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Safety Clauses

In the process of using the soft starter, please note the following Safety Clauses

⚠ Please check this user manual carefully before using the product.

⚠ Only the technical person is allowed to install the product.

⚠ To be sure that the motor is correctly matched with the soft starter.

⚠ It is forbid to connect capacitors to the output terminals (U V W).

⚠ Please seal the terminal switch insulation glue after finishing connect them.

⚠ The soft starter and its enclosures must be fixedly earthed.

⚠ During the maintenance and repair, the input must be off-power.

1. The general of GJ3 series soft starter

Gozuk GJ3 series soft starter is new type start-up equipment which integrates electric force and electronic techniques computer technique and modern control theory. It is the new generation product to replace the conventional star-delta starter, self-coupling voltage-drop starter and magnetic control voltage-drop starter.

1.1 The main function

●This motor soft starter can reduce the starting current of motor and the power-distribution capacity to motor effectively, so it could save the cost.

●It can reduce the starting current of motor and other loading equipments, so that lengthen their service life.

●The function of soft stopping can solve effectively the surging problem of inertia system when stopping. The conventional motor starting equipments cannot realize it.

●The perfect and reliable protection features, can give the effective protection to the operator's safety as well as the motor and matched equipments.

●The application of intelligent and network technique make the GJ3 type soft starter meet the high-speed development of electrical force automated technique effectively.

1.2 The main characteristics

Perfect design

Pretty external shape and structure, perfect and unique functions, simple and reliable operation, every technological is made in the best design.

Reliable and high-grade quality

This product is designed according to the computer analog test, has the best electromagnetic compatibility. It is proved high quality by the high-temperature ageing test and jigging test which done before the products out of factory.

Complete and perfect protection functions

Such as low voltage protection, failure voltage protection, over voltage protection, motor overheat or starting overtime protection, input or output failure phase and three-phase unbalanced protection, over current, over load and short current protection.

Having the self decision-making intellectual property of the product

Including exterior designing patent, decision-making software copyright, the starting and protection techniques of motor, and the technology of detecting and debugging

The best service

The reliable function and quality is the basic of the best service. Even more, we can supply the special designing and functions of product matched to your need and the timely and perfect usage consulting service.

2. Code explanation and check-up before using

Please check up the products before using, if in some problems; please do not hesitate to contact us with any request for additional information. Check-up the type of product whether it is the right one you order.

Shenzhen Gozuk Co., Limited	
Model	GJ3 -5d5
Product Name	Soft Starter
Power	5.5 KW
Rated voltage	3-phase AC380V 60Hz
Rated Current	11A
Rated Frequency	50-60Hz
www.gozuk.com	Made in China
Production Code	Year/Month/day/power/ No

● Check any damage to the product because of the transport, such as the spare parts are apart from the main body or the shell be damage etc.

● Check others, including the certificate of soundness, and the user manual.

3. Usage condition and installation requirement

It is strict rule for the users to use or install the soft starter according to the requirement; otherwise, it will be in bad result.

3.1 The usage condition

Power Supply: City grid power, self-provided power, diesel oil dynamotor, 3-phase alternating current 380V, 480V or 660V±15%, 50Hz or 60Hz. The power capacity of the soft start must meet the motor starting requirement.

Matched Motor: Motor should be three phase squirrel asynchronous motor, and its power capacity must be matched with soft starters.

Starting Frequency: The starting time is according to the loading equipments.

Cooling Mode: Naturally wind cooling.

Protective Grade: IP20

Environment Conditions: when altitude is less than 2000m, the temperature of the environment should be between -25～ 40, relative humidity should be less than 90%, no vapor, no flammable, volatile, corrosive gas. No electric dirt, indoor installation, ventilated, vibration is less 0.5G. Note: Over more, we can manufacture other type soft starters which are used in special conditions, such as explosion-proof type soft starter, low-temperature type soft starter, or high-voltage type soft starter.

3.2 The installation requirement

● The direction and distance of installation: In order to make sure that the soft starter be in good ventilation and heat dissipation, please install the product in vertical direction, and be sure the space around the product is enough.

(See the following diagram 3.1)

● If the soft starter is installed in a box, please note that the ventilation is very good, as well as the above notes. (See the following diagram 3.1)
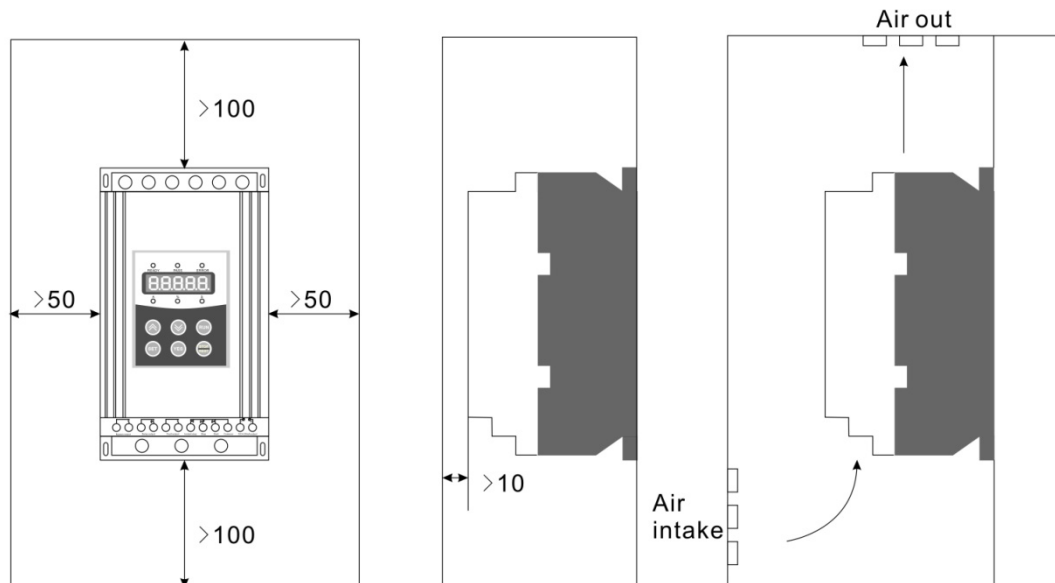

