8200B Smart Easy Pump Drive

User Manual

Version code：8200B-E2016-03-1MB

Preface

Thank you for using 8200B Smart Easy Pump Drive. 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.....03
Chapter 1 Operation Panel Instruction.....07
1.1 Operation Panel Diagram.....07
1.2 Indicator Light Instruction.....07
1.3 Key Operating Instruction.....08
1.4 Pressure Setting Instruction.....09
Chapter 2 Model, Appearance and Wiring.....10
2. 1 Model Instruction.....10
2.2 Outline & Installation Dimensions.....10
2.3 Controller Installation Diagram.....11
2.4 Wiring Diagram of Main Circuit and Control Terminals.....13
2.5 Wiring of Sensors.....14
2.6 Control Terminal Identifier and Instruction.....15
Chapter 3 Quick Debugging.....17
Chapter 4 Datasheet of 8200B 20
Chapter 5 Fault Information and Removal.....56
5.1 Fault Codes Description.....56
5.2 Common Faults and Handling.....60
Chapter 6 Communication Protocol.....62
6.1 Command Codes and Communication Data Description.....62
Chapter 7 Typical Application Cases.....66
7.1 Single Pump Control Case 1.....66
7.2 Single Pump Control Case 2.....67
7.3 Multi-pumps control case.....69
7.4 Multiline communication protocol.....69
7.5 Two driven by one control case 70

Notes for Safe Operation

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the frequency inverters. 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. Choose the motor of insulation class B or above. Otherwise it may cause an electrical shock.

Installation

⚠ WARNING
Install the SPD on nonflammable material like metal. Otherwise it may cause a fire.

WARNING
Make sure that the mounting environment is away from metal dust. Otherwise it may cause damage to the SPD.

CAUTION
When mounting over two SPD in the same cabinet or enclosure, install a fan or other cooling device to keep the temperature inside below 50℃ . Do not let the conductor head or screws fall into the inside of the SPD. Otherwise it may cause damage to the SPD.

Wiring

WARNING
Ensure only qualified personnel to operate. Otherwise it can cause an electrical shock. Make sure the SPD is isolated from power supply by the circuit breaker. Otherwise it may cause a fire. Verify that the power supply is turned OFF before start wiring. Otherwise it may cause an electrical shock or fire. Make sure that the ground terminal is grounded correctly. Otherwise it may cause an electrical shock.

CAUTION
Never connect the AC power supply to output terminals U, V and W. Otherwise the inverter will be damaged and the guarantee is invalid. Make sure that wiring conforms to EMC requirements and local power safe standard. Make sure to use right wire according to this instruction manual. Otherwise it may cause an accident. Braking resistor or braking unit cannot be directly connected to DC bus terminals (P+) and (N-). Otherwise it may cause a fire.

Before Turn on the AC Power Supply

⚠ WARNING
Make sure that the voltage of SPD conforms to the local power supply voltage. Verify that the wiring of input and output is correct and there is no short-circuit in peripheral circuit. Tighten the terminal screws. Otherwise these may cause damage to the SPD. Turn on the input AC power only after the front cover is put correctly. Otherwise it may cause an electrical shock.

⚠ CAUTION
Never perform a hi-pot or withstand voltage test of the SPD. Otherwise it may cause damage to the SPD. Make sure that the optional parts are connected correctly. Otherwise it may cause damage to the SPD.

When the Power is On

⚠ WARNING
Do not open or remove the front cover when operation. Otherwise it may cause an electrical shock. Never touch the SPD and optional parts by wet hands. Never touch the connection terminals. Otherwise it may cause an electrical shock. When the power is on, the SPD will automatically check the power supply circuit. Do not touch U, V, W terminals and motor connection terminals. Otherwise it may cause an electrical shock.

⚠ CAUTION
It is dangerous for the personnel to approach the motor and load during rotation of the motor. Do not change the factory parameters or settings unnecessarily. Otherwise it may cause a damage or injury.

Operation

⚠ WARNING
When select the function of restart, do not approach the mechanical load. Otherwise it may cause an injury if it restarts suddenly. Do not touch the heat sink or discharging resistor. Otherwise it may cause harmful burns to the body. Never change or check signals if not a professional or qualified personnel. Otherwise it may cause damage and injury.

⚠ CAUTION
Make sure nothing falls into the mechanical load or SPD. Otherwise it may cause damage. Start or stop SPD by corresponding buttons only. Otherwise it may cause damage.

Maintenance

⚠ WARNING
After the main circuit power supply is OFF, make sure the charge LED is OFF when you maintain or inspect. Never maintain or inspect the SPD and mechanical load when the power supply is still ON. Otherwise it may cause damage and injury. Only qualified or authorized professional personnel can maintain, replace and inspect the SPD. Otherwise it may cause damage and injury.

Chapter 1 Operation Panel Instruction

1.1 Key Functions

Operation panel diagram

PRGM: used to switch from fixed model to modification model

Pressure/ENT: shortcut key of water pressure setting and "confirmation" key of parameter setting

Shift: used to shift display and move cursors in parameter modification

In running status, pressing "shift" can switch back and forth among running frequency, output current, pressure setting and feedback pressure. Press "shift" to modify parameters. Flicker bit is the current bit which can be modified.

▲▼keys: used to modify parameter values

Run: start button when using keyboard as starting mode

Stop: stop button and fault reset button when using keyboard as start mode

In stop and parameter monitoring state, pressing "shift" for more than 5 seconds, F0, F1 sets of parameters will be restored to factory settings. When the LED displays "End", restoring factory settings is finished.

1.2 Indicator Light Instruction

Run: (Always on)running instruction;(flicker):sleep or stop instruction

Stop: stop or standby instruction

Alarm 1: SPD fault alarm

Alarm 2: pipe network abnormal alarm

1.3 Key Operating Instruction

Three-class menus are:

① Function code group (first class)

② Function code (second class)

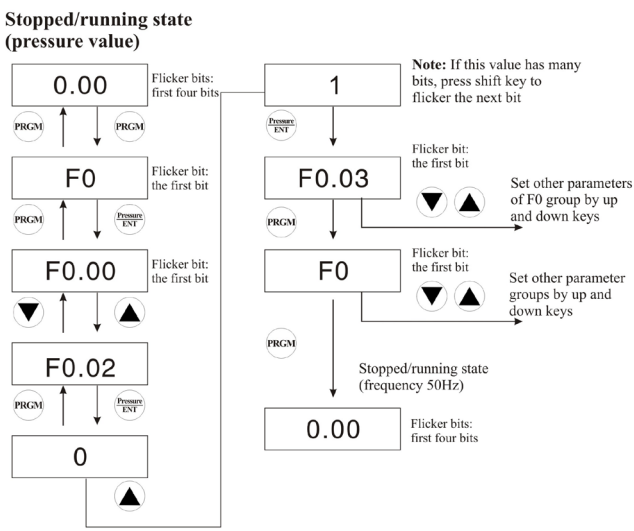
③ Function code (third class)

Instruction: In the third class menu, pressing “PRGM” or “pressure/ENT” can return to the second class menu. Pressing “pressure/ENT” first saves parameters to control board, and then returns to the second class menu and shifts to next function code automatically; pressing “PRGM” 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. Press “shift” to select flicker bit.

Note: For parameters marked with “●” , please modify them in stopped state. Parameters marked with “ ◎ ” are actual detected and recorded values which can’t be modified.

Example: Modify F002 from 0 to 1



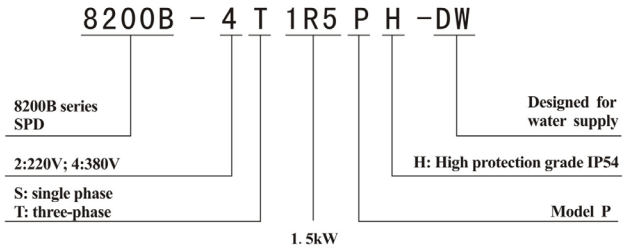
1.4 Pressure Setting Instruction

Remarks--Pressure Measure:

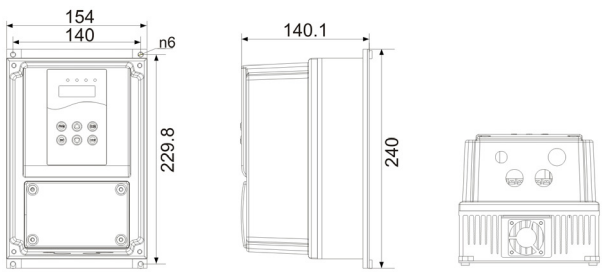
0.1MPa = 100KPa = 1Bar = 1Kgf / cm^2

Chapter 2 Model, Appearance and Wiring

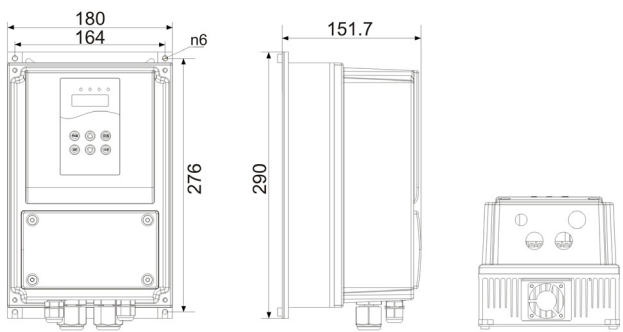
2. 1 Model Instruction



2.2 Outline & Installation Dimensions



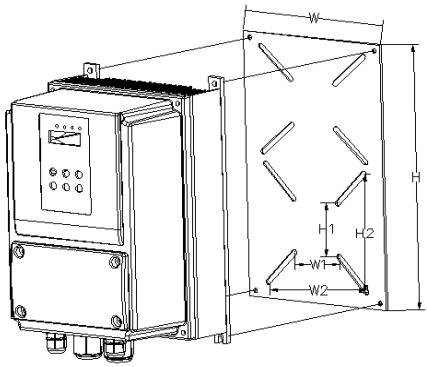
0.75-2.2KW Outline & installation dimensions diagram



