PC20 Smart Mini Pump Drive

User Manual

Preface

Thank you for using PC20 series products. This manual provides you with relevant operation instructions and detailed description of parameters. Please read this manual carefully before installation, running, maintenance or inspection.

Please make sure the wiring and the pump's rotation direction is correct before use.

CONTENTS

Notes for Safe Operation

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the smart pump drive. In this manual, safe operation are classified as "WARNING" or "CAUTION".

SPD: Abbreviation of smart pump drive.

⚡**WARNING**
Indicate a potentially dangerous situation which, if not avoided, could result in death or serious injury to personnel.

⚠**CAUTION**
Indicate a potentially dangerous situation which, if not avoided, could result in minor or moderate injury and damage to equipment. It may also be used for warning against unsafe practices.

Even items described as (⚠CAUTION) may result in a vital accident in some situations. Please follow these important notes:

Before Installation

⚡**WARNING**
Do not install or operate any SPD that is damaged or has missing parts. Otherwise, it may result in equipment damage or harm life.

Installation

⚠
Hold the bottom of the SPD when install or move the SPD, cannot just hold the shell to prevent the injured or broken SPD.
SPD must be far away from heat source, flammable and explosive objects, and installed on metal or other nonflammable objects.
If the SPD is mounted in a protective cabinet, the cabinet need to set vents to ensure ambient temperature is below 40℃; otherwise it may be damaged because of high temperature.

Wiring

⚡
Ensure only qualified personnel to operate. Otherwise it can cause an electrical shock or damage of the SPD.
Make sure the SPD is isolated from power supply by the circuit breaker. Otherwise it may cause a fire.
Make sure that the ground terminal ⏚ is grounded correctly. Otherwise it can cause an electrical shock.
Please do not touch the main circuit terminal, and the main circuit terminals of the SPD do not contact the shell. Otherwise it may cause an electrical shock.

⚠
Before connecting, make sure that the SPD rated voltage, phase number confirm to input voltage, phase number; Otherwise it may cause fire or personal injury.
Never connect the AC input power supply to output terminals V, U, W; Otherwise the SPD will be damaged and the guarantee is invalid.
Never perform with stand voltage test of the SPD, otherwise it may cause a damage to the SPD.
The main circuit wiring of the SPD and the control loop wiring should be separated or

vertical crossed, otherwise it will make the control signal interference.

The cable connected to the main circuit terminals should be use lugswith isolated casing.

If the length of cable between the SPD and the motor is more than 50 meters, it is recommended touse a output reactor to protect the SPD and motor.

Run

⚠

Turn on the input AC power only after the front cover is put correctly; Do not open or remove the front cover when operation. Otherwise it may cause an electric shock.

If the function fault automatic reset or restart after power failure had been set, a safety measures should be taken in advance; otherwise it may cause damage or injury.

The key " ⏻ " may be lose efficacy because some function had been set, a separate emergency power switch can be installed in the SPD control system; otherwise it may cause damage or injury.

When the SPD is power on, the SPD terminal is still live even in stop state, do not touch, otherwise there is a risk of electric shock.

⚠

Do not use circuit breaker to control the stop or start of the SPD; Otherwise it may cause damage to the SPD.

Because the SPD speed from low to high that is in a very short time, make sure that the motor and equipment are in the permitted range to use. Otherwise it may cause damage to the equipment.

Do not touch the heat sink. Otherwise it may cause harmful burns

The factory parameters of the SPD can meet most requirements of equipment operation, if not necessary, please do not modify the parameters. Even though some equipment has special needs, only necessary parameters can be modified. Otherwise, random modifications may cause damage to the device.

Maintenance and check

⚠
When power on, do not touch the connection terminals. Otherwise it may cause an electrical shock.
Only qualified electrical engineering personnel can maintain, replace and inspect the SPD.
Wait at least 10 minutes after the power failure, or make sure that is no residual voltage before carry out maintenance and inspection, otherwise it may cause damage.

⚠
PCB board has CMOS integrated circuit, do not touch, otherwise the static electricity may damage PCB board.

Others

⚠
It is strictly forbidden to transform the SPD, otherwise it may cause casualties. After arbitrarily changing SPD, the guarantee will be invalid.

Chapter 1 Operation Panel

1.1 Operation Panel Diagram

Name	Definition and operating instructions
"MENU" button	Hold down 2S to enter the level 1 parameter setting menu;
"ENT" button	Click to confirm the parameter setting action on the machine;
"+" button	Click to increase the set pressure, frequency, and modify parameter values, and hold down to increase the value quickly;
"-" button	Click to reduce the set pressure, frequency, modify the parameter value, long press to quickly reduce;
"SHIFT" button	Click to realize the display parameter conversion view and parameter setting displacement function;
" ⏻ " button	Click to start, stop, or reset the machine
"Target" light	When displayed as "target pressure" light, light when adjusting pressure;
"Feedback" light	Light up when displayed as "feedback pressure";
"Run" light	The device is always on when it is running, blinks when it is hibernating, and goes off when it stops failing.
"Alarm" light	Blinking when the device is faulty and off when it is not faulty.

"Multi Drive"　light	When the multi drive mode is used, the machine connection communication normal indicator light is lit;
"Manual"　light	When P0.44=1 speed control mode, the indicator is on and other modes are off.

1.2 Operation and display mode

(1) Status display mode:

When power on the SPD, it enters the status display mode. When it stops, it displays pressure setting. Press "+" or "-"to modify pressure setting. When it is running,it displays current pressure, operating frequency, and setting pressure. Press the "+" or "-" to switch the display; press "MENU" for two seconds to enter the parameter setting mode.

(2) Parameter setting mode:

To view or set the parameters, as starting from status display mode, press the "MENU" for 2 seconds to enter the parameter setting mode, and then press the " ENT " starts to set parameters. After you set the parameter press twice "MENU" to exit parameter setting mode, and return to the status display mode.

(3) The alarm display mode:

Automatically enter this mode when a drive fault or warning arises; press the

" ⏻ " to reset, or it can automatically restored the previous mode after the alarm is eliminated.

1.3 Menu Operation

Three.class menus are:

① Function group (first class)

② Function code setting(second class)

③Function code setting(third class)

Instruction: In the third class menu, pressing "MENU" or "ENT" can return to the second class menu. The difference is that pressing "ENT" first saves parameters to control board, and then returns to the second class menu and shifts to next function code automatically; pressing "MENU" returns to the second class menu directly without saving parameters and keeps staying at current function code.

Under the third class menu, only flicker bit can be modified. Revisable bit will shift automatically after 5 seconds.

