



SWP-B-series

Intelligent Inverter of Water Pump

Operation Instructions



Zhejiang Saikong Electrical Technology Co., Ltd.

Address: #22 Liujiang Avenue, Liushi Town, Yueqing City,
Zhejiang Province, China

Nationwide hotline: +86 0577 61768877

<http://safeinvert.com/us/>

Zhejiang Saikong Electrical Technology Co., Ltd.



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Preface

Thank you for selecting our SWP-B-series intelligent inverter of water pump! And our company will serve you wholeheartedly.

Before installing, debugging and using the inverter, for your personal safety and prolonging of the service life, please read the safety specification and warnings as well as the warning labels on the equipment. During operation, please pay attention to the mechanical condition of drive and all the safety related notifications.

Operation attentions	 Danger
	Since the equipment has dangerous voltage, the operation not conforming to warning or violating the manual may lead to life hazard and physical injury. Only relevant professionals can operate the equipment after getting familiar with safety attentions and installation operation of the manual.
	The power must be shut down when conducting the wiring and inspection, etc. Before the charge indicator light on print circuit board of the machine is off or within 5 minutes after the keyboard indicator has been off, do not contact circuit board or any other components inside the machine. Use the instrument to ensure that the capacity inside the machine is discharged completely before conducting operation, otherwise there is a risk of electric shock.
	Never connect AC power to output terminal U, V and W of inverter. During operation, grounding terminal of inverter shall have correct and reliable grounding based on IEC electrical safety regulation or other similar standards.
	 Warning
	Unauthorized change of wiring in the machine and usage of accessories being sold or recommended by illegal vender may lead to fire, electric shock and physical injury.
	Since static electricity on human body will damage static electricity sensitive device such as internal MOSFET badly, please never touch internal components such as printed circuit board and IGBT module by hand without taking electrostatic prevention measures; otherwise, it may lead to fault.
	Please ensure all labels or identifications are clear and legible and replace lost or abraded labels at any time.
	Please place the instructions to an accessible place nearby the inverter and hand them to all users to read.

Our company reserves the rights to modify the manual without advance notice. Please contact us or our agent in time for any query of question. And your suggestion on improvement is welcomed.

I. Purchase inspection

1. Please inspect whether product package is damaged by careless transportation before unpacking.
2. Inspect whether specification and model of product conform to the purchased machine.
3. SWP-B-series intelligent inverter of water pump has undergone strict test and quality inspection before its delivery. Please inspect whether it has certificate and product operation manual.
4. Inspect whether interior of the machine has any damage. If there is any obvious damage, please do not operate and use it and please contact our company or distributor to avoid accident.

II. Model and its definition

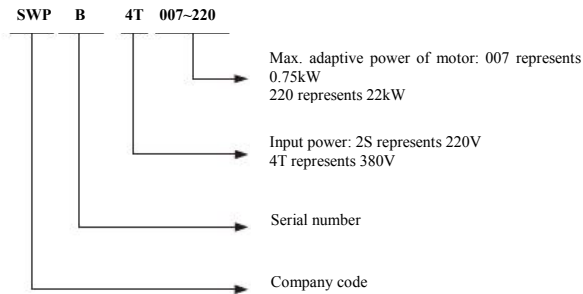


Figure 2-1 Description of Inverter model

III. Installation size of inverter (unit: mm)

1. Diagram of size indication mode

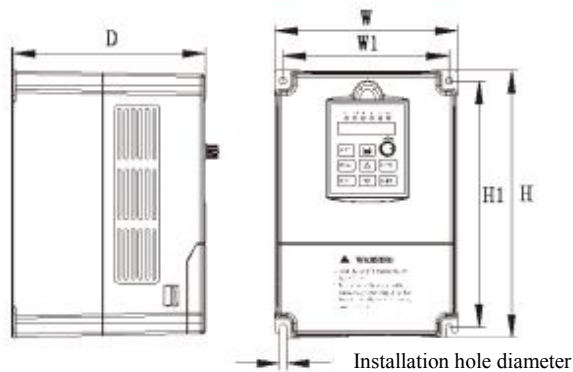


Diagram (1) of size indication mode

2. Size table of molded case with 220V

Inverter model	Output power (KW)	W	W1	H	H1	D	Installation hole diameter
SWP-B-2S004	0.4	189	178.5	122	105	130	Φ4.5
SWP-B-2S007	0.75						
SWP-B-2S015	1.5						
SWP-B-2S022	2.2						

3. Size table of molded case with 380V

Inverter model	Output power (KW)	W	W1	H	H1	D	Installation hole diameter
SWP-B-4T004	0.4	126	111	170	157	165	Φ4.5
SWP-B-4T007	0.75						
SWP-B-4T015	1.5						
SWP-B-4T022	2.2						
SWP-B-4T040	4.0	152	137	220	208	180	Φ5
SWP-B-4T055	5.5						
SWP-B-4T075	7.5	217	205	300	286	237	Φ6.5
SWP-B-4T110	11						
SWP-B-4T150	15						

4. Size table of iron case with 380V

Inverter model	Output power (KW)	W	W1	H	H1	D	Installation hole diameter
SWP-B-4T185	18.5	250	180	440	420	250	Φ6.5
SWP-B-4T220	22						

