DOPPLER
LIFT MANUFACTURERS

DOPPLER HD5L

Short Manual

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

2. Mechanical Installation

2.1 Precautions

	• Do not install if HD5L is incomplete or impaired. • Please see the controller size to take appropriate tools for handing, avoid harming from sharp edges or injured by a dropped controller. • Make sure that HD5L is far from the explosive and flammable things. • Do not do wiring operation until power supply is cut off for more than 10 minutes, the internal charge indicator of HD5L is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.
	• It is required not only carry the keypad and the cover but also bottom enclosure of HD5L. • Do not let wires, screws or residues fall into HD5L when installing.

2.2 Install and Dismantle Keypad

According to the direction of **Figure 1**, press the keypad until hear a “click” sound.
Do not install the keypad from other directions or it will cause poor contact.

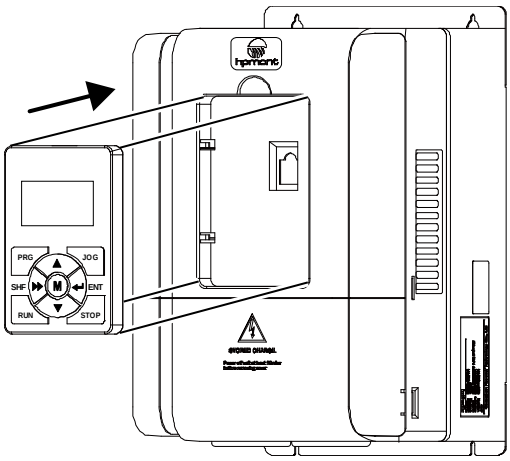


Figure 1

There are two steps in **Figure 2**.
First, press the hook of the keypad according to direction 1. Second, take out of the keypad according to direction 2.

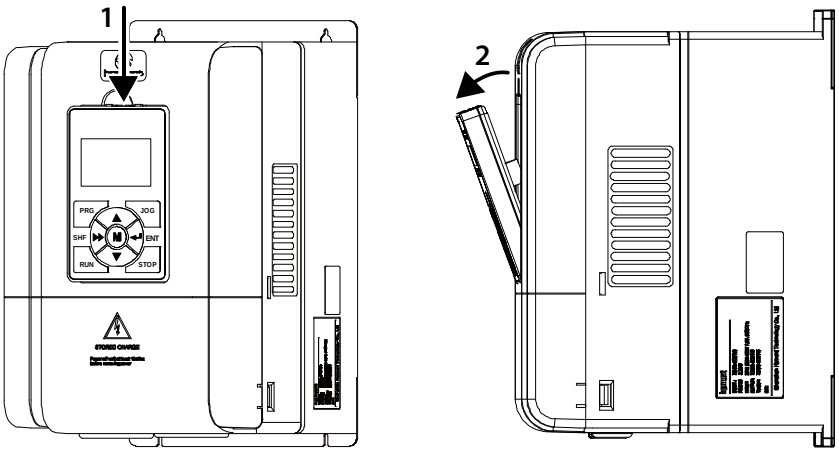
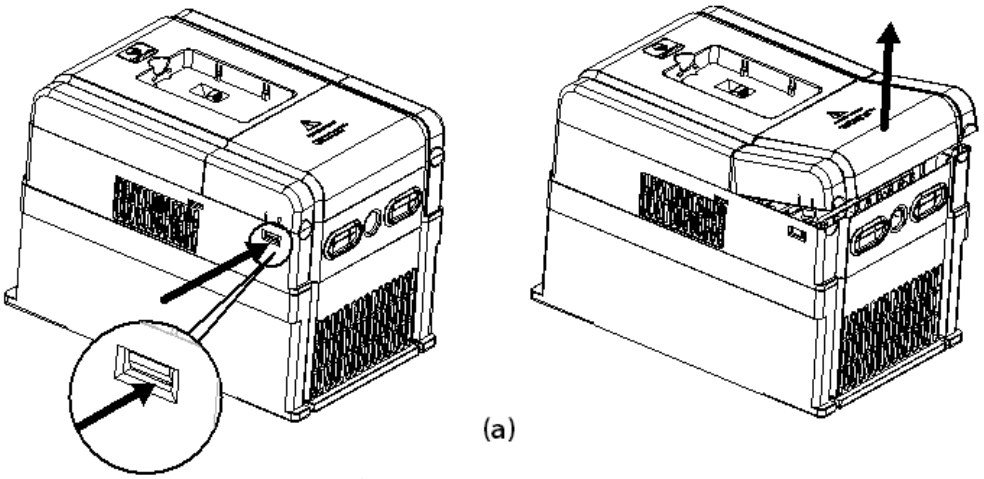


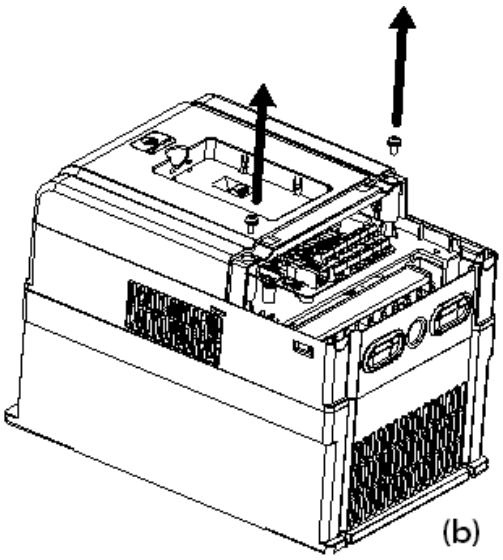
Figure 2

2.3 Dismantle Plastic Cover

The upper cover and the lower cover of HD5L are removable. The dismantle steps are shown as **Figure 3** (a), (b) and (c).
Before removing the upper cover, please take away the keypad.



(a)



(b)

The removing processes of plastic cover board:

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

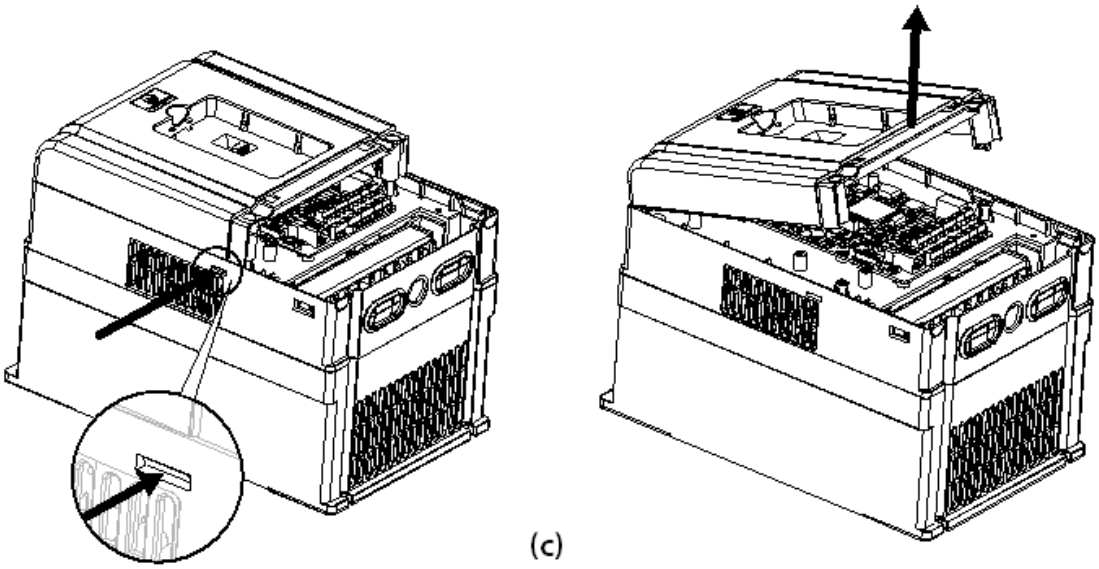


Figure 3

3. Electrical Installation

3.1 Precautions

- Only qualified electrical engineer can perform wiring job.
- To facilitate the input side over-current protection and outage maintenance, connect HD5L with power supply via the MCCB or fuse.
- Do not dismantle HD5L or do wiring operation until the power is cut-off for more than 10 minutes, the internal charge indicator of HD5L is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.
- Check the wiring carefully before connecting emergency stop or safety circuit.
- There is more than 3mA leakage current in HD5L grounding, depending on the operating conditions. To ensure safety, HD5L 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 HD5L 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 HD5L.
- For HD5L 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 HD5L.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure HD5L has ceased output before switching motor or change-over switches.
- The HD5L DC bus terminals must not be short-circuited.

3.2 Control Board and I/O Board

- The control circuit is basically isolated with the power circuit. Do not touch HD5L after it is powered.

- If the control circuit is connected to external devices with live touchable port, it should increase an additional isolating barrier to ensure that voltage 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 forbidden for this connection.

3.2.1 Control Board Terminal

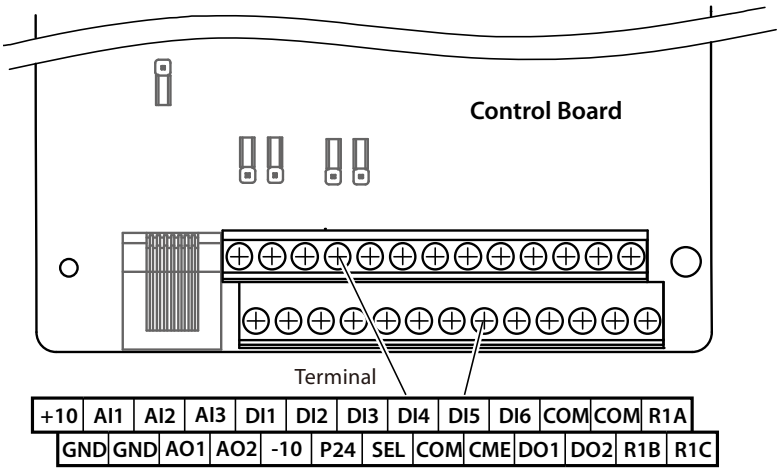


Figure 4

Control Board Terminal

Terminal		Description
+10, GND	+10V power supply	Analogue input use +10V power supply, max. output current is 100mA
-10, GND	-10V power supply	Analogue input use -10V power supply, max. output current is 10mA GND is isolated to COM
AI1, AI2, AI3	Analogue input	AI1 input voltage: 0 - 10V (input impedance: 34kΩ) AI2, AI3 input voltage: -10V - 10V (input impedance: 34kΩ); AI2, AI3 input current: 0 - 20mA (input impedance: 500Ω) • AI2, AI3 can select voltage/current;
AO1, AO2	Analogue output	Output voltage/current signal: 0 - 10V/0 - 20mA; Programmable output
GND	Analogue ground	
DI1 - DI6	Digital input	Programmable bipolar optional input signal Input voltage: 0 - 30VDC DI1 - DI5 input impedance: 4.7kΩ; DI6 input impedance: 1.6kΩ
P24, COM	Digital power supply	Digital input use +24V as supply, max. output current is 200mA COM is isolated to CME
SEL	Digital input common terminal	SEL and P24 are connected by default (factory setting). • Disconnect SEL and P24 when use external power to drive DI1 – DI6
DO1, CME	Digital output	Programmable optical-coupled isolation, open collector output Output voltage: 0 - 30VDC, max. output current 50mA CME is isolated to COM, shortly connected to COM by default • Disconnect CME and COM when they are isolating output
DO2, COM	Digital output	
R1A/ R1B/ R1C	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A • R1B,R1C: normally closed; R1A,R1C: normally open

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

3.2.2 I/O Board Terminal

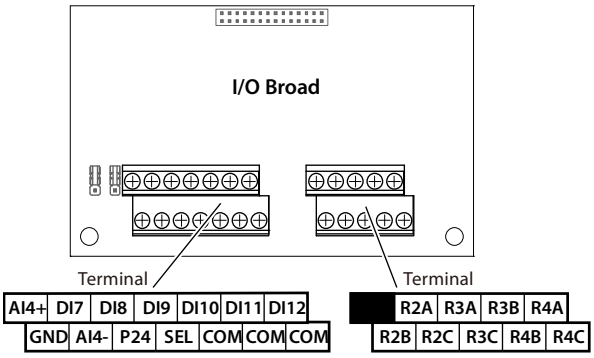


Figure 5

I/O Board Terminal

Terminal		Description
AI4+, AI4-	Analogue differential input	Selectable input voltage/current Input voltage: -10V - 10V (input impedance: 34kΩ); Input current: 0 - 20mA (input impedance: 500Ω)
GND	Analogue ground	GND is isolated to COM
DI7 - DI12	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, maximum output current is 200mA
SEL	Digital input common terminal	SEL and P24 are connected by default (factory setting). Disconnected SEL and P24 when use external power to drive DI7 - DI12
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

Table 1

I/O Board Terminal Description

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

3.2.3 Jumper

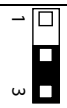
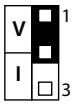
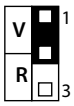
Jumper		Description
Control Board CN5		AI2 can select voltage or current signal. • Pin 1 & 2 are short-connected, AI2 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AI2 inputs current signal.
Control Board CN6		AI3 can select voltage or current signal. • Pin 1 & 2 are short-connected, AI3 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AI3 inputs current signal.
Control Board CN7		AO1 can select voltage or current signal. • Pin 1 & 2 are short-connected, AO1 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AO1 inputs current signal.
Control Board CN8		AO2 can select voltage or current signal. • Pin 1 & 2 are short-connected, AO2 inputs voltage signal (factory setting). • Pin 2 & 3 are short-connected, AO2 inputs current signal.
Control Board CN9		SCI communication can select proper resistance. • Pin 1 & 2 are short-connected, select the proper resistance. • Pin 2 & 3 are short-connected, no resistance (factory setting).
I/O Board CN2		AI4 can select voltage or current signal. • Pin 1 &2 are short-connected, AI4 inputs voltage signal (factory setting); • Pin 2 & 3 are short-connected, AI4 inputs current signal. Note: Pin 2 &3 of CN3 must be short-connected.
I/O Board CN3		AI4 can select thermistor. • Pin 1 & 2 are short- connected, AI4 is for the user reference analogue input (factory setting); • Pin 2 & 3 are short- connected, AI4 is for the motor over-heating detection signal input via the external connected thermistor.

Table 2

Jumper Description

3.2.4 Control Terminal Wiring

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

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

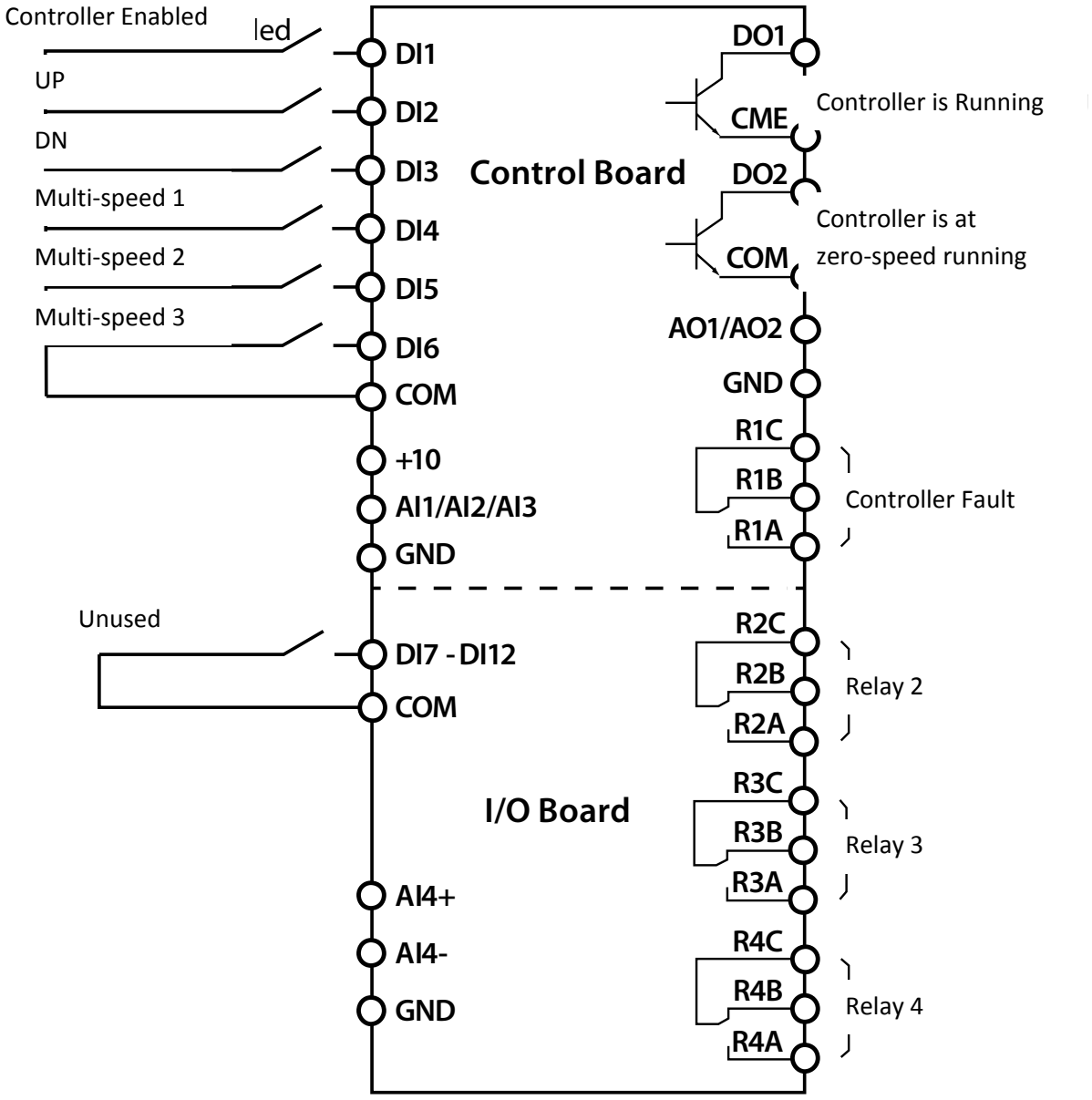


Figure 6

HD5l Control Board Connection

Digital Input Connection

Dry contact

Using the internal 24V power supply (SEL and P24 are short-connected at factory) or external power supply (remove the connector between SEL and P24), their connections are shown in **Figure 7**.

