

## **Foreword**

Thank you very much for purchasing PR5200 (C) soft starter.

This user's manual provides the users with the instructions on the installation, parameter setting, error diagnosis, 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>.

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## Precaution

- Thanks for selecting intelligent motor soft starter products from Powtran technology Co., LTD., we will with excellent performance in return for your attention!
- Please pay attention to the following matters during the soft starter installation, operation and maintenance process



please be sure to read the operating instructions before installation



Must by professional technicians to install the soft starter



The specifications of the motor must match with the soft starter



Prohibit to connect the capacitors in soft starter output terminal (U, V, W)



The bare terminals must be wrapped by insulating tape after installation



Soft starter or related equipment should be reliable grounding



Input power must be cut off when equipment maintenance



Do not disassemble , modify, maintenance of this product personally.

Only trained people are allowed to operate this device, please read this manual about the safety, installation, operation, and maintenance section before use of the items. The safe application of this equipment depends on the correct transportation, installation,operation and maintenance.

# Section I The introduction of PR5200(C) soft starter

## 1-1. The feature of the PR5200(C) soft starter

PR5200(C) series intelligent motor soft starter incorporates the latest motor control theory and proprietary motor protection technology and advanced software technology of new equipment, it is an ideal replacement of startup products which early used start method of “Star to Triangle conversion”, “autoformer step-down voltage” and “magnetic control step-down voltage” ; at present market ,Its performance is more superior than other ordinary soft starter without using intelligent control technology.

## 1-2. The main function of the PR5200(C) 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 equipments.
- 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 PR5200(C) 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.

- Startup 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.

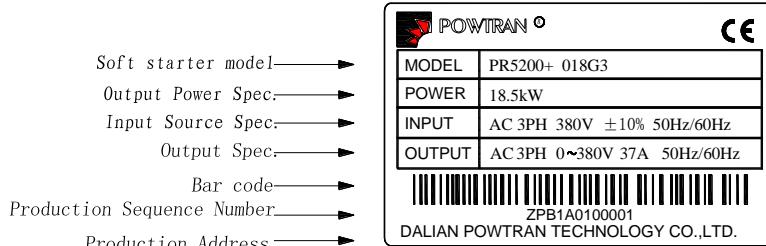
**● Swift thoughtful after-sales service:**

- 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

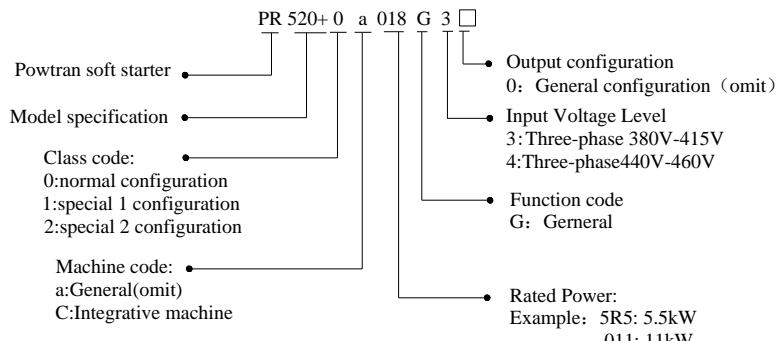
## Section II Product model description and open - package inspection

### 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 PR5200(C) 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

## Section III The Conditions of use and installation requirements

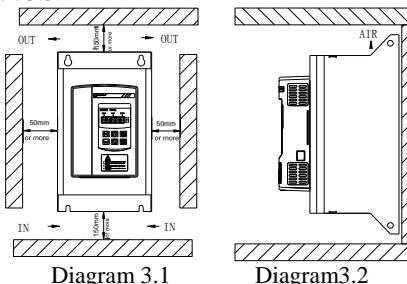
PR5200(C) series soft starter should comply with the following conditions of use and installation requirements; otherwise, the performance will not guarantee, it can shorten life of soft starter even damage.

### 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: air cooling.
- 3-1-5. The protective level: IP20.
- 3-1-6. Environmental conditions: Below elevation 3000 meters, the environment Temperature between -25 °C ~ + 40 °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.
  - ★ 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

- Installation direction and distance: in order to ensure that the soft starter in use with good ventilation and cooling conditions, soft starter should be installed vertically, and in the equipment with sufficient heat dissipation space all round, as shown in chart 3.2 3.1, in the photo, to allow the minimum distance.
- Soft starter install inside ark, in addition to the above requirements outside, still must choose, under ventilated cabinet put oneself in another's position, as shown in chart 3.3.



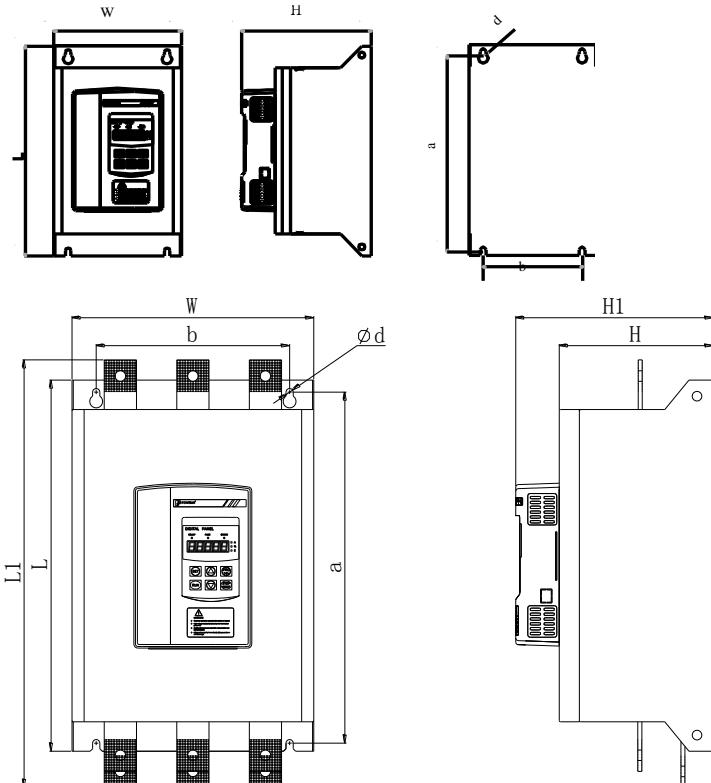
PR5200(C) series integrative machine,wall-mounted(without cabinet installation)and cabinet choose wall-mounted or landed installation,require surroundings ventilated,without dust and other suspended solids.