IV. Basic wiring diagram of inverter

The following diagrams include two parts: main and control loops

1. 220V basic wiring diagram

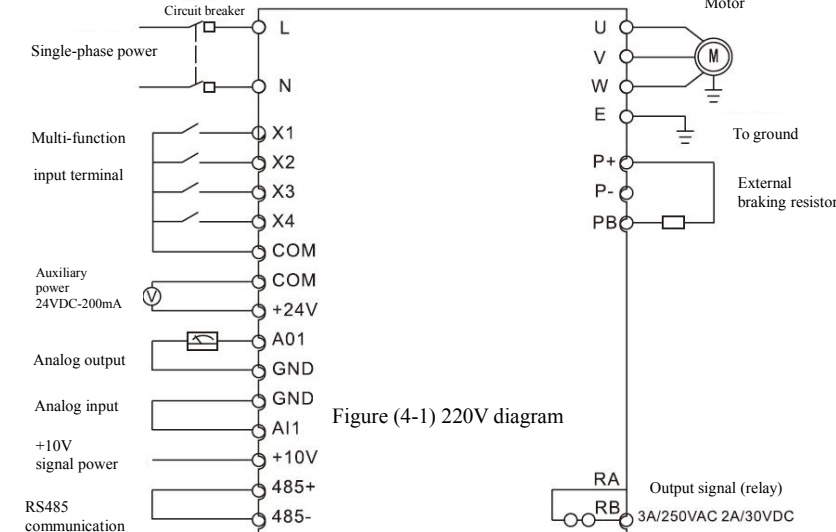


Figure (4-1) 220V diagram

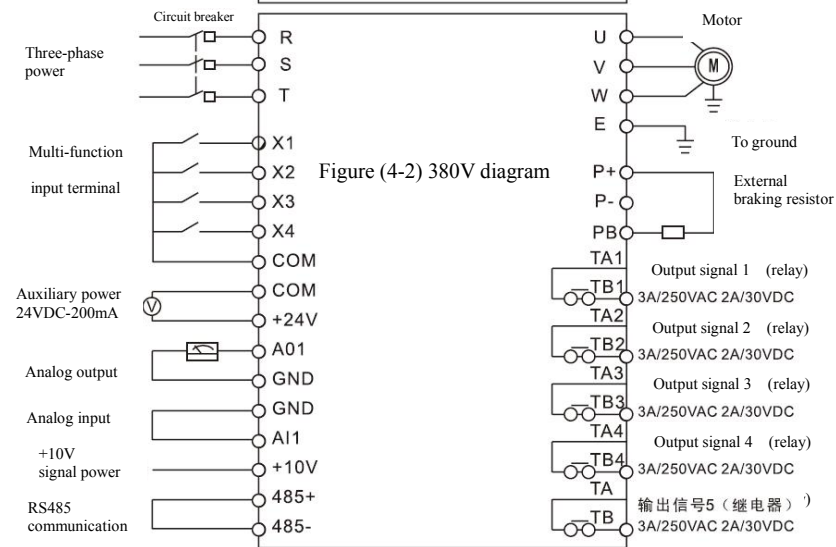


Figure (4-2) 380V diagram

V. Control terminal instructions

1. 220V-series control terminal

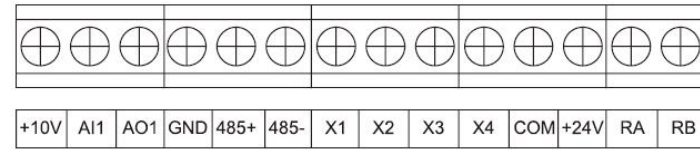


Figure 5-1 Wiring of control loop terminal

2. 380V-series control terminal

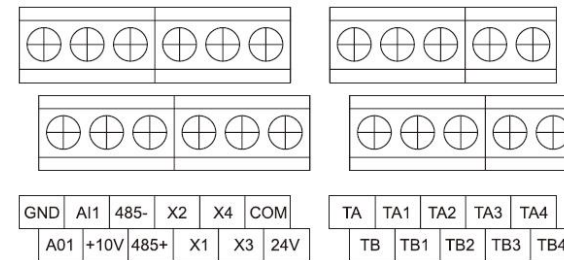


Figure 5-2 Wiring of control loop terminal

To reduce interference and attenuation of control signal, length of control signal wiring shall be limited within 60cm and at least 30cm away from power cable. Besides, control cable shall be prevented from paralleling to power cable as far as possible. When connecting analog input and output signals, please use shielded-twisted pair. Specific functions of terminal are shown in the following table:

Type	Terminal No.	Function instructions	Specification
Multi-function digital input terminal	X1	Valid in case of jump between X1 and COM; its function parameter is set as F2.06 (common port: COM)	INPUT, 0~24V electrical level signal, low electrical level valid, 5mA
	X2	Valid in case of jump between X1 and COM; its function parameter is set as F2.07 (common port: COM)	
	X3	Valid in case of jump between X1 and COM; its function parameter is set as F2.08 (common port: COM)	
	X4	Valid in case of jump between X1 and COM; its function parameter is set as F2.09 (common port: COM)	

Type	Terminal No.	Function instructions	Specification
Output terminal of relay	TA, TB (RA, RB)	Programmable definition is multi-functional relay output terminal and up to 10 types. See details in function introduction of output terminal in F2.10 and F2.14.	TA-TB: normally open. Contact capacity: 250VAC/2A (COS=1); 250VAC/1A (COS=0.4), 30VDC/1A
	TA1, TB1		
	TA2, TB2		
	TA3, TB3		
	TA4, TB4		
Analog input and output terminals	AI1	Receive voltage/current input; voltage and current are switched by jumper JP2 (AI1 dial switch); factory default is to input current. To input voltage, just turn JP2 dial switch to the other end. Range set refers to function code F2.00~F2.02 (Reference ground: GND)	INPUT, input voltage range: 0~10V (input impedance: 100K Ω), input current range: 0~20mA (input impedance: 500 Ω).
	AO1	Provide analog voltage/current quantity output; capable of indicating 3 physical quantities; output voltage and current are switched by JP1 (AO1 dial switch); factory default is to output voltage, corresponding to output frequency (before slip compensation); to input current, just turn Jp1 dial switch to the other end. See details in instructions of function code F2.04 and F2.05. (Reference ground: GND)	OUTPUT, 0~10V DC voltage. AO1 and terminal output voltage is PWM wave form from central processing unit. Output voltage is in proportion to width of PWM wave form.
Power interface	+24V	24V is common power supply of circuit of digital signal input terminal	Maximum output current 200mA
	+10V	10V is common power supply of circuit of analog input and output terminal	Maximum output current 200mA
	COM	Digital signal and +24V power reference ground	Interior is isolated from GND
	GND	Analog signal and +10V power reference ground	Interior is isolated from COM
Communication interface	485+	RS485 signal + end	Standard RS485 communication interface, not isolating from GND; please use twisted pair or
	485-	RS485 signal - end	

shielded wire.

VI. Technical indicators of product

Item name	Instructions	
Control mode	SPWM	
Input voltage	220:220V \pm 15%; 380:380V \pm 15%.	
Output voltage	0-output voltage	
4-bit digital display and status indicator	Display frequency, current, set pressure, feedback pressure, clockwise and anticlockwise rotation status, fault, etc.	
Communication control	RS-485	
Operation temperature	-10~40 $^{\circ}$ C	
Humidity	0-95% relative humidity	
Vibration	<0.5g	
Protection grade	220V: IP54/380V: IP20	
Cooling mode	Air-cooled, with fan control	
Frequency control	Range	0.1-2000.0Hz
	Set frequency	Digital mode: 0.1Hz; analog mode: 1% maximum frequency
	Output frequency	0.1Hz
	Keyboard set mode	Directly set by \blacktriangle \blacktriangledown
	Analogue set mode	External analog signal 0-10V, 4-20mA
Other functions	Lower limit of frequency, start frequency, stop frequency and three jump frequencies can be set separately.	
Protection function	Overload	Constant torsion (150%) 1 minute Fan type (120%) 1 minute
	Under-voltage	220V: DC voltage < 220V 380V: DC voltage < 400V
	Over-voltage	220V: DC voltage < 400V 380V: DC voltage < 800V
	Restart after instantaneous stop	Capable of restarting frequency tracking way after instantaneous stop
	Stall prevention	Stall prevention during acceleration/deceleration operation
Short circuit at output end	Electronic circuit protection	
Other functions	Temperature protection, anticlockwise rotation limit, direct start after switching on, fault reset, parameter lock PID, one inverter for several motors, etc.	

