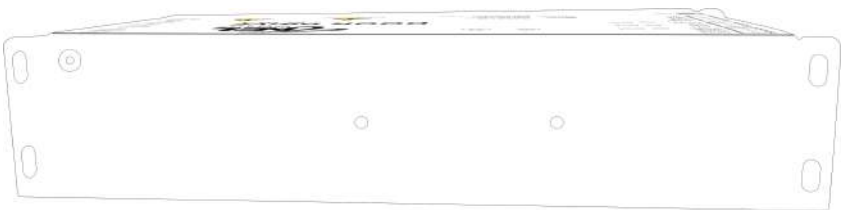
INNOVATION MATTERS
ELECTRONICS

USER MANUAL

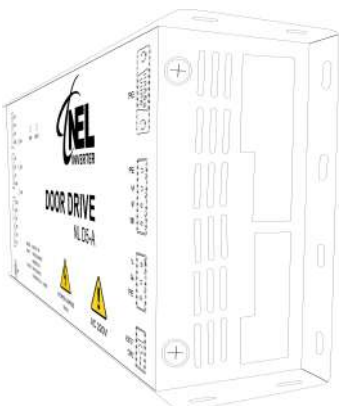
NL D5-A

Door Drive


DOA
DCA
DPA
CME
DOA
OD
CD
SS
COM
DCA
DPA
COM
P24
DI4
DI3
DI2
DI1
HMI
RUN
FAULT
INVERTER
DOOR DRIVE
NL D5-A
PG
PE
U
V
W
L
N
PE
OFF
ON
MODEL: NLD5-A-1-2A
INPUT: 1PH 200-240VAC
50/60Hz 5.8A
OUTPUT: 3PH 0-220VAC
0-99.99Hz 2.2A 0.4KW
STORED CHARGE
10min
AC 220V




DOOR DRIVE


INVERTER
DOOR DRIVE
NL D5-A

FORWARD

Thank you for purchasing NL D5-A Door Controller.

This user manual describes how to use NL D5-A and its installation wiring, parameter setting, troubleshooting and daily maintenance etc.

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

Note:

- Preserve this manual for future.
- If you need the user manual due to damage, loss or other reasons, please contact distributors of our company or directly contact our Technical Service Center.
- If you still have some problems during use, please contact with our Technical Service Center.
- Due to product upgrade or specification change, and for the purpose of improving convenience and accuracy of this manual, this manual's contents may be modified.

Version and Revision Records

Time: 2022/09

Version: V1.6

Revised Chapter	Revised Contents
Chapter 3	• Add set the encoder power supply to 24V, refer to

NL D5-A Common Function List

Functions	Function Description	Remarks
Sync and Aync motor	NL D5-A door controller can work with Async and Sync motor,with encoder,without encoder	F00.00
Aync motor,limit switches	NL D5-A door controller can work with Async motor with limit switches,speed control,for modernization.	F00.01
Automatic demo mode	In the demo mode, after setting the running cycles,it will automatically running up to the setting cycles.	F00.02
Automatic demo mode cycles	In the demo mode, pls set the demo mode running cycles	F07.02
Encoder direction	During commissioning,door opening,pulse increase,door close,pulse decerease,if not match,you have to change F02.01 para setting	F02.01
Puls monitoring	Puls monitoring para	F10.25
Default Parameter upload and download	The parameters can be uploaded and downloaded via keypad.	F11.01

CONTENTS

Chapter 1 Safety Information and Precautions

Safety Definition

Pay attention to contents with following marks in the user manual or on the product.

Danger

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

Warning

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. .

Professional Personnel

Only qualified electrical engineer can perform electrical wiring.
Only a trained and authorized professional person can maintain the product.

Chapter 2 Product Information

2.1 Rated Value

Power (kW)	Capacity (kVA)	Rated Input Current (A)	Rated Output Current (A)	G.W. (kg)
0.4	1.0	5.8	2.5	1.7

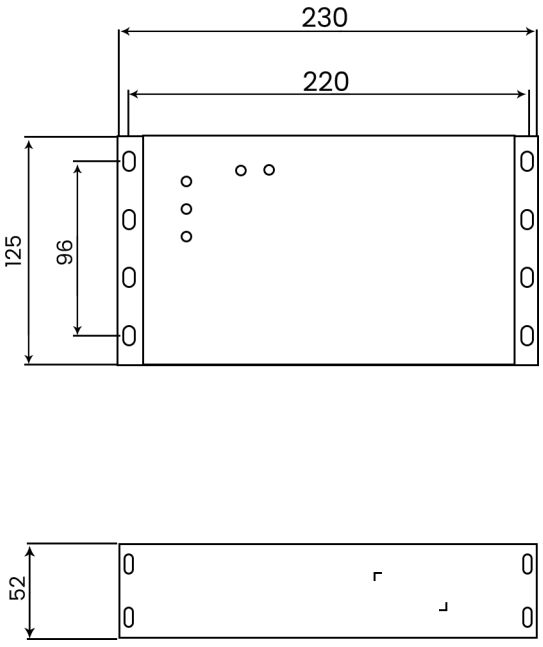
2.2 Technical Data

Electrical Specification	
Input voltage	Single phase: 200 - 240V Fluctuating within ±5%, imbalance rate <3%
Input frequency	50/60Hz ± 5%
Output voltage	0V - input voltage
Output frequency	0.00 - 99.99Hz
Control Characteristic	
Control mode	SVC; VC
Speed range	1:100 (SVC); 1:1000 (VC)
Speed accuracy	±0.5% (SVC); ±0.05% (VC)
Starting torque	180% rated torque at 0.5Hz (SVC); 180% rated torque at 0Hz (VC)
Frequency setting	Keypad setting
Resolution	Frequency: 0.01Hz; Current: 0.01A
Capacity	150% rated output current for 1 minute, 180% rated output current for 1 second
Function	
Main function	• When controlling Asyn. motor, it supports dynamic tuning of motor parameter • When controlling PMSM, it supports no-load/load tuning and encoder zero position of motor parameter • Support normal ABZ encoder, achieve closed loop vector control of PMSM • Support receiving open collector or push-pull encoder input signal • Distance control and speed control • Support door width self-learning, auto demo loop, resistance auto recognization and parameter upload/download
Protection	Overload protection, overvoltage protection, under-voltage protection, overcurrent protection, inter-phase short-circuit protection, etc.