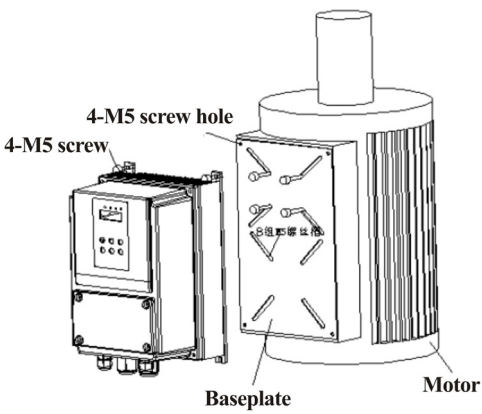
4KW-7.5KW Outline & installation dimensions diagram

2.3 Installation Diagram

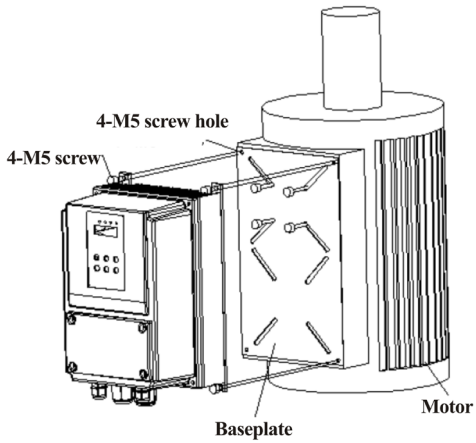
Step 1: Remove the iron plate at the bottom of the SPD



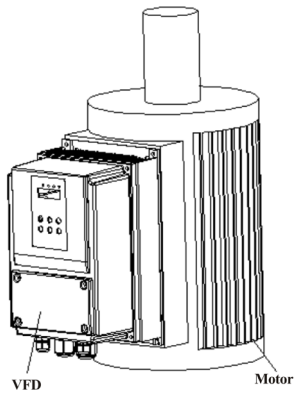
Step 2: Install the baseplate to the motor



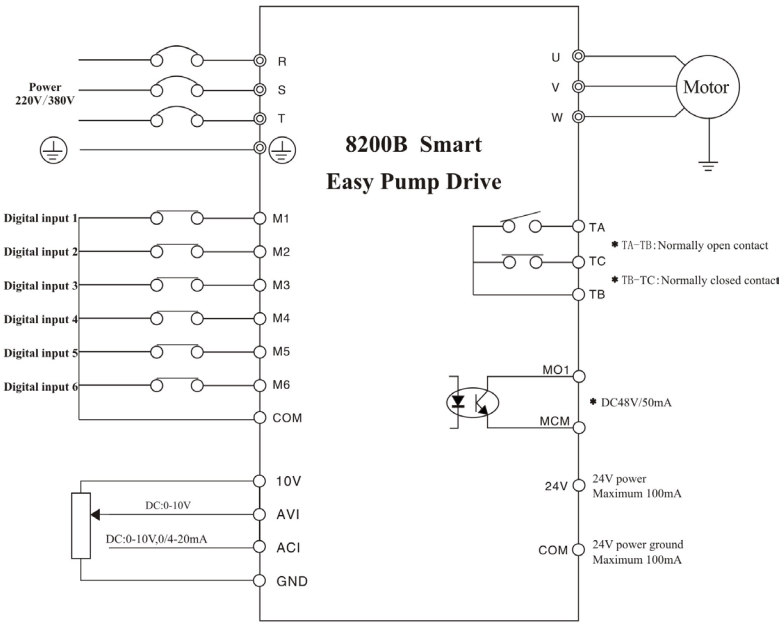
Step 3: Fix the SPD on the plate



Step 4: Finish installation



2.4 Wiring Diagram of Main Circuit and Control Terminals



Note:

① Terminals: ◎ refers to main circuit terminals; ○ control loop terminals

② For SPD of 220V, main circuit terminals are R,T.

2.5 Wiring of Sensors

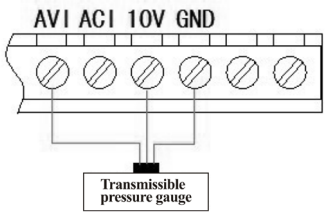
(1) Terminal instruction

① 10V/24V --- Terminal of transmissible pressure gauge/pressure transmitter
② AVI --- 0 ～ 10V analog signal input terminal
③ ACI --- 4 ～ 20mA signal input terminal
④ GND --- 10V power ground
⑤ COM --- 24V power ground

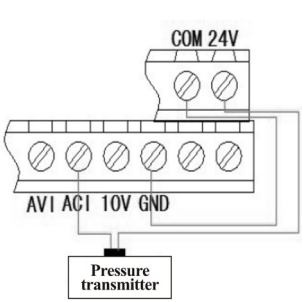
(2) Wiring diagram

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

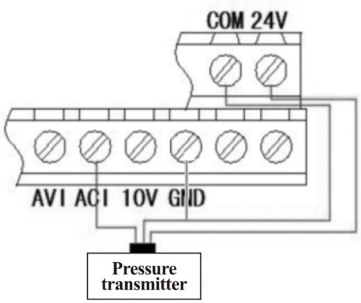
① Transmissible pressure gauge: working voltage 10VDC, output 0 ～ 10VDC. Wiring method is shown as below.



② 24V pressure transmitter: working voltage range 10 ～ 30V, output 4 ～ 20mA.

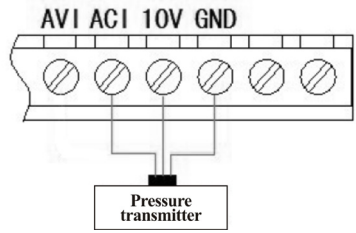


Wiring diagram of two-wire pressure transmitter



Wiring diagram of three-wire pressure transmitter

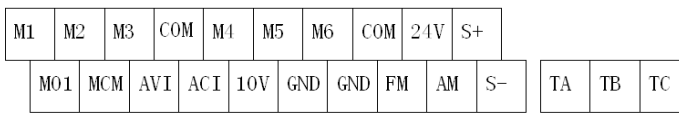
③ 10V pressure transmitter: working voltage range 10DC, output 4 ～ 20mA



Wiring diagram of three-wire pressure transmitter

2.6 Control Terminal Instruction

(1) Control terminals



(2) Control terminal instruction

Terminal symbol	Terminal name	Technical data
M1-M6	Multi-function digital input terminal	Optical couplers isolation one-way input Enabled when connected to GND. Disabled when open Input voltage range: 9 ～ 36V DC Input impedance: 3.3kΩ
MO1	Multi-function output terminal	(optical couplers isolation) MAX 48VDC/50mA
MCM	Common terminal of multi-function output terminals	(optical couplers isolation) MAX 48VDC/50mA
AVI	Analog input terminal 1	Input voltage range: DC 0 ～ 10V(input impedance 20KΩ)

ACI	Analog input terminal 2	1. Input voltage range: DC 0 ～ 10V or 0/4 ～ 20mA, determined by the choice of JP1 jumper on control panel, current input by default. Voltage input with jumper 1-2Pin; current input with jumper 2-3Pin 2.Input impedance: 20KΩ with voltage input; 500Ω with current input
10V	Analog reference voltage	10V ±5%, maximum output current 30mA
GND	Analog ground terminal	+10V reference zero potential
FM	Analog output 1	FM:0-10V
AM	Analog output 2	JP2 jumper on the control panel decides whether it is voltage output or current output, current output by default. Current output with jumper 1-2Pin; voltage output with jumper 2-3Pin. 0 ～ 10V/0/4 ～ 20 mA
TA/TB/ TC	Relay output	TA-TB: normally open terminals TB- TC: normally closed terminals Contact capacity: AC 250V / 3A / normally open terminals AC 250V / 3A / normally closed terminals
+24V	+24V power for external devices	Provide +24V power to external devices. Maximum output current 100 mA. Commonly used as digital input working power and external sensor power.
COM	+24V power public terminal	Provide +24V power public terminal to external devices
S+/S-	485 communication terminal	Standard 485 communication interface. Please use twisted pair or shielded wire

Chapter 3 Quick Setting

Please follow the steps below to finish setting

Step 1: Set the sensor scope, the sensor type:

F0.08 = 10.00 Sensor's scope

F0.09 = 1 Sensor type(0: Voltage feedback 1: Current feedback)

Step2: Confirm the motor's rotation direction:

Run the pump shortly, monitor if the direction is correct. You can change the rotation direction by 2 ways below:

1. Shut down the SPD and make sure the display is OFF, the exchange two line of any of U\V\W.

2. Stop the SPD, Modify F0.02 to 1.

Step 3: Adjust the display pressure:

There is two way to adjust the display pressure and actual pressure:

(1) If the display pressure is a little higher than actually should be, Just make the sensor scope lower. And vice versa.

(2) Adjust paras: F2.00~F2.03, refer to the manual details.

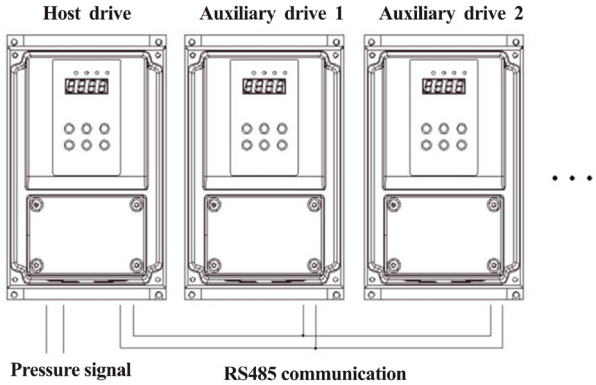
Step4: Macro Settings:

Please refre to the table below, to set your system quickly.