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

3-3-1. The appearance and installation dimension of the 5.5KW-55KW soft starter.

PR5200 series 75kW-400kW soft starter,the standard factory configuration is three input and six out.

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.



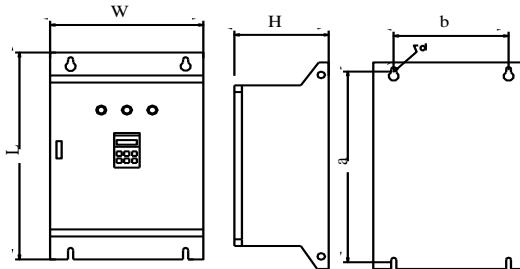
Model	Rated Power (KW)	Rated current (A)	Base No.	Dimension						Installation	Net(kg)	
				L1	L	W	H1	H	a			
PR5200 5R5G3	5.5	11	5R1	-	288	146	-	159	270	115	Ø8	<4.8
PR5200 7R5G3	7.5	15		-	288	146	-	159	270	115	Ø8	<4.8
PR5200 011G3	11	22		-	288	146	-	159	270	115	Ø8	<4.8
PR5200 015G3	15	30		-	288	146	-	159	270	115	Ø8	<4.8
PR5200	18.5	37		-	288	146	-	159	270	115	Ø8	<4.8

### Section III The Conditions of use and installation requirements

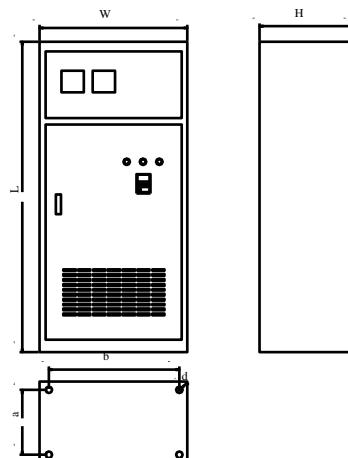
018G3										
PR5200 022G3	22	44		-	288	146	-	159	270	115 Ø8 <4.8
PR5200 030G3	30	60		-	288	146	-	159	270	115 Ø8 <4.8
PR5200 037G3	37	74		-	288	146	-	159	270	115 Ø8 <4.8
PR5200 045G3	45	90		-	288	146	-	159	270	115 Ø8 <4.8
PR5200 055G3	55	110		-	288	146	-	159	270	115 Ø8 <4.8
PR5200 075G3	75	150	5R2	-	350	206	-	210	330	160 Ø9 <10
PR5200 090G3	90	180		-	350	206	-	210	330	160 Ø9 <10
PR5200 115G3	115	230		-	350	206	-	210	330	160 Ø9 <10
PR5200 132G3	132	264	5R3	-	420	256	-	250	400	210 Ø9 <18
PR5200 160G3	160	320		-	420	256	-	250	400	210 Ø9 <18
PR5200 185G3	185	370		-	420	256	-	250	400	210 Ø9 <18
PR5200 200G3	200	400		-	420	256	-	250	400	210 Ø9 <18
PR5200 250G3	250	500	5R4	-	490	360	-	290	465	290 Ø9 <32
PR5200 280G3	280	560		-	490	360	-	290	465	290 Ø9 <32
PR5200 320G3	320	640		-	490	360	-	290	465	290 Ø9 <32
PR5200 400G3	400	800		-	490	360	-	290	465	290 Ø9 <32
PR5200T 132G3	132	264	5R3T	530						
PR5200T 160G3	160	320			460	300	245	191	435	240 Ø9 <22
PR5200T 185G3	185	370								
PR5200T 200G3	200	400								
PR5200T 250G3	250	500	5R4T	565						
PR5200T 280G3	280	560			490	350	245	191	465	290 Ø9 <22
PR5200T 320G3	320	640								
PR5200T 400G3	400	800								

3-3-2. PR5200C series integrative machine appearance and installation dimensions, the standard factory configuration is three input and three out.Wall-mounted size chart(6R1-6R3).

### Section III The Conditions of use and installation requirements



Cabinet size chart



Size table

Model	Rated power (KW)	Rated current(A)	Base No.	Dimension			Installation			Net(kg)
				L	W	H	a	b	d	
PR5200C 015G3	15	30	6R1	620	400	220	600	250	10	
PR5200C 018G3	18.5	37		620	400	220	600	250	10	
PR5200C 022G3	22	44		620	400	220	600	250	10	
PR5200C 030G3	30	60		620	400	220	600	250	10	
PR5200C 037G3	37	74		620	400	220	600	250	10	
PR5200C 045G3	45	90		620	400	220	600	250	10	
PR5200C 055G3	55	110		620	400	220	600	250	10	
PR5200C 075G3	75	150	6R2	980	534	278	852	275	12	
PR5200C 090G3	93	180		980	534	278	852	275	12	
PR5200C 115G3	115	230		980	534	278	852	275	12	
PR5200C 132G3	132	264		980	534	278	852	275	12	
PR5200C 160G3	160	320	6R3	1000	590	300	939	370	12	
PR5200C 185G3	185	370		1000	590	300	939	370	12	
PR5200C 200G3	200	400		1000	590	300	939	370	12	
PR5200C 250G3	250	500		1800	800	600	650	540	16	
PR5200C 280G3	280	560	GGD 柜	1800	800	600	650	540	16	
PR5200C 320G3	320	640		1800	800	600	650	540	16	
PR5200C 400G3	400	800		1800	800	600	650	540	16	
PR5200C 450G3	450	900		1800	800	600	650	540	16	
PR5200C 500G3	500	1000		1800	800	600	650	540	16	
PR5200C 560G3	560	1120		1800	800	600	650	540	16	
PR5200C 630G3	630	1260		1800	800	600	650	540	16	

