HD3N Series
High-performance Smart Inverter

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High-performance Smart Inverter

User Manual

V1.1 2018.09

FORWARD

Thank you for purchasing HD3N series high-performance smart inverter manufactured by Shenzhen Hpmont Technology Co., Ltd.

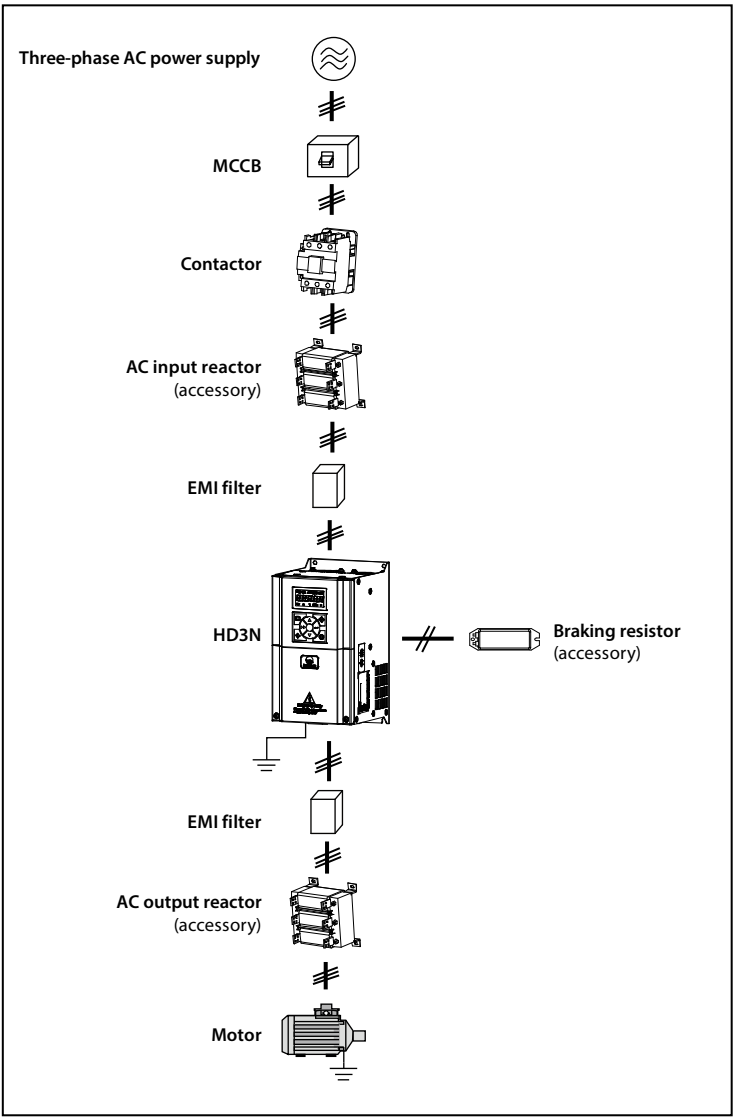
This User Manual describes how to use HD3N series high-performance smart inverter and their installation wiring, parameter setting, troubleshooting and daily maintenance etc.

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

Connectionwithperipheral devices



Version and Revision Records

Time: 2018/09

Version: V1.1

Revised chapter	Revised contents
	• Add 55 - 400kW, 200 - 400kW (-C) products • See section 2.3 for rated value • See section 3.3 for installation direction and space • See section 3.4 for structural specifications • Input and output wiring, power terminal wiring, see section 4.2 • For power terminal description see section 4.3 • See section 4.4 for control board instructions • For the selection of brake unit and braking resistor, see section 8.2 • See section 8.3 for reactor selection

HD3N Quick Start Guide

Note:

Some of the parameters are factory setting, user may not need to set them when first time using the product.

1. Set rated parameters of motor

Power on HD3N. Set below parameters via keypad. Refer to nameplate of motor for correct parameter.

Ref. code	Function	Ref. code	Function
F08.00	Rated power of motor	F08.03	Rated frequency of motor
F08.01	Rated voltage of motor	F08.04	Rated Rpm of motor
F08.02	Rated current of motor		

2. Start/Stop HD3N and set running frequency via keypad

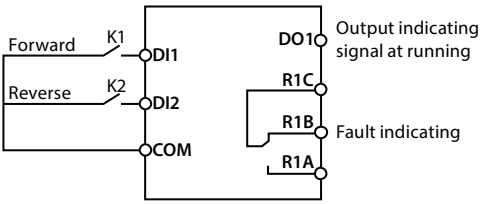
1. Power on HD3N. Use keypad to set motor parameter (F08.00 - F08.04), running frequency (F00.13) and Acc. / Dec. time (F03.01, F03.02).

Ref. code	Function	Setting	Description
F00.10	Frequency setting channel selection	0 (default)	Running frequency set by keypad digital setting
F00.11	Command setting channel selection	0 (default)	Keypad runs command channel
F00.13	Running frequency digital setting	-	Running frequency, adjust according to actual
F03.01	Acc. time 1	-	Acc. time, adjust according to actual
F03.02	Dec. time 1	-	Dec. time, adjust according to actual

2. Press ⏀ key (**RUN**) on keypad to start HD3N. Press ▲ / ▼ key to increase/decrease setting frequency. Press ⏁ key (**STOP**) to stop HD3N.

3. To use terminal to start/stop, and use keypad to set running frequency

1. DI1 is forward signal input, DI2 is reverse signal input. Below is the connection.



2. Power on HD3N. Set function codes according to connection.

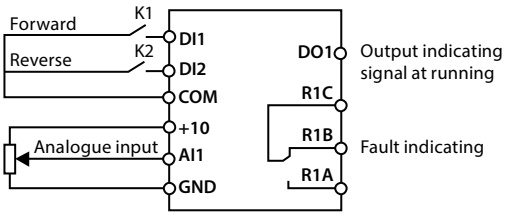
Ref. code	Function	Setting	Description
F00.10	Select frequency setting channel	0 (default)	Digital setting by keypad
F00.11	Select command setting channel	1	Set by terminal
F00.13	Running frequency digital setting	-	Running frequency, set according to actual
F03.01	Acc. time 1	-	Acc. time, set according to actual
F03.02	Dec. time 1	-	Dec. time, set according to actual
F15.00	DI1 function selection	2 (default)	Forward (terminal forward signal input)
F15.01	DI2 function selection	3 (default)	Reverse (terminal reverse signal input)

3. Connect K1, motor will forward run. Disconnect it, motor stops running. Connect K2, motor Reverse run. Disconnect K2, motor stops running. Disconnect K1 and K2, motor stops running.

Set F00.13 or press ▲ /▼ on keypad to increase / decrease setting frequency.

4. To use terminal to start/stop and set analogue running frequency

1. DI1 is forward signal input, DI2 is reverse signal input. Below is the connection.



2. Power on, and set function code according to connection.

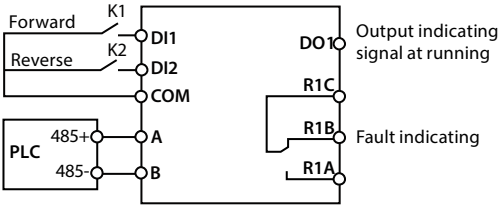
Ref. code	Function	Setting	Meaning
F00.10	Select frequency setting channel	3	Set by analogue
F00.11	Select command setting channel	1	Set by terminal
F03.01	Acc. time 1	-	Acc. time, adjust according to actual
F03.02	Dec. time 1	-	Dec. time, adjust according to actual
F15.00	DI1 function selection	2 (default)	Forward (terminal forward signal input)
F15.01	DI2 function selecrtion	3 (default)	Reverse (terminal reverse signal input)
F16.01	Analogue input AI1 function selection	2 (default)	Frequency setting channel (set by AI1)

3. Adjust AI1 to set running frequency.

4. Connect K1, motor forward run; disconnect K1, motor stops running. Connect K2, motor reverse run; disconnect K2, motor stops running. Connect or disconnect both K1 and K2, motor stops running.

5. To use terminal to start/stop, and use communication to set running frequency

1. DI1 is forward signal input, DI2 is reverse signal input. Below is the connection.



2. Power on, and set function parameters according to connection.

Ref. code	Function	Setting	Meaning
F00.10	To select frequency setting channel	2	SCI communication setting
F00.11	To select command setting channel	1	Running command set by terminal
F03.01	Acc. time 1	-	Acc. time, adjust according to actual
F03.02	Dec. time 1	-	Dec. time, adjust according to actual
F15.00	DI1 function selection	2 (default)	Forward (terminal forward signal input)
F15.01	DI2 function selection	3 (default)	Reverse (terminal reverse signal input)
F15.18	DO1 function selection	2 (default)	Inverter is running
F17.00	Data format	0 (default)	1-8-2 format, no parity, RTU
F17.01	Baut rate	3 (default)	9600bps
F17.02	Local address	2 (default)	

3. Connect K1, motor forward run; disconnect K1, motor stops running. Connect K2, motor reverse run; disconnect K2, motor stops running. Connect or disconnect both K1 and K2, motor stops running.

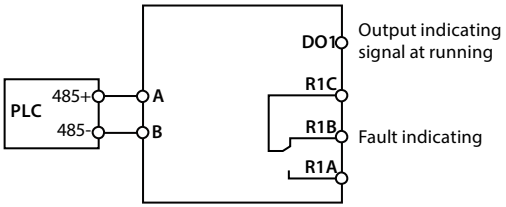
4. SCI code 0x06 reads to register 0x3201 to change running frequency.

E.g: set running frequency of slave address 2 = 15.00Hz:

Command / Response Frame	Address	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E

6. To use communication to start/stop and to set running frequency

1. Wire communication lines as following:



2. Power on, and set function parameters according to connection.

Ref. code	Function	Setting	Meaning
F00.10	To select frequency setting channel	2	SCI setting
F00.11	To select command setting channel	2	Running command channel set by SCI
F03.01	Acc. time 1	-	Acc. time, adjust according to actual
F03.02	Dec. time 1	-	Dec. time, adjust according to actual
F17.00	Data format	0 (default)	1-8-2 format, no parity, RTU
F17.01	Baut rate	3 (default)	9600bps
F17.02	Local address	2 (default)	

3. Register 0x3200 of SCI communication (code 0x06) starts/stops inverter whose local address = 2.

E.g: Forward start command is as following:

Command / Response Frame	Address	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x01	0x4B	0x41

E.g: Dec stop command is as following:

Command / Response Frame	Address	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x04	0x8B	0x42

4. Register 0x3201 of SCI communication (code 0x06) sets the running frequency.

E.g: Set the running frequency of local address = 45.00Hz:

Command / Response Frame	Address	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E

7. Motor parameter auto-tuning

1. Do parameter auto-tuning in keypad mode.

2. Wire correctly. Power on, and set motor parameter (F08.00 - F08.04) on keypad.

3. Below are auto-tuning methods for V/f and vector control.

Control mode	Auto-tuning methods (recommended)	
V/f control	Manually torque boost Static, rotary and stator resistance auto-tuning	Auto torque boost Static and rotary auto-tuning
Vector control	Rotary auto-tuning	

Static auto-tuning:

F08.06 = 1 (stationary auto-tuning), press button (PRG) to exit to parameter display status at stop. Press button (RUN) to start auto-tuning.

When auto-tuning finished, F08.07 - F08.09 are refreshed automatically.

Ref. code	Function	Ref. code	Function
F08.07	Stator resistor of motor	F08.09	Leakage inductance of motor
F08.08	Rotor resistance of electron 1		

Rotary auto-tuning:

Free the motor from load before start rotary auto-tuning.

F08.06 = 2 (rotary auto-tuning), press button (PRG) to exit to parameter display status at stop. Press button (RUN) to start auto-tuning.

Oscillation and over-current may occur during motor rotary. In this case, press button (STOP) immediately to stop tuning, and adjust Acc. / Dec. time, F09.15 (LF oscillation-suppression of motor) and F09.16 (HF oscillation-suppression of motor) to reduce the oscillation.

When auto-tuning finished, F08.04 and F08.07 - F08.16 are refreshed automatically.

Ref. code	Function	Ref. code	Function
F08.04	Rated rpm of motor	F08.12	Core saturation coefficient 1 of motor
F08.07	Stator resistance of motor	F08.13	Core saturation coefficient 2 of motor
F08.08	Rotor resistance of motor	F08.14	Core saturation coefficient 3 of motor
F08.09	Leakage inductance of motor	F08.15	Core saturation coefficient 4 of motor
F08.10	Mutual inductance of motor	F08.16	Core saturation coefficient 5 of motor
F08.11	Exitation current of motor		

To measure the stator resistance:

F08.06 = 3 (Test stator resistance), press button (PRG) to exit to parameter display status at stop. Press button (RUN) to start auto-tuning.

When auto-tuning finished, F08.07 is refreshed automatically.

Ref. code	Function	Ref. code	Function
F08.07	Stator resistance of motor		

8. Input/Output parameter setting for analogue AI and AO current 4 - 20mA

Analogue 4 - 20mA input

Current inputs through AI2. Default current: 0 - 20mA. Short connect pin 2 & pin 3 of CN2.

To use 4 - 20mA signal to adjust frequency 0 - 50Hz, set parameters according to following:

Method	Ref. code	Function	Setting	Meaning
By setting analogue curve	F00.10	Frequency setting channel	3	Analogue setting
	F05.01	Line 1 min. setting	20.0%	/
	F16.01	AI1 function	0	No function
	F16.02	AI2 function	2	Frequency setting
By setting analogue bias and gain	F00.10	Frequency setting channel	3	Analogue setting
	F00.18	Prevent reverse	1	Forbid reverse
	F16.01	AI1 function	0	No function
	F16.02	AI2 function	2	Frequency setting
	F16.08	AI2 bias	-20.0%	AI2 analogue bias
	F16.09	AI2 gain	1.20	AI2 analogue gain

Analogue 4 - 20mA output

AO1/AO2 can select current output, default: 0 - 20mA.

Short-connect pin2&3 on CN7 for AO1, and short-connect pin2&3 of CN8 for AO2.

To achieve 4 - 20mA output, please change bias and gain:

Output	Ref. code	Function	Setting	Meaning
AO1	F16.22	AO1 bias	20	AO1 analogue bias
	F16.23	AO1 gain	80	AO1 analogue gain
AO2	F16.24	AO2 bias	20	AO2 analogue bias
	F16.25	AO2 gain	80	AO2 analogue gain

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 industrial frequency operation

HD3N series are voltage-type inverters and their output is PWM wave with certain harmonic wave. Therefore, the temperature, noise and vibration of motor will be a little higher than that at industrial frequency running.

Constant torque at low-speed running

When HD3N drives a standard motor at low-speed running for a long time, the output torque ratings will become worse due to the motor cooling is less effective. In that case, we suggest that you should choose variable frequency motor.

Thermal protection of motor

When choose adaptive motor, HD3N can effectively implement the motor thermal protection. Otherwise it must adjust the motor protection parameters or other protection measures to ensure that the motor is at a safe and reliable running.

Running above the rated frequency of motor

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

Lubrication of mechanical devices

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

Mechanical resonance point of load

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

Check the insulation of the motor

For the first time using the motor or after long time storage, it needs check the insulation of the motor. Worse insulation can cause damage to HD3N.

Note:

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

Load and negative torque

For the occasion to boost load and the like, negative torque often occurs. Consider setting proper parameters of the braking unit if HD3N is prone to overcurrent or overvoltage fault trip.

Requirement for leakage current protector RCD

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

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

Warning for ground mass leakage current

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

1.3 About HD3N

No capacitor or varistor on the output side

Since HD3N 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 HD3N fault trip or component damage.

Contactors and circuit breakers connected to the output of HD3N

If circuit breaker or contactor needs to be connected between HD3N and the motor, be sure to operate these circuit breakers or contactor when HD3N has no output, so as to avoid any damage to HD3N.

Running voltage

HD3N is prohibited to be used beyond the specified range of running voltage. If needed, please use the suitable voltage regulation device to change the voltage.

Capacitor energy storage

When the AC power supply is cut off, capacitor of HD3N sustains deadly power for a while. So to disassemble HD3N that is powered, please cut off the AC power supply for more than 10 minutes, confirm the internal charge indicator is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.

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

Change three-phase input to single-phase input

For three-phase input inverter, users should not change it to be single-phase input.

To use single-phase power supply, disable the input phase-loss protection function. And the bus-voltage and current ripple will increase, which not only influences the life of electrolytic capacitor but also deteriorates the performance of the controller. In that case, the controller must be derating and should be 60% within rated value of controller.

Lightning surge protection

HD3N internal design has lightning surge over-current protection circuit, and has certain self-protection capacity against the lightning.

Altitude and derating

In area where altitude exceeds 1000 meters, HD3N should be derating since the heatsink efficiency will be reduced because of the tenuous air.

The rated value of output current derates by 1% for each 100m increase of the altitude. I.e for the altitude of 4000m, derated rate is 30% for rated current of HD3N. Figure 1-1 is the derating curve of rated current and the altitude.

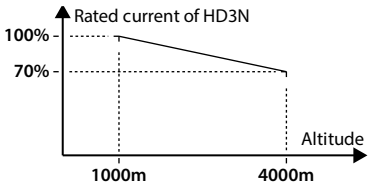
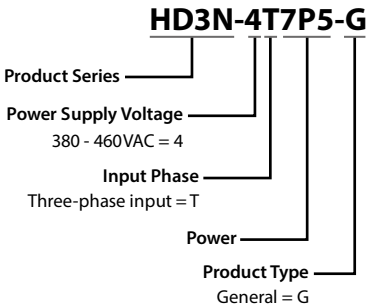


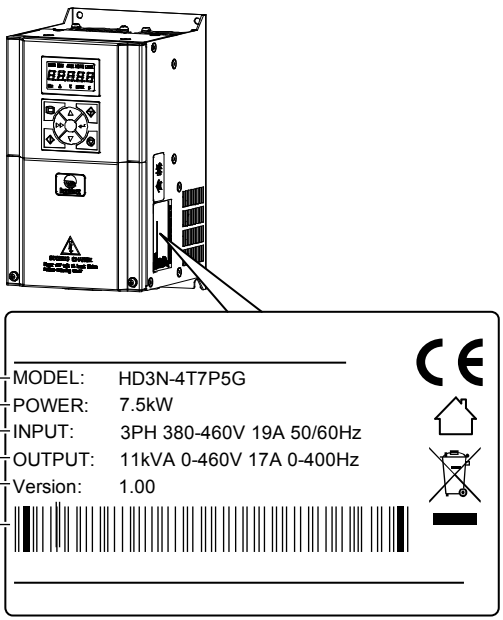
Figure 1-1 Derating curve of rated current and altitude

Chapter 2 Product Information

2.1 Model



2.2 Nameplate



2.3 Rated Value

Refer to section 3.4 Dimensions and Weight (on page 13) for size information.

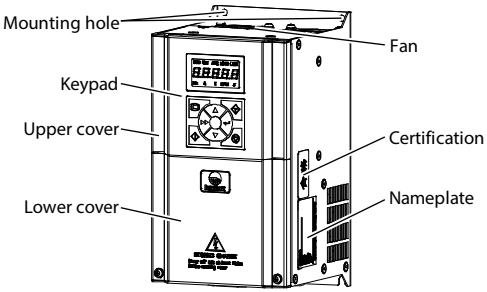
Model	Motor (kW)	Rated capacity (kVA)	Rated input current (A)	Rated output current (A)	Size
HD3N-4T7P5G	7.5	11	19	17	Frame 3
HD3N-4T011G	11	16	28	25	Frame 3
HD3N-4T015G	15	21	35	32	Frame 4
HD3N-4T018G	18.5	24	39	37	Frame 4
HD3N-4T022G	22	30	47	45	Frame 5
HD3N-4T030G	30	39	62	60	Frame 5
HD3N-4T037G	37	49	77	75	Frame 6
HD3N-4T045G	45	59	92	90	Frame 6
HD3N-4T055G	55	72	113	110	Frame 7
HD3N-4T075G	75	100	156	152	Frame 7
HD3N-4T090G	90	116	180	176	Frame 8
HD3N-4T110G	110	138	214	210	Frame 8
HD3N-4T132G	132	167	256	253	Frame 9
HD3N-4T160G	160	200	307	304	Frame 9
HD3N-4T200G HD3N-4T200G-C	200	250	385	380	Frame 10
HD3N-4T220G HD3N-4T220G-C	220	280	430	426	Frame 10
HD3N-4T250G HD3N-4T250G-C	250	309	475	470	Frame 11
HD3N-4T280G HD3N-4T280G-C	280	349	535	530	Frame 11
HD3N-4T315G HD3N-4T315G-C	315	398	609	600	Frame 12
HD3N-4T355G HD3N-4T355G-C	355	434	664	660	Frame 12
HD3N-4T400G HD3N-4T400G-C	400	494	754	750	Frame 12

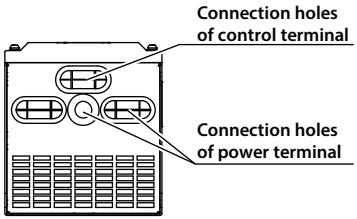
2.4 Technical Data

Electrical	
Input voltage	Three phase 380 - 460V Fluctuating within ± 10%, imbalance rate < 3%
Input frequency	50/60Hz ± 5%
Output voltage	0 - input vlotage
Output frequency	0 - 400.00Hz
Performance	
Maximum current	150% rated output current for 2 minutes 180% rated output current for 10 seconds
Control mode	SVC, V/f
Running command	Keypad; Terminal; SCI communication
Speed setting	Digital; Analogue/Pulse; SCI communication
Speed resulotion	Digital setting: 0.01Hz Analogue setting: 1‰ × max. frequency
Speed control accuracy	SVC: ± 0.5%
Speed control range	SVC: 1:100
Torque control response	SVC: < 200ms
Start torque	SVC: 180% rated torque /0.5Hz
Torque control accuracy	±5%
Characteristic Functions	
Parameter copy function	Copy 2 sets of parameters from MCB of inverter to keypad and vise versa • Apply when extension LED keypad is adopted
Programmable input/output terminal	Programmable input/output terminal
Process PID adjustment function	In-built process PID module
Simple PLC function	In-built simple PLC module for timing and multi frequency output
Wobble function	In-built wobble function module
Length control function	In-built length control module
Protection Functions	
Stall overvoltage	Busbar voltage can auto-control against overvoltage fault
Auto-limit current protection	Output current can auto-limit against overcurrent fault
Overload pre-alarm and alarm	Overload early pre-alarm and protect
Load loss protection	Load loss alarm function
Input / Output voltage phase loss protection	Input / Output voltage phase loss auto-detect and alarm function
Braking fault protection	Braking detection and alarming function
PID commands and feedback loss detection	PID can auto-identify whether loss the setting and feedback or the alarm function
Power output grounding fault protection	Power output grounding fault protection is enabled
Power output short circuit protection	Power output short circuit protection is enabled

Input / Output	
Analogue power supply	+10V, max. current 100mA
Digital power supply	+24V, max. current 200mA
Analogue input	AI1: voltage 0 - 10V AI2: 0V - +10V/0 - 20mA (selectable voltage/current)
Analogue output	AO1, AO2: 0 - 10V/0 - 20mA (selectable voltage/current)
Analogue input	DI1 - DI6; DI6 can be selectable for high speed pulse signal
Digital output	DO1, DO2; DO2 can be selectable for high-frequency pulse signal output
Relay output	R1A/R1B/R1C: Contact rating: 250VAC/3A or 30VDC/1A
SCI communication	A, B
Keypad	
LCD keypad	8 buttons, 5 units 8 segment LED display, 5 unit indicators, 5 status indicators
Optional LED keypad	Optional: HD-LED-P/HD-LED-P-S
LCD / LED display	Set parameter setting, check status parameter and fault code etc
Parameter copy	LED can achieve parameter copying
Environment	
Running temperature	-10 - +40℃, max. 50℃, air temperature fluctuation is less than 0.5℃/min The derating value of the output current of HD3N shall be 2% for each degree centigrade above 40℃. Max. allowed temperature is 50℃
Storage temperature	-40 - +70℃
Location for use	Indoor, preventing from direct sunlight, no dust, corrosive, flammable gases, oil mist, water vaper, dripping or salt etc.
Altitude	Less than 1000 meters, otherwise should be derating use
Humidity	Less than 95%RH, non-condensing
Vibration Resistance	It is 3.5m/s^2 in 2 - 9Hz, it is 10m/s^2 (IEC60721-3-3) in 9 - 200Hz
Protection class	IP20
Pollution level	Level 2 (Dry, non conducting dust pollution)
Accessories	
About keypad	LED keypad with potentiometer (HD-LED-P) and extension mounting base (HD-KMB) Small keypad (HD-LED-P-S) and extension mounting base (HD-KMB-S) 1m/2m/3m/6m extension cable to keypad (HD-CAB-1M/2M/3M/6M)

2.5 Parts of Inverter





Chapter 3 Machenical Installation

3.1 Precautions

Danger

- Do not install if HD3N is incomplete or impaired.
- When conveying HD3N, please employ suitable tools according to its weight. Avoid scratch to the product. Be careful: rollover and drop may cause hurt.
- Make sure that HD3N 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 HD3N 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 HD3N.
- Do not let wires, screws or residues fall into HD3N when installing.

3.2 Installation Site Requirement

Ensure the installation site meets the following requirements:

- Do not install at the direct sunlight, moisture, water droplet location;
- Do not install at flammable, explosive, corrosive gas and liquid location;
- Do not install at oily dust, fiber and metal powder location;
- Be vertical installed on fire-retardant material with a strong support;
- Make sure adequate cooling space for HD3N 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 HD3N is IP20 and pollution level is 2 (Dry, non-conducting dust pollution).

Note:

1. It needs derating use running temperature exceeds 40 ℃. The derating value of the output current of HD3N 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

To achieve good cooling efficiency, install HD3N perpendicularly and always provide the following space to allow normal heat dissipation.

The space are shown in Table 3-1.

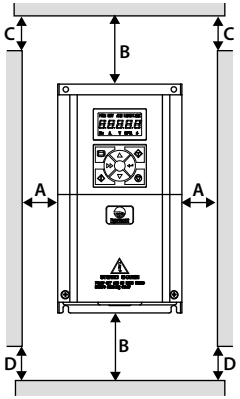


Table 3-1 Installation space

Inverter power	≤55kW	≥75kW
A (Left/Right)	≥50mm	≥150mm
B (UP/Down)	≥100mm	≥350mm
C (Upper air-vent)	≥50mm	≥100mm
D (Lower air-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.

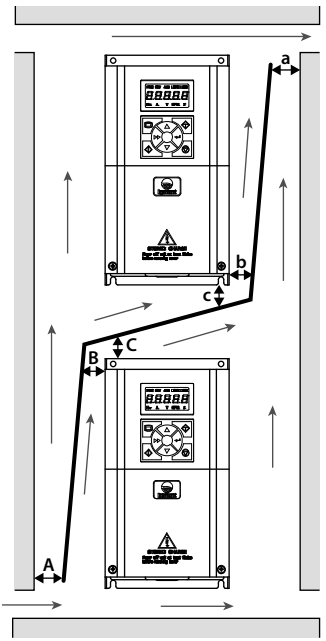


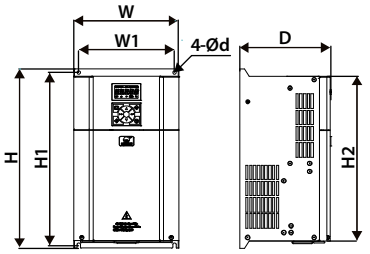
Table 3-2 Installation of several inverters

Inverter power	≤55kW	≥75kW
A	≥50mm	≥100mm
B	≥50mm	≥100mm
C	≥50mm	≥100mm
a	≥50mm	≥100mm
b	≥50mm	≥100mm
c	≥50mm	≥100mm

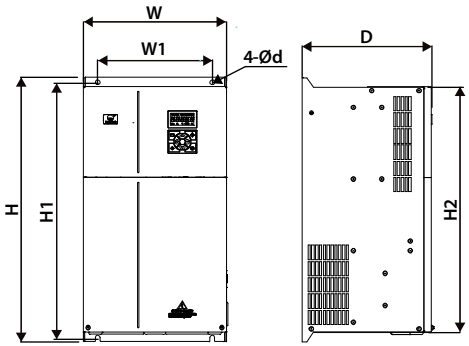
3.4 Dimensions and Weight

The dimensions and weight of HD3N are shown in Table 3-3,Table 3-4.

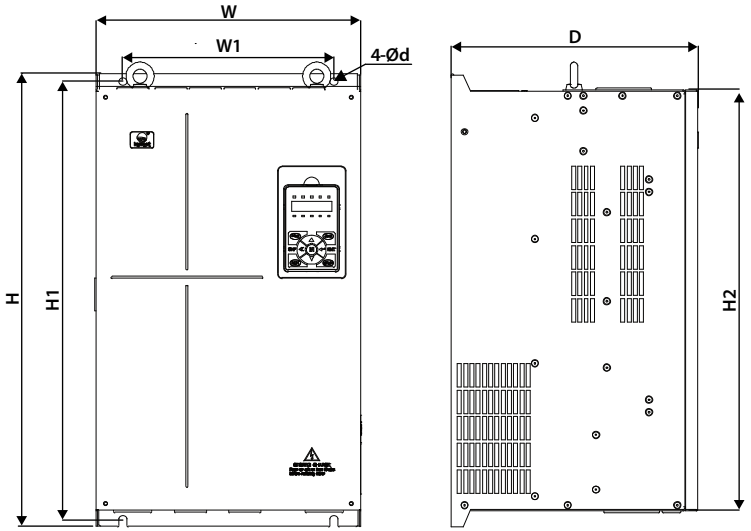
For the corresponding model of the mounting size, refer to section 2.3 Rated Value, on page 6.



Frame 3 - Frame 5



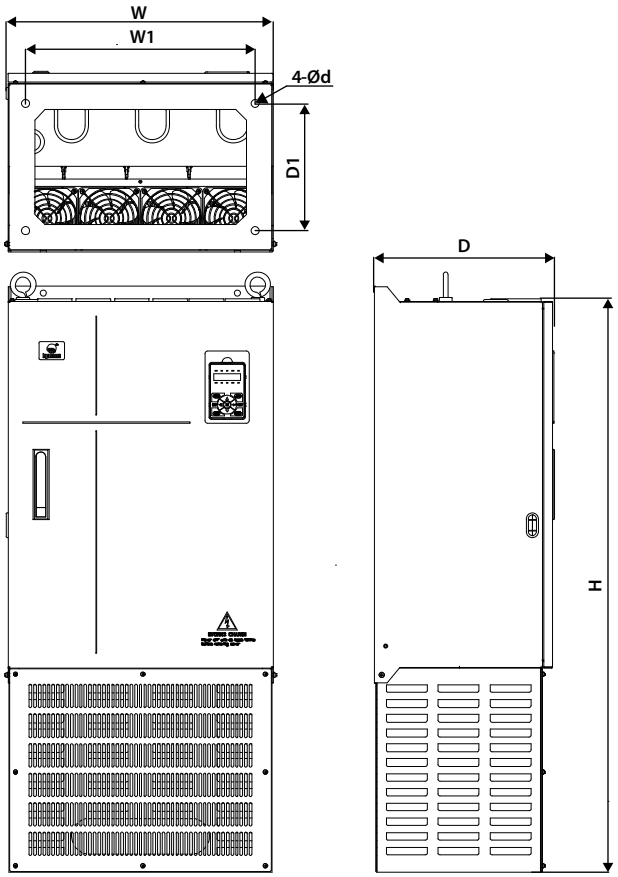
Frame 6 - Frame 7



Frame 8 - Frame 12

Table 3-3 HD3N dimensions and weight

Size	Dimension (mm)			Mounting size (mm)				GW
	W	H	D	W1	H1	H2	d	(kg)
Frame 3	140	260	155	122	248	235	6	5.4
Frame 4	180	298	175	160	284	270	6	8.3
Frame 5	220	375	190	200	360	345	7	13
Frame 6	260	440	230	220	420	403	8	21
Frame 7	300	555	270	240	535	515	10	36
Frame 8	338	580	315	270	560	538	10	41.5
Frame 9	400	840	340	320	816	792	10	73
Frame 10	520	780	350	380	752	720	12	95
Frame 11	620	880	360	480	848	823	14	120
Frame 12	780	1350	394	620	1320	1281	14	260



Frame 10 - Frame 12 (-C)

Table 3-4 HD3N (-C) dimensions

Size (-C)	Dimension (mm)			Mounting size (mm)		
	W	H	D	W1	D1	d
Frame 10	520	1120	350	450	250	16
Frame 11	620	1223	360	550	260	16
Frame 12	780	1681	394	620	290	18

Chapter 4 Electrical Installation

4.1 Precautions

Danger

- Only qualified electrical engineer can perform wiring job.
- To facilitate the input side over-current protection and outage maintenance, connect HD3N with power supply via the MCCB or fuse.
- Do not dismantle HD3N or do wiring operation until the power is cut-off for more than 10 minutes, the internal charge indicator of HD3N 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.
- There is more than 3mA leakage current in HD3N grounding, depending on the running conditions. To ensure safety, HD3N and the motor must connect to separate and independent grounding wire, so as to ground reliably. It must use Type B mode when utilize ground leakage protection devices (ELCB/RCD).
- Do not touch the wire terminals of HD3N when it is live. The main circuit terminals are neither allowed connecting to the enclosure nor short-circuiting.

Warning

- Do not do dielectric strength test on HD3N.
- For HD3N with more than 2 year's storage, please use regulator to power it slowly.
- 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 HD3N.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure HD3N has ceased output before switching motor or change-over switches.
- The DC bus terminals of HD3N must not be short-circuited.

4.2 Peripheral Accessories Selection

4.2.1 Wiring Specifications of Input and Output

The AC supply to HD3N must be installed with suitable protection against overload and short-circuits, i.e. MCCB (molded case circuit breaker) or equivalent device.

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

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

Table 4-1 Sectional area of ground protective conductor

Sectional area S of phase conductor (power supply cable) while installing (mm^2)	S ≤ 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 Input / Output wiring specification

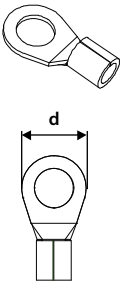
Model	MCCB (A)	Contactor (A)	Supply cable (mm^2)	Motor Cable (mm^2)	Ground cable (mm^2)	Size
HD3N-4T7P5G	40	32	4	4	4	Frame 3
HD3N-4T011G	63	40	6	6	6	Frame 3
HD3N-4T015G	63	40	10	10	10	Frame 4
HD3N-4T018G	100	63	10	10	10	Frame 4
HD3N-4T022G	100	63	16	16	16	Frame 5
HD3N-4T030G	125	100	25	25	16	Frame 5
HD3N-4T037G	160	100	35	35	16	Frame 6
HD3N-4T045G	200	125	35	35	16	Frame 6
HD3N-4T055G	200	125	50	50	25	Frame 7
HD3N-4T075G	250	160	50	50	25	Frame 7
HD3N-4T090G	250	160	95	70	50	Frame 8
HD3N-4T110G	350	350	120	120	60	Frame 8
HD3N-4T132G	400	400	120	120	60	Frame 9
HD3N-4T160G	500	400	185	185	95	Frame 9
HD3N-4T200G HD3N-4T200G-C	600	600	240	240	120	Frame 10
HD3N-4T220G HD3N-4T220G-C	600	600	120*2(1)	120*2(1)	120	Frame 10
HD3N-4T250G HD3N-4T250G-C	800	600	120*2(1)	120*2(1)	120	Frame 11
HD3N-4T280G HD3N-4T280G-C	800	800	150*2(1)	150*2(1)	150	Frame 11
HD3N-4T315G HD3N-4T315G-C	800	800	185*2(1)	185*2(1)	185	Frame 12
HD3N-4T355G HD3N-4T355G-C	800	800	240*2(1)	240*2(1)	240	Frame 12
HD3N-4T400G HD3N-4T400G-C	1000	1000	240*2(1)	240*2(1)	240	Frame 12

*(1): *2 indicates that two power or motor wires are connected in parallel.*

4.2.2 Power Terminal Lug

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

Table 4-3 Selection of power terminal lug

Size	Screw size	Tightening torque (N. M)	Max. outer diameter d (mm)	
Frame 3	M4	1.2 - 1.5	10.2	
Frame 4	M5	2.3 - 2.5	12.3	
Frame 5 / 6	M6	4.0 - 5.0	17.0	
Frame 7	M8	9.0 - 10.0	20	
Frame 8	M10	17.6 - 22.5	30	
Frame 9	M12	31.4 - 39.2	37	
Frame 10	M12	31.4 - 39.2	40	
Frame 11	M12	31.4 - 39.2	40	
Frame 12	M16	48.6 - 59.4	40	

4

4.3 Main Circuit Terminals and Wiring

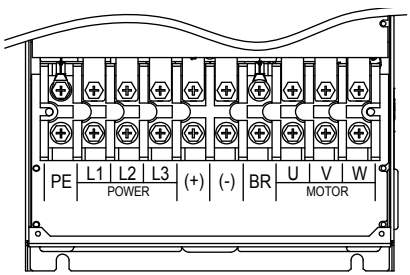
Danger

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

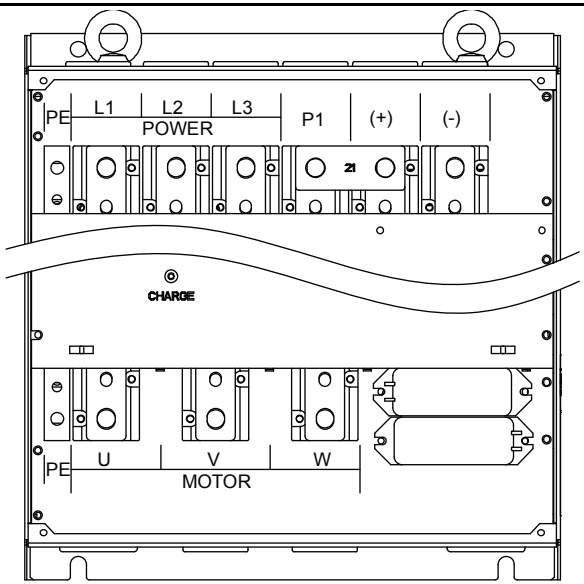
Warning

- Ensure that AC supply voltage is the same as rated input voltage of HD3N.

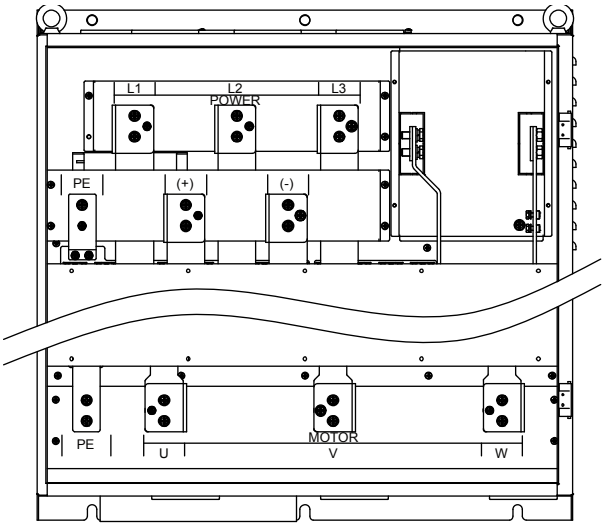
4.3.1 Supply and Motor Terminal



Frame 3 - Frame 7 supply and motor terminal



Frame 8 - Frame 11 / Frame 10 - Frame 11 (-C) supply and motor terminal



Frame 12 / Frame 12 (-C) supply and motor terminal

Table 4-4 Supply and motor terminal description

HD3N
• L1, L2, L3: Three-phase AC power input terminals • U, V, W: Output terminals, connect to three-phase AC motor • (+), (-): DC supply input terminals; connect to braking unit • (+), BR: Connect to braking resistor • PE: Ground terminal, connect to the ground

4.3.2 Supply and Motor Connection

During trial running, make sure HD3N runs forward when the forward command is enabled.

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 Table 4-5.

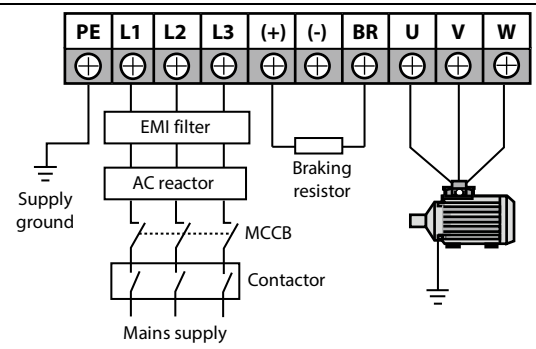
Refer to section 4.2 Peripheral Accessories Selection (on page 17) for product options.

Refer to section 8.2 Braking Unit and Braking Resistor (on page 109) for braking resistors and braking units.

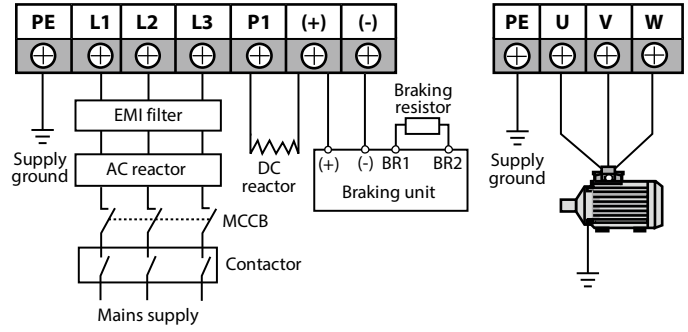
Refer to section 8.3 Reactor Selection (on page 110) for reactor.

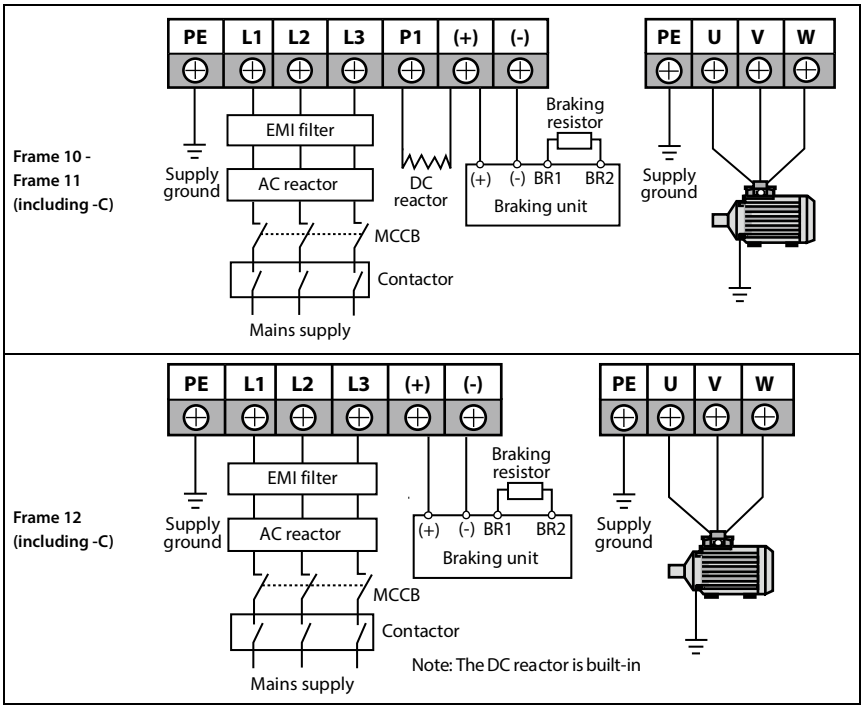
Table 4-5 Supply and motor connection

Frame 3 - Frame 7



Frame 8 - Frame 9





4.4 Control Board

Danger

- The control circuit and power circuit are basically insulated. Do not touch HD3N after it is powered.

Warning

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

4.4.1 Control Terminal (7.5 - 75kW)

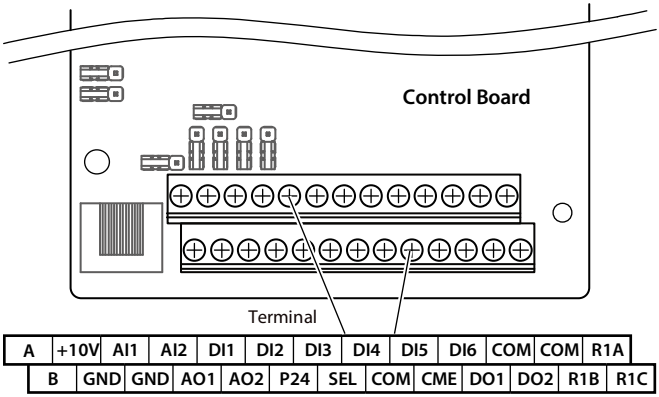


Figure 4-1 Control board terminal (7.5 - 75kW)

Table 4-6 Control board terminal description (7.5 - 75kW)

Terminal		Description
A, B	Communication terminal	A: 485+; B: 485-
+10V, GND	Analogue power supply	Analogue input use +10V power supply, max. output current is 100mA • Change to +5V by setting jumper on CN15 GND is isolated to COM
AI1, AI2	Anglogue input	AI1, AI2 input voltage: 0 - 10V (input impedance: 22kΩ) AI2 input current: 0 - 20mA (input impedance: 500Ω) • AI2 can select voltage/current; AI2 = current: input impedance is selectable;
AO1, AO2	Anglogue output	Output voltage/current signal: 0 - 10V/0 - 20mA Programmable output
GND	Anglogue ground	
DI1 - DI6	Digital input	Programmable bipolar optional input signal, compatible with DC/AC input signal. Input voltage: 15VDC - 56VDC, compatible with 24VDC/36VDC/48VDC Input voltage: 12VAC - 54VAC, compatible with 36VAC/48VAC Input impedance 6.2kΩ • DI6 can be selectable for high-frequency input, max-frequency 10kHz
P24, COM	Digital power supply	Digital 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 • Disconnect SEL and P24 when use external power to drive DI
DO1, CME	Digital output	Programmable optical-couple isolation, open collector output • DO1, DO2: open collector output; Output voltage 0 - 30VDC, max-output current 50mA • DO2 can be selectable for pulse frequency output, max. frequency 10kHz CME is isolated to COM, connected to COM by default • Disconnect CME and COM when they are isolating output
DO2, COM	Digital output	
R1A/R1B/R1C	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A • R1B, R1C: normally closed; R1A, R1C: normally open

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

4.4.2 Control Terminal (90 - 400kW)

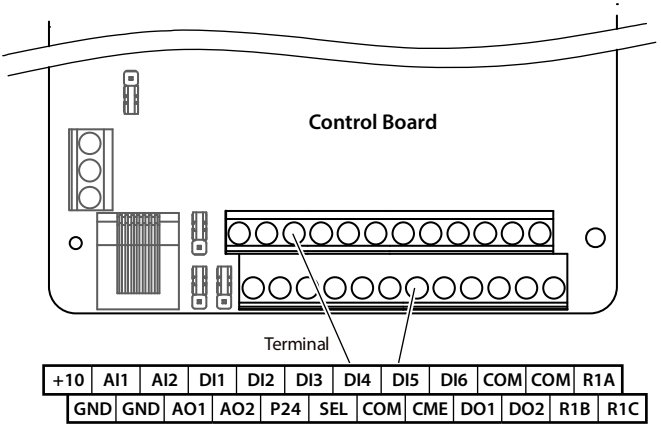


Figure 4-2 Control board terminal (90 - 400kW)

Table 4-7 Control board terminal description (90 - 400kW)

Terminal		Description
+10, GND	+10V power supply	Analogue input use +10V power supply, max. output current is 100mA GND is isolated to COM
AI1, AI2	Anglogue input	AI1 input voltage: 0 - 10V (input impedance: 34kΩ) AI2 input voltage: -10V - 10V (input impedance: 34kΩ) AI2 input current: 0 - 20mA (input impedance: 500Ω) • AI2, AI3 can select voltage/current
AO1, AO2	Anglogue output	Output voltage/current signal: 0 - 10V/0 - 20mA Programmable output
GND	Anglogue ground	
DI1 - DI6	Digital input	Programmable bipolar optional input signal Input voltage: 0 - 30VDC DI1 - DI5 input impedance: 4.7kW, DI6 input impedance: 1.6kΩ • DI6 can be selectable for high-frequency input, max-frequency 50kHz
P24, COM	Digital power supply	Digital input use +24V as supply, max. output current is 200mA COM is isolated to CME
SEL	Digital input common terminal	SEL and P24 are connected by default (factory setting) • Disconnect SEL and P24 when use external power to drive DI
DO1, CME	Digital output	Programmable optocoupler isolation • DO1, DO2 open collector output, output voltage: 0 - 30VDC, max. output current 50mA • DO2 can be selectable for high-frequency output, max-frequency 50kHz CME is isolated to COM, shortly connected to COM by default • Disconnect CME and COM when they are isolating output
DO2, COM	Digital output	

Terminal		Description
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.*

4.4.3 Jumper (7.5 - 75kW)

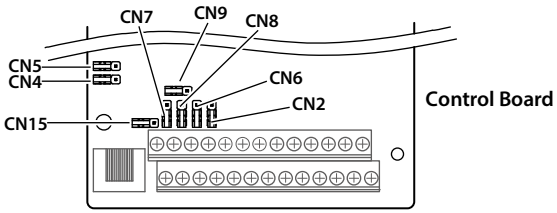


Figure 4-3 Jumper position (7.5 - 75kW)

Table 4-8 Jumper description (7.5 - 75kW)

Jumper	Description
CN2	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.
CN4	In interferential occasion, connecting PE and COM can increase immunity. • Pin 1 & 2 are short-connected, PE and COM are not connected (factory setting); • Pin 2 & 3 are short-connected, PE and COM are connected.
CN5	In interferential occasion, connecting PE and GND can increase immunity. • Pin 1 & 2 are short-connected, PE and GND are not connected (factory setting); • Pin 2 & 3 are short-connected, PE and GND are connected.
CN6	Impedance selection when AI2 = current input: • Pin 1 & 2 are short-connected, impedace = 500Ω (factory setting); • Pin 2 & 3 are short-connected, impedace = 250Ω.
CN7	AO1 can select output 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.
CN8	AO2 can select output 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.
CN9	Matching resistor selection for SCI communication: • Pin 1 & 2 are short-connected, do not use matching resistor (factory setting); • Pin 2 & 3 are short-connected, use matching resistor.
CN15	Voltage selection for analogue power input: • Pin 1 & 2 are short-connected, input voltage = +10V (factory setting); • Pin 2 & 3 are short-connected, input voltage = +5V.

4.4.4 Jumper (90 - 400kW)

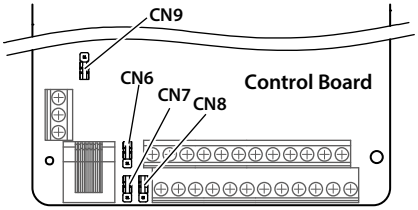
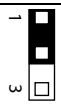
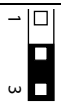


Figure 4-4 Jumper position (90 - 400kW)

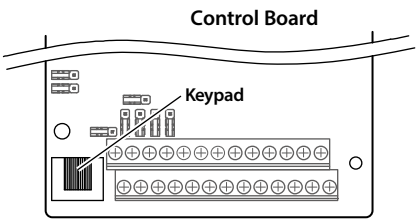
Table 4-9 Jumper description (90 - 400kW)

Jumper	Description
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.
CN7 	AO1 can select voltage or current signal. • Pin 1 & 2 are short-connected, AO1 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AO1 inputs current signal.
CN8 	AO2 can select voltage or current signal. • Pin 1 & 2 are short-connected, AO2 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AO2 inputs current signal.
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).

4.4.5 Communication Terminal (7.5 - 75kW)

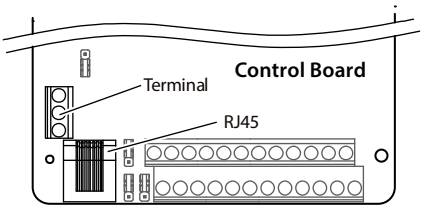
Connect optional keypad (HD-LED-P / HD-LED-P-S) through keypad terminal.

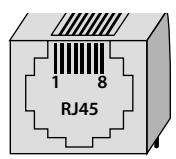
Refer to Chapter 5 Operation Instructions, (on page 37) for keypad description.



4.4.6 Communication Terminal (90 - 400kW)

Do not use communication terminal and RJ45 simultaneously.





Terminal	Description
A	485+
B	485-

Pin	Difinition
1,3	+5V
2	485+
4,5,6	GND
7	485-
8	Unused

4.4.7 Control Terminal Wiring

To reduce the interference and attenuation of control signal, length of control cable should limit within 50m. There should be more than 0.3m between the control cable and the motor cable.

The control cable must be shielded cable. The analogue signal cable must be shielded twisted pair.

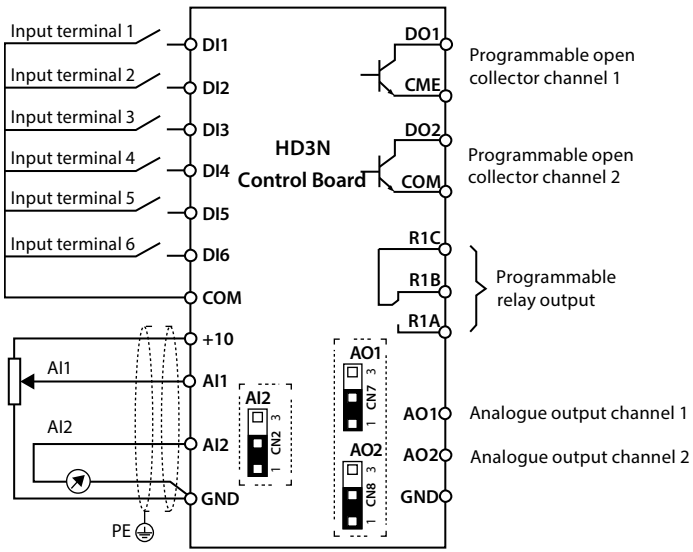


Figure 4-5 HD3N control board connection

Digital input (DI) connection

Compatible with DC/AC input signal.

- Input voltage: 15VDC - 56VDC, compatible with 24VDC/36VDC/48VDC.
- Input voltage: 12VAC - 54VAC, compatible with 36VAC/48VAC.

DC signal - Dry contact

Using the internal 24V power supply (SEL and P24 are short-connected at factory) or external power supply (remove the connector between SEL and P24), their connections are shown in Figure 4-6.

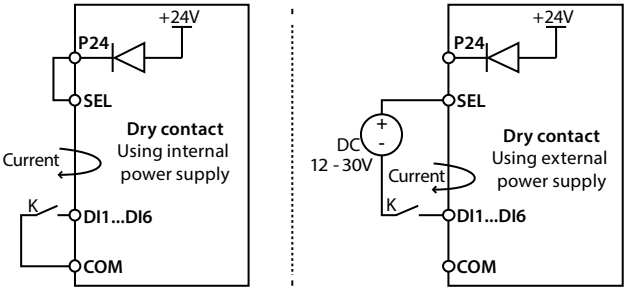


Figure 4-6 Dry contact connection

DC signal - Source / Drain

Using external power supply, the source / drain connection are shown in Figure 4-7. (Remove the connector between SEL and P24)

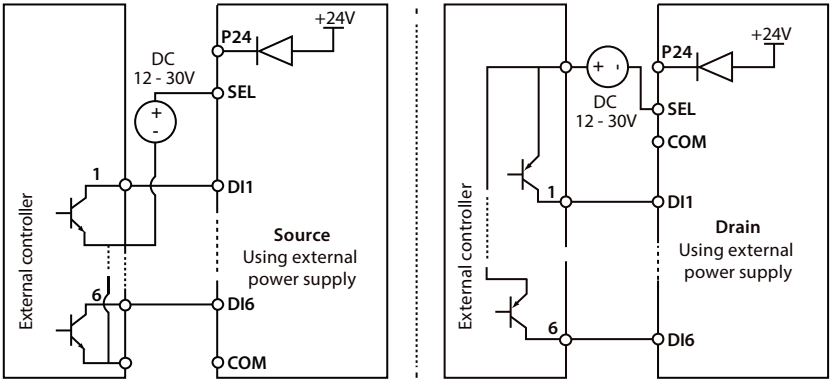


Figure 4-7 Source / Drain connection when using external power

Using internal 24V power supply of HD3N, it is NPN / PNP connection in which external controller is common emitter output, as shown in Figure 4-8. (For PNP, remove the connector between SEL and P24)

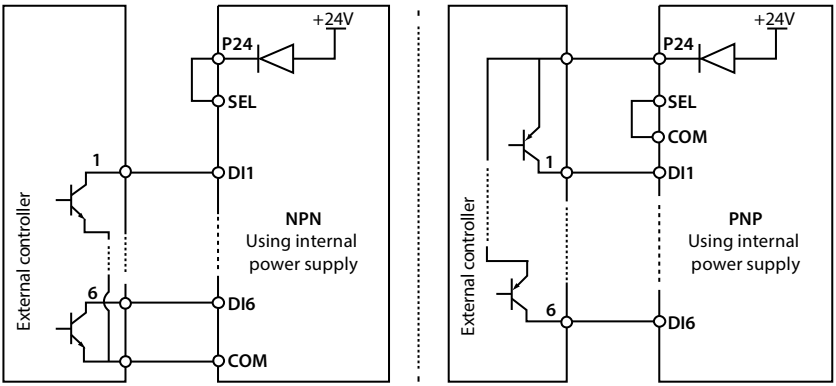


Figure 4-8 Connection when using internal 24V power supply

AC signal

DI terminal can input AC signal, refer to Figure 4-9. (Remove the connector between SEL and P24)

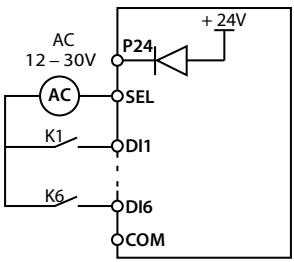


Figure 4-9 Connection when AC signal inputs (7.5 - 75kW)

Analogue Input (AI) Connection

The AI1 is voltage input and the range is 0 - 10V, as shown in Figure 4-10.

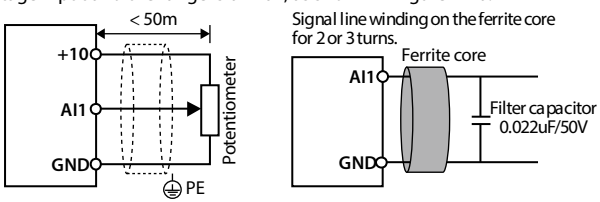


Figure 4-10 AI1 connection

Note:

1. To reduce the interference and attenuation of control signal, length of control cable should limit within 50m, and the shield should be reliably grounded.

2. In serious interference occasions, the analogue input signal should add filter capacitor and ferrite core, as shown in Figure 4-10.

AI2 can be selected as voltage input and the range is 0 - 10V. When selecting internal +10V of HD3N, refer to Figure 4-10; selecting 10V external supply, refer to Figure 4-11.

AI2 can be selected as current input and the range is 0 - 20mA, refer to Figure 4-11.

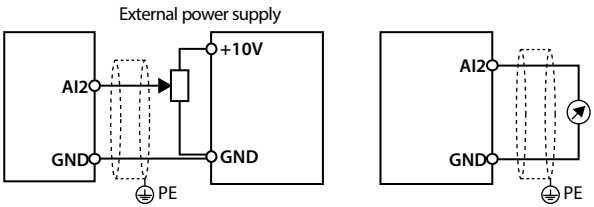


Figure 4-11 AI2 connection (7.5 – 75kW)

AI2 are selected as voltage input and the range is -10 - +10V. When selecting internal +10V of HD3N, refer to Figure 4-10; selecting +/-10V external supply, refer to Figure 4-12.

AI2 are selected as current input and the range is 0 - 20mA, refer to Figure 4-12.

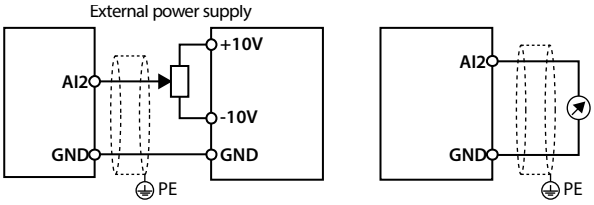


Figure 4-12 AI2 connection (90 – 400kW)

Digital Output (DO) Connection

DO1 is open collective output. DO1 can use internal 24V power supply of HD3N or external power supply. The connection is shown in Figure 4-13.

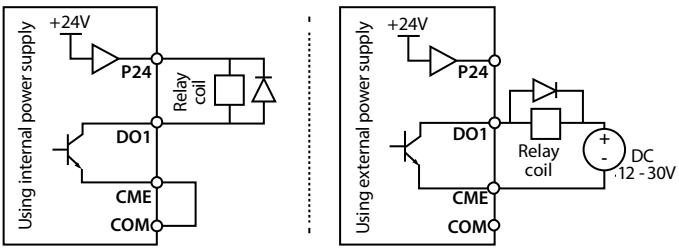


Figure 4-13 DO1 connection

DO2 is open collective output, refer to Figure 4-13.

DO2 is pulse frequency output; DO2 can use internal 24V power supply of HD3N or external power supply. The connection is shown in Figure 4-14.

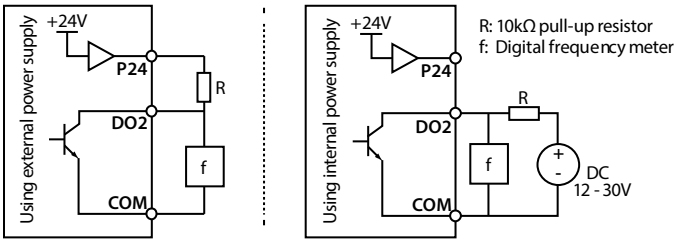


Figure 4-14 DO2 connection

4.5 Meet EMC Requirement of Installation

4.5.1 Correct EMC Installation

According to national standards GB/T12668.3, the controller should meet the two requirements of electromagnetic interference (EMI) and anti-electromagnetic interference. The international standards IEC/61800-3 (VVVF drive system part 3: EMC specifications and test methods) are identical to the national standards GB/T12668.3.

HD3N are designed and produced according to the requirements of IEC/61800-3. Please install the controller as per the description below so as to achieve good electromagnetic compatibility (EMC).

- In a drive system, the controller, control equipment and sensors are installed in the same cabinet; the electromagnetic noise should be suppressed at the main connecting points, and the EMI filter and AC reactor installed in cabinet to satisfy the EMC requirements.
- The most effective but expensive measure to reduce the interference is to isolate the noise source and the noise receiver, which should be considered in mechanical system design phase. In driving system, the noise source can be controller, braking unit and contactor. Noise receiver can be automation equipment, encoder and sensor etc.

The mechanical/system is divided into different EMC areas according to electrical characteristics. The recommended installation positions are shown in Figure 4-15.

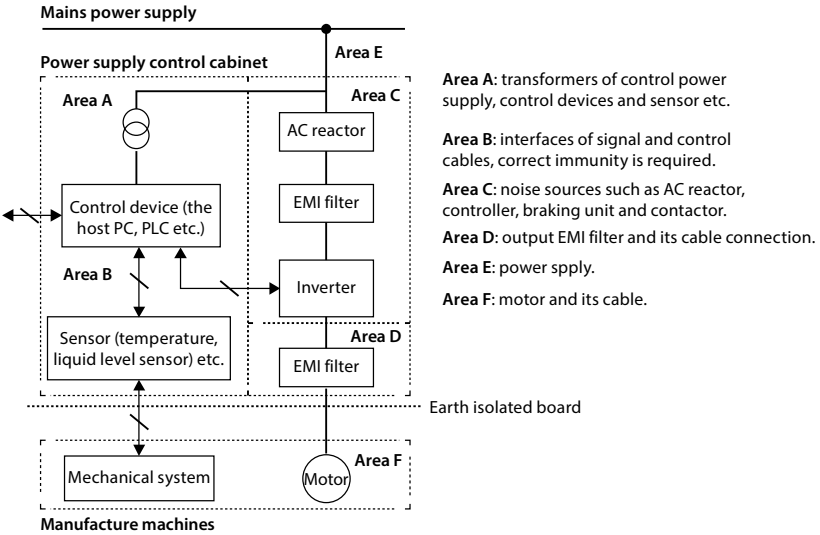


Figure 4-15 System wiring

Explanation:

- All areas should be isolated in space to achieve electromagnetic decoupling effect.
- The min. distance between areas should be 20cm, and use grounding bars for decoupling among areas, the cables from different area should be placed in different tubes.
- EMI filters should be installed at the interfaces between different areas if necessary.
- All of the communication cables from and signal cable from panel must be shielded.

4.5.2 Wiring Requirement

In order to avoid interference intercoupling, it is recommended to separate the power supply cables, motor cables and the control cables, and keep enough distance among them, especially when the cables are laid in parallel and are long enough.

The signal cables should cross the power supply cables or motor cables, keep it perpendicular (90°) as shown in Figure 4-16.

Distribute the power supply cables, motor cables and control cables in different pipelines.

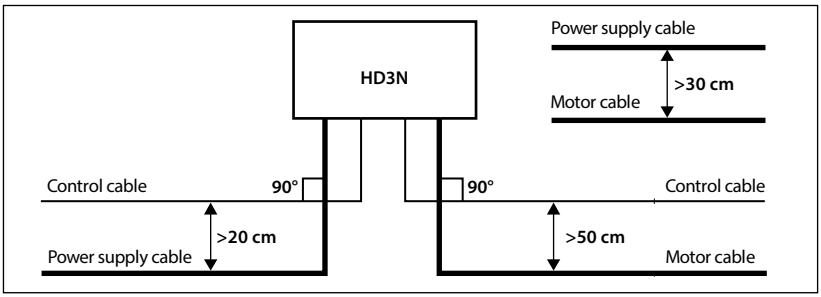


Figure 4-16 System wiring

Shielded / Armoured cable: High frequency low impedance shielded cable should be used. For example: copper net, aluminum net or iron net.

Normally, the control cables must use the shielded cables and the shielding metal net must be connected to the metal enclosure of the controller by cable clamps as shown in Figure 4-17.

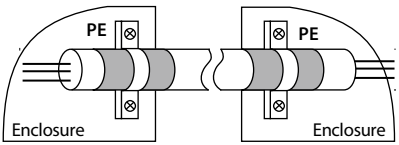


Figure 4-17 Shielded cable connection

4.5.3 Motor Connection

The longer cable between the controller and the motor is, the higher frequency leakage current will be, causing the inverter output current to increase as well. This may affect peripheral devices.

When the cable length is longer than 100 meters, it is recommended to install AC output reactor and adjust the carrier frequency according to Table 4-10.

Table 4-10 Carrier frequency and the cable length between inverter and motor

Cable length	< 30m	30 - 50m	50 - 100m	≥ 100m
Carrier frequency	Below 15kHz	Below 10kHz	Below 5kHz	Below 2kHz

The cross sectional area (CSA) of controller cables should refer to section 4.2 Peripheral Accessories Selection, on page 17.

The controller should be derated if motor cables are too long or their CSA is too large. The current should be decreased by 5% when per level of CSA is increased. If the CSA increase, so do the current to ground and capacitance.

4.5.4 Ground Connection

The grounding terminals PE must be connected to ground properly. The grounding cable should be as short as possible (the grounding point should be as close to the controller as possible) and the grounding area should be as large as possible. The grounding resistance should be less than 10Ω.

Do not share the grounding wire with other devices (A). HD3N can share grounding pole with other devices (C). It achieves the best effect if HD3N and other devices use dedicated grounding poles (B), as shown in Figure 4-18.

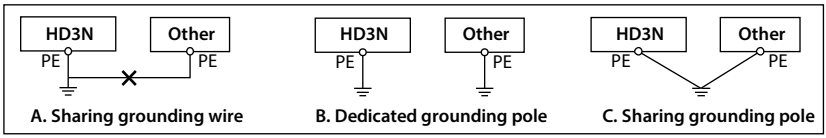


Figure 4-18 Grounding method

When using more than one inverter, be careful not to loop the ground wire as shown in Figure 4-19.

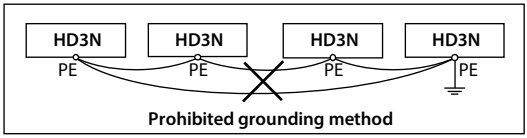


Figure 4-19 Prohibited grounding method

4.5.5 EMI Filter

The EMI filter should be used in the equipment that may generate strong EMI or the equipment that is sensitive to the external EMI. The EMI filter is a dual-way low pass filter through which lower frequency current can flow while higher frequency current can hardly flow.

Function of EMI filter

1. The EMI filter ensures the equipment not only satisfies the conducting emission and conducting sensitivity in EMC standard but also can suppress the radiation of the equipment.

2. It can prevent the EMI generated by equipment from entering the power cable and the EMI generated by power cable from entering equipment.

Common mistakes in using EMI filter

1. Too long the power cable is between the EMI filter and the controller

The filter inside the cabinet should be located near to the input power source. The length of the power cables should be as short as possible.

2. Too close the input and output cables of the EMI filter

The distance between input and output cables of the filter should be as far apart as possible. Otherwise the high-frequency noise may be coupled between the cables and bypass the filter. Thus, the filter will become ineffective.

3. Bad grounding of the EMI filter

The enclosure of EMI filter must be grounded properly to the metal case of the controller. In order to achieve better grounding effect, make use of a special grounding terminal on the enclosure. If using one cable to connect the filter to the case, the grounding is useless for high frequency interference. When the frequency is high, so is the impedance of cable, hence there is little bypass effect.

The correct installation: The filter should be mounted on the enclosure of equipment. Ensure to clear away the insulation paint between the filter case and the enclosure for good grounding contact.

4.5.6 Countermeasures for Conduction, Radiation and Radio Frequency Interference

EMI of the controller

The operating theory of controller means that some EMI is unavoidable. The controller is usually installed in a metal cabinet which normally little affects the instruments outside the metal cabinet. The cables are the main EMI source. If connect the cables according to this manual, the EMI can be suppressed effectively.

If the controller and other control equipment are installed in one cabinet, the area rule must be observed. Pay attention to the isolation between different areas, cable layout and shielding.

Reducing conducted interference

Add a noise filter to suppress conducted interference on the output side. Additionally, conducted interference can be efficiently reduced by threading all the output cables through a grounded metal tube. And conducted interference can be dramatically decreased when the distance between the output cables and the signal cables is above 0.3m.

Reducing RF interference

The I/O cables and the controller produce radio frequency interference. A noise filter can be installed both on the input side and output side, and shield them with iron utensil to reduce RF interference.

The wiring distance between the controller and the motor should be as short as possible shown in Figure 4-20.

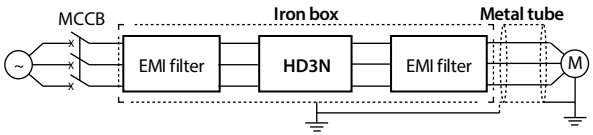


Figure 4-20 Reducing RF interference

4.5.7 Reactor

AC input reactor

The purpose of installing an AC input reactor: to increase the input power factor; to dramatically reduce the harmonics on the input side at the high voltage point of common coupling and prevent input current unbalance which can be caused by the phase-to-phase unbalance of the power supply.

DC reactor

The installation of a DC reactor can increase the input power factor, improve the overall efficiency and thermal stability of controller, substantially eliminate the upper harmonics influence on performance of controller, and decrease the conducted and radiated electromagnetic emissions from the controller.

AC output reactor

When the length of cable between controller and motor is more than 100m, it will cause leakage current and controller tripping. It is suggested that user should consider installing an AC output reactor.

Chapter 5 Operation Instructions

Danger

- Only when the terminal cover of HD3N has been fitted can you 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 HD3N starts.
- Keep away from HD3N if the auto-restart function is enabled at power outage.
- To change the main control PCBA, correctly set the parameters before operating.

Warning

- Do not check or detect the signal during HD3N running.
- Do not randomly change parameter setting of HD3N.
- Please thoroughly complete all control debugging and testing, make all adjustments and conduct a full safety assessment before switching the run command source of HD3N.
- Do not touch the energy-depletion braking resistor due to the high temperature.

5.1 Function Description

5

Note:

In the following sections, you may encounter control, running and status of HD3N description many times. Please read this section. It will help you to correctly understand and use the functions to be discussed.

Frequency setting channel

The final setting frequency of HD3N is set by main frequency setting channel (F00.10) and aux frequency setting channel (F19.00) (calculated by (F19.01). When aux setting channel = main setting channel (except analogue setting), main setting channel set the frequency.

Main frequency setting channel (F00.10)	Aux frequency setting channel (F19.00)	Note
/	0: No channel	
0: Keypad; F00.13 sets the initial value	1: Keypad; F19.03 sets the initial value	Press ▲, ▼ of keypad to set
1: Terminal; F00.13 sets the initial value	2: Terminal; F19.03 sets the initial value	Use UP/DN terminal to set
2: SCI; initial value: 0	3: SCI; initial value: 0	
3: Analogue	4: Analogue	
4: Pulse	5: Pulse	F15.05 set DI6 = 53
/	6: PID output	
6 - 7: AI1 - AI2	7 - 8: AI1 - AI2	
10: Potentionmeter on keypad	11: Potentionmeter on keypad	

Operation Mode

F00.11 and DI terminal can select command of HD3N (start, running, stop and jog start):

Operation mode	Description
Keypad control	Use ◇ button (RUN), ▽ button (STOP) and ◇ button (JOG) on keypad to start/stop/jog start HD3N.
Control terminal	Use control terminal to start/stop HD3N.
SCI communication	Use SCI to start/stop HD3N.

Operation status

Operation status	Description
Stop status	After HD3N is initialized, if no command inputs or stop command is given, there will be output from U/V/W of HD3N and status indicator on LCD keypad will flash.
Run status	When HD3N receives running command, U/V/W terminal outputs, status indicator on LCD keypad will flash.
Motor parameter auto-tuning	F08.06 = 1/2/3. After receiving running command, HD3N enters motor parameter auto-tuning. It stops when auto-tuning finished.
Running status	Running means two status: HD3N is running or it is in stop status and can auto start. In this status, running status indicator on keypad is lighting. Stop status parameter will flash on LCD. During running, the parameters with "X" can not be modified during running (refer to appendix A).

Running modes

Running modes	Description
Jog start	In keypad control mode, press ◇ button (JOG) to jog start frequency running (set F00.15, F03.15 and F03.16). In terminal control mode, when receiving DI jog start command (No. 20 - 25 function), HD3N runs according to relative frequency (set F00.15, F03.15, F03.16 and F05.21).
PID adjustment running	PID adjustment function is valid (F04.00 = 1), HD3N runs in PID mode. Process PID adjusts according to setting and feedback (need setting F04). • Disable process PID by DI terminal (No. 33 function) and switch to other running modes.
Multi-speed running	With logic combination of DI terminal (No. 13 - 16 function), select multi-speed frequency 1-15 (F06.00 - F06.14) running. • Set running direction and Acc. / Dec. time of multi-speed by F06.17 - F06.45 (tens and hundreds).
Simple PLC running	When simple PLC function is valid (F06.15 = 1), HD3N runs according to simple PLC (as per pre-set running parameter F06). • Set DI = No. 30 function to pause simple PLC.
Wobble running	When wobble running function is valid (F07.00 = 1), HD3N will wobble according to pre-set parameters (refer to F07).

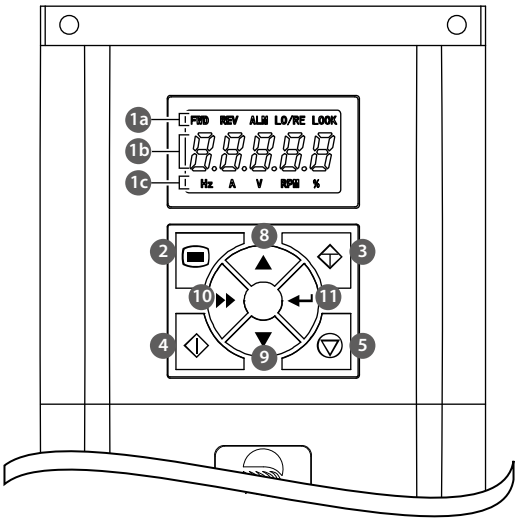
5.2 Keypad Description

HD3N keypad is equipped with LCD keypad; users can select LED keypad. Refer to Figure 5-1.

The standard LCD keypad cannot be dismantled. Wiring of LED is shown in section 4.4.5 and 4.4.6.

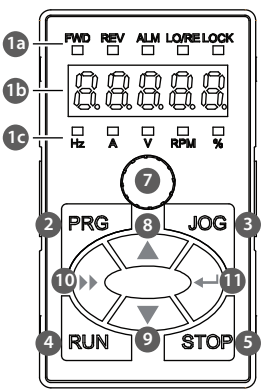
LCD keypad

Standard

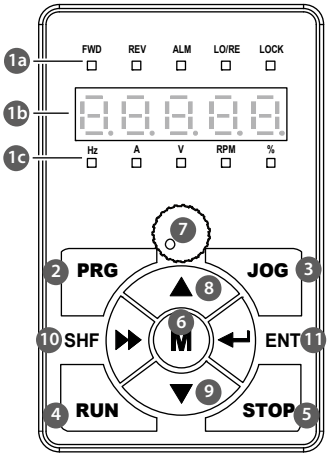


LED keypad

Optional



HD-LED-P-S



HD-LED-P

Figure 5-1 Keypad

<table>
<tr><th>No.</th><th>Description</th></tr>
<tr><td>1</td><td>Standard keypad is LCD display, while the optional keypad is LED display.
• Three states: Lighting, flashing, lightless.
• The LCD keypad can not be dismantled.

a. Status indicator: Display the current status.
• FWD (forward): Display FWD (LCD)/Lighting (LED) when motor is forward running
• REV (Reverse): Display REV (LCD)/Lighting (LED) when motor is reverse running
• ALM (Alarm): Display ALM (LCD) / Lighting (LED) when fault occurs
• LO/RE (Local/Remote): Display LO/RE (LCD)/Lighting (LED) in terminal or communication control
• LOCK (Lock): Display LOCK (LCD)/ Light (LED) when user password is effective
c. Unit indicator: Display the present unit.
• Hz (frequency), A (current), V (voltage), RPM (rotoray speed), % (%)

b. Display area: Display parameter in normal state; display fault code when fault occurs.
• The value is modifiable when it is flashing.
<table>
<tr><th>Display</th><th>Meaning</th><th>Display</th><th>Meaning</th><th>Display</th><th>Meaning</th><th>Display</th><th>Meaning</th></tr>
<tr><td>0</td><td>0</td><td>A</td><td>A</td><td>J</td><td>J</td><td>U</td><td>U</td></tr>
<tr><td>1</td><td>1</td><td>b</td><td>b</td><td>L</td><td>L</td><td>u</td><td>u</td></tr>
<tr><td>2</td><td>2</td><td>C</td><td>C</td><td>n</td><td>n</td><td>y</td><td>y</td></tr>
<tr><td>3</td><td>3</td><td>c</td><td>c</td><td>o</td><td>o</td><td>-</td><td>-</td></tr>
<tr><td>4</td><td>4</td><td>d</td><td>d</td><td>P</td><td>P</td><td>.</td><td>Dot</td></tr>
<tr><td>5</td><td>5</td><td>E</td><td>E</td><td>q</td><td>q</td><td>8.</td><td>Full display</td></tr>
<tr><td>6</td><td>6</td><td>F</td><td>F</td><td>r</td><td>r</td><td></td><td>No display</td></tr>
<tr><td>7</td><td>7</td><td>H</td><td>H</td><td>S</td><td>S</td><td>8.</td><td>Flashing Modifiable</td></tr>
<tr><td>8</td><td>8</td><td>h</td><td>h</td><td>T</td><td>T</td><td></td><td></td></tr>
<tr><td>9</td><td>9</td><td>i</td><td>i</td><td>t</td><td>t</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>2</td><td colspan="2">PRG</td><td>Program/Exit: Enter or exit</td></tr>
<tr><td>3</td><td colspan="2">JOG</td><td>Jog: Jog start HD3N in keypad control mode</td></tr>
<tr><td>4</td><td colspan="2">RUN</td><td>Run: Jog start HD3N in keypad control mode.</td></tr>
<tr><td>5</td><td colspan="2">STOP</td><td>Stop/Reset: Stop HD3N in keypad mode; reset fault when fault occurs</td></tr>
<tr><td>6</td><td>/</td><td>M</td><td>Multi-function button: F00.12 sets definite function</td></tr>
<tr><td>7</td><td>/</td><td>Knob</td><td>Potentionmeter: When setting parameter, turn anticlock wise to decrease, turn clockwise to increase</td></tr>
<tr><td>8</td><td colspan="2">▲</td><td>Increase: Increase parameter or value</td></tr>
<tr><td>9</td><td colspan="2">▼</td><td>Decrease: Decrease parameter or value</td></tr>
<tr><td>10</td><td colspan="2">▶▶</td><td>Shift: Shift one bit when selecting parameter or setting the parameter</td></tr>
<tr><td>11</td><td colspan="2">↵</td><td>Enter/Confirm: Enter lower menu; confirm saving the data</td></tr>
</table>

5.3 Display Status

Parameter display status at stop/run

When HD3N is in stop/run status, the keypad will display stop or run status and its parameters, as shown in Figure 5-2.

Other parameters (F18.08 - F18.13) or F18.02 - F18.07 can be displayed by pressing ▶▶.

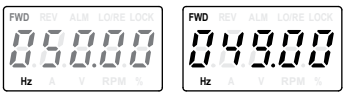


Figure 5-2 Display status of stop (left) and run (right)

Fault alarming status

If HD3N detects a fault signal, keypad will enter fault alarm status and display the fault code, as shown in Figure 5-3.

Fault history can be checked by Group F20 (F20.21 - F20.37) .

To reset the fault, press ▽ button (**STOP**), or use external fault reset terminal or communication reset command.

Figure 5-3 Fault alarming status

Other display status

Refer to Figure 5-4 for other display status.

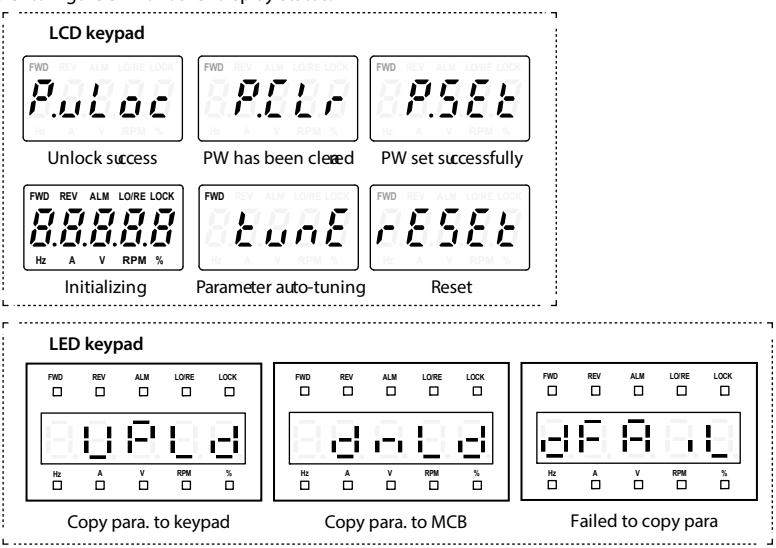


Figure 5-4 Other display status

Parameter setting

In stop / run / fault status, press ⏺ button (PRG) to set parameter. (If user password has been set, refer to F00.00 and section 5.3).

The keypad uses four-level menu: mode setting (first-level)→function parameter group setting (second-level)→function parameter setting (third-level)→parameter setting (fourth-level).

Figure 5-5 is an example in LCD display and the description of buttons is shown in Table 5-1.

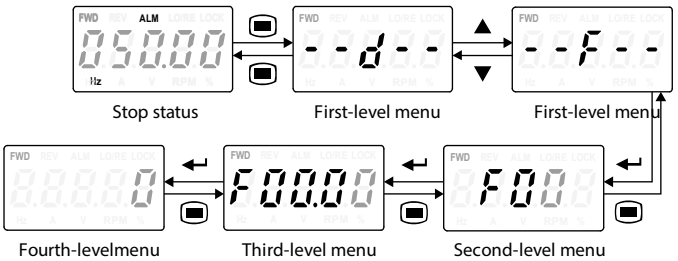


Figure 5-5 Four-level operation process

Table 5-1 Button description

Button	First-level menu	Second-level menu	Third-level menu	Fourth-level menu
⏺ PRG	Fault, return to fault display; Fault cleared, return to run or stop status display	Return to first-level menu	Return to second-level menu	Do not save the present value and return to third-level
↵	Enter second-level menu	Enter third-level menu	Enter fourth-level menu	Save the present value and return to third-level
▲	Select function group Cycle according to d-F-R-y	Modify No. function. Increase by 1 when press this key one time	Modify the internal No. of function group. Increase by 1 according to the present modified bit	Modify function value. Increase by 1 according to the present modified bit
▼	Select function group Cycle according to y-R-F-d	Modify No. function. Decrease by 1 when press this key one time	Modify the internal No. of function group. Decrease by 1 according to the present modified bit	Modify function value. Decrease by 1 according to the present modified bit
▶▶	Invalid	Invalid	Switch units and tens	Switch units , ten thousands, thousands, hundreds, tens

When setting fourth-level menu, if the parameter does not flash, it indicates that this parameter can't be modified. The possible reasons are as follows:

- The parameter can't be modified, such as the actual detected parameters or recorded parameters etc.
- Only when HD3N stops can the function parameter be modified.
- Only input the correct password can edit the function parameter.

Restore to factory setting

Set F01.02 = 1 (Restore to factory settings) to restore the values of parameter to factory setting, as shown in Figure 5-6.

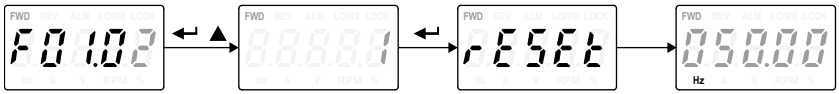


Figure 5-6 Restore to factory setting

Unlock user password

F01.00 = non-zero value, press ⏎ button (PRG) to exit to stop / run display status, or do not operate within 5 minutes, the user password will be valid and "LOCK" will be lighting. In this status, parameters can not be modified.

In "LOCK" status, to modify parameter, user needs to unlock the password. Figure 5-7 takes "00004" as the user password.

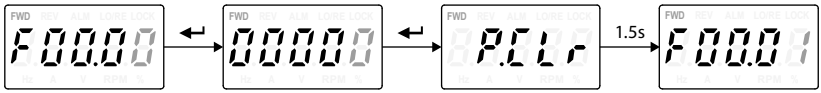


Figure 5-7 Unlock user password

Modify user password

Provided that new password is "02004", if password haven't been set, set F00.00 according to Figure 5-8. If password have been set, unlock according to Figure 5-7, then set F00.00 according to Figure 5-8.

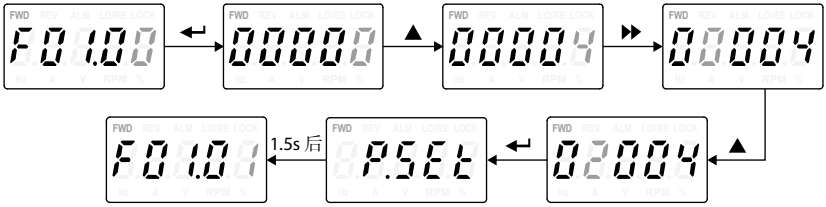


Figure 5-8 Modify user password

Clear user password

If password have been set, unlock according to Figure 5-7, then clear F00.00 according to Figure 5-9.

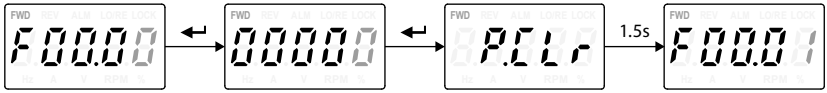


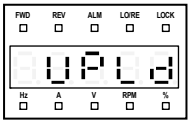
Figure 5-9 Clear user password

Copy parameter

Only LED keypad can copy parameter.

Copy parameter from control board to keypad:

Set F01.03 = 1/2 (copy current function code to keypad parameter 1/2), keypad displays "UPLd", when copying finished, keypad will display F01.00.

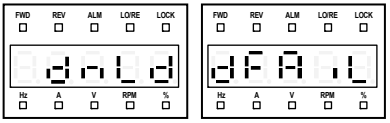


Uploading parameters

Figure 5-10 Copy to keypad

Copy parameter from keypad to control board:

Set F01.02 = 2/3 (copy keypad parameter 1/2 to current function code) or F01.02 = 5/6 (the parameter copying includes motor parameter), keypad displays "dnLd", when copying finished, keypad will display F01.03.



Downloading parameters Downloading error

Figure 5-11 Copy to control board

Note:

1. When copying to control board, it displays "dFAiL" which means that EEPROM storage parameters of keypad do not mathc with function parameters of HD3N. First, copy the setting value of the correct function code to EEPROM of keypad, and then copy to control board.

2. When copying parameter, keypad displays and flashes "E0022" (keypad EEPROM fault). It will jump to next function code 10s later. The troubleshooting is in section 7.1 Troubleshooting, on page 101.

Chapter 6 Function Introduction

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

Display parameter:

General function parameter:

Manufacturer Function Parameters (on page 100)

6.1 Group d: Display Parameter

Group d is status display parameter.

6.1.1 d00: Status Display Parameter

<table>
<tr><th>Ref. code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d00.00</td><td>HD3N series</td><td>[Actual value]</td></tr>
<tr><td>d00.01</td><td>Software version of HD3N</td><td>[Actual value]</td></tr>
<tr><td>d00.03</td><td>Non-standard software version of HD3N</td><td>[Actual value]</td></tr>
<tr><td>d00.05</td><td>Software version of keypad</td><td>[Actual value]</td></tr>
<tr><td></td><td>Valid only when LED keypad adopted.</td><td></td></tr>
<tr><td>d00.06</td><td>Customized serial number</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>Displays present motor and control mode.
Unit: Unused
Ten: Control mode
• 0: V/f control without PG.
• 2: Vector control without PG.</td><td></td></tr>
<tr><td>d00.08</td><td>Rated current of HD3N (A)</td><td>[Actual value]</td></tr>
<tr><td>d00.10</td><td>Inverter status</td><td>[Actual value]</td></tr>
<tr><td></td><td>Displays the inverter status, as following:
<table>
<tr><td>Thousands</td><td>Bit15: Unused</td><td>Bit14: Hardware current restriction
0: Do not restrict
1: Restrict</td><td>Bit13: Software current restriction
0: Do not restrict
1: Restrict</td><td>Bit12: Stall overvoltage
0: Invalid
1: Valid</td></tr>
<tr><td>Hundreds</td><td>Bit11: Control mode
0: Speed control
1: Torque control</td><td>Bit10: Speed limitation
0: Below limitation
1: Above limitation</td><td>Bit9: Unused</td><td>Bit8: Auto-tuning
0: Not in auto-tuning
1: In suto-tuning</td></tr>
<tr><td>Tens</td><td>Bit7: DC brake
0: Invalid
1: Valid</td><td>Bit6: Unused</td><td colspan="2">Bit5&Bit4: Acc. / Dec./Constant
00: Constant 01: Acc
11: Constant 10: Dec</td></tr>
<tr><td>Units</td><td>Bit3: Zero speed
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: Faulty
1: Normal</td></tr>
</table></td><td></td></tr>
<tr><td>d00.11</td><td>Main setting frequency channel</td><td>[Actual value]</td></tr>
<tr><td></td><td>0: Keypad.
1: Terminal.
2: Communication.
3: Analogue.
4: Terminal pulse.
6 - 7: AI1 - AI2.
10: Potentionmeter on keypad.
11: PID.
12: Multi-speed.
13: PLC.
14: Wobble.</td><td></td></tr>
<tr><td>d00.12</td><td>Main setting frequency (Hz)</td><td>[Actual value]</td></tr>
<tr><td>d00.13</td><td>Aux setting frequency (Hz)</td><td>[Actual value]</td></tr>
<tr><td>d00.14</td><td>Setting frequency (Hz)</td><td>[Actual value]</td></tr>
<tr><td>d00.15</td><td>Setting frequency (after Acc. / Dec.) (Hz)</td><td>[Actual value]</td></tr>
<tr><td></td><td>Display the setting frequency after Acc. / Dec..</td><td></td></tr>
</table>

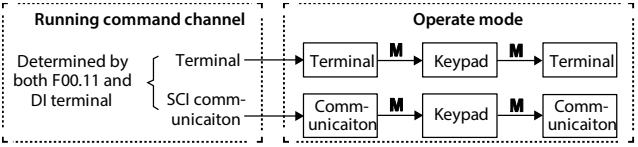
Ref. code	Function Description	Setting Range [Default]
d00.16	**Output frequency (Hz)**	[Actual value]
d00.17	**Setting rpm (rpm)**	[Actual value]
d00.18	**Runnig rpm (rpm)**	[Actual value]
d00.19	**Input voltage (V)**	[Actual value]
d00.20	**Output voltage (V)**	[Actual value]
d00.21	**Output current (A)**	[Actual value]
d00.22	**Torque setting (%)**	[Actual value]
	Display torque setting which is relative percentage of the rated torque.	
d00.23	**Output torque (%)**	[Actual value]
	Display output torque which is relative percentage of rated torque of motor.	
d00.24	**Output power (kW)**	[Actual value]
	Display present actual output power.	
d00.25	**DC busbar voltage (V)**	[Actual value]
d00.26	**Input voltage of potentionmeter (%)**	[Actual value]
	Display input voltage of potentionmeter that is calculated by gain, bias and filter, relative percentage of 5V. • Valid when LED keypad adopted.	
d00.27	**AI1 input (%)**	[Actual value]
	Display AI1 calculated by filter, percentage of 10V.	
d00.28	**AI1 input (after calculating) (%)**	[Actual value]
	Display AI calculated by gain, bias and filter, percentage of 10V.	
d00.29	**AI2 input (%)**	[Actual value]
	Display AI2 input voltage/current calculated by filter. • When AI2 selects voltage input, 0V corresponds to 0.0%, and 10V corresponds to 100.0%. • When AI2 selects current input, 0mA corresponds to 0.0%, 20mA corresponds to 100.0%.	
d00.30	**AI2 input (after calculating) (%)**	[Actual value]
	Display AI2 input voltage/current which is calculated by gain and bias. • Refer to d00.29.	
d00.35	**DI6 terminal pulse input frequency (Hz)**	[Actual value]
d00.36	**AO1 output (%)**	[Actual value]
	When AO1 selects voltage output, 0.0% corresponds to 0V, 100.0% corresponds to 10V. When AO1 selects 0 - 20mA current output, 0.0% corresponds to 0mA, 100.0% corresponds to 20mA. When AO1 selects 4 - 20mA current output, 0.0% corresponds to 4mA, 100.0% corresponds to 20mA. • Refer to F16.22 and F16.23 for setting of 4 - 20mA current output.	
d00.37	**AO2 output (%)**	[Actual value]
	The relationship is same as AO1, refer to d00.36.	
d00.38	**High speed output pulse frequency (Hz)**	[Actual value]
d00.40	**Setting line speed**	[Actual value]
d00.41	**Reference line speed**	[Actual value]
d00.44	**PID setting (%)**	[Actual value]
	Display PID setting relative to full scale percentage.	
d00.45	**PID feedback (%)**	[Actual value]
	Display PID feedback relative to full scale percentage.	
d00.46	**PID tolerance (%)**	[Actual value]
	Display PID tolerance relative to full scale percentage.	

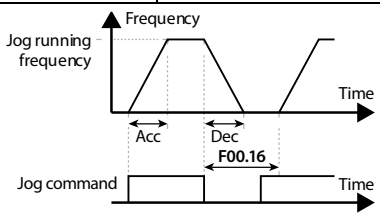
<table>
<tr><th>Ref. code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d00.47</td><td>PID integral item (%)</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display PID integral item tolerance relative to percentage of max. output frequency.</td></tr>
<tr><td>d00.48</td><td>PID output (%)</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display PID output relative to percentage of max. output frequency.</td></tr>
<tr><td>d00.49</td><td>External count value</td><td>[Actual value]</td></tr>
<tr><td>d00.50</td><td>Input terminal status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display input terminal status. Each bit (binary) of this parameter stands for different physical sources which are in below table.
• 0: Input terminals disconnect with common terminals.
• 1: Input terminals connect with common terminals.
<table>
<tr><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>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
</table></td></tr>
<tr><td>d00.51</td><td>Output terminal status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display output terminal status. Each bit (binary) of this parameter stands for different physical sources which are in the below table.
• 0: Output terminals disconnect with common terminals.
• 1: Output terminals connect with common terminals.
<table>
<tr><td>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>-</td><td>-</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.
2: Wrong data Frame head.
4: Wrong 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>Accumulative length (km)</td><td>[Actual value]</td></tr>
<tr><td>d00.55</td><td>Total power up time (h)</td><td>[Actual value]</td></tr>
<tr><td>d00.56</td><td>Total running time (h)</td><td>[Actual value]</td></tr>
<tr><td>d00.57</td><td>Total energy consumption high bit of motor (k kW.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.58</td><td>Total energy consumption low bit of motor (k kW.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.59</td><td>Present energy consumption high bit (k kW.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.60</td><td>Present energy consumption low bit (k kW.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.61</td><td>Present fault</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display 100: means under-voltage.</td></tr>
</table>

6.2 Group F: General Parameters

6.2.1 F00: Basic Parameters

Ref. code	Function Description	Setting Range [Default]
F00.00	**Motor control mode**	**0,1 [0]**
	0: Speed control. 1: Torque control. • Torque control is valid only when motor control mode = 2 (F00.01 = 2). • Refer to group F15 DI terminal (No. 56/57 function) for detail description of torque control and group F21 for torque control parameter.	
F00.01	**Motor control mode**	**0 - 2 [0]**
	0: V/f control without PG. Constant control voltage/frequency rate. • It is applicable for occasions when one inverter drives more than one motors to achieve proper efficiency. • When select V/f control, please properly set the V/f control Group F09 to achieve proper efficiency. 2: Vector control without PG. (SVC control) • It is applicable for application with high requirement on inverter performance and torque. • At first, it must perform motor parameter auto-tuning. And then adjust the settings of F08.00 - F08.04 according to the nameplate of the motor. Start the motor parameter auto-tuning function and properly set Group F10 parameters, so as to achieve excellent vector control efficiency.	
F00.06	**Max. output frequency of HD3N**	**50.00 - 400.00 [50.00Hz]**
	Defines the max. frequency that HD3N is allowed to output. • V/f: max. 400Hz; Vector control: max. 200Hz. • Please set F00.06 according to nameplate of motor and actual running conditions.	
F00.07	**Upper limit of running frequency setting channel**	**0 - 7 [0]**
	Defines the max. frequency that system is allowed to run, and use F00.07 to select setting channels to set the upper limit frequency. 0: Digital setting. Set the upper limit frequency by F00.08. 1: Analogue input setting. Refer to Group F16. 2: Terminal pulse setting. Set by F16.17, and its max. pulse input frequency corresponds to F00.06 (max. output frequency of HD3N). 3: AI1. 4: AI2. 7: Potentionmeter. Valid when LED keypad adopted only.	
F00.08	**Upper limit of running frequency**	**0.00 - F00.06 [50.00Hz]**
	F00.07 = 0, the upper limit frequency is set by F00.08.	
F00.09	**Lower limit of running frequency**	**0.00 - F00.08 [0.00Hz]**
	Use F00.09 to limit the actual output frequency. When Zero frequency threshold (F19.10) < setting frequency < F00.09, HD3N will run at lower limit frequency. • Properly set F00.09 according to the nameplate of the motor and actual running conditions. • No limitation on the motor parameter auto-tuning function. • Besides the lower /upper limit frequency, the running frequency of inverter is also limited by starting/stop DWELL frequency (F02.02, F02.14), zero frequency threshold (F19.10), starting frequency of stop DC brake (F02.16) and skip frequency (F05.17 - F05.19).	

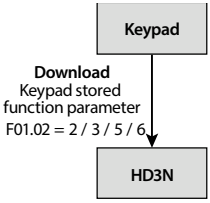
Ref. code	Function Description	Setting Range [Default]
F00.10	**Frequency setting channels**	**0 - 10 [0]**
	0: Keypad. Change the value by pressing ▲, ▼ button on keypad. Initial value is set by F00.13. 1: Terminal. Change the value by using UP/DN. Initial value is set by F00.13. 2: SCI communication. Change the setting frequency by SCI command. • The initial value of the SCI frequency is 0. 3: Analogue. Set by analogue input voltage, refer to group F16. • Refer to Group F05 for the corresponding relationship between the analogue value and the running frequency of HD3N. 4:DI6 pulse. • Refer to Group F05 for the corresponding relationship between the pulse terminal frequency and the running frequency of HD3N. 6: AI1. 7: AI2. 10: Potentionmeter. Valid when LED keypad adopted only.	
F00.11	**Command setting channel**	**0 - 2 [0]**
	0: Keypad. • Start and stop HD3N by pressing ◇ button (**RUN**), ▽ button (**STOP**) and ◇ (**JOG**). 1: Terminal. Start and stop by using corresponding external terminals. • DI treminal is set as FWD (DI = 2), REV (DI = 3), JOGF1 (DI = 20), JOGR1 (DI = 21), JOGF2 (DI = 22) and JOGR2 (DI = 23), refer to group F15. 2: SCI. Start and stop by SCI port according to communication protocol.	
F00.12	**M key function**	**0 - 2 [2]**
	Note: Valid when LED keypad adopted only. 0: Switch running direction. Switch running direction by **M** button. • F00.11 = 0, it is valid. Do not save when power is off. • Direction can be switched only when keypad displays status parameter. 1: Switch local and remote control. Switch the local and remote control by **M**. The logic is shown in below figure. • F00.11 = 0: LOCAL. • F00.11 = 1,2: REMOTE. • Channel priority: Local/Remote > command source set by DI terminal (No. 9, 10, 11 function) > command set by F00.11.  • LO/RE indicator: Lighting: terminal source. Flash: SCI communication source. Lightless: Keypad source. 2: M key invalid.	
F00.13	**Starting frequency digital setting**	**0.00 - upper limit frequency [50.00Hz]**
	F00.10 = 0 or 1, F00.13 sets the initial frequency value.	

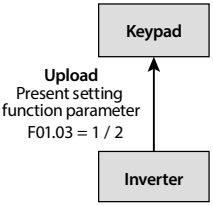
Ref. code	Function Description	Setting Range [Default]
F00.14	**Frequency setting control**	**0000 - 1111 [1001]**
	Units and tens are valid only when F00.10 = 0 or 1. The current setting frequency value will be replaced by a new one when F00.13 has been changed. **Unit: Save selection of frequency setting at power outage** • 0: Do not save at power outage. • 1: Save at power outage. **Ten: Control selection of frequency setting at stop** • 0: Set frequency is kept in stop. • 1: Restore to F00.13 at stop. **Hundred: Save selection of communication setting frequency** • 0: Do not save at power outage. • 1: Save at power outage. **Thousand: Save selection of frequency setting when switching frequency source** • 0: Do nto save. • 1: Save. When frequency setting source swicthes from keypad -> terminal digital setting –> keypad, setting on keypad do not change.	
F00.15	**Jog running frequency digital setting 1**	**0.00 - upper limit frequency [5.00Hz]**
F00.16	**Interval of jog running**	**0.0 - 100.0 [0.0s]**
	After cancel jog command, HD3N will not respond to jog command within F00.16. • After the interval of jog is completed, it immediately executes the arrived jog command. As show in figure. 	
F00.17	**Running direction**	**0,1 [0]**
	0: The same as running command. 1: Opposite to running command.	
F00.18	**Reverse**	**0,1 [0]**
	This function is valid when F00.11 = 0,1,2. 0: Permitted. 1: Prohibitted. • HD3N responds to FWD/REV commands only. If frequency < 0Hz, HD3N will run at zero-frequency. • HD3N will not responds to FWD/REV commands at stop status; during running, if HD3N receives REV command, it will accelerates to stop status. • Simple PLC runs to setting range of REV, HD3N will accelerates and run at zero-speed. It will not resume running until meeting FWD setting range.	
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.	
F00.20	**Enable key operation of keypad**	**0,1 [0]**
	0: Enable. When LCD and LED keypads are connected to HD3N, LED keypad can operate. 1: Invalid. When LCD and LED keypads are connected to HD3N, LED keypad can not operate.	
F00.21	**Dormant function**	**0,1 [0]**
	0: Disabled. This function is invalid. 1: Enable.	

Ref. code	Function Description	Setting Range [Default]
F00.22	**Dormancy wake up time**	**0.0 - 6000.0 [1.0s]**
F00.24	**Dormancy delay time**	**0.0 - 6000.0 [1.0s]**
F00.25	**Dormancy frequency**	**0.00 - upper limit frequency [0.00Hz]**
	F00.21 - F00.25 is used for dormancy and wake up. • If HD3N is in dormant status and receive run command, and setting frequency ≥ F00.25, when F00.22 (dormancy wake up time) is finished, HD3N wakes up from dormancy status and starts running; • During running, and setting frequency < F00.25, when F00.24 (dormancy delay time) is finished, HD3N enters dormancy status (Run indicator is lighting, and LED is flashing) and stop running.	
F00.26	**Action selection of HD3N at zero-speed**	**000 - 332 [111]**
	Unit: Action selection of zero-speed under V/f control • 0: Do not process. • 1: HD3N does not output. • 2: HD3N runs at DC brake. **Ten: Action selection of zero-speed under open loop vector control** **Hundred: Action selection of zero-speed under torque control** • 0: Do not process. • 1: HD3N does nto output. • 2: HD3N runs at DC brake. • 3: HD3N runs at pre-excitation.	
F00.27	**Command source binding frequency source**	**000 - ddd [000]**
	Valid only for main frequency. When command source is bound to frequency source, frequnecy source set by F00.10 will be invalid during this binding. **Unit: keypad binds to frequency source** **Ten: Terminal binds to frequency source** **Hundred: SCI binds to frequency source** • 0: No binding. • 1: Keypad digital setting. • 2: Terminal digital setting. • 3: SCI setting. • 5: Terminal pulse setting. • 7: AI1 setting. • 8: AI2 setting. • B: Potentionmeter setting. • Valid when LED keypad adopted only. • C: PID setting. • D: Multi-speed setting.	
F00.28	**Function of STOP button**	**0,1 [0]**
	0: Valid in keypad control mode only. 1: Valid in all control modes.	

6.2.2 F01: Protection of Parameters

Ref. code	Function Description	Setting Range [Default]
F01.00	**User 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 ▣ button (PRG) to exit to stop / run display status or by detecting no press on the keypad within 5 minutes, the user's password will be valid. To change parameters, input correct password. It will restart when there is no press on the keypad within 5 minutes. 00000: The factory setting of F01.00 is 00000, namely the password protection function is disabled. • If user unlocks the password, it means clearing the user's password. • Refer to section 5.3 for more information about unlock/modify and clear password.	
F01.01	**Menu mode**	**000 - 101 [000]**
	Units: • 0: Full menu mode. All function parameters can be displayed. • 1: Checking menu mode. Only parameters different from factory setting can be displayed. **Ten: Unused** **Hundreds:** • 0: Group F can check after setting password. • 1: Group F can not check after setting password.	
F01.02	**Function code parameter initialization (download)**	**0 - 6 [0]**
	0: No operation. HD3N is in regular parameter read / write status. • Whether can change the parameter depends on user password status and the actual running condition of HD3N. 1: Restore to factory settings. • Except F01.00, F01.02, F01.03, Group F08, F19.15, F19.19, F19.24, F20.08, F20.09, F20.21 - F20.37, F23.00 and Group y. • **Steps:** If set F01.02 = 1, press ↵ to ensure and the parameters are restored to factory settings. The keypad dispalys "rESEt". Then the keypad will display parameters in stop status after finish restoring to factory setting. 2,3: Download the keypad EEPROM parameter 1 / 2 to the current function code settings. 4: Clear fault information. The fault history of F20.21 - F20.37 will be cleared. 5,6: Copy the keypad EEPROM parameter 1 / 2 to the current function code settings (including the motor parameters). *Note:* *1. F01.00, F01.02, F01.03, F20.21 - F20.37 and group y can not be copied.* *2. Parameter copying (no. 2/3/5/6 function) is valid when LED keypad adopted.*	
F01.03	**Copy parameter to keypad (upload)**	**0 - 2 [0]**
	0: No operation. HD3N is in regular parameter read / write status. 1: Copy the current function code settings to keypad EEPROM parameter 1. 2: Copy the current function code settings to keypad EEPROM parameter 2. *Note:* *1. F01.00, F01.02, F01.03, F20.21 - F20.37 and group y can not be copied.* *2. Parameter copying (no. 1/2 function) is valid when LED keypad adopted.*	





6

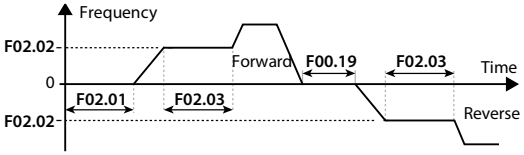
6.2.3 F02: Parameters for Start and Stop

Ref. code	Function Description	Setting Range [Default]
F02.00	**Start mode**	0 - 2 [0]

In torque control mode, the setting of start mode is invalid.

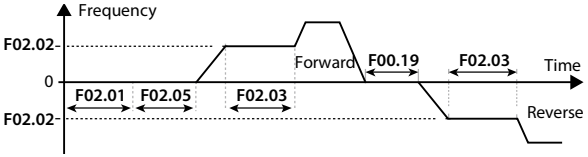
0: Start from starting DWELL frequency.

- Refer to F02.02 and F02.03 for starting DWELL frequency.



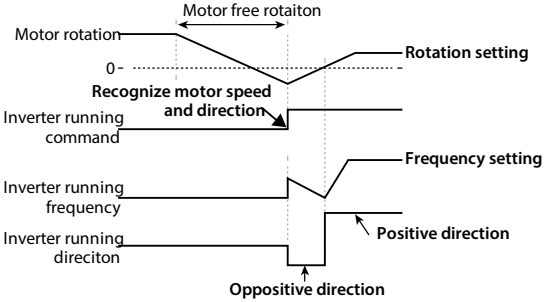
1: Brake and then start from starting DWELLfrequency.

- Refer to F02.04 and F02.05 for DC brake.
- The starting DC brake is valid only during process of stop status switching to running status. It is invalid when FWD and REV reversed during running. Refer to bolow figure F02.05 (DC brake starting time) is invalid).

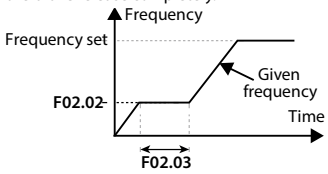
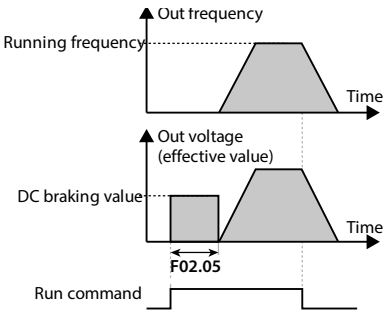


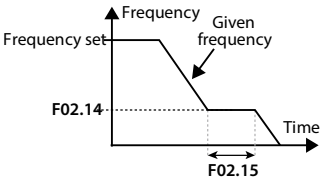
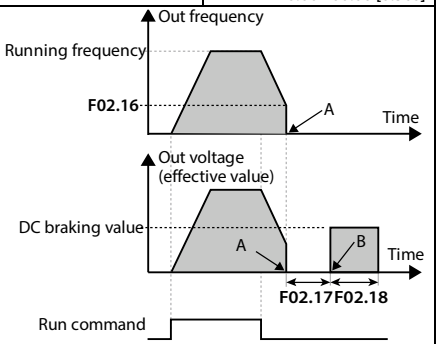
2: Rotate speed tracking re-start. When the result is lower than F02.02, HD3N starts from starting DWELL frequency.

- Tracks the rotate speed and direction of motor automatically,smooth and low impact is applied to motor which is rotating.
- Rotate speed tracking is valid only during the process of switching from stop to running. It is invalid during running when the direction switches.

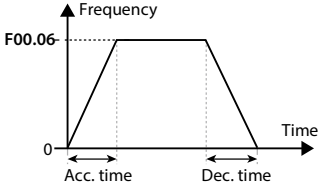
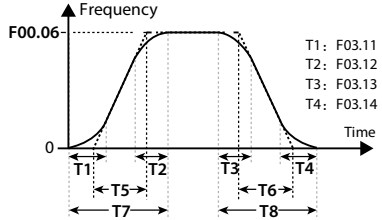


F02.01	**Start delay time**	0.00 - 10.00 [0.00s]
	On receiving run conmand, HD3N will wait until F02.01 is finished and run.	

Ref. code	Function Description	Setting Range [Default]
F02.02	**Starting DWELL frequency setting**	**0.00 - upper limit frequency [0.00Hz]**
F02.03	**Starting DWELL retention time**	**0.00 - 10.00 [0.00s]**
	At start, HD3N runs at the output frequency so to avoid the motor from a stall. If the load of motor is equiped with brake, when the brake responds too slow, to avoid friction, starting DWELL function is adopted. HD3N will not fully accelerate until the brake release completely. • During acceleration, when setting frequency = F02.02, output frequency goes through the time of F02.03 and then continue to accelerate. • F02.02/F02.03 = 0, starting DWELL frequency is invalid. *Note: Starting DWELL function is invalid for torque control, process PID /aux process PID, simple PLC and wobble running.* 	
F02.04	**Current at DC brake**	**0 - 100 (rated current of HD3N) [50%]**
F02.05	**DC brake starting time**	**0.00 - 60.00 [0.50s]**
	F02.04 is percentage to rated current of HD3N. It sets current value of starting DC brake and stop DC brake. • If setting DC brake current is 5 times higher than rated current of motor, the inputing current will be 5 times rated current of motor. • DC brake current is valid for both start and stop DC brake. F02.05 = 0, there is no DC brake acting. • F02.05 is valid only when F02.00 = 1. 	
F02.06	**Compensation for full speed tracking**	**0.000 - 2.000 [0.000Hz]**
F02.13	**Stop modes at speed control**	**0 - 2 [0]**
	0: Decelerate to stop. • On receiving stop command, HD3N decrease output frequency according to dec time. When output frequency = F02.14 and wait till F02.15 is finished, HD3N stops. • Refer to figure in F02.14, F02.15. 1: Coast to stop. • On receiving stop command, HD3N stops output. The load coast to stop according to mechanical inertia. 2: Decelerate to stop+DC brake. • On receiving stop command, HD3N decrease the output frequency according to dec time. When output frequency = F02.16, DC brake starts. • Refer to F02.16 - F02.18 for DC brake stop. • Refer to F03.00 - F03.08 for dec time.	

Ref. code	Function Description	Setting Range [Default]
F02.14	**Stop DWELL frequency setting**	**0.00 - upper limit frequency [0.00Hz]**
F02.15	**Stop DWELL frequency retention time**	**0.00 - 10.00 [0.00s]**
	When HD3N stops, it maintains the setting output frequency to avoid motor from a stall. If load of motor is equiped with brake, when the brake responds too slow, to avoid danger caused by uncomplete close of brake, stop DWELL function is adopted. HD3N will not stop until the brakeclose completely. • Valid only when F02.13 = 0. • During deceleration, when setting frequency = F02.14, output frequency goes through the time of F02.16 and then continue to decelerate. • F02.14/F02.15 = 0, stop DWELL frequency is invalid. *Note: Starting DWELL function is invalid for torque control, process PID /aux process PID, simple PLC and wobble running.* 	
F02.16	**Starting frequency of stop DC brake**	**0.00 - 50.00 [0.50Hz]**
F02.17	**Waiting time of stop DC brake**	**0.00 - 10.00 [0.00s]**
F02.18	**Stop DC brake time**	**0.00 - 60.00 [0.50s]**
	F02.17 means the interval from A (running frequency = F02.16) to B (DC brake is added) during stop process. • HD3N does not output during waiting time of stop brake. F02.17 can avoid overshoot at point B (start time of brake) of high power motor. • F02.04 sets the current at DC brake. F02.18 = 0, there is no DC brake acting. • F02.16 - F02.18 is valid only when F02.13 = 2. 	
F02.19	**Jog control mode**	**00 - 11 [10]**
	Units: 0: Can not jog the start and stop function. • When jog run, start mode (F02.00) and stop mode (F02.13) is invalid; when jog command is valid, HD3N starts directly. When jog command is invalid, HD3N decelerate to stop. 1: Can jog the start and stop function. • When jog run, HD3N starts according to F02.00 and stops according to F02.13. **Tens:** 0: Terminal jog is not preferred. Under terminal control, the terminal do not respond to jog command. 1: Terminal jog is preferred.	
F02.20	**Pre-excitation time**	**0.00 - 0.50 [0.50s]**
	Function of pre-excitation: Obtain motor flux before it rotates so to get better acceleration performance. • This function is valid only under open loop vector control mode. F02.20 should be no less than 0.10s. • F02.20 = 0, pre-excitation function is invalid.	
F02.21	**End selection of DWELL frequency in stop**	**0,1 [0]**
	0: Time (F02.15). 1: Terminals (88 function).	

6.2.4 F03: Acc. / Dec. Parameter

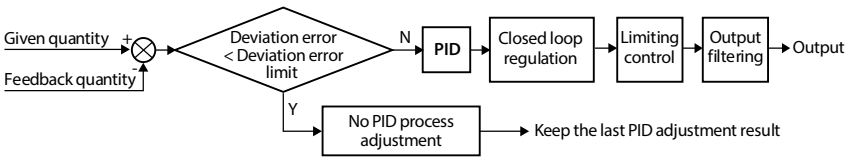
Ref. code	Function Description	Setting Range [Default]
F03.00	**Acc. / Dec. modes selection**	**00 - 11 [00]**
	Unit: Acc. / Dec. modes selection 0: Linear Acc. / Dec.. Output frequency increase or decrease according to constant slope. 1: S curve Acc. / Dec.. Output frequency increase or decrease accoring to S curve. • T5: setting acc time; T7: actual acc time. T6: setting dec time; T8: actual dec time.   **Ten: Reference frequency for Acc. / Dec. time** 0: Max frequency (F00.06). 1: Setting frequency.	
F03.01	**Acc time 1**	**0.0 - 6000.0** **[7.5 - 15kW inverter: 10.0s]** **[18.5 - 45kW inverter: 30.0s]**
F03.02	**Dec time 1**	
F03.03	**Acc time 2**	
F03.04	**Dec time 2**	
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 that HD3N accelerates from 0 Hz to reference frequency in linear form. Dec time is the time that HD3N decelerates from reference frequency to 0Hz in linear form. • Reference frequency is set by tens of F03.00. It supports acc time or dec time only, refer to figure in F03.00. Switching of Acc. / Dec. time: • Select Acc. / Dec. time by No. 26/27 of DI terminal or F03.09/F03.10 when HD3N is running. Switching of Acc. / Dec. mode: • The Acc. / Dec. modes (linear or S curve) can be set by F03.00 or No 28 function of DI terminal. *Note: If braking units are not adopted correctly, dec speed is too high or load interia is too large, over-pressure will occur to HD3N. Please select suitable braking unit, increase the dec time or adjust F19.18/F19.19.*	
F03.09	**Switching frequency of acc time 1 and 2**	**0.00 - Upper limit frequency [0.00Hz]**
	When running frequency is lower than F03.09, acc time 2 is adopted; otherwise acc time 1 is adopted. • This function is invalid when Acc. / Dec. time is selected by DI terminal (DI = 26/27).	
F03.10	**Switching frequency of dec time 2 and 1**	**0.00 - Upper limit frequency [0.00Hz]**
	When running frequency is lower than 03.10, dec time 2 is adopted; otherwise dec time 1 is adopted. • This function is invalid when Acc. / Dec. time is selected by DI terminal (DI = 26/27).	
F03.11	**Characteristic time of S curve at beginning of acc**	**0.00 - 2.50 [0.20s]**
F03.12	**Characteristic time of S curve at end of acc**	**0.00 - 2.50 [0.20s]**
F03.13	**Characteristic time of S curve at beginning of dec**	**0.00 - 2.50 [0.20s]**

Ref. code	Function Description	Setting Range [Default]
F03.14	**Characteristic time of S curve at end of dec**	**0.00 - 2.50 [0.20s]**
	Refer to figure in F03.00.	
F03.15	**Jog acc time**	**0.1 - 6000.0 [6.0s]**
F03.16	**Jog dec time**	**0.1 - 6000.0 [6.0s]**
	F03.15/F03.16 define the Acc. / Dec. time during jog running.	
F03.17	**Dec time for EMR stop**	**0.1 - 6000.0 [10.0s]**
	Define dec time for EMR stop.	

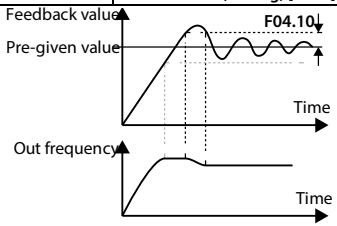
6.2.5 F04: Process PID Control

Both analogue setting and feedback or pulse setting and feedback can form closed loop. Generally PID is used for physical control, such as pressure, water level and temperature.

Below is the process:

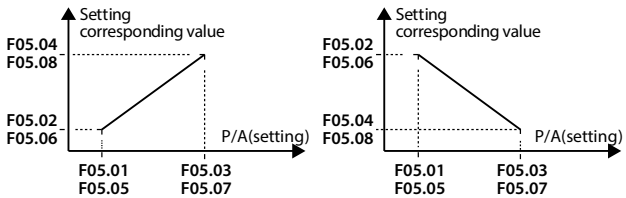


Ref. code	Function Description	Setting Range [Default]
F04.00	**Process PID control selection**	**0,1 [0]**
	0: PID control is disabled. 1: PID control is enabled. *Note: Set F04.00 = 0 when using aux PID.*	
F04.01	**Setting channel selection**	**0 - 7 [0]**
	0: Digital. Set by F04.03. 1: Analogue. Set by analogue input voltage. Max. analogue input corresponds to 100% of PID setting, refer to group F16. 2: Terminal pulse. Set the terminal pulse input. Max. input pulse frequency corresponds to 100% of PID setting, refer to group F16. 3: AI1. 4: AI2. 7: Potentionmeter. Valid when LED keypad adopted only.	
F04.02	**Feedback channel selection**	**0 - 7 [0]**
	0: Analogue. 1: Terminal pulse. 2: AI1. 3: AI2. 6: Potentionmeter. Valid when LED keypad adopted only. 7: Speed closed-loop.	
F04.03	**Setting digital reference**	**-100.0 - 100.0 [0.0%]**
	Define the setting of PID regulator. Valid when F04.01 = 0 (digital setting).	
F04.04	**Proportional gain (P1)**	**0.0 - 500.0 [50.0]**
F04.05	**Integral time (I))**	**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 upper limit**	**0.0 - 100.0 [20.0%]**

Ref. code	Function Description	Setting Range [Default]
F04.09	**Sampling time (T)**	**0.01 - 50.00 [0.10s]**
	F04.04, F04.05 and F04.07 define the PID parameter. F04.06 defines the intergral upper limit. F04.08 defines differential upper limit. F04.09 defines sampling time of feedback value. The regulator calculates once during every sampling period. • F04.07 = 0, differential does not act.	
F04.10	**Bias limit**	**0.0 - 20.0 (setting) [0.0%]**
	The system output value of regulator is relevant to the max. tolerance of PID setting. • Within permitted range, the regulator stops regulating. • Proper setting of F04.10 helps keeping accuracy and stability of system output. • High setting of F04.10 may cause sharply regulation of PID, during which infinite oscillation occurs. 	
F04.11	**Upper limit channel of PID regulator**	**0 - 7 [0]**
	When PID serves as aux frequency setting channel, F04.11is invalid, the upper limit is set by F19.35, F19.36. 0: Set by F04.13. 1: Analogue. • Set by analogue input voltage, refer to F16. 2: Terminal pulse. 3: AI1. 4: AI2. 7: Potentionmeter. • Valid when LED keypad adopted only.	
F04.12	**Lower limit channel of PID regulator**	**0 - 7 [0]**
	When PID serves as aux frequency setting channel, F04.12 is invalid, the lower limit = REV frequency upper limit. • F04.12 is valid only when PID (F04.00 = 1) and prohibit reverse (F04.18 = 0). 0: Set by F04.14. 1: Analogue setting. Set by analogue input voltage, refer to F16. 2: Terminal pulse setting. 3: AI1. 4: AI2. 7: Potentionmeter. Valid when LED keypad adopted only.	
F04.13	**PID regulator upper limit**	**0.0 - 100.0 [100.0%]**
F04.14	**PID regulator lower limit**	**0.0 - 100.0 [0.0%]**
	Define output upper/lower limit of PID regulator.	
F04.15	**Regulating characteristic of PID regulator**	**0,1 [0]**
	0: Positive characteristic. Option when the setting is added and motor rpm increase. 1: Negative characteristic. Optional when the setting is added and motor rpm decrease.	
F04.17	**PID output filtering time**	**0.01 - 10.00 [0.05s]**
	Defines filtering time of PID output.	
F04.18	**REV selection when PID outputs**	**0,1 [0]**
	0: Prohibit REV when PID regulates. PID output < 0, 0 is the limit. 1: Permit REV. F00.18 = 1 (prohibitted), 0 is the limit. • When PID serves as aux frequency setting channel, PID can reverse by default. Setting of F04.18 is invalid.	

Ref. code	Function Description	Setting Range [Default]
F04.19	**REV frequency upper limit of PID output**	**0.0 - 100.0 [100.0%]**
	Defines the frequency upper limit when reverse at PID. It is valid when F04.18 = 1 (permit REV). • When PID serves as aux frequency setting channel, F04.19 is invalid, upper limit is set by F19.35 and F19.36.	
F04.20	**Proportional gain (P2)**	**0.0 - 500.0 [50.0]**
F04.21	**Integral time (I2)**	**0.01 - 10.00 [1.00s]**
F04.22	**Differential time (D2)**	**0.00 - 10.00 [0.00s]**
F04.23	**PID parameter adjustment bases**	**0 - 3 [0]**
	0: Do not adjust. Second PID is invalid. 1: DI. • Switch PID parameter according to DI terminal No. 59 function. When the terminal is invalid, select group 1 (F04.04, F04.05, F04.07); when valid, select group 2 (F04.20 - F04.22). 2: Bias. • Select group 2 when bias between PID feedback and PID setting< switching point 1 (F04.24); • Select group 1 when bias between PID feedback and PID setting> switching point 1 (F04.25); • Select linear interpolation when bias between PID feedback and PID setting is within switching point 1 and 2. 3: Frequency. • Select group 1 when PID output frequency<switching point 1 (F04.24); • Select group 2 when PID output frequency> switching point 2 (F04.25); • Select linear interpolation when PID output frequency is within switching point 1 and 2.	
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	**Rpm**	**1 - 9999 [1024]**
F04.28	**Max. closed-loop speed**	**1 - 24000 [1500rpm]**
F04.29	**PID calculating mode**	**0,1 [0]**
	0: Do not calculate when HD3N stops. 1: Calculate when HD3N stops.	
F04.30	**PID dormancy selection**	**0,1 [0]**
	0: Disable. 1: Enable.	
F04.31	**Wakeup tolerance**	**0.0 - 100.0 [10.0%]**
F04.32	**Wakeup delay**	**0.0 - 6000.0 [0.0s]**
	Positive: in dormant status, when feedback≤setting × (100% - F04.31), and counting time≥F04.32, wake up HD3N; Negative: in dormant status, when feedback≥setting × (100% + F04.31), and counting time≥F04.32, wake up HD3N.	
F04.33	**Dormancy tplerance**	**0.0 - 100.0 [10.0%]**
F04.34	**Dormancy delay**	**0.0 - 6000.0 [0.0s]**
F04.35	**Dormancy frequency**	**0.00 - max. frequency [20.00Hz]**
	Positive: in wakeup status, when feedback≥setting × (100% + F04.33), target frequency≤F04.35 and counting time≥F04.34, HD3N is dormant; Negative: in wakeup status, when feedback≤setting × (100% - F04.33), target frequency≤F04.35 and counting≥F04.34, HD3N is dormant.	

6.2.6 F05: External Setting Curve Parameter

Ref. code	Function Description	Setting Range [Default]
F05.00	**External setting curve selection**	**00000 - 33333 [33333]**
	Unit: AI1 curve **Ten: AI2 curve** **Hundreds, Thousand: Unused** **Tens thousands: Pulse curve** Each bit sets below: • 0: Line 1. • 1: Line 2. • 2: Polyline. • 3: Do not dispose.	
F05.01	**Line 1 min. setting**	**0.0 - F05.03 [0.0%]**
F05.02	**Corresponding value of line 1 min. setting**	**0.0 - 100.0 [0.0%]**
F05.03	**Line 1 max. setting**	**F05.01 - 100.0 [100.0%]**
F05.04	**Corresponding value of line 1 max. setting**	**0.0 - 100.0 [100.0%]**
F05.05	**Line 2 min. setting**	**0.0 - F05.07 [0.0%]**
F05.06	**Corresponding value of line 2 min. setting**	**0.0 - 100.0 [0.0%]**
F05.07	**Line 2 max. setting**	**F05.05 - 100.0 [100.0%]**
F05.08	**Corresponding value of line 2 max. setting**	**0.0 - 100.0 [100.0%]**
F05.09	**Max. setting of polyline**	**F05.11 - 100.0 [100.0%]**
F05.10	**Max. setting corresponding value of polyline**	**0.0 - 100.0 [100.0%]**
F05.11	**Inflection point 2 setting of polyline**	**F05.13 - F05.09 [100.0%]**
F05.12	**Inflection point 2 corresponding value**	**0.0 - 100.0 [100.0%]**
F05.13	**Inflection point 1 setting of polyline**	**F05.15 - F05.11 [0.0%]**
F05.14	**Inflection point 1 corresponding value**	**0.0 - 100.0 [0.0%]**
F05.15	**Min. setting of polyline**	**0.0 - F05.13 [0.0%]**
F05.16	**Min. setting 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**  	

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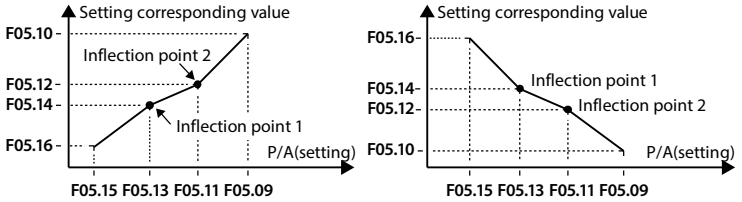
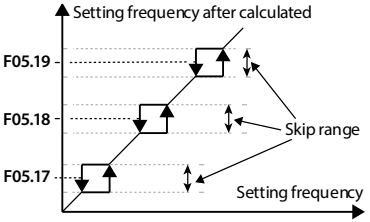
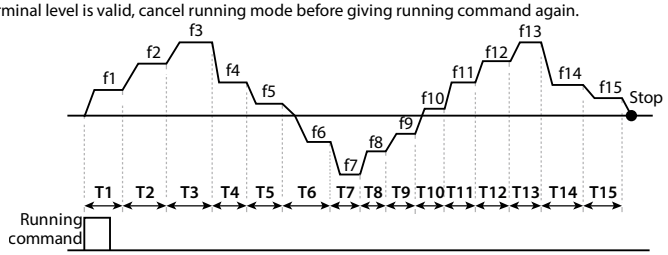
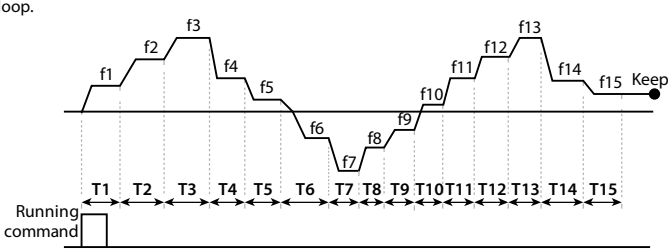
Ref. code	Function Description	Setting Range [Default]
	Positive and negative characteristic of polyline  **In the figure:** • P / A is terminal pulse / analogue setting. • Pulse frequency (P) is 100% corresponding to F16.17 max. input pulse frequency. • Analogue input (A) is 100% corresponding to 10V or 20mA.	
F05.17	**Skip frequency 1**	**F00.09 - Upper limit frequency [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 HD3N to avoid resonance with the load. • HD3N can not run at constant speed during skip range, the frequency will be updated automatically. • When setting the frequnecy skip, output frequency of HD3N changes smoothly according to Acc. / Dec. curve setting. • Skip frequency setting is invalid when PID control or aux frequency setting selects process PID. 	
F05.21	**Digital setting 2 of jog run frequency**	**0.00 - Upper limit frequency [5.00Hz]**
	When terminal selects jog run 2, HD3N runs according to F05.21.	
F05.22	**Curve selection for potentionmeter**	**0 - 3 [3]**
	Note: Valid only when LED keypad is adopted. 0: Line 1. 1: Line 2. 2: Polyline. 3: Do not dispose.	

6.2.7 F06: Multi-speed and Simple PLC

Ref. code	Function Description	Setting Range [Default]
F06.00	Multi-frequency command 1	F00.09 – F00.08 [5.00Hz]
F06.01	Multi-frequency command 2	F00.09 – F00.08 [5.00Hz]
F06.02	Multi-frequency command 3	F00.09 – F00.08 [5.00Hz]
F06.03	Multi-frequency command 4	F00.09 – F00.08 [5.00Hz]
F06.04	Multi-frequency command 5	F00.09 – F00.08 [5.00Hz]
F06.05	Multi-frequency command 6	F00.09 – F00.08 [5.00Hz]
F06.06	Multi-frequency command 7	F00.09 – F00.08 [5.00Hz]
F06.07	Multi-frequency command 8	F00.09 – F00.08 [5.00Hz]
F06.08	Multi-frequency command 9	F00.09 – F00.08 [5.00Hz]
F06.09	Multi-frequency command 10	F00.09 – F00.08 [5.00Hz]
F06.10	Multi-frequency command 11	F00.09 – F00.08 [5.00Hz]
F06.11	Multi-frequency command 12	F00.09 – F00.08 [5.00Hz]
F06.12	Multi-frequency command 13	F00.09 – F00.08 [5.00Hz]
F06.13	Multi-frequency command 14	F00.09 – F00.08 [5.00Hz]
F06.14	Multi-frequency command 15	F00.09 – F00.08 [5.00Hz]
	Define the intial value of each speed under multi-speed mode and PLC mode. • During multi-speed running, tens of F06.17 - F06.45 (PLC phase setting) sets direction of each speed, and hundreds sets time of each speed.	
F06.15	Simple PLC control selection	0,1 [0]
	0: PLC is invalid. 1: PLC is enabled. Set F06.16 - F06.46 according to actual condition.	
F06.16	Simple PLC running mode selection	0000 - 1122 [0000]
	Parameter setting: units (0 - 2), tens (0 - 2), hundreds (0,1), thousands (0,1). **Unit: PLC running selection (take 15 speed as an example)** • 0: Stop after single loop. HD3N stops after one loop, and will not start until receiving running command. If terminal level is valid, cancel running mode before giving running command again.  • 1: Runs at final value after single loop. HD3N maintains the final running frequency and direction after one loop.  	

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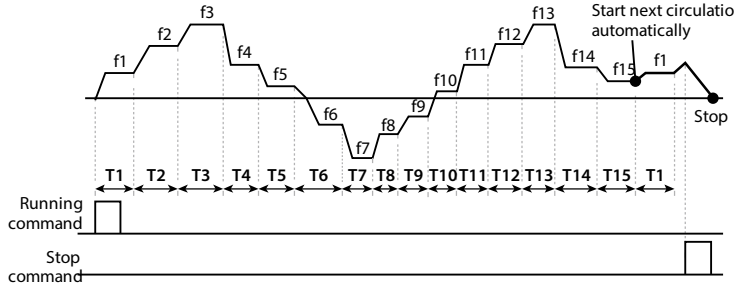
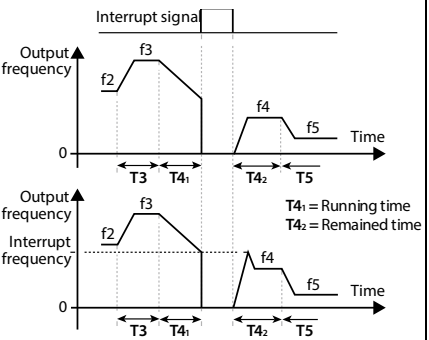
Ref. code	Function Description	Setting Range [Default]
	• 2: Continous loop. HD3N enters the next loop after one loop is finished, and not stop until receiving stop command.	



Ten: restart mode after stop during PLC

- 0: Start from the first frequency.
  - Start from the first frequency after stop during running (stop command, fault or power failure).
- 1: Start from the frequency when HD3N stops.
  - If HD3N stops during running (stop command or fault), it will record the current running time.
  - When restart, HD3N enters this phase, and runs at the frequency in the remain time. (at the right)
- 2: Runs at the moment when signal loss.



  - If HD3N stops during running (stop command or fault), it will record the current running time and running frequency.
- When restart, HD3N will resume running frequency when it stopped and then enter the next phase. (at the right).

Note: Compared with mode 1, mode 2 memorize the running frequency at stop, and restarts from this frequency.

Hundred: PLC state saving selection at power failure

- 0: Do not save. Do not save PLC running state. HD3N starts from the first phase after power on.
- 1: Save. Save PLC running state, including phase, running frequency and the running time. HD3N runs according to tens of F06.16.

Thousand: PLC phase time unit

- 0: Second (s).
- 1: Minute (m).

F06.17	PLC phase 1 setting	000 - 421 [420]
F06.19	PLC phase 2 setting	000 - 421 [420]
F06.21	PLC phase 3 setting	000 - 421 [420]
F06.23	PLC phase 4 setting	000 - 421 [420]
F06.25	PLC phase 5 setting	000 - 421 [420]
F06.27	PLC phase 6 setting	000 - 421 [420]
F06.29	PLC phase 7 setting	000 - 421 [420]
F06.31	PLC phase 8 setting	000 - 421 [420]

Ref. code	Function Description	Setting Range [Default]
F06.33	PLC phase 9 setting	000 - 421 [420]
F06.35	PLC phase 10 setting	000 - 421 [420]
F06.37	PLC phase 11 setting	000 - 421 [420]
F06.39	PLC phase 12 setting	000 - 421 [420]
F06.41	PLC phase 13 setting	000 - 421 [420]
F06.43	PLC phase 14 setting	000 - 421 [420]
F06.45	PLC phase 15 setting	000 - 421 [420]
	F06.17, F06.19, F06.21, F06.23, F06.25, F06.27, F06.29, F06.31, F06.33, F06.35, F06.37, F06.39, F06.41, F06.43, F06.45 define running frequency, direction and Acc. / Dec. time of each phase. **Unit: PLC phase frequency selection** • 0: Multi frequency commmand. Absolute frequency of each phase = setting value. • E.g.: Absolute frequency of phase 15 = value of F06.14. • 1: Set by F00.1. Frequency is set by F00.10. **Ten: PLC phase direction selection** • 0: Forward. • 1: Reverse. • 2: Set by running command, and changes if receiving external command. Runing direction = command. • If direction can not change, HD3N runs according to the previous phase. **Hundred: PLC phase Acc. / Dec. time selection** • 0: Acc. / Dec. time 1. • 1: Acc. / Dec. time 2. • 2: Acc. / Dec. time 3. • 3: Acc. / Dec. time 4. • 4: Set by Acc. / Dec. speed.	
F06.18	Phase 1 running time	0.0 - 3276.7 [5.0]
F06.20	Phase 2 running time	0.0 - 3276.7 [0.0]
F06.22	Phase 3 running time	0.0 - 3276.7 [0.0]
F06.24	Phase 4 running time	0.0 - 3276.7 [0.0]
F06.26	Phase 5 running time	0.0 - 3276.7 [0.0]
F06.28	Phase 6 running time	0.0 - 3276.7 [0.0]
F06.30	Phase 7 running time	0.0 - 3276.7 [0.0]
F06.32	Phase 8 running time	0.0 - 3276.7 [0.0]
F06.34	Phase 9 running time	0.0 - 3276.7 [0.0]
F06.36	Phase 10 running time	0.0 - 3276.7 [0.0]
F06.38	Phase 11 running time	0.0 - 3276.7 [0.0]
F06.40	Phase 12 running time	0.0 - 3276.7 [0.0]
F06.42	Phase 13 running time	0.0 - 3276.7 [0.0]
F06.44	Phase 14 running time	0.0 - 3276.7 [0.0]
F06.46	Phase 15 running time	0.0 - 3276.7 [0.0]
	F06.18, F06.20, F06.22, F06.24, F06.26, F06.28, F06.30, F06.32, F06.34, F06.36, F06.38, F06.40, F06.42, F06.44 and F06.46 define the running time of eacg PLC phase. • When the running time = 0, it means the corresponding phase is invalid.	

6.2.8 F07: Wobble Function Parameter

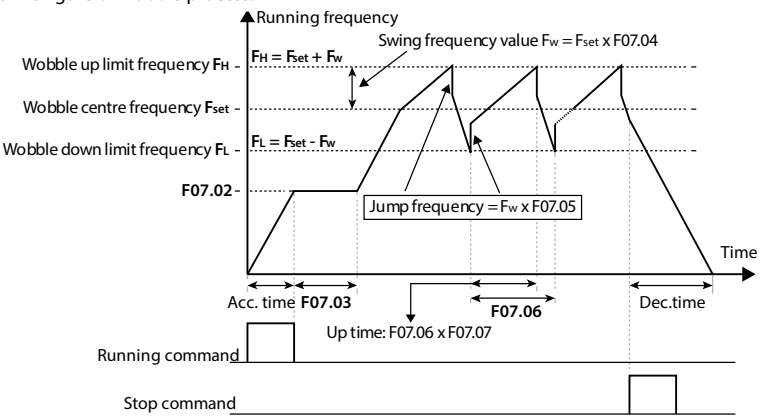
Wobble process:

Accelerate according to acc time to wobble pre-set frequency (F07.02) and waiting time (F07.03), then transit to wobble centric frequency according to Acc. / Dec. time.

Then circle runs according to wobble value (F07.04), skip frequency (F07.05), wobble period (F07.06) and wobble increase time (F07.07).

It will not stop until stop command outputs and decelerated to stop according to dec time.

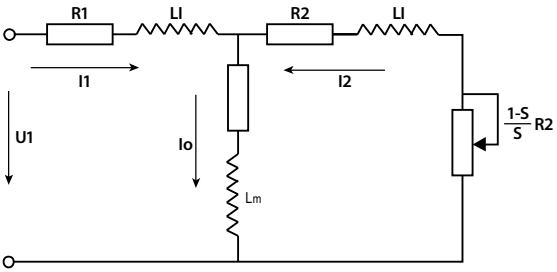
Below is figure of wobble process:



Ref. code	Function Description	Setting Range [Default]
F07.00	**Wobble function selection**	**0,1 [0]**
	0: Disable. 1: Enable.	
F07.01	**Wobble running mode**	**0000 - 1111 [0000]**
	Unit: Entry way • 0: Auto entry. HD3N started, it runs the waiting time (F07.03) at wobble pre-set frequency (F07.02), and then enter wobble running. • 1: Manually terminal entry way. Set DI = No. 36 function (wobble entry function) and when this signal is valid, HD3N enters wobble statue. When invalid, HD3N exits wobble state and the running frequency remains (F07.02). **Ten: Wobble control** (refer to 07.04) • 0: Relate to wobble centric frequency. • 1: Relate to max. Output frequency. **Hundred: Start when HD3N stops during wobbling** • 0: Start according to memory before it stops. • 1: Restart. **Ten thousand: Save selection at power failure** • 0: Save wobble state at power failure. Valid only when F07.01 tens = 0. • 1: Do not wobble state at power failure.	

Ref. code	Function Description	Setting Range [Default]
F07.02	**Wobble preset frequency**	**0.00 - F00.08 [0.00Hz]**
F07.03	**Waiting time for wobble preset frequency**	**0.0 - 999.9 [0.0s]**
	F07.02 defines running frequency of HD3N before entering wobble sate. F07.03 defines the duration of F07.02 before entering wobble state. • Valid when F07.01 units = 0.	
F07.04	**Wobble value**	**0.0 - 50.0 [0.0%]**
	Calculated from wobble centric frequency: F_W = centric frequency × F07.04. • Wobble centric frequency is a value set by F00.10 (frequency setting channel selection). Calculated from max. Output frequency: FW = max. Output frequency F00.06 × F07.04.	
F07.05	**Skip frequency**	**0.0 - F07.04 [0.0%]**
	It is percentage from wobble value. F07.05 = 0, there is no skip frequency.	
F07.06	**Wobble period**	**0.1 - 999.9 [10.0s]**
	Defines the time during which wobble goes up and down.	
F07.07	**Triangular wave rising time**	**0.0 - 100.0 [50.0%]**
	Defines the running times that wobble rise and fall. It relates to F07.06. Unit: s. • Running time at rising = F07.06 × F07.07. • Running time at falling = F07.06 × (1 - F07.07).	

6.2.9 F08: Asyn. Motor Parameters



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

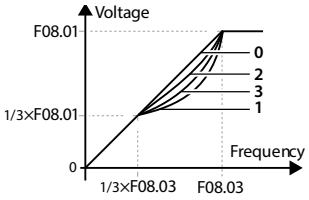
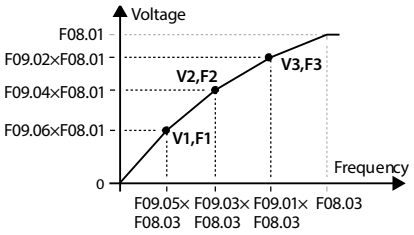
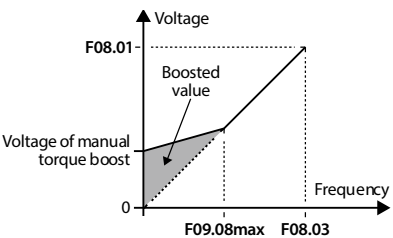
Formula of mutual inductance:

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

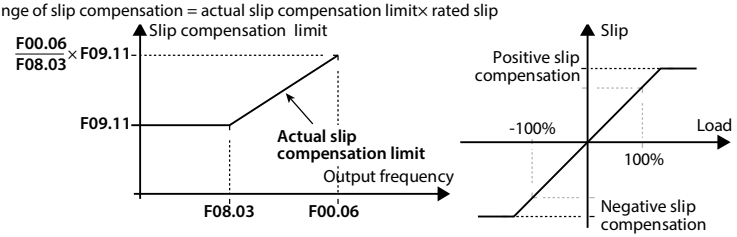
Ref. code	Function Description	Setting Range [Default]
F08.00	**Rated power of motor**	**0.2 - 500.0kW [Depend on HD3N]**
F08.01	**Rated voltage of motor**	**0 - 999V [Depend on HD3N]**
F08.02	**Rated current of motor**	**0.1 - 999.9A [Depend on HD3N]**
F08.03	**Rated frequency of motor**	**1.0 - 400.0 [50.0Hz]**
F08.04	**Rated Rpm of motor**	**1 - 24000rpm [Depend on HD3N]**
	F08.00 - F08.04: Set rated value of motor according to motor nameplate.	

Ref. code	Function Description	Setting Range [Default]
F08.06	**Parameter auto-tuning of motor**	**0 - 3 [0]**
	Note: F08.06 is enabled only in keypad control (F00.11 = 0). 0: No action. 1: Stationary auto-tuning. • In the process of motor stationary auto-tuning, the stator resistance, rotor resistance and leakage inductance will be auto-measured and written into F08.07, F08.08 and F08.09. 2: Rotary auto-tuning. • Firstly motor is in stationary state, and stator resistance, rotor resistance and leakage inductance are measured; then motor enters rotary state, and mutual inductance, excitation current, rated slip, flux saturation coefficient will be auto-measured and written into F08.07 - F08.16. • During rotating, motor may encounter oscillation and or overcurrent. Press ▽ button (**STOP**) to stop suto-tuning, and adjust F09.15, F09.16 (oscillation suppresstion coeffiscient) to lessen oscillation. 3: Motor stator resistance measurement. • When motor is in stationary state, stator resistance will be auto-measured and written into F08.07. **Steps:** 1. Correctly set motor parameter (F08.00 - F08.04). 2. When F08.06 = 2, set proper acc time (F03.01) and dec time (F03.02), free motor axis from load and make sure it is safe. 3. When F08.06 = 1 or 2 or 3, press ↵ , then press ▣ button (**PRG**) to exit to parameter display state, and press ◇ button (**RUN**) to start auto-tuning. LED keypad displays "tunE". 4. When run command flahses on keypad, it means auto-tuning is finished and return to stop state display, and F08.06 resumes 0.	
F08.07	**Stator resistance of motor**	**0.000 - 9.999Ω [Depend on HD3N]**
F08.08	**Rotor resistance of a motor**	**0.000 - 9.999Ω [Depend on HD3N]**
F08.09	**Leakage inductance of motor**	**0.00 - 500.00mH [Depend on HD3N]**
F08.10	**Mutual inductance of motor**	**0.00 - 500.00mH [Depend on HD3N]**
F08.11	**Excitation current of motor**	**0.0 - 999.9A [Depend on HD3N]**
F08.12	**Core saturation coefficient 1 of motor**	**0.00 - 1.00 [1.00]**
F08.13	**Core saturation coefficient 2 of motor**	**0.00 - 1.00 [1.00]**
F08.14	**Core saturation coefficient 3 of motor**	**0.00 - 1.00 [1.00]**
F08.15	**Core saturation coefficient 4 of motor**	**0.00 - 1.00 [1.00]**
F08.16	**Core saturation coefficient 5 of motor**	**0.00 - 1.00 [1.00]**

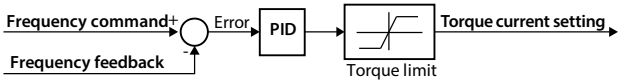
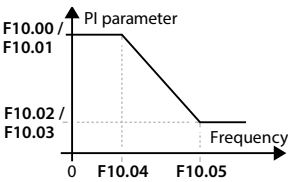
6.2.10 F09: V/f Control Parameters

Ref. code	Function Description	Setting Range [Default]
F09.00	**V/f curve of motor**	**0 - 4 [0]**
	Defines flexible V/f setting modes so as to meet requirements of different load characteristics. • Four curves and one user-defined curve can be selected according to the setting of F09.00. 0: Line. Sea line 0 in figure. 1: Square curve. Sea curve 1 in the figure. 2: 1.2 exponential curve. Sea curve 2 in the Figure. 3: 1.7 exponential curve. Sea curve 3 in the Figure. 4: User-defined curve. 	
F09.01	**V/f frequency of motor (F3)**	**F09.03 - 100.0 [0.0%]**
F09.02	**V/f voltage of motor (V3)**	**F09.04 - 100.0 [0.0%]**
F09.03	**V/f frequency of motor (F2)**	**F09.05 - F09.01 [0.0%]**
F09.04	**V/f voltage of motor (V2)**	**F09.06 - F09.02 [0.0%]**
F09.05	**V/f frequency of motor (F1)**	**0.0 - F09.03 [0.0%]**
F09.06	**V/f voltage of motor (V1)**	**0.0 - F09.04 [0.0%]**
	F09.01 - F09.06 is user-definable V/f curve. • If F09.00 = 4 (user-definable curve), F09.06 is enabled. • The V/f curve can be defined by connecting 3 points of (V1, F1), (V2, F2) and (V3, F3), to apply to special load. • According to actual condition, set proper curve to meet requirements of load characteristics. 	
F09.07	**Torque boost of motor**	**0.0 - 30.0 [2.0%]**
F09.08	**Cut-off point used for manual torque boost of motor**	**0.0 - 50.0 (F08.03) [25.0%]**
	In order to compensate the torque drop at low frequency, HD3N 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 ≠ 0, it is manually torque boost. • F09.07 = 0, it is auto torque boost. User needs to set motor rated frequency (F08.03); set according to nameplate or auto-tune to get rated Rpm (F08.04); get motor stator resistance (F08.07) by auto-tuning; set slip compensation gain F09.09 = 100.0% to enable slip compensation to achieve fine load capability. • F09.08 is relative to percentage of rated frequency (F08.03). 	
F09.09	**Slip compensation gain of motor**	**0.0 - 300.0 [0.0%]**
F09.10	**Slip compensation filter time of motor**	**0.01 - 10.00 [0.10s]**

6

Ref. code	Function Description	Setting Range [Default]
F09.11	**Slip compensation limit of motor**	**0.0 - 250.0 [200.0%]**
	The motor slip changes with the load torque, which results in the variance of motor speed. Reduce the influence through slip compensation. • Electric and generating state can increase slip compensation (F09.09) gradually. • Slip compensation limit is fixed value within constant torque. It increases in proportion to output frequency within constant power. • Auto slip compensation depends on rated slip of motor. User should properly set rated frequency (F08.03) and rated rpm (F08.04). Range of slip compensation = actual slip compensation limit× rated slip 	
F09.12	**Motor iron loss**	**0.000 - 9.999kW [Depend on HD3N]**
	F09.12 is used for slip compensation under V/f control. F09.12 has been set according to rated power of motor. In general, user does not need to set F09.12 but can set if user can get iron loss value from test report of motor.	
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	**Low frequency oscillation-suppression of motor**	**0 - 200 [50]**
F09.16	**High frequency oscillation-suppression of motor**	**0 - 200 [20]**
	This function is used to suppress the existed oscillation when inverter works with motor. • If output current changes repeatedly when inverter runs with constant load, user can adjust F09.16 to depress oscillation to keeprunning smoothly.	
F09.17	**Energy saving control selection**	**0 - 3 [0]**
	0: Invalid. 3: Enabled according to output current. When F09.17 = 3 and V/f control mode (F00.01 = 0): • When output frequency ≥ F09.19 and output current ≤ F09.20 × rated current of HD3N, enter energy saving mode. • If neither of above conditions is met, exit energy saving mode. *Note: Energy saving mode is valid in constant state only.*	
F09.18	**Motor energy saving coefficient**	**0.0 - 100.0 [5.0%]**
F09.19	**Starting frequency of motor energy saving**	**0.00 - 50.00 [25.00Hz]**
F09.20	**Switching point of motor energy saving**	**0.0 - 100.0 [100.0%]**
F09.21	**Detection times of motor energy saving**	**0 - 5000 [10 times]**
F09.22	**Voltage recovery time of motor energy saving**	**40 - 4000 [100ms]**
F09.23	**Voltage decrease time of motor energy saving**	**40 - 4000 [100ms]**

6.2.11 F10: Motor Vector Control Speed-loop Parameters

Ref. code	Function Description	Setting Range [Default]
F10.00	Proportional gain 1 of motor speed control	0.1 - 200.0 [10.0]
F10.01	Integral time 1 of motor speed control	0.00 - 10.00 [0.10s]
F10.02	Proportional gain 2 of motor speed control	0.1 - 200.0 [10.0]
F10.03	Integral time 2 of motor speed control	0.00 - 10.00 [0.20s]
F10.04	Switching frequency 1 of motor speed loop	0.00 - F10.05 [10.00Hz]
F10.05	Switching frequency 2 of motor speed loop	F10.04 - 50.00 [15.00Hz]
	F10.00 - F10.05, F10.07 set the PID parameter of speed regulator (ASR). The structure of ASR is shown in figure:  As the right figure: • When HD3N operates within 0 - F10.04, the PI parameters of vector control are F10.00 and F10.01; • When HD3N operates above F10.05, the PI parameters of vector control are F10.02 and F10.03; • When HD3N operates within F10.04 - F10.05, P is the linear interpolation between F10.00 and F10.02, while I is the linear interpolation between F10.01 and F10.03.  • The system response can be expedited through increasing proportional gain P, but oscillation may occur if the value of P is too high. • The system response can be expedited through decreasing ASR integral time Ti, but oscillation and big overshoot may occur if the value of Ti is too smaal. • If integral time constant = 0, intergral function is not effective, and speed loop is merely a propotional regulator. • Generally, adjust proportional gain P first to the max. condition that the system does not vibrate, and then adjust the Ti to shorten the response time without overshoot. • To shorten dynamic response time during low frequency running, increase proportional gain and decrease Ti.	
F10.06	ASR integral limit	0.0 - 200.0 (F08.02) [180.0%]
	It is used to limit the max. value of the vector control speed-loop integral.	
F10.07	Motor speed loop differential time	0.00 - 1.00 [0.00s]
	Defines the vector control speed-loop differential time. • Generally do not set F10.07. But to quicken system response, user can properly set it. • F10.07 = 0, there is no speed-loop differential.	
F10.08	Motor speed loop otuput filter time	0.000 - 1.000 [0.000s]
	It is used to filter the output of ASR regulator. • F10.08 = 0, the speed-loop filter is unused.	
F10.09	Locking selection for motor torque limit	0,1 [0]
	0: Do not lock. 1: All of the torque limit is same with FWD electric torque limit.	

Ref. code	Function Description	Setting Range [Default]
F10.10	**Setting channel of motor torque**	**0000 - 7777 [0000]**
	Define the setting channel of torque value. **Unit: Electric torque limit channel when motor is FWD** **Ten: Electric torque limit channel when motor is REV** **Hundred: Braking torque limit channel when motor is FWD** **Thousand: Braking torque limit channel when motor is REV** • 0: Limit by digital setting. • 1: Limit by analogue input. • 2: Limit by terminal pulse. • 3: Limit by AI1. • 4: Limit by AI2. • 7: Potentionmeter. Valid when LED keypad adopted only.	
F10.11	**Electric torque limit when motor is FWD**	**0.0 - 200.0 (F08.02) [180.0%]**
F10.12	**Electric torque limit when motor is REV**	
F10.13	**Braking torque limit when motor is FWD**	
F10.14	**Braking torque limit when motor is REV**	
	Be careful when setting F10.11 - F10.14 as too high value may cause damage to motor.	

6.2.12 F11: Motor Vector Control Current-loop Parameters

Ref. code	Function Description	Setting Range [Default]
F11.00	**Current-loop KP of motor**	**1 - 2000 [800]**
F11.01	**Current-loop KI of motor**	**1 - 1000 [200]**
	F09.00 and F09.01 are the PI regulator parameter of current ring (ACR). • Generally adjustment to current-loop parameters is not recommended.	
F11.02	**Current-loop output filter times**	**0 - 31 [3]**
	F11.02 is used to filter the output of ACR.	
F11.03	**Enable feedforward of motor current-loop**	**0,1 [0]**
	The current-loop feedforward real time calculates the voltage feedforward according to motor parameter, detected excitation field current and torque current. • When motor parameters are correct, it enables current-loop feedforwaed which quickens the system response. • Please forbid current-loop feedforward when motor parameters are not correct. 0: Forbid feedforward. 1: Enable feedforward.	
F11.04	**Motor excitation boost setting**	**0.0 - 30.0 [0.0%]**
	The setting range is 0.0 - 30.0% motor idling excitation current. Increase motor excitation current and increase the loaded capacity of motor whenit is heavily loaded during rated frequency range.	
F11.05	**To optimize motor magnatic field orientation**	**00 - 11 [00]**
	Units:Orientation adjustment • 0: Prohibit. • 1: Enable. **Ten: Mutual inductance calculation** • 0: Prohibit. • 1: Enable.	

6.2.13 F15: Digital I/O Terminal Parameters

Ref. code	Function Description	Setting Range [Default]
F15.00	DI1 function	0 - 88 [2]
F15.01	DI2 function	0 - 88 [3]
F15.02	DI3 function	0 - 88 [0]
F15.03	DI4 function	0 - 88 [0]
F15.04	DI5 function	0 - 88 [0]
F15.05	DI6 function	0 - 88 [0]

0: Unused. It disables the terminal function. HD3N ignores any signal input via this terminal.

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

1: Inverter enabled.

- When enabled, HD3N is enabled to run.
- When disabled, HD3N is disabled to run and will be in auto stop status.
- If no terminal selects this function, it defaults that HD3N is enabled.

2,3: FWD / REV.

- FWD / REV is valid only in terminal control mode.
- Refer to F15.16.

4 Three-wire running mode.

- Refer to F15.16.

5 - 7,87: Frequency setting source selection 1 - 4.

- Achieve 2^n frequency setting channel via terminals logic combination, as follow table.

Channel 4 (No. 87)	Channel 3 (No. 7)	Channel 2 (No. 6)	Channel 1 (No. 5)	Setting channel
0	0	0	0	Not change
0	0	0	1	Keypad digital
0	0	1	0	Terminal digital
0	0	1	1	Communication digital
0	1	0	0	Analogue
0	1	0	1	High speed pulse
0	1	1	X	Not change
1	0	0	0	Keypad digital
1	0	0	1	Terminal digital
1	0	1	0	Communication digital
1	0	1	1	AI1
1	1	0	0	AI2
1	1	1	1	Potentionmeter

<table>
<tr><th>Ref. code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td colspan="2">
8: Switch to analogue.
• When valid, frequency setting channel is switched to to analogue.
• Priority of frequency setting channel:
M button switching function (F00.12 = 1) > Switch from frequency to analogue (DI = 8) > Switch to normal running mode (DI = 30) > PLC > Wobble > Multi-speed (DI = 13 - 16) > frequency setting channel terminal 1 - 3 (DI = 5 - 7) > channel set by F00.10.
9,10: Running command switching 1, 2.
• Achieve 4 commands:
<table>
<tr><th>Channel 2 (No. 10)</th><th>Channel 1 (No. 9)</th><th>Command</th></tr>
<tr><td>0</td><td>0</td><td>Not change</td></tr>
<tr><td>0</td><td>1</td><td>Keypad</td></tr>
<tr><td>1</td><td>0</td><td>Terminal</td></tr>
<tr><td>1</td><td>1</td><td>SCI</td></tr>
</table>
• The running commands can be switched during running,but not effective until stop state.
11: Command switch to terminal.
• When valid, running channel is switched to terminal.
• Priority of running command channel:
M switching function (F00.12 = 1) > switching to terminal (DI = 11) > Running command switching 1, 2 (DI = 9,10) > running command set by F00.11.
• Valid only when HD3N stops.
12: External command for stop.
• When valid, HD3N stops according to F02.13. Effective for all of the running command channels.
</td></tr>
</table>

Ref. code	Function Description	Setting Range [Default]

13 - 16: Multi-speed frequency terminal 1 – 4.

- By logic combination, HD3N can run at frequency setting channel and 15 frequency.
- Set 4 terminal function, HD3N can switch between frequency setting channel and 15 frequency.
- Set 3 terminal function, HD3N can switch between frequency setting channel and 7 frequency.
- Set 2 terminal function, HD3N can switch between frequency setting channel and 3 frequency.
- Set 1terminal function, HD3N can switch between frequency setting channel and multi-speed.
- K1-multi-speed frequency terminal 1, K2-multi-speed frequency terminal 2, K3-multi-speed frequency terminal 3, K4-multi-speed frequency terminal 4.

K4 (No. 16)	K3 (No. 15)	K2 (No. 14))	K1 (No. 13)	Frequency setting
0	0	0	0	Not change
0	0	0	1	Multi frequency 1 (F06.00)
0	0	1	0	Multi frequency 2 (F06.01)
0	0	1	1	Multi frequency 3 (F06.02)
0	1	0	0	Multi frequency 4 (F06.03)
0	1	0	1	Multi frequency 5 (F06.04)
0	1	1	0	Multi frequency 6 (F06.05)
0	1	1	1	Multi frequency 7 (F06.06)
1	0	0	0	Multi frequency 8 (F06.07)
1	0	0	1	Multi frequency 9 (F06.08)
1	0	1	0	Multi frequency 10 (F06.09)
1	0	1	1	Multi frequency 11 (F06.10)
1	1	0	0	Multi frequency 12 (F06.11)
1	1	0	1	Multi frequency 13 (F06.12)
1	1	1	0	Multi frequency 14 (F06.13)
1	1	1	1	Multi frequency 15 (F06.14)

17,18: Increase(UP) / decrease(DN) frequency.

- Increase or decrease frequency by terminal, equal to remote control by keypad.
- Range is set by F15.12. Refer to below table.
- Valid when normal running F00.10 = 1 (terminal digital setting) or aux frequency F19.00 = 2 (terminal digital setting).

UP (No. 17)	DN (No. 18)	Frequency change
0	0	Not change
0	1	Decrease
1	0	Increase
1	1	Not change

19: Clear aux setting frequency to 0.

- When valid, aux frequency is cleared to 0, and setting frequency is up to main setting.

20,21: FWD/REV jog 1 command input (JOGF1 / JOGR1).

22,23: FWD/REV jog 2 command input (JOGF2 / JOGR2).

Ref. code	Function Description	Setting Range [Default]

24,25: Jog 1 command and direction input.

- Jog command in terminal control mode.JOGF is jog forward running and JOGR is jog reverse running.
- Need define F00.15 (jog running frequency), F00.16 (jog interval, F03.15 (jog acc time) and F03.16 (jog dec time):

Jog direction input (No. 25)	Jog command input (No. 24)	Running command
0	0	Invalid
1	0	Invalid
0	1	Jog 1 FWD
1	1	Jog 1 REV

Note: when No. 20 and 21 are selected, No. 24 and 25 are invalid.

26,27: Acc. / Dec. time terminal 1 and 2.

- Priority of Acc. / Dec. time:
  Acc. / Dec. time define by No. 26 and 27 of terminal > Acc. / Dec. time defined by F03.09 and F03.10.
- By logic combination of Acc. / Dec. time terminal 1 and 2 can realize 4 sets of Acc. / Dec. time (as table below).
- 4 groups time can be selected by setting 2 Acc. / Dec. terminals.
- 2 groups time can be selected by setting 1 terminals.

Acc. / Dec. terminal 2 (No 27)	Acc. / Dec. terminal 1(No 26)	Acc. / Dec. selection
0	0	Acc. / Dec. time 1
0	1	Acc. / Dec. time 2
1	0	Acc. / Dec. time 3
1	1	Acc. / Dec. time 4

28: Acc/dec mode selection.

- When valid, select S curve mode; when invalid, select line mode.
- Priority: Acc. / Dec. mode defined by No. 28 > Acc. / Dec. mode defined by F03.00.

29: Forbid Acc. / Dec.. motor maintain current running speed despite external signal (but stop).

- Invalid when decelerates to stop.

30: Switch to normal run.

- When valid, frequency commands (multi-speed, simple PLC, process PID, wobble function, etc.) are switched to normal mode.

31: Reset infor PLC stop state reset.

- When valid, clear the infor about PLC running phase, running time, running frequency. Refer to F06.

32: Pause process PID.

- When valid, process PID function will pause, and HD3N continues running at present frequency.

33: Forbid process PID. Switch PID to other modes.

- When valid, HD3N switches to other running modes.
- Priority:
  Jog running > Process PID > PLC > Wobble > Multi-speed > Normal run.

34: PID integral holding.

- When valid, process PID stops integral accumulation, and the integrator keeps the current result.

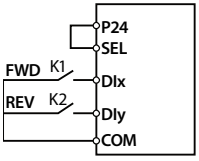
35: Clear PID integral.

- When valid, integrator clears PID ingetral.

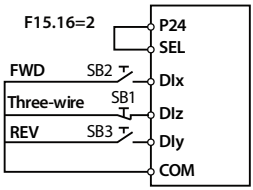
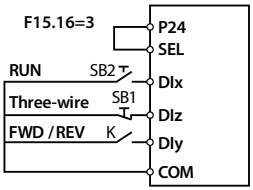
36: Wobble mode. Wobble mode = manual (F07.01 units = 1).

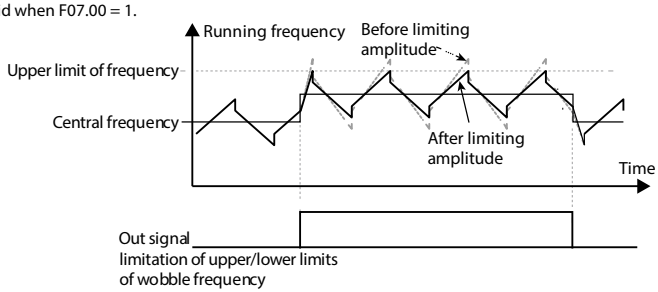
- When valid, enter wobble state.

Ref. code	Function Description	Setting Range [Default]
	37: Reset wobble state. • When select wobble function (F07.00 = 1), no matter automatic or manual mode (F07.01), DI6 = 37 will reset wobble state. 38: Stop DC brake input. • Apply DC brake to motor which is in stop status via control terminal. Refer to F02.04 for braking current. • The terminal is valid in dec to stop process and DC brakes motor immediately. When invalid, DC brake stops. 39,40: External stop NO/NC contact input. • In running, when HD3N receives external stop signal, it stops output. • When external stop signal is cancelled and HD3N can run, it tracks and start running. 41,42: Coast to stop NO/NC input. • After HD3N receives command, it stops output at once, the load will coast to stop according to mechanical inertia. 43: Emergency stop. • After HD3N receives command, it decelerates to stop. The dec time is set by F03.17. 44,45: NO/NC input for external fault. • HD3N can detect fault of external device and acts according to F15.17. • HD3N shows external device's fault after receiving fault signal. • Two input modes for fault signal: NO or NC. 46: External reset (RST) input. Reset fault when HD3N has fault. • It has the same function as ▽ button (STOP) on keypad. 48: Timing input. Used on timming input terminal. • Refer to F15.25 and F15.26. 49: Input for clearing actual length. • Input terminal for clearing actual length of length control. • Refer to F19.26 - F19.34. 50: Signal input to clear counter. To clear value of counter in HD3N. • Used together with No. 51 function (triggering signal input of counter). 51: Triggering signal input of counter. • Counting pulse input of counter can save current counting value at power failure. • Max. pulse. frequency: 200Hz. • Refer to F15.37 and F15.38. 52: Length counting input (DI6 only). Length input terminal under length control. • Refer to F19.26 - F19.34. 53: Pulse frequency input (DI6 only). It receives pulse signal as frequency setting. • Refer to F05 for relationship of input signal pulse frequency and setting frequency. 54: Switch main/aux frequency source. 56: Switch speed control and torque control. • Valid: F00.00 = 0, switch to torque control; F00.00 = 1, switch to speed control. • Invalid: Set by F00.00 (control mode selection). 57: Polarity switching of torque control. • Valid: Reverse direction of that by F21. • Invalid: Direction set by F21. 59: Switch PID parameter.	

<table>
<tr><th>Ref. code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td colspan="2">85: Simple PLC pause command. To pause PLC during running.
• When valid, system keeps running at present phase and does not count running time. When invalid, system counts time.
86: Activate terminal DC brake input.
• HD3N starts DC brake if this terminal is valid during running. If no stop command, HD3N restarts after this terminal is invalid.
• HD3N starts DC brake if this terminal is valid during dec stop process, while stops after invalid.
• Invalid in stop state.
87: Frequency setting channel = 4. Refer to No. 5 and 7.
88: DWELL end enable in stop.</td></tr>
<tr><td>F15.12</td><td>UP/DN Acc. / Dec. rate</td><td>0.00 - 99.99 [1.00Hz/s]</td></tr>
<tr><td></td><td colspan="2">Defines setting frequency changing rate by UP/DN.</td></tr>
<tr><td>F15.13</td><td>Interval between terminal detection</td><td>0 - 2 [0]</td></tr>
<tr><td></td><td colspan="2">0: 2ms.
1: 4ms.
2: 8ms.</td></tr>
<tr><td>F15.14</td><td>Terminal detection filter times</td><td>0 - 10000 [2]</td></tr>
<tr><td></td><td colspan="2">Delay or confirm digital input signal in case of mal-function.</td></tr>
<tr><td>F15.15</td><td>Terminal input logic setting</td><td>00 - 0x3F [00]</td></tr>
<tr><td></td><td colspan="2">Defines that each bit (binary) represents different physical sources.
• 0: Positive logic. Connected to corresponding common port: this logic is enabled. Otherwise disabled.
• 1: Negative logic. Connected to corresponding common port: this logic is disabled. Otherwise enabled.
<table>
<tr><th colspan="4">Tens</th><th colspan="4">Units</th></tr>
<tr><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>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 running 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.
Define four modes under external terminal control.
0: Two-wire running mode 1.
1: Two-wire running mode 2.
 

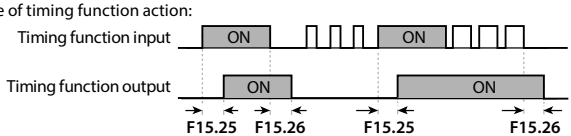
<table>
<tr><th rowspan="2">K2</th><th rowspan="2">K1</th><th colspan="2">Run Command</th></tr>
<tr><th>F15.16=0</th><th>F15.16=1</th></tr>
<tr><td>0</td><td>0</td><td>Stop</td><td>Stop</td></tr>
<tr><td>1</td><td>0</td><td>Reverse</td><td>Stop</td></tr>
<tr><td>0</td><td>1</td><td>Forward</td><td>Forward</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, HD3N will keep the control mode B.</td></tr>
</table>

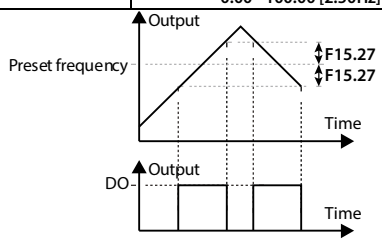
Ref. code	Function Description	Setting Range [Default]
	3: Three-wire running mode 2. • If SB2 changes from enabled into disabled, HD3N will keep the same mode. • Three-wire running mode: DI terminal is defined as No. 4 function.  *SB1: Normally closed stop button* *SB2: Normally open forward button* *SB3: Normally open reverse button*  *K: Direction selection terminal (level on)* *K = 0(forward) K = 1(reverse)* *SB1: Normally closed stop button* *SB2: Normally open run button*	
F15.17	**Action selection when extrenal device has fault**	**0 - 3 [0]**
	Protection action when external device has fault. 0: Coast to stop. 1: Emergency stop. 2: Decelerate to stop. 3: Continue to run.	
F15.18	**DO1 function**	**0 - 36 [2]**
F15.19	**DO2 function**	**0 - 38 [0]**
F15.20	**RLY1 relay function**	**0 - 36 [31]**
	0: Unused. 1: Inverter is ready. • HD3N completes power on and no fault occurs, then it can normally run. 2: Inverter running. HD3N is in run status. 3: Forward running. HD3N is forward running. 4: Reverse running. HD3N1 is reverse running. 5: DC brake. HD3N is DC brake. 6: Zero-frequency status. • In zero-frequency range, the output frequency (including in stop status) outputs. • Refer to F15.28 and F15.29. 7: Zero-frequency running. • HD3N output frequency is within zero-frequency range. • Refer to F15.28 and F15.29. 9,10: Frequency level detection signal (FDT1,FDT2). • Refer to F15.31 - F15.35. 11: Frequency within FAR range (FAR). • The output frequency is within FAR range. • Detection range is set by F15.27. 12: Frequency upper limit. • Indicating signal will output when setting frequency ≥ upper limit frequency. 13: Frequency lower limit. • Indicating signal will output when setting frequency ≤ lower limit frequency.	

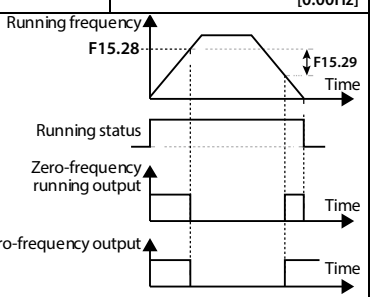
Ref. code	Function Description	Setting Range [Default]
	14: Upper/Lower limit of wobble. • Indicating signal will output if wobble frequency range based on central frequency exceeds upper or lower limit (F00.09). • Valid when F07.00 = 1.  15: Running in simple PLC mode. HD3N is in simple PLC running state. 16: Pause simple PLC running. When paused, output signal. 17: Simple PLC loop done. When done, output signal. 18: Simple PLC phase running is finished. When finished, output signal. 19: Simple PLC running is finished. When finished, output signal. 20: Signal output from SCI. • SCI control open collector output terminal or relay to output signal. 21: Set fully met running time. • When present accumulative running time meets set running times (F15.36), output signal. *Note: Output indicating signal of 17,18,19,21 function is single pulse signal, 500ms width.* 22: Timing function. Output terminal of timing function. • Refer to F15.25, F15.26. 23: Set fully counting value. 24: Specific fully counting value. • Refer to F15.37, F15.38. 25: Set length. • Actual length = setting length, output indicating signal under length control. 27: Analogue input exceeding limit. • When analogue exceeds upper or lower limit, output indicating signal. Refer to F15.39 - F15.42. 29: Stop in under-voltage condition. • When DC busbar voltage is lower than under-voltage level, output indicating signal. • "-Lu-" is displayed on LED keypad. 30: Overload detection signal. • When output current of HD3N > F20.01 (overload pre-alarm detection value), and time > F20.02 (overload pre-alarm detection time), output indicating signal. 31: Inverter fault. HD3N has fault. 32: External fault. HD3N detects external devcice has fault via terminal. 33: Fault of inverter is reset automatically. 35: Dormancy function. 36: System is running. • When U/V/W terminals have output signal or waiting for starting status, output indicating signal. • Waiting for starting includes: dormancy, stop after analogue exceeding limit, stop caused by external signal lost, stop by fault automatically reset,stop at zero frequency and and stop at power failure.	

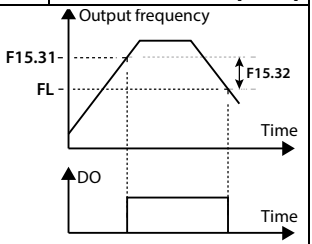
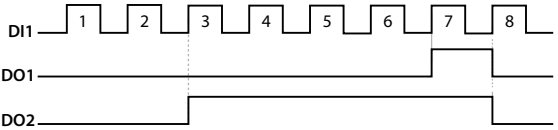
Ref. code	Function Description	Setting Range [Default]
	38: High speed pulse output (DO2 only). • Refer to F16.21.	
F15.24	**Terminal output logic setting**	**0 - 0x7 [0]**
	Terminal input logic setting. Defines that each bit (binary) represents different physical sources. • 0: Positive logic. Connected to corresponding common port, this logic is enabled. Otherwise disabled. • 1: Negative logic. Connected to corresponding common port, this logic is disabled. Otherwise enabled.	
F15.25	**Delay time at ON side for timing**	**0.00 - 300.00 [0.00s]**
F15.26	**Delay time at OFF side for timing**	
	F15.25, F15.26 set delay time (dead zone) at ON/OFF side for timming function, relating to input. • Timing function output is ON when time of timing function input > F15.25. • Timing function output is OFF when time of timing function input < F15.25. Below is figure of timing function action:	
F15.27	**Speed within FAR range**	**0.00 - 100.00 [2.50Hz]**
	The pulse signal will output if elevator speed is within the FAR range. As shown in the right figure.	
F15.28	**Zero speed threshold**	**0.00 - upper limit frequency [0.00Hz]**
F15.29	**Zero speed tolerance**	
	F15.28 and F15.29 defines the zero speed output control function.	
F15.30	**FDT1 detection mode**	**0,1 [0]**
	0: Detect according to setting frequency. 1: Detect according to output frequency.	

Bit3	Bit2	Bit1	Bit0
-	RLY1	DO2	DO1





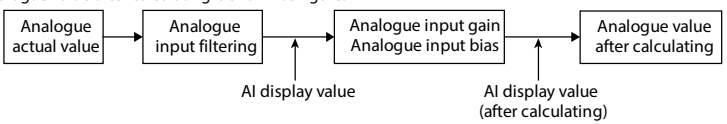


Ref. code	Function Description	Setting Range [Default]
F15.31	**FDT1 level**	**0.00 – F00.08 [5.00Hz]**
F15.32	**FDT1 delay**	**0.00 – F00.08 [0.00Hz]**
	When F15.30 > F15.31, HD3N outputs command signal until output frequency is lower than FDT1 level and delay (FL) (F15.31 - F15.32). 	
F15.33	**FDT2detection mode**	**0,1 [0]**
	0: Detect according to setting frequency. 1: Detect according to output frequency.	
F15.34	**FDT2 level**	**0.00 – F00.08 [5.00Hz]**
F15.35	**FDT2delay**	**0.00 – F00.08 [0.00Hz]**
	Refer to F15.31 and F15.32.	
F15.36	**Set running times**	**0 - 65535 [0h]**
	If accumulative time = F15.36, HD3N has a 500ms mark internally. If output terminal/relay = No. 21, HD3N outputs according to correct internal control status.	
F15.37	**Set fully counting value**	**F15.38 - 9999 [0]**
F15.38	**Specific fully counting value**	**0 - F15.37 [0]**
	F15.37 defines DO terminal or relay outputing signal at certain input pulse when DI terminal (= No. 51) at certain input pulse. Meanwhile external counter will clear ot zero. F15.38 defines DO terminal or relay outputing signal at certain input pulse when DI terminal (= No. 51) at certain input pulse until specific counting value is met. **Example:** Set F15.37 = 7 and F15.38 = 3, DO1 = counter fully met (F15.18 = 23), DO2 = specific counter fully met (F15.19 = 24), DI1 = signal input to trigger counter (F15.00 = 51). Refer to below figure: • DO2 outputs an indicating signal when DI1 inputs the 3rd pulse, until counting value = 7. • DO1 outputs an indicating signal when DO1 outputs the 7th pulse; DO1 resumes to low level voltage when DI1 inputs the 9th pulse. 	

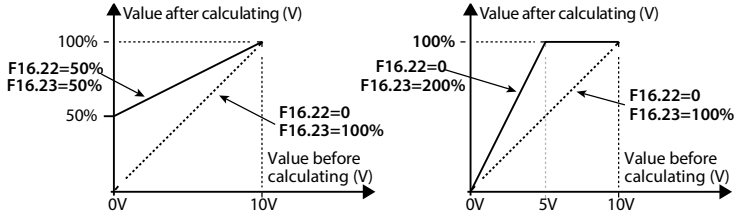
Ref. code	Function Description	Setting Range [Default]
F15.39	**Action selection when analogue input exceeding limit**	**00000 - 21133 [0000]**
	If corresponding analogue > F15.40 or analogue < F15.41 and go through F15.42, detect analogue input is exceeding limit. After detection, HD3N runs according to setting of thousands when F15.41 ≤ analogue ≤ F15.40. **Unit: Action of HD3N when input exceeding limit** • 0: Coast to stop. • 1: Emergency stop. • 2: Decelerate to stop. • 3: No action. **Ten: Select analogue input terminal** • 0: No analogue terminal. • 1: Potentionmeter on keypad. • Valid only when LED keypad adopted. • 2: AI1. • 3: AI2. **Hundred: Condition for detecting analogue exceeding limit** • 0: Detect all the time. • 1: Detect according to command. **Thousand: Running selection after exceeding** • 0: Do not permit auto running. • 1: Permit auto running. **Ten thousand: Action at analogue exceeding limit** • 0: Do not report external fault (E0024). • 1: Report external fault (E0024), can not auto reset. • 2: Report external fault (E0024), can auto reset. • when conditions are invalid, external fault (E0024) can auto reset.	
F15.40	**Upper limit of exceeded analogue input**	**F15.41 - 100.0 [100.0%]**
F15.41	**Lower limit of exceeded analogue input**	**0.0 - F15.40 [0.0%]**
F15.42	**Detection time for exceeded analogue**	**0.00 - 50.00 [5.00s]**
F15.43	**Terminal output delay**	**0.0 - 100.0 [0.0s]**
F15.44	**Detection time for exceeded analogue at start**	**0.00 - 50.00 [15.00s]**

6.2.14 F16: Analogue I/O Terminal Parameters

Ref. code	Function Description	Setting Range [Default]
F16.00	**Keypad with potentiometer function**	**0 - 15 [0]**
F16.01	**AI1 function**	**0 - 15 [2]**
F16.02	**AI2 function**	**0 - 15 [5]**
	Note: F16.00 is valid only when LED keypad is adopted. 0: Used. 1: Upper frequency setting. • F00.07 = 1 (analogue input sets upper limit frequency setting channel), upper limit frequency is set by corresponding input voltage. 2: Frequency setting. • F00.10 = 3 (analogue input sets frequency setting channel), setting frequency is set by corresponding input voltage. 3: Aux frequency setting. • F19.00 = 4 (analogue sets aux frequency setting), aux frequency is set by corresponding input voltage. 4: Process PID setting. • F04.01 = 1 (analogue sets process PID setting), process PID setting is set by corresponding input voltage. 5: Process PID feedback. • F04.02 = 0 (analogue inputs process PID feedback), process PID feedback is set by corresponding input voltage.	

<table>
<tr><th>Ref. code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td colspan="2">6: Process PID regulating upper limit.
• F04.11 = 1 (analogue sets upper limit of PID regulator), process PID regulating upper limit is set by corresponding input voltage.
7: Process PID regulating lower limit.
• F04.12 = 1, process PID regulating lower limit is set by corresponding input voltage.
9: Electric torque limit when motor is forward.
• F10.09 units = 1, electric torque limit when motor forwards is set by corresponding input voltage.
10: Electric torque limit when motor is reverse.
• F10.09 tens = 1, electric torque limit when motor reverses is set by corresponding input voltage.
11: Re-generative torque when motor is forward.
• F10.10 tens = 1, re-generative torque when motor forwards is set by corresponding input voltage.
12:Re-generative torque when motor is reverse.
• F10.10 units = 1, re-generative torque when motor is reverse is set by corresponding input voltage.
13: Torque command setting.
• F21.00 = 1, setting command is set by corresponding input voltage.
15: Upper limit frequency in torque control.
• F21.04 = 2, speed limit is set by corresponding input voltage.</td></tr>
<tr><td>F16.05</td><td>AI1 bias</td><td rowspan="2">-100.0 - 100.0 [0.0%]</td></tr>
<tr><td>F16.08</td><td>AI2 bias</td></tr>
<tr><td>F16.06</td><td>AI1 gain</td><td rowspan="2">0.00 - 10.00 [1.00]</td></tr>
<tr><td>F16.09</td><td>AI2 gain</td></tr>
<tr><td>F16.07</td><td>AI1 filtering time</td><td rowspan="2">0.01 - 10.00 [0.05s]</td></tr>
<tr><td>F16.10</td><td>AI2 filtering time</td></tr>
<tr><td></td><td colspan="2">When AI1 - AI2 is open loop frequency setting source, the relationship between the analogue input and the analogue value after calculating is shown as figure:
 

Analogue actual value is calculated by filter, bias and gain. Group F05 calculates the analogue value and gets the internal analogue setting of HD3N.
• The formula is:Y = kX+bA
• Y is analogue after calculating, X is value before adjusting, k is analogue input gain (F16.06 and F16.09), b is analogue input bias (F16.05 and F16.08), A is analogue max input (10V or 20mA).
• F16.07 and F16.10 define the channel filter time and filters the input signal. The longer filter time, the stronger immunity ability but the shorter respond time; the shorter filter time, the shorter respond time but the weaker immunity ability.
• When AI2 selects current input, short-connect pin 2&3 on control board.</td></tr>
<tr><td rowspan="2">F16.17</td><td>Max. input pulse frequency</td><td>0 - 10000 [10000Hz]</td></tr>
<tr><td colspan="2">When set the DI6 as pulse input, F16.17 defines the max. input pulse frequency.</td></tr>
<tr><td rowspan="2">F16.18</td><td>Input pulse filter time</td><td>0.01 - 10.00 [0.20s]</td></tr>
<tr><td colspan="2">It is used to filter the input pulse frequency and filter out the small fluctuations in the pulse frequency.</td></tr>
</table>

Ref. code	Function Description	Setting Range [Default]
F16.19	**AO1 function**	**0 - 21 [2]**
F16.20	**AO2 function**	**0 - 21 [0]**
F16.21	**High-speed pulse output function**	**0 - 20 [0]**
	0: Unused. 1,2: Output frequency / setting frequency (0 - max. output frequency). 3: Motor RPM (0 - max. output frequency corresponding to RPM). 4: Output current (0 - twice rated current of HD3N). 5: Output current (0 - twice rated current of motor). 6: Torque command (0 - 3 times rated torque of motor). 10: Output torque (0 - 3 times rated torque of motor). 11: Output torque (0 – 1.2 times rated voltage of HD3N). 12: Bus voltage (0 - 2.2 times rated voltage of HD3N). 13: Output power (0 - twice rated power of motor). 14: AI1 input (0 – max. AI1 after calculating). 15: AI2 input (0 - max. AI2 after calculating). 18,19: Output frequency, setting frequency (-1 - 1 times max. output frequency). 20: Setting frequency (0 - max. output frequency). 21: SCI data output (communication data 0 - 1000 corresponding to AO output 0.00 - 10.00V).	
F16.22	**AO1 bias**	**-100.0 - 100.0 [0.0%]**
F16.23	**AO1 gain**	**0.0 - 200.0 [100.0%]**
	User can use output gain to adjust AO1 output.Below is a figure shows curve relationship between AO and F16.22, F16.23. • AO gain and bias formula: actual output (%) = F16.23 × value before calculating (%)+ F16.22  • By short-connecting pin 2&3 in CN7 and CN8, AO1 analogue output can achieve 0 - 20mA output. • To achieve 4 - 20mA output: set F16.22 = 20.0%, F16.23 = 80.0% (4mA corresponds to 0%, 20mA corresponds to100%).	
F16.24	**AO2 bias**	**-100.0 - 100.0 [0.0%]**
F16.25	**AO2 gain**	**0.0 - 200.0 [100.0%]**
	Refer to F16.22, F16.23.	
F16.26	**DO2 max. output pulse frequency**	**0.1 - 10.0 [10.0kHz]**
	Defines max. frequency that DO2 can output.	
F16.27	**Bias of potentionmeter**	**-100.0 - 100.0 [0.0%]**
F16.28	**Gain of potentionmeter**	**0.00 - 10.00 [1.00]**
	Note: F16.27 - F16.28 are valid only when LED keypad is adopted.	

6.2.15 F17: SCI Communication Parameter

Refer to Appendix B, on page 143 for communication function.

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: 1-8-1 format, no parity, RTU.	
F17.01	**Baud rate**	**0 - 8 [3]**
	0：1200bps. 1：2400bps. 2：4800bps. 3：9600bps. 4：19200bps. 5：38400bps. 6: 57600bps. 7: 76800bps. 8: 115200bps.	
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	**Detection time at communication timeout**	**0.0 - 600.0 [0.0s]**
	Time at no communication data > setting time of F17.04, it will be considered as communication timeout, and select and action according to F17.06. • 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 SCI error. • When F17.05 = 0, it will not detect the communication error.	
F17.06	**Action selection at communication timeout**	**0 - 3 [3]**
F17.07	**Action selection at communication error**	**0 - 3 [3]**
F17.08	**Action selection at communication peripheral device fault**	**0 - 3 [1]**
	F17.06 defines the action selection at communication timeout. F17.07 defines the action selection at communication error. In the communication command setting mode, F17.08 will define the action selection when communication peripheral device fault is alarmed. 0: Coast to stop. 1: Emergency stop. 2: Decelerate to stop. 3: Continue to run.	
F17.09	**EEPROM storage selection under communication read/write function parameter**	**00 - 11 [01]**
	F17.109 is used to select parameter storage during modifying. **Unit: parameters storage selection except F00.13 and F19.03** 0: Do not store to EEPROM. 1: Store to EEPROM. **Ten: F00.13 and F19.03 storage selection** 0: Do not store to EEPROM. 1: store to EEPROM. *Note:* *1. Caution! When tens = 1, it may cause damage to HD3N.* *2. F17.09 is valid only for communication reas/write function and whe nfunction code = 0x06 or 0x10.Refer to appendix B MODBUS protocal for more detail.*	
F17.10	**Detection time of networking communication timeout**	**0.0 - 600.0 [0.0s]**
	Communication timeout means when the interval of two sets of data (including local andnon-local data) > F17.10, and selectand action according to F17.06. • F17.10 = 0, do not detect communication timeout.	

6.2.16 F18: Display Control Parameter

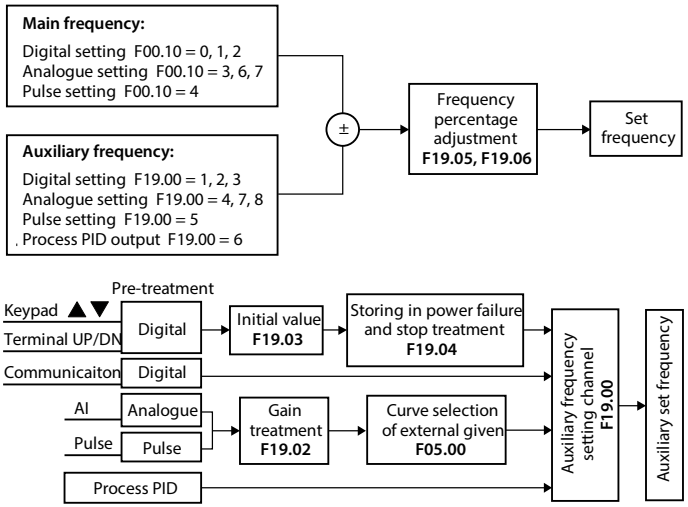
Ref. code	Function Description	Setting Range [Default]
F18.02	Set parameter 1 of run status	0 - 49 [8]
F18.03	Set parameter 2 of run status	0 - 49 [7]
F18.04	Set parameter 3 of run status	0 - 49 [9]
F18.05	Set parameter 4 of run status	0 - 49 [13]
F18.06	Set parameter 5 of run status	0 - 49 [14]
F18.07	Set parameter 6 of run status	0 - 49 [18]
F18.08	Set parameter 1 of stop status	0 - 49 [7]
F18.09	Set parameter 2 of stop status	0 - 49 [18]
F18.10	Set parameter 3 of stop status	0 - 49 [20]
F18.11	Set parameter 4 of stop status	0 - 49 [22]
F18.12	Set parameter 5 of stop status	0 - 49 [43]
F18.13	Set parameter 6 of stop status	0 - 49 [44]
	The keypad displayparameters which is the run status (F18.02 - F18.07) or stop status (F18.08 - F18.13). It can be cycling displayed by ▶▶ key on the keypad. 0: Unuesd. 1: Rated current of HD3N. 3: Invertre status. • Refer to d00.10. 4: Main setting frequency channel. 5: Main setting frequency. 6: Aux setting frequency. 7: Setting frequency. 8: Setting frequency (after Acc. / Dec.). 9: Output frequency. • Hz flashes during running. 10 Setting Rpm. 11: Running Rpm. • RPM flashes during running. 12: Input cable voltage. 13: Output voltage. 14: Output current. 15: Torque setting. 16: Output torque. 17: Output power. 18: DC busbar voltage. 19: Input voltage of potentionmeter. 20: AI1 input voltage. 21: AI1 input voltage (after calculating). 22: AI2 input voltage. 23: AI2 input voltage (after calculating). 28: DI6 terminal pulse input frequency. 29: AO1 output. 30: AO2 output. 31: High speed output pulse frequency. 32: Heatsink temperature. 33: Setting line speed. 34: Reference line speed. 37: Process PID setting. 38: Process PID feedback. 39: Process PID deviation. 40: Process PID integral value. 41: Process PID output. 42: External counting value. 43: Input terminal status. • Bit0 - Bit5 corresponds to DI1 - DI6. 44: Output terminal status. • Bit0 - Bit2 corresponds to DO1, DO2 and RLY1. 45: MODBUS status. 46: Actual length. 47: Accumulative length. 48: Total time at power on (hour). 49: Total running time (hour).	
F18.14	Frequency display gain	0.1 - 160.0 [1.0]
F18.15	Max. line speed	0 - 65535 [1000]
F18.16	Display accuracy of line speed	0 - 3 [0]
	0: Round number. 1: One decimal. 2: Two decimals. 3: Three decimals. *Note: Once set F18.16, re-set F18.15.*	

6.2.17 F19: Function-boost Parameters

Aux frequency setting source (F19.00 - F19.06)

Final setting frequency of HD3N is combined with main setting frequency and aux setting frequency.

F19.00 defines the aux frequency setting source. Aux setting source is invalid when it is same as main frequency setting source (except analogue setting).



Ref. code	Function Description	Setting Range [Default]
F19.00	**Aux frequency setting source selection**	0 - 11 [0]
	Define setting source. • F19.00 = 1 or 2, initial value is set by F19.03. • F19.00 = 4,5,7 - 8, value is set by actual analogue input. Refer to F05.00 for frequency curve selection. • F19.00 = 6, value is set by PID setting and PID feedback. • Refer to above figure. 0: No aux channel. 1: Keypad. Adjust by ▲ and ▼ button on keypad. 2: Terminal. Adjust by UP/DN terminal. 3: SCI. Initial value is 0. 4: Analogue. 5: Terminal puse. 6: PID output. 7: AI1. 8: AI2. 11: Potentionmeter. Valid when LED keypad adopted only.	

Ref. code	Function Description	Setting Range [Default]
F19.01	**Main/Aux setting calculating**	**00 - 41 [10]**

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/Aux calculating

0: Main+Aux setting.

1: Main-Aux setting.

Ten: Frequency source selection

0: Main.

1: Main/Aux calculating.

2: Main/Aux switching.

3: Main and Main/Aux calculating switching.

4: Aux and Main/Aux calculating switching.

DI = 54	F19.01setting value									
	00	10	20	30	40	01	11	21	31	41
0	Main	Main+Aux	Aux	Main+Aux	Main+Aux	Main	Main-Aux	Aux	Main-Aux	Main-Aux
1	Main	Main+Aux	Main	Main	Aux	Main	Main-Aux	Main	Main	Aux

F19.02	**Aux setting coefficient**	**0.00 - 9.99 [1.00]**

Use F19.02 to calculate gain, then calculate aux frequency by F05.

- Valid when F19.00 = 4,5,7 - 8.

F19.03	**Initial value of digital aux frequency**	**0.00 - F00.06 [0.00Hz]**

Valid when 19.00 = 1,2. F19.03 is initial value for the two aux frequency setting.

F19.04	**Digital aux frequency control**	**00 - 11 [00]**

Valid when F19.00 = 1,2.

Unit: Storage selection at power failure

- 0: Do not save aux frequency.
- 1: Save aux frequency.

Ten: Frequency at stop

- 0: Maintain aux frequency at stop.
- 1: Aux frequency resumes to F19.03 at stop.

F19.05	**Setting frequency adjustment selection**	**0 - 2 [1]**
F19.06	**Setting frequency adjustment coefficient**	**0.0 - 200.0 [100.0%]**

F19.05,F19.06 define the adjustment ways of setting frequency (the frequency that calculated by main and aux setting frequency is shorted as resultant frequency).

0: Do not adjust.

- Setting frequency = resultant frequency.

1: Adjust according to max. output frequency (F00.06).

- Setting frequency = resultant frequency + F00.06 × (F19.06 – 100%).

2: Adjust according to current frequency.

- Setting frequency = resultant frequency × F19.06.

Cooling fan (F19.07 - F19.08)

Ref. code	Function Description	Setting Range [Default]
F19.07	**Fan control**	**0 - 2 [0]**
F19.08	**Fan control delay 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.

- The fan runs all the time when HD3N is running. After HD3N stops for the time set by F19.08, the fan continues running if overheat protection is activated.

1: Immediate stop.

- The fan runs all the time when HD3N is running and stops when HD3N stops.

2: Runs all the time when power on.

- The fan runs all the time when HD3N is powered on.

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

Check details in below figure.

Fcmd = setting frequency

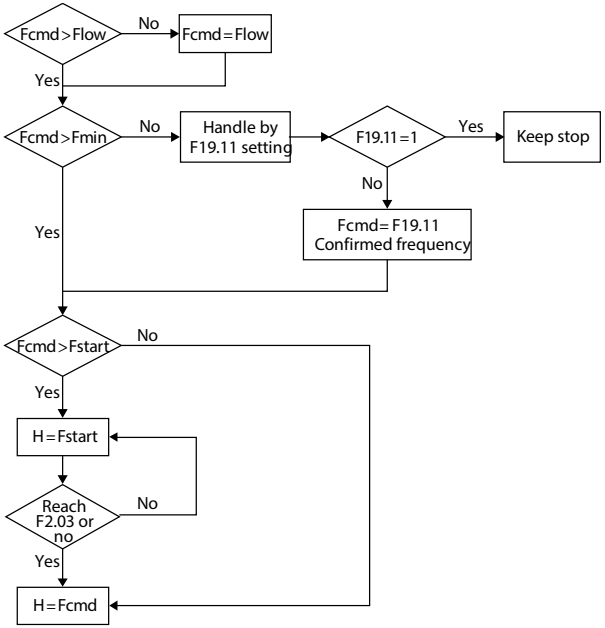
Fmin = zero frequency threshold (F19.10)

Flow = lower limit frequency (F00.09)

H = target frequency

Fstart = start delay time (F02.02)

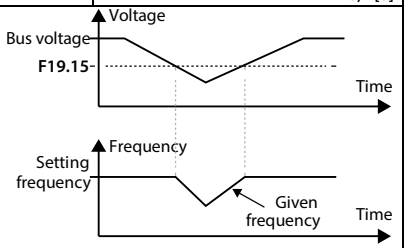
F02.03 (Starting DWELL retention time)



Ref. code	Function Description	Setting Range [Default]
F19.10	**Zero frequency threshold**	**0.00 - Upper limit frequency [1.00Hz]**
F19.11	**Action selection when setting frequency<zero frequency threshold**	**0 - 3 [0]**
	0: Runs according to frequency command. 1: Remains stop and does not output. 2: Runs according to zero frequency. 3: Runs at 0Hz.	

Non-stop at instantaneous power loss (F19.12 - F19.15)

When voltage decreases or instantaneous under-voltage, HD3N compensates the voltage and decrease output frequency. With load feedback energy, HD3N runs non-stop.

Ref. code	Function Description	Setting Range [Default]
F19.12	**Non-stop at instantaneous power loss**	0,1 [0]
	If instantaneous power loss occurs when HD3N is running (DC busbar voltage of main circuit V_{DC} < F19.15), HD3N runs non-stop by decreasing output frequency and maintain DC busbar voltage. 0: Forbid non-stop at instantaneous power loss. 1: Enable non-stop at instantaneous power loss. Compensate to under-voltage.	
F19.13	**Voltage compensation gain for non-stop running**	0.010 - 1.000 [0.500]
	When F19.12 = 1, HD3N judges the difference between current DC busbar and F19.15 as well as voltage compensation gain. By real time adjusts output frequency, HD3N maintains DC busbar voltage to avoid stop due to under-voltage. • Under-voltage can not fully compensate if compensation gain and and load feedback energy is too small; • Output frequency will fluctuate even system oscillates if compensation gain and and load feedback energy is too big.	
F19.15	**Voltage for action judgement at instantaneous power loss**	400 - 670 [430V]

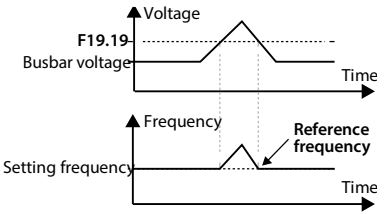
Restart after power failure (F19.16 - F19.17)

This function decides whether HD3N starts automatically or not and the waiting time before restart when HD3N restarts after power failure.

Ref. code	Function Description	Setting Range [Default]
F19.16	**Restart after power failure**	0,1 [0]
	0: Disabled. 1: Enabled. In the occation that power failure occurs to HD3N that is running,when HD3N is powered on again and the run command is still valid, it will wait until time of F19.17 is finished and then restart the motor.	
F19.17	**Waiting time for restart after power failure**	0.00 - 10.00 [2.00s]

Stall overvoltage function (F19.18 - F19.19)

During running process of HD3N, it will encounter DC busbar voltage increase and overvoltage protection due to load inertia. DC busbar voltage may increase because of sudden increase/decrease of load during dec process.

Ref. code	Function Description	Setting Range [Default]
F19.18	**Overvoltage suppression gain**	**0.000 - 1.000 [0.500]**
	0: Forbid stall overvoltage. 0.001 - 1.000: Enable stall overvoltage. • When HD3N is running, it detects busbar voltage and compares it with F19.19, if busbar voltage > F19.19, HD3N will increase output frequency to avoid large load feedback. • If F19.18 is too small, it can not effectively supress increase of busbar voltage; • If F19.18 is too large, output frequency will fluctuate even system oscillates; to avoide this problem, increase duration of dec process. *Note: If stall overvoltage ;asts for more than 1 minute, HD3N reports stall overvoltage fault (E0007), and stops output.*	
F19.19	**Stall overvoltage point**	**650 - 790 [690V]**
	If overvoltage occurs suring running, properly increase stall overvoltage gain and decrease F19.19. Stall overvoltage and braking unit: • Usually when appling braking units to inverter, please forbid stall overvoltage (F19.18 = 0); • But if feedback energy is too large at loading moment and delayed energy release of braking unit, HD3N will adopt overvoltage protection. To avoid protection, enable stall overvoltage and F19.19) should > action voltage of braking unit.  $\triangle F = F19.18 \times (V_{DC}\text{-}F19.19)$	

Auto current limit (F19.20 - F19.21)

Auto current limit is used to limit the load current in real time < F19.21. Therefore HD3N 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 HD3N may change; therefore, it is recommended not to enable when stable output frequency is required.

Note: when HD3N is used at geopotential load (lift and hoister),to ensure safety of whole system, forbit these functions: F19.12 - F19.15, F19.16 - F19.17, F19.18 - F19.19 and19.20 - F19.21.

Ref. code	Function Description	Setting Range [Default]
F19.20	**Auto current limit gain**	**0.000 - 1.000 [0.500]**
	Output frequency of HD3N>F19.21, HD3N will limit current to avoid over-current protection. • Adjust F19.20 according to actual load: • If F19.20 is too small, it can not fully limit increase of output current; • If F19.20 is too large, output frequency will fluctuate even system oscillates. • Auto current limt is invalid when F19.20 = 0.	
F19.21	**Auto current limit threshold**	**20.0 - 200.0 [150.0%]**
	Defines the current threshold of auto current limit. The current = F19.21 × rated current of HD3N. • When auto current limit is valid, if F19.21 is too small, it may affect the load capacity of HD3N.	

Terminal detection (F19.23)

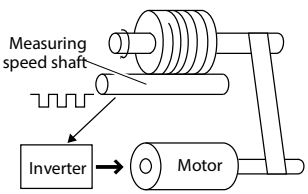
Ref. code	Function Description	Setting Range [Default]
F19.23	**Terminal running command detection**	**00 - 11 [00]**
	Valid in two-wire control mode only. **Unit: terminal selection when powered on** **Ten: terminal selection after powered on** • 0: Edge is valid. • 1: Level is valid.	

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 [680V]**
	Note: Only in inverter running status is the braking enabled.	
F19.25	**Flux braking**	**0,1 [0]**
	0: Disabled. 1: Enable, and disable stall overvoltage automatically. • By increasing wear to the motor, HD3N can quicken dec without connecting braking unit. • Use F19.40 and F19.41 to adjust flux braking. • Valid in V/f control. *Note: please set F19.25 = 0 when brake a lot, otherwise will damage the motor.*	

Stop function when length is met (F19.26 - F19.34)

HD3N inputs counting pulse through DI terminal (No. 52), and calculated the length according to pulse No. per rotate of testing axis (F19.31) and axis diameter (F19.30), then correct the counting length according to length multiplying power (F19.28) and length correction coefficient (F19.29), finally getting actual length (F19.27). The formula is:



F19.27 = counting length × F19.28 ÷ F19.29 ÷ 100

Counting length = counting pulse ÷ F19.31 × F19.30 × π

F19.27 ≥ F19.26, HD3N commands to stop. To restart, please clear value of F19.27 or set F19.27 < F19.26, otherwise HD3N can not restart.

Ref. code	Function Description	Setting Range [Default]
F19.26	**Setting length**	**0 - 65535 [0m]**
F19.27	**Actual length**	**0 - 65535 [0m]**
F19.28	**Length multiplying power**	**0.001 - 30.000 [1.000]**
F19.29	**Length correction coefficient**	**0.001 - 1.000 [1.000]**
F19.30	**Axis diameter**	**1.00 - 100.00 [10.00cm]**
F19.31	**Pulse No. per rotate of testing axis**	**1 - 9999 [1]**
F19.32	**Length fully met function**	**00 - 11 [00]**
	Units: • 0: Outputs level signal. • 1: Outputs 500ms pulse. **Tens:** • 0: Stop. • 1: Continue running.	

Ref. code	Function Description	Setting Range [Default]
F19.33	**Action of length when length is met**	**0 - 2 [0]**
F19.34	**Action of length at stop**	**0 - 2 [0]**
	0: Clear to 0. 1: Remain. 2: Continue calculating.	

Aux PID limit (F19.35 - F19.36)

Ref. code	Function Description	Setting Range [Default]
F19.35	**Aux PID output limit**	**0.0 - 100.0 [100.0%]**
	When aux frequency selects PID, adjustment upper limit of PID output = F19.35 × main setting frequency.	
F19.36	**Aux PID output setting**	**0.0 - 100.0 [0.0%]**
	Aux PID output setting = output llimit of F19.35 + F19.36 × F00.06.	

Frequency adjustment range (F19.37)

Ref. code	Function Description	Setting Range [Default]
F19.37	**Frequency adjustment range**	**000 - 111 [100]**
	Unit: main frequency calculating range • 0: 0-max. frequency. • 1: Negative max. frequency- max. frequency. **Ten: Aux frequency calculating range** • 0: 0-max. frequency. • 1: Negative max. frequency- max. frequency. **Hundred: Resultant frequency calculating range** • 0: 0-upper limit frequency. • 1: Negative upper limit frequency–upper limit frequency.	

Short-circuit detection (F19.38)

Ref. code	Function Description	Setting Range [Default]
F19.38	**Inter-phase short-circuit detection**	**0,1 [1]**
	Used to detect inter-phase short-circuit before running HD3N. 0: Do not detect. 1: Detect.	

Input voltage selection (F19.39)

Ref. code	Function Description	Setting Range [Default]
F19.39	**Inout voltage selection**	**0 - 2 [0]**
	0: 380 - 460V. 1: 260 - 460V. 2: 200 - 460V. *Note: when F19.39 = 1 or 2, HD3N needs derating to use, and the actual output current should not surpass rated output current of HD3N.*	

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

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

LCD backlight (F19.44)

Ref. code	Function Description	Setting Range [Default]
F19.44	**LCD backlight display time**	**0.0 - 999.9 [5.0min]**
	Defines display time of keypad LCD backlight when there is no operation on keypad. • F19.44 = 0, backlight always light. • Back always light at fault. • At normal state, backlight lights for time of F19.44 and then does not light. Now pressing any button only turns on backlight and do not send command.	

6.2.18 F20: Fault Protection Parameters

Overload fault (F20.00 - F20.02)

Ref. code	Function Description	Setting Range [Default]
F20.00	**Overload pre-alarm detection**	**00000 - 31111 [00000]**
	Unit: Overload pre-alarm detection • 0: It is active all the time in running status. • 1: It is active only at constant speed. **Ten: Overload pre-alarm action** • 0: HD3N doesn't alarm and continues running when detecting an active overload signal. • 1: HD3N alarms and stops running when detecting an active overload signal. **Hundred: Overload detection threshold** • 0: Relates to rated current of motor (alarm E0019: motor overload). • 1: Relates to rated current of HD3N (alarm E0017: inverter overload). **Thousand: Motor type** • 0: Standard motor. As the cooling effect of the standard motor deteriorates at low speed, HD3N will automatically make regulation to the time of motor overload protection. • 1: Variable frequency motor. The cooling effect of the variable frequency motor is not affected by the motor speed due to its forced cooling potential, HD3N will not automatically make regulation to the time of motor overload protection. **Ten thousand: Overload protection** • 0: Enable inverter overload protection and motor overload protection. • 1: Enable inverter overload protection; shield motor overload protection. • 2: Shield inverter overload protection; enable motor overload protection. • 3: Shield inverter overload protection and motor overload protection.	
F20.01	**Overload pre-alarm detection value**	**20.0 - 200.0 [150.0%]**
	Defines the current value for overload pre-alarm. It relates to rated current of motor or inverter.	
F20.02	**Overload pre-alarm detection time**	**0.0 - 60.0 [5.0s]**
	When output current of HD3N > F20.01, and duration>F20.02, HD3N will report E0017 fault (inverter overload) or E0019 fault (motor overload).	

Inverter output load loss detection fault (F20.03 - F20.05)

Ref. code	Function Description	Setting Range [Default]
F20.03	**Detection action for inverter output load loss**	**0 - 4 [0]**
	0: Invalid, not detect. 1: Detect during running and keep running (alarm). 2: Detect during constant speed and keep running (alarm). 3: Detect during running and stop output (fault). 4: Detect during constant speed stop output (fault).	
F20.04	**Detection value for inverter output load loss**	**0 - 100 [30%]**
	Defines the current value for output load loss alarm. It relates to rated current of inverter.	
F20.05	**Detection time for invertre output load loss**	**0.00 - 20.00 [1.00s]**
	When inverter output current < F20.04, and duration > F20.05, inverter reports E0018 fault. • F20.04 = 0 or F20.05 = 0, inverter does not detect inverter load loss fault (E0018).	

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

Ref. code	Function Description	Setting Range [Default]
F20.08	**The detection base of lack of input**	**0 - 80 [30%]**
F20.09	**The detection time of lack of input**	**1.00 - 5.00 [1.00s]**
	F20.08 is a percentage of rated voltage of HD3N. When HD3N detects certain input voltage does not hit the detection base (F20.08) and exceeds the preset detection time (F20.09), HD3N alarms E0015 fault. • F20.08 = 0, HD3N will not detect input phase loss fault (E0015).	
F20.10	**The detection base of lack of output**	**0 - 100 [20%]**
F20.11	**The detection time of lack of output**	**1.00 - 20.00 [3.00s]**
	F20.10 is a percentage of rated current of HD3N. When HD3N detects certain output current does not hit the detection base (F20.10) and exceeds the detection time (F20.11), HD3N alarms E0016 fault. • F20.10 = 0, HD3N will not detect output phase loss fault (E0016).	

PID fault (F20.12 - F20.17)

Ref. code	Function Description	Setting Range [Default]
F20.12	**PID setting lose detection value**	**0 - 100 [0%]**
F20.13	**PID setting loss detection time**	**0.00 - 10.00 [0.20s]**
	F20.12 value is a percentage of the max. setting source. If the PID setting < F20.12 within detection time (F20.13), HD3N will alarm E0025 fault. • F20.12 or F20.13 = 0, HD3N will not detect PID setting loss fault (E0025).	
F20.14	**PID feedback loss detection value**	**0 - 100 [0%]**
F20.15	**PID feedback loss detection time**	**0.00 - 10.00 [0.20s]**
	F20.14 value is a percentage of the max. feedback source. If the PID feedback value < F20.14 in the detection time (F20.15), HD3N will alarm E0026 fault. • F20.14 or F20.15 = 0, HD3N will not detect PID feedback loss fault (E0026).	
F20.16	**Detection value at PID feedback out of the limit**	**0 - 100 [100%]**
F20.17	**Detection time at PID feedback out of the limit**	**0.00 - 10.00 [0.20s]**
	F20.16 value is a percentage of the max. feedback source. If the PID feedback value > F20.16 in the detection time (F20.17), HD3N will alarm E0027 fault. • F20.16 = 100 or F20.17 = 0, HD3N will not detect PID feedback out of limit fault (E0027).	

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

Auto reset function enables HD3N to reset the fault as per the reset times and interval.

During the reset interval, HD3N stops output and it will automatically restarts if running command is valid.

The following faults do not have the auto reset function:

E0008: Power module fault
E0010: Braking unit fault
E0014: Current detection fault
E0021: Read / Write fault of control board EEPROM
E0023: Wrong parameter setting
E0024: External fault

Ref. code	Function Description	Setting Range [Default]
F20.18	**Fault auto reset times**	**0 - 100 [0]**
F20.19	**Fault auto reset interval**	**0.01 - 200.00 [5.00s/time]**
	When F20.18 = 0, it means "auto reset" is unused and the protective device will be activated. • If no other fault is detected within 5 minutes, the auto reset count will be automatically cleared. • On condition of external fault reset, auto reset count will be cleared.	
F20.20	**Faulty relay action**	**00 - 11 [00]**
	Unit: In auto reset process • 0: Faulty relay doesn't act. • 1: Faulty relay acts. **Ten: In undervoltage process** • 0: Faulty relay doesn't act. • 1: Faulty relay acts. *Note: relay must be set as No. 31 function.*	

Fault history (F20.21 - F20.37)

Ref. code	Function Description	Setting Range [Default]
F20.21	**NO.5 fault type**	**[Actual value]**
F20.22	**Setting frequency at NO.5 fault**	
F20.23	**Running frequency at NO.5 fault**	
F20.24	**DC bus vlotage at NO.5 fault**	
F20.25	**Output voltage at NO.5 fault**	
F20.26	**Output current at NO.5 fault**	
F20.27	**Input terminal status at NO.5 fault**	
F20.28	**Output terminal status at NO.5 fault**	
F20.29	**NO.5 fault interval**	
F20.30	**NO.4 fault type**	
F20.31	**NO.4 fault interval**	
F20.32	**NO.3 fault type**	
F20.33	**NO.3 fault interval**	
F20.34	**NO.2 fault type**	
F20.35	**NO.2 fault interval**	
F20.36	**NO.1 fault type**	
F20.37	**NO.1 fault interval**	
F20.38	**Last time fault interval**	
	F20.22 - F20.29 record status parameters of HD3N at the last fault. F20.30 - F20.37 record the type and interval per time of four faults before the latest. The unit of interval is 0.1 hour.	

6.2.19 F21: Torque Control Parameter

Under open loop control, set F00.00 = 1 (torque control), group F21 controls motor torque output.

Under torque control, if the output torque is not balanced with load torque, motor will accelerate or decelerate.

In electric state, motor running speed is limited by F21.04. In generating state, motor running speed changed along with load speed.

Internal torque command depends on combination of running command and torque setting.

Running command	N/P of torque setting	Internal torque command
Forward	Positive	Forward
	Negative	Reverse
Reverse	Positive	Reverse
	Negative	Forward

Ref. code	Function Description	Setting Range [Default]
F21.00	**Torque command setting source selection**	**0 - 3 [0]**
	0: F21.01 digital. 2: Terminal puls. 1: Analogue. 3: SCI communication.	
F21.01	**Torque command digital setting**	**-100.0 - 100.0 (F21.02) [0.0%]**
	Defines the torque setting value when F21.00 = 0.	
F21.02	**Max. torque setting**	**0.0 - 500.0 (rated torque of motor) [100.0%]**
	Defines the max. output torque.	
F21.03	**Filtering time of torque command**	**0.000 - 1.000 [0.000s]**
	F21.03 is the time that external torque is filtered through the filter setting source. • Suitable filtering time can avoid motor jitter due to the change of torque command.	
F21.04	**Speed control under torque control**	**0 - 2 [1]**
	0: Set by F21.05 and F21.06. 1: Set by F00.06 (max. output frequency). 2: Set by analogue limit. When analogue input terminal (F16.01 - F16.04) = No. 15,F21.04 is set by analogue limit.	
F21.05	**Forward speed limit under torque control**	**0 - 100 (F00.06) [100%]**
F21.06	**Reverse speed limit under torque control**	**0 - 100 (F00.06) [100%]**
	F21.05,F21.06 define forward/reverse speed under torque control (F00.00 = 1).	
F21.10	**Stop mode selection under torque control**	**0 - 2 [0]**
	0: Decelerates to stop + DC brake. • When receiving stop command, the output frequency decelerates according to dec time, when output frequency = F02.16, DC brake start acting. • Refer to F02.16 - F02.18 for DC brake function. 1: Stop torque output. • When receiving stop command, HD3N stops torque output, and motor moves due to the load. 2: Coast to stop. • When receiving stop command, HD3N stops output immediately, and motor coast to stop according to mechanical inertia.	

6.2.20 F23: PWM Control Parameter

Ref. code	Function Description	Setting Range [Default]
F23.00	**Carrier frequency**	**1 - 8 [6kHz]**
	F23.00 defines the carrier frequency of PWM output wave. • The carrier frequency will affect the running noise of the motor. The higher the carrier frequency, the lower the noise made by the motor. So properly set the carrier frequency. • When the value > factory setting, DH3N should be derated by 5% when per 1kHz is increased compared to the factory setting.	
F23.01	**Auto adjust carrier frequency**	**0 - 2 [1]**
	0: Prohibited. 1: Adjust 1. 2: Adjust 2. • HD3N auto asjust the carrier frequency according to output frequency and heatsink temperature. • Auto adjust is invalid under torque control.	
F23.02	**PWM overshoot enable**	**0,1 [1]**
	0: Disabled. 1: Enabled.	
F23.03	**PWM modulation mode**	**0,1 [0]**
	0: Switch between two phase/three phase. 1: Three phase.	
F23.04	**Switch point 1 of PWM modulation mode**	**5.00 - 50.00 [5.00Hz]**
F23.05	**Switch point 2 of PWM modulation mode**	**7.00 - 50.00Hz [10.00Hz]**
	PWM modulation mode applies to V/f control and carrier frequency > 3kHz; HD3N selects three phase modulation for open loop vector control or carrier frequency ≤ 3kHz. *Note: upper limit of F23.04 = F23.05 - 2.00Hz, lower limit of F23.05 = F23.04 + 2.00Hz.*	
F23.09	**Random carrier factor K1**	**0 - 2000 [2]**
F23.10	**Random carrier factor K2**	**0 - 2000 [3]**

6.2.21 R02: Analogue Parameter Correction Factor

Ref. code	Function Description	Setting Range [Default]
R02.00	AI1 display voltage 1	**0.0 - 100.0 [0.0%]**
R02.01	AI1 actual voltage 1	**0.00 - 10.00V [Default]**
R02.02	AI1 display voltage 2	**0.0 - 100.0 [0.0%]**
R02.03	AI1 actual voltage 2	**0.00 - 10.00V [Default]**
R02.04	AI2 display voltage 1	**0.0 - 100.0 [0.0%]**
R02.05	AI2 actual voltage 1	**0.00 - 10.00V [Default]**
R02.06	AI2 display voltage 2	**0.0 - 100.0 [0.0%]**
R02.07	AI2 actual voltage 2	**0.00 - 10.00V [Default]**
	R02.00 - R02.07 is used to correct AI1/AI2 input signal. **Steps (take AI1 as example):** 1. Set R02.00 - R02.03 = 0 before correcting, thus to obtain the original input value of AI1. 2. Input a value between 0 - 10V. Check D00.27 and us multimeter to detect the actual input value. Records the two values. 3. Input another value between 0 - 10V. Check D00.27 and us multimeter to detect the actual input value. Records the two values. 4. Input the above two sets of value into R02.00 - R02.01 and R02.02 - R02.03 to complete correcting. *Note: Above parameters have been corrected in factory. Usually users do not need to correct.*	

6.3 Group y: Manufacturer Function Parameters

The Group y is the manufacturer parameters group for commissioning at the factory before delivery.

Chapter 7 Troubleshooting and Maintenance

7.1 Troubleshooting

If a fault occurs, the keypad will display the fault alarm status. Meanwhile, faulty relay acts, accordingly HD3N stops output and the motor coasts to stop.

When fault alarm occurs, user should record the fault in detail and take proper action according to Table 7-1. If technical help is needed, contact the suppliers or directly call Shenzhen Hpmont Technology Co., Ltd.

After the fault is eliminated, reset HD3N by any of the following methods:

1. Keypad reset.
2. External reset terminal (DI terminal = No. 16 function).
3. Communication fault reset.
4. Switching on HD3N after completely power off.

Table 7-1 Fault and counter-measures

Fault		Fault reasons	Counter-measures
-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 HD3N 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 • Restart motor that is rotating after sudden instantaneous voltage loss • Did not auto-tune motor in vector control mode	• Connect HD3N and motor properly • Set correct motor parameter (F08.00 - F08.04) • Select inverter with higher rating • Set proper Acc / Dec time (F03.01 - F03.08) • Set F02.00 = 2 • Do parameter auto-tuning (F08.06)
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 • Deceleration time is too short • Improper wiring leads to overvoltage of hardware • Restart motor that is rotating after sudden instantaneous voltage loss • Improper selection of the braking devices	• Check power input • Set a proper value for Dec time (F03.02, F03.04, F03.06, F03.08) • Check wiring and wire HD3N properly • Set F02.00 = 2 • Select recommended braking devices according to section 8.2.
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)

Note: E0001 - E0003 and E0008can be reset only after reporting to 3s.

Fault		Fault reasons	Counter-measures
E0008	Power module fault	• Short circuit between phases output • Short circuit to the ground • Output current is too high • Power module is damaged	• Check the connection and connect the wire properly • Check the connection and connect the wire properly • Check the connection and mechanism • Contact the supplier for repairing
E0009	Heatsink overheat	• Ambient temperature is too high • Poor external ventilation of HD3N • Fan fault • Fault occurs to temperature detection circuit	• Use inverter with higher power capacity • Improve the ventilation around HD3N • Replace the cooling fan • Seek technical support
E0010	Braking unit fault	• Circuit fault of braking unit	• Seek technical support
E0012	Parameters auto-tuning fault	• Parameter auto-tuning is timeout	• Check the motor connection • Input correct motor parameters (F08.00 - F08.04) • Seek technical support
E0014	Current detection circuit fault	• Current detection circuit is damaged	• Contact the supplier for repairing
E0015	Input voltage phase loss	• For three-phase input HD5L, input 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 HD3N is severely unbalanced	• Check the connection between HD5L and motor • Check the quality of motor
E0017	Inverter overload	• Acc time is too short • Improper setting of motor parameter • Improper setting of V/f curve or torque boost leads to over current • Did not auto-tune motor in vector control mode • Restart motor that is rotating after sudden instantaneous voltage loss • Mains supply voltage is too low • Motor load is too high	• Adjust Acc time (F03.01, F03.03, F03.05, F03.07) • Set proper motor parameter (F08.00 - F08.04) • Adjust V/f curve (F09.00 - F09.06) or torque boost (F09.07,F09.08) • Do parameter auto tuning (F08.06) • Set F02.00 = 2 • Check mains supply voltage • Use HD3Nr with proper power rating
E0018	Inverter output load-loss	• Load disappears or falls suddenly • Parameters are not set properly	• Check load and mechanical transmission devices • Set the parmeters properly (F20.03 - F20.05)
E0019	Motor overload	• Improper setting of V/f curve • Mains supply voltage is too low • Normal motor runs for a long time with heavy load at low speed • Motor locked-rotor or overload	• Adjust V/f curve (F09.00 - F09.06) • Check the power input • Use special motor if the motor needs to operate for a long time with heavy load • Check the load and mechanical transmission devices

Fault		Fault reasons	Counter-measures
E0020	Motor overheat	• Motor overheat • The setting of motor parameter is incorrect	• Reduce the load; Repair or replace the motor • Increase the Acc / Dec time (F03.01 - F03.08) • Set the motor parameter (F08.00 - F08.04)
E0021	Read / Write fault of control board EEPROM	• Memory circuit fault of control board EEPROM	• Contact the supplier for repairing
E0022	Read / Write fault of keypad EEPROM	• Memory circuit fault of keypad EEPROM	• Replace the keypad • Contact the supplier for repairing
E0023	Faulty setting of parameters	• The power rating between motor and inverter is too different • Improper setting of motor parameters	• Select an inverter with suitable power rating • Set correct value of motor parameters (F08.00 - F08.04)
E0024	Fault of external equipment	• Fault terminal of external equipment operates	• Check external equipment
E0025	PID setting loss	• Analogue reference signal < F20.12 • Analogue input circuit fault	• Check the connection • Seek technical support
E0026	PID feedback loss	• Analogue setting < F20.14 • Analogue input circuit fault	• Check the connection • Seek technical support
E0027	PID feedback out of limit	• Analogue setting signal > F20.16 • Analogue input circuit fault	• Check the connection • Seek technical support
E0028	SCI communication timeout	• Connection fault of Communication cable • Disconnected or not well connected	• Check the connection
E0029	SCI communication error	• Connection fault of communication cable • Disconnected or not well connected • Communication setting error • Communication data error	• Check the connection • Check the connection • Correctly set the communication format (F17.00) and the baud rate (F17.01) • Send the data according to MODBUS protocol

Note: E0022 does not affect the normal use of HD3N.

7.2 Maintenance

Factors such as ambient temperature, humidity, PH, dust, oscillation, internal component aging, wear and tear will give rise to the occurrence of potential faults. Therefore, it is necessary to conduct daily maintenance to the controller.

- If HD3N has been transported for a long distance, check whether the components of HD3N are complete and the screws are well tightened.
- Periodically clean the dust inside HD3N and check whether the screws are loose.

Danger

- Only a trained and qualified professional person can maintain HD3N.
- Maintenance personnel should take off all metal jewelry before carrying out maintenance or internal measurements in HD3N. Suitable clothes and tools must be used.
- High voltage exists when HD3N is powered up or running.
- Checking and maintaining can only be done after AC power of HD3N is cut off and wait for at least 10 minutes. The cover maintenance can only be done after ensured that the charge indicator inside HD3N and the indicators on the keypad are off and the voltage between power terminals (+) and (-) is below 36V.

Warning

- For HD3N with more than 2 years storage, please use voltage regulator to increase the input voltage gradually.
- Do not leave metal parts like screws or pads inside HD3N.
- Do not make modification on the inside HD3N without instruction from the supplier.
- There are IC components inside HD3N, which are sensitive to stationary electricity. Directly touch the components on the PCB board is forbidden.

Daily Maintenance

HD3N must be operated in the specified environment, refer to section 3.2, on page 11.

Therefore maintain it according to Table 7-2. To prolong the lifetime of HD5L, keep good running environment, record the daily run data and detect any abnormal behavior.

Table 7-2 Daily maintenance

Items	Content	Criteria
Running environment	Temperature and humidity	-10 - +40℃, derating at 40 - 50℃ Less than 95%RH, non-condensing
	Dust and water dripping	No conductive dust accumulating, no water dripping
	Gas	No strange smell
HD3N	Oscillation and heating	Stable oscillation and proper temperature
	Noise	No abnormal sound
Motor	Heating	No overheat
	Noise	Low and regular noise
Running status parameters	Output current	Within rated range
	Output voltage	Within rated range

Periodical Maintenance

Customer should check HD3N in every 3 to 6 months according to the actual environment so as to avoid hidden problems and make sure HD3N runs well for a long time.

General Inspection:

- Check whether the screws of control terminals are loose. If so, tighten them with a screw driver;
- Check whether the main circuit terminals are properly connected; whether the copper bar and mains cables are overheated;
- Check whether the power cables and control cables are damaged, check especially for any wear on the cable tube;
- Check whether the insulating tapes around the cable lugs are stripped, and for signs of overheating near terminations;
- Clean the dust on PCBs and air ducts with a vacuum cleaner.

Note:

1. Dielectric strength test of HD3N has already been conducted in the factory. Do not do the test again. Otherwise, HD3N might be damaged.

2. If insulation test to the motor is necessary, it should be done after the input terminals U/V/W of motor have been detached from HD3N. Otherwise, HD3Nwill be damaged.

3. For HD3N that have been stored for a long time, they must be powered up every 2 years. When supplying AC power to HD3N, use a voltage regulator to gradually raise the input voltage to rated input voltage at least 5 hours.

Replacing Damaged Parts

The components that are easily damaged are: cooling fan and electrolytic capacitors of filters. Their lifetime depends largely on their application environment and preservation. Users can decide the time when the components should be replaced according to their service time.

Easily damaged	Cooling fan	Electrolytic capacitors
Life	60, 000 hours	50, 000 hours
Possible cause of damages	Wear of the bearing, aging of the fan vanes	High ambient temperature, aging of electrolyte and large pulse current induced by rapid changing loads
Criteria	After the inverter is switched off, check if the abnormal conditions such as crack existing on fan vanes and other parts. When the inverter is switched on, check if inverter running is normal, and check if there is any abnormal oscillation	Check if frequent overcurrent or overvoltage failures occur during inverter start-up with load. Check if there is any leakage of liquids. Check if the safety valve protrudes. Measure the static capacitance and insulation resistance

Unwanted Controller Recycling

When disposing HD3N, pay attention to the following factors:

- The capacitors may explode if they are burnt.
- Poisonous gas may be generated when the plastic parts like front covers are burnt.
- Disposing method: Dispose unwanted controllers as industrial waste.

Chapter 8 Accessories

8.1 Extension Keypad and Accessories

Optional LED keypad (HD-LED-P/HD-LED-P-S) can be installed on panel of control cabinet.

Extension cable

The extension cables are:

- 1m extension cable to keypad: HD-CAB-1M
- 2m extension cable to keypad: HD-CAB-2M
- 3m extension cable to keypad: HD-CAB-3M
- 4m extension cable to keypad: HD-CAB-6M

Install HD-LED-P

Keypad HD-LED-P is configured with mounting base (HD-KMB). Install the base on panel of control cabinet, then install HD-LED-P to the base.

Mounting base (HD-KMB) and its size are in Figure 8-1, unit: mm.

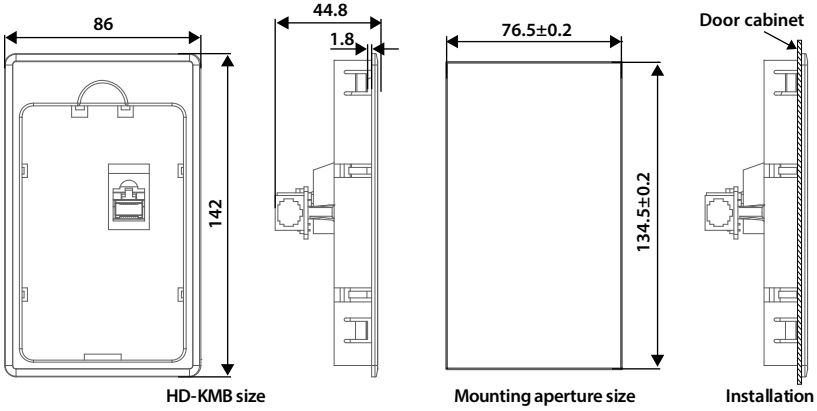


Figure 8-1 HD-KMB

8

Install HD-LED-P-S

Install HD-LED-P-S with screws or with mounting base.

When packing HD-LED-P-S, mounting base, keypad, 2 pcs of M3 × 5 size screws, 1 pcs of 1m extension cable.

To install with the screw

Install keypad on panel of control cabinet with the screws.

Size of HD-LED-P-S is show in Figure 8-2, unit: mm.

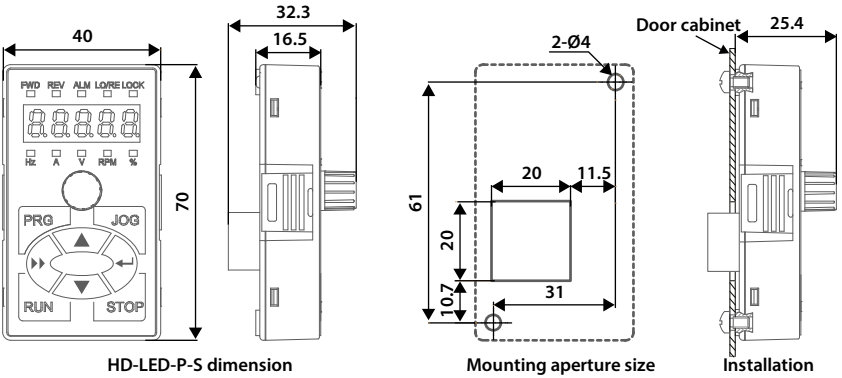


Figure 8-2 HD-LED-P-S

To install with the mounting base

Install the mounting base (HD-KMB-S) on panel of control cabinet, then install keypad on the base.

Mounting base (HD-KMB-S) and its size are in Figure 8-3, unit: mm.

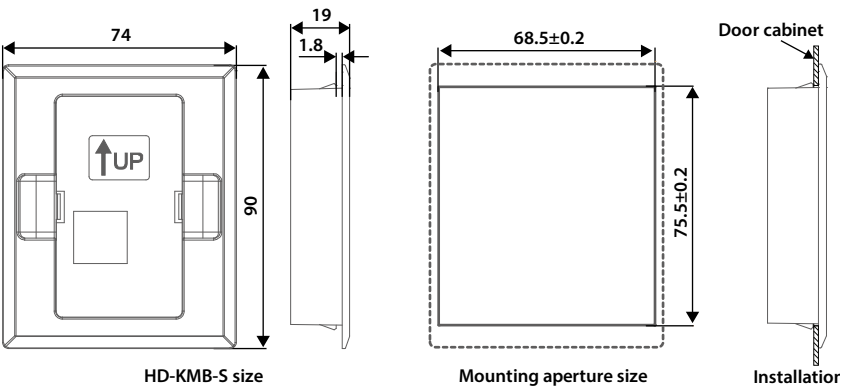


Figure 8-3 HD-KMB-S

8.2 Braking Unit and Braking Resistor

The braking unit and braking resistor selection is shown as Table 8-1. For wiring, see section 4.3.2 Supply and Motor Connection, on page 21.

Table 8-1 Braking unit and braking resistor selection

Model	Motor (kW)	Braking unit	Recommend value (Ω)			
			Lifting type		None lifting type	
			Min. resistor	Min. power	Resistor	Min. power
HD3N-4T7P5G	7.5 kW	In-built	45 Ω	2.4 kW	60 - 80 Ω	800 W
HD3N-4T011G	11 kW	In-built	40 Ω	3.6 kW	40 - 50 Ω	1.2 kW
HD3N-4T015G	15 kW	In-built	25 Ω	4.5 kW	30 - 40 Ω	1.5 kW
HD3N-4T018G	18.5 kW	In-built	20 Ω	6 kW	25 - 30 Ω	2 kW
HD3N-4T022G	22 kW	In-built	18 Ω	7.5 kW	20 - 25 Ω	2.5 kW
HD3N-4T030G	30 kW	In-built	15 Ω	9 kW	15 - 20 Ω	3 kW
HD3N-4T037G	37 kW	Optional	12 Ω	12 kW	15 - 20 Ω	4 kW
HD3N-4T045G	45 kW	Optional	10 Ω	13.5 kW	10 - 15 Ω	4.5 kW
HD3N-4T055G	55 kW	Optional	9 Ω	16.5 Kw	10 - 15 Ω	5.5 kW
HD3N-4T075G	75 kW	Optional	6 Ω	22.5 kW	8 - 10 Ω	7.5 kW
HD3N-4T090G	90 kW	HDBU-4T150	6 Ω	27 kW	8 - 10 Ω	9 kW
HD3N-4T110G	110 kW	HDBU-4T150	6 Ω	33 kW	6 - 8 Ω	11 kW
HD3N-4T132G	132 kW	HDBU-4T250	4 Ω	40 kW	6 - 8 Ω	13.2 kW
HD3N-4T160G	160 kW	HDBU-4T250	4 Ω	48 kW	4 - 6 Ω	16 kW
HD3N-4T200G HD3N-4T200G-C	200 kW	HDBU-4T250	4 Ω	60 kW	4 - 6 Ω	20 kW
HD3N-4T220G HD3N-4T220G-C	220 kW	HDBU-4T250*2	4 Ω*2	33 kW *2	6 - 8 Ω*2	11 kW *2
HD3N-4T250G HD3N-4T250G-C	250 kW	HDBU-4T250*2	4 Ω*2	37.5 kW *2	6 - 8 Ω*2	12.5 kW *2
HD3N-4T280G HD3N-4T280G-C	280 kW	HDBU-4T250*2	4 Ω*2	42 kW *2	4 - 6 Ω*2	14 kW *2
HD3N-4T315G HD3N-4T315G-C	315 kW	HDBU-4T250*2	4 Ω*2	48 kW *2	4 - 6 Ω*2	16 kW *2
HD3N-4T355G HD3N-4T355G-C	355 kW	HDBU-4T250*3	4 Ω*3	33 kW *3	4 - 6 Ω*3	11 kW *3
HD3N-4T400G HD3N-4T400G-C	400 kW	HDBU-4T250*3	4 Ω*3	42 kW *3	4 - 6 Ω*3	14 kW *3
*Remarks: *2, *3 means 2, 3 parallel ways.*						

Note:

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

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

8.3 Reactor Selection

The reactor selections is shown as Table 8-2。

Table 8-2 Reactor selection

Model	AC input reactor		AC output reactor		DC reactor	
	Model	Parameter (mH-A)	Model	Parameter (mH-A)	Model	Parameter (mH-A)
HD3N-4T037G	HD-AIL-4T037	0.19/75	HD-AOL-4T037	0.08/80	-	-
HD3N-4T045G	HD-AIL-4T045	0.16/90	HD-AOL-4T045	0.06/100		
HD3N-4T055G	HD-AIL-4T055	0.13/115	HD-AOL-4T055	0.04/125		
HD3N-4T075G	HD-AIL-4T075	0.093/150	HD-AOL-4T075	0.035/160		
HD3N-4T090G	HD-AIL-4T090	0.08/180	HD-AOL-4T090	0.03/200	HD-DCL-4T090	0.14/240
HD3N-4T110G	HD-AIL-4T110	0.067/210	HD-AOL-4T110	0.02/225	HD-DCL-4T110	0.12/290
HD3N-4T132G	HD-AIL-4T132	0.055/255	HD-AOL-4T132	0.016/280	HD-DCL-4T132	0.11/330
HD3N-4T160G	HD-AIL-4T160	0.046/305	HD-AOL-4T160	0.013/320	HD-DCL-4T160	0.09/400
HD3N-4T200G HD3N-4T200G-C	HD-AIL-4T200	0.037/380	HD-AOL-4T200	0.011/400	HD-DCL-4T200	0.07/500
HD3N-4T220G HD3N-4T220G-C	HD-AIL-4T220	0.034/415	HD-AOL-4T220	0.01/450	HD-DCL-4T220	0.06/550
HD3N-4T250G HD3N-4T250G-C	HD-AIL-4T250	0.026/530	HD-AOL-4T250	0.009/560	HD-DCL-4T250	0.05/700
HD3N-4T280G HD3N-4T280G-C	HD-AIL-4T280		HD-AOL-4T280		HD-DCL-4T280	
HD3N-4T315G HD3N-4T315G-C	HD-AIL-4T315	0.023/600	HD-AOL-4T315	0.007/630	In-built	-
HD3N-4T355G HD3N-4T355G-C	HD-AIL-4T355	0.019/760	HD-AOL-4T355	0.006/800	In-built	-
HD3N-4T400G HD3N-4T400G-C	HD-AIL-4T400		HD-AOL-4T400		In-built	-

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 controller is in run status.

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

"—": It denotes that the parameters have same mapping.

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00: Status Display Parameter (on pages 46 - 49)						
d00.00	HD3N series	0x10 - 0x50			*	
d00.01	Software version of HD3N	00.00 - 99.99			*	
d00.03	Non-standard software version of HD3N	00.00 - 99.99			*	
d00.05	Software version of keypad	00.00 - 99.99 *Valid only when LED adopted*			*	
d00.06	Customized serial number	0 - 9999			*	
d00.07	Motor and control mode	Unit: Unused Ten: Control mode 0: V/f control without PG 2: Vector control without PG			*	
d00.08	Rated current of HD3N (A)	0.1A			*	
d00.10	Inverter status	Bit0: Inverter fault Bit1: Run/Stop Bit2: Forward/Reverse Bit3: Zero speed Bit5&Bit4: Acc. / Dec./Constant Bit7: DC brake Bit8: Auto-tuning Bit10: Speed limitation Bit11: Control mode Bit12: Stall overvoltage Bit13: Software current restriction Bit14: Hardware current restriction			*	
d00.11	Main setting frequency channel	0 - 14			*	
d00.12	Main setting frequency (Hz)	0.01 - 400.00Hz			*	
d00.13	Aux setting frequency (Hz)	0.01 - 400.00Hz			*	
d00.14	Setting frequency (Hz)	0.01 - 400.00Hz			*	
d00.15	Setting frequency (after Ac/Dec) (Hz)	0.01 - 400.00Hz			*	
d00.16	Output frequency (Hz)	0.01 - 400.00Hz			*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00.17	Setting rpm (rpm)	0 - 60000rpm			*	
d00.18	Runnig rpm (rpm)	0 - 60000rpm			*	
d00.19	Input voltage (V)	0 - 999V			*	
d00.20	Output voltage (V)	0 - 999V			*	
d00.21	Output current (A)	Actual value, unit: 0.1A			*	
d00.22	Torque setting (%)	-250.0 - 250.0% (rated torque of motor)			*	
d00.23	Output torque (%)	0.0 - 300.0% (rated torque of motor)			*	
d00.24	Output power (kW)	Actual value, unit: 0.1kW			*	
d00.25	DC busbar voltage (V)	0 - 999V			*	
d00.26	Input voltage of potentionmeter (%)	0.0 - 100.0% *Valid when LED keypad adopted*			*	
d00.27	AI1 input (%)	0.0 - 100.0%			*	
d00.28	AI1 input (after calculating) (%)	0.0 - 100.0%			*	
d00.29	AI2 input (%)	0.0 - 100.0%			*	
d00.30	AI2 input (after calculating) (%)	0.0 - 100.0%			*	
d00.35	DI6 terminal pulse input frequency (Hz)	0 - 10000Hz			*	
d00.36	AO1 output (%)	0.0 - 100.0%			*	
d00.37	AO2 output (%)	0.0 - 100.0%			*	
d00.38	High speed output pulse frequency (Hz)	0 - 10000Hz			*	
d00.40	Setting line speed	0 - max output line speed			*	
d00.41	Reference line speed	0 - max output line speed			*	
d00.44	PID setting (%)	-100.0 - 100.0%			*	
d00.45	PID feedback (%)	-100.0 - 100.0%			*	
d00.46	PID tolerance (%)	-100.0 - 100.0%			*	
d00.47	PID integral item (%)	-100.0 - 100.0%			*	
d00.48	PID output (%)	-100.0 - 100.0%			*	
d00.49	External count value	0 - 9999			*	
d00.50	Input terminal status	Bit0 - Bit8 correspond to DI1 - DI6 0: Input terminals disconnect with common terminals 1: Input terminals connect with common terminals			*	
d00.51	Output terminal status	Bit0 - Bit1 correspond to DO1 - DO2 Bit2 correspond to RLY1 0: Output terminals disconnect with common terminals 1: Output terminals connect with common terminals			*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00.52	MODBUS communication status	0: Normal 1: Communication timeout 2: Wrong data Frame head 4: Wrong data Frame content			*	
d00.53	Actual length (m)	0 - 65535m			*	
d00.54	Accumulative length (km)	0 - 65535km			*	
d00.55	Total power up time (h)	0 - 65535h			*	
d00.56	Total running time (h)	0 - 65535h			*	
d00.57	Total energy consumption high bit of motor (k kW.h)	0 - 65535k kW.h			*	
d00.58	Total energy consumption low bit of motor (k kW.h)	0.0 - 999.9kW.h			*	
d00.59	Present energy consumption high bit (k kW.h)	0 - 65535k kW.h			*	
d00.60	Present energy consumption low bit (k kW.h)	0.0 - 999.9kW.h			*	
d00.61	Present fault	0 - 100 *100: Under-voltage*			*	
F00: Basic Parameters (on pages 49 - 53)						
F00.00	Motor control mode	0: Speed control 1: Torque control	0	1	×	
F00.01	Motor control mode	0: V/f control without PG 2: Vector control without PG	0	1	×	
F00.06	Max. output frequency of HD3N	50.00 - 400.00Hz	50.00Hz	0.01Hz	×	
F00.07	Upper limit of running frequency setting channel	0: Digital setting (F00.08) 1: Analogue input setting 2: Terminal pulse setting 3 - 4: AI1 - AI2 7: Potentionmeter	0	1	×	
F00.08	Upper limit of running frequency	0.00 - F00.06	50.00Hz	0.01Hz	×	
F00.09	Lower limit of running frequency	0.00 - F00.08	0.00Hz	0.01Hz	×	
F00.10	Frequency setting channels	0: Keypad 1: Terminal 2: SCI communication 3: Analogue 4:DI6 pulse 6 - 7: AI1 - AI2 10: Potentionmeter (Valid when LED keypad adopted only)	0	1	○	

A

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F00.11	Command setting channel	0: Keypad 1: Terminal 2: SCI	0	1	×	
F00.12	M key function	0: Switch running direction 1: Switch local and remote control 2: M key invalid *Valid when LED keypad adopted only*	2	1	○	
F00.13	Starting frequency digital setting	0.00 - upper limit frequency	50.00Hz	0.01Hz	○	
F00.14	Frequency setting control	Unit: Save selection of frequency setting at power outage 0: Do not save at power outage 1: Save at power outage Ten: Control selection of frequency setting at stop 0: Set frequency is kept in stop 1: Restore to F00.13 at stop Hundred: Save selection of communication setting frequency 0: Do not save when power is off 1: Save to F00.13 when power is off Thousand: Save selection of frequency setting when switching frequency source 0: Do nto save 1: Save	1001	1	○	
F00.15	Jog running frequency digital setting 1	0.00 - upper limit frequency	5.00Hz	0.01Hz	○	
F00.16	Interval of jog running	0.0 - 100.0s	0.0s	0.1s	×	
F00.17	Running direction	0: The same as running command 1: Opposite to running command	0	1	×	
F00.18	Reverse	0: Permitted 1: Prohibitted	0	1	×	
F00.19	Dead time of direction switch	0.0 - 3600.0s	0.0s	0.1s	×	
F00.20	Enable key operation of keypad	0: Enable 1: Invalid *Valid when LED keypad adopted only*	0	1	○	
F00.21	Dormant function	0: Disabled 1: Enable	0	1	×	
F00.22	Dormancy wake up time	0.0 - 6000.0s	1.0s	0.1s	○	
F00.24	Dormancy delay time	0.0 - 6000.0s	1.0s	0.1s	○	
F00.25	Dormancy frequency	0.00Hz - F00.08	0.00Hz	0.01Hz	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F00.26	Action selection of HD3N at zero-speed	Unit: Action selection of zero-speed under V/f control 0: Do not process 1: HD3N does not output 2: HD3N runs at DC brake Ten: Action selection of zero-speed under open loop vector control Hundred: Action selection of zero-speed under torque control 0: Do not process 1: HD3N does nto output 2: HD3N runs at DC brake 3: HD3N runs at pre-excitation	111	1	×	
F00.27	Command source binding frequency source	Unit: keypad binds to frequency source Ten: Terminal binds to frequency source Hundred: SCI binds to frequency source 0: No binding 1: Keypad digital 2; Terminal digital 3: SCI 5: Terminal pulse 7-8: AI1-AI2 b: Potentionmeter C: PID d: Multi-speed	000	1	×	
F00.28	Function of STOP button	0: Valid in keypad control mode only 1: Valid in all control modes	0	1	○	
F01: Protection of Parameters (on pages 53 - 54)						
F01.00	User password	00000 - 65535	0	1	○	
F01.01	Menu mode	Units: 0: Full menu mode 1: Checking menu mode Ten: Unused Hundreds: 0: Group F can check after setting password 1: Group F can not check after setting password	000	1	○	

A

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F01.02	Function code parameter initialization (download)	0: No operation 1: Restore to factory settings 2/3: Download the keypad EEPROM parameter 1/2 to the current function code settings 4: Clear fault information 5/6: Copy the keypad EEPROM parameter 1/2 to the current function code settings (including the motor parameters) *2/3/5/6 is valid when LED keypad adopted*	0	1	×	
F01.03	Copy parameter to keypad (upload)	0: No operation 1/2: Copy the current function code settings to keypad EEPROM parameter 1/2 *1/2 is valid when LED keypad adopted*	0	1	○	
F02: Parameters for Start and Stop (on pages 54 - 57)						
F02.00	Start mode	0: Start from starting DWELL frequency 1: Brake and then start from starting DWELL frequency 2: Rotate speed tracking re-start	0	1	×	
F02.01	Start delay time	0.00 - 10.00s	0.00s	0.01s	×	
F02.02	Starting DWELL frequency setting	0.00 –F00.08	0.00Hz	0.01Hz	×	
F02.03	Starting DWELL retention time	0.00 - 10.00s	0.00s	0.01s	×	
F02.04	Current at DC brake	0 - 100% (rated current of HD3N)	50%	1%	×	
F02.05	DC brake starting time	0.00 - 60.00s	0.50s	0.01s	×	
F02.06	Compensation for full speed tracking	0.000 - 2.000Hz	0.000Hz	0.001Hz	○	
F02.13	Stop modes at speed control	0: Decelerate to stop 1: Coast to stop 2: Decelerate to stop+DC brake	0	1	×	
F02.14	Stop DWELL frequency setting	0.00 - upper limit frequency	0.00Hz	0.01Hz	×	
F02.15	Stop DWELL frequency retention time	0.00 - 10.00s	0.00s	0.01s	×	
F02.16	Starting frequency of stop DC brake	0.00 - 50.00Hz	0.50Hz	0.01Hz	×	
F02.17	Waiting time of stop DC brake	0.00 - 10.00s	0.00s	0.01s	×	
F02.18	Stop DC brake time	0.00 - 60.00s	0.50s	0.01s	×	
F02.19	Jog control mode	Units: 0: Can not jog the start and stop function	10	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		1: Can jog the start and stop function Tens: 0: Terminal jog is not preferred 1: Terminal jog is preferred				
F02.20	Pre-excitation time	0.00 - 0.50s	0.50s	0.01s	×	
F02.21	End selection of DWELL frequency in stop	0: Time (F02.15) 1: Terminals (88 function)	0	1	×	
F03: Acc. / Dec. Parameter (on pages 57 - 58)						
F03.00	Acc. / Dec. modes selection	Unit: Acc. / Dec. modes selection 0: Linear Acc. / Dec. 1: S curve Acc. / Dec. Ten: Reference frequency for Acc. / Dec. time 0: Max frequency (F00.06) 1: Setting frequency	00	1	○	
F03.01	Acc time 1	0.0 - 6000.0s	7.5 - 15kW inverter: 10.0s 18.5kW inverter: 30.0s	0.1s	○	
F03.02	Dec time 1	0.0 - 6000.0s		0.1s	○	
F03.03	Acc time 2	0.0 - 6000.0s		0.1s	○	
F03.04	Dec time 2	0.0 - 6000.0s		0.1s	○	
F03.05	Acc time 3	0.0 - 6000.0s		0.1s	○	
F03.06	Dec time 3	0.0 - 6000.0s		0.1s	○	
F03.07	Acc time 4	0.0 - 6000.0s		0.1s	○	
F03.08	Dec time 4	0.0 - 6000.0s		0.1s	○	
F03.09	Switching frequency of acc time 1 and 2	0.00 - upper limit frequency	0.00Hz	0.01Hz	×	
F03.10	Switching frequency of dec time 2 and 1	0.00 - upper limit frequency	0.00Hz	0.01Hz	×	
F03.11	Characteristic time of S curve at beginning of acc	0.00 - 2.50s	0.20s	0.01s	○	
F03.12	Characteristic time of S curve at end of acc	0.00 - 2.50s	0.20s	0.01s	○	
F03.13	haracteristic time of S curve at beginning of dec	0.00 - 2.50s	0.20s	0.01s	○	
F03.14	Characteristic time of S curve at end of dec	0.00 - 2.50s	0.20s	0.01s	○	
F03.15	Jog acc time	0.1 - 6000.0s	6.0s	0.1s	○	
F03.16	Jog dec time	0.1 - 6000.0s	6.0s	0.1s	○	
F03.17	Dec time for EMR stop	0.1 - 6000.0s	10.0s	0.1s	○	
F04: Process PID Control (on pages 58 - 61)						
F04.00	Process PID control selection	0: PID control is disabled 1: PID control is enabled	0	1	×	

A

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F04.01	Setting channel selection	0: Digital 1: Analogue 2: Terminal pulse 3 - 4: AI1 - AI2 7: Potentionmeter (LED keypad)	0	1	×	
F04.02	Feedback channel selection	0: Analogue 1: Terminal pulse 2: AI1 - AI2 6: Potentionmeter (LED keypad) 7: Speed closed-loop	0	1	×	
F04.03	Setting digital reference	-100.0 - 100.0%	0.0%	0.1%	○	
F04.04	Proportional gain (P1)	0.0 - 500.0	50.0	0.1	○	
F04.05	Integral time (I)	0.01 - 10.00s	1.00s	0.01s	○	
F04.06	Integral upper limit	0.0 - 100.0%	100.0%	0.1%	○	
F04.07	Differential time (D1)	0.00 - 10.00s *0.00s: F04.07 is invalid*	0.00s	0.01s	○	
F04.08	Differential upper limit	0.0 - 100.0%	20.0%	0.1%	○	
F04.09	Sampling time (T)	0.01 - 50.00s	0.10s	0.01s	○	
F04.10	Bias limit	0.0 - 20.0% (setting)	0.0%	0.1%	○	
F04.11	Upper limit channel of PID regulator	0: Set by F04.13 1: Analogue 2: Terminal pulse 3 - 4: AI1 - AI2 7: Potentionmeter (LED keypad)	0	1	×	
F04.12	Lower limit channel of PID regulator	0: Set by F04.14 1: Analogue 2: Terminal pulse 3 - 4: AI1 - AI2 7: Potentionmeter (LED keypad)	0	1	×	
F04.13	PID regulator upper limit	0.0 - 100.0%	100.0%	0.1%	×	
F04.14	PID regulator lower limit	0.0 - 100.0%	0.0%	0.1%	×	
F04.15	Regulating characteristic of PID regulator	0: Positive characteristic 1: Negative characteristic	0	1	×	
F04.17	PID output filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F04.18	REV selection when PID outputs	0: Prohibit REV when PID regulates 1: Permit REV	0	1	×	
F04.19	REV frequency upper limit of PID output	0.0 - 100.0%	100.0%	0.1%	×	
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	Differential time (D2)	0.00 - 10.00s	0.00s	0.01s	○	
F04.23	PID parameter adjustment bases	0: Do not adjust 1:DI 2: Bias	0	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		3: Frequency				
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	Rpm	1 - 9999	1024	1	×	
F04.28	Max. closed-loop speed	1 - 24000rpm	1500rpm	1rpm	×	
F04.29	PID calculating mode	0: Do not calculate when HD3N stops 1: Calculate when HD3N stops	0	1	×	
F04.30	PID dormancy selection	0: Disable 1: Enable	0	1	×	
F04.31	Wakeup tolerance	0.0 - 100.0%	10.0%	0.1%	○	
F04.32	Wakeup delay	0.0 - 6000.0s	0.0s	0.1s	○	
F04.33	Dormancy tplerance	0.0 - 100.0%	10.0%	0.1%	○	
F04.34	Dormancy delay	0.0 - 6000.0s	0.0s	0.1s	○	
F04.35	Dormancy frequency	0.00Hz - max. frequency	20.00Hz	0.01Hz	○	
F05: External Setting Curve Parameter (on pages 61 - 63)						
F05.00	External setting curve selection	Unit: AI1 curve Ten: AI2 curve Tens thousands: Pulse curve 0: Line 1 1: Line 2 2: Polyline 3: Do not dispose	33333	1	×	
F05.01	Line 1 min. setting	0.0% - F05.03	0.0%	0.1%	○	
F05.02	Corresponding value of line 1 min. setting	0.0 - 100.0%	0.0%	0.1%	○	
F05.03	Line 1 max. setting	F05.01 - 100.0%	100.0%	0.1%	○	
F05.04	Corresponding value of line 1 max. setting	0.0 - 100.0%	100.0%	0.1%	○	
F05.05	Line 2 min. setting	0.0% - F05.07	0.0%	0.1%	○	
F05.06	Corresponding value of line 2 min. setting	0.0 - 100.0%	0.0%	0.1%	○	
F05.07	Line 2 max. setting	F05.05 - 100.0%	100.0%	0.1%	○	
F05.08	Corresponding value of line 2 max. setting	0.0 - 100.0%	100.0%	0.1%	○	
F05.09	Max. setting of polyline	F05.11 - 100.0%	100.0%	0.1%	○	
F05.10	Max. setting corresponding value of polyline	0.0 - 100.0%	100.0%	0.1%	○	
F05.11	Inflection point 2 setting of polyline	F05.13 - F05.09	100.0%	0.1%	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F05.12	Inflection point 2 corresponding value	0.0 - 100.0%	100.0%	0.1%	○	
F05.13	Inflection point 1 setting of polyline	F05.15 - F05.11	0.0%	0.1%	○	
F05.14	Inflection point 1 corresponding value	0.0 - 100.0%	0.0%	0.1%	○	
F05.15	Min. setting of polyline	0.0% - F05.13	0.0%	0.1%	○	
F05.16	Min. setting corresponding value of polyline	0.0 - 100.0%	0.0%	0.1%	○	
F05.17	Skip frequency 1	F00.09 - upper limit frequency	0.00Hz	0.01Hz	○	
F05.18	Skip frequency 2	F00.09 - upper limit frequency	0.00Hz	0.01Hz	○	
F05.19	Skip frequency 3	F00.09 - upper limit frequency	0.00Hz	0.01Hz	○	
F05.20	Range of skip frequency	0.00 - 30.00Hz	0.00Hz	0.01Hz	○	
F05.21	Digital setting 2 of jog run frequency	0.00 - upper limit frequency	5.00Hz	0.01Hz	○	
F05.22	Curve selection for potentionmeter	0: Line 1 1: Line 2 2: Polyline 3: Do not dispose (LED keypad)	3	1	×	
F06: Multi-speed and Simple PLC (on pages 63 - 66)						
F06.00	Multi-frequency command 1	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.01	Multi-frequency command 2	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.02	Multi-frequency command 3	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.03	Multi-frequency command 4	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.04	Multi-frequency command 5	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.05	Multi-frequency command 6	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.06	Multi-frequency command 7	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.07	Multi-frequency command 8	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.08	Multi-frequency command 9	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.09	Multi-frequency command 10	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.10	Multi-frequency command 11	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.11	Multi-frequency command 12	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F06.12	Multi-frequency command 13	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.13	Multi-frequency command 14	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.14	Multi-frequency command 15	F00.09 - upper limit frequency	5.00Hz	0.01Hz	○	
F06.15	Simple PLC control selection	0: PLC is invalid 1: PLC is enabled	0	1	×	
F06.16	Simple PLC running mode selection	Unit: PLC running selection 0: Stop after single loop 1: Runs at final value after single loop 2: Continous loop Ten: restart mode after stop during PLC 0: Start from the first frequency 1: Start from the frequency when HD3N stops 2: Runs at the moment when signal loss Hundred: PLC state saving selection at power failure 0: Do not save 1: Save Thousand: PLC phase time unit 0: Second (s) 1: Minute (m)	0000	1	×	
F06.17	PLC phase 1 setting	Unit: PLC phase frequency selection 0: Multi frequency commmand 1: Set by F00.1 Ten: PLC phase direction selection 0: Forward 1: Reverse 2: Set by running command Hundred: PLC phase Acc. / Dec. time selection 0: Acc. / Dec. time 1 1: Acc. / Dec. time 2 2: Acc. / Dec. time 3 3: Acc. / Dec. time 4 4: Set by Acc. / Dec. speed	420	1	○	
F06.19	PLC phase 2 setting		420	1	○	
F06.21	PLC phase 3 setting		420	1	○	
F06.23	PLC phase 4 setting		420	1	○	
F06.25	PLC phase 5 setting		420	1	○	
F06.27	PLC phase 6 setting		420	1	○	
F06.29	PLC phase 7 setting		420	1	○	
F06.31	PLC phase 8 setting		420	1	○	
F06.33	PLC phase 9 setting		420	1	○	
F06.35	PLC phase 10 setting		420	1	○	
F06.37	PLC phase 11 setting		420	1	○	
F06.39	PLC phase 12 setting		420	1	○	
F06.41	PLC phase 13 setting		420	1	○	
F06.43	PLC phase 14 setting		420	1	○	
F06.45	PLC phase 15 setting		420	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F06.18	Phase 1 running time	0.0 - 3276.7	5.0	0.1	○	
F06.20	Phase 2 running time	0.0 - 3276.7	0.0	0.1	○	
F06.22	Phase 3 running time	0.0 - 3276.7	0.0	0.1	○	
F06.24	Phase 4 running time	0.0 - 3276.7	0.0	0.1	○	
F06.26	Phase 5 running time	0.0 - 3276.7	0.0	0.1	○	
F06.28	Phase 6 running time	0.0 - 3276.7	0.0	0.1	○	
F06.30	Phase 7 running time	0.0 - 3276.7	0.0	0.1	○	
F06.32	Phase 8 running time	0.0 - 3276.7	0.0	0.1	○	
F06.34	Phase 9 running time	0.0 - 3276.7	0.0	0.1	○	
F06.36	Phase 10 running time	0.0 - 3276.7	0.0	0.1	○	
F06.38	Phase 12 running time	0.0 - 3276.7	0.0	0.1	○	
F06.40	Phase 12 running time	0.0 - 3276.7	0.0	0.1	○	
F06.42	Phase 13 running time	0.0 - 3276.7	0.0	0.1	○	
F06.44	Phase 14 running time	0.0 - 3276.7	0.0	0.1	○	
F06.46	Phase 15 running time	0.0 - 3276.7	0.0	0.1	○	
F07: Wobble Function Parameter (on pages66 - 67)						
F07.00	Wobble function selection	0: Disable 1: Enable	0	1	×	
F07.01	Wobble running mode	Unit: Entry way 0: Auto entry (refer to F07.03) 1: Manually terminal entry way Ten: Wobble control (refer to 07.04) 0: Relate to wobble centric frequency 1: Relate to max. Output frequency Hundred: Start when HD3N stops during wobbling 0: Start according to memory before it stops 1: Restart Ten thousand: Save selection at power failure 0: Save wobble state at power failure 1: Do not wobble state at power failure	0000	1	×	
F07.02	Wobble preset frequency	0.00 - upper limit frequency	0.00Hz	0.01Hz	×	
F07.03	Waiting time for wobble preset frequency	0.0 - 999.9s	0.0s	0.1s	×	
F07.04	Wobble value	0.0 - 50.0%	0.0%	0.1%	×	
F07.05	Skip frequency	0.0% - F07.04	0.0%	0.1%	×	
F07.06	Wobble period	0.1 - 999.9s	10.0s	0.1s	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F07.07	Triangular wave rising time	0.0 - 100.0% (F07.06)	50.0%	0.1%	×	
F08: Asyn. Motor Parameters (on pages 67 - 69)						
F08.00	Rated power of motor	0.2 - 500.0kW	Depend on HD3N	0.1kW	×	
F08.01	Rated voltage of motor	0 - 999V		1V	×	
F08.02	Rated current of motor	0.1 - 999.9A		0.01A	×	
F08.03	Rated frequency of motor	1.0 - 400.0Hz	50.0Hz	0.1Hz	×	
F08.04	Rated Rpm of motor	1 - 24000rpm	Depend on HD3N	1rpm	×	
F08.06	Parameter auto-tuning of motor	0: No action 1: Stationary auto-tuning 2: Rotary auto-tuning 3: Motor stator resistance measurement	0	1	×	
F08.07	Stator resistance of motor	0.000 - 9.999Ω	Depend on HD3N	0.001Ω	×	
F08.08	Rotor resistance of a motor	0.000 - 9.999Ω		0.001Ω	×	
F08.09	Leakage inductance of motor	0.00 - 500.00mH		0.01mH	×	
F08.10	Mutual inductance of motor	0.00 - 500.00mH		0.01mH	×	
F08.11	Excitation current of motor	0.0 - 999.9A		0.01A	×	
F08.12	Core saturation coefficient 1 of motor	0.00 - 1.00	1.00	0.01	×	
F08.13	Core saturation coefficient 2 of motor	0.00 - 1.00	1.00	0.01	×	
F08.14	Core saturation coefficient 3 of motor	0.00 - 1.00	1.00	0.01	×	
F08.15	Core saturation coefficient 4 of motor	0.00 - 1.00	1.00	0.01	×	
F08.16	Core saturation coefficient 5 of motor	0.00 - 1.00	1.00	0.01	×	
F09: V/f Control Parameters (on pages 69 - 71)						
F09.00	V/f curve of motor	0: Line. Sea line 0 in figure 1: Square curve 2: 1.2 exponential curve 3: 1.7 exponential curve 4: User-defined curve	0	1	×	
F09.01	V/f frequency of motor (F3)	F09.03 - 100.0%	0.0%	0.1%	×	
F09.02	V/f voltage of motor (V3)	F09.04 - 100.0%	0.0%	0.1%	×	
F09.03	V/f frequency of motor (F2)	F09.05 - F09.01	0.0%	0.1%	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F09.04	V/f voltage of motor (V2)	F09.06 - F09.02	0.0%	0.1%	×	
F09.05	V/f frequency of motor (F1)	0.0% - F09.03	0.0%	0.1%	×	
F09.06	V/f voltage of motor (V1)	0.0% - F09.04	0.0%	0.1%	×	
F09.07	Torque boost of motor	0.0 - 30.0% *0.0%: Auto torque boost*	2.0%	0.1%	×	
F09.08	Cut-off point used for manual torque boost of motor	0.0 - 50.0% (F08.03)	25.0%	0.1%	○	
F09.09	Slip compensation gain of motor	0.0 - 300.0%	0.0%	0.1%	○	
F09.10	Slip compensation filter time of motor	0.01 - 10.00s	0.10s	0.01s	○	
F09.11	Slip compensation limit of motor	0.0 - 250.0%	200.0%	0.1%	×	
F09.12	Motor iron loss	0.000 - 9.999kW	Depend on HD3N	0.001kW	×	
F09.14	AVR (automatic voltage regulation) function of motor	0: Disabled 1: Enabled all the time 2: Disabled in Dec process	1	1	○	
F09.15	Low frequency oscillation-suppression of motor	0 - 200	50	1	○	
F09.16	High frequency oscillation-suppression of motor	0 - 200	20	1	○	
F09.17	Energy saving control selection	0: Invalid 3: Enabled according to output current	0	1	×	
F09.18	Motor energy saving coefficient	0.0 - 100.0%	5.0%	0.1%	○	
F09.19	Starting frequency of motor energy saving	0.00 - 50.00Hz	25.00Hz	0.01Hz	○	
F09.20	Switching point of motor energy saving	0.0 - 100.0%	100.0%	0.1%	○	
F09.21	Detection times of motor energy saving	0 – 5000times	10times	1times	○	
F09.22	Voltage recovery time of motor energy saving	40 - 4000ms	100ms	1ms	○	
F09.23	Voltage decrease time of motor energy saving	40 - 4000ms	100ms	1ms	○	
F10: Motor Vector Control Speed-loop Parameters (on pages 71 - 72)						
F10.00	Proportional gain 1 of motor speed control	0.1 - 200.0	10.0	0.1	○	
F10.01	Integral time 1 of motor speed control	0.00 - 10.00s	0.10s	0.01s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F10.02	Proportional gain 2 of motor speed control	0.1 - 200.0	10.0	0.1	○	
F10.03	Integral time 2 of motor speed control	0.00 - 10.00s	0.20s	0.01s	○	
F10.04	Switching frequency 1 of motor speed loop	0.00Hz - F10.05	10.00Hz	0.01Hz	○	
F10.05	Switching frequency 2 of motor speed loop	F10.04 - 50.00Hz	15.00Hz	0.01Hz	○	
F10.06	ASR integral limit	0.0 - 200.0% (F08.02)	180.0%	0.1%	○	
F10.07	Motor speed loop differential time	0.00 - 1.00s *0.00s: There is no speed-loop differential*	0.00s	0.01s	○	
F10.08	Motor speed loop otuput filter time	0.000 - 1.000s *0.000s : The speed-loop filter is unused*	0.000s	0.001s	○	
F10.09	Locking selection for motor torque limit	0: Do not lock 1: All of the torque limit is same with FWD electric torque limit	0	1	×	
F10.10	Setting channel of motor torque	Unit: Electric torque limit channel when motor is FWD Ten: Electric torque limit channel when motor is REV Hundred: Braking torque limit channel when motor is FWD Thousand: Braking torque limit channel when motor is REV 0: Limit by digital setting 1: Limit by analogue input 2: Limit by terminal pulse 3: Limit by AI1 4: Limit by AI2 7: Potentionmeter (LED keypad)	0000	1	×	
F10.11	Electric torque limit when motor is FWD	0.0 - 200.0% (F08.02)	180.0%	0.1%	○	
F10.12	Electric torque limit when motor is REV	0.0 - 200.0% (F08.02)	180.0%	0.1%	○	
F10.13	Braking torque limit when motor is FWD	0.0 - 200.0% (F08.02)	180.0%	0.1%	○	
F10.14	Braking torque limit when motor is REV	0.0 - 200.0% (F08.02)	180.0%	0.1%	○	
F11: Motor Vector Control Current-loop Parameters (on pages 72 - 73)						
F11.00	Current-loop KP of motor	1 - 2000	800	1	○	
F11.01	Current-loop KI of motor	1 - 1000	200	1	○	
F11.02	Current-loop output filter times	0 - 31	3	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F11.03	Enable feedforward of motor current-loop	0: Forbid feedforward 1: Enable feedforward	0	1	×	
F11.04	Motor excitation boost setting	0.0 - 30.0%	0.0%	0.1%	×	
F11.05	To optimize motor magnatic field orientation	Unit: Orientation adjustment 0: Prohibit 1: Enable Ten: Mutual inductance calculation 0: Prohibit 1: Enable	00	1	×	
F15: Digital I/O Terminal Parameters (on pages 73 -83)						
F15.00	DI1 function	0: Unused 1: Inverter enabled 2,3: FWD / REV 4: Three-wire running mode. 5 - 7,87: Frequency setting source selection 1 - 4 8: Switch to analogue 9,10: Running command switching 1, 2 11: Command switch to terminal 12: External command for stop 13 - 16: Multi-speed frequency terminal 1 - 4 17: Increase(UP) frequency. 18: Decrease(DN) frequency 19: Clear aux setting frequency to 0 20,21: FWD/REV jog 1 command input (JOGF1 / JOGR1) 22,23: FWD/REV jog 2 command input (JOGF2 / JOGR2) 24: Jog 1 command input 25: Jog 1 direction input *Note: when No. 20 and 21 are selected, No. 24 and 25 are invalid.* 26,27: Acc. / Dec. time terminal 1 and 2 28: Acc/dec mode selection 29: Forbid Acc. / Dec. 30: Switch to normal run 31: Reset infor PLC stop state reset 32: Pause process PID 33: Forbid process PID 34: PID integral holding 35: Clear PID integral 36: Wobble mode	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	37: Reset wobble state 38: Stop DC brake input 39: External stop NO contact input 40: External stop NC contact input 41,42: Coast to stop NO/NC input 43: Emergency stop 44,45: NO/NC input for external fault 46: External reset (RST) input 48: Timing input 49: Input for clearing actual length 50: Signal input to clear counter 51: Triggering signal input of counter 52: Length counting input (DI6 only) 53: Pulse frequency input (DI6 only) 54: Switch main/aux frequency source 56: Switch speed control and torque control 57: Polarity switching of torque control 59: Switch PID parameter 85: Simple PLC pause command. 86: Activate terminal DC brake input 87: Frequency setting channel = 4 88: DWELL end enable in stop	0	1	×	
F15.05	DI6 function		0	1	×	
F15.12	UP/DN Acc. / Dec. rate	0.00 - 99.99Hz/s	1.00Hz/s	0.01Hz/s	×	
F15.13	Interval between terminal detection	0: 2ms 1: 4ms 2: 8ms	0	1	○	
F15.14	Terminal detection filter times	0 - 10000	2	1	○	
F15.15	Terminal input logic setting	Bit0 - Bit8 correspond to DI1 - DI6 Bitx: Dly onput pos/neg logic 0: Positive logic 1: Negative logic	00	1	○	
F15.16	FWD / REV running mode	0: Two-wire running mode 1 1: Two-wire running mode 2 2: Three-wire running mode 1 3: Three-wire running mode 2	0	1	×	
F15.17	Action selection when extrenal device has fault	Protection action when external device has fault 0: Coast to stop 1: Emergency stop 2: Decelerate to stop 3: Continue to run	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.18	DO1 function	0: Unused 1: Inverter is ready 2: Inverter running 3: Forward running 4: Reverse running 5: DC brake 6: Zero-frequency status 7: Zero-frequency running 9,10: Frequency level detection signal (FDT1,FDT2) 11: Frequency within FAR range (FAR) 12: Frequency upper limit 13: Frequency lower limit 14: Upper/Lower limit of wobble 15: Running in simple PLC mode 16: Pause simple PLC running 17: Simple PLC loop done 18: Simple PLC phase running is finished 19: Simple PLC running is finished 20: Signal output from SCI 21: Set fully met running time 22: Timing function 23: Set fully counting value 24: Specific fully counting value 2525: Set length 2727: Analogue input exceeding limit 29:Stop in under-voltage condition 30: Overload detection signal 31: Inverter fault 32: External fault 33: Fault of inverter is reset automatically 35: Dormancy function 36: System is running 38: High speed pulse output (DO2 only)	2	1	○	
F15.19	DO2 function		0	1	○	
F15.20	RLY1 relay function		31	1	○	
F15.24	Terminal output logic setting	Bit0 - Bit1 corresponds to DO1 - DO2 Bit2 = RLY1 0: Positive logic 1: Negative logic	0	1	○	
F15.25	Delay time at ON side for timing	0.00 - 300.00s	0.00s	0.01s	○	
F15.26	Delay time at OFF side for timing	0.00 - 300.00s	0.00s	0.01s	○	
F15.27	Speed within FAR range	0.00 - 100.00Hz	2.50Hz	0.01Hz	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.28	Zero speed threshold	0.00 - upper limit frequency	0.00Hz	0.01Hz	○	
F15.29	Zero speed tolerance	0.00 - upper limit frequency	0.00Hz	0.01Hz	○	
F15.30	FDT1 detection mode	0: Detect according to setting frequency 1: Detect according to output frequency	0	1	○	
F15.31	FDT1 level	0.00 - upper limit frequency	5.00Hz	0.01Hz	○	
F15.32	FDT1 delay	0.00 - upper limit frequency	0.00Hz	0.01Hz	○	
F15.33	FDT2detection mode	0: Detect according to setting frequency 1: Detect according to output frequency	0	1	○	
F15.34	FDT2 level	0.00 - upper limit frequency	5.00Hz	0.01Hz	○	
F15.35	FDT2delay	0.00 - upper limit frequency	0.00Hz	0.01Hz	○	
F15.36	Set running times	0 - 65535h *0h: F15.36 is invalid*	0h	1h	○	
F15.37	Set fully counting value	F15.38 - 9999	0	1	○	
F15.38	Specific fully counting value	0 - F15.37	0	1	○	
F15.39	Action selection when analogue input exceeding limit	Unit: Action of HD3N when input exceeding limit 0: Coast to stop 1: Emergency stop 2: Decelerate to stop 3: No action Ten: Select analogue input terminal 0: No analogue terminal 1: Potentionmeter on keypad 2: AI1 3: AI2 Hundred: Condition for detecting analogue exceeding limit 0: Detect all the time 1: Detect according to command Thousand: Running selection after exceeding 0: Do not permit auto running 1: Permit auto running Ten thousand: Action at analogue exceeding limit 0: Do not report external fault (E0024)	00000	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		1: Report external fault (E0024), can not auto reset. 2: Report external fault (E0024), can auto reset				
F15.40	Upper limit of exceeded analogue input	F15.41 - 100.0%	100.0%	0.1%	○	
F15.41	Lower limit of exceeded analogue input	0.0% - F15.40	0.0%	0.1%	○	
F15.42	Detection time for exceeded analogue	0.00 - 50.00s	5.00s	0.01s	○	
F15.43	Terminal output delay	0.0 - 100.0s	0.0s	0.1s	○	
F15.44	Detection time for exceeded analogue at start	0.00 - 50.00s	15.00s	0.01s	○	
F16: Analogue I/O Terminal Parameters (on pages 83 - 86)						
F16.00	Keypad with potentiometer function	0: Used 1: Upper frequency setting 2: Frequency setting 3: Aux frequency setting 4: Process PID setting 5: Process PID feedback 6: Process PID regulating upper limit 7: Process PID regulating lower limit 9: Electric torque limit when motor is forward 10: Electric torque limit when motor is reverse 11: Re-generative torque when motor is forward 12:Re-generative torque when motor is reverse 13: Torque command setting 15: Upper limit frequency in torque control	0	1	×	
F16.01	AI1 function		2	1	×	
F16.02	AI2 function		5	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%	○	
F16.06	AI1 gain	0.00 - 10.00	1.00	0.01	○	
F16.09	AI2 gain	0.00 - 10.00	1.00	0.01	○	
F16.07	AI1 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.10	AI2 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.17	Max. input pulse frequency	0 - 10000Hz	10000Hz	1Hz	○	
F16.18	Input pulse filter time	0.01 - 10.00s	0.20s	0.01s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F16.19	AO1 function	0: Unused 1,2: Output frequency / setting frequency (0 - max. output frequency) 3: Motor RPM (0 - max. output frequency corresponding to RPM) 4: Output current (0 - twice rated current of HD3N) 5: Output current (0 - twice rated current of motor) 6: Torque command (0 - 3 times rated torque of motor) 10: Output torque (0 - 3 times rated torque of motor) 11: Output torque (0 – 1.2 times rated voltage of HD3N) 12: Bus voltage (0 - 2.2 times rated voltage of HD3N) 13: Output power (0 - twice rated power of motor) 14: AI1 input (0 – max. AI1 after calculating) 15: AI2 input (0 - max. AI2 after calculating) 18,19: Output frequency, setting frequency (-1 - 1 times max. output frequency) 20: Setting frequency (0 - max. Output frequency) 21: SCI data output (communication data 0 - 1000 corresponding to AO output 0.00 - 10.00V)	2	1	○	
F16.20	AO2 function		0	1	○	
F16.21	High-speed pulse output function		0	1	○	
F16.22	AO1 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.23	AO1 gain	0.0 - 200.0%	100.0%	0.1%	○	
F16.24	AO2 bias	-100.0 - 100.0%	0.0%	0.1%	○	
F16.25	AO2 gain	0.0 - 200.0%	100.0%	0.1%	○	
F16.26	DO2 max. output pulse frequency	0.1 - 10.0kHz	10.0kHz	0.1kHz	○	
F16.27	Bias of potentionmeter	-100.0 - 100.0% (LED keypad)	0.0%	0.1%	○	
F16.28	Gain of potentionmeter	0.00 - 10.00 (LED keypad)	1.00	0.01	○	
F17: SCI Communication Parameter (on pages 86 - 87)						
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: 1-8-1 format, no parity, RTU	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F17.01	Baud rate	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	1ms	1ms	×	
F17.04	Detection time at communication timeout	0.0 - 600.0s *0.0s: Not detect communication timeout*	0.0s	0.1s	×	
F17.05	Detection time at communication error	0.0 - 600.0s *0.0s: Not detect the communication error*	0.0s	0.1s	×	
F17.06	Action selection at communication timeout	0: Coast to stop 1: Emergency stop 2: Decelerate to stop 3: Continue to run	3	1	×	
F17.07	Action selection at communication error		3	1	×	
F17.08	Action selection at communication peripheral device fault		1	1	×	
F17.09	EEPROM storage selection under communication read/write function parameter	Unit: parameters storage selection except F00.13 and F19.03 0: Do not store to EEPROM 1: Store to EEPROM Ten: F00.13 and F19.03 storage selection 0: Do not store to EEPROM 1: Store to EEPROM	01	1	×	
F17.10	Detection time of networking communication timeout	0.0 - 600.0s *0.0s: Not detect communication timeout*	0.0s	0.1s	×	
F18: Display Control Parameter (on pages 87 - 88)						
F18.02	Set parameter 1 of run status	0: Unuesd 1: Rated current of HD3N 3: Invertre status 4: Main setting frequency channel 5: Main setting frequency 6: Aux setting frequency 7: Setting frequency 8: Setting frequency (after Acc. / Dec.) 9: Output frequency	8	1	○	
F18.03	Set parameter 2 of run status		7	1	○	
F18.04	Set parameter 3 of run status		9	1	○	
F18.05	Set parameter 4 of run status		13	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F18.06	Set parameter 5 of run status	10 Setting Rpm 12: Input cable voltage 13: Output voltage 14: Output current 15: Torque setting 16: Output torque 17: Output power 18: DC busbar voltage 19: Input voltage of potentionmeter 20: AI1 input voltage 21: AI1 input voltage (after calculating) 22: AI2 input voltage 23: AI2 input voltage (after calculating) 28: DI6 terminal pulse input frequency 29: AO1 output 30: AO2 output 31: High speed output pulse frequency 32: Heatsink temperature 33: Setting line speed 34: Reference line speed 37: Process PID setting 38: Process PID feedback 39: Process PID deviation 40: Process PID integral value 41: Process PID output 42: External counting value 43: Input terminal status 44: Output terminal status 45: MODBUS status 46: Actual length 47: Accumulative length 48: Total time at power on (hour) 49: Total running time (hour)	14	1	○	
F18.07	Set parameter 6 of run status		18	1	○	
F18.08	Set parameter 1 of stop status		7	1	○	
F18.09	Set parameter 2 of stop status		18	1	○	
F18.10	Set parameter 3 of stop status		20	1	○	
F18.11	Set parameter 4 of stop status		22	1	○	
F18.12	Set parameter 5 of stop status		43	1	○	
F18.13	Set parameter 6 of stop status		44	1	○	
F18.14	Frequency display gain	0.1 - 160.0	1.0	0.1	○	
F18.15	Max. line speed	0 - 65535	1000	1	○	
F18.16	Display accuracy of line speed	0: Round number 1: One decimal 2: Two decimals 3: Three decimals	0	1	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19: Function-boost Parameters (on pages 88 - 95)						
F19.00	Aux frequency setting source selection	0: No aux channel 1: Keypad 2: Terminal 3: SCI 4: Analogue 5: Terminal puse 6: PID output 7: AI1 8: AI2 11: Potentionmeter (LED keypad)	0	1	○	
F19.01	Main/Aux setting calculating	Unit: Main/Aux calculating 0: Main+Aux setting 1: Main-Aux setting Ten: Frequency source selection 0: Main 1: Main/Aux calculating 2: Main/Aux switching 3: Main and Main/Aux calculating switching 4: Aux and Main/Aux calculating switching	10	1	○	
F19.02	Aux setting coefficient	0.00 - 9.99	1.00	0.01	○	
F19.03	Initial value of digital aux frequency	0.00 - F00.06	0.00Hz	0.01Hz	○	
F19.04	Digital aux frequency control	Unit: Storage selection at power failure 0: Do not save aux frequency 1: Save aux frequency Ten: Frequency at stop 0: Maintain aux frequency at stop 1: Aux frequency resumes to F19.03 at stop	00	1	○	
F19.05	Setting frequency adjustment selection	0: Do not adjust 1: Adjust according to max. output frequency (F00.06) 2: Adjust according to current frequency	1	1	○	
F19.06	Setting frequency adjustment coefficient	0.0 - 200.0%	100.0%	0.1%	○	
F19.07	Fan control	0: Auto stop 1: Immediate stop 2: Runs all the time when power on	0	1	○	
F19.08	Fan control delay time	0.0 - 600.0s	60.0s	0.1s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19.10	Zero frequency threshold	0.00 - upper limit frequency	1.00 Hz	0.01Hz	○	
F19.11	Action selection when setting frequency<zero frequency threshold	0: Runs according to frequency command 1: Remains stop and does not output 2: Runs according to zero frequency 3: Runs at 0Hz	0	1	×	
F19.12	Non-stop at instantaneous power loss	0: Forbid non-stop at instantaneous power loss 1: Enable non-stop at instantaneous power loss	0	1	×	
F19.13	Voltage compensation gain for non-stop running	0.010 - 1.000	0.500	0.001	○	
F19.15	Voltage for action judgement at instantaneous power loss	400 - 670V	430V	1V	×	
F19.16	Restart after power failure	0: Disabled 1: Enabled	0	1	×	
F19.17	Waiting time for restart after power failure	0.00 - 10.00s	2.00s	0.01s	○	
F19.18	Overvoltage suppression gain	0.000 - 1.000 *0.000: Forbit*	0.500	0.001	○	
F19.19	Stall overvoltage point	650 - 790V	690V	1V	○	
F19.20	Auto current limit gain	0.000 - 1.000	0.500	0.001	○	
F19.21	Auto current limit threshold	20.0 - 200.0%	150.0%	0.1%	○	
F19.23	Terminal running command detection	Unit: terminal selection when powered on Ten: terminal selection after powered on 0: Edge is valid 1: Level is valid	00	1	○	
F19.24	Action voltage of braking unit	630 - 750V	680V	1V	○	
F19.25	Flux braking	0: Disabled 1: Enable	0	1	○	
F19.26	Setting length	0 - 65535m	0m	1m	○	
F19.27	Actual length	0 - 65535m	0m	1m	*	
F19.28	Length multiplying power	0.001 - 30.000	1.000	0.001	○	
F19.29	Length correction coefficient	0.001 - 1.000	1.000	0.001	○	
F19.30	Axis diameter	1.00 - 100.00cm	10.00cm	0.01cm	○	
F19.31	Pulse No. per rotate of testing axis	1 - 9999	1	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19.32	Length fully met function	Units: 0: Outputs level signal 1: Outputs 500ms pulse Tens: 0: Stop 1: Continue running	00	1	○	
F19.33	Action of length when length is met	0: Clear to 0 1: Remain 2: Continue calculating	0	1	○	
F19.34	Action of length at stop		0	1	○	
F19.35	Aux PID output limit	0.0 - 100.0%	100.0%	0.1%	×	
F19.36	Aux PID output setting	0.0 - 100.0%	0.0%	0.1%	×	
F19.37	Frequency adjustment range	Unit: main frequency calculating range 0: 0 - max. frequency 1: Negative max. frequency- max. frequency Ten: Aux frequency calculating range 0: 0 - max. frequency 1: Negative max. frequency- max. frequency Hundred: Resultant frequency calculating range 0: 0 - upper limit frequency 1: Negative upper limit frequency–upper limit frequency	100	1	○	
F19.38	Inter-phase short-circuit detection	0: Do not detect 1: Detect	1	1	○	
F19.39	Inout voltage selection	0: 380 - 460V 1: 260 - 460V 2: 200 - 460V	0	1	×	
F19.40	Flux braking PI regulator Kp	0 - 4000	1000	1	○	
F19.41	Flux braking PI regulator Ki	0 - 500	20	1	○	
F19.44	LCD backlight display time	0.0 - 999.9min	5.0min	0.1min	○	
F20: Fault Protection Parameters (on pages 95 - 98)						
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: Overload pre-alarm action	00000	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		0: HD3N doesn't alarm and continues running when detecting an active overload signal 1: HD3N alarms and stops running when detecting an active overload signal Hundred: Overload detection threshold 0: Relates to rated current of motor (alarm E0019: motor overload) 1: Relates to rated current of HD3N (alarm E0017: inverter overload) Thousand: Motor type 0: Standard motor 1: Variable frequency motor Ten thousand: Overload protection 0: Enable inverter overload protection and motor overload protection 1: Enable inverter overload protection; shield motor overload protection 2: Shield inverter overload protection; enable motor overload protection 3: Shield inverter overload protection and motor overload protection				
F20.01	Overload pre-alarm detection value	20.0 - 200.0%	150.0%	0.1%	○	
F20.02	Overload pre-alarm detection time	0.0 - 60.0s	5.0s	0.1s	○	
F20.03	Detection action for inverter output load loss	0: Invalid, not detect 1: Detect during running and keep running (alarm) 2: Detect during constant speed and keep running (alarm) 3: Detect during running and stop output (fault) 4: : Detect during constant speed stop output (fault)	0	1	○	
F20.04	Detection value for inverter output load loss	0 - 100%	30%	1%	○	
F20.05	Detection time for invertre output load loss	0.00 - 20.00s	1.00s	0.01s	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.08	The detection base of lack of input	0 - 80% *0%: Not detect E0018 fault*	30%	1%	○	
F20.09	The detection time of lack of input	1.00 - 5.00s	1.00s	0.01s	○	
F20.10	The detection base of lack of output	0 - 100% *0%: Not detect input phase loss*	20%	1%	○	
F20.11	The detection time of lack of output	1.00 - 20.00s	3.00s	0.01s	○	
F20.12	PID setting lose detection value	0 - 100% *0%: Not detect PID setting loss*	0%	1%	○	
F20.13	PID setting loss detection time	0.00 - 10.00s *0.00s: Not detect PID setting loss*	0.20s	0.01s	○	
F20.14	PID feedback loss detection value	0 - 100% *0%: Not detect PID feedback loss*	0%	1%	○	
F20.15	PID feedback loss detection 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 exceeding limit*	100%	1%	○	
F20.17	Detection time at PID feedback out of the limit	0.00 - 10.00s *0.00s: Not detect PID feedback exceeding limit*	0.20s	0.01s	○	
F20.18	Fault auto reset times	0 - 100 *0: No auto reset function*	0	1	○	
F20.19	Fault auto reset interval	0.01 - 200.00s/per time	5.00s/次	0.01s/次	○	
F20.20	Faulty relay action	Unit: In auto reset process 0: Faulty relay doesn't act 1: Faulty relay acts Ten: In undervoltage process 0: Faulty relay doesn't act 1: Faulty relay acts	00	1	○	
F20.21	NO.5 fault type	*1. E0001 - E0003 and E0008 can be reset only after reporting to 3s* *2. E0022 does not affect the normal use of HD3N* -Lu-: DC bus undervoltage E0001: Inverter output overcurrent (in Acc process) E0002: Inverter output overcurrent (in Dec process) E0003: Inverter output overcurrent (in constant speed process) E0004: DC bus over voltage (in Acc process)	0	1	*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		E0005: DC bus over voltage (in Dec process) E0006: DC bus over voltage (in constant speed process) E0007: Stall overvoltage E0008: Power module fault E0009 :Heatsink overheat E0010: Braking unit fault E0012: Parameters auto-tuning fault E0014: Current detection circuit fault E0015: Input voltage phase loss E0016: Output voltage phase loss E0017: Inverter overload E0018: Inverter output load-loss E0019: Motor overload E0020: Motor overheat E0021: Read / Write fault of control board EEPROM E0023: Faulty setting of parameters E0024: Fault of external equipment E0025: PID setting loss E0026: PID feedback loss E0027: PID feedback out of limit E0028: SCI communication timeout E0029: SCI communication error				
F20.22	Setting frequency at NO.5 fault	0.00 - 400.00Hz	0.00Hz	0.01Hz	*	
F20.23	Running frequency at NO.5 fault	0.00 - 400.00Hz	0.00Hz	0.01Hz	*	
F20.24	DC bus vlotage at NO.5 fault	0 - 999V	0V	1V	*	
F20.25	Output voltage at NO.5 fault	0 - 999V	0V	1V	*	
F20.26	Output current at NO.5 fault	Actual value	0.0A	0.1A	*	
F20.27	Input terminal status at NO.5 fault	0 - 0x1FF	0	1	*	
F20.28	Output terminal status at NO.5 fault	0 - 0x7FF	0	1	*	
F20.29	NO.5 fault interval	0 - 6553.5 hours	0.0h	0.1h	*	
F20.30	NO.4 fault type	0 - 99	0	1	*	
F20.31	NO.4 fault interval	0 - 6553.5 hours	0.0h	0.1h	*	
F20.32	NO.3 fault type	0 - 99	0	1	*	
F20.33	NO.3 fault interval	0 - 6553.5 hours	0.0h	0.1h	*	
F20.34	NO.2 fault type	0 - 99	0	1	*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.35	NO.2 fault interval	0 - 6553.5 hours	0.0h	0.1h	*	
F20.36	NO.1 fault type	0 - 99	0	1	*	
F20.37	NO.1 fault interval	0 - 6553.5 hours	0.0h	0.1h	*	
F20.38	Last time fault interval	0 - 6553.5 hours	0.0h	0.1h	*	
F21: Torque Control Parameter (on pages 98 - 99)						
F21.00	Torque command setting source selection	0: F21.01 digital 1: Analogue 2: Terminal puls 3: SCI communication	0	1	×	
F21.01	Torque command digital setting	-100.0 - 100.0% (F21.02)	0.0%	0.1%	○	
F21.02	Max. torque setting	0.0 - 500.0% (rated torque of motor)	100.0%	0.1%	×	
F21.03	Filtering time of torque command	0.000 - 1.000s	0.000s	0.001s	○	
F21.04	Speed control under torque control	0: Set by F21.05 and F21.06 1: Set by F00.06 2: Set by analogue limit	1	1	×	
F21.05	Forward speed limit under torque control	0 - 100% (F00.06)	100%	1%	○	
F21.06	Reverse speed limit under torque control	0 - 100% (F00.06)	100%	1%	○	
F21.10	Stop mode selection under torque control	0: Decelerates to stop + DC brake 1: Stop torque output 2: Coast to stop	0	1	×	
F23: PWM Control Parameter (on pages 99 - 100)						
F23.00	Carrier frequency	1 - 8kHz	6kHz	1kHz	×	
F23.01	Auto adjust carrier frequency	0: Prohibited 1: Adjust 1 2: Adjust 2	1	1	×	
F23.02	PWM overshoot enable	0: Disabled 1: Enabled	1	1	×	
F23.03	PWM modulation mode	0: Switch between two phase/three phase 1: Three phase	0	1	×	
F23.04	Switch point 1 of PWM modulation mode	5.00 - 50.00Hz	Depend on HD3N	0.01Hz	×	
F23.05	Switch point 2 of PWM modulation mode	7.00 - 50.00Hz	Depend on HD3N	0.01Hz	×	
F23.09	Random carrier factor K1	0 - 2000	2	1	×	
F23.10	Random carrier factor K2	0 - 2000	3	1	×	
R02: Analogue Parameter Correction Factor ((on pages 100 - 100)						
R02.00	AI1 display voltage 1	0.0 - 100.0%	0			
R02.01	AI1 actual voltage 1	0.00 - 10.00V	0			
R02.02	AI1 display voltage 2	0.0 - 100.0%	0			

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
R02.03	AI1 actual voltage 2	0.00 - 10.00V	0			
R02.04	AI2 display voltage 1	0.0 - 100.0%	0			
R02.05	AI2 actual voltage 1	0.00 - 10.00V	0			
R02.06	AI2 display voltage 2	0.0 - 100.0%	0			
R02.07	AI2 actual voltage 2	0.00 - 10.00V	0			

Appendix B Communication Protocol

1. Introduction

HD3N series adopts 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 controller's function code, read the status parameters and write the control command etc. The inverter is in slave mode when it is communicating.

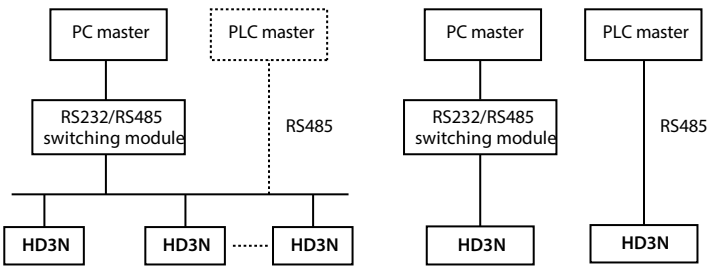
Communication Terminal

Refer to section 4.4.1 Control Terminal (on page 23) for communication terminal.

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
Baut rate	9600bps
Relative setting	Refe to F17: SCI Communication Parameter, on page 86

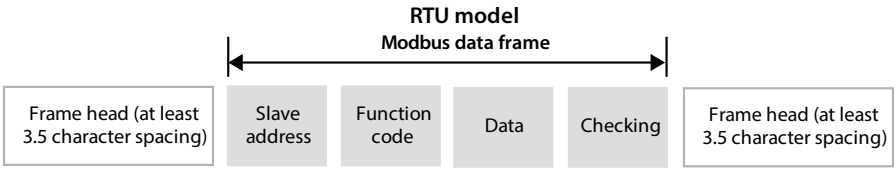
Network mode



B

Protocol Format

The MODBUS protocol simultaneously supports RTU mode and ASCII mode, with corresponding Frame format as shown below:



MODBUS adopts "Big Endian" encoding mode, higher byte prior to lower byte at sending.

- 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 relies on CRC-16. The whole information need be checked. The concrete CRC checking is referred to the page 150.

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

Command	**Address**	**Parameter**	**Register Address**		**Read char no.**		**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 Values

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 minimum unit.

Remarks:

1. 0-2000 of F04.03, F21.01, F16.05, F16.08, F16.22, F16.24 correspond to -1000 - +1000.

2. Communication data 0 - 16000 of status parameter 0x3318 correspond to -8000 - +8000.

3. Output data 0 –2000 of status parameter (process PID setting, process PID feedback, process PID tolerance, process PID integral and process PID output) correspond to-1000 - + 1000.

3. Protocol Function

Supported function

MODBUS protocol supports the below parameter operation:

Supported function	Code	Instructions
To read function parameters and status parameter	0x03	
To rewrite single function parameter or control parameter	0x06	Set by F17.09
	0x41	Not saved at power off
To rewrite numbers of function parameters or control parameters	0x10	Set by F17.09
	0x43	Saved at power off

To read function parameters and status parameter

Function code 0x03, command Frame and response Frame are in below table (Take RTU as an example).

Command Frame	Address	Code	Starting register address	No. of register	CRC/LRC checking
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 no.	Register content	CRC/LRC checking
Data Frame bytes	1	1	1	2* no. of registers	2/1
Value or range	1 - 247	0x03	2* no. of registers		

To rewrite single function parameter or control parameter

Function code 0x06 (set by F17.09), 0x41 (Not saved at power off); command Frame and response Frame are in below table (Take RTU as an example).

Command Frame	Address	Code	Register address	Register content	CRC/LRC checking
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 checking
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 0x10 (set by F17.09), 0x43 (Saved at power off); command Frame and response Frame are in below table (Take RTU as an example).

Command Frame	Address	Code	Starting register address	No. of register	Byte no. of register content	Register content	CRC /LRC checking
Data Frame bytes	1	1	2	2	1	2* no. of registers	2/1
Value or range	0 - 247	0x10, 0x43	0x0000 - 0xFFFF	0x0000 - 0x0004	2* no. of registers		

Response Frame	Address	Code	Starting register address	No. of operation registers	CRC checking
Data Frame bytes	1	1	2	2	2/1
Value or range	1 - 247	0x10, 0x43	0x0000 - 0xFFFF	0x0000 - 0x0004	

This command rewrites the contents of continuous data unit from starting register address where is mapped as function parameter and control parameter of controller, etc. The controller 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 command fails, the response is fault code. The fault code is + 0x80.

Exception code	Instructions
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 command 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.

E.g.: Write STOP function selection of address 2 (range: 0x00 - 0x01, 0x02 exceeds limit of register content, and fault code is 0x86 (0x06 + 0x80), abnormal code 0x03.

Command Frame	Address	Code	Register address		Register content		Checksum	
	0x02	0x06	0x00	0x1C	0x00	0x02	0xc9	0xfe

Response Frame	Address	Error code	Exception code	Checksum	
	0x02	0x86	0x03	0xF2	0x61

4. Address Mapping

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

Function code address mapping

Their group numbers are mapped as higher bytes of register address while the relationships are shown as below table. The intergroup indexes are mapped as lower bytes. Please refer to user manual for F00 - F23, R02.

High bytes of register address	Group number	High bytes of register address	Group number	High bytes of register address	Group number
0x00	F00	0x07	F07	0x11	F17
0x01	F01	0x08	F08	0x12	F18
0x02	F02	0x09	F09	0x13	F19
0x03	F03	0x0a	F10	0x14	F20
0x04	F04	0x0b	F11	0x14	F21
0x05	F05	0x0f	F15	0x17	F23
0x06	F06	0x10	F16	0x1B	R02

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

Control parameter (0x33) address mapping

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

Address	Function	Save at power failure or not
0x3200	Control command	No
0x3201	Running frequency setting	Set by F00.14 hundreds
0x3202	Aux running frequency setting	No
0x3203	Torque setting	No
0x3204	Virtual terminal control setting	No
0x3210	AO output setting	No

Control command (0x3200) and its setting:

Control (Bit)	Meaning		Description
Bit0	0: Running command is invalid	1: Running commandi s valid	Control start and stop (Edge trigger)
Bit1	0: FWD	1: REV	Control running direction
Bit2	0: Unused	1: Coast to stop	Control stop mode (Edge trigger)
Bit3	0: Unused	1: Emergency to stop	Control stop mode (Edge trigger)
Bit4	0: Unused	1: Coast to stop	Control stop mode (Edge trigger)
Bit5	0: Unused	1: Eexternal fault signal	Display external fault and stop or run according to F17.08
Bit6	0: Stop jog FWD	1: Jog FWD	Control jog FWD
Bit7	0: Stop jog REV	1: Jog REV	Control jog REV
Bit8	0: Fault reset is invalid	1: Fault reset is valid	Control fault reset
Bit9 - Bit11	0: Unused		
Bit12	0: Current control is invalid	1: Current control is valid	Control is valid/invalid
Bit13 - Bit15	0: Unused		

Register content can control command:

Register content	Control command	Register address	Parameter name
0x1001	RFWD	0x1020	Stop due to external fault
0x1003	REV	0x1040	Jog FWD
0x1004	Dec to stop	0x1080	Jog REV
0x1008	Emergency to stop	0x1100	Fault reset
0x1010	Coast to stop		

Virtual terminal control setting (0x3204) and its setting:

Control (Bit)	Meaning	
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 - Bit15	Unused	Unused

Status parameter (0x33) address mapping

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

Address	Function	Address	Function
0x3300	Controller series	0x331C	AI1input voltage (after calculating)
0x3301	Software version of DSP	0x331D	AI2 input voltage
0x3303	Special sofwtware ersion of MCB	0x331E	AI2 input voltage (after calculating)
0x3305	Software of keypad	0x3323	DI6 terminal pulse input frequency
0x3306	Customized serial No.	0x3324	AO1 output
0x3307	Motor and control mode selection	0x3325	AO2 output
0x3308	Rated current of inverter	0x3326	High speed output pulse frequency
0x330A	Inverter status	0x332C	Process PID setting
0x330B	Main setting frequency channel	0x332D	Process PIDfeedback
0x330C	Main setting frequency	0x332E	Process PID tolerance
0x330D	Aux setting frequency	0x332F	Process PID integral
0x330E	Setting frequency	0x3330	Process PID output
0x330F	Setting frequency (after calculated)	0x3331	External counting value
0x3310	Output frequency	0x3332	Input terminal status
0x3311	Setting rpm	0x3333	Output terminal status
0x3312	Running rpm	0x3334	MODBUS status
0x3313	Input cable voltage	0x3335	Actrual length
0x3314	Output voltage	0x3336	Accumulative length
0x3315	Output current	0x3337	Total power up time
0x3316	Torque setting	0x3338	Total running time
0x3317	Output torque	0x3339	Total energy consumption high bit of motor
0x3318	Output frequency	0x333A	Total energy consumption low bit of motor
0x3319	DC busbar voltage	0x333B	Present energy consumption high bit
0x331A	Input voltage of potentionmeter	0x333C	Present energy consumption low bit
0x331B	AI1 input voltage	0x333D	Present fault

5. Special Instruction

1. Host computer cannot restore to factory setting. It can read but not write these parameters: F08 (Asyn motor parameter) and F17 (SCI parameter).

2. Host computer cannot modify F01.00 (user password). But it can write F01.00 to verify user password. When verified, host computer access modifying function parameter of inverter. After modifying, write invalid password into F01.00 to disable this access.

3. If many multi-function input terminals setting are the same, 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 controller via communication. In addition, please preset the communication data format, baud rate and communication address.

1. To read max. output frequency of address 2(to read command Frame F00.06), response Frame = 50.00Hz

Command Frame	Address	Code	Register address		Word no. of read		Checksum	
	0x02	0x03	0x00	0x06	0x00	0x01	0x64	0x38
Response Frame	**Address**	**Code**	**Answer byte**		**Register content**		**Checksum**	
	0x02	0x03	0x02		0x13	0x88	0xF1	0x12

2. To read the DC bus voltage of address 2 (group d00), corresponding answer Frame = 537V)

Command Frame	Address	Code	Register address		Word no. of read		Checksum	
	0x02	0x03	0x33	0x19	0x00	0x01	0x5A	0xBA
Response Frame	**Address**	**Code**	**Answer byte**		**Register content**		**Checksum**	
	0x02	0x03	0x02		0x02	0x19	0x3C	0xEE

3. To write setting frequency of address 2 (F00.13 = 45.00Hz)

Command / Response Frame	Address	Code	Register address		Register content		Checksum	
	0x02	0x06	0x00	0x0D	0x11	0x94	0x15	0xC5

4. F00.10 = 2, write setting running frequency of address 2 = 45.00Hz, register content 0x11,0x94

Command / Response Frame	Add.	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E

5. F00.11 = 2, address 2 is reverse

Command / Response Frame	Add.	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x03	0xCA	0x80

6. F00.11 = 2, address 2 decelerates to stop

Command / Response Frame	Add.	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x04	0x8B	0x42

7. F00.11 = 2, address 2 emergency stops

Command / Response Frame	Add.	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x08	0x8B	0x47

8. F00.11 = 2, address 2 coasts to stop

Command / Response Frame	Add.	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x10	0x8B	0x4D

9. Address 2 has external fault

Command / Response Frame	Add.	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x20	0x8B	0x59

10. Address 2 fault reset

Command / Response Frame	Add.	Code	Register address		Register content		Checksum	
	0x02	0x06	0x32	0x00	0x11	0x00	0x8B	0x11