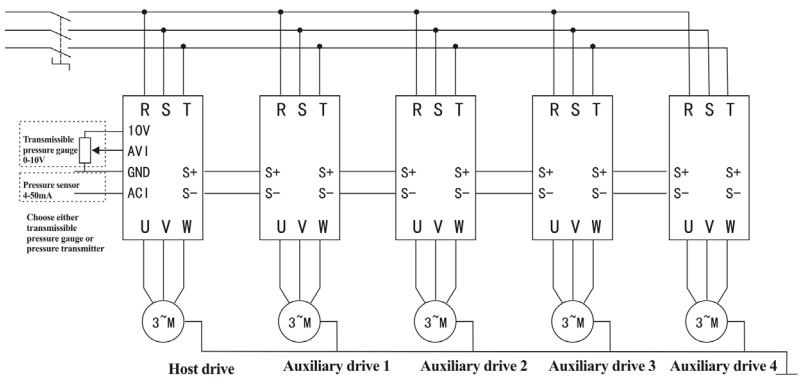
Sytem Type	Parameter	details of paras changed automatically	details
Solo Pump setting	F0.20=1	F0.06=1; F1.01=1; F1.02=0; F1.03 = 0; F2.05=8; F5.12=1	Auto-Reset, Auto-Start enable, As Rs485 Slave
Two SPDs,as Master	F0.20=2	F0.06=1; F1.01=1; F1.02=1; F1.03 = 1; F2.05=8; F5.12=1	Auto-Reset, Auto-Start enable, As Rs485 Master
Three SPDs,Master	F0.20=3	F0.06=1; F1.01=1; F1.02=1; F1.03 = 2; F2.05=8; F5.12=1	Auto-Reset, Auto-Start enable, As Rs485 Master
Four SPDs,Master	F0.20=4	F0.06=1; F1.01=1; F1.02=1; F1.03 = 3; F2.05=8; F5.12=1	Auto-Reset, Auto-Start enable, As Rs485 Master

Five SPDs,Master	F0.20=5	F0.06=1; F1.01=1; F1.02=1; F1.03 = 4; F2.05=8; F5.12=1	Auto-Reset, Auto-Start enable, As Rs485 Master
One SPD, one grid	F0.20=6	F0.06=1; F1.01=1; F1.02=0; F1.03 = 0; F2.05=8; F5.12=1; F7.07=2	Use RO1 control a Pump
Emergent Mode	F0.20=9	F2.05=5; F0.06=1; F5.12 = 1	Frequecy source changed
SPD network, Slave No.1	F0.20=11	F0.05=2; F0.06=1; F1.00=1; F1.01=0; F1.02 = 1; F1.04=1; F2.05=9; F5.12=1;	SPD commu address set to 1
SPD network, Slave No.2	F0.20=12	F0.05=2; F0.06=1; F1.00=2; F1.01=0; F1.02 = 1; F1.04=1; F2.05=9; F5.12=1	SPD commu address set to 2
SPD network, Slave No.3	F0.20=13	F0.05=2; F0.06=1; F1.00=3; F1.01=0; F1.02 = 1; F1.04=1; F2.05=9; F5.12=1;	SPD commu address set to 3
SPD network, Slave No.4	F0.20=14	F0.05=2; F0.06=1; F1.00=4; F1.01=0; F1.02 = 1; F1.04=1; F2.05=9; F5.12=1	SPD commu address set to 4
Settings	F0.20=0	F0.06=0; F5.12=0	Auto-reset & anto-start disable.

Step5: Press Key “Pressure” 2 second, set the pressure you need. Then press RUN.



Outline



Wiring diagram

Chapter 4 Datasheet of 8200B

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.

When the SPD is power on, only parameters of level 0 are shown. Set F0.15=1, confirm by pressing "Pressure/ENT" key to confirm and parameters of other levels can be shown.

4.1 Parameters Displayed at Running Status

Note: Press "Shift" key to switch

Display	Name	Description	Unit	Remarks
P	Current pressure	Pressure value of actual operation	bar	◎
H	Running frequency	Current running frequency	HZ	◎
d	Set pressure/temperature	Set pressure/temperature	Bar/℃	◎
A	Running current	Actual output current of the SPD	A	◎

4.2 Parameters Displayed at Stopped Status

Note: Press "Shift" key to switch

Display	Name	Description	Unit	Remarks
P	Current pressure	Pressure value of actual operation	Bar	◎
d	Set pressure/temperature	Set pressure/temperature	Bar/℃	◎
	DC Bus voltage	Pressure value of DC bus	V	◎

4.3 Common Parameter Sets of Single-drive

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F0.00	Pre-set Pressure	0.0 ～ F0.08	Bar	3.0	0	○	In multi-drive mode, users only need to set parameters of the host drive.
F0.01	Startup pressure derivation	0.0 ～ F0.00	Bar	0.3		○	Wakeup from standby mode when the pressure is lower than pre-set pressure
F0.02	Motor rotation direction	0: Forward 1: Reverse		0		●	Rotation direction can be changed by modifying this parameter
F0.03	Antifreeze	0：Disabled 1：Enabled, 2: Enabled		0		●	Antifreeze function of the pump itself
F0.04	Water leakage coefficient	0.0-100.0		2.0		○	The bigger the water leakage, the bigger the coefficient.
F0.05	Start/stop source option	0 ～ 3		0		○	0:Keyboard start/stop 1:Terminal start/stop 2:Start/stop by communication control 3：Start/stop according to the pressure of water inlet Note：This parameter of auxiliary drives must be set to 2 in multi-drive mode
F0.06	Auto-starting option	0 ～ 1		0		●	0：Disabled 1：Enabled Note：The function is invalid when F0.05 = 3
F0.07	Auto-starting delay time	0.0 ～ 100.0	s	1.0		●	Delay time while auto-starting at power on

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F0.08	Sensor range	0.0 ~ 200.0	Bar	10.0	0	●	The maximum range of sensor
F0.09	Feedback type of sensor	0: Voltage feedback 1: Current feedback		1		●	
F0.10	Set value of high pressure alarm	F0.00 ~ F0.08	Bar	9.0		○	When feedback pressure is bigger than this set pressure, it alarms and stops when the delay time set by F4.08 is over. When the pressure returns to normal, after the same delay time, the fault is solved automatically.
F0.11	Set value of low pressure alarm	0.0 ~ F4.01	Bar	0.0		○	When the feedback pressure is less than this set pressure, it alarms and stops after alarm delay set by F4.08. This function is invalid when this parameter is set as 0. When the pressure returns to normal, after the same delay, the fault is solved automatically.
F0.12	Pressure point to stop at inlet	0.0 ~ F0.08	Bar	3.2		○	It is valid when F0.05 = 3. The frequency converter starts when pressure feedback of water inlet is less than F0.13. The frequency converter stops when pressure feedback of water inlet is bigger than or equals to F0.12.
F0.13	Pressure point to start at inlet	0.0 ~ F0.12	Bar	3.0		○	

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F0.14	Displayed parameters at user level	0000-FFFF		0	0	○	This parameter is a 16-bit binary number. Bit 0-bit 16 corresponds to F0-FF 16 group of parameters respectively. When the bit is set as 0, the corresponding group of parameters is hidden; when the bit is set as 1, the corresponding group of parameters is displayed. However, F0, FD and FE group of parameters will always be displayed no matter corresponding bits are set as 0 or 1. For more details, please refer to parameter instruction.
F0.15	Parameter display level setting	0-3		0		○	3: Parameters of Frequency converter manufacture 2: Parameters of Pump manufacture 1: Agent parameters 0: User parameters
F0.16	Product number					◎	Product predefined
F0.17	Software version					◎	
F0.18	Acceleration time	0.1 ～ 360	s	5.0		○	
F0.19	Deceleration time	0.1 ～ 360	s	4.0		○	
F0.20	Parameter locker & Macro function	0 ～ 14		0		○	Refer to quick settings

4.4 Common Parameter Groups of Multi-drive Mode

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F1.00	Local SPD communicaton address	0 ～ 247		1	1	●	1-4 is the address of auxiliary drives. The address of host drive can be any other values.
F1.01	Host/auxiliary frequency giving mode	0 ～ 1		1	1	●	0: frequency is given by auxiliary drives. By default, the value of F0.05 is 2, referring to communication start; the value of F2.05 is 9, referring to setting frequency by communication. Note: Pressure feedback signal is not accepted in this mode. 1: Frequency is given by the host drive. By default, the value of F0.05 is 0, referring to keyboard start; the value of F2.05 is 8, referring to setting frequency by PID. Frequency feedback signal must be connected in this mode.
F1.02	Multi-drive mode choice	00 ～ 11		11	1	●	**Ones:** Multi-drive mode choice 0:single pump mode, Host-auxiliary function is disabled. 1:Multi-drive mode. The one with F1.01=1 is the host drive and it sends commands to auxiliary drives; those with F1.01=0 are auxiliary drives and it just accepts frequency commands from the host drive. **Tens:** Switch of sending the drive's state 0: Do not send the state 1: Send the state

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F1.03	Auxiliary number	0 ～ 4	set	0	1	●	0: Cancel the control of the host drive over the auxiliaries. Note: This parameter is only set in the host drive. Don't set this parameter in auxiliary drives.
F1.04	Backup settings of the host drive	Ones: backup host drive Tens: rotation timekeeping mode Hundreds: uniform speed mode of multi-pump Thousands: the delay selection of adding pumps		0001	1	●	**Ones:** 0: disable this function 1: When this slave machine reports fault, it switches to the host drive running automatically. **Tens:** 0: rotation with power on time interval 1: rotation with running time interval **Hundreds:** 0: Overflow mode 1: Dividing the running frequency of each pump equally **Thousands:** 0: the delay of adding pump is valid 1: no delay function
F1.05	Alternating time	0 ～ 3600	min	120	1	○	The host SPD and the auxiliary SPD alternating time.
F1.06	Function setting of small pump	0 ～ 10		5	1	○	It is invalid when this address is bigger than the number of auxiliary drives. 0 means that the host drive is the small pump.