Diagram 3.1

3.3 The installation dimensions

The external shape and installation dimensions of 5.5KW~75KW (Diagram 3.2)

Specifications	Power (KW)	Current (A)	External shape dimensions(mm)			Installation dimensions(mm)			N.W (KG)
			W1	H1	D	W2	H2	d	
GJ3-5d5	5.5	11	146	270	160	131	247	M6	<5
GJ3-7d5	7.5	15	146	270	160	131	247	M6	<5
GJ3-011	11	23	146	270	160	131	247	M6	<5
GJ3-015	15	30	146	270	160	131	247	M6	<5
GJ3-018	18.5	37	146	270	160	131	247	M6	<5
GJ3-022	22	43	146	270	160	131	247	M6	<5
GJ3-030	30	60	146	270	160	131	247	M6	<5
GJ3-037	37	75	146	270	160	131	247	M6	<5
GJ3-045	45	90	146	270	160	131	247	M6	<5
GJ3-055	55	110	146	270	160	131	247	M6	<5
GJ3-075	75	150	146	270	160	131	247	M6	<5

Note: The rated power of motor in the above form is the maximum rated value. Generally, the values of matched motor power capacity should not be more than this value.
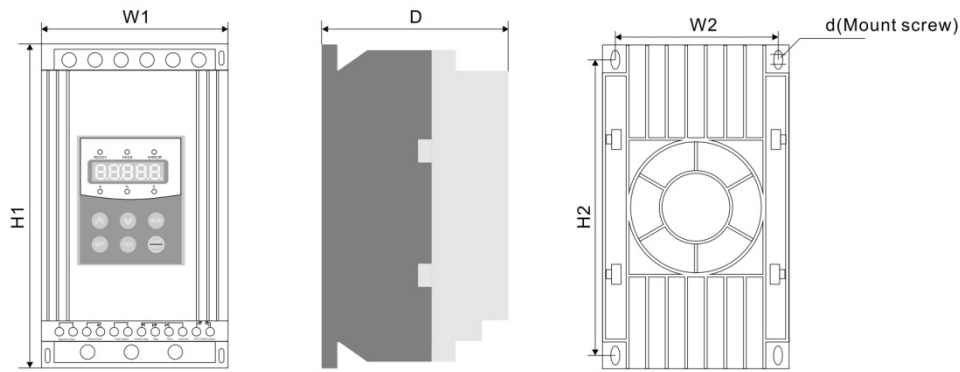
Diagram 3.2

The external shape and installation dimensions of 90KW~600KW (Diagram 3.3)

Specifications	Power (KW)	Current (A)	External shape dimensions(mm)			Installation dimensions(mm)			N.W
			W1	H1	D	W2	H2	d	(KG)
GJ3-090	90	180	257	525	194	195	377	M8	<21
GJ3-115	115	230	257	525	194	195	377	M8	<21
GJ3-132	132	264	257	525	194	195	377	M8	<21
GJ3-160	160	320	257	525	194	195	377	M8	<21
GJ3-185	185	370	257	525	194	195	377	M8	<21
GJ3-200	200	400	257	525	194	195	377	M8	<21
GJ3-250	250	500	290	560	245	260	465	M8	<25
GJ3-280	280	560	290	560	245	260	465	M8	<25
GJ3-320	320	640	290	560	245	260	465	M8	<25
GJ3-400	400	800	330	590	245	300	490	M8	<32
GJ3-450	450	900	330	590	245	300	490	M8	<32
GJ3-500	500	1000	450	740	300	400	575	M10	<40
GJ3-600	600	1200	450	740	300	400	575	M10	<40

Note: The rated power of motor in the above form is the maximum rated value. Generally, the values of matched motor power capacity should not be more than this value.
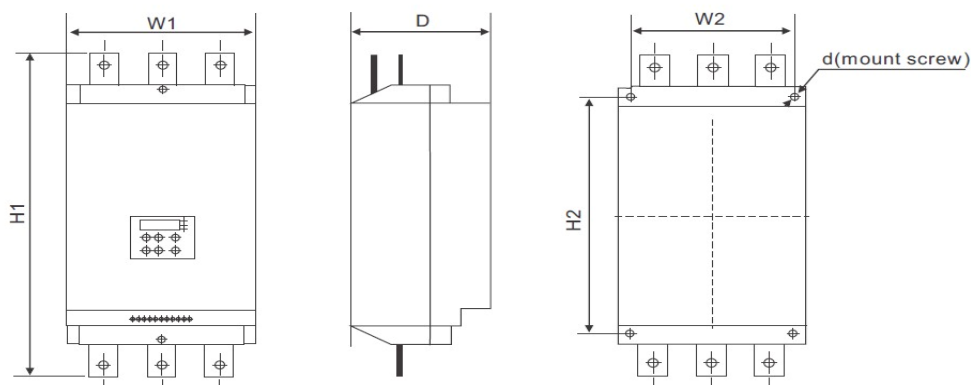

Diagram 3.3

4. Connection and external terminal

Gozuk GJ3 soft starter has three types of connection as following:

Main circuit connection: It contains the wiring of 3-phase source input, the output to motor, and the pass -by contactor connection.