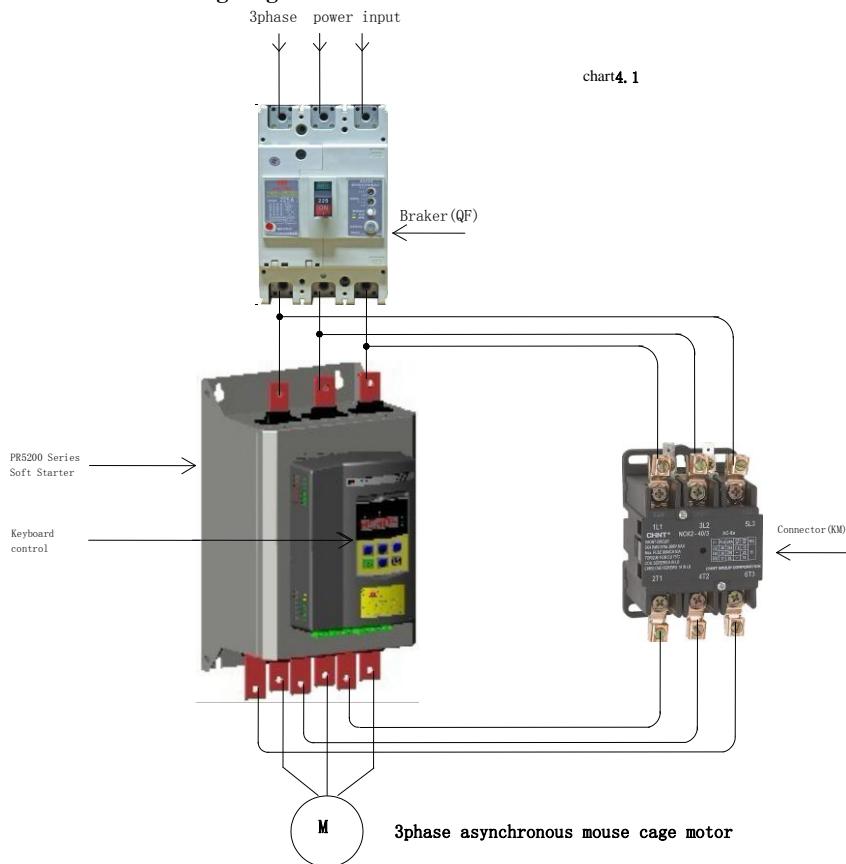
## Section IV Main circuit and terminal wiring

- ★ PR5200(C) 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



### 4-2. Instruction of soft starter terminal wiring.

Output terminal like chart 4.2 illustration:

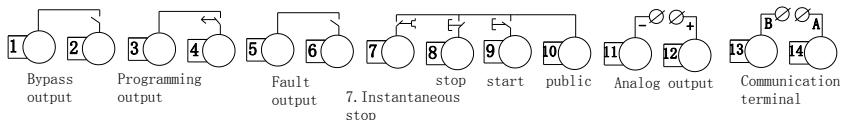


chart4.2

4-2-1.Terminal 1、2 is bypass output which is used to control bypass contactor.

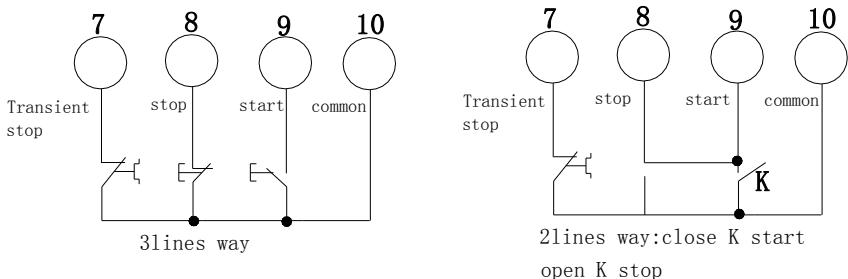
Normally open terminal will close. The terminal capacity is AC 250V/5A.

4-2-2.Terminal 3、4 is programable relay output, output model and function set by “PE”parameter. This terminal is normally open passive pot. Capacity is AC 250V/5A.

4-2-3.Terminal 5、6 is error output: which will close when soft starter error or power lose. Capacity is AC250V/5A.

4-2-4.Terminal 7 is transient stop input. This terminal must connect with terminal 10 when soft starter normally work. If Terminal 7 disconnect with terminal 10, softstart will transient stop and show error. This terminal can be controled by normal close output terminal of outside protection device, set PA to 0 (primary protection),this terminal funtion is prohibited.

4-2-5.Terminal 8、9、10 is for wiring of outside control start,stop button. There are two type wiring way(3 lines and 2 lines) to choose proper way according to demand. As chart 4.3.