Input and Output	
Power supply	+24V, Max. output current is 200mA
Digital input	DI1 – DI4, OD, CD,SS
Relay output	DOA, DCA, DPA Contact rating: 125VAC/0.5A or 24VDC/1A
Keypad	
LED keypad	8 keys, 5 LED nixie tube, 5 unit indicators, 5 status indicators
LED display	Set function parameter, check status parameter, check fault code, etc.
Environment	
Running temperature	-10 - +40℃, Max. 50℃, air temperature fluctuation is less than 0.5℃/min The derating value of output current shall be 2% for each degree centigrade above 40℃. Max. allowed temperature is 50℃
Storage temperature	-40 - +70℃
Applicable place	Indoor, preventing from direct sunlight, no dust, corrosive, flammable gases, oil mist, water vaper, dripping or salt etc.
Altitude	Less than 1000 meters, otherwise it should be derating use
Humidity	Less than 95%RH, non-condensing
Vibration resistance	It is 3.5m/s^2 in 2 - 9Hz, and 10m/s^2 in 9 - 200Hz (IEC 60721-3-3)
Protection class	IP20
Pollution level	2 (dry, non conducting dust pollution)
Accessories	
About keypad	LED keypad [Ne-LED] 1m extension cable to keypad [Ne-CAB-1M]

2.3 Dimension and Installation

The dimension of NL D5-A and mounting size is shown as below, the unit is mm.



Note:

Do not install if NL D5-A is incomplete or impaired upon unpacking.

2.4 Installation Site Requirement

Ensure the Installation Site Meets the Following Requirements:

- Do not install in a place exposed to direct sunlight, humidity, or water droplets;
- Do not install in flammable, explosive, corrosive gas and liquid places;
- Do not install in places with oily dust, fiber and metal powder;
- Be vertical installed on fire-retardant material with a strong support;
- Make sure adequate cooling space for NL D5-A to keep ambient temperature between -10 - +40℃;
- Install at where the vibration is 3.5m/s^2 in 2 - 9Hz, 10m/s^2 in 9 - 200Hz (IEC 60721-3-3);
- Install in place where the humidity is less than 95%RH and there is no condensation;
- Controller meets IP20 and pollution level 2 (dry, none conducting dust pollution).

Note:

1. It needs derating use if running temperature exceeds 40℃. The NL D5-A needs to be derated by 2% for every 1℃ increase. Max. allowed environment temperature is 50℃.

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

Chapter 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 NL D5-A with supply via the MCCB or fuse.
- Do not do wiring until the power of NL D5-A is cut off for more than 10 minutes.
- Check the wiring carefully before connecting emergency stop or safety circuit.
- There is more than 3mA leakage current in NL D5-A grounding, depending on the operating conditions. To ensure safety, NL D5-A 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 NL D5-A when it is charged. The main circuit terminals are neither allowed connected to the enclosure nor short-circuiting.
- The bare portions of the power cables must be bound with insulation tapes.

- Do not do dielectric strength test on NL D5-A.
- Connect the terminals firmly.
- Do not start or stop NL D5-A by connect/disconnect the contactor.
- Do not connect the input power to U, V, W terminals of NL D5-A.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure the AC input power supply voltage is the same as rated input current of NL D5-A.

3.2 Electrical Requirement

The recommended specifications of cables are shown as below table.

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

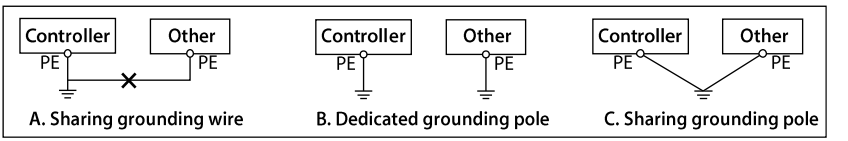
Power Supply Cable (mm^2)	Motor Cable (mm^2)	Ground Cable (mm^2)
0.75	0.5	2.5

Ground Wiring

- Connect the ground terminal of NL D5-A to ground reliably before power on.

There is current leakage to ground in NL D5-A. The grounding terminals PE must be connected to ground properly and be as close to grounding point as possible. The grounding area should be as large as possible. The grounding resistance should be less than 10Ω.

Do not share the grounding wire with other devices (A). NL D5-A can share grounding pole with other devices (C). It achieves the best effect if NL D5-A and other devices use dedicated grounding poles (B).

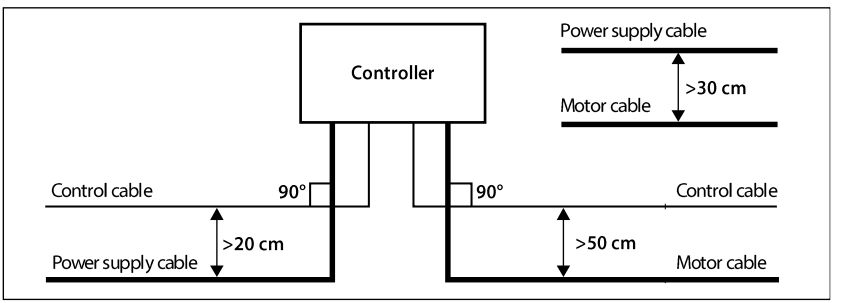


Cable Wiring

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

The signal cables should cross the power supply cables or motor cables, keep it perpendicular (90°) as shown in the figure below.

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



Power Supply Cable

- Do not connect the input power to U, V, W terminals of NL D5-A.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure the AC input power supply voltage is the same as rated input current of NL D5-A.

Motor Cable

The longer motor cable is, the higher frequency leakage current will be, causing higher harmonic output current to increase. This may affect peripheral devices.

Control Cable

To reduce the interference and attenuation of control signal, length of control cable should be limited to 50m.

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

Shielded cable should use high frequency low impedance shielded cable. For example: Copper net, aluminum net or iron net.

3.3 Interface Description

3.3.1 Power Switch

The power switch of NL D5-A is designed to improve convenient debugging and maintenance of door motor, as shown below.

- When power switch of NL D5-A is switched off, high voltage exists in input 220V terminal. It's strictly forbidden to touch connect or disconnect this terminal before external power supply is completely off. Otherwise electrical shock may occur.

3.3.2 Power Terminal

The power terminals are pictured at right.

Terminal	Description
L, N	Single phase AC 220V input
U, V, W	Output terminal of NL D5-A, connect to motor
PE	Ground terminal, connect to protective ground

3.3.3 Control Terminal

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

Terminal		Description
DI1 – DI4	Digital input	Optical-cupler isolated input signal Connect to COM (ON): Command is valid Disconnect to COM (OFF): Command is invalid • Use F06.03 - F06.07 to set DI1 - DI5 function
OD	Open door command input	
CD	Close door command input	
P24	+24V power supply	+24V power supply, Max. output current is 200mA
COM	Input reference ground	
DPA	Door position output	Contact rating: 125VAC/0.5A or 24VDC/1A • F09.11 for para setting
DOA, CME	Door open arrival relay	DOA, DCA: Normally closed; CME is isolated from COM • F09.09&F09.10 for para setting(NO setting,set 3rd bit para setting as 0)
DCA, CME	Door close arrival relay	

3.3.4 Connecting Encoder

DB9 of NL D5-A is for connecting encoder.

