INNOVATION MATTERS
ELECTRONICS

USER MENUAL

NL V6-M

Elevator controller drive

BRIEF INTRODUCTION

Naqsh-e-Lasani Electronics is a firm specializing in sales, installation/ commissioning, software programming, troubleshooting, repairing and maintenance of VFDs (Variable Frequency Drives), PLCs and other industrial automation Parts. We provide innovative technological solution for a wide range of clients in the manufacturing and industrial processes with the support of our team of qualified experts. Our talented employees focus their energy on helping businesses meet the challenges of today's new economic realities, such as globalization, competitiveness and the changing commodity and energy prices.

Why Naqsh-E-Lasani Electronics?

- Based on International Standards
- Experience from Different Industrial and Applications
- User Specific Requirements
- Technical Expertise
- High Quality Products
- Professional Services
- Customer Support & Feedback

FOREWORD

Thank you for purchasing NLV6-M series elevator controller manufactured by Naqsh-e-Lasani Electronics

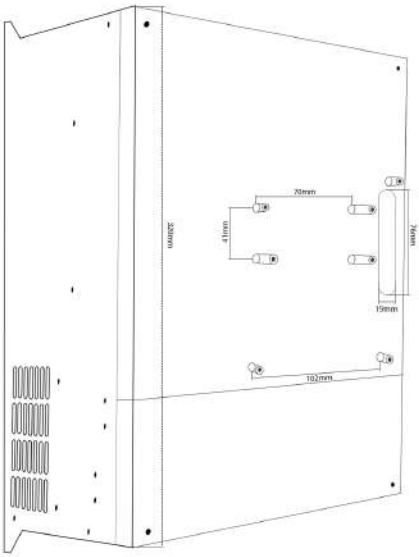
This User Manual describes how to use NLV6-M series elevator controller and their installation wiring, parameter setting, troubleshooting and daily maintenance etc.

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

Note:

