HD31 Series

Aqua Inverter

User Manual

HD31 Series
Aqua Inverter

V1.1 2017.07

FOREWORD

Thank you for purchasing HD31 series aqua inverter manufactured by Shenzhen Hpmont Technology Co., Ltd.

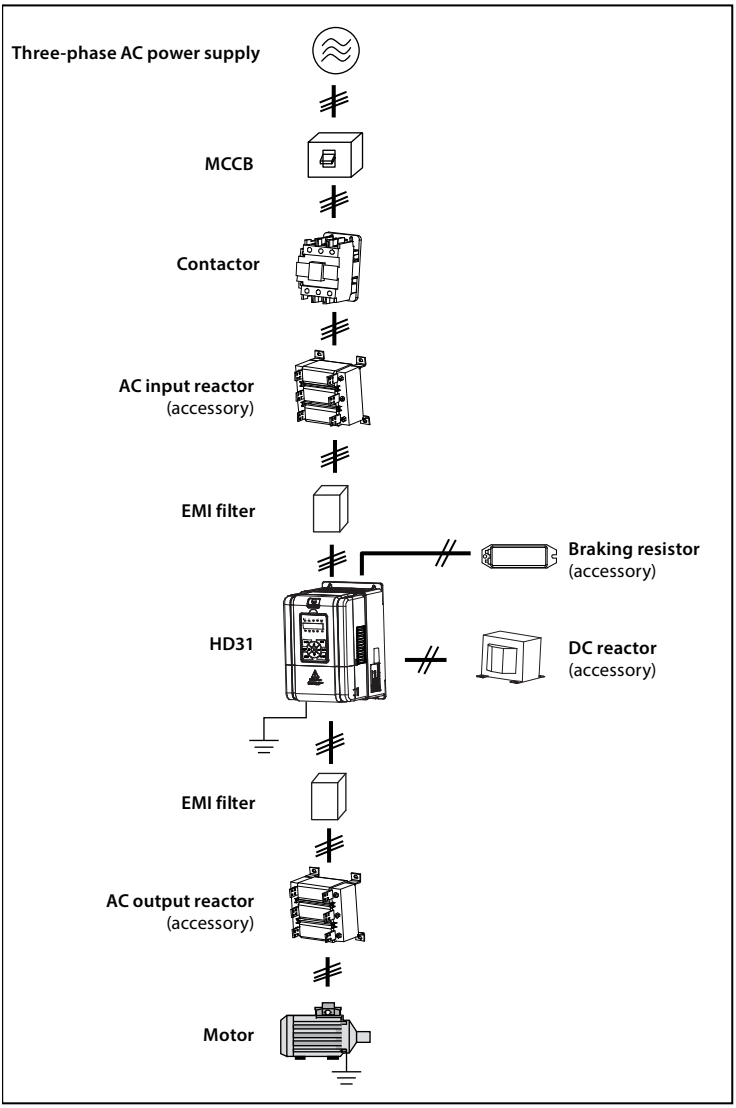
This User Manual describes how to use HD31 series inverters and their installation wiring, parameter setting, troubleshooting and daily maintenance etc.

Before using the product, please read through this User Manual carefully. In addition, please do not use this product until you have fully understood safety precautions.

Note:

- Preserve this Manual for future.
- Due to product upgrade or specification change, and for the purpose of improving convenience and accuracy of this manual, this manual's contents may be modified.
- If you need the User Manual due to damage, loss or other reasons, please contact the regional distributor of our company or directly contact our company Technical Service Center.
- For the first time using, the user should carefully read this manual.
- If you still have some problems during use, please contact our company Technical Service Center.
- Email address: **overseas_1@hpmont.com**

Connection with peripheral devices



Version and Revision Records

The version information is on top of the backbone and the bottom left of the cover.

Time: 2017/07

Version: V1.1

Revised chapter	Revised contents
	• New model: HD31-4T2P2P, HD31-4T3P7P • Refer to 2.3 Rated Value, 4.2.1 Wiring specifications of input and output, 9.3 Braking Resistor and Braking Unit for details • Modify the input and output lines, see 4.2.1 • New content: 4.2.2 Power terminal lug. • Add adjustment in switching from variable frequency to power frequeny, see 7.2 • Add fault: E00.37 (Input wrong phase), see Chapter 8
Chapter 6 Appendix A	• Change the pressure unit to: kg/cm^2 • Concrete parameter: P00.05, P02.01, P02.04, P02.06, P02.08, P02.10, P02.12, P02.14, P02.16, P02.18, P02.20, P02.22, P02.24, P02.26, P04.00, P04.02 • Add d00.42 (Set water supply pressure), d00.43 (Actual water supply pressure) • Add F00.04 (Extension card selection) • F15.00 – F15.08 (DI function) add: 54 Clear fault records • F18.02 – F18.13 (Set parameter of run/stop status) modify: • Add: 35 (Content water supply pressure setting), 36(Actula feedback pressure) • F18.04, F18.12, F18.13 modify default • P00.07 (Dormancy enable) add: 3 (No flow dormancy 1), 4 (No flow dormancy 2) • Modify defination of P00.13, P00.14 • Add P00.23 – P00.30 ((no-flow power function), P00.31 – P00.38 (function of switching from variable frequency to power frequency), P00.39 – P00.50 (pump contactor function) • P02.28 (Proportional gain of pressure closed-loop) modify default and range: 0.00 – 10.00 [0.01] • Add P02.35 (Digital setting for saving selection when power failure) • Add P05.03 – P05.04 (pressure sensor function), P05.05 (Water supply method)

CONTENTS

Chapter 1 Safety Information and Precautions

1.1 Safety Definition

Danger

Danger: A Danger contains information which is critical for avoiding safety hazard.

Warning

Warning: A Warning contains information which is essential for avoiding a risk of damage to products or other equipements.

Note

Note: A Note contains information which helps to ensure correct operation of the product.

1.2 About Motor and Load

Compared to the industrial frequency running

The HD31 series inverters are voltage-type frequency inverters and their output is PWM wave with certain harmonic wave. Therefore, the temperature, noise and vibration of the motor will be a little higher than that at industrial frequency running.

Constant torque at low-speed running

When HD31 drives a standard motor at low-speed running for a long time, the output torque ratings will become worse due to the motor cooling is less effective. In that case, we suggest that you should choose variable frequency motor.

Thermal protection of motor

When choose the adaptive motor, HD31 can effectively implement thermal protection of motor. Otherwise it must adjust the motor protection parameters or other protection measures to ensure that the motor is at a safe and reliable running.

Running above the rated frequency of motor

If the motor runs exceeding its rated frequency, the noise will increase. Pay attention to the motor vibration as well as ensure the motor bearings and mechanical devices to meet the requirement of running speed range.

Lubrication of mechanical devices

At long time low-speed running, provide periodical lubrication maintenance for the mechanical devices such as gear box and geared motor etc. to make sure the drive results meet the site need.

Mechanical resonance point of load

Set the skip frequency (F05.17 - F05.19) to avoid the load device or the motor mechanical resonance point.

Start and stop HD31

User should use the control terminal to start and stop HD31.

It is strictly forbidden to use contactor or other switches on the input side of HD31 to start and stop directly, or it will damage the device.

Check the insulation of the motor

For the first time using of the motor or after long time storage, it needs checking the insulation of the motor. Worse insulation can cause damage to HD31.

Note:

Use a 500V Mega-Ohm-Meter to test and the insulation resistance must be higher than 5Mohm.

Load and negative torque

For the occasion to boost load and the like, negative torque often occurs. Consider setting proper parameters of the braking unit if HD31 is prone to overcurrent or overvoltage fault trip.

Requirement for leakage current protector RCD

Since the device generates high leakage current which goes through the protective grounding conductor, please install B type leakage current protector RCD on one side of the power supply.

For the selection of RCD, users need to consider the possible problems of ground leakage current in both transient status and steady status at start and during running. It is recommended to choose either special RCD that can suppress the higher harmonics, or general RCD that has more aftercurrent.

Warning for ground mass leakage current

The device generates mass leakage current, so users need to confirm the reliable grounding before connect to the power supply. The grounding should comply with the local relative IEC standard.

1.3 About HD31

No capacitor or varistor on the output side

Since HD31 output is PWM wave, it is strictly forbidden to connect capacitor for improving the power factor or varistor for lightning protection to the output terminals so as to avoid HD31 fault trip or component damage.

Contactors and circuit breakers connected to the output of HD31

If circuit breaker or contactor needs to be connected between HD31 and the motor, be sure to operate these circuit breakers or contactor when HD31 has no output, so as to avoid any damage to HD31.

Running voltage

HD31 is prohibited to be used beyond the specified range of running voltage. If needed, please use suitable voltage regulation device to change the voltage.

Capacitor energy storage

When the AC power supply is cut off, capacitor of HD31 sustains deadly power for a while. So to disassemble HD31 that is powered, please cut off the AC power supply for more than 10 minutes, confirm the internal charge indicator is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.

Generally, the internal circuit enables the capacitor to discharge. However, the discharging may fail in some exceptions. In these cases, users need to consult Hpmont or our regional distributor.

Lightning surge protection

HD31 internal design has lightning surge overcurrent protection circuit, and has certain self-protection capacity against the lightning.

Altitude and derating

In area where altitude exceeds 1000 meters, HD31 should be derating since the heatsink efficiency will be reduced because of the tenuous air.

The rated value of output current derates by 1% for each 100m increase of the altitude. I.e. for the altitude of 4000m, derated rate is 30% for rated current of HD31. Figure 1–1 is the derating curve of rated current and the altitude.

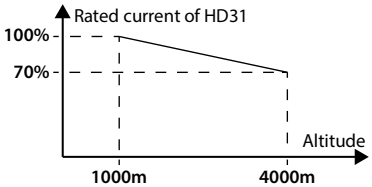
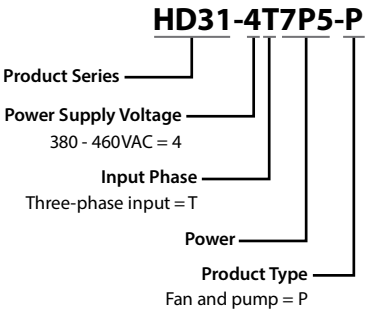


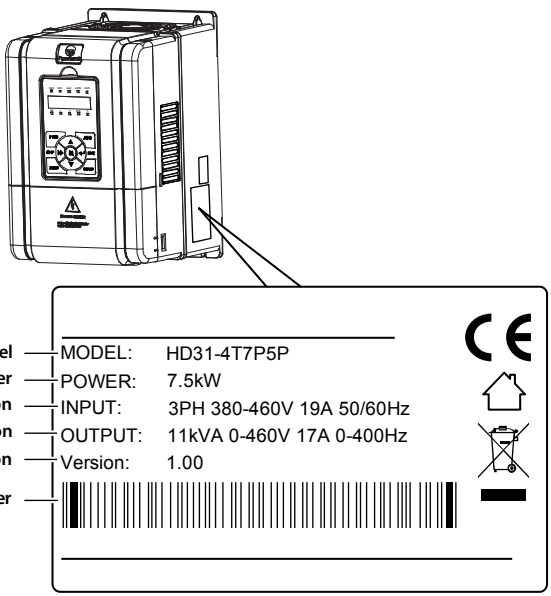
Figure 1–1 Derating curve of rated current and altitude

Chapter 2 Product Information

2.1 Model



2.2 Nameplate



2.3 Rated Value

Refer to section 3.4 Dimensions and Weight (on page 11) for size information.

Model	Motor (kW)	Rated Capacity (kVA)	Rated Input Current (A)	Rated Output Current (A)	Size
HD31-4T2P2P	2.2	3.4	7.3	5.1	F2
HD31-4T3P7P	3.7	5.9	11.9	9.0	F2
HD31-4T5P5P	5.5	8.5	15	13	F2
HD31-4T7P5P	7.5	11	19	17	F2
HD31-4T011P	11	16	28	25	F3
HD31-4T015P	15	21	35	32	F3
HD31-4T018P	18.5	24	39	37	F4
HD31-4T022P	22	30	47	45	F4
HD31-4T030P	30	39	62	60	F5
HD31-4T037P	37	49	77	75	F5
HD31-4T045P	45	59	92	90	F6
HD31-4T055P	55	72	113	110	F6
HD31-4T075P	75	100	156	152	F6
HD31-4T090P	90	116	180	176	F7
HD31-4T110P	110	138	214	210	F7
HD31-4T132P	132	167	256	253	F7

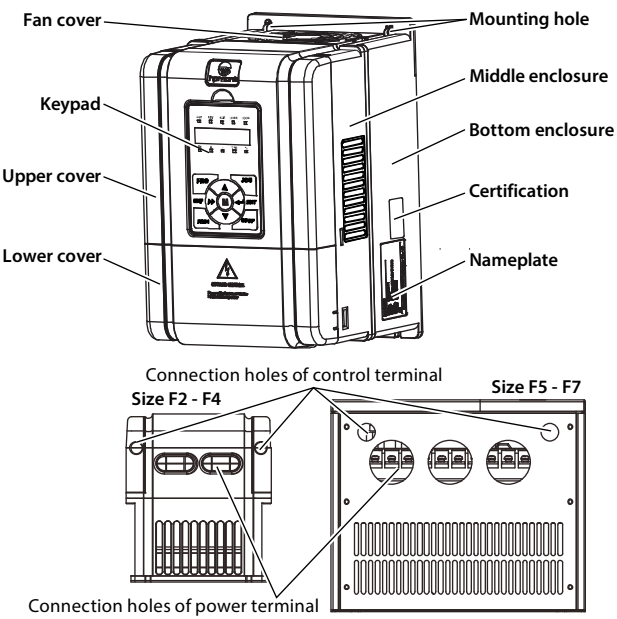
2.4 Technical Data

Electrical	
Input voltage	Three-phase: 380 - 460V, 50/60Hz Fluctuating within ± 10%, imbalance rate < 3%
Input frequency	50/60Hz ± 5%
Output voltage	0 - input voltage
Output frequency	0 - 400.00Hz
Performance	
Control mode	V/f, SVC
Max. current	120% rated output current for 5 minutes; 135% rated output current for 35 seconds
Running command	Keypad; Terminals; Communication
Speed setting	Digital; Analogue; Communication
Speed resulotion	Digital setting: 0.01Hz Analogue setting: 0.1% × max-frequency
SVC	Speed control accuracy: ± 0.5% Speed control range: 1:100 Torque control response: < 200ms Start torque: 180% rated torque / 0.5Hz
Torque control accuracy	±5%

Protection Functions	
Stall overvoltage	Bus voltage can auto-control against overvoltage fault
Auto-limit current protection	Output current can auto-limit against overcurrent fault
Overload pre-alarm and alarm	Overload early pre-alarm and protect
Load loss protection	Load loss alarm function
Input / Output voltage phase loss protection	Input / Output voltage phase loss auto-detect and alarm function
Braking fault protection	Braking detection and alarming function
PID commands and feedback loss detection	PID can auto-identify whether loss the setting and feedback or the alarm function
Power output grounding fault protection	Power output grounding fault protection is enabled
Power output short circuit protection	Power output short circuit protection is enabled
Input / Outpot	
Analogue power supply	+10V, max. current 100mA
Digital power supply	+24V, max. current 200mA
Analogue input	AI1 (control board): voltage 0 - 10V AI2 (control board): -10 - +10V/0 - 20mA (selectable voltage/current) AI3, AI4 (I/O board): -10 - +10V/0 - 20mA (selectable voltage/current)
Analogue output	AO1, AO2: 0 - 10V/0 - 20mA (selectable voltage/current)
Digital input	DI1 - DI6 (control board); DI7 - DI9 (I/O board) DI6 can be selectable for high-frequency input
Digital output	DO1, DO2 DO2 can be selectable for high-frequency output
Relay output	R1A/R1B/R1C(control board), R2A/R2C - R10A/R10C(I/O board) Contact rating: 250VAC/3A or 30VDC/1A
Keypad	
LED display	Five LEDs display, 5 unit indicators, 5 status indicators Setting frequency, output frequency, output voltage, output current, motor speed, output torque, switching value terminal, status parameter, programm menu parameter and fault code etc.
LCD display	Optional [HD-LCD], display contents in Chinese or English
Parameter copy	Both LED and LCD keypad can achieve quick parameter copy
Communication	
SCI communication	RS-485 interface; Terminal

Environment	
Running temperature	-10 - +40℃, max. 50℃, air temperature fluctuation is less than 0.5℃/min The derating value of the output current of HD31 shall be 2% for each degree centigrade above 40℃. Max. allowed temperature is 50℃
Storage temperature	-40 - +70℃
Location for use	Indoor, preventing from direct sunlight, no dust, corrosive, flammable gases, oil mist, water vaper, dripping or salt etc.
Altitude	Less than 1000 meters, otherwise should be derating use
Humidity	Less than 95%RH, non-condensing
Vibration Resistance	It is 3.5m/s^2 in 2 - 9Hz, it is 10m/s^2 (IEC60721-3-3) in 9 - 200Hz
Protection class	IP20
Pollution level	Level 2 (Dry, non conducting dust pollution)
Accessories	
Bus communication	PROFIBUS option [HDFB-PROFIBUS-DP] DeviceNet option [HDFB-DeviceNet] CAN option [HDFB-CAN]
About keypad	LCD keypad (HD-LCD) Mounting base to keypad (HD-KMB) 1m/2m/3m/6m extension cable to keypad (HD-CAB-1M/2M/3M/6M)
Power units	Dynamic braking unit [HDBU]

2.5 Parts of Inverter



Chapter 3 Machenical Installation

3.1 Precautions

Danger

- Do not install if HD31 is incomplete or impaired.
- When conveying HD31, please employ suitable tools according to its weight. Avoid scratch to the product. Be careful: rollover and drop may cause hurt.
- Make sure that HD31 is far from explosive and flammable things.
- Do not do wiring operation until power supply is cut off for more than 10 minutes, the internal charge indicator of HD31 is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.

Warning

- It is required not only carry the keypad and the cover but also bottom enclosure of HD31.
- Do not let wires, screws or residues fall into HD31 when installing.

3.2 Installation Site Requirement

Ensure the installation site meets the following requirements:

- Do not install at direct sunlight, moisture, water droplet location;
- Do not install at flammable, explosive, corrosive gas and liquid location;
- Do not install at oily dust, fiber and metal powder location;
- Be vertical installed on fire-retardant material with a strong support;
- Make sure adequate cooling space for HD31 so as to keep ambient temperature between - 10 - + 40℃;
- Install at where the vibration is 3.5m/s^2 in 2 - 9Hz, 10m/s^2 in 9 - 200Hz (IEC60721-3-3);
- Install at where the humidity is less than 95%RH and non-condensing location;
- Protection level of HD31 is IP20 and pollution level is 2 (Dry, non-conducting dust pollution).

Note:

1. It needs derating use if running temperature exceeds 40 ℃. The derating value of the output current of HD31 shall be 2% for each degree centigrade. Max. allowed temperature is 50 ℃.

2. Keep ambient temperature between -10 - +40 ℃. It can improve the running performance if install at location with good ventilation or cooling devices.

3.3 Installation Direction and Space Requirements

To achieve good cooling efficiency, install the inverter perpendicularly and always provide the following space to allow normal heat dissipation. The requirements on mounting space and clearance are shown in Table 3-1.

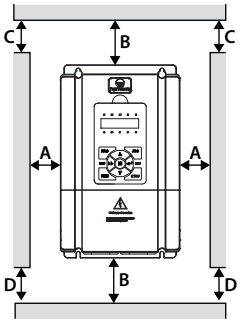


Table 3-1 Installation space

HD31 power	5.5 - 75kW	90 - 132kW
A (left and right)	⩾50mm	⩾150mm
B (up and down)	⩾100mm	⩾350mm
C (upper vent)	⩾50mm	⩾100mm
D (lower vent)	⩾50mm	⩾100mm

When one inverter is mounted on top of another, an air flow diverting plate should be fixed between them. Just as shown in Table 3-2.

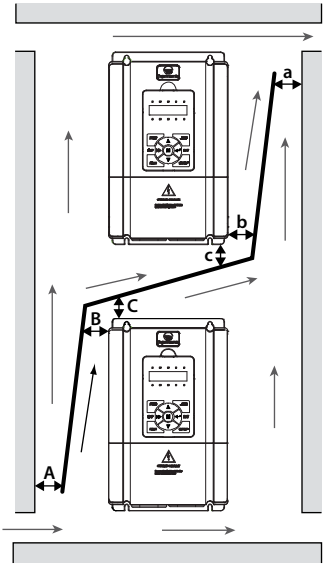


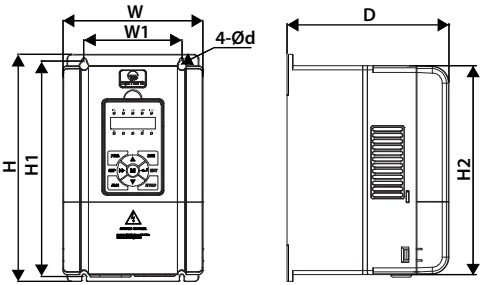
Table 3-2 Installation of several inverters

HD31 power	5.5 - 75kW	90 - 132kW
A	⩾50mm	⩾100mm
B	⩾50mm	⩾100mm
C	⩾50mm	⩾100mm
a	⩾50mm	⩾100mm
b	⩾50mm	⩾100mm
c	⩾50mm	⩾100mm

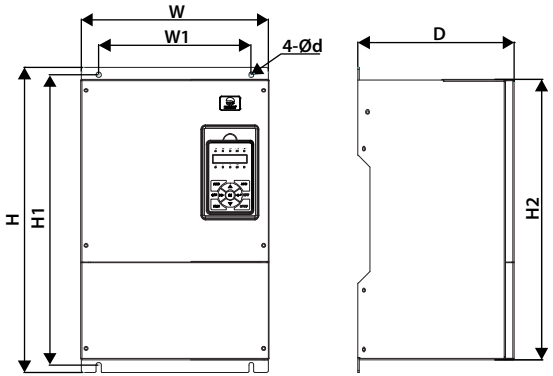
3.4 Dimensions and Weight

The dimensions and weight of HD31 are as shown in Table 3-3.

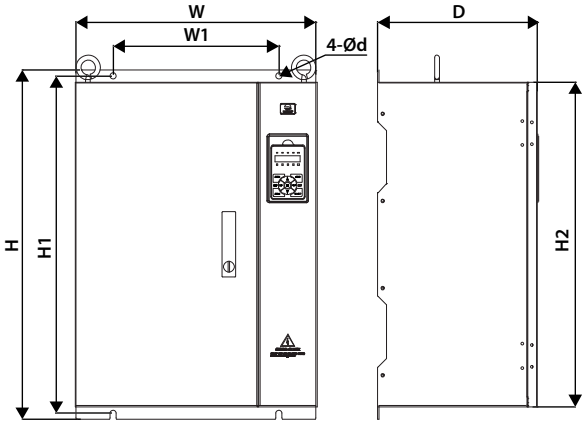
For the corresponding model of the mounting size, refer to section 2.3 Rated Value, on page 6.



Size F2 - F4



Size F5 - F6



Size F7

Table 3-3 HD31 dimensions and weight

Size	Dimension (mm)			Mounting size (mm)				GW
	W	H	D	W1	H1	H2	d	(kg)
F2	165	266	190	115	253	245	5	4.4
F3	200	299	210	146	286	280	5	5.8
F4	235	353	222	167	337	330	7	8.2
F5	290	469	240	235	445	430	8	20.4
F6	380	598	290	260	576	550	10	48
F7	500	721	330	343	696	670	12	80

3.5 Install and Dismantle Keypad

According to the direction of Figure 3–1, press the keypad until hear a "click" sound.

Do not install the keypad from other directions or it will cause poor contact.

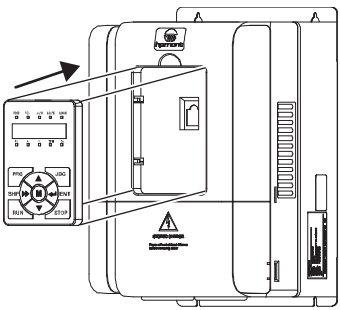


Figure 3–1 Install keypad

There are two steps in Figure 3–2.

First, press the hook of the keypad according to direction 1. Second, take out of the keypad according to direction 2.

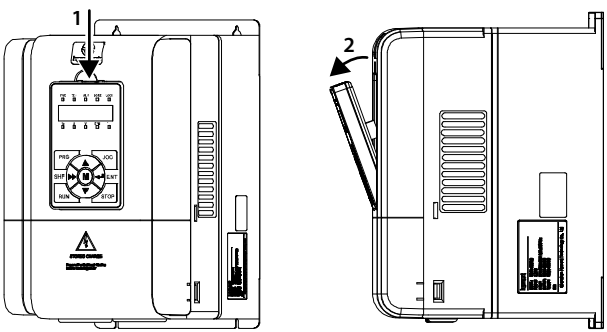
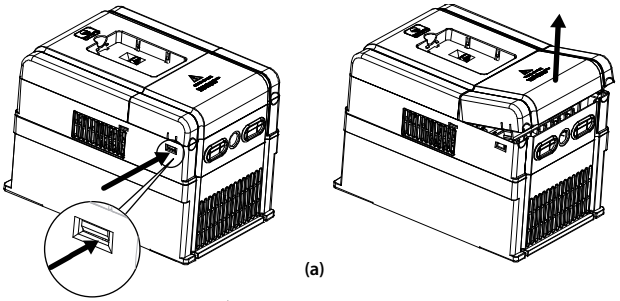


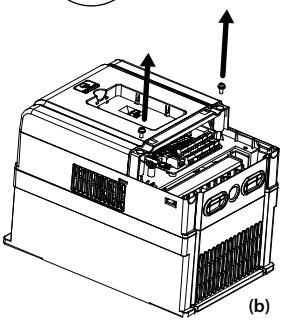
Figure 3–2 Dismantle keypad

3.6 Dismantle Plastic Cover

The upper cover and lower cover of HD31 are removable. The dismantle steps are shown as Figure 3–3. Before removing the upper cover, please take away the keypad.