Example: Modify P0.02 from 0 to 1

Stopped/Running State
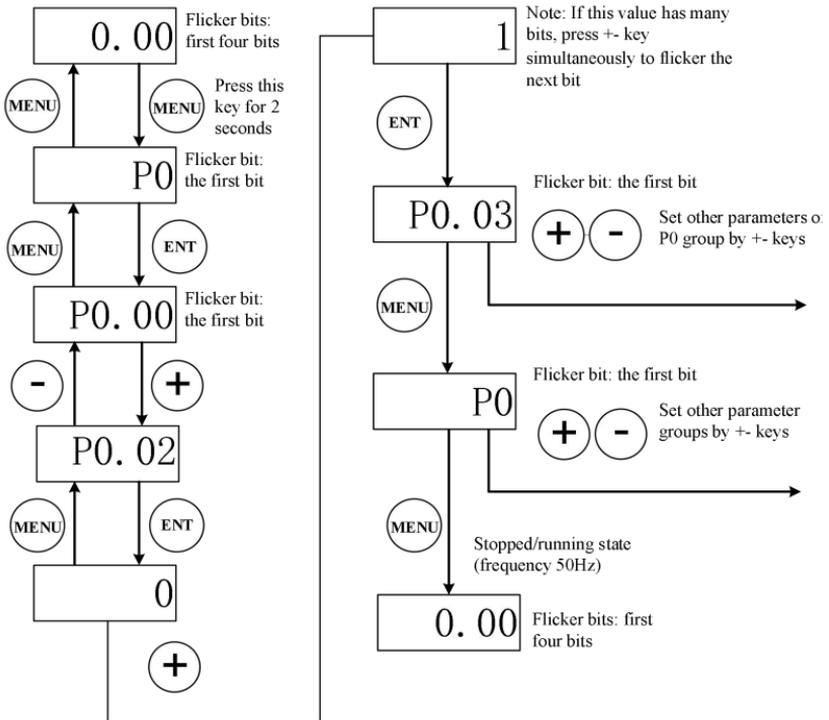
Remarks: 0.1MPa = 100kPa = 1bar = 1kgf / cm^2

Chapter 2 Appearance and Wiring

2.1 Model Description

PC20 – 2 S 2R2 - E

PC20 smart mini pump drive

2: AC 220V

S: single phase input

2R2: 2.2kW;
R:decimal point

E: English series;
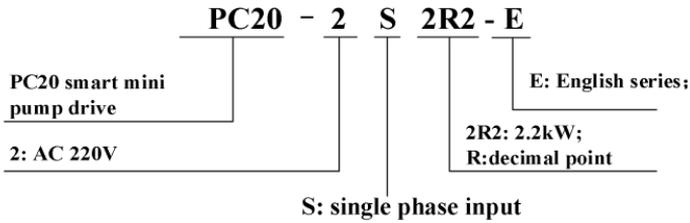
2.2 Selection table

Voltage	Model	Power (kW)	Size（mm）			Motor (kW)
			H	W	D	
	PC20-2S2R2-E	2.2	209	160	90	2.2

2.3 Dimensions(Unit: mm)
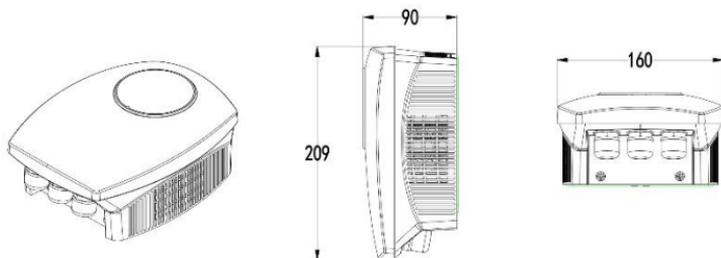
2.4 Installation Procedure Illustrations.

Step 1: Remove the bottom plate

Step 2: Install the bottom plate
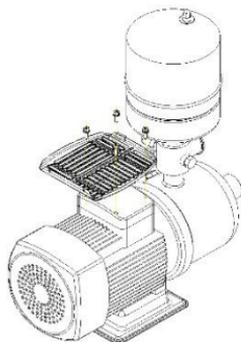
Step 3:Install the bottom plate
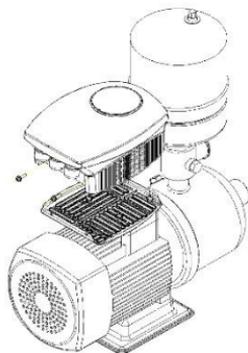
Step 4: The installation is complet
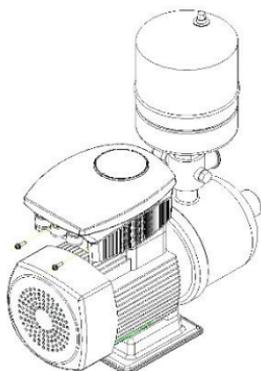
2.5Wiring Diagram of Main Circuit and Control Terminals
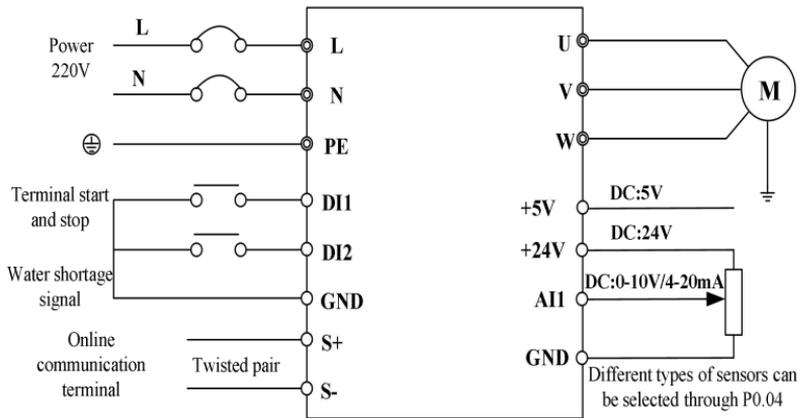
2.6Control Terminals

2.6.1 Control terminals

The wiring mode of control terminals is internal terminal wiring or outer lead connection, cabled.out by waterproof connectors.

S+	S-	DI1	DI2	GND	AI1	24V	5V

Control terminals

2.6.2 Terminal instruction

Terminal symbol	Terminal name	Technical data
DI1	Multi.function input terminal 1	Enabled when connected to GND; Disabled when open
DI2	Multi.function input terminal 2	Enabled when connected to GND; Disabled when open
AI1	Analog input terminal 1	It is $0\sim10V$ analog voltage input terminal or 4-20mA analog current input terminal, chosen by function codes.
24V	Positive terminal of analog power	+24VDC,±10%,Max 100mA
5V	Positive terminal of analog power	+5VDC,±10%,Max 100mA
GND	Negative terminal of analog power	Reference zero potential of analog power
S+	Standard RS485 communication terminal	Standard isolated 485 communication interface. Please use twisted pair or shielded wire
S-		

2.7 Wiring of Sensors

2.7.1 Sensor configuration instruction

A current type pressure sensor will be used by default; output signal is 4~20mA. If use other types of sensors, please refer to the setting parameters P0.03，P0.04，P0.05 in Chapter 4.5.

2.7.2 Wiring diagram

The drive can be connected to transmissible pressure gauge and pressure transmitter. Please connect wire according to below diagrams.