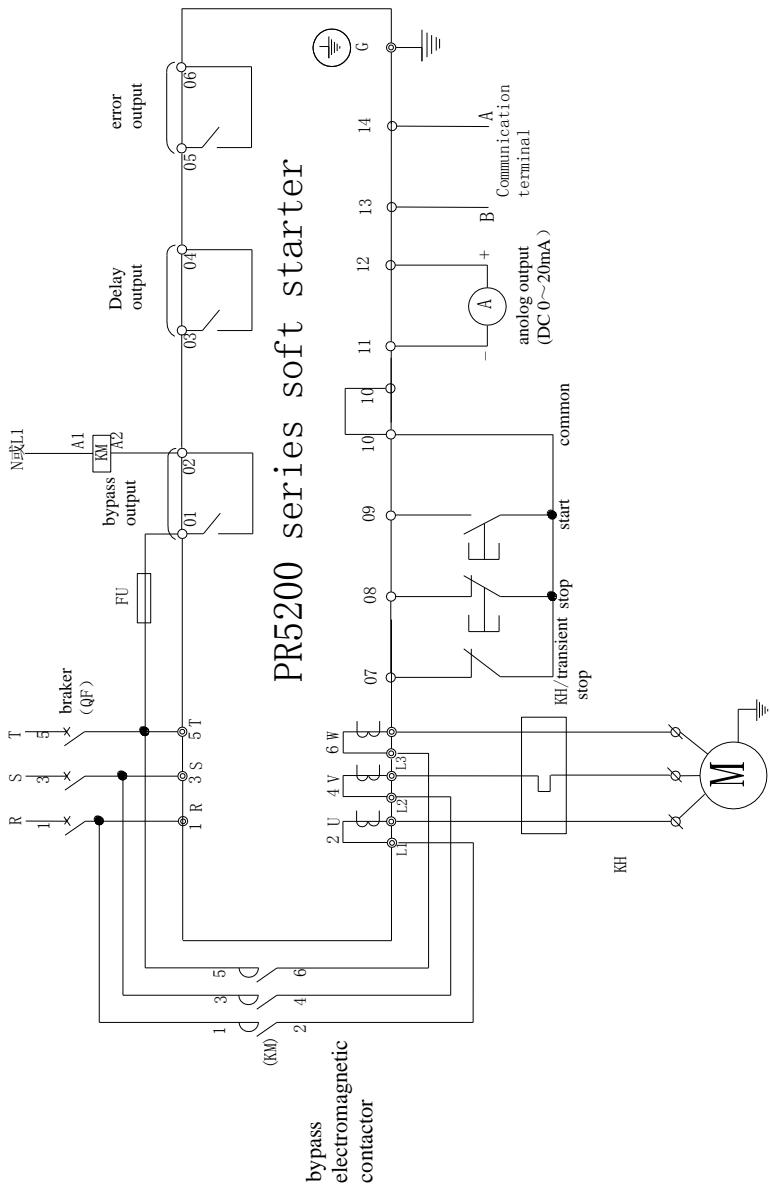


4-2-6.Terminal 11、12 is 0~20mA、4~20mA DC analog output. Which is used to inspect the motor current. The max 20mA indicates motor current is 4 times of soft starter rated current. Which can be viewed by extra 0~20mA、4~20mA current meter. The max resistor of output load is 300Ω. Remark: the machine defaults to 4 ~ 20mA output, if need 0 ~ 20mA output please explain in order.

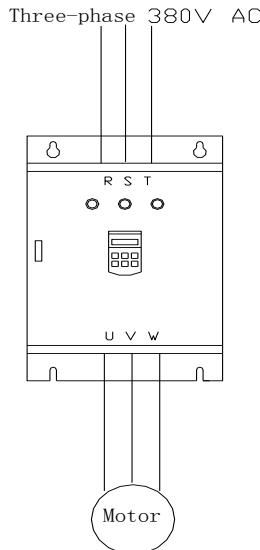
4-2-7.Terminal 13, 14 for the RS485 communication terminal, 13 for the communication terminal B, 14 for the communication terminal A.

4-2-8.The outside terminal should be correct connection, otherwise which will damage this softstarter.

4-2-9.PR5200series soft starter main circuit diagram.



4-3. PR5200C series integrative machine wiring diagram



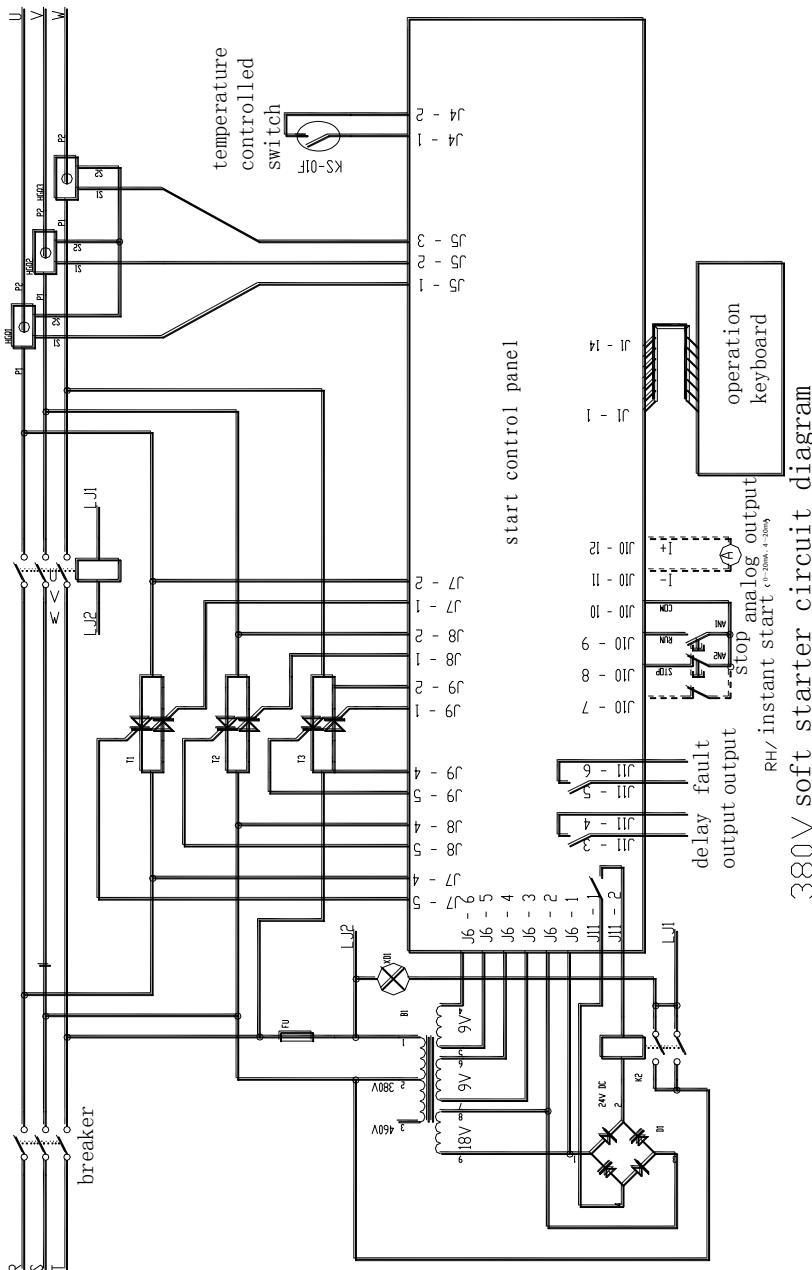
#### 4-4. PR5200C external terminal description

4-4-1. Terminal 3,4 is programmable relay,output and function set by the setting item PE, as normally open dry contact.Contact capacity is:AC 250V/5A.