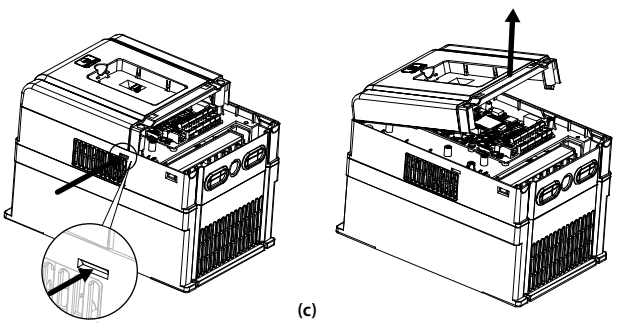
(a)



(b)

The removing processes of plastic cover board:

1. Extrude the hooks at both sides together, take off the lower cover, as (a).
2. Dismantle the screws of upper cover, as (b).
3. Extrude the hooks at both sides together, take off the upper cover, as (c).



(c)

Figure 3–3 Dismantle the plastic cover

Chapter 4 Electrical Installation

4.1 Precautions

Danger

- Only qualified electrical engineer can perform wiring job.
- Only when the power supply switch is completely off can you do the wiring job.
- You can't open the inverter cover to do wiring operation until the power is cut-off 10 minutes later. Do not wire or detach the inverter internal devices at power-on situation.
- Do not do wiring operation until the internal charge indicator of the inverter is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.
- Check the wiring carefully before connecting emergency stop or safety circuit.
- The earth terminal PE of the inverters must be reliable earthing. It must use two separate earth wire due to the leakage current from the inverter to ground.
- It must use Type B mode when utilize earth leakage protection devices(ELCB/RCD).
- Do not touch the wire terminals of the inverter when it is live. The main circuit terminals is neither allowed connecting to the enclosure nor short-circuiting.

Warning

- Do not do dielectric strength test on the inverter.
- Do wiring connection of the braking resistor or the braking unit according to the wiring figure.
- Make sure the terminals are fixed tightly.
- Do not connect the AC supply cable to the output terminals U, V, W of the inverter.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure the inverter has ceased output before switching motor or change-over switches.
- The inverter DC bus terminals must not be short-circuited.

4.2 Peripheral Accessories Selection

4.2.1 Wiring specifications of input and output

The AC supply to HD31 must be installed with suitable protection against overload and short-circuits, i.e. MCCB (molded case circuit breaker) or equivalent device.

The recommended specification of MCCB, contactor & cables are shown as Table 4-2.

The size of ground wire should accord with the requirement in 4.3.5.4 of IEC61800-5-1, as shown in Table 4-1.

Table 4-1 Sectional area of ground protective conductor

Sectional area S of phase conductor (power supply cable) while installing (mm^2)	$S \leq 2.5$	$2.5 < S \leq 16$	$16 < S \leq 35$	$S > 35$
Min. sectional area Sp of relative protective conductor (ground cable) (mm^2)	2.5	S	16	S/2

Table 4-2 HD31 I/O wiring specification

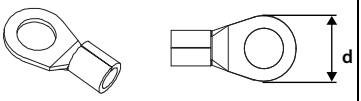
Model	MCCB (A)	Contactor (A)	Power Cable (mm^2)	Motor Cable (mm^2)	Ground Cable (mm^2)	Size
HD31-4T2P2P	16	10	1.5	0.75	2.5	F2
HD31-4T3P7P	16	10	2.5	1.5	2.5	F2
HD31-4T5P5P	25	16	2.5	2.5	2.5	F2
HD31-4T7P5P	32	25	4	4	4	F2
HD31-4T011P	40	32	6	6	6	F3
HD31-4T015P	63	40	10	10	10	F3
HD31-4T018P	63	40	10	10	10	F4
HD31-4T022P	100	63	16	16	16	F4
HD31-4T030P	100	63	25	25	16	F5
HD31-4T037P	125	100	35	35	16	F5
HD31-4T045P	160	100	35	35	16	F6
HD31-4T055P	200	125	35	35	16	F6
HD31-4T075P	200	125	50	50	25	F6
HD31-4T090P	250	160	95	70	50	F7
HD31-4T110P	250	160	120	120	50	F7
HD31-4T132P	350	350	120	120	50	F7

4.2.2 Power terminal lug

Select the lug of power terminal according to the size of terminal, screw size and max. outer diameter of lug. Refer to Table 4-3.

Take the round terminal as an example.

Table 4-3 Selection of power terminal lug

Size	Screw size	Tightening torque (N. M)	Max. outer diameter of lug d (mm)	
F2	M4	1.2 - 1.5	9.9	
F3	M5	2.5 - 3.0	12	
F4	M5	2.5 - 3.0	12	
F5	M6	4.0 - 5.0	15.5	
F6	M8	9.0 - 10.0	24	
F7	M10	17.6 - 22.5	30	

4.3 Main Circuit Terminals and Wiring

Danger

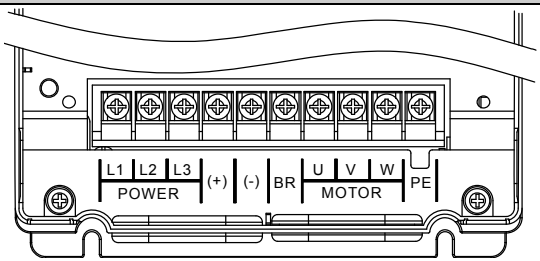
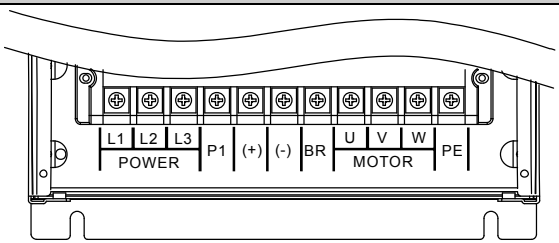
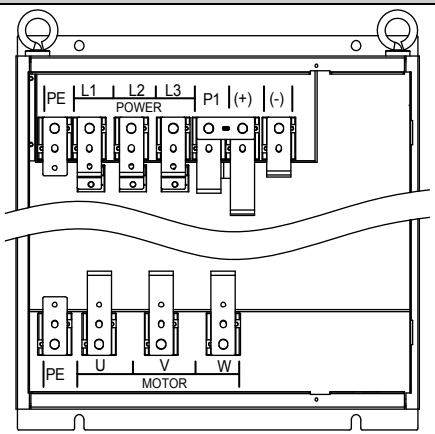
- The bare portions of the power cables must be bound with insulation tapes.

Warning

- Ensure that AC supply voltage is the same as rated input voltage of HD31.

4.3.1 Supply and Motor Terminal

Table 4-4 Supply and motor terminal description

Terminal description	Frame 2
• L1, L2, L3: Three-phase AC power input terminals • U, V, W: Output terminals, connect to three-phase AC motor • P1, (+):DC reactor connection terminals • (+), (-):DC supply input terminals; DC input terminals of power regenerative unit • (+), BR: Braking resistor connection terminals • PE: Ground terminal, connect to the ground	
	Frame 3 – Frame 6
	
	Frame 7
	

4.3.2 Supply and Motor Connection

During trial running, make sure HD31 runs forward when the forward command is enabled.

If not, switch any two of the output terminals (U/V/W) or modify parameter F00.17 to change the motor direction.

The supply and motor connection are shown as Figure 4–1.

Refer to section 4.2 Peripheral Accessories Selection (on page 15) for product options.

Refer to section 9.3 Braking Resistor and Braking (on page 72) for braking resistors and braking units.

Refer to section 9.2 Reactor Selection (on page 71) for AC reactors and DC reactors.

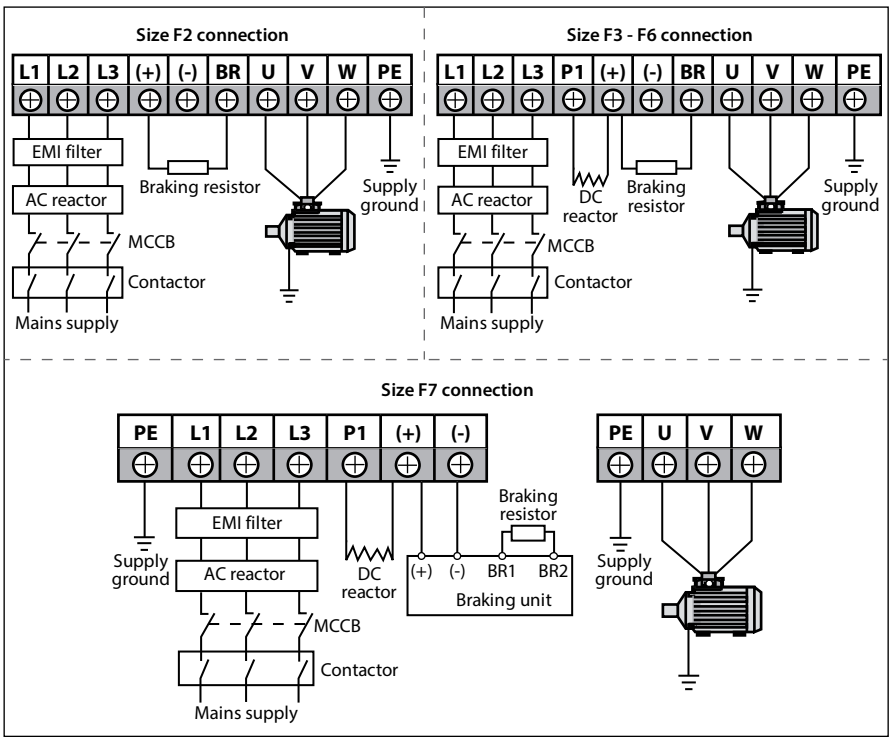


Figure 4–1 Supply and motor connection

4.4 Control Board and I/O Board

Danger

- The control circuit is basically isolated with the power circuit. Do not touch HD31 after it is powered.

Warning

- If the control circuit is connected to the external devices with live touchable port, it should increase an additional isolating barrier to ensure that classification of external devices not be changed
- If connect the communication terminal of the control circuit to the PC, choose RS485/232 isolating converter which meets the safety requirement.
- Only connect the relay terminal to AC 220V voltage signal. Other control terminal are strictly forbiden for this connection.

HD31 includes control board and I/O board, as shown in Figure 4–2.

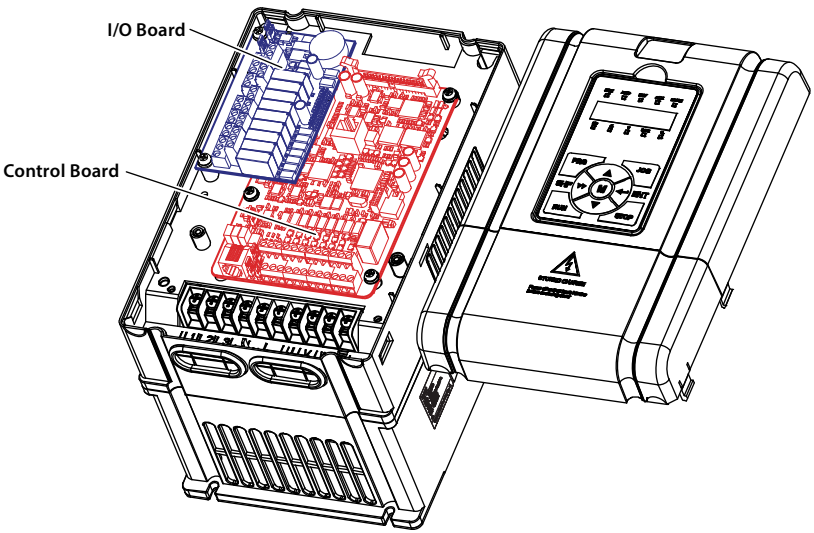


Figure 4–2 Control board and I/O board

4.4.1 Control Board Terminal

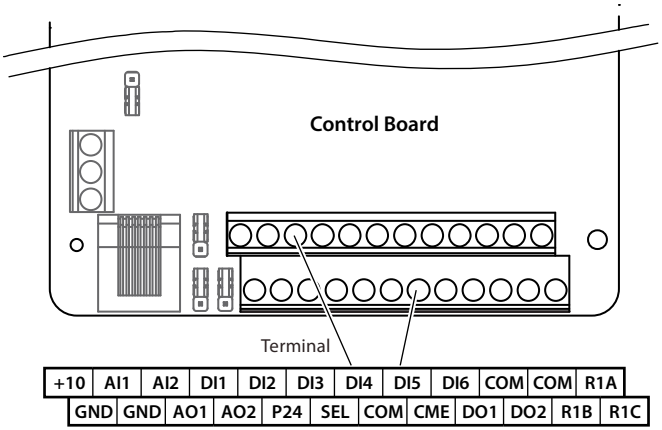


Figure 4–3 Control board terminal

Table 4-5 Control board terminal description

Terminal		Description
+10, GND	Analogue power supply	Analogue input use +10V power supply, max. output current is 100mA GND is isolated to COM
AI1, AI2	Analogue input	AI1 Input voltage: 0 - 10V (input impedance: 32kΩ) AI2 Input voltage: -10 - +10V (input impedance: 32kΩ) AI2 Input current: 0 - 20mA (input impedance: 500Ω) • AI2 can be voltage / current selectable
AO1, AO2	Analogue output	Output voltage / current signal: 0 - 10V/0 - 20mA Programmable output
GND	Analogue ground	
DI1 - DI6	Digital input	Programmable bipolar optional input signal Input voltage: 0 - 30VDC DI1 - DI5 input impedance 4.7kΩ, DI6 input impedance 1.6kΩ • DI6 can be selectable for high-frequency input, max-frequency 50kHz
P24, COM	Digital power supply	Analogue input use +24V power supply, max. output current is 200mA COM is isolated to CME
SEL	Digital input common terminal	SEL and P24 are connected by default • Disconnected SEL and P24 when use external power to drive DI
DO1, CME	Digital output	Programmable optical-couple isolation, open collector output • Output voltage: 0 - 30VDC, max-output current 50mA • DO2 can be selectable for pulse frequency output, max. frequency 50kHz CME is isolated to COM, connected to COM by default • Disconnect CME and COM when they are isolating output
DO2, COM	Digital output	
R1A/R1B/R1C	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A • R1B, R1C: normally closed; R1A, R1C: normally open

Note:

Limit the current within 3A if the relay terminal is to connect to AC 220V voltage signal.

4.4.2 I/O Board Terminal

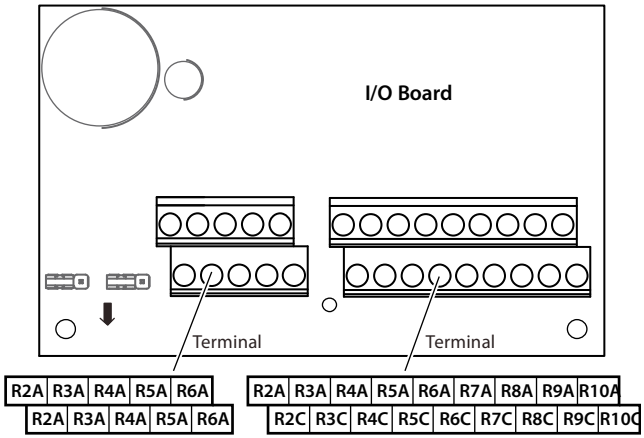


Figure 4–4 I/O board terminal

Table 4-6 I/O board terminal description

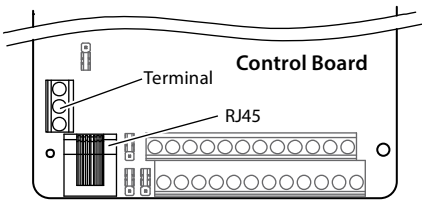
Terminal		Function Description
AI3 / AI4	Analogue input	Input voltage: -10 - +10V (input impedance: 32kΩ) Input current: 0 - 20mA (input impedance: 500Ω)
+10 / GND	Analogue power supply	Analogue input use +10V as supply, max. output current is 100mA
DI7 - DI9	Digital input	Programmable bipolar optional input, low level is effective by default. Input voltage: 0 - 30VDC (input impedance: 4.7kΩ)
P24, COM	Digital power supply	Digital input use +24V as supply, max. output current is 200mA
SEL	Digital input common terminal	SEL and P24 are connected by default • Disconnected SEL and P24 when use external power to drive DI7 - DI9
R2A/R2C - R10A/R10C	Relay output	Programmable normally open output Contact rating: 250VAC / 3A or 30VDC / 1A

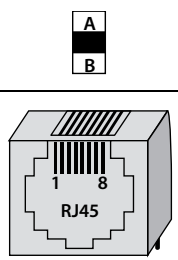
Note:

Limit the current within 3A if the relay terminal is to connect to AC 220V voltage signal.

4.4.3 Modbus Communication Terminal

Do not use communication terminal and RJ45 simultaneously.





Terminal	Description
A	485+
B	485-
Pin	**Difinition**
1,3	+5V
2	485+
4,5,6	GND
7	485-
8	Unused

4.4.4 Jumper

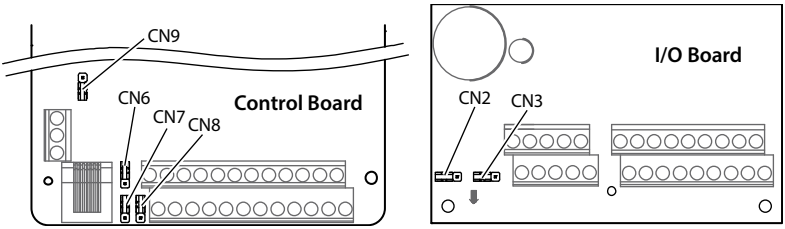
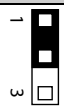
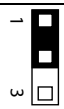
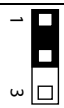
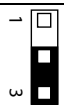
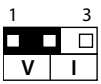
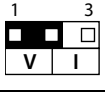


Figure 4–5 Jumper position

Table 4-7 Jumper description

Jumper	Description
Control board CN6 	AI2 can select voltage or current signal. • Pin 1 & 2 are short-connected, AI2 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AI2 inputs current signal.
Control board CN7 	AO1 can select voltage or current signal. • Pin 1 & 2 are short-connected, AO1 outputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AO1 outputs current signal.
Control board CN8 	AO2 can select voltage or current signal. • Pin 1 & 2 are short-connected, AO2 outputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AO2 outputs current signal.
Control board CN9 	SCI communication can select proper resistance. • Pin 1 & 2 are short-connected, select the proper resistance. • Pin 2 & 3 are short-connected, no resistance (factory setting).
I/O board CN2 	AI3 can select voltage or current signal. • Pin 1 & 2 are short-connected, AI3 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AI3 inputs current signal.
I/O board CN3 	AI4 can select voltage or current signal. • Pin1 & 2 are short-connected, AI4 inputs voltage signal (factory setting). • Pin2 & 3 are short-connected, AI4 inputs current signal.

Chapter 5 Keypad

Danger

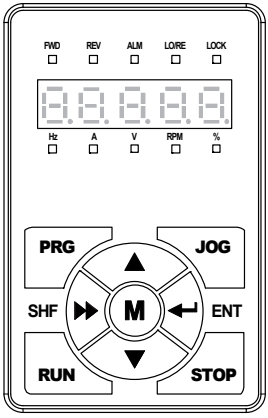
- Only when the terminal cover of HD31 has been fitted can user switch on AC power source. Do not remove the cover after power is switched on.
- Ensure the motor and the mechnical device are in the use application before HD31 starts.
- Keep away from HD31 if the auto-restart function is enabled at power outage.
- To change the PCBA, correctly set the parameters before running.

Warning

- Do not check or detect the signal during HD31 running.
- Do not randomly change HD31 parameter setting.
- Please thoroughly complete all control commissioning and testing, make all adjustments and conduct a full safety assessment before switching the running command source of HD31.
- Do not touch the energy-depletion braking resistor due to the high temperature.

The standard HD31 are installed with LED keypad which is shown as Table 5-1.

Table 5-1 Key description of keypad



Key	Description
PRG	Entry or exit programming key
JOG	In the keypad control, jog start HD31
RUN	In the keypad control, press this key to run HD31
STOP	a. In the keypad control, press this key to stop HD31 b. In the detection fault, press this key to reset at fault
M	Set certain function by F00.12
▲	Increase value or parameter
▼	Decrease value or parameter
▶▶	a. Select display parameter and shift bit b. Stop in loop/Display the parameter during running
↵	a. Enter lower menu b. Confirm saving the data

The kaypad consists of 5 status indicators and 5 unit indicators and shown as Table 5-2.

Table 5-2 Indicator description of the keypad

Mark	Name	■: Lighting	▣: Flashing	□: Lightless
FWD	Forward status	HD31 is forward running at the moment	The start of HD31 is forward running next time	
REV	Reverse status	HD31 is reverse running at the moment	The start of HD31 is reverse running next time	
ALM	Alarm status	HD31 is faulty at the moment		HD31 is well at the moment
LO/RE	Remote/Local status	Indicate HD31 isn't in keypad control mode		HD31 is in keypad control mode
LOCK	Password locked status	The user password lock of HD31 is avail		There is no user password or unlocked
Hz	Frequency unit	The unit of the present parameter is Hz	The present parameter is output frequency	
A	Current unit	The unit of the present parameter is A		
V	Voltage unit	The unit of the current parameter is V		
RPM	Rotary speed unit	The unit of the present parameter is rpm	The present parameter is rotary speed unit	
%	% unit	The unit of the present function parameter is %		

The keypad of HD31 has five LED displays and their meanings are shown in Table 5-3.

Table 5-3 LED display description

LED display	Meaning	LED display	Meaning	LED display	Meaning	LED display	Meaning
	0		A		J		U
	1		b		L		u
	2		C		n		y
	3		c		o		-
	4		d		P		Point
	5		E		q		Full display
	6		F		r		No display
	7		H		S		Flash modifiable
	8		h		T		
	9		i		t		

Chapter 6 Function Introduction

This chapter will provide user with detail function introduction of each group.

Display Parameters:

General Parameters:

Specialized parameter for multi-pump water supply:

6.1 Group d: Display Parameters

Users can directly check the status parameters by checking the function code of Group d.

6.1.1 d00: Status Display Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d00.00</td><td>Inverter series</td><td>[Actual value]</td></tr>
<tr><td>d00.01</td><td>Software version of the control board</td><td>[Actual value]</td></tr>
<tr><td>d00.03</td><td>Special software version of the control board</td><td>[Actual value]</td></tr>
<tr><td>d00.05</td><td>Software version of the keypad</td><td>[Actual value]</td></tr>
<tr><td>d00.06</td><td>Customized series No.</td><td>[Actual value]</td></tr>
<tr><td>d00.08</td><td>Rated current of the inverter</td><td>[Actual value]</td></tr>
<tr><td>d00.09</td><td>Extended function of the inverter</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display extended function of HD31.
0: No extended function.
1: Constant pressure water supply function.</td></tr>
<tr><td>d00.10</td><td>Inverter status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display HD31 status, as shown in the following table:
<table>
<tr><td>Bit15: Unused</td><td>Bit14: Unused</td><td>Bit13: Current limit
0: Invalid
1: Valid</td><td>Bit12: Stall overvoltage
0: Invalid
1: Valid</td></tr>
<tr><td>Bit11: Unused</td><td>Bit10: Speed limit value
0: Invalid
1: Valid</td><td>Bit9: Unused</td><td>Bit8: Auto-tuning
0: Not in auto-tuning
1: In auto-tuning</td></tr>
<tr><td>Bit7: DC braking
0: Invalid
1: Valid</td><td>Bit6: Unused</td><td colspan="2">Bit5&Bit4: Acc / Dec / Constant
00: Constant 01: Acc
11: Constant 10: Dec</td></tr>
<tr><td>Bit3: Zero speed running
0: Invalid
1: Valid</td><td>Bit2: Forward / reverse
0: Forward
1: Reverse</td><td>Bit1: Run / stop
0: Stop
1: Run</td><td>Bit0: Inverter fault
0: No fault
1: Fault</td></tr>
</table></td></tr>
<tr><td>d00.14</td><td>Setting frequency</td><td>[Actual value]</td></tr>
<tr><td>d00.15</td><td>Setting frequency (after Acc / Dec)</td><td>[Actual value]</td></tr>
<tr><td>d00.16</td><td>Output frequency</td><td>[Actual value]</td></tr>
<tr><td>d00.17</td><td>Setting RPM</td><td>[Actual value]</td></tr>
<tr><td>d00.18</td><td>Running RPM</td><td>[Actual value]</td></tr>
<tr><td>d00.19</td><td>Three-phase power supply input sequence phase</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display sequence phase of the three-phase input.
• 0: Positive sequence: L1 (R) preceding L2 (S) preceding L3 (T).
• 1: Negative sequence: L1 (R) preceding L3 (T) preceding L2 (S).</td></tr>
<tr><td>d00.20</td><td>Output voltage</td><td>[Actual value]</td></tr>
<tr><td>d00.21</td><td>Output current</td><td>[Actual value]</td></tr>
<tr><td>d00.23</td><td>Output torque</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display output torque which is the relative percentage of the motor rated torque.</td></tr>
<tr><td>d00.24</td><td>Output power</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display present actual output power whose unit is 0.1kW.</td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]
d00.25	**DC bus voltage**	[Actual value]
d00.26	**Potentiometer input voltage of the keypad**	[Actual value]
	Display potentiometer input voltage of the keypad.	
d00.27	**AI1 voltage**	[Actual value]
	Display AI1 input voltage.	
d00.28	**AI1 voltage (after calculating)**	[Actual value]
	Display A1 input voltage which is calculated by the gain, bias and filter.	
d00.29	**AI2 voltage**	[Actual value]
	Display AI2 input voltage. When selects current input, 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.30	**AI2 voltage (after calculating)**	[Actual value]
	Display AI2 input voltage which is calculated by the gain, bias and filter.	
d00.31	**AI3 voltage**	[Actual value]
	Display AI3 input voltage. When selects current input, 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.32	**AI3 voltage (after calculating)**	[Actual value]
	Display AI3 input voltage which is calculated by the gain, bias and filter.	
d00.33	**AI4 voltage**	[Actual value]
	Display AI4 input voltage. When selects current input, 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.34	**AI4 voltage (after calculating)**	[Actual value]
	Display AI4 input voltage which is calculated by the gain, bias and filter.	
d00.35	**DI6 pulse input frequency**	[Actual value]
	Display DI6 terminal pulse input frequency (Hz).	
d00.36	**AO1 output**	[Actual value]
	Display AO1 output. When selects current output, 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.37	**AO2 output**	[Actual value]
	Display AO2 output. When selects current output, 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.38	**High-speed output pulse frequency**	[Actual value]
	Display high-speed output pulse frequency (Hz).	
d00.39	**Heatsink temperature**	[Actual value]
	Display heatsink temperature.	
d00.42	**Set water supply pressure**	[Actual value]
	When the system is supplying water at constant pressure, the current supply pressure will be displayed.	
d00.43	**Actual water supply pressure**	[Actual value]
	When the system is supplying water at constant pressure, system pressure value detected by remote pressure gauge will be displayed.	
d00.44	**PID setting**	[Actual value]
	Display PID setting relative to full scale (10.00V) percentage.	
d00.45	**PID feedback**	[Actual value]
	Display PID feedback relative to full scale (10.00V) percentage.	
d00.46	**PID tolerance**	[Actual value]
	Display PID tolerance relative to full scale (10.00V) percentage.	