External terminal connection: that is the wire comes from twelve external terminals which including control signal and analogue output signal.

4.1 The diagram connection (see the diagram 4.1)
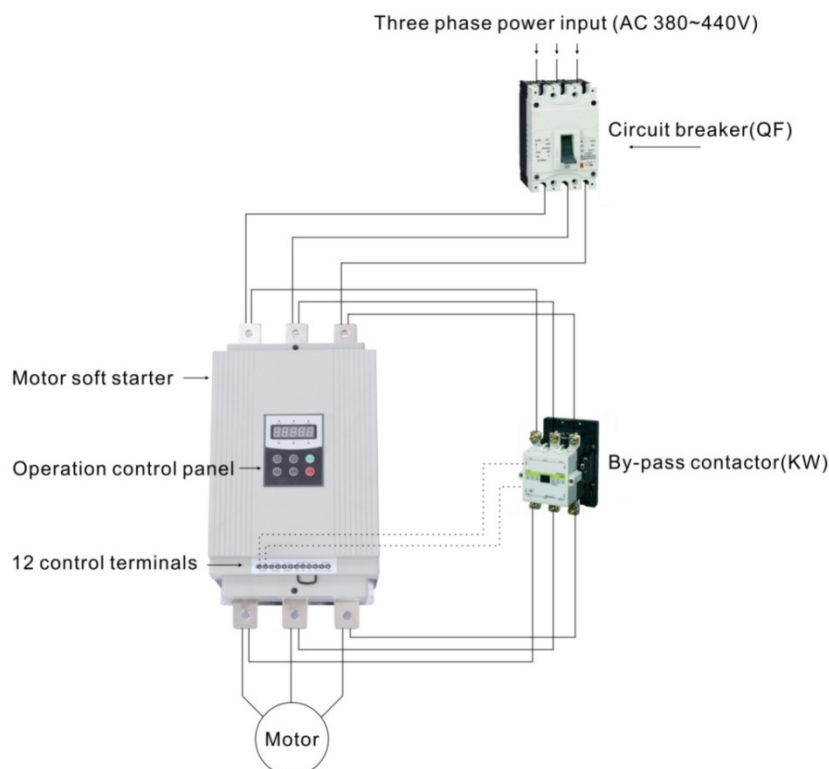

Diagram 4.1

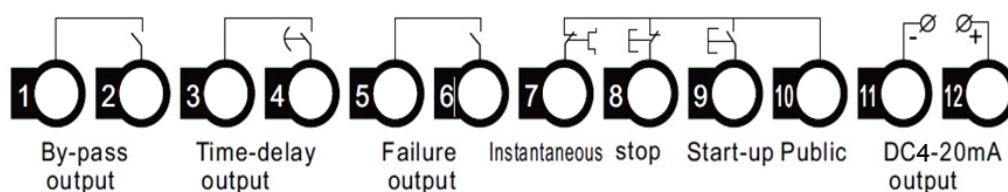## 4.2 The external terminal

Please see the diagram 4.2

Diagram 4.2

- Terminal ① ② are by-pass output, are used to control the by-pass contactor. They are normal open contacts and are closed when finishing starting. The terminal contact capacity is AC 250V/5A.
- Terminal ③ ④ are programmable relay output: The delay time is set by P4 code.

The output command type is set by PJ code. They are normal open no-power terminals, being close when output valid. Please see the detailed information in item 5.3. This terminal contact capacity is AC250V/5A.

- Terminal ⑤ ⑥ are fault output , they will be closed when there are any fault matters happened to the soft starter or electricity lost, while at normal case they are open. This terminal contact Capacity is AC250V/0.3A.

- Terminal ⑦ are instantaneous stop input, this terminal must be connected with terminal ⑩ when the starter works normally. But if these two terminals are open, the soft starter will stop, and at this time the starter is at the state of fault protection. This terminal ⑦can be controlled by the normally closed output terminals of external protection device, and it is useless when the PC code is set to 0(basic protection).

- Terminal ⑧ ⑨ ⑩ are startup or stop input .There are two ways of connections for your selection; those are 3-wire connection and 2-wire connection.

- Ple
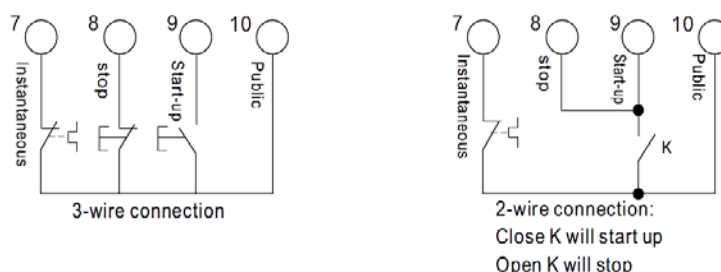
Diagram 4.3

- Terminal ⑪ ⑫ are DC 4~20mA analogue output ,they indicate the current value of motor at real-time working. The 20mA is full-scale value and that is four times than rated current of nominal power of soft starter, while, we can connect a 4~20mADC current meter to check. The max value of output load resistance is 300Ω.

Note: Please make sure that external terminals are in right connection; otherwise, the product may be damaged.

