

POWER DATA 3.0 Smart Pro Pump Drive

User Manual

Preface

Thank you for using PDH3.0 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.


Make sure the wiring and the pump's rotation direction is correct before using.


Content

PREFACE.....	- 2 -
NOTES FOR SAFE OPERATION.....	- 5 -
CHAPTER 1 OPERATION PANEL INSTRUCTION.....	- 8 -
1.1 OPERATION PANEL DIAGRAM.....	- 8 -
1.2 INDICATOR LIGHT INSTRUCTION.....	- 9 -
1.3 OPERATION AND DISPLAY MODE.....	- 10 -
(1) STATUS DISPLAY MODE:.....	- 10 -
(2) PARAMETER SETTING MODE:.....	- 10 -
(3) THE ALARM DISPLAY MODE:.....	- 10 -
1.4 MENU OPERATION.....	- 10 -
1.5 PRESSURE SETTING INSTRUCTION.....	- 12 -
CHAPTER 2 MODEL DESCRIPTION AND INSTALLATION....	- 13 -
2. 1 MODEL INSTRUCTION.....	- 13 -
2.2 QUICK SELECTION.....	- 13 -
2.3 INSTALLATION PROCEDURE ILLUSTRATIONS.....	- 14 -
2.4 WIRING DIAGRAM OF MAIN CIRCUIT AND CONTROL TERMINALS.....	- 15 -
2.5 CONTROL LOOP TERMINALS AND FUNCTIONS.....	- 16 -
2.6 WIRING DIAGRAM.....	- 18 -
CHAPTER 3 QUICK SETTING.....	- 19 -
PLEASE FOLLOW THE STEPS BELOW TO FINISH SETTING-	19 -
CHAPTER 4 DATASHEET OF PDH30.....	- 22 -

4.1 PARAMETERS DISPLAYED AT RUNNING STATUS.....	- 22 -
4.2 PARAMETERS DISPLAYED AT STOPPED STATUS.....	- 23 -
4.3 COMMON PARAMETER SETS OF SINGLE-DRIVE.....	- 23 -
4.4 COMMON PARAMETER GROUPS OF MULTI-DRIVE MODE.....	- 26 -
4.5 DEBUGGING PARAMETER GROUPS.....	- 28 -
4.6 PID AND STANDBY PARAMETER SETS.....	- 31 -
4.7 PARAMETER SETS OF PUMP PROTECTION.....	- 34 -
4.8 PARAMETER SETS OF MOTOR.....	- 37 -
4.9 PARAMETER SETS OF TERMINALS.....	- 38 -
4.10 COMMUNICATION PARAMETER SETS.....	- 40 -
4.11 MONITORING PARAMETER SETS.....	- 41 -
4.12 USER PARAMETER SETS.....	- 42 -
4.13 AGENT PARAMETER SETS.....	- 43 -
4.14 D0 GROUP MONITORING PARAMETERS.....	- 43 -
4.15 FAULT RECORD PARAMETER GROUPS.....	- 44 -
CHAPTER 5 FAULT INFORMATION AND TROUBLESHOOTING.....	- 46 -
5.1 FAULT CODES DESCRIPTION.....	- 46 -
5.2 COMMON FAULTS AND HANDLING.....	- 50 -
CHAPTER 6 COMMUNICATION PROTOCOL.....	- 52 -
6.1 COMMAND CODES AND COMMUNICATION DATA DESCRIPTION.....	- 52 -
MEANING OF FAULT CODES.....	- 55 -
THE EXAMPLE OF READING AND WRITING PARAMETERS COMMAND.....	- 56 -

Notes for Safe Operation

 Warning: Indicate a potentially dangerous situation in which could result in death or serious physical injuries.

 Caution: Indicate a potentially dangerous situation in which could result in minor or moderate physical injuries and damage to equipments. Meanwhile, this sign can be also used for indicating errors or unsafe operation.

SPD: Abbreviation of smart pump drive.

■ Inspection



ⓈDo not install or operate the SPD if it is damaged or has missing parts. Otherwise it may result in equipment damage or physical injuries.

■ Installation



ⓈPlease hold the bottom of SPD when installing or moving it. In case that the SPD is broken or damaged; only holding the shell is not allowed.

ⓈKeep the SPD away from heat, inflammable and explosive goods; Install SPD on the metal or other nonflammable objects.

ⓈIf the SPD is mounted in an electric cabinet or other enclosed objects, fans or other cooling device should be installed inside the cabinet; Setting ventilation opening to ensure ambient temperature is below 40°C. Otherwise it may be damaged because of high temperature.

■ Wiring



WARNING

- ◎ Wiring must be completed by qualified electrical engineers. Otherwise it can cause an electrical shock or SPD damage.
- ◎ Before wiring, make sure the power supply is de-energized. Otherwise it will cause an electrical shock or a fire.
- ◎ Make sure the ground terminal (⊕) is grounded safely and correctly. Otherwise there will be a risk of electrical shock on the shell of SPD.
- ◎ Do not touch the main circuit terminal, and the main circuit terminals of the SPD are not allowed to contact the shell. Otherwise it may cause an electrical shock.



CAUTION

- ◎ Before connecting, make sure the voltage rating and phase number of SPD is conformed to the input power voltage, phase number; Otherwise it may cause a fire or physical injuries.
- ◎ Never connect the AC input power supply to the output terminals V, U, W of SPD; Otherwise it will cause damage to the SPD and you are not guaranteed to enjoy the warranty services.
- ◎ Never conduct a pressure test on SPD; Otherwise it will cause damage to the SPD.
- ◎ The main circuit wiring of the SPD and the control loop wiring should be separated or vertical crossed, otherwise the control signal will be interfered.
- ◎ The cable connected to the main circuit terminals should be use lugs with isolated casing
- ◎ If the length of cable between the SPD and the motor is over 50 meters, an output reactor is recommended so as to protect the SPD and motor.

■ Running



WARNING

- ◎ Turn on the input AC power after the wiring of SPD is completed and the front cover is installed. Do not dismantle the front cover when operating; otherwise it will lead to an electric shock.

◎When SPD is set with the function of fault automatic reset or auto-restart after power failure, protection measures for equipment system should be taken in advance. Otherwise it will cause physical injuries.

◎The key “RUN/STOP” 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 physical injuries.

◎Though the SPD terminal is in stop state, the terminal is electrified after power on. Do not touch; otherwise there will be a risk of electric shock.

■ Maintenance and Inspection



WARNING

◎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.