Pin		Description
1	COM	Encoder power ground
2	A	A/B phase signal of encoder, there is 90° difference which is used to judge the rotary speed and direction
6	B	
3, 7	Z	Z phase signal of encoder, the falling edge is valid, used for positioning the datum point
5	Encoder power supply	+24V, Max. output current is 100mA, optional 12V
4, 8, 9		Reserved

Chapter 4 Operation

4.1 Keypad Description

NL D5-A is equipped with external LED keypad, and model is Ne-LED.

<table>
<tr><th>No.</th><th>Description</th></tr>
<tr><td>1</td><td>a, c. Indicator: Display the current status or unit.
<table>
<tr><th>LED</th><th>Name</th><th>Status</th></tr>
<tr><td>RUN</td><td>Open door running status</td><td>On: NL D5-A is in door open status
Flashing: NL D5-A is in stop status</td></tr>
<tr><td>REV</td><td>Close door running status</td><td>On: NL D5-A is in door close status
Flashing: NL D5-A is in stop status</td></tr>
<tr><td>ALM</td><td>Warning status</td><td>On: NL D5-A has fault</td></tr>
<tr><td>/</td><td>Complete OD status</td><td>On: NL D5-A is complete door open status</td></tr>
<tr><td>LO/RE</td><td>Remote/local status</td><td>On: NL D5-A is controlled by terminal
Off: NL D5-A is controlled by keypad</td></tr>
<tr><td>/</td><td>Complete CD status</td><td>On: NL D5-A is complete door close status</td></tr>
<tr><td>RPM</td><td>Rotory speed unit</td><td>On: The unit is rpm</td></tr>
<tr><td>Hz</td><td>Frequency unit</td><td>On: The unit is Hz</td></tr>
<tr><td>A</td><td>Current unit</td><td>On: The unit is A</td></tr>
<tr><td>V</td><td>Voltage unit</td><td>On: The unit is V</td></tr>
<tr><td>%</td><td>Percentage unit</td><td>On: The unit is %</td></tr>
</table>
b. Display area: Display parameter in normal condition; Fault code will flash when fault occurs.
<table>
<tr><th>Display</th><th>Meaning</th><th>Display</th><th>Meaning</th><th>Display</th><th>Meaning</th><th>Display</th><th>Meaning</th></tr>
<tr><td></td><td>0</td><td></td><td>A</td><td></td><td>J</td><td>  </td><td>U</td></tr>
<tr><td>  </td><td>1</td><td></td><td>b</td><td>  </td><td>L</td><td>  </td><td>u</td></tr>
<tr><td>  </td><td>2</td><td></td><td>C</td><td>  </td><td>n</td><td>  </td><td>y</td></tr>
<tr><td>  </td><td>3</td><td></td><td>c</td><td>  </td><td>o</td><td>  </td><td>-</td></tr>
<tr><td>  </td><td>4</td><td></td><td>d</td><td>  </td><td>P</td><td></td><td>Dot</td></tr>
<tr><td>  </td><td>5</td><td></td><td>E</td><td>  </td><td>q</td><td>  </td><td>Full display</td></tr>
<tr><td>  </td><td>6</td><td></td><td>F</td><td>  </td><td>r</td><td></td><td>No display</td></tr>
<tr><td>  </td><td>7</td><td></td><td>H</td><td>  </td><td>S</td><td>  </td><td>Flash modifiable</td></tr>
<tr><td>  </td><td>8</td><td></td><td>h</td><td>  </td><td>T</td><td></td><td></td></tr>
<tr><td>  </td><td>9</td><td></td><td>i</td><td>  </td><td>t</td><td></td><td></td></tr>
</table>
</td></tr>
</table>

No.	Description		
2	PRG	**PRG**	**Program/exit key:** Enter or exit key; Switch between programming status and monitoring status.
3	CD	CD	**Close key:** CD command via this key
4	OD	**OD**	**Open key:** OD command via this key
5	STOP	**STOP**	**Stop/reset key:** Stop NL D5-A by using keypad; Reset the fault when detecting a fault.
6	▲		**Increase key:** Increase parameter when selecting it; Increase value when setting parameter.
7	▼		**Decrease key:** Decrease parameter when selecting it; Decrease value when setting parameter.
8	▶▶		**Shift key:** When selecting parameter or setting parameter, shift to the next value.
9	ENT		**Enter/confirm key:** Enter lower menu; Save the value when setting parameter.

4.2 Display on Keypad

Display of Stop or Run Parameter

When NL D5-A is in stop or run status, the keypad displays stop or run status parameters, as shown on the right.

Press ▶▶ key to display stop status parameter cyclically:

F10.28-F10.33(Status monitoring,current,voltage,DC bus)

F10.34 terminal status monitoring

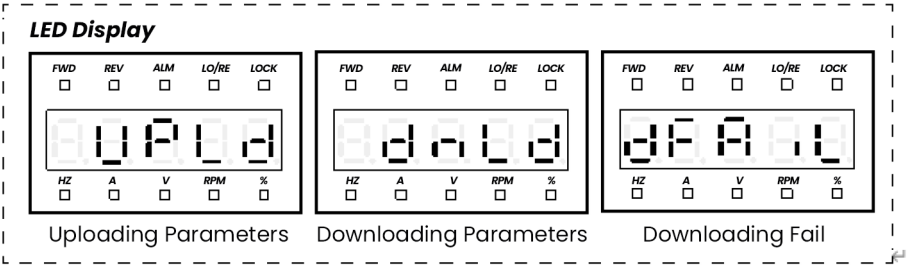
Fault Alarm Display

When NL D5-A alarms fault, the keypad enters fault alarm display status and fault code flashes, as shown on the right.

Enter group F10 to check the fault records.

Reset the fault by pressing (**STOP** key) to reset.

Special Display Status



Parameter Editing Display

When NL D5-A is in stop or run or fault status, press (**PRG** key) to enter parameter editing status.

Using 4-level menu: **Mode setting (first-level) → function parameter group setting (second-level) → function parameter setting (third-level) → parameter setting (fourth-level).** Take LED keypad as an example:

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
ENT	Enter second-level menu	Enter third-level menu	Enter fourth-level menu	Save the present value and return to third-level
▲	Select function group. Cycle according to d-F-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 unit and ten	Switch unit, ten, thousand, ten thousand

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

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

4.3 Reset Default Parameter

Set F11.01 = 1 and restore all para to default value.

