bar
PR5300 160G3	160	320	350A	630A	40*4mm ² Copper bar
PR5300 185G3	185	370	400A	630A	40*4mm ² Copper bar
PR5300 200G3	200	400	500A	630A	40*4mm ² Copper bar
PR5300 250G3	250	500	630A	630A	40*4mm ² Copper bar
PR5300 280G3	280	560	630A	1000A	40*5mm ² Copper bar
PR5300 320G3	320	630	800A	1000A	40*5mm ² Copper bar
PR5300 400G3	400	800	1000A	1000A	50*8 mm ² Copper bar
PR5300 450G3	450	900	1000A	1000A	50*8 mm ² Copper bar
PR5300 500G3	500	998	1000A	1000A	50*8 mm ² Copper bar

Chapter 11 Warranty

The product quality shall comply with the following provisions (overseas market):

1. Warranty terms

1-1. The product from the ex-factory date, the warranty period of 18 months(except non-standard products). It is based on factory records.

1-2. The product from the ex-factory date. If the product appear quality problem within the normal operating range. We provide free warranty under 18 months.

1-3. The product from the ex-factory date, enjoy lifelong compensable service.

If there is a contract, we will according to the priority principle of the contract.

2. Exceptions clause

If belongs to the quality problems caused by following reasons products, we provide compensable service even though under the warranty. We will charge a maintenance fee.

2-1. The user is not in accordance with the "products manual" is used method of operation

Caused the failure.

2-2. Users without permission to alteration or repair caused by product failure.

2-3. Users beyond the standard specifications require the use of the inverter caused by Product failure.

2-4. Users to buy and then fell loss or damage caused by improper handling.

2-5. Because the user use adverse environment (such as: Humid environment, Acid and alkaline corrosion gas and so on) lead to product failure.

2-6. Due to the fault cause of earthquake, fire, lightning, wind or water disaster, abnormal

Voltage irresistible natural disasters.

2-7. Damaged during shipping ,but users are not rejected goods.

3. The following conditions, manufacturers have the right not to be warranty.

3-1. No product nameplate or product nameplate blurred beyond recognition.

3-2. Not according to the purchase contract agreement to pay the money.

3-3. For installation, wiring, operation, maintenance and other users can not describe the objective reality to the company's technical service center.

4. About the repair fee, according to our company latest price list as a standard.

5. When the products is broken, please complete the form and warranty card, shipping with the failure machine to our company.

6. Dalian Powtran Technology Co.,Ltd reserve the right to explain the terms of the event.

Product information feedback

Dear users:

Thank you for your attention and purchasing POWTRAN technology products! In order to serve you better, we hope to get your personal general information about using POWTRAN technology products, your now and future demand on POWTRAN technology products, gain for your valuable feedback. To facilitate as early as possible when you need our services, please visit the company website POWTRAN technology <http://www.powtran.com> "technologies and services" and "Downloads" section for information feedback.

- 1) Download and update you product manual
- 2) Access to products, technical information, such as instructions, size characteristics, and frequently asked questions
- 3) Application Case Share.
- 4) Technical consulting, on-line feedback
- 5) Feedback by the form of e-mail on product information and user needs information
- 6) For the latest products, access to all kinds of additional services and extended warranty.