4.5 Debugging Parameter Groups

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F2.00	Lower limit of AVI input	0.00 ～ 10.00	V	0.00	1	○	Used to correct the lower limit of AVI signal
F2.01	Upper limit of AVI input	0.00 ～ 10.00	V	10.00	1	○	Used to correct the upper limit of AVI signal
F2.02	Lower limit of ACI input	0.0 ～ 20.00	mA	4.00	1	○	Used to correct the lower limit of ACI signal
F2.03	Upper limit of ACI input	0.0 ～ 20.00	mA	20.00	1	○	Used to correct the lower limit of ACI signal
F2.04	Pressure correction		Bar		1	○	Pressure correction steps: 1. Make the system output pressure less than 1.0 bar. Enter F2.04 after the pressure is steady. Adjust the value of F2.04 to match the pressure meter. Save the setting and the system will record this pressure point. 2. Make the system output pressure bigger than the value of the first time (such as 1/4 of the sensor range). Enter F2.04 after the pressure is steady. Adjust the value of F2.04 to match the pressure meter. Save the setting and the system will record the second pressure point. The SPD will correct the displayed pressure automatically according to these two points after finishing above two steps.

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F2.05	Frequency source choice	0: set by digital up/down keys 1: panel potentiometer 2: AVI 3: ACI 5:Emergent water supply 8: PID 9: setting by communication		8	1	●	Choose 8 for the host drive Choose 9 for auxiliary drives Choose 5 for emergent water supply.
F2.06	Upper limit of running frequency	F2.08- F2.07	Hz	50.00Hz	1	●	
F2.07	Maximum output frequency	10.00-600.0	Hz	60.00Hz	1	●	
F2.08	Lower limit of running frequency	0.00Hz ～ F2.06	Hz	0.00Hz	1	●	
F2.09	Options when it reaches the lower limit frequency	0: run at the lower limit frequency 1: stop 2: standby		2	1	●	
F2.10	Setting of carrier frequency	1.0 ～ 15.0kHz	KHz	Set according to the machine type	1	○	Noise of the motor can be adjusted by modifying this value

4.6 PID and Standby Parameter Sets

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F3.00	Proportional gain	0.00 ～ 99.99	%	5	1	○	The bigger this parameter is, the quicker the response speed of water pressure system will be. However, if the value is too big, the system will oscillate. The value should be adjusted according to different water supply system.
F3.01	Integral time	0.01 ～ 10.00	S	0.36	1	○	
F3.02	Derivative time	0.00 ～ 10.00	S	0	2	○	
F3.03	Sampling period	0.00 ～ 100.0	S	0.01	1	○	
F3.04	Deviation limit of PID control	0.0 ～ 100.0	%	0.3	1	○	
F3.05	PID source setting choice	0		0	1	○	0: setting by keyboard
F3.06	PID output characteristics choice	Ones: 0：Positive 1：Negative Tens: 0: Display “d” 1:Display “c”		00	2	○	**Ones**: 1、Positive control: When the feedback signal is bigger than the PID setting signal, the output frequency decreases; when the feedback signal is smaller than the PID setting signal, the output frequency increases. 2、Negative control: When the feedback signal is bigger than the PID setting signal, the output frequency increases; when the feedback signal is smaller than the PID setting signal, the output frequency decreases.

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F3.07	Broken-line fault detection time of PID feedback	0.0-100.0	S	5.0	1	○	When the running frequency reaches upper limit set by F2.06, after this detection period, if the PID feedback value is still 0, feedback broken-line fault is reported. This function is invalid when this parameter is set as 0. Either machine reaching the maximum running frequency, the host drive will report fault, no matter the host drive reaches the maximum running frequency or not.
F3.08	SPD standby function option	0: Disabled 1: Standby Mode 1 2: Standby Mode 2 3: Standby Mode 3 4: Standby Mode 4		4	1	○	**Standby mode 1:** Judging pressure, frequency, standby treatment of time, the function of standby frequency and time validity. **Standby mode 2:** By setting F3.17,it can deal with the standby function automatically. **Standby mode 3:** It is the treatment of forced standby function after the pressure and frequency meet the condition of standby. **Standby mode 4:** Self-adaptive standby, it requires 10-20 times standby learning process.
F3.09	PID wakeup detection delay	0.0 ～ 120.0	S	0.0	1	○	PID wakeup detection delay

Function code	Description	Set range	Unit	Default	Display level	Modifi-cation level	Notes
F3.10	PID standby detection delay	0.0 ～ 120.0	S	1.0	1	○	If the standby is slow or it can't enter standby in small water demand, decrease this value. If it enters standby in advance or it is started and stopped frequently, increase this value.
F3.11	PID standby deviation pressure	0.0 ～ 25.0	Bar	0.1	1	○	When the feedback pressure is within standby deviation scope，it starts standby.
F3.12	PID standby hold frequency	0.00 ～ 50.00	Hz	20.00	1	○	PID runs at standby hold frequency. After the standby duration, PID enters standby status.
F3.14	The feedback of disconnected detection value	0~1.00	V	0.03	1	○	Sampling minimum value in the system. It is judged by the voltage.
F3.15	Increment set by standby mode 3:	1.0~12.0	%	1	1	○	By referring to the range, the fixed increment of pressure is set when using standby mode 3.
F3.16	The frequency for half pump flow (The pumping flow ratio between small pump and large pump)	10.00~60.00	Hz	30	1	○	Used in the mode of average dividing frequency. It is the frequency value that the pump reach half pump flow (notes: the parameter is reused in the small pump, serving as the flow percentage for small pumps and large pumps)
F3.17	SPD Sleep Raio	1~50		9	1	○	Set bigger make sleep quicker

4.7 Parameter Sets of Pump Protection

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F4.00	Water shortage protection	0-3		2	1	●	0：Disabled 1：Enabled. Judge by frequency, pressure and current 2：Enabled. Judge by outlet pressure 3：Enabled. Judge by inlet pressure(a sensor needs to be installed at inlet)
F4.01	Threshold of water shortage detection	0.00 ～ F0.08	Bar	0.5	1	●	When feedback pressure is smaller than this value, water shortage judgement is made.
F4.02	Detection frequency of water shortage protection	0-50.00	HZ	50.00	1	●	It is valid only when F4.00 = 1. Comparison frequency to judge whether water shortage occurs. When running frequency is bigger than this frequency, it is judged as water shortage.
F4.03	Current percentage of water shortage protection detection	0-100.0		40.0	1	●	It is valid only when F4.00 = 1. The percentage of motor rated current. When running current is less than this current, it is judged as water shortage.
F4.04	Automatic restart delay of water shortage protection	0 ～ 9999	min	15	1	●	Set 0 to use F4.06,F4.07 as water recovery

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F4.05	Automatic reset times of water shortage protection	0 ～ 50		3	1	●	When water shortage fault is reported, after the period set by F4.04, the frequency converter resets and runs automatically. Reset times are limited by F4.05. When it reaches reset times, water shortage fault can't be cleared automatically. Press REST manually to reset the fault.
F4.06	Input water recover pressure	0~200.0	Bar	3.0			When system alarm E027, then if the pressure is higher than this value, and more than F4.07 second, SPD will reset the E027.
F4.07	Input water recover detect time	0~100.0	s	20.0			
F4.08	Alarm delay time of abnormal pressure	0.0 ～ 120.0	S	3.0	1	●	Alarm delay time of high pressure, low pressure
F4.09	Antifreeze running frequency	0.0-30.00	Hz	10.00	1	●	
F4.10	Antifreeze running time	0-9999	s/min	60	1	●	
F4.11	Antifreeze running interval	0-9999	s/min	300	1	●	When this parameter is set as 0, it always runs at antifreeze frequency.

4.8 Parameter Sets of Motor

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F5.00	Motor rated power	0.4 ～ 90.0kW	KW	Default value of corresponding motor	1	●	Set according to motor nameplate.
F5.01	Motor rated frequency	10 ～ F2.07	Hz	50.00Hz	1	●	
F5.02	Motor rated speed	0 ～ 36000rpm	R/M	Default value of corresponding motor	1	●	
F5.03	Motor rated voltage	0 ～ 480V	V	Default value of corresponding motor	1	●	
F5.04	Motor rated current	0.8 ～ 200.0A	A	Default value of corresponding motor	1	●	
F5.12	Fault/ Warning automatic reset option	0：Disabled 1：Enabled		1	1	●	Choose 1 to enable the function of fault automatic reset. If there is fault in running, it resets the fault automatically . Faults relevant to water like water shortage are not affected by this code.