VII. Machine model of inverter series

Inverter model	Input voltage	Rated output power (kW)	Rated output current (A)	Adaptive motor
SWP-B-2S004	Single-phase 220V ±15%	0.4	2.4	0.4
SWP-B-2S007		0.75	4.5	0.75
SWP-B-2S015		1.5	7.0	1.5
SWP-B-2S022		2.2	10	2.2
SWP-B-4T004	Three-phase 380V ±15%	0.4	1.2	0.4
SWP-B-4T007		0.75	2.5	0.75
SWP-B-4T015		1.5	3.7	1.5
SWP-B-4T022		2.2	5	2.2
SWP-B-4T040		4.0	9	4.0
SWP-B-4T055		5.5	13	5.5
SWP-B-4T075		7.5	17	7.5
SWP-B-4T110		11	25	11.0
SWP-B-4T150		15.0	32	15.0
SWP-B-4T185		18.5	37	18.5
SWP-B-4T220		22	45	22

VIII. Keyboard instructions

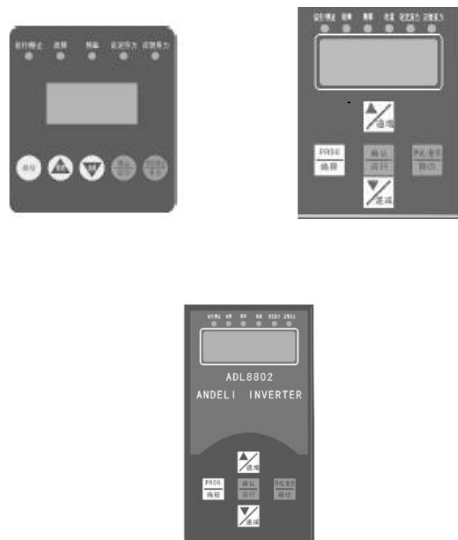


Figure 8-1 Keyboard diagram

As shown in Figure 8-1, top LED indicators are Run/Stop, Fault, Output frequency, Output current, Set pressure and Feedback pressure indication from the left to the right. About Run/Stop indicator, it is normally on during inverter operation, is normally off when inverter stops and flashes during inverter standby. About fault indicator, it flashes in case of inverter fault; otherwise, it is normally off. Bottom keys are Programming (FROG), Increase (▲) and Decrease (▼), Set/Run (SET/RUN) and Stop/Reset/Shift (STOP/RST/>>>). FROG is used to realize switching among three interfaces or return from secondary menu to primary menu. Increase and Decrease keys are used to realize progressive increase and decrease of menu or parameter. SET/RUN key is Run key under monitor interface and Set key under other interfaces; Set key is used to realize enter/exit secondary menu and read/save parameter simultaneously. Under monitor interface, Stop/Reset/Shift key is Stop key during inverter operation and Reset key when inverter stops; under other interfaces, it is Shift key being used to shift among 4-bit segment display during programming.

As shown in Figure 8-2, there are monitor interface, function parameter interface and monitor parameter interface on the left from the top down, among which the last two have secondary menus as shown in the right part of the figure.

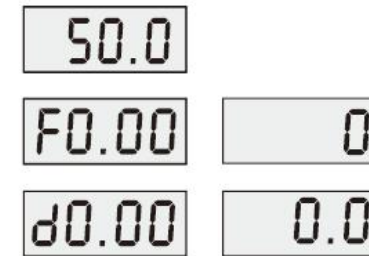


Figure 8-2 Menu diagram

IX. Function parameter table

Parameter table of intelligent inverter of water pump					
○: Modifiable parameter under any status X: Un-modifiable parameter under operation status					
◆: Actual detection parameter, unable to be modified					
◇: Manufacturer parameter, able to be modified by manufacturer only instead of by a user.					
F0 Group System management parameter					
Function code	Name	Set range	Minimum unit	Factory set	Modify
F0.00	Run monitor object selection	0000~DDDD each bit selects one monitor object	1	BA10	○
F0.01	Stop monitor object selection	separately (0~D correspond to d-00~d-13)	1	DBA3	○
F0.02	Write protect of parameter	0: write-protect is closed 1: all parameters (exclude F0.00~F0.02) are prohibited to be modified	1	0	○
F0.03	Parameter initialization	0: no operation 1: reset all parameters to factory defaults 2: eliminate fault records	1	0	X
F0.04	Function selection of STOP key on panel	0: invalid only to terminal control 1: invalid only to communication control	1	3	X

		2: all valid 3: all valid			
F0.05	Accumulative operation time	0.0~999.9h	0.1h	0.0	◆
F0.06	Inverter power specification	0.10~655.35KW	0.01KW	Set of machine model	◆
F0.07	Software version of main controller	1.00~99.99	0.01	1.00	◆
F1 Group Basic operation parameter					
Function code	Name	Set range	Minimum unit	Factory set	Modify
F1.00	Rated voltage of motor	100~250V/200~500V	1V	220/380	X
F1.01	Rated current of motor	0.1~6553.5A	0.1A	Machine model set	X
F1.02	Rated frequency of motor	1.0Hz~2000.0Hz	0.1Hz	50.0	X

F1 Group Basic operation parameter					
Function code	Name	Set range	Minimum unit	Factory set	Modify
F1.03	Run command channel	0: panel runs command channel 1: terminal runs command channel 2: communication runs command channel	1	0	X
F1.04	Frequency source selection	0: F1.04 digital set UP/DOWN key regulation 1: communication set 2: AI analog input 3: PID regulation	1	3	X
F1.05	Operation frequency	0.0~upper limit frequency	0.1Hz	0.0	○
F1.06	Upper limit frequency	Lower limit frequency~2000.0Hz	0.1Hz	50.0	X
F1.07	Lower limit frequency	0.1~upper limit frequency	0.1Hz	35.0	X
F1.08	Running direction	0: clockwise rotation 1: anticlockwise rotation	1	0	X
F1.09	Acceleration time 1	0.1~3600.0s	0.1S	Set of machine model	○
F1.10	Deceleration time 1				○
F1.11	Acceleration time 2	0.1~3600.0s	0.1S	Set of machine model	○

F1.12	Deceleration time 2		0.1S	Set of machine model	○
F1.13	Carrier frequency	1.0~12.0KHz	0.1 KHz	Set of machine model	○
F1.14	Sensor range	0.01~200.00Bar	0.01 Bar	10.00	X
F1.15	PID digital set	0.00~sensor range, UP/DOWN key regulation	0.01 Bar	2.00	○
F1.16	PID proportional gain	0.01~5.00	0.01	1.00	○
F1.17	PID integration time	0.0: no integration effect 0.1~50.0s	0.1s	1.0	○
F1.18	PID differential time	0.0: no differential effect 0.1~50.0s	0.1s	0.0	○
F1.19	PID sampling time	0.0: automatic, 0.1~10.0s	0.1s	0.0	○
F1.20	PID deviation limit	0.0~30.0% (sensor range)	0.1%	0.0	X
F1.21	Standby sleep selection	0: select internal standby signal 1: select external standby signal 2: automatic	1	2	X

F1 Group Basic operation parameters					
Function code	Name	Setting range	Min. unit	Factory settings	Modification
F1.22	Sleep detection frequency	Lower limit frequency ~ upper limit frequency	0.1Hz	35.0	○
F1.23	Sleep detection time	0.1-100.0s	0.1s	2.0	○
F1.24	Awake detection pressure	0.1-100% (set pressure)	0.1%	90.0	○
F1.25	Awake detection time	0.1-100.0s	0.1s	1.0	○
F1.26	Quick awake function	0: invalid 1: valid	1	1	X
F1.27	Threshold value of pressure change ratio	0.1-100.0%/s	0.1%/s	5.0	○
F1.28	Quantity of auxiliary pump	0-11	1	0	X
F1.29	Start frequency of auxiliary pump	Stop frequency of auxiliary pump ~ upper limit frequency	0.1Hz	50.0	○
F1.30	Start delay of auxiliary pump	1-6000s	1s	5	○
F1.31	Stop frequency of auxiliary pump	Sleep detection frequency ~ start frequency of auxiliary pump	0.1Hz	38.0	○
F1.32	Stop delay of auxiliary pump	1-6000s	1s	5	○
F1.33	Interval time of auto switch	0.0: auto switch over pump function is invalid 0.1-48.0h	0.1h	24.0	X
F1.34	Rated rotation speed of motor	1-60000RPM	1RPM	1440	X