CAUTION

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

■ Others

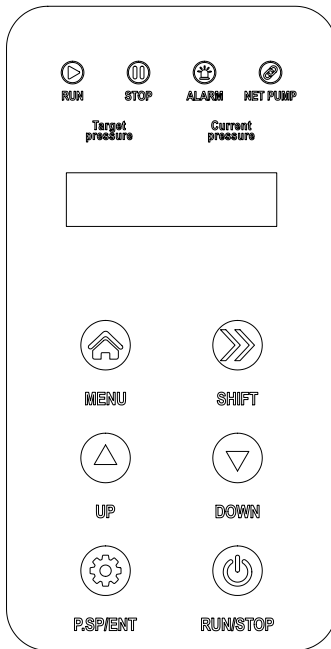


WARNING

◎It is strictly forbidden to transform the SPD, otherwise it may cause casualties. After arbitrarily changing SPD, will no longer enjoy the warranty service.

Chapter 1 Operation Panel Instruction

1.1 Operation Panel Diagram



(1) **MENU:** used to switch from fixed model to modification model.

(2) **P.SP/ENT:** shortcut key of water pressure setting and “confirmation” key of parameter setting.

(3) **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.

(4) **▲ ▼ keys:** used to modify parameter values.

(5) **RUN:** start button when using keyboard as starting mode.

(6) **STOP:** stop button and fault reset button when using keyboard as start mode.

1.2 Indicator Light Instruction

(1) **Run:** (Always on) Running instruction; (Flicker): Sleep or stop instruction

(2) **Stop:** Stop or standby instruction

(3) **Alarm:**Inverter protection alarm.

(4)**Net Pump:** Online instruction: When the light is on, the communication is successful.

(5)**Target pressure:**When the display shows "target pressure" and "current pressure", it lights up when the pressure is adjusted;

(6)**Current pressure:**When the display is "target pressure" and "current pressure" light up;

1.3 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 "RUN / STOP" 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 "RUN / STOP" to reset, or it can automatically restored the previous mode after the alarm is eliminated.

1.4 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 “RUN/STOP” can return to the second class menu. The difference is that pressing “RUN/STOP” 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.

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 F0.02 from 0 to 1; pressing the menu key for two seconds can access to parameter set.

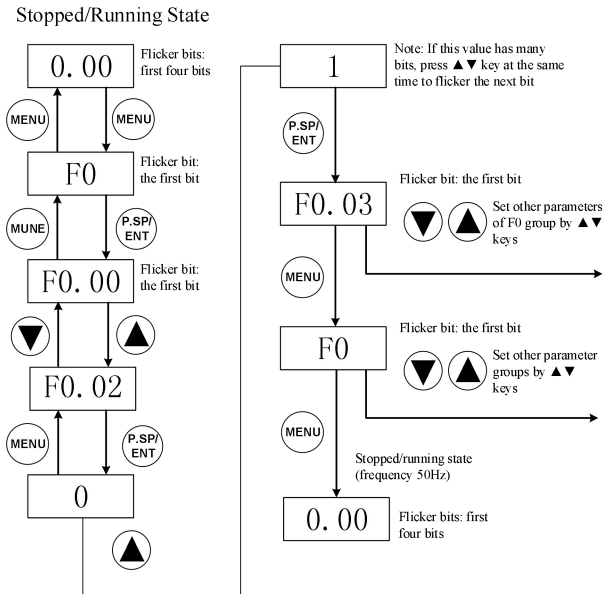


Figure1-3-1 Parametric settings diagram

1.5 Pressure Setting Instruction

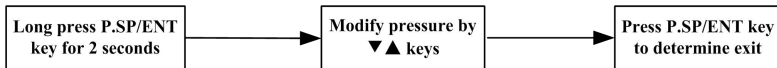


Figure1-4-1 Pressure setting diagram

Remarks--Pressure Measure:

$$0.1\text{MPa} = 100\text{kPa} = 1\text{bar} = 1\text{kgf} / \text{cm}^2$$

Chapter 2 Model description and installation

2.1 Model Instruction

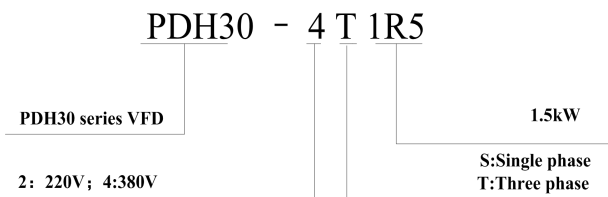


Figure2-1-1 model instruction of PDH30 diagram

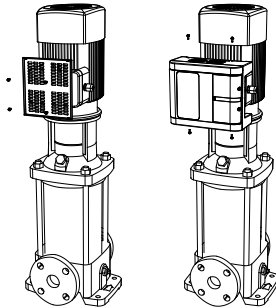
2.2 Quick selection

Inverter Model	Rated power (kW)	Power capacity	Input current	Output current	G/P	
		kVA	A	A	kW	HP
PDH30-4TR75	0.75	1.5	3.4	2.1	0.75	1
PDH30-4T1R5	1.5	3	5.0	3.8	1.5	2
PDH30-4T2R2	2.2	4	5.8	5.1	2.2	3
PDH30-4T004	4	5.9	10.5	9	4	5.5
PDH30-4T5R5	5.5	8.9	14.6	13	5.5	7.5
PDH30-4T7R5	7.5	11	20.5	17	7.5	10
PDH30-4T011	11	17	26	25	11	15
PDH30-4T015	15	21	35	32	15	20
PDH30-4T18R5	18.5	24	38.5	37	18.5	25

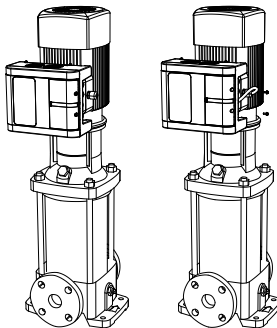
Table 2-2-1 selection table of PDH30

2.3 Installation Procedure Illustrations.

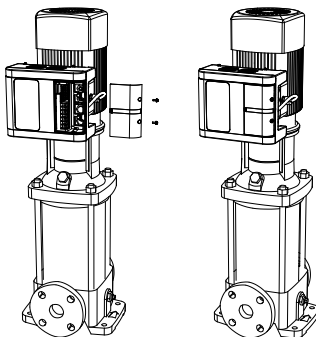
First open the pump motor junction box, fix the connection terminal between the power line and the water pump, and then fix the bottom plate on the motor junction box, consider the frequency converter is centered, and the bottom plate should be adjusted reasonably.



2. Fix the machine on the bottom plate, remove the wiring surface shell on the right side of the machine, so that the pump output line, the input line of the frequency converter and the sensor line pass through the waterproof joint successively, and fix it according to the mark.



