



PDG10 Smart Pump Drive User Manual

Preface

Thank you for using PDG10 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 Key Operating Instruction	- 9 -
1.4 Pressure Setting Instruction	- 10 -
Chapter 2 Model description and installation	- 11 -
2. 1 Model Instruction	- 11 -
2.2 Quick selection	- 11 -
2.3 The VFD Structural Dimension Diagram (unit: mm)	- 13 -
2.4 The Keyboard Structural Dimension Diagram	- 18 -
2.5 Main circuit connection	- 20 -
2.6 Control circuit connection	- 21 -
Chapter 3 Quick Setting	- 26 -
Chapter 4 Datasheet of PDG10	- 29 -
4.1 Parameters Displayed at Running Status	- 29 -
4.2 Parameters Displayed at Stopped Status	- 29 -
4.3 Common Parameter Sets of Single-drive	- 30 -
4.4 Common Parameter Groups of Multi-drive Mode	- 32 -
4.5 Debugging Parameter Groups	- 34 -
4.6 PID and Standby Parameter Sets	- 36 -
4.7 Parameter Sets of Pump Protection	- 39 -
4.8 Parameter Sets of Motor	- 41 -
4.9 Parameter Sets of Protections and Faults	- 42 -
4.10 Parameter Sets of Terminals	- 43 -

4.11 Communication Parameter Sets	- 46 -
4.12 Monitoring Parameter Sets	- 47 -
4.13 User Parameter Sets	- 48 -
4.14 Agent Parameter Sets	- 48 -
4.15 FF group manufacturer parameters	- 49 -
4.16 D0 group monitoring parameters	- 49 -
4.17 Fault record parameter groups.....	- 50 -
4.18 Details of Some Parameters	- 50 -
Chapter 5 Fault Information and Troubleshooting	- 59 -
5.1 Fault Codes Description	- 59 -
5.2 Common Faults and Handling.....	- 62 -
Chapter 6 Communication Protocol.....	- 64 -
6.1 Command Codes and Communication Data Description	- 64 -
Chapter 7 Typical Application Cases	- 68 -
7.1 Single Pump Control Case 1	- 68 -
7.2 Single Pump Control Case 2	- 68 -
7.3 Multi-pump (online system) control case.....	- 70 -
7.4 Two driven by one control case.....	- 71 -

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 equipment. Meanwhile, this sign can be also used for indicating errors or unsafe operation.

VFD: Abbreviation of smart pump drive.

■ Inspection



CAUTION

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

■ Installation



CAUTION

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

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

◎If the VFD 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 VFD 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 VFD.

◎Do not touch the main circuit terminal, and the main circuit terminals of the VFD 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 VFD 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 VFD; Otherwise it will cause damage to the VFD and you are not guaranteed to enjoy the warranty services.

◎Never conduct a pressure test on VFD; Otherwise it will cause damage to the VFD.

◎The main circuit wiring of the VFD 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 VFD and the motor is over 50 meters, an output reactor is recommended so as to protect the VFD and motor.

■ Running



WARNING

◎Turn on the input AC power after the wiring of VFD 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 VFD 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 VFD control system; Otherwise it may cause damage or physical injuries.

©Though the VFD 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 VFD.

©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 VFD, otherwise it may cause casualties. After arbitrarily changing VFD, will no longer enjoy the warranty service.

Chapter 1 Operation Panel Instruction

1.1 Operation Panel Diagram

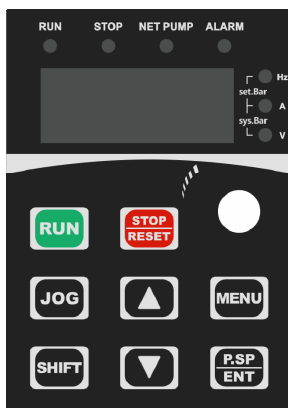


Figure1-1-1 Operation panel diagram

- (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.
- (7) **JOP**: Used in the debugging stage of VFD, the auxiliary machine can run independently.
- (8) **Knob**: Turn to the knob to change the setting pressure

1.2 Indicator Light Instruction

- (1) **RUN:** (Always on) Running instruction; (Flicker): Sleep or stop instruction
- (2) **STOP:** Stop or standby instruction
- (3) **NET PUMP:** Online instruction: When the light is on, the communication is successful.
- (4) **ALARM:** VFD fault alarm
- (5) **Hz:** When the light is on, the content of the display is running frequency.
- (6) **A:** When the light is on, the content of the display is the output current.
- (7) **V:** When the light is on, the content of the display is the bus voltage.
- (8) **Set Bar:** When the light of running frequency and output current is on, the content of the display is Pre-set pressure.
- (9) **Sys Bar:** When the light of output current and bus voltage is on, the content of the display is Pre-set pressure.

1.3 Key Operating Instruction

Three-class menus are:

- ① Function code group (first class)
- ② Function code (second class)
- ③ Function Code Settings (third class)

Instruction: In the third class menu, pressing “MENU” or “P.SP/ENT” can return to the second class menu. Pressing “P.SP /ENT” first saves parameters to control board, and then returns to the second class menu and shifts to next function code automatically; pressing “MENU” returns to the second class menu directly without saving parameters and keeps staying at current function code.

Under the third class menu, only flicker bit can be modified. 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 F0.02 from 0 to 1; pressing the menu key for two seconds can access to parameter set.