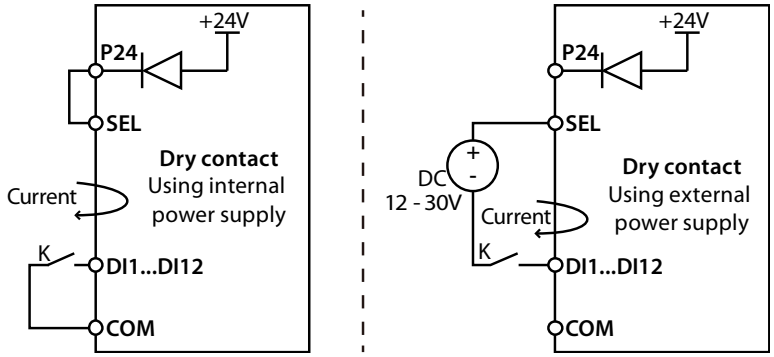


Figure 7

Dry Contact Connection

Source / Drain

Using external power supply, the source / drain connection are shown in **Figure 8**. (Remove the connector between SEL and P24)

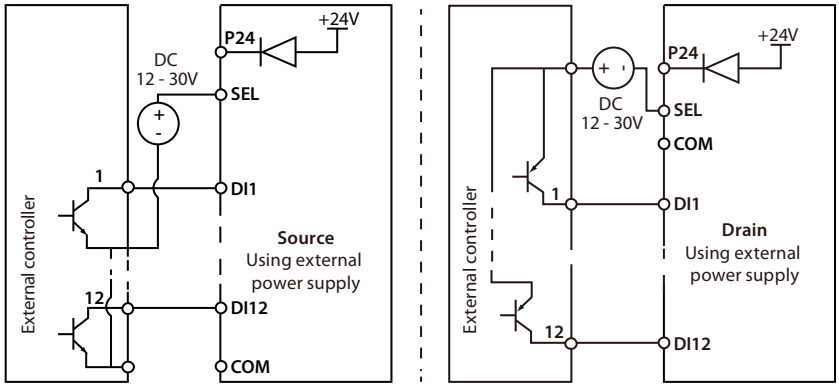


Figure 8

Source / Drain connection when using external power

Using internal 24V power supply of HD5L, it is NPN / PNP connection in which external controller is common emitter output, as shown in **Figure 9**. (For PNP, remove the connector between SEL and P24)

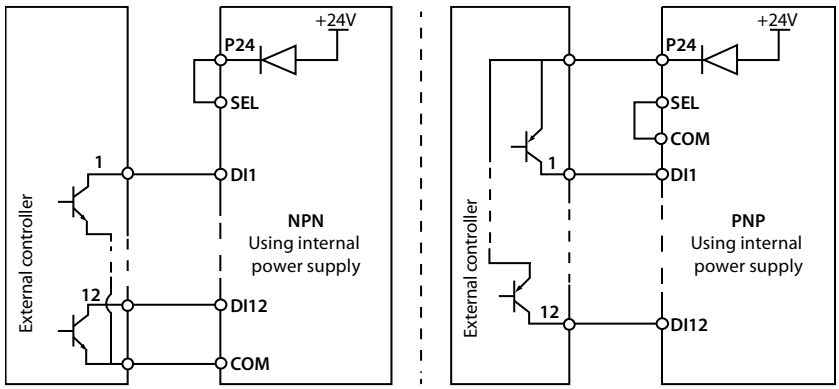


Figure 9

NPN (source) / PNP (drain) connection when using internal power supply

Digital Output Connection

DO1 can use internal 24V power supply of HD5L or external power supply, the connection is shown in **Figure 10**.

DO1 connection also applies to DO2.

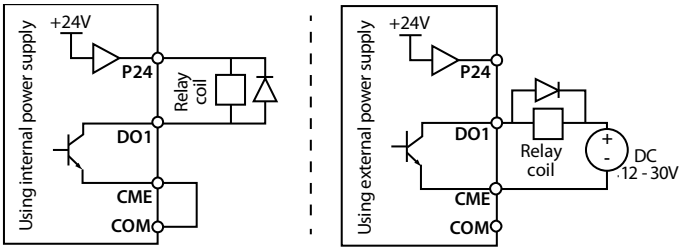


Figure 10

DO1 Connection

3.3 Encoder Interface Board

3.3.1 Encoder Interface Board Introduction

There are 4 kind encoder interface boards provided for HD5L series controller. And their models and functions are shown as **Table 3**.

Encoder interface boards	Functions
HD-PG2-OC-FD OC encoder interface board with frequency de-multiplication (FD) output	• Support the differential ABZ signals and the pulse FD output; • Apply to asyn. motor closed-loop vector control (VC)
HD-PG5-SINCOS-FD SINCOS encoder interface board with FD output	• Support the SINCOS signal and the pulse FD output; • Apply to syn. motor closed-loop vector control (VC)
HD-PG6-UVW-FD Line drive encoder interface board with FD output	• Support the differential ABZ and UVW signal and the pulse FD output; • Apply to syn. motor closed-loop vector control (VC)
HD-PG9-SC-FD SC encoder interface board with FD output	• Support the serial communication signal and the pulse FD output; • Apply to syn. motor closed-loop vector control (VC)

Table 3

Encoder Interface Boards

Wiring Requirements

1. Encoder card wire should be laid separately and keep distance from power cables and forbidden to parallel with them.
2. Encoder card wire should be installed inside separated metal conduits and connected to ground firmly.

3.3.2 FD Description

To change the FD coefficient, shift 6-digit FD switches. When the switch shifts to ON, it means "1", otherwise means "0". Convert the 6-digit binary number into decimal number. Multiple the decimal number by 2, the result is FD coefficient, as shown in Error! Reference source not found..
Maximum value is "111111" which is 63x2 FD.

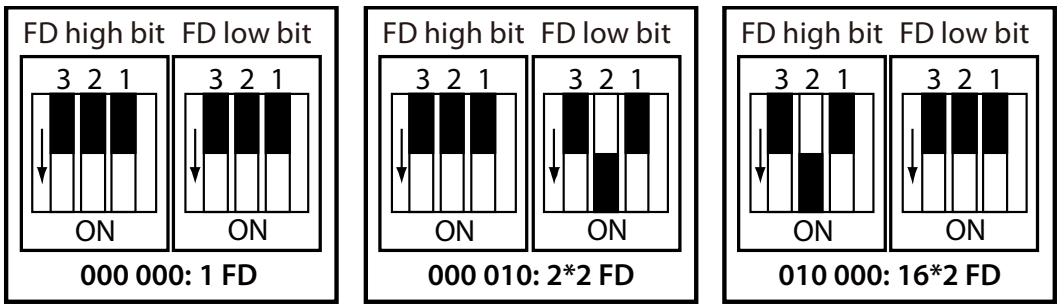


Figure 11
Encoder Interface board FD Description

3.3.3 HD-PG2-OC-FD

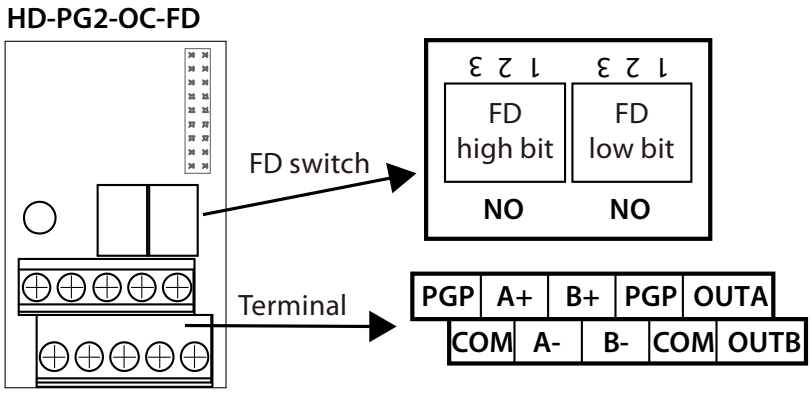


Figure 12
HD-PG2-OC-FD

FD Switch

FD switch is shown as section 3.3.2 FD Description.

Terminal Description

Terminal	Description	Terminal	Description
PGP	+12V power supply output	OUTA	Output A signal, NPN type OC output
COM	Power ground, isolated from GND	OUTB	Output B signal, NPN type OC output
A+ / A-	A+ / A- signals of encoder	COM	Output ground, isolated from GND
B+ / B-	B+ / B- signals of encoder		

Table 4

Terminal Description

Connection

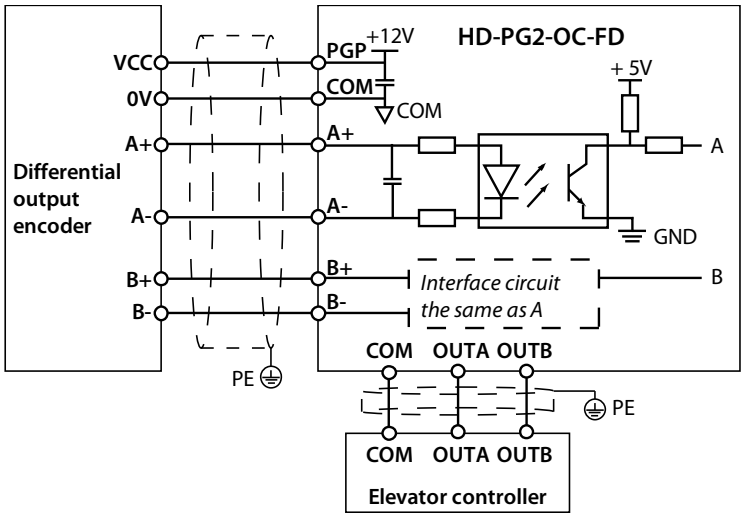


Figure 13

Connection of differential output encoder

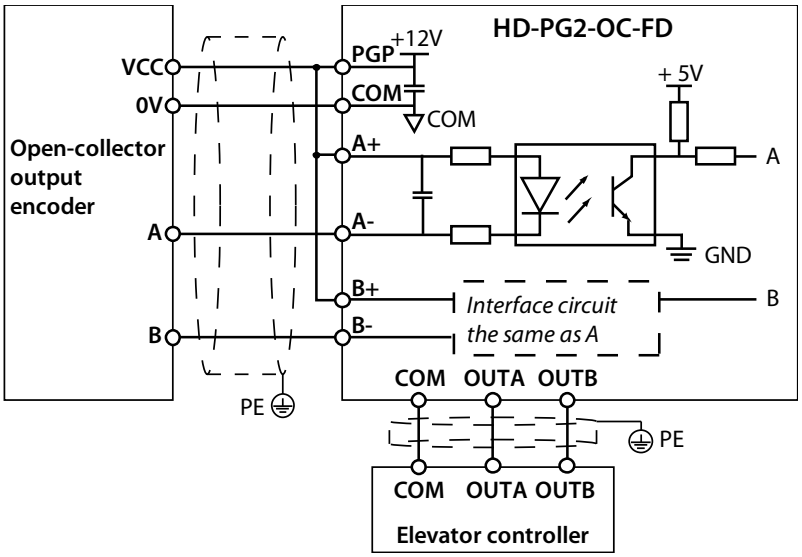


Figure 14

Connection of open-collector output encoder

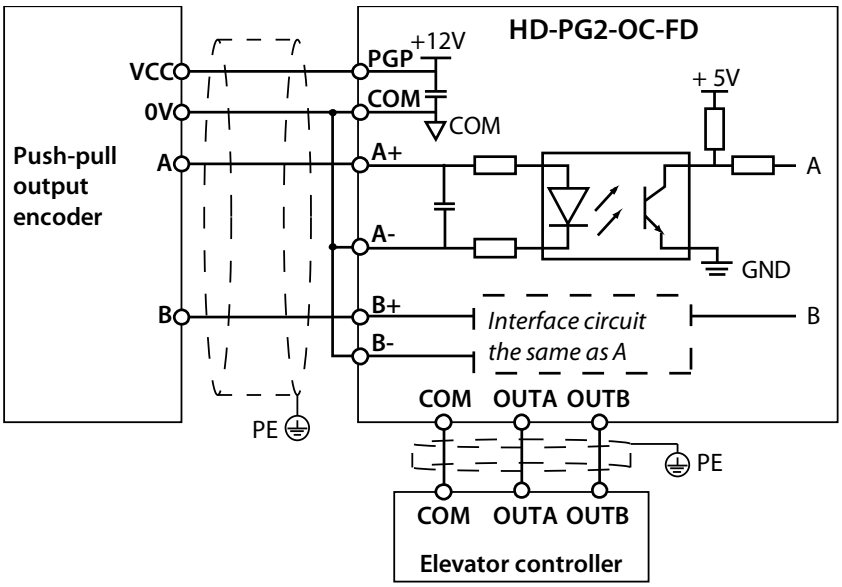


Figure 15

Connection of push-pull output encoder

3.3.4 HD-PG5-SINCOS-FD

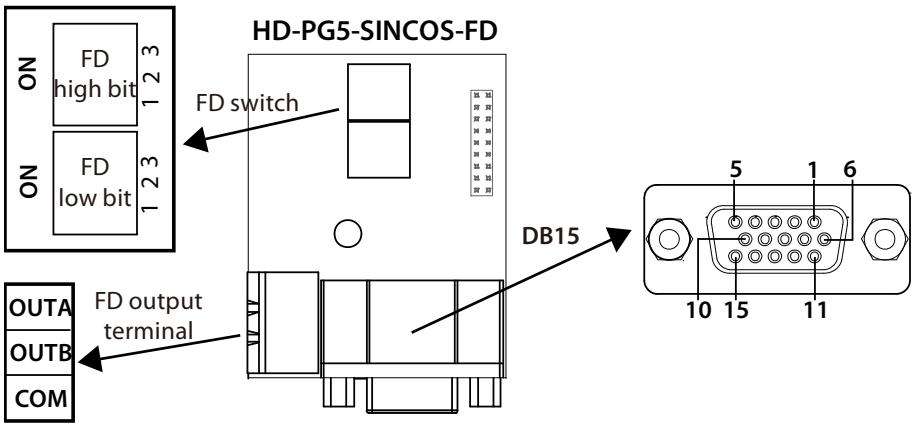


Figure 16

HD-PG5-SINCOS-FD

FD Switch

FD switch is shown as section 3.3.2 FD Description.

Terminal description

Connect the DB15 terminal to the DB15 socket of motor encoder signal cable.

Terminal		Description	Terminal		Description
1 / 8	B- / B+	Differential signal B- / B+	12 / 13	D+ / D-	Differential signal D+ / D-
3 / 4	R+ / R-	Differential signal R+ / R-	2 / 14 / 15		Unused
5 / 6	A+ / A-	Differential signal A+ / A-			
7	GND	Power supply ground	OUTA		Output A signal, NPN type OC output
9	PGVCC	+5V power supply	OUTB		Output B signal, NPN type OC output
10 / 11	C+ / C-	Differential signal C+ / C-	COM		Output ground, isolated from GND

Table 5

DB15 terminal and FD output terminal description

Connection

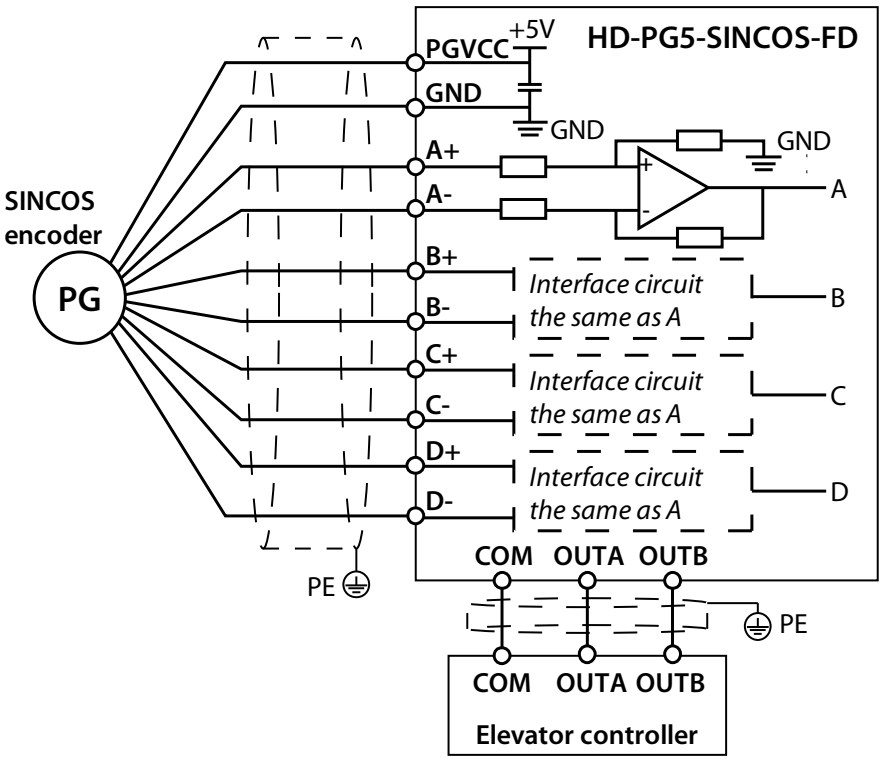


Figure 17

Connection of SINCOS encoder

3.3.5 HD-PG6-UVW-FD

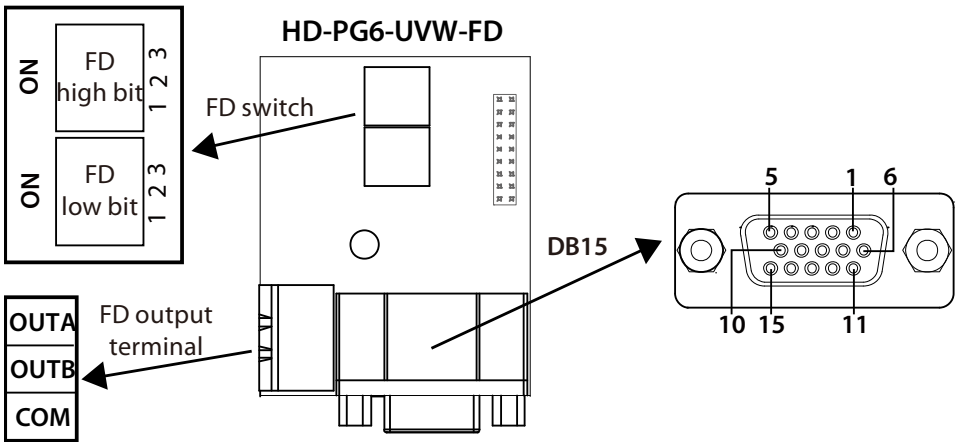


Figure 18

HD-PG6-UVW-FD

FD Switch

FD switch is shown as section 3.3.2 FD Description.

Terminal description

Connect the DB15 terminal to the DB15 socket of motor encoder signal cable.