3. The main terminal of the machine is R/S/T is the input end of the power supply, U/V/W is the output end of the motor, pay attention to the wiring, to prevent the wrong connection resulting in the explosion of the machine.



2.4 Wiring Diagram of Main Circuit and Control Terminals

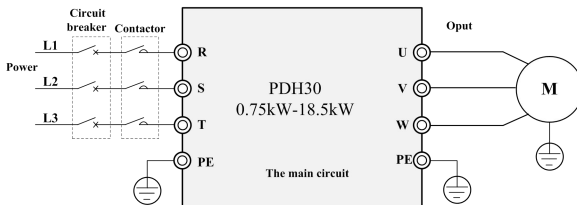


Figure 2-4-1

Terminal mark	Name	Instructions
R、S、T	Three-phase power input terminal	Three - phase AC power input connection terminal
U、V、W	Inverter output terminal	Connection of three-phase motor

PE	Earthing terminal	Connect the earth terminal
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Figure 2-4-2

2.5 Control loop terminals and functions

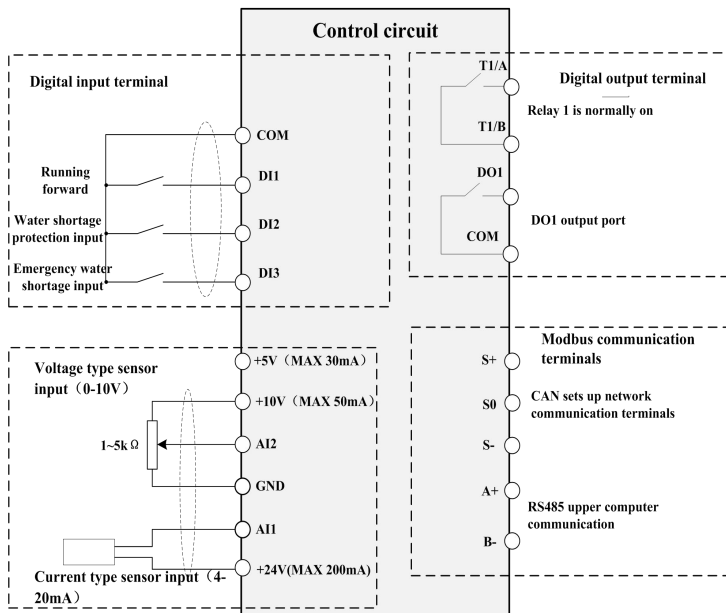


Figure 2-5-1

■ Control terminal instruction

Terminal symbol	Terminal name	Technical specification
DI1~DI3	Multi-function digital input terminal	1. Optical couplers isolation one-way input 2. Enabled when connected to GND. Disabled when open 3. Input voltage range: 9~36 VDC 4. Input impedance: 4 K Ω 5. the terminal of 11-400kW is DI1-DI6
AI1	Analog input terminal 1	1. Input voltage range: DC 0~10VDC or 0/4~20mA, determined by parameters.
AI2	Analog input terminal 2	2. Input impedance: 22K Ω when voltage input; 500 Ω when current input
5V	Analog reference voltage	5V, $\pm 5\%$ maximum output current 30mA
10V	Analog reference voltage	10V, $\pm 5\%$ maximum output current 50mA
GND	Analog ground terminal	5V and 10V reference zero potential
T1A/T1B	Relay RO1 output	T1A~T1B: normally open terminals Contact capacity: AC 250V / 3A / normally open 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
A+	Standard RS485 communication terminal	Standard isolated 485 communication interface. Please use twisted pair or shielded wire. Can be used for PC communication control.
B-		
S+	CAN	Standard CAN communication interface.

Terminal symbol	Terminal name	Technical specification
S-	communication terminal	Please use twisted pair or shielded wire. Can be used for inverter on-line.
S0		

Figure 2-5-2

2.6 Wiring diagram

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

① Remote pressure gauge: Working voltage 4~13VDC, output 0~10VDC. Wiring method is shown as below,Signal input connection AI2;

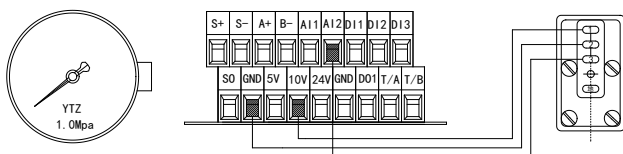


Figure 2-6-1

② 24V pressure transmitter: working voltage range 10~30VDC, output 4~20mA,Signal input connection AI1.

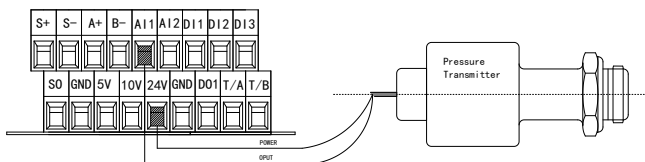


Figure 2-6-2

Chapter 3 Quick Setting

Please follow the steps below to finish setting

Step 1: Set the sensor range, the sensor type

F0.08 = 16.0 Sensor's range

F0.09 = 2 Sensor feedback channel selection (0: AI1 channel 1: AI2 channel;
2: Max (AI1, AI2))

F2.00= 0 AI1 Sensor type (0:4-20mA; 1:0-10V; 2:0.5-4.5V)

Step2: Confirm the motor's rotation direction

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

① Disconnect the input power and make sure the display is OFF, then exchange two lines of any of U\V\W.

② Stop the VFD, Modify to F0.02.

Step 3: Adjust the display pressure

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

① When the pressure is stable, adjust F2.01 or F2.03 within each range of 0.010.

② If the VFD pressure is a little higher, make the sensor range lower(F0.08);
If the VFD pressure is a little lower, make the sensor range higher (F0.08).

