HD31 Series

Aqua Inverter

User Manual

HD31 Series
Aqua Inverter

V1.6 2021.03

FOREWORD

Thank you for purchasing HD31 Series AQUA Inverter Manufactured by Shenzhen Hpmont Technology Co., Ltd.

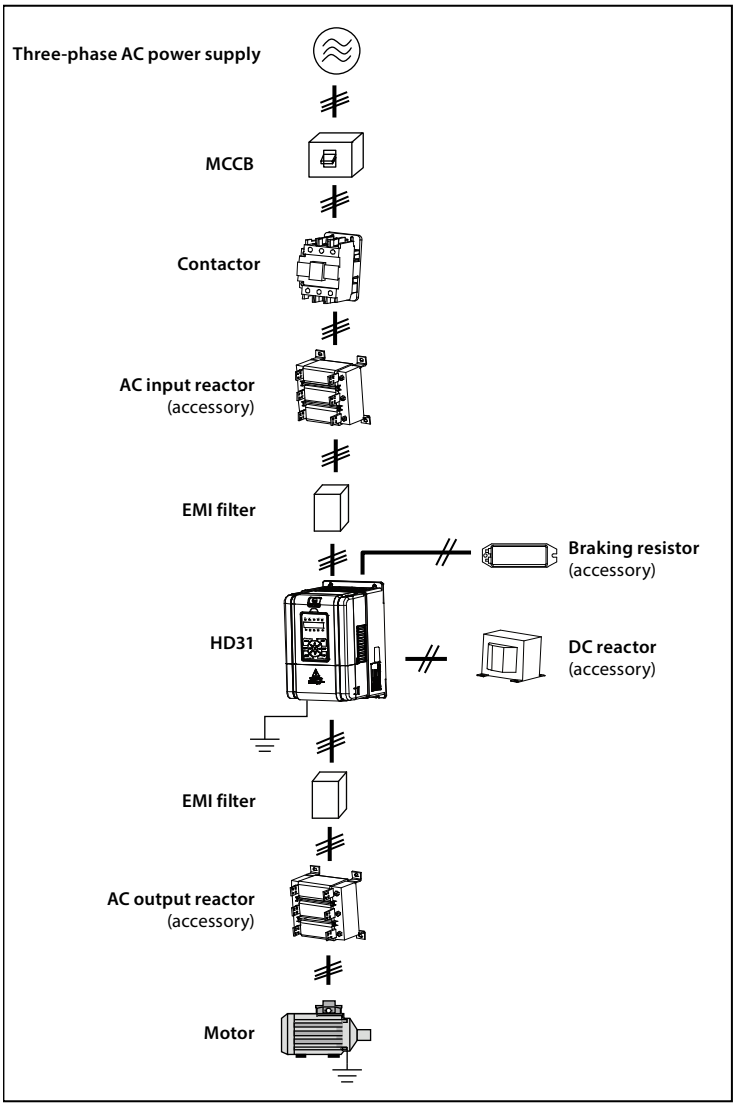
This user manual describes how to use HD31 series inverters and their installation wiring, parameter setting, troubleshooting and daily maintenance etc.

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 reveised.
- If you need the user manual due to damage, loss or other reasons, please contact with the regional distributor of our company or directly contact our company Technical Service Center.
- The user should read this manual carefully when using it for the first time.
- If you still have some problems during use, please contact our company Technical Service Center.
- Email address: **marketing@hpmont.com**

Connectoion with Peripheral Devices



Version and Revision Records

Time: 2021/3

Version: V1.6

Revised Chapter	Revised Contents
Chapter 2	• Add P05.06 (water supply fault status display and clearing)

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 rating will become worse due to the motor cooling is less effective. In that case, we suggest to choose variable frequency motor.

Thermal Protection of Motor

When choosing 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 gear motor and so on 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

After the motor is used for the first time or stored for a long time, the insulation of the motor needs to be checked. Poor insulation can damage HD31.

Note:

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

Load and Negative Torque

In the case of increasing load, negative torque often occurs. If HD31 is prone to over-current or over-voltage fault trip, you should consider setting appropriate brake unit parameters.

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.

When choosing RCD, the user needs to consider the ground leakage current that may occur during transient and steady states during startup and operation. It is recommended to choose either special RCD that can suppress the higher harmonics, or general RCD with a large residual 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 discharge 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 derated since the heatsink efficiency will be reduced because of the thin air.

For every 100 meters of altitude increase, the output current rating is reduced by 1%. 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.

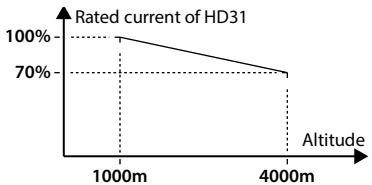
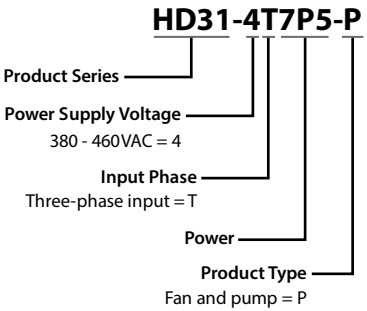


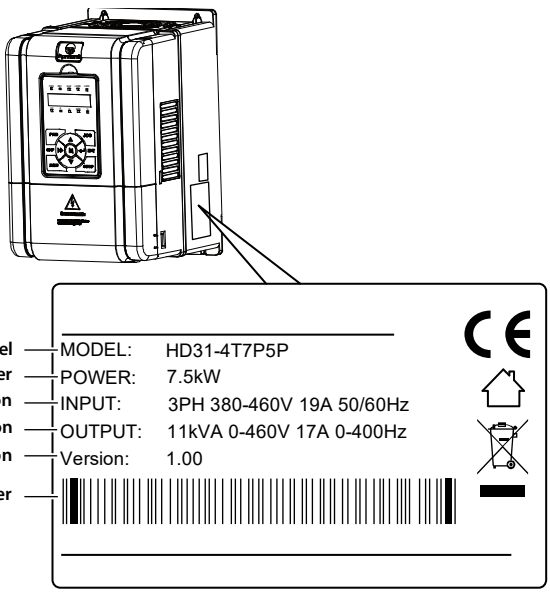
Figure 1-1 Derating curve of rated current and altitude

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

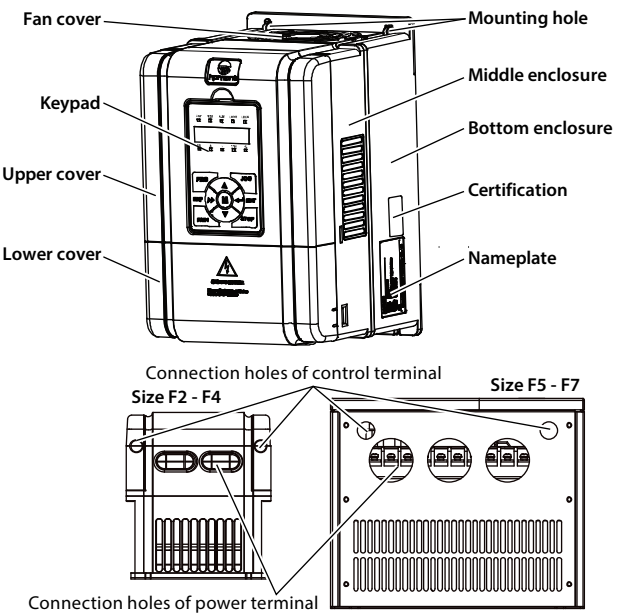
2.4 Technical Data

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	0.00 - 400.00Hz
Performance	
Control mode	V/f, SVC
Max. current	120% rated output current for 5 minutes 135% rated output current for 35 seconds
Run command	Keypad; Terminals; Communication
Speed setting	Digital; Analog; Communication
Speed resulotion	Digital setting: 0.01Hz Analog 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 and output voltage phase loss protection	Input and 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 valid
Power output short circuit protection	Power output short circuit protection is valid
Input and Output	
Analog power supply	+10V, Max. current is 100mA
Digital power supply	+24V, Max. current is 200mA
Analog 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)
Analog output	AO1, AO2: 0 - 10V/0 - 20mA (selectable voltage/current)
Digital input	DI1 - DI6 (control board); DI7 - DI9 (I/O board) DI6 can be selected for high-frequency input
Digital output	DO1, DO2 DO2 can be selected 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	5 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, program 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	
Run 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℃
Applicable place	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) Device Net option (HDFB-Device Net) 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 unit	Dynamic braking unit (HDBU)

2.5 Parts of Inverter



Chapter 3 Mechanical 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 scratching the product. Caution: Rolling and falling may cause injury.
- 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 in a place exposed to direct sunlight, humidity, or water droplets;
- Do not install in flammable, explosive, corrosive gas and liquid places;
- Do not install in places with oily dust, fiber and metal powder;
- 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 HD31 verticaliy and always provide the following space to allow normal heat dissipation. The requirements on mounting space and clearance are shown in Table 3-1.

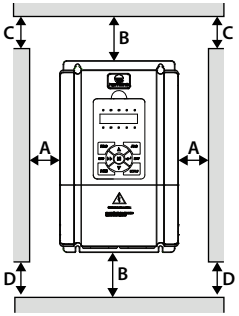


Table 3-1 Installation space

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.

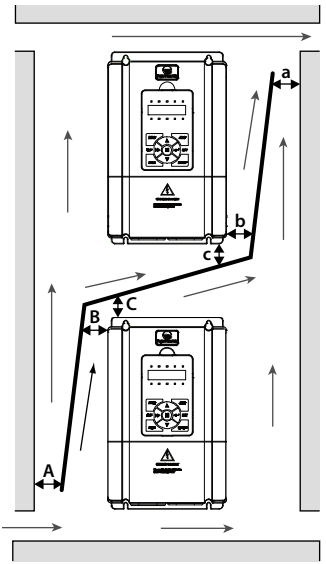


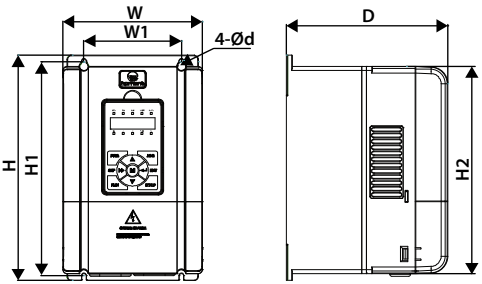
Table 3-2 Installation of several inverters

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

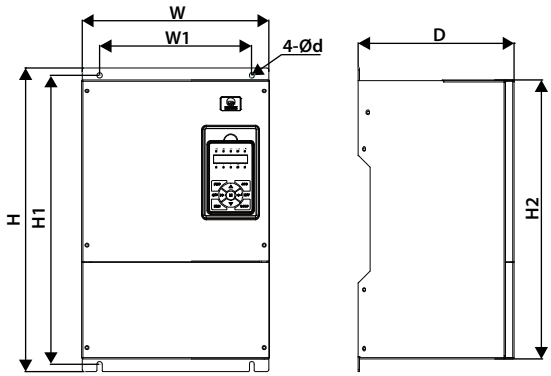
3.4 Dimensions and Weight

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

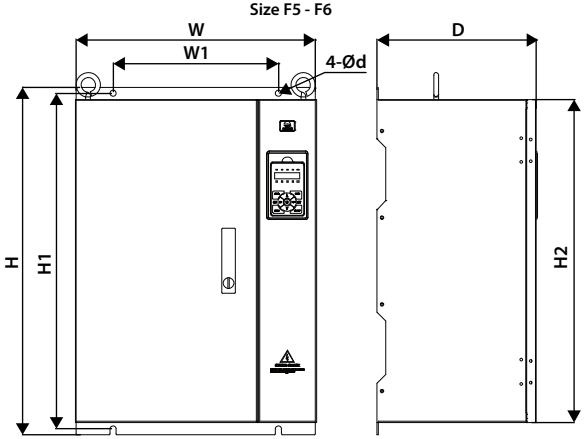
For the corresponding model of the mounting size, refer to section 2.3 Rated Value, on page 6.



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.

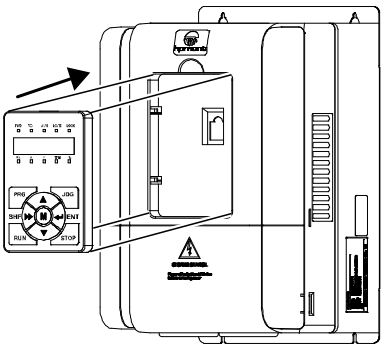


Figure 3-1 Install keypad

There are two steps in Figure 3-2.

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

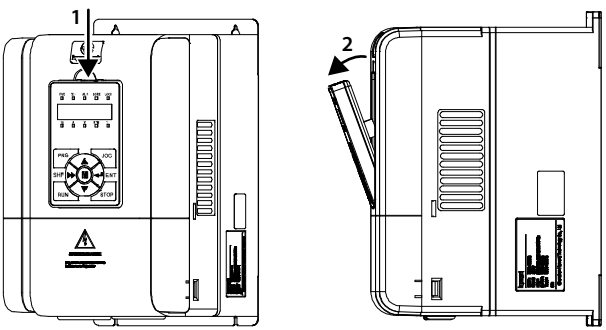
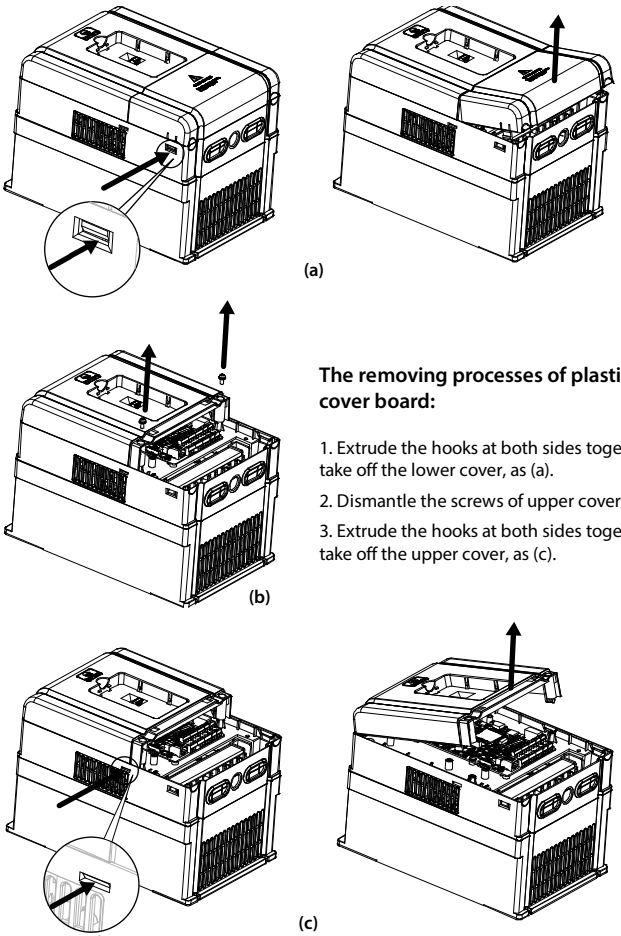


Figure 3-2 Dismantle keypad

3.6 Dismantle Plastic Cover

The upper cover and lower cover of HD31 are removable. The dismantle steps are shown in Figure 3-3.

Before removing the upper cover, please take away the keypad.



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).

Figure 3-3 Remove 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.
- Don'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 grounding terminal PE of the inverters must be reliable grounding. 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 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-circuit, i.e. MCCB (molded case circuit breaker) or equivalent device.

The recommended specification of MCCB, contactor&cable 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 Cable) While Installing (mm^2)	S ≤ 2.5	2.5 < S ≤ 16	16 < S ≤ 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

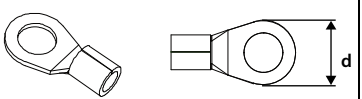
Model	MCCB (A)	Contactor (A)	Power Cable (mm^2)	Motor Cable (mm^2)	Ground Cable (mm^2)	Size
HD31-4T2P2P	16	10	1.5	0.75	2.5	F2
HD31-4T3P7P	16	10	2.5	1.5	2.5	F2
HD31-4T5P5P	25	16	2.5	2.5	2.5	F2
HD31-4T7P5P	32	25	4	4	4	F2
HD31-4T011P	40	32	6	6	6	F3
HD31-4T015P	63	40	10	10	10	F3
HD31-4T018P	63	40	10	10	10	F4
HD31-4T022P	100	63	16	16	16	F4
HD31-4T030P	100	63	25	25	16	F5
HD31-4T037P	125	100	25	25	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 terminal size, 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

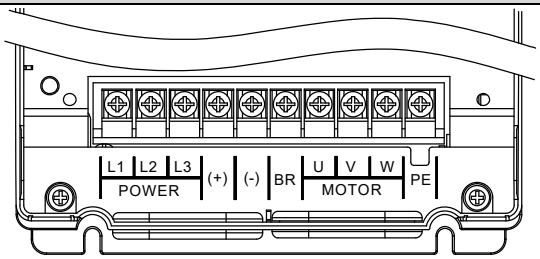
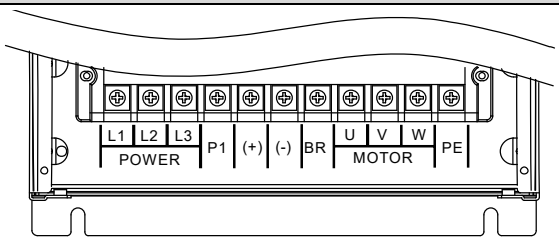
- The bare portions of the power cables must be bound with insulation tapes.

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
	
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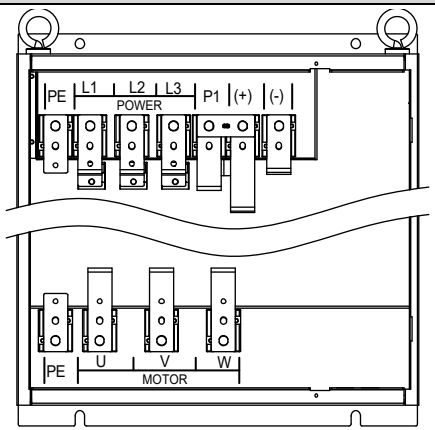
	

4.3.2 Supply and Motor Connection

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

If not, switch any two of the output terminals (U/V/W) or modify 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 98) for braking resistors and braking unit.

Refer to section 9.2 Reactor Selection (on page 97) for AC reactors and DC reactors.

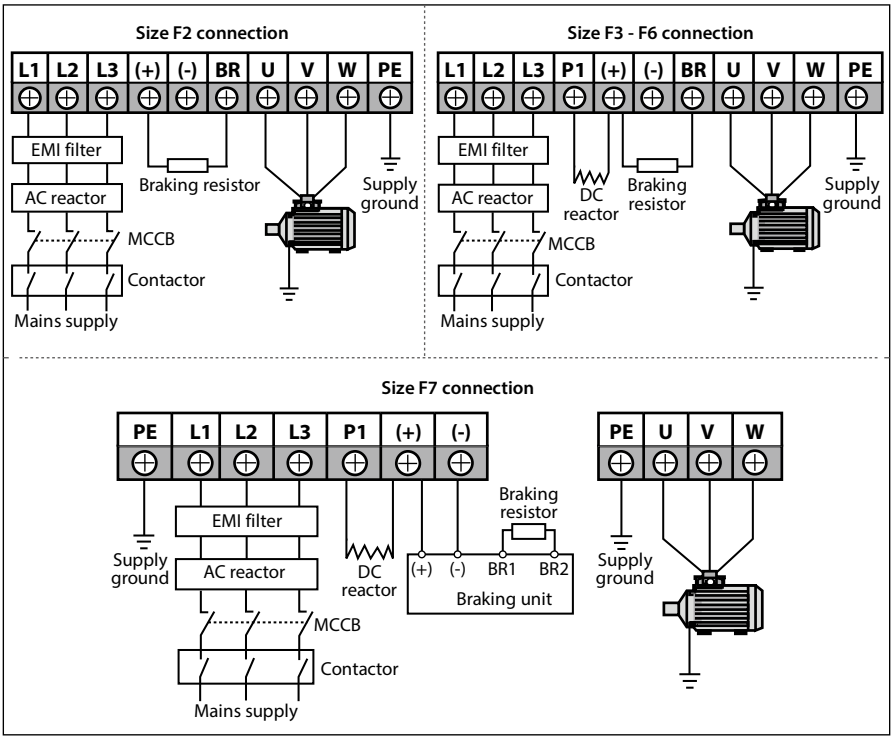


Figure 4-1 Supply and motor connection

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 device with an accessible port during power on, pay attention to adding an additional insulation protection isolation device to ensure that the original voltage level of the external device is not changed.
- If connect the communication terminal of the control circuit to the PC, choose RS485/232 isolating converter which meets the safety requirement.
- It is strictly forbidden to connect control terminals other than relay terminals to AC 220V voltage.

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

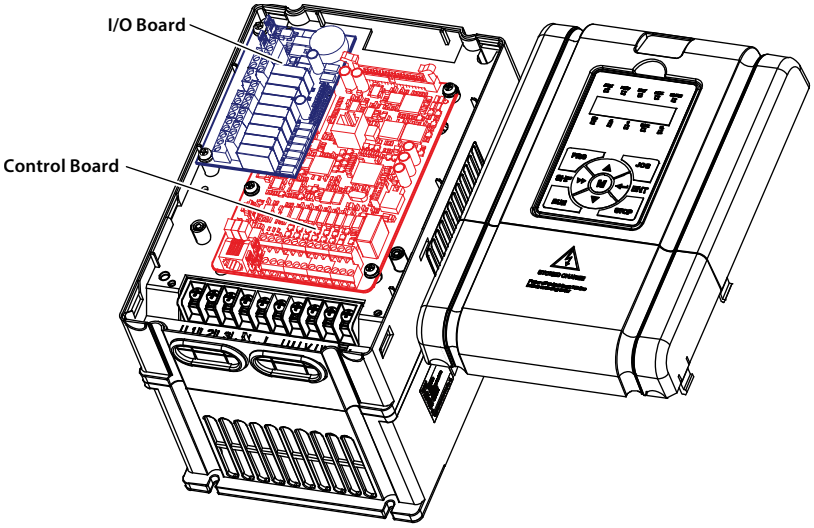


Figure 4-2 Control board and I/O board

4.4.1 Control Board Terminal

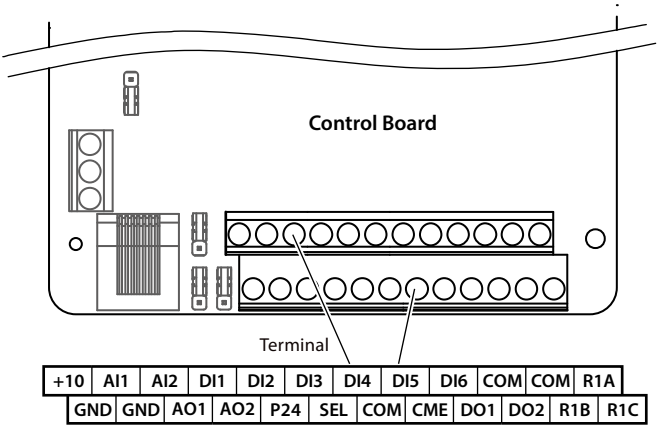


Figure 4-3 Control board terminal

Table 4-5 Control board terminal description

Terminal		Description
+10, GND	Analog power supply	Analog input use +10V power supply, Max. output current is 100mA GND is isolated to COM
AI1, AI2	Analog 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	Analog output	Output voltage/current signal: 0 - 10V/0 - 20mA Programmable output
GND	Analog 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	Analog 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 is 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		
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

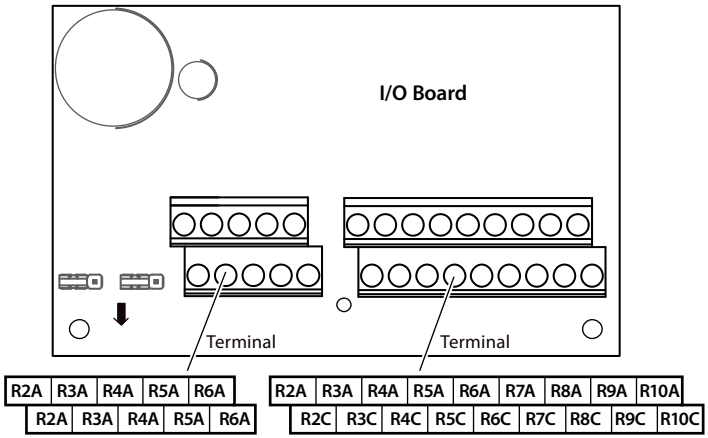


Figure 4-4 I/O board terminal

Table 4-6 I/O board terminal description

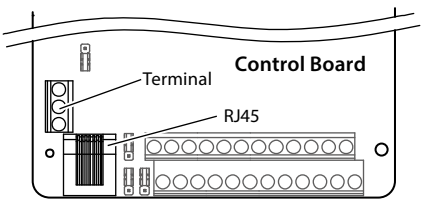
Terminal		Description
AI3, AI4	Analog input	Input voltage: -10 - +10V (input impedance: 32kΩ) Input current: 0 - 20mA (input impedance: 500Ω)
+10, GND	Analog power supply	Analog input use +10V as supply, Max. output current is 100mA
DI7 - DI9	Digital input	Programmable bipolar optional input, low level 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

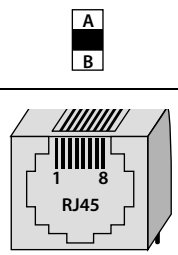
Note:

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	Reserved

4.4.4 Jumper

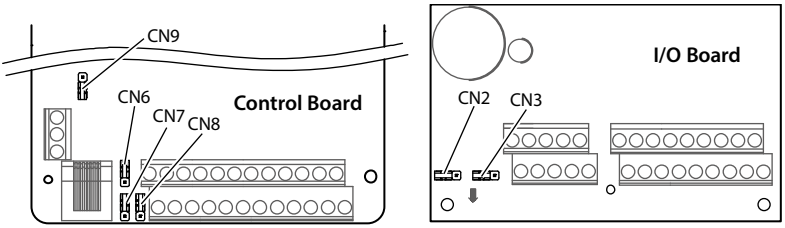
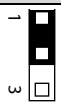
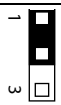
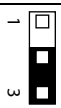


Figure 4-5 Jumper position

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. • Pin 1&2 are short-connected, AI4 inputs voltage signal (factory setting). • Pin 2&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-off.
- To change the PCBA, correctly set the parameters before running.

Warning

- Do not check or detect the signal during HD31 running.
- Do not change HD31 parameter setting randomly.
- Please complete all control debugging and testing thoroughly, 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.