Terminal		Description	Terminal		Description
1 / 2	A+ / A-	Differential signal A+ / A-	13	PGVCC	+5V power supply
3 / 4	B- / B+	Differential signal B- / B+	14	PGGND	Power supply ground
5 / 6	Z+ / Z-	Differential signal Z+ / Z-	15		Unused
7 / 8	U+ / U-	Differential signal U+ / U-	OUTA		Output A signal, NPN type OC output
9 / 10	V+ / V-	Differential signal V+ / V-	OUTB		Output B signal, NPN type OC output
11 / 12	W+ / W-	Differential signal W+ / W-	COM		Output ground, isolated from GND

Connection

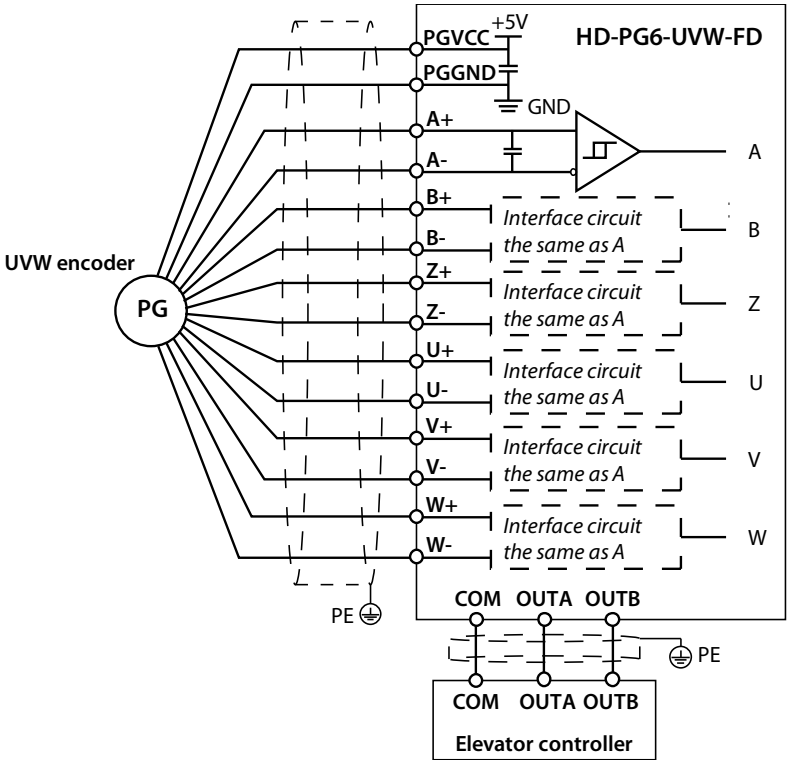


Figure 19

Connection UVW encoder

3.3.6 HD-PG11-SC-FD

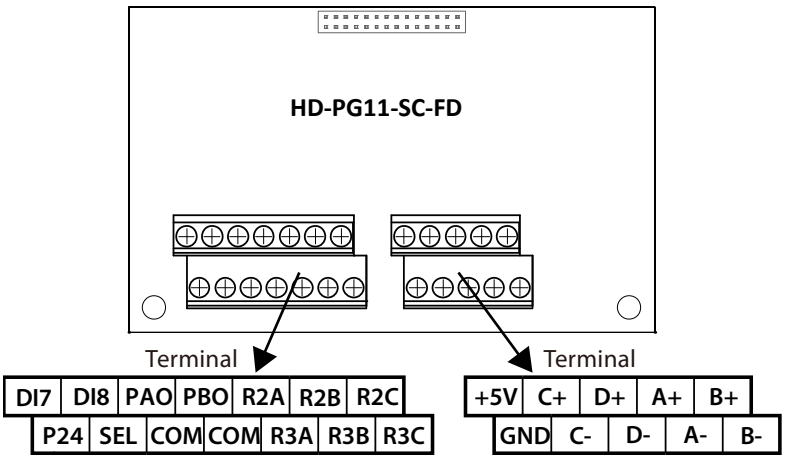


Figure 20

HD-PG11-SC-FD

FD description

The FD coefficient of HD-PG9-SC-FD is set by F16.10.

Terminal description

Terminal		Description
DI7 - DI8	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, maximum output current is 200mA COM is isolated from CME
SEL	Digital input common terminal	Factory settings default SEL and P24 are connected. • Disconnect SEL and P24 when use external power to drive DI7 - DI12
PAO, COM	FD output	FD output signal A, NPN type OC output
PBO, COM		FD output signal B, NPN type OC output
R2A/R2B/R2C R3A/R3B/R3C	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A • RB,RC: normally closed; RA,RC: normally open
+5V, GND	+5V power	+5V power supply for PG
C+ / C-	CLK	CLK Differential signal C+ / C-
D+ / D-	Data	Data Differential signal D+ / D-
A+ / A- / B+ / B-	Sin/Cos Signal	Differential signal A+ / A- / B+ / B-

Note !

1. *Limit the current within 3A if the relay terminal is to connect to AC 220V voltage signal.*
2. *HD-PG9-SC-FD and I/O board cannot be used at the same time.*

4. Operation Instructions

- Only when the terminal cover of HD5L 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 HD5L starts.
- Keep away from HD5L 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 HD5L running.
- Do not randomly change HD5L parameter setting.
- Please thoroughly complete all control debugging and testing, make all adjustments and conduct a full safety assessment before switching the run command source of HD5L.
- Do not touch the energy-depletion braking resistor due to the high temperature.

4.1 Function Description

Note !

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

4.1.1 Operation Mode

The operation mode defines how HD5L receives run commands (start or stop command) and speed command. There are selectable through parameter F00.05.

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 analogue 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.
Communication speed control	The run command and the run multi-step speed are set by PC communication.

4.1.2 Control Mode

HD5L series have three control modes which are V/f control, SVC control and VC control. (Refer to F00.01 for more detail)

4.1.3 Controller Status

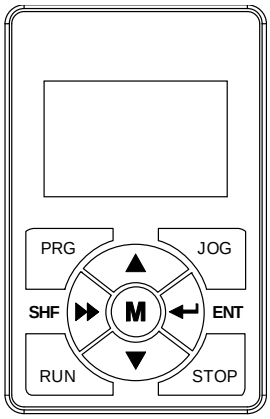
Controller Status	Description
Stop status	After HD5L is switched on and initialized, if no run command inputs or the stop command is given, there will be no output from U/V/W of HD5L and the LCD keypad will be anti-color display STOP under the left.
Run status	The controller will start output from U/V/W terminals after it receives the run command. And the LCD keypad will be anti-color display RUN under the left.
Motor parameters auto-tuning	Set F07.06/F10.10 = 1 or 2, HD5L will receive the run command then enter motor parameters auto-tuning status. If the auto-tuning process is completed, the controller will enter into stop status.
Fault alarm status	HD5L has fault.
Under-voltage status	HD5L is under-voltage.

4.1.4 Controller Running Mode

Running Mode	Description
Auto-tuning running	Set F07.06/F10.10 = 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 or 4.
Inspection running	When inspection signal is valid, the speed will be set by F05.08 (inspection run speed). This mode is accessible when F00.05 = 1, 2 or 4.
Battery-driven running	When emergency signal is valid, the speed will be set by F05.09 (battery driven speed). This mode is accessible when F00.05 = 1, 2 or 4.
Normal running	Controlled by keypad (F00.05 = 0) or terminal analogue (F00.05 = 1).

4.2 Operating Instructions

4.2.1 Keypad



Key	Description
PRG	Entry or exit programming key
JOG	Unused
RUN	In the keypad control, press this key to run HD3L
STOP	a. In the keypad control, press this key to stop HD3L b. In the detection fault, press this key to reset at fault
M	Set certain function by F00.06
▲	Increase value or parameter
▼	Decrease value or parameter
▶▶	a. Select display parameter and shift bit b. Stop in loop/Display the parameter during running
↵	a. Enter lower menu b. Confirm saving the data

Table 6

Key description of Keypad

4.2.2 Display Status

LCD anti-color displays: white on black display such as STOP, RUN, F03: , 0.3 5 0 m/s *etc.*

Note !

1. *If the parameter or the setting value is in anti-color displaying, it is changeable. Take* 0.3 5 0 m/s *for example; the units of setting value can be changed.*
2. *If the status is in anti-color displaying, it means that it is in this status. Take* RUN *for example, it means that HD5L is in the run status.*

Parameter display status at stop / run

When HD5l is in stop / run status, the keypad will display stop or run status and its parameters, as shown in **Figure 21**.

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

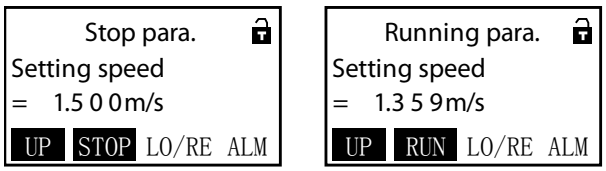


Figure 21

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 parameter F01.00 and the user password unlock and modify of section **4.2.3**), as shown in **Figure 22**.

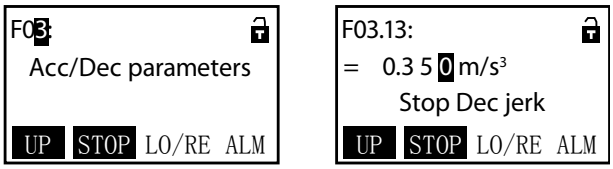


Figure 22

Parameters editing status

Fault alarming status

If HD5L detects a fault signal, the keypad will enter the fault alarm status and LCD will display the fault code and name and anti-color display ALM, as shown in **Error! Reference source not ound.**.

The fault history can be checked by entering Group F17.

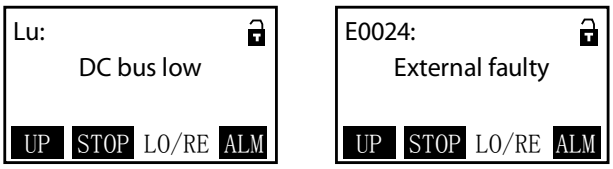


Figure 23

Fault Alarming Status

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

4.2.3 Keypad Operation Examples

Four-level menu switching operation

The keypad uses four-level menu configuration for parameter setting or other operations. Configuring mode can be displayed in 4-level menu: mode setting (first-level)→function parameter group setting (second-level)→function parameter setting (third-level)→parameter setting (fourth-level). The operation process is shown in **Figure 24** and the description of the keys is shown in **Table 7**

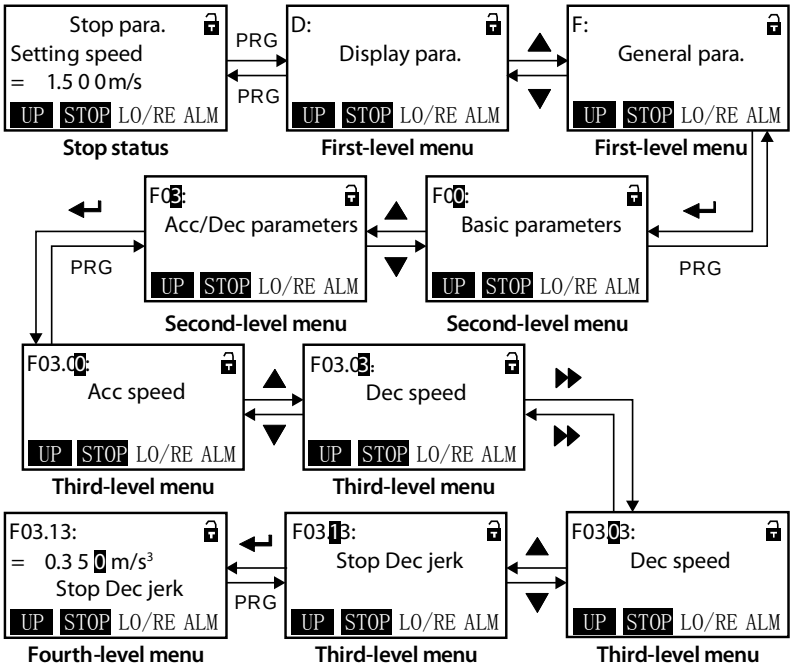


Figure 24

Four level operation process

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

Table 7

Parameter setting

For example: To modify the setting value of the F00.07 from 1.500m/s to 1.000m/s, refer to **Figure 25**.

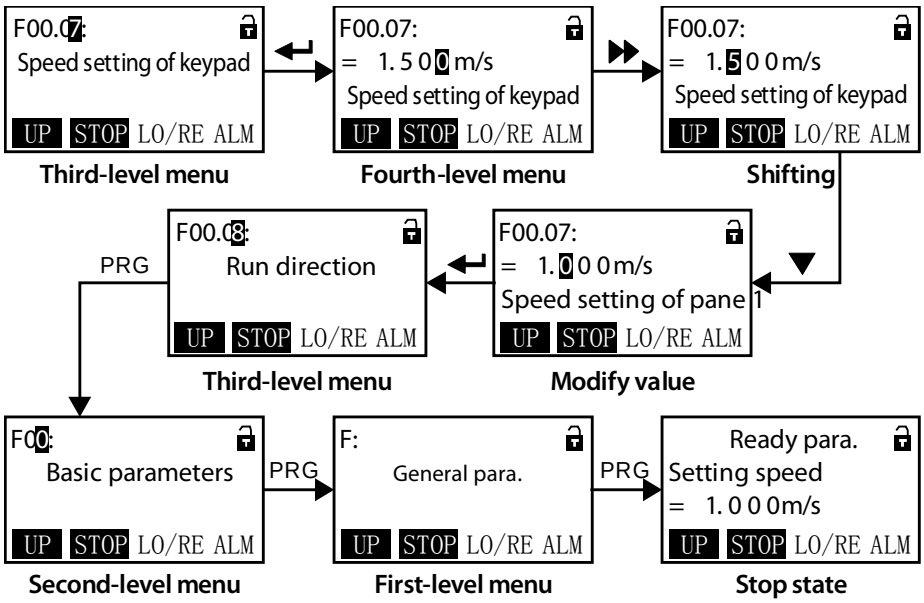


Figure 25

Parameter setting

When setting fourth-level menu, if the parameter is not in anti-color displaying, 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 input the correct password can it edit the function parameter due to the valid password.

Switching display parameters at stop status

The keypad can display six stop parameters (F15.08 - F15.13) in loop. Take the default parameter as an example, **Figure 26** shows the switching process at stop status.

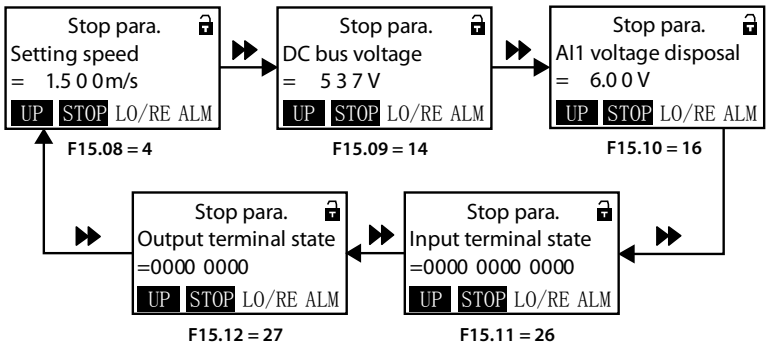


Figure 26

Switching display parameters stop status

Unlock user's password

F01.00 = non-zero value and detect no press on the keypad within 5 minutes, the user's password will be valid. The lock identification of keypad will be .

The operation of unlock user's password is as shown in **Figure 27** which takes 4 as the user's password. The lock identification will be when it successfully unlocks.

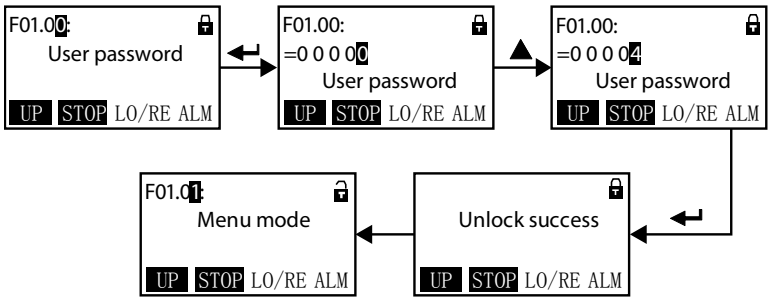


Figure 27

Operation of unlocking user's password

Modify user's password

If no password, directly modify the value of F01.00 according to **Figure 28**.

If there is password, unlock the password according to **Figure 27**. When the lock successfully displays the , you can set a new password according to **Figure 28** which takes "02004" as the new password. When the password is valid, the lock identification will be .

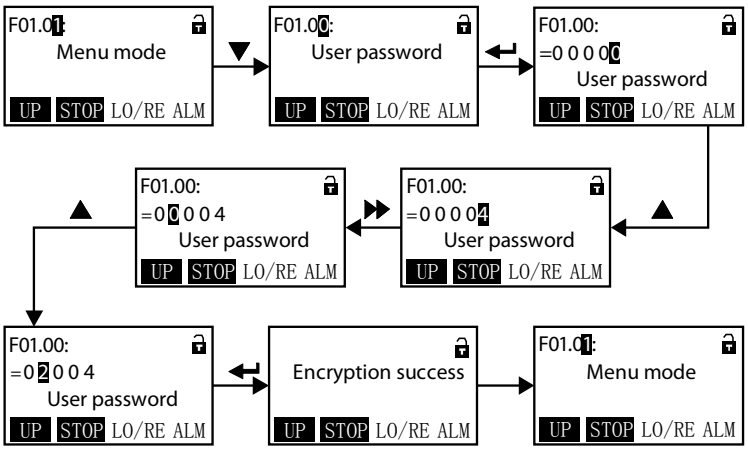


Figure 28

Operation of modifying user's password

Clear user's password

If there is password, unlock according to **Figure 27**. When it successfully displays , clear the user's password according to **Figure 29**.

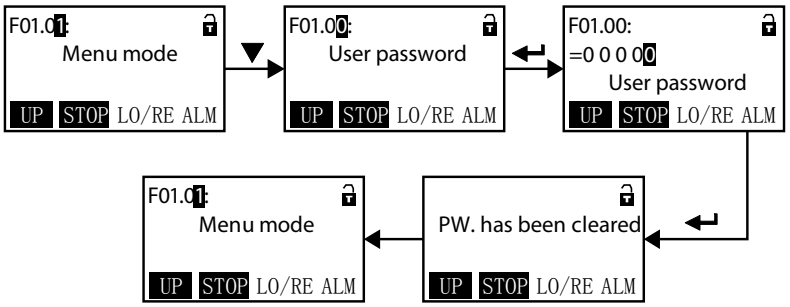


Figure 29

Operation of clearing user's password

Upload and download parameters

Upload:

When F01.03 = 1, it uploads the setting value to the keypad. When the upload is finished, the keypad will jump to display F01.00.

Download:

When F01.02 = 2, it downloads the setting value from the keypad. When the download is finished, the keypad will jump to display F01.03.

The upload and download parameters are as shown in.

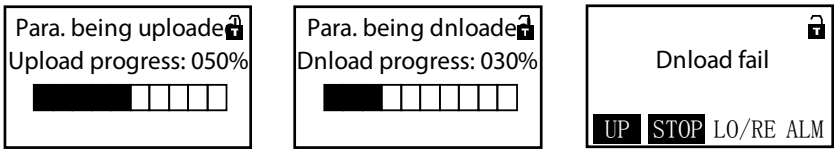


Figure 30

Display upload and download parameters

Note !	1. *When downloading parameters, it displays "dFAiL" which means that the EEPROM storage parameters of keypad do not match with function parameters of HD5L. First, upload the setting value of the correct function code to the EEPROM of keypad, and then download.* 2. *When uploading / downloading parameters, it displays "E0022" (keypad EEPROM fault). It will jump to next function code 10 seconds later. The troubleshooting is in 7 Troubleshooting and Maintenance.*

4.3 Initial Power On

It needs carefully check before power is on. Please wire the controller according to the specifications supplied by this manual.