Step4: Macro Settings

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

System Type	Parameter	Details of parameters changed automatically	Description
Solo Pump setting	F0.20=1	F0.06=1; F1.02=0; F1.03=0; F2.05=8; F8.00=1	Auto-Reset, Auto- Start enable,
Two VFDs, as Host drives	F0.20=2	F0.06=1; F1.02=1; F1.03=1; F2.05=8; F8.00=1	Auto-Reset, Auto- Start enable, an auxiliary drives can be controlled
Three VFDs, as Host drives	F0.20=3	F0.06=1; F1.02=1; F1.03 = 2; F2.07=8; F8.00=1	Auto-Reset, Auto- Start enable, two auxiliary drives can be controlled
Four VFDs , as Host drives	F0.20=4	F0.06=1; F1.02=1; F1.03=3; F2.05=8; F8.00=1	Auto-Reset, Auto- Start enable, three auxiliary drives can be controlled
Five VFDs , as Host drives	F0.20=5	F0.06=1; F1.02=1; F1.03=4; F2.07=5; F8.00=1	Auto-Reset, Auto- Start enable, four auxiliary drives can be controlled
Six VFDs, as Host drives	F0.20=6	F0.06=1; F1.02=1; F8.00=1 F1.03=5; F2.07=5	Auto-Reset, Auto- Start enable, five auxiliary drives can be controlled
One VFD drive two pumps mode	F0.20=7	F0.06=1; F1.02=0; F1.03=0; F2.05=8; F7.08=3; F7.09=4; F8.00=1;	Auto- Start; RO1 and RO2 through pressure output
One VFD drive multiple pumps mode	F0.20=8	F0.05=1; F2.00=1; F2.05=2; F2.12=1;	Terminal start up, Free stop, Turn off water pressure alarm
Emergent Mode	F0.20=9	F2.05=1; F0.06=1; F8.00=1	Frequency source changed
VFD network, Auxiliary No.1	F0.20=11	F0.05=2; F0.06=1; F1.00=1; F1.04=0; F2.05=9; F8.00=2	Auto- Start enable, The VFD communication address set to 1, Start up the standby host
VFD network, Auxiliary No.2	F0.20=12	F0.05=2; F0.06=1; F1.00=2; F1.04=0; F2.05=9; F8.00=3	Auto- Start enable, The VFD communication address set to 2 , Start up the standby host

VFD network, Auxiliary No.3	F0.20=13	F0.05=2; F0.06=1; F1.00=3; F1.04=0; F2.05=9; F8.00=4	Auto- Start enable, The VFD communication address set to 3 , Start up the standby host
VFD network, Auxiliary No.4	F0.20=14	F0.05=2; F0.06=1; F1.00=4; F1.04=0; F2.05=9; F8.00=5	Auto- Start enable, The VFD communication address set to 4 , Start up the standby host
VFD network, Auxiliary No.5	F0.20=15	F0.05=2; F0.06=1; F1.00=5; F1.04=0; F2.05=9; F8.00=6	Auto- Start enable, The VFD communication address set to 5 , Start up the standby host

Figure 3-1-1

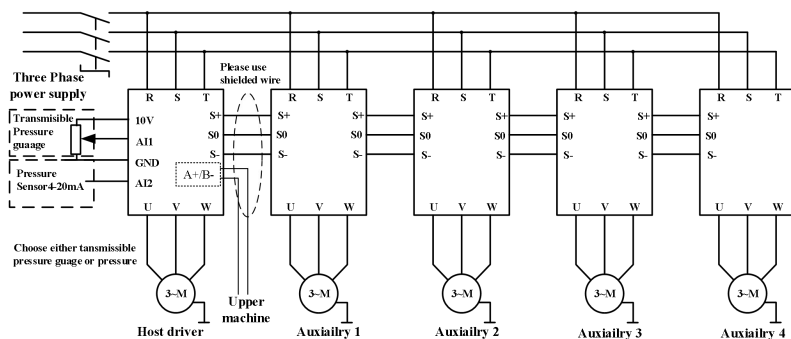


Figure 3-1-2

Chapter 4 Datasheet of PDH30

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.

4.1 Parameters Displayed at Running Status

Note: Press “SHIFT” key to switch

Display	Name	Description	Unit	Revision level
P	Current pressure	Pressure value of actual operation	bar	◎
H	Running frequency	Current running frequency	Hz	◎
d	Set pressure	Set pressure	bar	◎
A	Running current	Actual output current of the VFD	A	◎
U	DC Bus voltage	Bus voltage of VFD	V	◎

4.2 Parameters Displayed at Stopped Status

Note: Press “SHIFT” key to switch

Display	Name	Description	Unit	Revision level
P	Current pressure	Pressure value of actual operation	Bar	⊙
d	Set pressure	Set pressure	bar	⊙
U	DC Bus voltage	Bus voltage of VFD	V	⊙

4.3 Common Parameter Sets of Single-drive

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F0.00	Pre-set pressure	F4.01~F0.10	bar	3.0	○	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

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F0.03	Antifreeze function	0: Disabled 1: Enabled (in seconds) 2: Enabled (in minutes) 3: inlet pressure control	\	0	○	Antifreeze and rust-proof function of the pump itself. For details, please refer to F0.12~F0.14 The antifreeze function for each VFD need to be set separately in multi-pump.
F0.04	Water leakage coefficient	0.0~100.0	\	2.5	○	The bigger the water leakage, the smaller the coefficient.
F0.05	Start/stop signal option	0~2	\	0	○	0:Keyboard start/stop 1:Terminal start/stop 2:Start/stop by communication control
F0.06	Auto-starting option	0~1	\	0	○	0:Disabled 1:Enabled
F0.07	Auto-starting delay time	0.0~100.0	s	5.0	○	Delay time while auto-starting at power on
F0.08	Sensor range	0.0~200.0	bar	16.0	○	The maximum range of sensor
F0.09	The selection of sensor feedback channel	0:A11 1:A12 2: Max (A11,A12) 3:Min(A11,A12)	\	2	○	A11 and A12 can be connected to the default sensor randomly.
F0.10	High pressure alarm value setting	F0.00~F0.08	bar	14.4	○	When feedback pressure is bigger than this set pressure, it alarms and stops after 0.1s delay. When the pressure returns to normal, after the reset delay time, the fault is solved automatically.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F0.11	Low pressure alarm value setting	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 F4.09. This function is invalid when this parameter is set as 0. When the pressure returns to normal, the fault is solved automatically after the reset delay
F0.12	Inlet stop pressure	0.0Bar~F0.08	Bar	3.5Bar	○	Effective when F0.05=3, the converter starts when the inlet pressure is less than F0.13, and stops when the inlet pressure is greater than F0.12. The inlet pressure sensor can choose AI1 or AI2 as signal detection.
F0.13	Intake starting pressure	0.0Bar~F0.12	Bar	2.5Bar	○	
F0.14	Intake feedback channel	0:A11 1:A12	0	0	○	
F0.15	Working mode of VFD	0~1	\	0	○	0:Pressure mode 1:General mode
F0.16	Product number		\		⊙	Product predefined by manufacturer
F0.17	Software version	2.000~2.999	\		⊙	This instruction is only applicable to the software in this version.
F0.18	Acceleration time	0.0 ~6500.0	s	5.0	○	Differentiating from the power range
F0.19	Deceleration time	0.0~6500.0	s	5.0	○	Differentiating from the power range