4.3 The diagram of main circuit connection

Diagram 4.4

5. Control panel and its operation

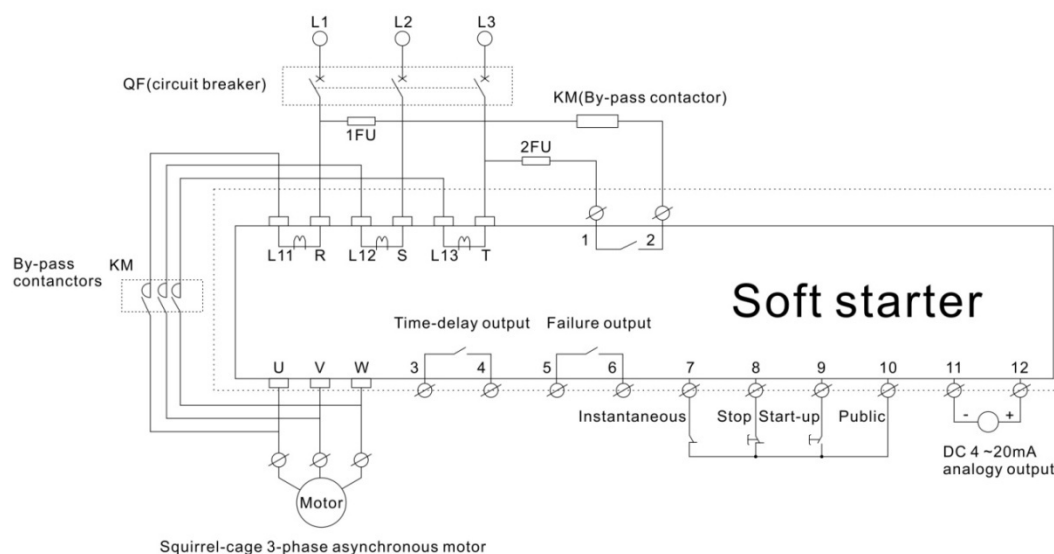Gozuk GJ3 series soft starters have five working states, those are: Ready, Run, Fault, Start and Stop. The control panel will show the current vault of motor when in the process of start or stop, and it will show the set and help menu at other states.

5.1 The operation of control panel
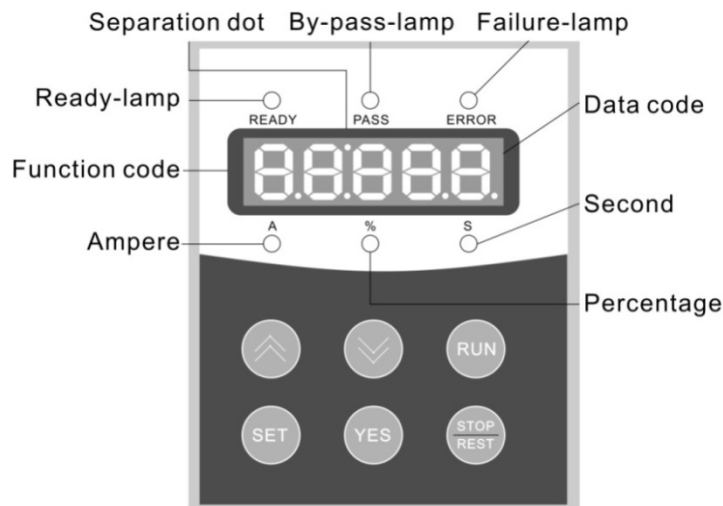
Please see the diagram 5.1

Diagram 5.1

- Open state: Please do not press the "run" key until the ready-lamp lights and show "READY"
- Time-delay state: When the ready-lamp or fault-lamp is shining, it means it is interval time delay; and when the display screen shows "dEXXX" and count down, that means staring time-delay.
- The "RUN" or "STOP" key: In the process of staring, the panel shows "XXXX" that is the value of start-up current .At this time only "STOP" key is valid. And the lamps of Ready, Run and Error are all dark, and you can't come into the "set" and "help menu" state. While, in the process of stopping, the panel shows "XXXX" that is the value of motor current. At this time, only "RUN" key is valid, and the lamps of Ready, Run and Error are all dark, and you can't come into the "set" and "help menu" state. The "STOP" key also has reset function.
- The "SET" key: Press 'SET' key to enter the Set Menu and panel shows P X: X X X. Please press "Set" key again and Colon is shining, then you can change the parameters after the colon you need. If you want to save the parameter change, please press "YES" key. If you do not want to save, please press the "SET" key until the colon stops shining, then the parameters recover. Having finished the above operation, please press the "YEX" key to exit or press "Stop" key to exit directly.
- The "YES" key: Under non-Set State, press the "YES" key to enter Help Menu and the panel shows HX: XXX. When you finish reading the Help Menu, you can press "YES" key again or "Stop" key to exit. Under Set State, This key can save parameters,

and press again can exit set state.

● The "Up" (∧) and "Down"(∨) key: In Set Menu, when the colon is not shining, you can press these two keys to select the Function Code; When colon is shining, you can press these two keys to change parameters. It is the same as the operation in Help Menu. When the Pass-by -lamp is lighting and the display Screen shows AXXX which means the operation current value of motor, now you can press "Up" or "Down" key and the screen will display PXXXX or HXXXX. (P X XXX means the apparent power of motor; HXXXX means the over-load heat balance coefficient, if this value is more than 100%,the screen shows"Err08",that means soft starter is at state of over-load protection.)

Note: 1. only the operation is valid, soft starter will be with the voice when pressing the key. Otherwise, the operation is invalid.

     2. The control panel uses the super anti-interference material, so keypad cable can be external connection 3 meters away.