After checking the wiring and mains supply voltage, switch on the circuit breaker and the controller will be initialized. The keypad will display as shown in **Figure 31**.

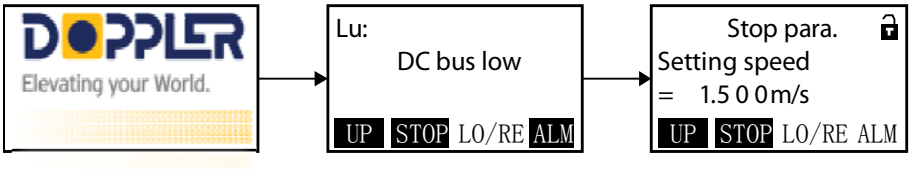


Figure 31

Display initialling keypad

5. Function Introduction

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

Group D: Display Parameters

D00: System Status Parameters
D01: Drive Status Parameters
D02: Analogue Status Display Parameters
D03: Running Status Parameters
D04: Encoder Status Parameters

Group F: General Function Parameters

F00: Basic Parameters
F01: Protection of Parameters
F02: Start & Stop Parameters
F03: Acc / Dec Parameters
F04: Analogue Curve Parameters
F05: Speed Parameters
F06: Weighting Compensation Parameters
F07: Asyn. Motor Parameters
F08: Motor Vector Control Speed Loop Parameters
F09: Current Loop Parameters
F10: Syn. Motor Parameters
F11: PG Parameters
F12: Digital I/O Terminal Parameters
F13: Analogue I/O Terminal Parameters
F14: SCI Communication Parameters
F15: Display Control Parameters
F16: Function Boost Parameters
F17: Fault Protect Parameters
F18: PWM Parameters
F19: Unused
F20: Unused

Group Y: Manufacturer Function Parameters

5.1 Group D: Display Parameters

Group D is status display parameters. The users can directly check the status parameters by checking the function code of Group D.

5.1.1 D00: System Status Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th><th>DOPPLER's Value</th></tr>
<tr><td rowspan="2">D00.00</td><td>Controller series</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display controller series.</td></tr>
<tr><td rowspan="2">D00.01</td><td>Software version of DSP</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display software version of DSP.</td></tr>
<tr><td rowspan="2">D00.02</td><td>Special software version of DSP</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display special software version of DSP.</td></tr>
<tr><td rowspan="2">D00.03</td><td>Software version of keypad</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display software version of keypad.</td></tr>
<tr><td rowspan="2">D00.04</td><td>Elevator running status</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display the elevator running status in 16-bit binary. As following:
<table>
<tr><td>Bit15: Battery driven run
0: No
1: Yes</td><td>Bit14: MS terminal 3
0: Invalid
1: Valid</td><td>Bit13: MS terminal 2
0: Invalid
1: Valid</td><td>Bit12: MS terminal 1
0: Invalid
1: Valid</td></tr>
<tr><td>Bit11: Down forced Dec. input
0: Invalid
1: Valid</td><td>Bit10: Up forced Dec. Input
0: Invalid
1: Valid</td><td>Bit9: Contactor feedback input
0: Invalid
1: Valid</td><td>Bit8: Brake feedback input
0: Invalid
1: Valid</td></tr>
<tr><td colspan="4">Bit7 - bit4: unused which means "0"</td></tr>
<tr><td>Bit3: Analogue run
0: No
1: Yes</td><td>Bit2: MS run
0: No
1: Yes</td><td>Bit1: Inspection run
0: No
1: Yes</td><td>Bit0: controller enable
0: Disenable
1: Enable</td></tr>
</table></td></tr>
<tr><td rowspan="2">D00.05</td><td>Rated current of HD5L</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display rated current of HD5L.</td></tr>
<tr><td>D00.06</td><td>Controller status</td><td>[actual value]</td><td></td></tr>
<tr><td></td><td colspan="3">Display HD5L status in 16-bit binary. As following:
<table>
<tr><td>Bit15: Unused</td><td>Bit14: Unused</td><td>Bit13: Stop signal
0: No stop signal
1: Stop signal</td><td>Bit12: Contactor output
0: Invalid
1: Valid</td></tr>
<tr><td>Bit11: Brake output
0: Invalid
1: Valid</td><td>Bit10: Ready to run
0: Not ready
1: Ready</td><td>Bit9: Speed within FAR
0: No
1: Yes</td><td>Bit8: Auto-tuning
0: Not in auto-tuning
1: In auto-tuning</td></tr>
<tr><td rowspan="2">Bit7: Zero-speed running
0: Not at zero-speed
1: At zero-speed</td><td rowspan="2">Bit6: Zero-speed signal
0: Invalid
1: Valid</td><td colspan="2">Bit5&Bit4: Acceleration / Deceleration / Constant</td></tr>
<tr><td>00: Constant
11: Unused</td><td>01: Acceleration
10: Deceleration</td></tr>
<tr><td>Bit3: DN
0: No
1: Yes</td><td>Bit2: UP
0: No
1: Yes</td><td>Bit1: Run/Stop
0: Stop
1: Run</td><td>Bit0: Controller fault
0: No fault
1: Fault</td></tr>
</table></td></tr>
</table>

5.1.2 D01: Drive Status Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
D01.00	**Control mode**	**[actual value]**	
	Display control 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.		
D01.09	Unused	**[actual value]**	
D01.10	**Output voltage**	**[actual value]**	
	Display output voltage.		
D01.11	**Output current**	**[actual value]**	
	Display output current.		
D01.12	**Output torque**	**[actual value]**	
	Display output torque which is the relative percentage of the motor rated torque.		
D01.13	**Output power**	**[actual value]**	
	Display output power which is the relative percentage of rated power of motor.		
D01.14	**DC bus voltage**	**[actual value]**	
	Display DC bus voltage.		
D01.15	**Unused**	**[actual value]**	

5.1.3 D02: Analogue Status Display Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
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 AI2 selects current input, - 10.00V corresponds to 0mA, and 10.00V corresponds to 20mA.		
D02.03	AI2 voltage (after calculating)	**[actual value]**	
	Display A2 input voltage which is calculated by the gain, bias and filter.		
D02.04	AI3 voltage	**[actual value]**	
	Display AI3 input voltage. When AI3 selects current input, - 10.00V corresponds to 0mA, and 10.00V corresponds to 20mA.		
D02.05	AI3 voltage (after calculating)	**[actual value]**	
	Display A3 input voltage which is calculated by the gain, bias and filter.		
D02.06	AI4 voltage	**[actual value]**	
	Display AI4 input voltage. When AI4 selects current input, - 10.00V corresponds to 0mA, and 10.00V corresponds to 20mA.		
D02.07	AI4 voltage (after calculating)	**[actual value]**	
	Display AI4 input voltage which is calculated by the gain, bias and filter.		
D02.08	AO1 output	**[actual value]**	
	Display AO1 output. When AO1 selects current output, 0V corresponds to 0mA, and 10.00V corresponds to 20mA.		
D02.09	AO2 output	**[actual value]**	
	Display AO2 output. When AO2 selects current output, the corresponding relations are: 0V corresponds to 0mA, and 10.00V corresponds to 20mA.		

5.1.4 D03: Running Status Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th><th>DOPPLER's Value</th></tr>
<tr><td rowspan="2">D03.00</td><td>Heatsink temperature</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display heatsink temperature.</td></tr>
<tr><td rowspan="2">D03.01</td><td>Input terminal status</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">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>DI12</td><td>DI11</td><td>DI10</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 rowspan="2">D03.02</td><td>Output terminal status</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">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 rowspan="2">D03.03</td><td>MODBUS status</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">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><td></td></tr>
<tr><td rowspan="2">D03.05</td><td>Total running time</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">D03.04 displays total time at power-on; D03.05 displays total running time. The unit is hour.</td></tr>
<tr><td rowspan="2">D03.06</td><td>Running times</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display the running times of the HD5L.</td></tr>
<tr><td rowspan="2">D03.07</td><td>Present fault</td><td>[actual value]</td><td></td></tr>
<tr><td colspan="3">Display present fault.</td></tr>
</table>

5.1.5 D04: Encoder Status Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
D04.00	**C phase value of SINCOS encoder**	**[actual value]**	
	Display the actual AD sample value of SINCOS encoder C phase.		
D04.01	**D phase value of SINCOS encoder**	**[actual value]**	
	Display the actual AD sample value of SINCOS encoder D phase.		
D04.02	**A phase value of SINCOS encoder**	**[actual value]**	
	Display the actual AD sample value of SINCOS encoder A phase.		
D04.03	**B phase value of SINCOS encoder**	**[actual value]**	
	Display the actual AD sample value of SINCOS encoder B phase.		
D04.04	**UVW status of UVW encoder**	**[actual value]**	
	Display the UVW status of UVW encoder.		
D04.05	**Electrical angle**	**[actual value]**	
D04.06	**Unused**		
D04.07	**Unused**		
D04.08	**Pulses of PG**	**[actual value]**	
	Displaying number of encoder pulses can be used to check the encoder is connected correctly. If the encoder is connected correctly, when the motor is rotated, D04.08 value is incremented or decremented in accordance with the running direction.		
D04.09	**Unused**		
D04.10	**Unused**		
D04.11	**Unused**		

5.2 Group F: General Function Parameters

5.2.1 F00: Basic Parameters

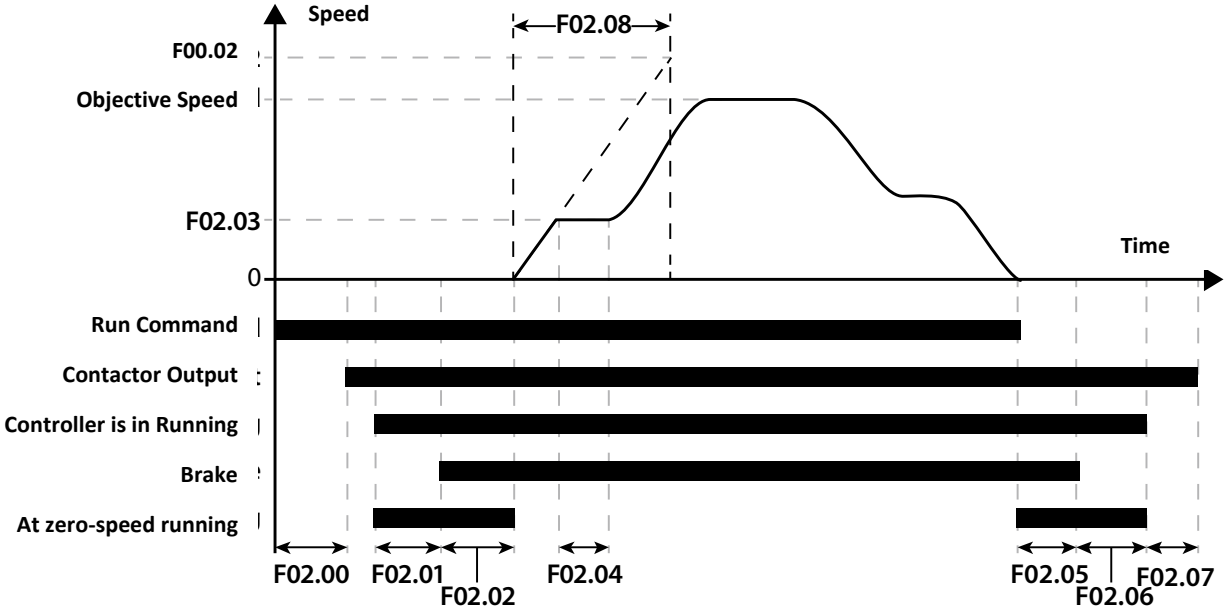
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F00.00	**Motor type**	**0,1 [0]**	*Depends on Motor Type*
	0: Asyn. motor. **1:** syn. motor.		
F00.01	**Control mode**	**0 - 2 [2]**	*1 or 2*
	0: V/f control. Constant voltage/frequency ratio control. • It is applicable for special 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. It is only applicable for asyn. Motor: **2:** Closed-loop vector control. Sensor vector control. • Closed-loop vector and applicable for high accuracy speed control occasion. Generally the elevator will take this mode. **Note:** 1. V/f and SVC control are temporary running modes applicable when the motor does not install encoder and the elevator is in inspection running. 2. Set motor parameter auto-tuning when select SVC or closed-loop vector control mode. *Auto-tuning steps: Correctly set the motor nameplate parameters (F07.00 - F07.04 / F10.00 - F10.05), then start the motor parameter auto-tuning to obtain the right parameters. Meanwhile 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]**	*Nominal Speed*
	Refers to nominal rated speed of elevator. All speed setting value in the parameters must < F00.02.		
F00.03	**Max. output frequency of HD5L**	**5.00 - 100.00 [50.00Hz]**	*Depends on Motor*
	Defines the max. frequency that HD5L 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]**	*Depends on installation*
	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.*		

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F00.05	**Operating mode**	**0 - 5 [0]**	*2*
	0: Keypad control. • Controlled by pressing the **RUN** or **STOP** key of the keypad. Set the run speed in F00.07. **1:** Terminal analogue control. • The run command is controlled by UP and DN of the terminal; and the run speed is set by analogue 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. **3:** Unused. **4:** SCI control. • The run command and the run multi-step speed are set by PC communication. **5:** Unused.		
F00.06	**M-key function**	**0,1 [0]**	*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]**	*1.500 m/s*
	F00.05 = 0, it sets the objective speed at running.		
F00.08	**Run direction**	**0,1 [0]**	*Depends on installation*
	0: The same as run command. **1:** Opposite to run command.		

5.2.2 F01: Protection of Parameters

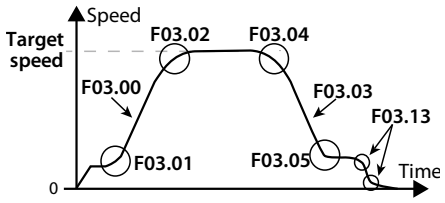
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F01.00	**User's password**	**00000 - 65535 [00000]**	-
	XXXXX: To enable the password protection function, set any non-zero number as the password. • Once the password is set, and detect that there is no press on the keypad within 5 minutes, the user's password will be valid. • 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's password. • If user unlocks the password, it means clearing the user's password. • To unlock, change and clear the user's password, refer to section 4.2.3.		
F01.01	**Menu mode**	**0,1 [0]**	*0*
	0: Full menu mode. All parameters can be displayed. **1:** Checking menu mode. Only parameters different from factory setting can be displayed.		
F01.02	**Function code parameter initialization**	**0 - 3 [0]**	*0*
	0: No operation. HD5L is in regular parameter read/write status. • Whether can change the parameter depends on the user's password status and the actual operating conditions of HD5L. **1:** Restore to factory settings. • Except Group F01, F07.00 - F07.14, Group F10, Group F11, F15.00, F17.11 - F17.27, Group F18 and Group Y. • Steps: If set F01.02 = 1, press ↵ to ensure and the parameters are restored to factory settings. The keypad dispalys "loading defualt para.". Then the keypad will display 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. will be 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 will be cleared.		
F01.03	**Keypad EEPROM parameter initialization**	**0,1 [0]**	*0*
	0: No operation. HD5L is in regular parameter read/write status. **1:** Parameter upload. Upload the current function code settings to the keypad EEPROM parameter. Note: Group F01, F17.11 - F17.27, Group F18 and Group Y do not upload.		

5.2.3 F02: Start & Stop Parameters



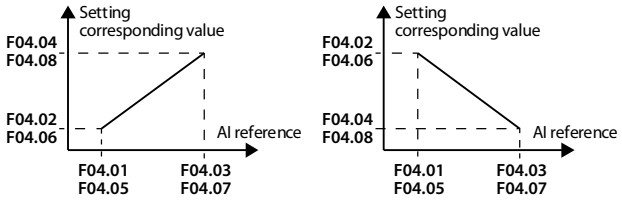
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F02.00	**Start delay time**	**0.000 - 4.999 [0.000s]**	*0.000s*
	When HD5L receives the run command, it will wait for the delay time set by F02.00 and then start running. When controlled by keypad (F00.05 = 0), F02.00 is invalid.		
F02.01	**Brake open delay time**	**0.000 - 4.999 [0.000s]**	*0.000s*
	Defines the time from zero-speed running to output brake-open command. F02.01 enables HD5L 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 [0.500s]**	*0.500s*
	Defines the retention time from brake-open to output with speed. During the retention time, the motor has output torque, which makes more comfortable. F06.00 = 4(No weighing auto-compensation is used), the value of F02.02 should exceed 0.5s.		
F02.03	**Start speed**	**0.000 - 0.400 [0.000m/s]**	*0.000 m/s*
	Defines the initial speed required for starting the controller. The start speed, when properly set, can minimize the start jerk.		
F02.04	**Retention time of start speed**	**0.000 - 4.999 [0.000s]**	*0.000s*
	Defines the time in whichHD5L runs at start speed (F02.03).		
F02.05	**Brake close delay time**	**0.000 - 4.999 [0.000s]**	*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 [0.000s]**	*0.000s*
	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]**	*0.000s*
	Defines the running contactor delay release time after the run command is revoked.		
F02.08	**Start ramp time**	**0.000 - 2.000[0.000s]**	*0.000s*
	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.		
F02.09	**Unused**		

5.2.4 F03: Acc / Dec Parameters

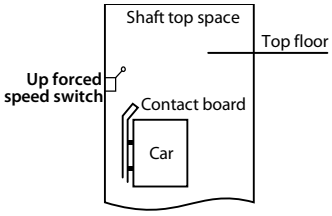
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F03.00	**Acc speed**	**0.020 - 9.999 [0.700m/s^2]**	*0.700m/s^2*
F03.01	**Start Acc jerk**	**0.020 - 9.999 [0.350m/s^3]**	*0.350 m/s^3*
F03.02	**End Acc jerk**	**0.020 - 9.999 [0.600m/s^3]**	*0.600 m/s^3*
F03.03	**Dec speed**	**0.020 - 9.999 [0.700m/s^2]**	*0.700 m/s^2*
F03.04	**Start Dec jerk**	**0.020 - 9.999 [0.600m/s^3]**	*0.600 m/s^3*
F03.05	**End Dec jerk**	**0.020 - 9.999 [0.350m/s^3]**	*0.350 m/s^3*
	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 raised; • The S-curve becomes slower when parameter values are decreased. 		
F03.06	**Inspection Acc speed**	**0.020 - 9.999 [0.200m/s^2]**	*0.200 m/s^2*
	Defines the Acc speed of elevator at inspection run mode.		
F03.07	**Inspection Dec speed**	**0.020 - 9.999 [1.000m/s^2]**	*1.000 m/s^2*
	Defines the Dec speed of elevator at inspection run mode.		
F03.08	**Battery driven Acc speed**	**0.020 - 9.999 [1.000m/s^2]**	*1.000 m/s^2*
	Defines the Acc speed of elevator at battery driven mode.		
F03.09	**Battery driven Dec speed**	**0.020 - 9.999 [1.000m/s^2]**	*1.000 m/s^2*
	Defines the Dec speed of elevator at battery driven mode		
F03.10	**Asyn. motor auto-tuning Acc speed**	**0.020 - 9.999 [0.100m/s^2]**	*0.100 m/s^2*
	Defines the acceleration speed at auto-tuning of motor.		
F03.11	**Asyn. motor auto-tuning Dec speed**	**0.020 - 9.999 [0.100m/s^2]**	*0.100 m/s^2*
	Defines the deceleration speed at auto-tuning of motor.		
F03.12	**Abnormal Dec speed**	**0.020 - 9.999 [1.000m/s^2]**	*1.000 m/s^2*
	Defines the deceleration speed at valid forced or wrong run mode.		