4.9 Parameter Sets of Protections and Faults

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F6.00	Motor overload protection choices	0 ～ 2		1	1	●	0: Unprotected 1: common motor(with low speed compensation) 2: variable frequency motor(without low speed compensation)
F6.01	Overload protection current of the motor	20.0 ～ 120.0	%	100	1	○	The percentage relative to motor rated current
F6.02	Automatic current limiting choices	0 ～ 1		1	1	○	0: Always enabled 1: Disabled at constant speed
F6.03	Input phase loss protection choices	0: Disabled 1: Enabled		1	1	○	
F6.04	Output phase loss protection choices			1	1	○	
F6.05	Over voltage stalling protection			0	1	○	
F6.06	Over voltage stalling protection voltage	110-150	%	130	1	○	The percentage relative to motor's standard bus voltage
F6.07	Automatic current-limiting level	50-200	%	160	1	○	

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F6.08	Display choices of stopped status			0X32	1	○	0 ～ 0xFFFF BIT0:Set frequency BIT1:Bus voltage BIT2:Input terminals state BIT3: Output terminals state BIT4:PID set value BIT5:PID feedback value BIT6:alalog AVI value BIT7:analog ACI value
F6.09	Frequency decrease rate in current limiting	0.00 ～ 50.00	Hz/S	10	1	○	
F6.10-11	Reserved						
F6.12	Under-clocking point of instant power off	70.0 ～ 110.0	%	80	1	○	The percentage relative to motor's standard bus voltage
F6.13	Frequency reduction of instant power off	0.00 ～ F2.07	Hz	0	1	○	
F6.14	Previous two fault types				0	◎	Please refer to fault code and treatment
F6.15	Last fault type				0	◎	
F6.16	Current fault type				0	◎	
F6.17	Current fault running frequency		Hz		0	◎	
F6.18	Current fault output current		A		0	◎	

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F6.19	Bus voltage of current fault		V		0	◎	
F6.20	Fault-input terminal state				0	◎	
F6.21	Fault-output terminal state				0	◎	

4.10 Parameter Sets of Terminals

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F7.00	M1 input terminal function choices	0、1、7、9、16、17、18、37	None	1	1	●	0：No function 1：Forward running（FWD） 7：Fault reset 9：Water shortage protection is normally open 16：the pressure switch connected to terminal 1 17：the pressure switch connected to terminal 2 18：the pressure switch connected to terminal 3 37：Output delay of terminal input Note: Parameters not listed in this list mustn't be set.
F7.01	M2 input terminal function choices			9	1	●	
F7.02	M3 input terminal function choices			7	1	●	
F7.03	M4 input terminal function choices			0	1	●	
F7.04	M5 input terminal function choices			0	1	●	
F7.05	M6 input terminal function choices			0	1	●	

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F7.06	MO1 output terminal function choices	0、1、2、3、16		1	1	○	0: No output 1: Motor is in forward running 2: Motor is in reverse running 3: Fault output 16: Output delay of terminal input It is forbidden to set unlisted function codes.
F7.07	Relay output function choices			3	1	○	
F7.08	Terminal running protection choices at power on	0:Terminal running command is invalid at power on 1: Terminal running command is valid at power on		1	1	○	When F0.05=1 and start/stop signal is given by external terminals, users can set this parameter to choose whether terminal start command is valid or invalid at power on.
F7.09	Start power frequency pump detection time	2~99.99	s	10	1	○	
F7.10-F7.12	Reserved						
F7.13	AVI lower limit setting	0.0 ～ 100.0%	%	0.0	1	○	
F7.14	AVI upper limit setting	0.0 ～ 100.0%	%	100.0	1	○	
F7.15	AVI input filter time	0.00 ～ 10.00s	s	0.03	1	○	
F7.16	ACI lower limit setting	0.0 ～ 100.0%	%	0.0	1	○	
F7.17	ACI upper limit setting	0.0 ～ 100.0%	%	100.0	1	○	
F7.18	ACI input filter time	0.00 ～ 10.00s	s	0.03	1	○	

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F7.24	Water shortage check time	0.0~120.0s	s	10.0	1	○	
F7.25	Quickly Wakeup pressure slope	0.0~10.0%/s	%/s	0.0	0.1	○	0: disabled not 0: while the pressure slope bigger than this value, SPD wakeup immediatly
F7.26	Choose Mx input terminal is normally open or closed	0x00 ～ 0x3F		0x3F	1	●	Setting corresponding bit of each terminal as 0 refers to the input is normally open and 1 normally closed. BIT0: M1 input terminal BIT1: M2 input terminal BIT2: M3 input terminal BIT3: M4 input terminal BIT4: M5 input terminal BIT5: M6 input terminal

4.11 Communication Parameter Sets

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F8.00	Baud rate setting of communication	0：1200BPS 1：2400BPS 2：4800BPS 3：9600BPS 4：19200BPS 5：38400BPS		5	1	○	When the host drive is connected to the auxiliary drives, use 38400BPS for baud rate of communication.
F8.01	Data bit check setting	0: No check		0	1	○	（N，8，1）for-RTU
		1: Even check					（E，8，1）for-RTU
		2: Odd check					（O，8，1）for-RTU
		3: No check					（N，8，2）for-RTU
		4: Even check					（E，8，2）for-RTU
		5: Odd check					（O，8，2）for-RTU
F8.02	Response delay	3 ～ 200	ms	5	1	○	
F8.03	Time out fault time	0. ～ 100.0s	s	0	1	○	0.0: The function is disabled. When multi-drive function is used, set this parameter of the auxiliary to a nonzero value after connecting the communication line between the host and the auxiliary drives.

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F8.04	Communication fault handling	0 ～ 3		0	1	○	0: Alarm and stop 1: No alarm and keep running 2: No alarm and stop according to stop mode(only in communication control mode) 3: No alarm and stop according to stop mode(in all control modes) In multi-drive mode, the host drive doesn't have this function.
F8.05	Communication response actions	Ones: 0 ～ 1		0	1	○	Ones: transmission response handling 0: Respond to writing operation 1: No response to writing operation
		Tens: 0 ～ 1					Tens: storage choices 0: Communication setting values are not saved at power down. 1: Communication setting values are saved at power down.

4.12 Monitoring Parameter Sets

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
F9.00	Temperature of radiator	0-100	℃	0	1	◎	
F9.01	Running time of this machine	0-9000	Min	0	1	○	Running time of this machine(when pumps rotation starts, both this parameter of the host and the auxiliary need to be set as 0)
F9.06	Number of the first started machine	0-4 0：Main unit 1: No. 1 auxiliary 2: No. 2 auxiliary 3: No. 3 auxiliary 4: No. 4 auxiliary		0	1	◎	In multi-drive mode, start the auxiliaries in the sequence set by F9.06-F9.10. When timing rotation function is started, the host drive will save the corresponding machine number to F9.06-F9.10 according to running time from short to long.
F9.07	Number of the second started machine			1	1	◎	
F9.08	Number of the third started machine			2	1	◎	
F9.09	Number of the fourth started machine			3	1	◎	
F9.10	Number of the fifth started machine			4	1	◎	
F9.11	Number of the current running machine	0-4		0	1	◎	0：Host drive 1: No. 1 auxiliary 2: No. 2 auxiliary 3: No. 3 auxiliary 4: No. 4 auxiliary
F9.12	Running time of the host drive	0-9999	Min	0	1	◎	
F9.13	Running time of No. 1 auxiliary	0-9999	Min	0	1	◎	
F9.14	Running time of No. 2 auxiliary	0-9999	Min	0	1	◎	
F9.15	Running time of No. 3 auxiliary	0-9999	Min	0	1	◎	
F9.16	Running time of No. 4 auxiliary	0-9999	Min	0	1	◎	

4.13 Agent Parameter Sets

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
FD.00	Password of the agent	0000 ～ 9999		0	0	◎	Password to enter group FD
FD.01	Restore factory defaults	0-2		0	0	●	0:No operation 1: Restore factory defaults 2:Clear fault records
FD.02	Parameter Locked	0~1		0			0:Unlocked; 1:locked
FD.03	Reserved						
FD.04	Parameter sets display setting of the agent level	0000-FFFF		0	0	○	Please refer to description of F0.14.
FD.05	Display level of the agent	0 ～ FE.09		1	0	○	

4.14 Factory Parameter Sets

Function code	Description	Set range	Unit	Default	Display level	Modification level	Notes
FE.00	Password	0000 ～ 9999		0	0	◎	The password to enter group FE
FE.01	Running time setting	0000-9999	h	0	0	○	0: No time limit
FE.02	Action choices when it reaches the running time	0 ～ 1		0	0	○	0: Keep running 1: Breakdown

FE.03	Accumulated running time of this machine	0 ～ 9999	h	0	0		
FE.04-FE.07	Reserved						
FE.08	Parameter display setting of pump factory	0000-FFFF		0	0	○	Please refer to the description of F0.14
FE.09	Display level of factory	0-FF.01		1	0	○	

4.15 Details of Some Parameters

F0.00	Pressure setting	0.0 ～ F0.08	Bar	3	0	○	In multi-drive mode, only the parameter of the host drive needs to be set.
F0.08	Sensor range	0.0 ～ 200.0	Bar	10	0	●	The maximum range of corresponding sensor

F0.08 is the range of the sensor. The common range is 1MPa, namely 10.0 Bar.

F0.00 is the pressure set by the pump network. If F0.00 = 3.0Bar, the pressure of the pump network is constant 3.0 Bar. Note: In multi-pump system, users only need to set the parameter F0.00 of the host drive and the auxiliary doesn't need to be set.

F0.01	Start pressure deviation	0.0 ～ F0.00	Bar	0.3	0	○	The standby is woken up when the pressure is lower than the PID set pressure.
F3.09	PID wakeup detection delay	0.0 ～ 120.0	S	0	1	○	PID wakeup detection delay

When the feedback value is less than or equivalent to set pressure minus PID start pressure（F0.00-F0.01）and holds for the time set by F3.09, PID adjustment will restart. For example, when F0.00=3, F0.01=0.3, F3.09=5.0 and the feedback pressure is less than or equivalent to 2.7 and holds for more than 5 seconds, PID adjustment will restart. Once the value is larger than 2.7, time will be recounted.

F0.02	Motor rotation direction	0: Forward 1：Reverse		0	0	●	Change the rotation direction by modifying this parameter.

In first use, please confirm the rotation direction of the motor. Exchange any two of the output power line U,V,W or modify the parameter F0.02 to change the rotation direction of the motor.

F0.03	Antifreeze function	0：Off 1：On, counting as second 2:On, counting as minute		0	0	●	Self-antifreeze function of the pump
F4.09	Antifreeze running frequency	0.0-30.00	Hz	10	1	●	
F4.10	Antifreeze running time	0-9999	s/min	60	1	●	
F4.11	Antifreeze running interval	0-9999	s/min	300	1	●	0: Keep running at antifreeze running frequency

F0.03=1: Enable anti-freeze function. The running frequency of the pump is adjusted automatically according to the current state after the SPD is started.