     3. Using "3-wire connection", the external start and stop button are same function as keypad "RUN" and "STOP".

5.2 Parameters set and explanation

The explanation for "Parameter-set" codes

Code	Explanation for codes	The range of value	Ex-factory value	Special explanation
P0	Initial voltage	30-70%	30%	This code can be used when the starting mode is set as "Voltage ramp to start," and if is "Limit-current" mode ,the value will be fixed as 40%
P1	Soft starting time	2-60S	16S	It is invalid in "Limit-Current" starting mode.
P2	Soft stopping time	0-60S	0S	If the code set as "0", the motor will free stop. One soft starter for 2 motor, this code should set "0".
P3	Start-up time delay	0-999S	0S	Delay is with countdown mode; If set as "0", the starter will start up the motor immediately.
P4*	Programming time-delay	0-999S	0S	Set "0" immediately close, this code be used with "programming relay output"
P5	Interval start time-delay	0-999S	0S	Be used when you need or have to Re-start the motor for several times, or Re-start the motor after removing the over-heat protection for motor.
P6	Start-up limit current value	50-500%	280%	It is used when the staring mode is "current limit", and the value will be fixed as 400% when the starting mode is "Voltage ramp to start"

Code	Explanation for codes	The range of value	Ex-factory value	Special explanation
P7*	Maximum current of soft starter	50-200%	100%	The "50-200%"is basic on the nominal current of motor. If the set value of this code over 200%,the soft starter will reverse to over heat protection
P8*	Modes of input display	0-3	1	Set the detailed in Item 5.3.
P9	Lower voltage protection	40-90%	80%	When the working voltage is under the voltage range(80%),the soft starter will be low voltage protection
PA	Over voltage protection	100-140%	120%	When the working voltage is over the voltage range(120%),the soft starter will be over voltage protection
PB	Modes of starting	0-5	1	0: Limit-current to start 1: Voltage ramp start 2: Torque control + limit current 3: Torque control + voltage ramp 4: Current ramp start 5: Double closed loop
PC	Output protection allowed	0-4	4	0: Primary level; 1: Light load; 2: Standard load; 3: Heavy load; 4: Super level
PD	Operation control mode	0-7	1	Set "7" is for prohibition startup or stopping of operation, details see Item 5.3.
PE*	Restart	0-13	0	0: Restart prohibit; 1 ~ 9: Restart times; 10 ~ 13: Other functions.
PF*	Parameter revise	0-2	1	0: Parameter revise prohibit; 1: Partial parameter revise prohibit; 2: All parameter allow to revise.
PH*	Communication address	0-63	0	Many soft starters connect with upper computer.
PJ*	Programming output	0-19	7	Set the detailed in Item 5.3
PL*	Soft-stopping current limit	20-100%	80%	Set the detailed in Item 7.3

Code	Explanation for codes	The range of value	Ex-factory value	Special explanation
PP	Motor rated current		Rated value	"The rated current of motor" is the same as the motor nominal current.
PU*	Motor underload protection	10-90%	0	Set the detailed in Item 6.

Note:

● P7 the "Max working current", is basic on the nominal current of motor.

● If you have no any operation for 2 minutes after you come into the "set" state, soft starter will exit from "set" state.

● You can not set any parameters in the process of starting or stopping.

● If you press the "YES" key to power on soft starter, all parameters will recover to factory setting except PJ code.

● When PF=1, these parameters with "*" prohibit to be revised.

5.3 Parameters code function explanation

The parameter P8 is use to select mode of input and display.

As the following form:

Numerical value of P8	0	1	2	3
Input Way(P6,P7)	Input current value	Input percentage	Input current value	Input percentage
Keypad display	Current Value	Current Value	Percentage	Percentage

Note: If the P6, P7 items input the percentage numerical value, the percentage is the current Percentage set by PP code.

The parameter PD is used to set the control ways of soft starter; as the following form:

Numerical value	0	1	2	3	4	5	6	7
Keypad	1	1	0	0	1	1	0	0
External control	0	1	1	1	1	0	0	0
Communication	0	0	0	1	1	1	1	0

Note: In the above form,"**1**" is allowing,"**0**" is forbidding. For example, if you forbid any unexpected stopping or starting when soft starter is in working or in maintenance, you can set PD as"7", which means forbidding any starting or stopping operation.

If the "External Control" is allowing, you must contact a normally closed switch button between the terminal 8 and 10, otherwise the soft starter can't start-up the motor.

The parameter PJ is use to set the moment of programmable relay output, As the following form:

Numerical Value of PJ	The moment for program output
0(10)	When sending the order of starting , the program output
1(11)	When beginning to start , the program output
2(12)	When at the start of bypass operation, the program output
3(13)	When sending the order of stopping, the program output
4(14)	When finishing the operation of stopping, the program output

If users need programmable relay output time delay, the time can be set by parameter P4.

● When the PJ is set as 5-9(or 15-19), the programmable operation way is time sequence output, As the following form:

The number set by PJ	The "output state" showed
5（15）	Error state
6（16）	Working state
7（17）	Ready state
8（18）	Starting state
9（19）	By-pass operation state

● The way of programmable state output is used to show the working state of soft starter state, and under this way, the P4 code is invalid;

● The factory setting of PJ code is "7" showing the ready state of soft starter and at this time the motor can be started up;

● when the PJ code is "5" outputting error state of motor, Terminal ③ ④ can output fault such as: Err05, Err06, Err07, Err08,Err12, Err15. Which will not affect the function of ⑤⑥ error output terminals.

● When PJ > 9, the programmable output will be "reverse phase output", (Normal open will reverse to normal close).

5.4 The function of automatic Re-start

When the PE code is not set as "0", the automatic Re-start function is allowing. This function is valid only the external control connection is 2-wire way and is out of control by the PD code. When there is 2-wire way you can:

● After power on and delaying 60 seconds, the soft starter will Re-start automatically.