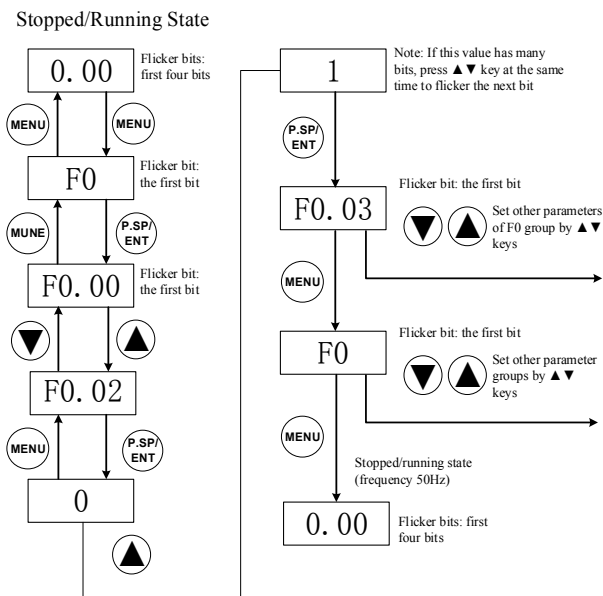


Figure1-3-1 Parametric settings diagram

1.4 Pressure Setting Instruction

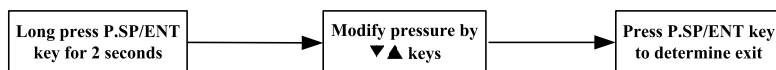


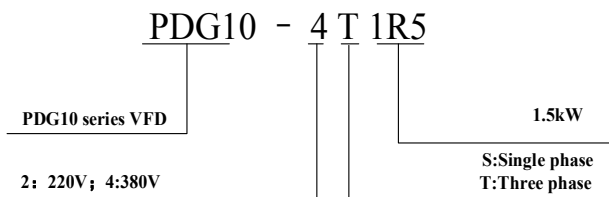
Figure1-4-1 Pressure setting diagram

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



Inverter Model	Rated power (kW)	Power capacity kVA	Input current A	Output current A	G/P	
					kW	HP
PDG10-4T055	55	85	113	112	55	70
PDG10-4T075	75	114	157	150	75	100
PDG10-4T093	93	134	180	176	93	125
PDG10-4T110	110	160	214	210	110	150
PDG10-4T132	132	192	256	253	132	180
PDG10-4T160	160	231	307	304	160	220
PDG10-4T200	200	250	385	377	200	275
PDG10-4T220	220	280	430	426	220	300
PDG10-4T250	250	355	468	465	250	340
PDG10-4T280	280	396	525	520	280	380
PDG10-4T315	315	445	590	585	315	430
PDG10-4T355	355	500	665	650	355	480
PDG10-4T400	400	565	785	725	400	545

Table 2-1-1 selection table of PDG10

2.3 The VFD Structural Dimension Diagram (unit: mm)

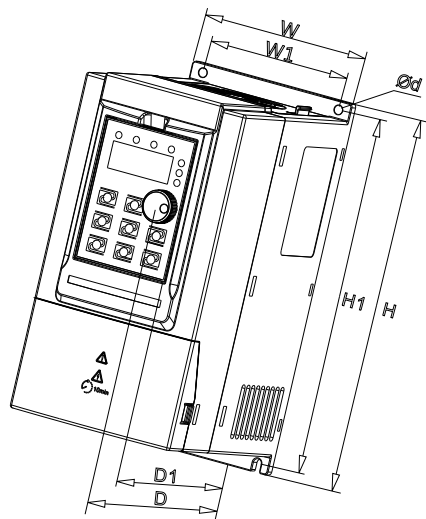


Figure 2-3-1 0.75-7.5kW Outline dimension diagram

Inverter Model	Outline size				Installation dimension		Opening size
	H	W	D	D1	H1	W1	d
PDG10-2SR75GB	187	88	138	130	177	73	5
PDG10-2S1R5GB							
PDG10-2S2R2GB							
PDG10-4TR75GB							
PDG10-4T1R5GB							
PDG10-4T2R2GB							
PDG10-4T004	207	100	147	139	197	85	5
PDG10-4T5R5	247	130	167	159	237	113	5
PDG10-4T7R5							

Table 2-3-1 0.75-7.5kW Outline dimension

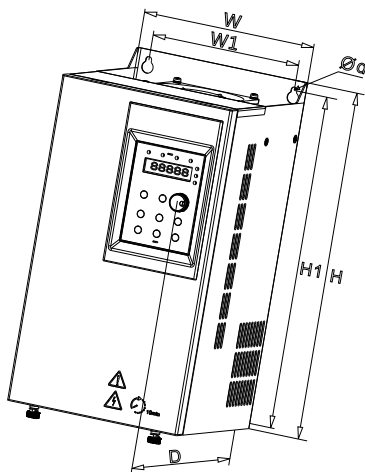


Figure 2-3-2 11-37kW Outline dimension diagram

Inverter Model	Outline size			Installation dimension		Opening size
	H	W	D	H1	W1	d
PDG10-4T011	360	182	197	331	156	7
PDG10-4T015						
PDG10-4T18R5	385	219	197	356	156	7
PDG10-4T022						
PDG10-4T030	442	256	228	414	199	7
PDG10-4T037						

Table 2-3-2 11-37kW Outline dimension

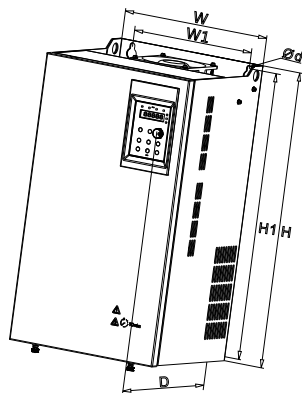


Figure 2-3-3 45-160kW Outline dimension diagram

Inverter Model	Outline size			Opening size		Opening size
	H	W	D	H1	W1	d
PDG10-4T045	557	300	282	524	245	10
PDG10-4T055						
PDG10-4T075	597	338	322	560	270	10
PDG10-4T093						
PDG10-4T110						
PDG10-4T132	866	442	358	823	270	10
PDG10-4T160						

Table 2-3-3 45-160kW Outline dimension

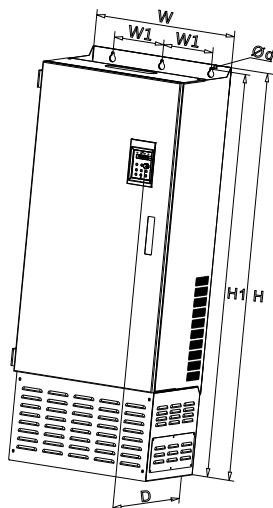


Figure 2-3-4 200-400kW Outline dimension diagram

Inverter Model	Outline size			Opening size		Opening size
	H	W	D	H1	W1	d
PDG10-4T200	1464	561	405	1448	200/200	12
PDG10-4T220						
PDG10-4T250						
PDG10-4T280						
PDG10-4T315	1769	800	398	1733	80/260/ 260/80	16
PDG10-4T355						
PDG10-4T400						

Table 2-3-4 200-400kW Outline dimension

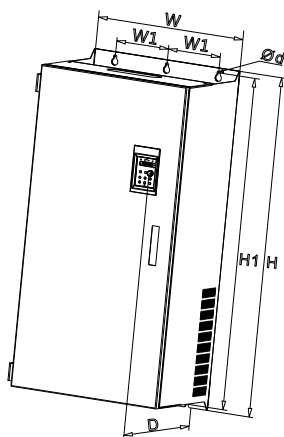


Figure 2-3-5 200-400kW Outline dimension diagram (No base)

Inverter Model	Outline size			Opening size		Opening size
	H	W	D	H1	W1	
PDG10-4T200	1175	561	405	1145	200/200	12
PDG10-4T220						
PDG10-4T250						
PDG10-4T280						
PDG10-4T315	1358	800	398	1302	80/260/ 260/80	16
PDG10-4T355						
PDG10-4T400						

Table 2-3-5 200-400kW Outline dimension (No base)