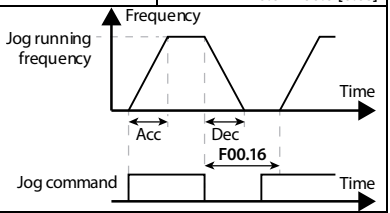
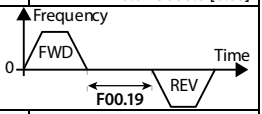
<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d00.47</td><td>PID integral item</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display PID integral item relative to full scale (10.00V) percentage.</td></tr>
<tr><td>d00.48</td><td>PID output</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display PID output to full scale (10.00V) percentage.</td></tr>
<tr><td>d00.49</td><td>External counting value</td><td>[Actual value]</td></tr>
<tr><td>d00.50</td><td>Input terminal status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display input terminal status. Each bit (binary) of this parameter stands for different physical sources which are in the below table.
• 0: Input terminals disconnect with common terminals.
• 1: Input terminals connect with common terminals.
<table>
<tr><td>Bit11</td><td>Bit10</td><td>Bit9</td><td>Bit8</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>DI9</td><td>DI8</td><td>DI7</td><td>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
</table></td></tr>
<tr><td>d00.51</td><td>Output terminal status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display output terminal status. Each bit (binary) of this parameter stands for different physical sources which are in the below table.
• 0: Output terminals disconnect with common terminals.
• 1: Output terminals connect with common terminals.
<table>
<tr><td>Bit11</td><td>Bit10</td><td>Bit9</td><td>Bit8</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>RLY10</td><td>RLY9</td><td>RLY8</td><td>RLY7</td><td>RLY6</td><td>RLY5</td><td>RLY4</td><td>RLY3</td><td>RLY2</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>d00.55</td><td>Total time at power-on</td><td>[Actual value]</td></tr>
<tr><td>d00.56</td><td>Total time at running</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">d00.55 displays total time at power-on; d00.56 displays total time at running. The unit is hour.</td></tr>
<tr><td>d00.57</td><td>High bit of motor total energy consumption</td><td>[Actual value]</td></tr>
<tr><td>d00.58</td><td>Low bit of motor total energy consumption</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display high bit (d00.57) and low bit (d00.58) of the motor total energy consumption.</td></tr>
<tr><td>d00.59</td><td>High bit of energy consumption at this time running</td><td>[Actual value]</td></tr>
<tr><td>d00.60</td><td>Low bit of energy consumption at this time running</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display high bit (d00.59) and low bit (d00.60) of energy consumption at this time running.</td></tr>
<tr><td>d00.61</td><td>Present fault</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display present fault.
• Displaying 100 means undervoltage.</td></tr>
</table>

6.2 Group F: General Parameters

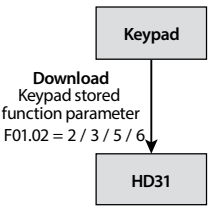
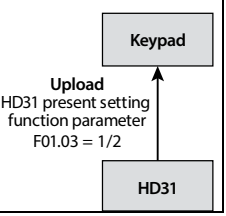
6.2.1 F00: Basic Parameters

Ref. Code	Function Description	Setting Range [Default]
F00.01	**Motor control mode**	**0 - 2 [0]**
	0: V/f control. Constant voltage/frequency ratio control. • It is specially applicable for occasions when one inverter drives more than one motors to achieve proper efficiency. • When select V/f control, please properly set the V/f control Group F09 to achieve proper efficiency. 1: Unused. 2: SVC control. Sensorless vector control. • It is applicable for application with high requirement on inverter performance and torque. • At first, it must perform motor parameter auto-tuning. And then adjust the settings of F08.00 - F08.04 according to the nameplate of the motor. Start the motor parameter auto-tuning function and properly set Group F10 parameters, so as to achieve excellent vector control efficiency.	
F00.02	**Inverter type setting**	**0,1 [1]**
	0: G type, to drive heavy and general motor. 1: P type, to drive pump and fan.	
F00.04	**Extension card selection**	**0,2 [2]**
	0: Invalid. 2: HD30-WIO extension valid.	
F00.05	**HD31 extended function**	**0,1 [0]**
	0: No extended. 1: Constant pressure water supply.	
F00.06	**Max. output frequency of HD31**	**50.00 - 400.00 [50.00Hz]**
	Defines the max. frequency that HD31 is allowed to output. • Be careful to set reasonable parameters according to the nameplate of the motor and the actual running conditions.	
F00.07	**Upper limit of running frequency setting source**	**0 - 2 [0]**
	Defines the highest frequency that user can set, and select setting sources to set the upper limit frequency via F00.07. 0: Digital setting. Set the upper limit frequency by F00.08. 1: Analogue input setting. Refer to Group F16. 2: DI6 pulse setting. Set by F16.17, and its max. pulse input frequency corresponds to F00.06 (max. output frequency of HD31).	
F00.08	**Upper limit of running frequency**	**0 - F00.06 [50.00Hz]**
	F00.07 = 0, the upper limit frequency is set by F00.08.	
F00.09	**Lower limit of running frequency**	**0 - F00.08 [0.00Hz]**
	Use F00.09 to limit the actual output frequency. When the setting frequency value < F00.09, it will operate at lower limit frequency. • Properly set the parameters according to the nameplate of the motor and actual running conditions. • No limitation on the motor parameter auto-tuning function. • Besides the lower /upper limit frequency, the running frequency of inverter is also limited by the parameter settings of skip frequency (F05.17 - F05.19).	

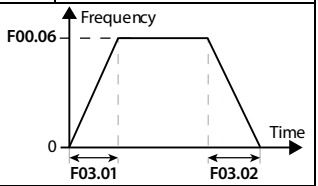
Ref. Code	Function Description	Setting Range [Default]
F00.10	**Frequency setting sources**	**0 - 4 [0]**
	0: Keypad setting. Change the value by pressing the ▲ or ▼ key of the keypad. Initial value is set by F00.13. 1: Terminal digital setting. Change the value by using the terminals UP / DN, F00.13 sets initial value. 2: SCI communication setting. Change the setting frequency by SCI communication frequency command. • The initial value of the SCI communication frequency is 0. 3: Analogue setting. Set by the analogue input voltage. • Refer to Group F16. • Refer to Group F5 for the corresponding relationship between the analogue value and the running frequency of HD31. 4: DI6 pulse setting. • The specification of input pulse signal: voltage range 15 - 30V; frequency range 0 - 50.0kHz. • Refer to Group F05 for the corresponding relationship between the pulse terminal frequency and the running frequency of HD31.	
F00.11	**Command setting source**	**0 - 2 [0]**
	0: Keypad setting. Start and stop the inveter by pressing **RUN**, **STOP** and **JOG**. 1: Terminal setting. Start and stop by using the corresponding external terminals. • DI terminal is set as FWD (No. 2 function), REV (No. 3 function), refer to Group F15. 2: SCI communication setting. Start and stop by SCI communication port according to communication protocol.	
F00.12	**M key function**	**0 - 2 [2]**
	0: Switch running direction. Switch the keypad running direction by **M** key. • F00.11 = 0, it is valid. Do not save when power is off. 1: Switch local and remote control. Switch the local and remote control by **M** key. • F00.11 = 0 or 1, it is valid. 2: Invalid.	
F00.13	**Starting frequency digital setting**	**0 - upper limit [50.00Hz]**
	F00.10 = 0 or 1, F00.13 sets the initial frequency value.	
F00.14	**UP / DOWN digital setting**	**000 - 111 [000]**
	Only valid when F00.11 = 0 or 1. • The current setting frequency value will be replaced by a new one when the value of the F00.13 has been changed by setting the parameter. **Units: Save selection of frequency setting at power outage** • 0: Do not save at power outage. • 1: Save to F00.13 at power outage. **Tens: Control selection of frequency setting at stop** • 0: Do not restore to F00.13 at stop. • 1: Restore to F00.13 at stop. **Hundreds: Save selection of communication setting frequency** • 0: Do not save when power is off. • 1: Save to F00.13 when power is off.	

Ref. Code	Function Description	Setting Range [Default]
F00.15	**Jog running frequency digital setting 1**	**0 - upper limit frequency [5.00Hz]**
F00.16	**Interval of jog running**	**0.0 - 100.0 [0.0s]**
	After cancel the jog command, HD31 will not respond to the jog command at the interval of jog running set by F00.16. • After the interval of jog is completed, it immediately executes the arrived jog command. As show in figure. 	
F00.17	**Running direction**	**0,1 [0]**
	0: The same as running command. 1: Opposite to running command.	
F00.18	**Reverse**	**0,1 [0]**
	This function is valid when F00.11 = 0,1,2. 0: Permitted. 1: Prohibitted. It can respond to the FWD / REV commands. When the analogue value is set to positive / negative voltage and the negative voltage corresponds to the reverse frequency, HD31 will run in accordance with the zero-frequency run.	
F00.19	**Dead time of direction switch**	**0.0 - 3600.0 [0.0s]**
	Defines the dead time of direction switch, namely, the time of zero-frequency output in the process of direction switch shown as the right figure. 	
F00.20	**Key enable of optional keypad**	**0,1 [0]**
	0: Enabled. When HD31 connects to two keypads, the keys of optional display using the communication port can be operated. 1: Invalid. When HD31 connects to two keypads, the keys of optional display using the communication port can not be operated.	
F00.21	**Dormant function**	**0,1 [0]**
	0: Disabled. This function is invalid. 1: Enabled. At running status, when the setting frequency ≤ lower limit of running frequency (F00.09), HD31 coasts to stop and enters dormant status.	
F00.22	**Dormancy wake up time**	**0.0 - 360.0 [0.0s]**
	When HD31 is at dormancy status, and the setting frequency > lower limit of running frequency (F00.09), and the duration achieves the setting time of F00.22, then HD31 wakes up from dormancy status, and starts at the mode of F02.00.	

6.2.2 F01: Protection of Parameters

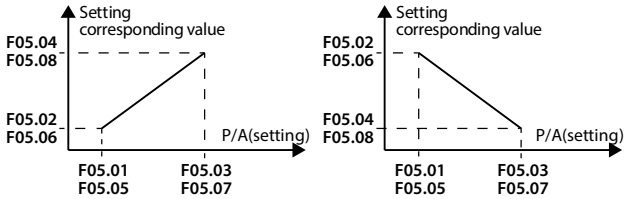
Ref. Code	Function Description	Setting Range [Default]
F01.00	**User's password**	**00000 - 65535 [00000]**
	XXXXX: To enable the password protection function, set any non-zero number as the password. • Once the password is set, to change any parameter, input correct password. Otherwise, all the parameters cannot be changed but only read. • When input correct password, by pressing **PRG** key to exit to stop / run display status or by detecting no press on the keypad within 5 minutes, the user's password will be valid. To change parameters, input correct password. It will restart when there is no press on the keypad within 5 minutes. 00000 : The factory setting of F01.00 is 00000, namely the password protection function is disabled. • If user unlocks the password, it means clearing the user's password.	
F01.01	**Menu mode**	**0,1 [0]**
	0: Full menu mode. All function parameters can be displayed. 1: Checking menu mode. Only parameters different from factory setting can be displayed.	
F01.02	**Function code parameter initialization (download)**	**0 - 6 [0]**
	0: No operation. HD31 is in regular parameter read / write status. • Whether can change the parameter depends on user's password status and the actual running condition of HD31. 1: Restore to factory settings. • Except F01.00, F01.02, F01.03, F19.19, F19.24, F20.08, F20.09, F20.21 - F20.37, F23.00. • **Steps:** If set F01.02 = 1, press ↵ to ensure and the parameters are restored to factory settings. The keypad dispalys "rESEt". Then the keypad will display parameters in stop status after finish restoring to factory setting. 2: Download the keypad EEPROM parameter 1 to the current function code settings. 3: Download the keypad EEPROM parameter 2 to the current function code settings. 4: Clear fault information. The fault history of F20.21 - F20.37 will be clear. 5: Download the keypad EEPROM parameter 1 to the current function code settings (including the motor parameters). 6: Download the keypad EEPROM parameter 2 to the current function code settings (including the motor parameters).	
F01.03	**Keypad EEPROM parameter initialization (upload)**	**0 - 2 [0]**
	0: No operation. HD31 is in regular parameter read / write status. 1: Upload the current function code settings to the keypad EEPROM parameter 1. 2: Upload the current function code settings to the keypad EEPROM parameter 2. *Note: F01.00, F01.02, F01.03, F20.21 - F20.37 and Group y do not upload or download*	

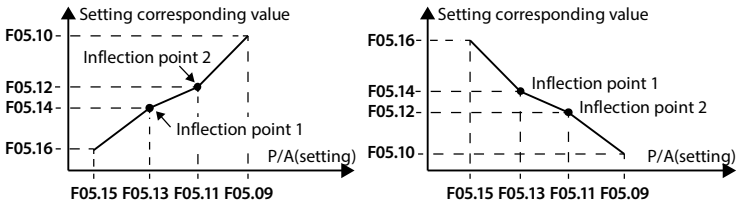
6.2.3 F03: Acc / Dec Parameters

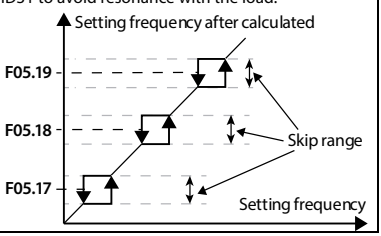
Ref. Code	Function Description	Setting Range [Default]
F03.01	**Acc time**	**0.1 - 6000.0 [18.5kW and below: 10.0s] [22 - 75kW: 30.0s] [90kW and above: 60.0s]**
F03.02	**Dec time**	
	Acc time is the time that output frequency accelerates from 0 Hz to F00.06 (the max-output frequency) in linear form. Dec time is the time that output frequency decelerates from F00.06 (the max-output frequency) to 0 Hz in linear form.	
F03.15	**Acc time of jog running**	**0.1 - 6000.0 [6.0s]**
F03.16	**Dec time of jog running**	**0.1 - 6000.0 [6.0s]**
	F03.15 and F03.16 define the Acc / Dec time of jog running.	
F03.17	**Dec time of emergency stop**	**0.1 - 6000.0 [10.0s]**
	Defines the Dec time of emergency stop.	

6.2.4 F05: External Setting Curve Parameters

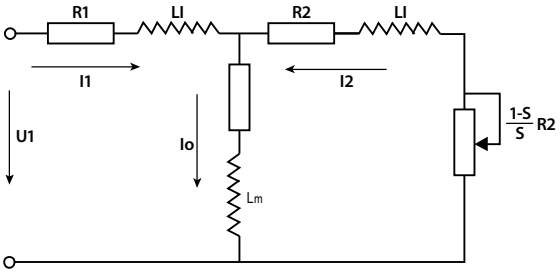
Ref. Code	Function Description	Setting Range [Default]
F05.00	**External setting curve**	**00000 - 22222 [00000]**
	Units: AI1 curve. Tens: AI2 curve. Hundreds: AI3 curve. Thousands: AI4 curve. Ten thousands: Pulse input curve. Each bit setting: • 0: Line 1. • 1: Line 2. • 2: Polyline.	
F05.01	**Min. setting of line 1**	**0.0 - F05.03 [0.0%]**
F05.02	**Min. setting corresponding value of line 1**	**0.0 - 100.0 [0.0%]**
F05.03	**Max. setting of line 1**	**F05.01 - 100.0 [100.0%]**
F05.04	**Max. setting corresponding value of line 1**	**0.0 - 100.0 [100.0%]**
F05.05	**Min. setting of line 2**	**0.0 - F05.07 [0.0%]**
F05.06	**Min. setting corresponding value of line 2**	**0.0 - 100.0 [0.0%]**
F05.07	**Max. setting of line 2**	**F05.05 - 100.0 [100.0%]**
F05.08	**Max. setting corresponding value of line 2**	**0.0 - 100.0 [100.0%]**
F05.09	**Max. setting of polyline**	**F05.11 - 100.0 [100.0%]**
F05.10	**Max. setting corresponding value of polyline**	**0.0 - 100.0 [100.0%]**
F05.11	**Inflection point 2 setting of polyline**	**F05.13 - F05.09 [100.0%]**
F05.12	**Inflection point 2 corresponding value**	**0.0 - 100.0 [100.0%]**
F05.13	**Inflection point 1 setting of polyline**	**F05.15 - F05.11 [0.0%]**
F05.14	**Inflection point 1 corresponding value**	**0.0—100.0 [0.0%]**
F05.15	**Min. setting of polyline**	**0.0 - F05.13 [0.0%]**

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F05.16</td><td>Min. setting corresponding value of polyline</td><td>0.0 - 100.0 [0.0%]</td></tr>
<tr><td></td><td colspan="2">F05.01 - F05.04 define line 1. F05.05 - F05.08 define line 2. F05.09 - F05.16 define the polyline.
• Line 1, line 2 and the polyline can independently achieve positive and negative characteristics as shown in following figure.
• If the curve min. setting is the same as max. setting, it is a line. The default frequency is the corresponding frequency of the curve min. setting.
Positive and negative characteristic of line
 

Positive and negative characteristic of polyline
 

In the figure:
• P / A is terminal pulse / analogue setting.
• Pulse frequency (P) is 100% corresponding to F16.17 max. input pulse frequency.
• Analogue input (A) is 100% corresponding to 10V or 20mA.</td></tr>
<tr><td>F05.17</td><td>Skip frequency 1</td><td rowspan="3">F00.09 - upper limit [0.00Hz]</td></tr>
<tr><td>F05.18</td><td>Skip frequency 2</td></tr>
<tr><td>F05.19</td><td>Skip frequency 3</td></tr>
<tr><td>F05.20</td><td>Range of skip frequency</td><td>0.00 - 30.00 [0.00Hz]</td></tr>
<tr><td></td><td colspan="2">The setting of skip frequency is for output frequency of HD31 to avoid resonance with the load.
• HD31 will skip the above frequencies as shown in figure. Up to 3 skip frequency ranges can be set.
• During the process of Acc / Dec, HD31 will run with countinous frequency output, ignoring the skip frequency ranges. But HD31 will not run at constant speed in the skip frequency ranges.
• Frequency setting is uncontinuous, while frequency output is continuous.
 
</td></tr>
</table>

6.2.5 F08: Asynchronous Motor Parameters



R1=F08.07 (Stator resistance) LI=F08.09 (Leakage inductance)
R2=F08.08 (Rotor resistance) Lm=F08.10 (Mutual inductance)
Io=F08.11 (Excitation current) S=Slip ratio

The idling excitation current (F08.11) can be calculated by the rated current (F08.02) and power factor (F08.05) or detected by parameter auto-tuning (F08.06 = 2).

The relationship between rated torque current, F08.11 and F08.02 is below:

Rated torque current = F08.05 × F08.02

Idling excitation current F08.11 = $\sqrt{1 - \text{F08.05}^2}$ × F08.02

Mutual inductance F08.10 = $\dfrac{\text{F08.01}}{2\sqrt{3}\pi \times \text{F08.03} \times \text{F08.11}}$ − F08.09

Note: Except F08.03, F08.04 and F08.06, the other factory settings are depended on motor.

Ref. Code	Function Description		Setting Range [Default]
F08.00	Rated power of motor		0.2 - 500.0kW
F08.01	Rated voltage of motor		0 - 999V
F08.02	Rated current of motor	7.5kW above motor	0.1 - 999.9A
		7.5kW and below motor	0.01 - 99.99A
F08.03	Rated frequency of motor		1.0 - 400.0 [50.0Hz]
F08.04	Rated RPM of motor		1 - 24000 [1500rpm]
	F08.03 and F08.04 should be set in accordance with the parameters of motor nameplate.		
F08.05	Power factor of motor		0.001 - 1.000
F08.06	Parameter auto-tuning of motor		0 - 2 [0]
	0: Auto-tuning is disabled. 1: Stationary auto-tuning. • In the process of stationary auto-tuning, the motor is at rest. The stator resistance, rotor resistance and leakage inductance will be measured and written into F08.07, F08.08 and F08.09 automatically. 2: Rotary auto-tuning. • In process of rotary auto-tuning, the motor is at rest at the beginning, and the stator resistance, rotor resistance and leakage inductance will be measured. Hinterher the motor will start rotating, accordingly mutual inductance and idling excitation inductance will be measured automatically. All the measured values above will be saved respectively in F08.07, F08.08, F08.09, F08.10 and F08.11 • When the motor is in rotating status, oscillation, even overcurrent, might occur. In this case, press the **STOP** key to stop auto-tuning and then adjust the F09.15 (oscillation-suppression mode) and F09.16 (oscillation-suppression coefficient) suitably to mitigate the possible oscillation. *Note: The auto-tuning is enabled only in keypad control mode (F00.11 = 0).*		

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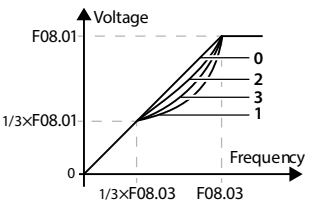
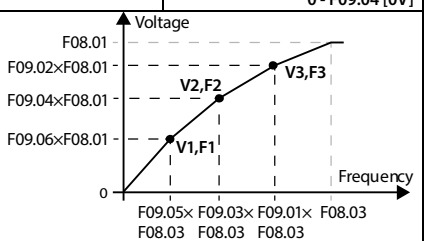
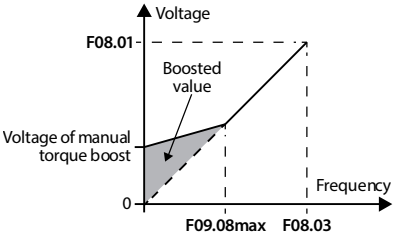
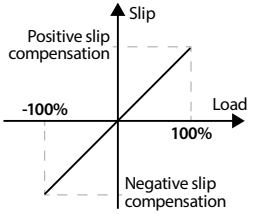
Ref. Code	Function Description		Setting Range [Default]
	Auto-tuning steps: • 1. Input correct motor parameters as per its nameplate (F08.00 - F08.04). • 2. When F08.06 is set as 2, set proper Acc time (F03.01) and Dec time (F03.02) and make sure the motor is disconnected with the load for security. • 3. Set F08.06 as 1 or 2 firstly, then press the ↵ key, and therewith press **RUN** key to start auto-tuning. The LED will display "tunE". • 4. When the RUN indicator is flashing, it indicates that auto-tuning has been completed.Now the keypad displays the parameters of stop status and F08.06 resets to 0.		
F08.07	Stator resistance of motor	7.5kW above motor	0.000 - 9.999Ω
		7.5kW and below motor	0.00 - 99.99Ω
F08.08	Rotor resistance of motor	7.5kW above motor	0.000 - 9.999Ω
		7.5kW and below motor	0.00 - 99.99Ω
F08.09	Leakage inductance of motor	7.5kW above motor	0.00 - 500.00mH
		7.5kW and below motor	0.0 - 5000.0mH
F08.10	Mutual inductance of motor	7.5kW above motor	0.00 - 500.00mH
		7.5kW and below motor	0.0 - 5000.0mH
F08.11	Idling excitation current of motor	7.5kW above	0.0 - 999.9A
		7.5kW and below	0.00 - 99.99A

6.2.6 F09: V/f Control Parameters

Ref. Code	Name Description	Setting Range [Default]
F09.00	**V/f curve of motor**	0 - 4 [0]
	Defines flexible V/f setting modes so as to meet requirements of different load characteristics. • Four curves and one user-defined curve can be selected according to the setting of F09.00. 0: Line. Shown as curve 0 in figure. 1: Square curve. Shown as curve 1 in the figure. 2: 1.2 exponential curve. Shown as curve 2 in the Figure. 3: 1.7 exponential curve. Shown as curve 3 in the Figure. 4: User-defined curve. 	
F09.01	**V/f frequency of motor (F3)**	F09.03 - F08.03 [0.00Hz]
F09.02	**V/f voltage of motor (V3)**	F09.04 - F08.01 [0V]
F09.03	**V/f frequency of motor (F2)**	F09.05 - F09.01 [0.00Hz]
F09.04	**V/f voltage of motor (V2)**	F09.06 - F09.02 [0V]
F09.05	**V/f frequency of motor (F1)**	0.00 - F09.03 [0.00Hz]
F09.06	**V/f voltage of motor (V1)**	0 - F09.04 [0V]
	F09.01 - F09.06 is user-definable V/f curve. • If F09.00 = 4 (user-definable curve), F09.06 is enabled. • The V/f curve can be defined by connecting 3 points of (V1, F1), (V2, F2) and (V3, F3), to adapt to special load. • According to the actual condition, set proper curve to meet the requirements of load characteristics. 	