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

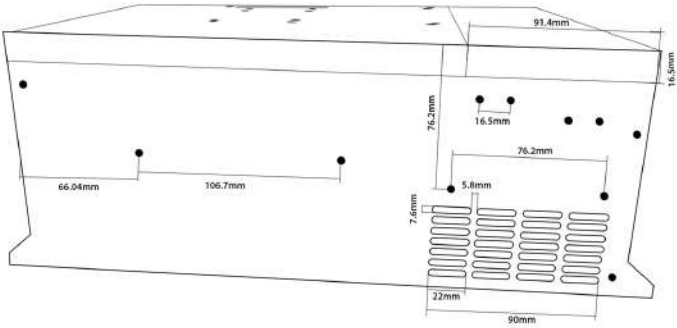
Front View



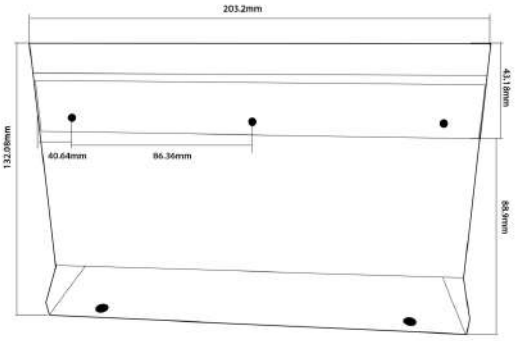
NLV6-M

7.5kw to 22kw

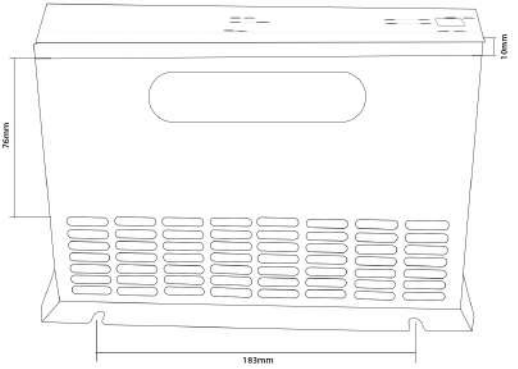
SIDE VIEW



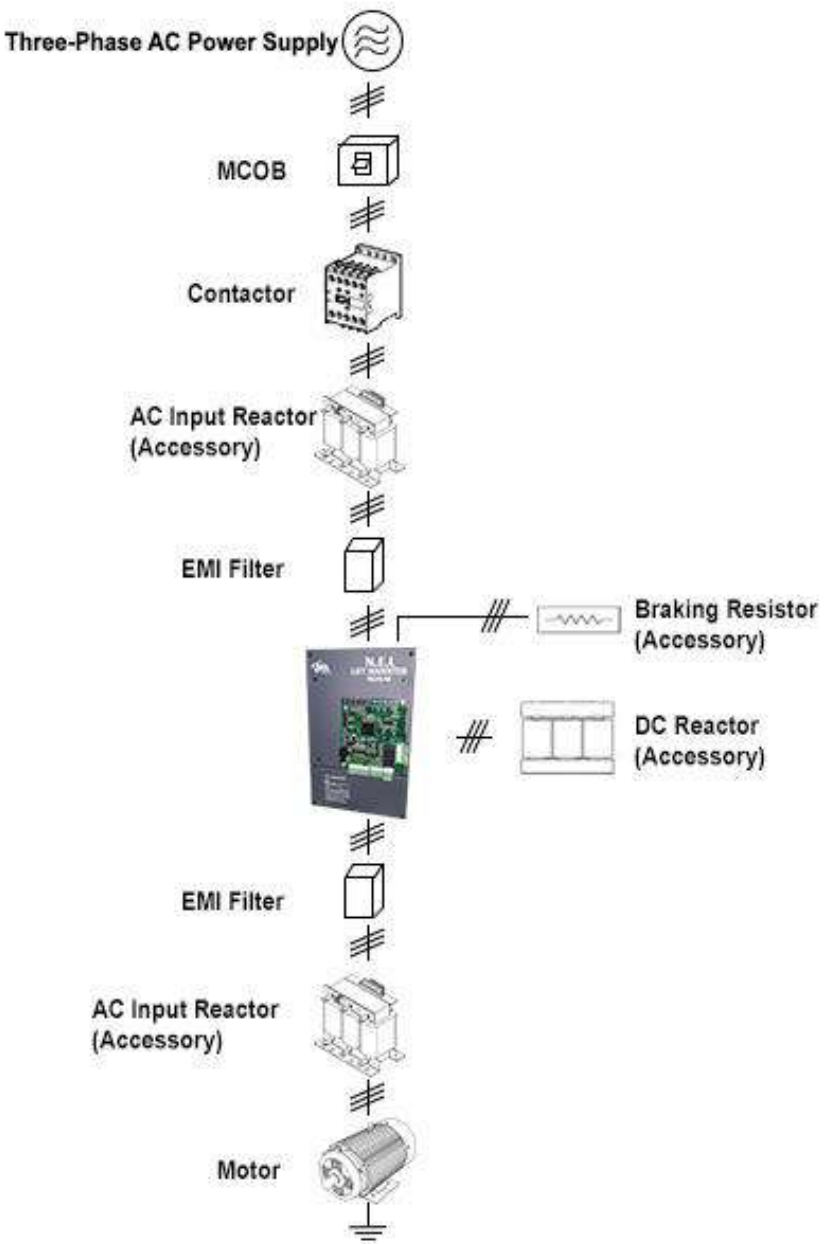
TOP VIEW



Bottom View



Connectiion with peripheral devices



Version and Revision Records

The version information is on top of the backbone and the bottom left of the cover.

Time: 2016/07

Version: V1.3

Revised chapter	Revised contents
Chapter 7	• Add F10.19 (optimize 1313 encoder start algorithm) • Add F16.17 - F16.19 (DC brake stopping functions enhancement) • DO terminal (F12.15 – F12.16) and relay (F12.17 – F12.20) add No. 21 function: speed outputs

CONTENTS

Chapter 1 Safety Information and Precautions

1.1 Safety Definition

Danger

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

Warning

Warning: A Warning contains information which is essential for avoiding a risk of damage to products or other equipements.