(1) **Pressure transmitter** : working voltage 5VDC, output 0.5～4.5VDC. Wiring method is shown as below.
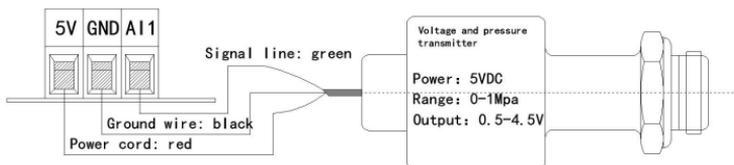
(2) **Pressure transmitter**: working voltage range 10 ～ 30VDC, output 4 ～ 20mA.Wiring method is shown as below.
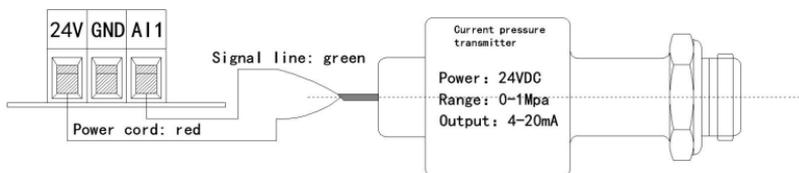
Notes: Model for PC20-2SXXX products will be equipped with dedicated sensors (red line connected to terminal **+24V**; black line connected to terminal **AI1**). For the wiring method of various sensors and the setting of relevant parameters, please refer to appendix.

Chapter 3 Quick Start

3.1 Parameter Settings

★Single machine debugging mode:

Under normal circumstances, the machine is equipped with standard input and output lines and sensors. When connecting the pump, the motor connection method needs to be adjusted from the original star (380V) to the delta (220V) working mode;

After power on, long press the "+" or "-" key for 3 seconds to enter the pressure setting mode, set the target pressure d, and then press the " ⏻ " key to save, and then press the " ⏻ " key to start the machine, and the machine will proceed Normal working mode;

P0.14 = 1 Power.on self.start function (need to be turned on by the customer)

Pump steering confirmation

After setting the parameters, you can do a short trial run to observe whether the steering of the water pump is correct. The pump steering can be changed in the following two ways:

Stop the inverter and exchange any two phases of the inverter output power lines U, V, W.

Stop the inverter and modify parameter P0.02.

★Multi.online mode:

Wiring: Connect all the machine terminals S+ that need to be connected in parallel, and all S- in parallel;

For parameter setting, refer to the macro parameter table below:

Please refer to the table below, to set the system quickly.

System Typ	Host Driver	Auxiailry1	Auxiailry2	Auxiailry3	Auxiailry4	Auxiailry5
Solo Pump setting	P0.47=1	\	\	\	\	\
Two VFDs, as Host drives	P0.47=2	P0.47=11	\	\	\	\
Three VFDs, as Host drives	P0.47=3	P0.47=11	P0.47=12	\	\	\
Four VFDs , as Host drives	P0.47=4	P0.47=11	P0.47=12	P0.47=13	\	\
Five VFDs , as Host drives	P0.47=5	P0.47=11	P0.47=12	P0.47=13	P0.47=14	\
Six VFDs, as Host drives	P0.47=6	P0.47=11	P0.47=12	P0.47=13	P0.47=14	P0.47=15
Emergent Mode	P0.47=9	When the sensor is faulty, set this parameter, the machine will turn off the pressure alarm, and the output frequency can be adjusted by the plus or minus key to ensure emergency water use;				

Terminal wiring diagram (5 auxiliaries at most)：
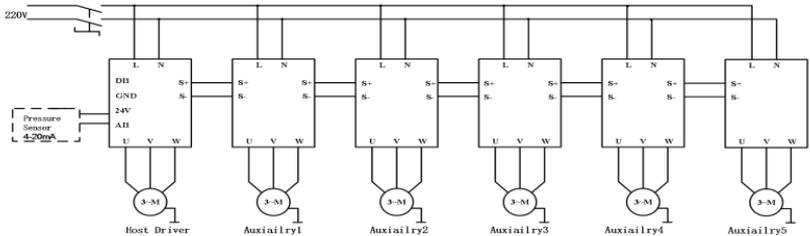
Chapter 4　Programming and Parameters

Note: "☆": The parameter can be modified in both standby and operating state.

"★": The parameter can't be modified in operating state.

"●": The parameter is the actual detected and recorded value which can't be modified.

4.1Pressure and Protection Function Group

Function code	Description	Set range	Unit	Default	Modificationlevel	Notes
P0.00	Pressure setting	1.0～P0.21	0.1bar	3.0	☆	
P0.01	Deviation of pressure	0.0～P0.00	0.1bar	0.3	☆	Dormancy awakens deviation pressure
P0.02	Operation direction selection	0: Same direction 1: Opposite direction	1	0	☆	Adjustable water pump steering
P0.03	Sensor range	1.0～200.0	0.1bar	10.0	☆	
P0.04	Sensor feedback type	0：4～20mA/24V 3：0.5～5V 4：0～5V	1	0	☆	Different modes can be selected according to the sensor feedback signal used
P0.05	Pressure calibration factor	0.750 ～ 1.250	0.001	1.000	☆	
P0.06	Proportional gain P1	0.0 ～ 1000.0	0.1s	20.00	☆	
P0.07	Integration time I1	0.00s ～ 10.00s	0.01s	0.50	☆	

Function code	Description	Set range	Unit	Default	Modificationlevel	Notes
P0.08	PID function selection	0: off 1: Sleep mode 1 2: Sleep mode 2 2: Sleep mode 3	1	2	☆	Mode 1: Sleep is preferred Mode 2: Constant voltage is preferred Mode 3: Balance mode
P0.09	PID sleep delay	0.0s ～ 100.0s	0.1s	5.0	☆	
P0.10	PID wake.up delay	0.0s ～ 100.0s	0.1s	3.0	☆	
P0.11	PID sleep frequency	P1.31～ upper limit frequency	0.01Hz	30.00	☆	If the frequency is lower than this frequency, the machine will go to sleep
P0.12	PID low frequency hold frequency running time	0.0s ～ 120.0s	0.1s	5.0	☆	
P0.13	PID sleep deviation pressure	0.0bar ～ 1.0bar	0.1bar	0.1	☆	
P0.14	Power on automatic start function	0: off 1: open	1	0	☆	After it is turned on, it will start automatically after power.on
P0.15	Power.on automatic start delay	0.0～100.0	0.1s	5.0	☆	
P0.16	Antifreeze function	0: Off 1: Time in seconds 2: Count by minutes 3: Temperature control (seconds)	1	3	☆	Taking the temperature sensor inside the machine as the starting judgment, there will be a certain temperature deviation in different scenarios;