2.4 The Keyboard Structural Dimension Diagram

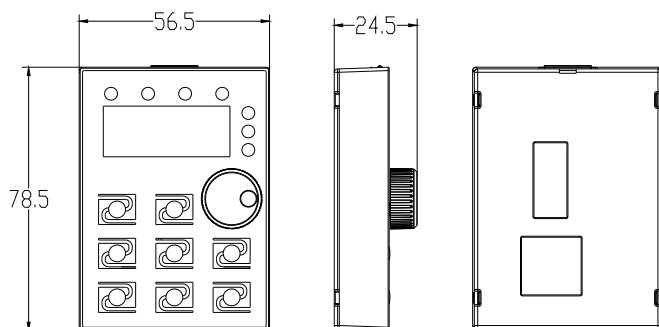


Figure 2-4-1 0.75-7.5kW the keyboard structure size

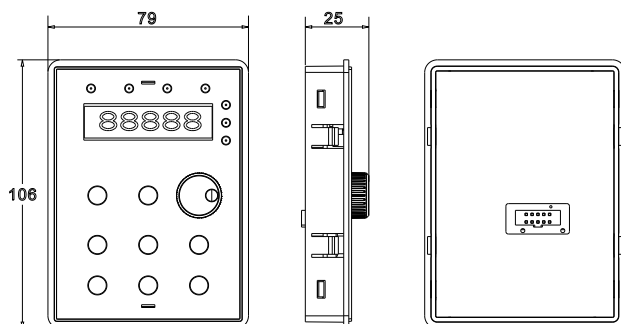


Figure 2-4-2 11-400kW the keyboard structure size

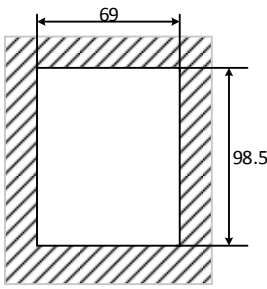
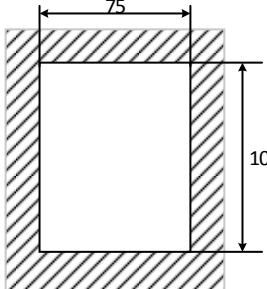
Inverter Model	0.75kW-7.5kW	11kW-400kW
Opening size		

Figure 2-4-3 The keyboard opening size

2.5 Main circuit connection

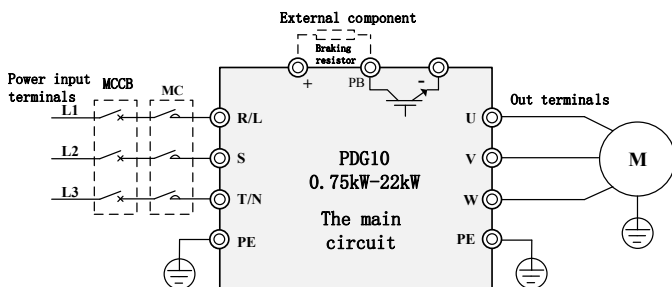


Figure 2-5-1 0.75-22kW main circuit wiring diagram

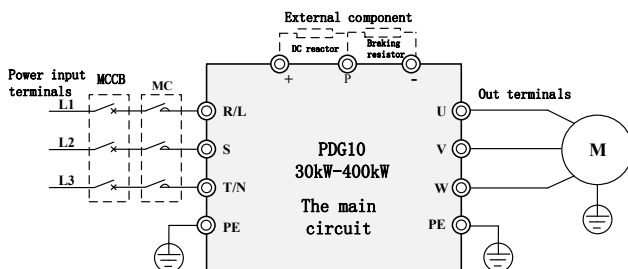


Figure 2-5-2 30-400kW main circuit wiring diagram


Terminal mark	Name	Descriptions
R、S、T	Three phase power input terminal.	AC three phase input power connection terminal.
(+)、(-)	DC bus positive and negative terminal.	Common dc busbar input terminal (connection terminal of 30kW and above external braking units)
(+)、PB	Brake resistance connecting terminal.	22kW and below brake resistance connection terminal.
P、(+)	External reactor terminals.	External reactor connection terminal.
U、V、W	Inverter output terminal.	Connect the three-phase motor.
	Earthing terminal	Ground terminal

Table 2-5-1 main circuit terminals and functions.

2.6 Control circuit connection

■ 0.75kW-7.5kW control terminal

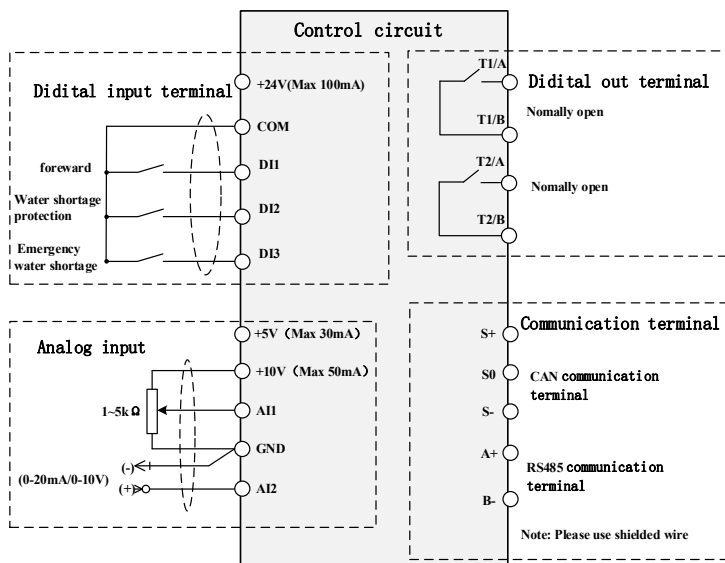


Figure 2-6-1 0.75-7.5kW control terminal diagram

■ 11kW-400kW control terminal

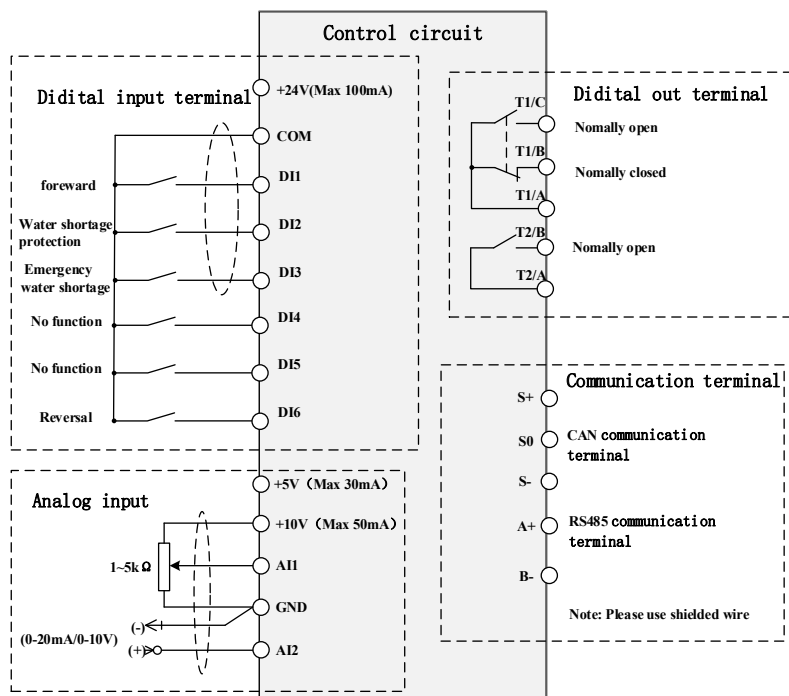


Figure 2-6-2 11-400kW control terminal diagram

■ 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
A11	Analog input terminal 1	1. Input voltage range: DC 0~10VDC or 0/4~20mA, determined by parameters.
A12	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/T1C	Relay RO1 output	0.75~7.5kW: T1A-T1B: normally open terminals 11~400kW: T1A-T1B : normally closed terminals T1A-T1C: normally open terminals Contact capacity: AC 250V / 3A / normally open terminals AC 250V / 3A / normally closed terminals
T2A/T2B	Relay RO2 output	T2A~T2B: 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