Note

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

1.2 About Motor and Load

Compared to the industrial frequency operation

The NLV6-M series controllers are voltage-type controllers and their output is PWM wave with certain harmonic wave. Therefore, the temperature, noise and vibration of the motor will be a little higher than that at industrial frequency running.

Thermal protection of motor

When choose the adaptive motor, NLV6-M can effectively implement the motor thermal protection. Otherwise it must adjust the motor protection parameters or other protection measures to ensure that the motor is at a safe and reliable running.

Lubrication of mechanical devices

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

Start and stop NLV6-M

User should use the control terminal to start and stop NLV6-M. It is strictly forbidden to use contactor or other switches on the input side of NLV6-M to start and stop directly, or it will damage the device.

Check the insulation of the motor

For the first time using the motor or after long time storage, it needs check the insulation of the motor. Worse insulation can cause damage to NLV6-M.

Note:

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

Requirement for leakage current protector RCD

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

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

Warning for ground mass leakage current

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

1.3 About NLV6-M

No capacitor or varistor on the output side

Since NLV6-M output is PWM wave, it is strictly forbidden to connect capacitor for improving the power factor or varistor for lightning protection to the output terminals so as to avoid NLV6-M fault trip or component damage.

Contactors and circuit breakers connected to the output of NLV6-M

If circuit breaker or contactor needs to be connected between NLV6-M and the motor, be sure to operate these circuit breakers or contactor when NLV6-M has no output, so as to avoid any damage to NLV6-M.

Running voltage

NLV6-M is prohibited to be used beyond the specified range of running voltage. If needed, please use the suitable voltage regulation device to change the voltage.

Capacitor energy storage

When the AC power supply is cut off, capacitor of NLV6-M sustains deadly power for a while. So to disassemble NLV6-M that is powered, please cut off the AC power supply for more than 10 minutes, confirm the internal charge indicator is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.

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

Change three-phase input to single-phase input

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

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

Lightning surge protection

NLV6-M internal design has lightning surge over-current protection circuit, and has certain self-protection capacity against the lightning.

Altitude and derating

In area where altitude exceeds 1000 meters, NLV6-M should be derating since the heatsink efficiency will be reduced because of the tenuous air.

The rated value of output current de-rates by 1% for each 100m increase of the altitude. I.e for the altitude of 3000m, de-rated rate is 20% for rated current of NLV6-M. Figure 1-1 is the de-rating curve of rated current and the altitude.

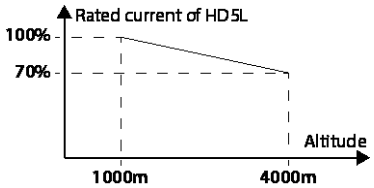
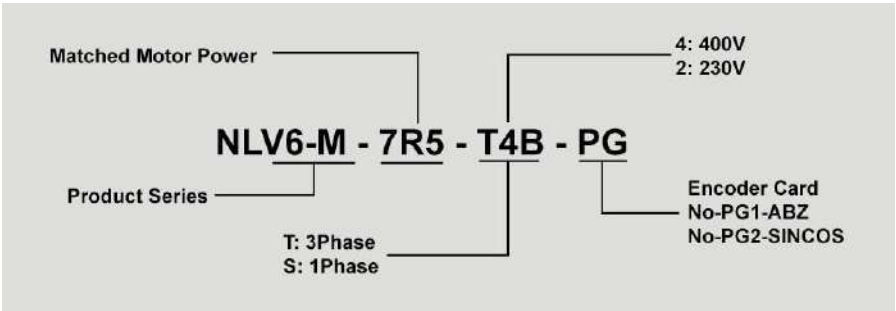