4-4-2. Terminal 5, 6 as fault output,when the soft starter failure or loss of power closed, when the soft starter normal open, contact capacity is:AC 250V/5A

4-4-3. Terminal 11, 12 as 0 to 20mA、4 to 20mA DC analog output, use for real-time monitoring current,when the full scale is 20mA,the instruction motor current is four times as the soft starter nominal rated current,you can external 0 to 20mA、4 to 20mA DC ammeterto observe, the output load resistance max value is 300 ohm.  
Remark: the machine defaults to 4 ~ 20mA output, if need 0 ~ 20mA output please explain in order.

4-4-4. PR5200C series main circuit wiring schematic diagram.

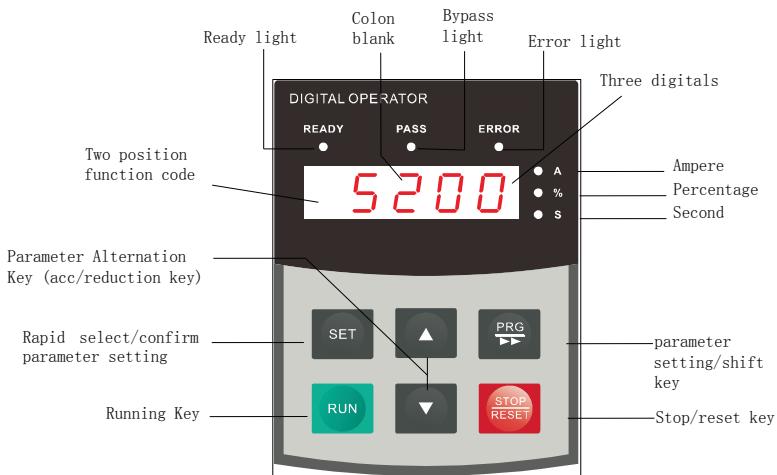


## Section V Control panel and operation

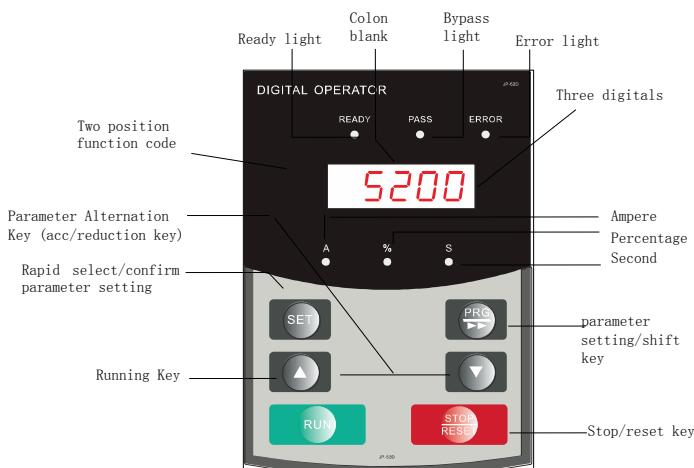
★PR5200(C)series soft starter has five kinds working state:ready,running,error,start and stop. Ready、running、error has corresponding state light.Startup indicates xxxx, softstop indicates —xxxx, and xxxx indicates motor current.

### 5-1 Keyboard operational approach

JP3E5200 keyboard diagram



JP3E5200D keyboard diagram



- 5-1-1. startup state: when the indication ready light display 5200 or **rEAdy**,then softstater can start. The displaying 5200 means POWTRAN 5200 series softstarter. And **rEAdy** means ready to start.
- 5-1-2. Delay state: ready or error state indication light flash means interval, display dE××× and count down means startup delay.
- 5-1-3. Start and stop key:in the process of soft startup,the screen display ×××× to indicates motor current, and only Stop key is valid, and can not enter menu to set parameter, and ready,running,error lights black out.In the process of soft stop, the screen display×××× to indicates motor current, and only RUN key is valid, and can not enter menu to set parameter, and ready, running, error lights black out, meanwhile the stop key has reset function.
- 5-1-4. 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.
- 5-1-5. 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.
- 5-1-6. 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.
- 5-1-7. When the data is more than 999, the last decimal point is bright, indicates the mantissa + 0.
- 5-1-8. If the key operating is effective,there will be a voice tip, or this key does not work in this state.
- 5-1-9. When the external control terminal connected to a 3-wire mode, the external control start button and stop button have the equivalent function with start and stop keys on the control panel.
- 5-1-10. The control panel with super anti-jamming design, and the outside connection

distance is allow to be more than 3 m.

### 5-1-11. Keyboard digital display illustration

Display letter	relative letter	Display letter	relative letter	Display letter	relative letter
0	0	1	1	2	2
3	3	4	4	5	5
6	6	7	7	8	8
9 或 g	A	A 或 R	b	B	B
C	d	d 或 D	E	E	E
F	H	H	J	J	J
L	N	U	U 或 V	V	V
o	P	P	r	r	r
Y	RUN	RUN	UEr	Ver	Ver
READY	READY	good	- Err	Err	Err
M	—	N			

### 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 starting time	2-60S	16S	Limiting current mode does not work.
P2	Soft stop time	0-60S	0S	Setting 0 means free stopping, please set 0 for one with two onnections .
P3	Start delay	0-999S	0S	With a countdown delay, set to 0 without delay, starting immediately.
P4	Language selection	0、1	0	0 for Chinese display, 1 for the English display.
P5	Starting current limit	50-500%	280%	The current limiting mode is effective; the maximum flow value of the voltage slope mode is 400%.
P6	Load regulation rate	50-200%	100%	Relative to the value of the rated current PP.
P7	Under voltage protection	40-90%	80%	Protection below the set value.