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F0.20	Macro function	0~15	\	0	●	Refer to quick settings (Chapter 3)

4.4 Common Parameter Groups of Multi-drive Mode

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F1.00	On-line communication address	0-5	\	0	◎	1-5 is the address of auxiliary drives. The address of host drive is 0.
F1.01	The selection of host(auxiliary)	0: closing down 1: constant speed 2: constant pressure	\	0	○	0: auxiliaries shut down after the host is disconnected. 1: auxiliaries can operate at a constant speed without connecting pressure sensors. 2: auxiliaries can operate at a constant pressure
F1.02	The selection of communication network mode	0~1	\	0	◎	0: CAN was set to auxiliary 1: CAN was set to host
F1.03	Number of the auxiliary drives	0~5	Set	0	◎	0: Cancel the control function of the host drives over the auxiliaries. Note: This parameter only serves as PID frequency source and is only set in CAN host drive.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F1.04	On-line operation mode	0: Sequential control 1: Synchronous control 2: Standby mode	\	0	●	0: when the pressure is not enough, and the system is put into auxiliary operation in turn. 1: when the pressure is not enough, host and auxiliary Operating frequency is the same. 2: Only one VFD runs at any time and the rest is standby.
F1.05	Alternating time	0~3600	min	240	○	The alternating time of host drives and auxiliary drives 0: Cancel the alternating function of host drives and the auxiliary drives.
F1.06	Address setting of small pump	0~6	\	6	○	It is invalid when this address is bigger than the number of auxiliary drives. 0 means that the host drive is the small pump.
F1.07	Delay time of adding pumps	0.0~100.0	s	5.0	○	It means the delay time of adding pumps when the pressure is not enough.
F1.17	Alternate host boot command control	0: Controlled by the original host's original start signal 1: Automatic start	1	1	○	When the alternate host is enabled, you can modify the parameters to choose how to start the command.
F1.18	Communication start command control	0: Host computer start control 1: Multi-line communication control	1	1	○	When the host computer is installed, you can modify this parameter to select the machine to directly start and stop the machine.

4.5 Debugging Parameter Groups

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F2.00	Selection of AI1 channel feedback types	0-2	/	0	○	0:4-20mA 1:0-10V 2:0.5-4.5V 3:0-5V
F2.01	AI1 signal correction coefficient	0.750-1.250	0.001	1.000	○	Correction of AI1 channel signal deviation
F2.02	Selection of AI2 channel feedback types	0-2	/	1	○	0:4-20mA 1:0-10V 2:0.5-4.5V 3:0-5V
F2.03	AI2 signal correction coefficient	0.750-1.250	0.001	1.000	○	Correction of AI2 channel signal deviation
F2.04	Motor control mode	0: SVC 1: VF	1	1	●	0: AM-SVC; 1: AM-VF;
F2.05	Frequency source choice	1: Up/Down is digital set 2: AI1 3: AI2 5: Emergent water supply 8: PID 9: Setting-by communication	/	8	●	Choose 8 for the host drives Choose 9 for auxiliary drives Choose 5 for emergent water supply.
F2.06	Upper limit of running frequency	F2.08~F2.07	Hz	50.00	○	The upper limit of VFD's running frequency

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F2.07	Maximum output frequency	50.00-320.00	Hz	50.00	●	
F2.08	Lower limit of running frequency	0.00~F2.06	Hz	0.00	○	
F2.09	Options when it reaches the lower limit frequency	0: Running according to the lower limit frequency 1: stop 2: standby	\	2	○	
F2.10	Setting of carrier frequency	0.5~15.0	kHz	Set according to the machine type	○	Noise of the motor can be adjusted by modifying this value
F2.11	Fan running mode	0: Running constantly when start-up 1: Running constantly when power on	\	0	○	
F2.12	Selection of the halt mode	0: Stop by deceleration 1: Stop automatically	\	0	○	The selection for the halt mode of VFD.
F2.13	Number of automatic reset failures	0~5	\	3	○	(E015/E024/E027/E028/E029/E031) These are not affected by this function.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F2.14	Random carrier	<p>LED bits: Carrier is associated with temperature 0: It doesn't depend on temperature 1: It has to do with temperature</p> <p>LED 10 bits: Carrier is associated with output frequency 0: Independent of the output frequency 1: Related to the output frequency</p> <p>LED hundred: random PWM depth 0: shut down 1-8: Open and adjust the depth</p> <p>LED thousand: overmodulation option 0: shut down 1: open</p>	1001	0	○	Electromagnetic noise can be improved
F2.15	Frequency of standby host(auxiliary)	0~100.0	%	80.0%		Standby host uses the operating frequency of constant speed mode.

4.6 PID and Standby Parameter Sets

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F3.00	Proportional gain	0.00~100.0	%	20.0	○	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	1.00	○	
F3.02	Differential time	0.000~10.000	s	0.00	○	
F3.03	Start-up time of PID	0.00~100.0	s	0.10	○	
F3.04	Deviation limit of PID control	0.0~100.0	%	0.0	○	
F3.05	PID source setting choice	0~2	\	0	○	0: setting by keyboard 1: setting by AI1 2: setting by AI2

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F3.06	PID output characteristic choice	Ones 0: Positive 1: Negative Tens: Reserved Hundreds: Reserved	\	0000	○	Ones: 0000: 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. 0001: 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.
F3.07	Broken-line fault detection time of PID feedback	0.0~100.0	s	30.0	○	When the inverter runs through the detection time, If the PID feedback value is still 0, the PID feedback disconnection fault is reported. This function is invalid when the setting is 0.
F3.08	PID standby function option	0: Disabled 1: Sleep mode 1 2: Sleep mode 2	\	1	○	Sleep mode 1: The system performs sleep processing based on pressure, frequency and time. At this time, the water leakage coefficient, the pressure holding detection time and the sleep rate are effective. Sleep mode 2: Sleep based on pressure and sleep frequency
F3.09	PID wakeup detection delay	0.0~100.0	s	3.0	○	PID wakeup detection delay

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F3.10	PID standby detection delay	0.0~100.0	s	0.5	○	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	0.0~1.0	bar	0.1	○	When the feedback pressure is within standby deviation range, it starts standby.
F3.12	PID standby hold frequency	0.00~F3.13	Hz	20.00	○	PID runs at standby hold frequency. After the standby duration, PID enters standby status.
F3.13	Standby detection frequency	F3.12~F2.07	Hz	25.00	○	The system will judge whether the condition of standby function, meet the frequency.
F3.14	Low frequency operation hold time	0~120.0	s	3.0	○	When the system goes to sleep, the running time of PID standby hold frequency.
F3.15	Pressure check interval	0~120.0	s	30.0		After this time, the system automatically detects the pressure hold status.
F3.16	The frequency for half pump flow (The pumping flow ratio between small pump and large pump)	20.00~F2.07	Hz (%)	30.00	○	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.)