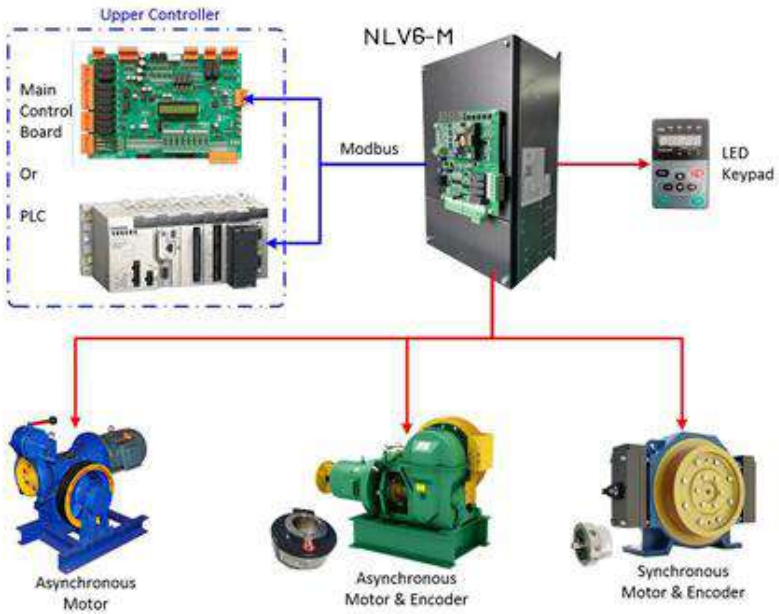
Figure 1-1 Derating curve of rated current and altitude

Chapter 2 Product Information

2.1 Model



2.2 Connection



2.3 Technical Data

Electrical		
Input voltage	Single-phase: 200 - 240V Three -phase: 200 - 240V Three-phase: 380 - 460V Fluctuating within ± 10%, unbalance rate < 3%	
Input frequency	50/60Hz ± 5%	
Output voltage	0 - input voltage	
Output frequency	0 - 100.00Hz	
Performance		
Control mode	V/f, SVC, VC	
Maximum current	150% rated output current for 2 minutes 180% rated output current for 10 seconds	
Running command	Keypad; Terminal; SCI communication	
Speed setting	Digital; Analogue; SCI communication	
Speed resulotion	Digital setting: 0.01Hz Analogue setting: 0.1% × max-frequency	
Speed control accuracy	SVC: ± 0.5%	VC: ± 0.05%
Speed control range	SVC: 1:100	VC: 1:1000
Torque control response	SVC: < 200ms	VC: < 50ms
Start torque	SVC: 180% rated torque / 0.5Hz	VC: 180% rated torque / 0Hz
Characteristic Functions		
Parameter upload and download function	Achieve parameters uploading and downloading	
I/O interface	The programmable input interface has up to 34 functions The pragrammable output interface has up to 19 functions	
Communication protocol	Built-in MODBUS communication protocol	
Protection Functions		
Auto-inspection	To eliminate the potential safety problems, safety inspection for the peripheral devices is provided when power on	
Over-speed protection	To make sure safe running, elevator over-speed protection is provided	
Speed deviation protection	To eliminate the potential safety problems, speed deviation detection protection is provided	
Up/down forced speed switch function	Up/down forced speed switch function, to avoid climbing elevator or plunging elevator	
Input /Output phase loss protection	Input /Output phase loss auto-detect and alarm function	
Motor temperature detection	Real time detection for the motor temperature	
Output GND short circuit protection	Enabled	
Output inter-phase short circuit protection	Enabled	

Input / Output	
Analogue power supply	+10V, max. current 100mA -10V, max. current 10mA
Digital supply	+24V, max. current 200mA
Analogue input	AI(control board): voltage 0 - 10V
Analogue output	AO1, AO2: 0 - 10V/0 - 20mA (selectable voltage/current)

Digital input	DI1 - DI8(control board)
Digital output	DO1, DO2
Programmable relay output	RA/RB/RC (control board) Y1; Y2;Y3 (control board) Contact rating 250VAC/3A or 30VDC/1A
Communication	
SCI communication	RS-485 interface
Keypad	
LED display	Setting function parameter, checking status parameter, checking fault code etc.
Parameter copy	Achieve quick parameter copy
Environment	
Running temperature	-10 - +40℃, max. 50℃, air temperature fluctuation is less than 0.5℃/min The derating value of output current of NLV6-M shall be 2% for each degree centigrade above 40℃. Max. allowed temperature is 50℃
Storage temperature	-40 - +70℃
Location for use	Indoor, preventing from direct sunlight, no dust, corrosive, flammable gases, oil mist, water vaper, dripping or salt etc.
Altitude	Less than 1000 meters, otherwise should be derating use
Humidity	Less than 95%RH, non-condensing
Ocsillation	Less than 5.9m/s^2 (0.6g)
Protection Class	IP20
Pollution level	Level 2 (Dry, non canducting dust pollution)
Accessories	
Encoder interface board	Geared motor ABZ encoder interface board [NL-PG1-ABZ] Gearless motor SINCOS encoder interface boardNL-PG2-SINCOS]
About keypad	Mounting base to keypad [NL-LED] 1m/2m/3m/6m extension cable to keypad [NL-CAB-1M/2M/3M/6M]
Power unit	Power regenerative unit [HDRU]