Terminal symbol	Terminal name	Technical specification
COM	24V power public terminal	Provide 24V power public terminal to external devices
A+	Standard RS485 communication terminal	Standard isolated RS485 communication interface. Please use twisted pair or shielded wire. Can be used for PC communication control.
B-		
S+	CAN communication terminal	Standard CAN communication interface. Please use twisted pair or shielded wire. Can be used for inverter on-line.
S-		
S0		

Table 2-6-1 Control terminal instruction

2.7 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.

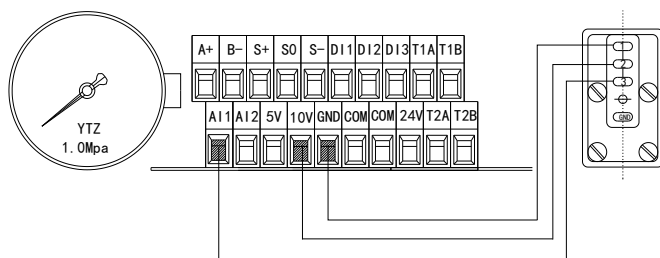


Figure 2-7-1 0.75-7.5kW Wiring diagram of remote pressure gauge

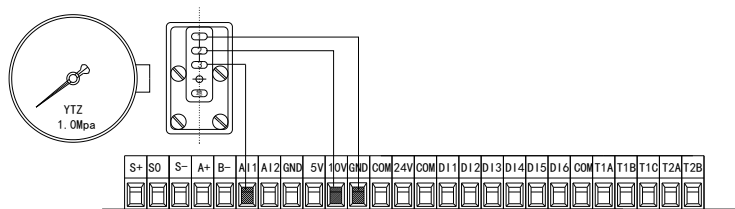


Figure 2-7-2 11-400kW Wiring diagram of remote pressure gauge

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

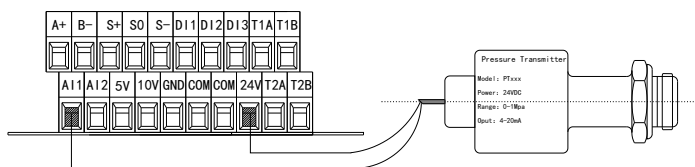


Figure 2-7-3 0.75-7.5kW Wiring diagram of two-wire pressure transmitter

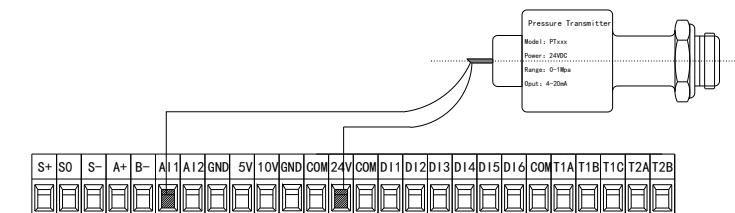


Figure 2-7-4 11-400kW Wiring diagram of two-wire pressure transmitter

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

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

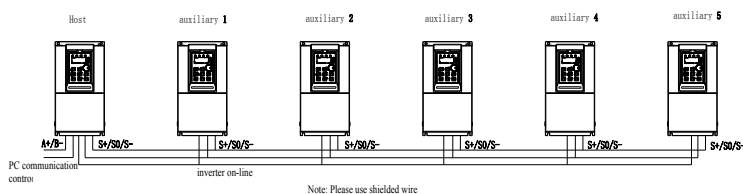


Figure 3-1-1 Outline diagram

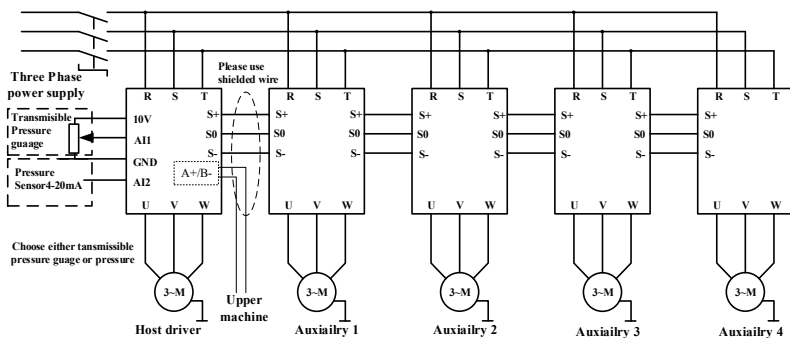


Figure 3-1-2 Terminal wiring diagram (5 auxiliaries at most)

Chapter 4 Datasheet of PDG10

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	0.0~F0.00	bar	2.4	○	Wakeup from standby mode when the pressure is lower than startup pressure
F0.02	Motor rotation direction	0: Forward 1: Reverse	\	0	●	Rotation direction can be changed by modifying this parameter
F0.03	Antifreeze function	0: Disabled 1: Enabled (in seconds) 2: Enabled (in minutes)	\	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	\	5.0	○	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:AI1 1:AI2 2: Max (AI1,AI2) 3:Min(AI1,AI2)	\	2	○	AI1 and AI2 can be connected to the default sensor randomly.
F0.10	High pressure alarm value setting	F0.00~F0.08	bar	12.8	○	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.
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	Antifreeze running frequency	0.00~F2.07	Hz	10.00	○	The time unit of antifreeze and antirust function can be second or minute, refer to
F0.13	Antifreeze running time	0~65000	s/min	60	○	The set of F0.03. When the interval setting is 0, it always runs with antifreeze running frequency.
F0.14	Antifreeze running interval	0~65000	s/min	300	○	
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
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 standby 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	120	○	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.
F1.08	One VFD drive two pumps mode	0: Fixed variable frequency pump 1: Rotate variable frequency pump	\	0	●	Set to rotate mode, the rotation time is set by F1.05.
F1.09	Pressure deviation of starting power frequency pump	0~F0.00	bar	0.5	○	When power frequency pump starts, the pressure is equal to the set pressure (F0.00) minus this deviation (F1.09)
F1.10	Delay time of starting power frequency pump	0.0~100.0	s	10.0	○	When the water pressure is less than the starting pressure of the power frequency pump, the power frequency pump will run after delay.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F1.11	Pressure deviation of stopping power frequency pump	0.0~F0.00	bar	0.5	○	When power frequency pump stops, the pressure is equal to the set pressure (F0.00) plus this deviation (F1.11).
F1.12	Delay Time of stopping Power frequency Pump	0.0~F1.13	s	5.0	○	When the pressure of water is greater than the pressure of stopping power frequency pump, the power frequency pump stops after delay.
F1.13	The frequency hold time of the stopping power frequency Pump	0.0~100.0	s	10.0	○	When the feedback pressure is between the sleeping pressure and the pressure of stopping power frequency, after the delay of F1.13, the power frequency pump stops.
F1.14	The limit pressure deviation of the stopping power frequency Pump	0.0~F0.00	Bar	1.0	○	When the feedback pressure is greater than the sum of the setting pressure and the limit deviation pressure, the power frequency pump stops Immediately.
F1.15	Delay time to start the frequency pump	10.0~100.0	s	10.0	○	