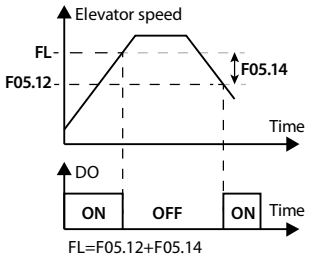
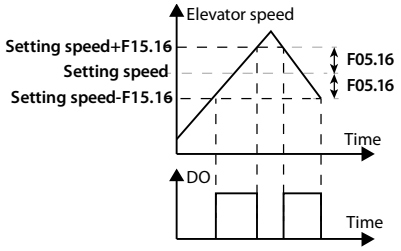
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F03.13	**Stop Dec jerk**	**0.020 - 9.999 [0.350m/s^2]**	*0.350 m/s^2*
	Defines Dec change rate from non-zero speed to zero speed. It can adjust the smooth stop of the elevator and ass riding comfort.		
F03.14	**Asyn. motor field-weakening optimization**	**0 – 2 [0]**	*0*
	0: No field-weakening optimization. **1:** Optimize according to voltage. **2:** Optimize according to current. F03.14 = 1 or 2, it can reduce the current noise and improve the dynamic performance of asyn. motor.		
F03.15	**Field-weakening Kp**	**0 – 5000 [4000]**	*4000*
F03.16	**Field-weakening Ki**	**0 - 5000 [1000]**	*1000*
F03.17	**Field-weakening voltage limit**	**4000 - 5000 [4126]**	*4126*
	F03.15 - F03.17 is uesd to adjust the effect of asyn. motor field-weakening so that user need not regulate them usually.		
F03.18	**Unused**		-
F03.19	**Sincos encoder CD phase learning**	**0,1 [0]**	*0*
	0: Learning. **1:** Not learning.		
F03.20	**Unused**		-

5.2.5 F04: Analogue Curve Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F04.00	**Setting curve** Units: AI1 characteristic curve selection. Tens: AI2 characteristic curve selection. Hundreds: AI3 characteristic curve selection. Thousands: AI4 characteristic curve selection. Each bit setting: • **0:** Line 1. • **1:** Line 2.	**0000 - 1111 [0000]**	*0000*
F04.01	**Line 1 min. setting**	**0.0 - F04.03 [0.0%]**	*0.0%*
F04.02	**Corresponding value of line 1 min. setting**	**0.0 - 100.0 [0.0%]**	*0.0%*
F04.03	**Line 1 max. setting**	**F04.01 - 100.0 [100.0%]**	*100.0%*
F04.04	**Corresponding value of line 1 max. setting**	**0.0 - 100.0 [100.0%]**	*100.0%*
F04.05	**Line 2 min. setting**	**0.0 - F04.07 [0.0%]**	*0.0%*
F04.06	**Corresponding value of line 2 min. setting**	**0.0 - 100.0 [0.0%]**	*0.0%*
F04.07	**Line 2 max. setting**	**F04.05 - 100.0 [100.0%]**	*100.0%*
F04.08	**Corresponding value of line 2 max. setting** F04.01 - F04.04 define the line 1. F04.05 - F04.08 define the line 2. • Both line 1 and line 2 can independently achieve positive and negative characteristics as shown in following figure. 	**0.0 - 100.0 [100.0%]**	*100.0%*

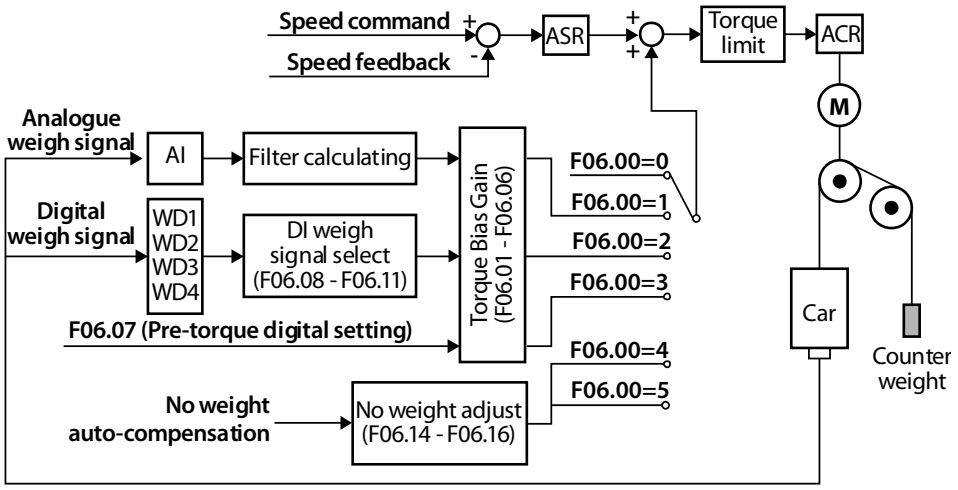
5.2.6 F05: Speed Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F05.00	**Multi-speed 0**	**0.000 - F00.02 [0.000m/s]**	*0.000 m/s*
F05.01	**Multi-speed 1**	**0.000 - F00.02 [0.000m/s]**	*Nominal Speed*
F05.02	**Multi-speed 2**	**0.000 - F00.02 [0.000m/s]**	*0.050 m/s*
F05.03	**Multi-speed 3**	**0.000 - F00.02 [0.000m/s]**	*Nominal Speed if more than 1m/s*
F05.04	**Multi-speed 4**	**0.000 - F00.02 [0.000m/s]**	*0.150 m/s*
F05.05	**Multi-speed 5**	**0.000 - F00.02 [0.000m/s]**	*0.000 m/s*
F05.06	**Multi-speed 6**	**0.000 - F00.02 [0.000m/s]**	*0.000 m/s*
F05.07	**Multi-speed 7**	**0.000 - F00.02 [0.000m/s]**	*0.000 m/s*
	F05.00 - F05.07 define the MS running speed which use in MS run mode. • F00.02 defines the rated speed of elevator.		
F05.08	**Inspection run speed**	**0.000 - 0.630[0.200m/s]**	*0.150 m/s*
	Defines the running speed of elevator in the inspection mode.		
F05.09	**Battery driven run speed**	**0.000 - F00.02 [0.100m/s]**	*0.120 m/s*
	Defines the running speed of elevator in the battery driven run mode.		
F05.10	**Up forced speed switch detection value**	**0.0 - 100.0 (F00.02) [97.0%]**	*97.0%*
	Defines the speed detection value at the forced switch action. • After forced switch act, the running speed exceeds speed switch detection value, and decelerates to F05.22 (creeping speed) according to F03.12 (abnormal Dec speed). • Properly set F05.10 to avoid climbing elevator at elevator up. 		

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F05.11	**Down forced speed switch detection value**	**0.0 - 100.0 (F00.02) [97.0%]**	*97.0%*
	To avoid plunging elevator at elevator down. Refer to F05.10.		
F05.12	**FDT1**	**0.0 - 100.0 (F00.02) [90.0%]**	*90.0%*
F05.13	**FDT2**	**0.0 - 100.0 (F00.02) [90.0%]**	*90.0%*
F05.14	**FDT1 delay level**	**0.0 - 100.0 (F00.02) [1.0%]**	*1.0%*
F05.15	**FDT2 delay level**	**0.0 - 100.0 (F00.02) [1.0%]**	*1.0%*
	When running speed is lower than one speed (F05.12 + F05.14) FL in the right figure, ON indicating signal will output till the running speed is lower than F05.12. • Refer to parameter F05.12 and F05.14 about F05.13 and F05.15. 		
F05.16	**Speed within FAR range**	**0.0 - 20.0 [1.0%]**	*1.0%*
	The pulse signal will output if elevator speed is within the FAR range. As shown in the right figure. 		
F05.17	**Over-speed setting**	**80.0 - 120.0 (F00.02) [115.0%]**	*115.0%*

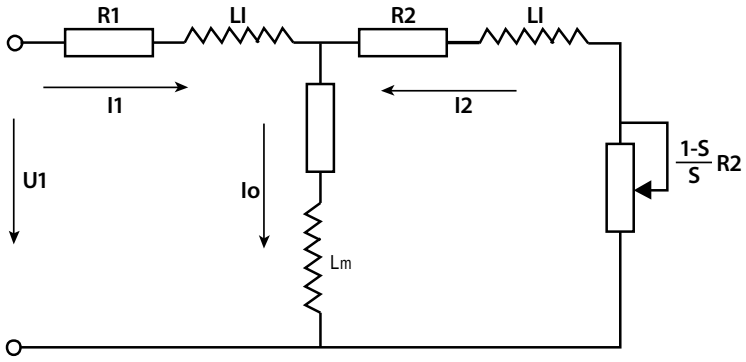
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F05.18	**Over-speed detection time**	**0.0 - 2.0 [0.2s]**	*0.2s*
	When the actual elevator speed exceeds F05.17 and the duration time exceeds F05.18, HD5L alarms E0032 fault (motor over speed). • F05.18 = 0, HD5L does not detect motor over speed fault.		
F05.19	**Detected value of speed deviation**	**0.0 - 30.0 (F00.02) [20.0%]**	*20.0%*
F05.20	**Detected time of speed deviation**	**0.0 - 2.0 [1.0s]**	*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, HD5L alarms E0018 fault (excessive speed deviation). • F05.19 or F05.20 = 0, HD5L does not detect the excessive speed deviation fault of motor.		
F05.21	**Unused**		
F05.22	**Creeping speed**	**0.000 - 0.400 [0.050m/s]**	*0.050 m/s*
	Defines the running speed at the forced Dec run.		
F05.23	**Unused**		
F05.24	**Unused**		
F05.25	**Unused**		

5.2.7 F06: Weighting Compensation Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F06.00	**Pre-torque selection**	**0 – 5 [4]**	*4: for Gearless*
	The pre-torque function can output the load balancing torque in advance to avoid reverse and reduce the start impact. **0:** No pre-torque function. **1:** Analogue setting. Output balancing torque according to the input analogue weight signal. **2:** DI setting. Output balancing torque according to the input digital weight signal. **3:** Digital pre-torque. Select 3 if no weighing device is at the elevator. • Then adjust the pre-torque digital setting parameter to make the elevator fully excitation before open brake, therefore improve the starting comfort. • Compensation value = Pre-torque bias - Pre-torque digital setting. **4:** No weighing auto-compensation. Suitable for all PG. **5:** Asyn. motor zero-serve auto-compensation. 		
F06.01	**Up pre-torque bias**	**0.0 - 100.0 [50.0%]**	*50.0%*
F06.02	**Down pre-torque bias**	**0.0 - 100.0 [50.0%]**	*50.0%*
	Pre-torque bias = (Elevator counter weight – Car weight)/ Rated load.		
F06.03	**Up electrical pre-torque gain**	**0.000 - 9.000 [1.000]**	*1.000*
F06.04	**Up brake pre-torque gain**	**0.000 - 9.000 [1.000]**	*1.000*
F06.05	**Down electrical pre-torque gain**	**0.000 - 9.000 [1.000]**	*1.000*
F06.06	**Down brake pre-torque gain**	**0.000 - 9.000 [1.000]**	*1.000*
F06.07	**Pre-torque digital setting**	**-100.0 - 100.0 [10.0%]**	*10.0%*
	At no weighing device, set the pre-torque value via changing F06.07.		

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F06.08	**DI weighing signal 1**	**0.0 - 100.0 [10.0%]**	*10.0%*
F06.09	**DI weighing signal 2**	**0.0 - 100.0 [30.0%]**	*30.0%*
F06.10	**DI weighing signal 3**	**0.0 - 100.0 [70.0%]**	*70.0%*
F06.11	**DI weighing signal 4**	**0.0 - 100.0 [90.0%]**	*90.0%*
	When digital weighing signal terminal input is enabled, its value is the percentage of rated load. **For example:** If DI weighing signal 1 is enabled, it expresses that the present load is F06.08% of the rated load. • If numbers of terminals are enabled simultaneously, the max. number terminal will be considered as the valid one.		
F06.12	**Unused**		
F06.13	**Unused**		
F06.14	**No weighing current coefficient**	**0 - 9999 [3000]**	*3000*
F06.15	**No weighing speed-loop KP**	**1 - 9999 [2000]**	*2000*
F06.16	**No weighing speed-loop KI**	**1 - 9999 [2000]**	*2000*
	F06.14 - F06.16 are used to adjust the effect of no weighing auto-compensation (F06.00 = 4). • The system response can be expedited through increasing F06.14 - F0616, but system oscillation and overshoot may occur if the value of F06.14 - F0616 is too high. • Generally, it can smoothly start elevator via adjusting F06.14 when debugging. - Increase F06.14 to avoid sliding vehicle at starting moment. Decrease F06.17 to avoid shake at starting moment.		
F06.17	**Unused**		
F06.18	**Unused**		
F06.19	**Unused**		
F06.20	**Unused**		

5.2.8 F07: Asyn. Motor Parameters



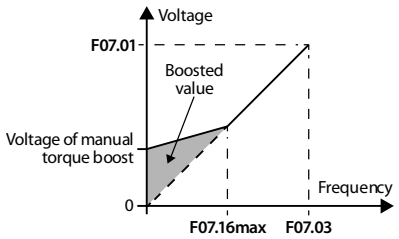
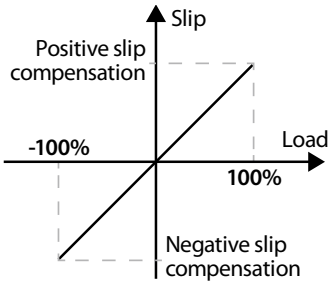
R1=F07.07 (Stator resistance) LI=F07.09 (Leakage inductance)
R2=F07.08 (Rotor resistance) Lm=F07.10 (Mutual inductance)
Io= F07.11 (Excitation current) S=Slip ratio

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

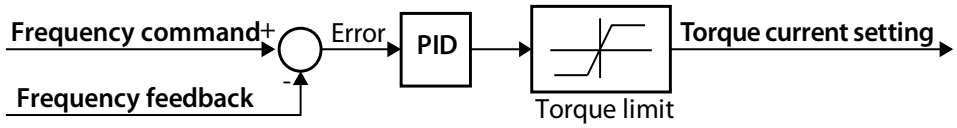
- Rated torque current = F07.05 × F07.02
- Excitation current F07.11 = $\sqrt{1 - F07.05^2}$ × F07.02
- Mutual inductance F07.10 = $\frac{F07.01}{2\sqrt{3}\pi \times F07.03 \times F07.11} - F07.09$

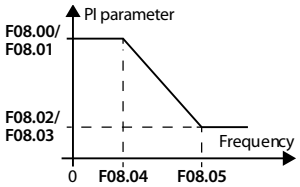
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F07.00	**Rated power of asyn. motor**	**0.2 - 400.0kW [Depend on HD5L]**	*Depends on Motor*
F07.01	**Rated voltage of asyn. motor**	**0V - Controller rated voltage [Depend on HD5L]**	*Depends on Motor*
F07.02	**Rated current of asyn. motor**	**0.0 - 999.9A [Depend on HD5L]**	*Depends on Motor*
F07.03	**Rated frequency of asyn. motor**	**1.00 - 100.00 [50.00Hz]**	*Depends on Motor*
F07.04	**Rated Rpm of asyn. motor**	**1 - 24000 [1440rpm]**	*Depends on Motor*
F07.05	**Power factor of asyn. motor**	**0.001 - 1.000 [Depend on HD5L]**	*Depends on Motor*

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F07.06	**Parameter auto-tuning of asyn. motor**	**0 – 2 [0]**	*0*
	0: No action. **1:** Stationary auto-tuning. **2:** Rotary auto-tuning. **Motor auto-tuning:** • In the process of motor stationary auto-tuning, the stator resistance (F07.07), rotor resistance (F07.08) and leakage inductance (F07.09) will be auto-measured and written into corresponding parameters automatically. • For mutual inductance (F07.10) and excitation current (F07.11), - At stationary auto-tuning (F07.06 = 1), it will 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 will be at rotary status and the auto-measured value will be written into F07.10 and F07.11. • When the motor is in rotary status, the oscillation and even the overcurrent might occur. In this case, press the STOP key to stop auto-tuning and then properly adjust the F07.21 (oscillation-suppression mode) and F07.22 (oscillation-suppression coefficient) to mitigate the possible oscillation. ***Note:*** *The auto-tuning is enabled only in keypad control mode (F00.05 = 0).* **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. F07.06 = 1 or 2, then press the ↵ key, and therewith press **RUN** key to start auto-tuning. The LCD will display "Motor para. auto-tuning". When the auto-tuning is completed, the keypad will return to stop display status and F07.06 resets to 0.		
F07.07	**Stator resistance of asyn. motor**	**0.000 - 65.535Ω [Depend on HD5L]**	-
F07.08	**Rotor resistance of a syn. motor**	**0.000 - 65.535Ω [Depend on HD5L]**	**-**
F07.09	**Leakage inductance of asyn. motor**	**0.0 - 6553.5mH [Depend on HD5L]**	**-**
F07.10	**Mutual inductance of asyn. motor**	**0.0 - 6553.5mH [Depend on HD5L]**	**-**
F07.11	**Excitation current of asyn. motor**	**0.0 - 999.9A [Depend on HD5L]**	**-**
F07.12	**Core saturation coefficient 1 of asyn. motor**	**0.00 - 0.50 [0.50]**	**-**

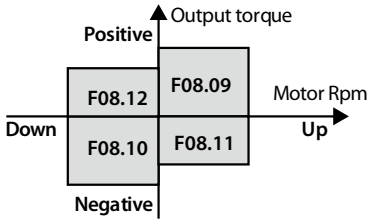
Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F07.13	**Core saturation coefficient 2 of asyn. motor**	**0.00 - 0.75 [0.75]**	*0.75*
F07.14	**Core saturation coefficient 3 of asyn. motor**	**0.00 - 1.20 [1.20]**	*1.20*
F07.15	**Asyn. motor torque boost**	**0.1 - 30.0 [0.1%]**	*0.1%*
F07.16	**Torque boost end-point of asyn. motor**	**0.1 - 50.0 (F07.03) [2.0%]**	*2.0%*
	To compensate the torque drop at low frequency, HD5L can boost the voltage so as to boost the torque. F07.16 is relative to percentage of rated frequency of motor (F07.03). 		
F07.17	**Slip compensation gain of asyn. motor**	**0.0 - 300.0 [100.0%]**	*100.0%*
F07.18	**Slip compensation filter time of asyn. motor**	**0.1 - 10.0 [0.1s]**	*0.1s*
F07.19	**Slip compensation limit of asyn. motor**	**0.0 - 250.0 [200.0%]**	*200.0%*
	The slip of motor changes with the load torque, which results in the variance of motor speed. Through slip compensation (HD5L 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 (the 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. 		
F07.20	**AVR function**	**0 - 2 [1]**	*1*
	0: Disabled. **1:** Enabled all the time. **2:** Disabled in Dec process. • The output voltage can be regulated to maintain constant via AVR. Thus, normally the AVR function should be enabled, especially when the input voltage is higher than the rated voltage. • In Dec process, if F07.20 = 0 or 2, the running current will be a little higher; while if F07.20 =1, the motor will decelerate steadily and the current will be smaller.		
F07.21	**Oscillation-suppression mode of asyn. motor**	**0,1 [0]**	*0*
	0: Depend on exciting component. **1:** Depend on torque component.		
F07.22	**Oscillation-suppression coefficient of asyn. motor**	**0 - 200 [100]**	*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.		