Note:（1）If anti-freeze function is in need, the parameters F0.03, F4.09, F4.10, F4.11 of both the host and the auxiliary drives need to be set.

（2）Pump's self-adjustment of the given frequency is prior to anti-freeze frequency.

（3）The anti-freeze frequency can't be set too large. It should be set as the output frequency which can just make the pump run but can't provide the pressure.

F0.04	Leakage coefficient	0.0-100.0		2.0	0	○	The bigger the leakage, the bigger this coefficient.

In no water use condition, the leakage of the pump network prevents the SPD from stopping, as a result, the SPD starts and stops frequently. To solve the leakage problem of the pump network, modify the value of F0.04 according to the leakage degree. The bigger the leakage is, the bigger this coefficient will be.

F0.05	Start/stop signal choices	0 ～ 3		0	0	○	0:By keyboard 1: By terminals 2:By communication control 3：By inlet pressure Note: In multi-drive mode, the parameter of the auxiliary needs to be set as 2.
F2.05	Frequency source choices	0：Digital set by up/down keys 1：Panel potentiometer 2：AVI 3：ACI 5: Emergent Mode 8：PID 9：Set by communication		8	1	●	Choose 8 for the host drive Choose 9 for auxiliary drives

Different start/stop modes and frequency source modes can be chosen for every SPD.

Note: （1）In multi-pump system, F2.05 of auxiliary drives needs to be modified as 9.

（2）If communication start/stop is chosen for the host drive, auxiliary drives can't be connected in the system and F1.02 needs to be set as 0.

（3）In multi-pump system, F2.05 of the host drive can be only set as 8 and F2.05 of auxiliary drives 9.

F0.06	Auto-start option	0 ～ 1		0	0	●	0：Disabled 1：Enabled Note：The function is invalid when F0.05= 3
F0.07	Auto-start delay at power on	0.0 ～ 100.0	s	1	0	●	The delay time before self-starting at power on

If you hope the SPD to self-start after the delay set by F0.07 when the SPD is power on, you need to set F0.06 as 1 to enable SPD self-starting function after setting all parameters. It will self-start every time it is power on.

F0.09	Sensor feedback type	0：Voltage feedback 1：Current feedback		1	0	●	

General sensors are current mode, connected to the ACI terminal of the SPD as pressure feedback.

If voltage mode sensors are used, modify F0.09 as 0 and connect them to the AVI terminal of the SPD as pressure feedback.

F0.10	High pressure alarm value setting	F0.00 ～ F0.08	Bar	9	0	○	When the feedback pressure is no less than this value, it alarms and stops after alarm delay set by F4.08. The fault is removed automatically after the same delay when the pressure returns to normal.

F0.11	Low pressure alarm value setting	0.0 ～ F4.01	Bar	0	0	○	When the feedback pressure is less than this value, it alarms and stops after alarm delay set by F4.08. This function is invalid when the parameter is set as 0. The fault is removed automatically after the same delay when the pressure returns to normal When the feedback pressure is no less than this value, it alarms and stops after alarm delay set by F4.08. The fault is removed automatically after the same delay when the pressure returns to normal

The SPD will compare F0.10 and F0.11 automatically according to pump network pressure fed back by the sensor. If the pressure is abnormal, it stops and alarms to protect the pump network system.

F0.12	Stop pressure of the inlet	0.0 ～ F0.08	Bar	3.2	0	○	It is valid when F0.05 = 3. The frequency converter starts when the pressure feedback of the inlet is less than F0.13. The frequency converter stops when the pressure feedback of the inlet is no less than F0.12.
F0.13	Start pressure of the inlet	0.0 ～ F0.12	Bar	3	0	○	

When F0.05 = 3, it starts or stops according to the pressure of the inlet. The SPD will judge the pressure of the inlet. The SPD starts when the feedback is less than F0.13.

The SPD stops when the feedback is no less than F0.12.

Note: In such an application, voltage mode pressure sensor needs to be installed to the inlet.

F0.14	Parameter sets display setting at user level	0000-FFFF		0	0	○	This parameter is a binary number with 16 bits, corresponding to F0-FF 16 sets of parameters respectively. When a bit is set as 0, corresponding set of parameter is hidden. When a bit is set as 1, corresponding set of parameter is displayed. However, F0, FD, FE groups of parameters will always be displayed no matter corresponding bits are set as 0 or 1. For more details, please refer to parameter description.
FD.04	Parameter sets display setting at agent level	0000-FFFF	None	0	0	○	Please refer to description of F0.14.
FE.08	Parameter sets display setting at pump factory level	0000-FFFF		0	0	○	Please refer to description of F0.14.

F0.14, FD.04, FE.08 can set the parameters to be displayed or hidden in the unit of parameter set. The parameter is a binary number with 16 bits. Bit 0 to bit 16 corresponds to F0-FF 16 sets of parameters respectively. When a bit is set as 1, corresponding set of parameter is displayed. When a bit is set as 0, corresponding set of parameter is hidden. The bitwise value of four 16-bit binary numbers of F0.14, FD.04, FE.08 parameters decides the parameter set is displayed or hidden. However, F0, FD, FE groups of parameters will always be displayed no matter corresponding bits are set as 0 or 1. For more details, please refer to parameter description.

F0.15	Parameter display level setting	0-3		0	0	○	3：Factory parameters of frequency converters 2：Factory parameters of pumps 1：Agent parameters 0：User parameters

F0.15 (parameter display level setting) is used to set parameters to be displayed or hidden according to the display level. Please pay attention to the difference between F0.15 and F0.14 (display setting of parameter sets). To display a parameter, you must

first set the parameter group which the display belongs to by F0.14 and then set the level needed by the parameter by F0.15.

F0.18	Acceleration time	0.1 ～ 360	s	1.5	0	○	
F0.19	Deceleration time	0.1 ～ 360	s	1.5	0	○	

The acceleration/deceleration time setting of the pump's motor. The factory default of the machine with power no more than 5.5KW is 1.5S; that of no less than 7.5KW is 20.0S.

F1.00	Communication address of this machine	0 ～ 247		1	1	●	1-4 is the address of auxiliary drives. The address of the host drive can be any other values.

In multi-pump system, auxiliary drives need to be set as different addresses with range of 1-4. The address of the host drive can be set at random.

F1.01	Set frequency by the host or auxiliary drives	0 ～ 1		1	1	●	0: Frequency is given by auxiliary drives. By default, the value of F0.05 is 2, referring to communication start; the value of F2.05 is 9, referring to setting frequency by communication. Note: Pressure feedback signal is not accepted in this mode. 1: Frequency is given by the host drive. By default, the value of F0.05 is 0, referring to keyboard start; the value of F2.05 is 8, referring to setting frequency by PID. Frequency feedback signal must be connected in this mode.

If the sensor needs to be connected to the host drive, F1.01 of the controller needs to be set as 1. Else, it needs to be set as 0.

(1) Note: When F1.01 is changed to 0 from 1, by default, F0.05 will be changed to 2 referring to start by communication and F2.05 will be changed to 9 referring to setting frequency by communication.

(2) When F1.01 is changed to 1 from 0, by default, F0.05 will be changed to 0 referring to start by keyboard and F2.05 will be changed to 8 referring to setting frequency by PID.

F1.02	Multi-pump connection mode choices	00 ～ 11		11	1	●	**Ones**: 0:Single pump mode. There is no control function of the host drive over the auxiliary drives. 1:Multi-drive mode. The one with F1.01=1 is the host drive and it sends commands to auxiliary drives; those with F1.01=0 are auxiliary drives and it just accepts frequency commands from the host drive. **Tens**: If set to 1, in multi-pump mode ,each drive will send its own state

By default, the SPDs are in multi-pump connection mode.

If only one SPD is used and start/stop is controlled by communication, F1.02 needs to be set as 0.

F1.03	Number of the auxiliary drives	0 ～ 4	set	0	1	●	Choose 0 to cancel the control of the host drive over auxiliary drives Note: This parameter is only set in the host drive. Don't set this parameter to auxiliary drives.

In multi-pump system, you should set F1.03 (the number of auxiliaries) in the host drive.

Note: Don't set this parameter to auxiliaries.

F1.05	Interval of rotation	0 ～ 3600	min	120	1	○	When the interval of rotation among the host and the auxiliary drives is set as 0, the rotation function will be disabled.

In multi-pump system, if pump rotation function is needed, you need to set the value of F1.05.

Note: The minimum unit is 1 minute. This function is disabled when the parameter is set as 0.

F2.00	Lower limit of AVI input signal	0.00 ～ 10.00	V	0	1	○	Used to correct the lower limit of AVI signal
F2.01	A Upper limit of AVI input signal	0.00 ～ 10.00	V	10	1	○	Used to correct the upper limit of AVI signal
F2.02	Lower limit of ACI input signal	0.0 ～ 20.00	mA	4	1	○	Used to correct the lower limit of ACI signal
F2.03	Upper limit of ACI input signal	0.0 ～ 20.00	mA	20	1	○	Used to correct the upper limit of ACI signal

If you find that there is deviation between feedback pressure of the sensor and the feedback pressure displayed by the controller, adjust the above parameters to correct the sensor.

F3.00	Proportional gain	0.00 ～ 99.99	%	5	1	○	The bigger the parameter is set, the faster the response speed of the pressure system will be. However, if the parameter is set too large, the system will vibrate. The parameter needs to be adjusted by different water supply system.
F3.01	Integral time	0.01 ～ 10.00	S	0.36	1	○	

The bigger F3.00 is set, the faster the response speed of the pressure system will be. However, if the parameter is set too large, the system will vibrate. The parameter needs to be adjusted by different water supply system.