2.4 Rated Value

Refer to section 3.3 Dimensions and Weight (on page 12) for size information.

Model	Motor (kW)	Rated capacity (kVA)	Rated input current (A)	Rated output current (A)	Size
Single-phase / Three-phase power supply: 200 - 240V, 50/60Hz					
NLV6-M-2R2T2B	2.2	3.8	24.1 / 12 (1)	10	F3
NLV6-M-3R7T2B	3.7	5.9	40 / 19 (1)	17	F3
NLV6-M-5R5T2B	5.5	8.5	60 / 28 (1)	25	F3
Three-phase power supply: 380 - 460V, 50/60Hz					
NLV6-M-2R2T4B	2.2	3.4	7.3	5.1	F3
NLV6-M-3R7T4B	3.7	5.9	11.9	9.0	F3
NLV6-M-5R5T4B	5.5	8.5	15	13	F3
NLV6-M-7R5T4B	7.5	11	19	17	F3
NLV6-M-011RT4B	11	16	28	25	F3
NLV6-M-015RT4B	15	21	35	32	F3
NLV6-M-018RT4B	18.5	24	39	37	F4
NLV6-M-022RT4B	22	30	47	45	F4

Model	Motor (kW)	Rated capacity (kVA)	Rated input current (A)	Rated output current (A)	Size
NLV6-M-030RT4B	30	39	62	60	F4
(1): Value before / is for single-phase model, value after / is for three-phase model.					

2.5 Parts of Controller

NLV6-M adopted the latest technology and use the latest integrated design Top mother board plus the down drive part.

More convenient to do wiring in site and we can utilize minimum stock to have more models for example we can change it into integrated drive after replacing the control card.

Chapter 3 Mechanical Installation

3.1 Precautions

Danger

- Do not install if NLV6-M 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 NLV6-M 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 NLV6-M is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.

Warning

- It is required not only carry the keypad and the cover but also bottom enclosure of NLV6-M.
- Do not let wires, screws or residues fall into NLV6-M when installing.

3.2 Installation Site Requirement

Ensure the installation site meets the following requirements:

- Do not install at the direct sunlight, moisture, water droplet location;
- Do not install at flammable, explosive, corrosive gas and liquid location;
- Do not install at oily dust, fiber and metal powder location;
- Be vertical installed on fire-retardant material with a strong support;
- Make sure adequate cooling space for NLV6-M so as to keep ambient temperature between - 10 - + 40℃;
- Install at where the vibration is less than 5.9m/s² (0.6g);
- Install at where the humidity is less than 95%RH and non-condensing location;
- Protection level of NLV6-M is IP20 and pollution level is 2 (Dry, non-conducting dust pollution).

Note:

1. It needs derating use running temperature exceeds 40 ℃. The derating value of the output current of NLV6-M shall be 2% for each degree centigrade. Max. allowed temperature is 50 ℃.

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

3.3 Dimensions and Weight

The dimensions and weight of NLV6-M are as shown in figure

Table 3-1 NLV6-M dimensions and weight

Size	Dimension (mm)			Mounting Size (mm)				GW (kg)
	W	H	D	W1	H1	H2	d	
F3	200	320	160	200	330	170	5	6.5
F4	280	420	260	280	440	270	7	15

Chapter 4 Electrical Installation

4.1 Precautions

Danger

- Only qualified electrical engineer can perform wiring job.
- To facilitate the input side over-current protection and outage maintenance, connect NLV6-M with power supply via the MCCB or fuse.
- Do not dismantle NLV6-M or do wiring operation until the power is cut-off for more than 10 minutes, the internal charge indicator of NLV6-M 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 NLV6-M grounding, depending on the operating conditions. To ensure safety, NLV6-M 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 NLV6-M when it is live. The main circuit terminals are neither allowed connecting to the enclosure nor short-circuiting.