Ref. Code	Name Description	Setting Range [Default]
F09.07	**Torque boost of motor**	**0.0 - 30.0** **[55kW and below: 2.0%]** **[75 - 132kW: 1.0%]**
F09.08	**Cut-off point used for manual torque boost of motor**	**0.0 - 50.0 (F08.03) [10.0%]**
	In order to compensate the torque drop at low frequency, HD31 can boost the voltage so as to boost the torque. • No matter what kind of V/f curve is set by F09.00, the torque boost is enabled. F09.07 is manually torque boost. • If F09.07=0, it is manually torque boost. User needs to set rated frequency (F08.03) and rated rotary speed (F08.04) of the motor correctly according to its nameplate. F09.08 is relative to percentage of rated frequency (F08.03). 	
F09.09	**Slip compensation gain of motor**	**0.0 - 300.0 [100.0%]**
F09.10	**Slip compensation filter time of motor**	**0.01 - 10.00 [0.10s]**
F09.11	**Slip compensation limit of motor**	**0.0 - 250.0 [200.0%]**
F09.12	**Compensation time constant of motor**	**0.1 - 25.0 [2.0s]**
	The motor slip changes with the load torque, which results in the variance of motor speed. Reduce the influence through slip compensation (HD31 will automatically adjust its output frequency according to the load torque). • In driving status (the actual speed < the setting speed) and in generating status (the actual speed > the setting speed), the slip compensation gain (F09.09) should be increased gradually. • The auto slip compensation depends on the rated slip of motor, consequently make sure the rated frequency (F08.03) and rated speed (F08.04) are set correctly. • Range of slip compensation = F09.11 × Rated slip. • Rated slip = F08.03 - F08.04 × Np / 60. • Np is the number of the motor pole pairs. 	
F09.14	**AVR (automatic voltage regulation) function of motor**	**0 - 2 [1]**
	0: Disabled. 1: Enabled all the time. 2: Disabled in Dec process. • The output voltage can be regulated to maintain constant via AVR. Thus, normally the AVR function should be enabled, especially when the input voltage is higher than the rated voltage. • In Dec process, if F09.14 = 0 or 2, the running current will be a little higher; while if F09.14 =1, the motor will decelerate steadily and the current will be smaller.	
F09.15	**Oscillation-suppression mode of motor**	**0,1 [0]**
	0: Depend on excitation current component. 1: Depend on torque current component.	
F09.16	**Oscillation-suppression coefficient of motor**	**0 - 200 [50]**
	This function is used to damp oscillation when output current is continually unstable. • This function helps to keep the motor running smoothly through correctly adjusting the setting of F09.16.	

6.2.7 F15: Digital I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F15.00	DI1 function	0 – 54 [2]
F15.01	DI2 function	0 - 54 [3]
F15.02	DI3 function	0 - 54 [0]
F15.03	DI4 function	0 - 54 [0]
F15.04	DI5 function	0 - 54 [0]
F15.05	DI6 function	0 - 54 [0]
F15.06	DI7 function	0 - 54 [0]
F15.07	DI8 function	0 - 54 [0]
F15.08	DI9 function	0 - 54 [0]

0: Unused. It disables the terminal function. HD31 ignores the signal input via this terminal.

- The unused terminal is recommended to be set as 0 to avoid wrong connection or action.

1: Inverter enabled.

- When enabled, HD31 is enabled to run;
- When disabled, HD31 is disabled to run and will be in auto stop status.
- If no terminal selects this function, it defaults that HD31 is enabled.

2,3: FWD / REV.

- Set any DI terminal for the FWD / REV to control run / stop of HD31.
- FWD / REV is valid only in terminal control mode (F00.11 = 1).
- Refer to parameter F15.16.

4: Three-wire running mode.

- Refer to parameter 15.16.

12: External stop command input.

- F00.05=1, the pump stops in sequence, otherwise stops according to stop mode. It is valid for all running command sources.

41,42: Coast to stop normally open / normally closed input.

- HD31 will stop outputting immediately and the load will coast to stop in accordance with the mechanical inertia when a DI terminal is set as 41 or 42.

44,45: External fault normally open / normally closed input.

- When HD31 receives the EXT signal, E0024 fault (fault of external equipment) will be displayed.
- The fault signal has two input modes: normally open and normally closed input.

46: External reset (RST) input. When HD31 alarms fault, reset it by this terminal.

- The function of RST terminal is the same as the **STOP** key.

53: Pulse frequency input (DI6).

- This terminal is used to input pulse signal as frequency setting.
- Refer to Group F05 for the relationship between input pulse frequency and frequency setting.

54: Clear fault records. In valid, clear P04.04 at stop.

F15.15	Terminal input positive and negative logic setting	000 - 0x1FF [000]

Defines that each bit (binary) represents different input terminal.

- 0: Positive logic. When input terminals are connected to corresponding common port, this logic is enabled. Otherwise the logic is disabled.
- 1: Negative logic. When input terminals are connected to corresponding common port, this logic is disabled. Otherwise the logic is enabled.

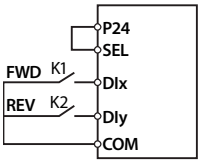
Hundreds				Tens				Units			
Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	DI9	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1

Ref. Code	Name Description	Setting Range [Default]
F15.16	**FWD / REV running mode**	**0 - 3 [0]**

- FWD:DI terminal is defined as No. 2 function.
- REV: DI terminal is defined as No. 3 function.
- Three-wire running: DI terminal is defined as No. 4 function.

0, 1: Two-wire running mode 1, 2.

- When stop command coming from other sources makes HD31stop though the terminal logic enabled in the terminal control mode, there is no running command even the control terminals FWD / REV are still valid.
- To run HD31 again, trigger the active FWD and REV.



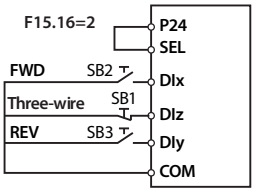
K2	K1	Run Command	
		F15.16=0	F15.16=1
0	0	Stop	Stop
1	0	Reverse	Stop
0	1	Forward	Forward
1	1	Stop	Reverse

2: Three-wire running mode 1.

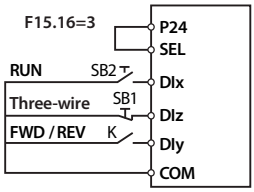
- If the shift between SB2 and SB3 is disabled, HD31 will keep the control mode.

3: Three-wire running mode 2.

- If SB2 changes from enabled into disabled, HD31 will keep the same mode.



SB1: Normally closed stop button
SB2: Normally open forward button
SB3: Normally open reverse button



K: Direction selection terminal (level on)
K = 0(forward) K = 1(reverse)
SB1: Normally closed stop button
SB2: Normally open run button

F15.18	**DO1 function**	**0 - 35 [2]**
F15.19	**DO2 function**	**0 - 38 [0]**
F15.20	**RLY1 function**	**0 - 35 [31]**
F15.21	**RLY2 function**	**0 - 35 [0]**
F15.22	**RLY3 function**	**0 - 35 [0]**
F15.23	**RLY4 function**	**0 - 35 [0]**

0: Unused.

1: Inverter is ready.

- HD31 completes power on and no fault occurs, then it can normally run the indicating signal.

2: Inverter running.

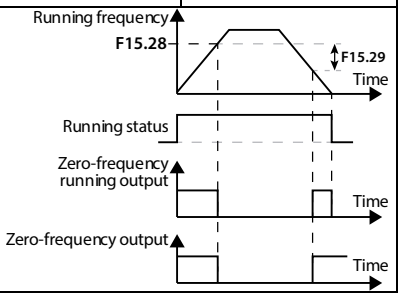
- HD31 is in run status and outputs indicating signal.

3: Forward running.

- HD31 is forward running the indicating signal.

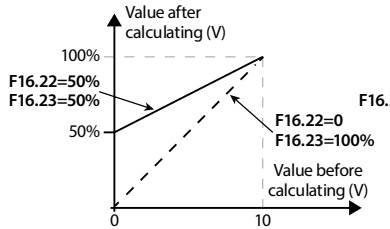
4: Reverse running.

- HD31 is reverse running the indicating signal.

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td colspan="2">6: Zero-frequency status.
• In the zero-frequency range, the output frequency (including in stop status) outputs the indication signal.
7: Zero-frequency running.
• In the zero-frequency range HD31 output frequency outputs the indicating signal.
31: Inverter fault.
• HD31 will output fault signal when it has a fault.
32: External fault.
• The indicating signal can output when HD31 detects the external fault signal via terminal.
35: Dormancy indicating function.
38: High-frequency output (DO2).
• DO2 can be selected as high-frequency output.</td></tr>
<tr><td>F15.24</td><td>Output terminal logic setting</td><td>000 - 0xFFF [000]</td></tr>
<tr><td></td><td colspan="2">Defines that each bit (binary) represents different output terminal.
• 0: Positive logic. When output terminals are connected to corresponding common port, this logic is enabled. Otherwise the logic is disabled.
• 1: Negative logic. When output terminals are connected to corresponding common port, this logic is disabled. Otherwise the logic is enabled.
<table>
<tr><th colspan="4">Thousands</th><th colspan="4">Tens</th><th colspan="4">Units</th></tr>
<tr><td>Bit11</td><td>Bit10</td><td>Bit9</td><td>Bit8</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>RLY10</td><td>RLY9</td><td>RLY8</td><td>RLY7</td><td>RLY6</td><td>RLY5</td><td>RLY4</td><td>RLY3</td><td>RLY2</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>F15.28</td><td>Zero-frequency signal detection threshold</td><td>0.00 - upper limit [0.00Hz]</td></tr>
<tr><td>F15.29</td><td>Zero-frequency hysteresis</td><td></td></tr>
<tr><td></td><td colspan="2">F15.28 and F15.29 are used to set the zero-frequency output control function, refer to the right figure.
 
</td></tr>
</table>

6.2.8 F16: Analogue I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F16.00	**Keypad with potentiometer function**	**0 - 2 [0]**
	Only when using keypad with potentiometer is F16.00 enabled.	
F16.01	**AI1 function**	**0 - 2 [2]**
F16.02	**AI2 function**	**0 - 2 [0]**
F16.03	**AI3 function**	**0 - 2 [0]**
F16.04	**AI4 function**	**0 - 2 [0]**
	0: Unused. 1: Upper limit frequency setting • F00.07 = 1 (analogue input sets upper limit frequency), the upper limit frequency is set by the input voltage corresponding to the AI terminal. 2: Frequency setting. • F00.10 = 3 (analogue input sets frequency), the setting frequency is set by the input voltage corresponding to the AI terminal.	
F16.05	**AI1 bias**	**-100.0 - 100.0 [0.0%]**
F16.08	**AI2 bias**	
F16.11	**AI3 bias**	
F16.14	**AI4 bias**	
F16.06	**AI1 gain**	**-10.00 - 10.00 [1.00]**
F16.09	**AI2 gain**	
F16.12	**AI3 gain**	
F16.15	**AI4 gain**	
F16.07	**AI1 filter time**	**0.01 - 10.00 [0.05s]**
F16.10	**AI2 filter time**	
F16.13	**AI3 filter time**	
F16.16	**AI4 filter time**	
	When AI1 - AI4 sets frequency, the relationship between the analogue input and the analogue value after calculating is shown as figure: Analogue actual value → Analogue input filtering → Analogue input gain Analogue input bias → Analogue value after calculating • The formula is: AI actual value = Gain × Value before calculating +Bias • F16.07, F16.10, F16.13, F16.16 define the filter time. • The longer filter time is, the higher immunity level is, the response time is prolonged. The shorter filter time is, the quicker response time is, the lower the immunity level is.	
F16.17	**Max. input pulse frequency**	**0.0 - 50.0 [10.0kHz]**
	When set the DI6 terminal as pulse input, F16.17 defines the max. input pulse frequency.	
F16.18	**Input pulse filter time**	**0 - 500 [10ms]**
	It is used to filter the input pulse frequency and filter out the small fluctuations in the pulse frequency.	
F16.19	**AO1 function**	**0 - 19 [1]**
F16.20	**AO2 function**	**0 - 19 [0]**
F16.21	**High-speed pulse output function**	**0 - 19 [0]**
	0: Unused. 1,2: Output frequency / setting frquency (0 - max. output frequency) 3: Motor RPM (0 - max. output frequency corresponding to RPM). 4: Output current (0 - twice rated current of motor).	

Ref. Code	Function Description	Setting Range [Default]
	5: Output current (0 - twice rated current of motor) 6 - 9: Unused. 10: Output torque (0 - 3 times rated torque of motor). 11: Output voltage (0 - 1.2 times rated voltage of HD31). 12: Bus voltage (0 - 2.2 times rated voltage of HD31). 13: Output power (0 - twice rated power of motor). 14: AI1 input (after calculating). 15: AI2 input (after calculating). 16: AI3 input (after calculating). 17: AI4 input (after calculating). 18,19: Output frequency / setting frequency (- 1 times - 1 times max. output frequency).	
F16.22	**AO1 bias**	**-100.0 - 100.0 [0.0%]**
F16.23	**AO1 gain**	**0.0 - 200.0 [100.0%]**
	The proportional relation of output can be adjusted by output gain, as shown in the figure below. • The formula is: AO1 actual output = F16.23 × Value before calculating + F16.22 	
F16.24	**AO2 bias**	**-100.0 - 100.0 [0.0%]**
F16.25	**AO2 gain**	**0.0 - 200.0 [100.0%]**
	Refer to F16.22 and F16.23.	
F16.26	**DO2 max. output pulse frequency**	**0.1 - 50.0 [10.0kHz]**
	Defines the DO2 terminal allowable max. output frequency.	

6.2.9 F17: SCI Communication Parameters

Ref. Code	Function Description	Setting Range [Default]
F17.00	**Data format**	**0 - 5 [0]**
	0: 1-8-2 format, no parity, RTU. 1: 1-8-1 format, even parity, RTU. 2: 1-8-1 format, odd parity, RTU. 3: 1-7-2 format, no parity, ASCII. 4: 1-7-1 format, even parity, ASCII. 5: 1-7-1 format, odd parity, ASCII.	
F17.01	**Baud rate**	**0 - 5 [3]**
	0: 1200bps. 1: 2400bps. 2: 4800bps. 3: 9600bps. 4: 19200bps 5: 38400bps.	
F17.02	**Local address**	**0 - 247 [2]**
	F17.02 = 0, it means broadcast address.	
F17.03	**Host PC response time**	**0 - 1000 [0ms]**
F17.04	**Detection time at communication timeout**	**0.0 - 1000.0 [0.0s]**
	Time at no communication data > setting time of F17.04, it will be considered as E0028 fault (SCI timeout fault). • F17.04 = 0, it will not detect communication timeout.	
F17.05	**Detection time at communication error**	**0.0 - 1000.0 [0.0s]**
	Time at communication error > setting time of F17.05, it will be considered as E0029 fault (SCI error). • When F17.05 = 0, it will not detect the communication error.	
F17.06	**Action selection at communication timeout**	**0 - 3 [3]**
F17.07	**Action selection at communication error**	**0 - 3 [3]**
F17.08	**Action selection at communication peripheral device fault**	**0 - 3 [1]**
	F17.06 defines the action selection at commmunication timeout. F17.07 defines the action selection at communication error. In the communication command setting mode, F17.08 will define the action selection when communication peripheral device fault is alarmed. 0: Coast to stop. 1: Emergency stop. 2: Decelerate to stop. 3: Continue to run.	

6.2.10 F18: Display Control Parameters

Ref. Code	Function Description	Setting Range [Default]
F18.00	**Language selection**	**0,1 [0]**
	Defines the displaying language on the LCD keypad. 0: Chinese. 1: English.	
F18.01	**Display contrast of the LCD keypad**	**1 - 10 [5]**
	To select LCD display contrast.	
F18.02	**Set parameter 1 of run status**	**0 - 49 [8]**
F18.03	**Set parameter 2 of run status**	**0 - 49 [7]**
F18.04	**Set parameter 3 of run status**	**0 - 49 [36]**
F18.05	**Set parameter 4 of run status**	**0 - 49 [13]**
F18.06	**Set parameter 5 of run status**	**0 - 49 [14]**
F18.07	**Set parameter 6 of run status**	**0 - 49 [18]**
F18.08	**Set parameter 1 of stop status**	**0 - 49 [7]**
F18.09	**Set parameter 2 of stop status**	**0 - 49 [18]**
F18.10	**Set parameter 3 of stop status**	**0 - 49 [20]**
F18.11	**Set parameter 4 of stop status**	**0 - 49 [22]**
F18.12	**Set parameter 5 of stop status**	**0 - 49 [35]**
F18.13	**Set parameter 6 of stop status**	**0 - 49 [36]**
	The keypad displays parameters which is the run status (F18.02 - F18.07) and stop status (F18.08 - F18.13). • It can be cycling displayed by ▶▶ key on the keypad. • Each content of display parameter can be set corresponding to 49 statuses. • For instance: when set F18.08 as 7, the stop parameter is setting frequency at initial power on. 1: Rated current of HD31. 7: Setting frequency. 8: Setting frequency (after Acc / Dec). 9: Output frequency. At running status, Hz indicator is flashing. 10: Setting RPM. 11: Running RPM. At running status, RPM indicator is flashing. 12: Three-phase power supply input phase sequence. • 0: Positive sequence, L1(R) preceding L2(S) preceding L3(T). • 1: Negative sequence, L1(R) preceding L3(T) preceding L2(S) 13: Output voltage. 14: Output current. 16: Output torque. 17: Output power. 18: DC bus voltage. 19: Potentiometer input voltage. 20: AI1 voltage. 21: AI1 voltage (after calculating). 22: AI2 voltage. 23: AI2 voltage (after calculating). 24: AI3 voltage. 25: AI3 voltage (after calculating). 26: AI4 voltage. 27: AI4 voltage (after calculating). 28: DI6 pulse input frequency. 29, 30: AO1 / AO2 output. 31: High-speed output pulse frequency. 32: Heatsink temperature. 35: Content water supply pressure setting. 36: Actula feedback pressure. 37: PID setting. 38: PID feedback. 39: PID error. 40: PID integral value. 41: PID output. 43: Input terminal status. • Bit0 - Bit8 are corresponding to DI1 - DI9. 44: Output terminal status • Bit0 - Bit11 are corresponding to DO1, DO2, RLY1 - RLY10 48: Total time at power on (hour). 49: Total time at running (hour).	

6.2.11 F19: Function-boost Parameters

Cooling fan (F19.07 - F19.08)

Ref. Code	Name Description	Setting Range [Default]
F19.07	**Fan control**	**0 - 2 [0]**
F19.08	**Fan control delay time**	**0.0 - 600.0 [30.0s]**
	Defines the control mode of cooling fan. With overheat protection, the fan runs all the time. 0: Auto stop. • The fan runs all the time when HD31 is in running status. After HD31stops for the time set by F19.08, the fan continues running if overheat protection is activated. 1: Immediate stop. • The fan runs all the time when HD31 is in running status and stops when HD31stops. 2: Runs all the time when power on. • The fan runs all the time when HD31 is powered on.	

Restart after power failure (F19.16 - F19.17)

When terminal sets running command, this function decides whether HD31 starts automatically or not and the delay time for restart when HD31 restarts after power failure.

Ref. Code	Name Description	Setting Range [Default]
F19.16	**Restart after power failure**	**0,1 [0]**
	0: Disabled. 1: Enabled. In the terminal two-wire control mode and suddenly power failure during running process, when HD31 is powered on again and the terminal is still enabled, it will wait certain time defined by F19.17 and then restart with speed tracking mode.	
F19.17	**Delay time for restart after power failure**	**0.00 - 10.00 [2.00s]**

Protection of stall overvoltage (F19.18 - F19.19)

During Dec, the actual decrease rate of motor may < output frequency due to the load inertia. At this time, the motor will feed the energy back to HD31, resulting in voltage rise on the DC bus. If no measure is taken, HD31 will trip due to overvoltage.

Ref. Code	Name Description	Setting Range [Default]
F19.18	**Stall overvoltage**	**0,1 [1]**
	0: Disabled. Braking unit and braking resistor are recommended to be installed if F19.18 is set as 0. 1: Enabled. During the Dec, HD31 detects the bus voltage and compares it with F19.19. • If the detected bus voltage > F19.19, HD31 will stop reducing its output frequency. When detect again, if the DC bus voltage < F19.19, the Dec continues. *Note: Stall overvoltage > 1 minute, HD31 will alarm E0007 fault, meanwhile stops output.*	
F19.19	**Stall overvoltage point**	**0 - 1200 [740V]**
	If the stall overvoltage point is set a little lower, Dec time should be comparatively longer.	

Auto current limit (F19.20 - F19.22)

Auto current limit is used to limit the load current in real time < F19.21. Therefore HD31 will not trip due to surge current. It is especially suitable for applications with big load inertia or big change of load.

In auto current limit process, output frequency of HD31 may change; therefore, it is recommended not to enable when stable output frequency is required.

Ref. Code	Name Description	Setting Range [Default]
F19.20	**Auto current limit**	**0 - 2 [1]**
	0: Disabled. 1: Enabled in Acc / Dec running process, but disabled in constant speed running process. 2: Enabled both in Acc / Dec and constant speed running process. • When the auto current limit is enabled, the output overload capacity will be impaired if auto current limit threshold is set too low.	
F19.21	**Auto current limit threshold**	**20.0 - 200.0 [110%]**
	Defines the current threshold of auto current limit. The current = F19.21 × rated current of HD31.	
F19.22	**Dec time at auto current limit**	**0.0 - 6000.0** **[18.5kW and below: 10.0s]** **[22 - 75kW: 30.0s]** **[90kW and above 60.0s]**
	Defines the speed rate for the output frequency adjustment at auto current limit action. • If the setting is too big, it will not be easy to get over the auto current limit status and finally result in overload fault. If the setting is too small, the frequency will change too sharply and therefore, HD31 may be in generating status for a long time, which may result in overvoltage protection. • F19.22=0 , it will not decelerate at current limit.	
F19.23	**Enabled terminal at power on**	**0,1 [0]**
	0: Rise edge. • For many applications, HD31 is not allowed to auto run to avoid device damage and ensure safety due to no person interference at power on. In these applications, when the inverter has power initialized and ready to run, it can not start to run until the terminal run command is given. 1: Level. • For certain applications, when ensured personal safety and device safety, HD31 needs immediately run at power on in order to provide automation and efficiency. In these applications, HD31 will immediately run as soon as the terminal running command is given whether before or after power on.	

Braking unit (F19.24)

Ref. Code	Name Description	Setting Range [Default]
F19.24	**Action voltage of braking unit**	**630 - 750 [720V]**
	Note: Only in inverter running status is the braking enabled.	

6.2.12 F20: Fault Protection Parameters

Overload fault (F20.00 - F20.02)

Ref. Code	Name Description	Setting Range [Default]
F20.00	**Overload pre-alarm detection**	**00000 - 11111 [00000]**
	Units: Overload pre-alarm detection • 0: It is active all the time in running status. • 1: It is active only at constant speed. **Tens: Overload pre-alarm action** • 0: HD31 doesn't alarm and continues running when detecting an active overload signal. • 1: HD31 alarms and stops running when detecting an active overload signal. **Hundreds: Overload detection threshold** • 0: Relates to rated current of motor (alarm E0019: motor overload). • 1: Relates to rated current of HD31 (alarm E0017: inverter overload). **Thousands: Motor type** • 0: Standard motor. • As the cooling effect of the standard motor deteriorates at low speed, HD31 will automatically make regulation to the time of motor overload protection. • 1: Variable frequency motor. • The cooling effect of the variable frequency motor is not affected by the motor speed due to its forced cooling potential, HD31 will not automatically make regulation to the time of motor overload protection. **Ten thousands: Overload protection** • 0: Enabled. • 1: Disabled.	
F20.01	**Overload pre-alarm detection threshold**	**20.0 - 200.0 [150.0%]**
	Defines the current threshold for overload pre-alarm protection. The current = F20.01 × rated current of motor / rated current of HD31.	
F20.02	**Overload pre-alarm detection time**	**0.0 - 60.0 [5.0s]**
	Defines the time during which the output current of HD31 > F20.01. If the status remains after overload pre-alarm detection time (F20.02), HD31 will alarm E0017 fault (inverter overload) or E0019 fault (motor overload).	