Function code	Description	Set range	Unit	Default	Modification level	Notes
P0.17	Antifreeze operating frequency	0.0～P1.06	0.01Hz	10.00	☆	
P0.18	Antifreeze running time	0～1000	1s/min	60	☆	
P0.19	Antifreeze operation cycle	0～1000	1s	300	☆	
P0.20	Leakage size factor	0.1～100.0	0.1	2.0	☆	
P0.21	High pressure alarm setting value	P0.00～P0.03	0.1bar	9.0	☆	
P0.22	High voltage alarm delay time	0.0～120.0	0.1s	3.0	☆	
P0.23	Low pressure alarm setting value	0.0～P0.00	0.1bar	0.0	☆	
P0.24	Low voltage alarm delay time	0.0～120.0	0.1s	3.0	☆	
P0.25	Water shortage protection function	0: off 1: Judging water shortage according to frequency and current 2: Judging by frequency and pressure 3: Judging water shortage based on frequency, current and pressure	1	2	☆	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P0.26	Water shortage fault detection threshold	0.0～P0.00	0.1bar	0.5	☆	Water shortage will be judged below this pressure
P0.27	Water shortage protection testing frequency	0～Upper frequency	0.01Hz	48.00	☆	More than this frequency will judge water shortage
P0.28	Water shortage protection detection current percentage	0～100.0	0.1%	40.0	☆	When the operating current is less than this current, it is judged as water shortage
P0.29	Water shortage protection detection time	0.0～200.0	0.1s	60.0	☆	After meeting the water shortage condition, alarm after this time
P0.30	Water shortage protection automatic restart delay	0～9999	1min	15	☆	After the water shortage fault is reported, after this time delay, the machine resets the fault code
P0.31	PID sleep rate	0 ～ 30	1	9	☆	
P0.32	Incoming water detection pressure	0.0～P0.00	0.1bar	1.0	☆	When the water outlet pressure is greater than this value, the fault will be reset after a delay of P0.30
P0.33	Incoming water detection time	0.0～100.0	0.1s	20.0	☆	
P0.34	AI minimum input	0.00V ～ +10.00V	0.01V	2.00	☆	
P0.35	AI maximum input	0.00V ～ +10.00V	0.01V	10.00	☆	
P0.36	Acceleration time 1	0.0s ～ 100.0s	0.1s	5.0	☆	
P0.37	Deceleration time 1	0.0s ～ 100.0s	0.1s	10.0	☆	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P0.38	Parameter initialization	0: no operation is performed 1: Restore factory parameters, excluding motor parameters 2: clears the record information 3: Restore all parameters (including motor parameters)	1	0	★	
P0.39	Parameter function lock	0: The parameter is not locked 1: Parameter lock	1	0	☆	
P0.40	Broken record	0-50	1	0.0	●	
P0.41	Radiator temperature		1℃	0	●	
P0.42	Software version number			1.000	●	The actual batch version prevails

Function code	Description	Set range	Unit	Default	Modificationlevel	Notes
P0.43	Main frequency source X selection	0: Digital setting (no memory after power off) 1: Digital setting (memory after power failure) 3: AI1 8: PID 9: Communication setting	1	8	★	
P0.44	System working mode	0: Constant voltage mode 1: Constant speed mode	1	0	★	Adjust this value to change the working mode
P0.45	Pressure display mode	0: overall display 1: Independent display	1	0	☆	

Function code	Description	Set range	Unit	Default	Modific ationlev el	Notes
P0.46	Multifunction button (Confirm button under Level 0 menu)	0: No function 1: Change the running direction 2: Automatic/ manual mode switch 3: Lock/unlock parameter switchover 4: Multi-scene switch (standard, hotel, villa) 5: Restore factory parameters	1	2	☆	In the shutdown mode, hold down the "Confirm" button for 3 seconds to realize the shortcut setting function
P0.47	Application macro selection	0-15	1	0	★	Refer to the macro parameter setting table for details
P0.48	Antifreeze starting temperature	0~100°C	1	7	☆	Note: The internal temperature of the machine and the ring temperature are stored in the temperature difference
P0.49	Fire mode	0: Off 1: Mode 1 (ignoring all faults except overcurrent) 2: Mode 2 (ignore all failures)	1	0	☆	Note: Turn on the fire mode machine is not normal warranty, because the machine protection is off, the machine is easy to damage in the limit condition.
P0.50	Low power mode	0: Off 1: Enable	1	0	☆	
P0.51	Rated motor speed	0 ~ 9999rpm	1rpm	1500	★	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P0.52	Rated torque of the motor	0 ～ 99.99N.m	0.01N.m	10.00	★	
P0.53	Permanent magnet synchronous motor tuning selection	0: Off 11: Static part tuning (excluding back electromotive force P5.09) 12: complete no-load tuning 13: Static full tuning	0	0	★	

4.2 Frequency and Auxiliary Function Group

Function code	Description	Set range	Unit	Default	Modification level	Notes
P1.00	Multiple online slave backup host action selection	0: stop 1: Constant speed 2: Constant pressure	1	0	☆	
P1.01	Multiple online network mode selection	0: slave 1: Host	1	0	●	
P1.02	Number of multi.line auxiliary machines	0～5	1	0	●	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P1.03	Multiple online operating modes	0: Multi.pump main and auxiliary control 1: Multi.pump synchronous control 2: Multiple pumps, one use and one standby control	1	0	☆	
P1.04	Multi.line rotation interval time	0min～2000min	1min	240	☆	
P1.05	Maximum output frequency	50.00Hz ～ 500.00Hz	0.1Hz	50.00	★	
P1.06	Upper frequency	Lower limit frequency P1.07 ～ Maximum frequency P1.05	0.1Hz	50.00	☆	Maximum adjustable frequency range of the machine
P1.07	Lower limit frequency	0.00Hz ~ upper limit frequency P1.06	0.1Hz	0.00	☆	
P1.08	Frequency is lower than the lower limit frequency action	0: run at lower frequency limit 1: shutdown 2: Zero speed operation	1	0	☆	
P1.09	Carrier frequency	1.0kHz ～ 16.0kHz	0.1kHz	8.0	★	
P1.10	PID feedback loss detection value	0.00 ～ 10.00V	0.01V	0.20	☆	
P1.11	PID feedback loss detection time	0.0s ～ 100.0s	0.1s	30.0	☆	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P1.12	Motor power selection	0： 0.75kW 1： 1.1kW 2:1.5kW 3:2.2kW	1	3	★	The factory is 2.2kW, the customer needs to adjust the settings according to the actual pump
P1.13	Motor rated power	0.1kW ～ 2.2kW	0.1kW	2.2	★	
P1.14	Motor rated frequency	0.Maximum frequency P1.05	0.1Hz	50.00	★	
P1.15	Motor rated voltage	0～380V	1	220	★	
P1.16	Motor rated current	1.00-10.00	0.01A	9.60	★	
P1.17	User password	0 ～ 65000	1	0	☆	
P1.18	DI1 terminal function selection	0: No function 1: Forward running FWD .10: External fault input (normally open)	1	1	★	
P1.19	DI2 terminal function selection		1	10	★	
P1.20	DI filter time	0.000s ～ 1.000s	0.001s	0.010	☆	
P1.21	DI1 enable delay time	0.0s ～ 100.0s	0.1s	1.0	☆	
P1.22	DI2 enable delay time	0.0s ～ 100.0s	0.1s	1.0	☆	
P1.23	DI1 disable delay time	0.0s ～ 100.0s	0.1s	0.0	☆	
P1.24	DI2 disable delay time	0.0s ～ 100.0s	0.1s	0.0	☆	
P1.25	Automatic fault reset times	0 ～ 10	1	5	☆	
P1.26	Automatic fault reset time	0.0 ～100.0s	0.1s	30.0	☆	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P1.27	Cooling fan control	0: The cooling fan runs when the motor is running 1: Automatically operate according to the radiator temperature	1	1	☆	
P1.28	Stop mode	0: Decelerate to stop 1: Free parking	1	0	☆	
P1.29	Keyboard setting frequency	0.00Hz ~ maximum frequency P1.05	0.01Hz	50.00	☆	
P1.30	PID action direction	0: positive effect 1: Counteraction	1	0	☆	
P1.31	PID low frequency hold frequency	0.00Hz ～ 50Hz	0.01Hz	20.00	☆	
P1.32	Sleep detection cycle	0.0 ～ 1000.0	0.1s	30.0	☆	The machine detects sleep at this time
P1.33	Water tower model	0: Off 1: Under pressurization 2: Supercharging	1	1	★	
P1.34	Command source selection	0: Operation panel command channel (LED off) 1: Terminal command channel (LED on) 2: Serial port communication command channel (LED flashes)	1	0	☆	Choose different start and stop methods
P1.35	Local address	1～63, 0 is the broadcast address	1	1	☆	
P1.36	Baud rate	1：9600 bPS	1	1	☆	
P1.37	Data Format	0: No parity (8.N.1)	1	0	☆	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P1.40	Multi-scene mode	0: balance 1: Hotel (constant pressure preferred) 2: Villa (sleep priority)	1	0	☆	
P1.41	Output phase missing detection	0: Disable 1: Allow	1	1	☆	
P1.42	Motor type selection	0:Three-phase asynchronous motor 1: Single-phase asynchronous motor 2: Permanent magnet synchronous motor 3: Single-phase dual-value capacitor asynchronous motor	1	0	★	Use mode 1 for one capacitor or uncapacitor, use mode 2 for dual capacitor and single camera;
P1.43	Single.phase motor main and auxiliary winding turns ratio	50 ～ 200	1	100	☆	
P1.44	Single.phase motor current correction factor	50.0 ～ 200.0	1.0%	150	☆	
P1.45	Water shortage protection reset times	0～9999	1	10	☆	
P1.46	Overtemperature limit power	0: Off 1: Open	1	0	★	