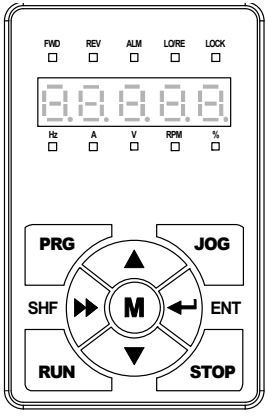


Table 5-1 Key description of keypad

Key	Description
PRG	Enter 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 to save 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 communication control mode	HD31 is in keypad control mode
LOCK	Password locked status	The user password lock of HD31 is available		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 present 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>d00.07</td><td>Motor and control mode</td><td>[Actual value]</td></tr>
<tr><td></td><td>Display the current motor and the control mode.
Unit: Display the current driving motor
• 0: Motor 1.
• 1: Motor 2.
Ten: Control mode
• 0: V/f contorl without PG.
• 2: Vector control without PG.</td><td></td></tr>
<tr><td>d00.08</td><td>Rated current of the inverter</td><td>[Actual value]</td></tr>
<tr><td>d00.10</td><td>Inverter status</td><td>[Actual value]</td></tr>
<tr><td></td><td>Display HD31 status, as shown in the following table:
<table>
<tr><td>Bit15: Reserved</td><td>Bit14: Reserved</td><td>Bit13: Current limit
0: Invalid
1: Valid</td><td>Bit12: Stall overvoltage
0: Invalid
1: Valid</td></tr>
<tr><td>Bit11: Reserved</td><td>Bit10: Speed limit value
0: Invalid
1: Valid</td><td>Bit9: Reserved</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: Reserved</td><td colspan="2">Bit5&Bit4: Acc./Dec./constant
00: Constant 01: Acc.
11: Constant 10: Dec.</td></tr>
<tr><td>Bit3: Zero speed run
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><td></td></tr>
<tr><td>d00.11</td><td>Master setting frequency source</td><td>[Actual value]</td></tr>
<tr><td></td><td>0: Keypad.
1: Terminal.
2: Communicaiton.
3: Analog.
4: Terminal pulse.
6 - 9: AI1 - AI4.
10: Keypad potentiometer.
11: PID.
12: Multi-speed.
13: PLC.</td><td></td></tr>
<tr><td>d00.12</td><td>Master setting frequency (Hz)</td><td>[Actual value]</td></tr>
<tr><td>d00.13</td><td>Auxiliary setting frequency (Hz)</td><td>[Actual value]</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 speed</td><td>[Actual value]</td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]
d00.18	**Running speed**	**[Actual value]**
	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).	
d00.20	**Output voltage**	**[Actual value]**
d00.21	**Output current**	**[Actual value]**
d00.22	**Torque given (%)**	**[Actual value]**
	Display torque pro-given, the percentage of rated torque.	
d00.23	**Output torque**	**[Actual value]**
	Display output torque which is the relative percentage of the motor rated torque.	
d00.24	**Output power**	**[Actual value]**
	Display actual output power whose unit is 0.1kW.	
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 input voltage**	**[Actual value]**
	Display AI1 input voltage.	
d00.28	**AI1 input voltage (after disposal)**	**[Actual value]**
	Display A1 input voltage which is calculated by the gain, bias and filter.	
d00.29	**AI2 input voltage**	**[Actual value]**
	Display AI2 input voltage. When selects current input, 0.00V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.30	**AI2 input voltage (after disposal)**	**[Actual value]**
	Display AI2 input voltage which is calculated by the gain, bias and filter.	
d00.31	**AI3 input voltage**	**[Actual value]**
	Display AI3 input voltage. When selects current input, 0.00V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.32	**AI3 input voltage (after disposal)**	**[Actual value]**
	Display AI3 input voltage which is calculated by the gain, bias and filter.	
d00.33	**AI4 input voltage**	**[Actual value]**
	Display AI4 input voltage. When selects current input, 0.00V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.34	**AI4 input voltage (after disposal)**	**[Actual value]**
	Display AI4 input voltage which is calculated by the gain, bias and filter.	
d00.35	**DI6 terminal 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, 0.00V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.37	**AO2 output**	**[Actual value]**
	Display AO2 output. When selects current output, 0.00V corresponds to 0mA and 10.00V corresponds to 20mA.	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d00.38</td><td>High-speed output pulse frequency</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display high-speed output pulse frequency (Hz).</td></tr>
<tr><td>d00.39</td><td>Heatsink temperature</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display heatsink temperature.</td></tr>
<tr><td>d00.40</td><td>Setting line speed</td><td>[Actual value]</td></tr>
<tr><td>d00.41</td><td>Reference line speed</td><td>[Actual value]</td></tr>
<tr><td>d00.42</td><td>Set water supply pressure</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">When the system is supplying water at constant pressure, the current supply pressure will be displayed.</td></tr>
<tr><td>d00.43</td><td>Actual water supply pressure</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">When the system is supplying water at constant pressure, system pressure value detected by remote pressure gauge will be displayed.</td></tr>
<tr><td>d00.44</td><td>Process PID reference (%)</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display process PID reference relative to full scale (10.00V) percentage.</td></tr>
<tr><td>d00.45</td><td>Process PID feedback (%)</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display process PID feedback relative to full scale (10.00V) percentage.</td></tr>
<tr><td>d00.46</td><td>Process PID tolerance (%)</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display process PID tolerance relative to full scale (10.00V) percentage.</td></tr>
<tr><td>d00.47</td><td>Process PID integral item (%)</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display process PID integral item relative to full scale (10.00V) percentage.</td></tr>
<tr><td>d00.48</td><td>Process 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 access 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 access 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>d00.52</td><td>Modbus communication status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display Modbus communication status.
0: Normal.
1: Communication timeout.
4: Incorrect data frame content.</td></tr>
<tr><td>d00.53</td><td>Actual length (m)</td><td>[Actual value]</td></tr>
<tr><td>d00.54</td><td>Total length (km)</td><td>[Actual value]</td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]
d00.55	**Total time at power-on**	[Actual value]
d00.56	**Total time at running**	[Actual value]
	d00.55 displays total time at power-on; d00.56 displays total time at running. The unit is hour.	
d00.57	**High bit of motor total energy consumption**	[Actual value]
d00.58	**Low bit of motor total energy consumption**	[Actual value]
	Display high bit (d00.57) and low bit (d00.58) of the motor total energy consumption.	
d00.59	**High energy con. for this run**	[Actual value]
d00.60	**Low energy con. for this run**	[Actual value]
	Display high bit (d00.59) and low bit (d00.60) of energy consumption at this running.	
d00.61	**Present fault**	[Actual value]
	Display present fault. • Displaying 100 means undervoltage.	

6.1.2 d02: Water Supply System Status

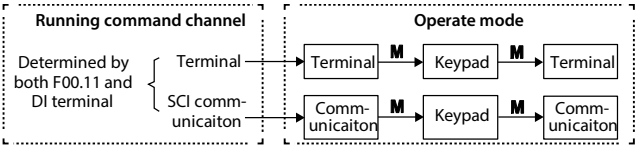
Ref. Code	Function Description	Setting Range [Default]
d02.00	**Current moment**	[Actual value]
	Current system hour and minute format is displayed as 23.59, 23 is the hour and 59 is the minute.	
d02.01	**Pump 1 status**	[Actual value]
d02.02	**Pump 2 status**	[Actual value]
d02.03	**Pump 3 status**	[Actual value]
d02.04	**Pump 4 status**	[Actual value]
d02.05	**Pump 5 status**	[Actual value]
d02.06	**Pump 6 status**	[Actual value]
d02.07	**Pump 7 status**	[Actual value]
	0: Waiting for run. 1: Running. 2: Fault pump.	

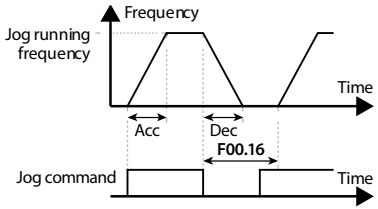
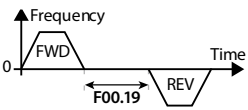
6.2 Group F: General Parameters

6.2.1 F00: Basic Parameters

Ref. Code	Function Description	Setting Range [Default]
F00.00	**Control mode selection**	**0,1 [0]**
	0: Speed control. 1: Torque control. • Torque control is valid only when the motor control mode is selected for PG vector control (F00.01/F13.00 = 2). • Refer to group F15 DI terminal (56, 57) function description and group F21 torque control parameter description for details of torque control.	
F00.01	**Motor 1 control mode selection**	**0 - 2 [0]**
	0: V/f control without PG. Constant voltage/frequency ratio control. • It is specially suitable for occasions where one inverter drives multiple motors to improve the current speed control system. • When selects V/f control, please set the V/f control group F09 to achieve proper efficiency. 2: Vector control without PG. 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.	
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.	
F00.03	**Motor selection**	**0,1 [0]**
	0: Motor 1. 1: Motor 2. *Note: It can preset two group motor parameters. At stop they can shift even without input parameters when they are respectively driving two motors.*	
F00.04	**Extension card selection**	**0,2 [2]**
	0: Option is invalid. 2: HD30-WIO is valid.	
F00.05	**HD31 extended function**	**0,1 [0]**
	0: No extended. 1: Constant pressure water supply.	
F00.06	**Max. output frequency**	**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 run frequency setting access**	**0 - 2 [0]**
	Defines the highest frequency that user can set, and select setting access to set the upper limit frequency via F00.07. 0: Digital setting. Set the upper limit frequency by F00.08. 1: Analog 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 run frequency**	**0.00 - F00.06 [50.00Hz]**
	F00.07 = 0, the upper limit frequency is set by F00.08.	

Ref. Code	Function Description	Setting Range [Default]
F00.09	**Lower limit of run frequency**	**0.00 - F00.08 [0.00Hz]**
	Use F00.09 to limit the actual output frequency. When the setting frequency value < F00.09, it will run at lower limit frequency. • Set the parameters reasonably according to the nameplate of the motor and actual run conditions. • No limitation on the motor parameter auto-tuning function. • Besides the lower/upper limit frequency, the run frequency of inverter is also limited by the parameter settings of skip frequency (F05.17 - F05.19).	
F00.10	**Frequency setting access selection**	**0 - 10 [0]**
	0: Keypad digital setting. Change the value by pressing the ▲ or ▼ key. Initial value is set by F00.13. 1: Terminal digital setting. Change the value by using the terminals UP/DN. Initial value is set by F00.13. 2: SCI communication setting. Change the setting frequency by SCI communication frequency command. • The initial value is 0. 3: AI analog setting. It is set by the analog input voltage. • See group F16. • The corresponding relationship between the analog value of AI1 and the inverter's run frequency setting is referred to group F05. 4: Terminal pulse setting. It is set by the terminal pulse DI6. • Refer to group F05 for the corresponding relationship between the pulse terminal frequency and the inverter's run frequency setting. 6 - 9: AI1 - AI4 setting. 10: Keypad potentiometer setting.	
F00.11	**Command setting access selection**	**0 - 2 [0]**
	0: Keypad running access. Start and stop the inveter by pressing the key **RUN**, **STOP**, **JOG**. 1: Terminal running access. Start and stop by using the corresponding external terminals. • External terminal FWD (DI terminal is set to 2), REV (DI terminal is set to 3), JOGF1 (DI terminal is set to 20), JOGR1 (DI terminal is set to 21), JOGF2 (DI terminal is set to 22), JOGR2 (DI terminal is set to 23). For more information, please see group F15. 2: SCI communication running access. Start and stop by SCI communication port according to communication protocol.	

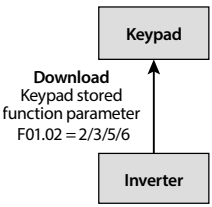
Ref. Code	Function Description	Setting Range [Default]
F00.12	**M key function**	**0 - 2 [2]**
	0: Switch the keypad direction. Switch the keypad direction by **M** key. • When F00.11 = 0, it is valid. Do not save when power-off. • The run direction can only be switched when the keypad is in the status parameter display. 1: Switch local and remote control. Switch the local and remote control by **M** key. • LOCAL: When the run command access is keypad command access (F00.11 = 0). • REMOTE: When the command access is a command access other than keypad (F00.11 = 1, 2). • Run command access priority: Local remote switch > command access determined by DI terminal (9, 10, 11 function) > F00.11 set command access.  • LO/RE indicator: Lit: Indicates that the current drive is in the terminal running command access. Blinking: Indicates that the current drive is in the communication run command access. Off: Indicates that the current drive is in the keypad running command access. 2: Multi-function key is invalid.	
F00.13	**Starting frequency digital setting**	**0.00 - upper limit [50.00Hz]**
	F00.10 = 0 or 1, F00.13 sets the initial frequency value.	
F00.14	**Frequency setting control**	**0000 - 1111 [1001]**
	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. **Unit: Save selection of frequency setting at power-off** • 0: Do not store. • 1: Stored. **Ten: Control selection of frequency setting at stop** • 0: Do not restore to F00.13. • 1: Restore to F00.13. **Hundred: Save selection of communication setting frequency** • 0: Do not store. • 1: Stored. **Thousand: Switch the frequency access to the analog selection** • 0: Not save. • 1: Save.	
F00.15	**Jog run frequency digital setting 1**	**0.00 - upper limit frequency [5.00Hz]**

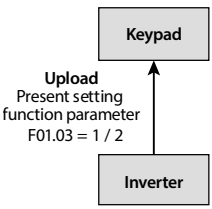
Ref. Code	Function Description	Setting Range [Default]
F00.16	**Interval of jog running**	**0.0 - 100.0 [0.0s]**
	After cancelling the jog command, HD31 will not respond to the jog command at the interval of jog running set by F00.16. • After the jog interval is over, if there is a jog command, executes the jog immediately. As shown in figure. 	
F00.17	**Direction**	**0,1 [0]**
	0: The same as run command. 1: Opposite to run command.	
F00.18	**Reverse**	**0,1 [0]**
	This function is valid when F00.11 = 0, 1, 2. 0: Permitted. 1: Prohibited. It can respond to the FWD/REV commands. When the analog 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 running.	
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: Enable. 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	**Sleep function**	**0,1 [0]**
	0: Prohibited. This function is invalid. 1: Enable. At running status, when the setting frequency ≤ lower limit of run frequency (F00.09), HD31 coasts to stop and enters sleep status.	
F00.22	**Wake up time when sleep**	**0.0 - 360.0 [0.0s]**
	When HD31 is in sleep status, and the setting frequency > lower limit of run frequency (F00.09), and the duration achieves the setting time of F00.22, then HD31 wakes up from sleep status, and starts at the mode of F02.00.	
F00.24	**Sleep delay time**	**0.0 - 6000.0 [1.0s]**
F00.25	**Sleep frequency**	**0.00 - upper limit [0.00Hz]**
	F00.21 - F00.25 can realize functions of sleep and wake up. • With running command and in sleep state, after setting the frequency ≥ F00.25, after the time F00.22 (sleep wake-up time), the inverter will exit the sleep state and start. • During running, when setting frequency < F00.25, the inverter enters the sleep state (the operation indicator is on and the LED flashes) and stops after the elapsed time F00.24 (sleep delay time). • The above sleep function is only valid when F00.11 = 1 (terminal running command access).	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F00.26</td><td>Action selection for inverter running at zero frequency</td><td>000 - 332 [111]</td></tr>
<tr><td></td><td colspan="2">Unit: When running is controlled by V/f, action selection of zero frequency
• 0: No treatment.
• 1: Inverter locks output.
• 2: Inverter runs in DC brake.
Ten: Zero frequency action selection in open loop vector running
Hundred: Zero frequency action selection in torque control
• 0: No treatment.
• 1: Inverter locks output.
• 2: Inverter runs in DC brake.
• 3: The variable frequency is run by pre-excitation.</td></tr>
<tr><td>F00.27</td><td>Command source binding frequency source selection</td><td>000 - ddd [000]</td></tr>
<tr><td></td><td colspan="2">Only valid for the main frequency, when the command source has a binding frequency source, the command source is valid, F00.10 the frequency source is invalid.
Unit: Keypad command binding frequency source selection
Ten: Terminal command binding frequency source selection
Hundred: Communication command binding frequency source selection
• 0: No binding.
• 1: Keypad digital setting.
• 2: Terminal digital setting.
• 3: SCI communicaiton setting.
• 5: Terminal pulse setting.
• 7: AI1 setting.
• 8: AI2 setting.
• 9: AI3 setting.
• A: AI4 setting.
• b: Keypad potentiometer setting.
• C: PID setting.
• d: Multi-speed setting.</td></tr>
<tr><td>F00.28</td><td>Functions selection of STOP key</td><td>0,1 [0]</td></tr>
<tr><td></td><td colspan="2">0: Only valid in control of keypad.
1: Valid in all control mode.</td></tr>
</table>

6.2.2 F01: Protection of Parameters

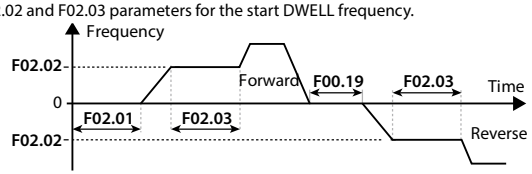
Ref. Code	Function Description	Setting Range [Default]
F01.00	**User's password**	**00000 - 65535 [00000]**
	XXXXX: To enable the password protection function, set any non-zero number as the password. • Once the password is set, to change any parameter, input correct password. Otherwise, all the parameters 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 5min, the user's password will be valid. To change parameters, enter correct password. It will restart when there is no press on the keypad within 5min. 00000 : The factory setting of F01.00, which means no user password. • If user unlocks the password, it means clear the user's password.	
F01.01	**Menu mode**	**000 - 111 [010]**
	Unit: • 0: Full menu mode. All function parameters can be displayed. • 1: Verify menu mode (only display parameters that are different from the factory setting). **Ten:** • 0: Does not lock the parameter mapping relationship of group F. • 1: Lock the parameter mapping relationship of group F. **Hundred:** • 0: After password protection, group F parameters can be read. • 1: After password protection, group F parameters are prohibited from reading.	
F01.02	**Function code parameter initialization (download)**	**0 - 6 [0]**
	0: No operation. HD31 is in normal parameter read/write status. • Whether the parameters can be changed depends on the user's password status and the actual running condition of HD31. 1: Restore to factory parameters. • Except F01.00, F01.02, F01.03, F19.19, F19.24, F20.08, F20.09, F20.21 - F20.37, F23.00. • **Steps:** If F01.02 = 1, press ↵ to confirm, and restore to the factory parameters at this time. The keypad dispalys "rESEt". Then the keypad display parameters in stop status after 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.*	

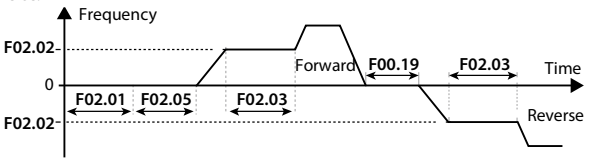


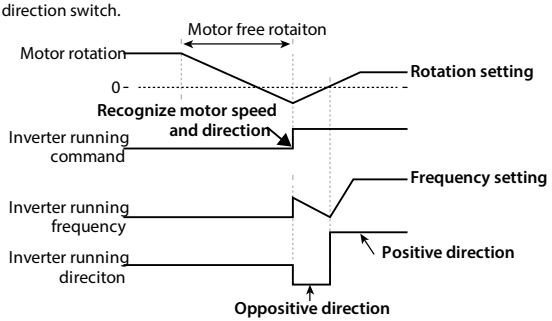


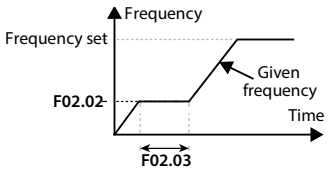
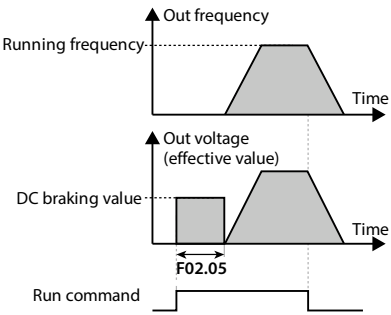
6

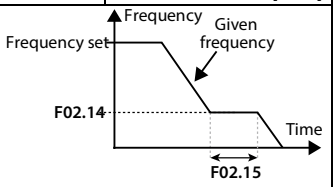
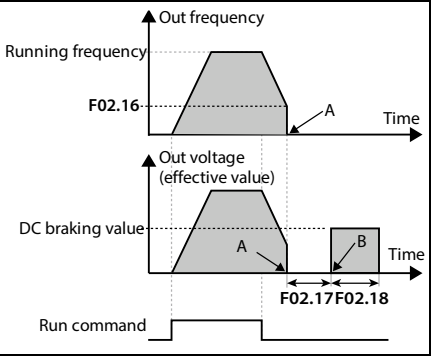
6.2.3 F02: Run/Stop Control Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F02.00</td><td>Start mode</td><td>0 - 2 [0]</td></tr>
<tr><td></td><td colspan="2">0: Start from starting DWELL frequency.
• Refer to F02.02 and F02.03 parameters for the start DWELL frequency.
 

1: Brake first and then starting DWELL frequency.
• Refer to F02.04 and F02.05 parameters for the DC braking.
• Starting DC braking is valid only during the process from the stop status to running status. And it is invalid in the process of direction switch, as shown in the figure. There is no F02.05 (DC braking time) when reverse.
 

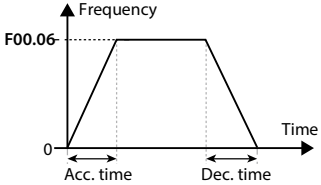
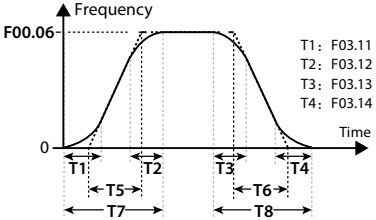
2: Start after speed tracking. If the result of speed tracking is smaller than F02.02, it will start from the starting DWELL frequency.
• The inverter automatically tracks the motor's running direction and speed, and starts the rotating motor smoothly without impact. As the below figure.
• This mode is valid only during the process from stop status to running status, but invalid in the process of direction switch.
 
</td></tr>
<tr><td>F02.01</td><td>Starting delay time</td><td>0.00 - 10.00 [0.00s]</td></tr>
<tr><td></td><td colspan="2">When the inverter receives run command, it will wait for the delay time set by F02.01 and then start to run.</td></tr>
<tr><td>F02.02</td><td>Start DWELL frequency setting</td><td>0.00 - upper limit [0.00Hz]</td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]
F02.03	**Retention time of starting DWELL frequency**	**0.00 - 10.00 [0.00s]**
	When starting, keep the output frequency temporarily to prevent the motor entering a stall state. When it is loaded with a brake, and running slowly, in order to prevent the brake from friction, use DWELL function to accelerate after the brake is fully opened. • During Acc., when the given frequency matches the frequency set by F02.02, the output frequency will remain at the time set in F02.03 and continue to Acc. • When F02.02 or F02.03 = 0, the starting DWELL frequency is invalid. *Note: Torque control, process PID/auxiliary set process PID, simple PLC and wobble , DWELL function is invalid.* 	
F02.04	**DC braking current setting**	**0 - 100 (HD31 rated current) [50%]**
F02.05	**DC braking time at start**	**0.00 - 60.00 [0.50s]**
	F02.04 is a percentage of the inverter's rated current. To set the current value of the DC braking at start and stop. • If the setting is higher than fivefold of motor's rated current, the injection current value is fivefold of the motor's rated current. • The DC braking current is valid to both start and stop DC braking. F02.05 = 0.0s, there is no DC braking process at start. • F02.05 is valid only when F02.00 = 1. 	
F02.06	**Faster tracking results compensation value**	**0.000 - 2.000 [0.000Hz]**
F02.08	**Voltage self-learning**	**0,1 [0]**
	0: Invalid. 1: Valid. Steps : • 1. Please confirm that the inverter is connected to the motor line (if F00.05 = 1, set P01.00 - P01.06 and P03.15 - P03.24 reasonably). • 2. The motor is in a static state. • 3. When F02.08 = 1, the keypad displays "tunE" during self-learning, self-learning is completed after 2 - 3s, and F02.08 automatically turns to 0. *Note:* *1. If E0023 fault is reported in the process of voltage self-learning, please confirm again whether the motor is in a complete static state, and then restart the enable voltage self-learning.* *2. If F00.05 = 1, set the variable frequency pump (P01.00 - P01.06) and its corresponding relay (P03.15 - P03.24).*	
F02.09	**Search frequency direction reverse**	**0,1 [0]**
	0: Not reversed. 1: Reversed.	
F02.10	**Speed search start threshold**	**0.0 - 60.0 [15.0%]**
F02.11	**Voltage difference**	**0 - 200 [30%]**

Ref. Code	Function Description	Setting Range [Default]
F02.12	**Speed search post-processing time**	0.0 - 5.0s [Depend on HD31]
F02.13	**Stop mode selection**	0 - 2 [0]
	0: Dec. to stop. • After receiving the stop command, the inverter reduces output frequency according to the Dec. time. When the frequency decreases to F02.14 and holds on a time F02.15 set, it will stop. • Refer to the parameter F02.14 and F02.15 in the figure. 1: Coast to stop. • After receiving the stop command, the inverter stops output immediately and the motor stops under the effects of mechanical inertia. 2: Dec. to stop with DC braking. • After receiving the stop command, the inverter reduces output frequency according to the Dec. time and starts DC braking when the output frequency reaches F02.16 setting frequency. • Refer to parameter F02.16 - F02.18 in the figure for the DC braking at stop. • Refer to parameter F03.00 - F03.08 for the Dec. time.	
F02.14	**DWELL frequency setting at stop**	0.00 - upper limit [0.00Hz]
F02.15	**Retention time of DWELL frequency at stop**	0.00 - 10.00 [0.00s]
	F02.14 defines inverter's DWELL frequency at stop. F02.15 is a holding time DWELL frequency at stop (F02.14) in inverter stop process. • Only when F02.13 = 0, it is valid. • When F02.14 or F02.15 = 0, DWELL frequency at stop is invalid. 	
F02.16	**DC braking initial frequency at stop**	0.00 - 50.00 [0.50Hz]
F02.17	**DC braking waiting time at stop**	0.00 - 10.00 [0.00s]
F02.18	**DC braking time at stop**	0.00 - 10.00 [0.50s]
	F02.17 is the interval from A to B in the right figure during Dec. stop process. • The inverter has no output during the waiting time. By F02.17 setting the waiting time, the current overshoot in the initial stage (point B in the figure) of braking can be reduced when the inverter drives a high power motor. • By F02.04 setting the DC braking current at stop. F02.18 = 0.00s, there is no DC braking process at stop. • F02.16 - F02.18 is valid only when F02.13 = 2. 	

Ref. Code	Function Description	Setting Range [Default]
F02.19	**Jog control mode**	**00 - 11 [10]**
	Unit: • 0: Jog functions such as start and stop mode are invalid. • In jog running, start mode set by F02.00 and stop mode set by F02.13 are invalid. When the jog command is valid, the inverter starting to run. When it's invalid, the inverter Dec. to stop. • 1: Jog functions such as start and stop mode enabled. • In jog running, HD31 runs in start mode set by F02.00 and stop mode set by F02.13. **Ten:** • 0: Terminal jog is not preferred. • Terminal control operation does not respond to terminal jog command. • 1: Terminal jog priority.	
F02.20	**Pre-excitation time**	**0.00 - 0.50 [0.50s]**
	Pre-excitation effect: Before the motor rotates, determines the motor magnetic flux to obtain faster acceleration performance. • This function only takes effect in open loop vector control mode. It is recommended that F02.20 value not less than 0.10s. • F02.20 = 0.00s, the pre-excitation function is invalid.	
F02.21	**Frequency threshold judged by voltage**	**0.00 - 20.00 [0.00Hz]**

6.2.4 F03: Acc. and Dec. Parameters

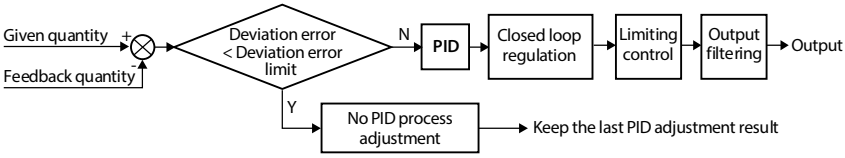
Ref. Code	Function Description	Setting Range [Default]
F03.00	**Acc./Dec. mode selection**	**00 -11 [00]**
	Unit: Mode selection of Acc. and Dec. • 0: Linear Acc. or Dec. • Output frequency increases or decreases according to the constant slope. • 1: S-curve Acc. or Dec. • Output frequency increases or decreases according to the S-curve. • T5 is the setting Acc. time, T7 is the actual value. T6 is the setting Dec. time, T8 is the actual value.   **Ten: Acc./Dec. time reference frequency adjustment** • 0: Max. frequency (F00.06). • 1: Set frequency.	

Ref. Code	Function Description	Setting Range [Default]
F03.01	**Acc. time 1**	**0.1 - 6000.0**
F03.02	**Dec. time 1**	**[18.5kW and below: 10.0s]**
F03.03	**Acc. time 2**	**[22 - 75kW: 30.0s]**
F03.04	**Dec. time 2**	**[90kW and above: 60.0s]**
F03.05	**Acc. time 3**	
F03.06	**Dec. time 3**	
F03.07	**Acc. time 4**	
F03.08	**Dec. time 4**	
	Acc. time is the time required for inverter to accelerate from zero frequency to the reference frequency in a straight line. Dec. time is the time required for inverter to decrease from the reference frequency to the zero frequency in a straight line. • The reference frequency can be set by the F03.00 ten digit. Only on group of Acc./Dec. time can be selected. See the illustration in F03.00. Acc., Dec. time switch: • The Acc./Dec. time can be selected by 26, 27 of DI terminal or F03.09, F03.10 during inverter running. Acc./Dec. mode switch: • The inverter can select the Acc./Dec. mode (straight line or S curve) by setting F03.00 or DI terminal No. 28 function. *Note: The inverter may have an overvoltage fault when the brake assembly is not properly selected, rapid Dec. or load inertia is large. F19.18, F19.19 can be adjusted by selecting appropriate brake assembly or increasing the Dec. time to avoid possible overvoltage faults.*	
F03.09	**Switching frequency of Acc. time 2 and time 1**	**0.00 - upper limit [0.00Hz]**
F03.10	**Switching frequency of Dec. time 2 and time 1**	**0.00 - upper limit [0.00Hz]**
	When the run frequency is smaller than the F03.09 setting, it will accelerate according to Acc. time 2; Otherwise it will accelerate according to Acc. time 1. When the run frequency is smaller than the F03.10 setting, it will decelerate according to Dec. time 2; Otherwise it will decelerate according to Dec. time 1. • When using terminals to select Acc./Dec. time (set multi-function terminal as No.26 and 27 function), F03.10 is invalid.	
F03.11	**S-curve characteristic time at starting Acc.**	**0.00 - 2.50 [0.20s]**
F03.12	**S-curve characteristic time at ending Acc.**	**0.00 - 2.50 [0.20s]**
F03.13	**S-curve characteristic time at starting Dec.**	**0.00 - 2.50 [0.20s]**
F03.14	**S-curve characteristic time at ending Dec.**	**0.00 - 2.50 [0.20s]**
	Refer to the figure of F03.00.	
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.	

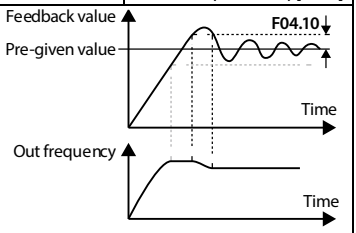
6.2.5 F04: Process PID Control

Closed-loop can be constituted not only by analog reference and feedback but also by pulse reference and feedback. Generally, the process PID control mode is used to regulate on-site pressure, liquid level and temperature etc.

The process PID control is shown in the following figure:

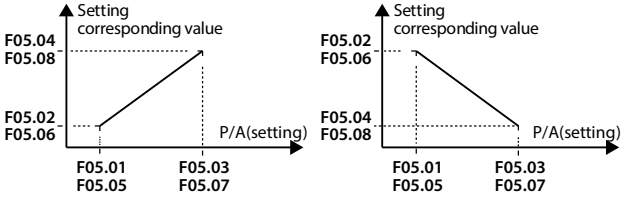


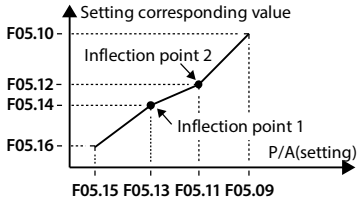
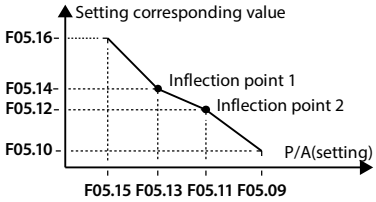
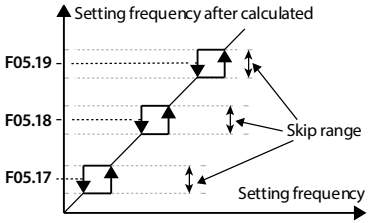
Ref. Code	Function Description	Setting Range [Default]
F04.00	**Process PID control selection**	**0,1 [0]**
	0: Invalid. 1: Valid. *Note: When using the auxiliary PID, set F04.00 = 0.*	
F04.01	**Reference access selection**	**0 - 7 [0]**
	0: Digital reference. Given by F04.03. 1: AI analog reference. It is the value of the analog input voltage AI reference, and refer to group F16. 2: Terminal pulse reference. It is the value of the terminal pulse input reference, and Max. input pulse frequency corresponding to 10V of the PID reference. 3 - 6: AI1 - AI4 reference. 7: Keypad potentiometer reference.	
F04.02	**Feedback source selection**	**0 - 7 [0]**
	0: AI analog feedback. 4: AI3 reference. 1: Terminal pulse feedback. 5: AI4 reference. 2: AI1 reference. 6: Keypad potentiometer reference. 3: AI2 reference. 7: Speed closed-loop feedback.	
F04.03	**Setting digital reference**	**-100.0 - +100.0 [0.0%]**
	It defines the process PID regulator reference. • When F04.01 = 0 (digital reference), it is valid.	
F04.04	**Proportional gain (P1)**	**0.0 - 500.0 [50.0]**
F04.05	**Integral time (I1)**	**0.01 - 10.00 [1.00s]**
F04.06	**Integral upper limit**	**0.0 - 100.0 [100.0%]**
F04.07	**Differential time (D1)**	**0.00 - 10.00 [0.00s]**
F04.08	**Differential amplitude limit value**	**0.0 - 100.0 [20.0%]**
F04.09	**Sampling cycle (T)**	**0.01 - 50.00 [0.10s]**
	F04.04, F04.05 and F04.07 define the process PID parameters. F04.06 defines the process PID integral upper limit. F04.08 defines the process PID differential amplitude limit value. F04.09 defines the sampling cycle of feedback value and the PID regulator calculates once in each sampling cycle. • When F04.07 = 0, the differential is invalid.	

Ref. Code	Function Description	Setting Range [Default]
F04.10	**Bias limit**	**0.0 - 20.0 (reference) [0.0%]**
	F04.10 defines the Max. deviation of the output from the reference closed-loop. • PID regulator stops running when the feedback value is within this range. • Setting this parameter correctly is conducive to improve the system output accuracy and stability. • Large setting value of F04.10 may cause the process PID gap to adjust greatly, the whole process system does not converge the shock. 	
F04.11	**PID regulator upper limit access selection**	**0 - 7 [0]**
	0: Set F04.13. 1: Set AI analog value. Set by analog input voltage AI and refer to group F16. 2: Set terminal pulse input. 3 - 6: Set AI1 - AI4. 7: Set keypad potentiometer.	
F04.12	**PID regulator lower limit access selection**	**0 - 7 [0]**
	It defines the setting access of PID regulator lower limit value. 0: Set F04.14. 1: Set AI analog value. Set by analog input voltage AI and refer to group F16. 2: Set terminal pulse. 3 - 6: Set AI1 - AI4. 7: Set keypad potentiometer.	
F04.13	**PID regulator upper limit value**	**0.00 - upper limit [50.00Hz]**
F04.14	**PID regulator lower limit value**	**0.00 - upper limit [0.00Hz]**
	It defines that the process PID regulator output digital setting value of upper limit or lower limit.	
F04.15	**PID regulator characteristic**	**0,1 [0]**
	0: Positive. The motor RPM is required to increase with the increase of the reference. 1: Negative. The motor RPM is required to decrease with the increase of the reference.	
F04.17	**PID output filter time**	**0.01 - 10.00 [0.05s]**
	It defines the filtering time of process PID output.	
F04.18	**PID output reverse selection**	**0,1 [0]**
	0: PID regulation prohibits reverse. When PID output is negative, 0 is the limit. 1: PID regulation allows reverse. When F00.18 = 1 (prohibits reverse), 0 is the limit.	
F04.19	**PID output reverse frequency's upper limit**	**0.00 - upper limit [50.00Hz]**
	It defines the PID upper limit frequency when PID reverses. • When F04.18 = 1 (PID regulation enable reverse), it is invalid.	
F04.20	**Proportional gain (P2)**	**0.0 - 500.0 [50.0]**
F04.21	**Integral time (I2)**	**0.01 - 10.00 [1.00s]**
F04.22	**Derivative time (D2)**	**0.00 - 10.00 [0.00s]**

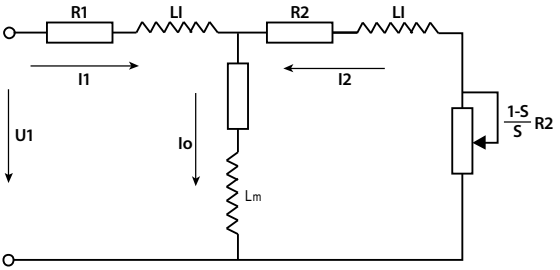
Ref. Code	Function Description	Setting Range [Default]
F04.23	**PID parameter adjustment basis**	**0 - 3 [0]**
	0: Do not adjust. The second segment PID is invalid. 1: DI. • PID parameter switchs according to DI terminal function No. 59. When the terminal is invalid, select parameter group 1 (F04.04, F04.05, F04.07), and select parameter group 2 (F04.20 - F04.22) when it is valid. 2: Deviation. • PID parameter selects parameter group 1 when the deviation between PID feedback and PID reference is less than PID parameter switching point 1 (F04.24). • PID parameter selects parameter group 2 when the deviation between PID feedback and PID reference is greater than PID parameter switching point 2 (F04.25). • When the deviation between the PID feedback and the PID reference is between the PID parameter switching points 1 and 2, the PID parameter is a linear interpolation of the two sets of parameters. 3: Frequency. • PID parameter selects parameter group 1 when PID output frequency is less than PID parameter switching point 1 (F04.24). • PID parameter selects parameter group 2 when PID output frequency is greater than PID parameter switching point 2 (F04.25). • When the PID output frequency is between PID parameter switching points 1 and 2, the PID parameter is a linear interpolation of two sets of parameters.	
F04.24	**PID parameter switching point 1**	**0.0 - F04.25 [0.0%]**
F04.25	**PID parameter switching point 2**	**F04.24 - 100.0 [100.0%]**
F04.27	**Pulse of each turn**	**1 - 9999 [1024]**
F04.28	**Max. closed loop speed**	**1 - 24000 [1500rpm]**
F04.29	**PID arithmetic mode**	**0,1 [0]**
	0: No operation at stop. 1: Operation at shutdown.	
F04.30	**PID sleep**	**0,1 [0]**
	0: No sleep. 1: Sleep enable.	
F04.31	**Tolerance of waking up**	**0.0 - 100.0 [10.0%]**
F04.32	**Delay of waking up**	**0.0 - 6000.0 [0.0s]**
	Positive characteristics: In the sleep state, when the feedback value ≤ set value × (100% - F04.31), and the time ≥ F04.32, wake up the inverter. Negative characteristics: In the sleep state, when the feedback value ≥ set value × (100% + F04.31), and the time ≥ F04.32, wake up the inverter.	
F04.33	**Sleep tolerance**	**0.0 - 100.0 [10.0%]**
F04.34	**Sleep delay**	**0.0 - 6000.0 [0.0s]**
F04.35	**Sleep frequency**	**0.00 - Max. frequency [20.00Hz]**
	Positive characteristics: Wake-up state, when the feedback value ≥ given value × (100% + F04.33), the target frequency ≤ F04.35 and the time ≥ F04.34, the inverter sleep. Negative characteristics: In the wake-up state, when the feedback value is less than or equal to × (100% - F04.33), the target frequency is ≤ F04.35 and the counting time is ≥ F04.34. the inverter sleep.	

6.2.6 F05: External Setting Curve Parameters

Ref. Code	Function Description	Setting Range [Default]
F05.00	**External reference curve selection**	**00000 - 33333 [00000]**
	Unit: AI1 characteristic curve selection **Ten: AI2 characteristic curve selection** **Hundred: AI3 characteristic curve selection** **Thousand: AI4 characteristic curve selection** **Ten thousad: Pulse input curve selection** Each bit setting: • 0: Line 1. • 1: Line 2. • 2: Polyline. • 3: No treatment.	
F05.01	**Min. reference of line 1**	**0.0 - F05.03 [0.0%]**
F05.02	**Min. reference corresponding value of line 1**	**0.0 - 100.0 [0.0%]**
F05.03	**Max. reference of line 1**	**F05.01 - 100.0 [100.0%]**
F05.04	**Max. reference corresponding value of line 1**	**0.0 - 100.0 [100.0%]**
F05.05	**Min. reference of line 2**	**0.0 - F05.07 [0.0%]**
F05.06	**Min. reference corresponding value of line 2**	**0.0 - 100.0 [0.0%]**
F05.07	**Max. reference of line 2**	**F05.05 - 100.0 [100.0%]**
F05.08	**Max. reference corresponding value of line 2**	**0.0 - 100.0 [100.0%]**
F05.09	**Max. reference of polyline**	**F05.11 - 100.0 [100.0%]**
F05.10	**Max. reference corresponding value of polyline**	**0.0 - 100.0 [100.0%]**
F05.11	**Inflection point 2 reference 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 reference of polyline**	**F05.15 - F05.11 [0.0%]**
F05.14	**Inflection point 1 corresponding value**	**0.0 - 100.0 [0.0%]**
F05.15	**Min. reference of polyline**	**0.0 - F05.13 [0.0%]**
F05.16	**Min. reference corresponding value of polyline**	**0.0 - 100.0 [0.0%]**
	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**  	

Ref. Code	Function Description	Setting Range [Default]
	Positive and negative characteristic of polyline   **In the figure:** • P/A is terminal pulse/analog setting. • Pulse frequency (P) is 100% corresponding to F16.17 Max. input pulse frequency. • Analog input (A) is 100% corresponding to 10V or 20mA.	
F05.17	**Skip frequency 1**	**F00.09 - upper limit [0.00Hz]**
F05.18	**Skip frequency 2**	
F05.19	**Skip frequency 3**	
F05.20	**Range of skip frequency**	**0.00 - 30.00 [0.00Hz]**
	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. 	
F05.21	**Jog operation frequency digital setting 2**	**0.00 - upper limit [5.00Hz]**
	When selecting jog operation 2 through terminal, set the jog frequency operation according to F05.21.	
F05.22	**Keypad potentiometer curve selection**	**0 - 3 [3]**
	0: Straight line 1. 1: Straight line 2. 2: Polyline. 3: No treatment.	

6.2.7 F08: Asyn. 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:

$$\text{Rated torque current} = \text{F08.05} \times \text{F08.02}$$

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

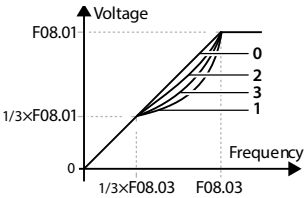
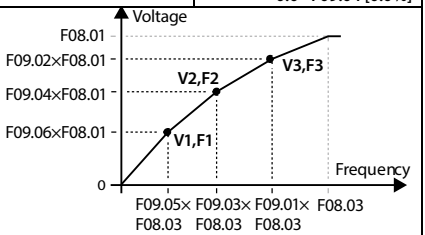
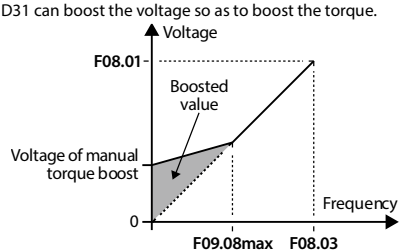
$$\text{Mutual inductance F08.10} = \frac{\text{F08.01}}{2\sqrt{3}\pi \times \text{F08.03} \times \text{F08.11}} - \text{F08.09}$$

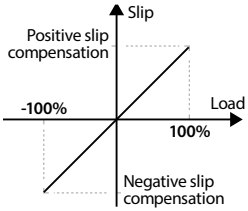
Note: Except F08.03, F08.04 and F08.06, the other factory settings are depended on HD31.

Ref. Code	Function Description		Setting Range [Default]
F08.00	**Rated power of motor 1**		**0.2 - 999.9kW**
F08.01	**Rated voltage of motor 1**		**0 - inverter's rated voltage**
F08.02	**Rated current of motor 1**	**7.5kW above motor**	**0.1 - 2500.0A**
		7.5kW or below motor	**0.01 - 250.00A**
F08.03	**Rated frequency of motor 1**		**1.0 - 400.0 [50.0Hz]**
F08.04	**Rated speed of motor 1**		**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 1**		**0.001 - 1.000**
F08.06	**Parameter auto-tuning of motor 1**		**0 - 3 [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. Then 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. 3: Motor stator resistance measurement. • The motor is at rest, and the stator resistance of the motor is automatically measured and the measured parameters are automatically written to F08.07.		

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 ↵ key, and 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 1	11 - 90kW above motor	0.000 - 9.999Ω
		7.5kW or below motor	0.00 - 99.99Ω
F08.08	Rotor resistance of motor 1	7.5kW or below motor	0.00 - 99.99Ω
		11 - 90kW above motor	0.000 - 9.999Ω
		90kW above motor	0.0000 - 0.9999Ω
F08.09	Leakage inductance of motor 1	7.5kW or below motor	0.0 - 5000.0mH
		11 - 90kW above motor	0.00 - 500.00mH
		90kW above motor	0.000 - 50.000mH
F08.10	Mutual inductance of motor 1	7.5kW or below motor	0.0 - 5000.0mH
		11 - 90kW above motor	0.00 - 500.00mH
		90kW above motor	0.000 - 50.000mH
F08.11	Idling excitation current of motor 1	7.5kW above motor	0.0 - 999.9A
		7.5kW or below	0.00 - 99.99A
F08.12	Motor 1 core saturation coefficient 1		0.00 - 1.00 [1.00]
F08.13	Motor 1 core saturation coefficient 2		0.00 - 1.00 [1.00]
F08.14	Motor 1 core saturation coefficient 3		0.00 - 1.00 [1.00]
F08.15	Motor 1 core saturation coefficient 4		0.00 - 1.00 [1.00]
F08.16	Motor 1 core saturation coefficient 5		0.00 - 1.00 [1.00]

6.2.8 F09: V/f Control Parameters

Ref. Code	Function Description	Setting Range [Default]
F09.00	**V/f curve selection of motor 1**	**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 the 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 value F3 of motor 1**	**F09.03 - 100.0 [80.0%]**
F09.02	**V/f voltage value V3 of motor 1**	**F09.04 - 100.0 [80.0%]**
F09.03	**V/f frequency value F2 of motor 1**	**F09.05 - 100.0 [80.0%]**
F09.04	**V/f voltage value V2 of motor 1**	**F09.06 - 100.0 [80.0%]**
F09.05	**V/f frequency value F1 of motor 1**	**0.0 - F09.03 [0.0%]**
F09.06	**V/f voltage value V1 of motor 1**	**0.0 - F09.04 [0.0%]**
	F09.01 - F09.06 is user-defined V/f curve. • If F09.00 = 4 (user-defined 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. 	
F09.07	**Torque boost of motor 1**	**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 1**	**0.0 - 50.0 (F08.03) [25.0%]**
	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). 	

Ref. Code	Function Description	Setting Range [Default]
F09.09	**Slip compensation gain of motor 1**	**0.0 - 300.0 [0.0%]**
F09.10	**Slip compensation filter time of motor 1**	**0.01 - 10.00 [0.10s]**
F09.11	**Slip compensation limit of motor 1**	**0.0 - 250.0 [200.0%]**
F09.12	**Compensation time constant of motor 1**	**0.1 - 25.0 [2.0s]**
	The motor slip changes with the load torque, which leads to the change 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	**Motor 1 low frequency suppression shock coefficient**	**0 - 200 [50]**
	0: Depend on excitation current component. 1: Depend on torque current component.	
F09.16	**Motor 1 high frequency suppression shock coefficient**	**0 - 200 [20]**
	This function is used to damp oscillation when output current is continually unstable. • This function helps to keep the motor running smoothly by adjusting the setting of F09.16 correctly.	
F09.17	**Motor 1 energy saving control select**	**0 - 3 [0]**
	0: Energy saving control invalid. 3: Energy saving according to output currently. When F09.17 = 3 and V/f control mode (F00.01 = 0). • When the output frequency ≥ F09.19 and the output current ≤ F09.20 × inverter rated current, enter the energy saving mode. • If any of the above conditions are not currently met, the drive will exit the power saving mode. *Note: The power saving mode is only valid at constant speed.*	
F09.18	**Motor 1 energy saving factor**	**0.0 - 100.0 [5.0%]**
F09.19	**Motor 1 energy start frequency**	**0.00 - 50.00 [25.00Hz]**
F09.20	**Motor 1 energy switching point**	**0.0 - 100.0 [100.0%]**
F09.21	**Motor 1 energy saving detecting times**	**0 - 5000 [10 times]**

6.2.9 F13: Asyn. Motor 2 Parameters

This group can be set as the second group of motor parameters and control parameters corresponding to the group 1 parameters (motor 1). The concrete meaning refers to the corresponding parameters of motor 1 and achieves flexible switching between the 2 motors (refer to DI terminal No. 47 function).

Note:

Check group F08 for F13.01 - F13.15, F13.53, F13.54.

Check group F09 for F13.16 - F13.34, F13.58 - F13.62.

Ref. Code	Function Description		Setting Range [Default]
F13.00	Control mode selection of motor 2		0 - 2 [0]
	0: V/f control without PG. 2: Vector control without PG.		
F13.01	Rated power of motor 2		0.2 - 999.9kW [Depend on HD31]
F13.02	Rated voltage of motor 2		0 - 999V [Depend on HD31]
F13.03	Rated current of motor 2	7.5kW above motor	0.0 - 2500.0A [Depend on HD31]
		7.5kW or below motor	0.00 - 250.00A [Depend on HD31]
F13.04	Rated frequency of motor 2		1.0 - 400.0 [50.0Hz]
F13.05	Rated speed of motor 2		1 - 24000 [Depend on HD31]
F13.07	Parameter auto-tuning of motor 2		0 - 3 [0]
	0: Auto-tuning is disabled. 1: Stationary auto-tuning.	2: Rotary auto-tuning. 3: Motor stator resistance measurement.	
F13.08	Stator resistance of motor 2	7.5kW below motor	0.00 - 99.99Ω [Depend on HD31]
		11 - 90kW motor	0.000 - 9.999Ω [Depend on HD31]
		90kW and above motor	0.0000 - 0.9999Ω [Depend on HD31]
F13.09	Rotor resistance of motor 2	7.5kW below motor	0.00 - 99.99Ω [Depend on HD31]
		11 - 75kW motor	0.000 - 9.999Ω [Depend on HD31]
		90kW and above motor	0.0000 - 0.9999Ω [Depend on HD31]
F13.10	Leakage inductance of motor 2	7.5kW below motor	0.0 - 5000.0mH [Depend on HD31]
		11 - 75kW motor	0.00 - 500.00mH [Depend on HD31]
		90kW and above motor	0.000 - 50.000 mH [Depend on HD31]
F13.11	Mutual inductance of motor 2	75kW below motor	0.0 - 5000.0mH [Depend on HD31]
		11 - 75kW motor	0.00 - 500.00mH [Depend on HD31]
		90kW and above motor	0.000 - 50.000 mH [Depend on HD31]
F13.12	Idling exciting current of motor 2	7.5kW or below motor	0.00 - 99.99A [Depend on HD31]
		7.5kW above motor	0.0 - 999.9A [Depend on HD31
F13.13	Motor 2 core saturation coefficient 1		0.00 - 1.00 [1.00]
F13.14	Motor 2 core saturation coefficient 2		0.00 - 1.00 [1.00]
F13.15	Motor 2 core saturation coefficient 3		0.00 - 1.00 [1.00]

Ref. Code	Function Description	Setting Range [Default]
F13.16	V/f curve selection of motor 2	0 - 4 [0]
	0: Line. 1: Square curve. 2: 1.2 exponential curve. 3: 1.7 exponential curve. 4: User-defined curve.	
F13.17	V/f frequency value F3 of motor 2	F13.19 - 100.0 [0.0%]
F13.18	V/f voltage value V3 of motor 2	F13.20 - 100.0 [0.0%]
F13.19	V/f frequency value F2 of motor 2	F13.21 - F13.17 [0.0%]
F13.20	V/f voltage value V2 of motor 2	F13.22 - F13.18 [0.0%]
F13.21	V/f frequency value F1 of motor 2	0.0 - F13.19 [0.0%]
F13.22	V/f voltage value V1 of motor 2	0.0 - F13.20 [0.0%]
F13.23	Torque boost of motor 2	0.0 - 30.0 [55kW and below inverter: 2.0%] [75 - 132kW inverter: 1.0%]
F13.24	Cut-off point used for manual torque boost of motor 2	0.0 - 50.0 (F13.04) [30.0%]
F13.25	Slip compensation gain of motor 2	0.0 - 300.0 [0.0%]
F13.26	Slip compensation filter time of motor 2	0.01 - 10.00 [0.10s]
F13.27	Slip compensation limitation of motor 2	0.0 - 250.0 [200.0%]
F13.28	Compensation constant of motor 2	0.000 - 9.999kW [Depend on HD31]
F13.30	AVR (automatic voltage regulation) function of motor 2	0 - 2 [1]
	0: No action. 1: Act all the time. 2: No action in Dec. process.	
F13.31	Motor 2 low frequency suppression shock coefficient	0 - 200 [50]
F13.32	Motor 2 high frequency suppression shock coefficient	0 - 200 [20]
F13.33	Motor 2 energy saving control select	0 - 3 [0]
	0: Invalid. 3: According to output current.	
F13.34	Motor 2 energy saving factor	0.0 - 100.0 [5.0%]
F13.53	Motor 2 core saturation coefficient 4	0.00 - 1.00 [1.00]
F13.54	Motor 2 core saturation coefficient 5	0.00 - 1.00 [1.00]
F13.55	Motor 2 current loop feedforward enabled	0,1 [1]
F13.58	Motor 2 energy start frequency	0.00 - 50.00 [25.00Hz]
F13.59	Motor 2 energy switching point	0.0 - 100.0 [100.0%]
F13.60	Motor 2 energy saving detecting times	0 - 5000 [10 times]
F13.61	Motor 2 energy voltage recovery time	40 - 4000 [100ms]
F13.62	Motor 2 energy voltage decreasing time	40 - 4000 [100ms]

6.2.10 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: Reserved. It disables the terminal function. HD31 ignores the signal input via this terminal.

- The reserved 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 prohibited 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 function.

- 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 operation mode.

- Refer to parameter 15.16.

5, 6, 7: Frequency access selects 1, 2, 3.

8: The frequency switch to analog setting.

9, 10: Run command access selection 1, 2.

11: Switch to terminal control mode.

12: External stop command input.

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

13 - 16: Multi-step frequency terminal 1 - 4.

17: Frequency ramp (UP).

18: Frequency ramp (DN).

19: Clear auxiliary frequency setting.

20, 21: Command control input for forward/reverse jog 1 (JOGF1/JOGR1).

22, 23: Command control input for forward/reverse jog 2 (JOGF2/JOGR2).

24: Jog 1 command control input.

25: Jog 1 direction control input.

Remark: When selects 20 and 21, the functions 24 and 25 are invalid.

26: Acc./Dec. time selects terminals 1.

27: Acc./Dec. time selects terminals 2.

28: Acc./Dec. mode selection.

29: Acc./Dec. is prohibited.

30: Switch to ordinary running mode.

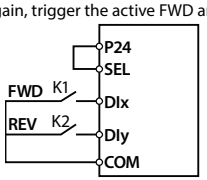
31: Reset the stop status of PLC operation.

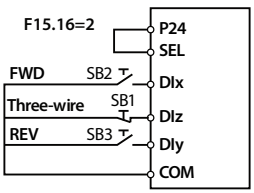
32: Pause the process PID.

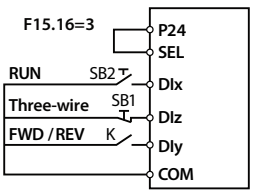
33: Prohibit the process PID.

34: Hold PID integral.

Ref. Code	Function Description	Setting Range [Default]
	35: Clear PID integral. 36: Switch to wobble operation. 37: Reset the wobble run status. 38: DC braking start while stopping. 39: External pause signal (normally-open input). 40: External pause signal (normally-closed input). 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. 43: Emergency stop. 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. 47: Switch between motor 1 and motor 2. 48: Timing function input. 49: Clear the length. 50: Clear the counter to zero. 51: Counter's triggering signal input. 52: Length counting input (only DI6). 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. 56: Speed control/torque control switching. 57: Torque control torque polarity switching. 59: PID parameter switch. 85: Pause PLC operation. 86: Terminal stop DC braking. 87: Frequency setting access selects 4.	
F15.12	**Acc./Dec. rate of UP/DN terminal**	**0.00 - 99.99 [1.00Hz/s]**
	It defines the change rate of setting frequency via the UP/DN terminal.	
F15.13	**Terminal detecting interval**	**0 - 2 [0]**
	0: 2ms. 1: 4ms. 2: 8ms.	
F15.14	**Terminal detecting filter number**	**0 - 10000 [2]**
	The digital input terminal signal should be delayed and confirmed so as to avoid digital input error.	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F15.15</td><td>Terminal input positive and negative logic setting</td><td>000 - 0x1FF [000]</td></tr>
<tr><td></td><td colspan="2">Defines that each bit (binary) represents different input terminal.
• 0: Positive logic. When the input terminal is connected to corresponding common port, this logic is enabled. Otherwise the logic is disabled.
• 1: Negative logic. When the input terminal is connects to corresponding common port, this logic is disabled. Otherwise the logic is enabled.
<table>
<tr><th colspan="4">Hundred</th><th colspan="4">Ten</th><th colspan="4">Unit</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>-</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>F15.16</td><td>FWD/REV operation mode</td><td>0 - 3 [0]</td></tr>
<tr><td></td><td colspan="2">• 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 the stop command comes from other sources makes HD31stop though the terminal logic enabled in the terminal control mode, there is no run command even the control terminals FWD/REV are still valid.
• To run HD31 again, trigger the active FWD and REV.
 

<table>
<tr><th rowspan="2">K2</th><th rowspan="2">K1</th><th colspan="2">Run Command</th></tr>
<tr><th>F15.16=0</th><th>F15.16=1</th></tr>
<tr><td>0</td><td>0</td><td>Stop</td><td>Stop</td></tr>
<tr><td>1</td><td>0</td><td>Reverse</td><td>Stop</td></tr>
<tr><td>0</td><td>1</td><td>Forward</td><td>Forward</td></tr>
<tr><td>1</td><td>1</td><td>Stop</td><td>Reverse</td></tr>
</table>
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</td></tr>
<tr><td>F15.17</td><td>Terminal operating selection due to fault of external equipment</td><td>0 - 3 [0]</td></tr>
<tr><td></td><td colspan="2">When there is fault of external equipment, it can select protection.
0: Coast to stop.
1: Emergency stop.
2: Dec. to stop.
3: Continue to run.</td></tr>
<tr><td>F15.18</td><td>DO1 function</td><td>0 - 35 [2]</td></tr>
<tr><td>F15.19</td><td>DO2 function</td><td>0 - 38 [0]</td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]
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: Reserved.
1: Inverter ready.
- HD31 completes power on and no fault occurs, then it can normally run the indicating signal.

2: Inverter is running (RUN).
- HD31 is in running status and outputs indicating signal.

3: Inverter is forward running.
- HD31 is forward running the indicating signal.

4: Inverter is reverse running.
- HD31 is reverse running the indicating signal.

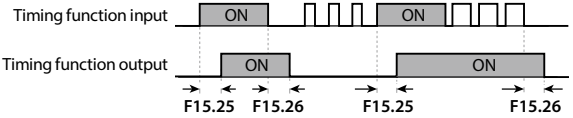
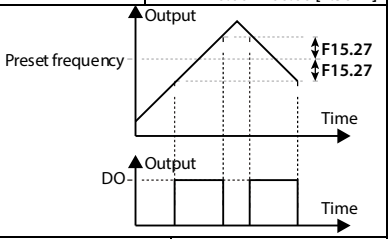
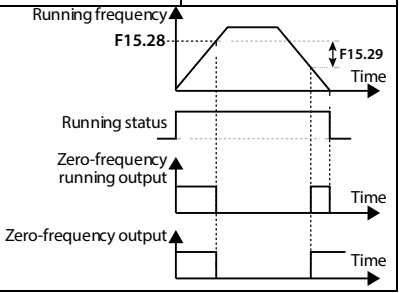
5: Inverter is DC braking.
6: Inverter is in zero-frequency status.
- In the zero-frequency range, the output frequency (including in stop status) outputs the indication signal.

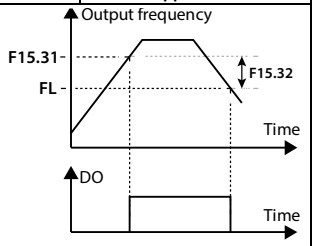
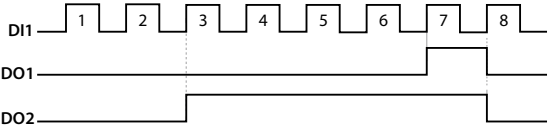
7: Inverter is in zero-frequency running.
- In the zero-frequency range HD31 output frequency outputs the indicating signal.

9, 10: Frequency detection threshold (FDT1, FDT2).
11: Frequency arriving signal (FAR).
12: Limitation of upper limit of frequency.
13: Limitation of lower limit of frequency.
14: Limitation of upper/lower limits of wobble frequency.
15: Simple PLC operating status indication.
16: Simple PLC pausing indication.
17: Simple PLC cycle completion indication.
18: Completion of simple PLC operation stages.
19: Completion of simple PLC operation.
20: Output data from SCI communication.
21: Preset operating time out.
22: Timing function output.
23: Preset counting value reach.
24: Indicating counting value reach.
25: Setting length arrive.
26: Indication of motor 1 and motor 2.
27: Analog input overrun output.
29: Undervoltage lock-up signal (LU).
30: Overload signal (OL).
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.

33: Inverter auto-reset fault.
35: Sleep indicating function.
38: High-frequency output (DO2). DO2 can be selected as high-frequency output.

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F15.24</td><td>Output terminal positive and negative logic selection</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 invalid.
• 1: Negative logic. When output terminals are connected to corresponding common port, this logic is disabled. Otherwise the logic is valid.
<table>
<tr><th colspan="4">Thousand</th><th colspan="4">Ten</th><th colspan="4">Unit</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>F15.25</td><td>ON side delay time of timing function</td><td>0.00 - 300.00 [0.00s]</td></tr>
<tr><td>F15.26</td><td>OFF side delay time of timing function</td><td></td></tr>
<tr><td></td><td colspan="2">F15.25 and F15.26 can be used to set the ON/OFF side delay time (dead area) of the timing function output relative to the input.
• The timing function output will be ON when the ON time of timing function is longer than that defined by F15.25.
• The timing function output will be OFF when the OFF time of timing function delays behind that defined by F15.26.
The timing function operation figure is shown as follows:
 
</td></tr>
<tr><td>F15.27</td><td>FAR range</td><td>0.00 - 100.00 [2.50Hz]</td></tr>
<tr><td></td><td colspan="2">The pulse signal will be output if the inverter's output frequency is within the FAR range. As shown in the right figure.
 
</td></tr>
<tr><td>F15.28</td><td>Zero-frequency operation 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>

Ref. Code	Function Description	Setting Range [Default]
F15.30	**FDT1 detection mode**	**0,1 [0]**
	0: Detect according to the reference frequency. 1: Detect according to the output frequency.	
F15.31	**FDT1 level**	**0.00 - upper limit [50.00Hz]**
F15.32	**FDT1 lag**	**0.00 - upper limit [1.00Hz]**
	The indicating signal can be output if the setting frequency F15.30 is higher than certain frequency (F15.31), and become disabled when the setting frequency is lower than certain frequency of FDT1 level (F15.31 - F15.32). Please refer to FL of the right figure. 	
F15.33	**FDT2 detection mode**	**0,1 [0]**
	0: Detect according to the reference frequency. 1: Detect according to the output frequency.	
F15.34	**FDT2 level**	**0.00 - F00.06 [50.00Hz]**
F15.35	**FDT2 lag**	**0.00 - F00.06 [1.00Hz]**
	Refer to parameters F15.31 and F15.32.	
F15.36	**Preset running time**	**0 - 65535 [0h]**
	When the total running time reaches the preset running time (F15.36), the inverter will output an indicating signal (500ms). • 0: Preset running time is disabled.	
F15.37	**Preset counting value arriving**	**F15.38 - 9999 [0]**
F15.38	**Specified counting value arriving**	**0 - F15.37 [0]**
	F15.37 presents that when the number of pulse input by the DI terminals (set as No.51 function) reaches a certain quantity, the DO terminals or relay will send an indicating signal. F15.38 presents that when the number of pulse input by the DI terminals (set as No.51 function) reaches a specified quantity, the DO terminals or relay will send an indicating signal until the pulse number hits the preset counting value. **For example:** If F15.37 = 7 and F15.38 = 3, DO1 selects preset count arriving function (F15.18 = 23), DO2 selects specified count arriving (F15.19 = 24), and DI1 selects counter trigger signal input function (F15.00 = 51). Sequence of counting value arriving is shown in figure: • DO2 will output an indicating signal when DI1 inputs the third pulse until the preset count value reachs seven. • DO1 will output an indicating signal when DI1 inputs the seventh pulse; Output signal of DO1 returns to low level when DI1 inputs the eighth pulse. 	

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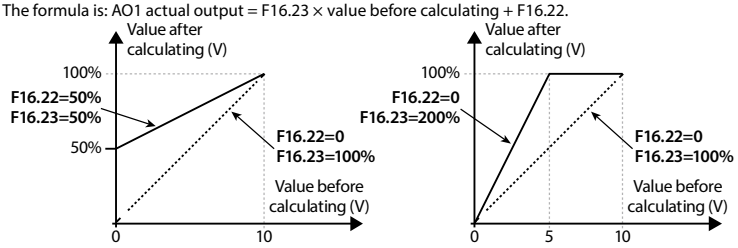
Ref. Code	Function Description	Setting Range [Default]
F15.39	**Analog input over-limitation selection**	**0000 - 1133 [0000]**
	If the corresponding analog > F15.40 or analog < F15.41, and continued F15.42 time, the overrun check. After the limit detection, when F15.41 ≤ analog ≤ F15.40, according to thousand to determine whether the automatic running of the inverter. **Unit: Action drive when the input exceeds the limit** • 0: Free stop. • 1: Emergency shutdown. • 2: Dec. stop. • 3: No action. **Ten: Select the analog input port** • 0: No analog port. • 1: Keypad potentiometer. • 2: AI1 port. • 3: AI2 port. **Hundred: Analog overrun detection conditions** • 0: Always detected. • 1: Run command is detected. **Thousand: Automatical selection when analog overrun is detected** • 0: Do not allow automatic running. • 1: Allows automatic running. *Note: Thousand are valid only in terminal two-wire mode.*	
F15.40	**Analog input overrun upper limit**	**F15.41 - 100.0 [100.0%]**
F15.41	**Analog input overrun lower limit**	**0.0 - F15.40 [0.0%]**
F15.42	**Analog overrun detection time**	**0.00 - 50.00 [5.00s]**
F15.43	**Terminal output delay**	**0.0 - 100.0 [0.0s]**
F15.44	**Start analog overrun detection time**	**0.00 - 50.00 [15.00s]**

6.2.11 F16: Analog I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F16.00	**Keypad with potentiometer function selection**	**0 - 18 [0]**
	Only when using keypad with potentiometer is F16.00 enabled.	
F16.01	**AI1 function**	**0 - 8 [2]**
F16.02	**AI2 function**	**0 - 18 [5]**
F16.03	**AI3 function**	**0 -18 [0]**
F16.04	**AI4 function**	**0 - 18 [0]**
	0: Reserved. 1: Upper limit frequency setting source. • F00.07 = 1 (analog input set upper limit frequency), the upper limit frequency is set by the input voltage corresponding to the AI terminal. 2: Frequency setting. • F00.10 = 3 (analog input set frequency), the setting frequency is set by the input voltage corresponding to the AI terminal. 3: Auxiliary frequency reference. 4: Process PID reference. 5: Process PID feedback. 6: Process PID regulating upper limit. 7: Process PID regulating lower limit. 8: Motor overheating signal input. 9: Motor 1 forward rotation torque limit. 10: Motor 1 reverse electrical torque limit. 11: Motor 1 forward regeneration rotation torque limit. 12: Motor 1 reverse regeneration rotation torque limit. 13: Torque command given. 15: Torque control upper limit frequency. 16: Motor 2 forward rotation electrical torque limit. 17: Motor 2 reverse rotation electrical torque limit. 18: Motor 2 forward regeneration torque limit. 19: Motor 2 reverse regeneration torque limit.	

Ref. Code	Function Description	Setting Range [Default]
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 set frequency, the relationship between the analog input and the analog value after calculating is shown as figure:  • 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: Reserved. 1, 2: Output frequency/setting frquency (0 - Max. output frequency). 3: Motor speed (0 - Max. output frequency corresponding to speed). 4: Output current (0 - 2 times of inverter rated current). 5: Output current (0 - 2 times of motor rated current). 6: Torque command (0 - 3 times motor rated torque). 10: Output torque (0 - 3 times rated torque of motor). 11: Output voltage (0 - 1.2 times inverter's rated voltage). 12: Bus voltage (0 - 2.2 times inverter's rated voltage). 13: Output power (0 - twice rated power of motor). 14: AI1 input (0 - 10V). 15: AI2 input (-10 - +10V/0 - 20mA). 16: AI3 input (-10 - +10V/0 - 20mA). 17: AI4 input (-10 - +10V/0 - 20mA). 18: Output frequency (-1 - +1 times Max. output frequency). 19: Reference frequency (-1 - +1 times Max. output frequency). 20: Set frequency (0 - Max. output frequency).	

Ref. Code	Function Description	Setting Range [Default]
F16.22	**Analog output AO1 bias**	**-100.0 - +100.0 [0.0%]**
F16.23	**Analog output 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	**Analog output AO2 bias**	**-100.0 - +100.0 [0.0%]**
F16.25	**Analog output 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.	
F16.27	**Keypad potentiometer offset**	**-100.0 - +100.0 [0.0%]**

6.2.12 F17: SCI Communication Parameters

Ref. Code	Function Description	Setting Range [Default]
F17.00	**Data format**	**0 - 6 [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. 6: 1-8-11 format, no parity, RTU.	
F17.01	**Baud rate selection**	**0 - 5 [3]**
	0: 1200bps. 5: 38400bps. 1: 2400bps. 6: 57600bps. 2: 4800bps. 7: 76800bps. 3: 9600bps. 8: 115200bps. 4: 19200bps.	
F17.02	**Local address**	**0 - 247 [2]**
	F17.02 = 0, it means broadcast address.	
F17.03	**Host PC response time**	**0 - 1000 [1ms]**
F17.04	**Time threshold for detecting communication status**	**0.0 - 600.0 [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 - 600.0 [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.	

Ref. Code	Function Description	Setting Range [Default]
F17.06	**Action selection at communication time out**	**0 - 3 [3]**
F17.07	**Action selection at communication fault**	**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: Dec. to stop. • 3: Continue to run.	
F17.09	**Communication write function parameter of storage EEPROM method selection**	**00 - 11 [01]**
	When using to change parameter in selecting communicaition, whether stored in EEPROM or not. **Unit: Except of F00.13, F19.03, EEPROM storage selection in communication** • 0: Not save in EEPROM. • 1: Save in EEPROM. **Ten: For F00.13, F19.03, EEPROM storage selection in communication** • 0: Not save in EEPROM. • 1: Save in EEPROM. *Note:* *1. When the ten is set to 1, it may damage the inverter. Please be careful.* *2. Only when using the communication write function parameter, and function code is 0x06 or 0x10, the F17.09 is valid. Refer to of Appendix B for details.*	
F17.10	**Detecting time of network communicaiton overtime**	**0.0 - 600.0 [0.0s]**
	The time interval between two received correct data (including local or non-native data) continues to exceed F17.10 and is detected for communication timeout. The timeout is checked and the timeout protection is selected according to F17.06. • F17.10 = 0, the communication timeout is not detected.	

6.2.13 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 the display parameter 1 during running**	**0 - 49 [8]**
F18.03	**Set the display parameter 2 during running**	**0 - 49 [7]**
F18.04	**Set the display parameter 3 during running**	**0 - 49 [36]**
F18.05	**Set the display parameter 4 during running**	**0 - 49 [13]**
F18.06	**Set the display parameter 5 during running**	**0 - 49 [14]**
F18.07	**Set the display parameter 6 during running**	**0 - 49 [18]**
F18.08	**Set the display parameter 1 at stop**	**0 - 49 [7]**
F18.09	**Set the display parameter 2 at stop**	**0 - 49 [18]**
F18.10	**Set the display parameter 3 at stop**	**0 - 49 [20]**

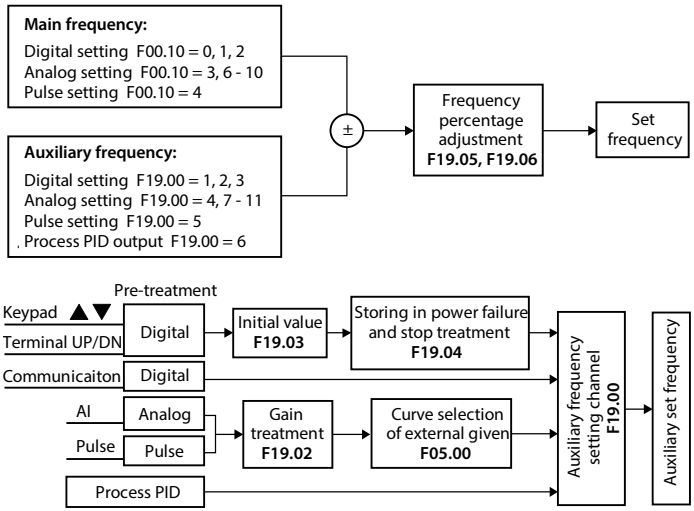
Ref. Code	Function Description	Setting Range [Default]
F18.11	**Set the display parameter 4 at stop**	**0 - 49 [22]**
F18.12	**Set the display parameter 5 at stop**	**0 - 49 [35]**
F18.13	**Set the display parameter 6 at stop**	**0 - 49 [36]**
	The keypad displays parameters which is the run status (F18.02 - 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 status. • For example: When F18.08 = 7, the stop parameter is setting frequency at initial power on. 0: Reserved. 1: Inverter's rated current. 3: Inverter status. 4: Master setting frequency source. 5: Master setting frequency. 6: Auxiliary setting frequency. 7: Setting frequency. 8: Reference frequency (after Acc./Dec.). 9: Output frequency. 10: Setting speed. 11: Run speed. 13: Output voltage. 14: Output current. 15: Torque reference. 16: Output torque. 17: Output power. 18: DC bus voltage. 19: Potentiometer input voltage. 20: AI1 input voltage. 21: AI1 input voltage (after disposal). 22: AI2 voltage. 23: AI2 input voltage (after disposal). 24: AI3 input voltage . 25: AI3 input voltage (after disposal). 26: AI4 input voltage. 27: AI4 input voltage (after disposal). 28: DI6 terminal pulse input frequency. 29: AO1 output. 30: AO2 output. 31: High-speed output pulse frequency. 32: Heatsink temperature. 33: Set the line speed. 34: Reference line speed. 35: Content water supply pressure setting. 36: Actual feedback pressure. 37: Process PID reference. 38: Process PID feedback. 39: Process PID error. 40: Process PID integral value. 41: Process PID output. 42: External couting value. 43: Input terminal status. • Bit0 - Bit8 are corresponding to DI1 - DI9. 44: Output terminal status. • Bit0 - Bit11 are corresponding to DO1, DO2, RLY1 - RLY10. 45: Modbus communication status. 46: Actual length. 47: Total length. 48: Total time at power on (hour). 49: Total time at running (hour).	
F18.14	**Frequency display gain**	**0.1 - 160.0 [1.0]**
F18.15	**Max. line speed**	**0 - 65535 [1000]**
F18.16	**Line speed display accuracy**	**0 - 3 [0]**
	0: Integer. 1: One decimal. 2: Two decimal. 3: Three decimal. *Note: The Max. linear velocity must be newly set when the display accuracy is changed.*	

6.2.14 F19: Function-boost Parameters

Frequency Auxiliary Setting Access (F19.00 - F19.06)

The multi-step frequency of HD31 is the result of both master setting frequency and auxiliary setting frequency.

F19.00 defines the auxiliary frequency setting access. When the auxiliary frequency setting access is the same as the master frequency setting access (except analog setting), the auxiliary frequency setting access is invalid.



Ref. Code	Function Description	Setting Range [Default]
F19.00	**Auxiliary frequency setting access selection**	**0 - 11 [0]**
	It defines the setting access of the auxiliary frequency. • When F19.00 = 1, 2, the initial value is set by F19.03. • When F19.00 = 4, 5, 7 - 10, the initial value is set by the actual analog input. Refer to F05.00 about the frequency relation characteristic curve selections. • When F19.00 = 6, set the auxiliary setting frequency according to the relationship of PID setting and feedback. • Please refer to the above figure. 0: No auxiliary access. 1: Digital setting 1 (the initial value is set by F19.03 and adjusted by ▲ and ▼ keys on the keypad). 2: Digital setting 2 (the initial value is set by F19.03 and adjusted by terminals UP/DN). 3: Digital setting 3 (the initial value = 0, set by SCI direct communication). 4: AI analog setting. 5: Terminal pulse setting. 6: Process PID output. 7 - 10: AI1 - AI4. 11: Keypad potentiometer.	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F19.01</td><td>Master/auxiliary setting calculation</td><td>00 - 41 [10]</td></tr>
<tr><td></td><td colspan="2">Define the relationship between final setting frequency and main/Aux. frequency.
Switch frequency by No.54 function of DI terminal (switching main/Aux. frequnecy source).
Unit: Main and auxiliary operations
• 0: Master setting + auxiliary setting.
• 1: Master setting - auxiliary setting.
Ten: Frequency source switch selection
• 0: Main.
• 1: Main and auxiliary operations.
• 2: Main and auxiliary switching.
• 3: Master and main auxiliary operation switch.
• 4: Auxiliary and main auxiliary operation switch.
<table>
<tr><th rowspan="2">DI = 54</th><th colspan="10">F19.01 setting value</th></tr>
<tr><th>00</th><th>10</th><th>20</th><th>30</th><th>40</th><th>01</th><th>11</th><th>21</th><th>31</th><th>41</th></tr>
<tr><td>0</td><td>Main</td><td>Main + Aux.</td><td>Aux.</td><td>Main + Aux.</td><td>Main + Aux.</td><td>Main</td><td>Main - Aux.</td><td>Aux.</td><td>Main - Aux.</td><td>Main - Aux.</td></tr>
<tr><td>1</td><td>Main</td><td>Main + Aux.</td><td>Main</td><td>Main</td><td>Aux.</td><td>Main</td><td>Main - Aux.</td><td>Main</td><td>Main</td><td>Aux.</td></tr>
</table></td></tr>
<tr><td>F19.02</td><td>Analog auxiliary setting coefficient</td><td>0.00 - 9.99 [1.00]</td></tr>
<tr><td></td><td colspan="2">First, calculate the gain by using F19.02, then calculate auxiliary frequency according to the frequency characteristic curve of group F05. When F19.00 = 4, 5, 7 - 10, F19.02 is enabled.</td></tr>
<tr><td>F19.03</td><td>Initial value of digital auxiliary frequency</td><td>0.00 - F00.06 [0.00Hz]</td></tr>
<tr><td></td><td colspan="2">Only when F19.00 = 1 or 2 will F19.03 be enabled and provide the initial value for the two methods.</td></tr>
<tr><td>F19.04</td><td>Control selection of digital auxiliary frequency</td><td>00 - 11 [00]</td></tr>
<tr><td></td><td colspan="2">Only when F19.00 = 1 or 2, F19.04 is valid.
Unit: Save selection at power-off
• 0: Not save auxiliary frequency at power-off.
• 1: The auxiliary frequency will be saved to F19.03 at power-off.
Ten: Frequency disposal when the inverter stops
• 0: Maintain the auxiliary frequency when the inverter stops.
• 1: The auxiliary frequency clears to zero when the inverter stops.</td></tr>
<tr><td>F19.05</td><td>Adjustment selection of setting frequency</td><td>0 - 2 [1]</td></tr>
<tr><td>F19.06</td><td>Adjustment coefficient of setting frequency</td><td>0.0 - 200.0 [100.0%]</td></tr>
<tr><td></td><td colspan="2">F19.05 and F19.06 is set the adjustment mode of setting frequency (the compounded frequency is computed by master setting frequency plus auxiliary setting frequency).
0: No adjustment.
• Setting frequency = synthetic frequency.
1: To adjust as per the Max. output frequency.
• Setting frequency = synthetic frequency + F00.06 × (F19.06 - 100%).
2: To adjust as per the current frequency.
• Setting frequency = synthetic frequency × F19.06.</td></tr>
</table>

Cooling Fan (F19.07 - F19.08)

Ref. Code	Function Description	Setting Range [Default]
F19.07	**Control selection of cooling fan**	**0 - 2 [0]**
F19.08	**Cooling fan controls delaying time**	**0.0 - 600.0 [60.0s]**
	Defines the control mode of cooling fan. With overheat protection, the fan runs all the time. 0: Auto stop mode. • 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 mode. • The fan runs all the time when HD31 is in running status and stops when HD31stops. 2: The fan runs continuously when power on. • The fan runs all the time when HD31 is power on.	

Zero-frequency Operation (F19.10 - F19.11)

Refer to below figure for the details.

Fcmd = Setting frequency

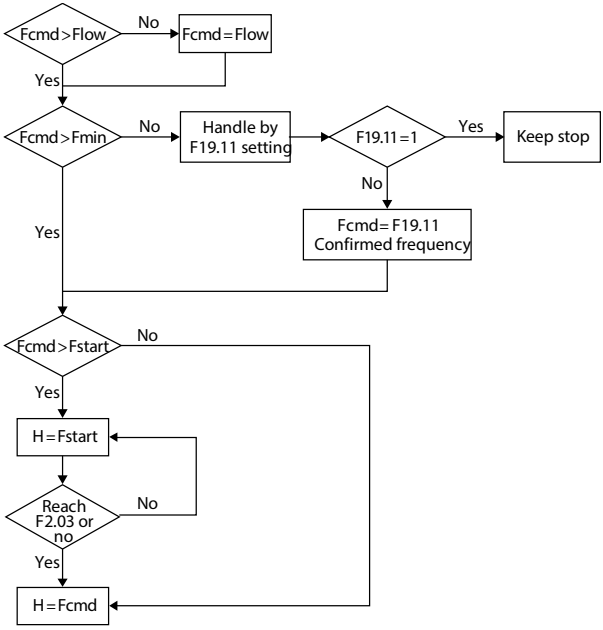
Fmin = Zero-frequency threshold (F19.10)

Flow = Lower limit frequency (F00.09)

H = Target frequency

Fstart = Start DWELL frequency (F02.02)

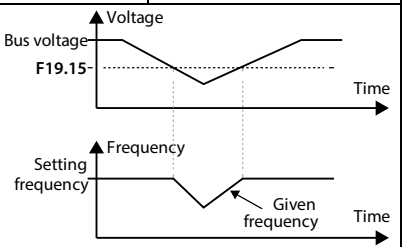
F02.03 (keeping time of start frequency)



Ref. Code	Function Description	Setting Range [Default]
F19.10	**Zero-frequency threshold**	**0.00 - upper limit [1.00Hz]**
F19.11	**Action selection at setting frequency is lower than zero-frequency threshold**	**0 - 3 [0]**
	0: Run according to frequency command. 1: Hold stop, no output. 2: Run according to zero-frequency threshold. 3: Run according to zero-frequency.	

Trip-free Running During Momentary Power-off (F19.12 - F19.15)

The inverter can automatically perform low-voltage compensation when the voltage decreases or instantaneous under-voltage occurs. The inverter can continue to run without tripping by reducing its output frequency and feedback energy via motor.

Ref. Code	Function Description		Setting Range [Default]
F19.12	**Trip-free selection at momentary power-off**		**0,1 [0]**
	If the inverter is momentarily lost during running (main circuit DC bus voltage VDC < F19.15), the inverter maintains the DC bus voltage by reducing the output frequency to avoid undervoltage shutdown. 0: Invalid. 1: Valid. Low-voltage compensation is activated.		
F19.13	**Dec. time at voltage compensation**		**0.1 - 6000.0 [5.0s]**
	When the instantaneous stop is enabled, the inverter will judge the voltage difference, the voltage compensation gain according to the current DC bus voltage and the F19.15 instantaneous stop running, adjust the output frequency in real time, and maintain the DC bus voltage to avoid the undervoltage shutdown. • If F19.13 is too small, the motor feedback energy is too large, which may trigger over-voltage protection. • If F19.13 is too large, the motor feedback energy is too small and the voltage compensation effect cannot be achieved.		
F19.15	**Reference voltage of trip-free operation at the moment of power-off**	**220V inverter**	**210 - 370 [248V]**
		380V inverter	**400 - 670 [430V]**
		660V inverter	**620 - 1130 [747V]**

Restart after Power-off (F19.16 - F19.17)

This function decides in different control modes whether the inverter starts automatically or not and the delay time for restart when the inverter is switched off and then switched on.

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

Protection of Stall Overvoltage (F19.18 - F19.19)

During deceleration, due to load inertia, the actual rate of decrease of the motor may be less than the output frequency. At this time, the motor feeds back energy to the HD31, causing the voltage on the DC bus to increase. If no measures are taken, HD31 will trip due to overvoltage.

Ref. Code	Function Description		Setting Range [Default]
F19.18	**Overvoltage suppression gain**		**0.000 - 1.000 [0.500]**
	0.000: Overvoltage stall is prohibited. 0.001 - 1.000: Turn on overvoltage stall. • During running, the bus voltage is greater than F19.19 overvoltage stall when the bus voltage is compared with F19.19, the inverter automatically increases the output frequency to avoid the load from feeding more energy to the inverter. • Overvoltage suppression gain setting is too small to effectively suppress DC bus voltage rise. • The overvoltage suppression gain setting is too large, which may cause the output frequency to fluctuate and cause the whole system to oscillate. The Dec. time may be appropriate to increase during Dec. to avoid the system shock caused by overvoltage stall. *Note: When the overvoltage stall condition is held for more than 1 minute, the inverter reports overvoltage stall failure (E0007) and stops the output.*		
F19.19	**Stall overvoltage point**	**220V inverter**	**210 - 370 [390V]**
		380V inverter	**650 - 790 [690V]**
		660V inverter	**900 - 1180 [1150V]**
	If the stall overvoltage point is set a little lower, Dec. time should be comparatively longer.		

6

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	Function Description	Setting Range [Default]
F19.20	**Auto current limiting selection**	**0.000 - 1.000 [0.500]**
	When the inverter output current exceeds F19.21, the inverter will automatically suppress further increase of output current to avoid overcurrent protection. • The automatic current limiting gain should be adjusted according to the actual load conditions: • Automatic current limiting gain setting is too small to effectively suppress the increase in output current. • The automatic current limit gain setting is too large, which may cause the output frequency to fluctuate and cause the entire system to oscillate. • F19.20 = 0, the automatic current limit is invalid.	
F19.21	**Auto current limiting threshold**	**20.0 - 200.0 [110%]**
	Defines the current threshold of auto current limit. The current = F19.21 × rated current of HD31.	
F19.23	**Terminal run commands valid method**	**0x00 - 0x11 [0x00]**
	Unit: Terminal detection at the moment of power-on **Ten: Effective way to run command** • 0: Rising edge enabled mode. • 1: Level enabled mode.	

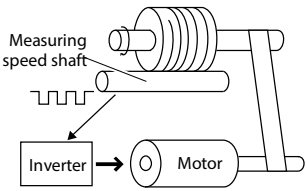
Braking Unit (F19.24 - F19.25, F19.40 - F19.41)

Ref. Code	Function Description	Setting Range [Default]
F19.24	**Action voltage of braking unit**	**630 - 750 [720V]**
	Note: Only the frequency converter with built-in brake unit releases energy through the braking resistor, and the energy release only occurs when the inverter is running.	
F19.25	**Flux brake enabled**	**0,1 [0]**
	0: Prohibited. 1: Enable, automatically disable overvoltage stall function. • By increasing the loss of the motor, you can decelerate faster without braking resistors. • The flux brake effect can be adjusted by F19.40, F19.41. • Valid only when V/f control is active. *Note: Do not use this function during frequent braking, which may damage the motor.*	

Fixed Length Arrive and Stop Function (F19.26 - F19.34)

This group is used to realize fixed length stop function. As the right figure:

The inverter inputs the count pulse from the terminal (multi-function terminal is set as No.52 function) and gets the count length according to the measuring number of pulses per revolution (F19.31) and shaft diameter (F19.30). Then modify the count length and obtain the actual length (F19.27) via length ratio (F19.28) and length checking coefficient (F19.29) too.



The formula is as follows:

F19.27 = counted length × F19.28 / F19.29.

Counted length = counted pulse number / F19.31 × F19.30 × π.

If F19.27 ≥ F19.26, the inverter will automatically send the stop command. Before running again, it need clear F19.27 or changed to F19.27 < F19.26. Otherwise the inverter can't be started.

Ref. Code	Function Description	Setting Range [Default]
F19.26	**Preset length**	**0 - 65535 [0m]**
F19.27	**Actual length**	**0 - 65535 [0m]**
F19.28	**Length ratio**	**0.001 - 30.000 [1.000]**
F19.29	**Length checking coefficient**	**0.001 - 1.000 [1.000]**
F19.30	**Measuring shaft diameter**	**1.00 - 100.00 [10.00cm]**
F19.31	**Number of pulses per revolution**	**1 - 9999 [1]**
F19.32	**Length arrive and output function selection**	**0,1 [0]**
	0: Output level signal. 1: Output 500ms pulse.	
F19.33	**Record of length disposal after length arrive**	**0,1 [0]**
F19.34	**Record of length disposal at stop**	**0,1 [0]**
	0: Auto-clear. 1: No change.	

Auxiliary PID Limit (F19.35 - F19.36)

Ref. Code	Function Description	Setting Range [Default]
F19.35	**Auxiliary PID output limit**	**0.0 - 100.0 [100.0%]**
	Auxiliary frequency selected as PID, PID takes as PID adjustment up limit F19.35 × main given frequency.	
F19.36	**Auxiliary PID output limit increase**	**0.0 - 100.0 [0.0%]**
	Auxiliray PID output limit = output limit comfirmed by F19.35 + F19.36 × F00.06.	

Frequency Adjust Range (F19.37)

Ref. Code	Function Description	Setting Range [Default]
F19.37	**Frequency adjust range selection**	**000 - 111 [100]**
	Unit: The main frequency calculation range • 0: 0 - Max. frequency. • 1: Negative Max. frequency - Max. frequency. **Ten: Auxiliary frequency calculation range** • 0: 0 - Max. frequency. • 1: Negative Max. frequency - Max. frequency. **Hundred: Synthetic frequency calculation range** • 0: 0 - upper limit frequency. • 1: Negative upper limit frequency - upper limit frequency.	

Short Detection (F19.38)

Ref. Code	Function Description	Setting Range [Default]
F19.38	**Phase short circuit detection action selection**	**0,1 [1]**
	Used to select whether or not to detect a short circuit between each run. 0: No detection. 1: Detection.	

Input Voltage Selection (F19.39)

Ref. Code	Function Description	Setting Range [Default]
F19.39	**Input voltage selection**	**000 - 002 [0]**
	Unit: 380V model input voltage selection • 0: 380 - 460V. • 1: 260 - 460V. • 2: 200 - 460V. **Ten, hundred: Reserved**	

Brake Function (F19.24 - F19.25, F19.40 - F19.41)

Ref. Code	Function Description	Setting Range [Default]
F19.40	**Flux brake PI regulator Kp**	**0 - 4000 [1000]**
F19.41	**Flux brake PI regulator Ki**	**0 - 500 [20]**

6.2.15 F20: Fault Protection Parameters

Overload Fault (F20.00 - F20.02)

Ref. Code	Function Description	Setting Range [Default]
F20.00	**Overload pre-alarm detection**	**00000 - 11111 [00000]**
	Unit: Overload pre-alarm detection • 0: It is active all the time in run status. • 1: It is active only at constant speed. **Ten: Action selection for overload pre-alarm** • 0: The inverter doesn't alarm and continues running when detecting an active overload signal. • 1: The inverter alarms and stops running when detecting an active overload signal. **Hundred: Overload threshold selection** • 0: Ratio of load current to the motor's rated current (alarm: motor overload). • 1: Ratio of load current to the inverter's rated current (alarm: inverter overload). **Thousand: Motor type selection** • 0: Standard motor. • As the cooling effect of the standard motor becomes worse at low speed, HD31 will automatically adjust the time of motor overload protection. • 1: Variable frequency. • 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 adjust the time of motor overload protection. **Ten thousand: Overload protection** • 0: Enabled. • 1: Disabled.	
F20.01	**Overload pre-alarm detected 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 detected 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 Detected Fault of HD31(F20.03 - F20.05)

Ref. Code	Function Description	Setting Range [Default]
F20.03	**Inverter output load-loss detection**	**0 - 4 [0]**
	0: Invalid. It does not detect output load-loss. 1: It detects all the time in running, and then continues running after detecting (alarm). 2: It detects only at the same speed, and then continues running after detecting (alarm). 3: It detects all the time in running, and then cuts off the output after detecting (fault). 4: It detects only at the same speed, and then cut off the output after detecting (fault).	
F20.04	**Inverter output load-loss detected threshold**	**0 - 100 [30%]**
	Defines the current threshold of load-loss. The current = F20.01 × rated current of HD31.	
F20.05	**Inverter output load-loss detected time**	**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	Function Description	Setting Range [Default]
F20.06	**Motor overheat signal input type**	**0 - 2 [0]**
	0: Does not detect the motor overheating. 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	Function Description	Setting Range [Default]
F20.08	**Input phase loss detected reference**	**0 - 50 [30%]**
F20.09	**Input phase loss detected 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 phase loss detected reference**	**0 - 100 [20%]**
F20.11	**Output phase loss detected time**	**1.00 - 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	Function Description	Setting Range [Default]
F20.12	**PID reference lose detected value**	**0 - 100 [0%]**
F20.13	**PID reference loss detected time**	**0.0 - 10.0 [0.2s]**
	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 detected value**	**0 - 100 [0%]**
F20.15	**PID feedback loss detected time**	**0.0 - 10.0 [0.2s]**
	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	Function Description	Setting Range [Default]
F20.16	**Detected value at PID feedback out of the limit**	**0 - 100 [100%]**
F20.17	**Detected 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 Faulty 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	Function Description	Setting Range [Default]
F20.18	**Auto reset times**	**0 - 100 [0]**
F20.19	**Auto reset interval**	**0.01 - 200.00 [5.00s/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 selection**	**00 - 11 [00]**
	Unit: In auto reset process • 0: Faulty relay doesn't act. • 1: Faulty relay acts. **Ten: 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	Function 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	Run 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 of fifth 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 latest fault	
F20.37	Interval of 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.	
F20.38	Last fault interval	[Actual value]
	F20.22 - F20.29 record the inverter status parameters at the last fault. F20.30 - F20.37 record the type and interval per time of four faults before the latest. The interval's unit is 0.1 hour.	

6.2.16 F23: PWM Control Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F23.00</td><td>Set the carrier frequency</td><td>1 - 16kHz [Depend on HD31]</td></tr>
<tr><td></td><td colspan="2">F23.00 defines the carrier frequency of PWM output wave.
<table>
<tr><th>Inverter Power</th><th>Setting Range</th><th>Factory Setting</th></tr>
<tr><td>7.5 - 30kW</td><td>1 - 16kHz</td><td>8kHz</td></tr>
<tr><td>37 - 45kW</td><td>1 - 12kHz</td><td>6kHz</td></tr>
<tr><td>55kW</td><td>1 - 6kHz</td><td>4kHz</td></tr>
<tr><td>≥ 75kW</td><td>1 - 4kHz</td><td>2kHz</td></tr>
</table>
• 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 set the carrier frequency reasonably.
• When the value > the factory setting, HD31 should be derated by 5% when per 1kHz is increased compared to the factory setting.</td></tr>
<tr><td>F23.01</td><td>Carrier frequency is automatically adjusted</td><td>0 - 2 [1]</td></tr>
<tr><td></td><td colspan="2">0: The carrier frequency is invalid automatically.
1: Carrier frequency automatic adjust to 1.
2: Carrier frequency automatic adjust to 2.
• When the carrier frequency is automatically adjusted, the inverter automatically adjusts the carrier frequency according to the output frequency and the radiator temperature.
• Invalid carrier frequency automatic adjust during torque control.</td></tr>
<tr><td>F23.02</td><td>PWM overshoot enable</td><td>0,1 [1]</td></tr>
<tr><td></td><td colspan="2">0: Invalid.
1: Valid.</td></tr>
<tr><td>F23.03</td><td>PWM modulation mode</td><td>0 - 2 [0]</td></tr>
<tr><td></td><td colspan="2">0: Two-phase modulation or three-phase modulation.
1: Three-phase modulation.
2: Two-phase modulation.</td></tr>
<tr><td>F23.04</td><td>PWM modulation mode switching point 1</td><td>0.00 - 50.00Hz</td></tr>
<tr><td>F23.05</td><td>PWM modulation mode switching point 2</td><td>[Dependent on HD31]</td></tr>
<tr><td></td><td colspan="2">PWM modulation mode switching only applies to working conditions of V/f control and carrier frequency > 3kHz. Open loop vector or carrier frequency ≤ 3kHz, the inverter automatically selects the three-phase modulation.
• F23.04 sets the switching frequency of two-phase modulation → three-phase modulation.
• 2.2kW and below models (380V and 220V) factory value 10.00Hz, the lower limit of 10.00Hz.
• Other models, factory default 5.00Hz, lower limit 5.00Hz.
• F23.05 sets the switching frequency of three-phase modulation → two-phase modulation.
• 2.2kW and below models (380V and 220V) factory value 15.00Hz.
• Other models, factory value 10.00Hz.
Note: F23.04 setting value is F23.05 - 2.00Hz, F23.05 lower limit is F23.04 + 2.00Hz.</td></tr>
</table>

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

6.3.1 P00: Water Supply Logic Parameter

Ref. Code	Function Description	Setting Range [Default]
P00.00	**Water supply mode**	**0,1 [1]**
	0: Running mode. • It is suitable for general water supply systems, such as domestic and production water supply, municipal water supply systems and sewage treatment systems. • In addition, this mode can also be selected in other similar systems, such as oil supply system, ventilation system, etc. 1: Water supply debug mode. • It is used for on-site debug 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 analog 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	**Standby pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
	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 the pumps 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 returned to normal pressure running when upper limit WL of intake pool < current WL.	
P00.06	**Pressure tolerance for adding pump**	**0.0 - 50.0 [10.0%]**
P00.07	**Detected 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]**

Ref. Code	Function Description	Setting Range [Default]
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 run 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, if the next pump is variable frequency pump. • The current running variable frequency pump needs switch to power frequency. The 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 debug. • **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 of pipe pressure, the current variable frequency pump reduces the output frequency to F00.09 according to P00.09, and performs PI adjustment. *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	**Detected 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, the pump is a variable frequency pump. • 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 performs PI adjustment. • 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 performs PI adjustment. *Note: Reduce the power frequency pump preferentially when there are inverter&power frequency pumps which run with power frequency.*	
P00.13	**Breaking delay of pump 1 contactor**	**0.000 - 5.000 [0.020s]**

Ref. Code	Function Description	Setting Range [Default]
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 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 run status and one 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 run status and one 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	**Sleep enable**	**0 - 4 [0]**
	0: No sleep. 1: Constant pressure sleep. 2: Specified pressure sleep. 3: No flow sleep 1. 4: No flow sleep 2. *Note: F00.21 and F00.22 support specified pressure sleep (it's sleep when the setting frequency meets lower limit frequency).*	
P00.18	**Pressure tolerance of sleep awakening**	**0.0 - 100.0 [10.0%]**
P00.19	**Delay time of sleep awakening**	**0.0 - 3600.0 [5.0s]**
	P00.17 = 0: Sleep function is invalid. • P00.17 = 1: When the system meets the condition of reducing pump, and there is no power frequency pump or variable frequency pump running at power frequency, the system will enter sleep status. Meanwhile, it will start a sleep pump if there is one in the system. • P00.17 = 2: When feedback pressure > setting pressure - setting pressure × P00.20, and the time set by P00.22 is exceeded, the system will stop all running pumps and sleep. • P00.17 = 3: When there is only one inverter in the system, the feedback pressure > setting prsssure - setting pressure × P00.20 and output frequency is less than P00.23 for a certain time, (if it is a start-up process, the time is P00.24, others is P00.22. if there is no special requirement, you can set P00.22 = P00.24), and the system will sleep. • P00.17 = 4: When there is only one inverter in the system, the feedback pressure > setting prsssure - setting pressure × P00.20 and output frequency is less than no-flow power or output frequency is less than P00.23 for a certain time (P00.22), the system will sleep. In sleep status, when feedback pressure < setting pressure - setting pressure × P00.18, and exceeds setting time of P00.19, the sleep is awakened. If P00.17 = 1 , the sleep pump is disconnected. When sleep 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	Function 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: Sleep pump > sewage pump > power frequency pump > variable frequency pump running with power frequency > variable frequency pump running with variable frequency.	
P00.22	**Detected time of shutdown detection**	**0.0 - 3600.0 [6.0s]**
P00.23	**No-flow detecting frequency**	**0.0 - 50.00 [25.00Hz]**
P00.24	**Detected 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, please 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 setting 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 setting 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, please select reasonbale curve.*	
P00.31	**Phase sequence detection enable from variable frequency to power frequency**	**0,1 [0]**
	0: Prohibited. • 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 Debug for Switching between VF and PF, on page 92.*	

Ref. Code	Function 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 setting 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 [0.020s]
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 [0.020s]
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 [0.020s]
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 [0.020s]
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 [0.020s]
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 [0.020s]
	For details, pleasure see P00.13, P00.14.	

6.3.2 P01: Water Supply Pump Parameter

Ref. Code	Function 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]

Ref. Code	Function Description		Setting Range [Default]
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. • When the conditions for switching the pump are not met, the pump is used as the variable frequency regulating pump of the entire water supply system, which is controlled by HD31 and automatically adjusts the speed of the pump according to the actual pressure of the system to maintain a constant system pressure. • When the switching condition is reached, the pump will switch to power frequency running or quit running according to the setting of switching mode. 2: Power frequency pump. It only runs with power frequency. • When the grid capacity is sufficient and the pump power is below 15kW, the full voltage direct start method can be used. • If the power of the pump is18.5kW and above, it is recommended to use reduced-voltage start methods, such as reduced-voltage start of Y-△mode, self coupling voltage start, soft start, etc. to reduce the impact on the grid and system pipe network. 3: Sleep pump. It serves as sleep pump for the system. • When the system reaches the set sleep conditions, the system enters sleep running, and automatically enters or wakes up sleep according to the set sleep pressure and deviation tolerance. 4: Sewage pump. It serves assewage pump for the system. • The prerequisite for the sewage pump setting is that the system must be equipped with a sewage pool water level sensor and correctly connected to HD31. HD31 automatically controls the sewage pump to start and stop according to the sewage pool water level. *Note:* *1. When the pump is set as a variable frequency pump, its corresponding variable frequency control relay and power frequency control relay must be set, otherwise it's not recognized as effective pump. If there is only one variable frequency pump in the system, and there is no inverter control relay or power frequency control relay, HD31 will not output after the system is started.* *2. When the pump is set as a power frequency pump, sleep pump, or sewage pump, its corresponding power frequency control relay must be set, otherwise it's not recognized as effective pump.*		
P01.07	**Rated current of pump 1**	**5.5kW above motor**	**0.1 - 999.9A [Depend on HD31]**
		5.5kW and below motor	**0.01 - 99.99A [Depend on HD31]**
P01.08	**Rated current of pump 2**	**5.5kW above motor**	**0.1 - 999.9A [Depend on HD31]**
		5.5kW and below motor	**0.01 - 99.99A [Depend on HD31]**
P01.09	**Rated current of pump 3**	**5.5kW above motor**	**0.1 - 999.9A [Depend on HD31]**
		5.5kW and below motor	**0.01 - 99.99A [Depend on HD31]**
P01.10	**Rated current of pump 4**	**5.5kW above motor**	**0.1 - 999.9A [Depend on HD31]**
		5.5kW and below motor	**0.01 - 99.99A [Depend on HD31]**
P01.11	**Rated current of pump 5**	**5.5kW above motor**	**0.1 - 999.9A [Depend on HD31]**
		5.5kW and below motor	**0.01 - 99.99A [Depend on HD31]**
P01.12	**Rated current of pump 6**	**5.5kW above motor**	**0.1 - 999.9A [Depend on HD31]**
		5.5kW and below motor	**0.01 - 99.99A [Depend on HD31]**
P01.13	**Rated current of pump 7**	**5.5kW above motor**	**0.1 - 999.9A [Depend on HD31]**
		5.5kW and below motor	**0.01 - 99.99A [Depend on HD31]**
	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	Function 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 analog water supply. The selected analog of P03.00 - P03.03 set the setting pressure.	
P02.01	**Pressure digital setting**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
	Used for digital pressure setting. 100.0% of digital setting is corresponding to 10V or 20mA. *Note:* *1. 100% 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 [0.0kg/cm²]**
P02.06	**T2 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.08	**T3 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.10	**T4 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.12	**T5 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.14	**T6 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.16	**T7 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.18	**T8 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.20	**T9 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.22	**T10 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**
P02.24	**T11 time pressure**	**0.0 - P05.03 × 10 [0.0kg/cm²]**

Ref. Code	Function Description	Setting Range [Default]
P02.26	**T12 time pressure**	**0.0 - P05.03 × 10 [0.0kg/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 period from the beginning of T1 till beginning of T2; T2 refers to the period from beginning of T2 till the beginning of T3, and so forth. T12 refer to the period from 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**	**0.00 - upper limit [50.00Hz]**
	Max. frequency of closed-loop regulator output.	
P02.28	**Proportional gain of pressure closed-loop (Kp)**	**0.00 - 10.00 [0.10]**
	Defines the proportional gain, decides the adjustment intensity of the regulator: The bigger Kp is, the greater the adjustment intensity.	
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-off**	**0,1 [1]**
	0: Not save. 1: Save. When P02.00 = 0 and inverter is in stop/running, setted pressure is displaying. We can adjust the setted pressure through ▲ or ▼ key. After power-off, adjusted pressure value can be saved by P02.35.	

6.3.4 P03: Water Supply AIO Function Parameter

Ref. Code	Function 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: Reserved. 1: Analog pressure setting. • When P02.00 = 2 (pressure setting of analog water supply), this function is selected by analog source, which corresponds to input voltage. The input voltage sets the setting pressure. 2: Analog feedback setting. • This function is selected by analog source, which corresponds to input voltage. The input voltage sets the feedback pressure. 3: Analog WL feedback. • When P00.01 = 2 (WL signal is set by analog source), this function is selected by analog 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 0.0 - 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: Reserved. 1 - 7: Pump 1 - 7 is in debug running. • Respectively specify inverter drive motor that needs debug start. When the debug 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 debug terminals, HD31 starts and switches them according to their consequence of switch off. 8 - 14: Pump 1 - 7 is 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	Function 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: Reserved. 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 debugging.
- Only power frequency signal is effective for power frequency pump, sewage pump and sleep pump.

15: Sleep running.

- This signal is valid when the system is in sleep 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: Standby 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 is not 0.

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

22: Reserved.

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>Function 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 [0.0kg/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">When the pipe network pressure reaches the Max. pressure set by P04.00 and continues for the time set by P04.01, the system will overpressure alarm.
After the alarm, the pipe network pressure is lower than the overpressure protection value and continues for the time set by P04.01 to eliminate the overpressure alarm.</td></tr>
<tr><td>P04.02</td><td>Setting value of under-pressure protection</td><td>0.0 - P05.03 × 10 [0.0kg/cm²]</td></tr>
<tr><td>P04.03</td><td>Detected 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 to the over-pressure (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 according to F20.18 and F20.19. If the fault can not be reset, the system automatically stop.
• 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>Reserved</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; 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	Function 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.	
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 terminals AI2, AI3, AI4 can input current signals, and the CN6 of the control board or the CN2 and CN3 jumpers on water supply card need to be changed. Refer to the jumper instruction in the user manual for details.* *2. When P05.04 = 2, set the F05.00 ten to 1 and set F05.05 = 20.0%. When P05.04 = 0 or 1, set F05.00 ten to 0 and set F05. 05 = 0.0%.*	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>P05.05</td><td>Water supply method selection</td><td>0x00 - 0x75 [0x00]</td></tr>
<tr><td></td><td colspan="2">Modify P05.05, the system will automatically set P01.00 - P01.06, P03.15 - P03.24. Setting principle:
Set variable frequency/power frequency pumps in sequence, and set variable frequency control for P03.16 - P03.24 and P03.15 in sequence.
For example: Set P05.05 = 0x24, the parameters automatically set, as follows:
<table>
<tr><th>Ref. Code</th><th>Function</th><th>Value</th><th>Defination</th></tr>
<tr><td>P01.00</td><td>Pump 1 type</td><td>1</td><td>Pump 1 is variable frequency pump</td></tr>
<tr><td>P01.01</td><td>Pump 2 type</td><td>1</td><td>Pump 2 is variable frequency pump</td></tr>
<tr><td>P01.02</td><td>Pump 3 type</td><td>1</td><td>Pump 3 is variable frequency pump</td></tr>
<tr><td>P01.03</td><td>Pump 4 type</td><td>1</td><td>Pump 4 is variable frequency pump</td></tr>
<tr><td>P01.04</td><td>Pump 5 type</td><td>2</td><td>Pump 5 is power frequency pump</td></tr>
<tr><td>P01.05</td><td>Pump 6 type</td><td>2</td><td>Pump 6 is power frequency pump</td></tr>
<tr><td>P01.06</td><td>Pump 7 type</td><td>0</td><td>Invalid</td></tr>
<tr><td>P03.15</td><td>RLY1 function</td><td>12</td><td>Pump 6 power frequency running</td></tr>
<tr><td>P03.16</td><td>RLY2 function</td><td>1</td><td>Pump 1 variable frequency running</td></tr>
<tr><td>P03.17</td><td>RLY3 function</td><td>2</td><td>Pump 1 power frequency running</td></tr>
<tr><td>P03.18</td><td>RLY4 function</td><td>3</td><td>Pump 2 variable frequency running</td></tr>
<tr><td>P03.19</td><td>RLY5 function</td><td>4</td><td>Pump 2 power frequency running</td></tr>
<tr><td>P03.20</td><td>RLY6 function</td><td>5</td><td>Pump 3 variable frequency running</td></tr>
<tr><td>P03.21</td><td>RLY7 function</td><td>6</td><td>Pump 3 power frequency running</td></tr>
<tr><td>P03.22</td><td>RLY8 function</td><td>7</td><td>Pump 4 variable frequency running</td></tr>
<tr><td>P03.23</td><td>RLY9 function</td><td>8</td><td>Pump 4 power frequency running</td></tr>
<tr><td>P03.24</td><td>RLY10 function</td><td>10</td><td>Pump 5 power frequency running</td></tr>
</table>
Note:
1. A unit 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.</td></tr>
<tr><td>P05.06</td><td>Water supply fault status display and clearing</td><td>0x00 - 0x11 [0x00]</td></tr>
<tr><td></td><td colspan="2">Unit: Water supply failure status display
• Display EP0 + fault pump record (P04.04).
Ten: STOP key to clear faulty pump status
• 0: Prohibited.
• 1: Enable.
Note:
1. Fault display (unit): Display EP0 + fault pump record (P04.04), if pump No.1 is faulty, display EP001 (EP0 + 01),
2. Fault pump clear (ten): After the system stops and the keypad displays the status interface, press the STOP key to clear.</td></tr>
</table>

Chapter 7 Application Reference

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

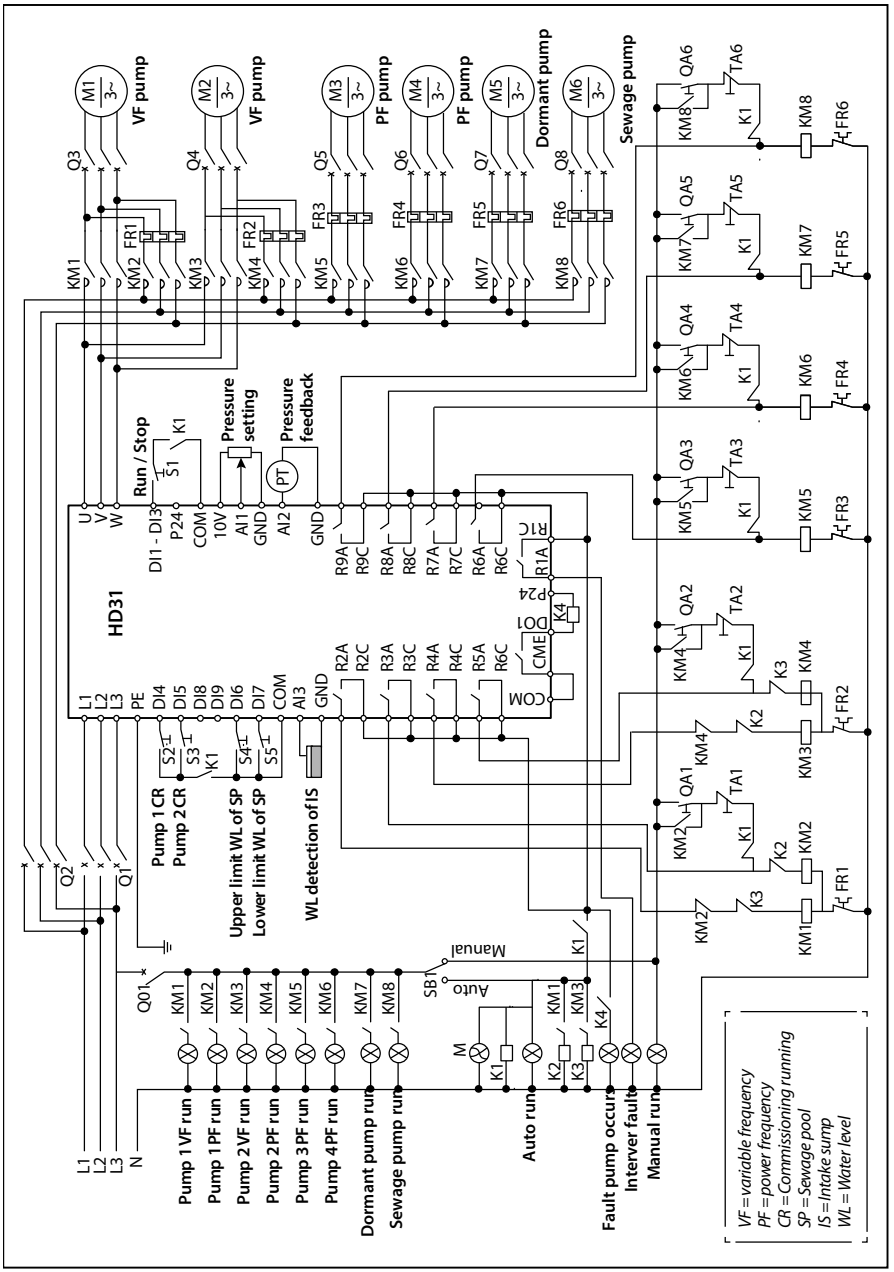
1. Compatible with: Variable pump × 2, industrial pumps × 2, sleep pump × 1, sewage pump × 1.

2. Technical requirements:

- The analog value sets the water pressure.
- The analog 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 HD30-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	Set it to 1 for debug and run to confirm that the wiring is correct, then change to 0 for water supply
P01.00	1	Pump 1&2: Variable frequency pump
P01.01	1	
P01.02	2	Pump 3&4: Power frequency pump
P01.03	2	
P01.04	3	Pump 5: Sleep pump
P01.05	4	Pump 6: Sewage pump
P01.06	0	Pump 7: Invalid
P01.07 - P01.13	Depend on HD31	Depend on rated current of motor
P03.07	1	DI4 function: Pump 1 debug running
P03.08	2	DI5 function: Pump 2 debug 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 is not 0
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	Analog value sets WL
P03.02	3	AI3 function: Anolog 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%	Standby pressure: 0.2Mpa
P02.00	2	Pressure setting of analog water supply
P03.00	1	AI1 function: Analog pressure setting
P03.01	2	AI2 function: Analog 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 Debug 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:

- Conduct professional wiring according to the actual pump configuration according to the wiring diagram in section 7.1.
- 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, you need to switch any two phases of the control cabinet, and reconfirm the power frequency contactor phase sequence and the inverter output phase sequence are consistent, that L1-U, L2-V, L3-W.
- Use the debug mode to confirm the motor rotation direction. If it is reversed, change the motor side to input any two phase sequence (please ensure F00.17 = 0, do not change the rotation direction of 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 debug 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		Reasons	Countermeasure
-Lu-	DC bus undervoltage	• At the begining of power-on and at the end of power-off • Input voltage is too low • Improper wiring leads to undervoltage of hardware	• It is normal status of power-on and power-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 • Dec. 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		Reasons	Countermeasure
E0008	Power module fault	• Short circuit between phases output • Short circuit to the ground • Output current is too high • Power module is damaged	• Check wiring, standardize wiring • Check wiring, standardize wiring • Check wiring 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 wiring • Set 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 wiring 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)

Fault		Reasons	Countermeasure
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
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 the motor that matches the inverter power • 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	• Analog reference signal < F20.12 • Analog input circuit fault	• Check the wiring • Seek technical support
E0026	PID feedback loss	• Analog setting < F20.14 • Analog input circuit fault	• Check the wiring • Seek technical support
E0027	PID feedback out of limit	• Analog setting signal > F20.16 • Analog input circuit fault	• Check the wiring • Seek technical support
E0028	SCI communication time-out	• Connection fault of communication cable • Disconnected or not well connected	• Check the wiring
E0029	SCI communication error	• Connection fault of communication cable • Disconnected or not well connected • Communication setting error • Communication data error	• Check the wiring • Check the wiring • 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.

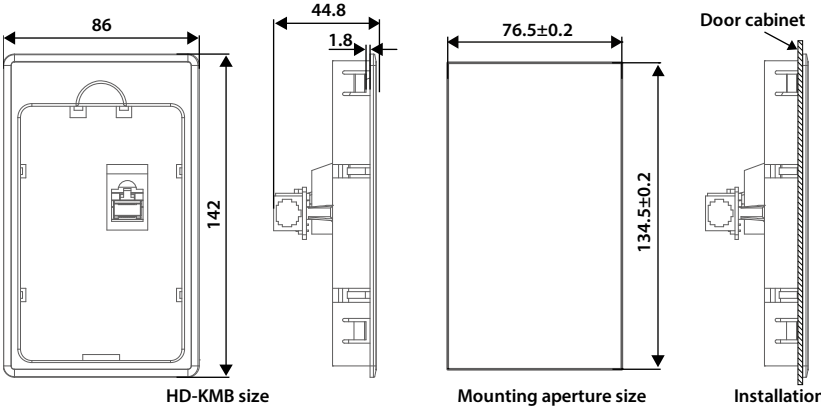


Figure 9-1 Mounting base and its size

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

Model	AC Input Reactor		AC Output Reactor		DC Reactor	
	Model	Parameter (mH-A)	Model	Parameter (mH-A)	Model	Parameter (mH-A)
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 Recommend for the braking unit and braking resistor

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

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:

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

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

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

"-": The same as the mapping functional parameter.

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00: Status Display Parameters						
d00.00	Inverter series	0x10 - 0x50			*	
d00.01	Software version of control board	00.00 - 99.99			*	
d00.03	Special software version of control board	00.00 - 99.99			*	
d00.05	Software version of keypad	00.00 - 99.99			*	
d00.06	Custom series number	0 - 9999			*	
d00.07	Motor and control mode	Unit: Display the current driving motor 0: Motor 1 1: Motor 2 Ten: Control mode 0: V/f control without PG 2: Vector control without PG			*	
d00.08	Rated current of the inverter	7.5kW or below type: 0.01A 11kW or above type: 0.1A			*	
d00.10	Inverter status	Unit: Bit0: Inverter fault Bit1: Run/stop Bit2: Forward/reverse Bit3: Zero speed running Ten: Bit1&Bit0: Acc./Dec./constant Bit3: DC braking (including start and stop DC braking) Hundred: Bit0: Parameter auto-tuning Bit2: Speed limiting value Bit3: Control mode Thousand: Bit0: Stall overvoltage Bit1: Current limiting			*	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00.11	Master setting frequency source	0: Keypad 1: Terminal 2: Communicaiton 3: Analog 4: Terminal pulse 6 - 9: AI1 - AI4 10: Keypad potentiometer 11: PID 12: Multi-speed 13: PLC			*	
d00.12	Master setting frequency	0.01 - 400.00Hz			*	
d00.13	Auxiliary setting frequency	0.01 - 400.00Hz			*	
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 speed	0 - 60000rpm			*	
d00.18	Running speed	0 - 60000rpm			*	
d00.20	Output voltage	0 - 999V			*	
d00.21	Output current	Actual value, unit is 0.1A			*	
d00.22	Torque given	-250.0 - +250.0% (motor rated torque)			*	
d00.23	Output torque	0 - 300.0% (motor rated torque)			*	
d00.24	Output power	Actual value, the 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 input voltage	0.00 - 10.00V			*	
d00.28	AI1 input voltage (after disposal)	0.00 - 10.00V			*	
d00.29	AI2 input voltage	-10.00 - +10.00V			*	
d00.30	AI2 input voltage (after disposal)	-10.00 - +10.00V			*	
d00.31	AI3 input voltage	-10.00 - +10.00V			*	
d00.32	AI3 input voltage (after disposal)	-10.00 - +10.00V			*	
d00.33	AI4 input voltage	-10.00 - +10.00V			*	
d00.34	AI4 input voltage (after disposal)	-10.00 - +10.00V			*	
d00.35	DI6 terminal pulse input frequency	0 - 50000Hz			*	
d00.36	AO1 output	0.00 - 10.00V			*	
d00.37	AO2 output	0.00 - 10.00V			*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00.38	High-speed output pulse frequency	0 - 50000Hz			*	
d00.39	Heatsink temperature	0.0 - 999.9℃			*	
d00.40	Setting line speed	0 - Max. output line speed			*	
d00.41	Reference line speed	0 - Max. output line speed			*	
d00.42	Set water supply pressure	0 - P05.03 × 10kg/cm^2			*	
d00.43	Actual water supply pressure	0 - P05.03 × 10kg/cm^2			*	
d00.44	Process PID reference	-100.0 - +100.0%			*	
d00.45	Process PID feedback	-100.0 - +100.0%			*	
d00.46	Process PID tolerance	-100.0 - +100.0%			*	
d00.47	Process PID integral item	-100.0 - +100.0%			*	
d00.48	Process 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 terminal disconnect with common terminal 1: Input terminal connect with common terminal			*	
d00.51	Output terminal status	Bit0 - Bit1 corresponding to DO1 - DO2 Bit2 - Bit5 corresponding to RLY1 - RLY10 0: Output terminal disconnect with common terminal 1: Output terminal connect with common terminal			*	
d00.52	Modbus communication status	0: Normal 1: Communication timeout 2: Incorrect data frame head 3: Incorrect data frame checking 4: Incorrect data frame content			*	
d00.53	Actual length (m)	0 - 65535m			*	
d00.54	Total length (km)	0 - 65535km			*	
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 energy con. for this run	0 - 65535k kW.h			*	
d00.60	Low energy con. for this run	0.0 - 999.9kW.h			*	
d00.61	Present fault	1 - 100 *100: Undervoltage*			*	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d02: Water Supply System Status						
d02.00	Current time	Current system time			*	
d02.01	Pump 1 status	0: Waiting for run 1: Running 2: Fault pump			*	
d02.02	Pump 2 status				*	
d02.03	Pump 3 status				*	
d02.04	Pump 4 status				*	
d02.05	Pump 5 status				*	
d02.06	Pump 6 status				*	
d02.07	Pump 7 status				*	
F00: Basic Parameter						
F00.00	Control mode selection	0: Speed control 1: Torque control	0	1	×	
F00.01	Motor 1 control mode selection	0: V/f control without PG 2: Vector control without PG	0	1	×	
F00.02	Inverter type setting	0: G type 1: P type	0	1	×	
F00.03	Motor selection	0: Motor 1 1: Motor 2	0	1	×	
F00.04	Extension card selection	0: Option is invalid 2: HD30-WIO is valid	0	1	×	
F00.05	HD31 extended function	0: No extended 1: Constant pressure water supply	0	1	×	
F00.06	HD31 Max. output frequency	50.00 - 400.00Hz	50.00Hz	0.01Hz	×	
F00.07	Upper limit of run frequency setting source	0: Digital setting (F00.08) 1: Analog input AI setting 2: DI6 pulse setting	0	1	×	
F00.08	Upper limit of run frequency	0.00Hz - F00.06	50.00Hz	0.01Hz	×	
F00.09	Lower limit of run frequency	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F00.10	Frequency setting access selection	0: Keypad digital setting 1: Terminal digital setting 2: SCI communication setting 3: AI analog setting 4: Terminal pulse setting 6 - 9: AI1 - AI4 setting 10: Keypad potentiometer setting	0	1	○	
F00.11	Command setting access selection	0: Keypad running access 1: Terminal running access 2: SCI communication running access	0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F00.12	**M** key function	0: Switch the keypad running direction 1: Switch local and remote control 2: Multi-function key is invalid	2	1	○	
F00.13	Starting frequency digital setting	0.00Hz - upper limit	50.00Hz	0.01Hz	○	
F00.14	Frequency setting control	Unit: Save selection of frequency setting at power-off 0: Do not store at power-off 1: Stored at power-off Ten: Control selection of frequency setting at stop 0: Do not restore to F00.13 at stop 1: Restore to F00.13 at stop Hundred: Save selection of communication setting frequency 0: Do not store at power-off 1: Stored at power-off Thousand: Switch the frequency access to the analog selection 0: Not save 1: Save	1001	1	○	
F00.15	Jog run frequency digital setting 1	0.00Hz - 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 run command 1: Opposite to run command	0	1	×	
F00.18	Reverse	0: Permitted 1: Prohibited	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: Enable 1: Invalid	0	1	○	
F00.21	Sleep function	0: Prohibited 1: Enable	0	1	×	
F00.22	Sleep wake up time	0.0 - 360.0s	1.0s	0.1s	○	
F00.24	Sleep delay time	0.0 - 6000.0s	1.0s	0.1s	○	
F00.25	Sleep frequency	0.00Hz - upper limit	0.00Hz	0.01Hz	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F00.26	Action selection for inverter running at zero frequency	Unit: When running is controlled by V/f, action selection of zero frequency 0: No treatment 1: Inverter locks output 2: Inverter runs in DC brake Ten: Zero frequency action selection in open loop vector running Hundred: Zero frequency action selection in torque control 0: No treatment 1: Inverter locks output 2: Inverter runs in DC brake 3: The frequency converter is run by pre-excitation	111	1	×	
F00.27	Command source binding frequency source selection	Unit: Keypad command binding frequency source selection Ten: Terminal command binding frequency source selection Hundred: Communication command binding frequency source selection 0: No binding 1: Keypad digital setting 2: Terminal digital setting 3: SCI communicaiton setting 5: Terminal pulse setting 7 - 9: AI1 - AI3 setting A: AI4 setting b: Keypad potentiometer setting C: PID setting d: Multi-speed setting	000	1	×	
F00.28	Functions selection of STOP key	0: Only valid in control of keypad 1: Valid in all control mode	0	1	○	
F01: Protection of Parameters						
F01.00	User's password	00000 - 65535	0	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F01.01	Menu mode	Unit: 0: Full menu mode 1: Verify menu mode (only display parameters that are different from factory setting) Ten: 0: Does not lock the parameter mapping relationship of group F 1: Lock the parameter mapping relationship of group F Hundred: 0: After password protection, group F parameters can be read 1: After password protection, group F parameters are prohibited from reading	010	1	○	
F01.02	Function code parameter initialization (download)	0: No operation 1: Restore to factory parameters 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	○	
F02: Run/Stop Control Parameters						
F02.00	Start mode selection	0: Start from starting DWELL frequency 1: Brake first and then start from DWELL frequency 2: Start after speed tracking	0	1	×	
F02.01	Starting delay time	0.00 - 10.00s	0.00s	0.01s	×	
F02.02	Start DWELL frequency setting	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F02.03	Retention time of starting DWELL frequency	0.00 - 10.00s	0.00s	0.01s	×	
F02.04	DC braking current setting	0 - 100% (HD31 rated current)	50%	1%	×	
F02.05	DC braking time at start	0.00 - 60.00s	0.50s	0.01s	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F02.06	Faster tracking results compensation value	0.000 - 2.000Hz	0.000Hz	0.001Hz	○	
F02.08	Voltage self-learning	0: Invalid 1: Valid	0	1	×	
F02.09	Search frequency direction reverse	0: Not reversed 1: Reversed	0	1	×	
F02.10	Speed search start threshold	0.0 - 60.0%	15.0%	0.1%	○	
F02.11	Voltage difference	0 - 200%	30%	1%	○	
F02.12	Speed search post-processing time	0.0 - 5.0s	Depend on HD31	0.1s	○	
F02.13	Stop mode selection	0: Dec. to stop 1: Coast to stop 2: Dec. to stop with DC braking	0	1	×	
F02.14	DWELL frequency setting at stop	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F02.15	Retention time of DWELL frequency at stop	0.00 - 10.00s	0.00s	0.01s	×	
F02.16	DC braking initial frequency at stop	0.00 - 50.00Hz	0.50Hz	0.01Hz	×	
F02.17	DC braking waiting time at stop	0.00 - 10.00s	0.00s	0.01s	×	
F02.18	DC braking time at stop	0.00 - 10.00s	0.50s	0.01s	×	
F02.19	Jog control mode	Unit: 0: Jog functions such as start and stop mode are invalid 1: Jog functions such as start and stop mode enabled Ten: 0: Terminal jog is not preferred 1: Terminal jog priority	10	1	×	
F02.20	Pre-excitation time	0.00 - 0.50s	0.50s	0.01s	×	
F02.21	Frequency threshold judged by voltage	0.00 - 20.00Hz	0.00Hz	0.01Hz	○	
F03: Acc./Dec. Parameters						
F03.00	Acc./Dec. mode selection	Unit: Mode selection of Acc. and Dec. 0: Linear Acc. or Dec. 1: S-curve Acc. or Dec. Ten: Acc./Dec. time reference frequency adjustment 0: Max. frequency (F00.06) 1: Set frequency	00	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F03.01	Acc. time 1	0.1 - 6000.0s	18.5kW or below: 10.0s 22 - 75kW: 30.0s 90kW and above: 60.0s	0.1s	○	
F03.02	Dec. time 1	0.1 - 6000.0s		0.1s	○	
F03.03	Acc. time 2	0.1 - 6000.0s		0.1s	○	
F03.04	Dec. time 2	0.1 - 6000.0s		0.1s	○	
F03.05	Acc. time 3	0.1 - 6000.0s		0.1s	○	
F03.06	Dec. time 3	0.1 - 6000.0s		0.1s	○	
F03.07	Acc. time 4	0.1 - 6000.0s		0.1s	○	
F03.08	Dec. time 4	0.1 - 6000.0s		0.1s	○	
F03.09	Switching frequency of Acc. time 2 and time 1	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F03.10	Switching frequency of Dec. time 2 and time 1	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F03.11	S-curve characteristic time at starting Acc.	0.00 - 2.50s	0.20s	0.01s	○	
F03.12	S-curve characteristic time at ending Acc.	0.00 - 2.50s	0.20s	0.01s	○	
F03.13	S-curve characteristic time at starting Dec.	0.00 - 2.50s	0.20s	0.01s	○	
F03.14	S-curve characteristic time at ending Dec.	0.00 - 2.50s	0.20s	0.01s	○	
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	○	
F04: Process PID Control						
F04.00	Process PID control selection	0: Invalid 1: Valid	0	1	×	
F04.01	Reference source selection	0: Digital reference 1: AI analog reference 2: Terminal pulse reference 3 - 6: AI1 - AI4 reference 7: Keypad potentiometer reference	0	1	×	
F04.02	Feedback source selection	0: AI analog feedback 1: Terminal pulse feedback 2 - 5: AI1 - AI4 reference 6: Keypad potentiometer reference 7: Speed closed loop feedback	0	1	×	
F04.03	Setting digital reference	-100.0 - +100.0%	0.00%	0.01%	○	
F04.04	Proportional gain (P1)	0.0 - 500.0	50.0	0.1	○	
F04.05	Integral time (I1)	0.01 - 10.00s	1.00s	0.01s	○	
F04.06	Integral upper limit	0.0 - 100.0%	100.0%	0.1%	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F04.07	Differential time (D1)	0.00 - 10.00s *0.00: The differential is disabled*	0.00s	0.01s	○	
F04.08	Differential amplitude limit value	0.00 - 100.0%	20.0%	0.1%	○	
F04.09	Sampling cycle (T)	0.01 - 50.00s	0.10s	0.01s	○	
F04.10	Bias limit	0.0 - 20.0% (reference)	0.0%	0.1%	○	
F04.11	PID regulator upper limit access selection	0: Set F04.13 1: Set AI analog value 2: Set by terminal pulse input 3 - 6: Set AI1 - AI4 7: Set keypad potentiometer	0	1	×	
F04.12	PID regulator lower limit access selection	0: Set F04.14 1: Set AI analog value 2: Set by terminal pulse input 3 - 6: Set AI1 - AI4 7: Set keypad potentiometer	0	1	×	
F04.13	PID regulator upper limit value	0.00Hz - upper limit	50.00Hz	0.01Hz	×	
F04.14	PID regulator lower limit value	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F04.15	PID regulator characteristic	0: Positive 1: Negative	0	1	×	
F04.17	PID output filter time	0.01 - 10.00s	0.05s	0.01s	○	
F04.18	PID output reverse selection	0: PID regulation prohubits reverse (when PID output is negative, 0 is the limit) 1: PID regulation allows reverse (when F00.18 = 1, prohibits reverse, 0 is the limit)	0	1	×	
F04.19	PID output reverse frequency's upper limit	0.00Hz - upper limit	50.00Hz	0.01Hz	×	
F04.20	Proportional gain (P2)	0.0 - 500.0	50.0	0.1	○	
F04.21	Integral time (I2)	0.01 - 10.00s	1.00s	0.01s	○	
F04.22	Derivative time (D2)	0.00 - 10.00s	0.00s	0.01s	○	
F04.23	PID parameter adjustment basis	0: Do not adjust 1: DI 2: Deviation 3: Frequency	0	1	○	
F04.24	PID parameter switching point 1	0.0% - F04.25	0.0%	0.1%	○	
F04.25	PID parameter switching point 2	F04.24 - 100.0%	100.0%	0.1%	○	
F04.27	Pulse of each turn	1 - 9999	1024	1	×	
F04.28	Max. closed loop speed	1 - 24000rpm	1500rpm	1rpm	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F04.29	PID arithmetic mode	0: No operation at stop 1: Operation at shutdown	0	1	×	
F04.30	PID sleep	0: No sleep 1: Sleep enable	0	1	×	
F04.31	Tolerance of waking up	0.0 - 100. 0%	0.0%	0.1%	○	
F04.32	Delay of waking up	0.0 - 6000.0s	10.0s	0.1s	○	
F04.33	Sleep tolerance	0.0 - 100.0%	0.0%	0.1%	○	
F04.34	Sleep delay	0.0 - 6000.0s	10.0s	0.1s	○	
F04.35	Sleep frequency	0.00Hz - Max. frequency	20.00Hz	0.01Hz	○	
F05: External Setting Curve Parameters						
F05.00	External reference curve selection	Unit: AI1 characteristic curve selection Ten: AI2 characteristic curve selection Hundred: AI3 characteristic curve selection Thousand: AI4 characteristic curve selection Ten thousand: Pulse input characteristic curve selection Each unit setting: 0: Line 1 1: Line 2 2: Polyline 3: No treatment	33333	1	×	
F05.01	Min. reference of line 1	0.0% - F05.03	0.0%	0.1%	○	
F05.02	Min. reference corresponding value of line 1	0.0 - 100.0%	0.0%	0.1%	○	
F05.03	Max. reference of line 1	F05.01 - 100.0%	100.0%	0.1%	○	
F05.04	Max. reference corresponding value of line 1	0.0 - 100.0%	100.0%	0.1%	○	
F05.05	Min. reference of line 2	0.0% - F05.07	0.0%	0.1%	○	
F05.06	Min. reference corresponding value of line 2	0.0 - 100.0%	0.0%	0.1%	○	
F05.07	Max. reference of line 2	F05.05 - 100.0%	100.0%	0.1%	○	
F05.08	Max. reference corresponding value of line 2	0.0 - 100.0%	100.0%	0.1%	○	
F05.09	Max. reference of polyline	F05.11 - 100.0%	100.0%	0.1%	○	
F05.10	Max. given corresponding value of polyline	0.0 - 100.0%	100.0%	0.1%	○	
F05.11	Inflection point 2 reference 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%	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F05.13	Inflection point 1 reference 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. reference of polyline	0.0% - F05.13	0.0%	0.1%	○	
F05.16	Min. reference 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					
F05.19	Skip frequency 3					
F05.20	Range of skip frequency	0.00 - 30.00Hz	0.00Hz	0.01Hz	○	
F05.21	Jog run frequency digital setting 2	0.00Hz - upper limit	5.00Hz	0.01Hz	○	
F05.22	Keypad potentiometer curve selection	0: Straight line 1 1: Straight line 2 2: Polyline 3: No treatment	3	1	×	
F08: Asyn. Motor 1 Parameters						
F08.00	Rated power of motor 1	0.2 - 999.9kW	Depend on HD31	0.1kW	×	
F08.01	Rated voltage of motor 1	0V - inverter's rated voltage		1V	×	
F08.02	Rated current of motor 1	7.5kW above: 0.1 - 2500.0A		0.1A	×	
		7.5kW or below: 0.01 - 250.00A		0.01A	×	
F08.03	Rated frequency of motor 1	1.0 - 400.0Hz	50.0Hz	0.1Hz	×	
F08.04	Rated speed of motor 1	1 - 24000rpm	1500rpm	1rpm	×	
F08.05	Power factor of motor 1	0.001 - 1.000	Depend on HD31	0.001	×	
F08.06	Parameter auto-tuning of motor 1	0: Auto-tuning is disabled 1: Stationary auto-tuning 2: Rotary auto-tuning 3: Motor stator resistance measurement	0	1	×	
F08.07	Stator resistance of motor 1	7.5kW or below: 0.00 - 99.99Ω	Depend on HD31	0.01Ω	×	
		11 - 90kW: 0.000 - 9.999Ω		0.001Ω		
		90kW above: 0.0000 - 0.9999Ω		0.0001Ω		
F08.08	Rotor resistance of motor 1	7.5kW or below: 0.00 - 99.99Ω		0.01Ω	×	
		11 - 90kW: 0.000 - 9.999Ω		0.001Ω		
		90kW above: 0.0000 - 0.9999Ω		0.0001Ω		
F08.09	Leakage inductance of motor 1	7.5kW or below: 0.0 - 5000.0mH		0.1mH	×	
		11 - 90kW: 0.00 - 500.00mH		0.01mH		
		90kW above: 0.000 - 50.000 mH		0.001 mH		
F08.10	Mutual inductance of motor 1	7.5kW or below: 0.0 - 5000.0mH		0.1mH	×	
		11 - 90kW: 0.00 - 500.00mH		0.01mH		
		90kW above: 0.000 - 50.000 mH		0.001 mH		

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F08.11	Idling exciting current of motor 1	7.5kW or below: 0.00 - 99.99A		0.01A	×	
		7.5kW above: 0.0 - 999.9A		0.1A		
F08.12	Core saturation coefficient 1	0.00 - 1.00	1.00	0.01	×	
F08.13	Core saturation coefficient 2	0.00 - 1.00	1.00	0.01	×	
F08.14	Core saturation coefficient 3	0.00 - 1.00	1.00	0.01	×	
F08.15	Core saturation coefficient 4	0.00 - 1.00	1.00	0.01	×	
F08.16	Core saturation coefficient 5	0.00 - 1.00	1.00	0.01	×	
F09: V/f Control Parameters						
F09.00	V/f curve selection of motor 1	0: Line shown as curve 0 1: Square curve 2: 1.2 exponential curve 3: 1.7 exponential curve 4: User-defined curve	0	1	×	
F09.01	V/f frequency value F3 of motor 1	F09.03 - 100.0%	80.0%	0.1%	×	
F09.02	V/f voltage value V3 of motor 1	F09.04 - 100.0%	80.0%	0.1%	×	
F09.03	V/f frequency value F2 of motor 1	F09.05 - 100.0%	50.0%	0.1%	×	
F09.04	V/f voltage value V2 of motor 1	F09.06 - 100.0%	50.0%	0.1%	×	
F09.05	V/f frequency value F1 of motor 1	0.0% - F09.03	0.0%	0.1%	×	
F09.06	V/f voltage value V1 of motor 1	0.0% - F09.04	0.0%	0.1%	×	
F09.07	Torque boost of motor 1	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 1	0.0 - 50.0% (F08.03)	25.0%	0.1%	○	
F09.09	Slip compensation gain of motor 1	0.0 - 300.0%	0.0%	0.1%	○	
F09.10	Slip compensation filter time of motor 1	0.01 - 10.00s	0.10s	0.01s	○	
F09.11	Slip compensation limit of motor 1	0.0 - 250.0%	200.0%	0.1%	×	
F09.12	Compensation time constant of motor 1	0.1 - 25.0s	2.0s	0.1s	×	
F09.14	AVR function of motor 1	0: Disabled 1: Enabled all the time 2: Disabled in Dec. process	1	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F09.15	Motor 1 low frequency suppression shock coefficient	0 - 200	50	1	○	
F09.16	Motor 1 high frequency suppression shock coefficient	0 - 200	20	1	○	
F09.17	Motor 1 energy saving control select	0: Invalid 3: According to output current	0	1	×	
F09.18	Motor 1 energy saving factor	0.0 - 100.0%	5.0%	0.1%	○	
F09.19	Motor 1 energy start frequency	0.00 - 50.00Hz	25.00Hz	0.01Hz	○	
F09.20	Motor 1 energy switching point	0.0 - 100.0%	100.0%	0.1%	○	
F09.21	Motor 1 energy saving detecting times	0 - 5000 times	10 times	1 times	○	
F13: Asyn. Motor 2 Parameters						
F13.00	Control mode selection of motor 2	0: V/f control without PG 2: Vector control without PG	0	1	×	
F13.01	Rated power of motor 2	0.2 - 999.9kW	Depend on HD31	0.1kW	×	
F13.02	Rated voltage of motor 2	0 - 999V		1V	×	
F13.03	Rated current of motor 2	7.5kW above: 0.0 - 2500.0A		0.1A	×	
		7.5kW or below: 0.00 - 250.00A		0.01A		
F13.04	Rated frequency of motor 2	1.0 - 400.0Hz	50.0Hz	0.1Hz	×	
F13.05	Rated speed of motor 2	1 - 24000rpm	Depend on HD31	1rpm	×	
F13.07	Parameter auto-tuning of motor 2	0: Auto-tuning is disabled 1: Stationary auto-tuning 2: Rotary auto-tuning 3: Motor stator resistance measurement	0	1	×	
F13.08	Stator resistance of motor 2	7.5kW or below: 0.00 - 99.99Ω	Depend on HD31	0.01Ω	×	
		11 - 90kW: 0.000 - 9.999Ω		0.001Ω		
		90kW above: 0.0000 - 0.9999Ω		0.0001Ω		
F13.09	Rotor resistance of motor 2	7.5kW or below: 0.00 - 99.99Ω		0.01Ω	×	
		11 - 75kW: 0.000 - 9.999Ω		0.001Ω		
		90kW above: 0.0000 - 0.9999Ω		0.0001Ω		
F13.10	Leakage inductance of motor 2	7.5kW below: 0.0 - 5000.0mH		0.1mH	×	
		11 - 75kW: 0.00 - 500.00mH		0.01mH		
		90kW above: 0.000 - 50.000 mH		0.001 mH		
F13.11	Mutual inductance of motor 2	7.5kW below: 0.0 - 5000.0mH		0.1mH	×	
		11 - 75kW: 0.00 - 500.00mH		0.01mH		
		90kW above: 0.000 - 50.000 mH		0.001 mH		
F13.12	Idling exciting current of motor 2	7.5kW or below: 0.00 - 99.99A		0.01A	×	
		7.5kW above: 0.0 - 999.9A		0.1A		

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F13.13	Core saturation coefficient 1	0.00 - 1.00	1.00	0.01	×	
F13.14	Core saturation coefficient 2					
F13.15	Core saturation coefficient 3					
F13.16	V/f curve selection of motor 2	0: Line 1: Square curve 2: 1.2 exponential curve 3: 1.7 exponential curve 4: User-defined curve	0	1	×	
F13.17	V/f frequency value F3	F13.19 - 100.0%	0.0%	0.1%	×	
F13.18	V/f voltage value V3	F13.20 - 100.0%	0.0%	0.1%	×	
F13.19	V/f frequency value F2	F13.21 - F13.17	0.0%	0.1%	×	
F13.20	V/f voltage value V2	F13.22 - F13.18	0.0%	0.1%	×	
F13.21	V/f frequency value F1	0.0% - F13.19	0.0%	0.1%	×	
F13.22	V/f voltage value V1	0.0% - F13.20	0.0%	0.1%	×	
F13.23	Torque boost of motor 2	0.0 - 30.0% *0.0: Auto torque boost*	55kW and below: 2.0% 75 - 132 kW: 1.0%	0.1%	×	
F13.24	Cut-off point used for manual torque boost of motor 2	0.0 - 50.0% (F13.04)	30.0%	0.1%	○	
F13.25	Slip compensation gain	0.0 - 300.0%	0.0%	0.1%	○	
F13.26	Slip compensation filter time	0.01 - 10.00s	0.10s	0.01s	○	
F13.27	Slip compensation limitation	0.0 - 250.0%	200.0%	0.1%	×	
F13.28	Compensation constant	0.000 - 9.999kW	Depend on HD31	0.001kW	×	
F13.30	AVR function of motor 2	0: No action 1: Act all the time 2: No action in Dec. process	1	1	○	
F13.31	Motor 2 low frequency suppression shock coefficient	0 - 200	50	1	○	
F13.32	Motor 2 high frequency suppression shock coefficient	0 - 200	20	1	○	
F13.33	Motor 2 energy saving control select	0: Invalid 3: According to output current	0	1	×	
F13.34	Motor 2 energy saving factor	0.0 - 100.0%	5.0%	0.1%	○	
F13.53	Motor 2 core saturation coefficient 4	0.00 - 1.00	1.00	0.01	×	
F13.54	Motor 2 core saturation coefficient 5	0.00 - 1.00	1.00	0.01	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F13.58	Motor 2 energy start frequency	0.00 - 50.00Hz	25.00Hz	0.01Hz	○	
F13.59	Motor 2 energy switching point	0.0 - 100.0%	100.0%	0.1%	○	
F13.60	Motor 2 energy saving detecting times	0 - 5000 times	10 times	1 times	○	
F13.61	Motor 2 energy voltage recovery time	40 - 4000ms	100ms	1ms	○	
F13.62	Motor 2 energy voltage decreasing time	40 - 4000ms	100ms	1ms	○	
F15: Digital I/O Terminal Parameters						
F15.00	DI1 function	0: Reserved 1: Inverter enabled 2: FWD function 3: REV function 4: Three-wire operation mode 5, 6, 7: Frequency access selects 1, 2, 3 8: The frequency switch to analog setting 9, 10: Run command access selects 1, 2 11: Switch to terminal control mode 12: External stop command input 13 - 16: Multi-step frequency terminal 1 - 4 17: Frequency ramp (UP) 18: Frequency ramp (DN) 19: Clear auxiliary frequency setting 20, 21: Command control input for forward/reverse jog 1 (JOGF1/JOGR1) 22, 23: Command control input for forward/reverse jog 2 (JOGF2/JOGR2) 24: Jog 1 command control input 25: Jog 1 direction control input *Remark: When selects 20 and 21, the functions 24 and 25 are invalid* 26: Acc./Dec. time selects terminal 1 27: Acc./Dec. time selects terminal 2 28: Acc./Dec. mode selection 29: Acc./Dec. prohibited 30: Switch to ordinary running mode 31: Reset the stop status of PLC operation	2	1	×	
F15.01	DI2 function		3	1	×	
F15.02	DI3 function		0	1	×	
F15.03	DI4 function		0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.04	DI5 function	32: Pause the process PID 33: Prohibit the process PID 34: Hold PID integral 35: Clear PID integral 36: Switch to wobble operation 37: Reset the wobble operating status 38: DC braking start while stopping 39: External pause signal (normally-open input) 40: External pause signal (normally-closed input) 41, 42: Coast to stop (normally-open/normally-closed input) 43: Emergency stop 44: External fault signal (normally-open input) 45: External fault signal (normally-closed input) 46: External reset (RST) input 47: Switch between motor 1 and motor 2 48: Timing function input 49: Clear the length 50: Clear the counter to zero 51: Counter's triggering signal input 52: Length counting input (only DI6) 53: Pulse frequency input (DI6) 54: Clear fault records 56: Speed control/torque control switching 57: Torque control torque polarity switching 59: PID parameter switch 85: Pause PLC operation 86: Terminal stop DC braking 87: Frequency setting access selection 4	0	1	×	
F15.05	DI6 function		0	1	×	
F15.06	DI7 (option terminal) function		0	1	×	
F15.07	DI8 (option terminal) function		0	1	×	
F15.08	DI9 (option terminal) function		0	1	×	
F15.12	Acc./Dec. rate of UP/DN terminal	0.00 - 99.99Hz/s	1.00Hz/s	0.01Hz/s	×	
F15.13	Terminal detecting interval	0: 2ms 1: 4ms 2: 8ms	0	1	○	
F15.14	Terminal detecting filter number	0 - 10000	2	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.15	Terminal input positive and negative logic setting	Bit0 - Bit8 is corresponding to DI1 - DI9 Bitx: Dly terminal input positive and negative logic • 0: Positive logic • 1: Negative logic	000	1	○	
F15.16	FWD/REV operation mode	0, 1: Two-wire running mode 1, 2 2: Three-wire running mode 1 3: Three-wire running mode 2	0	1	×	
F15.17	Terminal operating selection due to fault of external equipment	0: Coast to stop 1: Emergency stop 2: Dec. to stop 3: Continue to run	0	1	×	
F15.18	DO1 function	0: Reserved 1: Inverter ready 2: Inverter is running (RUN) 3: Inverter is forward running 4: Inverter is reverse running 5: Inverter is DC braking 6: Inverter is in zero-frequency status 7: Inverter is in zero-frequency running 9, 10: Frequency detection threshold (FDT1, FDT2) 11: Frequency arriving signal (FAR) 12: Limitation of upper limit of frequency 13: Limitation of lower limit of frequency 14: Limitation of upper/lower limits of wobble frequency 15: Simple PLC operating status indication 16: Simple PLC pausing indication 17: Simple PLC cycle completion indication 18: Completion of simple PLC operation stages 19: Completion of simple PLC operation 20: Output data from SCI communication 21: Preset operating time out 22: Timing function output 23: Preset counting value reach 24: Indicate counting value reach 25: Set length arrive	2	1	○	
F15.19	DO2 function		0	1	○	
F15.20	RLY1 function		31	1	○	
F15.21	RLY2 function		0	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.22	RLY3 function	26: Indicate motor 1 and motor 2 27: Analog input overrun output 29: Undervoltage lock-up signal (LU) 30: Overload signal (OL) 31: Inverter fault	0	1	○	
F15.23	RLY4 function	32: External fault 33: Inverter auto-reset fault 35: Sleep indicting function 36: The system is running 38: High-frequency output (DO2)	0	1	○	
F15.24	Output terminal positive and negative logic selection	Bit0 - Bit1 is corresponding to DO1 - DO2 Bit2 - Bit5 is corresponding to RLY1 - RLY4 Bitx: DOy and RLYy terminals output positive and negative logic 0: Positive logic 1: Negative logic	000	1	○	
F15.25	ON side delay time of timing function	0.00 - 300.00s	0.00s	0.01s	○	
F15.26	OFF side delay time of timing function	0.00 - 300.00s	0.00s	0.01s	○	
F15.27	FAR range	0.00 - 100.00Hz	2.50Hz	0.01Hz	○	
F15.28	Zero-frequency operation threshold	0.00Hz - upper limit	0.00Hz	0.01Hz	○	
F15.29	Zero-frequency hysteresis	0.00Hz - upper limit	0.00Hz	0.01Hz	○	
F15.30	FDT1 detection mode	0: Detect according to the reference frequency 1: Detect according to the output frequency	0	1	○	
F15.31	FDT1 level	0.00Hz - upper limit	50.00Hz	0.01Hz	○	
F15.32	FDT1 lag	0.00Hz - upper limit	1.00Hz	0.01Hz	○	
F15.33	FDT2 detection mode	0: Detect according to the reference frequency 1: Detect according to the output frequency	0	1	○	
F15.34	FDT2 level	0.00Hz - F00.06	50.00Hz	0.01Hz	○	
F15.35	FDT2 lag	0.00Hz - F00.06	1.00Hz	0.01Hz	○	
F15.36	Preset running time	0 - 65535h *0: Preset operating time is disabled*	0h	1h	○	
F15.37	Preset counting value arriving	F15.38 - 9999	0	1	○	
F15.38	Specified counting value arriving	0 - F15.37	0	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.39	Analog input over-limitation selection	Unit: Action drive when the input exceeds the limit 0: Free stop 1: Emergency shutdown 2: Dec. stop 3: No action Ten: Select the analog input port 0: No analog port 1: Keypad potentiometer 2: AI1 port 3: AI2 port Hundred: Analog overrun detection conditions 0: Always detected 1: Run command is detected Thousand: Automatical selection when analog overrun is detected 0: Do not allow automatic running 1: Allows automatic running	0000	1	×	
F15.40	Analog input overrun upper limit	F15.41 - 100.0%	100.0%	0.1%	○	
F15.41	Analog input overrun lower limit	0.0% - F15.40	0.0%	0.1%	○	
F15.42	Analog overrun detection time	0.00 - 50.00s	5.00s	0.01s	○	
F15.43	Terminal output delay	0.0 - 100.0s	0.0s	0.1s	○	
F15.44	Start analog overrun detection time	0.00 - 50.00s	15.00s	0.01s	○	
F16: Analog I/O Terminal Parameters						
F16.01	AI1 function	0: Reserved 1: Upper limit frequency setting source 2: Frequency setting 3: Auxiliary frequency reference 4: Process PID reference 5: Process PID feedback 6: Process PID regulating upper limit 7: Process PID regulating lower limit 8: Motor overheating signal input 9: Motor 1 forward rotation torque limit 10: Motor 1 reverse electric torque limit 11: Motor 1 forward regeneration rotation torque limit	2	1	×	
F16.02	AI2 function		5	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F16.03	AI3 function	12: Motor 1 reverse regeneration rotation torque limit 13: Torque command given 15: Torque control upper limit frequency 16: Motor 2 forward rotation electrical torque limit 17: Motor 2 reverse rotation electrical torque limit 18: Motor 2 forward regeneration torque limit 19: Motor 2 reverse regeneration torque limit	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 filter time	0.01 - 10.00s	0.05s	0.01s	○	
F16.10	AI2 filter time	0.01 - 10.00s	0.05s	0.01s	○	
F16.13	AI3 filter time	0.01 - 10.00s	0.05s	0.01s	○	
F16.16	AI4 filter 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	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F16.19	AO1 function	0: Reserved 1, 2: Output frequency/setting frquency (0 - Max. output frequency) 3: Motor speed (0 - Max. output frequency corresponding to speed) 4: Output current (0 - 2 times of inverter rated current) 5: Output current (0 - 2 times of motor rated current) 6: Torque command (0 - 3 times motor rated torque) 10: Output torque (0 - 3 times motor rated torque) 11: Output voltage (0 - 1.2 times inverter rated voltage) 12: Bus voltage (0 - 2.2 times inverter rated voltage) 13: Output power (0 - 2 times motor rated power) 14: AI1 input (0 - 10V) 15: AI2 input (-10 - +10V/0 - 20mA) 16: AI3 input (-10 - +10V/0 - 20mA) 17: AI4 input (-10 - +10V/0 - 20mA) 18: Output frequency (-1 - +1 times Max. output frequency) 19: Reference frequency (-1 - +1 times Max. output frequency) 20: Set frequency (0 - Max. output frequency)	2	1	○	
F16.20	AO2 function		0	1	○	
F16.21	High-speed pulse output function		0	1	○	
F16.22	Analog output AO1 bias	-100.0 - +100.0%	0.0%	0.1%	○	
F16.23	Analog output AO1 gain	0.0 - 200.0%	100.0%	0.1%	○	
F16.24	Analog output AO2 bias	-100.0 - +100.0%	0.0%	0.1%	○	
F16.25	Analog output 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	○	
F16.27	Keypad potentiometer offset	-100.0 - +100.0%	0.0%	0.1%	○	
F17: SCI Communication Parameters						
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 6: 1-8-11 format, no parity, RTU	0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F17.01	Baud rate selection	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps 6: 57600bps 7: 76800bps 8: 115200bps	3	1	×	
F17.02	Local address	0 - 247	2	1	×	
F17.03	Host PC response time	0 - 1000ms	1s	1ms	×	
F17.04	Time threshold for detecting communication status	0.0 - 600.0s *0.0: Not detect communication time out*	0.0s	0.1s	×	
F17.05	Detecting time at communication error	0.0 - 600.0s *0.0: Not detect communication error*	0.0s	0.1s	×	
F17.06	Action selection at communication time out	0: Coast to stop 1: Emergency stop 2: Dec. to stop 3: Continue to run	3	1	×	
F17.07	Action selection at communication fault		3	1	×	
F17.08	Action selection at communication peripheral device fault		1	1	×	
F17.09	Communication write function parameter of storage EEPROM method selection	Unit: Except of F00.13, F19.03, EEPROM storage selection in communication Ten: For F00.13, F19.03, EEPROM storage selection in communication 0: Not save in EEPROM 1: Save in EEPROM	01	1	×	
F17.10	Detecting time of network communicaiton overtime	0.0 - 600.0s *0.0: Not detected communication timeout*	0.0s	0.1s	×	
F18: Display Control Parameters						
F18.00	Language selection	0: Chinese 1: English	0	1	○	
F18.01	Display contrast of the LCD keypad	1 - 10	5	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F18.02	Set the display parameter 1 during running	0: Reserved 1: Inverter's rated current 3: Inverter status 4: Master setting frequency source 5: Master setting frequency 6: Auxiliary setting frequency 7: Setting frequency 8: Reference frequency (after Acc./Dec.) 9: Output frequency 10: Setting speed 11: Running speed 13: Output voltage 14: Output current 15: Torque given 16: Output torque 17: Output power 18: DC bus voltage 19: Potentiometer input voltage 20: AI1 input voltage 21: AI1 input voltage (after disposal) 22: AI2 input voltage 23: AI2 input voltage (after disposal) 24: AI3 input voltage 25: AI3 input voltage (after disposal) 26: AI4 input voltage 27: AI4 input voltage (after disposal) 28: DI6 terminal pulse input frequency 29: AO1 output 30: AO2 output 31: High-speed output pulse frequency 32: Heatsink temperature 33: Set the line speed 34: Reference line speed 35: Content water supply pressure setting 36: Actual feedback pressure 37: Process PID reference 38: Process PID feedback 39: Process PID error 40: Process PID integral value 41: Process PID output 42: External couting value 43: Input terminal status	8	1	○	
F18.03	Set the display parameter 2 during running		7	1	○	
F18.04	Set the display parameter 3 during running		36	1	○	
F18.05	Set the display parameter 4 during running		13	1	○	
F18.06	Set the display parameter 5 during running		14	1	○	
F18.07	Set the display parameter 6 during running					
F18.08	Set the display parameter 1 at stop		7	1	○	
F18.09	Set the display parameter 2 at stop		18	1	○	
F18.10	Set the display parameter 3 at stop		20	1	○	
F18.11	Set the display parameter 4 at stop		22	1	○	
F18.12	Set the display parameter 5 at stop		35	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F18.13	Set the display parameter 6 at stop	44: Output terminal status 45: Modbus communication status 46: Actual length 47: Total length 48: Total time at power on (hour) 49: Total time at running (hour)				
F18.14	Frequency display gain	0.1 - 160.0	1.0	0.1	○	
F18.15	Max. line speed	0 - 65535	1000	1	○	
F18.16	Line speed display accuracy	0: Integer 1: One decimal 2: Two decimal 3: Three decimal	0	1	○	
F19: Function-boost Parameters						
F19.00	Auxiliary frequency setting access selection	0: No auxiliary source 1: Digital setting 1 (the initial value is set by F19.03 and adjusted by ▲ and ▼ keys on the keypad) 2: Digital setting 2 (the initial value is set by F19.03 and adjusted by terminals UP/DN) 3: Digital setting 3 (the initial value = 0, set by SCI direct communication) 4: AI analog setting 5: Terminal pulse setting 6: Process PID output 7 - 10: AI1 - AI4 11: Keypad potentiometer	0	1	○	
F19.01	Master/auxiliary setting calculation	Unit: Main and auxiliary operations 0: Master setting + auxiliary setting 1: Master setting - auxiliary setting Ten: Frequency source switch selection 0: Main 1: Main and auxiliary operations 2: Main and auxiliary switching 3: Master and main auxiliary operation switch 4: Auxiliary and main auxiliary operation switch	10	1	○	
F19.02	Analog auxiliary setting coefficient	0.00 - 9.99	1.00	0.01	○	
F19.03	Initial value of digital auxiliary frequency	0.00Hz - F00.06	0.00Hz	0.01Hz	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19.04	Control selection of digital auxiliary frequency	Unit: Save selection at power -down (only when F19.00 = 1 or 2, F19.04 is valid) 0: Not save auxiliary frequency at power-off 1: The auxiliary frequency saved to F19.03 at power-off Ten: Frequency disposal when the inverter stops 0: Maintain the auxiliary frequency when the inverter stops 1: The auxiliary frequency clears to zero when it stops	00	1	○	
F19.05	Adjustment selection of setting frequency	0: No adjustment 1: To adjust as per the Max. output frequency 2: To adjust as per the current frequency	1	1	○	
F19.06	Adjustment coefficient of setting frequency	0.0 - 200.0%	100.0%	0.1%	○	
F19.07	Control selection of cooling fan	0: Auto stop mode 1: Immediate stop mode 2: The fan runs continuously when power on	0	1	○	
F19.08	Cooling fan control delay time	0.0 - 600.0s	60.0s	0.1s	○	
F19.10	Zero-frequency threshold	0.00Hz - upper limit	1.00Hz	0.01Hz	○	
F19.11	Action selection at setting frequency is lower than zero-frequency threshold	0: Run according to frequency command 1: Hold stop, no output 2: Run according to zero-frequency threshold 3: Run according to zero-frequency	0	1	×	
F19.12	Trip-free selection at momentary power-off	0: Invalid 1: Valid	0	1	×	
F19.13	Dec. time at voltage compensation	0.1 - 6000.0s	5.0s	0.1s	○	
F19.15	Reference voltage of trip-free operation at moment of power-off	220V inverter: 210 - 370V	248V	1V	×	
		380V inverter: 400 - 670V	430V			
		660V inverter: 620 - 1130V	747V			
F19.16	Restart after power-off	0: Prohibited 1: Enabled	0	1	×	
F19.17	Delay time for restart after power-off	0.00 - 10.00s	2.00s	0.01s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19.18	Overvoltage suppression gain	0.000 - 1.000 *0.000: Overvoltage stall is prohibited*	0.500	0.001	○	
F19.19	Stall overvoltage point	220V inverter: 350 - 400V	390V	1V	○	
		380V inverter: 650 - 790V	690V			
		660V inverter: 900 - 1180V	1150V			
F19.20	Auto current limiting selection	0.000 - 1.000 *0.000: The automatic current limit is invalid*	0.500	0.001	○	
F19.21	Auto current limiting threshold	20.0 - 200.0%	110.0%	0.1%	○	
F19.23	Terminal running commands valid method	Unit: Terminal detection at the moment of power-on Ten: Effective way to run command 0: Rising edge enabled mode 1: Level enabled mode	0	1	○	
F19.24	Action voltage of braking unit	630 - 750V	720V	1V	○	
F19.25	Flux brake enabled	0: Prohibited 1: Enable	0	1	○	
F19.26	Preset length	0 - 65535m	0m	1m	○	
F19.27	Actual length	0 - 65535m	0m	1m	*	
F19.28	Length ratio	0.001 - 30.000	1.000	0.001	○	
F19.29	Length checking coefficient	0.001 - 1.000	1.000	0.001	○	
F19.30	Measuring shaft diameter	1.00 - 100.00cm	10.00cm	0.01cm	○	
F19.31	Number of pulses per revolution	1 - 9999	1	1	○	
F19.32	Length arrive and output function selection	0: Output level signal 1: Output 500ms pulse	0	1	○	
F19.33	Record of length disposal after length arrive	0: Auto-clear 1: No change	0	1	○	
F19.34	Record of length disposal at stop	0: Auto-clear 1: No change	0	1	○	
F19.35	Auxiliary PID output limit	0.0 - 100.0%	100.0%	0.1%	×	
F19.36	Auxiliary PID output limit increase	0.0 - 100.0%	0.0%	0.1%	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19.37	Frequency adjust range selection	Unit: The main frequency calculation range 0: 0 - Max. frequency 1: Negative Max. frequency - Max. frequency Ten: Auxiliary frequency calculation range 0: 0 - Max. frequency 1: Negative Max. frequency - Max. frequency Hundred: Synthetic frequency calculation range 0: 0 - upper limit frequency 1: Negative upper limit frequency - upper limit frequency	100	1	○	
F19.38	Phase short circuit detection action selection	0: No detection 1: Detection	1	1	○	
F19.39	Input voltage selection	Unit: 380V model input voltage selection 0: 380 - 460V 1: 260 - 460V 2: 200 - 460V Ten, hundred: Reserved	0	1	×	
F19.40	Flux brake PI regulator Kp	0 - 4000	1000	1	○	
F19.41	Flux brake PI regulator Ki	0 - 500	20	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20: Protection of Fault Parameters						
F20.00	Overload pre-alarm detection	Unit: Overload pre-alarm detection 0: It is active all the time in running status 1: It is active only at constant speed Ten: Action selection for overload pre-alarm 0: The inverter doesn't alarm and continues running when detecting active overload signal 1: The inverter alarms and stops running when detecting an active overload signal Hundred: Overload threshold selection 0: Ratio of load current to the motor's rated current (alarm: motor overload) 1: Ratio of load current to the inverter's rated current (alarm: inverter overload) Thousand: Motor type selection 0: Standard motor 1: Variable frequency Ten thousand: Overload protection 0: Enabled 1: Disabled	00000	1	○	
F20.01	Overload pre-alarm detected threshold	20.0 - 200.0%	150.0%	0.1%	○	
F20.02	Overload pre-alarm detected time	0.0 - 60.0s	5.0s	0.1s	○	
F20.03	Inverter output load-loss detection	0: Invalid 1: It detects all the time in running process, and then continues running after detecting (alarm) 2: It detects only at the same 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 the same speed, and then cut off the output after detecting (fault)	0	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.04	Inverter output load-loss detected threshold	0 - 100%	30%	1%	○	
F20.05	Inverter output load-loss detected time	0.00 - 20.00s	1.00s	0.01s	○	
F20.06	Motor overheat signal input type	0: Do not detect the motor overheating 1: Positive charateristic (PTC) 2: Negative charateristic (NTC)	0	1	○	
F20.07	Thermistor value at motor overheating	0.0 - 10.0kΩ	5.0kΩ	0.1kΩ	○	
F20.08	Input phase loss detected reference	0 - 80% *0%: Not detect input phase loss fault*	30%	1%	○	
F20.09	Input phase loss detected time	1.00 - 5.00s	1.00s	0.01s	○	
F20.10	Output phase loss detected reference	0 - 100% *0%: Not detect output phase loss fault*	20%	1%	○	
F20.11	Output phase loss detected time	1.00 - 20.00s	3.00s	0.01s	○	
F20.12	PID reference lose detected value	0 - 100% *0%: Not detect PID reference lose*	0%	1%	○	
F20.13	PID reference loss detected time	0.00 - 10.00s *0.00s: Not detect PID reference 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 detected time	0.00 - 10.00s *0.00s: 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 *0.00s: 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	0.01 - 200.00s/time	5.00s/time	0.01s/time	○	
F20.20	Faulty relay action selection	Unit: In auto reset process Ten: In the undervoltage process 0: Faulty relay doesn't act 1: Faulty relay acts	00	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.21	Type of fifth latest (the last) fault	E0001: Acc. overcurrent E0002: Dec. overcurrent E0003: Costant overcurrent E0004: Acc. overvoltage E0005: Dec. overvoltage E0006: Constant overvoltage E0007: Stall overvoltage E0008: Power module fault E0009: Heatsink overheat E0010: Braking unit fault E0011: CPU fault E0012: Parameters auto-tuning fault E0013: Contactor is not acted E0014: Current detection fault E0015: Fault of input phase E0016: Fault of output phase E0017: Inverter overload E0018: Inverter output unloaded 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: Parameters setting fault E0024: Peripheral device fault E0025: PID reference loss E0026: PID feedback loss E0027: PID feedback out of limiting 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	0.10Hz	*	
F20.24	Bus voltage at the last fault	0 - 1999V	0V	1V	*	
F20.25	Output voltage at the last fault	0 - 999V	0V	1V	*	
F20.26	Output current at the last fault	7.5kW above: Actual value	0.0A	0.1A	*	
		7.5kW or below: Actual value	0.00A	0.01A		
F20.27	Input terminal status at the last fault	0 - 0x1FF	0	1	*	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.28	Output terminal status at the last fault	0 - 0x7FF	0	1	*	
F20.29	Interval of fifth latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.30	Type of fourth latest fault	0 - 99	0	1	*	
F20.31	Interval of fourth latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.32	Type of third latest fault	0 - 99	0	1	*	
F20.33	Interval of third latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.34	Type of second latest fault	0 - 99	0	1	*	
F20.35	Interval of second latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.36	Type of latest fault	0 - 99	0	1	*	
F20.37	Interval of latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.38	Last fault interval	0.0 - 6553.5h	0.0h	0.1h	*	
F23: PWM Control Parameters						
F23.00	Set the carrier frequency	1 - 16kHz	Depend on HD31	1kHz	×	
F23.01	Carrier frequency is automatically adjusted	0: The carrier frequency is invalid automatically 1: Carrier frequency auto adjust to 1 2: Carrier frequency auto adjust to 2	1	1	×	
F23.02	PWM overshoot enable	0: Invalid 1: Valid	1	1	×	
F23.03	PWM modulation mode	0: Two-phase or three-phase modulation 1: Three-phase modulation 2: Two-phase modulation	0	1	×	
F23.04	PWM modulation mode switching point 1	0.00 - 50.00Hz	Depend on HD31	0.01Hz	×	
F23.05	PWM modulation mode switching point 2					
P00: Water Supply Logic Parameter						
P00.00	Water supply mode	0: Running mode 1: Debug mode	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%	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P00.04	Water shortage WL of intake pool	0.0% - P00.03	10.0%	0.1%	○	
P00.05	Standby pressure	0.0 - P05.03 × 10kg/cm²	0.0kg/cm²	0.1kg/cm²	○	
P00.06	Pressure tolerance for adding pump	0.0 - 50.0%	10.0%	0.1%	○	
P00.07	Detected 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	Detected time for reducing pump	0.0 - 3600.0s	5.0s	0.1s	○	
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 contactor	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	Sleep enable	0: No sleep 1: Constant pressure sleep 2: Specified pressure sleep 3: No flow sleep 1 4: No flow sleep 2	0	1	○	
P00.18	Pressure tolerance of sleep awakening	0.0 - 100.0%	10.0%	0.1%	○	
P00.19	Delay time of sleep 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	Detected time of shutdown detection	0.0 - 3600.0s	6.0s	0.1s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P00.23	No-flow detecting frequency	0.00 - 50.00Hz	25.00Hz	0.01Hz	○	
P00.24	Detected time for no-flow detecting start delay	0.00 - 3600.00s	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: Prohibited 1: Enable	0	1	×	
P00.32	Switching angle of variable and power frequecny of pump 1	-50.0 - +50.0°	0.0°	0.1°	○	
P00.33	Switching angle of variable and power frequecny of pump 2					
P00.34	Switching angle of variable and power frequecny of pump 3					
P00.35	Switching angle of variable and power frequecny of pump 4					
P00.36	Switching angle of variable and power frequecny of pump 5					
P00.37	Switching angle of variable and power frequecny of pump 6					
P00.38	Switching angle of variable and power frequecny of pump 7					
P00.39	Dealy of pump 2 contactor breaking	0.000 - 5.000s	0.020s	0.001s	○	
P00.40	Dealy of pump 2 contactor touching					
P00.41	Dealy of pump 3 contactor breaking					

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P00.42	Dealy of pump 3 contactor touching	0.000 - 5.000s	0.020s	0.001s	○	
P00.43	Dealy of pump 4 contactor breaking					
P00.44	Dealy of pump 4 contactor touching					
P00.45	Dealy of pump 5 contactor breaking					
P00.46	Dealy of pump 5 contactor touching					
P00.47	Dealy of pump 6 contactor breaking					
P00.48	Dealy of pump 6 contactor touching					
P00.49	Dealy of pump 7 contactor breaking					
P00.50	Dealy of pump 7 contactor touching					
P01: Water Supply Pump Parameter						
P01.00	Pump 1 type	0: Invalid 1: Variable frequency pump 2: Power frequency pump 3: Sleep pump 4: Sewage pump	0	1	×	
P01.01	Pump 2 type		0	1	×	
P01.02	Pump 3 type		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	5.5kW above motor: 0.1 - 999.9A	Depend on motor	0.1A	×	
		5.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.08	Rated current of pump 2	5.5kW above motor: 0.1 - 999.9A		0.1A	×	
		5.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.09	Rated current of pump 3	5.5kW above motor: 0.1 - 999.9A		0.1A	×	
		5.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.10	Rated current of pump 4	5.5kW above motor: 0.1 - 999.9A		0.1A	×	
		5.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.11	Rated current of pump 5	5.5kW above motor: 0.1 - 999.9A		0.1A	×	
		5.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.12	Rated current of pump 6	5.5kW above motor: 0.1 - 999.9A		0.1A	×	
		5.5kW and below motor: 0.01 - 99.99A		0.01A		
P01.13	Rated current of pump 7	5.5kW above motor: 0.1 - 999.9A		0.1A	×	
		5.5kW and below motor: 0.01 - 99.99A		0.01A		

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P02: Water Supply PID Parameter						
P02.00	Pressure setting source	0: Digital setting 1: Timing water supply 2: Analog water supply	0	1	×	
P02.01	Pressure digital setting	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
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	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.05	T2 start time	00.00 - 23.59	00.00	0.01	×	
P02.06	T2 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.07	T3 start time	00.00 - 23.59	00.00	0.01	×	
P02.08	T3 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.09	T4 start time	00.00 - 23.59	00.00	0.01	×	
P02.10	T4 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.11	T5 start time	00.00 - 23.59	00.00	0.01	×	
P02.12	T5 time pressure	0.00 - P05.03 × 10kg/cm2	0.00kg/cm²	0.10kg/cm²	×	
P02.13	T6 start time	00.00 - 23.59	00.00	0.01	×	
P02.14	T6 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.15	T7 start time	00.00 - 23.59	00.00	0.01	×	
P02.16	T7 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.17	T8 start time	00.00 - 23.59	00.00	0.01	×	
P02.18	T8 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.19	T9 start time	00.00 - 23.59	00.00	0.01	×	
P02.20	T9 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.21	T10 start time	00.00 - 23.59	00.00	0.01	×	
P02.22	T10 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.23	T11 start time	00.00 - 23.59	00.00	0.01	×	
P02.24	T11 time pressure	0.00 - P05.03 × 10kg/cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.25	T12 start time	00.00 - 23.59	00.00	0.01	×	
P02.26	T12 time pressure	0.00 - P05.03 × 10kg/ cm²	0.00kg/cm²	0.10kg/cm²	×	
P02.27	Upper limit of pressure closed-loop	0.00Hz - upper limit	50.00Hz	0.01Hz	○	
P02.28	Proportional gain of pressure closed-loop (Kp)	0.00 - 10.00	0.10	0.01	○	
P02.29	Integration time of pressure closed-loop (Ti)	0.01 - 10.00	0.10	0.01	○	
P02.30	Differential time of pressure closed-loop (Td)	0.00 - 1.00	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 - 30.00	0.50s	0.01s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
P02.34	Regulating characteristic of pressure closed-loop	0: Positive characteristic 1: Negative characteristic	0	1	○	
P02.35	Digital setting for saving selection when power off	0: Not save 1: Save	1	1	○	
P03: Water Supply AIO Function Parameter						
P03.00	AI1 function	0: Reserved 1: Analog pressure setting 2: Analog feedback setting 3: Analog WL feedback	0	1	×	
P03.01	AI2 function					
P03.02	AI3 function					
P03.03	AI4 function					
P03.04	DI1 function	0: Reserved 1 - 7: Pump 1 - 7 is in debug running 8 - 14: Pump 1 - 7 is invalid 15, 16: Upper/lower limit WL of intake pool 17: Water shortage WL 18, 19: Upper/lower limit WL of sewage pool	0	1	×	
P03.05	DI2 function					
P03.06	DI3 function					
P03.07	DI4 function					
P03.08	DI5 function					
P03.09	DI6 function					
P03.10	DI7 function					
P03.11	DI8 function					
P03.12	DI9 function					
P03.13	DO1 function	0: Reserved 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: Sleep running 16: Over-pressure 17: Under-pressure 18: Standby pressure running 19: Pool water shortage 20: WL of the sewage pool reaches the upper limit 21: Faulty pump occurs 22: Reserved 23: The supply system is in running status	0	1	×	
P03.14	DO2 function					
P03.15	RLY1 function					
P03.16	RLY2 function					
P03.17	RLY3 function					
P03.18	RLY4 function					
P03.19	RLY5 function					
P03.20	RLY6 function					
P03.21	RLY7 function					
P03.22	RLY8 function					
P03.23	RLY9 function					
P03.24	RLY10 function					
P04: Water Supply Fault Protection Parameter						
P04.00	Setting value of over-pressure protection	0.00 - P05.03 × 10kg/cm^2	0.00kg/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	0.00 - P05.03 × 10kg/cm^2	0.00kg/cm^2	0.10kg/cm^2	○	
P04.03	Detected time of under-pressure protection	0.0 - 3600.0s	300.0s	0.1s	○	

A

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
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						
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 - 10.0MPa	1.6MPa	0.1MPa	×	
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	×	
P05.06	Water supply fault status display and clearing	Unit: Water supply failure status display Display EP0 + fault pump record (P04.04) Ten: STOP key to clear faulty pump status 0: Prohibited 1: Enable	0x00	1	○	

Appendix B Modbus Communication Protocol

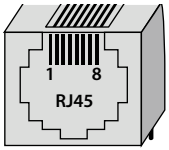
1. Introduction

HD31 series inverters provide one RS485 communication interface which uses the standard Modbus communication protocol.

By using the host computer (including communication devices such as computer and PLC) the user can operate to read-write the inverter's function code, read the status parameters and write the control command etc. The inverter is in slave mode when it is communicating.

Communication Terminal

The communication terminal is shown in following table.

<table>
<tr><th colspan="2">Terminal</th><th colspan="2">Description</th></tr>
<tr><td rowspan="6"> 

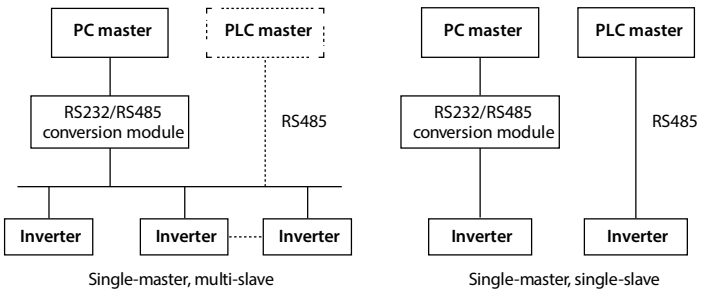
SCI terminal</td><td>Pin</td><td>Difinition</td></tr>
<tr><td>1, 3</td><td>+5V</td></tr>
<tr><td>2</td><td>485+</td></tr>
<tr><td>4, 5, 6</td><td>GND</td></tr>
<tr><td>7</td><td>485-</td></tr>
<tr><td>8</td><td>Reserved</td></tr>
<tr><td rowspan="3"> 

Terminal</td><td>Terminal</td><td>Description</td></tr>
<tr><td>A</td><td>485+</td></tr>
<tr><td>B</td><td>485-</td></tr>
</table>

The transmitting mode is shown in following table.

Port	Asyn., half-duplex
Format	1-8-2 (1 start bit, 8 data bits, 2 stop bits), no parity, RTU
Baud Rate	9600bps
Relative Setting	Refer to F17: SCI Communication Parameters

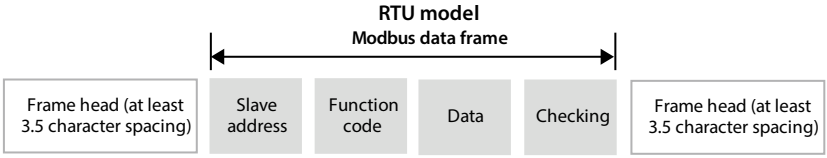
Network Mode



B

Protocol Format

The Modbus protocol simultaneously supports RTU mode, the corresponding frame format is as follows:



Modbus adopts "Big Endian" encoding mode, sending high byte first, then low byte.

In the RTU mode

- The idle time of frame head and frame tail passing bus should be not less than 3.5 bytes.
- Slave address = 0, it means broadcast address.
- Data checking uses CRC-16. The whole information need be checked. The concrete CRC checking is referred to the page 144.

For example: To read the slave internal register F00.08 = 50.00Hz of No.1 address:

Request	**Address**	**Parameter**	**Register Address**		**Register Number**		**Checksum**	
Frame	0x01	0x03	0x00	0x08	0x00	0x01	0x05	0xC8
Response	**Address**	**Parameter**	**Response Byte**		**Content of Register**		**Checksum**	
Frame	0x01	0x03	0x02		0x13	0x88	0xB5	0x12

2. Scaling of Drive Transmitting Value

Except the parameters of the remarks, all other function codes can define the scaling relationship of the specified function code via referring the manual's Min. unit.

Remarks:

1. Communication data for F04.03, F21.01, F16.05, F16.08, F16.11, F16.14, F16.22, F16.24 0 - 2000 corresponding to the data -1000 - +1000.

2. Status parameter 0x3318 communication data 0 - 16000 corresponds to data -8000 - +8000.

3. Status parameters: AI2 - AI4 input voltage, AI2 - AI4 input voltage (after processing), process PID reference, process PID feedback, process PID error, process PID integral item and process PID output communication data 0-2000 corresponding data -1000 - +1000.

3. Protocol Function

Support Function

Modbus protocol supports the below parameter operation:

Support Function	**Code**	**Instruction**
To read function parameters and status parameter	0x03	
To rewrite single function parameter or control parameter	0x06	Whether to save when power-off is set by F17.09
	0x41	Don't save when power-off
To rewrite numbers of function parameters or control parameters	0x10	Whether to save when power-off is set by F17.09
	0x43	Save when power-off

To Read Function Parameters and Status Parameter

Function code 0x03, the request frame and response frame are in below table.

Request Frame	Address	Code	Starting Register Address	Register Number	CRC/LRC Check
Data frame bytes	1	1	2	2	2/1
Value or range	0 - 247	0x03	0x0000 - 0xFFFF	0x0001 - 0x000C	

Response Frame	Address	Code	Read Byte Number	Register Content	CRC/LRC Check
Data frame bytes	1	1	1	2 * No. of register	2/1
Value or range	1 - 247	0x03	2 * No. of register		

To Rewrite Single Function Parameter or Control Parameter

Function code 0x06 (saving or not is set by F17.09 in power-off) or 0x41 (not save at power-off).

Request frame and response frame are in below table.

Request Frame	Address	Code	Register Address	Register Content	CRC/LRC Check
Data frame bytes	1	1	2	2	2/1
Value or range	0 - 247	0x06, 0x41	0x0000 - 0xFFFF	0x0000 - 0xFFFF	

Response Frame	Address	Code	Register Address	Register Content	CRC/LRC Check
Data frame bytes	1	1	2	2	2/1
Value or range	1 - 247	0x06, 0x41	0x0000 - 0xFFFF	0x0000 - 0xFFFF	

To Rewrite Numbers of Function Parameters or Control Parameters

Function code 0x06 (saving or not is set by F17.09 in power-off) or 0x43 (save at power-off). Request frame and response frame are in below table.

Request Frame	Address	Code	Starting Register Address	Number of Register	Byte No. of Register Content	Register Content	CRC/LRC Checking
Data frame bytes	1	1	2	2	1	2 * No. of operation registers	2/1
Value or range	0 - 247	0x10, 0x43	0x0000 - 0xFFFF	0x0000 - 0x0004	2 * No. of operation registers		

Response Frame	Address	Code	Starting Register Address	No. of Operation Registers	CRC Check
Data frame bytes	1	1	2	2	2/1
Value or range	1 - 247	0x10, 0x43	0x0000 - 0xFFFF	0x0000 - 0x0004	

This request rewrites the contents of continuous data unit starting from register address where is mapped as function parameter and control parameter of controller, etc.

The inverter will start to save from low address to high address of the register when it continuously saves many register parameters. The saving will return from the firstly failed address if the saving process isn't completely successful.

Fault and Exception Code

If the operation request fails, the response is fault code. The fault code is + 0x80. Below is the instruction for the exception codes.

Exception Code	Instruction
0x01	Illegal function parameters.
0x02	Illegal register address.
0x03	Data fault. Data is exceeded the upper/lower limit.
0x04	Slave operation fails (including fault caused by data invalid).
0x16	Unsupported operation (unsupported to read the attributes, factory default and upper/lower limit for the control parameter and status parameter).
0x17	The register number of request frame is fault.
0x18	Incorrect information frame, including incorrect information length and incorrect checking.
0x20	Parameters cannot be modified.
0x21	Parameters are unchangeable when the controller is in running status.
0x22	Parameters are protected by password.

4. Address Mapping

The function parameters, control parameters and status parameters are all mapped as Modbus's read-write register.

Function Code Address Mapping

The group numbers are mapped as higher bytes of register address while the relationships are shown as below table.

The inter group indexes are mapped as lower bytes. Please refer to user manual for index of F00 - F23.

High Bytes of Register Address	Group Number	High Bytes of Register Address	Group Number	High Bytes of Register Address	Group Number
0x00	F00	0x0d	F13	0x28	P00
0x01	F01	0x0f	F15	0x29	P01
0x02	F02	0x10	F16	0x2a	P02
0x03	F03	0x11	F17	0x2b	P03
0x04	F04	0x12	F18	0x2c	P04
0x05	F05	0x13	F19	0x2d	P05
0x08	F08	0x14	F20		
0x09	F09	0x17	F23		

For example: The register address of function parameter F03.02 is 0x0302, and that of function parameter F16.01 is 0x1001.

Control Parameter (0x32) Address Mapping

The users can realize the inverter's starting, stopping and running speed setting through the control parameter, and obtain the inverter's running frequency, output current, etc. through indexing the inverter's status parameters.

The status parameters (0x32) are mapped as higher bytes of the register address, and the inter group indexes are as following:

Register Address	Parameter Name	Retained or Not at Power Loss
0x3200	Control command character	No
0x3201	Running frequency setting	Saving or not is set by hundreds bit of F00.14 in power failure
0x3202	Auxiliary running frequency setting	No
0x3204	Virtual terminal control setting	No

B

Definition of inverter control command words (0x3200):

Bit	Value and Definition		Function Description
Bit0	0: Invalid run command	1: Valid run command	To control the inverter's starting and stop (in edge triggering mode)
Bit1	0: Forward	1: Reverse	Running direction: Equivalent to the terminal FWD/REV
Bit2	0: Reserved	1: Stop mode: Dec. to stop	Dec. to stop the inverter (in edge triggering mode)
Bit3	0: Reserved	1: Stop mode: Emergency to stop	Emergency to stop the inverter (in edge triggering mode)
Bit4	0: Reserved	1: Stop mode: Coast to stop	Coast to stop the inverter (in edge triggering mode)
Bit5	0: Reserved	1: Stop mode: External fault	The inverter is displaying external fault, and will stop in accordance with F17.08 setting mode or continue to run
Bit6	0: Jog forward stop	1: Jog forward run	Jog forward control
Bit7	0: Jog reverse stop	1: Jog reverse run	Jog reverse control
Bit8	0: Fault reset is invalid	1: Fault reset is valid	Fault reset control
Bit9 - Bit11	0: Reserved		
Bit12	0: Invalid current control	1: Valid current control	The present sending control word is valid
Bit13 - Bit15	0: Reserved		

The content of the register can be defined as control commands, as shown in the table below, i.e. the logical combination of control command words and bits.

Register Content	Control Command	Register Address	Parameter Name
0x1001	Forward running	0x1020	Stop due to external fault
0x1003	Reverse running	0x1040	Forward jog
0x1004	Dec. to stop	0x1080	Reverse jog
0x1008	Emergency to stop	0x1100	Fault reset
0x1010	Coast to stop		

Definition of virtual terminal control setting word (0x3204):

Bit	Value and Definition	
Bit0	0: DO1 output is invalid	1: DO1 output is valid
Bit1	0: DO2 output is invalid	1: DO2 output is valid
Bit2	0: RLY1 output is invalid	1: RLY1 output is valid
Bit3	0: RLY2 output is invalid	1: RLY2 output is valid
Bit4	0: RLY3 output is invalid	1: RLY3 output is valid
Bit5	0: RLY4 output is invalid	1: RLY4 output is valid
Bit6 - Bit15	Reserved	Reserved

Status Parameter (0x33) Address Mapping

The status parameters (0x33) are mapped as higher bytes of the register address, and the inter group indexes are as following:

Address	Function	Address	Function
0x3300	Inverter series	0x3323	DI6 terminal pulse input frequency
0x3301	Software version of DSP	0x3324	AO1 output
0x3303	Special software version of DSP	0x3325	AO2 output
0x3305	Software version of keypad	0x3326	High-speed output pulse frequency
0x3306	Custom series No.	0x3327	Heatsink temperature
0x3307	Motor and control mode	0x332C	Process PID reference
0x3308	Rated current of HD31	0x332D	Process PID feedback
0x330A	Inverter status	0x332E	Process PID error
0x330B	Master setting frequency source	0x332F	Process PID integral
0x330C	Master setting frequency	0x3330	Process PID output
0x330D	Auxiliary setting frequency	0x3331	External counting value
0x330E	Setting frequency	0x3332	Input terminal status
0x330F	Reference frquency (after Acc./Dec.)	0x3333	Output terminal status
0x3310	Output frequency	0x3334	Modbus communication status
0x3311	Setting Rpm	0x3335	Actual length
0x3312	Running Rpm	0x3336	Total length
0x3314	Output voltage	0x3337	Total time at power on (hour)
0x3315	Output current	0x3338	Total time at running (hour)
0x3316	Setting torque	0x3339	High byte of motor total energy
0x3317	Output torque	0x333A	Low byte of motor total energy
0x3318	Output power	0x333B	High byte of this running energy
0x3319	DC bus voltage	0x333C	Low byte of this running energy
0x331A	Input voltage of keypad of potentiometer	0x333D	The present fault code
0x331B	AI1 voltage	0x3347	Current moment
0x331C	AI1 voltage (after calculating)	0x3348	Pump 1 status
0x331D	AI2 voltage	0x3349	Pump 2 status
0x331E	AI2 voltage (after calculating)	0x334A	Pump 3 status
0x331F	AI3 voltage	0x334B	Pump 4 status
0x3320	AI3 voltage (after calculating)	0x334C	Pump 5 status
0x3321	AI4 voltage	0x334D	Pump 6 status
0x3322	AI4 voltage (after calculating)	0x334E	Pump 7 status

5. Special Instruction

1. Group F08 (Asyn. motor 1 parameter setting), group F12 (reserved), F13.00 - F13.15 (Asyn. motor 2 parameter setting) and group F17 (SCI communication parameters) are the inverter parameter which can be read but cannot be modified by the host computer.

2. F01.00 (user password) cannot be set and adjusted through communication as well, but the user can verify the user password by writing F01.00 and get access to adjust inverter function parameters on the host. After adjustment, the user can close the permission by writing invalid password to F01.00.

3. If many multi-function input terminals are set the same function, it may cause dysfunction. Therefore, the user should avoid this case when modify the multi-function terminal function via the Modbus.

6. CRC Checking

Code of online calculating CRC is shown below:

```
unsigned int crc_check(unsigned char *data,unsigned char length)
{
    int i;
    unsigned crc_result=0xffff;
    while(length--)
    {
        crc_result^=*data++;
        for(i=0;i<8;i++)
        {
            if(crc_result&0x01)
                crc_result=(crc_result>>1)^0xa001;
            else
                crc_result=crc_result>>1;
        }
    }
    return (crc_result=((crc_result&0xff)<<8)|(crc_result>>8));
}
```

7. Application Case

Remarks: Please verify all the hardware equipments are connected well before controlling the inverter via communication. In addition, please preset the communication data format, baud rate and communication address.

1. To read the request frame of the Max. output frequency of slave 2 (to read F00.06), answer 50.00Hz.

Request	Address	Code	Register Address		Word No. of Read		Checksum	
Frame	0x02	0x03	0x00	0x06	0x00	0x01	0x64	0x38
Response	Address	Code	Answer Byte		Register Content		Checksum	
Frame	0x02	0x03	0x02		0x13	0x88	0XF1	0x12

2. To read the DC bus voltage of slave 2 (to read status parameter), answer 537V.

Request	Address	Code	Register Address		Word No. of Read		Checksum	
Frame	0x02	0x03	0x33	0x19	0x00	0x01	0x5A	0xBA
Response	Address	Code	Answer Byte		Register Content		Checksum	
Frame	0x02	0x03	0x02		0x02	0x19	0x3C	0xEE

3. To read the setting frequency of slave 2 (set F00.13 to 45.00Hz).

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x00	0x0D	0x11	0x94	0x15	0xC5
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x00	0x0D	0x11	0x94	0x15	0xC5

4. When the frequency setting source F00.10 = 2, set the frequency value to 45.00Hz by writing the register content 0x11, 0x94.

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E

5. F00.11 = 2, give the reverse operation command to the address 2 of slave.

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x03	0xCA	0x80
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x03	0xCA	0x80

6. F00.11 = 2, give the Dec. stop command to the address 2 of slave.

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x04	0x8B	0x42
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x04	0x8B	0x42

7. F00.11 = 2, give the emergency stop command to the address 2 of slave.

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x08	0x8B	0x47
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x08	0x8B	0x47

8. F00.11 = 2, give the coast to stop command to the address 2 of slave.

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x10	0x8B	0x4D
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x10	0x8B	0x4D

9. External fault stop control of slave 2 via communication (E0024 fault).

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x20	0x8B	0x59
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x10	0x20	0x8B	0x59

10. Give the fault reset signal to the address 2 of slave.

Request	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x11	0x00	0x8B	0x11
Response	Address	Code	Register Address		Register Content		Checksum	
Frame	0x02	0x06	0x32	0x00	0x11	0x00	0x8B	0x11

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