F3.08	SPD standby option	0: Disabled 1: Standby Mode 1 2: Standby Mode 2 3: Standby Mode 3 4: Standby Mode 4		2	1	○	Standby mode 1: Judging pressure, frequency, standby treatment of time, the function of standby frequency and time validity. Standby mode 2: By setting F3.17, it can deal with the standby function automatically. Standby mode 3: It is the treatment of forced standby function after the pressure and frequency meet the condition of standby. Standby mode 4: Self-adaptive standby, it requires 10-20 times standby learning process.
F3.09	PID wakeup detection delay	0.0 ～ 120.0	S	0.0	1	○	PID wakeup detection delay
F3.10	PID standby detection delay	0.0 ～ 120.0	S	1.0	1	○	If the standby is slow or it can't enter standby in small water demand, decrease this value. If it enters standby in advance or it is started/stopped frequently, increase this value.
F3.11	PID standby deviation pressure	0.0 ～ 120.0	Bar	0.1	1	○	When the feedback pressure is in standby deviation range, it starts standby.
F3.12	PID standby hold frequency	0.00 ～ 50.00	Hz	20.0	1	○	PID runs at standby hold frequency. After the standby duration, PID enters standby status.

When the standby is enabled by F3.08, the SPD will detect whether the feedback pressure is bigger than set pressure. If yes, the SPD will start standby detection. After the PID standby detection delay period set by F3.10, if the feedback pressure is still bigger than set pressure, the SPD will decrease the output frequency to low hold frequency of the standby detection set by F3.12. After low hold frequency of the standby detection

waits for the set period, if the feedback pressure is still bigger than set pressure, the SPD will decrease the output frequency to 0Hz and enters standby. In above process, if the feedback pressure is less than set pressure, the SPD will judge that standby detection is invalid and will return to PID adjustment state.

When the SPD enters standby status, if the feedback pressure is lower than wakeup pressure threshold value, wakeup will be successful and the SPD will return to PID adjustment state. Else, the wakeup will be failed. Too high wakeup threshold value will lead the SPD to start and stop frequently. Too low wakeup threshold value will lead to shortage of pressure.

Note: The standby hold frequency of different water supply system is different. If there is no water use and the tap is turned off but the pump is still running, F3.12 standby hold frequency needs to be increased manually.

The mode 2 is automatic standby mode. Modify F3.17 to change the speed to standby.

Mode 3 is enforce standby mode.

F4.00	Water shortage protection	0-3		2	1	●	0：Disabled 1：Enabled. Judge by frequency, pressure and current 2：Enabled. Judge by outlet pressure 3：Enabled. Judge by inlet pressure(a sensor needs to be installed at inlet)
F4.01	Threshold of water shortage detection	0.00 ～ F0.08	Bar	0.5	1	●	When feedback pressure is smaller than this value, water shortage judgement is made.
F4.02	Water shortage protection detection frequency	0-50.00	HZ	50	1	●	It is valid only when F4.00 = 1. Comparison frequency to judge whether water shortage occurs. When running frequency is bigger than this frequency, it is judged as water shortage.

F4.03	Current percentage of water shortage protection detection	0 ～ 100.0		40	1	●	It is valid only when F4.00 = 1. The percentage of motor rated current. When running current is less than this current, it is judged as water shortage.
F4.04	Automatic restart delay of water shortage protection	0 ～ 9999	min	15	1	●	
F4.05	Automatic reset times of water shortage protection	0 ～ 50		10	1	●	When water shortage fault is reported, after the period set by F4.04, the frequency converter resets and runs automatically. Reset times are limited by F4.05. When it reaches reset times, water shortage fault can't be cleared automatically. Press REST manually to reset the fault.
F4.06	Input water recover pressure	0~200.0	Bar	3.0			
F4.07	Input water recover detect time	0~100.0	s	20.0			
F4.08	Alarm delay time of abnormal pressure	0.0 ～ 120.0	S	3.0	1	●	Alarm delay time of high pressure, low pressure

The following methods can realize water shortage protection:

（1）Add water level sensor to inlet. Report E015 fault by the terminal's closing and opening function.

（2）Add water voltage type pressure sensor to inlet and connect it to the AVI terminal of the SPD to judge water shortage. Make F4.00=3.

（3）Judge by pressure feedback of the outlet sensor. Make F4.00=2(Some risks exist)

（4）Judge by the pressure of the inlet and the frequency current of the motor. Make F4.00=1. (Some risks exist)

Note: It is recommended to choose method 1 and method 2 to judge water shortage or fault.

When F4.00 is set as 2 and the feedback pressure is less than the set value of F4.01, water shortage fault is reported after abnormal pressure alarm delay set by F4.08.

When F4.00 is set as 1, the conditions to report water shortage are as follows:

（1）The switch of water shortage protection is turned on（F4.00=1）;

（2）The feedback pressure is less than allowed threshold value of water shortage detection (feedback pressure<F4.01);

（3）The current running frequency is no less than water shortage protection detection frequency (running frequency>=F4.02);

（4）The current output current is no bigger than the current percentage of water shortage detection.

（5）When (1)-(4) are satisfied, timing starts. When the time meeting the condition exceeds abnormal pressure alarm delay time, 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 F4.04, the SPD will reset and restart. When the reset times reach the value set by F4.05, it won't restart and enters judgement of water coming. When the feedback pressure is bigger than the value set by F4.06 and holds for the time set by F4.07, it will reset and restart.

Note: Because the working condition of each controller is different such as range of load size, only setting the value of F4.03 reasonably according to site conditions can it make correct judgement to water shortage.

Setting method: Run the SPD. When running frequency reaches maximum frequency, turn off inlet and record the output current displayed on the controller. Divide this current by F5.04 (the rated current of the motor) to get a percentage. Make the value of F4.03 a little higher than 5-10 percentage points of the percentage. Too high value of F4.03 will lead to false water shortage report in normal operation. Water shortage protection will not work effectively with too low value of F4.03.

Chapter 5 Fault Information and Removal

5.1 Fault Codes Description

fault code	fault type	Possible fault reasons	Solution
E001	Invert cells fault	1. Too fast acceleration	1. Increase acceleration time
		2. IGBT inside broken	2.Seek for support
		3. Malfunciton 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
		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

fault code	fault type	Possible fault reasons	Solution
E007	Over voltage in constant speed running	1. Abnormal changes happen to input voltage	1.Install input reactor
		2. The inertia of load is to 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 undervoltage	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
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
E012	Input phase loss	Phase loss of input R,S,T	1.Check input power
			2.Check wiring installation
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

fault code	fault type	Possible fault reasons	Solution
E014	Module overheating	1.Instant over current of controller	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	
E015	External faults	External input terminals faults	1. Check input of external equipment
E016	Communication faults	1. Baud rate is set improperly.	1. Set proper baud rate
		2.Communication faults of adopting serial communication	2. Press RUN/STOP key to reset; seek for service
		3. Communication is interrupted for a long time.	3. Check wiring of communication interface
E017	Reserved	Reserved	Reserved
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

fault code	fault type	Possible fault reasons	Solution
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 controller
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
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 （F4.08）	3.C heck relavant parameter settings
		4 Water shortage protection frequency is too low(F4.02)	
		5Water shortage protection detection current is too low(F4.03)	
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 （F0.10）	2.Check relative parameter settings
		3.Alarm detection time adjustment is too short （F4.08）	

fault code	fault type	Possible fault reasons	Solution
E029	Low pressure alarm	1. Low pressure alarm value is set too high（F0.11）	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	

5.2 Common Faults and Handling

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 F3.10 and increase F3.12.

(3) If feedback pressure changes nearby set value, stop the controller 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 F3.10 and increase F3.12, If it is still not effective, increase F0.04.

(2) If it sleeps in advance, first increase F3.10. If it is still not effective, decrease F0.04.

(3) If it starts and stops frequently, first increase F3.10. If it is not effective, increase F0.04. If it is still not effective, increase F0.01.

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

(1) Water shortage protection switch F4.00 is not enabled.

(2) The threshold value of water shortage detection F4.01 is set too low.

(3) The current percentage of water shortage detection F4.03 is set too low.

Chapter 6 Communication Protocol

8200B series SPD provides RS485 communication interface and adopts international standard ModBus communication protocol to make master and slave communication. Users can realize centralized control by PC/PLC, upper machine to suit for specific application demand. (Setting SPD control command, running frequency, modifying function code parameters, motoring controller working status and fault information)

Note: In multi-pump connection system, upper machine communication can't be used to control the start and stop of the pump system. If upper machine is used, only one frequency converter in the system can work. Set F1.02 = 0, F1.03=0. For more details please refer to upper machine case of chapter 7 application cases.