F2 Group Auxiliary parameter					
F2.00	AI input type	0: 0-10V 1: 4-20mA	1	1	X
F2.01	AI lower limit voltage	0.01~AI upper limit voltage	0.01V	2.00	○
F2.02	AI upper limit voltage	AI lower limit voltage-10.00V	0.01V	10.00	○
F2.03	AO output function	0: output frequency 1: set frequency 2: output current 3: AI input	1	0	X
F2.04	AO output type	0: 0-10V 1: 4-20mA	1	0	X
F2.05	AO output gain	0.0-100.0%	0.1%	100.0	○
F2.06	Function of input terminal X1	0: terminal inactivity 1: run/stop control 2: water shortage detection	1	1	X
F2.07	Function of input terminal X2	3: low water level/negative pressure detect	1	2	X
F2.08	Function of input terminal X3	4: external sleep signal 5: external reset signal	1	3	X
F2.09	Function of input terminal X4		1	4	X

F2 Group Auxiliary parameter					
Function code	Name	Set range	Min. unit	Factory settings	Modification
F2.10	Function of multiple-function output terminals TA1,TB1	0: terminal inactivity 1: running indication 2: frequency convertor fault	1	0	X
F2.11	Function of multiple-function output terminals TA2,TB2	3:feedback breakage 4:reach the lower limit frequency 5: reach the upper limit frequency	1	0	X
F2.12	Function of multiple-function output terminals TA3,TB3	6: general pump 1 controls 7: general pump 2 controls		0	X
F2.13	Function of multiple-function output terminals TA4,TB4	8: general pump 3 controls 9: general pump 4 controls	1	1	X
F2.14	Function of multiple-function output terminals TA,TB	10: general pump 5 controls	1	2	X
F2.15	Pressure threshold value of feedback breakage	0.0-sensor measurement range	0.01Bar	1.0	X
F2.16	Testing time of feedback breakage pressure	1.0-100.0s	0.1s	10.0	○
F2.17	Threshold value of high-pressure protection at water outlet	Water outlet low pressure protective threshold value-sensor measurement range	0.01Bar	80.0	X

F2.18	Threshold value of low-pressure protection at water outlet	threshold value of feedback break pressure - threshold value of high pressure protection at water outlet	0.01Bar	5.0	X
F2.19	Testing time of high and low pressure at water outlet	0.0: not test, 0.1-260.0s	0.1s	1.0	○
F2.20	Testing time of water shortage	0.0: not test, 0.1-260.0s	0.1s	3.0	○
F2.21	Test method of low water level/negative pressure at water inlet	0: normally open input, closing is valid 1:normally closed input, disconnecting is valid	1	0	X
F2.22	Protection time of low water level/negative pressure at water inlet	0.0: not protective, 0.1-260.0s	0.1s	1.0	○
F2.23	Recover time of low water level/negative pressure at water inlet	0.0: not recover, 0.1-260.0s	0.1s	1.0	○
F2.24	Interval of anti-freeze protection action	0: no action 1-1000min	1min	0	○
F2.25	Frequency of anti-freeze protection action	0.0-lower limit frequency	0.1Hz	30.0	○
F2.26	Time of anti-freeze protection action	1-60000s	1s	10.	○
F2.27	Machine address	0-11	1	0	X
F2.28	Communication baud rate	0: 4800bps, 1: 9600bps 2;19200bps	1	1	○

		3:38400bps			
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F2 Group Auxiliary parameter					
Function code	Name	Setting range	Min. unit	Factory settings	Modification
F2.29	Communication check method	0: Without check 1: even-parity check 2:odd parity check	1	0	○
F2.30	Test time of communication breakage	0-100s	1s	0	○
F2.31	Terminal runs automatically after electrifying	0:forbidden 1: enable	1	1	X
F3.32	Reserved			0	◇
F2.33	Reserved			0	◇

X Parameter instruction

F0 System management parameter

F0.00	Run monitoring objective selection	
	0000-DDDD	Ba10
F0.01	Stop monitoring objective selection	
	0000-DDDD	DBA3

Through changing the set value of above function codes, the monitoring items in the main monitoring interface under running (stop) status can be changed. Each item chooses one monitoring objective (0-D corresponds to d-00- d-13).

F0.02	Write protect of parameter	
	0-1	0

0: Write protect is off.

1: Apart from F0.00-F0.02, the other parameters are not allowed to be modified.

This function could prevent other persons from changing the parameter settings. When released from the factory, this function code is set to be 0, which generally allows changing all parameters. After finishing the modification of the parameter, if it's necessary to protect the parameter, function code can be set as 1.

F0.03	Parameter initialization	
	0-2	0

0: without operations

The inverter is at the normal parameter reading and writing status. Whether the set value of function code can be changed or not is related to the setting status of user password and current operation status of inverter.

1: all parameters recover to factory settings; all user parameters recover to the factory settings of machine type.

2: eliminate fault records

Conduct the eliminating operation of all the fault records (D-14~D-21).

F0.04	STOP/RESET stop function selection	
	0-3	3

0: only invalid for the terminal control

Only when F1.01=1, this button is invalid: under running mode of operation panel and communication control, this button can control the inverter to be stopped.

1: only invalid for communication operation

Only when F1.01=2, this button is invalid: under running mode of operation panel and communication control, this button can control the inverter to be stopped.

2: invalid for all

Only when F1.01=0, this button can control the inverter to be stopped; under running mode of operation panel and communication control, this button is invalid.

3: valid for all

At any running command channel mode, this button could control the inverter to be stopped.

F0.05	Accumulative operation time	
	0-999.9h	0.0
F0.06	Power specification of inverter	
	0.10-655.35kw	Machine type set
F0.07	Software version of main controller	
	1.00-99.99	1.00

The above function codes are used for indicating related information of inverter and can only be read without any change.

F1 Basic operation parameter

F1.00	Rated voltage of motor	
	100-250V/200-500V	220/380
F1.01	Rated current of motor	
	0.1-6553.5A	Machine type set
F1.02	Rated frequency of motor	
	1.0-2000.0Hz	50.0Hz

The above function codes must be set according to the label parameters of motor. Equip proper motor for the inverter based on its power, if the power difference is too large, then

the control performance of inverter would be reduced.

F1.03	Selection of running command channel	
	0-2	0

0: Running command channel on operation panel

Controlled by the RUN button on the operation panel.

1: Terminal running command channel

Need to choose the X terminal function to be “running/stop control”, operate after being connected and stop after disconnection. If it is stopped by other means, the terminal needs to be reconnected to the inverter to rework after it is disconnected.

2: Communication running command channel

Controlled by the upstream machine through communication method.