4.4 User's Password

Set F11.00 ≠ 0, if no key operation is detected within 5 minutes, the user password will take effect. Now user can check the parameter but not modify it.

Clear User's Password

To clear the password, you have to input the correct password.

Safety

Without external keypad,no other person could access our door controller.

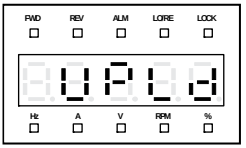
.

4.5 Upload and Download Parameter

Upload and download can only be done when using optional Ne-LED keypad.

Upload

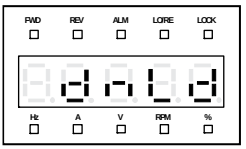
When F11.01 = 4, the keypad displays "UPLd" (as right figure). It will enter stop status automatically after uploading is finished.



Uploading parameters

Download

When F11.01 = 5, the keypad displays "dnLd" (as right figure). It will enter stop status automatically after downloading is finished.



Downloading parameters

Note:

1. To download the parameter, firstly upload the parameter.

2. When downloading parameters, it displays "dFAiL", means that the storage parameters of keypad do not match with function parameters of NL D5-A. Firstly upload the correct parameters and then download.

3. When uploading or downloading parameters, it displays "E0022" and flashes, means EEPROM of keypad is faulty. It will jump to next function code 10 seconds later. The troubleshooting is in 7.1 Troubleshooting, on page 39.

Chapter 5 Function Introduction

5.1 Group F: General Function Parameter

5.1.1 F00: Basic Parameters

Ref. Code	Function Description	Setting Range [Default]
F00.00	**Control method selection**	2
	0: Asyn. motor open-loop vector control. 1: Asyn. motor closed loop vector control. 2: Syn. motor closed loop vector control. 3: Asyn. motor flux vector control.	
F00.01	**OD/CD mode selection**	0,1 [0]
	0: Speed control (with 4 switches). 1: Distance control (with encoder).	
F00.02	**OD/CD mode selection**	0-3 [0]
	0: Keypad (manual). Run and stop are controlled by keypad. 1: Terminal (automatic). • NL D5-A opens/closes the door by OD/CD command of control system. 2: Demo cycles running. Without controlled by the system, the automatic demo mode is used to demonstrate door motor and trial operation in factory. 3: Factory debugging mode. Special function of door motor is invalid.	

Ref. Code	Function Description	Setting Range [Default]
F00.04	**Max. output frequency**	1.00 - 99.99 [50.00Hz]
	Define Max. output frequency of NL D5-A.	
F00.05	**Running speed when 1st time power on**	0.01-15[7]
	When F00.01=1,distance control,this para is effective.	
F00.06	**Slow speed setting**	0.01 - 15 [4]
	With SS command,controller running speed setting	

F00.07	**Carrier frquency**	2- 16k[8]
	IGBT carrier frequency setting	
F00.10	**Max output toque when keypad running**	0.00 - 250[180%]
	Output torque	
F00.11	**Max output frequency**	0.00 - 99 [24]
	Door controller maxium output frequency	

5.1.2 F01: Motor Parameters

Ref. Code	Function Description	Setting Range [Default]
F01.00	Motor Type 0:Aync motor 1:Sync motor	0,1 [1]
F01.01	Motor rated power	1 - 750 [250W]
F01.02	Motor rated voltage	1 - 300 [220V]
F01.03	Motor rated current	0.10 - 2.50 [0.55A]
F01.04	Motor rated frequency	1.00 - 99.99 [50.00Hz]
F01.05	Motor rated Rpm	1 - 6000 [900rpm]
	In order to ensure the control performance, the motor should match the power level of NL D5-A.	
F01.06	Motor parameter auto-tuning	0, 1 [0]
	0: No action. 1: Motor parameter auto-tuning.	
F01.07	Stator resistance	0.00 - 99.99Ω [Depend on NL D5-A]
F01.08	Rotor resistance	0.00 - 99.99Ω [Depend on NL D5-A]
F01.09	Stator inductance	0 - 9999mH [Depend on NL D5-A]
F01.10	Mutual inductance	0 - 9999mH [Depend on NL D5-A]
F01.11	Async motor No-load magnetizing current	0.01 - 2.5A [0.38A]
F01.12	Sync motor D axis inductance	11.21mH
F01.13	Sync motor Q axis inductance	11.21mH
F01.14	Magnetic pole position identification pulse width	0
F01.15	Sync motor encoder zero position(After tuing,we have data here)	0
F01.16	Sync motor real-time angle	0
F01.17	Rotor inductance	11.22mH
F01.18	Gear Ratio	1 (1-9.99)
	This parameter needs to be set only when the encoder is not installed on the motor shaft;	

5.1.3 F02: Performance Control Parameter

Ref. Code	Function Description	Setting Range [Default]
F02.00	Pulse per rpm of encoder	0 - 9999 [1024]
F02.01	Encoder direction setting	0, 1 [1]
	0: Same direction. 1: Opposite direction.	
F02.02	Speed loop proportional gain 1	10 - 3000 [200]
F02.03	Speed loop integral gain 1	0 - 1000 [20]
F02.04	Switching frequency 1	0 – 99Hz [5.00Hz]
F02.05	Speed loop proportional gain 2	0 - 2 [0]
F02.06	Speed loop integral gain 2	0 - 9999 [780]
F02.07	Switching frequency 2	0 – 99Hz [15.00Hz]
F02.08	Current loop proportional gain	0 - 9999 [0]
F02.09	Current loop integral gain	0 - 9999 [100]
F02.10	Slip Compensation Coefficient	0 - 200 [100%]
F02.11	Inertia compensation	0 - 65535 [0]
F02.12	Torque limit	0 - 200 [120%]
F02.16	Flux Vector Voltage Compensation	0 - 40 [10%]
F02.17	Flux vector close-in-place hold frequency	1 – 5Hz [1.00Hz
F02.18	Flux vector door open in place to hold frequency	1 – 5Hz [1.00Hz
F02.19	Flux vector speed torque switching delay time	100 - 3999 [100]
F02.20	Flux vector does not detect switching gate blocked frequency range	0.1 – 15Hz [7.00Hz]
F02.21	Flux Vector Door Open Voltage Compensation	0 - 8 [0%
F02.22	Flux Vector Voltage Compensation Frequency Cutoff Point	10– 50Hz [24.00Hz

5.1.4 F03: OD Curve Parameter

Ref. Code	Function Description	Setting Range [Default]
F03.00	OD start speed	0.00 - 15.00 [4Hz]
F03.01- F03.02-	Reserved	0
F03.03	OD High speed	0.00 -99Hz [24.00Hz]
	Define the high running speed (frequency) during OD process.	
F03.04	OD Accel time	1.7S [0.1-99S]
	Door open time from Zero speed to Maxium speed	
F03.05	OD creep speed	3.5Hz [0-15Hz]