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F3.17	VFD Sleep Ratio	0~30	\	9	○	Set bigger make sleep quicker
F3.18	The feedback of disconnected detection value	0~1.00	V	0.20	○	Sampling minimum value in the system. It is judged by the voltage.
F3.19	Proportional gain 2	0.0~100.0	%	20.0	○	
F3.20	Integral time 2	0.00~10.00	s	2.00	○	

4.7 Parameter Sets of Pump Protection

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F4.00	Water shortage protection	0~2	\	2	○	0: Disabled 1: Enabled. Judge by frequency, pressure and current 2: Enabled. Judge by outlet pressure
F4.01	Threshold of water shortage detection	0.0~F0.00	bar	0.5	○	When feedback pressure is smaller than this value, water shortage judgement is made
F4.02	Detection frequency of water shortage protection	0~F2.07	Hz	48.00	○	Comparison frequency to judge whether water shortage occurs. When running frequency is bigger than this frequency, it is judged as water shortage.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F4.03	Detection time of water shortage protection	0.0~200.0	s	60.0	○	When it meets the condition of water shortage, water shortage fault will be reported after this time.
F4.04	Current percentage of water shortage protection detection	0~100.0	%	40.0	○	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.
F4.05	Automatic restart delay of water shortage protection	0~9999	min	15	○	Set 0: use F4.07 and F4.08 to reset water shortage faults. If it is not the "Set 0"
F4.06	Automatic reset times of water shortage protection	0~9999	\	10	○	When water shortage fault is reported, after the period set by F4.05, the VFD 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. 9999 can reset the fault unlimitedly
F4.07	Input water recover pressure	0~F0.00	bar	1.0	○	If the system reported the water shortage fault (E027); When the VFD detection pressure is greater or equal to detection pressure of setting input water, and the time is greater than the detection time of input water, the system will reset to E027. This is applicable to pressurization system. of water inlet This is pressure value of output water
F4.08	Input water recover detect time	0~100.0	s	20.0	○	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F4.09	The delay time of abnormal pressure alarm	0.0~120.0	s	3.0	○	The delay time of water pressure alarm and failure alarm
F4.10	Antifreeze operation frequency	0.00Hz ~ upper frequency F2.07	Hz	10.00	○	The time unit of antifreeze and antirust can be seconds or minutes, refer to the setting of F0.03. When the interval is set to 0, always run at the antifreeze operating frequency.
F4.11	Antifreeze running time	0s/min ~ 65000s/min	s/min	60	○	
F4.12	Antifreeze operation interval time	0s/min ~ 65000s/min	s/min	300	○	
F4.13	Detection time of burst pipes	0~1000	s	0	○	The running frequency of all drives in system is greater or equal than F4.02, and the pressure is less than the starting pressure. It will report E030 fault after the time of F4.15. Set“0”: The detection of burst pipes is invalid.

4.8 Parameter Sets of Motor

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F5.00	The motor type	0 ~ 2	1	0	●	0: asynchronous motor (AM) 1: Permanent magnet synchronous motor (PM) 2: Single-phase motor
F5.01	Motor rated power	0.75~18.5	kW	Default value of corresponding motor	●	Set according to motor nameplate.
F5.02	Motor rated voltage	1~440	V	Default value of corresponding motor	●	Set according to motor nameplate.
F5.03	Motor rated current	0.01A ~ 50A	0.01A / 0.1A	Default value of corresponding motor	●	Set according to motor nameplate.
F5.04	Motor rated frequency	0.01~F2.07	Hz	Default value of corresponding motor	●	Set according to motor nameplate.
F5.05	Motor rated speed	1~36000	rpm	Default value of corresponding motor	●	Set according to motor nameplate.
F5.06	The number of motor	2 ~ 48		4	●	
F5.07	Motor no-load current	0.1 ~ 50.0A			●	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F5.08	Motor stator resistance	0.001 ~ 65.000			●	
F5.09	Motor rotor resistance	0.001 ~ 65.000			●	
F5.10	Motor stator inductance	0.1 ~ 6500.0mH			●	
F5.11	Motor stator rotor mutual inductance	0.1 ~ 6500.0mH			●	
F5.12	Motor parameters self-tuning selection	0: No operation 1: Rotary self-learning 2: static self-learning		0	●	Different learning classes will be adopted according to F0.00 and F5.00; Synchronizer needs to learn rotation, PG synchronization vector will learn encoder installation Angle;

4.9 Parameter Sets of Terminals

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F7.00	Choose DI1 input terminal function	0: Non-function 1: Forward running 2: Reverse running		1	●	
F7.01	Choose DI2 input terminal function	7: Fault resetting 11:Water		11	●	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F7.02	Choose DI3 input terminal function	shortage protection normally open input 12: No. 1 pump failure 13: No. 2 pump failure 18: Emergency water shortage switch Attention : This form is not listed the function of the data is used to set prohibited		18	●	
F7.07	Output terminal 1 (DO1)	0-2 0: No function 1: Run the output	1	2	●	
F7.08	Relay RO1 output function selection	2: Fault output	1	1	●	

4.10 Communication Parameter Sets

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F8.00	Local communication address	1~6	/	1	○	This address is used for PC communication.
F8.01	RS485 Baud rate setting of communication	0:300BPS 1:600BPS 2:1200BPS 3:2400BPS 4:4800BPS 5:9600BPS 6:19200BPS 7:38400BPS 8:57.6kBPS 9:115.2kBPS	\	5	○	The baud rate of the VFD must be the same as the baud rate of the PC.
F8.02	RS485 Data bit check setting	0: No check (8, N, 2) 1: Even check (8, E, 1) 2: Odd check (8, O, 1) 3: No check (8, N, 1)	\	3	○	The data bit check setting of the VFD must be the same as the data bit check setting of the PC.
F8.03	RS485 Response delay	0~20	ms	2	○	
F8.04	RS485 Time out fault time	0.0~60.0	s	0.0	○	0.0: The function is disabled.
F8.05	RS485 read current resolution	0: 0.01A 1: 0.1A	\	0	○	This is to determine the current unit read by the communication.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F8.00	Local communication address	1~6	/	1	○	This address is used for PC communication.
F8.01	RS485 Baud rate setting of communication	0:300BPS 1:600BPS 2:1200BPS 3:2400BPS 4:4800BPS 5:9600BPS 6:19200BPS 7:38400BPS 8:57.6kBPS 9:115.2kBPS	\	5	○	The baud rate of the VFD must be the same as the baud rate of the PC.