5.2.9 F08: Motor Vector Control Speed Loop Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th><th>DOPPLER's Value</th></tr>
<tr><td>F08.00</td><td>Low speed ASR Kp</td><td>1 – 9999 [500]</td><td>500</td></tr>
<tr><td>F08.01</td><td>Low speed ASR KI</td><td>0 – 9999 [500]</td><td>500</td></tr>
<tr><td>F08.02</td><td>High speed ASR Kp</td><td>1 – 9999 [500]</td><td>500</td></tr>
<tr><td>F08.03</td><td>High speed ASR KI</td><td>0 – 9999 [500]</td><td>500</td></tr>
<tr><td>F08.04</td><td>ASR PI switching frequency 1</td><td>0.00 - 50.00 [10.00Hz]</td><td>10.00Hz</td></tr>
<tr><td rowspan="2">F08.05</td><td>ASR PI switching frequency 2</td><td>0.00 - 50.00 [15.00Hz]</td><td>15.00Hz</td></tr>
<tr><td colspan="3">F08.00 - F08.05 and F08.07 confirm the PID parameters of ASR. The structure of ASR is shown in figure.
 

As the right figure:
• When HD5L operates with 0 - F08.04, the PI parameters of vector control are F08.00 and F08.01;
• WhenHD5L operates above F08.05, the PI parameters of vector control are F08.02 and F08.03;
• When HD5L 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 disabled, the speed-loop works only as a proportional regulator.
• Generally, adjust the KP firstly to the max. 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 low frequency running, increase KP and KI.</td></tr>
<tr><td rowspan="2">F08.06</td><td>ASR integral limit</td><td>0.0 - 200.0 (F07.02) [180.0%]</td><td>180.0%</td></tr>
<tr><td colspan="3">It is used to limit the max. value of the vector control speed-loop integral.</td></tr>
<tr><td rowspan="2">F08.07</td><td>ASR differential time</td><td>0.000 - 1.000 [0.000s]</td><td>0.000s</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td rowspan="2">F08.08</td><td>ASR output filter time</td><td>0.000 - 1.000 [0.008s]</td><td>0.008s</td></tr>
<tr><td colspan="3">It is used to filter the output of ASR regulator.
• F08.08 = 0, the speed-loop filter is unused.</td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F08.09	**UP electrical torque limit**	**0.0 - 200.0 (F07.02) [180.0%]**	*180.0%*
F08.10	**DN electrical torque limit**	**0.0 - 200.0 (F07.02) [180.0%]**	*180.0%*
F08.11	**UP regenerative torque limit**	**0.0 - 200.0 (F07.02) [180.0%]**	*180.0%*
F08.12	**DN regenerative torque limit**	**0.0 - 200.0 (F07.02) [180.0%]**	*180.0%*
	F08.09 - F08.12 are the relative percentage of motor rated current (F07.02). As the right figure: • 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. 		

5.2.10 F09: Current Loop Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F09.00	**Current-loop KP**	**1 - 4000 [500]**	*500*
F09.01	**Current-loop KI**	**1 - 4000 [500]**	*500*
	F09.00 and F09.01 are the PI regulator parameter of current ring (ACR). • Increasing F09.00 or F09.01 can fasten the system dynamic response to the output torque, while decreasing F09.00 or F09.01 can build up system stability. • Too big F09.00 or F09.01 makes the system apt to oscillate, while too small F09.00 or F09.01 affects the system torque output.		
F09.02	**Current-loop output filter time**	**0.000 - 1.000 [0.000s]**	*0.000s*
F09.03	**Unused**		
F09.04	**Unused**		
F09.05	**Unused**		
F09.06	**Unused**		
F09.07	**Unused**		

5.2.11 F10: Syn. Motor Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F10.00	**Syn. motor type**	**0,1 [0]**	*0*
	0: IPM. **1:** SPM.		
F10.01	**Rated power of syn. motor**	**0.2 - 400.0kW [Depend on HD5L]**	*Depends on Motor*
F10.02	**Rated voltage of syn. motor**	**0 - Rated voltage of HD5L [Depend on HD5L]**	*Depends on Motor*
F10.03	**Rated current of syn. motor**	**0.0 - 999.9A [Depend on HD5]**	*Depends on Motor*
F10.04	**Rated frequency of syn. motor**	**1.00 - 100.00 [19.20Hz]**	*Depends on Motor*
F10.05	**Rated rpm of syn. motor**	**1 - 24000 [96rpm]**	*Depends on Motor*
F10.06	**Stator resistance of syn. motor**	**0.000 - 9.999 [0.000Ω]**	-
F10.07	**Quadrature axis inductance of syn. motor**	**0.0 - 999.9 [0.0mH]**	-
F10.08	**Direct axis inductance of syn. motor**	**0.0 - 999.9 [0.0mH]**	-
F10.09	**Back EMF of syn. motor**	**0 - Rated voltage of HD5L [380V]**	-
F10.10	**Angle auto-tuning of syn. motor**	**0 - 2 [0]**	*0*
	0: No action. **1:** Stationary auto-tuning. **2:** Rotary auto-tuning. • Refer to section 6.1.3 Motor Auto-tuning about parameter auto-tuning.		
F10.11	**Stationary auto-tuning voltage setting of syn. motor**	**0.0 - 100.0 (F10.02) [100.0%]**	*100.0%*
	If syn. motor reports over-current fault at stationary auto-tuning, the setting value should be smaller.		
F10.12	**Start angle of syn. motor**	**0.0 - 359.9 [0.0°]**	*0.0°*
F10.13	**Z pulse start angle of syn. motor**	**0.0 - 359.9 [0.0°]**	*0.0°*
F10.14	**SINCOS encoder C amplitude of syn. motor**	**0 - 9999 [2048]**	*2048*
F10.15	**SINCOS encoder C zero-bias of syn. motor**	**0 - 9999 [2048]**	*2048*
F10.16	**SINCOS encoder D amplitude of syn. motor**	**0 - 9999 [2048]**	*2048*
F10.17	**SINCOS encoder D zero-bias of syn. motor**	**0 - 9999 [2048]**	*2048*
F10.18	**Sincos encoder CD phase**	**0,1 [0]**	*0*
	0: C phase ahead of D phase. **1:** D phase ahead of C phase. ***Note:*** *At motor parameter auto-tuning , F10.18 can self-learn without manual changes.*		
F10.19	**Optimize 1313 encoder start algorithm**	**0,1 [0]**	*0*
	0: Optimize. **1:** Do not optimize.		
F10.20	**Synchronous performance optimization**	**0 - 65535 [0]**	*0*
	Bit0 - Bit1: Unused **Bit2:** Optimization for detecting speed **0:** No optimization. **1:** Optimization. **Bit3 - Bit15:** Unused		

5.2.12 F11: PG Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F11.00	**HD5L PG interface board**	**1 - 4 [4]**	*Depends on Encoder*
	1: HD-PG2-OC-FD is valid. Only for asyn. motor. **2:** HD-PG6-UVW-FD is valid. Only for syn. motor. **3:** HD-PG5-SINCOS-FD is valid. Only for syn. motor. **4:** HD-PG11-SC-FD is valid. Only for syn. motor. (support Endat)		
F11.01	**PG P/R**	**1 - 9999 [2048]**	*Depends on Encoder*
F11.02	**PG direction setting**	**0,1 [0]**	*Depends on Installation*
	Defines the connection sequence of PG whether the same as that of the drive-motor connection. • In order to change the connection of AB two phases of the PG, you can change this parameter. **0:** The same direction. **1:** The reverse direction.		
F11.03	**PG signal filter coefficient**	**0x00 - 0x77 [0x11]**	*0x11*
	Units: Low-speed filter coefficient. Tens: High-speed filter coefficient.		
F11.04	**The protocol of serial communication PG**	**0 - 9 [0]**	*0*
	0: Endat. **1:** Rotary transformer protocol. **2 - 9:** Unused.		
F11.05	**Detecting time of PG wire disconnection**	**0.00 - 2.00 [1.00s]**	*1.00s*
	F11.05 specifies the duration time for detecting PG wire disconnection fault. HD5L detects the PG wire disconnection and the duration time exceeds F11.05, then the controller reports E0031 fault (PG disconnection). • No detection will be conducted when F11.05 = 0.		

5.2.13 F12: Digital I/O Terminal Parameters

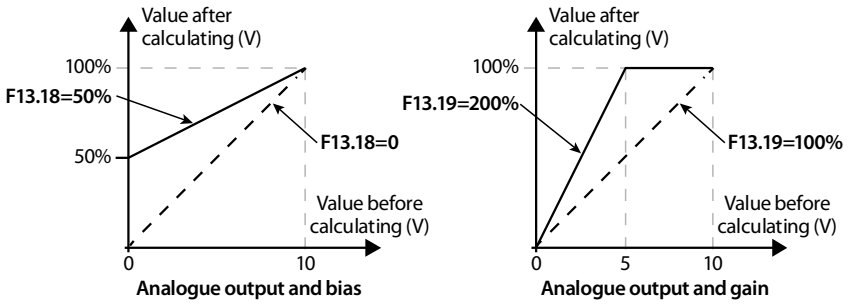
<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th><th>DOPPLER's Value</th></tr>
<tr><td rowspan="2">F12.00</td><td>Input terminal filter time</td><td>0.000 - 1.000 [0.010s]</td><td>0.010s</td></tr>
<tr><td colspan="3">Defines filter time of digital input terminal 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.</td></tr>
<tr><td>F12.01</td><td>DI1 function</td><td>000 - 134 [1]</td><td>2</td></tr>
<tr><td>F12.02</td><td>DI2 function</td><td>000 - 134 [2]</td><td>3</td></tr>
<tr><td>F12.03</td><td>DI3 function</td><td>000 - 134 [3]</td><td>4</td></tr>
<tr><td>F12.04</td><td>DI4 function</td><td>000 - 134 [4]</td><td>6</td></tr>
<tr><td>F12.05</td><td>DI5 function</td><td>000 - 134 [5]</td><td>5</td></tr>
<tr><td>F12.06</td><td>DI6 function</td><td>000 - 134 [6]</td><td>8</td></tr>
<tr><td>F12.07</td><td>DI7 (I/O board) function</td><td>000 - 134 [0]</td><td>16</td></tr>
<tr><td>F12.08</td><td>DI8 (I/O board) function</td><td>000 - 134 [0]</td><td>9</td></tr>
<tr><td>F12.09</td><td>DI9 (I/O board) function</td><td>000 - 134 [0]</td><td>0</td></tr>
<tr><td>F12.10</td><td>DI10 (I/O board) function</td><td>000 - 134 [0]</td><td>0</td></tr>
<tr><td>F12.11</td><td>DI11 (I/O board) function</td><td>000 - 134 [0]</td><td>0</td></tr>
<tr><td rowspan="2">F12.12</td><td>DI12 (I/O board) function</td><td>000 - 134 [0]</td><td>0</td></tr>
<tr><td colspan="3">
Note: Hundred digit = 0, normally open input selected; = 1, normally closed input selected.
0: Unused. Terminal function is unused. HD5L 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 enabled. (EN)
• When enabled, HD5L is enabled to run;
• When unused, HD5L is unused to run and will be in coasts to stop status.
• When no terminal selects this function, it defaults that HD5L is at enabled status.
2, 3: UP / DN.
• Set control terminal to control up and down of elevator. The terminals are in below table.
<table>
<tr><th>UP Terminal</th><th>DN Terminal</th><th>Selection</th></tr>
<tr><td>0</td><td>0</td><td>Stop</td></tr>
<tr><td>0</td><td>1</td><td>Down</td></tr>
<tr><td>1</td><td>0</td><td>Up</td></tr>
<tr><td>1</td><td>1</td><td>Stop</td></tr>
</table>
4 - 6: MS1 - MS3.
• Achieve 8-speed running curve via terminals logic combination, as follow table.
<table>
<tr><th>MS3 Terminal</th><th>MS2 Terminal</th><th>MS1 Terminal</th><th>Multi-speed setting</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>Multi-speed 0 (F05.00)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Multi-speed 1 (F05.01)</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>Multi-speed 2 (F05.02)</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Multi-speed 3 (F05.03)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>Multi-speed 4 (F05.04)</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>Multi-speed 5 (F05.05)</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>Multi-speed 6 (F05.06)</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>Multi-speed 7 (F05.07)</td></tr>
</table>
</td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
	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. **8:** Battery-driven input (BAT). • If enabled, elevator will enter battery-driven running status. **9:** Contactor feedback input (CSM). **10:** Brake feedback input (BSM). **11 - 14:** Weighing signal input 1 - 4 (WD1 - WD4). • The switch weight signals can input through this terminal. Based on these signals, HD5L sets the torque bias and starts the elevator stably. • Select among WD1 - WD4 according to the actual number of weighing devices and set the load of switches based on F6.08 - F6.11 (DI weighing signal 1 - 4). • If many terminals are enabled, the max No. terminal will be enabled. ***For example:*** *When WD1 and WD2 are enabled simultaneously, only WD2 is the valid one.* **15:** Motor overheat input (OH). **16:** Fault reset input (RST). • When HD5L alarms fault, reset it by this terminal. • The function of RST terminal is the same as the **STOP** key. **17:** Up forced speed input (UPF). **18:** Down forced speed input (DNF). **19:** Governor feedback input(OSG). **20 - 33:** Unused. **34:** External fault (EXT). • The fault signal of external equipment can be input through this terminal, so HD5L can monitor that equipment and respond accordingly. HD5L alarms E0024 fault (external fault) when receives the EXT signal.		
F12.13	**Filter time of multi-speed terminal**	**0.000 - 2.000 [0.010s]**	*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.		
F12.14	**Unused**		
F12.15	**DO1 function**	**0 - 20 [2]**	
F12.16	**DO2 function**	**0 - 20 [3]**	
F12.17	**RLY1 function**	**0 - 20 [14]**	*14*
F12.18	**RLY2 (I/O board) function**	**0 - 20 [0]**	*5*
F12.19	**RLY3 (I/O board) function**	**0 - 20 [0]**	*6*

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th><th>DOPPLER's Value</th></tr>
<tr><td rowspan="2">F12.20</td><td>RLY4 (I/O board) function</td><td>0 - 20 [0]</td><td>14</td></tr>
<tr><td colspan="3">0: Unused.
1: Controller is ready.
• Signal ON will output if HD5L has no fault.
2: Controller is running.
• HD5L is in running status and outputs indicating signal.
3: Zero-speed running.
• ON signal will output if output speed of HD5L is zero but HD5L is in run status.
4: Zero-speed.
• ON signal will output if output speed of HD5L 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 will output when output speed of HD5L is within the FAR range. The detect range is set by F05.16 (speed within FAR range).
• The indication signal will also output at stop.
10: Up signal output.
• ON signal will output when the elevator is at up running.
11: Down signal output.
• ON signal will output when the elevator is at down running.
12: Under-voltage.
• ON signal will output when HD5L is in under-voltage status.
13: Unused.
14: Controller fault.
• ON signal will output when HD5L has fault.
15: Elevator stop signal.
• When the elevator stops, HD5L will stop and outputs 2s pulse signal, according to which HD5L revokes run command.
16 - 19: Unused.
20: Speed outputs.</td></tr>
<tr><td rowspan="2">F12.21</td><td>Output terminal logic setting</td><td>00 - 0x3F [0]</td><td>0</td></tr>
<tr><td colspan="3">Defines that each bit (binary) represents different physical sources.
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">Tens</th><th colspan="4">Units</th></tr>
<tr><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>-</td><td>-</td><td>RLY4</td><td>RLY3</td><td>RLY2</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>F12.22</td><td>Unused</td><td></td><td></td></tr>
<tr><td>F12.23</td><td>Unused</td><td></td><td></td></tr>
<tr><td>F12.24</td><td>Unused</td><td></td><td></td></tr>
</table>

5.2.14 F13: Analogue I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F13.00	**AI1 function**	**0 - 2 [0]**	*0*
F13.01	**AI2 function**	**0 - 2 [0]**	*0*
F13.02	**AI3 function**	**0 -2 [0]**	*0*
F13.03	**AI4 function**	**0 - 3 [0]**	*0*
	0: Unused. **1:** Speed setting. **2:** Weighing signal. **3:** Motor overheat signal input (only AI4 enabled). - Connect the electronic thermistor embedded motor stator coils to AI4, refer to **Error! Reference source not found.**. - Refer to parameters F17.01 and F17.02 about the thermistor. • AI1 input range: 0 - 10V. AI2 - AI4 input range: -10 - +10V.		
F13.04	**AI1 bias**	**-100.0 - 100.0 [0.0%]**	*0.0%*
F13.07	**AI2 bias**		*0.0%*
F13.10	**AI3 bias**		*0.0%*
F13.13	**AI4 bias**		*0.0%*
F13.05	**AI1 gain**	**-10.00 - 10.00 [1.00]**	*1.00*
F13.08	**AI2 gain**		*1.00*
F13.11	**AI3 gain**		*1.00*
F13.14	**AI4 gain**		*1.00*
F13.06	**AI1 filter time**	**0.01 - 10.00 [0.05s]**	*0.05s*
F13.09	**AI2 filter time**		*0.05s*
F13.12	**AI3 filter time**		*0.05s*
	AI4 filter time		*0.05s*
F13.15	When select AI1 - AI4 as open-loop frequency setting source, the relationship between the analogue input and the analogue value after calculating is shown as figure:  • The formula is: Analogue value after calculating = Gain × Analogue actual value + Bias • F13.06, F13.09, F13.12 and F13.15 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*

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F13.17	**AO2 function**	**0 - 9 [0]**	*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 HD5L). **4:** Output voltage (0 - 1.2 times rated voltage of HD5L). **5:** DC bus voltage (0 - 2.2 times rated voltage of HD5L). **6:** AI1 input (0 - 10V). **7:** AI2 input (-10 - 10V/0 - 20mA). **8:** AI3 input (-10 - 10V/0 - 20mA). **9:** AI4 input (-10 - 10V/0 - 20mA). **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 - 9 function inputs, the AO will output its absolute value.*		
F13.18	**AO1 bias**	**-100.0 - 100.0 [0.0%]**	*0.0%*
F13.19	**AO1 gain**	**0.0 - 200.0 [100.0%]**	*100.0%*
	The proportional relation of output can be adjusted by output gain, as shown in the figure below. • The formula is: AO1 actual output = F13.19 × Value before calculating + F13.18  		
F13.20	**AO2 bias**	**-100.0 - 100.0 [0.0%]**	*0.0%*
F13.21	**AO2 gain**	**0.0 - 200.0 [100.0%]**	*100.0%*
	Refer to parameters F13.18 and F13.19.		