Warning

- Do not do dielectric strength test on NLV6-M.
- For NLV6-M 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 NLV6-M.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure NLV6-M has ceased output before switching motor or change-over switches.
- The NLV6-M DC bus terminals must not be short-circuited.

4.2 Peripheral Accessories Selection

4.2.1 Wiring specifications of input and output

The AC supply to NLV6-M must be installed with suitable protection against overload and short-circuits, i.e. MCCB (molded case circuit breaker) or equivalent device.

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

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

Table 4-1 Sectional area of ground protective conductor

Sectional area S of phase conductor (power supply cable) while installing (mm^2)	$S \leq 2.5$	$2.5 < S \leq 16$	$16 < S \leq 35$	$S > 35$
Min. sectional area Sp of relative protective conductor (ground cable) (mm^2)	2.5	S	16	S/2

Table 4-2 NLV6-M I/O wiring specification

Model	MCCB (A)	Contactor (A)	Supply Cable (mm^2)	Motor Cable (mm^2)	Ground cable (mm^2)	Size
Single-phase / Three-phase power supply: 200 - 240V, 50/60Hz						
NLV6-M-2R2T2B	32	20	6	2.5	2.5	F3
NLV6-M-3R7T2B	63	32	16	4	2.5	F3

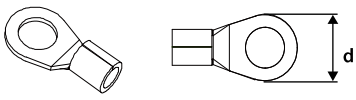
Model	MCCB (A)	Contactor (A)	Supply Cable (mm^2)	Motor Cable (mm^2)	Ground cable (mm^2)	Size
NLV6-M-5R5T2B	32	20	6 / 2.5 (1)	2.5	6 / 2.5 (1)	F3
Three-phase power supply: 380 - 460V, 50/60Hz						
NLV6-M-2R2T4B	16	10	1.5	0.75	2.5	F3
NLV6-M-3R7T4B	25	16	2.5	2.5	2.5	F3
NLV6-M-5R5T4B	32	25	4	4	2.5	F3
NLV6-M-7R5T4B	40	32	6	4	2.5	F3
NLV6-M-011RT4B	63	40	10	6	2.5	F3
NLV6-M-015RT4B	63	40	16	10	2.5	F3
NLV6-M-018RT4B	100	63	16	16	2.5	F4
NLV6-M-022RT4B	100	63	25	16	16	F4
NLV6-M-030RT4B	125	100	25	25	16	F4
(1): Value before / is for single-phase model, value after / is for three-phase model.						

4.2.2 Power terminal lug

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

Take the round terminal as an example.

Table 4-3 Selection of power terminal lug



Size	F3 / F4	F5	F6
Screw size	M5	M6	M8
Tightening torque (N. M)	2.5 - 3.0	4.0 - 5.0	9.0 - 10.0
Max. outer diameter of lug d (mm)	12	15.5	24

4.3 Main Circuit

Danger

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

Warning

- Ensure that AC supply voltage is the same as rated input voltage of NLV6-M.

4.3.1 Supply and Motor Terminal

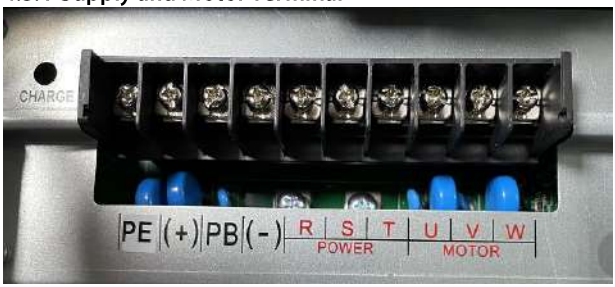


Figure 4–1 Size F3 – F4

Table 4-4 NLV6-M supply and motor terminal description

Terminal	Description
R, S, T	Three-phase AC power input terminals
U, V, W	Output terminals, connect to three-phase AC motor
(+), (-)	DC supply input terminals; DC input terminals of power regenerative unit
(+), PB	Braking resistor connection terminals
PE	Ground terminal, connect to the ground

4.4 Control Board

Danger

- The control circuit is basically isolated with the power circuit. Do not touch NLV6-M after it is powered.