Output load-loss detection fault of HD31(F20.03 - F20.05)

Ref. Code	Name Description	Setting Range [Default]
F20.03	**Output load-loss detection of HD31**	**0 - 4 [0]**
	0: Disabled. It does not detect output load-loss. 1: It detect all the time in running process, and then continues running after detecting (alarm). 2: It detects only at constant speed, and then continues running after detecting (alarm). 3: It detects all the time in running process, and then cuts off the output after detecting (fault). 4: It detects only at constant speed, and then cuts off the output after detecting (fault).	
F20.04	**Output load-loss detection threshold of HD31**	**0 - 100 [30%]**
	Defines the current threshold of load-loss. The current = F20.01 × rated current of HD31.	
F20.05	**Output load-loss detection time of HD31**	**0.00 - 20.00 [1.00s]**
	If the output current of HD31 < F20.04 and exceeds the time defined by load-loss detection time (F20.05), HD31 will alarm E0018 fault (inverter output load-loss). • F20.04 or F20.05 = 0, HD31 will not detect load-loss fault.	

Motor overheat fault (F20.06 - F20.07)

It can connect the electronic thermistor embedded motor stator coils to the AI terminal of HD31 in order to protect motor overheat.

Ref. Code	Name Description	Setting Range [Default]
F20.06	**Motor overheat signal input type**	**0 - 2 [0]**
	0: Does not detect the motor overheat. 1: Positive charateristic (PTC). 2: Negative charateristic (NTC).	
F20.07	**Thermistor value at motor overheat**	**0 - 10.0 [5.0kΩ]**

Input and output voltage phase loss fault (F20.08 - F20.11)

Ref. Code	Name Description	Setting Range [Default]
F20.08	**Input voltage phase loss detection setting**	**0 - 50 [30%]**
F20.09	**Input voltage phase loss detection time**	**1.00 - 5.00 [1.00s]**
	The detection voltage = F20.08 × rated voltage of HD31. When HD31 detects certain input voltage < the detection setting (F20.08) and exceeds the detection time (F20.09), HD31 will alarm E0015 fault (input voltage phase loss). • F20.08 = 0, HD31 will not detect input voltage phase loss fault.	
F20.10	**Output voltage phase loss detection setting**	**0 - 50 [20%]**
F20.11	**Output voltage phase loss detection time**	**0.00 - 20.00 [3.00s]**
	The detection current = F20.10 × rated current of HD31. When HD31 detects certain output current < the detection setting (F20.10) and exceeds the detection time (F20.11), HD31will alarm E0016 fault (output voltage phase loss). • F20.10 or F20.11 = 0, HD31 will not detect output voltage phase loss fault.	

PID setting and feedback loss fault (F20.12 - F20.17)

Ref. Code	Name Description	Setting Range [Default]
F20.12	**PID setting lose detection value**	**0 - 100 [0%]**
F20.13	**PID setting loss detection time**	**0.0 - 10.0 [0.20s]**
	F20.12 value is a percentage of the max. setting source. If the PID setting < F20.12 in the detection time (F20.13), HD31 will alarm E0025 fault (PID setting loss). • F20.12 or F20.13 =0, HD31 will not detect PID setting loss fault.	
F20.14	**PID feedback loss detection value**	**0 - 100 [0%]**
F20.15	**PID feedback loss detection time**	**0.0 - 10.0 [0.20s]**
	F20.14 value is a percentage of the max. feedback source. If the PID feedback value < F20.14 in the detection time (F20.15), HD31 will alarm E0026 fault (PID feedback loss). • F20.14 or F20.15 = 0, HD31 will not detect PID feedback loss fault.	

Fault at PID feedback value out of the limit (F20.16 - F20.17)

Ref. Code	Name Description	Setting Range [Default]
F20.16	**Detection value at PID feedback out of the limit**	**0 - 100 [100%]**
F20.17	**Detection time at PID feedback out of the limit**	**0.00 - 10.00 [0.20s]**
	F20.16 value is a percentage of the max. feedback source. If the PID feedback value > F20.16 in the detection time (F20.17), HD31 will alarm E0027 fault (PID feedback out of limit). • F20.16=100 or F20.17=0, HD31 will not detect PID feedback out of limit fault.	

Fault auto reset function and faulted relay action (F20.18 - F20.20)

Auto reset function enables HD31 to reset the fault as per the reset times and interval.

During the reset interval, HD31 stops output and it will automatically restarts with speed tracking mode.

The following faults do not have the auto reset function:

E0008: Power module fault
E0010: Braking unit fault
E0013: Soft start contactor failed
E0014: Current detection fault
E0021: Read / Write fault of control board EEPROM
E0023: Parameter setting fault
E0024: Peripheral device fault

Ref. Code	Name Description	Setting Range [Default]
F20.18	**Auto reset times**	**0 - 100 [0]**
F20.19	**Auto reset interval**	**2.0 - 20.0 [5.0s/times]**
	F20.18 = 0, it means "auto reset" is disabled and the fault protection will be activated. • If no other fault is detected within 5 minutes, the auto reset times will be automatically cleared. • On condition of external fault reset, auto reset time will be cleared.	
F20.20	**Faulty relay action**	**00 - 11 [00]**
	Units: In auto reset process 0: Faulty relay doesn't act. 1: Faulty relay acts. **Tens: In the undervoltage process** 0: Faulty relay doesn't act. 1: Faulty relay acts. *Note: Relay needs to be set as No. 31 function (inverter fault).*	

Fault history (F20.21 - F20.37)

Ref. Code	Name Description	Setting Range [Default]
F20.21	Type of fifth latest (the last) fault	[Actual value]
F20.22	Setting frequency at the last fault	
F20.23	Running frequency at the last fault	
F20.24	Bus voltage at the last fault	
F20.25	Output voltage at the last fault	
F20.26	Output current at the last fault	
F20.27	Input terminal status at the last fault	
F20.28	Output terminal status at the last fault	
F20.29	Interval at the latest fault	
F20.30	Type of fourth latest fault	
F20.31	Interval of fourth latest fault	
F20.32	Type of third latest fault	
F20.33	Interval of third latest fault	
F20.34	Type of second latest fault	
F20.35	Interval of second latest fault	
F20.36	Type of first latest fault	
F20.37	Interval of first latest fault	
	F20.22 - F20.29 record status parameters of HD31 at the last fault. F20.30 - F20.37 record the type and interval per time of four faults before the latest. The unit of interval is 0.1 hour.	

6.2.13 F23: PWM Control Parameters

Ref. Code	Name Description	Setting Range [Default]
F23.00	Carrier frequency	1 - 16kHz [Depend on HD31]
	F23.00 defines the carrier frequency of PWM output wave.	

Inverter power	Setting range	Factory setting
7.5 - 30kW	1 - 16kHz	8kHz
37 - 45kW	1 - 12kHz	6kHz
55kW	1 - 6kHz	4kHz
⩾75kW	1 - 4kHz	2kHz

- The carrier frequency will affect the running noise of the motor. The higher the carrier frequency, the lower the noise made by the motor. So properly set the carrier frequency.
- When the value > the factory setting, HD31 should be derated by 5% when per 1kHz is increased compared to the factory setting.

F23.02	PWM overshoot enable	0,1 [1]
	0: Disabled. 1: Enabled.	

6.3 Group P: Special Parameter for Multi-pump Water Supply

6.3.1 P00: Water Supply Logic Parameter

Ref. Code	Name Description	Setting Range [Default]
P00.00	**Water supply mode**	**0,1 [1]**
	0: Running. • Applicable to common water supply system, e.g., water supply for daily use, industrial use, municipal use as well as sewage treatment system. • Also applicable to similar systems, such as oil supply system, vent system and other systems. 1: Commissioning. • Used for on-site commissioning, and to confirm the switching logic and wiring of HD31. *Note: The above modes are valid when F00.05 = 1. The I/O terminals of I/O board are valid when F00.04=2.*	
P00.01	**Water level (WL) signal input**	**0 - 2 [0]**
	0: No input. No control for WL signal of the intake pool. 1: DI terminal input. • No. 15 - 17 function of P03.04 - P03.12 respectively set the current upper limit WL, lower limit WL and water shortage WL. 2: AI terminal input. • The P03.00 - P03.03 set the signal source of the analogue WL. • The P00.02 - P00.04 respectively set the upper limit WL, lower limit WL and water shortage WL.	
P00.02	**Upper limit WL of intake pool**	**0.0 - 100.0 [50.0%]**
P00.03	**Lower limit WL of intake pool**	**0.0 - P00.02 [30.0%]**
P00.04	**Water shortage WL of intake pool**	**0.0 - P00.03 [10.0%]**
P00.05	**Backup pressure**	**0.0 - P05.03 × 10 [0.0 kg/cm^2]**
	100.0% of the WL signal corresponds to 10V or 20mA. **Water level control:** • When WL of the intake pool decreases: • The system runs in accordance with P00.05 when water shortage WL of intake pool < current WL < lower limit WL of intake pool; • The system stops all of the bumps when current WL < water shortage WL of intake pool. • When WL of the intake pool increases: • The system runs in accordance with P00.05 when lower limit WL of intake pool < current WL < upper limit WL of intake pool; • The system resumes normal pressure running when upper limit WL of intake pool < current WL.	

Ref. Code	Function Description	Setting Range [Default]
P00.06	Pressure tolerance for adding pump	0.0 - 50.0 [10.0%]
P00.07	Detection time for adding pump	0.0 - 3600.0 [5.0s]
P00.08	Upper switch frequency when adding variable frequency pump	P02.27 - upper limit [50.00Hz]
P00.09	Dec time of variable frequency pump when adding power frequency pump	0.0 - 100.0 [10.0s]
	Conditions for adding pump: • ① The currently running frequency reaches P02.27 (upper limit of pressure closed-loop) • ② Pipe system pressure ≤ setting pressure × (1 - P00.09) • ③ Duration of condition ① and ② ≥ P00.07 • **Adding variable frequency pump:** when the system meets the conditions of adding pump and if next pump is an inverter drive one. • The currently running variable frequency pump needs switching to run with power frequency. A disconnected inverter must comply with P00.13. HD31 needs to accelerate to P00.08, thus to reduce the network pipe pressure drop and then stops output. • Disconnect inverter drive contactor, apply P00.13, and connect the normal drive contactor to complete the frequency change. At the same time, HD31 controls the next pump to proceed to PI commissioning. • **Adding power frequency pump:** when the system meets the conditions of adding pump and if next pump is a normal drive one. • The system automatically starts the next power frequency pump. • To avoid a sudden increase in the pipe pressure, the current variable frequency pump decreases its output frequency to F00.09 according to P00.09, and proceeds to PI conmissioning. *Note:* *1. Priority of adding pumps: variable frequency pump > power frequency pump.* *2. If there are multiple normal / inverter frequency pumps, the system adds pumps in a circle way according to "first stop, first resume".*	
P00.10	Pressure tolerance for reducing pump	0.0 - 50.0 [10.0%]
P00.11	Detection time for reducing pump	0.0 - 3600.0 [5.0s]
P00.12	Acc time of variable frequency pump when reducing pump	0.0 - 100.0 [10.0s]
	Conditions for reducing pump: • ① When the current variable frequency pump operates at the lower limit • ② Pipe system pressure ≥ setting pressure × (1 + P00.10) • ③ Duration of ① and ② ≥ P00.11 • **Reducing variable frequency pump:** when the system meets the conditions of reducing pump and if the pump is an inverter drive one. • If the current pump is running with power frequency, directly switch the signal; meanwhile, the pump accelerates to the upper limit according to P00.12, then proceed to PI commissioning; • If the current pump is running with variable frequency, there is no need to reduce the pump. The pump can always run at lower limit frequency. • **Reducing power frequency pump:** when the system meets the conditions of reducing pump and if the pump is a normal drive one. • Firstly the system disconnects the power frequency signal. • At the same time, the pump accelerates to upper limit frequency according to P00.12, then proceed to PI commissioning. *Note: Reduce the power frequency pump preferentially when there are both inverter & power frequency pumps which run with power frequency.*	

Ref. Code	Name Description	Setting Range [Default]
P00.13	**Breaking delay of pump 1 contacotr**	**0.000 - 5.000 [0.020s]**
P00.14	**Touching delay of pump 1 contactor**	**0.000 - 5.000 [0.200s]**
	Used during the pump switch process. It is used for the mechanical delay close and open of the contactor. And more importantly, it's used to avoid the remanence effect. This effect occurs during the process of variable frequency switching to power frequency. Remanence effect may cause the switch fail. • P00.13 is the duration of HD31 from sending a command of free stop (send an instruction to disconnect HD31 drive contactor simultaneously) to close the normal drive contactor. • For pumps over 45kW which require to switch from variable frequency to power frequency, P00.13 can effectively reduce the switching current and improve successful switching. • P00.14 is the duration from sending a close command of inverter drive contactor to the output moment of HD31. It allows for the mechenical delay of the contactor before starting the next variable frequency pump.	
P00.15	**Switch circle of power frequency pump**	**0 - 9999 [0h]**
P00.16	**Switch circle of variable frequency pump**	**0 - 9999 [0h]**
	Switch between power frequency pumps: When there are one power frequency pump in running status and one that is waiting, the switch will occur only when the running pump meets P00.15. Switch between variable frequency pumps: When there are one variable frequency pump in running status and one that is waiting, the switch will occur only when the running pump meets P00.16. • P00.15 and P00.16 = 0, the switch function is valid.	
P00.17	**Dormancy enable**	**0 - 4 [0]**
	0: No dormancy. 1: Constant pressure dormancy. 2: Specified pressure dormancy. 3: No flow dormancy1. 4: No flow dormancy 2. *Note: F00.21 and F00.22 support specified pressure dormancy (it's dormant when the setting frequency meets lower limit frequency).*	
P00.18	**Pressure tolerance of dormancy awakening**	**0.0 - 100.0 [10.0%]**
P00.19	**Delay time of dormancy awakening**	**0.0 - 3600.0 [5.0s]**
	P00.17 = 0: dormant function is invalid. • P00.17 = 1: when the system meets the condition of reducing pump, provided that there is no power frequency pump or variable frequency pump that runs with power frequency, the system enters dormant status. Mmeanwhile, is will start a dormant pump if there is one in the system. • P00.17 = 2: when feedback pressure > setting pressure + setting pressure × P00.20, and surpass setting time of P00.22, the system stops all running pumps and enters dormant status. • P00.17 = 3: when only one inverter existed in the system, feedback pressure > setting prsssure + setting pressure × P00.20 and output frequency is smaller than P00.23 for certain time, (if it is starting procedure, the time will be P00.24, others will be P00.22. if no special requirements, can set P00.22 = P00.24), system will sleep. • P00.17 = 4: when only one inverter existed in the system, feedback pressure > setting prsssure + setting pressure × P00.20 and output frequency is smaller than no-flow power or output frequency is smaller than P00.23 for a certain time (P00.22), system will sleep. In dormant status, when feedback pressure < setting pressure - setting pressure × P00.18, and exceeds setting time of P00.19, the dormancy is awakened. While if P00.17 = 1 , the dormant pump is disconnected. When dormant is awakened, HD31 drive pump is preferably added if there is any waited in the system. If there is power frequency pump waiting, it is added directly.	

Ref. Code	Name Description	Setting Range [Default]
P00.20	**Shutdown detection coefficient**	**0.0 - 100.0 [0.0%]**
P00.21	**Interval of shutdown the pump and water supply**	**0.0 - 60.0 [10.0s]**
	When the system receives stop command, it will shut off the pumps in accordance with P00.21. The shutoff sequence is: dormant pump > sewage pump > power frequency pump > variable frequency pump running with power frequency > variable frequency pump running with variable frequency.	
P00.22	**Detection time of shutdown detection**	**0.0 - 3600.0 [6.0s]**
P00.23	**No-flow detecting frequency**	**0.0 - 50.00[25.00Hz]**
P00.24	**Detecting time for no-flow detecting start delay**	**0.0 - 3600.0[60.0s]**
P00.25	**No flow correction factor**	**1 - 400[100%]**
	Before correcting no-flow frequency, pls refer to d00.41.	
P00.26	**No-flow low speed**	**0.00 - 99.99 [0.00Hz]**
P00.27	**No-flow low speed power**	**0.00 - 10.00 [0.00kW]**
P00.28	**No-flow high speed**	**0.00 - 99.99 [0.00Hz]**
P00.29	**No-flow high speed power**	**0.00 - 10.00 [0.00kW]**
	No-flow power measuring steps: • Set F00.05 = 0, F00.10 = 0 and ensure the system reach normal temporature before no-flow power testing. • Close main valve and stop flow • When the setted frequency is about 50% of motor rated frequency, recording setted frequency in P00.26 and recording current value of D00.40 in P00.27 • When the setted frequency is about 85% of motor rated frequency, recording setted frequency in P00.28 and recording current value of D00.40 in P00.29.	
P00.30	**No-flow detection curve**	**0 - 3 [0]**
	0: Square curve. 1: Straight line. 2: Cubic curve 1. 3: Cubic curve 2. *Note: By P00.26 - P00.29, corresponding no-flow power will be work out by setted curve and will be recorded in d00.41, pleasure select reasonbale curve.*	
P00.31	**Phase sequence detection enable from variable frequency to power frequency**	**0,1 [0]**
	0: Disable. • No phase sequency detecting before switch variable frequency into power frequency. 1: Enable. • Before switch cariable frequency into power frequency, detect phase sequency. And difference of power frequency phase angle will be changed within range of P00.32 - P00.38. *Note: Detailed steps refer to 7.2 Debugging for Switching between VF and PF, on page 66.*	

Ref. Code	Name Description	Setting Range [Default]
P00.32	Switching angle of variable and power frequecny of pump 1	-50.0 - 50.0 [0.0°]
P00.33	Switching angle of variable and power frequecny of pump 2	-50.0 - 50.0 0.0°]
P00.34	Switching angle of variable and power frequecny of pump 3	-50.0 - 50.0 [0.0°]
P00.35	Switching angle of variable and power frequecny of pump 4	-50.0 - 50.0 [0.0°]
P00.36	Switching angle of variable and power frequecny of pump 5	-50.0 - 50.0 [0.0°]
P00.37	Switching angle of variable and power frequecny of pump 6	-50.0 - 50.0 [0.0°]
P00.38	Switching angle of variable and power frequecny of pump 7	-50.0 - 50.0 [0.0°]
	When seting as positive angle, variabe frequency phase exceeds power frequency and the difference reaches setted angle, switching action from variable frequency to power frequcny will be started. When setting as negative angle, variable frequency is slower than power frequency and the difference reaches setted angle, switching action from variable frequency to power frequcny will be started.	
P00.39	Dealy of pump 2 contactor breaking	0.000 - 5.000 [0.020s]
P00.40	Dealy of pump 2 contactor touching	0.000 - 5.000 [0.200s]
P00.41	Dealy of pump 3 contactor breaking	0.000 - 5.000 [0.020s]
P00.42	Dealy of pump 3 contactor touching	0.000 - 5.000 [0.200s]
P00.43	Dealy of pump 4 contactor breaking	0.000 - 5.000 [0.020s]
P00.44	Dealy of pump 4 contactor touching	0.000 - 5.000 [0.200s]
P00.45	Dealy of pump 5 contactor breaking	0.000 - 5.000 [0.020s]
P00.46	Dealy of pump 5 contactor touching	0.000 - 5.000 [0.200s]
P00.47	Dealy of pump 6 contactor breaking	0.000 - 5.000 [0.020s]
P00.48	Dealy of pump 6 contactor touching	0.000 - 5.000 [0.200s]
P00.49	Dealy of pump 7 contactor breaking	0.000 - 5.000 [0.020s]
P00.50	Dealy of pump 7 contactor touching	0.000 - 5.000 [0.200s]
	For details, pleasure see P00.13, P00.14.	

6.3.2 P01: Water Supply Pump Parameter

Ref. Code	Name Description		Setting Range [Default]
P01.00	Pump 1 type		0 - 4 [0]
P01.01	Pump 2 type		0 - 4 [0]
P01.02	Pump 3 type		0 - 4 [0]
P01.03	Pump 4 type		0 - 4 [0]
P01.04	Pump 5 type		0 - 4 [0]
P01.05	Pump 6 type		0 - 4 [0]
P01.06	Pump 7 type		0 - 4 [0]
	0:Invalid. It is not installed or does not work in the system. 1: Variable frequency pump. It starts with variable frequency. • If it is unqualified to switch, it works as an inverter drive adjustable pump for the whole system. It is controlled by HD31, which adjust the rotating speed of pump according to the actual pressure so as to maintain constant system pressure. • If it is qualified to switch, the pump switches to power frequency running or exit running, depending on the switch mode. 2: Power frequency pump. It only runs with power frequency. • Adopt full-pressure direct start method when the power grid is sufficient and the pump power is under 15kW. • It is recommended to adopt reduced-voltage method such as reduced-voltage of Y-△mode, self coupling voltage start, soft start, etc. for pumps with power of no less than 18.5kW. That can reduce the impact on the power grid and pipe network. 3: Dormant pump. It serves as dormant pump for the system. • The system enters dormant run when it meets the dormant condition. It will enter dormant running or awaken dormancy according to the dormant pressure and tolerant limit. 4: Sewage pump. It serves as dormant pump for the system. • Condition for setting a sewage pump: water level sensor of sewage pool must be installed in the system and correctly connect to HD31. HD31 automatically controls the start and stop of the sewage pump according to WL of sewage water pool. *Note:* *1. For a pump which is set as variable frequency pump, the corresponding inverter / normal drive relay must be set again, otherwise it's not recognized as effective pump. After starting the system, HD31 will not output if there is only one variable frequency pump in the system and no setting for inverter / normal drive relay.* *2. For a pump which is set as variable frequency pump, dormant pump and sewage pump, the corresponding inverter drive relay must be set again, otherwise the is not recognized as effective pump.*		
P01.07	Rated current of pump 1	7.5kW above motor	0.1 - 999.9A [Depend on motor]
		7.5kW and below motor	0.01 - 99.99A [Depend on motor]
P01.08	Rated current of pump2	7.5kW above motor	0.1 - 999.9A [Depend on motor]
		7.5kW and below motor	0.01 - 99.99A [Depend on motor]
P01.09	Rated current of pump3	7.5kW above motor	0.1 - 999.9A [Depend on motor]
		7.5kW and below motor	0.01 - 99.99A [Depend on motor]
P01.10	Rated current of pump4	7.5kW above motor	0.1 - 999.9A [Depend on motor]
		7.5kW and below motor	0.01 - 99.99A [Depend on motor]
P01.11	Rated current of pump5	7.5kW above motor	0.1 - 999.9A [Depend on motor]
		7.5kW and below motor	0.01 - 99.99A [Depend on motor]
P01.12	Rated current of pump6	7.5kW above motor	0.1 - 999.9A [Depend on motor]
		7.5kW and below motor	0.01 - 99.99A [Depend on motor]

Ref. Code	Name Description		Setting Range [Default]
P01.13	Rated current of pump7	7.5kW above motor	0.1 - 999.9A [Depend on motor]
		7.5kW and below motor	0.01 - 99.99A [Depend on motor]
	Please set the above rated current according to the nameplate on the motor. These parameters will affect the overload protection of HD31 for the motor.		