● After stopping because of any fault and delaying 60 seconds, the soft starter will Re-start automatically, when P5 set value is over 60 seconds, the Re-start delay time will be P5 set time.

● The total number of times of automatic re-start is "n" times; "n" is set by PE item.

● The function of automatic re-start is valid only when getting new power on.

● PE=10: Prohibit under-voltage protection (automatic Re-start is allowing);

● PE=11: Re-start is allowing after instantaneous stop (not need to reset).

● PE=12: Prohibit under-voltage protection and Re-start is allowing after instant stop.

● PE=13: Working state recover function, that means power off and on again soft starter will automatic restart and transfer to by-pass working state.

● **Warn**: The soft starter has the protection function of under-voltage, so when the

power be cut off and then get on again, the soft starter will not Re-start no matter which state the control terminals at, that avoid danger to operator. But if the automatic Re-start is allowed or to prohibit under-voltage protection, the protection function of under-voltage will be invalid. Then the operators need to be careful.

5.5 Help message and explanation

When the product is not starting or stopping ,or not at the "set" state, you can press "Yes" key and come into Help menu ,then press the "Up" Ⓐ or "Down" Ⓥ key to choose the help message. Please press "Yes" or "Stop" key to return.

Help message Form

Message displayed	Explanation
AC 380	That is the 3-phase power voltage is AC 380V.
05.5-3	That is the specification is AC 380V, 60Hz, 5.5KW.
H1:E05	The fault message Err05 that happened at the last time.
:	:
H9:E00	It says no fault happened.
Uer1.5	It says the software of the products is Ver1.5 ~ 6.5.
Lxxxx	Xxxxx is times of successful soft starting
RUNxx	Xx is last soft starting time
Note: The message H1 ~ H9 displayed means 9 faults records that happened lately.	

6. Protection functions and directions

We make our motor soft starters have all kinds of protection functions to protect the safty of soft starter and the motor. Please choose the correct protection Class and parameters according to your application conditions!

Over-Heat Protection：When soft starter inside temperature is up to 80 ℃,the starter will turn to Over-Heat protection, when be down to 55 ℃,this protection removes.

- Input default phase protection: the delayed time < 3s
- Output default-phase protection: the delayed time < 3s
- Three-phase unbalance protection: the delayed time < 3s,when the difference of current among three phrases is more than 50%±10%,the protection be valid.
- Starting over-current protection time: The diagram of over current 5 times of P7 set rated working current is just as diagram 6.1.
- Working over-load protection time: the starter will be in inverse time thermal protection on. Base of the Max working current of motor (Set by P7), (The diagram 6.1 show)
- Low voltage protection delay time: When power voltage is less than 40%, the protection delayed time < 0.5S; When power voltage is less than 80%, the protection delayed time < 3S.
- Over-voltage protection delay time: When power voltage is more than 130%, the

protection delayed time < 0.5S; When power voltage is more than 120%, the protection delayed time < 3S.

● Load short-circuit protection delay time: The protection delayed time < 0.1S.
● Motor underload protection delay time: The protection range (10% ~ 90%) is set by PU, the delayed time is 5 seconds. When PU < 10, the protection is invalid.

6.1 Protection classes and explanation

According different usage conditions, GJ3 Soft Starter has five protection classes, as following:

0. Basic protection
1. Light-load protection
2. Standard protection
3. Heavy-load protection
4. The superior protection

● Basic protection includes the protection functions of overheat, short circuit, and input default phase protection and prohibit external instantaneous stop terminal. Which is proper urgently startup conditions, such as fire pump.
● The protections of light load, standard and heavy-load have the overall protection function of soft starter. The difference among them is protection level of overload and over current. See the diagram of 6.1.
● Under the superior protection, the soft starter has a higher protection level.

The protection classes and the time of heat protection as (diagram 6.1)

| PC code	0:Basic protection	1:Light-load protection			2:Standard protection			3:Heavy-load protection			4:Superior protection			Note
The grade of overload protection	No	2 grade			10 grade			20 grade			10 grade			Standard of IEC60947-4-2
The grade of over-current protection	No	3 Second			15 Second			30 Second			15 Second			The 5 times of P7 current
Overload drop-away time	The multiple to the rated current	3	4	5	3	4	5	3	4	5	3	4	5	They are the typical values
	Drop-away time (S)	4.5	2.2	1.5	23	12	7.5	46	23	15	23	12	7.5	
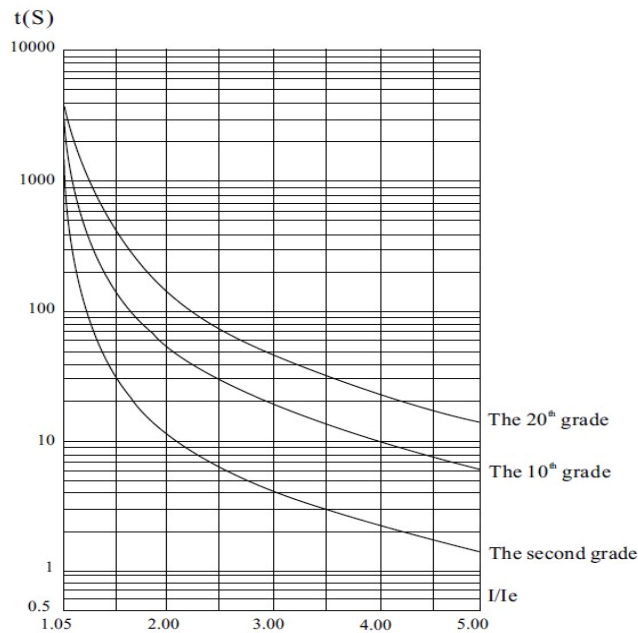
Diagram 6.1 (IEC60947-4-2 standard)
Motor heat protection curve (overload drop-away time)

Remark:

1. PP set value should be same as motor nameplate rated current.
2. The PP set value should be less than 15% of soft starter rated current, otherwise the overheat protection will be useless because of big tolerance.