Warning

- 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 forbiden for this connection.

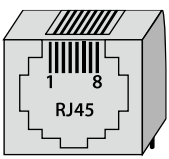
4.4.1 Control Board Terminal

Terminal		Description
AI	Anglogue input	AI1 input voltage: 0 - 10V (input impedance: 34kΩ)
GND	Anglogue ground	
DI1 – DI8	Digital input	Programmable bipolar optional input signal Input voltage: 0 - 30VDC DI1 – DI8 input impedance: 4.7kΩ;
24V, COM	Digital power supply	Digital input use +24V as supply, max. output current is 200mA COM is isolated to CME
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	
RA/ RB/ RC	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A • RB,RC: normally closed; RA,RC: normally open
Y1,Y2,Y3/COM	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A

Note:

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

4.4.2 Modbus Communication Terminal



	Pin	Definition
	4	+5V
	3	485+
	5	GND
	7	485-
	8	Unused

Figure 4–2 DO1 connection

4.5 Encoder Interface Board

4.5.1 Encoder Interface Board Introduction

There are 4 kind encoder interface boards provided for NLV6-M series controller. And their models and functions are shown as Table 4-5.

Table 4-5 Encoder interface boards

Encoder interface boards	Functions
NL-PG1-ABZ	Apply to asyn. motor closed-loop vector control (VC)
NL-PG2-SINCOS	Apply to syn. motor closed-loop vector control (VC)

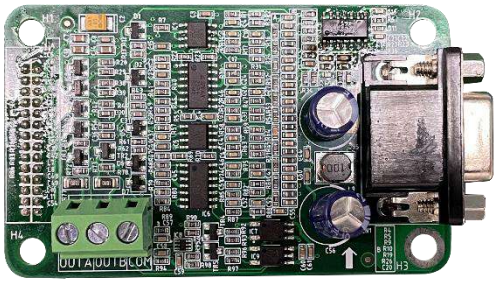
Wiring Requirement:

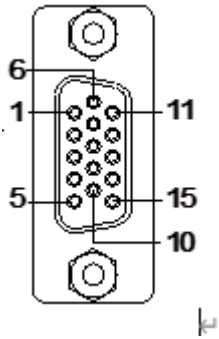
1. Encoder card wire should be laid separately and keep distance from power cables and forbidden to parallel with them.
2. Encoder card wire should be installed inside separated metal conduits and connected to ground firmly.

ABZ encoder card Terminals Description

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

SINCOS encoder card Terminals Description





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		Invalid
5 / 6	A+ / A-	Differential signal A+ / A-	OUTA		Output signal A /B, output type is OC output
7	PGGND	Power supply ground	OUTB		
9	PGVCC	+5V power supply	COM		Output signal site, isolated from GND
10 / 11	C+ / C-	Differential signal C+ / C-			

4.6 Meet EMC Requirement of Installation

4.6.1 Correct EMC Installation

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

NLV6-M are designed and produced according to the requirements of IEC/61800-3. Please install the controller as per the description below so as to achieve good electromagnetic compatibility (EMC).

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

The mechanical/system is divided into different EMC areas according to electrical characteristics. The recommended installation positions are shown in Figure 4-3.