4.11 Monitoring Parameter Sets

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F9.00	Temperature of radiator	0~100	°C	0	◎	Temperature of VFD.
F9.01	Running time of this VFD	0~65535	min	0	○	Running time of this VFD. (this is the statistical time).
F9.12	Running time of this host drives	0~65535	min	The time is decided by the host and auxiliary drive	◎	The host drives will count the running time of each machine and conduct the rotation.
F9.13	Running time of No. 1 auxiliary	0~65535	min		◎	
F9.14	Running time of No. 2 auxiliary	0~65535	min		◎	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F9.15	Running time of No. 3 auxiliary	0~65535	min		⊙	
F9.16	Running time of No. 4 auxiliary	0~65535	min		⊙	
F9.17	Running time of No. 5 auxiliary	0~65535	min		⊙	

4.12 User Parameter Sets

Function code	Description	Set range	Unit	Default	Revision level	Remarks
FD.00	Password of the agent	00000~65535	\	0000	○	Password to enter group FD.
FD.01	Restore factory defaults	0~2	\	0	●	0: No operation 1: Restore factory defaults 2: Clear fault records
FD.02	Parameter locked	0~1	\	0	○	0: unlocked 1: locked

4.13 Agent Parameter Sets

Function code	Description	Set range	Unit	Default	Revision level	Remarks
FE.00	Password	0000~9999	\	0000	○	The password to enter group FE.
FE.01	Number of times the fault record is displayed	0~15	h	0000	○	
FE.02	Power-on arrival time setting	0~65535	h	0	○	After the power-on time is reached, the VFD will stop.
FE.03	Run time arrival setting	0~65535	h	0	○	After the Running time is reached, the VFD will stop.

4.14 D0 group monitoring parameters

Function code	Description	Unit
D0.00	Operating frequency	0.01 Hz
D0.01	Setting frequency	0.01 Hz
D0.02	Bus voltage	0.1V
D0.03	Output voltage	1V
D0.04	Output current	0.01A (>55Kw , 0.1A)
D0.05	Output Power	0.1kW
D0.06	Output torque	0.1%
D0.07	DI input status	1
D0.08	DO output status	1
D0.09	All voltage	0.01V

D0.10	AI2 voltage	0.01V
D0.11	Cumulative power-on time	1H
D0.12	Cumulative running time	1H
D0.13	Cumulative power consumption	1kWh
D0.14	Load speed	1RPM
D0.15	PID setting	0.1Bar
D0.16	PID feedback	0.1Bar

4.15 Fault record parameter groups

Function code	Description	Default	Revision level
E0.00	Last fault type	\	©
E0.01	Frequency at the last fault		
E0.02	Current at the last fault		
E0.03	Bus voltage at the last fault		
E0.04	input terminal status at the last fault		
E0.05	Output terminal status at the last fault		
E0.06	VFD status at the last fault		
E0.07	Failure time at the last fault (Starting from this power-on)		

E0.08	Failure time at the last fault (Starting from the run)		
E0.09	Reserved		
E0.10	Reserved		

Chapter 5 Fault Information and Troubleshooting

5.1 Fault Codes Description

Fault code	Fault type	Possible fault reasons	Solution
E002	Over current in accelerated running	1. Too fast acceleration 2. Too low grid voltage 3. The power of the VFD is too low	1. Increase acceleration time 2. Check input power 3. Use bigger power VFD
E003	Over current in decelerated running	1. Too fast deceleration 2. The power of the VFD is too low	1. Increase deceleration time 2. Increase power of the VFD
E004	Over current in constant speed running	1. Saltation or abnormality happens to load 2. The grid voltage is too low 3. The power of the VFD is too low	1. Check the load or decrease the saltation of the load 2. Check input power supply 3. Use bigger power VFD
E005	Over voltage in accelerated running	1. The input voltage is abnormal 2. Restart rotating motor after momentary outages	1. Check input power supply 2. Avoid restarting after it is stopped
E006	Over voltage in decelerated running	1. Too fast deceleration 2. The inertia of load is too big 3. The input voltage is abnormal	1. Increase acceleration time 2. Increase dynamic braking modules 3. Check input power
E007	Over voltage in constant speed running	1. Abnormal changes happen to input voltage 2. The inertia of load is too big	1. Install input reactor 2. Add proper dynamic braking modules
E008	Buffer resistor overload	1. Input voltage is not within the specified rang	1. Adjust the input voltage to the specified range

Fault code	Fault type	Possible fault reasons	Solution
E009	Low bus voltage	1. The grid voltage is too low.	1. Check grid input power supply
E010	VFD overload	1. Too fast acceleration 2. Restart rotating motor 3. The grid voltage is too low. 4. Overload	1. Increase acceleration time 2. Avoid restarting after it is stopped 3. Check grid voltage 4. Use bigger power VFD
E011	Motor overload	1. The grid voltage is too low. 2. Wrong setting to motor rated current 3. Motor stall or big changes to load 4. Motor is too small	1. Check grid voltage 2. Reset motor rated current 3. Check the load and adjust torque lifting capacity 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
E014	Module overheating	1. Instant over current of VFD 2. Output three phases have interphase or ground is short circuit 3. Air passage block or fan broken 4. The environmental temperature is too high 5. Control panel wire or plugins loose 6. Power circuit irregularity 7. Control board exception	1. Refer to over current solutions 2. Re-wiring 3. Dredge air passage or change fan 4. Decrease environmental temperature 5. Check and re-connect 6. Seek for service
E015	External faults	External input terminals faults	1. Check input of external equipment
E016	Communication faults	1. Baud rate is set improperly 2. Communication faults of adopting serial communication 3. Communication is interrupted for a long time	1. Set proper baud rate 2. Press RUN/STOP key to reset; seek for service 3. Check wiring of communication interface
E017	Relay failure	1. The relay is not closed	1. Replacement relay and seek for service