Ref. Code	Function Description	Setting Range [Default]
F03.06	OD Decel time	0.8S [0.1-99S]
	Door open time from Maxium speed to zero speed	
F03.07-F03.10	Reserved	
F03.11	Reopening curve high speed zone setting	10 -90 [90%]
F03.12	Door open creep time	0.7S [0.0-5S]
F03.13	Door open stuck	0,1 [0]
	0: Door open stuck and stop; 1: Keep the door open after being blocked, the multi-function output can output the blocked signal, and the elevator control system can freely choose to open or close the door according to the blocked signal When it is set to 1, after the door operator is blocked, the maximum output torque is 1.1 times of the door blocking torque	
F03.14	Reserved	

5.1.5 F04: CD Curve Parameters

Ref. Code	Function Description	Setting Range [Default]
F04.00	**CD start speed**	**0.00 - 15.00 [5.00Hz]**
F04.01-F04.02	**Rserved**	**0.1 - 99.9 [1.4s]**
F04.03	**CD High speed**	**0.00 -99Hz [18.00Hz]**
	Define the high running speed (frequency) during CD process.	
F04.04	**CD Accel time**	**1.1S [0.1-99S]**
	• Door close time from Zero speed to Maxium speed	
F04.05	**CD creep speed**	**0Hz [0-15Hz]**
F04.06	**CD Decel time**	**1.0S [0.1-99S]**
	Door close time from Maxium speed to zero speed	
F04.07	**The door knife on distance when closing**	**1 - 500 [150]**
F04.08	**The door knife on speed when closing.**	**0.00 – 99Hz [4.00Hz]**
F04.09	**The door close creep speed before fully closing**	**0.00 – 99Hz [3.00Hz]**
F04.10	**Reserved**	
F04.11	**The door knife end speed when closing**	**0.00 – 5Hz [1.50Hz]**
F04.12	**The door knife end range when closing**	**0.00 – 5000 [0]**
F04.13	**Reserved**	
F04.14	**Door closing limit setting**	**1 – 500 [60]**

Ref. Code	Function Description	Setting Range [Default]
F04.15- F04.16	Reserved	
F04.17	Door closing block creep speed setting	0.00 – 99Hz [5.00Hz]
F04.18	Door closing block high speed setting	5.00 – 99Hz [10.00Hz]
F04.19	The creeping time when closing	0.00 – 5s [10.7s]
F04.20	The door block when closing	0,1 [0]
	0: Reopen the door when blocked 1: Keep the door closing after being blocked, the multi-function output can output the blocked signal, and the elevator control system can freely choose to open or close the door according to the blocked signal When set to 1, after the door operator is blocked, the maximum output torque is 1.1 times of the door closing blocking torque	

5.1.6 F05: Torque Parameters

Ref. Code	Function Description	Setting Range [Default]
F05.00	Door open switching torque	0.0 – 100% [80.0%]
F05.01	Door open holding torque	0.0 – 100% [75.0%]
F05.02	Final holding torque at complete door open	0.0 – 100% [7.0%]
F05.03	Switching time from OD holding torque to final holding torque	0.1 - 999.9 [30.0s]
F05.04	Door close switching torque	0.0 – 100% [75.0%]
F05.05	Door close holding torque	0.0 – 100% [70.0%]
F05.06	Final holding torque of complete door close	0.0 – 100% [50.0%]
F05.07	Switching time from CD holding torque to final holding torque	0.1 - 999.9 [30.0s]
F05.08	Torque setting at low speed door close resistance	0.0 -120% [80.0%]
F05.09	Time at low speed door close resistance	0 - 4999 [1000ms]
F05.10	Torque setting at high speed CD resistance	0.0 -120% [10.0%]
F05.11	Time of high speed door close resistance	0 - 4999 [1000ms]
F05.12	Low speed setting at door close resistance	0.00 - F00.07 [5.00Hz]
F05.13	The door open torque when blocking	30.0 -150% [100.0%]
F05.14	The door open resistance time setting	0 - 4999 [1600ms]
F05.15	The door open block and stop setting	0 -3000 [9999ms]
F05.16- F05.19	RESERVED	
F05.20	The door open maintaining torque auto-calculation	0,1 [0]
	0:Via para setting; 1:Via software auto calculation	
F05.21	Reserved	

5.1.7 F06: Distance Control Parameters

Ref. Code	Function Description	Setting Range [Default]
F06.00	Door width self-learning	0, 1 [0]
F06.01	Door width self-learning speed	0.01 – 99Hz [4.00Hz]
F06.02	Door width position low bit	0 - 9999 [2943]
F06.03	Door width positon high bit	0 - 9999 [0]
F06.04	Door opening start creep speed	0 - 9999 [400]
F06.05	The decel point position during door opening	50.0 -99.9% [75.0%]
F06.06	The door open limit setting when door opening	80.0 -99.9% [95.0%]
F06.07	The creep distance when door closing	0 - 9999 [200]
F06.08	The decel point position during door closing	50.0 -99.9% [68.0%]

Ref. Code	Function Description	Setting Range [Default]
F06.09- F06.20	Reserved	
F06.21	The door position setting	0.1 -99.9% [90.0%]
F06.22	The door switch position pulse for door closing limit	0 - 9999 [0]

F07: Demo(Simulation) Para setting

Ref. Code	Function Description	Setting Range [Default]
F07.00	Door open arrival keeping time	1- 999.9S [2S]
F07.01	Door close arrival keeping time	1- 999.9S [2S]
F07.02	The demo running cycles records	0 - 65535 2080]
F07.03	The demo running designed cycles	0 -65535[55535]

5.1.8 F08: Auxiliary Parameter

Ref. Code	Function Description	Setting Range [Default]
F08.00	Auxiliary detection time for door closing obstruction	0 ms [0-4999ms]
F08.01	Operation mode when cancelling running command	0-2 [2]
	0: The torque is maintained within the range of the door opening and closing, and it runs at zero speed in other positions 1: Stop running 2: Torque maintenance is only performed when door opening and closing arrival effective	
F08.02	Auxiliary para 1	00000- 11111 [0]
	00000-11111 1st Bit: Priority setting for Door opening&Closing 0: Door open priority 1: Door close priority 2nd Bit: Reserved 3rd Bit: Door closing limit switch mode 0: Door closing limit position is not learned during door width self-learning 1: When the door width is self-learning, the door closing limit position is learned. If this signal is valid, the current position can be automatically reset. 4th Bit: Stop key on the keypad when running in terminal mode 0: The stop key of the operation panel does not work under the terminal control 1: The stop key on the operation panel works under the terminal control (continue to press the key for 2S), press the stop key during operation, the system stops, the LED displays STOP, press the stop key again, and the system returns to normal; 5th Bit:Distance control door closing start 1/3 of the trip to detect that the door is blocked	