5.2.15 F14: SCI Communication Parameters

Refer to Error! Reference source not found. for the communication function.

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F14.00	**Data format**	**0 – 5 [0]**	*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]**	*3*
	0: 1200bps. **1:** 2400bps. **2:** 4800bps. **3:** 9600bps. **4:** 19200bps. **5:** 38400bps.		
F14.02	**Local address**	**0 – 247 [2]**	*2*
	F14.02 = 0, it means broadcast address.		
F14.03	**Host PC response time**	**0 – 1000 [0ms]**	*0ms*
F14.04	**Detection time of communication timeout**	**0.0 - 1000.0 [0.0s]**	*0.0s*
	Time at no communication data > setting time of F14.04, it will be considered as E0028 fault (SCI timeout fault). • F14.04 = 0, it will not detect communication time out.		
F14.05	**Detection time of communication error**	**0.0 - 1000.0 [0.0s]**	*0.0s*
	Time at communication error > setting time of F14.05, it will be considered as E0029 fault (SCI fault). • F14.05 = 0, it will not detect the communication error.		
F14.06	**Unused**		
F14.07	**Unused**		

5.2.16 F15: Display Control Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F15.00	**Language selection**	**0,1 [0]**	*0*
	Defines the displaying language on the LCD keypad. **0:** Chinese. **1:** English. **2 - 9:** Unused.		
F15.01	**Display contrast of LCD keypad**	**1 – 10 [5]**	*5*
	To select LCD display contrast.		
F15.02	**Set parameter 1 of run status**	**0 – 32 [5]**	*5*
F15.03	**Set parameter 2 of run status**	**0 – 32 [6]**	*6*
F15.04	**Set parameter 3 of run status**	**0 – 32 [10]**	*10*
F15.05	**Set parameter 4 of run status**	**0 – 32 [11]**	*11*
F15.06	**Set parameter 5 of run status**	**0 – 32 [0]**	*0*
F15.07	**Set parameter 6 of run status**	**0 – 32 [0]**	*0*
F15.08	**Set parameter 1 of stop status**	**0 – 32 [4]**	*4*
F15.09	**Set parameter 2 of stop status**	**0 – 32 [14]**	*14*
F15.10	**Set parameter 3 of stop status**	**0 – 32 [16]**	*16*
F15.11	**Set parameter 4 of stop status**	**0 – 32 [26]**	*26*
F15.12	**Set parameter 5 of stop status**	**0 – 32 [27]**	*27*
F15.13	**Set parameter 6 of stop status**	**0 – 32 [0]**	*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. • Each display parameter of content can be set corresponding to 32 statuses. • For instance: when set F15.08 as 7, the stop parameter is setting Rpm at initial power on. **0:** Unused. **1:** Rated current of HD5L. **2:** Controller status. Refer to D00.06. **3:** Operate channel. **4:** Setting speed. **5:** Setting speed (after Acc/Dec) **6:** Output frequency. **7:** Setting Rpm. **8:** Actual Rpm. **9:** Unused. **10:** Output voltage. **11:** Output current. **12:** Output torque. **13:** Output power. **14:** DC bus voltage. **15:** AI1 voltage. **16:** AI1 voltage (after calculating). **17:** AI2 voltage. **18:** AI2 voltage (after calculating). **19:** AI3 voltage. **20:** AI3 voltage (after calculating). **21:** AI4 voltage. **22:** AI4 voltage (after calculating). **23:** AO1 output. **24:** AO2 output. **25:** Heatsink temperature. **26:** Input terminal status. **27:** Output terminal status. **28:** MODBUS status. **29:** Total time at power on (hour). **30:** Total running time (hour). **31:** Unused. **32:** Unused.		

5.2.17 F16: Function Boost Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F16.00	**Zero-speed running signal delay time**	**0.00 - 10.00 [0.30s]**	*0.30s*
	Defines the delay time of HD5L from zero-speed run status to zero-speed run signal output.		
F16.01	**Zero-speed signal delay time**	**0.00 - 10.00 [0.30s]**	*0.30s*
	Defines the delay time of HD5L from zero-speed status to zero-speed signal output.		
F16.02	**Current keep time after stop**	**0 - 9999 [0ms]**	*0ms*
	To eliminate the current noise of motor at stop, when the brake is finished, the cut-off run signal will reduce the current to zero after the time of F16.02.		
F16.03	**Fan control mode**	**0 - 2 [0]**	*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 HD5L is in run status. After HD5L 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 HD5L is in running status, but stops when HD5L stops. **2:** Run when power on. • The fan runs continuously after HD5L is switched on.		
F16.04	**Fan control delay time**	**0.0 - 600.0 [30.0s]**	*30.0s*
F16.05	**Brake unit action voltage**	**380 - 750V [Depend on HD5L]**	-
	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 HD5L.*		
F16.06	**Contactor fault detect time**	**0.1 - 10.0 [2.0s]**	*2.0s*
F16.07	**Multi-speed inspection**	**0 - 7 [0]**	*0*
	When the DI terminals are not enough, the MS1 - MS3 can achieve the inspection run. • DI terminal = inspection terminal INS (No. 7 function), only need set F16.07 as 0 to enter terminal inspection run. • DI terminals ≠ inspection terminal INS (No. 7 function), the MS1 - MS3 can achieve inspection run. • 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]**	*0.003m/s*
	When the present run speed ≤ F16.08, the system run speed will be condidered as 0. After zero-speed delay signal, the zero-speed signal will output.		

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F16.09	**Selection at motor overheat fault**	**0,1 [0]**	*0*
	0: When detect that the motor is overheated, alarms E0020 fault (motor overheat) after motor stops. **1:** When detect that the motor is overheated, alarms E0020 fault (motor overheat) at once.		
F16.10	**The coefficient of frequency demultiplication of HD-PG9-SC-FD**	**1 - 256 [1]**	*1*
	To set the coefficient of frequency demultiplication of HD-PG9-SC-FD.		
F16.11	**Stationary auto-tuning and current limit of syn. motor**	**20 - 200 [120%]**	*120%*
F16.12	**Delay time of run output signal**	**0.00 - 10.00 [0.00s]**	*0.00s*
	Note: *F16.12 is used to delay the controller running signal (output = No. 2 function) so as to control HD5L to open the brake.*		
F16.13	**UPS running direction auto-determine enable**	**0,1 [0]**	*1*
	0: Not enable. **1:** Enable. In the UPS mode, HD5L will not run in the direction given by the terminal and auto-determine the elevator light-load running direction. In the UPS mode, HD5L will automatically up, and down, and then run according to the light-load direction of determining.		
F16.14	**Running minimum current limit**	**0 - 100 (F07.11) [20%]**	*20%*
F16.15	**Running minimum detect time**	**0.0 - 5.0 [0.0s]**	*0.0s*
	When the elevator run current is less than F16.14 and duration exceed F16.05, HD5L will alarm E0025 fault (too small running current).		
F16.16	**Governor fault detection time**	**0.0 - 2.0 [1.0s]**	*1.0s*
	When the detection terminal of governor detects signal and exceed F16.16, HD5L alarms E0037 fault (governor fault).		
F16.17	**DC braking current at stop**	**0 - 150 [100%]**	*100%*
F16.18	**Starting frequency of DC braking current at stop**	**0.20 - 10.00 [0.50Hz]**	*0.50Hz*
F16.19	**Brake release frequency**	**0.00 - 10.00 [0.00Hz]**	*0.00Hz*
F16.20	**Unused**		
F16.21	**Unused**		
F16.22	**Unused**		
F16.23	**Unused**		
F16.24	**Unused**		

5.2.18 F17: Fault Protect Parameters

Motor overheat fault (F17.00 - F17.02)

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F17.00	**Input voltage at motor overheat**	**0.00 - 10.00 [0.00V]**	*0.00V*
F17.01	**Thermistor type**	**0 - 2 [0]**	*0*
	0: Not detect the motor overheat (NC). **1:** Positive charateristic (PTC). • When AI4 input exceeds F17.00, HD5L alarms E0020 fault (motor overheat). **2:** Negative charateristic (NTC). • When AI4 input is less than F17.00, HD5L alarms E0020 fault (motor overheat). *Note: Only when correctly set CN2 and CN3 of I/O board can do the motor overheat detection.*		
F17.02	**Threshold resistance at motor overheat**	**0 - 10.0 [5.0kΩ]**	*5.0kΩ*

Input and output phase loss fault (F17.03 - F17.06)

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F17.03	**The detection base of lack of input**	**0 - 100 [30%]**	*30%*
F17.04	**The detection time of lack of input**	**0.0 - 5.0 [1.0s]**	*1.0s*
	F17.03 is a percentage of rated voltage of HD5L. When HD5L detects certain input voltage does not hit the detection base (F17.03) and exceeds the preset detection time (F17.04), HD5L alarms E0015 fault (lack of input). • F17.03 or F17.04 = 0 or in the battery driven run mode, HD5L will not detect input phase loss fault.		
F17.05	**The detection base of lack of output**	**0 - 100 [20%]**	*20%*
F17.06	**The detection time of lack of output**	**0.0 - 20.0 [3.0s]**	*3.0s*
	F17.05 is a percentage of rated current of HD5L. When HD5L detects certain output current does not hit the detection base (F17.05) and exceeds the detection time (F17.06), HD5L alarms E0016 fault (lack of output). • F17.05 or F17.06 = 0, HD5L will not detect output phase loss fault.		

Motor fault (F17.07)

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F17.07	**Motor overload protect factor**	**20.0 - 110.0 [100.0%]**	*100.0%*
	The motor overload protection factor can be set as 100% when HD5L 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: $\text{Motor overload protect factor (F17.07)} = \frac{\text{Rated current of motor(F07.02/F10.03)}}{\text{Rated output current of HD5L}} \times 100\%$		

Fault auto-reset function and fault relay action (F17.08 - F17.10)

Auto reset function enables HD5L to reset the fault as per the preset times and interval.
The following faults do not have the auto reset function:

E0008: Power module fault
E0010: Brake unit fault
E0013: Soft start contactor failed
E0014: Current detection fault
E0021: Read / Write fault of control board EEPROM
E0023: Read / Write fault of keypad EEPROM
E0024: External fault
E0036: Contactor fault

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F17.08	**Fault auto reset times**	**0 - 100 [0]**	*0*
F17.09	**Fault auto reset interval**	**2.0 - 20.0 [5.0s/times]**	*5.0*
	When F17.08 = 0, it means "auto reset" is unused and the protective device will be activated in case of fault. If no other fault is detected within 5 minutes, the auto reset count will be automatically cleared. On condition of external fault reset, auto reset count will be cleared.		
F17.10	**Faulty relay action**	**00 - 11 [00]**	*00*
	Units: In auto reset process • 0: Faulty relay doesn't act. • 1: Faulty relay acts. **Tens: 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]	DOPPLER's Value
F17.11	NO.5 fault type	**[actual value]**	-
F17.12	Setting freqency at NO.5 fault		-
F17.13	Output freqency 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		-

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F17.24	NO.2 fault type	[actual value]	-
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 HD5L at the last fault. F17.20 - F27 record the type and interval per time of four faults before the latest. The unit of interval is 0.1 hour.		

5.2.19 F18: PWM Parameters

Ref. Code	Function Description	Setting Range [Default]	DOPPLER's Value
F18.00	**Carrier frequency**	**1 - 16kHz [depend on HD5L]**	*10kHz*
	Defines the carrier frequency of PWM output wave. • The carrier frequency will affect 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, HD5L should be de-rated by 5% when per 1kHz is increased compared to the factory setting.		
F18.01	**Carrier frequency auto adjust selection**	**0,1 [0]**	*0*
F18.02	**PWM over-modulation enable**	**0,1 [1]**	*1*
	0: Disable. **1:** Enable.		
F18.03	**PWM over-modulation mode**	**0,1 [0]**	*0*
	0: Two phase / Three phase switch. **1:** Three phase.		

Controller power	Setting range	Factory setting
0.2 - 22kW	1 - 16kHz	8kHz
30 - 45kW	1 - 12kHz	6kHz

5.2.20 F19: Unused

5.2.21 F20: Unused

5.3 Group Y: Manufacturer Function Parameters

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

6. Elevator Application Guidance

6.1 Basic Commissioning Procedures

6.1.1 System Analysis and Wire

It is recommended to analyze the actual application requirements before the wiring design. Basic configuration for elevator system with HD5L is shown in Figure 32.

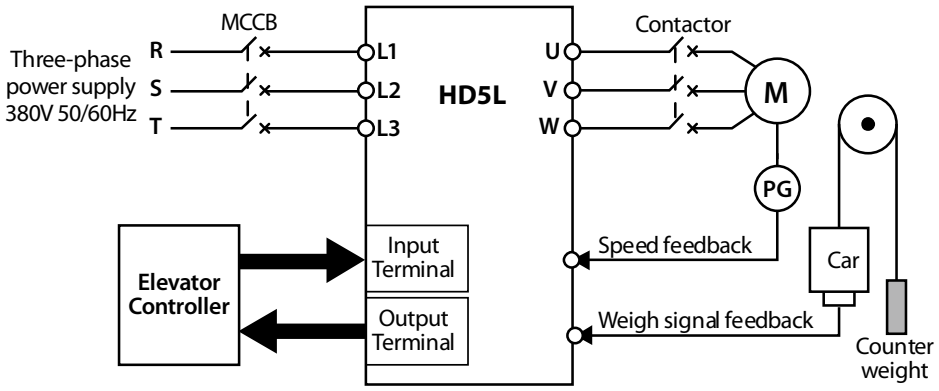


Figure 32

Elevator System

6.1.2 Set Basic Parameters

1. Correctly set F00.00 (motor type) and F00.01 (control mode) according to motor type.
2. Set Group F07 for the asyn. motor, set Group F10 for the syn. 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 encoder relevant parameters of Group F11 according to the encoder configured to motor.
5. Set digital I/O terminal parameters of Group F12 according to the actual wiring.
6. 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 analogue running mode: Set analogue curve parameters of Group F04 and analogue 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 HD5L catch the speed command of elevator controller.

6.1.3 Motor Auto-tuning

Note !	*The crane car is needed for the rotary auto-tuning but not for the stationary auto-tuning.*

Syn. motor rotary auto-tuning with A/B/Z/U/V/W encoder

1. Set F00.05 as 0 (keypad control).
2. Set F10.10 as 2 (rotary angle auto-tuning), then press **RUN** key to start parameter auto-tuning.
3. Auto-tuning steps: The controller with DC fixes the motor to one direction, then slowly starts the motor for a while and finally stops. When finishes auto-tuning, F10.12 (motor start angle) will be obtained.

Note !	1. *During step 2 and step 3, manually open the brake contactor and the run contactor together.* 2. *If the system has syn. motor radial contactor, the short-circuit signal of radial contactor should be removed. Otherwise it will cause over-current fault.*

Syn. motor stationary auto-tuning with A/B/Z/U/V/W encoder

1. Set F00.05 as 0 (keypad control).
2. Set F10.10 as 1 (stationary angle auto-tuning), then press **RUN** key to start parameter auto-tuning.
3. During auto-tuning, the controller will make a serial pulse voltage and the motor will buzz. When buzz is over and the keypad returns to stop status, please check and record D04.05.
4. Restart step 2 and step 3, check and record D04.05. Then compare the twice obtained value of D04.05.

   If the comparison value is smaller than 5000, it means that the steps are successful. Otherwise check the encoder connection and then restart step 2 - 4.

Note !	***Step 4*** *If the comparison value is too large, count it according to the following formula. And if the result is smaller than 5000, it means that the above steps are also successful.* **Formula:** 65535 + smaller value – larger value < 5000

5. Set F00.05 according to elevator control mode, and set F06.00 as 0 (no pre-torque compensation).
6. Set inspection run command and direction so that the motor slowly runs, F10.12 (motor start angle) will be obtained the auto-tuning process is finished.

Pay attention to the following circumstances at step 6 inspection running:

1. *The setting direction and the actually running direction are not the same.*
   Take measures: *Set the reverse value of F00.08 (run direction), then restart auto-tuning.*
2. *There is fault such as over-current or encoder reversion enabled etc. It may be encoder reversion enabled.*
   Take measures: *Set F11.02 as 1 (the reverse direction of PG interface board), then restart auto-tuning.*

Syn. motor rotary auto-tuning with SINCOS encoder

1. Set F00.05 as 0 (keypad control).
2. Set F10.10 as 2 (rotary angle auto-tuning), then press **RUN** key to start parameter auto-tuning.
3. Auto-tuning steps: The controller with DC fixes the motor to one direction, then slowly starts the motor for one cycle and finally stops. When auto-tuning finishes, F10.14 - F10.17 (encoder relevant parameters) and F10.12 (motor start angle) will be obtained.

Note !	*During step 2 and step 3, manually open the brake contactor and the run contactor together.*

Syn. motor stationary auto-tuning with SINCOS encoder

1. Set F00.05 as 0 (keypad control).
2. Set F10.10 as 1 (stationary angle auto-tuning), then press **RUN** key to start parameter auto-tuning.
3. During auto-tuning, the controller will make a serial pulse voltage and the motor will buzz. When buzz is over and the keypad returns to stop status, please check and record D04.05.
4. Restart step 2 and step 3, check and record D04.05. Then compare the twice obtained value of D04.05.
   If the comparison value is smaller than 5000, it means that the steps are successful. Otherwise check the encoder connection and then restart step 2 - 4.