Fault code	Fault type	Possible fault reasons	Solution
E018	Fault of current detection circuits	1.Poor contact of control board connector 2.Power circuit irregularity 3.Damage to hall devices 4.Exception of amplifying circuit	1.Check connector and re-plug 2.Seek for service
E022	EEPROM read write faults	1.Read write of control parameter goes wrong 2.EEPROM broken	1.Press RUN/STOP key to reset 2.Seek for service
E023	Short circuit protection with earth	1. The motor and the ground are short-circuited	1. Seek for service
E024	Feedback broken line fault	1. Sensor broken line or poor contact 2.Broken line detection time is too short 3.The sensor is broken or the system has no feedback signal.	1.Check the installation and wiring of sensor 2.Increase broken line detection time 3.Change sensor
E025	Power-on time arrival	1. The power-on time is reached	1.Seek for service
E026	Running time arrival	1.The running time is reached	1.Seek for service
E027	Water shortage alarm	1.Water pressure/level exception 2. Sensor broken line or poor contact. System has no feedback signal 3.Water shortage alarm detection time is too short (F4.03) 4.Water shortage protection frequency is too low(F4.02) 5.Water shortage protection detection current is too low (F4.04)	1. Check whether the pressure of inlet is abnormal or not 2.Check the installation and wiring of sensor 3.Check relevant parameter settings
E028	High pressure alarm	1.Feedback signal of sensor exception 2.High pressure alarm value adjustment is too low (F0.10)	1.Check the wiring of sensor 2.Check relative parameter settings

Fault code	Fault type	Possible fault reasons	Solution
E029	Low pressure alarm	1. Low pressure alarm value is set too high (F0.11) 2. Sensor broken line or poor contact. System has no feedback signal 3. Sensor type is inconsistent with actual situation	1. Modify parameters 2. Check the sensor
E031	Burst pipes alarm	The detection time of burst pipe is too short (F4.10)	Pipe detection (Notes: This fault is only for manual reset)
E050	On-line communication error	1. Abnormal multi-drive communication	1. Be power on again 2. Check the parameter of communication 3. Seek for services
E098/E099	Keyboard communication failure	1. The line of keyboard communication is abnormal 2. Control board is abnormal 3. Keyboard is abnormal	1. Replace the keyboard communication line 2. Replace the keyboard or control board 3. Seek for services

Table 5-1-1 Fault codes description

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 VFD 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 It doesn't stop in no water use.

(1) Check whether the feedback pressure displayed on the VFD 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 value change back and forth around the set value, stop the VFD manually and check whether the pressure keep declining or not. If yes, it needs to change the check valve.

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

If it can't sleep or the sleep time is too long, please decrease the value of F0.04 properly.

If it starts and stops frequently, please increase the value of F0.04 properly.

5.2.6 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 (F4.04) is set too low.

Chapter 6 Communication Protocol

PDH30 series provides RS485 communication interfaces (A+/B-), and adopts international standard Mod-Bus communication protocol. Users can realize centralized control by PC/PLC/touch screen and other upper machine to suit for specific application demand. (Setting VFD control command, running frequency, modifying function code parameters, motoring VFD working status and fault information)

6.1 Command Codes and Communication Data Description

(1)Address of functions

Function	Address definition	Data meaning	R/W character
Communication control command	0x2000H	0x0001:Forward running	W
		0x0002:Reverse running	
		0x0003:JOG forward	
		0x0004: JOG reverse	
		0x0005: Free stop (emergency stop)	
		0x0006:Deceleration stop	
		0x0007:Fault reset	
VFD status	0x3000H	0x0001: Forward running	R
		0x0002: Reverse running	
		0x0003:Stop	

Function	Address definition	Data meaning	R/W character
Stopping or running parameters	0x1000	Communication setting value range (-10000~10000) Note: Communication setting value is the percentage of relative value (-100.00%~100.00%) .Communication write operation can be made. When it serves as frequency source setting, the relative value is the percentage of maximum frequency (F2.07) .	W/R
	0x1001	Running frequency(0.01Hz)	R
	0x1002	Bus voltage (0.1V)	R
	0x1003	Output voltage(1V)	R
	0x1004	Output current(0.01A,>55kW,0.1A)	R
	0x1005	Out power(0.1kW)	R
	0x1006	Out torque (0.1%)	R
	0x1007	Running speed(1RPM)	R
	0x1008	Terminal input mark state (0 decimal)	R
	0x1009	Terminal output mark state (0 decimal)	R
	0x100A	AI1 value(0.01V)	R
	0x100B	AI2 value(0.01V)	R
	0x100C	Cumulative power-on time(1h)	R
	0x100D	Cumulative running time(1h)	R
	0x100E	Cumulative power consumption (1kWh)	R
	0x100F	Setting pressure(0.1bar)	R
	0x1010	Feedback pressure(0.1bar)	R

Table 6-1-1 Address of functions

Notes: When reading parameters, read 12 consecutively.

Data	Fault
0x00	No faults
0x01	Reserved
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	Buffer resistor overload
0x09	Low bus voltage
0x0A	VFD overload
0x0B	Motor overload
0x0C	Input phase loss
0x0D	Output phase loss
0x0E	Module overheating
0x0F	External fault
0x10	Communication fault
0x11	Reserved
0x12	Fault of current detection circuits
0x16	EEPROM read-write fault
0x17	Short circuit protection with earth
0x18	PID feedback broken line fault
0x19	Power-on time arrival
0x1A	Running time arrival
0x1B	Water shortage alarm
0x1C	High water pressure alarm
0x1D	Low water pressure alarm

0x1F	Burst pipes alarm
0x32	On-line communication error
0x63	Keyboard communication failure

Table 6-1-2 Comparison of values and actual faults

Meaning of fault codes

Mod-bus fault codes		
Code	Name	Meaning
0x01	code error	The code written in the code checking address is different from the code set by FD.00 user
0x02	Illegal functions	Function code received from upper machine is not allowed operation. Perhaps the slave unit processes such requests in wrong state
0x03	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.
0x04	Illegal data address	Request data address of the upper machine is not allowed address. Especially, the combination of register address and transferred byte is invalid.
0x05	Illegal data value	Data field received includes not allowed value. Note: It does not mean that the data item submitted for saving in the register has an unexpected value.
0x06	Parameter modification invalid	In the writing command sent by the upper machine, the data sent is beyond parameter range or the writing address cannot be written currently.
0x07	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.

0x08	EEPROM is operating	VFD is busy(EEPROM is under saving)
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Table 6-1-3 Meaning of fault codes

The example of reading and writing parameters command

	VFD address	Command	High address of parameters	Low address of parameters	High bit of data content	Low bit of data content	Low bit of CPR check	High bit of CRC check
Reading command(F0.12)	01	03	F0	0C	00	02	37	08
Writing command(F0.12)	01	06	F0	0C	00	21	BA	D1

Notes: Reading parameters address directly. For example, the read address of F3.15 is 0xF30F; the maximum-continuous units is 12.

Write parameters and save. The address is the same as the reading address. For example, the writing address of F3.17 is 0xF311