Ref. Code	Function Description	Setting Range [Default]
	0: Detection of door closing blocked 1: Do not detect that the door is blocked	
F08.03-F08.04	Reserved	
F08.05	Auxiliary para 2	00000- 11111 [0]
	00000-11111 1st Bit: Slow signal command 0: Used with open/close door command 1: Slow signal for door closing only 2nd Bit: Anti-pinch function when power off 0: Not valid 1:Valid 3rd Bit : Command mode of opening and closing the door 0: Non-pulse trigger 1: Pulse trigger type 4th Bit: Check output phase loss before running 0: Do not detect 1: Detect 5th Bit: Output when the door position arrival 0: Door open limit output is only related to door position 1: Output signal for canceling the door-open arrival output by the relevant door command	

5.1.9 F09: I/O Setting Parameters

Ref. Code	Function Description	Setting Range [Default]
F09.00	Filter time	2- 300ms [10]
F09.01	0: No function 1: Open door command	Di1 (0-20)
F09.02	2: Close the door command 3: External fault reset	Di2 (0-20)
F09.03	4: Door open prohibition	Di3 (0-20)
F09.04	5: No function	Di4 (0-20)
F09.05	6: Slow input	Di5(SS) (0-20)
F09.06	7: Motor overheated 8: No function	DI6(OD) (0-20)
F09.07	10: Light curtain input 11: Touchpad input 12: Door open limit input 13: close limit input 14: Door open deceleration signal input 15: Door closing deceleration signal input 16: Door lock input 17: Forced door close input 3rd Bit=1,which means normally closed signal (101, means open door input normally closed is valid	DI7(CD) (0-20)
F09.09	0: no function	
F09.10	1: Door open arrival 0	
F09.11	2: Door close arrival 0 3: Door open arrival 1 4: Door close arrival 1 5: Fault output 6: Reserved 7: Door open arrival 2 8: Door close arrival 2 9: Door lock signal input (synchronous input door lock signal) 10: Re-opening signal output (normally open) 11: output in case of resistance 12: Door position output (normally open) 13: Door drive ready output 14: Fault output (normally closed) 15: Running (normally open) 16: Door knife solenoid valve output (normally closed) 17: Door position output (normally closed)	

Ref. Code	Function Description	Setting Range [Default]
	18: Running (normally closed) 19-20: Reserved 3rd Bit=1,which means normally closed signal (101, means open door input normally closed is valid)	

5.1.10 F10: Display and Fault Record Parameters

Ref. Code	Function Description	Setting Range [Default]
F10.00	NO.5 fault type	
F010.01	NO.4 fault type	
F10.02	NO.3 fault type	
F10.03	NO.2 fault type	
F10.04	NO.1 fault type	
	-Lu-: DC bus under-voltage. E0001: NL D5-A over-voltage. E0002: Hardware of NL D5-A is over-current. E0003: Software of NL D5-A is over-current. E0004: Encoder Z signal of PMSM is lost. E0006: Motor parameter auto tuning failed. E0007: NL D5-A overloaded. E0008: Permanent magnet Syn. motor first current detection is too small. E0009: Motor overload fault. E0010: Abnormal opening fault. E0011: Motor overheating fault. E0012: Abnormal closing fault. E0014: Read/write fault of NL D5-A EEPROM. E0015: Speed deviation is too large. E0016: Overspeed fault. E0017: Module fault. E0018: Current detection circuit fault. E0022: Read/write fault of keypad EEPROM. E0023: Encoder fault. E0024: Wrong logic. E0026: Door width self-learning failed.	
F10..05	• Bus voltage at last fault	
F10.06	Output current at last fault	
F10.07	Running frequency at last fault	
F10.08	Setting frequency at last fault	
F10.09	• Door position at last fault	
F10.10	• Reserved	
F10.11	Input terminal status 1 at last fault	
F10.12	• Input terminal status 2 at last fault 2	
F10.13	Output terminal status at last fault	
F10.14	• Low bit of OD/CD times record	

Ref. Code	Function Description	Setting Range [Default]
F10.15	• High bit of OD/CD times record	
F10.16	• Runnning hours record	
F10.17	• Running days record	
F10.23	• Controller software version	
F10.24	• Keypad software version	
F10.25	• Door width pulse monitoring	
F10.26	• Door position percentage monitoring	
F10.27	• Door open arrival and door close arrival siganl monitoring	
	• • 0000-1111: • 1st Bit Door open pulse in place • 2nd Bit: Door opening torque in place • 3rd Bit Door closing pulse in place • 4th Bit:Door closing torque in place	•
F10.28	• Given Frequency monitoring	• 0.01 – 99.99Hz [0Hz]
F10.29	• Output Frequency monitoring	• 0.01 – 99.99Hz [0Hz]
F10.30	• Output voltage monitoring	• 0-999V
F10.31	• Output current monitoring	• 0.0-9.9A
F10.32	• Output torque monitoring	• 0-200%
F10.33	• DC BUS voltage monitoring	• 0-999V
F10.34	• Input I/O terminal monitoring 1	•
	• 00000-11111 • 5th Bit: DI5 status • 4th Bit: DI4 status • 3rd Bit: DI3 status • 2nd Bit: DI2 status • 1st Bit: DI1 status	•
F10.35	• Input I/O terminal monitoring 1	•
	• 00-11 • 2nd Bit: DI7 status • 1st Bit: DI6 status •	•
F10.36	• Output relay terminal status monitoring 000-111 3rd Bit: Relay3	•

Ref. Code	Function Description	Setting Range [Default]
	2nd Bit: Relay2 1st Bit: Relay1	
F10.37	• Encoder counter monitoring	•
F10.38	• Z Signal pulse monitoring	•
F10.39	• Z signal correction pulse deviation monitoring	•
F10.40	• Z signal correction error count monitoring	•
F10.41	• Z signal correction deviation maximum value monitoring	•

Ref. Code	Function Description	Setting Range [Default]
F11.00	**User password**	**0 - 65535 [0]**
F11.01	**Para upload&download**	**0 -7 [0]**
	0: Invalid, set parameters manually. 1: Restore to default parameter. 2: Clear fault information. 3: Unused. 4: Upload parameter to external keypad (F00 - F08). 5: Download parameter from external keypad to NL D5-A (F00 - F08). 6: Restore customer customized parameter of Syn. motor. 7: Restore customer customized parameter 2 of Syn. motor.	
F11.11	**Customized para setting**	**0.0 - 99 [00]**
	00-99 **00: Invalid** **51: Restore PM motor parameters and door motor self-tuning;** **96: PM motor door width self-learning and automatically set to terminal control;**	

Chapter 6 Application Debugging

6.1 Motor Parameter Auto-tuning

NL D5-A adopts high performance vector control technology to control the door motor. Before controlling the motor, start motor parameter auto-tuning to achieve correct motor parameter. That can ensure fine running efficiency.