Note !	***Step 4*** *If the comparison value is too large, count it according to the following formula. And if the result is smaller than 5000, it means that the above steps are also successful.* **Formula:** 65535 + smaller value – larger value < 5000

5. Set F00.05 according to elevator control mode, and set F06.00 as 0 (no pre-torque compensation).
6. Set inspection run command and direction so that the motor slowly runs for a circle then keeps at zero-speed. When revoke run command and direction at the moment, the auto-tuning process is finished, and obtain F10.14 - F10.17 (encoder relevant parameters) and F10.12 (motor start angle).

Pay attention to the following circumstances at step 6 inspection running:

1. *The setting direction and the actually running direction are not the same.*
   Take measures: *Set the reverse value of F00.08 (run direction), then restart auto-tuning.*
2. *There is fault such as over-current or encoder reversion enabled etc. It may be encoder reversion enabled.*
   Take measures: *Set F11.02 as 1 (the reverse direction of PG interface board), then restart auto-tuning.*

7. When auto-tuning is finished, give inspection running and direction signal again to observe that the motor runs normally. If not, check encoder C and D phase connection, then restart step 2 - 7.

Note !	***1.*** *During step 2 and step 3, it needs open the run contactor manually.* ***2.*** *If the system has syn. motor radial contactor, the short-circuit signal of radial contactor should be removed. Otherwise it will cause over-current fault.* ***3.*** *If the system is power off before step 7finishes, restart auto-tuning.*

Syn. motor rotary auto-tuning with serial communication encoder

1. Set F00.05 as 0 (keypad control).
2. Set F10.10 as 2 (rotary angle auto-tuning), then press **RUN** key to start parameter auto-tuning.
3. Auto-tuning steps: The controller with DC fixes the motor to one direction, then slowly starts the motor for a while and finally stops. When auto-tuning finishes, F10.12 (motor start angle) will be obtained.

Note !

1. *During step 2 and step 3, manually open the brake contactor and the run contactor together.*
2. *If the system has syn. motor radial contactor, the short-circuit signal of radial contactor should be removed. Otherwise it will cause over-current fault.*

Syn. motor stationary auto-tuning with serial communication encoder

1. Set F00.05 as 0 (keypad control).
2. Set F10.10 as 1 (stationary angle auto-tuning), then press **RUN** key to start parameter auto-tuning.
3. During auto-tuning, the controller will make a serial pulse voltage and the motor will buzz. When buzz is over and the keypad returns to stop status, please check and record D04.05.
4. Restart step 2 and step 3, check and record D04.05. Then compare the twice obtained value of D04.05. If the comparison value is smaller than 5000, it means that the steps are successful. Otherwise check the encoder connection and then restart step 2 - 4.

Note !

Step 4

If the comparison value is too large, you could count it according to the following formula. And if the result is smaller than 5000, it means that the above steps are also successful.

Formula: 65535 + smaller value – larger value < 5000

5. Set F00.05 according to elevator control mode, and set F06.00 as 0 (no pre-torque compensation).
6. Set inspection run command and direction so that the motor slowly runs, F10.12 (motor start angle) will be obtained the auto-tuning process is finished.

Pay attention to the following circumstances at step 6 inspection running:

1. *The setting direction and the actually running direction are not the same.*
   Take measures: *Set the reverse value of F00.08 (run direction), then restart auto-tuning.*
2. *There is fault such as over-current or encoder reversion enabled etc. It may be encoder reversion enabled.*
   Take measures: *Set F11.02 as 1 (the reverse direction of PG interface board), then restart auto-tuning.*

Note !

1. *During step 2 and step 3, it needs open the run contactor manually.*
2. *If the system has syn. motor radial contactor, the short-circuit signal of radial contactor should be removed. Otherwise it will cause over-current fault.*
3. *If the system is power off before step 7finishes, restart auto-tuning.*

Asyn. motor parameter auto-tuning

1. Set F00.05 as 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 !	When auto-tuning, it needs open the run contactor; if at rotary auto-tuning, it needs open the brake contactor manually too.

6.1.4 Inspection Running

Before inspection running

Make sure the follow steps:

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, 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 will do high speed running.

6.1.5 High Speed Running

1. Give the floor normal run command so that to 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.
   - For asyn. motor, adjust Group F02 to avoid obviously shaking at start &stop.
   - For syn. motor, set Group F06 additionally to avoid elevator brake at start.
   - If syn. motor has SINCOS encoder, it can achieve elevator smooth start using weigh less method (Group F06). And F02.02 (retention time of start zero-speed) is set at least as 0.5s.
2. If the elevator has slight shake at running, properly adjust Group F08.
3. To adjust levelling 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 levelling precision.

6.2 Power-off Battery Driven Run Application

During using elevator, if the system power is off, passengers will be shut in car. HD5L provide battery driven run mode to resolve this problem.

Connection

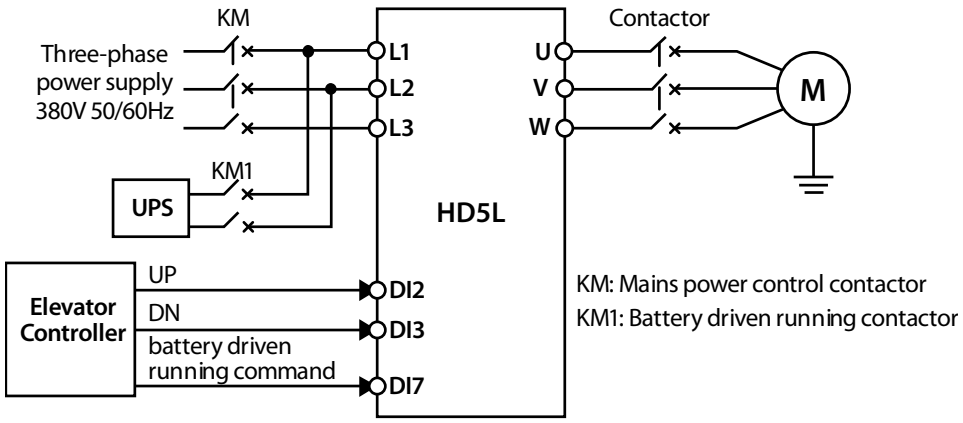


Figure 33

Battery driven run connection

Running Time Sequence

1. When mains power fails, the KM (mains power control contactor) opens, and elevator controller outputs battery driven running command (BAT), and controls KM1 to close.
2. After some time delay, the elevator controller outputs running command (UP / DN). When HD5L receives the command, the running contactor will be closed and the brake will be opened. HD5L accelerates at the line rate of F03.08 (battery driven Acc speed) till the speed of F05.09 (battery driven run speed).
3. When the elevator runs near a leveling area, the elevator controller cuts off the battery driven run command (BAT), and HD5L begin to Dec at the rate of F03.09 (battery driven 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 running command (UP / DN) and HD5L releases the contactor. A complete battery driven running process is over.

Note !	1. *The battery voltage should be bigger than150VDC to ensure normal running.* 2. *In the battery driven running mode, the controller does not detect the input phase failure.*

7. Troubleshooting and Maintenance

7.1 Troubleshooting

If a fault occurs, the keypad will display the fault alarm status. Meanwhile, faulty relay acts, accordingly HD5L stops output and the motor coasts to stop.
When fault alarm occurs, user should record the fault in detail and take proper action according to the **Error! Reference source not found.**. If technical help is needed, contact the suppliers or directly call Shenzhen Hpmont Technology Co., Ltd.

After the fault is eliminated, reset HD5L by any of the following methods:

1. Keypad reset.
2. External reset terminal (DI terminal = No. 16 function).
3. Communication fault reset.
4. Switching on HD5L after completely power off.

Fault		Fault reasons	Counter-measures
-Lu-	DC bus undervoltage	• At the begining of power on and at the end of power off • Input voltage is too low • Improper wiring leads to undervoltage of hardware	• It is normal status of power on and power off • Check input power voltage • Check wiring and wire HD5L properly
E0001	Acc overcurrent	• Improper connection between controller and motor • Improper motor parameters • The rating of the used HD5L is too small • Acc / Dec time is too short	• Connect HD5L and motor properly • Set correct motor parameters • Select controller with higher rating • Set proper Acc time and Dec time
E0002	Dec overcurrent		
E0003	Constant speed overcurrent		
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 HD5L 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

Fault		Fault reasons	Counter-measures
E0009	Heatsink overheat	• Ambient temperature is too high • Poor external ventilation of HD5L • Fan fault • Fault occurs to temperature detection circuit	• Use controller with higher power capacity • Improve the ventilation around HD5L • 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	Motor auto-tuning fault	• Parameter auto-tuning is time out	• Check the motor connection • Input correct nameplate 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 HD5L, input phase loss fault occurs to power input	• Check the three-phase power input • Seek technical support
E0016	Output voltage phase loss	• Output voltage phase disconnection or loss • Three-phase load of HD5L is severely unbalanced	• Check the connection between HD5L 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
E0018	Excessive speed deviation	• Brake fault or contactor fault • PG pulse number fault • Improper setting of 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 bigger capacity • Correctly set speed-loop PI parameter

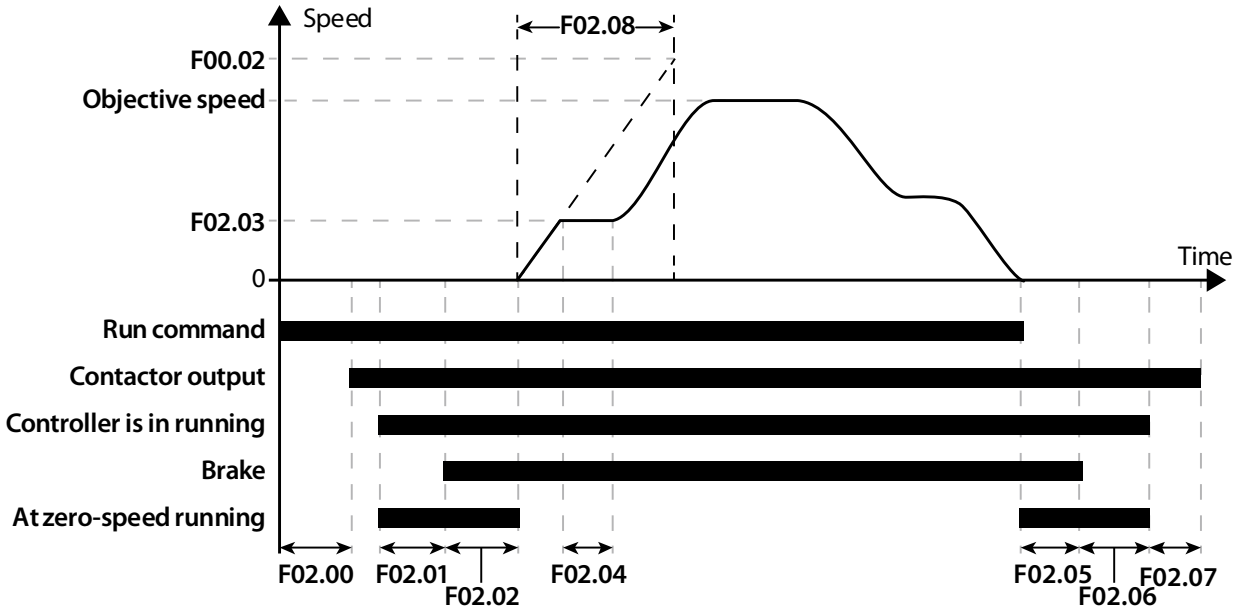
Fault		Fault reasons	Counter-measures
E0019	Motor overload	• Improper setting of V/f curve • Mains supply voltage is too low • Overload protection factor of motor is not set properly • Motor blocked-rotor torque or overload	• Adjust V/f curve • Check the power input • Properly set the overload protection factor of the 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; Increas the Acc / Dec time; Repair or replace the motor • Detect whether the overheat detection input signal is correct • Set the motor parameter according to 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	• 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 HD5L and motor • Detect HD5L whether output • Detect whether the output contactor work is normal
E0028	SCI communication timeout	• Connection fault of Communication cable • Disconnected or not well connected	• Check the connection

Fault		Fault reasons	Counter-measures
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
E0030	Wrong PG direction	• PG wire phase and motor phase do not match	• Set the reverse value of F11.02
E0031	PG direction reverse	• PG without input signal	• Check the PG connection
E0032	Motor over speed	• PG pulse number fault • Inadequate controller torque • Speed-loop PI parameter setting is incorrect	• Set proper PG pulse number • Select bigger capacity controller • Correctly set speed-loop PI parameter
E0033	Z signal loss of ABZ encoder	• Connection problem • Severe interference	• Check the connection
E0034	UVW signal wrong of UVW encoder	• UVW PG fan-area error	• Check the UVW connection
E0035	CD phase wrong of SINCOS encoder	• PG fault • PG disconnection	• Check the PG • Check the PG connection
E0036	Contactor fault	• Contactor damaged • Feedback contact connection problem	• Change the contactor • Check the connection
E0037	Governor fault	• Check external governor • Check feedback signal	• Replace governor • Replace circuit

Note ! *E0022 does not affect normal run of controller.*

Appendix A Travel Optimization

1. Starting and Stopping Sequence



- **Starting Sequence**
  1. Reading of the Run command (Forward or Reverse signals) and checking for alarms.
  2. When the time set in **F02.00 Start Delay Time** has elapsed, the Motor Contactor Output command is activated.
  3. The drive detects the Contactor feedback input (DI8=**9:** Contactor feedback input (CSM)).
  4. When the Contactor feedback is energised, the drive gives an output on terminals UVW in order to magnetise motor coils and the **F02.01 Brake Open Delay Time** starts counting.
  5. When the time set in **F02.01 Brake Open Delay Time** has elapsed, the Brake Output command is activated and the motor brake is released.
  6. When the brake Output command is activated the **F02.02 Retention time of start zero speed** is counting.
  7. When the **F02.02 Retention time of start zero speed** has elapsed, the movement starts.

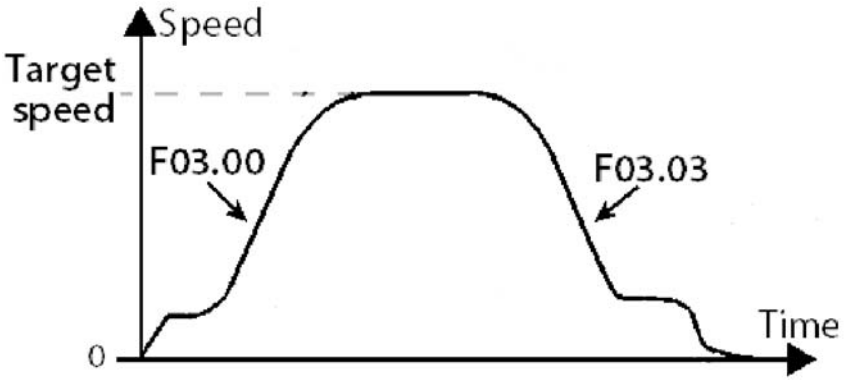
- **Movement Sequence**

  1. The motor is started and moves slowly at the speed set in **F02.03 Start Speed** for the time indicated in **F02.04 Retention time of start speed**.
  2. At the end of **F02.04 Retention time of start speed**, movements are managed by the multispeeds and S-shaped ramp.
  3. When the Run command (Forward or Reverse signals) is removed the lift decelerates to zero speed and stops.

- **Stopping Sequence**

    1. When the zero speed is reached the DC stop command is enabled.
    2. When the **F02.05 Brake close delay time** has elapsed, the drive de-activated the brake output and the **F02.06 Retention time of stop zero speed** starts counting.
    3. Whem the **F02.06 Retention time of stop zero speed** has elapsed, the drive stops the output on UVW and the waits for the **F02.07 Contactor close delay time** in order to de-activate the motor contactor output.

2. Acceleration and Deceleration Adjustment

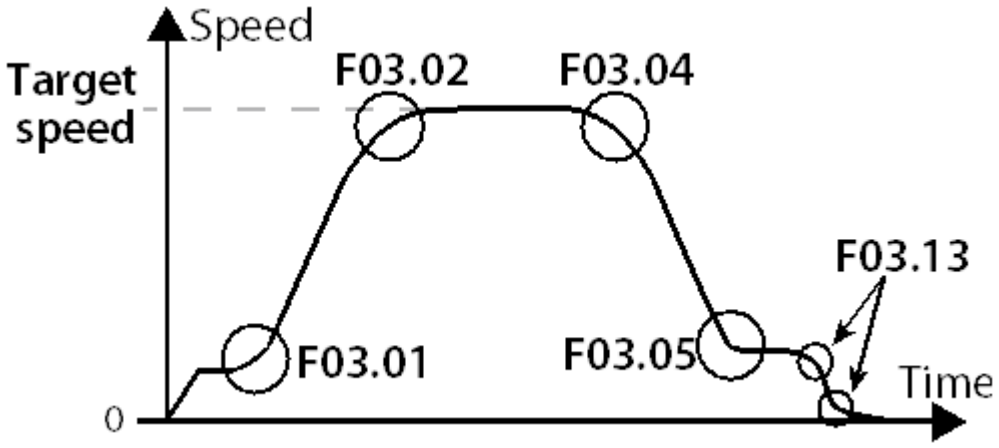


- Parameter F03.00 Acc Speed is the Acceleration that is needed to accelerate form 0m/s to nominal speed.
- Parameter F03.03 Dec Speed is the Deceleration that is need to decelerate from nominal speed to levelling speed.

Those parameters should be reduced for smoother acceleration / deceleration and should be increased for faster acceleration / deceleration.

If the speed change magnets are already placed and adjusted in the shaft, and the lift stops correct at the floor level when it's arrives from adjacent floor, but when it's arrives from a distant floor it can't stop at floor correctly, then the value on parameter **F03.03** should be increased.

3. Jerk Adjustment



Five deferent jerks are used to adjust te speed changes.
Parameter **F03.01 Start Acc jerk** is the jerk at start of acceleration.
Parameter **F03.02 End Acc jerk** is the jerk at the end of acceleration.
Parameter **F03.04 Start Dec jerk** is the jerk at start of deceleration.
Parameter **F03.05 End Dec jerk** is the jerk at the end of deceleration.
Parameter **F03.13 Stop Dec jerk** is the final jerk from levelling speed to zero speed.

Those parameters should be reduced for smoother acceleration / deceleration speed changes and should be increased for faster acceleration / deceleration speed changes.

4. Starting Improvement

4.1 PM motor starting improvement

1. Set **F06.00 Pre-torque selection** to value **4:** *No weight auto-compensation*.
2. Confirm the **F02.02 Retention time of start zero-speed** is higher than *0.5s*
3. Increase **F06.14 No weighing current coefficient** in order to eliminate the rollback at start.
4. Slightly reduce the **F06.15 No weighing speed-loop KP** in order to reduce vibration at start.
5. Increase **F06.16 No weighing speed-loop KI i**n order to improve starting.

5. Stopping Improvement

5.1 PM motor stopping improvement

To eliminate the current noise on PM motors during stopping the parameter **F16.02 Current keep time after stop** should be increased.
Additionally the **F02.06 Retention time of stop zero-speed** could be adjusted as well.