P8	Overtoltage protection	100-140%	120%	Protection is higher than the set value.
P9	Starting mode	0-6	1	0 limit current; 1 voltage; 2 jump; limit current; 3 jump + voltage; 4 current ramp; 5 double closed loop; 6 monitoring.
PA	Protection level	0-4	4	0 primary; 1 light load; 2 standard; 3 heavy load; 4 advanced.
PB	Control mode	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	Parameter modification allowed	0-3	1	See 5.5 other setup instructions.
PD	Correspondence address	0-64	0	For MODBUS native slave address setting.
PE	Programming output	0-19	7	See 5.3 programmable relay output functions.
PF	Soft stop current	20-100%	80%	See 7.3.1 soft stop mode.
PP	Motor rated current	11-998A	Rated value	Nominal rated current for input motor.
PU	Bypass delay	0-40S	3S	Used to set bypass time delay.
PL	Three phase unbalance	0、1	1	0 is prohibited, 1 is allowed.
PM	Current regulation rate	50-150%	100%	Used to adjust the current value of the display.
PN	Voltage regulation rate	50-150%	100%	Used to adjust the display voltage value.
<p>Note: 1, set the P6 load adjustment rate is calculated based on the load weight of the motor in the number of PP based on the calculation of the maximum current, more than this value will do the inverse time thermal protection.</p> <p>2, setting the state, if more than 2 minutes without a button operation, will automatically exit the setting state.</p> <p>3, in the soft start and soft stop process can not set parameters, the other state can be set parameters.</p> <p>4, according to the confirmation key (PRG) on the power on the boot, can set parameters to restore the factory value.</p>				

### 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

(1)This way of working contains a 999 seconds timer which setted by the setting item P4. If P4 is not 0, the start timing is according to the initial setting time setted by PE , when the time is up changing the output state, if P4 is 0, changing the output state immediately. The output of the reset time is to sustain 1 seconds after finishing the time delay setted by P4 and in the state of readiness.

(2)The control cycle of programmable output timing is according to one starting process, if re-start the motor , the last programming output process is automatically stopped and re-started the programming process.

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	Readiness	Start state	Bypass state

(1)Programmable state output to indicate the working state of the soft starter, the time setted 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 Operation protection function of power on terminal

The jumper mode is selected, divided into two states.

Status 1: power terminal operation effective protection: external control starting terminal before the power is in a closed state, soft does not respond to run the command must first run the command to remove a and run the command again after the effective soft response.

Soft fault reset time command to run effectively, soft nor the response command to run, we must first run the command removed to eliminate the operation state of protection.

Status 2: on the terminal operation protection is not valid: on the power, if the external control starting terminal is in a closed state, then the automatic starting motor, which is allowed to start on.

The J14 2, 3 short connected to state 1, J14 1, 2 short connected to state 2.

#### 5-5 Other settings Description

5-5-1. set item PC to modify the parameters to allow the selection of items, there are three options:

(1) when the item PC is 0, no parameters are modified.

(2) when the item PC is 1, the P6, PD, PE, PP, PU, and P4 parameters are forbidden to modify the settings.

(3) when the item PC is 2, the parameters of all settings are allowed.

## 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 soft starter specifications for 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 upgrade, 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 the help menu, and then press the acceleration or deceleration key to select message。
- (2) In the help state, press the set key or stop button to exit help state.

## Section VI Protection and description

PR5200(C) 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 setted based on different situation.

### 6-1 Protection functions and their parameters

- 6-1-1. Soft starter over-temperature protection: the temperature rose to  $80^{\circ}\text{C} \pm 5^{\circ}\text{C}$  over-temperature protection, when the temperature dropped to  $55^{\circ}\text{C}$  (the lowest), no over-temperature protection.
- 6-1-2. Input phase protection lag time : <3 seconds.
- 6-1-3. Three-phase unbalance protection lag time: <3 seconds.
- 6-1-4. Three-phase unbalance protection lag 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 benchmark deviation will increase.
- 6-1-5. start over current protection time: the duration is greater than the set P6 load regulation rate for the benchmark 5 times the protection time see table 6.1.
- 6-1-6. Running overload protection time: to set the P6 load regulation rate as the benchmark for anti time thermal protection, protective tripping time curve as shown in Figure 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

## Section VI Protection and description

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PR5200(C) 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, PR5200(C) series soft starter has five protection level, there are 0: primary, 1: light load, 2: Standard 3: heavy, 4: Advanced, it setted by PA setting. 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 Chart 6.1.

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

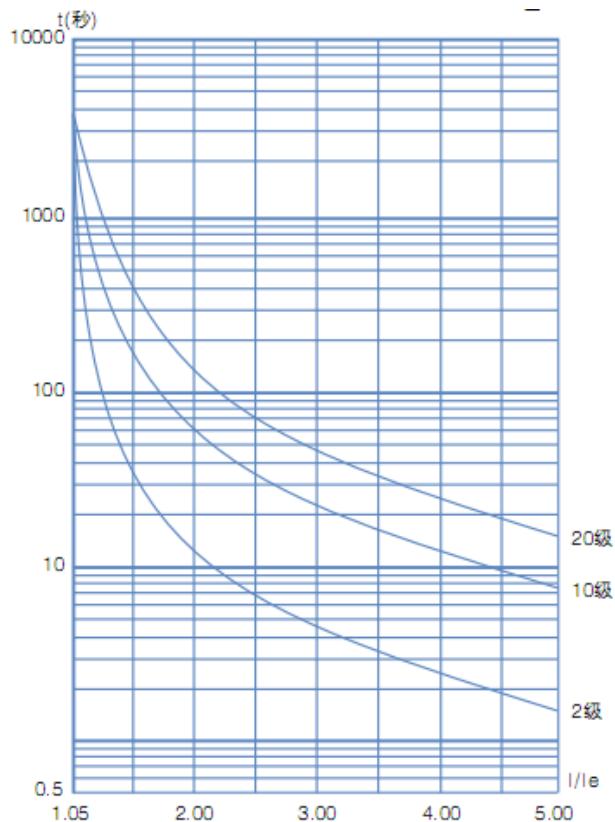
6-2-2. Protection level and thermal protection time according to PA setting is as the diagram below:

Diagram 6.1

PA setting	0(Primary)	1(Light load)			2(standard)			3(heavy load)			4(high grade)			Description
Running overload Level of protection	no	2 level			10 level			20 level			10 level			According to IEC60947-4-2 Standard
Start over-current Protection time	no	3 seconds			15 seconds			30 seconds			15 seconds			Starting current for more than P0setting 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:

Chart 6.1

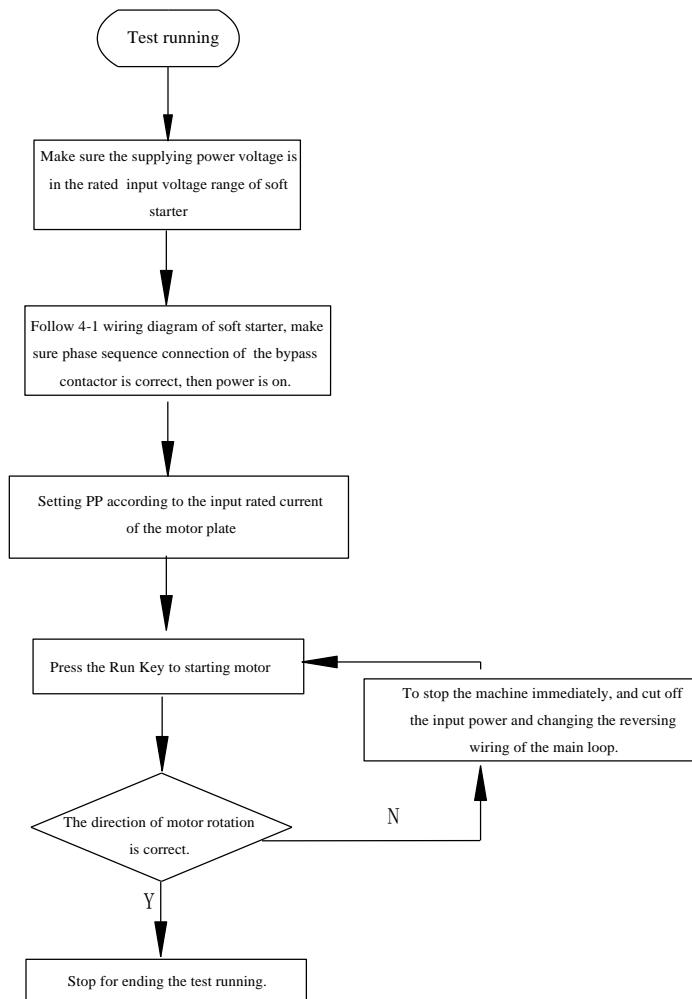


Protection tripping time curve (thermal state)

## Section VII Test running 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



- 7-1-1. If the motor starter status is not satisfactory, 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. Press the stop button or external stop button to reset the fault status.

★ Note:

- (1) When the ambient 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. PR5200(C) Series soft starter starting mode and application

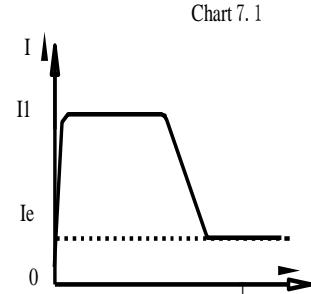
PR5200(C) series soft starter has Seven models to suit a variety of complex starter motor and load conditions, the user can choose it as different application.

### 7-2-1 Current limit starting mode

When setting PB to 0, set the start mode for this mode.

Chart 7.1 shows the current limit mode of the motor starting current waveform changes.  $I_1$  is starting current limit by setting, when the motor starts, the output voltage rapidly increases, till the motor current reaches the current limit value  $I_1$ , 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.

When the motor is lightly loaded or setting the current limit highly, the maximum starting current may not reach the set limit value is normal.

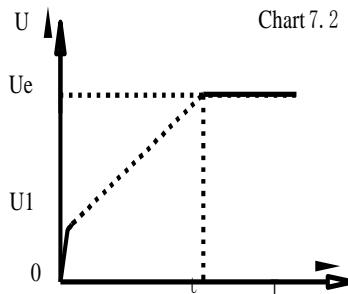


Current limit starting mode is generally used for a strictly limited starting current requirements of the occasion.

### 7.2-2 Voltage ramp start mode

When P9 setting item is 1, start mode is for this mode.

Chart 7.2 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  $U_1$ , 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.



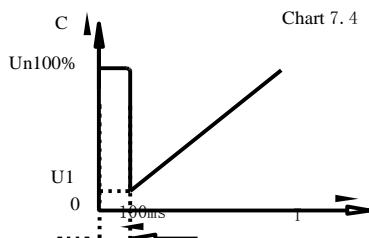
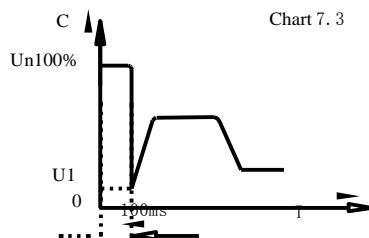
Starting time  $t$  is based on standard load obtained in the standard experimental conditions, control parameters, PR5200(C) series soft starter is based on this parameter benchmark, by controlling the output voltage, make the motor speed up in a smooth start-up process, not a mechanical control, regardless 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 suitable for 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.

Chart 7.3 and Chart 7.4 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



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.

Chart 7.5 shows the current ramp start mode output current waveform, which  $I_1$  is the current limit set  $P6$ ,  $T1$  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.

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

Set P9 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 Monitor start mode

Started in this mode will run in direct starting, can monitor the operation of the motor current and other parameters, when running overload, overvoltage or undervoltage, fault output 5,6 terminal to cut output, also shows the corresponding fault information.

### 7-3. PR5200(C) series soft starter's stop mode and application

PR5200(C) series soft starters, there are two stop modes, soft-stop mode and free stop mode.