4.5 Debugging Parameter Groups

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F2.00	Selection of All channel feedback types	0-2	/	0	○	0:4-20mA 1:0-10V 2:0.5-4.5V

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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
F2.03	AI2 signal correction coefficient	0.750-1.250	0.001	1.000	○	Correction of AI2 channel signal deviation
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
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	○	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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.
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	%	20.00	○	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.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F3.01	Integral time	0.01~10.00	s	2.00	○	
F3.02	Differential time	0.000~10.000	s	0.00	○	
F3.03	Start-up time of PID	0.00~100.0	s	5.0	○	
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
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	10.0	○	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.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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
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	20.00	○	The system will judge whether the condition of standby function, meet the frequency.
F3.14	Low frequency operation hold time	0~120.0	s	5.0	○	When the system goes to sleep, the running time of PID standby hold frequency.
F3.15	Pressure check interval	0~120.0	s	60.0		After this time, the system automatically detects the pressure hold status.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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.)
F3.17	VFD Sleep Ratio	0~40	\	4	○	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

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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.
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	\	100	○	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

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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	○	
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
F4.15	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
F5.01	Motor rated power	0.1~400.0	kW	Default value of corresponding motor	●	Set according to motor nameplate.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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~655.35A (≤55kW) 0.1A~6553.5A (>55kW)	0.01 A/ 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.

4.9 Parameter Sets of Protections and Faults

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F6.00	Motor overload protection choices	0~1	\	1	○	0: Unprotected 1: Protection
F6.01	Motor overload protection factor	0.20~10.00	\	1.00	○	Motor overload protection is an inverse time curve.
F6.02	Motor overload warning coefficient	50~100	%	80	○	Reference current is motor overload current.
F6.03	Overvoltage stall coefficient	0~100	\	0	○	By increasing this value, overvoltage faults can be avoided in some cases.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F6.04	Over voltage stalling protection voltage	120~150	%	130	○	Protection point for overvoltage stall function.
F6.05	Overcurrent stall coefficient	0~100	\	20	○	By increasing this value, overcurrent faults can be avoided in some cases.
F6.06	Overcurrent stalling protection current	100~200	%	150	○	Protection point for overcurrent stall function.
F6.07	Short circuit protection with earth	0: Disabled 1: Enabled	\	1	○	This function is used to detect whether the motor and the ground are short-circuited.
F6.08	Input phase loss protection choices	0: Disabled 1: Enabled	\	1	○	
F6.09	Output phase loss protection choices	0: Disabled 1: Enabled	\	1	○	
F6.11	Undervoltage setting	60.0~140.0	%	100.0	○	This parameter can adjust the inverter undervoltage (Err09) fault point.

4.10 Parameter Sets of Terminals

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F7.00	Choose DI1 input terminal function	0、1、2、7、11、12、13、18	\	1	●	0: Non-function 1: Forward running 2: Reverse running 7: Fault resetting 11: Water shortage protection normally open input
F7.01	Choose DI2 input terminal function			11	●	
F7.02	Choose DI3 input terminal function			18	●	
F7.03	Choose DI4 input terminal function			0	●	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F7.04	Choose DI5 input terminal function			0	●	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
F7.05	Choose DI6 input terminal function			2	●	
F7.06	DI terminal filter time	0.000~1.000	s	0.010	○	This parameter can be increased if the digital input terminal is susceptible to interference.
F7.08	Relay RO1 function, of output	0、1、2、3、14	\	1	●	0: Non-function 1: In the operation of the motor 2: Fault output 3: One driving two RO1 function (For variable frequency pump control) 4: One driving two RO2 function (For power frequency pump control)
F7.09	Relay RO2 function, of output			2	●	
F7.10	UP/DOWN of the rate of change	0.01~6553.5	Hz	0.50	○	This is the rate of change of the adjustment frequency.
F7.11	AI1 lower limit setting	0.00~F7.13	V	0.00	○	The correspondence of AI1 linear output and filter time
F7.12	Percentage corresponding to AI1 lower limit setting	-100.0~100.0	%	0.0	○	
F7.13	AI1 upper limit setting	F7.11~10.00	V	10.00	○	
F7.14	The percentage corresponding to the AI1 upper limit setting	-100.0~100.0	%	100.0%	○	
F7.15	AI1 input filter time	0.00~10.00	s	0.10	○	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F7.16	AI2 lower limit setting	0.0~F7.18	V	0.00	○	The correspondence of AI2 linear output and filter time
F7.17	Percentage corresponding to AI2 lower limit setting	-100.0~100.0	%	0.0	○	
F7.18	AI2 upper limit setting	F7.18~10.00	V	10.00	○	
F7.19	The percentage corresponding to the AI2 upper limit setting	-100.0~100.0	%	100.0%	○	
F7.20	AI2 input filter time	0.00~10.00	s	0.01	○	
F7.21	DI1 closed function delay	0.0~3600.0	s	0.0	○	The detection time of DI1/DI2 terminal closed and disconnection function. (used as the filter anti-shake for liquid level sensor)
F7.22	DI2 closed function delay	0.0~3600.0	s	0.0	○	
F7.23	DI1 disconnection function delay	0.0~3600.0	s	0.0	○	
F7.24	DI2 disconnection function delay	0.0~3600.0	s	0.0	○	

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F7.25	Valid state of the DI input terminal 1	0: High level 1: Low level Position: DI1 Ten: DI2 Hundred: DI3 Thousand: DI4 ten thousand DI5	\	0	○	High level: When Xi and COM are connected, the function is valid. Low level: When Xi and COM are disconnected, the function is valid
F7.26	Valid state of the DI input terminal 2	0: High level 1: Low level Position: DI6	\	0	○	

4.11 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.

Function code	Description	Set range	Unit	Default	Revision level	Remarks
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.

4.12 Monitoring Parameter Sets

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F9.00	Temperature of radiator	0~100	℃	0	◎	Temperature of VFD.
F9.01	Running time of this VFD	0~9000	min	0	○	Running time of this VFD. (this is the statistical time).