Function code	Description	Set range	Unit	Default	Modification level	Notes
P1.47	Parameter hidden selection	0: not hidden 1: hidden	1	1	☆	

4.3 Parameter Setting Procedure

Taking the commonly used parameters of P0.00 . P0.05 as an example, the parameters setting steps are as follows.
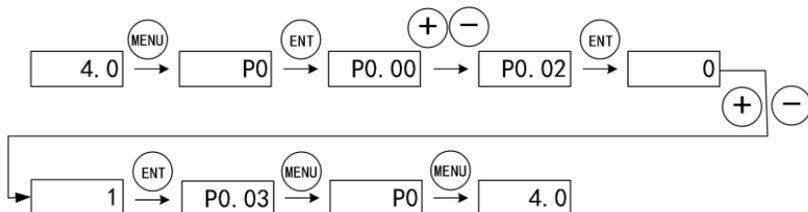
Set P0.00 (Pressure setting)
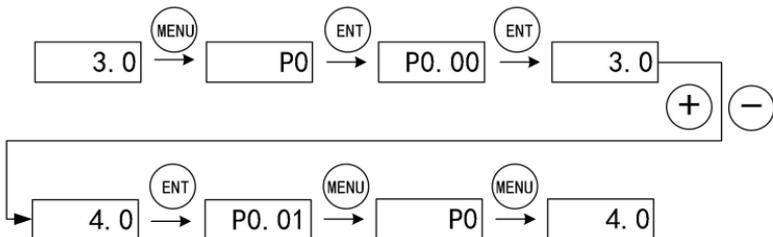
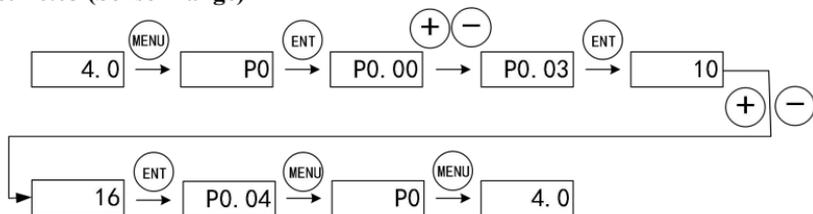Notes: Pressing "+" or "-" to modify the setting pressure as 4.0 in the stop displayed status
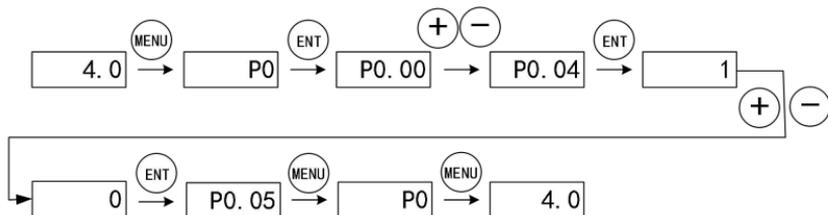
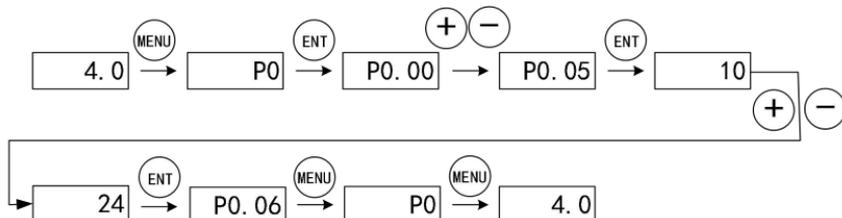**Set P0.01 (Startup pressure derivation)**
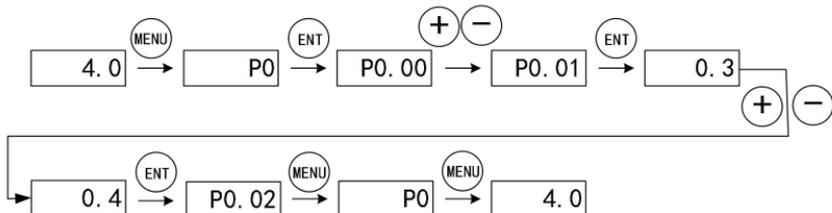
Set P0.02 (Running direction)

Set P0.03 (Sensor range)

Set P0.04 (Sensor feedback type)

Set P0.05 (Power setting of sensor)

4.4 Programming Description of Parameters

P0.00	Pressure setting	0.0～P0.03	bar	3.0	
P0.03	Sensor range	0.0～200.0	bar	10.0	The maximum range of sensor
P0.04	Sensor feedback type	0：Voltage feedback 1：Current feedback		1	

P0.03 is the range of the sensor. Common range is 1MPa, namely 10.0bar.

P0.00 is the pressure value of the pipe network. If P0.00=3.0bar, after the smart pump drive is started, the pressure of the pipe network keeps constant at 3.0 bar.