#### 7-3-1 Soft stop mode

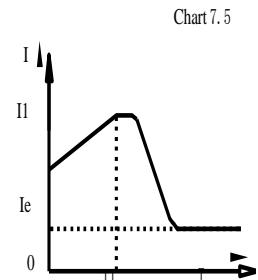
When Setting item P2 is not zero, set the stop mode for this mode.

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, pay attention that, 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 exceed 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 time should provide additional thermal protection devices for each motor.

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

PR5200(C) 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 7.2. Data in the table is only for reference, should be adjusted according to actual situation

Table 7.2

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
Enhance the mechanical	16	60%	4	3.5
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

## Section VIII     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 overheating	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 P6, PP parameters set incorrectly.
Err09	Supply voltage is too low	Check the input voltage or setting item P7 parameter set incorrectly.
Err10	Supply voltage is too high	Check the input voltage or setting item P8 parameter set incorrectly.
Err11	Set the parameters error	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 underload	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.

## Section IX Soft-start model specifications and options

### 9-1 PR5200(C) series soft starter (5.5KW-55KW) list of the external parts of the specification reference:

Soft starter model	Rated Power (KW)	Rated current (A)	Supporting circuit breaker model (QF)	Supporting the bypass contactor model porting the bypass contactor type (KM)	A line size	Remarks
PR5200 5R5G3	5.5	11	16A	25A	2.5mm <sup>2</sup> Cable	Rated power and rated current is the maximum rating of the soft starter, matching circuit breaker and the bypass contactor should match the size of motor specification.
PR5200 7R5G3	7.5	15	20A	25A	4mm <sup>2</sup> Cable	
PR5200 011G3	11	22	32A	40A	6mm <sup>2</sup> Cable	
PR5200 015G3	15	30	40A	63A	10mm <sup>2</sup> Cable	
PR5200 018G3	18	37	50A	63A	10mm <sup>2</sup> Cable	
PR5200 022G3	22	44	63A	63A	16mm <sup>2</sup> Cable	
PR5200 030G3	30	60	80A	100A	25mm <sup>2</sup> Cable	
PR5200 037G3	37	74	100A	160A	35mm <sup>2</sup> Cable	
PR5200 045G3	45	90	125A	160A	35mm <sup>2</sup> Cable	
PR5200 055G3	55	110	160A	160A	35mm <sup>2</sup> Cable	
PR5200 075G3	75	150	180A	250A	30*3mm <sup>2</sup> Cable	
PR5200 090G3	90	180	225A	250A	30*3mm <sup>2</sup> Cable	
PR5200 115G3	115	230	315A	400A	30*3mm <sup>2</sup> Cable	
PR5200 132G3	132	260	315A	400A	30*4mm <sup>2</sup> Cable	
PR5200 160G3	160	320	350A	630A	30*4mm <sup>2</sup> Cable	
PR5200 185G3	185	370	400A	630A	40*4mm <sup>2</sup> Cable	
PR5200 200G3	200	400	500A	630A	40*4mm <sup>2</sup> Cable	
PR5200 250G3	250	500	630A	630A	40*4mm <sup>2</sup> Cable	
PR5200 280G3	280	560	630A	1000A	40*4mm <sup>2</sup> Cable	
PR5200 320G3	320	640	800A	1000A	40*4mm <sup>2</sup> Cable	
PR5200 400G3	400	800	1000A	1000A	40*4mm <sup>2</sup> Cable	

## **Section X    Quality Assurance**

The product quality shall comply with the following provisions:

### **1. Warranty terms**

1-1. The product from the user the date of purchase, the warranty period of 12 months (limited to domestic market).

1-2. Export products and non-standard products warranty period is 12 months or according to the agreement of warranty execution.

1-3. The product from the user the purchase date, guarantee to return, replacement, repair service, within one month after the date of shipment.

1-4. The product from the user the date of purchase, replacement, repair within three months after the date of shipment.

1-5. The product from the user the purchase date, enjoy lifelong compensable service.

### **2. Exceptions clause**

If belongs to the quality problems caused by following reasons products, not within the warranty.

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 repair or alteration 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 environment device caused by aging 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 (Note: the transport mode specified by the customer, the company to assist to handle cargo transfer procedures).

### **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. In return, replacement, repair service, shall be returned the company, confirmed the attribution of responsibility, can be returned or repair



# **POWTRAN Technology Product Warranty Card**

Thank you very much for purchasing POWTRAN product.

The product has passed the strict quality inspection by POWTRAN technology. According to the guarantee card, in the warranty period, if the product has quality problem caused by the hardware malfunction during the normal using condition, the company will be responsible for free maintenance.

Product type:	Producing number:		
Warranty Period:			
Purchasing date:	_____ Day	_____ Month	_____ Year
Invoice No.:			
Customer Name: (Or Company Name)			
Address:			
Postcode:	Tel:	Fax:	
Dealers Name:			
Address:			
Postcode:	Tel:	Fax:	
Dealers Seal			

**Customer feedback form of soft starter fault**

Dear customer: In order to provide our best service to you ,please fill in the table below

Applicatio n			Motor	KW	pole type
When happens	Continuous operation Acceleration slow down power supply others ( )				
What displays	Alarm display ( ) with or without keyboard display ( ) output voltage (YES NO)				
Running after rest	Yes	No	Resetting way	Keyboard Panel	Terminal Power
Others( )					
The control terminal	<u>01,02</u> <u>03,04</u> <u>05,06</u> <u>07</u> <u>08</u> <u>09</u> <u>10</u> <u>11,12</u>				
Others( )					
Working hours		frequency		Installatio n place	
Whether the power is off	Yes No	Whether the machine is abnormal	YES No	Whether it has fault before	Yes( Times) No



The following table is filled in by service agencies

Maintenance Record:

The first time	Maintenance Agency Name		Tel	
	Address		Postcode	
	Maintenance bill number		Maintenance staff sign	
The second time	Maintenance Agency Name		Tel	
	Address		Postcode	
	Maintenance bill number		Maintenance staff sign	
The third time	Maintenance Agency Name		Tel	
	Address		Postcode	
	Maintenance bill number		Maintenance staff sign	



# **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.