6.1 Command Codes and Communication Data Description

(1) Address of functions

Function	Address definition	Data meaning	R/W character
Communication control command	1000H	0001H：Under running	W/R
		0002H：Reserved	
		0003H：Reserved	
		0004H：Reserved	
		0005H：Stop	
		0006H：Free stop（emergency stop）	
		0007H：Fault reset	
		0008H：Reserved	
SPD status	1001H	0001H：Forward running	R
		0002H：Reserved	
		0003H：SPD standby	
		0004H：At fault	
		0005H: SPD LU state	

Function	Address definition	Data meaning	R/W character
Address of communication set value	2000H	Communication setting value range(-10000~10000)	W/R
		Note: Communication set value is the percentage of relative value. Communication write operation can be made. When it serves as frequency source setting, the relative value is the percentage of maximum frequency （F0.10）. When it serves as PID setting or feedback, the relative value is the percentage of PID.	
	2001H	PID setting, range（0~1000）	W/R
	2002H	PID feedback, range（0~1000）	W/R
	2003H	Reserved	
	2004H	Reserved	W/R
Running/stop parameter address	3000H	Running frequency(two decimals)	R
	3001H	Set frequency(two decimals)	R
	3002H	Bus voltage(one decimal)	R
	3003H	Output voltage(zero decimal)	R
	3004H	Output current(one decimal)	R
	3005H	Running speed(zero decimal)	R
	3006H	Reserved	R
	3007H	Reserved	R
	3008H	PID given value(two decimals)	R
	3009H	PID feedback value(two decimals)	R
	300BH	Terminal output mark state	R
	300CH	AVI value(two decimals)	R
	300DH	ACI value(two decimals)	R
Fault address of the SPD	5000H	The number of fault code and fault type in function code menu is consistent. Here the returned data is hexadecimal, not fault character.	R

Note: The correspondence of the read data and the actual fault is listed as below:

Data	Fault
0x00	No faults
0x01	Invert cells fault
0x02	Over current in acceleration running
0x03	Over current in deceleration running
0x04	Over current in constant running
0x05	Over voltage in acceleration running
0x06	Over voltage in deceleration running
0x07	Over voltage in constant running
0x08	Hardware over voltage
0x09	Bus undervoltage
0x0A	SPD overload
0x0B	Motor overload
0x0C	Phase loss of input
0x0D	Phase loss of output
0x0E	Module overheating
0x0F	External fault
0x10	Communication fault
0x11	Reserved
Data	Fault
0x12	Current detection current fault
0x13	Reserved
0x14	Reserved
0x15	Reserved
0x16	EEPROM read-write fault
0x17	Overload pre-alarm
0x18	PID feedback broken line fault
0x19	Reach running time
0x1A	Reserved
0x1B	Water shortage alarm
0x1C	High water pressure alarm
0X1D	Low water pressure alarm

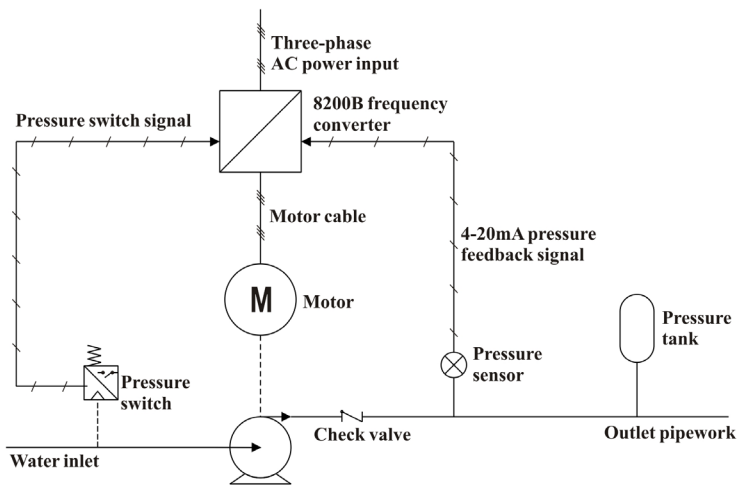
Meaning of fault codes

Modbus fault codes		
Code	Name	Meaning
01H	Illegal functions	Function code received from upper machine is unallowed operation
		Perhaps the slave unit processes such requests in wrong state
02H	Illegal data address	Request data address of the upper machine is unalowed address
		Especially, the combination of register address and transferred byte is invalid
03H	Illegal data value	Data field received includes unallowed value.
		Note: It doesn't mean that the data item submitted for saving in the register has an unexpected value.
06H	Slave drive is busy	SPD is busy(EPPROM is under saving)
10H	Password error	The password written by password check address is different from the password set by user
11H	Check error	In the frame information sent by the upper machine, when RTU format CRC check bit or ASCII format LRC check bit is different with the check number of lower machine, check error will be reported.
12H	Parameter modification invalid	In the writing command sent by the upper machine, the date sent is beyond parameter range or the writing address can't be written currently.
13H	System is locked	When the upper machine is reading or writing, if user password is set and password lock is not removed, it will report that the system is locked.

Chapter 7 Typical Application Cases

7.1 Single Pump Control Case 1

Condition	Requirement	Parameter setting
Pump network pressure	3.0kg	F0.00 = 3.0
Start mode	Start/stop by keyboard	F0.05 = 0
Number of auxiliaries	0: No auxiliaries	F1.03 = 0
Pump rotation time	0: No pump rotation	F1.05 = 0
Water shortage protection mode	Switching value sensor is installed at inlet.	Input by external terminals



7.2 Single Pump Control Case 2

Condition	Requirement	Parameter setting
Pump network pressure	3.5kg	F0.00 = 3.5
Start mode	Start/stop by communication	F0.05 = 2
		F1.02 = 0
Communication address	The address is 01	F1.00 = 01
Communication baud rate	38400BPS	F8.00 = 5
Water shortage protection mode	Voltage type sensor is installed at inlet	F4.00 = 3

The data format of start command sent by the upper machine (like PLC) is hexadecimal.

Write command example

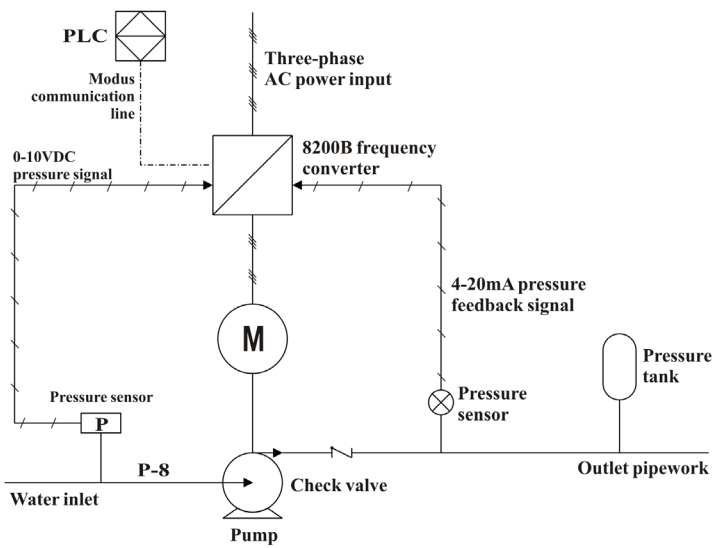
	Frequency converter address	Write command	High address of writing data	Low address of writing data	High bit of data content	Low bit of data content	Low bit of CRC check	High bit of CRC check
Start command	01	06	10	00	00	01	4C	CA
Stop command	01	06	10	00	00	05	4D	09
Fault reset	01	06	10	00	00	07	CC	C8

Read command example

	Frequency converter address	Read command	High address of reading data	Low address of reading data	High bit of reading data number	Low bit of reading data number	Low bit of CRC check	High bit of CRC check
Read running frequency	01	03	30	00	00	01	8B	0A

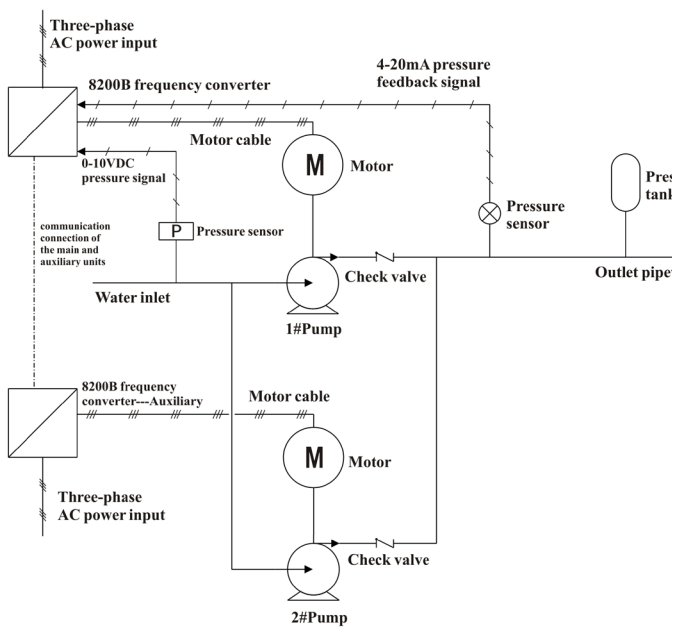
After the auxiliary drives receive data from the host drive, the following format data is returned. The data returned in in this example is 1388H, namely decimal 5000, which means that the current running frequency is 50.00Hz.

	Frequency converter address	Read command	Byte number	Date high bit	Data low bit	Low bit of CRC check	High bit of CRC check
Date returned by SPD	01	03	02	13	88	B5	12



7.3 Multi-pump control case

Condition	Requirement	Parameter setting
Pump network pressure	4.0kg	F0.00 = 4.0
Start mode	Start by keyboard	F0.05 = 0
Number of auxiliaries	One auxiliary	F1.03 = 1
Pump rotation time	30min	F1.05 = 30
Pump rotation time check	Make sure F9.12，F9.13 is 0 in first use	F9.01 = 0（All host and auxiliary drives need to be set）
Water shortage protection mode	Voltage type sensor is installed at inlet	F4.00 = 3
Water shortage protection threshold value of inlet	Fault is reported if less than 1.0kg	F4.01 = 1.0



7.4 Multiline communication protocol

Note: please consult the manufacturers or suppliers.

7.5 Two driven by one control case

Two driven by one means one SPD drives two pumps; one pump which is the host pump work sat variable frequency, the other pump which is the auxiliary pump works at power frequency. If the host pump works at full frequency, but the water pressure still cannot meet the demand; the terminal TA will be connected to TB, and then the auxiliary pump will work at power frequency. If the water pressure is adequate, the auxiliary pump will be stopped at first. You can only set F0.20 =7, or set F7.07 = 2 separately to start the one driven two mode.

Condition	Requirement	Parameter setting
Pump network pressure	4.0kg	F0.00 = 4.0
Start mode	Start by keyboard	F0.05 = 0
Water shortage protection mode	Voltage type sensor is installed at inlet	Input by external terminals
Control mode	Two driven by one	F0.20=7 (or F7.07=2 recommended setting F0.20=7)

Please set the parameters F0.08, F0.09, F2.01 according to the pressure sensor type.