Function code	Description	Set range	Unit	Default	Revision level	Remarks
F9.05 ~F9.11	Test monitoring parameter	reserved	\	\	⊙	reserved
F9.12	Running time of this host drives	0~9999	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	0~9999	min		⊙	
F9.14	Running time of No. 2 auxiliary	0~9999	min		⊙	
F9.15	Running time of No. 3 auxiliary	0~9999	min		⊙	
F9.16	Running time of No. 4 auxiliary	0~9999	min		⊙	
F9.17	Running time of No. 5 auxiliary	0~9999	min		⊙	

4.13 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

4.14 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.

4.15 FF group manufacturer parameters

4.16 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	AI1 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

4.17 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		

4.18 Details of Some Parameters

F0.00	Pre-set pressure	F4.01~F0.10	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	16.0	The maximum range of corresponding sensor

F0.08 is the range of the sensor. The common range is 1MPa or 1.6MPa, namely 10.0 bar or 16.0 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 online system, users only need to set the pressure parameter of the host drive and the auxiliary doesn't need to be set. (Backup host drive need to set the pressure parameter)

F0.01	Startup pressure	0.0~F0.00	bar	2.4	The standby is woken up when the pressure is lower than the PID set pressure.
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F3.09	PID wakeup detection delay	0.0~100.0	s	3.0	PID wakeup detection delay
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When the feedback pressure is equivalent to startup pressure and holds for the time set by F3.09, PID adjustment will restart. For example, when F0.00=3.0, F0.01=2.4, F3.09=3.0 and the feedback pressure is equivalent to 2.4 and holds for more than 3 seconds, PID adjustment will restart. When the feedback pressure is less than 2.4 bar, PID adjustment starts immediately.

F0.02	Motor rotation direction	0:Forward 1:Reverse	\	0	Change the rotation direction by modifying this parameter
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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: Disabled 1: Enabled (in seconds) 2: Enabled (in minutes)	\	0	S 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.
F0.12	Antifreeze running frequency	0.00~F2.07	Hz	10.00	The time unit of antifreeze and antirust function can be second or minute, refer to The set of F0.03. When the interval setting is 0, it always runs with antifreeze running frequency.
F0.13	Antifreeze running time	0~65000	s/min	60	
F0.14	Antifreeze running interval	0~65000	s/min	300	

F0.03=1 or 2: Enable antifreeze function. The running frequency of the pump is adjusted automatically according to the current state after the VFD is started.

Note:

- (1) If antifreeze function is in need, the parameters F0.03, F0.12, F0.13, and F0.14 of both the host and the auxiliary drives need to be set.
- (2) Pump's self-adjustment of the given frequency is prior to antifreeze running frequency.

(3) The anti-freeze frequency cannot 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	Water leakage coefficient	0.0~100.0	\	5.0	The bigger the water leakage, the smaller the coefficient.
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In no water use condition, the leakage of the pump network prevents the VFD from stopping, as a result, the VFD 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 smaller this coefficient will be.

F0.05	Start/stop signal option	0~2	\	0	0:Keyboard start/stop 1:Terminal start/stop 2:Start/stop by communication control
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 drive Choose 9 for auxiliary drives Choose 5 for emergent Water supply.

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

Note: These parameters can be completed by using macro function.

(1) In online system, F2.05 of auxiliary drives needs to be modified as 9.

(2) In online system, F2.05 of the host drive can be only set as 8.

F0.06	Auto-start option	0~1	\	0	0:Disabled 1:Enabled
F0.07	Auto-starting delay time	0.0~100.0	s	5.0	The delay time before self-starting at power on.

If you hope that the power-on VFD will conduct the auto-start option (or fault automatic reset), you need to set F0.06 as 1. It will auto-start every time when it is power-on.

Notes: The VFD will not start after user stop it.

F0.09	The selection of sensor feedback channel	0: AI1 1: AI2 2: Max(AI1,AI2) 3: Min(AI1,AI2)	\	2	AI1 and AI2 can be connected to the default sensor randomly.
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The default AI1 feedback channel is 4-20mA and the default AI2 feedback channel is 0-10V.

F0.10	High pressure alarm value setting	F0.00~F0.08	bar	12.8	When the feedback pressure is greater than or equal to this value, it alarms and stops after 0.1 second alarm delay.
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 F4.09. 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
F4.09	The delay time of abnormal water pressure alarm	0.0~120.0	s	3.0	The delay time of water voltage faults alarm

The VFD 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.

F0.15	Working mode of VFD	0~1	\	0	0:Pressure mode 1:General mode
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F0.15=0; When the feedback pressure is less than the starting pressure, the VFD accelerates. When the feedback pressure is greater than the set pressure (on used water), the VFD enters sleep.

F0.15=1; The VFD turns off the water pressure abnormal alarm and the operating frequency can be changed by adjusting the potentiometer.

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	

The acceleration & deceleration time setting of the VFD will be automatically set with power rate.

F1.00	Online communication address	0~5	\	0	1-5 is the address of auxiliary drives. The address of host drive is 0.
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This parameter is automatically set in the online system.

F1.01	The selection of standby host(auxiliary)network	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 drives
F1.03	Number of the auxiliary drives	0~5	set	0	0: Cancel the control function of the host drive over the auxiliaries. Note: This parameter only serves as PID frequency source and is only set in CAN host drive.

In online system, according to different situations, you can set the parameters of F1.01 of the auxiliary drives. F1.02 and F1.03 will change by setting the macro parameters.

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	min	120	The alternating time of host drives and auxiliary drives 0: Cancel the alternating function of host drives and the auxiliary drives.

In online system, according to the system requirements, the value of F1.04 can be modified.

0: Sequential control of the host drives and auxiliary drives

When the pressure is not enough, and the system is put into auxiliary operation in turn.

1: Synchronous control

When the pressure is not enough, host and auxiliary operating frequency is the same.

2: Standby mode

Only one VFD runs at any time and the rest is standby. After the alternating time, another VFD starts.

F1.07	The delay time of adding pump	0~100	s	5.0	
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In online system, start the delay time of next pump when the pressure is insufficient.

F2.00	Selection of AI1 channel feedback types	0-2	/	0	0:4-20mA 1:0-10V 2:0.5-4.5V
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
F2.03	AI2 Signal correction coefficient	0.750-1.250	0.001	1.000	Correction of AI1 channel signal deviation.

Modify the channel feedback type of AI1 and the channel feedback type of AI2 according to the type of sensor actually installed.

If you find that there is deviation between feedback pressure of the sensor and the feedback pressure displayed by the VFD, adjust the parameters of the F2.01 and F2.03 to correct the sensor.

F3.00	Proportional gain	0.00~100.0	%	20.00	
F3.01	Integral time	0.01~10.00	s	4.00	

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	PID standby 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
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F3.09	PID wakeup detection delay	0.0~100.0	s	3.0	PID wakeup detection delay
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 in 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	20.00	The system will judge whether the condition of standby function, meet the frequency.
F3.14	Low frequency operation hold time	0~120.0	s	5.0	When the system goes to sleep, the running time of PID standby hold frequency.
F3.15	Pressure check interval	0~120.0	s	60.0	After this time, the system automatically detects the pressure hold status.
F3.17	VFD Sleep Ratio	0~40	\	4	Set bigger make sleep quicker.