General sensor is in current type. The wiring method of SPD is similar to pressure transmitter, connected to AI terminal as pressure feedback: if voltage sensor is use, please modify P0.04 to 0. The wiring method of SPD is similar to transmissible pressure gauge, connected to AI terminal as pressure feedback.

When feedback value is smaller than or equal to set pressure minus PID start pressure（P0.00～P0.01）, and it holds the state in P0.10 set time, PID adjustment will be restarted. For example, when P0.00=3，P0.01=0.3，P0.10=5.0, if feedback value is smaller than or equal to 2.7, and the time is longer than 5s, PID adjustment

P0.01	Start pressure deviation	0.0～P0.00	bar	0.3	The value that is lower than PID set pressure
P0.10	PID wakeup detection delay	0.0～100.0	s	3.0	PID wakeup detection delay

will be restarted. Once it is larger than 2.7, the time will recount.

P0.02	Running direction of motor	0: Forward 1: Reverse		0	Modify this parameter to change running direction

In initial use, confirm the rotation direction of motor. Exchange arbitrary two lines of output power line U, V, W of the SPD or modify parameter P0.02 to change the rotation direction of the motor.

P0.06	Proportional gain	0.0~100.0	%	2	The larger the parameter, the faster the response speed of the pressure system. However, when it is set too big, the system will oscillate. Adjust it according to different water supply system.

Adjustment method:

If factory parameters can't meet demands, adjust parameters finely. First increase proportional gain to make sure that the system will not oscillate.

Note: improper parameter setting of P0.06 will cause huge speed overshoot, and

P0.08	PID sleep choices	0~2		2	0: Sleep invalid 1: Sleep mode 1 2: Sleep mode 2
P0.09	PID sleep detection delay	0.0~120.0	s	1.0	In small water consumption, if sleeping is slow or it can't sleep, make the value smaller; if it sleeps in advance or it starts and stops frequently, make the value bigger.
P0.10	PID wakeup detection delay	0.0~120.0	s	1.0	PID wakeup detection delay
P0.11	PID sleep low level hold frequency	0.00~60.00	Hz	35.00	PID runs at sleep low level hold frequency. After the time of P0.12, PID sleeps.
P0.12	Running time at PID low level hold frequency	0.00~3600	s	3.0	
P0.13	PID sleep deviation pressure	0.0~P0.01	bar	0.1	If feedback pressure is in sleep deviation range, start sleeping treatment.

even over voltage fault in overshoot back.

After selecting sleep mode 1 by parameter P0.08, the SPD will detect whether feedback pressure is higher than set pressure. If yes, the SPD will start sleep detection. After PID sleep detection delay set by P0.09, if feedback pressure is still higher than set pressure, SPD will decrease output frequency gradually to sleep detection low level hold frequency set by P0.11. After sleep detection low level hold frequency waiting time, if feedback pressure is still higher than set pressure, the SPD decreases output frequency to 0Hz and enter standby. If in above process, feedback pressure is lower than set pressure, the SPD will judge as invalid sleep detection and come back to PID adjustment status.

After the SPD enters standby, if feedback pressure is lower than PID sleep threshold, SPD will start wakeup detection. After PID wakeup detection delay set by P0.10, if feedback pressure is still lower than wakeup pressure threshold, wakeup is successful and SPD comes back to PID adjustment status; else, wakeup fails. Too high PID sleep threshold may cause frequent start and stop of the SPD. Too low PID sleep threshold may cause deficient pressure.

Notes: sleep holding frequency of different water supply system is different. When there is no water outside and the water tap is turned off, but the pump is still running, increase P0.11 to sleep holding frequency.

P0.14	Power on automatic start function	0: off 1: open		1	0	☆
P0.15	Power.on automatic start delay	0.0~100.0		0.1s	5.0	☆

If you hope that the SPD can start automatically after time delay set by P0.15 at power on, after setting all parameters, make P0.14 = 1 to enable auto.start function of the SPD. Every time at power on or fault reset, it will start automatically.

P0.16	Antifreeze	0: OFF 1: ON			0	Self anti.freezing function of pump
P0.17	Anti.freezing	0.0~60.00	Hz	8.00		

	running frequency				
P0.18	Anti.freezing running time	0～9999	s	60	
P0.19	Anti.freezing running interval	0～9999	s	300	When it is set as 0, it keeps running at anti.freezing running frequency

Set P0.16=1 to enable anti.freezing function. The SPD will adjust the running frequency of pump according to current status after it is started.

Note:

① Pump auto.adjusting given frequency is prior to anti.freezing frequency.

② Anti.freezing frequency can't be set to high. It should be set as the frequency that can just drive the pump but can't supply pressure.

P0.20	Water leakage coefficient	0.0～100.0		1.0	The bigger the water leakage, the bigger the coefficient.

In no water consumption, because of water leakage of pipe network, the SPD can't sleep and stop. It starts and stops frequently. To solve the water leakage problem of pipe network, modify the value of P0.20 according to water leakage. The bigger the water leakage, the bigger the coefficient.

P0.21	Set value of high pressure alarm	0.0～P0.03	bar	8.0	When feedback pressure is bigger than or equal to the set value, after the delay of P0.22, it alarms and stops.
P0.22	Detection time of high pressure alarm	0.0～200.0	s	3.0	
P0.23	Set value of low pressure alarm	0.0～P0.21	bar	0.0	When feedback pressure is smaller than the set value, after the delay of P0.24, it alarms and stops. This function is invalid when it is set to 0.
P0.24	Detection time of low pressure alarm	0.0～200.0	s	3.0	

The SPD will compare P0.21 and P0.23 according pipe network pressure fed back by sensor. If pressure is abnormal, it will stop and alarm automatically to protect pipe network system.

P0.25	Water shortage protection	0.3		2	0: off 1: Judging water shortage according to frequency and current 2: Judging by frequency and pressure 3: Judging water shortage based on frequency, current and pressure
P0.26	Water shortage fault detection threshold	0.0~P0.00	bar	0.5	It judges water shortage only when feedback pressure is smaller than the set value.
P0.27	Water shortage protection detection frequency	0~60.00	Hz	48.00	It is valid when P0.25 = 01. Comparison frequency of water shortage judgment.
P0.28	Current percentage of water shortage protection detection	0.100	%	40.0	It is valid only whenP0.25=01. Percentage of motor rated current.
P0.29	Water shortage protection detection time	0~900.0	s	60.0	
P0.30	Self.restarting delay of water shortage protection	0~9999	min	15	If it is set to be 0, use pressure to self.reset water shortage.

Following methods can realize water shortage protection by default:

（1）The switch of water shortage protection is turned on（P0.25=X）;

（2）The feedback pressure is less than allowed threshold value of water shortage detection(feedback pressure<P0.26);

（3）The current running frequency is no less than water shortage protection detection frequency（running frequency>=P0.27）;

（4）When （1）-（3） are satisfied, timing starts. When the time meeting the condition exceeds abnormal pressure alarm delay time (delay time>P0.29), water shortage fault will be reported. When either condition is not satisfied during timing, timing recounts.

When water shortage fault is reported, after the time set by P0.30, the drive will reset. By setting the next following parameters:

P0.32	Inflow detection pressure	0.0～P0.00	bar	1.0	
P0.33	Inflow detection time	0.0～100.0	s	20.0	

Use inflow detection pressure to reset water shortage faults directly.