Note:

*In motor parameter auto-tuning, press (**STOP** key) on the keypad to reset if it shows fault.*

Asyn. Motor Auto-tuning

1.	Remove the belt to free of load.
2.	Set F00.02 = 0 (keypad control mode). Set F00.00 = 0 (open-loop distance control) or 1 (closed loop distance control) or 3 (flux vector control).
3.	Set F01.00 (motor type), F01.01 (rated power), F01.02 (rated Voltage), F01.03 (rated current), F01.04 (rated Frequency), F01.05 (rated RPM), F01.18 (rotation ratio) according to motor nameplate.
4.	Set F01.06 = 1 (motor parameter auto-tuning).
5.	Press (**RUN** key) for auto-tuning, the keypad will display "tunE". • During self-tuning, make sure the motor shaft rotates towards the door opening direction.
Note:	
1.	For Aync motor,pls remove belt when doing tuning. During self-tuning, motor shaft rotates towards the door opening direction. **Countermeasure**: User wait until auto-tuning is finished, then switch any two of U, V, W of NL D5-A.

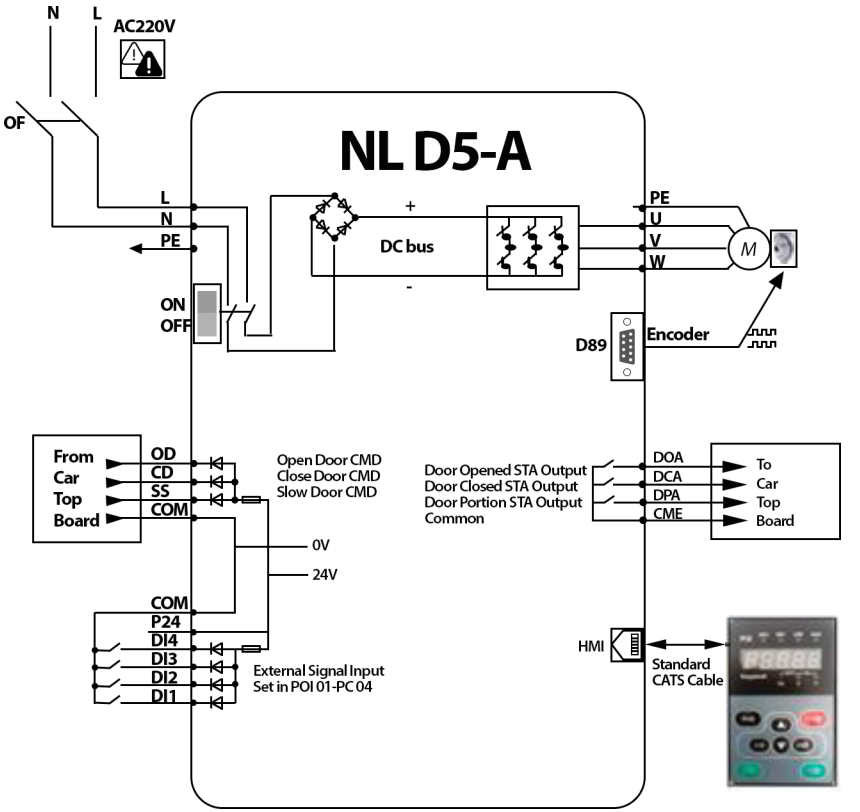
Distance Control

Use encoder to measure door position.

Main Debugging Steps

1.	Self-learn door width.
2.	Set OD/CD curve.
3.	Confirm door open and close arrival signal is valid
4.	Set F00.02= 1 (terminal control mode), and integrates into elevator system.

6.1.1 Wiring



Wiring requirements:

- 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 communication cable must be shielded twisted pair, 20 - 30mm shielded distance, and the shielded layer must be grounded.

- The encoder must use shielded cable, and one terminal of the shielded layer must be grounded firmly.

6.2 Speed Control

With four external limit switches, NL D5-A can realize speed control, no longer need external encoder to detect the door position. The installation position of each limit switch (signal connection) are shown in Figure 6-1.

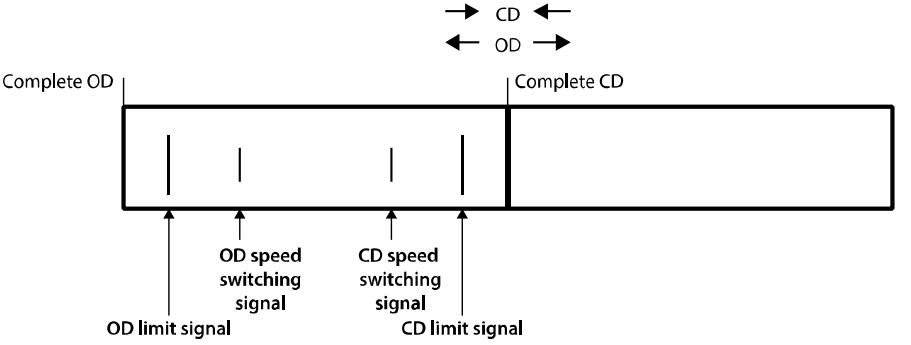


Figure 6-1 Speed control switches and their installation

Main Steps:

1.	Connect OD limit, OD speed switch, CD limit and CD speed switch to DI1 - DI4 respectively, and connect common terminal to COM.
2.	Then turn on the power supply switch of NL D5-A.
3.	Manually open and close the door, observe the F10.34 (input terminal status 1) by the keypad, confirm the limit switches and signals are normal. If the external switch is normally open (NO), it needs set DI1 - DI4 function (group F09) to be NO.
4.	Set F00.02 = 1 (terminal control mode), and integrate into elevator system.

Chapter 7 Troubleshooting and Maintenance

7.1 Troubleshooting

If fault occurs, the keypad will display the fault alarm. Meanwhile, faulty relay acts, accordingly NL D5-A 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 following table.