7. Test run and application

Please do some examinations before test running as following:

●   Whether the rated power of soft starter is matched with the Motor.

●   Whether the Insulation of motor meets requirement.

●   Whether the main circuit connection of input and output is correct.

●   Whether all the screws of terminals are twisted tightly.

7.1 Power on to test running

●   Power on, soft starter displays "READY ", and the Ready-lamp is light, then you can press "Run" key to start.

●   Set PP be same as motor nameplate rated current.

●   After started the motor, you should examine whether the motor running direction is correct, or whether runs normally. If not, you can press "STOP" key or cut off the power to stop running.

●   If the soft starter starting state is not satisfied. Please see the detailed explanation at 7.2: the starting mode and application

●   If the start torque is not enough, you can change the starting voltage (when the starting mode is voltage control) or the certain current value (when the mode is current control) to improve start torque.

●   Do not open the face cover in case of electric shock.

- If there is any abnormal voice, smoke or taste, please cut off power as soon as fast, and check the reason.
- When the starter power on or be in starting, the error lamp is lighting and screen displays" Err××", at this time, you can check diagram 7.1 to find out reason .
- Press "STOP" key or external stop button can reset the error state.

Note: When ambient temperature is less than -10°C, the starter should be power on to preheat for 30 minute, and then to start.

Errors and Solution way (Diagram 7.1)

The error display	Explanation	Reason and the solution way
Err00	The fault is removed	Any faults are removed, such as low-voltage, over-voltage, over-heat. Now the Ready-lamp is lighting and you can start the motor
Err01	The external instantaneous stop terminal is open	Please connect the external instantaneous stop terminal (terminal 7) with the public terminal (terminal 10)
Err02	The soft starter is over hot	The starter is started too frequently, or the starter power is not matched with the motor
Err03	The starting time is over long, which is longer than 60s.	The starting parameter is set wrong, or the load is over and the power capacity is not enough
Err04	Input phase failure	Please check whether the input circuit connections, bypass contactor and the controlled silicon is open or whether the KG wire is not connected.
Err05	Output phase-failure	Please check whether the output circuit connection, bypass contactor and the controlled silicon are short circuit, or whether the KG wire is connected well.
Err06	Three-phase unbalance	Please check the input three-phase power or the motor is abnormal
Err07	Starting over current	Overload, or the motor is not matched with the soft starter
Err08	Running over load	Overload or the P7 code is set wrong.
Err09	Low voltage	Please check the voltage of input power or the P9 item is set wrong.
Err10	Over voltage	Please check the voltage of input power or the PA item is set wrong.
Err11	The parameters are set wrong	Please change the parameter correctly, or you can press the 'YES' key to power on the starter again to recovery the factory setting

The error display	Explanation	Reason and the solution way
Err12	Load short circuit	Check load and the controlled silicon is short circuit or overload
Err13	The wiring of automatic Re-start is wrong	The external terminals is not connected according the 2-wire way.
Err14	The wiring of external terminal is wrong	When external control mode is allowing, the external stop terminal is open, and soft starter cannot start

Note: When the motor starts successfully, the bypass lamp will be lighting that means the bypass contactor is running. At this time, if the contactor is not closed, the motor will stop running, so you can check whether the wiring of the bypass contactor is right.

7.2 The starting mode and application
Gozuk GJ3 soft starter has six starting modes for the user to select according the motor and load equipments, as the following:
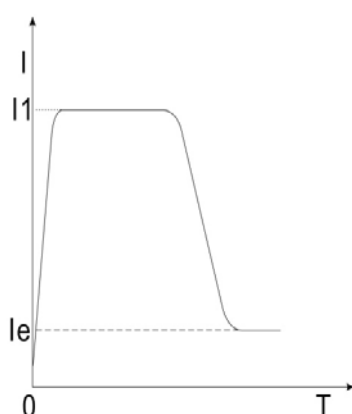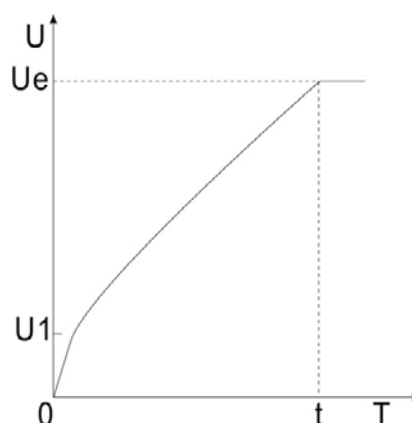

Diagram 7.1   Diagram 7.2

7.2.1 Current-limit to start (The PB code is set as"0") Diagram 7.1 shows the waveform of motor current . I1 is the starting limit-current preset value. When starting, the output voltage rises quickly till the motor current up to I1 value and not beyond this value. The motor runs steadily in pace with the rising of output voltage, and when the motor runs to be the rated speed, the output current will have a quick-drop and down to the motor rated current (Ie value),then the bypass contactor is working, the stating process finished.
Note:When motor load is too light or I1 preset value is too high, the max current of starting may can not reach I1 value. This starting mode fits for the conditions which requires strict current limit of starting.
7.2.2 Voltage ramp to start (The PB code is set as"1") Diagram 7.2 shows the output voltage waveform. In the diagram, the U1 is the initial voltage value of starting. When starting, if the motor current is not more 400% than the rated current, the output voltage of soft starter will rapidly rise to U1, and the output voltage rises gradually to the rated voltage (Ue), and the motor gradually increase and until running at rated voltage and

speed, and then the bypass contactor closed, the starting process finished.