When the standby is enabled by F3.08, the VFD will detect whether the feedback pressure is bigger than set pressure. If yes, the VFD will enter the two pressure check interval phase. If the feedback pressure is still greater than the setting pressure, the VFD enters the low frequency operation state. After 5 seconds, the VFD enters the sleep state.

If the system leaks, you can change the value of the leak detection coefficient so that the VFD can quickly go to sleep. But the setting is too big, the VFD will start frequently.

F4.00	Water shortage protection	0~2	\	2	0: Disabled 1: Enabled. Judge by frequency, pressure and current 2: Enabled. Judge by outlet pressure
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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.
F4.03	Detection time of water shortage protection	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 reset times of water shortage protection	0~9999	min	15	When water shortage fault is reported, after the period set by F4.05, the VFD resets and runs automatically. Reset times are limited by F4.06. 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
F4.06	Automatic reset times of water shortage protection	0~9999	\	100	
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	

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) Judge by pressure feedback of the outlet sensor. Make F4.00=2.
- (3) Judge by the pressure of the inlet and the frequency current of the motor. Make F4.00=1.

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

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 detection time of water shortage protection by F4.03.

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

- (1) The function of water shortage protection is turned on (F4.00=1) ;
- (2) The feedback pressure is less than threshold value of water shortage detection (feedback pressure<F4.01);
- (3) The current running frequency is no less than detection frequency of water shortage protection (running frequency \geq F4.02);
- (4) The percentage of output current is less than the current percentage of water shortage detection (percentage of output current \leq F4.04).
- (5) When it meets the condition of (1) - (4) , it will report water shortage faults.

When F4.05 is not “0”, the VFD will automatically reset and restart after the water shortage faults is reported and holds for time set by F4.05. When automatic reset times reach to the value set by F4.06, it won't restart automatically. When F4.06 is set as 9999 ,the system can reset the water shortage faults unlimitedly. When F4.05 is set as 0, it will use feedback pressure to detect input water and reset the water shortage faults. When the pressure of input water is bigger than the value of F4.07 and holds for the time set by F4.08, it will reset and restart.

Notes: Because every VFD is in different working condition, like lift and load size, the value of F4.04 should be set properly according to real situation. This can make an accurate judgement whether it is short of water or not.

Setting method: Turn off the water inlet when the running frequency of VFD reaches to the maximum value and record the output current displayed on the VFD. Dividing the current value by motor rated current (F5.03) to get a percentage. The value of F4.04 is 5%-10% higher than the percentage. When the value of F4.04 is too high, it may report the water shortage faults mistakenly in a normal operation. If it is too low, it cannot protect the VFD effectively when it is in water shortage.

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 range	1. Adjust the input voltage to the specified range
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
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
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

PDG10 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	
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

Function	Address definition	Data meaning	R/W character
	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.

Comparison of values and actual faults read from 8000H

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)

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

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
Water shortage protection mode	Switching value sensor is installed at inlet.	Input by external terminals. (Please connect to M2 terminal under the default condition)

Please set the parameters F0.08, F0.09, F2.00 or F2.02 according to the pressure sensor type.

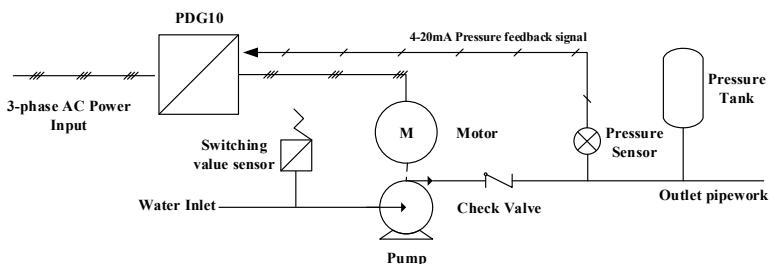


Figure 7-1-1 Single pump control 1 diagram

7.2 Single Pump Control Case 2

Condition	Requirement	Parameter setting
Pump network pressure	3.5kg	F0.00 = 3.5
Start mode	Keyboard start	F0.05 = 2; F0.06 = 1

Please set the parameters F0.08, F0.09, F2.00 or F2.02 according to the pressure sensor type.

The upper machine (such as PLC) sends the start command: the data format is hexadecimal.

The example of writing command

	VFD address	Writing 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	20	00	00	01	43	CA
Stop command	01	06	20	00	00	05	02	08
Faults reset	01	06	20	00	00	07	C3	C8

The example of reading command

	VFD address	Reading 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 CPR check	High bit of CPR check
Reading running frequency	01	03	10	01	00	01	D1	0A

Notes: reading data is 12 at maximum

After the VFD receive data from the upper machine (such as PLC), the following format data is returned. The data returned in this example is 1388H, namely decimal 5000, which means that the current running frequency is 50.00Hz.

Data returned by VFD	VFD address	Reading command	Byte number	Data high bit	Data low bit	Low bit of CRC check	High bit of CRC check
standard	01	03	02	13	88	B5	12

VFD returned	VFD address	Reading command	High bit of byte number	Low bit of byte number	Data high bit	Data low bit	Low bit of CRC check	High bit of CRC check
Non standard	01	03	00	02	13	88	E9	5C

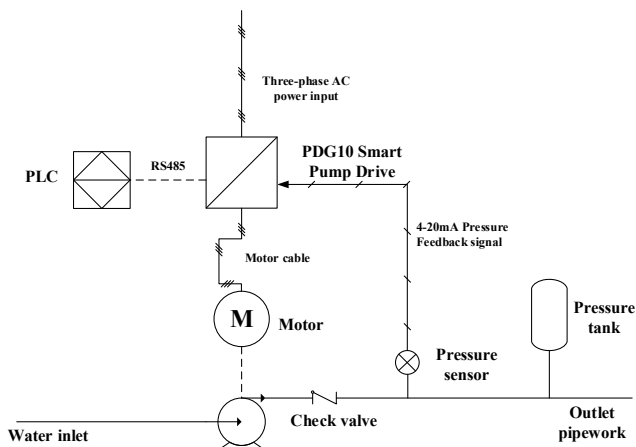


Figure 7-2-1 Single pump control 2 diagram

7.3 Multi-pump (online system) control case

Condition	Requirement	Parameter setting
Pump network pressure	4.0kg	F0.00 = 4.0
Network setting	Double master-slave network*	Macro setting: host: F0.20=2; auxiliary: F0.20=11

Please set the parameters F0.08, F2.00 or F2.01 according to the pressure sensor type.