F1.04	Frequency source selection	
	0-3	3

This function code is used for choosing the setting way of frequency of inverter.

0: F1.04 number setting, adjust with up/down button .

The running frequency is generated by the sum of the F1.04 setting value and increasing volume of panel frequency. The latter could be used for operating up/down button on panel to adjust and automatically save when the power is off. This increased volume can be returned to zero by recovering the factory value of [F0.03].

1: communication setting

Change set frequency through frequency set command of serial port, see F2.23~F2.25 communication parameter for details.

2: AI analog input

Frequency setting is defined by the analog voltage/current of AI terminal and the input range 0-10V/4-20mA. Related setting refers to definition in function code F2.00-F2.02.

3: PID adjustment

This frequency setting method is process PID control. The running frequency of inverter is frequency value after PID action. Specific settings refer to parameter F1.15~f1.27.

F1.05	Running frequency	
	0.0-upper limit of frequency	0.0

When given channel of frequency is number settings, F1.05 is the initial value of number settings of frequency of inverter.

F1.06	Upper limit frequency	
	Lower limit frequency~2000.0Hz	50.0
F1.07	Lower limit frequency	
	0.1Hz~ Upper limit frequency	35.0

Upper limit frequency is the maximum frequency allowed by inverter to output. It is the benchmark of setting acceleration and deceleration, as shown by fH in below figure. Basic running frequency is the corresponding min. frequency when inverter outputs the max voltage, which is generally rated frequency of motor as shown by fb in the following figure. The max. output voltage Vmax is corresponding output voltage when inverter outputs basic running

frequency of the frequency converter, which is generally rated voltage of motor as shown by Vmax in the following figure. fL is the lower limit frequency as shown in figure F1-1.

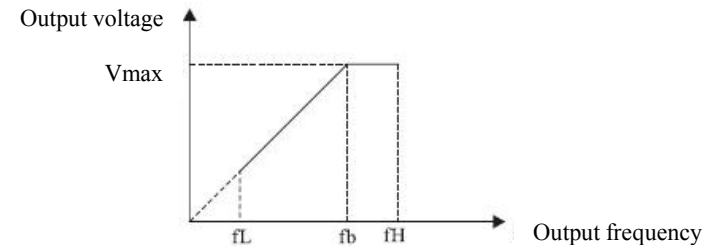


Fig. 1-1 Schematic diagram of voltage and frequency

F1.08	Setting of running direction	
	0-1	0

0: Direct rotation

Actual running direction is same as system direction by default.

1: Reverse rotation

When choosing this method, the actual output phase sequence is opposite to the system phase sequence by default.

Note: the setting of function code is valid to control running directions of all running command channels.

F1.09	Acceleration time 1	
	0.1-3600.0s	Set of machine type

The time for inverter to accelerate from 0Hz to lower limit frequency when it starts or awakens.

F1.10	Deceleration time1	
	0.1-3600.0s	Set of machine type

The time for inverter to decelerate from lower limit frequency to when it stops or alarms.

F1.11	Acceleration time 2	
	0.1-3600.0s	Set of machine type

The time for inverter to accelerate from lower limit frequency to upper limit frequency when it works normally.

F1.12	Deceleration time2	
	0.1-3600.0s	Set of machine type

The time for inverter to decelerate from upper limit frequency to lower limit frequency when it works normally.

F1.13	Carrier frequency	
	1.0-12.0KHz	Set of machine type

Power (kw)	Carrier (KHz)	Frequency (KHz)
0.4-4.0	7.0	1.0-12.0
5.5-30	5.5	1.0-12.0
37-132	4.0	1.0-8.0
160-630	2.5	1.0-8.0

This function code is used for setting carrier frequency of PMW wave output by inverter. Carrier frequency would affect the noise when motor runs. For the occasions requiring silence for operation, carrier frequency can be properly increased to meet requirements. However, the increasing of carrier frequency will increase the heat of inverter, and the electromagnetic interference to outside environment also enlarges.

If carrier frequency exceeds factory setting, the inverter needs to be derated for use. Generally, the carrier increases by 1 KHz, the inverter needs to be derated by almost 5%.

F1.14	Sensor measurement range	
	0.01-200.00 Bar	10.00
F1.15	PID number setting	
	0.0-sensor measurement range	2.00

When using the analog feedback, the function code could set the given value of enclosed circulation control through operation panel. This value is percentage being relative to the sensor measurement range (F1.14): f1.04=3, this function is valid.

F1.16	PID proportional gain	
	0.01-5.00	1.00
F1.17	PID integration time	
	0.0-50.0s	1.0
F1.18	PID differential time	
	0.0: no PID 0.1-10.0s	0.0

Proportional gain (P)

It decides the adjustment strength of whole PID adjustor. The larger the P, the larger the adjustment strength. If it's too larger, it is easy to produce vibration.

When there is deviation between feedback and given value, output is adjusted in proportion to deviation. If deviation is constant, the adjustment is constant. Proportional adjustment can quickly respond to the feedback changes, but proportional adjustment can't be purely used for no deviation control. The larger the proportional gain, the quicker the adjustment speed of system. If proportional gain is too large, vibration will occur. If the offset is on the changing direction of given value (e.g. increase given value, feedback value is always smaller than given value after system stabilizes), continue increasing proportional gain; otherwise, reduce proportional gain. Repeat above process until offset is small (it's difficult to eliminate offset).

Integration time (Ti)

It decides the adjustment speed of integration of deviation by PID adjustor.

When there is deviation between feedback and given value, output adjustment value continues increasing. If deviation keeps existing, the adjustment value will continue increasing until there is no deviation. Integration adjustor can effectively eliminate offset. If integration adjustor is too strong, over-adjustment will occur repeatedly, which produces vibration of

system. In general, adjustment of integration time parameter is from big to small. Gradually

adjust the integration time and observe the system adjustment effect until the speed of system stabilization meets requirements.

Differential time(Td)

It decides the adjustment strength of change rate of deviation by PID adjustor.

When the deviation between feedback and given value changes, it outputs adjustment value with proportion to change rate of deviation. This adjustment value only relates to the direction and size of deviation change, but it is not related to the direction and size of the deviation itself. The function of differential adjustment is that when the feedback signal changes, adjust according to changing trend, so as to restrict the change of feedback signals. Use differential adjustor with attention, because it easily enlarges the system interference, especially the interference with large changing frequency.

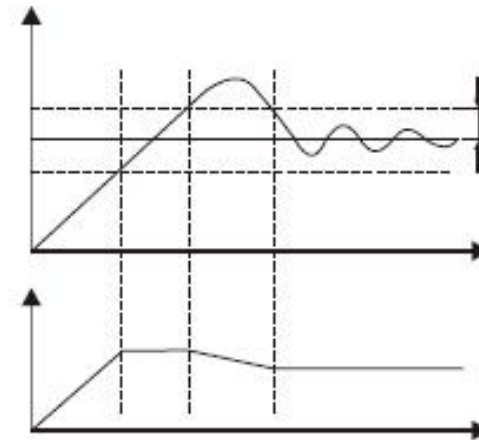
F1.19	PID sampling time	
	0.0-10.0s	0.0

0.0: Auto sampling mode

Sampling period is feedback sampling period. The adjustor calculates once during each sampling period. The longer the sampling period, the slower the response, but the restriction on the interference is better. Generally, it does not need to be set.

F1.20	PID deviation limit	
	0.0-30.0%	0.0%

The deviation limit is the ratio between absolute value and given value of deviation between feedback value and given value of system. When feedback value is within scope of deviation limit, PID regulation takes no actions as shown in the below figure. Setting a reasonable deviation limit prevents system adjusting too often around the target value, and helps to increase the system stability.



This function code is used for setting carrier frequency of PMW wave output by inverter. Carrier frequency would affect the noise when motor runs. For the occasions requiring silence for operation, carrier frequency can be properly increased to meet requirements. However, the increasing of carrier frequency will increase the heat of inverter, and the electromagnetic interference to outside environment also enlarges. If carrier frequency exceeds factory setting, the inverter needs to be derated for use. Generally, the carrier increases by 1 KHz, the inverter needs to be derated by almost 5%.

F1.21	0-2	
	Sleep signal selection	2

0: Choose internal sleep signal

When the following four conditions are met and the continuing time is longer than sleep testing time, the inverter enters into sleep mode.

- ① Feedback pressure is bigger than set pressure.
- ② Output frequency of (main pump) is equals to or smaller than sleep testing frequency.
- ③ All the auxiliary pumps are stopped (only for the multiple pumps mode)
- ④ Control relay of power frequency pump is disconnected

1: Choose external sleep signal

Choose function of X terminal to be “external sleep” and connects with COM terminal for 1s, the inverter enters into sleep status.

2: Automatic

Test the above two signals at the same time. If either one meets sleep requirement, the inverter enters into sleep status.

F1.22	Sleep detection frequency	
	Lower limit – upper limit	35.0
F1.23	Sleeping detection time	
	0.1-100.0s	2.0

See details in F1.20 parameter description.

F 1.24	Awake detection pressure	
	0.1-100.0%	90.0
F1.25	Awake detection time	
	0.0-10.0s	1.0

When the feedback pressure is smaller (set pressure x awaking detection pressure/100.0) and the duration time is longer than awaking detection time, the inverter awakes instantly.

F1.26	Quick awake function	
	0-1	1

0: invalid

1: valid

F1.25=1, the function code F1.26 is valid.

F1.27	Threshold value of pressure change ratio	
	0.1-100/0%/s	1.0

If the feedback pressure is smaller than set pressure and the change is bigger than the threshold value of pressure change ratio within 1s, the inverter would awake instantly, which is quick awaking function. This function is used for automatically identifying water leakage and water application. It is set based on application environment to avoid the case that it can't awake

quickly when starting and stopping water frequently due to water leakage.

F1.28	Quantity of auxiliary pump	
	Quantity of auxiliary pump is 0, it is single pump mode. If it's not 0, it is multiple pumps mode.	
F1.29	Start frequency of auxiliary pump	
	Auxiliary pump stop frequency—upper frequency limit	50.0
F1.30	Start delay of auxiliary pump	
	1-6000s	5

When meeting below two conditions and duration time exceeded start delay of auxiliary pump, add pumps.

- ① Feedback pressure is smaller than set pressure
- ② Output frequency is bigger than or equals to start frequency of auxiliary pump.

Sequence of adding pump: start auxiliary pump according to increasing sequence. For example, if function of switching over pump is invalid, firstly start #1 auxiliary pump, then #2 auxiliary pump and so on. After starting all auxiliary pumps, if F2.10 multiple output terminal function chooses control function of power frequency pump, the control relay of power frequency pump would be close.

F1.31	Stop frequency of auxiliary pump	
	lower frequency limit - Auxiliary pump start frequency	38.0
F1.32	Stop delay of auxiliary pump	
	1-6000s	5

When meeting below two conditions and duration time exceeded stop delay of auxiliary pump, reduce pumps.

- ① Feedback pressure is bigger than set pressure
- ② Output frequency of main pump is smaller than or equals to stop frequency of auxiliary pump.

Sequence of reducing pump: if control relay of power frequency pump is close, firstly disconnect and then stop auxiliary pumps according to principle of “first start, first stop”.

F1.33	Interval time of auto switch	
	0.1-48.0h	24

In multiple pumps mode, if continuous running time of current main pump exceeds interval time of auto switch over, the main pump stops automatically and switches to auxiliary pump, and the latter auxiliary pump switches to the main pump. If it is under stop condition, it works automatically, which is automatic switch over function. If the parameter is 0, this function is invalid. Automatic switch over function can balance the operation time of water pump and prolong the service life.



- Note:**
1. When the main pump reduces speed to be zero frequency for running due to alarms, automatic switch over function suspends.
 2. When the main pump stops due to fault, automatic switch over function puts into effect immediately.
 3. Jump over the fault unit during the switchover of the pump, the switchover time is 4s.

F1.34	Rated rotation speed of motor	
	1-6000RPM	1440

F2 group Auxiliary parameters

F2.00	AI input type	
	0-1	1

0: 0-10V
1: 4-20mA

F2.01	AI lower limit voltage	
	0.00V-AI upper limit voltage	2.00
F2.02	AI upper limit voltage	
	AI lower limit voltage-10.00V	10.00

AI lower limit voltage and upper limit voltage are corresponding to 0.0% and 100.0% of feedback signal range.

F2.03	AO output function	
	0-3	0

This function code defines the corresponding relation between analog output terminal AO and each physical volume, and the details are shown in below table:

Item	AO1	Item range
Output frequency	0V/0mA~AO1 upper limit	0.00~ upper limit frequency
	2V/4mA~AO1 upper limit	0.00~ upper limit frequency
Set frequency	0V/0mA~AO1 upper limit	0.00~ set frequency
	2V/4mA~AO1 upper limit	0.00~ set frequency
Output current	0V/0mA~AO1 upper limit	0.00~ 2.0 times of rate current
	2V/4mA~AO1 upper limit	0.00~ 2.0 times of rate current
AI1	0V/0mA~AO1 upper limit	0.00~10.00V
	2V/4mA~AO1 upper limit	0.00~10.00V

F2.04	AO output type	
	0-1	0

0: 0-10V

1: 4-20mA

F2.05	AO output gain	
	0.0~100.0%	100.0

This function code defines gain coefficient of the analog output AO. When the factory value is 100%, output current range is 4, 0~20.0mA.

F2.06	Function of input terminal X1	
	0~5	1
F2.07	Function of input terminal X2	
	0~5	2
F2.08	Function of input terminal X3	
	0~5	3
F2.09	Function of input terminal X4	
	0~5	4

0: Terminal inactivity

1: Run/stop control

If short circuit between terminal and COM, inverter runs; if disconnect, it stops.

2: Water shortage detection

Detailed descriptions refer to the parameter F2.16.

- 3: Low water level /Negative pressure detection
Please refer to parameters F2.17-F2.19 for details.
- 4: External sleep signal
Please refer to parameters F1.21 for details.

F2.10	Function of multiple-function output terminals TA1,TB1	
	0-10	0
F2.11	Function of multiple-function output terminals TA2,TB2	
	0-10	0
F2.12	Function of multiple-function output terminals TA3,TB3	
	0-10	0
F2.13	Function of multiple-function output terminals TA4,TB4	
	0-10	1
F2.14	Function of multiple-function output terminals TA,TB	
	0-10	2

- 0: Terminal inactivity
1: Operation indication
2: Faults of inverter
3: Feedback disconnection
4: Arrival of lower frequency
5: Arrival of upper frequency
6: Control of power frequency pump 1
7: Control of power frequency pump 2
8: Control of power frequency pump 3
9: Control of power frequency pump 4
10: Control of power frequency pump 5

When inverter and power frequency pump are in the running status or faults happen, relay will be switched on and the parameters mentioned above output the indicating signals.

F2.15	Pressure threshold value of feedback breakage	
	0.0-50.0%	1.0%

Put the maximum value of set pressure as the upper limit value of pressure threshold value of feedback breakage. Within detection time of feedback disconnection, if the feedback pressure is continuously smaller than pressure threshold value of feedback breakage, the inverter will report "A-15".

F2.16	Testing time of feedback breakage pressure	
	1.0-100.0s	10.0

When feedback breakage happens, it's the delay time before the alarm.

F2.17	Threshold value of high-pressure protection at water outlet	
	Outlet low pressure protection threshold value- 100.0%	80.0
F2.18	Threshold value of low-pressure protection at water outlet	
	Pressure threshold value of feedback disconnection - outlet high pressure protection threshold value	5.0
F2.19	Testing time of high and low pressure at water outlet	
	0.0-260.0s	1.0

High pressure protection conditions: the high pressure protection can be realized only if the following four conditions are satisfied and duration time exceeds detection time.

- 1 Feedback pressure rises to above threshold value of high pressure protection
- 2 Output frequency (Main pump) reaches the lower limit frequency (including sleep)
- 3 All auxiliary pumps are in shutdown status (only restricted to multiple pumps mode)
- 4 Control relay of power frequency pump is in off status.

When feedback pressure decreases to below threshold value of high pressure protection and the duration time exceeds the detection time, the high pressure fault at water outlet side will be eliminated. When the threshold value of high pressure protection is 100.0%, the function of high pressure protection is invalid.

Low pressure protection conditions: the low pressure protection can be realized only if the following four conditions are satisfied and duration time exceeds detection time.

- 1 Feedback pressure reduces to below threshold value of high pressure protection
- 2 Output frequency (Main pump) reaches the upper limit frequency
- 3 All auxiliary pumps are in shutdown status (only restricted to multiple pumps mode)
- 4 Control relay of power frequency pump is in close status (only when F2.10 function selection of multi-function output terminal is control function of power frequency pump).

When feedback pressure rises to above threshold value of high pressure protection and the duration time exceeds the detection time, the low pressure fault at water outlet side will be eliminated. When the threshold value of low pressure protection is 0.0%, the function of low pressure protection is invalid.

F2.20	Testing time of water shortage	
	0.0-260.0s	1.0

When water shortage detection terminal is short-circuited and the duration time exceeds detection time of water shortage, the inverter will report "A-22". When water shortage detection terminal is disconnected and duration time exceeds the detection time, the water shortage fault can be eliminated. If the detection time of water shortage is 0.0, the water shortage detection is invalid.

F2.21	Test method of low water level/negative pressure at water inlet	
	0-1	1

0: Normally open input, closing is valid.
1: Normally close input, disconnection is valid.

F2.22	Protection time of low water level/negative pressure at water inlet	
	0.0-260.0s	1.0
F2.23	Recover time of low water level/negative pressure at water inlet	
	0.0-260.0s	1.0

When low water level/negative pressure detection terminal is short-circuited and the duration time exceeds the protection time of low water level/negative pressure, the inverter will report the fault of low water level "A-23". When the low water level/negative pressure detection terminal is disconnected and its duration time exceeds its recovery time, the fault of low water level can be eliminated.

F2.24	Interval of anti-freeze protection action	
	0-1000min	0
F2.25	Frequency of anti-freeze protection	
	0.0-upper limit frequency	30.0
F2.26	Time of anti-freeze protection	
	1-6000s	10

After the system is hibernated, inverter makes interval of anti-freeze protection action as timing cycle. When the timing cycle is over, it automatically recovers operation at the frequency of anti-freezing protection action. After time of anti-freeze protection action, it stops and retimes to protect internal pipe from being frozen. When interval of anti-freezing protection action is 0, anti-freezing protection will not take any action.

F2.27	Machine address	
	0-11	0

It means the address identification of inverter when upper computer communicates with multiple frequency inverters. When this parameter is 0, it refers to the broadcast address.

F2.28	Communication baud rate	
	0-3	0

0: 4800BPS
1: 9600BPS

2: 19200BPS
3: 38400BPS

The function codes are used to define the data transfer rate between upper computer and inverter. The baud rates set by upper computer and inverter should be consistent, or the communication can't be realized. The larger the baud rate, the faster the data communication. However, if baud rate is too large, it may affect communication stability.

F2.29	Communication check method	
	0-2	0

0: No verification
1: Even check
2: Odd check

The data format set by upper computer and inverter should be consistent; otherwise, communication can't be realized normally.

F2.30	Test time of communication breakage	
	0-100s	0

0: Forbidden
1: Enable

This function is irrelevant with running command channel. The terminal is in access status when the power is on, and inverter runs automatically. This function is invalid for the auxiliary pump under multiple pumps mode.

F2.31	Terminal runs automatically after electrifying	
	0-1	1
F2.32	Reserved	
	Reserved	0
F2.33	Reserved	
	Reserved	0

XI. Monitoring parameters

Monitoring parameters group					
Function code	Name	Setting range	Minimum unit	Factory setting	Change
d-00	Output frequency (Hz)	0.0-2000.0Hz	0.1Hz	0.0	■
d-01	Set frequency (Hz)	0.0-2000.0Hz	0.1.Hz	0.0	■
d-02	Output voltage (V)	0-500V/1000V	1V	0	■
d-03	Bus voltage (V)	0-500V/1000V	1V	0	■
d-04	Output current (A)	0.0-10.0A	0.1 A	0.0	■
d-05	Motor speed (RPM)	0-1440 RPM	1 RPM	0	■
d-06	Status of inverter	0-FFFFH BIT0: run/stop BIT1: reverse/forward BIT2-7: reservation BIT8-9: 00-zero speed/01-acceleration/10-deceleration/11-constant speed BIT10: reservation BIT11: reservation BIT12-13: run command channel: 00-panel/01-terminal/10-communication BIT14-15: status of bus voltage: 00-normal/01-low voltage	1	0	■

Monitoring parameters group					
Function code	Name	Setting range	Minimum unit	Factory setting	Change
		protection/10-over-voltage protection			
d-07	Status of multiple pumps system	0-FFFF BIT0-3: No. of main pump BIT4: No.0 pump runs/stops BIT5: No.1 pump runs/stops BIT6: No.2 pump runs/stops BIT7: No.3 pump runs/stops BIT8: No.4 pump runs/stops BIT9: No.5 pump runs/stops BIT10: No.6 pump runs/stops BIT11: No.7 pump runs/stops BIT12: No.8 pump runs/stops BIT13: No.9 pump runs/stops BIT14: No.10 pump runs/stops BIT15: No.11 pump runs/stops	1	0	■
d-08	Analog input AI (V/mA)	0.00V-10.00V/0.0-20.0mA	0.01V	0.00	■
d-09	Analog output AI (V/mA)	0.00V-10.00V/0.0-20.0mA	0.01V	0.00	■

Monitoring parameters group					
Function code	Name	Setting range	Minimum unit	Factory setting	Change
d-10	PID set value (%)	0.0-100.0%	0.1%	0.0	
d-11	PID feedback value (%)	0.0-100.0%	0.1%	0.0	
d-12	Status of input terminal	0-FH	1	0	
d-13	Module temperature (°C)	0.0-132.3°C	0.1°C	0.0	
d-14	3 rd time of fault code	0-23	1	0	
d-15	2 nd time of fault code	0-23	1	0	
d-16	Recent time of fault code	0-23	1	0	
d-17	Status of inverter under recent time of fault	0-FFFFH	1	0	
d-18	Output frequency (Hz) under recent time of fault	0.0-2000.0Hz	0.1Hz	0.0	
d-19	Output current (A) under recent time of fault	0.0-6553.5A	0.1 A	0.0	
d-20	Bus voltage (V) under recent time of fault	0-500V/1000V	1V	0	
d-21	Module temperature(°C) under recent time of fault	0.0-132.3°C	0.1 °C	0	

XII. Application settings

1. Debug mode

F1.28 number of auxiliary pump =0;

F1.04 selection of frequency source = any method except for PID control;

2. Simple pump mode

Setting is as below:

F1.28 number of auxiliary pump =0;

F1.04 selection of frequency source = PID control;

When F2.27 machine address is set as non-zero value, user can modify or read the functional parameters and monitoring parameters of inverter via RS485communication, and send control command and operating frequency to inverter. When machine address is 0, inverter will regularly broadcast own control command and operating frequency with 100ms as cycle.

3. Multiple pumps mode

Setting is as below:

F1.28 number of auxiliary pumps = total number of pumps - 1;

F1.04 frequency source selection= PID control;

When F2.27 machine address is numbered as the order from 0 to 4.

In the multiple pumps mode, pumps are divided into main pump and auxiliary pump. The former is the management unit that is responsible for the initiation and shutdown of the latter.

According to the system default, 0# is the main pump and the others are auxiliary pumps. Given pressure of the former is set by F1.15, feedback pressure is input from AI, setting frequency is produced by PID control and the latter doesn't require given pressure or feedback pressure. The setting frequency is forced to be communication frequency. Main pump regularly sends control command and operating frequency to all auxiliary pumps in turn with 100ms as cycle. The auxiliary pumps receive the messages of address matching and then operates to the corresponding frequency or shuts down.

When the function of automatic switch over is valid, if 0# pump is switched to auxiliary pump, obtaining way of setting pressure and feedback pressure remains unchanged. If 1-11# pumps are switched to main pump, it needs to read given pressure and feedback pressure from 0# pump, send control command and operation frequency, read setting pressure and feedback pressure, which are conducted alternatively. After reset, 0# pump will revert to be the main pump.

Note: 1. Please be sure to connect the sensor with 0# pump.

2. Number of main pump and status of each pump can be viewed in monitoring parameters d-07, and please refer to parameters table for details.
3. The number of main pump can be stored automatically when power is off.

XIII. Fault code table

Fault code		
Fault code	Name	Troubleshooting method
E-01	Overcurrent accelerated operation	in 1. Check input power 2. Check whether the motor is short-circuited or locally short-circuited and whether the insulation of output line is good;
E-02	Overcurrent decelerating operation	in 3. Extend the acceleration time; 4. The type selection of inverter is small, and replace with larger capacity; 5. Check whether the motor is damaged; 6. Send it to the factory for maintenance if any fault
E-03	Overcurrent constant operation	in speed
E-04	Overvoltage accelerated operation	in 1. Check the input power; 2. Extend deceleration time;
E-05	Overvoltage decelerating operation	in 3. Improve network voltage and check whether there is sudden change in voltage.
E-06	Overvoltage constant operation	in speed
E-07	Overvoltage shutdown	at
E-08	Under Voltage in operation	1. Check whether the input voltage is normal; 2. Check whether there is sudden change of the load; 3. Whether there is phase failure.
E-09	Fault of power module	1. Check the wiring; 2. Send it to the factory for maintenance if any

		fault
E-10	Overheating of radiator	1. Check whether the fan is blocked and whether there are foreign substances in radiating fins
E-11	Overload of inverter	2. Check whether the ambient temperature is normal.
E-12	Overload of motor	1. Check whether the network voltage is low; 2. Check the load; 3. The type selection of inverter is small, and replace with larger capacity.
E-13	Reserved	-
E-14	CPU fault	Send it to the factory for maintenance if any fault
E-15	Reserved	-
E-16	Reserved	-
E-17	Reservation	-
E-18	Fault detection of current	Send it to the factory for maintenance if any fault

Fault code		
Fault code	Name	Exclusion method
A-15	Alarm of feedback wire-break	1. Check pressure of pipe network; 2. Check whether the sensor wiring is connected correctly; 3. Check whether the parameter settings are correct.
A-16	Alarm of communication wire-break	Check the communication connection
A-19	Read-write fault of EEPROM	1. Check the data; 2. Replace I/Q Board;
A-20	High pressure alarm at water outlet side	1. Check whether the sensor is disconnected; 2. Check whether parameter settings are correct;
A-21	Low pressure alarm at water outlet side	3. Check whether the pipes network of inlet and outlet are consistent.
A-22	Water shortage alarm at inlet side	1. Check whether there is water in the water inlet; 2. Check whether there is any foreign substance in the water inlet.
A-23	Alarm of low water level /negative pressure	1. Check whether the sensor is disconnected; 2. Check whether the parameter settings are correct

XIV. Quality Assurance

The product quality is guaranteed as per following clauses:

14.1 Since the purchase date of this product, users can enjoy the following three guarantee services arisen from product quality problems:

14.1.1 Within 1 month after purchase, it's guaranteed that product can be refunded, replaced and repaired.

14.1.2 Within 3 months after purchase, it's guaranteed that product can be replaced and repaired.

14.1.3. Within 12 months after purchase, it's guaranteed that product can be repaired.

14.1.4 When being exported abroad, it's guaranteed that purchase can be repaired within three months after being received.

14.2 No matter where you buy the product of our company, you can enjoy the lifetime paid services.

14.3 All of the offices, distributors and suppliers of company throughout the country can provide three guarantee services after acquiring the authorization of the company.

14.4 If there is quality problem happening to the product, the company shall assume only the three-guarantee responsibility in Clause 14.1 and Clause 14.2. When the user needs more responsibility guarantee, please insure it with the insurance company in advance.

14.5 For faults due to the following reasons, even if purchased products are within the warranty period, they belong to the paid services:

14.5.1 Faults caused by the use and operation without complying with the requirements in the instruction manual of the product;

14.5.2 Faults caused by unauthorized modification or overuse;

14.5.3 Failing to pay off payment for the goods according to the contract.

14.5.4 Faults caused by natural disasters such as earthquake, fire, flood, lightning or abnormal voltage, etc.

14.6 For guarantee services of refund, replacement and maintenance, the goods shall be returned to the company, and then they will be refunded, replaced or maintained after the responsibility is confirmed.