Fault		Reason	Countermeasure
-Lu-	DC bus undervoltage	• Power-on initial state, power-down end state • Input voltage is too low • Improper wiring leads to undervoltage of hardware	• Normal power-on/power-down state • Check input power voltage • Check wiring and wire NL D5-A properly
E0001	DC bus over voltage	• Input voltage is too high • Dec. time is too short • Improper wiring leads to overvoltage of hardware	• Check power input • Set proper Dec. time (F03.05, F04.05) • Check wiring and wire NL D5-A properly
E0002	NL D5-A output instantaneous overcurrent (hardware)	• Improper connection of NL D5-A and motor • Improper motor parameter • Wrong encoder signal • Improper wiring leads to overcurrent of hardware • Acc. or Dec. time is too short	• Connect NL D5-A and motor correctly • Set proper motor parameter (F01.00 - F01.04) • Check the connection of encoder and make sure the signal is correct • Check the system wiring and wire properly • Set proper Acc. time (F03.02, F04.02) or Dec. time (F03.05, F04.05)
E0003	NL D5-A output overcurrent (software)		
E0004	Encoder Z phase signal of PMSM lost	• Auto-tuning of PMSM did not detect Z signal	• Check encoder signal
E0006	Motor parameter auto-tuning failed	• Improper motor parameter setting • Improper motor wiring • Z phade signal of encoder is lost	• Set proper motor parameter (F01.00 - F01.04) • Check the motor wiring and wire properly • Check the encoder

Fault		Reason	Countermeasure
E0007	NL D5-A overloaded	• Load of door motor is too large • Door motor is resisted by obstacle	• Adjust the mechanical device • Check mechanical device for anything resisting it
E0008	Permanent magnet Syn. motor first current detection is too small	• When the first power-on mode of the permanent magnet Syn. motor is selected as the pulse method (F06.25 hundred = 1), the detected current is too small	• Check the motor wiring and wire properly • Check if the door controller output is normal
E0009	Motor overload fault	• Excessive load on door motor • A foreign object blocked the door motor	• Adjust mechanism • Check mechanical devices to remove foreign object • Improper parameter setting of door controller
E0010	Abnormal opening fault	• The motor was blocked for 10 consecutive times	• Adjust mechanism • Check mechanical device to remove foreign object • Improper parameter setting of door controller
E0011	Motor overheating fault	• External motor overheating signal is detected	• Motor overheating switch action
E0012	Abnormal closing fault	• After the motor is powered on, the CD complete signal is never detected, and the number of CD blocked exceeds 20 times	• Adjust mechanism • Check mechanical devices to remove foreign object • Improper setting of door controller parameters
E0014	Read/write fault of controller EEPROM	• Memory circuit fault of controller EEPROM	• Contact the supplier for repairing
E0015	Speed deviation is too large	• In the range of F10.16, the actual speed is greater than the given speed and exceeds the set value of F10.15	• Check if the F10.15 - F10.16 are set properly • Check encoder wiring • Redo self-tuning
E0016	Overspeed fault	• The actual speed detected in the range of F10.18 is greater than the motor rated frequency F10.17	• Check if the F10.17 - F10.18 are set properly • Check encoder wiring • Redo self-tuning

Fault		Reason	Countermeasure
E0017	Module fault	• Short circuit between phases • Short circuit to ground • Output current is too high	• Check the encoder wiring and wire properly • Check the encoder wiring and wire properly • Check electrical wiring and mechanism
E0018	Current detection circuit fault	• The detection error of current detection circuit is too large	• Contact the supplier for repairing
E0022	Read/write fault of keypad EEPROM	• Memory circuit fault of keypad EEPROM	• Replace the kaypad • Contact the supplier for repairing
E0023	Encoder fault	• Encoder is damaged • Encoder pulse setting error • Improper setting of pulse per rpm	• Check the encoder and replace it • Check the encoder wiring and wire properly • Set proper pulse per rpm (F02.00)
E0026	Door width self-learning failed	• Encoder is faulty • Improper encoder connection • Improper setting of self-learning speed or torque parameter	• Check the encoder and replace it • Check the encoder wiring and wire properly • Set proper self-learning speed (F02.04) and OD/CD switching torque (F05.14)

7.2 Reset Fault

After the fault is eliminated, reset NL D5-A by any of the following methods:

- Press (**STOP** key) on the keypad.
- External reset terminal (DI terminal = No.9 function).
- Switch on NL D5-A after completely power off.

7.3 Maintenance

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

- If NL D5-A has been transported for a long distance, check whether the components of the controller are complete and the screws are well tightened.
- Periodically clean the dust inside NL D5-A and check whether the screws are loose.

- Only a trained and qualified professional person can maintain the controller.
- The maintenance personnel must remove the metal jewelry before maintenance. Clothing and tools that meet insulation requirements must be used for maintenance.
- High voltage exists when the controller is powered up or running.
- Checking and maintaining can only be done after AC power of NL D5-A is cut off and wait at least 10 minutes.

- For NL D5-A with more than 2 years storage, please use voltage regulator to increase the input voltage gradually.
- Do not leave wires, tools, screws and other mental objects inside NL D5-A.
- Do not modify the inside of the controller without authorization.
- There are IC components sensitive to static electricity inside NL D5-A, please do not touch them directly.

Daily Maintenance

NL D5-A must be operated in specified environment.

Please do the daily maintenance work according to the following table, so as to find abnormal phenomena in time and extend the service life of the NL D5-A.

Items	Content	Criteria
Running environment	Temperature and humidity	-10 - +40℃, derating at 40 - 50℃ Less than 95%RH, non-condensing
	Dust and water dripping	No conductive dust, no water dripping
	Gas	No strange smell
NL D5-A	Oscillation and heating	Stable oscillation and proper temperature
	Noise	No abnormal sound

Periodical Maintenance

According to the operating environment, the controller shall be inspected regularly within 3-6 months to eliminate the hidden trouble and ensure the long-term stable operation of the equipment with high-performance.

General Inspection:

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

Note:

1. Dielectric strength test of NL D5-A has already been conducted in the factory. Do not do the test again. Otherwise, improper testing may damage NL D5-A.

2. When testing the insulation of the motor, the U / V / W terminal of the controller must be disconnected to test the motor separately. Otherwise, NL D5-A will be damaged.

3. For NL D5-A that have been stored for a long time, they must be powered up every 2 years. When supplying AC power to the controller, use a voltage regulator to gradually raise the input voltage to rated input voltage at least 5 hours.

Replacing Damaged Parts

Electrolytic capacitors of filter are easily damaged.

Generally, life of electrolytic capacitors is 40, 000 - 50, 000 hours.

Due to high ambient temperature and frequent load jumps, the pulsating current increases and the electrolyte is aging.

Criteria: Check if frequent over-current or overvoltage faults occur during controller start-up with load. Check if there is any leakage of liquids. Check if the safety value protrudes. Measure the static capacitance and insulation resistance.

Scrap Disposal

- The capacitors may explode if they are burnt.
- Poisonous gas may be generated when the plastic parts like front covers are burnt.
- Please dispose of as industrial waste.

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