*: Double master-slave network: One master-slave network is constituted by the A+/B- in PDG10 and upper machine; the upper machine serves as the master station. The other master-slave network is constituted by the S0/S+/S- in the VFDs; the S0/S+/S- in the PDG10-Host serve as master station. (As shown in the following figure)

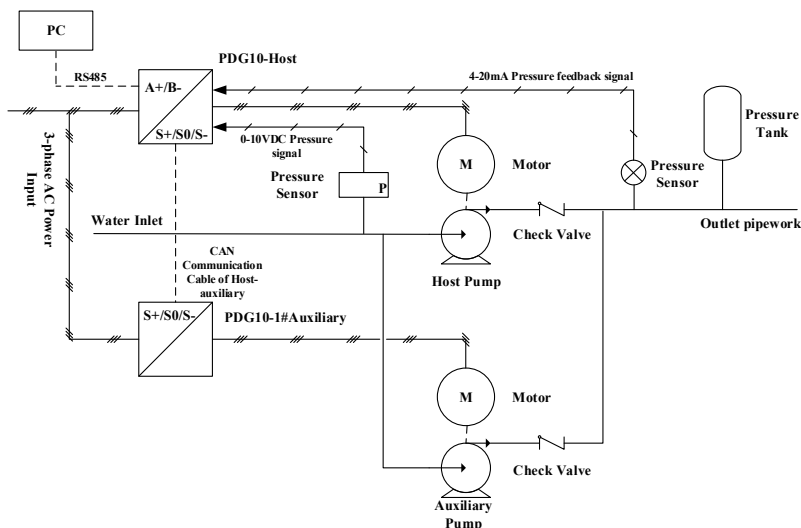


Figure 7-3-1 online system control diagram

7.4 Two driven by one control case

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, F2.00 or F2.01 according to the pressure sensor type.

The timing alternate control logic of one VFD drive two pumps mode:

1. Refer to the circuit diagram below, then turn on the power.
2. Setting parameters: F0.20=7, F1.08=1.
3. When manual control is selected, the MCB2 switch is turned on, then the SB1 button is turned on, and the pump starts running at power frequency.

4. When selecting automatic control, turn on MCB1 switch and MCB2.

When the VFD is powered on, the T1A/T1B (11-400kW: T1A/T1C) relay acts to make the AC contactor of KM2 energized. At this time, the DI1 terminal and COM terminal are turned on, and the VFD starts running. This M1 pump is a variable frequency pump. When the pressure is insufficient, if the feedback pressure is less than the adding pump pressure (F0.00-F1.09) after the VFD accelerates to the upper limit frequency, the VFD will stop and T2A/T2B relay acts to make the M2 pump power frequency operation after a delay of F1.10. After the delay of F1.15, the VFD runs, and the M1 pump frequency conversion work.

After alternating time of F1.05, all pump stop. At this time, the T2A/T2B relay acts to make the AC contactor of KM4 energized and the M2 pump operates in variable frequency. When the pressure is insufficient, if the feedback pressure is less than the adding pump pressure (F0.00-F1.09) after the VFD accelerates to the upper limit frequency, the VFD will stop and T1A/T1B (11-400kW: T1A/T1C) relay acts to make the M1 pump power frequency operation after a delay of F1.10. After the delay of F1.15, the VFD runs, and the M2 pump frequency conversion work.

When the two pumps are running, if the feedback pressure is large, the VFD will decelerate to the PID standby hold frequency of F3.12. After the delay of F1.13, the power frequency pump stops. When the feedback pressure is greater than the pressure of the water pump (F0.00+F1.11), the power frequency pump is stopped after a delay of F1.12. When the feedback pressure is greater than limit pressure (F0.00+F1.14), immediately stop the power frequency pump.

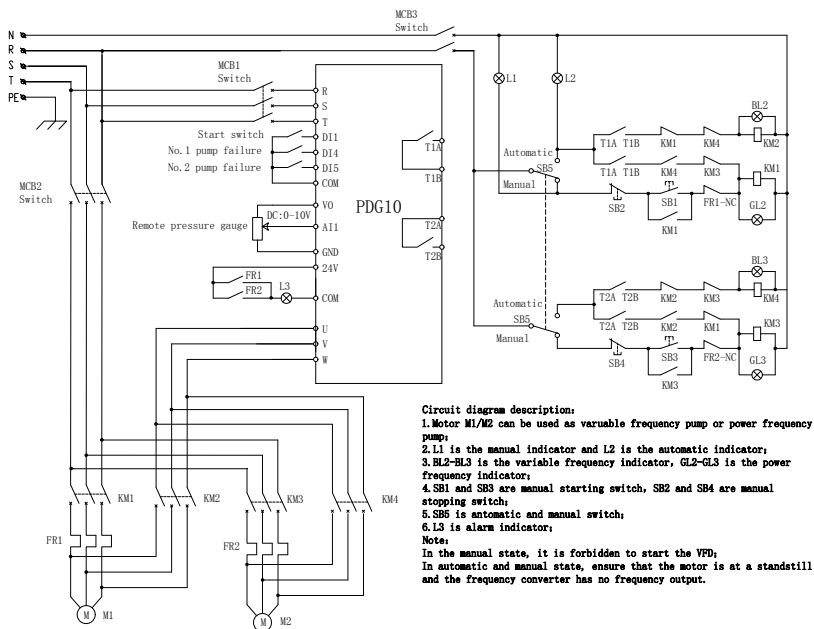


Figure 7-4-1 0.75-7.5kW circuit diagram

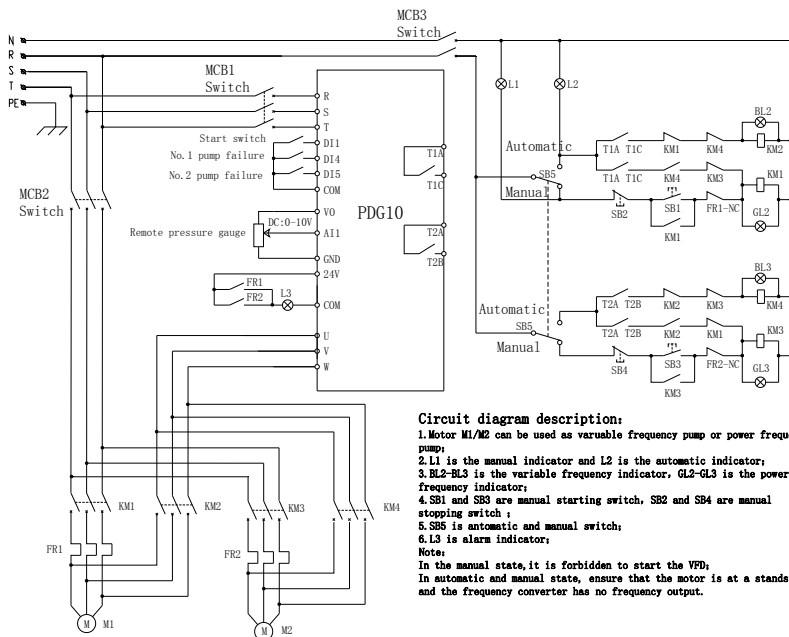


Figure 7-4-2 11-400kW circuit diagram