Note:When judge water shortage according to pressure, because the working condition of each drive is different such as range of load size, only setting the value of P0.28 reasonably according to site conditions can it make correct judgment to water shortage.

Setting method: Run the drive. When running frequency reaches maximum frequency, turn off inlet and record the output current displayed on the drive. Divide this current by P1.16 (the rated current of the motor) to get a percentage. Make the value of P0.28 a little higher than 5.10 percentage points of the percentage. Too high value of P0.28 will lead to false water shortage report in normal operation. Water shortage protection will not work effectively with too low value of P0.28.

P0.34	Lower limit of AI input signal	0.0~ P0.35	V/mA	2.00	Used to correct lower limit of AI signal
P0.35	Upper limit of AI input signal	P0.34~ 20	V/mA	10.00	Used to correct upper limit of AI signal

If you find there is some deviation between sensor feedback pressure and feedback pressure displayed on SPD, adjust above parameter to correct the sensor.

Note: the unit of current sensor is 4~20mA; that of voltage sensor is 0~10V.

P0.36	Acceleration time	0.1~3600	s	2.0	
P0.37	Deceleration time	0.1~3600	s	2.0	

Acceleration/deceleration time setting of the pump's motor.

P0.38	Parameter initialization	0~2		0	

When P0.38 is set as 1, restore factory defaults.

P0.39	Parameter lock function	0~1		0	

After setting parameters, if you don't want them to be modified by misoperation, make P0.39= 1. At this time, parameters can only be monitored, but not be modified. Only when P0.39 is modified to 0, can parameters be modified.

P0.40	Current fault type	0~29			

Record fault type of the SPD.0 means no fault. 1~29 refers to E001~E029. For more details, please refer to fault inspection and troubleshooting chapter.

P1.34	Start/stop signal choices	0~1		0	0：Start/stop by keyboard 1：Start/stop by terminals
P0.43	Frequency source choices	0~8		8	0：Digital setting 1~7：Reserved

					8：Water supply PID	

Each SPD can choose different start/stop modes and frequency sources.

P1 group parameters have the same meaning as P0 group. Please refer to P0 group for more details.

P1.06	Upper limit frequency	P1.07～60.0	Hz	50.00	
P1.07	Lower limit frequency	0.00～P1.06	Hz	0.00	
P1.08	Action choices when running frequency is lower than lower limit frequency	0: Run at lower limit frequency 1：Stop 2：Standby		2	

P1.06 limits the maximum working frequency of SPD.

Use P1.08 to choose running status of SPD when running frequency is lower than lower limit frequency. To prevent motor from being in low speed operation for a long time, you can use this parameter to stop it.

If use a 60Hz pump, please set parameters according to the following steps.

Step 1: Set the parameter P1.06 (Upper limit frequency) to 60

Step 2: Set the parameter P1.13 (Motor rated frequency) to 60

P1.09	Carrier frequency setting	1.0～16.0	kHz	Set according to models	

Use this parameter to adjust carrier frequency of SPD. You can decrease motor noise by adjusting carrier frequency, avoid point of resonance, decrease leakage current of wires to ground and decrease interference of SPD.

When carrier frequency is high, motor loss decreases, temperature rising of motor is small, but SPD loss increases, temperature rising of SPD increases and interference increases.

| P1.10 | Feedback broken line detection value | 0.0～1.00 | V | 0.20 | |
| P1.11 | Feedback broken line detection time | 0.0～3600 | s | 30.0 | |

Feedback broken line detection value: the detection value is relative to input signal voltage. System keeps detecting PID feedback value. When feedback value is smaller than or equal to feedback broken line detection, system starts detection timing. When detection timing exceeds feedback broken line detection time, system will report PID feedback broken line fault.

Please set according to parameters of the motor nameplate.

To guarantee control performance, please configure motor according to standard adaptive motor of drives. If there is big difference between motor power and standard adaptive motor, control performance of drives will decrease obviously.

Chapter 5 Fault Information and

Troubleshooting

5.1 Fault Codes Description

Fault code	Fault type	Possible reasons	Solution
E001	Invert cells fault	1. Too fast acceleration	1. Increase acceleration time
		2. IGBT inside broken	2. Seek for support
		3. Malfunction caused by interference	3. Check whether peripheral equipments have strong interference source
		4. .Sound grounding or not	4. Check grounding line
E002	Over current in accelerated running	1. Too fast acceleration	1. Increase acceleration time
		2. Too low grid voltage	2. Check input power
		3. The power of the SPD is too low	3. Use bigger power SPD
E003	Over current in decelerated running	1. Too fast deceleration	1. Increase deceleration time
		2. The inertia torque of load is too big.	2. Add proper dynamic braking modules
		3. The power of the SPD is too low	3. Increase power of the SPD
E004	Over current in constant speed running	1. Saltation or abnormality happens to load	1. Check the load or decrease the saltation of the load
		2. The grid voltage is too low	2. Check input power supply

Fault code	Fault type	Possible reasons	Solution
		3. The power of the SPD is too low	3. Use bigger power SPD
E005	Over voltage in accelerated running	1. The input voltage is abnormal	1. Check input power supply
		2. Restart rotating motor after momentary outages	2. Avoid restarting after it is stopped
E006	Over voltage in decelerated running	1. Too fast deceleration	1. Increase acceleration time
		2. The inertia of load is too big	2. Increase dynamic braking modules
		3. The input voltage is abnormal.	3. Check input power
E007	Over voltage in constant speed running	1. Abnormal changes happen to input voltage	1. Install input reactor
		2. The inertia of load is too big	2. Add proper dynamic braking modules
E008	Hardware over voltage	1. The input voltage is abnormal	1. Check input power supply
		2. Too fast deceleration	2. Increase deceleration time
		3. The inertia of load is too big	3. Increase dynamic braking modules
E009	Bus under voltage	1. The grid voltage is too low	1. Check grid input power supply
E010	Controller overload	1. Too fast acceleration	1. Increase acceleration time
		2. Restart rotating motor	2. Avoid restarting after it is stopped
		3. The grid voltage is too low	3. Check grid voltage
		4. Overload	4. Use bigger power SPD

Fault code	Fault type	Possible reasons	Solution
E011	Motor overload	1. The grid voltage is too low	1. Check grid voltage
		2. Wrong setting to motor rated current	2. Reset motor rated current
		3. Motor stall or big changes to load	3. Check the load and adjust torque lifting capacity
		4. Motor is too small	4. Use proper motor
E013	Output phase loss	U,V,W phase loss output(or the three phases of load is not symmetrical)	1. Check output wiring
			2. Check motor and cable
E014	Module overheating	1. Instant over current of SPD	1. Refer to over current solutions
		2. Output three phases have interphase or ground is short circuit	2. Re.wiring
		3. Air passage block or fan broken	3. Dredge air passage or change fan
		4. The environmental temperature is too high	4. Decrease environmental temperature
		5. SPD wire or plugins loose	5. Check and re.connect
		6. Power circuit irregularity	6. Seek for service
		8. Control board exception	