Note："T" is the automatic detecting starting time according to load. It will be less than set time when the load equipments are light; this starting mode fits for the common occasions where the motor need to be started smoothly.
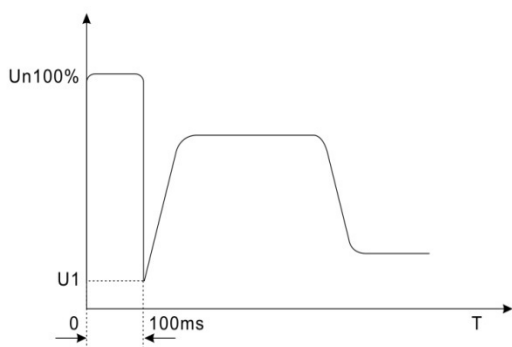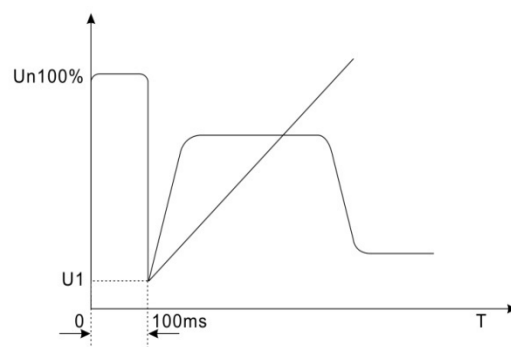

Diagram 7.3   Diagram 7.4

7.2.3 Torque control +current limit or +voltage ramp (The PB code is set as "2" or "3") Diagram 7.3 and 7.4 shows the output changing waveform of torque control starting mode. When the static friction force of heavy load is too stronger to start the motor, user can use this starting mode. At first state of starting, the motor needs a higher voltage to conquer the static friction force of heavy load, and then starts with current-limit or voltage ramp mode to start the heavy motor.

Note：This mode will cause big-current shock to the motor, so if the voltage ramp or current limit starting mode can startup the motor, it is better not to use this torque control mode to start.

7.2.4 Current ramp to start (The PB code is set as"4")

Diagram 7.5 shows the output current waveform. In the diagram I1 is current value preset by P6 code, and T1 is time value present by P1 code. This starting mode has very stronger speed-up ability and is suit for the bipolar motors, and it can reduce the starting time.
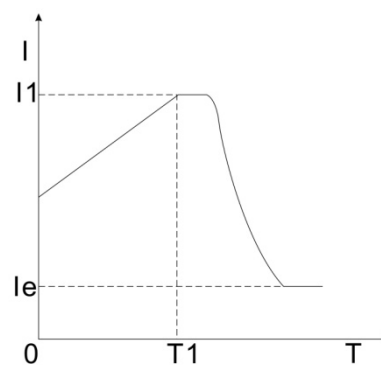

Diagram 7.5

7.2.5 Double closed loop (Both voltage ramp and current limit) to start (The PB items set as"5"). This starting mode uses voltage ramp and current limit double closed loop circuit; it is a composite starting mode. The output voltage waveform is changed as different motor and the load equipments. This mode fits for smooth starting and strictly current limit occasions.

7.3 The stopping mode and application

The soft starter has two stopping modes; those are Soft-stopping mode and Free-stopping mode.

7.3.1 Soft-stopping Mode (The P2 item is not set as"0") When using this mode to stop the motor, the power supply of motor will be transferred from the bypass contactor to the

controlled silicon of soft starter, and the output voltage of starter will be reduced gradually so that the running speed of motor can be cut down smoothly avoid mechanical shock. The output ending voltage is the same as the starting initial voltage. Soft-stopping mode can reduce or remove the surge of the loading equipments such as the water pump. You can set the soft-stopping current limit value through the PL code to reduce the high current shock to the motor when stopping. This current limit value is percentage of P6.

7.3.2 Free-stopping Mode (The P2 code is set as"0")

When using this mode to stop the motor, the soft starter will cut off the connection to the bypass contactor and forbid the controlled silicon output voltage after receiving stopping command. The motor stops gradually with its inertia. One soft start connecting with two motors must use this free stopping mode. Generally, if the soft stopping mode is not necessary, please choose the free stopping mode to prolong the service life of soft starter. This mode completely forbids the instantaneous output; avoid instantaneous high current shock to the motor of specially applying.

7.4 Application examples

The parameters of the different loads are different, please refer to diagram 7.2.

The loading	Voltage ramp starting time(s)	Voltage ramp stopping time(s)	Initial voltage	Voltage ramp (current limit)	Current limit to start
Ball mill machine	20	6	60%	400%	350%
Fan	26	4	30%	400%	350%
Centrifugal	16	20	40%	400%	250%
Piston compressor	16	4	40%	400%	300%
Lift	16	10	60%	400%	350%
Stirring machine	16	2	50%	400%	300%
Breaker	16	10	50%	400%	350%
Screw compressor	16	2	40%	400%	300%
Rotating conveyor	20	10	40%	400%	200%
Light load	16	2	30%	400%	300%
Convey belt	20	10	40%	400%	250%
Heat pump	16	20	40%	400%	300%