6.3.3 P02: Water Supply PID Parameter

Ref. Code	Name Description	Setting Range [Default]
P02.00	Pressure setting source	0 - 2 [0]
	0: Digital setting. P02.01 sets the setting pressure. 1: Pressure setting of timing water supply. P02.02 - P02.26 set the setting pressure. 2: Pressure setting of analogue water supply. The selected analogue of P03.00 - P03.03 set the setting pressure.	
P02.01	Pressure digital setting	0.0 - P05.03×10 [0.0 kg/cm^2]
	Used for digital pressure setting. 100.0% of digital setting is corresponding to 10V or 20mA. *Note:* *1. 100.0% of the feedback signal is corresponding to 10V or 20mA.* *2. 100% of P00.05、P02.01, P02.04, P02.06, P02.08, P02.10, P02.12, P02.14, P02.16, P02.18, P02.20, P02.22, P02.24, P02.26, P04.00 and P04.02 is corresponding to 10V or 20mA.* *3. 100% of P00.06, P00.10, P00.18 and P00.20 is corresponding to the setting pressure of P02.00.*	
P02.02	Pressure time	1 - 12 [1]
	P02.00 = 1, multi-time pressure is valid.	
P02.03	T1 start time	00.00 - 23.59 [00.00]
P02.05	T2 start time	00.00 - 23.59 [00.00]
P02.07	T3 start time	00.00 - 23.59 [00.00]
P02.09	T4 start time	00.00 - 23.59 [00.00]
P02.11	T5 start time	00.00 - 23.59 [00.00]
P02.13	T6 start time	00.00 - 23.59 [00.00]
P02.15	T7 start time	00.00 - 23.59 [00.00]
P02.17	T8 start time	00.00 - 23.59 [00.00]
P02.19	T9 start time	00.00 - 23.59 [00.00]
P02.21	T10 start time	00.00 - 23.59 [00.00]
P02.23	T11 start time	00.00 - 23.59 [00.00]
P02.25	T12 start time	00.00 - 23.59 [00.00]
P02.04	T1 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.06	T2 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.08	T3 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.10	T4 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.12	T5 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.14	T6 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.16	T7 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.18	T8 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.20	T9 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.22	T10 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]
P02.24	T11 time pressure	0.0 - P05.03×10 [0.0 kg/cm^2]

Ref. Code	Name Description	Setting Range [Default]
P02.26	**T12 time pressure**	**0.0 - P05.03×10 [0.0 kg/cm²]**
	Used for time setting of multi-time pressure water supply and the pressure setting of the corresponding time. • Principle of time setting: T1 ≤ T2 ≤ T3 ≤ T4 ≤ T5 ≤ T6 ≤ T7 ≤ T8 ≤ T9 ≤ T10 ≤ T11 ≤ T12. • T1 refers to the beginning of T1 till beginning of T2; T2 refers to the beginning of T2 till the beginning of T3, and so forth. T12 refer to the beginning of T12 till the beginning of T1. • The beginning time of a certain period may be the same as its' previous one. In this case, the previous one joins to this period. • There is only one period per day if T1 = T2 = T3 = T4 = T5 = T6 = T7 = T8 = T9 = T10 = T11 = T12.	
P02.27	**Upper limit of pressure closed-loop**	**0 - upper limit [50.00Hz]**
	Max. frequency of closed-loop regulator output.	
P02.28	**Proportional gain of pressure closed-loop (Kp)**	**0.00 - 10.00 [0.01]**
	Defines the proportional gain, decides the adjustment intensity of the regulator: the bigger KP is, the higher intensity will be.	
P02.29	**Integration time of pressure closed-loop (Ti)**	**0.01 - 10.00 [0.10s]**
	Defines the integration time (Ti), and decides the speed of integration adjustment. The regulator makes adjustment for the tolerance of feedback / setting pressure. • When the tolerance of feedback / setting pressure is 100%, the integral regulator, with the continuous adjustment of P02.29, reaches the max. pressure (overlook the effect of P02.28 and P02.30). • The shorter integration time is, the faster adjustment speed will be.	
P02.30	**Differential time of pressure closed-loop (Td)**	**0.00 - 1.00 [0.00s]**
	Differential time decides the intensity of integration adjustment. The regulator makes adjustment for the tolerance change of the feedback / setting pressure. • The adjustment of the derivative adjustment is max. pressure if the feedback pressure changes 100% within P02.30 (overlook the effect of P02.28 and P02.29). • The longer integration time is, the higher adjustment intensity will be.	
P02.31	**Sampling time (T)**	**0.01 - 30.00 [0.50s]**
	Defines sampling time of feedback value. The regulator calculates once during every sampling period. • The longer sampling time is, the slower response will be.	
P02.32	**Bias limit**	**0.0 - 20.0 [2.0%]**
	The output value of the regulator is relevant to the max. tolerance of pressure setting. Within permitted range, the regulator stops regulating.	
P02.33	**Output wave filter of pressure closed-loop**	**0.01 - 30.00 [0.50s]**
	Make wave filter to the output frequency signal of the regulator, and avoid the jumping interfering signal to influence on the system. • Adjustment sensitivity is affected by overlong time of wave filtering.	
P02.34	**Regulating characteristic of pressure closed-loop**	**0,1 [0]**
	0: Positive characteristic. When the setting is added, pressure increases. 1: Negative characteristic. When the setting is added, pressure decreases.	
P02.35	**Digital setting for saving selection when power failure**	**0,1 [1]**
	0: Not saving. 1: Saving. When P02.00 = 0 and inverter is in stop/running, setted pressure is displaying. We can adjust the setted pressure through button ▲ or ▼ . After power failure, adjusted pressure value can be saved by P02.35.	

6.3.4 P03: Water Supply AIO Function Parameter

Ref. Code	Name Description	Range setting [Default]
P03.00	AI1 function	0 - 3 [0]
P03.01	AI2 function	0 - 3 [0]
P03.02	AI3 function	0 - 3 [0]
P03.03	AI4 function	0 - 3 [0]
	0: Unused. 1: Analogue pressure setting. • When P02.00 = 2 (pressure setting of analogue water supply), this function is selected by analogue source, which corresponds to input voltage. The input voltage sets the setting pressure. 2: Analogue feedback setting. • This function is selected by analogue source, which corresponds to input voltage. The input voltage sets the feedback pressure. 3: Anologue WL feedback • When P00.01 = 2 (WL signal is set by analogue source), this function is selected by analogue source, which corresponds to input voltage. The input voltage decides the WL signal. *Note:* *1. Once set P03.00 - P03.01, the corresponding F16.01 - F16.02 are invalid.* *2. 0 - 10V of AI1 - AI4 are corresponding to feedback signal 0 - 100.0%.*	
P03.04	DI1 function	0 - 19 [0]
P03.05	DI2 function	0 - 19 [0]
P03.06	DI3 function	0 - 19 [0]
P03.07	DI4 function	0 - 19 [0]
P03.08	DI5 function	0 - 19 [0]
P03.09	DI6 function	0 - 19 [0]
P03.10	DI7 function	0 - 19 [0]
P03.11	DI8 function	0 - 19 [0]
P03.12	DI9 function	0 - 19 [0]
	0: Unused. 1 - 7: pump 1 - 7 commissioning running. • Respectively specify inverter drive motor that needs commissioning start. When the commission terminal of the specified variable frequency pump is valid, the pump will start with variable frequency, and switch to power frequency after meeting P00.08. If there are multiple valid commission terminals, HD31 starts and switches them according to their consequence of switch off. 8 - 14: pump 1 - 7 invalid. • Respectively specify motors that needs to quit the system. When the command is effective, the corresponding motor will not participate in switch logic of the system. This function enables force quit if the motor needs inspecting or fault occurs to the motor. That can enhance the switch efficiency. 15: Upper limit water level(WL) of intake pool. 16: Lower limit WL of intake pool. 17: Water shortage WL. • When P00.01 =1 , No. 15- 17 decide the upper limit WL, lower limit WL and water shortage WL. 18: Upper limit WL of sewage pool. 19: Lower limit WL of sewage pool. • The sewage pump is triggered into use when WL of sewage pool exceeds upper limit WL; otherwise it deactivates and stops output. *Note: After setting the P03.04 - P03.09 functions, the corresponding F15.00 - F15.05 function are invalid.*	

Ref. Code	Name Description	Setting Range [Default]
P03.13	DO1 function	0 - 23 [0]
P03.14	DO2 function	0 - 23 [0]
P03.15	RLY1 function	0 - 23 [0]
P03.16	RLY2 function	0 - 23 [0]
P03.17	RLY3 function	0 - 23 [0]
P03.18	RLY4 function	0 - 23 [0]
P03.19	RLY5 function	0 - 23 [0]
P03.20	RLY6 function	0 - 23 [0]
P03.21	RLY7 function	0 - 23 [0]
P03.22	RLY8 function	0 - 23 [0]
P03.23	RLY9 function	0 - 23 [0]
P03.24	RLY10 function	0 - 23 [0]

0: Unused. No output function.

1,3,5,7,9,11,13: pump 1 - 7 variable frequency running.

2,4,6,8,10,12,14: pump 1 - 7 power frequency running.

- Define the control signal of every pump. HD31 drive pump needs both control signals of variable frequency and industrial signal.
- Please do wiring correctly during commissioning.
- Only power frequency signal is effective for power frequency pump, sewage pump and dormant pump.

15: Dormant running.

- This signal is valid when the system is in dormant running mode.

16: Over-pressure.

- This signal is valid when the pressure of pipe network is pressure of P04.00 or above, and sustains the setting time of P04.01.

17: Under-pressure.

- This signal is valid when pipe network pressure is pressure of P04.02 or below, and sustains the setting time of P04.03.

18: Backup pressure running.

- This signal is valid when the system meets the running condition of backup pressure and runs according to it.
- Refer to P00.01 - P00.05.

19: Pool water shortage.

- This signal is valid when WL of the intake pool < shortage WL.

20: WL of the sewage pool reaches the upper limit.

- This signal is valid when WL of the sewage pool exceeds the upper limit WL.

21: Faulty pump occurs.

- This signal is valid when P04.04 is not 0.

22: Unused.

23: The supply system is in running status.

- This signal is valid when the water supply system is in running status.

Note: After setting the P03.13 - P03.15 functions, the corresponding functions of F15.18 - F15.20 are invalid.

6.3.5 P04: Water Supply Fault Protection Parameter

<table>
<tr><th>Ref. Code</th><th>Name Description</th><th>Setting Range [Default]</th></tr>
<tr><td>P04.00</td><td>Setting value of over-pressure protection</td><td>0.0 - P05.03×10 [0.0 kg/cm²]</td></tr>
<tr><td>P04.01</td><td>Detection time of over-pressure protection</td><td>0.0 - 3600.0 [300.0s]</td></tr>
<tr><td></td><td colspan="2">The system alarms for over-pressure when the pipe network pressure reaches the max. setting of P04.00 and sustains the setting time of P04.01.
The alarm will stop only after value of the pipe network pressure is no more than the over-pressure protection value and sustains the setting time of P04.01.</td></tr>
<tr><td>P04.02</td><td>Setting value of under-pressure protection</td><td>0.0 - P05.03×10 [0.0 kg/cm²]</td></tr>
<tr><td>P04.03</td><td>Detection time of under-pressure protection</td><td>0.0 - 3600.0 [300.0s]</td></tr>
<tr><td></td><td colspan="2">Alarm on and off for under-pressure protection is similar with over-pressure protection (refer to P04.00 and P04.01).</td></tr>
<tr><td>P04.04</td><td>Record of faulty pump</td><td>0 - 0x7F [0]</td></tr>
<tr><td></td><td colspan="2">• When an variable frequency pump occurs fault which can be reset, the system automatically reset the pump according to F20.18 and F20.19. If the fault can not be reset, the system automatically stops the pump.
• Reset times for fault > setting value of F20.18 and fault still exits, HD31 records this pump (its bit set as 1) and marks it as invalid. Meanwhile, the faulty pump quits the system and does not participate in the switch logic.
• The following figure shows corresponding relationship between the pump and the position.
<table>
<tr><th>Bit8</th><th>Bit7</th><th>Bit6</th><th>Bit5</th><th>Bit4</th><th>Bit3</th><th>Bit2</th><th>Bit1</th></tr>
<tr><td>Unused</td><td>Pump 7</td><td>Pump 6</td><td>Pump 5</td><td>Pump 4</td><td>Pump 3</td><td>Pump 2</td><td>Pump 1</td></tr>
</table>
• The faulty pump which had troubleshot can participate the switch logic only after clear fault information (F01.02 = 4).
Example: P04.04 = 0x18= 00011000B indicates that the pump 4 and pump 5 occurs fault.</td></tr>
<tr><td>P04.05</td><td>Troubleshooting for the inverter</td><td>0,1 [0]</td></tr>
<tr><td></td><td colspan="2">0: The whole system stops.
• Record the current faulty pump and stop the whole water supply system.
• If the the system had set auto-reset function, it will reset for the corresponding times and carry out the above operation. Otherwise it will carry out the above operation directly without reset.
1: HD31 automatically switches to the next variable frequency pump; while if there is no such pump, HD31 controls in power frequency mode.
• Record the current faulty pump and quit the water supply system. The system preferentially starts an inverter drive one if there are variable frequency pump or power frequency pump ready to run.
• If the the system had set auto-reset function, it will reset for the corresponding times and carry out the above operation. Otherwise it will carry out the above operation directly without reset.</td></tr>
</table>

6.3.6 P05: Water Supply Time Parameter

Ref. Code	Name Description	Setting Range [Default]
P05.00	**Set current time (Year)**	**11 – 99 [Actual value]**
	Set time of the system: Year.	
P05.01	**Set current time (Month & Date)**	**0101 – 1231 [Actual value]**
	Set time of the system: Month & Date.	
P05.02	**Set current time (Hour & Minute)**	**0000 – 2359 [Actual value]**
	Set time of the system: Hour & Minute.	

Ref. Code	Name Description	Setting Range [Default]
P05.03	**Pressure sensor range setting**	**0.0 - 10.0 [1.6MPa]**
	1MPa=10kg/cm^2.	
P05.04	**Pressure sensor signal type selection**	**0 - 2 [0]**
	0: 0 - 10V. 1: 0 - 20mA. 2: 4 - 20mA. *Note:* *1. Only the AI2, AI3, AI4 terminals can be input the current signal and need to change the CN6 of the control board or the CN2 or CN3 jumper on water supply card. Please refer to the jumper description in the user manual for details.* *2. When P05.04 = 2, set the F05.00 teb bit to 1 and set F05.05 = 20.0%. When P05.04 = 0 or 1, set F05.00 ten bit to 0 and set to F05. 05 = 0.0%.*	
P05.05	**Water supply method selection**	**0x00 - 0x75 [0x00]**

Modify P05.05 and system will automatically set P01.00 - P01.06, P03.15 - P03.24. Set the principle: Follow P01.00 - P01.06 to set the frequency conversion / power frequency pump, set P03.16 - P03.24, P03.15 power and variable frequency control in turns.

For example: Set P05.05 = 0x24, the parameters automatically set, as follows:

Ref. Code	Function	Value	Defination
P01.00	Pump 1 type	1	Pump 1 is variable frequency pump
P01.01	Pump 2 type	1	Pump 2 is variable frequency pump
P01.02	Pump 3 type	1	Pump 3 is variable frequency pump
P01.03	Pump 4 type	1	Pump 4 is variable frequency pump
P01.04	Pump 5 type	2	Pump 5 is power frequency pump
P01.05	Pump 6 type	2	Pump 6 is power frequency pump
P01.06	Pump 7 type	0	Invalid
P03.15	RLY1 function	12	Pump 6 power frequency running
P03.16	RLY2 function	1	Pump 1 variable frequency running
P03.17	RLY3 function	2	Pump 1 power frequency running
P03.18	RLY4 function	3	Pump 2 variable frequency running
P03.19	RLY5 function	4	Pump 2 power frequency running
P03.20	RLY6 function	5	Pump 3 variable frequency running
P03.21	RLY7 function	6	Pump 3 power frequency running
P03.22	RLY8 function	7	Pump 4 variable frequency running
P03.23	RLY9 function	8	Pump 4 power frequency running
P03.24	RLY10 function	10	Pump 5 power frequency running

Note:

1. A bit indicates the number of variable frequency pumps in the system; ten indicates the number of frequency pumps in the system.

2. The number of frequency pump plus frequency pump can not exceed 7, the total number of relays can not be more than 10.

Chapter 7 Application Reference

7.1 Take One-to-Six Inverter as an Example.

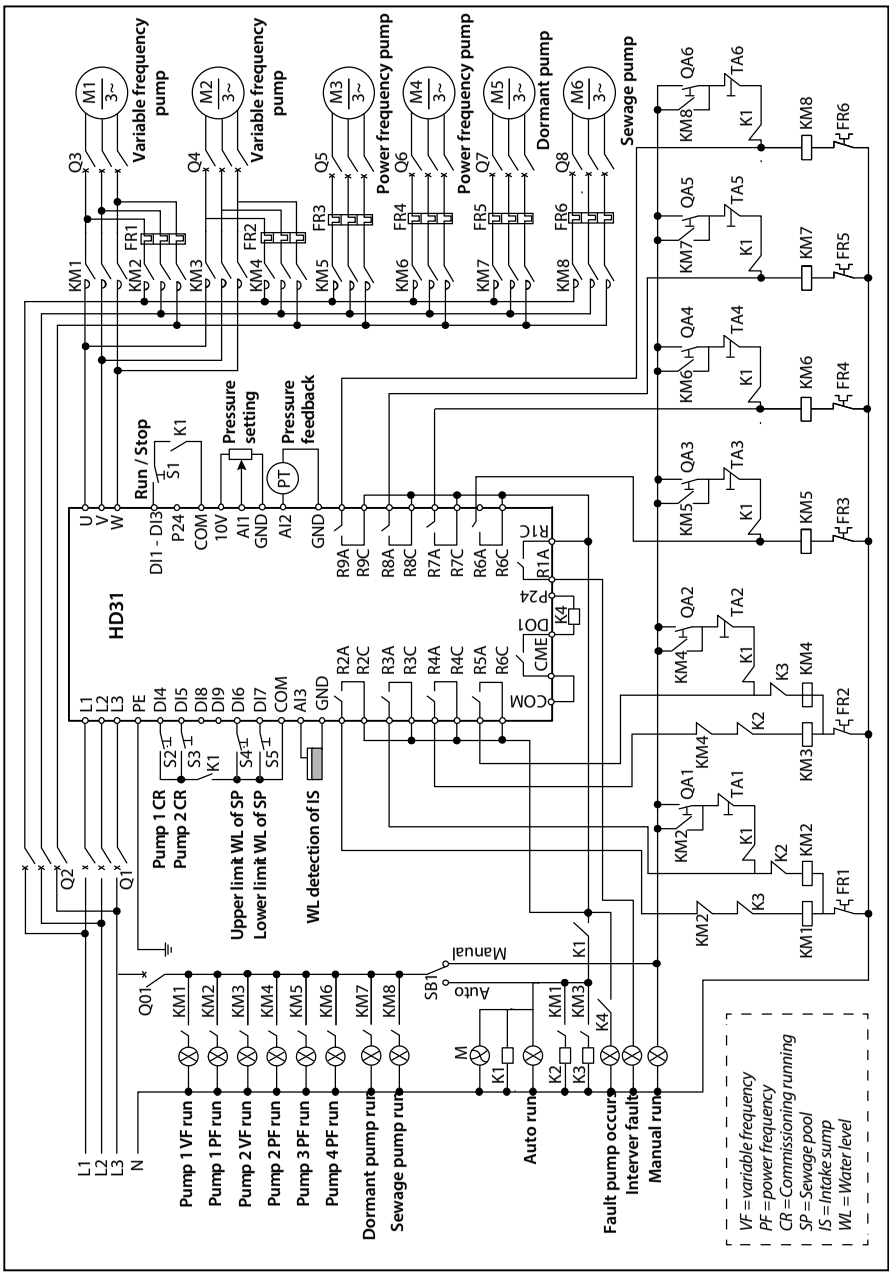
1. Compatible with: variable pump x 2, industrial pumps x 2, dormant pump x 1, sewage pump x 1.

2. Technical requirements:

- The analogue value sets the water pressure.
- The analogue value feeds back the intake pool WL (water level) signal. The liquid level signal feeds back the sewage pool WL signal.
- Backup pressure function: 0.2Mpa backup pressure.

3. Pressure gauge selection: remote control, DC 0 - 10V output, 1Mpa range.

HD31 system wiring is shown in figure below.



One-to-six wiring

Set parameter

Ref. Code	Setting	Description
F00.04	2	I/O terminal signal on HD31-WIO board is enabled
F00.05	1	Water supply function is enabled
F00.11	1	Terminal sets setting source
F15.00	2	Input terminal DI1: set as FWD command
P00.00	0 or 1	Select 1 for commissioning to confirm correct wiring, then select 0 for water supply
P01.00	1	Pump 1 & pump 2: variable frequency pump
P01.01	1	
P01.02	2	Pump 3 & pump 4: power frequency pump
P01.03	2	
P01.04	3	Pump 5: dormant pump
P01.05	4	Pump 6: sewage pump
P01.06	0	Pump 7: invalid
P01.07 - P01.13	Depend on motor	Depend on rated current of motor
P03.07	1	DI4 function: pump 1 commissioning running
P03.08	2	DI5 function: pump 2 commissioning running
P03.09	18	DI6 function: upper limit WL of sewage pool
P03.10	19	DI7 function: lower limit WL of sewage pool
P03.13	21	DO1 function: faulty pump occurs
F15.20	31	RLY1 function: inverter fault
P03.16	1	RLY2 function: pump 1variable frequency running
P03.17	2	RLY3 function: pump 1 power frequency running
P03.18	3	RLY4 function: pump 2 variable frequency running
P03.19	4	RLY5 function: pump 2 power frequency running
P03.20	6	RLY6 function: pump 3 power frequency running
P03.21	8	RLY7 function: pump 4 power frequency running
P03.22	10	RLY8 function: pump 5 power frequency running
P03.23	12	RLY9 function: pump 6 power frequency running
P00.01	2	Analogue value sets WL
P03.02	3	AI3 function: anologue WL feedback
P00.02	50.0%	Upper limit WL of intake pool: 50% (Depend on actual condition)
P00.03	30.0%	Lower limit WL of intake pool: 30% (Depend on actual condition)
P00.04	10.0%	Water shortage WL of intake pool: 10.0% (Depend on actual condition)
P00.05	20.0%	Backup pressure: 0.2Mpa
P02.00	2	Pressure setting of analogue water supply
P03.00	1	AI1 function: analogue pressure setting
P03.01	2	AI2 function: analogue feedback setting
P02.34	0	Regulating characteristic of close-loop: positive
P02.28 - P02.33		Parameters relative to PID, depend on actual condition

7.2 Debugging for Switching between VF and PF

VF = variable frequency, PF = power frequency

When the inverter pump needs to be switched to power frequency, the default does not detect the phase sequence. Switching current is large, especially for some high-power pumps, instantaneous impact current of switching may be an instant lower power grid voltage, affecting other equipment to normally run, even will cause the switch jump protection, but also affect the service life of the frequency contactor.

At this time, inverter phase sequence will be needed to detected and smooth switching to power frequency, and the current will be much smaller.

Notes for smooth switching from variable frequency to power frequency:

- According to the actual pump configuration, follow the wiring diagram in 7.1 for professional wiring.
- When P00.31 = 1 (switching function enable), if the inverter reports E0037 (input error phase fault) or view.
  D00.19 = 1 indicates that input phase sequence error phase of current inverter. At this time need to change any two phases of the control cabinet, and again confirm the power frequency contactor phase sequence and the inverter output phase sequence are consistent, that L1- U, L2-V, L3-W.
- Use the commissioning mode to confirm the direction of rotation of the motor. If the reverse direction, change the motor side to input any two phase sequence (please ensure F00.17 = 0, do not change the direction of rotation by changing F00.17 = 1).
- Switching frequency should be greater than the power frequency of the grid 0.50 - 1.00Hz. When P00.00 = 1 (water supply debugging mode), change the frequency of F00.13. When P00.00 = 0 (Water supply operation mode), change the value of P00.08.

Chapter 8 Troubleshooting

HD31 series inverter has inbuilt protective and warning self-diagnostic functions. If a fault occurs, the fault code will be displayed on the keypad. At the same time, faulty relay acts, accordingly HD31 stops output and the motor coasts to stop.

When fault or alarm occurs, user should record the fault details and take proper actions according to the Table below. If some technical help is needed, contact the suppliers or directly call Shenzhen Hpmont Technology Co., Ltd.