Fault code	Fault type	Possible reasons	Solution
E015	External water shortage	Water shortage is detected	Check whether water is deficient.
E018	Fault of current detection circuits	1．Poor contact of control board connector	1．Check connector and re.plug
		2．Power circuit irregularity	2．Seek for service
		3．Damage to hall devices	
		4．Exception of amplifying circuit	
E022	EEPROM read write faults	1．Read write of control parameter goes wrong	1．Press RUN/STOP key to reset
		2．EEPROM broken	2．Seek for service
E023	Torque rich	1．Too fast acceleration	1．Increase acceleration time
		2．Restart rotating motor	2．Avoid restart rotation motor
		3．Grid voltage is too low	3．Check grid voltage
		4．Load is too heavy	4．Use big power SPD
E024	PID feedback broken line fault	1．Sensor broken line or poor contact	1. Check the installation and wiring of sensor
		2．Broken line detection time is too short	2. .Increase broken line detection time
		3．The sensor is broken or the system has no feedback signal	3．Change sensor
E025	Running time reaches set time	1．Running time reaches set time	1．Seek for service

Fault code	Fault type	Possible reasons	Solution
E026	Reserved	Reserved	Reserved
E027	Water shortage alarm	1. Water pressure/level exception	1. Check whether the pressure of inlet is abnormal or not
		2. Sensor broken line or poor contact. System has no feedback signal	2. Check the installation and wiring of sensor
		3. Water shortage alarm detection time is too short（P0.29）	3. C heck relevant parameter settings
		4. Water shortage protection frequency is too low(P0.27)	
		5. Water shortage protection detection current is too low(P0.28)	
E028	High pressure alarm	1. Feedback signal of senor exception	1. Check the wiring of sensor
		2. High pressure alarm value adjustment is too low（P0.21）	2. Check relative parameter settings
		3. Alarm detection time adjustment is too short（P0.22）	
E029	Low pressure alarm	1. Low pressure alarm value is set too high（P0.23）	1. Modify parameters
		2. Sensor broken line or poor contact. System has no feedback signal	2. Check the sensor
		3. Sensor type is inconsistent with actual situation	

Fault code	Fault type	Possible reasons	Solution
E031	Burst tube fault	1. The water pipe pressure is set too high	1. Test related parameter Settings
		2. The sensor is faulty	2. Check the sensor
E040	Software overcurrent fault	1. Speeding up and slowing down too fast	1. Increase acceleration and deceleration time
		2. The load is sudden or abnormal	2. Check whether the load is normal
		3. The power grid voltage is low	3. Check the input power supply
		4. Inverter power is small	4. Choose a large frequency converter

5.2 Common Faults and Actions

The following faults may happen in use. For brief fault analysis, please refer to the following methods.

5.2.1 No display at power on

(1) Check whether the input power is consistent with the nominal voltage of the drive with multimeter.

(2) Check whether the three.phase rectifier bridge is intact. If the rectifier bridge is broken down, please request service.

5.2.2 The power air switch trips off at power on.

(1) Check whether there is short circuit or ground connection between input power. If yes, please eliminate it.

(2) Check whether the rectifier bridge has been broken down. If yes, please request service.

5.2.3 The motor doesn't rotate after the SPD runs.

(1) Check whether there is balanced three.phase output among U, V,W. If yes, check whether the motor is broken or blocked. If no, please confirm whether the motor parameters are set correctly.

(2) If there is output but the three.phase power is not balanced, please request service.

(3) If there is no output voltage, please request service.

5.2.4 SPD shows normally at power on but the power air switch trips off after running.

(1) Check whether short circuit occurs between output modules interval. If yes, please request service.

(2) Check if there is short circuit or ground connection between motor leads. If yes, please eliminate it.

(3) If switch stripping off occurs occasionally and the distance between motor and inverter is far, consider to add output AC reactor.

5.2.5 It doesn't stop in no water use.

(1) Check whether the feedback pressure displayed on the SPD board is no less than set pressure. If the feedback pressure is less than set pressure, please check whether the range of the pressure sensor is set correctly, whether the pump rotates reversely, whether there is air and whether the inlet is blocked by sundries.

(2) If the feedback pressure is no less than set pressure, please decrease the set value of P0.09 and increase P0.11.

(3) If feedback pressure changes nearby set value, stop the SPD manually and see whether the pressure decreases. If yes, check valve needs to be changed.

5.2.6 It can't sleep in small amount of water use or leakage

(1) If it can't sleep or the sleep time is too long, decrease P0.09 and increase P0.11, If it is still not effective, increase P0.31.

(2) If it sleeps in advance, first increase P0.09. If it is still not effective, decrease P0.20.

(3) If it starts and stops frequently, first increase P0.09. If it is not effective, increase P0.20. If it is still not effective, increase P0.01.

5.2.7 It can't stop to make protection in water shortage.

(1) Water shortage protection switch P0.25 is not enabled.

(2) The threshold value of water shortage detection P0.26 is set too low.

(3) The current percentage of water shortage detection P0.28 is set too low.

Chapter 6 Warranty Policy

Standard Warranty Period:

The pump controller manufacturer grants a standard warranty period of 18 months (1.5 years) for the pump controllers, starting from the date of shipment from manufacturer factory or 12 months (1 year) starting from the date of purchased invoice marked (whichever is longer).

Warranty Conditions:

If your pump controller gets fault and requires troubleshooting, please contact your distributor or dealer directly. Alternatively, feedback briefly to manufacture service hotline for logging and send your warranty card to our service department by fax/email to process the warranty claim. During the warranty period, the pump controller manufacturer covers all costs for replacing any product or parts of the product proved to be defective in design or manufacture. To claim the warranty under the warranty policy of pump controller manufacturer, you need to supply us with the following information and documentation regarding the faulty pump controller:

    1. Product model No.(e.g. PC20-2S2R2-E) and serial No. (e.g.C121661B280H000292YA).

    2. Copy of the invoice and warranty certificate of the controller.

    3. Copy of the installation report and installation date.

    4. Error message on LED screen (if available) or any information which would be helpful to determine the defect

    5. Detailed information about the entire system (modules, circuits, etc.).

    6. Documentation of previous claims/exchanges (if applicable).

After receiving above information, The pump controller manufacturer will decide how to proceed the service:

    ☐Repaired by manufacture factory, or

    ☐Repaired on.site by manufacture service center, or

    ☐Offer a replacement device of equivalent value according to model and age.

In the case of an exchange, the remaining portion of the original warranty period will be

transferred to the replacement device. You will not receive a new certificate, as your entitlement is documented at pump controller manufacturer.

If the pump controller needs to be replaced following assessment, manufacture will send a replacement unit immediately. The defective pump controller should be sent back to the closest manufacture service center by packing in its original package if possible.

Product warranty Card

Customer info.	Company name:	
	Company address:	
	Contact:	Tel.:
	Fax:	Zip code:
Product info.	Product model:	SN code:
	Buying date:	Fault date:
	Motor power:	Application situation:
Fault info.	Fault description:	
	Signature:	Date: