HD3L Series

Elevator Controller

User Manual

V1.3 2024.08

FOREWORD

Thank you for purchasing the HD3L series elevator controller developed by Shenzhen Hpmont Technology Co., Ltd.

This user manual explains how to use HD3L correctly, and comprehensively introduces the mechanical installation, electrical installation, function description, troubleshooting, maintenance and other detailed information of HD3L.

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 user manual for future use.
- If you need the user manual due to damage, loss or other reasons, please contact the distributor of our company or directly contact our Technical Service Center.
- If you have some problems during use, please contact our Technical Service Center.
- Due to product upgrade or specification change, and to improve the readability and accuracy of the user manual, Hpmont changes the content of the user manual timely without prior notice.
- Email address: **marketing@hpmont.com**

Version and Revision Records

Version	Time	Revised Contents
V1.3	2024/08	• Update parameters, faults • Optimize document structure
V1.2	2020/04	• Increase F00.01 (motor control mode) function: 5, 6 • Add parameter: Group F19 and F20 (enhance parameters)
V1.1	2019/06	• The product name changed to Elevator Controller
V1.0	2016/04	• V1.0 version released

Contents

Chapter 1 Safety Information and Precautions

1.1 Safety Definition

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

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 Precautions

Compared to the Industrial Frequency Running

The HD3L series controllers are voltage-type frequency controllers and their output is PWM wave with certain harmonic wave. Therefore, the temperature, noise and vibration of the motor will be a little higher than that at industrial frequency running.

Thermal Protection of Motor

When choose the adaptive motor, HD3L can effectively implement thermal protection of motor. Otherwise it must adjust the motor protection parameters or other protection measures to ensure that the motor is at a safe and reliable running.

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.

Start and Stop HD3L

User should use the control terminal to start and stop HD3L. It is strictly forbidden to use contactor or other switches on the input side of HD3L to start and stop directly, or it will damage the device.

Check the Insulation of the Motor

For the first time using the motor or after long time storage, it needs checking the insulation of the motor. Worse insulation can cause damage to HD3L.

Note:

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

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.

No Capacitor or Varistor on the Output Side

Since HD3L 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 HD3L fault trip or component damage.

Contactors and Circuit Breakers Connected to the Output of HD3L

If circuit breaker or contactor needs to be connected between HD3L and the motor, be sure to operate these circuit breakers or contactor when HD3L has no output, so as to avoid any damage to HD3L.

Running Voltage

HD3L is prohibited to be used beyond the specified range of running voltage. If needed, please use suitable voltage regulation device to change the voltage.

Capacitor Energy Storage

When the AC power supply is cut off, capacitor of HD3L sustains deadly power for a while. So to disassemble HD3L 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 controller, 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

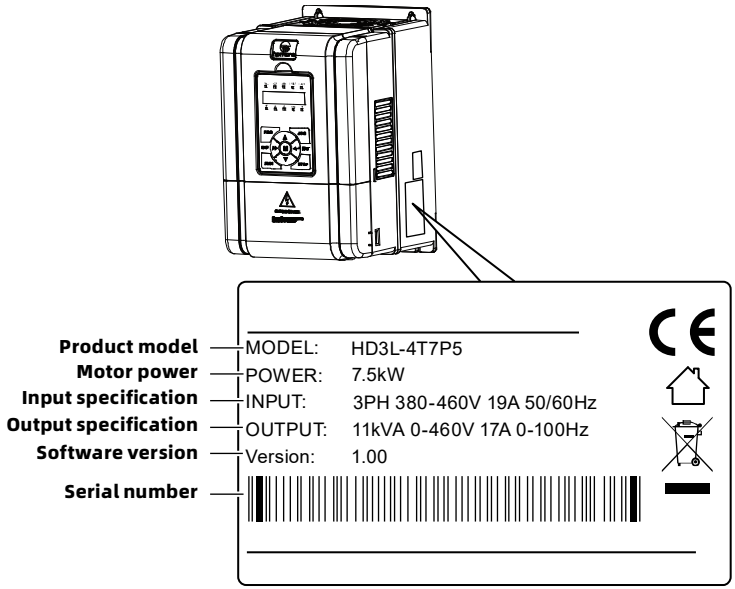
HD3L internal design has lightning surge over-current protection circuit, and has certain self-protection capacity against the lightning.

Altitude and Derating

In areas with an altitude of more than 1,000 meters, the heat dissipation effect of the controller becomes poor due to the thin air. At this time, the controller must be derated. For every 100m of altitude increase, the output current rating decreases by 1%.

Chapter 2 Product Information

2.1 Nameplate



Product Model

See instructions below.

H D 3 L - 4 T 5 P 5

1 2 3 4

Code	Description	
1	Product series	• **HD3L**: Elevator controller
2	Voltage level	• **2:** 200 - 240V • **4**: 380 - 460V
3	Phase	• **D**: Single/three phase • **T**: Three phase
4	Suitable for motor	• **2P2:** 2.2kW • **3P7:** 3.7kW • **5P5:** 5.5kW • **7P5:** 7.5kW • **011:** 11kW • **015:** 15kW • **018:** 18.5kW • **022:** 22kW • **030:** 30kW • **037:** 37kW • **045:** 45kW

2.2 Electrical Specifications

Refer to section 3.2.1 Size and Gross Weight, page 12 for size information.

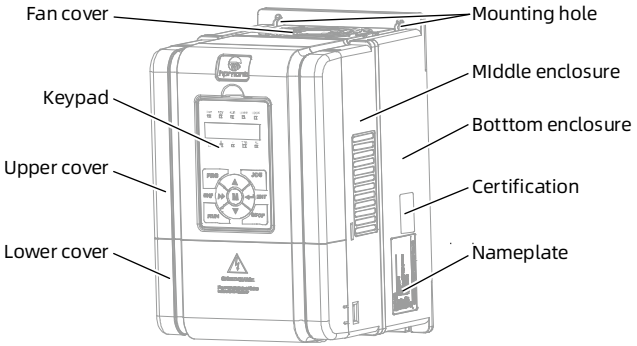
Model	Motor (kW)	Rated Capacity (kVA)	Rated Input Current (A)	Rated Output Current (A)	Size
Single/three phase power supply: 200 - 240V, 50/60Hz					
HD3L-2D2P2	2.2	3.8	24.1/12 (1)	10	F2
HD3L-2D3P7	3.7	5.9	40/19 (1)	17	F2
HD3L-2D5P5	5.5	8.5	60/28 (1)	25	F3
HD3L-2D7P5	7.5	11	75/35 (1)	32	F3
HD3L-2D011	11	16	100/47 (1)	45	F4
Three phase power supply: 200 - 240V, 50/60Hz					
HD3L-2T015	15	21	62	55	F5
HD3L-2T018	18.5	24	77	70	F5
HD3L-2T022	22	30	92	80	F6
HD3L-2T030	30	39	113	110	F6
Three phase power supply: 380 - 460V, 50/60Hz					
HD3L-4T2P2	2.2	3.4	7.3	5.1	F2
HD3L-4T3P7	3.7	5.9	11.9	9.0	F2
HD3L-4T5P5	5.5	8.5	15	13	F2
HD3L-4T7P5	7.5	11	19	17	F3
HD3L-4T011	11	16	28	25	F3
HD3L-4T015	15	21	35	32	F4
HD3L-4T018	18.5	24	39	37	F4
HD3L-4T022	22	30	47	45	F5
HD3L-4T030	30	39	62	60	F5
HD3L-4T037	37	49	77	75	F6
HD3L-4T045	45	59	92	90	F6
(1): The value before "/" corresponds to single phase power input, and the value after "/" corresponds to three phase power input.					

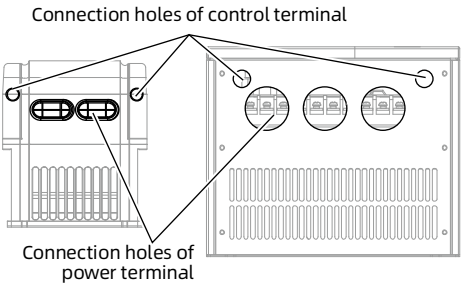
2.3 Technical Data

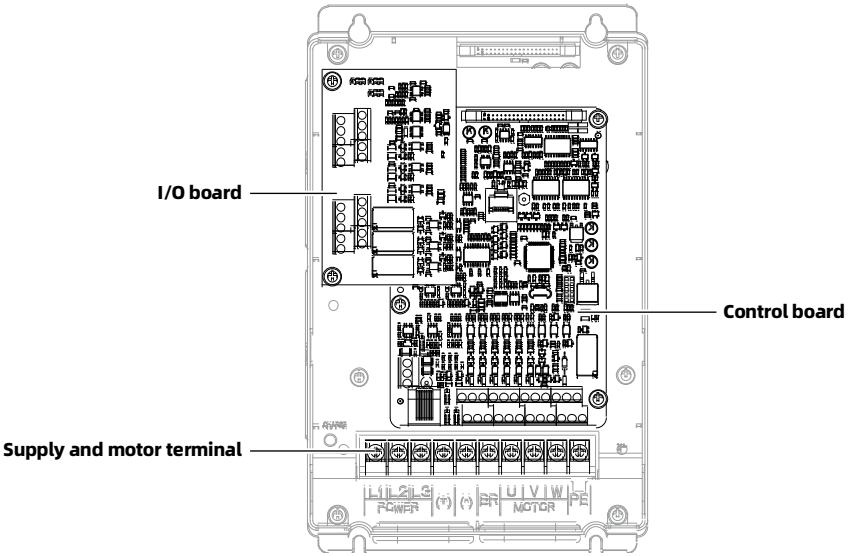
Electrical	
Input voltage	Single phase/three phase: 200 - 240V Three phase: 200 - 240V Three phase: 380 - 460V Fluctuating within ±10%, unbalance rate <3%
Input frequency	50/60Hz ± 5%
Output voltage	0V - input voltage
Output frequency	0 - 100.00Hz
Performance	
Control mode	V/f, SVC
Max. current	150% rated output current for 2 minutes 180% rated output current for 10 seconds
Run command	Keypad; Terminals
Speed setting	Digital; Analog
Speed resulotion	Digital setting: 0.01Hz Analog setting: 0.1% × max-frequency
SVC	Speed control accuracy: ±0.5% Speed control range: 1:100 Torque control response: <200ms Start torque: 180% rated torque/0.5Hz
Characteristic Function	
Parameter upload and download function	Achieve parameters uploading and downloading
I/O interface	The programmable input interface has up to 34 functions The pragrammable output interface has up to 19 functions
Communication protocol	Built-in Modbus communication protocol
Protection Function	
Auto-inspection	To eliminate the potential safety problems, safety inspection for the peripheral devices is provided when power on
Over-speed protection	To make sure safe running, elevator over-speed protection is provided
Speed deviation protection	To eliminate the potential safety problems, speed deviation detection protection is provided
Up/down forced speed switch function	Up/down forced speed switch function, to avoid climbing elevator or plunging elevator
Input/output voltage phase loss protection	Input/output voltage phase loss auto-detect and alarm function
Motor temperature detection	Real time detection for the motor temperature
Output GND short circuit protection	Enable
Output inter-phase short circuit protection	Enable

Input/Output	
Analog power supply	+10V, max. current 100mA
Digital power supply	+24V, max. current 200mA
Analog input	AI1 (control board): Voltage 0 - 10V AI2 (control board): -10 - +10V/0 - 20mA (selectable voltage/current) AI3, AI4 (I/O board): -10 - +10V/0 - 20mA (selectable voltage/current, AI4 supports differential input)
Analog output	AO1, AO2: 0 - 10V/0 - 20mA (selectable voltage/current)
Digital input	DI1 - DI6 (control board) DI7 - DI9 (I/O board)
Digital output	DO1, DO2
Relay output	R1A/R1B/R1C (control board) R2A/R2B/R2C, R3A/R3B/R3C, R4A/R4B/R4C (I/O board) Contact rating 250VAC/3A or 30VDC/1A
Communication	
SCI communication	RS-485 interface; Terminal
Keypad	
LED display	Five LEDs display Setting function parameter, checking status parameters, checking fault code, etc.
Indicators	5 unit indicators, 5 status indicators
Parameter copy	Achieve quick parameter copy
Environment	
Installation place	Indoor or in electrical control panel • No direct sunlight or water droplets • No gas and liquid with flammable, explosive and corrosive • No oily dust, fibers or metal particles • The mounting surface is flame retardant and strong enough to support the controller
Use ambient temperature	-10 - +50℃, when the temperature exceeds 40℃, the controller needs to be derated • For each temperature exceeding 1℃, derate by 2%
Storage temperature	-40 - +70℃
Use ambient humidity	Less than 95%RH, non-condensing
Vibration	IEC 60721-3-3 • 2 ≤ f < 9Hz, displacement 0.3mm • 9 < f ≤ 200Hz, acceleration 1m/s²
Protection level	IP20
Pollution level	Level 2 (dry, non-conductive dust pollution)
Altitude	Less than 1000 meters, otherwise should be derating use
Accessories	
About keypad	HD-KMB: Mounting base to keypad HD-CAB-1M/2M/3M/6M: 1m/2m/3m/6m cable
Power unit	HDRU-B: Power regenerative unit

2.4 Layout


Fan cover
Mounting hole
MIddle enclosure
Keypad
Botttom enclosure
Upper cover
Certification
Lower cover
Nameplate


Connection holes of control terminal
Connection holes of power terminal


I/O board
Control board
Supply and motor terminal
L1 L2 L3
POWER
(+) (-)
BR
U V W
MOTOR
PE

Chapter 3 Mechanical Installation

- Do not install if controller is incomplete or impaired.
- When conveying controller, please employ suitable tools according to its weight. Avoid scratch to the product. Be careful: Rollover and drop may cause hurt.
- Make sure that controller is far from explosive and flammable things.
- Before operation, please disconnect the input power supply reliably and wait for at least 10min. Confirm that the power indicator of the controller has gone out and the voltage between the power terminals (+) and (-) is lower than 36V.

- It is required not only carry the keypad and the cover but also bottom enclosure of controller.
- When installing, do not let cables, screws, or residues fall into the controller.

3.1 Environmental Requirement

Confirm that the installation site meets the following requirements.

Table 3-1 Installation site conditions

Requirement	Description
Installation place	Indoor or in electrical control panel • No direct sunlight or water droplets • No gas and liquid with flammable, explosive and corrosive • No oily dust, fibers or metal particles • The mounting surface is flame retardant and strong enough to support the controller
Use ambient temperature	-10 - +50℃, when the temperature exceeds 40℃, the controller needs to be derated • For every 1℃ increase, derate by 2%
Storage temperature	-40- + 70℃
Use ambient humidity	Less than 95%RH, no condensation
Vibration	IEC 60721-3-3 • 2 ≤ f < 9Hz, displacement 0.3mm • 9 < f ≤ 200Hz, acceleration 1m/s²
Protection level	IP20
Pollution level	Level 2 (dry, non-conductive dust pollution)
Altitude	Less than 1000 meters, otherwise needs derating use

3.2 Install HD3L

3.2.1 Size and Gross Weight

Table 3-2 Size and gross weight

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

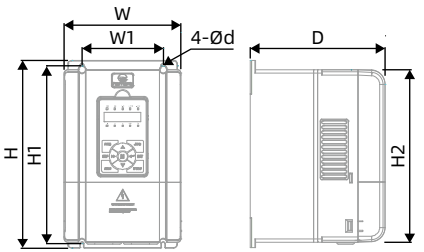


Figure 3-1 F2 - F4 size

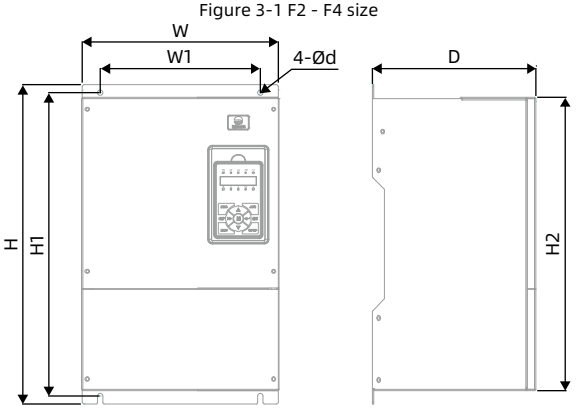


Figure 3-2 F5 - F6 size

3.2.2 Plan Installation Space

Install the controller in the electrical control panel.

The controller uses forced air cooling (top ventilation) for heat dissipation. To ensure the performance and life of the controller, please leave sufficient installation space around the controller.

3.2.2.1 Installation Direction

Wall-mounted installation is adopted, and the installation direction is perpendicular to the installation surface.

3.2.2.2 Installation Space

To achieve good cooling efficiency, install HD3L perpendicularly and always provide the following space to allow normal heat dissipation.

The requirements on mounting space and clearance are shown in table below.

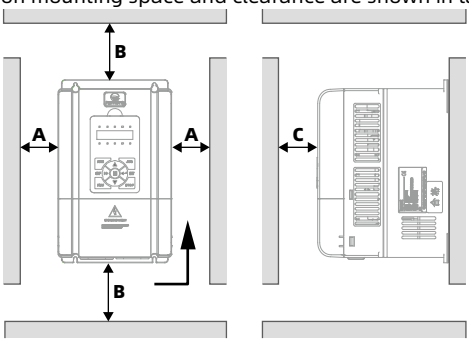


Figure 3-3 Installation space

Table 3-3 Installation space

Size	F2 – F6
A (left and right)	≥30mm
B (up and down)	≥50mm
C (front)	≥25mm

3.3 Install the Keypad

3.3.1 Install and Remove Keypad

According to the direction of Figure 3-4, press the keypad until hear a “click” sound. Do not install the keypad from other directions or it will cause poor contact.

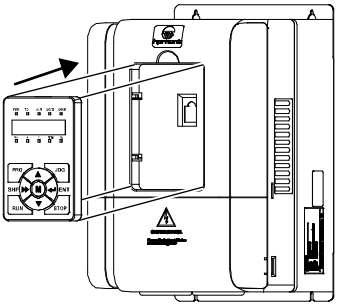


Figure 3-4 Install keypad

There are two steps in Figure 3-5.

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

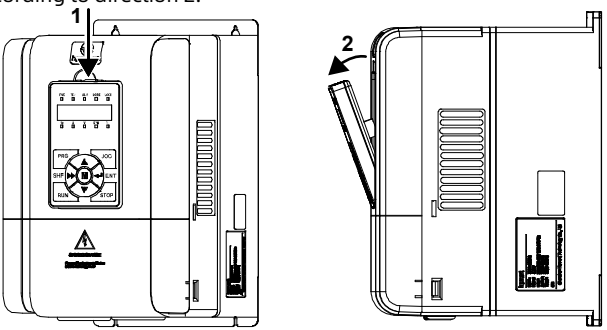


Figure 3-5 Dismantle keypad

3.3.2 Install the Keypad on the Control Panel Door

The keypad installation assembly includes mounting base and extension cable.

Mounting Base

Model: HD-KMB.

The sizes of the HD-KMB is shown in the figure below, the unit is mm.

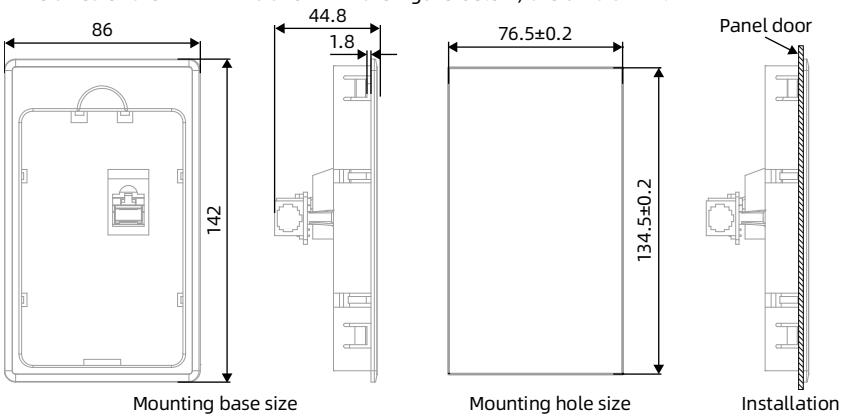


Figure 3-6 Mounting base size

Extenion Cable

The models are as follows:

- 1m cable: HD-CAB-1M
- 2m cable: HD-CAB-2M
- 3m cable: HD-CAB-3M
- 6m cable: HD-CAB-6M

Chapter 4 Electrical Installation

- Only qualified electrical engineer can perform wiring.
- To facilitate the input side over-current protection and outage maintenance, connect HD3L with power supply via the MCCB or fuse.
- Before wiring or disassembling the internal components of HD3L, please disconnect the input power supply reliably and wait for at least 10 minutes. Confirm that the power indicator of the controller has gone out and the voltage between the power terminals (+) and (-) is lower than 36V.
- Check the wiring carefully before connecting emergency stop or safety circuit.
- There is more than 3mA leakage current in HD3L grounding, depending on the operating conditions. To ensure safety, HD3L 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 HD3L when it is live. The main circuit terminals are neither allowed connecting to the enclosure nor short-circuiting.

- Do not do dielectric strength test on HD3L.
- For HD3L 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 HD3L.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure HD3L has ceased output before switching motor or change-over switches.
- The HD3L DC bus terminals must not be short-circuited.

4.1 Dismantle Plastic Cover

The upper cover and lower cover of HD3L are removable.
Before removing the upper cover, please take away the keypad.
Diamantle steps:

1.	Simultaneously squeeze the buckles on both ends and move the lower cover (a) upwards.
2.	Use a screwdriver to remove the screws (b) of the upper cover.
3.	Simultaneously squeeze the buckles on both ends and move the upper cover (c) upwards.

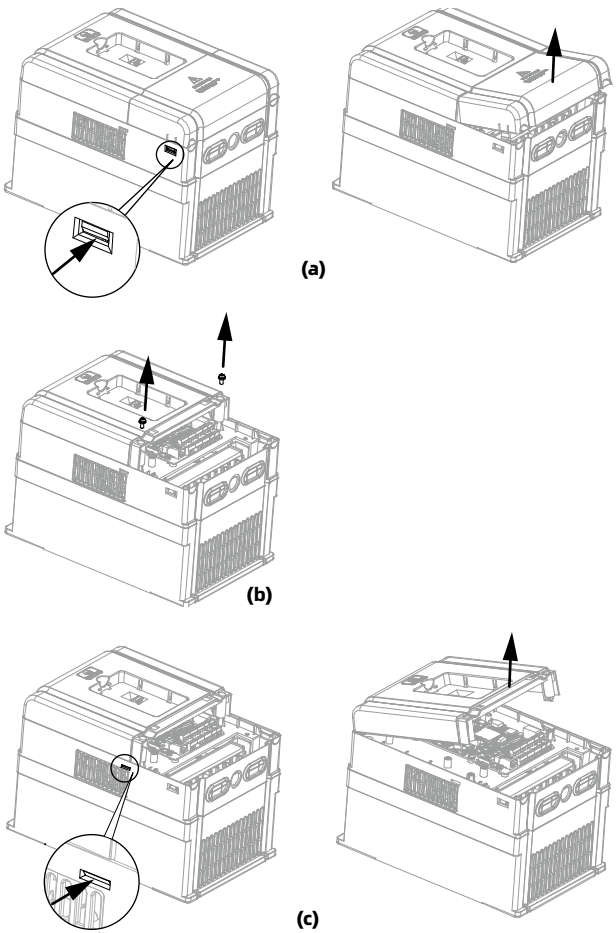


Figure 4-1 Dismantle plastic cover

4.2 Connect Power Cable

4.2.1 Select Peripherals

4.2.1.1 Connect Peripheral

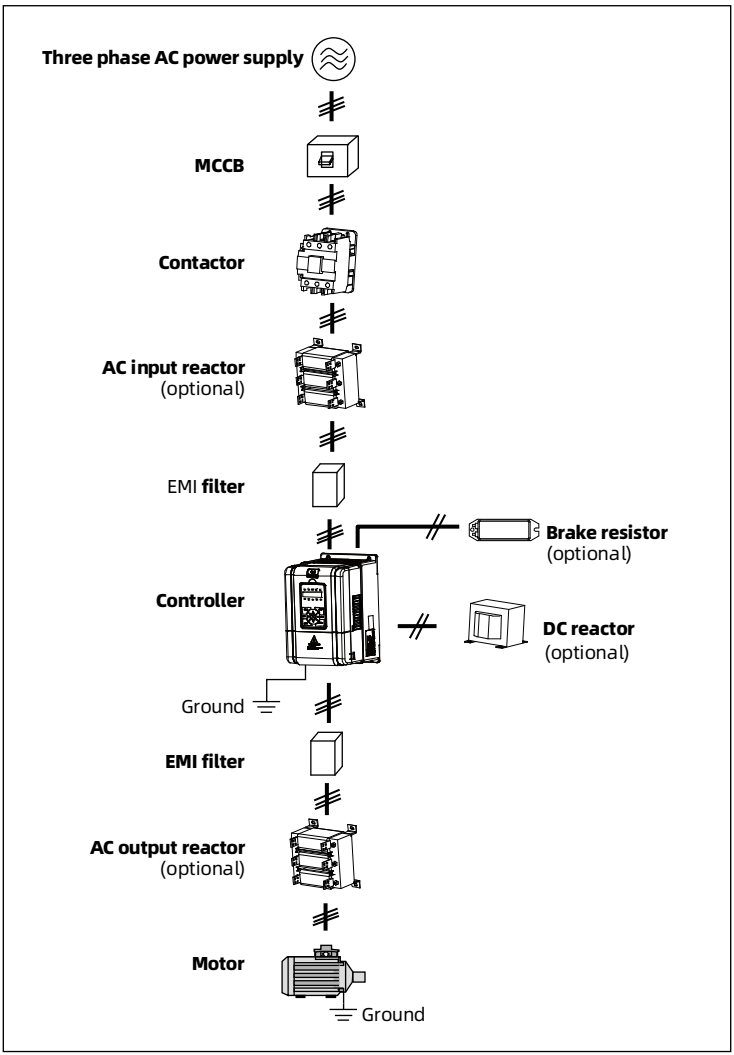


Figure 4-2 Connect peripheral devices

4.2.1.2 Select MCCB and Contactor

A disconnecting device such as an air switch (MCCB) or fuse with overcurrent protection must be installed between the power supply and the controller to avoid expanding the scope of impact due to subsequent equipment failure and to ensure equipment and personal safety.

The recommended air switch MCCB and contactor are shown in table below.

Table 4-1 Select MCCB and contactor

Model	MCCB(A)	Contactor(A)
HD3L-2D2P2	32	20
HD3L-2D3P7	63	32
HD3L-2D5P5	32	20
HD3L-2D7P5	100/40 (1)	63/32 (1)
HD3L-2D011	125/63 (1)	100/40 (1)
HD3L-2T015	125	100
HD3L-2T018	160	100
HD3L-2T022	200	125
HD3L-2T030	200	125
HD3L-4T2P2	16	10
HD3L-4T3P7	25	16
HD3L-4T5P5	32	25
HD3L-4T7P5	40	32
HD3L-4T011	63	40
HD3L-4T015	63	40
HD3L-4T018	100	63
HD3L-4T022	100	63
HD3L-4T030	125	100
HD3L-4T037	160	100
HD3L-4T045	200	125
(1): The value before "/" corresponds to single phase input power, and the value after "/" corresponds to three phase input power.		

4.2.1.3 Select Brake Resistor

Note:

1. It is recommended to select the brake resistor according to the recommended resistance values in table below.
   When the braking system fails, a larger resistance value can ensure safety, but if the resistance value is too high, the braking capacity will decrease and the controller may have overvoltage protection.
2. Install the brake resistor in a well-ventilated metal cover. During operation, the temperature of the brake resistor is very high. Do not touch the brake resistor.

Table 4-2 Select brake resistor

Model	Brake Resistor Value (Ω)			Brake Resistor Power (kW)
	Min	Max	Recommended	
HD3L-2D2P2	26	130	50	1
HD3L-2D3P7	26	50	30	1.2
HD3L-2D5P5	17	27	20	1.6
HD3L-2D7P5	11	20	15	2
HD3L-2D011	11	20	15	3.2
HD3L-2T015	10	16	12	4
HD3L-2T018	10	16	12	5
HD3L-2T022	7	10	9	6.4
HD3L-2T030	7	10	9	8
HD3L-4T2P2	56	210	100	1
HD3L-4T3P7	56	144	80	1.2
HD3L-4T5P5	56	100	70	1.6
HD3L-4T7P5	56	72	64	2
HD3L-4T011	34	48	40	3.2
HD3L-4T015	34	41	36	4
HD3L-4T018	17	31	24	5
HD3L-4T022	17	27	20	6.4
HD3L-4T030	11	20	15	8
HD3L-4T037	10	16	12	10
HD3L-4T045	7	10	9	15

4.2.1.4 Select Reactor

Table 4-3 Select reactor

Model	AC Input Reactor		AC Output Reactor		DC Reactor	
	Model HD-	Parameter mH/A	Model HD-	Parameter mH/A	Model HD-	Parameter mH/A
HD3L-4T037	AIL-4T037	0.16/90	AOL-4T037	0.08/90	DCL-4T037	0.07/78
HD3L-4T045	AIL-4T045	0.12/120	AOL-4T045	0.06/120	DCL-4T045	0.54/95

4.2.2 Select Power Cable

The ground cable diameter must accord with the requirement in 4.3.5.4 of IEC 61800-5-1.

Table 4-4 Ground cable diameter

Power Cable Diameter S (mm^2)	S ≤ 2.5	2.5 < S ≤ 16	16 < S ≤ 35	S > 35
Ground Cable Minimum Diameter Sp (mm^2)	2.5	S	16	S/2

Refer to the table below to select the cable diameter of the power cable.

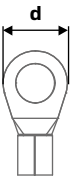
Table 4-5 Recommended cable diameter

Model	**Power Cable (mm^2)**	**Motor Cable (mm^2)**	**Ground Cable (mm^2)**
HD3L-2D2P2	6/2.5 (1)	2.5	6/2.5 (1)
HD3L-2D3P7	10/4 (1)	4	10/4 (1)
HD3L-2D5P5	25/6 (1)	6	16/6 (1)
HD3L-2D7P5	25/10 (1)	10	16/10 (1)
HD3L-2D011	25/16 (1)	16	16
HD3L-2T015	25	16	16
HD3L-2T018	25	25	16
HD3L-2T022	35	35	16
HD3L-2T030	50	35	25
HD3L-4T2P2	1.5	0.75	2.5
HD3L-4T3P7	2.5	1.5	2.5
HD3L-4T5P5	2.5	2.5	2.5
HD3L-4T7P5	4.0	4	2.5
HD3L-4T011	6.0	6	2.5
HD3L-4T015	6.0	10	2.5
HD3L-4T018	10	10	2.5
HD3L-4T022	16	16	16
HD3L-4T030	25	25	16
HD3L-4T037	25	35	16
HD3L-4T045	35	35	16
(1): The value before "/" corresponds to single phase input power, and the value after "/" corresponds to three phase input power.			

4.2.3 Select Power Cable Terminal

The power cable terminals use ring cable lug, and the specifications are shown in the table below.

Table 4-6 Power cable terminal data

Size	Screw Size	Tightening Torque (N·m)	Cable Lug Outer Diameter d (mm)	
F2	M4	1.2 - 1.5	≤9.9	
F3/F4	M5	2.5 - 3.0	≤12	
F5	M6	4.0 - 5.0	≤15.5	
F6	M8	9.0 - 10.0	≤24	

4.2.4 Power Terminal Description

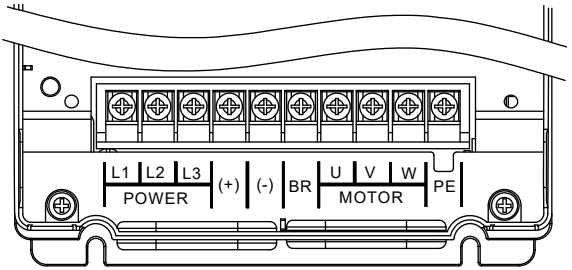


Figure 4-3 F2 size power terminal

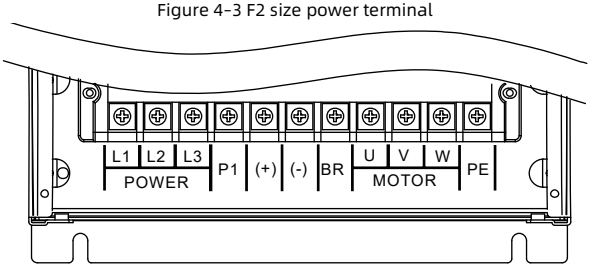


Figure 4-4 F3 - F6 size power terminal

Table 4-7 Power terminal description

Power Terminal	Description
L1, L2, L3	Three phase AC power input terminals
U, V, W	Output terminals, connect to three phase AC motor
P1, (+)	DC reactor connection terminals
(+), (-)	DC supply input terminals. DC input terminals of power regenerative unit
(+), BR	Brake resistor connection terminals
PE	Ground terminal, connect to the ground

4.2.5 Connect Power Cable

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 HD3L.

Connect the power cables as shown in the figure below.

- Refer to 4.2.1.2 to select MCCB and contactor.
- Refer to 4.2.1.3 to select the brake resistor.
- Refer to 4.2.1.4 to select the reactor.
- Refer to 4.2.2 to select the cable diameter of the power cable.
- Refer to 4.2.3 to select the terminals of the power cable.

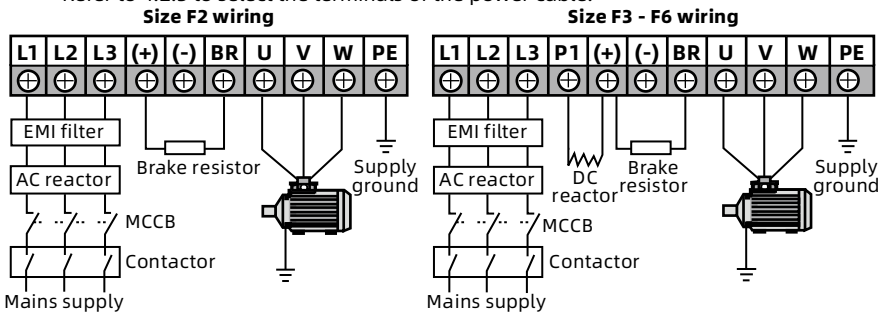


Figure 4-5 Power cable wiring

Note:

During trial running, confirm that the elevator runs up when the UP command is valid. If the elevator runs down, set F00.08 (running direction) = 1.

4.3 Connect Control Cable

Danger

- The control circuit and power circuit are basically insulated. Do not touch HD3L 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 the RS485/232 isolating converter which meets the safety requirement.
- Only connect the relay terminal to AC 220V voltage signal. Other control terminals are strictly forbiden for this connection.

4.3.1 Control Board Terminal Description

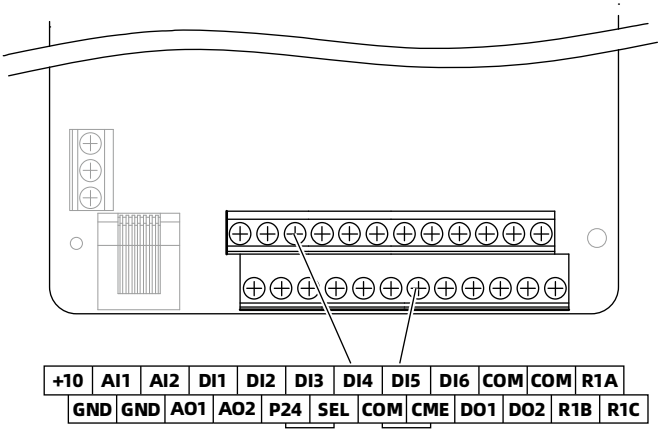


Figure 4-6 Control board terminals

Table 4-8 Control board terminal description

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

Note:

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

4.3.2 I/O Board Terminal Description

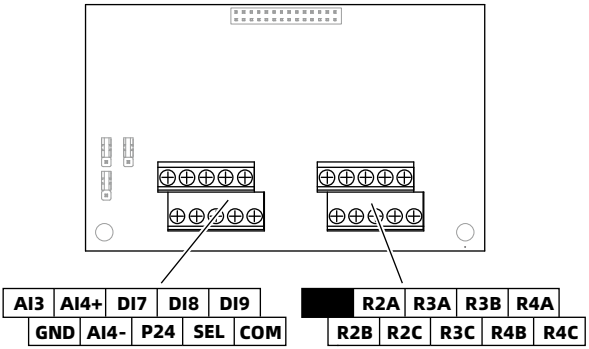


Figure 4-7 I/O board terminal

Table 4-9 I/O board terminal description

Terminal		Description
AI3	Analog input	Input voltage/current selectable Input voltage: -10 - +10V (AI3 input impedance 32kΩ, AI4 input impedance 34kΩ) Input current: 0 - 20mA (input impedance: 500Ω)
AI4+/AI4-	Analog difference input	
GND	Analog ground	GND isolated with COM
DI7 - DI9	Digital input	Programmable bipolar optional input signal Input voltage: 0 - 30VDC (input impedance: 4.7kΩ)
P24, COM	Digital power supply	Digital input use +24V as supply, max. output current is 200mA
SEL	Digital input common terminal	SEL and P24 are connected by default • Disconnected SEL and P24 when use external power to drive DI7 - DI9
R2A/R2B/R2C R3A/R3B/R3C R4A/R4B/R4C	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A • RB, RC: Normally closed. RA, RC: Normally open

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

4.3.3 Jumper Description

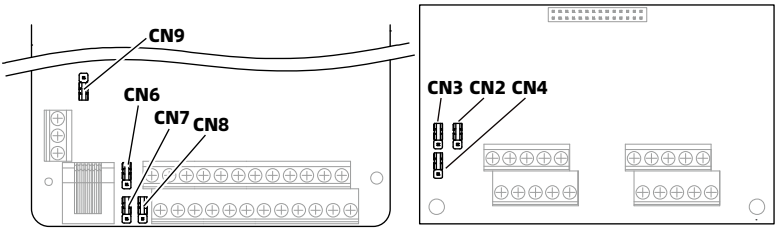
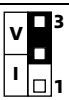
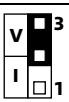
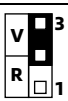


Figure 4-8 Jumper position

Table 4-10 Jumper description

Jumper	Description
Control board CN6 	AI2 can select voltage or current signal. • Pin 1&2 are short-circuited, AI2 inputs voltage signal (default). • Pin 2&3 are short-circuited, AI2 inputs current signal.
Control board CN7 	AO1 can select voltage or current signal. • Pin 1&2 are short-circuited, AO1 outputs voltage signal (default). • Pin 2&3 are short-circuited, AO1 outputs current signal.
Control board CN8 	AO2 can select voltage or current signal. • Pin 1&2 are short-circuited, AO2 outputs voltage signal (default). • Pin 2&3 are short-circuited, AO2 outputs current signal.
Control board CN9 	SCI communication can select proper resistance. • Pin 1&2 are short-circuited, select the proper resistance. • Pin 2&3 are short-circuited, no resistance (default).
I/O board CN2 	AI3 can select voltage or current signal. • Pin 1&2 are short-circuited, AI3 inputs current signal. • Pin 2&3 are short-circuited, AI3 inputs voltage signal (default).
I/O board CN3 	AI4 can select voltage or current signal. • Pin 1&2 are short-circuited, AI4 inputs current signal. • Pin 2&3 are short-circuited, AI4 inputs voltage signal (default). Note: Pin 2&3 of CN4 need to be short-circuited.
I/O board CN4 	AI4 can select input. • Pin 1&2 are short-circuited, AI4 input is invalid. • Pin 2&3 are short-circuited, AI4 inputs user setting analog (default).

4.3.4 Default IO 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 analog signal cable must be shielded twisted pair.

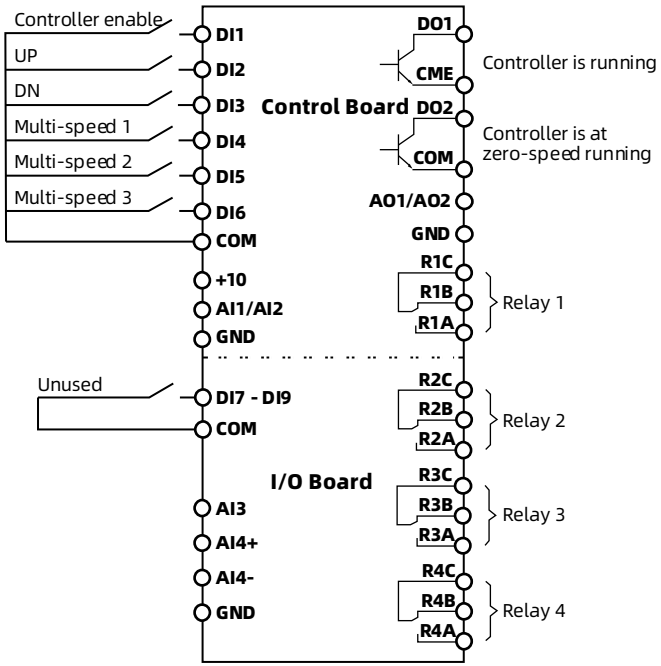


Figure 4-9 HD3L wiring

4.3.5 DI Terminal Wiring

4.3.5.1 Dry Contact Wiring

The wiring is shown in the figure below.

- Using internal 24V power supply: Short circuit SEL and 24V (default) with a shorting piece.
- Using external power supply: Remove the shorting piece between SEL and 24V, connect SEL to the DC power supply.

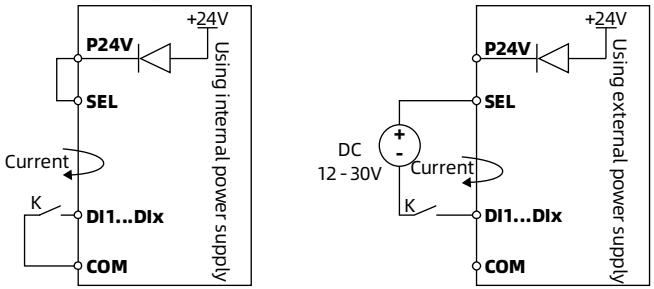


Figure 4-10 Dry contact wiring

4.3.5.2 NPN Type Wiring

The external controller is NPN type common emitter output, the wiring is shown in the figure below.

- Using internal 24V power supply: Short circuit SEL and 24V (default) with a shorting piece.
- Using external power supply: Remove the shorting piece between SEL and 24V, connect SEL to the DC power supply.

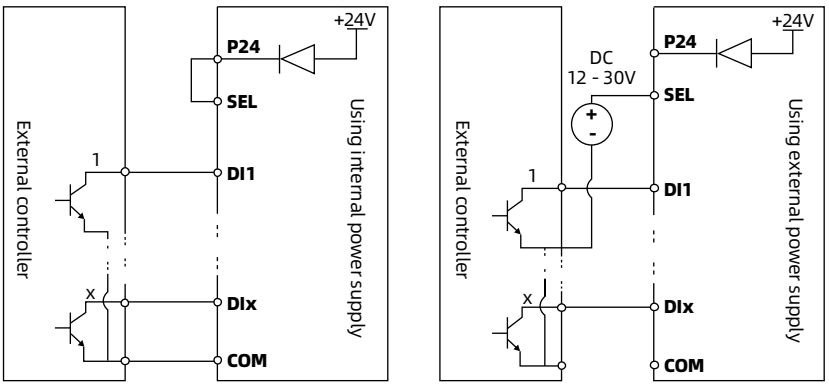


Figure 4-11 NPN type wiring

4.3.5.3 PNP Type Wiring

The external controller is a PNP type common emitter output, the wiring is shown in the figure below.

- Using internal 24V power supply: Remove the shorting piece between SEL and 24V, and short circuit the SEL and COM with a shorting piece.
- Using external power source: Remove the shorting piece between SEL and 24V, and connect SEL to a DC power supply.

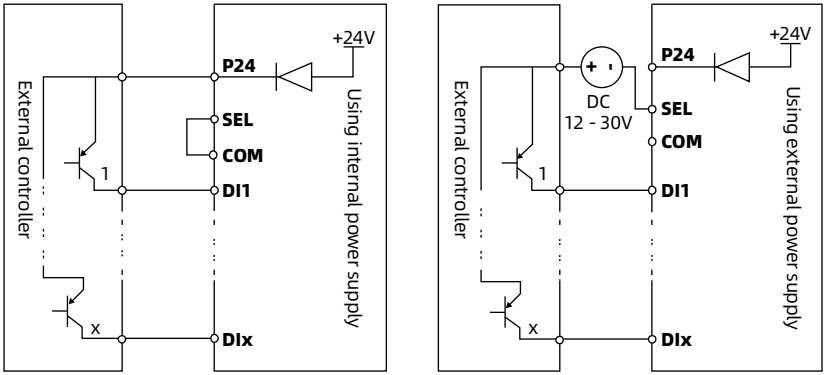


Figure 4-12 PNP type wiring

4.3.6 DO Terminal Wiring

Digital Output Wiring

DO1 and DO2 are open collector outputs that can be used with either an internal 24V power supply or an external power supply, the wiring is shown in the figure below. Take DO1 as an example.

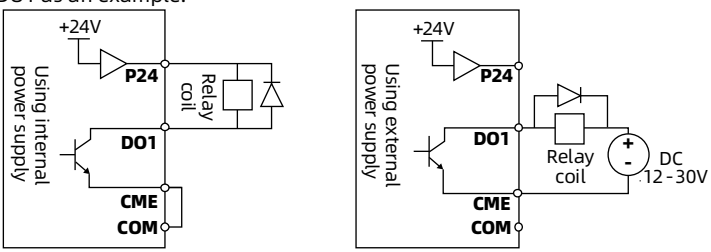


Figure 4-13 DO1 wiring

4.3.7 AI Terminal Wiring

AI1 Wiring

The AI1 is voltage input and the range is 0 - 10V, the wiring is shown in the figure below.

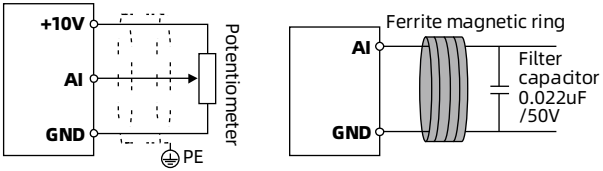


Figure 4-14 AI1 wiring (voltage input)

Note:

1. To reduce the interference and attenuation of control signal, the length of the control cable should be within 50m, and the shield should be reliably grounded.
2. In serious interference occasions, the analog input signal should add filter capacitor and ferrite core, as shown in Figure 4-14.

AI2/AI3 Wiring

AI2 and AI3 default voltage inputs, range -10 - +10V.

- When using internal 10V power supply, the wiring is the same as AI1.
- When using externally supplied +/-10V power supply, the wiring is shown in the figure below.

AI2 and AI3 can be set as current inputs with a range of 0 - 20mA, the wiring is shown in the figure below.

- AI2 current input: Short circuit 2, 3pin of jumper CN6 on the control board.
- AI3 current input: Short circuit 1, 2pin of jumper CN2 on the I/O board.

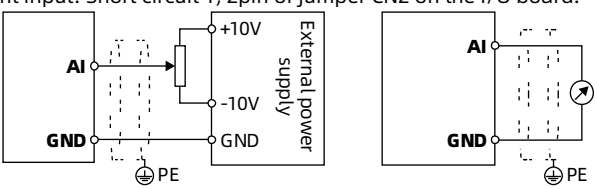


Figure 4-15 AI2/AI3 wiring (voltage/current input)

AI4 Wiring

AI4 is used by default to set analog input terminal.

AI4 default voltage inputs, range -10 - +10V. The wiring is shown in the figure below.

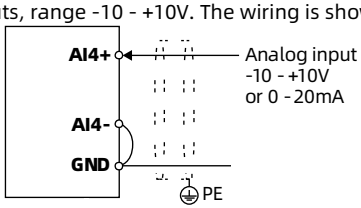
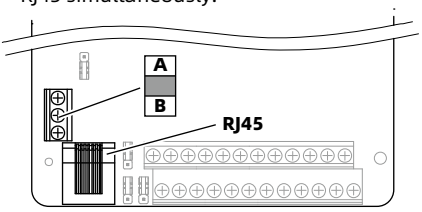


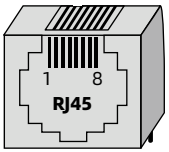
Figure 4-16 AI4 wiring

4.4 Connect Communication Terminal

Do not use communication terminal and RJ45 simultaneously.



Terminal	Description
A	485+
B	485-



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

4.5 Meet EMC Requirement of Installtion

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. HD3L 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 should be 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 are divided into different EMC areas according to electrical characteristics. Recommended installation positions are shown in the figure below.

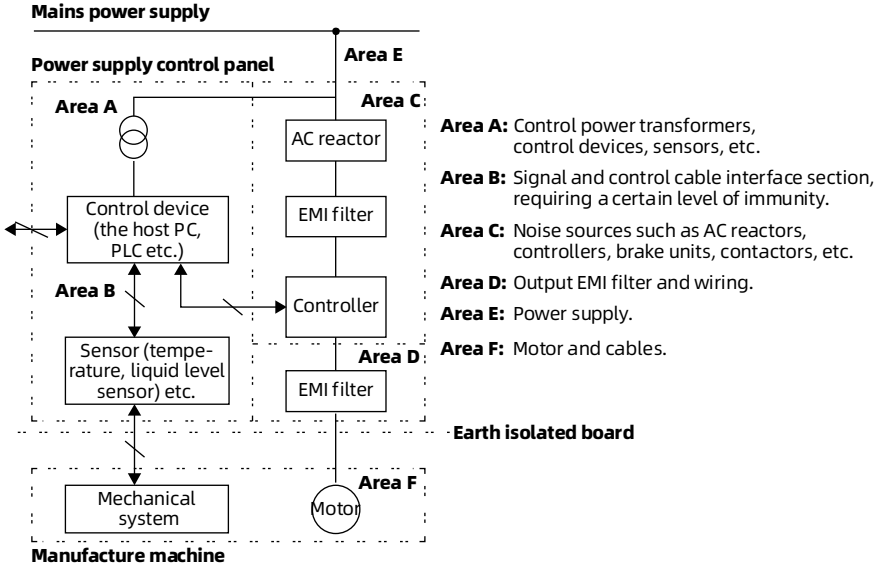


Figure 4-17 System wiring

- 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 Dec.oupling 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.
- Bus cable (such as RS485) and signal cable 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 the figure below.
Distribute the power supply cables, motor cables and control cables in different pipelines.

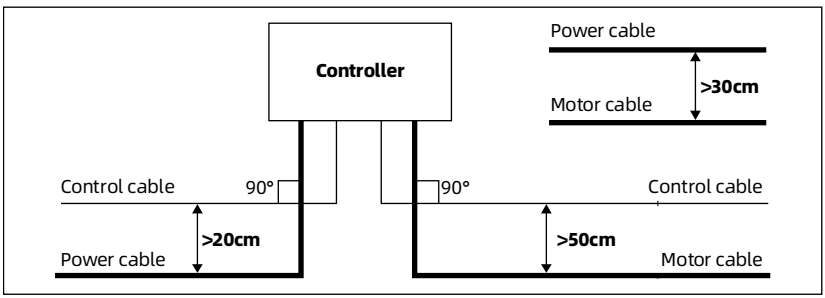


Figure 4-18 System wiring

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 the figure below.

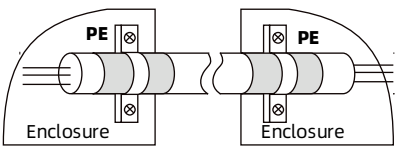


Figure 4-19 Shielded cable connection

4.5.3 Motor Wiring

The longer cable between the controller and the motor is, the higher frequency leakage current will be, causing the controller 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 4-11.

Table 4-11 Carrier frequency and the cable length between controller and motor

Cable Length	<30m	30 - 50m	50 - 100m	≥100m
Carrier Frequency	10 - 15kHz	5 - 10kHz	2 - 5kHz	<2kHz

The cross sectional area (CSA) of controller cables should refer to Table 4-2, on page 21. The controller should be derated if the 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 increases, do the current to ground and capacitance.

4.5.4 Ground Connection

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

Do not share the ground cable (A) with other power equipment. The ground pole (C) can be shared, but each has a dedicated ground pole (B) for the best effect, as shown in the figure below.

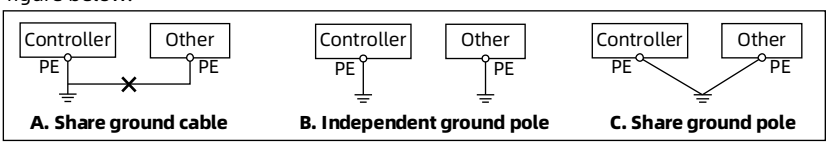


Figure 4-20 Recommended ground mode

When using more than one controller, be careful not to loop the ground wire as shown in the figure below.

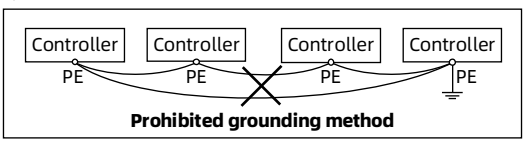


Figure 4-21 Prohibited grounding method

4.5.5 EMI Filter

The EMI filter should be used in equipment that may generate strong EMI or equipment that is sensitive to 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 satisfy the conducting emission and conducting sensitivity in EMC standard but also 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 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. **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

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 Dec.reased 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 utenil to reduce RF interference.

The wiring distance between the controller and the motor should be as short as possible, as shown in the figure below.

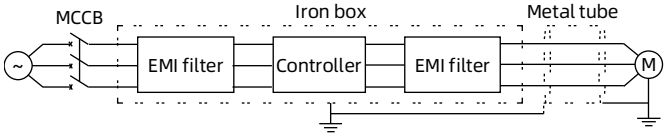


Figure 4-22 Reducing RF interference

4.5.7 Reactor

AC Input Reactor

- The function of AC input reactor:
- Improve the power coefficient on the input side.
- Effectively eliminate high-order harmonics on the input side and prevent damage to other equipment due to voltage waveform distortion.

Eliminate input current imbalance caused by unbalanced power supply phases.

DC Reactor

The function of DC reactor:

- Improve the power coefficient on the input side.
- Improve the overall efficiency and thermal stability of the controller.
- Effectively eliminate the impact of high-order harmonics on the input side on the controller.
- Reduce external conduction and radiation interference.

AC Output Reactor

- When the motor cable exceeds 100 meters, the leakage current on the cable causes the controller to report a fault.
- At this time, please install an output AC reactor.

Chapter 5 Operation Instructions

- Only when the terminal cover of HD3L 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 HD3L starts.
- Keep away from HD3L if the auto-restart function is enabled at power outage.
- To change the main control PCBA, correctly set the parameters before operating.

- Do not check or detect the signal during HD3L running.
- Do not randomly change HD3L parameter setting.
- Please thoroughly complete all control debugging and testing, make all adjustments and conduct a full safety assessment before switching the run command channel of HD3L.
- Do not touch the energy-depletion braking resistor due to the high temperature.

5.1 Function Description

Note:
In the following sections, you may encounter control, running and status of HD3L description many times.
Please read this section. It help you to correctly understand and use the functions to be discussed.

5.1.1 Operation Mode

The operation mode defines how HD3L receives run commands (start or stop command) and speed command. F00.05 sets the operation mode.

Operation Mode	Description
Keypad control	The run command is controlled by **RUN** and **STOP** keys of the keypad. And the run speed is set by F00.07.
Terminal analog control	The run command is controlled by UP and DN of the terminal. And the run speed is set by AI1 - AI4 terminals.
Terminal speed control	The run command is controlled by UP and DN of the terminal. And the run speed is set by MS1 - MS3 multi-step speed terminal combination.

5.1.2 Control Mode

HD3L has two control modes which are V/f and SVC control (refer to F00.01 for more detail).

5.1.3 Controller Status

Controller Status	Description
Stop status	After HD3L is switched on and initialized, if no run command inputs or the stop command is given, there will be no output from U/V/W of HD3L and the run status indicator on the keypad flashes.
Run status	HD3L starts output from U/V/W terminals after it receives the run command. And the run status indicator on the keypad lights.
Motor parameters auto-tuning	Set F07.06 = 1 or 2, HD3L receives the run command then enter motor parameters auto-tuning status. If the auto-tuning process is completed, the controller enters stop status.
Fault alarm status	HD3L has fault.
Under-voltage status	HD3L is under-voltage.

5.1.4 Controller Running Mode

Running Mode	Description
Auto-tuning running	Set F07.06 = 1 or 2 and press **RUN** key to enter the auto-tuning running.
MS speed running	The run speed is set by MS1 - MS3 in combination or communication. This mode is accessible when F00.05 = 2.
Inspection running	When inspection signal is valid, the speed sets by F05.08 (inspection run speed). This mode is accessible when F00.05 = 1 or 2.
Emergency running	When emergency signal is valid, the speed sets by F05.09 (emergency speed). This mode is accessible when F00.05 = 1 or 2.
Normal running	Controlled by keypad (F00.05 = 0) or terminal analog (F00.05 = 1).

5.2 Keypad Description

HD3L uses LED keypad by default, as shown in the figure below.

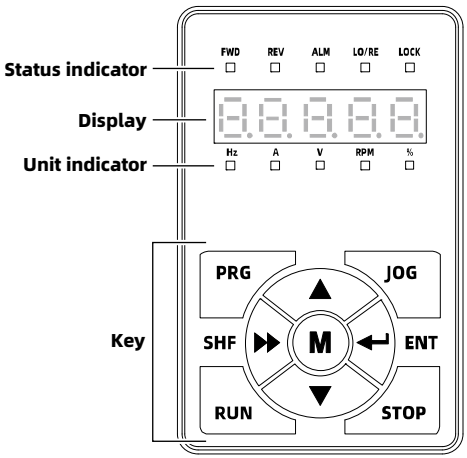


Figure 5-1 Keypad layout

5.2.1 Key Description

Table 5-1 Key description of keypad

Key		Function
PRG	**Program/exit**	• Press this key to enter or exit the menu setting • ress this key to return to the previous menu
JOG	**Jog**	• In keypad control, press this key to jog run the elevator controller
RUN	**Run**	• In keypad control, press this key to run the elevator controller
STOP	**Stop/reset**	• In keypad control, press this key to stop the elevator controller • When the elevator controller reports a fault, clear the fault, then press this key to reset the fault
M	**Multi-function key**	• Set certain function by F00.06
▲	**Increment**	• Press this key to increase the present value
▼	**Decrement**	• Press this key to decrease the present value
▶▶	**Shift**	• Press this key to move the setting bit of the parameter or parameter value • Press this key to switch stop and run display parameter
↵	**Enter/confirm**	• Press this key to enter the next level menu • Press this key to save changes and return to the previous menu

5.2.2 Indicator Description

The kaypad includes 5 status indicators and 5 unit indicators.

The indicator descriptions are shown in the table below.

Table 5-2 Status indicator description

Status Indicator		■ On	▣ Flashing	□ Off
FWD	Forward	HD3L is forward running at the moment	The start of HD3L is forward running next time	
REV	Reverse	HD3L is reverse running at the moment	The start of HD3L is reverse running next time	
ALM	Alarm	HD3L is faulty at the moment		HD3L is well at the moment
LO/RE	Remote or local	Indicate HD3L isn't in keypad control mode		HD3L is in keypad control mode
LOCK	Password	User password takes effect	/	No user password or unlocked status

Table 5-3 Status indicator description

Unit Indicator		■ On	▣ Flashing	□ Off
Hz	Frequency	The parameter unit is Hz	The present parameter is output frequency	/
A	Current	The parameter unit is A	/	/
V	Voltage	The parameter unit is V	/	/
RPM	Rotation speed	The parameter unit is rpm	The present parameter is running rpm	
%	Percentage	The parameter unit is %	/	/

5.2.3 Display Description

The keypad of HD3L has five LED displays and their meanings are shown in table below.

Table 5-4 LED display meaning

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

5.2.4 Display Status

The keypad can display parameters at stop, run, edit, alarm and special status.

Parameter Display Status at Stop/Run

When HD3L is in stop/run status, the keypad displays stop/run status and its parameters, and the unit indicator displays unit, as shown in Figure 5-2.

Other parameters stop (F15.08 - F15.13)/run (F15.02 - F15.07) can be displayed by pressing ▶▶.

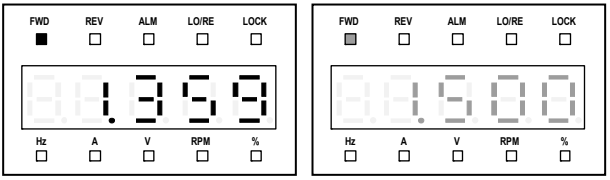


Figure 5-2 Display status of stop (left) and run (right)

Function Parameter Editing Status

At stop, run or fault alarm status, press **PRG** to enter function parameter edit status (see the description of F01.00 and the user password unlock and modify of section 5.2.3), as shown in the figure below.

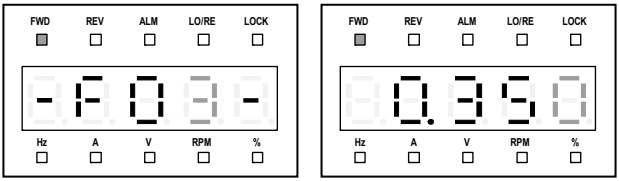


Figure 5-3 Parameter edit status

Fault Alarm Status

If HD3L detects a fault signal, the keypad enters the fault alarm status and flashes, LED displays the fault code, as shown in the figure below.

The fault history can be checked by entering group F17 (F17.11 - F17.27).

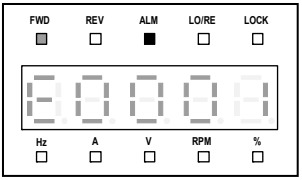
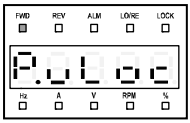


Figure 5-4 Fault alarm status

The reset at fault can be achieved by pressing **STOP** key or the external terminal.

Special Display Status

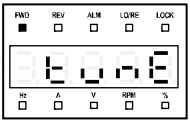
The special display status includes setting and clearing password status, parameter uploading and downloading, power on initialization, parameter auto-tuning, keypad inspection and restoring to factory setting parameter, as shown in the figure below.



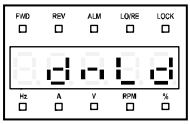
Password unlocked

Password cleared

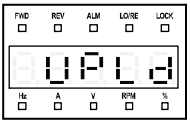
Set password success



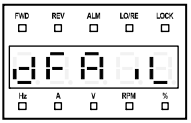
Parmeter auto-tuning



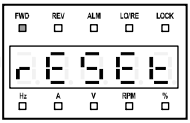
Download parameters



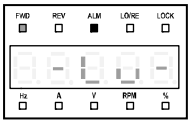
Upload parameters



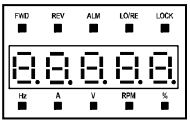
Parameter download error



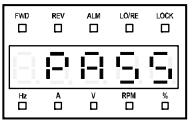
Restore factory setting



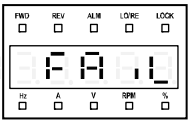
DC bus under-voltage



Power on initialization



Keypad inspection success



Keypad inspection error

Figure 5-5 Special display status

5.2.5 Keypad Operation Instructions

5.2.5.1 Switch Four-level Menu

Four-level menu: **Function group (first level) → Parameter group (second level) → Parameter (third level) → Parameter value (fourth level)**.

Refer to the figure below to switch the four-level menu, and the key descriptions are shown in the table below.

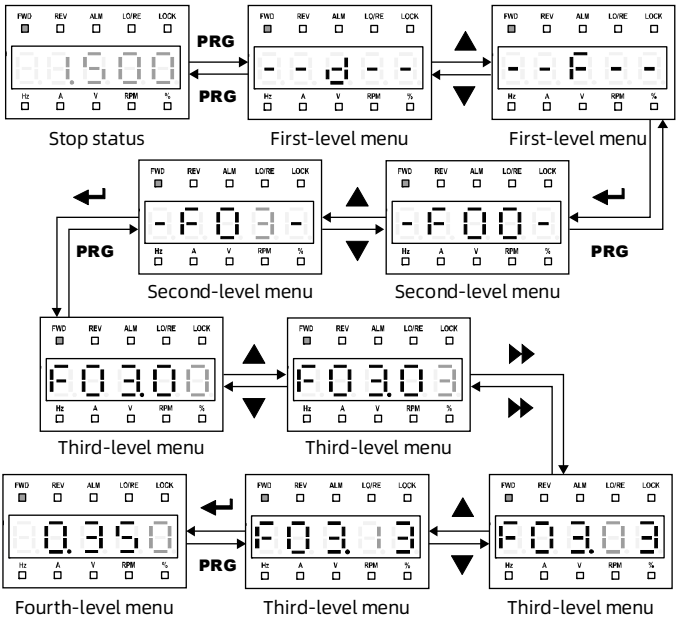


Figure 5-6 Switch the four-level menu

Table 5-5 Key description

Key	First Level Menu	Second Level Menu	Third Level Menu	Fourth Level Menu
PRG	Faulty: Return to the fault display No Fault: 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 the third level menu
↵	Enter to second level menu	Enter to third level menu	Enter to fourth level menu	Save the present value and return to third level menu
▲	Cycle function group: d-F-y	Increase parameter group, press once to increase by 1	Increase parameter, press once to increase by 1	Increase parameter value, press once to increase by 1
▼	Cycle function group: y-F-d	Decrease parameter group, press once to decrease by 1	Decrease parameter, press once to decrease by 1	Decrease parameter value, press once to decrease by 1
▶▶	Invalid	Invalid	Cycle switch parameter: Unit, ten	Cycle switch parameter value: Unit, ten thousand, thousand, hundred, ten

5.2.5.2 Set Parameter

For example, to modify the setting value of F00.07 from 1.500m/s to 1.000m/s.

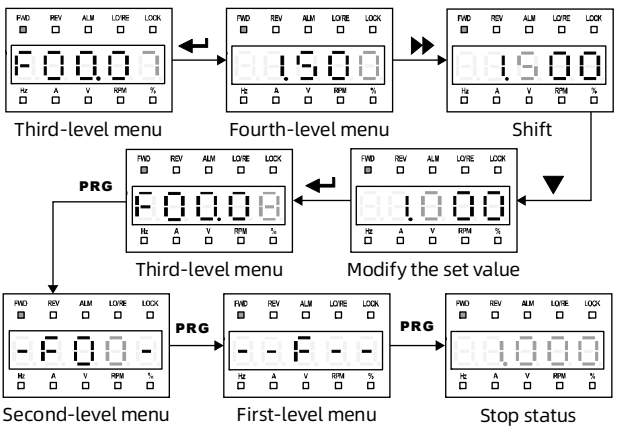


Figure 5-7 Set parameters

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

- The function parameter can't be modified, such as the actual detected parameters or recorded parameters etc.
- Only when the controller stops can the function parameter be modified.
- Only unlock password can the function parameter be edited due to the valid password.

5.2.5.3 Switch Display Parameters

The keypad can display six stop parameters (F15.08 - F15.13) in loop. Take the default parameter as an example, Figure 5-8 shows the switching process at stop status.

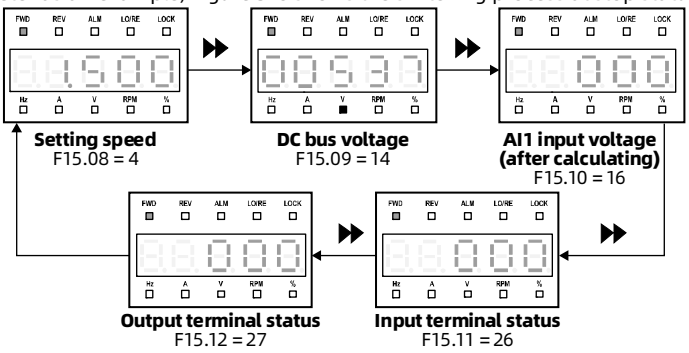


Figure 5-8 Switch display parameters at stop status

5.2.5.4 Unlock User Password

F01.00 = non-zero, press **PRG** key to exit to stop/run display status, or detect no operation on the keypad for 5 minutes, the user password take effects. The **LOCK** indicator of keypad will be lighting.

The operation of unlock user password is as shown in the figure below which takes 4 as the user password.

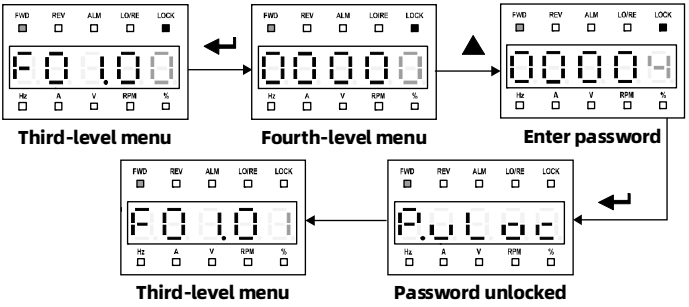


Figure 5-9 Unlock user password

5.2.5.5 Change User Password

If no password, directly modify the value of F01.00 according to Figure 5-10.
If there is password, unlock the password according to Figure 5-9. When the lock successfully displays "F01.01", set a new password according to Figure 5-10 which takes "02004" as password example.

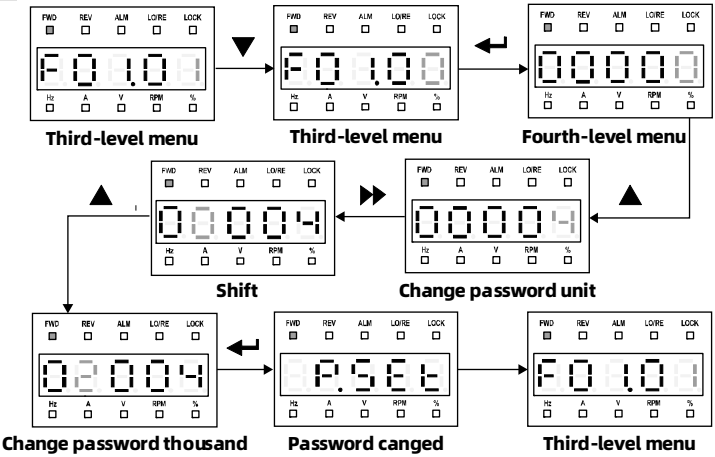


Figure 5-10 Change user password

5.2.5.6 Clear User Password

If there is password, unlock according to Figure 5-9. When unlock successfully, the keypad displays "F01.01", clear the user password according to Figure 5-11.

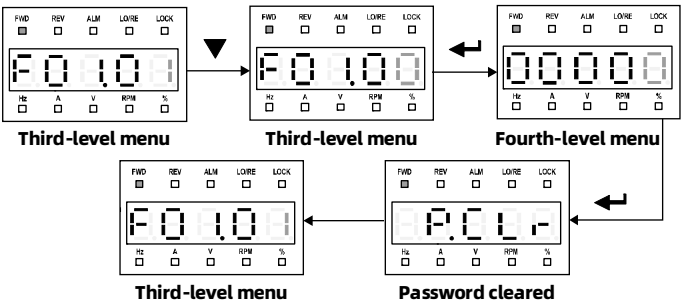
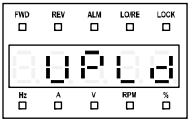


Figure 5-11 Clear user password

5.2.5.7 Upload and Download Parameters

Upload

When F01.03 = 1, the keypad displays "UPLd". When the upload is finished, the keypad displays F01.00.

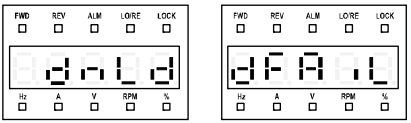


Upload parameter

Figure 5-12 Upload parameters

Download

When F01.02 = 2, the keypad displays "dnLd". When the download is finished, the keypad displays F01.03.



Download parameter Parameter download failed

Figure 5-13 Download parameters

Note:

1. When downloading parameters, it displays "dFAiL" which means that the EEPROM storage parameters of keypad does not match with function parameters of HD3L. First, upload the setting value of the correct parameter to the EEPROM of keypad, and then download.
2. When uploading/downloading parameters, it displays "E0022" and flashing which means EEPROM fault. The keypad displays the next parameter 10s later. The troubleshooting is in Chapter 8 (on page 91).

Chapter 6 Parameter Description

6.1 Group d: Display Parameter

6.1.1 d00: Status Display Parameters

Ref. Code	Function Description	Setting Range [Default]
d00.00	**Controller series**	**[Actual value]**
d00.01	**Software version of DSP**	**[Actual value]**
d00.02	**Special software version of DSP**	**[Actual value]**
d00.03	**Software version of the keypad**	**[Actual value]**
d00.04	**Elevator running status**	**[Actual value]**
	Display the elevator running status in 16-bit binary. **Bit0: Controller enable** 0: Disable 1: Enable **Bit1: Inspection run** **Bit2: MS run** **Bit3: Analog run** 0: No 1: Yes **Bit4 - Bit7: Unused** **Bit8: Brake feedback input** **Bit9: Contactor feedback input** **Bit10 - Bit11: Unused** **Bit12 - Bit14: MS terminal 1 - 3** 0: Invalid 1: Valid **Bit15: Emergency run** 0: No 1: Yes	
d00.05	**Rated current of HD3L**	**[Actual value]**
d00.06	**Controller status**	**[Actual value]**
	Display HD3L status in 16-bit binary. **Bit0: Controller fault** 0: No fault 1: Fault **Bit1: Run/stop** 0: Stop 1: Run **Bit2: UP** **Bit3: DN** 0: No 1: Yes **Bit5&Bit4: Acc./Dec./constant** 00: Constant 01: Acceleration 10: Deceleration 11: Unused **Bit6: Zero-speed signal** **Bit7: Zero-speed running** 0: Invalid 1: Valid **Bit8: Auto-tuning** 0: Not in auto-tuning 1: In auto-tuning **Bit9: Speed within FAR** 0: No 1: Yes **Bit10: Ready to run** 0: Not ready 1: Ready **Bit11: Brake output** **Bit12: Contactor output** 0: Invalid 1: Valid **Bit13 - Bit15: Unused**	

6.1.2 d01: Drive Status Parameters

Ref. Code	Function Description	Setting Range [Default]
d01.00	**Control mode**	**[Actual value]**
	Display cotrol mode.	
d01.01	**Setting speed (m/s)**	**[Actual value]**
	Display setting speed.	
d01.02	**Setting speed (after Acc./Dec.) (m/s)**	**[Actual value]**
	Display speed which is calculated by Acc./Dec. S curve.	
d01.03	**Feedback speed (m/s)**	**[Actual value]**
	Display actual speed of elevator.	
d01.04	**Setting frequency**	**[Actual value]**
	Display setting frequency.	
d01.05	**Setting frequency (after Acc./Dec.)**	**[Actual value]**
	Display frequency (after Acc./Dec.).	
d01.06	**Output frequency**	**[Actual value]**
	Display output frequency.	
d01.07	**Setting RPM**	**[Actual value]**
	Display setting RPM.	
d01.08	**Running RPM**	**[Actual value]**
	Display running RPM.	
d01.10	**Output voltage**	**[Actual value]**
	Display output voltage.	
d01.11	**Output current**	**[Actual value]**
	Display output current.	
d01.14	**DC bus voltage**	**[Actual value]**
	Display DC bus voltage.	

6.1.3 d02: Analog Status Display Parameters

Ref. Code	Function Description	Setting Range [Default]
d02.00	**AI1 voltage**	**[Actual value]**
	Display AI1 input voltage.	
d02.01	**AI1 voltage (after calculating)**	**[Actual value]**
	Display A1 input voltage which is calculated by the gain, bias and filter.	
d02.02	**AI2 voltage**	**[Actual value]**
	Display AI2 input voltage. When selects current input, -10.00V corresponds to 0mA, and 10.00V corresponds to 20mA.	
d02.03	**AI2 voltage (after calculating)**	**[Actual value]**
	Display AI2 input voltage which is calculated by the gain, bias and filter.	
d02.08	**AO1 output**	**[Actual value]**
	Display AO1 output. When selects current output, 0V corresponds to 0mA, and 10.00V corresponds to 20mA.	

6.1.4 d03: Running Status Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d03.00</td><td>Heatsink temperature</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display heatsink temperature.</td></tr>
<tr><td>d03.01</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 channels which are in the below table.
• 0: Digital input terminals disconnects with common terminals.
• 1: Digital input terminals connects with common terminals.
<table>
<tr><td>Bit11</td><td>Bit10</td><td>Bit9</td><td>Bit8</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>DI9</td><td>DI8</td><td>DI7</td><td>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
</table></td></tr>
<tr><td>d03.02</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 channels which are in the below table.
• Positive logic: 0 stands for invalid while 1 stands for valid.
• Negative logic: 0 stands for valid while 1 stands for invalid.
<table>
<tr><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>RLY4</td><td>RLY3</td><td>RLY2</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>d03.03</td><td>Modbus status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display Modbus communication status.
0: Normal.
1: Communication timeout.
2: Incorrect data frame head.
3: Incorrect data frame checking.
4: Incorrect data frame content.</td></tr>
<tr><td>d03.04</td><td>Total time at power-on</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display total time at power-on, the unit is hour.</td></tr>
<tr><td>d03.05</td><td>Total running time</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display total running time, the unit is hour.</td></tr>
<tr><td>d03.06</td><td>Running times</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display the running times of HD3L.</td></tr>
<tr><td>d03.07</td><td>Present fault</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display present fault.</td></tr>
</table>

6.2 Group F: General Parameters

6.2.1 F00: Basic Parameters

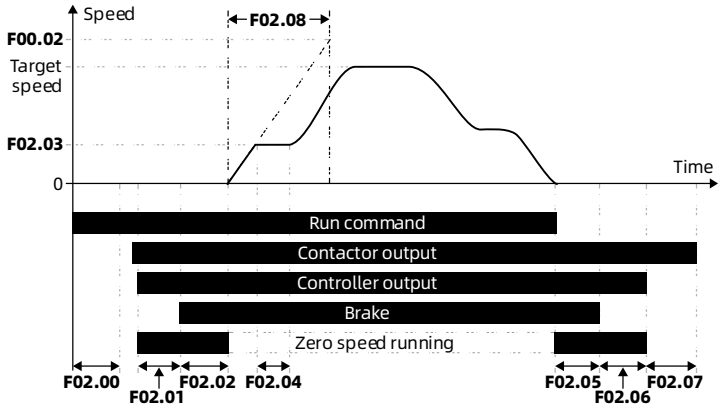
Ref. Code	Function Description	Setting Range [Default]
F00.00	**Motor type**	**0 [0]**
	0: Asyn. motor.	
F00.01	**Motor control mode**	**0 - 6 [1]**
	0: V/f control. Constant voltage/frequency ratio control. • It is applicable for special elevator occasion. This mode does not need the encoder and the control effect is not so good as the vector control. • When select V/f control, properly set the V/f control parameter of group F07 to achieve proper efficiency. 1: SVC control. Sensorless vector control. 5: SVC5 control. 6: SVC6 control. **Note:** Set motor parameter auto-tuning before selecting SVC control. Auto-tuning steps: Correctly set the motor parameters (F07.00 - F07.04), then start the motor parameter auto-tuning to obtain the right parameters. Set vector control parameters of group F08 to achieve excellent vector control efficiency.	
F00.02	**Rated speed of elevator**	**0.100 - 4.000 [1.500m/s]**
	Refers to nominal rated speed of elevator. • All of speed setting value in the parameters must <F00.02.	
F00.03	**Max. output frequency of HD3L**	**5.00 - 100.00 [50.00Hz]**
	Defines the max. frequency that HD3L is allowed to output. • Be careful to set reasonable parameters according to the nameplate of the motor and the actual operating conditions.	
F00.04	**Mechanical parameters of motor**	**10.0 - 6000.0 [60.0]**
	Defines the relationship between the elevator speed and the motor rotary speed. • The mechanical parameters are calculated based on the motor parameters. They determine the control precision and must be correctly set. The relationship of elevator speed and rotary speed of motor is: $\text{Elevator speed (m/s)} = \frac{\text{Rotary speed of motor (RPM)}}{60} \times \frac{\text{F00.04}}{1000}$ The formula for calculating F00.04 is: $\text{F00.04} = \frac{\pi \times D}{i \times \text{winding mode}}$ D: Diameter of motor (mm); i: Dec. rate; Winding mode: The way that the hoist cable is wound, set according to the actual elevator setting.	
F00.05	**Operating mode**	**0 - 3 [0]**
	0: Keypad control. • Controlled by pressing the **RUN** or **STOP** key of the keypad. Set the run speed in F00.07. 1: Terminal analog control. • The run command is controlled by UP and DN of the terminal, and the run speed is set by analog input terminals. 2: Terminal MS control. • The run command is controlled by UP and DN of the terminal, and the run speed is set by MS1 - MS3 multi-step speed terminal combination.	

Ref. Code	Function Description	Setting Range [Default]
	3: SCI speed setting.	
F00.06	**M-key function**	**0, 1 [0]**
	0: Unused. 1: UP/DN switch. Switch the UP/DN of motor with M key on the keypad.	
F00.07	**Speed setting of keypad**	**0.000 - F00.02 [1.500m/s]**
	F00.05 = 0, it sets the objective speed at running.	
F00.08	**Run direction**	**0, 1 [0]**
	0: The same as run command. 1: Opposite to run command.	

6.2.2 F01: Protection Parameters

Ref. Code	Function Description	Setting Range [Default]
F01.00	**User password**	**00000 - 65535 [0]**
	XXXXX: To enable the password protection function, set any non-zero number as the password. • Once the password is set, and detect that there is no press on the keypad within 5min, the password take effect. • To change the parameters, input correct password. Otherwise can not change any parameter via keypad, but only check. 00000: The factory setting and no user password. • If user unlocks the password, it means clearing the user password. • To unlock, change and clear the user password, refer to section 5.2.3.	
F01.01	**Menu mode**	**0, 1 [0]**
	0: Full menu mode. All parameters can be displayed. 1: Verify menu mode. Only parameters different from factory setting can be displayed.	
F01.02	**Function code parameter initialization**	**0 - 3 [0]**
	0: No operation. HD3L is in regular parameter read/write status. • Whether can change the parameter depends on the user password status and the actual running conditions of HD3L. 1: Restore to factory settings. • Except group F01, F07.00 - F07.14, F15.00, F17.11 - F17.27, group F18 and group Y. • **Steps:**Set F01.02 = 1, press ↵ key. The keypad dispalys "rESEt". Then the keypad displays parameters in stop status after finish restoring to factory setting. 2: Parameter download. • Except group F01, F17.11 - F17.27, group F18 and group Y. • Motor parameters, encoder parameters and magnetic pole angle etc. are downloaded. • Record the original parameters such as motor parameters, encoder parameters and magnetic pole angle etc. or restart parameter auto-tuning. 3: Clear fault information. The fault history of F17.11 - F17.27 is cleared.	
F01.03	**Keypad EEPROM parameter initialization**	**0, 1 [0]**
	0: No operation. HD3L is in regular parameter read/write status. 1: Upload the current parameter settings to the keypad EEPROM parameter. Note: Group F01, F17.11 - F17.27, group F18 and group Y do not upload.	

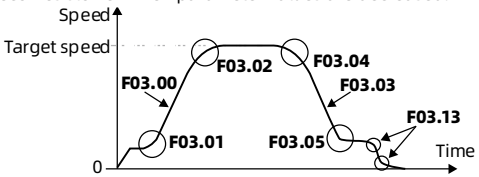
6.2.3 F02: Start and Stop Parameters



Ref. Code	Function Description	Setting Range [Default]
F02.00	**Start delay time**	**0.000 - 4.999 [0.000s]**
	When HD3L receives the run command, it waits for the delay time set by F02.00 and then start running. • When controlled by keypad (F00.05 = 0), F02.00 is invalid.	
F02.01	**Brake open delay time**	**0.000 - 4.999 [0.500s]**
	Defines the time from zero-speed running to output brake-open command. • F02.01 enables HD3L to enter running status before the brake open, so as to alleviate the impact at start.	
F02.02	**Retention time of start zero-speed**	**0.000 - 4.999 [0.000s]**
	Defines the retention time from brake-open to output with speed. During the retention time, the motor has output torque, which makes more comfortable.	
F02.03	**Start speed**	**0.000 - 0.400 [0.030m/s]**
	Defines the initial speed required for starting HD3L. • The start speed, if properly set, can minimize the start jerk.	
F02.04	**Retention time of start speed**	**0.000 - 4.999 [0.300s]**
	Defines the time in which HD3L runs at start speed (F02.03).	
F02.05	**Brake close delay time**	**0.000 - 4.999 [0.000s]**
	Defines the time interval from zero-speed running to output brake-closed command.	
F02.06	**Retention time of stop zero-speed**	**0.000 - 4.999 [0.300s]**
	Defines the time during which the motor runs at zero-speed and has output torque at stop, which makes more comfortable.	
F02.07	**Contactor close delay time**	**0.000 - 4.999 [0.000s]**
	Defines the running contactor delay release time after the run command is revoked.	
F02.08	**Start ramp time**	**0.000 - 2.000 [0.500s]**
	Defines the time that elevator takes to accelerate from zero to the rated speed (F00.02). • F02.08 = 0, the elevator starts from start speed directly.	

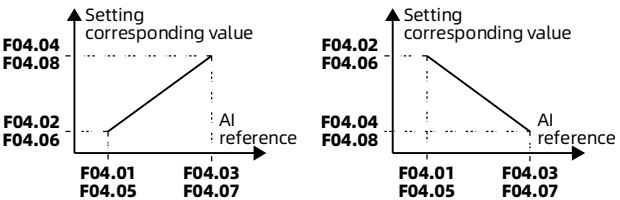
6.2.4 F03: Acc./Dec. Parameters

Ref. Code	Function Description	Setting Range [Default]
F03.00	**Acc. speed**	**0.020 - 9.999 [0.700m/s²]**
F03.01	**Start Acc. jerk**	**0.020 - 9.999 [0.350m/s³]**
F03.02	**End Acc. jerk**	**0.020 - 9.999 [0.600m/s³]**
F03.03	**Dec. speed**	**0.020 - 9.999 [0.700m/s²]**
F03.04	**Start Dec. jerk**	**0.020 - 9.999 [0.600m/s³]**
F03.05	**End Dec. jerk**	**0.020 - 9.999 [0.350m/s³]**

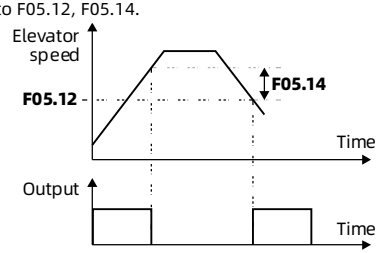
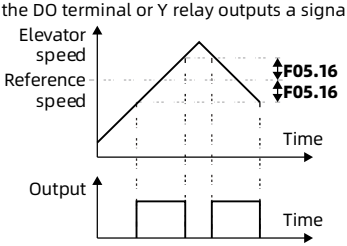
	F03.00 - F03.05 adjust the elevator speed via S-curve which can cushion the shock at elevator start/stop and improve riding comfort.
	• Acc. jerk: The change ratio of Acc.
	• See the right figure for the adjustment of S-curve.
	  • The S-curve becomes steeper when parameter values are increased;
	  • The S-curve becomes slower when parameter values are decreased.
	 	

F03.06	**Inspection Acc. speed**	**0.020 - 9.999 [0.200m/s²]**
	Defines the Acc. speed of elevator at inspection run mode.	
F03.07	**Inspection Dec. speed**	**0.020 - 9.999 [1.000m/s²]**
	Defines the Dec. speed of elevator at inspection run mode.	
F03.08	**Emergency Acc. speed**	**0.020 - 9.999 [0.200m/s²]**
	Defines the Acc. speed of elevator at emergency mode.	
F03.09	**Emergency Dec. speed**	**0.020 - 9.999 [0.200m/s²]**
	Defines the Dec. speed of elevator at emergency mode.	
F03.10	**Motor auto-tuning Acc. speed**	**0.020 - 9.999 [0.100m/s²]**
	Defines the Acc. speed at auto-tuning of the motor.	
F03.11	**Motor auto-tuning Dec. speed**	**0.020 - 9.999 [0.100m/s²]**
	Defines the Dec. speed at auto-tuning of the motor.	
F03.12	**Abnormal Dec. speed**	**0.020 - 9.999 [1.000m/s²]**
	Defines the Dec. speed at valid forced Dec. or wrong run mode.	
F03.13	**Stop Dec. jerk**	**0.020 - 9.999 [0.350m/s³]**
	Defines Dec. change rate from non-zero speed to zero speed. • It can adjust the smooth stop of the elevator and add riding comfort.	

6.2.5 F04: Analog Curve Parameters

Ref. Code	Function Description	Setting Range [Default]
F04.00	**Setting curve**	**0000 - 1111 [0000]**
	Unit: AI1 **Ten: AI2** **Hundred: AI3** **Thousand: AI4** • 0: Line 1. • 1: Line 2.	
F04.01	**Line 1 min.**	**0.0 - F04.03 [0.0%]**
F04.02	**Corresponding value of line 1 min.**	**0.0 - 100.0 [0.0%]**
F04.03	**Line 1 max**	**F04.01 - 100.0 [100.0%]**
F04.04	**Corresponding value of line 1 max.**	**0.0 - 100.0 [100.0%]**
F04.05	**Line 2 min.**	**0.0 - F04.07 [0.0%]**
F04.06	**Corresponding value of line 2 min.**	**0.0 - 100.0 [0.0%]**
F04.07	**Line 2 max.**	**F04.05 - 100.0 [100.0%]**
F04.08	**Corresponding value of line 2 max.**	**0.0 - 100.0 [100.0%]**
	F04.01 - F04.04 define line 1. F04.05 - F04.08 define line 2. • Both line 1 and line 2 can independently achieve positive and negative characteristics as shown in following figure. 	

6.2.6 F05: Speed Parameters

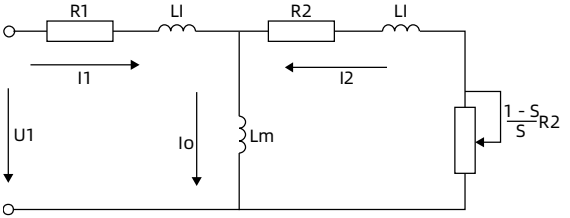
Ref. Code	Function Description	Setting Range [Default]
F05.00	**Multi-speed 0**	**0.000 - F00.02 [0.000m/s]**
F05.01	**Multi-speed 1**	**0.000 - F00.02 [0.000m/s]**
F05.02	**Multi-speed 2**	**0.000 - F00.02 [0.000m/s]**
F05.03	**Multi-speed 3**	**0.000 - F00.02 [0.000m/s]**
F05.04	**Multi-speed 4**	**0.000 - F00.02 [0.000m/s]**
F05.05	**Multi-speed 5**	**0.000 - F00.02 [0.000m/s]**
F05.06	**Multi-speed 6**	**0.000 - F00.02 [0.000m/s]**
F05.07	**Multi-speed 7**	**0.000 - F00.02 [0.000m/s]**
	F05.00 - F05.07 define the MS running speed which is used in MS run mode. • F00.02 defines the rated speed of elevator.	
F05.08	**Inspection run speed**	**0.000 - 0.630 [0.200m/s]**
	Defines the running speed of elevator in inspection mode.	
F05.09	**Emergency run speed**	**0.000 - F00.02 [0.100m/s]**
	Defines the running speed of elevator in the emergency run mode.	
F05.12	**FDT1**	**0.0 - 100.0 (F00.02) [90.0%]**
F05.13	**FDT2**	**0.0 - 100.0 (F00.02) [90.0%]**
F05.14	**FDT1 delay level**	**0.0 - 100.0 (F00.02) [1.0%]**
F05.15	**FDT2 delay level**	**0.0 - 100.0 (F00.02) [1.0%]**
	For accelerating, when the elevator running speed < F05.12 + F05.14, DO terminal or Y relay output signal. For decelerating, when the elevator running speed < F05.12, DO terminal or Y relay output signal. • F05.13, F05.15 refer to F05.12, F05.14. 	
F05.16	**Speed within FAR range**	**0.0 - 20.0 [1.0%]**
	When the elevator running speed is within the positive or negative detection width of the reference speed (F05.16), the DO terminal or Y relay outputs a signal. 	
F05.17	**Over-speed**	**80.0 - 120.0 (F00.02) [115.0%]**

Ref. Code	Function Description	Setting Range [Default]
F05.18	**Over-speed detection time**	**0.0 - 2.0 [0.2s]**
	When the actual elevator speed exceeds F05.17 and the duration time exceeds F05.18, HD3L alarms E0032 fault (motor over speed). • F05.18 = 0, HD3L does not detect motor over speed fault.	
F05.19	**Detection value of speed deviation**	**0.0 - 30.0 (F00.02) [20.0%]**
F05.20	**Detection time of speed deviation**	**0.0 - 2.0 [1.0s]**
	When the deviation of setting speed (after Acc./Dec.) and actual run speed of motor exceeds F05.19 and the duration time exceeds F05.20, HD3L alarms E0018 fault (excessive speed deviation). • F05.19 or F05.20 = 0, HD3L does not detect the excessive speed deviation fault of motor.	

6.2.7 F06: Weighing Compensation Parameters

Ref. Code	Function Description	Setting Range [Default]
F06.19	**Brake closing operation time in advance**	**0.000 - 1.999 [0.000s]**

6.2.8 F07: Asyn. Motor Parameters



R1 = F07.07 stator resistance
R2 = F07.08 rotor resistance
Io = F07.11 excitation current
LI = F07.09 leakage inductance
Lm = F07.10 mutual inductance
S = Slip ratio

The relationship between rated torque current, idling excitation current and rated current of motor is:

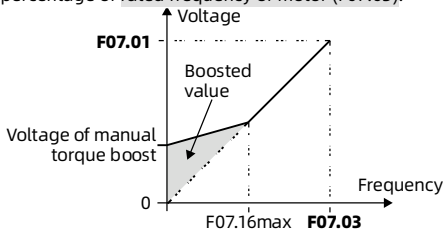
Rated torque current = F07.05 × F07.02

Idling excitation current $F07.11 = \sqrt{1 - F07.05^2} \times F07.02$

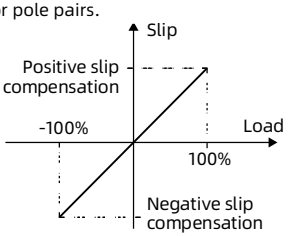
Mutual inductance $F07.10 = \frac{F07.01}{2\sqrt{3}\pi \times F07.03 \times F07.11} - F07.09$

Ref. Code	Function Description	Setting Range [Default]
F07.00	**Rated power of motor**	**0.2 - 400.0kW [Depend on HD3L]**
F07.01	**Rated voltage of motor**	**0V - HD3L rated voltage [Depend on HD3L]**
F07.02	**Rated current of motor**	**0.0 - 999.9A [Depend on HD3L]**
F07.03	**Rated frequency of motor**	**1.00 - 100.00 [50.00Hz]**
F07.04	**Rated RPM of motor**	**1 - 24000 [1440rpm]**
F07.05	**Power factor of motor**	**0.001 - 1.000 [Depend on HD3L]**
F07.06	**Motor parameter auto-tuning**	**0 - 2 [0]**

	0: Auto-tuning is disabled.
	1: Stationary auto-tuning.
	2: Rotary auto-tuning.
	Motor auto-tuning:
	• In the process of stationary auto-tuning, the stator resistance (F07.07), rotor resistance (F07.08) and leakage inductance (F07.09) are auto-measured and written into F07.07, F07.08 and F07.09 automatically.
	• For mutual inductance (F07.10) and idling excitation current (F07.11).
	  • At stationary auto-tuning (F07.06 = 1), it auto calculate according to F07.05 and F07.02, then write the result into F07.10 and F07.11.
	  • At rotary auto-tuning (F07.06 = 2), the motor is in rotary status and the auto-measured value will be written into F07.10 and F07.11.
	• When the motor is in rotary status, oscillation and even overcurrent might occur. In this case, press the **STOP** key to stop auto-tuning and then properly adjust the F07.21 (oscollation-suppression mode) and F07.22 (oscollation-suppression coefficient) to mitigate the possible oscillation.
	Note: The auto-tuning is enabled only in keypad control (F00.05 = 0).	

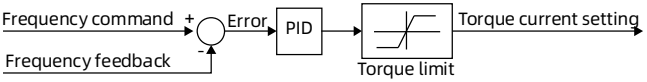
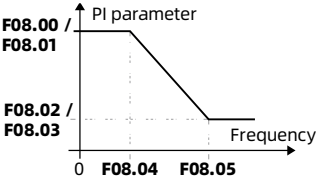
Ref. Code	Function Description	Setting Range [Default]
	Auto-tuning steps: • 1. Input correct motor parameters as per its nameplate (F07.00 - F07.04). • 2. F07.06 = 2, set proper Acc. speed (F03.10) and Dec. speed (F03.11) and make sure the motor is disconnected with the load for security. • 3. Set F07.06 = 1 or 2, then press the ↵ key, and there with press **RUN** key to start auto-tuning. The keypad will display "tunE". 4. When the auto-tuning is completed, the keypad displays the parameters of stop status and F07.06 resets to 0.	
F07.07	**Stator resistance of motor**	**0.000 - 65.535Ω [Depend on HD3L]**
F07.08	**Rotor resistance of motor**	**0.000 - 65.535Ω [Depend on HD3L]**
F07.09	**Leakage inductance of motor**	**0.0 - 6553.5mH [Depend on HD3L]**
F07.10	**Mutual inductance of motor**	**0.0 - 6553.5mH [Depend on HD3L]**
F07.11	**Idling excitation current of motor**	**0.0 - 999.9A [Depend on HD3L]**
F07.12	**Core saturation coefficient 1 of motor**	**0.00 - 0.50 [0.50]**
F07.13	**Core saturation coefficient 2 of motor**	**0.00 - 0.75 [0.75]**
F07.14	**Core saturation coefficient 3 of motor**	**0.00 - 1.20 [1.20]**
F07.15	**Motor torque boost**	**0.1 - 30.0 [2.0%]**
F07.16	**Torque boost end-point of motor**	**0.1 - 50.0 (F07.03) [50.0%]**
	To compensate the torque drop at low frequency, boost the voltage so as to boost the torque. F07.16 is relative to percentage of rated frequency of motor (F07.03). 	

Ref. Code	Function Description	Setting Range [Default]
F07.17	**Slip compensation gain of motor**	**0.0 - 300.0 [100.0%]**
F07.18	**Slip compensation filter time of motor**	**0.1 - 10.0 [0.1s]**
F07.19	**Slip compensation limitation of motor**	**0.0 - 250.0 [200.0%]**

	The slip of motor changes with the load torque, which results in the variance of motor speed. Slip compensation (HD3L will auto adjust its output frequency according to the motor load torque) can reduce the influence.
	• In driving status (actual speed < setting speed) and in generating status (actual speed > setting speed), the slip compensation gain (F07.17) can be increased gradually.
	  • The value of auto slip compensation depends on rated slip of motor, so make sure the rated frequency (F07.03) and rated RPM (F07.04) are set correctly.
	• Range of slip compensation = F07.19 × rated slip.
	• Rated slip = F07.03 - F07.04 × Np / 60.
	  • Np is the number of motor pole pairs.
	 	

F07.21	**Oscillation-suppression mode of motor**	**0, 1 [0]**
	0: Depend on exciting component. 1: Depend on torque component.	
F07.22	**Oscillation-suppression coefficient of motor**	**0 - 200 [100]**
	This function is used to damp oscillation when output current is continually unstable. • This function helps to keep the motor running smoothly through correctly adjusting the setting of F07.22.	

6.2.9 F08: Motor Vector Control Speed-loop Parameters

Ref. Code	Function Description	Setting Range [Default]
F08.00	**Low speed ASR KP**	**1 - 9999 [500]**
F08.01	**Low speed ASR KI**	**0 - 9999 [500]**
F08.02	**High speed ASR KP**	**1 - 9999 [500]**
F08.03	**High speed ASR KI**	**0 - 9999 [500]**
F08.04	**ASR PI swithcing frequency 1**	**0.00 - 50.00 [10.00Hz]**
F08.05	**ASR PI swithcing frequency 2**	**0.00 - 50.00 [15.00Hz]**
	F08.00 - F08.05 and F08.07 confirm the PID parameters of ASR. The structure of ASR is shown in figure:  As the figure below: • When HD3L operates within 0 - F08.04, the PI parameters of vector control are F08.00 and F08.01; • When HD3L operates above F08.05, the PI parameters of vector control are F08.02 and F08.03; • When HD3L operates within F08.04 - F08.05, P is the linear interpolation between F08.00 and F08.02, while I is the linear interpolation between F08.01 and F08.03.  • The system response can be expedited through increasing the ASR KP (F08.00, F08.02), but oscillation may occur if the value of KP is too high. • The system response can be expedited through increasing the ASR KI (F08.01, F08.03), but oscillation and high overshoot happen easily if the value of KI is too high. • If F08.01/F08.03 = 0 and the integral function is unused, the speed-loop works only as a proportional regulator. • Generally, adjust the KP firstly to the max. on condition that the system does not vibrate, and then adjust the KI to shorten the response time without overshoot. • To shorten dynamic response time during lowe frequency running, increase KP and KI.	
F08.06	**ASR integral limitation**	**0.0 - 200.0 (F07.02) [180.0%]**
	It is used to limit the max. value of the vector control speed-loop integral.	
F08.07	**ASR differential time**	**0.000 - 1.000 [0.000s]**
	Defines the vector control speed-loop differential time. • Generally, it doesn't need to set F08.07 except for expediting the dynamic response. • F08.07 = 0, there is no speed-loop differential.	
F08.08	**ASR output filter time**	**0.000 - 1.000 [0.008s]**
	It is used to filter the output of ASR regulator. • F08.08 = 0, the speed-loop filter is unused.	
F08.09	**Electrical torque limit**	**0.0 - 200.0 (F07.02) [180.0%]**
	F08.09 is the relative percentage of motor rated current (F07.02).	

Ref. Code	Function Description	Setting Range [Default]
	The bigger torque output, the bigger current output. • If the torque is too big, over-current is easy to occur. • If the torque is too small, the run speed and the Acc./Dec. speed may deviate from the setting value.	

6.2.10 F09: Current Loop Parameters

Ref. Code	Function Description	Setting Range [Default]
F09.00	**Current loop KP**	**1 - 4000 [500]**
F09.01	**Current loop KI**	**1 - 4000 [500]**
	Set the PI regulator parameters of the current loop (ACR).	
F09.04	**Current loop frequency**	**2 -6 [4k]**

6.2.11 F12: Digital I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F12.00	**Input terminal filter time**	**0.000 - 1.000 [0.010s]**
	Defines filter time of digital input termianl and to set input terminal sensibility. • The input terminals are susceptible to interference which will result in misoperation, so F12.00 can be increased. But too long filter time will affect sensibility.	
F12.01	**DI1 function**	**000 - 134 [1]**
F12.02	**DI2 function**	**000 - 134 [2]**
F12.03	**DI3 function**	**000 - 134 [3]**
F12.04	**DI4 function**	**000 - 134 [4]**
F12.05	**DI5 function**	**000 - 134 [5]**
F12.06	**DI6 function**	**000 - 134 [6]**
F12.07	**DI7 (I/O board) function**	**000 - 134 [0]**
F12.08	**DI8 (I/O board) function**	**000 - 134 [0]**
F12.09	**DI9 (I/O board) function**	**000 - 134 [0]**

Note: Hundred = 0, normally open input. Hundred = 1, normally closed input.

0: Unused. Terminal function is unused. HD3L ignores the signal input via this terminal.

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

1: Controller enable (EN).

- When enabled, HD3L is enabled to run.
- When unused, HD3L is unused to run and will be in coasts to stop status.
- When no terminal selects this function, it defaults that HD3L is at enabled status.123

2,3: UP/DN.

- Set control terminal to control up and down of elevator. The terminals are in below table.

UP Terminal	DN Terminal	Selection
0	0	Stop
0	1	Down
1	0	Up
1	1	Stop

4 - 6: Multi-speed 1 - 3 (MS1 - MS3).

- Achieve 8-speed running curve via terminals logic combination, as follow table.

MS3 Terminal	MS2 Terminal	MS1 Terminal	Multi-speed Setting
0	0	0	Multi-speed 0 (F05.00)
0	0	1	Multi-speed 1 (F05.01)
0	1	0	Multi-speed 2 (F05.02)
0	1	1	Multi-speed 3 (F05.03)
1	0	0	Multi-speed 4 (F05.04)
1	0	1	Multi-speed 5 (F05.05)
1	1	0	Multi-speed 6 (F05.06)
1	1	1	Multi-speed 7 (F05.07)

7: Inspection input (INS).

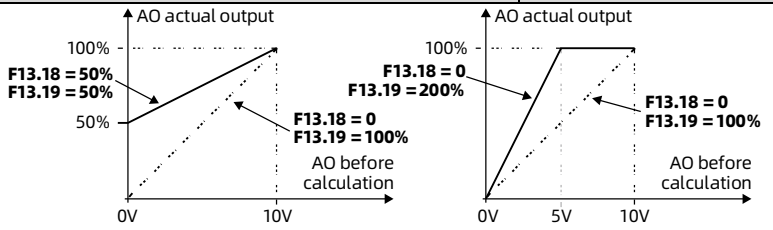
- If enabled, elevator will do inspection running.
- This signal, when used together with UP/DN (No.2 or No.3 function) command, can control the elevator to go up or down during inspection.

Ref. Code	Function Description	Setting Range [Default]
	8: Emergency input (BAT). • If enabled, elevator will enter battery-driven running status. 9: Contactor feedback input (CSM). 10: Brake feedback input (BSM). 11- 14: Unused. 15: Motor overheat input (OH). 16: Fault reset input (RST). • When HD3L alarms fault, reset it by this terminal. • The function of RST terminal is the same as the **STOP** key. 17 - 33: Unused. 34: External fault (EXT). • The fault signal of external equipment can input through this terminal, so HD3L can monitor that equipment and respond accordingly. HD3L alarms E0024 fault (external fault) when receives the EXT signal.	
F12.13	**Filter time of multi-speed terminal**	**0.000 - 2.000 [0.010s]**
	Defines the MS filter time to make up for the time error of MS input terminals. • Change F12.13 according to the change asynchronous level of numbers of MS input terminals.	
F12.15	**DO1 function**	**0 - 20 [2]**
F12.16	**DO2 function**	**0 - 20 [3]**
F12.17	**RLY1 function**	**0 - 20 [14]**
F12.18	**RLY2 (I/O board) function**	**0 - 20 [0]**
F12.19	**RLY3 (I/O board) function**	**0 - 20 [0]**
F12.20	**RLY4 (I/O board) function**	**0 - 20 [0]**
	0: Unused. 1: Controller is ready. • Signal ON outputs if HD3L has no fault. 2: Controller is running. • HD3L is in run status and outputs indicating signal. 3: Zero-speed running. • ON signal outputs if output speed of HD3L is zero but HD3L is in run status. 4: Zero-speed. • ON signal outputs if output speed of HD3L is zero. 5: Contactor output control. • To open/close the output contactor. 6: Brake output control. • To open/close the brake. 7, 8: FDT1, FDT2. • Refer to F05.12 - F05.13. 9: Speed within FAR signal. • The indication signal outputs when output speed of HD3L is within the FAR range. The detect range is set by F05.16 (speed within FAR range). • The indication signal also output at stop. 10: Up signal output. • ON signal outputs when the elevator is at up running. 11: Down signal output. • ON signal outputs when the elevator is at down running.	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td colspan="2">12: Under-voltage.
• ON signal outputs when HD3L is in under-voltage status.
14: Controller fault.
• ON signal outputs when HD3L has fault.
15 - 19: Unused.
20: Speed output.</td></tr>
<tr><td>F12.21</td><td>Output terminal logic</td><td>00 - 0x3F [0]</td></tr>
<tr><td></td><td colspan="2">Defines that each bit (binary) represents different output terminal.
• 0: Positive logic. When output terminals are connected to corresponding common port, this logic is enabled. Otherwise the logic is disabled.
• 1: Negative logic. When output terminals are connected to corresponding common port, this logic is disabled. Otherwise the logic is enabled.
<table>
<tr><th colspan="4">Ten</th><th colspan="4">Unit</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>RLY4</td><td>RLY3</td><td>RLY2</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table>
</td></tr>
</table>

6.2.12 F13: Analog I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F13.00	**AI1 function**	**0 - 3 [0]**
F13.01	**AI2 function**	**0 - 3 [0]**
	0: Unused. 1: Speed setting. 2: Weighing signal. 3: Motor overheat signal. • Refer to F17.01 about the thermistor. • AI1 input range: 0 - 10V. AI2 - AI4 input range: -10 - +10V.	
F13.04	**AI1 bias**	**-100.0 - +100.0 [0.0%]**
F13.05	**AI1 gain**	**-10.00 - +10.00 [1.00]**
F13.06	**AI1 filter time**	**0.01 - 10.00 [0.05s]**
F13.07	**AI2 bias**	**-100.0 - +100.0 [0.0%]**
F13.08	**AI2 gain**	**-10.00 - +10.00 [1.00]**
F13.09	**AI2 filter time**	**0.01 - 10.00 [0.05s]**
	When AI1 - AI2 sets frequency, the relationship between the analog input and the analog value after calculating is shown as figure:  • The formula is: Analog value after calculating = gain × analog actual value + bias. • F13.06 and F13.09 define the filter time. • The longer filter time is, the higher immunity level is, the response time is prolonged. The shorter filter time is, the quicker response time is, the lower the immunity level is.	
F13.16	**AO1 function**	**0 - 9 [0]**
	0: Unused. 1: Running speed (0 - max. output speed). 2: Setting speed (0 - max. output speed). 3: Output current (0 - twice rated current of HD3L). 4: Output voltage (0 - 1.2 times rated voltage of HD3L). 5: Bus voltage (0 - 2.2 times rated voltage of HD3L). 6: AI1 input (0 - 10V). 7: AI2 input (-10 - +10V/0 - 20mA). 8 - 9: Unused. Note: 1. At up, up limit of No.1 and No.2 function is corresponding to 10V, while down limit is corresponding to 5V; 2. At down, up limit of No.1 and No.2 function is corresponding to 0V, while down limit is corresponding to 5V; 3. Up limit of No. 3 - 5 functions is corresponding to max. output voltage 10V; 4. When the negative voltage of No.7 function inputs, the AO will output its absolute value.	
F13.18	**AO1 bias**	**-100.0 - +100.0 [0.0%]**
F13.19	**AO1 gain**	**0.0 - 200.0 [100.0%]**
	Adjust the AO output. Calculation formula: AO actual output = F13.19 × AO output before calculation + F13.18.	

Ref. Code	Function Description	Setting Range [Default]
		

6.2.13 F14: SCI Communication Parameters

Ref. Code	Function Description	Setting Range [Default]
F14.00	**Data format**	**0 - 5 [0]**
	0: 1-8-2 format, no parity, RTU. 1: 1-8-1 format, even parity, RTU. 2: 1-8-1 format, odd parity, RTU. 3: 1-7-2 format, no parity, ASCII. 4: 1-7-1 format, even parity, ASCII. 5: 1-7-1 format, odd parity, ASCII.	
F14.01	**Baud rate**	**0 - 5 [3]**
	0: 1200bps. 1: 2400bps. 2: 4800bps. 3: 9600bps. 4: 19200bps. 5: 38400bps.	
F14.02	**Local address**	**0 - 247 [2]**
	F14.02 = 0, it means broadcast address.	
F14.03	**Host PC response time**	**0 - 1000 [0ms]**
F14.04	**Detection time of communication timeout**	**0.0 - 1000.0 [0.0s]**
	Time at no communication data > setting time of F14.04, the controller reports E0028 fault (SCI communication timeout). • F14.04 = 0, the controller does not detect.	
F14.05	**Detection time of communication error**	**0.0 - 1000.0 [0.0s]**
	Time at communication error > setting time of F14.05, the controller reports E0029 fault (SCI communication error). • F14.05 = 0, the controller does not detect.	

6.2.14 F15: Display Control Parameters

Ref. Code	Function Description	Setting Range [Default]
F15.00	**Language**	**0, 1 [1]**
	Defines the displaying language on the LCD keypad. 0: Chinese. 1: English.	
F15.01	**Display contrast of the LCD keypad**	**1 - 10 [6]**
	To select LCD display contrast.	
F15.02	**Run status parameter 1**	**0 - 32 [5]**
F15.03	**Run status parameter 2**	**0 - 32 [6]**
F15.04	**Run status parameter 3**	**0 - 32 [10]**
F15.05	**Run status parameter 4**	**0 - 32 [11]**
F15.06	**Run status parameter 5**	**0 - 32 [0]**
F15.07	**Run status parameter 6**	**0 - 32 [0]**
F15.08	**Stop status parameter 1**	**0 - 32 [4]**
F15.09	**Stop status parameter 2**	**0 - 32 [14]**
F15.10	**Stop status parameter 3**	**0 - 32 [16]**
F15.11	**Stop status parameter 4**	**0 - 32 [26]**
F15.12	**Stop status parameter 5**	**0 - 32 [27]**
F15.13	**Stop status parameter 6**	**0 - 30 [0]**
	The keypad displays parameters which is the run status (F15.02 - F15.07) and stop status (F15.08 - F15.13). • It can be cycling displayed by ▶▶ key on the keypad. 0 - 3: Unused. 4: Setting speed. 5: Setting speed (after Acc./Dec.). 6: Output frequency. 7: Setting RPM. 8: Running RPM. 9: Unused. 10: Output voltage. 11: Output current. 12 - 13: Unused. 14: DC bus voltage. 15: AI1 voltage. 16: AI1 voltage (after calculating). 17 - 24: Unused. 25: Heatsink temperature. 26: Input terminal status. • Bit0 - Bit11 correspond to DI1 - DI12. 27: Output terminal status. • Bit0 - Bit5 correspond to DO1, DO2 and RLY1 - RLY4. 28 - 30: Unused.	

6.2.15 F16: Function-boost Parameters

Ref. Code	Function Description	Setting Range [Default]
F16.00	**Zero-speed running signal delay time**	**0.00 - 10.00 [0.30s]**
	Defines the delay time of HD3L from zero-speed run status to zero-speed run signal output.	
F16.01	**Zero-speed signal delay time**	**0.00 - 10.00 [0.30s]**
	Defines the delay time of HD3L from zero-speed status to zero-speed signal output.	
F16.02	**Current keep time after stop**	**0 - 9999 [0ms]**
	To eliminate the current noise of motor at stop, when the brake finished, the cut-off run signal will reduce the current to zero after the time of F16.02.	
F16.03	**Fan control**	**0 - 2 [0]**
	Defines the fan control mode. If there is overheat protection, the fan will run all the time. 0: Auto stop. • The fan runs all the time when HD3L is in run status. After HD3L stops for the time of F16.04, the fan continues running if overheat protection is activated. 1: Immediately stop. • The fan runs all the time when HD3L is in running status, but stops when HD3L stops. 2: Run when power on. • The fan runs continuously after HD3L is switched on.	
F16.04	**Fan control delay time**	**0.0 - 600.0 [30.0s]**
F16.05	**Brake unit action voltage**	**380 - 750V [Depend on HD3L]**
	For 380V voltage class controller, the braking voltage range is 630 - 750V. For 220V voltage class controller, the braking voltage range is 380 - 450V. Note: The braking action enables only in run status of HD3L.	
F16.06	**Detection time of contactor fault**	**0.1 - 10.0 [2.0s]**
F16.07	**Multi-speed inspection**	**0 - 7 [0]**
	When the DI terminals are not enough, the MS1 - MS3 can achieve inspection run. • DI terminal = INS (No. 7 function), only need set F16.07 as 0 to enter terminal inspection run. • DI terminal ≠ INS (No. 7 function), the inspection run can be achieved via the MS1 - MS3. • Value of MS1 - MS3 = value of F16.07, enter MS inspection run at MS run speed (F05.00 - F05.07). Note: When MS run speed (F05.00 - F05.07) exceeds 0.630m/s, run at 0.630m/s.	
F16.08	**Zero-speed threshold**	**0.001 - 0.010 [0.003m/s]**
	When the present run speed ≤ F16.08, the system run speed will be considered as 0. After zero-speed delay signal, the zero-speed signal will output.	
F16.09	**Selection at motor overheat fault**	**0, 1 [0]**
	0: When detect that the motor is overheated, alarm E0020 fault (motor overheat) after motor stops. 1: When detect that the motor is overheated, alarm E0020 fault (motor overheat) at once.	
F16.12	**Delay time of run output signal**	**0.00 - 1.00 [0.00s]**
	Note: F16.12 is used to delay the controller running signal (output = No. 2 function) so as to control the HD3L to open the brake.	
F16.13	**UPS running direction auto-determine enable**	**0, 1 [0]**
	0: Not enable. 1: Enable. • In UPS mode, HD3L will not run in the direction given by the terminal and auto-detemine the the elevator light-load running direction.	

Ref. Code	Function Description	Setting Range [Default]
	• In the UPS mode, HD3L will automatically up, and down, and then run according to the light-load direction of detemining.	
F16.14	**Running min. current limit**	**0 - 100 (F07.11) [20%]**
F16.15	**Running min. detection time**	**0.0 - 5.0 [0.0s]**
	When the elevator run current is less than F16.14 and duration exceeds F16.15, HD3L alarms E0025 fault (too small running current).	
F16.17	**DC braking current at stop**	**0 - 150 [100%]**
F16.18	**Starting frequency of DC braking current at stop**	**0.20 - 10.00 [0.50Hz]**
F16.19	**Brake release frequency**	**0.00 - 3.00 [0.00Hz]**

6.2.16 F17: Fault Protect Parameters

Motor Overheat Fault (F17.00 - F17.01)

Ref. Code	Function Description	Setting Range [Default]
F17.00	**Input voltage at motor overheat**	**0.00 - 10.00 [0.00V]**
F17.01	**Thermistor type**	**0 - 2 [0]**
	0: Not detect the motor overheat (NC). 1: Positive charateristic (PTC). • When AI input exceeds F17.00, HD3L alarms E0020 fault (motor overheat). 2: Negative charateristic (NTC). • When AI input is less than F17.00, HD3L alarms E0020 fault (motor overheat).	

Fault parameter (F17.02)

Ref. Code	Function Description	Setting Range [Default]
F17.02	**Fault parameter**	**0 - 65535 [0]**
	Bit0: E0010 fault detection shield 0: Not shielded. 1: Shielded. **Bit1 - Bit15: Unused**	

Input and Output Voltage Phase Loss Fault (F17.03 - F17.06)

Ref. Code	Function Description	Setting Range [Default]
F17.03	**Input phase loss detection reference**	**0 - 100 [30%]**
F17.04	**Input phase loss detection time**	**0.0 - 5.0 [1.0s]**
	F17.03 is a percentage of HD3L rated voltage. When HD3L detects certain input voltage does not hit the detect reference (F17.03) and exceeds the detect time (F17.04), HD3L reports E0015 fault (input voltage phase loss). • F17.03 or F17.04 = 0 or in the emergency run mode, HD3L not detect fault.	
F17.05	**Output phase loss detection reference**	**0 - 100 [20%]**
F17.06	**Output phase loss detection time**	**0.0 - 20.0 [4.0s]**
	F17.05 is a percentage of HD3L's rated current. When HD3L detects certain output current does not hit the detect reference (F17.05) and exceeds the detect time (F17.06), HD3L reports E0016 fault (output voltage phase loss). • F17.05 or F17.06 = 0, HD3L not detect fault.	

Motor Fault (F17.07)

Ref. Code	Function Description	Setting Range [Default]
F17.07	**Motor overload protect factor**	**20.0 - 110.0 [100.0%]**
	F17.07 can be set as 100% when HD3L drives a motor of the same power class. To protect the motor when the motor power is smaller than the standard matched power, user needs to set proper motor overload protection factor (F17.07). The factor can derive from the following formula: $F17.07 = \frac{\text{Rated current of motor (F07.02)}}{\text{Rated output current of HD3L}} \times 100\%$	

Fault Auto-reset Function and Fault Relay Action (F17.08 - F17.10)

Ref. Code	Function Description	Setting Range [Default]
F17.08	**Fault auto reset times**	**0 - 100 [0]**
F17.09	**Fault auto reset interval**	**2.0 - 20.0 [5.0s/times]**
	Auto reset function enables HD3L to reset the fault as per the reset times and interval. When F17.08 = 0, it means "auto reset" is unused and the protective device will be activated in case of fault. • If no 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. The following faults do not have the auto reset function: • E0008: Power module fault • E0021: Read/write fault of control board EEPROM • E0010: Brake unit fault • E0022: Read/write fault of keypad EEPROM • E0013: Soft start contactor failed • E0024: External fault • E0014: Current detection fault • E0036: Contactor fault	
F17.10	**Faulty relay action**	**00 - 11 [00]**
	Unit: In auto reset process **Ten: In undervoltage process** • 0: Faulty relay doesn't act. • 1: Faulty relay acts. Note: Relay needs to be set as No. 14 function (controller fault).	

Fault History (F17.11 - F17.27)

Ref. Code	Function Description	Setting Range [Default]
F17.11	**NO.5 fault type**	**[Actual value]**
F17.12	**Setting freqency at NO.5 fault**	
F17.13	**Output frequency at NO.5 fault**	
F17.14	**DC bus vlotage at NO.5 fault**	
F17.15	**Output voltage at NO.5 fault**	
F17.16	**Output current at NO.5 fault**	
F17.17	**Input terminal status at NO.5 fault**	
F17.18	**Output terminal status at NO.5 fault**	
F17.19	**NO.5 fault interval**	
F17.20	**NO.4 fault type**	
F17.21	**NO.4 fault interval**	
F17.22	**NO.3 fault type**	
F17.23	**NO.3 fault interval**	
F17.24	**NO.2 fault type**	
F17.25	**NO.2 fault interval**	
F17.26	**NO.1 fault type**	
F17.27	**NO.1 fault interval**	
	F17.12 - F17.19 record status parameters of HD3L at the last fault. F17.20 - F17.27 record the type and interval per time of four faults before the latest. The unit of interval is 0.1 hour.	

6.2.17 F18: PWM Parameters

Ref. Code	Function Description	Setting Range [Default]
F18.00	**Carrier frequency**	**1 - 16kHz [Depend on HD3L]**
	Defines the carrier frequency of PWM output wave. **Controller Power** / **Setting Range** / **Default** 2.2 - 22kW / 1 - 16kHz / 8kHz 30 - 45kW / 1 - 12kHz / 6kHz • The carrier frequency affects the operating noise of the motor. The higher the carrier frequency, the lower the noise made by the motor. Please properly set the carrier frequency. • When the value is higher than the factory setting, HD3L should be derated by 5% when per 1kHz is increased compared to the factory setting.	
F18.02	**PWM overmodulation enable**	**0, 1 [1]**
	0: Disabled. 1: Enable.	
F18.03	**PWM overmodulation mode**	**0, 1 [0]**
	0: Two phase/three phase swtich. 1: Three phase.	

6.2.18 F19: Enhance Parameter 1

Ref. Code	Function Description	Setting Range [Default]
F19.09	**Frequency and speed switch**	**0, 1 [0]**
	0: The given way is speed (m/s). 1: The given way is frequency (Hz).	
F19.10	**Multi-speed frequency 0**	**0.00 - F00.03 [0.00Hz]**
F19.11	**Multi-speed frequency 1**	**0.00 - F00.03 [0.00Hz]**
F19.12	**Multi-speed frequency 2**	**0.00 - F00.03 [0.00Hz]**
F19.13	**Multi-speed frequency 3**	**0.00 - F00.03 [0.00Hz]**
F19.14	**Multi-speed frequency 4**	**0.00 - F00.03 [0.00Hz]**
F19.15	**Multi-speed frequency 5**	**0.00 - F00.03 [0.00Hz]**
F19.16	**Multi-speed frequency 6**	**0.00 - F00.03 [0.00Hz]**
F19.17	**Multi-speed frequency 7**	**0.00 - F00.03 [0.00Hz]**
F19.18	**Maintenance operation frequency**	**0.00 - F00.03 [0.00Hz]**
F19.19	**Emergency operation frequency**	**0.00 - F00.03 [0.00Hz]**
F19.20	**Start operation frequency**	**0.00 - F00.03 [0.00Hz]**
F19.44	**SVC5 mode**	**0, 1 [1]**
	0: Formal mode. 1: Optimization mode.	
F19.45	**SVC6 M-axis current loop proportionality coefficient**	**1 - 200 [30]**
F19.46	**SVC flux cutoff frequency**	**0.30 - 8.00 [0.50Hz]**
F19.47	**SVC speed filter coefficient**	**0 - 2 [0]**
	0: 8. 1: 16. 2: 32.	
F19.48	**SVC speed observation period**	**0, 1 [0]**

Ref. Code	Function Description	Setting Range [Default]
	0: 1ms. 1: Interrupt.	
F19.49	**SVC no-load current boost**	**0, 1 [0]**
F19.50	**Low-speed variable carrier enable**	**0, 1 [1]**
	0: Disable. 1: Enable.	
F19.51	**Overload protection percentage of motor**	**150 - 200 [170%]**
F19.52	**Overload protection time of motor**	**0 - 10 [5s]**
	0 - 3: Disable. 4 - 10: Protection.	
F19.53	**Modify automaticly updated mutual inductance of no-load current**	**0, 1 [0]**
	0: Change automatically. 1: No change automatically.	
F19.55	**Enable about the compensation gains of the electric and power generation slip are compensated separately**	**0, 1 [0]**
	0: Disable. 1: Enable.	
F19.56	**Motorized slip compensation gain**	**200.0 - 20.0 [100.0%]**
F19.57	**Power generation slip compensation gain**	**200.0 - 20.0 [100.0%]**
F19.63	**Start DC when emergency operation**	**50 - 100 [70%]**
F19.64	**Start DC brake time when emergency operation**	**0.0 - 3.0 [0.0s]**
F19.65	**Stop DC when emergency operation**	**50 - 100 [70%]**
F19.66	**Stop DC brake time when emergency operation**	**0.0 - 3.0 [1.5s]**
F19.67	**Current search and torque limit when emergency operation**	**40.0 - 200.0 [100.0%]**
F19.68	**Torque boost when emergency operation**	**0.1 - 30.0 [0.2%]**
F19.69	**Torque boost cut-off point when emergency operation**	**0.1 - 50.0 F07.03 (motor rated frequency) [40.0%]**
F19.70	**VF output rated voltage percentage when emergency operation**	**60.0 - 100.0 [100.0%]**
F19.98	**SVC5 start process**	**0, 1 [1]**
	0: Normal. 1: Optimized.	

6.2.19 F20: Enhance Parameter 2

Ref. Code	Function Description	Setting Range [Default]
F20.00	**Start DC brake current**	**50 - 150 [100%]**
F20.01	**Duration of start DC brake current**	**0.0 - 3.0 [0.0s]**
F20.02	**DI enable function**	**0, 1 [0]**
	0: Original plan (only enable signal can output run contactor). 1: New plan (when there is a running command signal, open the running contactor. When the run contactor signal is turned on, if the enable signal is detected thereafter, the operation continues). • Plan 1 is used when the controller controls the run contactor and uses the run contactor feedback contact as an enable signal.	
F20.03	**Open time of output contactor**	**0 - 9 [0]**
	0: Keep open. 1 - 9: After the directional signal contactor opens for F20.03, the output contactor is closed after the enable signal is still invalid.	
F20.04	**Ground detection before running**	**0, 1 [0]**
	0: Detection. 1: No detection.	
F20.05	**Brake open frequency**	**0.00 - 10.00 [0.00Hz]**
F20.06	**Brake open current**	**0 - 150 motor rated current [0%]**
F20.07	**Restore customized parameters**	**0 - 9 [0]**
F20.13	**Torque limited when emergency operation**	**70.0 - 200.0 [0.0%]**
F20.14	**UPS operation undervoltage point**	**170 - 220 [190V]**
F20.15	**Emergency operation parameters**	**000 - 110 [0]**
	Unit: Unused **Ten: Torque limited when emergency operation** • 0: F20.19 no functional. • 1: F20.19 functional. **Hundred: Emergency operation mode determine** • 0: F00.01. • 1: VF control.	
F20.17	**Search speed of light load current method when emergecy operation**	**0.020 - 0.200 [0.150m/s]**
F20.18	**Search time of light-load current method when emergency operation**	**0.300 - 3.000 [0.500s]**
F20.19	**Torque limited when emergency operation**	**70.0 - 200.0 [100.0%]**

6.3 Group Y: Manufacturer Parameters

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

Chapter 7 Elevator Debugging and Application

The basic configuration of the elevator system composed of HD3L is shown in the figure below.

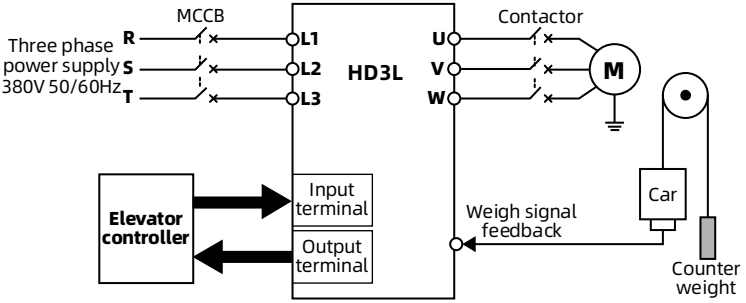


Figure 7-1 Elevator system

7.1 Debug

7.1.1 Set Basic Parameters

1.	Correctly set F00.01 (control mode).
2.	Set group F07 for motor.
3.	Set F00.02 (rated speed of elevator) and F00.04 (mechanical parameters of motor) according to the elevator requirement and motor parameters.
4.	Set digital I/O terminal parameters of group F12 according to the actual wiring.
5.	Set the parameter according to the actual running mode: • **Terminal MS running mode:** Set MS parameters of group F05 according to the actual requirement of elevator and the controller. Set Acc./Dec. curve parameters of group F03 according to the elevator speed. • **Terminal analog running mode:** Set analog curve parameters of group F04 and analog I/O terminal parameters of group F13 according to the actual requirement of elevator and the controller. The bigger Acc./Dec. curve parameters of group F03 are set, the quicker HD3L catch the speed command of elevator controller.

7.1.2 Motor Auto-tuning

1.	Set F00.05 = 0 (keypad control).
2.	Set F07.06 as 1 (stationary auto-tuning) or 2 (rotary auto-tuning), then press **RUN** key to start parameter auto-tuning. The motor will rotate at rotary auto-tuning, while it will not rotate at stationary auto-tuning.

Note:

1. The crane car is needed for the rotary auto-tuning but not for the stationary auto-tuning.
2. When auto-tuning, it needs open the run contactor. If at rotary auto-tuning, it needs open the brake contactor manually too.

7.1.3 Inspection Running

Preparation before Inspection Running

1.	After motor parameter auto-tuning, motor output U/V/W connections and encoder connection are not changed.
2.	Set F03.06 (inspection Acc. speed) and F03.07 (inspection Dec. speed).

Inspection Running

1.	If the actual running direction of motor is not the command direction, please set F00.08 (run direction) = 1.
2.	Make sure that the motor can run normally.
3.	Make sure the motor can run normally and the signals of the brake and power circuit etc. can act normally, then it perform high speed running.

7.1.4 High Speed Running

1.	Give the floor normal run command so that the elevator can run normally. Then set group F02 of start&stop parameters, start stopping parameters, adjust starting&stopping brake and motor running time sequence to make sure that the elevator does not shake at start&stop.
2.	If the elevator has slight shake at running, properly adjust group F08.
3.	To adjust leveling precision, Acc./Dec. curve (group F03) can adjust terminal MS control (F00.05 = 2) to unify level and adjust F03.13 (stop Dec. jerk) to make leveling precision.

7.2 Typical Application

7.2.1 Terminal MS Run Application

The elevator controller can calculate the motor present running direction (digital) and objective speed (digital) according to the elevator control logic and send them to HD3L. HD3L receives the objective speed of MS form and calculate the speed curve according to the S-curve parameter setting, then control the motor to run.

Example:

A certain elevator with rated speed of 1.750m/s uses a controller in terminal MS control (F00.05 = 2).

- The brake of elevator controller and the contactor are controlled by signal which comes from HD3L. Receiving signal of "HD3L is running", the brake opens. Receiving "HD3L is in zero-speed running", the brake closes.
- The inspection running is controlled by inspection MS command of elevator controller, and the running speed is obtained by speed combination of MS terminal.

Control Part Wiring

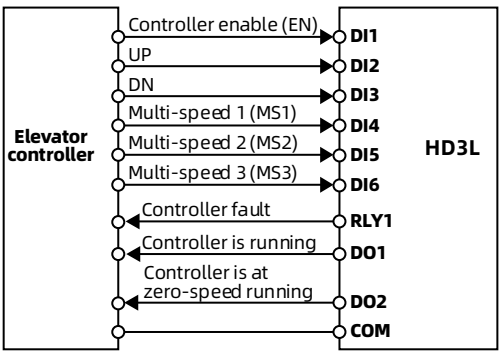


Figure 7-2 Terminal MS running wiring

Set Parameter

The setting content of terminal MS general parameter is shown as Table 7-1 and setting content of special parameter is shown as Table 7-2.

Table 7-1 General parameter

Ref. Code	Function	Value	Remark
F00.00	Motor type	Depend on actual value	
F00.01	Motor control mode	Depend on actual value	
F00.02	Rated speed of elevator	Depend on actual value	
F00.03	Max. output freqency of HD3L	Depend on actual value	
F00.04	Mechanical parameters of motor	Depend on actual calculate value	
F07.00	Rated power of motor	Depend on actual value	Motor nameplate parameters
F07.01	Rated voltage of motor	Depend on actual value	

Ref. Code	Function	Value	Remark
F07.02	Rated current of motor	Depend on actual value	
F07.03	Rated frequency of motor	Depend on actual value	
F07.04	Rated RPM of motor	Depend on actual value	
F08.00	ASR proportional gain 1	500	Adjust according to running effect. Generally use the default value
F08.01	ASR integral coefficient 1	500	
F08.02	ASR proportional gain 2	500	
F08.03	ASR integral coefficient 2	500	
F08.04	ASR swithcing frequency 1	10.00Hz	
F08.05	ASR swithcing frequency 2	15.00Hz	

Table 7-2 Terminal MS run parameter

Ref. Code	Function	Value	Remark
F00.05	Operating mode	2	Terminal MS control
F02.02	Retention time of start zero-speed	0.500s	Adjust according to the situation of running contactor and brake at motor start&stop
F02.06	Retention time of stop zero-speed	0.500s	
F03.00	Acc. speed	0.700m/s^2	Set according to the elevator speed and running effect
F03.01	Start Acc. jerk	0.350m/s^3	
F03.02	End Acc. jerk	0.600m/s^3	
F03.03	Dec. speed	0.700m/s^2	
F03.04	Start Dec. jerk	0.600m/s^3	
F03.05	End Dec. jerk	0.350m/s^3	
F03.06	Inspection Acc. speed	0.200m/s^2	
F03.07	Inspection Dec. speed	1.000m/s^2	
F03.13	Stop Dec. jerk	0.350 m/s^3	
F05.00	Multi-speed 0	0	As actual value
F05.01	Multi-speed 1	Re-leveling speed	
F05.02	Multi-speed 2	Creeping speed	
F05.03	Multi-speed 3	Emergency speed	
F05.04	Multi-speed 4	Inspection speed	
F05.05	Multi-speed 5	Normal low speed	
F05.06	Multi-speed 6	Normal mid speed	
F05.07	Multi-speed 7	Normal high speed	
F12.01	DI1 function	1	Controller enable (EN)
F12.02	DI2 function	2	UP
F12.03	DI3 function	3	DN
F12.04	DI4 function	4	MS1
F12.05	DI5 function	5	MS2
F12.06	DI6 function	6	MS3
F12.15	DO1 function	2	Controller is running

Ref. Code	Function	Value	Remark
F12.16	DO2 function	3	Controller is at zero-speed running
F12.17	RLY1 function	14	Controller fault
F16.07	Multi-speed inspection	4	Multi-speed inspection

7.2.2 Terminal Analog Run Application

The elevator controller can calculate the motor present running direction (digital) and running speed according (analog) to the elevator control logic and send them to HD3L respectively in the form of digital and analog. HD3L control the motor to run according to the controller's command and speed.

Example

A certain elevator with rated speed of 1.750m/s uses a controller in terminal analog control (F00.05 = 1).

- The brake and the running contactor are controlled by the elevator controller. The controller sends the direction signal to HD3L in the form of digital and output the running speed to drive in the form of analog.
- Use analog weighing device and AI1 as analog speed setting and AI2 as analog weigh.

Control Part Wiring

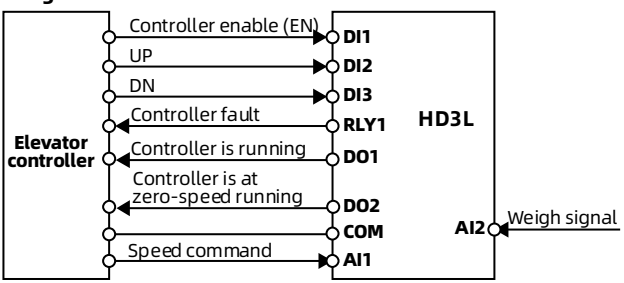


Figure 7-3 Terminal analog running wiring

Set Parameter

Refer to Table 7-1 for the general parameter. The terminal analog special parameter setting content is shown as Table 7-3.

Table 7-3 Terminal analog run parameter

Ref. Code	Function	Value	Remark
F00.05	Operating mode	1	Terminal analog control
F02.02	Retention time of start zero-speed	0.500s	Adjust according to the situation of running contactor and brake at motor start&stop
F02.06	Retention time of stop zero-speed	0.500s	
F03.00	Acc. speed	0.700m/s^2	If the controller can not fast-track speed command of the elevator controller, increase the values of F03.00 - F03.05
F03.01	Start Acc. jerk	0.350m/s^3	
F03.02	End Acc. jerk	0.600m/s^3	
F03.03	Dec. speed	0.700m/s^2	

Ref. Code	Function	Value	Remark
F03.04	Start Dec. jerk	0.600m/s³	
F03.05	End Dec. jerk	0.350m/s³	
F04.00	Setting curve	00000	Change according to the characteristics of analog curve
F04.01	Line 1 min.	0.0%	
F04.02	Corresponding value of line 1 min.	0.0%	
F04.03	Line 1 max.	100.0%	
F04.04	Corresponding value of line 1 max.	100.0%	
F04.05	Line 2 min.	0.0%	
F04.06	Corresponding value of line 2 min.	0.0%	
F04.07	Line 2 max.	100.0%	
F04.08	Corresponding value of line 2 max.	100.0%	
F12.01	DI1 function	1	Controller enable (EN)
F12.02	DI2 function	2	UP
F12.03	DI3 function	3	DN
F12.15	DO1 function	2	Controller is running
F12.16	DO2 function	3	Controller is at zero-speed running
F12.17	RLY1 function	14	Controller fault
F13.00	AI1 function	1	Speed setting
F13.01	AI2 function	2	Weighing signal
F13.04/F13.07	AI1/AI2 bias	0.0%	Adjust according to actual situation
F13.05/F13.08	AI1/AI2 gain	1.00	
F13.06/F13.09	AI1/AI2 filter time	0.05s	

7.2.3 Power-off Emergency Run Application

When passengers are using the elevator, if the system suddenly loses power, the passengers may be trapped in the car.

HD3L provide emergency run mode to resolve this problem.

Wiring

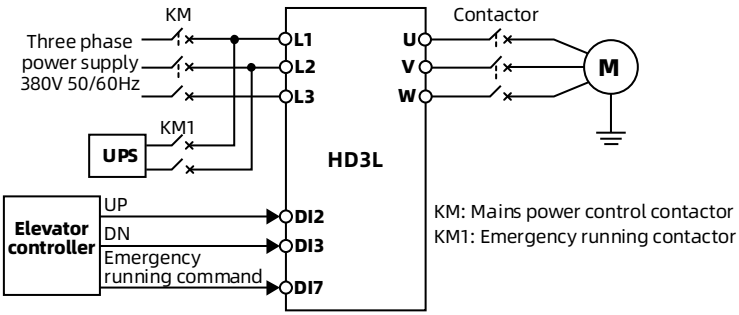


Figure 7-4 Emergency run wiring

Running Time Sequence

1.	When mains power fails, the KM (mains power control contactor) opens, and elevator controller outputs emergency run command (BAT), and controls KM1 to close.
2.	After some time delay, the elevator controller outputs running command (UP/DN). When HD3L receives the command, the running contactor will be closed and the brake will be opened. HD3L accelerates at the line rate of F03.08 (emergency Acc. speed) till the speed of F05.09 (emergency run speed).
3.	When the elevator runs near a leveling area, the elevator controller cuts off the emergency run command (BAT), and HD3L begins to Dec. at the rate of F03.09 (emergency Dec. speed) to stop.
4.	The controller outputs the brake close signal after the speed decelerates to zero. After some time delay, controller cuts off the run command (UP/DN) and HD3L releases the contactor. A complete emergency running process is finished.

Note:

1. The battery voltage should be bigger than 150VDC to ensure normal running.
2. In emergency running mode, the controller does not detect the input voltage phase loss.

Chapter 8 Maintenance

Many reasons can cause controller failure, such as: Environmental influences (temperature, humidity, pH, dust, vibration, etc.), aging and wear of components within the controller, etc. Therefore, please perform routine or regular inspection on the controller during storage and use.

Danger

- Only qualified professionals with professional training and authorization should maintain the controller.
- After transporting the controller for a long distance, please check the controller before use to make sure that the product components are complete and the screws are tight.
- Maintenance personnel should take off all metal jewellery before carrying out maintenance or internal measurements in the controller. Suitable clothes and tools must be used.
- High voltage exists when the controller is powered up or running.
- Before checking or maintaining the controller, please disconnect the input power reliably and wait for at least 10 minutes. Make sure the power indicator of the controller is off and the voltage between the power terminals (+) and (-) is less than 36V.

Warning

- For HD3L 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 the controller.
- Do not make modification on the inside of controller without instruction from the supplier.
- There are IC components inside the controller, which are sensitive to static electricity. Directly touch the components on the PCB board is forbidden.

Daily Maintenance

HD3L must be operated in specified environment, see section 3.2, on page 12.
Please follow the table below for daily maintenance. In order to detect abnormal phenomena in time and extend the service life of the controller.

Table 8-1 Daily maintenance

Items	Content	Criteria
Running environment	Temperature	-10 - +40℃, derating at 40 - 50℃
	Humidity	Less than 95%RH, non-condensing
	Dust	No conductive dust accumulating
	Water dripping	No water dripping
	Gas	No strange smell
HD3L	Oscillation	Stable oscillation
	Heating	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 HD3L every 3 to 6 months according to the actual environment so as to avoid hidden problems and make sure the controller 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 HD3L has already been conducted in the factory. Do not do the test again. Otherwise, HD3L might be damaged.
2. If insulation test to the motor is necessary, it should be done after input terminals U/V/W of motor have been detached from HD3L. Otherwise, HD3L will be damaged.
3. For controllers that have been stored for a long time, they must be powered up every 2 years. When supplying AC power to the controller, use a voltage regulator to gradually raise the input voltage to rated input voltage at least 5 hours.

Replace 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 controller is switched off, check if the abnormal conditions such as crack existing on fan vanes and other parts. When the controller is switched on, check if controller running is normal, and check if there is any abnormal oscillation	Check if frequent over-current or overvoltage failures occur during controller 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

Note:

- Burning the electrolytic capacitors inside the controller may cause an explosion.
- Burning plastic parts produces toxic gases, please dispose of them as industrial waste.

Chapter 9 Troubleshooting

9.1 Fault Phenomenon

When the controller reports a fault, the keypad displays the fault code, **ALM** indicator is on, the fault relay acts, the controller stops output and the motor coast to stop.

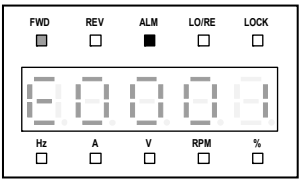


Figure 9-1 Keypad display the fault

9.2 Troubleshooting

After the controller reports a fault, please record the fault phenomenon in detail and refer to the following table to troubleshoot and clear the fault.
If you need technical support, please contact your supplier or Hpmont.

Fault		Reasons	Countermeasures
No display when power on		• Input grid voltage is too low or none • The power supply of the drive board is faulty	• Check input supply voltage • Check bus voltage
		• The wiring of the control board and driver board is disconnected	• Reconnect or check the wiring between the control board and the driver board
		• The rectifier bridge is damaged • The controller buffer resistor is damaged • The control board and keypad are faulty	• Contact the manufacturer for repair
Lu	DC bus undervoltage	• At the beginning 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 powering on and powering off • Check input power voltage • Check wiring and wire HD3L properly
E0001	Acc. overcurrent	• Improper connection between controller and motor • Improper motor parameters	• Connect HD3L and motor properly • Set correct motor parameters • Select controller with higher rating • Set proper Acc. time and Dec. time
E0002	Dec. overcurrent		

Fault		Reasons	Countermeasures
E0003	Constant speed overcurrent	• The rating of the used HD3L is too small • Acc./Dec. time is too short	
E0004	Acc. over voltage	• Input voltage is too high • Dec. time is too short • Improper wiring leads to overvoltage of hardware	• Check power input • Set a proper value for Dec. time • Check wiring and wire HD3L properly
E0005	Dec. over voltage		
E0006	Constant speed over voltage		
E0008	Power module fault	• Short circuit between phases output or the ground • Output current is too high • Power module is damaged	• 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 HD3L • Fan fault • Fault occurs to temperature detection circuit	• Use controller with higher power capacity • Improve the ventilation around HD3L • Replace the cooling fan • Seek technical support
E0010	Braking unit fault	• Circuit fault of braking unit	• Seek technical support
E0011	CPU fault	• CPU abnormal	• Detect at power on after completely power outage • Seek technical support
E0012	Parameter auto-tuning fault	• Parameter auto-tuning is timeout	• Check the motor connection • Input correct nameplates parameters • Seek technical support
E0013	Soft start contactor failed	• Contactor fault • Control circuit fault	• Replace the contactor • Seek technical support
E0014	Current detection fault	• Current detection circuit is damaged	• Contact the supplier for repairing
E0015	Input voltage phase loss	• For three phase input HD3L, input voltage phase loss fault occurs to power input	• Check the three phase power input • Seek technical support
E0016	Output voltage phase loss	• Output voltage phase disconnection or loss • Three phase load of HD3L is severely unbalanced	• Check the connection between HD3L and motor • Check the quality of motor
E0017	Controller overload	• Acc. time is too short • Improper setting of V/f curve or torque boost leads to over current • Mains supply voltage is too low • Motor load is too high	• Adjust Acc. time • Adjust V/f curve or torque boost • Check mains supply voltage • Use controller with proper power rating

Fault		Reasons	Countermeasures
E0018	Excessive speed deviation	• Brake fault or contactor fault • PG pulse number fault • Improper setting F05.19, F05.20 • Inadequate controller torque • Speed-loop PI parameter setting is incorrect	• Change contactor • Set proper PG P/R • Correct the setting of F05.19, F05.20 • Select HD3L with biger capacity • Correctly set speed-loop PI parameter
E0019	Motor overload	• Improper setting of V/f curve • Mains supply voltage is too low • Overload protection factor of motor is not set properly • Motor locked-rotor or overload	• Adjust V/f curve • Check the power input • Properly set the overload protection factor of motor • Check the load and mechanical transmission devices
E0020	Motor overheat	• Motor overheat • Motor overheat terminal (DI or AI terminal) connects incorrectly • The setting of motor paramteter is incorrect	• Reduce the load. Increase the Acc./Dec. time. Repaire or replace the motor • Detect whether the overheat detection input signal is correct • Set the motor parameter according to the nameplate
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 (HD3L does not stop)	• 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 controller is too different • Improper setting of motor parameters	• Select a controller with suitable power rating • Set correct value of motor parameters
E0024	Fault of external equipment	• Fault terminal of external equipment operates	• Check external equipment
E0025	Too small running current	• Improper setting of F16.14, F16.15	• Correct the setting of F16.14, F16.15 • Check the connection between HD3L and motor • Detect HD3L whether output • Detect whether the output contactor work is nomal
E0028	SCI communication timeout	• Connection fault of communication cable • Disconnected or not well connected	• Check the connection

Fault		Reasons	Countermeasures
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 and the baud rate • Send the data according to Modbus protocol
E0032	Motor over speed	• PG pulse number fault • Inadequate controller torque • Speed-loop PI parameter setting is incorrect	• Set proper PG pulse number • Select biger capacity controller • Correctly set speed-loop PI parameter
E0034	Excitation current of the Asy. motor is too small	• The motor wiring is wrong • The motor parameters (group F07) are set incorrectly	• Check the motor wiring • Set the motor parameters (group F07) correctly
E0036	Contator fault	• Contactor damaged • Feedback contact connection problem	• Change the contactor • Check the connection

9.3 Reset Fault

After clearing the fault, perform any of the following operations to reset the fault.

- Keypad: Press **STOP** key.
- External reset terminal: DI needs to set function (F12.00 - F12.07 = 16, external reset).
- Communication: Use communication command.
- Controller: Completely power off, then power on.

Appendix A Parameter

Parameter Setting Mode [Set]:

*: Actual parameters, cannot be modified.

×: Parameters cannot be modified when the controller is running.

○: Parameters can be modified when the controller is running.

Ref. Code	Function	Setting Range	Default	Set
d00: Status Display Parameters				
d00.00	Controller series	HD3L	Actual	*
d00.01	Software version of DSP	0.00 - 9.99	Actual	*
d00.02	Special software version of DSP	0.00 - 9.99	Actual	*
d00.03	Software version of keypad	0.00 - 9.99	Actual	*
d00.04	Elevator running status	Bit0: Controller enable Bit1: Inspection run Bit2: MS run Bit3: Analog run Bit4 - Bit7: Unused Bit8: Brake feedback input Bit9: Contactor feedback input Bit10 - Bit11: Unused Bit12: MS terminal 1 Bit13: MS terminal 2 Bit14: MS terminal 3 Bit15: Emergency run	Actual	*
d00.05	Rated current of HD3L	0.1 - 999.9A	Actual	*
d00.06	Controller status	Bit0: Controller fault Bit1: Run/stop Bit2: UP Bit3: DN Bit5&Bit4: Acc./ Dec./constant Bit6: Zero-speed signal Bit7: Run at zero-speed Bit8: Auto-tuning Bit9: Speed within FAR Bit10: Ready to run Bit11: Brake output Bit12: Contactor output Bit13 - Bit15: Unused	Actual	*
d01: Drive Status Parameters				
d01.00	Control mode	0 - 5	Actual	*
d01.01	Setting speed (m/s)	0.000 - 9.999	Actual	*
d01.02	Setting speed (after Acc./Dec.) (m/s)	0.000 - 9.999	Actual	*
d01.03	Feedback speed (m/s)	0.000 - 9.999	Actual	*
d01.04	Setting frequency (Hz)	0.01 - 100.00Hz	Actual	*
d01.05	Setting frequency (after Acc./Dec.)	0.01 - 100.00Hz	Actual	*
d01.06	Output frequency	0.01 - 100.00Hz	Actual	*
d01.07	Setting RPM	0 - 24000RPM	Actual	*
d01.08	Running RPM	0 - 24000RPM	Actual	*
d01.10	Output voltage	0 - 999V	Actual	*

Ref. Code	Function	Setting Range	Default	Set
d01.11	Output current	0.1 - 999.9A	Actual	*
d01.14	DC bus voltage	0 - 999V	Actual	*
d02: Analog Status Display Parameters				
d02.00	AI1 voltage	0.00 - 10.00V	Actual	*
d02.01	AI1 voltage (after calculating)	0.00 - 10.00V	Actual	*
d02.02	AI2 voltage	0.00 - 10.00V	Actual	*
d02.03	AI2 voltage (after calculating)	0.00 - 10.00V	Actual	*
d02.08	AO1 output	0.00 - 10.00V	Actual	*
d03: Running Status Parameters				
d03.00	Heatsink temperature	0.0 - 999.9℃	Actual	*
d03.01	Input terminal status	Bit0 – Bit8: DI1 – DI9 0: Disconnects with common terminal 1: Connects with common terminal	Actual	*
d03.02	Output terminal status	Bit0 – Bit1: DO1 – DO2 Bit2 – Bit5: RLY1 – RLY4 Positive logic: 0 stands for invalid while 1 stands for valid Negative logic: 0 stands for valid while 1 stands for invalid	Actual	*
d03.03	Modbus status	0: Normal 1: Communication timeout 2: Incorrect data frame head 3: Incorrect data frame checking 4: Incorrect data frame content	Actual	*
d03.04	Total time at power-on (hour)	0 - 65535	Actual	*
d03.05	Total running time (hour)	0 - 65535	Actual	*
d03.06	Running times	0 - 65535	Actual	*
d03.07	Present fault	0 - 100	Actual	*
F00: Basic Parameters				
F00.00	Motor type	0: Asyn. motor	0	×
F00.01	Motor control mode	0: V/f control 1: SVC control 5: SVC5 control 6: SVC6 control	1	×
F00.02	Rated speed of elevator	0.100 - 4.000m/s	1.500m/s	×
F00.03	Max. output frequency of HD3L	5.00 - 100.00Hz	50.00Hz	×
F00.04	Mechanical parameters of motor	10.0 - 6000.0	60.0	×
F00.05	Operating mode	0: Keypad control 1: Terminal analog control 2: Terminal MS control	0	×

Ref. Code	Function	Setting Range	Default	Set
		3: SCI speed setting		
F00.06	M-key function	0: Unused 1: UP/DN switch	0	○
F00.07	Speed setting of keypad	0.000m/s - F00.02	1.500m/s	○
F00.08	Run direction	0: The same as run command 1: Opposite to run command	0	×
F01: Protection Parameters				
F01.00	User password	00000 - 65535	00000	○
F01.01	Menu mode	0: Full menu mode 1: Verify menu mode (display parameters different from factory setting only)	0	○
F01.02	Function code parameter initialization	0: No operation 1: Restore to factory settings 2: Parameter download 3: Clear fault information	0	×
F01.03	Keypad EEPROM parameter initialization	0: No operation 1: Parameter upload	0	○
F02: Start and Stop Parameters				
F02.00	Start delay time	0.000 - 4.999s	0.000s	×
F02.01	Brake open delay time	0.000 - 4.999s	0.500s	×
F02.02	Retention time of start zero-speed	0.000 - 4.999s	0.000s	×
F02.03	Start speed	0.000 - 0.400m/s	0.030m/s	×
F02.04	Retention time of start speed	0.000 - 4.999s	0.300s	×
F02.05	Brake close delay time	0.000 - 4.999s	0.000s	×
F02.06	Retention time of stop zero-speed	0.000 - 4.999s	0.300s	×
F02.07	Contactor close delay time	0.000 - 4.999s	0.000s	×
F02.08	Start ramp time	0.000 - 2.000s 0.000: Ramp invalid	0.500s	×
F03: Acc./Dec. Parameters				
F03.00	Acc. speed	0.020 - 9.999m/s^2	0.700m/s^2	×
F03.01	Start Acc. jerk	0.020 - 9.999m/s^3	0.350m/s^3	×
F03.02	End Acc. jerk	0.020 - 9.999m/s^3	0.600m/s^3	×
F03.03	Dec. speed	0.020 - 9.999m/s^2	0.700m/s^2	×
F03.04	Start Dec. jerk	0.020 - 9.999m/s^3	0.600m/s^3	×
F03.05	End Dec. jerk	0.020 - 9.999m/s^3	0.350m/s^3	×
F03.06	Inspection Acc. speed	0.020 - 9.999m/s^2	0.200m/s^2	×
F03.07	Inspection Dec. speed	0.020 - 9.999m/s^2	1.000m/s^2	×
F03.08	Emergency Acc. speed	0.020 - 9.999m/s^2	0.200m/s^2	×
F03.09	Emergency Dec. speed	0.020 - 9.999m/s^2	0.200m/s^2	×

Ref. Code	Function	Setting Range	Default	Set
F03.10	Motor auto-tuning Acc. speed	0.020 - 9.999m/s²	0.100m/s²	×
F03.11	Motor auto-tuning Dec. speed	0.020 - 9.999m/s²	0.100m/s²	×
F03.12	Abnormal Dec. speed	0.020 - 9.999m/s²	1.000m/s²	×
F03.13	Stop Dec. jerk	0.020 - 9.999m/s³	0.350m/s³	×
F04: Analog Curve Parameters				
F04.00	Setting curve	Unit: AI1 Ten: AI2 Hundred: AI3 Thousand: AI4 0: Line 1 1: Line 2	0000	×
F04.01	Line 1 min.	0.0% - F04.03	0.0%	○
F04.02	Corresponding value of line 1 min.	0.0 - 100.0%	0.0%	○
F04.03	Line 1 max.	F04.01 - 100.0%	100.0%	○
F04.04	Corresponding value of line 1 max.	0.0 - 100.0%	100.0%	○
F04.05	Line 2 min.	0.0% - F04.07	0.0%	○
F04.06	Corresponding value of line 2 min.	0.0 - 100.0%	0.0%	○
F04.07	Line 2 max.	F04.05 - 100.0%	100.0%	○
F04.08	Corresponding value of line 2 max.	0.0 - 100.0%	100.0%	○
F05: Speed Parameters				
F05.00	Multi-speed 0	0.000m/s - F00.02	0.000m/s	○
F05.01	Multi-speed 1	0.000m/s - F00.02	0.000m/s	○
F05.02	Multi-speed 2	0.000m/s - F00.02	0.000m/s	○
F05.03	Multi-speed 3	0.000m/s - F00.02	0.000m/s	○
F05.04	Multi-speed 4	0.000m/s - F00.02	0.000m/s	○
F05.05	Multi-speed 5	0.000m/s - F00.02	0.000m/s	○
F05.06	Multi-speed 6	0.000m/s - F00.02	0.000m/s	○
F05.07	Multi-speed 7	0.000m/s - F00.02	0.000m/s	○
F05.08	Inspection run speed	0.000 - 0.630m/s	0.200m/s	○
F05.09	Emergency run speed	0.000m/s - F00.02	0.100m/s	○
F05.12	FDT1	0.0 - 100.0% (F00.02)	90.0%	○
F05.13	FDT2	0.0 - 100.0% (F00.02)	90.0%	○
F05.14	FDT1 delay level	0.0 - 100.0% (F00.02)	1.0%	○
F05.15	FDT2 delay level	0.0 - 100.0% (F00.02)	1.0%	○
F05.16	Speed within FAR range	0.0 - 20.0% (F00.02)	1.0%	○
F05.17	Over-speed	80.0 - 120.0% (F00.02)	115.0%	×
F05.18	Over-speed detection time	0.0 - 2.0s	0.2s	×

Ref. Code	Function	Setting Range	Default	Set
		0.0: Not detect motor over speed fault		
F05.19	Detection value of speed deviation	0.0 - 30.0% (F00.02)	20.0%	×
F05.20	Detection time of speed deviation	0.0 - 2.0s 0.0: Not detect the excessive speed deviation fault of motor	1.0s	×
F06: Weighing Compensation Parameters				
F06.19	Brake closing operation time in advance	0.000 - 1.999s	0.000s	×
F07: Asyn. Motor Parameters				
F07.00	Rated power of motor	0.2 - 400.0kW	Depend on HD3L	×
F07.01	Rated voltage of motor	0V - HD3L rated voltage		×
F07.02	Rated current of motor	0.0 - 999.9A		×
F07.03	Rated frequency of motor	1.00 - 100.00Hz	50.00Hz	×
F07.04	Rated RPM of motor	1 - 24000rpm	1440rpm	×
F07.05	Power factor of motor	0.001 - 1.000	Depend on HD3L	×
F07.06	Motor parameter auto-tuning	0: Auto-tuning is disabled 1: Stationary auto-tuning 2: Rotary auto-tuning	0	×
F07.07	Stator resistance of motor	0.000 - 65.535Ω	Depend on HD3L	×
F07.08	Rotor resistance of motor	0.000 - 65.535Ω		×
F07.09	Leakage inductance of motor	0.0 - 6553.5mH		×
F07.10	Mutual inductance of motor	0.0 - 6553.5mH		×
F07.11	Idling excitation current of motor	0.0 - 999.9A		×
F07.12	Core saturation coefficient 1 of motor	0.00 - 0.50 (magnetic flux = 50%)	0.50	×
F07.13	Core saturation coefficient 2 of motor	0.00 - 0.75 (magnetic flux = 75%)	0.75	×
F07.14	Core saturation coefficient 3 of motor	0.00 - 1.20 (magnetic flux = 120%)	1.20	×
F07.15	Motor torque boost	0.1 - 30.0%	2.0%	○
F07.16	Torque boost end-point of motor	0.0 - 50.0% (F07.03)	50.0%	○
F07.17	Slip compensation gain of motor	0.0 - 300.0%	100.0%	○
F07.18	Slip compensation filter time of motor	0.1 - 10.0s	0.1s	○
F07.19	Slip compensation limitation of motor	0.0 - 250.0%	200.0%	×
F07.21	Oscillation-suppression mode of motor	0: Depend on excitation component 1: Depend on torque component	0	○

Ref. Code	Function	Setting Range	Default	Set
F07.22	Oscillation-suppression coefficient of motor	0 - 200	100	○
F08: Motor Vector Control Speed-loop Parameters				
F08.00	Low speed ASR KP	1 - 9999	500	○
F08.01	Low speed ASR KI	0 - 9999	500	○
F08.02	High speed ASR KP	1 - 9999	500	○
F08.03	High speed ASR KI	0 - 9999	500	○
F08.04	ASR PI swithcing frequency 1	0.00 - 50.00Hz	10.00Hz	○
F08.05	ASR PI swithcing frequency 2	0.00 - 50.00Hz	15.00Hz	○
F08.06	ASR integral limit	0.0 - 200.0% (rated current of motor)	180.0%	○
F08.07	ASR differential time	0.000 - 1.000s 0.000: ASR without differential	0.000s	○
F08.08	ASR output filter time	0.000 - 1.000s 0.000: ASR without filter	0.008s	○
F08.09	Electrical torque limit	0.0 - 200.0% (F07.02)	180.0%	×
F09: Current Loop Parameters				
F09.00	Current loop KP	1 - 4000	500	×
F09.01	Current loop KI	1 - 4000	500	×
F09.04	Current loop frequency	2 - 6k	4k	×
F12: Digital I/O Terminal Parameters				
F12.00	Input terminal filter time	0.000 - 2.000s	0.010s	×
F12.01	DI1 function	Hundred = 0, normally open input Hundred = 1, normally closed input 0: Unused 1: Controller enable (EN) 2/3: UP/DN 4 - 6: MS1 - MS3 7: Inspection input (INS) 8: Emergency input (BAT) 9: Contactor feedback input (CSM) 10: Brake feedback input (BSM) 11- 14: Unused 15: Motor overheat input (OH) 16: Fault reset input (RST) 17 - 33: Unused 34: External fault (EXT)	1	×
F12.02	DI2 function		2	×
F12.03	DI3 function		3	×
F12.04	DI4 function		4	×
F12.05	DI5 function		5	×
F12.06	DI6 function		6	×
F12.07	DI7 function		0	×
F12.08	DI8 function		0	×
F12.09	DI9 function		0	×
F12.13	Filter time of multi-speed terminal	0.000 - 2.000s	0.010s	×
F12.15	DO1 function	0: Unused 1: Controller is ready 2: Controller is running 3: Controller is at zero-speed running	2	×
F12.16	DO2 function		3	×

Ref. Code	Function	Setting Range	Default	Set
F12.17	RLY1 function	4: Zero-speed running 5: Contactor output control 6: Brake output control 7, 8: FDT1, FDT2 9: Speed within FAR signal 10: Up signal output 11: Down signal output 12: Under-voltage 13: Unused 14: Controller fault 15 - 19: Unused 20: Speed output	14	×
F12.18	RLY2 function		0	×
F12.19	RLY3 function		0	×
F12.20	RLY4 function		0	×
F12.21	Output terminal logic	Bit0, Bit1: DO1, DO2 Bit2 - Bit5: RLY1 - RLY4 0: Positive logic 1: Negative logic	00	○
F13: Analog I/O Terminal Parameters				
F13.00	AI1 function	0: Unused 1: Speed setting 2: Weighing signal 3: Motor overheat signal	0	×
F13.01	AI2 function		0	×
F13.04	AI1 bias	-100.0 - +100.0%	0.0%	○
F13.05	AI1 gain	-10.00 - +10.00	1.00	○
F13.06	AI1 filter time	0.01 - 10.00s	0.05s	○
F13.07	AI2 bias	-100.0 - +100.0%	0.0%	○
F13.08	AI2 gain	-10.00 - +10.00	1.00	○
F13.09	AI2 filter time	0.01 - 10.00s	0.05s	○
F13.16	AO1 function	0: Unused 1: Running speed (0 - max output speed) 2: Setting speed (0 - max output speed) 3: Output current (0 - twice rated current of HD3L) 4: Output voltage (0 - 1.2 times rated voltage of HD3L) 5: DC bus voltage (0 - 2.2 times rated voltage of HD3L) 6: AI1 input (0 - 10V) 7: AI2 input (-10 - +10V/0 - 20mA) 8 - 9: Unused	0	○
F13.18	AO1 bias	-100.0 - +100.0%	0.0%	○
F13.19	AO1 gain	0.0 - 200.0%	100.0%	○
F14: SCI Communication Parameters				
F14.00	Data format	0: 1-8-2 format, no parity, RTU 1: 1-8-1 format, even parity, RTU 2: 1-8-1 format, odd parity, RTU 3: 1-7-2 format, no parity, ASCII	0	×

Ref. Code	Function	Setting Range	Default	Set
		4: 1-7-1 format, even parity, ASCII 5: 1-7-1 format, odd parity, ASCII		
F14.01	Baud rate	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	3	×
F14.02	Local address	0 - 247	2	×
F14.03	Host PC response time	0 - 1000ms	0ms	×
F14.04	Detection time of communication timeout	0.0 - 1000.0s 0.0: Not detect	0.0s	×
F14.05	Detection time of communication error	0.0 - 1000.0s 0.0: Not detect	0.0s	×
F15: Display Control Parameters				
F15.00	Language	0: Chinese 1: English	1	○
F15.01	Display contrast of the LCD keypad	1 - 10	6	○
F15.02	Run status parameter 1	1 - 3: Unused 4: Setting speed 5: Setting speed (after Acc./Dec.) 6: Output frequency 7: Setting RPM 8: Running RPM 9: Unused 10: Output voltage 11: Output current 12 - 13: Unused 14: DC bus voltage 15: AI1 voltage 16: AI1 voltage (after calculating) 17 - 24: Unused 25: Heatsink temperature 26: Input terminal status 27: Output terminal status 28 - 30: Unused	5	○
F15.03	Run status parameter 2		6	○
F15.04	Run status parameter 3		10	○
F15.05	Run status parameter 4		11	○
F15.06	Run status parameter 5		0	○
F15.07	Run status parameter 6		0	○
F15.08	Stop status parameter 1		4	○
F15.09	Stop status parameter 2		14	○
F15.10	Stop status parameter 3		16	○
F15.11	Stop status parameter 4		26	○
F15.12	Stop status parameter 5		27	○
F15.13	Stop status parameter 6		0	○
F16: Function-boost Parameters				
F16.00	Zero-speed running signal delay time	0.00 - 10.00s	0.30s	×
F16.01	Zero-speed signal delay time	0.00 - 10.00s	0.30s	×
F16.02	Current keep time after stop	0 - 9999ms	0ms	×
F16.03	Fan control	0: Auto stop 1: Immediately stop 2: Run when power on	0	○

Ref. Code	Function	Setting Range	Default	Set
F16.04	Fan control delay time	0.0 - 600.0s	30.0s	○
F16.05	Brake unit action voltage	220V: 380 - 450V 380V: 630 - 750V	Depend on HD3L	×
F16.06	Detection time of contactor fault	0.1 - 10.0s	2.0s	×
F16.07	Multi-speed inspection	0 - 7	0	×
F16.08	Zero-speed threshold	0.001 - 0.010m/s	0.003m/s	○
F16.09	Selection at motor overheat fault	0: Alarm fault after motor stops 1: Alarm fault at once	0	○
F16.12	Delay time of run output signal	0.00 - 1.00s	0.00s	×
F16.13	UPS running direction auto-determine enable	0: Not enable 1: Enable	0	×
F16.14	Running min. current limit	0 - 100% (F07.11)	20%	×
F16.15	Running min. detection time	0.0 - 5.0s	0.0s	×
F16.17	DC braking current at stop	0 - 150%	100%	×
F16.18	Starting frequency of DC braking current at stop	0.20 - 10.00Hz	0.50Hz	×
F16.19	Brake release frequency	0.00 - 3.00Hz	0.00Hz	×
F17: Fault Protect Parameters				
F17.00	Input voltage at motor overheat	0.00 -10.00V	0.00V	×
F17.01	Thermistor type	0: Not detect the motor overheat 1: Positive charateristic 2: Negative charateristic	0	×
F17.02	Fault parameter	Bit0: E0010 fault detection shield 0: Not shielded 1: Shielded Bit1 - Bit15: Unused	0	×
F17.03	Input phase loss detection reference	0 - 100% (HD3L rated voltage)	30%	×
F17.04	Input phase loss detection time	0.0 - 5.0s	1.0s	×
F17.05	Output phase loss detection reference	0 - 100% (HD3L rated current)	20%	×
F17.06	Output phase loss detection time	0.0 - 20.0s	4.0s	×
F17.07	Motor overload protect factor	20.0 - 110.0%	100.0%	×
F17.08	Fault auto reset times	0 - 100 0: No auto-reset function	0	×
F17.09	Fault auto reset interval	2.0 - 20.0s/times	5.0s/times	×
F17.10	Faulty relay action	Unit: In auto reset process Ten: In undervoltage process	00	○

Ref. Code	Function	Setting Range	Default	Set
		0: Faulty relay doesn't act 1: Faulty relay acts		
F17.11	NO.5 fault type	-Lu-: DC bus undervoltage E0001: Acc. overcurrent E0002: Dec. overcurrent E0003: Constant speed overcurrent E0004: Acc. over voltage E0005: Dec. over voltage E0006: Constant speed over voltage E0008: Power module fault E0009: Heatsink overheated E0010: Braking unit fault E0011: CPU fault E0012: Parameter auto-tuning fault E0013: Soft start contactor failed E0014: Current detection fault E0015: Input voltage phase loss E0016: Output voltage phase loss E0017: Controller overload E0018: Excessive speed deviation E0019: Motor overload E0020: Motor overheat E0021: Read/write fault of control board EEPROM E0022: Read/write fault of keypad EEPROM (display on the keypad only, HD3L does not stop) E0023: Faulty setting of parameters E0024: Fault of external equipment E0025: Too small running current E0028: SCI ommunication timeout E0029: SCI communication error E0032: Motor over speed E0034: Excitation current of the Asy. motor is too small E0036: Contator fault • E0008, E0010, E0013, E0014, E0021, E0022, E0024, E0036 can't auto reset	0	*
F17.12	Setting freqency at NO.5 fault	0.00 - 100.00Hz	0.00Hz	*
F17.13	Output freqency at NO.5 fault	0.00 - 100.00Hz	0.00Hz	*
F17.14	DC bus vlotage at NO.5 fault	0 - 999V	0V	*
F17.15	Output voltage at NO.5 fault	0 - 999V	0V	*
F17.16	Output current at NO.5 fault	0.0 - 999.9A	0.0A	*
F17.17	Input terminal status at NO.5 fault	0 - 0x1FF	0	*

Ref. Code	Function	Setting Range	Default	Set
F17.18	Output terminal status at NO.5 fault	0 - 0x3F	0	*
F17.19	NO.5 fault interval	0.0 - 6553.5h	0.0h	*
F17.20	NO.4 fault type	0 - 36	0	*
F17.21	NO.4 fault interval	0.0 - 6553.5h	0.0h	*
F17.22	NO.3 fault type	0 - 36	0	*
F17.23	NO.3 fault interval	0.0 - 6553.5h	0.0h	*
F17.24	NO.2 fault type	0 - 36	0	*
F17.25	NO.2 fault interval	0.0 - 6553.5h	0.0h	*
F17.26	NO.1 fault type	0 - 36	0	*
F17.27	NO.1 fault interval	0.0 - 6553.5h	0.0h	*
F18: PWM Parameters				
F18.00	Carrier frequency	1 - 16kHz	Depend on HD3L	×
F18.02	PWM overmodulation enable	0: Disable 1: Enable	1	×
F18.03	PWM overmodulation mode	0: Two/three phase swtich 1: Three phase	0	×
F19: Enhance Parameter 1				
F19.09	Frequency and speed switch	0: The given way is speed (m/s) 1: The given way is frequency (Hz)	0	×
F19.10	Multi-speed frequency 0	0.00Hz - F00.03	0.00Hz	○
F19.11	Multi-speed frequency 1	0.00Hz - F00.03	0.00Hz	○
F19.12	Multi-speed frequency 2	0.00Hz - F00.03	0.00Hz	○
F19.13	Multi-speed frequency 3	0.00Hz - F00.03	0.00Hz	○
F19.14	Multi-speed frequency 4	0.00Hz - F00.03	0.00Hz	○
F19.15	Multi-speed frequency 5	0.00Hz - F00.03	0.00Hz	○
F19.16	Multi-speed frequency 6	0.00Hz - F00.03	0.00Hz	○
F19.17	Multi-speed frequency 7	0.00Hz - F00.03	0.00Hz	○
F19.18	Maintenance operation frequency	0.00Hz - F00.03	0.00Hz	○
F19.19	Emergency operation frequency	0.00Hz - F00.03	0.00Hz	○
F19.20	Start operation frequency	0.00Hz - F00.03	0.00Hz	○
F19.44	SVC5 mode	0: Formal mode 1: Optimization mode	1	×
F19.45	SVC6 M-axis current loop proportionality coefficient	1 - 200	30	×
F19.46	SVC flux cutoff frequency	0.30 - 8.00Hz	0.50Hz	×
F19.47	SVC speed filter coefficient	0: 8 1: 16 2: 32	0	×

Ref. Code	Function	Setting Range	Default	Set
F19.48	SVC speed observation period	0: 1ms 1: Interrupt	0	×
F19.49	SVC no-load current boost	0: Disable 1: Enable	0	×
F19.50	Low-speed variable carrier enable	0: Disable 1: Enable	1	×
F19.51	Overload protection percentage of motor	150 - 200%	170%	×
F19.52	Overload protection time of motor	0 - 3: Disable 4 - 10: Protection	5s	×
F19.53	Modify automaticly updated mutual inductance of no-load current	0: Change automatically 1: Not change automatically	0	×
F19.55	Enable about the compensation gains of the electric and power generation slip are compensated separately	0: Disable 1: Enable	1	×
F19.56	Motorized slip compensation gain	200.0 - 20.0%	100.0%	×
F19.57	Power generation slip compensation gain	200.0 - 20.0%	100.0%	×
F19.63	Start DC when emergency operation	50 - 100%	70%	×
F19.64	Start DC brake time when emergency operation	0.0 - 3.0s	0.0s	×
F19.65	Stop DC when emergency operation	50 - 100%	70%	×
F19.66	Stop DC brake time when emergency operation	0.0 - 3.0s	1.5s	×
F19.67	Current search and torque limit when emergency operation	40.0 - 200.0%	100.0%	×
F19.68	Torque boost when emergency operation	0.1 - 30.0%	0.2%	×
F19.69	Torque boost cut-off point when emergency operation	0.1 - 50.0% (F07.03)	40.0%	×
F19.70	VF output rated voltage percentage when emergency operation	60.0 - 100.0%	100.0%	×
F19.98	SVC5 start process	0: Normal 1: Optimized	1	×
F20: Enhance Parameter 2				
F20.00	Start DC brake current	50 - 150%	100%	×
F20.01	Duration of start DC brake current	0.0 - 3.0s	0.0s	×

Ref. Code	Function	Setting Range	Default	Set
F20.02	DI enable function	0: Original plan 1: New plan	0	×
F20.03	Open time of output contactor	0: Keep open 1 - 9: After the directional signal contactor opens for F20.03, the output contactor is closed after the enable signal is still invalid	0	×
F20.04	Ground detection before running	0: Detection 1: No detection	0	×
F20.05	Brake open frequency	0.00 - 10.00Hz	0.00Hz	×
F20.06	Brake open current	0 - 150% (motor rated current)	0%	×
F20.07	Restore customized parameters	0 - 9	0	×
F20.13	Torque limited when emergency operation	70.0 - 200.0%	0%	×
F20.14	UPS operation undervoltage point	170 - 220V	190V	×
F20.15	Emergency operation parameters	Unit: Unused Ten: Torque limited when emergency operation 0: F20.19 no functional 1: F20.19 functional Hundred: Emergency operation mode determine 0: F00.01 1: VF control	000	×
F20.17	Search speed of light load current method when emergecy operation	0.020 - 0.200m/s	0.150m/s	×
F20.18	Search time of light-load current method when emergency operation	0.300 - 3.000s	0.500s	×
F20.19	Torque limited when emergency operation	70.0 - 200.0%	100.0%	×

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