After the fault is eliminated, reset HD31 by any of the following methods:

1. Keypad.

2. External reset terminal (DI terminal set as No. 46 function).

3. Communication.

4. Switch on HD31 after switch off.

Table 8-1 Fault alarm description and counter-measures

Fault		Fault reasons	Counter-measures
-Lu-	DC bus undervoltage	• At the begining of powering on and at the end of powering off • Input voltage is too low • Improper wiring leads to undervoltage of hardware	• It is normal status of powering on and powering off • Check input power voltage • Check wiring and wire HD31 properly
E0001	Inverter output overcurrent (in Acc process)	• Improper connection between inverter and motor • Improper motor parameters • The rating of the used inverter is too small • Acc / Dec time is too short	• Connect HD31 and motor properly • Set correct motor parameter (F08.00 - F08.04) • Select inverter with higher rating • Set proper Acc / Dec time (F03.01, F03.02)
E0002	Inverter output overcurrent (in Dec process)		
E0003	Inverter output overcurrent (in constant speed process)		
E0004	DC bus over voltage (in Acc process)	• Input voltage is too high • Decelearation time is too short • Improper wiring leads to overvoltage of hardware • Improper selection of the braking devices	• Check power input • Set a proper value for Dec time (F03.02) • Check wiring and wire HD31 properly • Select recommended braking devices according to section 9.3.
E0005	DC bus over voltage (in Dec process)		
E0006	DC bus over voltage (in constant speed process)		
E0007	Stall overvoltage	• Bus voltage is too high • The setting of stall overvoltage is too low	• Check power input or the function of brake • Properly set the value of stall overvoltage (F19.19)

8

Fault		Fault reasons	Counter-measures
E0008	Power module fault	• Short circuit between phases output • Short circuit to the ground • Output current is too high • Power module is damaged	• Check the connection and connect the wire properly • Check the connection and connect the wire properly • Check the connection and mechanism • Contact the supplier for repairing
E0009	Heatsink overheat	• Ambient temperature is too high • Poor external ventilation of HD31 • Fan fault • Fault occurs to temperature detection circuit	• Use inverter with higher power capacity • Improve the ventilation around HD31 • Replace the cooling fan • Seek technical support
E0010	Braking unit fault	• Circuit fault of braking unit	• Seek technical support
E0011	CPU fault	• CPU abnormal	• Detect at power on after completely power outage • Seek technical support
E0012	Parameters auto-tuning fault	• Parameter auto-tuning is timeout	• Check the motor connection • Input correct motor parameters (F08.00 - F08.04) • Seek technical support
E0013	Soft start contactor failed	• Contactor fault • Control circuit fault	• Replace the contactor • Seek technical support
E0014	Current detection fault	• Current detection circuit is damaged	• Contact the supplier for repairing
E0015	Input voltage phase loss	• For three-phase input inverter, input voltage phase loss fault occurs to power input	• Check the three-phase power input • Seek technical support
E0016	Output voltage phase loss	• Output voltage phase disconnection or loss • Three-phase load of HD31 is severely unbalanced	• Check the connection between HD31 and motor • Check the quality of motor
E0017	Inverter overload	• Acc time is too short • Improper setting of V/f curve or torque boost leads to over current • Mains supply voltage is too low • Motor load is too high	• Adjust Acc time (F03.01) • Adjust V/f curve (F09.00 - F09.06) or torque boost (F09.07,F09.08) • Check mains supply voltage • Use inverter with proper power rating
E0018	Inverter output load-loss	• Load disappears or falls suddenly • Parameters are not set properly	• Check load and mechanical transmission devices • Set the parmeters properly (F20.03 - F20.05)
E0019	Motor overload	• Improper setting of V/f curve • Mains supply voltage is too low • Normal motor runs for a long time with heavy load at low speed • Motor locked-rotor or overload	• Adjust V/f curve (F09.00 - F09.06) • Check the power input • Use special motor if the motor needs to operate for a long time with heavy load • Check the load and mechanical transmission devices

Fault		Fault reasons	Counter-measures
E0020	Motor overheat	• Motor overheat • The setting of motor paramteter is incorrect	• Reduce the load; Repaire or replace the motor • Increase the Acc / Dec time (F03.01, F03.02) • Set the motor parameter (F08.00 - F08.04)
E0021	Read / Write fault of control board EEPROM	• Memory circuit fault of control board EEPROM	• Contact the supplier for repairing
E0022	Read / Write fault of keypad EEPROM	• Memory circuit fault of keypad EEPROM	• Replace the keypad • Contact the supplier for repairing
E0023	Faulty setting of parameters	• The power rating between motor and inverter is too different • Improper setting of motor parameters	• Select an inverter with suitable power rating • Set correct value of motor parameters (F08.00 - F08.04)
E0024	Fault of external equipment	• Fault terminal of external equipment operates	• Check external equipment
E0025	PID setting loss	• Analogue reference signal < F20.12 • Analogue input circuit fault	• Check the connection • Seek technical support
E0026	PID feedback loss	• Analogue setting < F20.14 • Analogue input circuit fault	• Check the connection • Seek technical support
E0027	PID feedback out of limit	• Analogue setting signal > F20.16 • Analogue input circuit fault	• Check the connection • Seek technical support
E0028	SCI communication time-out	• Connection fault of communication cable • Disconnected or not well connected	• Check the connection
E0029	SCI communication error	• Connection fault of communication cable • Disconnected or not well connected • Communication setting error • Communication data error	• Check the connection • Check the connection • Correctly set communication format (F17.00) and the baud rate (F17.01) • Send the data according to MODBUS protocol
E0037	Input wrong phase	• F00.05 = 1 and P00 .3 = 1, input phase of inverter is negative phase (d00.19 = 1)	• Replace the inverter power input phase sequence

Note:

E0022 does not affect normal running of HD31.

Chapter 9 Accessories

9.1 Keypad Installation Assembly

The keypad installation assembly includes mounting base and extension cable.

Mounting Base

The keypad mounting base is an accessory. If needed, please order goods.

Model: HD-KMB. The mounting base and its size are shown as Figure 9–1 and the unit is mm.

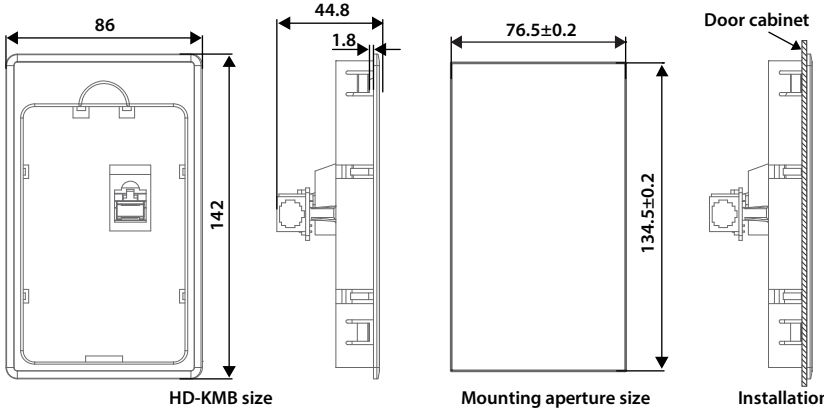


Figure 9–1 Mounting base and its size

Extension Cable

The keypad extension cable is an accessory. If needed, please order goods. The models are as follows:

- 1m extension cable to keypad: HD-CAB-1M
- 2m extension cable to keypad: HD-CAB-2M
- 3m extension cable to keypad: HD-CAB-3M
- 6m extension cable to keypad: HD-CAB-6M

9.2 Reactor Selection

Table 9-1 Reactor selection

Model	AC input reactor		AC output reactor		DC reactor	
	Model	Parameter (mH-A)	Model	Parameter (mH-A)	Model	Parameter (mH-A)
HD31-4T045P	HD-AIL-4T037	0.19-75	HD-AOL-4T037	0.08-80	HD-DCL-4T037	0.35-100
HD31-4T055P	HD-AIL-4T045	0.16-90	HD-AOL-4T045	0.06-100	HD-DCL-4T045	0.29-120
HD31-4T075P	HD-AIL-4T055	0.13-115	HD-AOL-4T055	0.04-125	HD-DCL-4T055	0.23-150
HD31-4T090P	HD-AIL-4T075	0.093-150	HD-AOL-4T075	0.035-160	HD-DCL-4T075	0.17-200
HD31-4T110P	HD-AIL-4T090	0.08-180	HD-AOL-4T090	0.03-200	HD-DCL-4T090	0.14-240
HD31-4T132P	HD-AIL-4T110	0.067-210	HD-AOL-4T110	0.02-225	HD-DCL-4T110	0.12-290

9.3 Braking Resistor and Braking Unit

For the braking unit HDBU-4T150, the max. braking current is 150A. Refer to the "HDBU Series Dynamic Braking Unit User Manual" for more details.

The braking resistor selection is shown as Table 9-2. If needed, please order goods.

The connection of braking resistor and the braking unit is shown as section 4.3.2 Supply and Motor Connection (on page 18).

Table 9-2 Recommendation for the braking unit and braking resistor

Model	Motor	Braking unit	Braking resistor Value	Braking resistor power
HD31-4T2P2P	2.2 kW	Built-in	200 - 300 Ω	0.2 kw
HD31-4T3P7P	3.7 kW	Built-in	150 - 250 Ω	0.25 kw
HD31-4T5P5P	5.5 kW	Built-in	100 - 150 Ω	0.3 kW
HD31-4T7P5P	7.5 kW	Built-in	80 - 100 Ω	0.5 kW
HD31-4T011P	11 kW	Built-in	60 - 80 Ω	0.7 kW
HD31-4T015P	15 kW	Built-in	40 - 50 Ω	1 kW
HD31-4T018P	18.5 kW	Built-in	30 - 40 Ω	1.5 kW
HD31-4T022P	22 kW	Built-in	25 - 30 Ω	2 kW
HD31-4T030P	30 kW	Built-in	20 - 25 Ω	2.5 kW
HD31-4T037P	37 kW	Built-in	15 - 20 Ω	3 kW
HD31-4T045P	45 kW	Built-in	15 - 20 Ω	3.5 kW
HD31-4T055P	55 kW	Built-in	10 - 15 Ω	4.5 kW
HD31-4T075P	75 kW	Built-in	10 - 15 Ω	5.5 kW
HD31-4T090P	90 kW	HDBU-4T150	8 - 10 Ω	7.5 kW
HD31-4T110P	110 kW	HDBU-4T150	8 - 10 Ω	9 kW
HD31-4T132P	132 kW	HDBU-4T150	6 - 8 Ω	11 kW

Note:

1. Please select braking resistor based on the above table.
Bigger resistor can protect the braking system in faulty condition, but oversized resistor may bring a capacity decrease, leading to over voltage protection.

2. The braking resistor should be mounted in a ventilated metal housing to prevent inadvertent contact during it works, for the temperature is high.

Appendix A Parameters

Attributes are changed:

"X": It denotes that the setting of this parameter cannot be modified when HD31 is in run status.

"O": It denotes that the setting of this parameter can be modified when HD31 is in run status.

"*": It denotes that the value of this parameter is the actual value which cannot be modified.

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00: Status Display Parameters, on pages 26 - 29						
d00.00	Inverter series	0x10 - 0x50			*	
d00.01	Software version of the control board	00.00 - 99.99			*	
d00.03	Special software version of the control board	00.00 - 99.99			*	
d00.05	Software version of the keypad	00.00 - 99.99			*	
d00.06	Customized series No.	0 - 9999			*	
d00.08	Rated current of the inverter	7.5kW and below: 0.01A 11kW and above: 0.1A			*	
d00.09	Extended function of the inverter	0: No extended function 1: Constant pressure water supply function			*	
d00.10	Inverter status	Bit0: Inverter fault Bit1: Run / stop Bit2: Forward / reverse Bit3: Zero speed running Bit5&Bit4: Acc / Dec / Constant Bit6: Unused Bit7: DC braking Bit8: Auto-tuning Bit9: Unused Bit10: Speed limit value Bit11: Unused Bit12: Stall overvoltage Bit13: Current limit Bit14, Bit15: Unused			*	
d00.14	Setting frequency	0.01 - 400.00Hz			*	
d00.15	Setting frequency (after Acc / Dec)	0.01 - 400.00Hz			*	
d00.16	Output frequency	0.01 - 400.00Hz			*	
d00.17	Setting RPM	0 - 60000rpm			*	
d00.18	Running RPM	0 - 60000rpm			*	
d00.19	Three-phase power supply input sequence phase	0: Positive sequence, L1(R) preceding L2(S) preceding L3(T) 1: Negative sequence, L1(R) preceding L3(T) preceding L2(S)			*	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00.20	Output voltage	0 - 999V			*	
d00.21	Output current	Actual value, unit is 0.1A			*	
d00.23	Output torque	0.0 - 300.0% (motor rated torque)			*	
d00.24	Output power	Actual value, unit is 0.1kW			*	
d00.25	DC bus voltage	0 - 999V			*	
d00.26	Potentiometer input voltage of the keypad	0.00 - 5.00V			*	
d00.27	AI1 voltage	0.00 - 10.00V			*	
d00.28	AI1 voltage (after calculating)	0.00 - 10.00V			*	
d00.29	AI2 voltage	-10.00 - 10.00V			*	
d00.30	AI2 voltage (after calculating)	-10.00 - 10.00V			*	
d00.31	AI3 voltage	-10.00 - 10.00V			*	
d00.32	AI3 voltage (after calculating)	-10.00 - 10.00V			*	
d00.33	AI4 voltage	-10.00 - 10.00V			*	
d00.34	AI4 voltage (after calculating)	-10.00 - 10.00V			*	
d00.35	DI6 pulse input frequency	0 - 50000Hz			*	
d00.36	AO1 output	0.00 - 10.00V			*	
d00.37	AO2 output	0.00 - 10.00V			*	
d00.38	High-speed output pulse frequency	0 - 50000Hz			*	
d00.39	Heatsink temperature	0.0 - 999.9℃			*	
d00.42	Set water supply pressure	0 - P05.03 × 10 kg/cm^2			*	
d00.43	Actual water supply pressure	0 - P05.03 × 10 kg/cm^2			*	
d00.44	PID setting	-100.0 - 100.0%			*	
d00.45	PID feedback	-100.0 - 100.0%			*	
d00.46	PID tolerance	-100.0 - 100.0%			*	
d00.47	PID integral item	-100.0 - 100.0%			*	
d00.48	PID output	-100.0 - 100.0%			*	
d00.49	External counting value	0 - 9999			*	
d00.50	Input terminal status	Bit0 - Bit8 corresponding to DI1 - DI9 0: Input terminals disconnect with common terminals 1: Input terminals connect with common terminals			*	
d00.51	Output terminal status	Bit0 - Bit1 corresponding to DO1 - DO2 Bit2 - Bit11 corresponding to			*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		RLY1 - RLY10 0: Output terminals disconnect with common terminals 1: Output terminals connect with common terminals				
d00.55	Total time at power-on	0 - 65535h			*	
d00.56	Total time at running	0 - 65535h			*	
d00.57	High bit of motor total energy consumption	0 - 65535k kW.h			*	
d00.58	Low bit of motor total energy consumption	0.0 - 999.9kW.h			*	
d00.59	High bit of energy consumption at this time running	0 - 65535k kW.h			*	
d00.60	Low bit of energy consumption at this time running	0.0 - 999.9kW.h			*	
d00.61	Present fault	0 - 100 *100: means undervoltage*			*	
F00: Basic Parameters, on pages 29 - 32						
F00.01	Motor control mode	0: V/f control 1: Unused 2: SVC control	0	1	×	
F00.02	Inverter type setting	0: G type 1: P type	1	1	×	
F00.04	Extension card selection	0: Invalid 2: HD30-WIO extension valid	2	1	×	
F00.05	HD31 extended function	0: No extended 1: Constant pressure water supply	0	1	×	
F00.06	Max. output frequency of HD31	50.00 - 400.00Hz	50.00Hz	0.01Hz	×	
F00.07	Upper limit of running frequency setting source	0: Digital setting (F00.08) 1: Analogue input setting 2: DI6 pulse setting	0	1	×	
F00.08	Upper limit of running frequency	0.00 - F00.06	50.00Hz	0.01Hz	×	
F00.09	Lower limit of running frequency	0.00 - upper limit	0.00Hz	0.01Hz	×	
F00.10	Frequency setting sources	0: Keypad setting 1: Terminal digital setting 2: SCI communication setting 3: Analogue setting 4: DI6 pulse setting	0	1	×	
F00.11	Command setting source	0: Keypad setting 1: Terminal setting	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		2: SCI communication setting				
F00.12	M key function	0: Switch running direction 1: Switch local and remote control 2: Invalid	2	1	○	
F00.13	Starting frequency digital setting	0.00 Hz- upper limit	50.00Hz	0.01Hz	○	
F00.14	UP / DOWN digital setting	Units: Save selection of frequency setting at power outage 0: Do not save at power outage 1: Save to F00.13 at power outage Tens: Control selection of frequency setting at stop 0: Do not restore to F00.13 at stop 1: Restore to F00.13 at stop Hundreds: Save selection of communication setting frequency 0: Do not save when power is off 1: Save to F00.13 when power is off	000	1	×	
F00.15	Jog running frequency digital setting 1	0.00 - upper limit	5.00Hz	0.01Hz	○	
F00.16	Interval of jog running	0.0 - 100.0s	0.0s	0.1s	×	
F00.17	Running direction	0: The same as running command 1: Opposite to running command	0	1	×	
F00.18	Reverse	0: Permitted 1: Prohibitted	0	1	×	
F00.19	Dead time of direction switch	0.0 - 3600.0s	0.0s	0.1s	×	
F00.20	Key enable of optional keypad	0: Enabled 1: Invalid	0	1	○	
F00.21	Dormant function	0: Disabled 1: Enabled	0	1	×	
F00.22	Dormancy wake up time	0.0 - 360.0s	0.0s	0.1s	○	
F01: Protection of Parameters, on pages 32 - 33						
F01.00	User's password	00000 - 65535	0	1	○	
F01.01	Menu mode	Units: 0: Full menu mode	0	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		1: Checking menu mode (Only different from factory setting parameters can be displayed)				
F01.02	Function code parameter initialization (download)	0: No operation 1: Restore to factory settings 2, 3: Download the keypad EEPROM parameter 1 / 2 to the current function code settings 4: Clear fault information 5, 6: Download the keypad EEPROM parameter 1 / 2 to the current function code settings (including the motor parameters)	0	1	×	
F01.03	Keypad EEPROM parameter initialization (upload)	0: No operation 1, 2: Upload the current function code settings to the keypad EEPROM parameter 1 / 2	0	1	○	
F03: Acc / Dec Parameters, on page 33						
F03.01	Acc time	0.1 - 6000.0s	18.5kW and below : 10.0s 22 - 75 kW: 30.0s	0.1s	○	
F03.02	Dec time	0.1 - 6000.0s	90kW and above: 60.0s	0.1s	○	
F03.15	Acc time of jog running	0.1 - 6000.0s	6.0s	0.1s	○	
F03.16	Dec time of jog running	0.1 - 6000.0s	6.0s	0.1s	○	
F03.17	Dec time of emergency stop	0.1 - 6000.0s	10.0s	0.1s	○	
F05: External Setting Curve Parameters, on pages 33 - 35						
F05.00	External setting curve	Units: AI1 curve Tens: AI2 curve Hundreds: AI3 curve Thousands: AI4 curve Ten thousands: Pulse input curve 0: Line 1 1: Line 2 2: Polyline	00000	1	×	
F05.01	Min. setting of line 1	0.0% - F05.03	0.0%	0.1%	○	
F05.02	Min. setting corresponding value of line 1	0.0 - 100.0%	0.0%	0.1%	○	
F05.03	Max. setting of line 1	F05.01 - 100.0%	100.0%	0.1%	○	
F05.04	Max. setting	0.0 - 100.0%	100.0%	0.1%	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
	corresponding value of line 1					
F05.05	Min. setting of line 2	0.0% - F05.07	0.0%	0.1%	○	
F05.06	Min. setting corresponding value of line 2	0.0 - 100.0%	0.0%	0.1%	○	
F05.07	Max. setting of line 2	F05.05 - 100.0%	100.0%	0.1%	○	
F05.08	Max. setting corresponding value of line 2	0.0 - 100.0%	100.0%	0.1%	○	
F05.09	Max. setting of polyline	F05.11 - 100.0%	100.0%	0.1%	○	
F05.10	Max. setting corresponding value of polyline	0.0 - 100.0%	100.0%	0.1%	○	
F05.11	Inflection point 2 setting of polyline	F05.13 - F05.09	100.0%	0.1%	○	
F05.12	Inflection point 2 corresponding value	0.0 - 100.0%	100.0%	0.1%	○	
F05.13	Inflection point 1 setting of polyline	F05.15 - F05.11	0.0%	0.1%	○	
F05.14	Inflection point 1 corresponding value	0.0 - 100.0%	0.0%	0.1%	○	
F05.15	Min. setting of polyline	0.0% - F05.13	0.0%	0.1%	○	
F05.16	Min. setting corresponding value of polyline	0.0 - 100.0%	0.0%	0.1%	○	
F05.17	Skip frequency 1	F00.09 - upper limit	0.00Hz	0.01Hz	×	
F05.18	Skip frequency 2	F00.09 - upper limit	0.00Hz	0.01Hz	×	
F05.19	Skip frequency 3	F00.09 - upper limit	0.00Hz	0.01Hz	×	
F05.20	Range of skip frequency	0.00 - 30.00Hz	0.00Hz	0.01Hz	×	
F08: Asynchronous Motor Parameters, on pages 35 - 36						
F08.00	Rated power of motor	0.2 - 500.0kW	Depend on motor	0.1kW	×	
F08.01	Rated voltage of motor	0 - 999V		1V	×	
F08.02	Rated current of motor	7.5kW above: 0.1 - 999.9A		0.1A	×	
		7.5kW or below: 0.01 - 99.99A		0.01A		
F08.03	Rated frequency of motor	1.0 - 400.0Hz	50.0Hz	0.1Hz	×	
F08.04	Rated RPM of motor	1 - 24000rpm	1500rpm	1rpm	×	
F08.05	Power factor of motor	0.001 - 1.000	Depend on motor	0.001	×	
F08.06	Parameter auto-tuning of motor	0: Auto-tuning is disabled 1: Stationary auto-tuning 2: Rotary auto-tuning	0	1	×	
F08.07	Stator resistance of motor	7.5kW above: 0.000 - 9.999Ω	Depend on motor	0.001Ω	×	
		7.5kW and below: 0.00 - 99.99Ω		0.01Ω		

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F08.08	Rotor resistance of motor	7.5kW above: 0.000 - 9.999Ω	Depend on motor	0.001Ω	×	
		7.5kW and below: 0.00 - 99.99Ω		0.01Ω		
F08.09	Leakage inductance of motor	7.5kW above: 0.00 - 500.00mH	Depend on motor	0.01mH	×	
		7.5kW and below: 0.0 - 5000.0mH		0.1mH		
F08.10	Mutual inductance of motor	7.5kW above: 0.00 - 500.00mH	Depend on motor	0.01mH	×	
		7.5kW and below: 0.0 - 5000.0mH		0.1mH		
F08.11	Idling excitation current of motor	7.5kW above: 0.0 - 999.9A	Depend on motor	0.1A	×	
		7.5kW and below: 0.00 - 99.99A		0.01A		
F09: V/f Control Parameters, on pages 36 - 38						
F09.00	V/f curve of motor	0: Line 1: Square curve 2: 1.2 exponential curve 3: 1.7 exponential curve 4: User-defined curve	0	1	×	
F09.01	V/f frequency of motor (F3)	F09.03 - F08.03	0.00Hz	0.01Hz	×	
F09.02	V/f voltage of motor (V3)	F09.04 - F08.01	0V	1V	×	
F09.03	V/f frequency of motor (F2)	F09.05 - F09.01	0.00Hz	0.01Hz	×	
F09.04	V/f voltage of motor (V2)	F09.06 - F09.02	0V	1V	×	
F09.05	V/f frequency of motor (F1)	0.00 - F09.03	0.00Hz	0.01Hz	×	
F09.06	V/f voltage of motor (V1)	0 - F09.04	0V	1V	×	
F09.07	Torque boost of motor	0.0 - 30.0% *0.0 : Auto torque boost*	55kW and below: 2.0% 75 - 132kW: 1.0%	0.1%	×	
F09.08	Cut-off point used for manual torque boost of motor	0.0 - 50.0% (F08.03)	10.0%	0.1%	○	
F09.09	Slip compensation gain of motor	0.0 - 300.0%	100.0%	0.1%	○	
F09.10	Slip compensation filter time of motor	0.01 - 10.00s	0.10s	0.01s	○	
F09.11	Slip compensation limit of motor	0.0 - 250.0%	200.0%	0.1%	×	
F09.12	Compensation constant of motor	0.1 - 25.0s	2.0s	0.1s	○	
F09.14	AVR function of motor	0: Disabled 1: Enabled all the time 2: Disabled in Dec process	1	1	○	
F09.15	Oscillation-suppression	0: Depend on excitation current	0	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
	mode of motor	component 1: Depend on torque current component				
F09.16	Oscillation-suppression coefficient of motor	0 - 200	50	1	○	
F15: Digital I/O Terminal Parameters, on pages 38 - 41						
F15.00	DI1 function	0: Unused 1: Inverter enabled 2, 3: FWD / REV 4: Three-wire running mode 12: External stop command input 41, 42: Coast to stop normally open / normally closed input 44, 45: External fault normally open / normally closed input 46: External reset (RST) input 53: Pulse frequency input (DI6) 54: Clear fault records	2	1	×	
F15.01	DI2 function		3	1	×	
F15.02	DI3 function		0	1	×	
F15.03	DI4 function		0	1	×	
F15.04	DI5 function		0	1	×	
F15.05	DI6 function		0	1	×	
F15.06	DI7 function		0	1	×	
F15.07	DI8 function		0	1	×	
F15.08	DI9 function		0	1	×	
F15.15	Terminal input positive and negative logic setting	Bit0 - Bit8 is corresponding to DI1 - DI9 0: Positive logic 1: Negative logic	000	1	○	
F15.16	FWD / REV running mode	0: Two-wire running mode 1 1: Two-wire running mode 2 2: Three-wire running mode 1 3: Three-wire running mode 2	0	1	×	
F15.18	DO1 function	0: Unused 1: Inverter is ready 2: Inverter running 3: Forward running 4: Reverse running 6:Zero-frequency status 7: Zero-frequency running 31: Inverter fault 32: External fault 35: Dormancy indicating function 38: High-frequency output (DO2)	2	1	×	
F15.19	DO2 function		0	1	×	
F15.20	RLY1 function		31	1	×	
F15.21	RLY2 function		0	1	×	
F15.22	RLY3 function		0	1	×	
F15.23	RLY4 function		0	1	×	
F15.24	Output terminal logic setting	Bit0 - Bit1 is corresponding to DO1 - DO2 Bit2 - Bit11 is corresponding to RLY1 - RLY10 0: Positive logic 1: Negative logic	000	1	○	
F15.28	Zero-frequency signal	0.00 - upper limit	0.00Hz	0.01Hz	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
	detection threshold					
F15.29	Zero-frequency hysteresis	0.00 - upper limit	0.00Hz	0.01Hz	○	
F16: Analogue I/O Terminal Parameters, on pages 41 - 43						
F16.00	Keypad with potentiometer function	0: Unused 1: Upper limit frequency setting 2: Frequency setting	0	1	×	
F16.01	AI1 function		2	1	×	
F16.02	AI2 function		0	1	×	
F16.03	AI3 function		0	1	×	
F16.04	AI4 function		0	1	×	
F16.05	AI1 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.08	AI2 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.11	AI3 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.14	AI4 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.06	AI1 gain	-10.00 - 10.00	1.00	0.01	○	
F16.09	AI2 gain	-10.00 - 10.00	1.00	0.01	○	
F16.12	AI3 gain	-10.00 - 10.00	1.00	0.01	○	
F16.15	AI4 gain	-10.00 - 10.00	1.00	0.01	○	
F16.07	AI1 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.10	AI2 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.13	AI3 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.16	AI4 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.17	Max. input pulse frequency	0.0 - 50.0kHz	10.0kHz	0.1kHz	○	
F16.18	Input pulse filter time	0 - 500ms	10ms	1ms	○	
F16.19	AO1 function	0, 6 - 9: Unused 1: Output frequency (0 - max. output frequency) 2: Setting frquency (0 - max. output frequency) 3: Motor RPM (0 - max. output frequency corresponding to RPM) 4: Output current (0 - twice rated current of motor) 5: Output current (0 - twice rated current of motor) 10: Output torque (0 - 3 times rated torque of motor) 11: Output voltage (0 - 1.2 times rated voltage of HD31) 12: Bus voltage (0 - 2.2 times rated voltage of HD31)	1	1	○	
F16.20	AO2 function		0	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F16.21	High-speed pulse function	13: Output power (0 - twice rated power of motor) 14: AI1 input (after calculating) 15: AI2 input (after calculating) 16: AI3 input (after calculating) 17: AI4 input (after calculating) 18: Output frequency (- 1 times - 1 times max. output frequency) 19: Setting frequency (- 1 times - 1 times max. output frequency)	0	1	○	
F16.22	AO1 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.23	AO1 gain	0.0 - 200.0%	100.0%	0.1%	○	
F16.24	AO2 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.25	AO2 gain	0.0 - 200.0%	100.0%	0.1%	○	
F16.26	DO2 max. output pulse frequency	0.1 - 50.0kHz	10.0kHz	0.1kHz	○	
F17: SCI Communication Parameters, on pages 43 - 44						
F17.00	Data format	0: 1-8-2 format, no parity, RTU 1: 1-8-1 format, even parity,RTU 2: 1-8-1 format, odd parity, RTU 3: 1-7-2 format, no parity, ASCII 4: 1-7-1 format, even parity, ASCII 5: 1-7-1 format, odd parity, ASCII	0	1	×	
F17.01	Baud rate	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	3	1	×	
F17.02	Local address	0 - 247	2	1	×	
F17.03	Host PC response time	0 - 1000ms	0ms	1ms	×	
F17.04	Detection time at communication timeout	0.0 - 1000.0s *0.0: Not detect communication timeout*	0.0s	0.1s	×	
F17.05	Detection time at communication error	0.0 - 1000.0s *0.0: Not detect the communication error*	0.0s	0.1s	×	
F17.06	Action selection at communication timeout	0: Coast to stop 1: Emergency stop 2: Decelerate to stop 3: Continue to run	3	1	×	
F17.07	Action selection at communication error		3	1	×	
F17.08	Action selection at communication peripheral device fault		1	1	×	
F18: Display Control Parameters, on pages 44 - 45						

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F18.00	Language selection	0: Chinese 1: English	0	1	○	
F18.01	Displaycontrast of the LCD keypad	1 - 10	5	1	○	
F18.02	Set parameter 1 of run status	1: Rated current of HD31 7: Setting frequency 8: Setting frequency (after Acc / Dec) 9: Output frequency 10: Setting RPM 11: Running RPM 12: Three-phase power supply input phase sequence 13: Output voltage 14: Output current 16: Output torque 17: Output power 18: DC bus voltage 19: Potentiometer input voltage 20: AI1 voltage 21: AI1 voltage (after calculating) 22: AI2 voltage 23: AI2 voltage (after calculating) 24: AI3 voltage 25: AI3 voltage (after calculating) 26: AI4 voltage 27: AI4 voltage (after calculating) 28: DI6 pulse input frequency 29, 30: AO1 / AO2 output 31: High-speed output pulse frequency 32: Heatsink temperature 35: Content water supply pressure setting 36: Actula feedback pressure 37: PID setting 38: PID feedback 39: PID error 40: PID integral value 41: PID outpu 43: Input terminal status 44: Output terminal status 48: Total time at power on (H) 49: Total time at running (H)	8	1	○	
F18.03	Set parameter 2 of run status		7	1	○	
F18.04	Set parameter 3 of run status		36	1	○	
F18.05	Set parameter 4 of run status		13	1	○	
F18.06	Set parameter 5 of run status		14	1	○	
F18.07	Set parameter 6 of run status		18	1	○	
F18.08	Set parameter 1 of stop status		7	1	○	
F18.09	Set parameter 2 of stop status		18	1	○	
F18.10	Set parameter 3 of stop status		20	1	○	
F18.11	Set parameter 4 of stop status		22	1	○	
F18.12	Set parameter 5 of stop status		35	1	○	
F18.13	Set parameter 6 of stop status		36	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19: Function-boost Parameters , on pages 45 - 47						
F19.07	Fan control	0: Auto stop 1: Immediate stop 2: Runs all the time when power on	0	1	○	
F19.08	Fan control delay time	0.0 - 600.0s	30.0s	0.1s	○	
F19.16	Restart after power failure	0: Disabled 1: Enabled	0	1	×	
F19.17	Delay time for restart after power failure	0.00 - 10.00s	2.00s	0.01s	○	
F19.18	Stall overvoltage	0: Disabled 1: Enabled	1	1	×	
F19.19	Stall overvoltage point	0 - 1200V	740V	1V	×	
F19.20	Auto current limit	0: Disabled 1: Enabled in Acc / Dec running process, but disabled in constant speed runnng process 2: Enabled both in Acc / Dec and constant speed running process	1	1	×	
F19.21	Auto current limit threshold	20.0 - 200.0%	110.0%	0.1%	×	
F19.22	Dec time at auto current limit	0.0 - 6000.0s *0.00: Limit current without Dec*	18.5kW and below:10.0s 22 - 75 kW: 30.0s 90kW and above: 60.0s	0.1s	×	
F19.23	Enabled terminal at power on	0: Rise edge 1: Level	0	1	○	
F19.24	Action voltage of braking unit	630 - 750V	720V	1V	×	
F20: Fault Protection Parameters, on pages 47 - 50						
F20.00	Overload pre-alarm detection	Units: Overload pre-alarm detection 0: It is active all the time in running status 1: It is active only at constant speed Tens: Overload pre-alarm action 0: HD31 doesn't alarm and continues running 1: HD31 alarms and stops running	00000	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		Hundreds: Overload detection threshold 0: Relates to rated current of motor (alarm E0019) 1: Relates to rated current of HD31 (alarm E0017) Thousands: Motor type 0: Standard motor 1: Variable frequency motor Ten thousands: Overload protection 0: Enabled 1: Disabled				
F20.01	Overload pre-alarm detection threshold	20.0 - 200.0%	150.0%	0.1%	×	
F20.02	Overload pre-alarm detection time	0.0 - 60.0s	5.0s	0.1s	×	
F20.03	Output load-loss detection of HD31	0: Disabled. It does not detect output load-loss 1: It detects all the time in running process, and then continues running after detecting (alarm) 2: It detects only at constant speed, and then continues running after detecting (alarm) 3: It detects all the time in running process, and then cut off the output after detecting (fault) 4: It detects only at constant speed, and then cuts off the output after detecting (fault)	0	1	×	
F20.04	Output load-loss detection threshold of HD31	0 - 100%	30%	1%	×	
F20.05	Output load-loss detection time of HD31	0.00 - 20.00s	1.00s	0.01s	×	
F20.06	Motor overheat signal	0: Does not detect 1: Positive charateristic (PTC) 2: Negative charateristic (NTC)	0	1	×	
F20.07	Thermistor value at motor overheat	0.0 - 10.0kΩ	5.0kΩ	0.1kΩ	×	
F20.08	Input voltage phase loss detection setting	0 - 50% *0: Not detect input voltage phase loss*	30%	1%	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.09	Input voltage phase loss detection time	1.00 - 5.00s	1.00s	0.01s	×	
F20.10	Output voltage phase loss detection setting	0 - 50% *0: Not detect output voltage phase loss*	20%	1%	×	
F20.11	Output voltage phase loss detection time	0.00 - 20.00s *0.00: Not detect output voltage phase loss*	3.00s	0.01s	×	
F20.12	PID setting lose detection value	0 - 100% *0: Not detect PID setting lose*	0%	1%	×	
F20.13	PID setting loss detection time	0.00 - 10.00s *0.00: Not detect PID setting loss*	0.20s	0.01s	×	
F20.14	PID feedback loss detected value	0 - 100% *0: Not detect PID feedback loss*	0%	1%	×	
F20.15	PID feedback loss detection time	0.00 - 10.00s *0.00: Not detect PID feedback loss*	0.20s	0.01s	×	
F20.16	Detection value at PID feedback out of the limit	0 - 100% *100: Not detect PID feedback out of the limit*	100%	1%	×	
F20.17	Detection time at PID feedback out of the limit	0.00 - 10.00s *0.00: Not detect PID feedback out of the limit*	0.20s	0.01s	×	
F20.18	Auto reset times	0 - 100 *0: No auto reset function*	0	1	×	
F20.19	Auto reset interval	2.0 - 20.0s/times	5.0s/times	0.1s/times	×	
F20.20	Faulty relay action	Units: In auto reset process 0: Faulty relay doesn't act 1: Faulty relay acts Tens: In the undervoltage process 0: Faulty relay doesn't act 1: Faulty relay acts	00	1	○	
F20.21	Type of fifth latest (the last) fault	-Lu-: DC bus undervoltage E0001: Inverter output overcurrent (in Acc process) E0002: Inverter output overcurrent (in Dec process) E0003: Inverter output overcurrent (in constant speed process) E0004: DC bus over voltage (in Acc process) E0005: DC bus over voltage (in Dec process) E0006: DC bus over voltage (in constant speed process)	0	1	*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.21	Type of fifth latest (the last) fault	E0007: Stall overvoltage E0008: Power module fault E0009: Heatsink overheat E0010: Braking unit fault E0011: CPU fault E0012: Parameters auto-tuning fault E0013: Soft start contactor failed E0014: Current detection fault E0015: Input voltage phase loss E0016: Output voltage phase loss E0017: Inverter overload E0018: Inverter output load-loss E0019: Motor overload E0020: Motor overheat E0021: Access fault of control board EEPROM E0022: Access fault of keypad EEPROM (only displaying without any protection) E0023: Faulty setting of parameters E0024: Fault of external equipment E0025: PID setting loss E0026: PID feedback loss E0027: PID feedback out of limit E0028: SCI communication time-out E0029: SCI communication error E0037: Input wrong phase	0	1	*	
F20.22	Setting frequency at the last fault	0.00 - 400.00Hz	0.00Hz	0.01Hz	*	
F20.23	Running frequency at the last fault	0.00 - 400.00Hz	0.00Hz	0.01Hz	*	
F20.24	Bus voltage at the last fault	0 - 999V	0V	1V	*	
F20.25	Output voltage at the last fault	0 - 999V	0V	1V	*	
F20.26	Output current at the last fault	7.5kW and above: actual value	0.0A	0.1A	*	
		5.5kW actual value	0.00A	0.01A		
F20.27	Input terminal status at the last fault	0 - 0x1FF	0	1	*	
F20.28	Output terminal status at the last fault	0 - 0x7FF	0	1	*	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.29	Interval of fifth latest fault	0 - 6553.5 hours	0.0h	0.1h	*	
F20.30	Type of fourth latest fault	0 - 99	0	1	*	
F20.31	Interval of fourth latest fault	0 - 6553.5 hours	0.0h	0.1h	*	
F20.32	Type of third latest fault	0 - 99	0	1	*	
F20.33	Interval of third latest fault	0 - 6553.5 hours	0.0h	0.1h	*	
F20.34	Type of second latest fault	0 - 99	0	1	*	
F20.35	Interval of second latest fault	0 - 6553.5 hours	0.0h	0.1h	*	
F20.36	Type of first latest fault	0 - 99	0	1	*	
F20.37	Interval of first latest fault	0 - 6553.5 hours	0.0h	0.1h	*	
F23: PWM Control Parameters, on pages 50 - 51						
F23.00	Carrier frequency	1 - 16kHz	Depend on HD31	1kHz	×	
F23.02	PWM overshoot enable	0: Disabled 1: Enabled	1	1	×	
P00: Water Supply Logic Parameter, on pages 51 - 56						
P00.00	Water supply mode	0: Running 1: Commissioning	1	1	×	
P00.01	Water level(WL) signal input	0: No input 1: DI terminal input 2: AI terminal input	0	1	×	
P00.02	Upper limit WL of intake pool	0.0 - 100.0%	50.0%	0.1%	○	
P00.03	Lower limit WL of intake pool	0.0 - P00.02	30.0%	0.1%	○	
P00.04	Water shortage WL of intake pool	0.0 - P00.03	10.0%	0.1%	○	
P00.05	Backup pressure	0.0 - P0 5.03×10 kg/cm^2	0.0 kg/cm^2	0.1 kg/cm^2	○	
P00.06	Pressure tolerance for adding pump	0.0 - 50.0%	10.0%	0.1%	○	
P00.07	Detection time for adding pump	0.0 - 3600.0s	5.0s	0.1s	○	
P00.08	Upper switch frequency when adding variable frequency pump	P02.27 - upper limit	50.00Hz	0.01Hz	○	
P00.09	Dec time of variable frequency pump when adding power frequency pump	0.0 - 100.0s	10.0s	0.1s	○	
P00.10	Pressure tolerance for reducing pump	0.0 - 50.0%	10.0%	0.1%	○	
P00.11	Detection time for reducing pump	0.0 - 3600.0s	5.0s	0.1s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P00.12	Acc time of variable frequency pump when reducing pump	0.0 - 100.0s	10.0s	0.1s	○	
P00.13	Breaking delay of pump 1 contacotr	0.000 - 5.000s	0.020s	0.001s	○	
P00.14	Touching delay of pump 1 contactor	0.000 - 5.000s	0.020s	0.001s	○	
P00.15	Switch circle of power frequency pump	0 - 9999h	0h	1h	○	
P00.16	Switch circle of variable frequency pump	0 - 9999h	0h	1h	○	
P00.17	Dormancy enable	0: No dormancy 1: Constant pressure dormancy 2: Specified pressure dormancy 3: No flow dormancy1 4: No flow dormancy 2	0	1	○	
P00.18	Pressure tolerance of dormancy awakening	0.0 - 100.0%	10.0%	0.1%	○	
P00.19	Delay time of dormancy awakening	0.0 - 3600.0s	5.0s	1.0s	○	
P00.20	Shutdown detection coefficient	0.0 - 100.0%	0.0%	0.1%	○	
P00.21	Interval of shutdown the pump and water supply	0.0 - 60.0s	10.0s	0.1s	○	
P00.22	Detection time of shutdown detection	0.0 - 3600.0s	6.0s	0.1s	○	
P00.23	No-flow detecting frequency	0.00 - 50.00Hz	25.00Hz	0.01Hz	○	
P00.24	Detecting time for no-flow detecting start delay	0.0 - 3600.0s	60.00s	0.01s	○	
P00.25	No flow correction factor	1 - 400%	100%	1%	○	
P00.26	No-flow low speed	0.00 – 99.99Hz	0.00Hz	0.01Hz	○	
P00.27	No-flow low speed power	0.00 – 10.00kW	0.00kW	0.01kW	×	
P00.28	No-flow high speed	0.00 – 99.99Hz	0.00Hz	0.01Hz	○	
P00.29	No-flow high speed power	0.00 – 10.00kW	0.00kW	0.01kW	×	
P00.30	No-flow detection curve	0: Square curve 1: Straight line 2: Cubic curve 1 3: Cubic curve 2	0	1	×	
P00.31	Phase sequence detection enable from variable frequency to power frequency	0: Disable 1: Enable	0	1	×	
P00.32	Switching angle of	-50.0 – 50.0°	0.0°	0.1°	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
	variable and power frequecny of pump 1					
P00.33	Switching angle of variable and power frequecny of pump 2	-50.0 – 50.0°	0.0°	0.1°	○	
P00.34	Switching angle of variable and power frequecny of pump 3	-50.0 – 50.0°	0.0°	0.1°	○	
P00.35	Switching angle of variable and power frequecny of pump 4	-50.0 – 50.0°	0.0°	0.1°	○	
P00.36	Switching angle of variable and power frequecny of pump 5	-50.0 – 50.0°	0.0°	0.1°	○	
P00.37	Switching angle of variable and power frequecny of pump 6	-50.0 – 50.0°	0.0°	0.1°	○	
P00.38	Switching angle of variable and power frequecny of pump 7	-50.0 – 50.0°	0.0°	0.1°	○	
P00.39	Dealy of pump 2 contactor breaking	0.000 – 5.000s	0.020s	0.001s	○	
P00.40	Dealy of pump 2 contactor touching	0.000 – 5.000s	0.020s	0.001s	○	
P00.41	Dealy of pump 3 contactor breaking	0.000 – 5.000s	0.020s	0.001s	○	
P00.42	Dealy of pump 3 contactor touching	0.000 – 5.000s	0.020s	0.001s	○	
P 00.43	Dealy of pump 4 contactor breaking	0.000 – 5.000s	0.020s	0.001s	○	
P00.44	Dealy of pump 4 contactor touching	0.000 – 5.000s	0.020s	0.001s	○	
P00.45	Dealy of pump 5 contactor breaking	0.000 – 5.000s	0.020s	0.001s	○	
P00.46	Dealy of pump 5 contactor touching	0.000 – 5.000s	0.020s	0.001s	○	
P00.47	Dealy of pump 6 contactor breaking	0.000 – 5.000s	0.020s	0.001s	○	
P00.48	Dealy of pump 6 contactor touching	0.000 – 5.000s	0.020s	0.001s	○	
P00.49	Dealy of pump 7 contactor breaking	0.000 – 5.000s	0.020s	0.001s	○	
P00.50	Dealy of pump 7 contactor touching	0.000 – 5.000s	0.020s	0.001s	○	
P01: Water Supply Pump Parameter, on pages 56 - 57						
P01.00	Pump 1 type	0: Invalid	0	1	×	
P01.01	Pump 2 type	1: Variable frequency pump	0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P01.02	Pump 3 type	2: Power frequency pump 3: Dormant pump 4: Sewage pump	0	1	×	
P01.03	Pump 4 type		0	1	×	
P01.04	Pump 5 type		0	1	×	
P01.05	Pump 6 type		0	1	×	
P01.06	Pump 7 type		0	1	×	
P01.07	Rated current of pump 1	7.5kW above motor: 0.1 - 999.9A	depend on motor	0.1A	×	
		7.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.08	Rated current of pump 2	7.5kW and above motor: 0.1 - 999.9A		0.1A	×	
		7.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.09	Rated current of pump 3	7.5kW above motor: 0.1 - 999.9A		0.1A	×	
		7.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.10	Rated current of pump 4	7.5kW above motor: 0.1 - 999.9A		0.1A	×	
		7.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.11	Ratedcurrent of pump 5	7.5kW above motor: 0.1 - 999.9A		0.1A	×	
		7.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.12	Rated current of pump 6	7.5kW above motor: 0.1 - 999.9A		0.1A	×	
		7.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.13	Ratedcurrent of pump 7	7.5kW above motor: 0.1 - 999.9A		0.1A	×	
		7.5kW and below motor: 0.01 - 99.99A		0.01A		
P02: Water Supply PID Parameter, on pages 57 - 59						
P02.00	Pressure setting source	0: Digital setting 1: Pressure setting of timing water supply 2: Pressure setting of analogue water supply	0	1	×	
P02.01	Pressure digital setting	0.0 - P05.0 3×10 kg/cm^2	0.0 kg/cm^2	0.10kg/cm^2	×	
P02.02	Pressure time	1 - 12	1	1	×	
P02.03	T1 start time	00.00 - 23.59	00.00	0.01	×	
P02.04	T1 time pressure	0.0 - P05.0 3×10 kg/cm^2	0.0 kg/cm^2	0.10kg/cm^2	×	
P02.05	T2 start time	00.00 - 23.59	00.00	0.01	×	
P02.06	T2 time pressure	0.0 - P05.0 3×10 kg/cm^2	0.0 kg/cm^2	0.10kg/cm^2	×	
P02.07	T3 start time	00.00 - 23.59	00.00	0.01	×	
P02.08	T3 time pressure	0.0 - P05.0 3×10 kg/cm^2	0.0 kg/cm^2	0.10kg/cm^2	×	
P02.09	T4 start time	00.00 - 23.59	00.00	0.01	×	
P02.10	T4 time pressure	0.0 - P05.0 3×10 kg/cm^2	0.0 kg/cm^2	0.10kg/cm^2	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P02.11	T5 start time	00.00 - 23.59	00.00	0.01	×	
P02.12	T5 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.13	T6 start time	00.00 - 23.59	00.00	0.01	×	
P02.14	T6 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.15	T7 start time	00.00 - 23.59	00.00	0.01	×	
P02.16	T7 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.17	T8 start time	00.00 - 23.59	00.00	0.01	×	
P02.18	T8 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.19	T9 start time	00.00 - 23.59	00.00	0.01	×	
P02.20	T9 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.21	T10 start time	00.00 - 23.59	00.00	0.01	×	
P02.22	T10 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.23	T11 start time	00.00 - 23.59	00.00	0.01	×	
P02.24	T11 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.25	T12 start time	00.00 - 23.59	00.00	0.01	×	
P02.26	T12 time pressure	0.0 - P05.0 3×10 kg/cm²	0.0 kg/cm²	0.10kg/cm²	×	
P02.27	Upper limit of pressure closed-loop	0 - upper limit	50.00Hz	0.01Hz	○	
P02.28	Proportional gain of pressure closed-loop (Kp)	0.00 – 10.00	0.01	0.01	○	
P02.29	Integration time of pressure closed-loop (Ti)	0.01 - 10.00s	0.10	0.01	○	
P02.30	Differential time of pressure closed-loop (Td)	0.00 - 1.00s	0.00	0.01	○	
P02.31	Sampling time (T)	0.01 - 30.00s	0.50s	0.01s	○	
P02.32	Bias limit	0.0 - 20.0%	2.0%	0.1%	○	
P02.33	Output wave filter of pressure closed-loop	0.01 - 30.00s	0.50	0.01	○	
P02.34	Regulating characteristic of pressure closed-loop	0: Positive characteristi 1: Positive characteristic	0	1	○	
P02.35	Digital setting for saving selection when power failure	0: Not saving 1:Saving	1	1	○	
P03: Water Supply AIO Function Parameter, on pages 59 - 61						
P03.00	AI1 function	0: Unused 1: Analoguepressure setting 2: Analoguefeedback setting 3: Anolog WL feedback	0	1	×	
P03.01	AI2 function		0	1	×	
P03.02	AI3 function		0	1	×	
P03.03	AI4 function		0	1	×	
P03.04	DI1 function	0: Unused. 1 - 7: Pump 1 - 7 commissioning running 8 - 14: Pump 1 - 7 invalid 15, 16: Upper / Lower limit WL of	0	1	×	
P03.05	DI2 function		0	1	×	
P03.06	DI3 function		0	1	×	
P03.07	DI4 function		0	1	×	
P03.08	DI5 function		0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P03.09	DI6 function	intake pool 17: Water shortage WL 18, 19: Upper / Lower limit WL of sewage pool	0	1	×	
P03.10	DI7 function		0	1	×	
P03.11	DI8 function		0	1	×	
P03.12	DI9 function		0	1	×	
P03.13	DO1 function	0: Unused 1,3,5,7,9,11,13: Pump 1 - 7 variable frequency running 2,4,6,8,10,12,14: Pump 1 - 7 power frequency running 15: Dormant running 16: Over-pressure 17: Under-pressure 18: Backup pressure running 19: Pool water shortage 20: WL of the sewage pool reaches the upper limit 21: Faulty pump occurs 22: Unused 23: The supply system is in running status	0	1	×	
P03.14	DO2 function		0	1	×	
P03.15	RLY1 function		0	1	×	
P03.16	RLY2 function		0	1	×	
P03.17	RLY3 function		0	1	×	
P03.18	RLY4 function		0	1	×	
P03.19	RLY5 function		0	1	×	
P03.20	RLY6 function		0	1	×	
P03.21	RLY7 function		0	1	×	
P03.22	RLY8 function		0	1	×	
P03.23	RLY9 function		0	1	×	
P03.24	RLY10 function		0	1	×	
P04: Water Supply Fault Protection Parameter, on page 61						
P04.00	Setting value of over-pressure protection	0.0 - P05.0 3×10 kg/cm^2	0.0 kg/cm^2	0.10kg/cm^2	○	
P04.01	Detection time of over-pressure protection	0.0 - 3600.0s	300.0s	0.1s	○	
P04.02	Setting value of under-pressure protection	0.0 - P05.0 3×10 kg/cm^2	0.0 kg/cm^2	0.10kg/cm^2	○	
P04.03	Detection time of under-pressure protection	0.0 - 3600.0s	300.0s	0.1s	○	
P04.04	Record of faulty pump	0 - 0x7F	0	1	*	
P04.05	Troubleshooting for the inverter	0: The whole system stops 1: HD31 automatically switches to the next variable frequency pump; while if there is no such pump, HD31 controls in power frequency mode	0	1	○	
P05: Water Supply Time Parameter, on page 61						
P05.00	Set current time (Year)	11 - 99	Actual value	1	○	
P05.01	Set current time (Month & Date)	0101 - 1231	Actual value	1	○	
P05.02	Set current time (Hour & Minute)	0000 - 2359	Actual value	1	○	
P05.03	Pressure sensor range setting	0.0 – 10.0 MPa	1.6 MPa	0.1 MPa	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P05.04	Pressure sensor signal type selection	0: 0 - 10V 1: 0 - 20mA 2: 4 - 20mA	0	1	×	
P05.05	Water supply method selection	0x00 - 0x75	0x00	0x01	×	