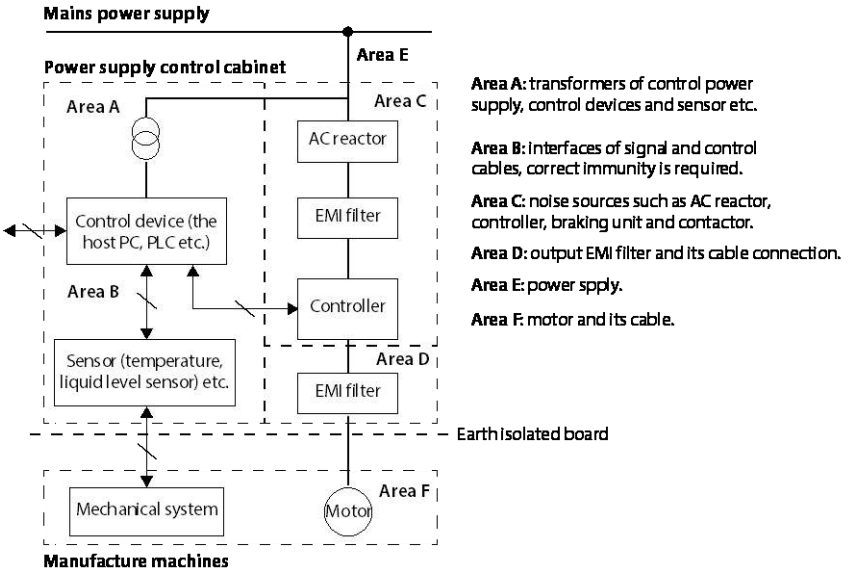


Figure 4-3 System wiring

- All areas should be isolated in space to achieve electromagnetic decoupling effect.
- The min. distance between areas should be 20cm, and use grounding bars for decoupling among areas, the cables from different area should be placed in different tubes.
- EMI filters should be installed at the interfaces between different areas if necessary.
- Bus cable (such as RS485) and signal cable must be shielded.

4.6.2 Wiring Requirement

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

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

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

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

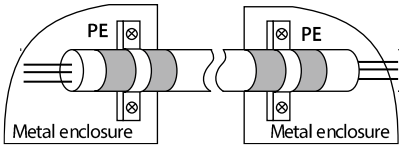


Figure 4-4 Shielded cable connection

4.6.3 Motor Connection

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

When the cable length is longer than 100 meters, it is recommended to install AC output reactor and adjust the carrier frequency according to Table 4-7.

Table 4-7 Carrier frequency and the cable length between controller and motor

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

The cross sectional area (CSA) of controller cables should refer to Table 4-2, on page 13.

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

4.6.4 Ground Connection

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

Do not share the grounding wire with other devices (A). NLV6-M can share grounding pole with other devices (C). It achieves the best effect if NLV6-M and other devices use dedicated grounding poles (B).

Figure 4-5 Grounding method

When using more than one controller, be careful not to loop the ground wire.

4.6.5 EMI Filter

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

Function of EMI filter

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

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

Common mistakes in using EMI filter

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

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

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

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

3. Bad grounding of the EMI filter

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

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

4.6.6 Countermeasures for Conduction, Radiation and Radio Frequency Interference

EMI of the controller

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

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

Reducing conducted interference

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

Chapter 5 Operation Instructions

Danger

- Only when the terminal cover of NLV6-M 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 NLV6-M starts.
- Keep away from NLV6-M if the auto-restart function is enabled at power outage.
- To change the main control PCBA, correctly set the parameters before operating.

Warning

- Do not check or detect the signal during NLV6-M running.
- Do not randomly change NLV6-M 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 NLV6-M.
- Do not touch the energy-depletion braking resistor due to the high temperature.

5.1 Function Description

5.1.1 Operation Mode

The operation mode defines how NLV6-M 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.

5.1.2 Control Mode

NLV6-M series have three control modes which are V/f control, SVC control and VC control. (Refer to F00.01 for more detail)

5.1.3 Controller Status

Controller Status	Description
Stop status	After NLV6-M 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 NLV6-M
Run status	The controller will start output from U/V/W terminals after it receives the run command.
Motor parameters auto-tuning	Set F07.06/F10.10 = 1 or 2, NLV6-M 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	NLV6-M has fault.
Under-voltage status	NLV6-M is under-voltage.

5.1.4 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 control (F00.05 = 1).

5.2 Operating Instructions

5.2.1 Keypad

The standard NLV6-M are installed with LCD keypad which is shown in Table 5-1.

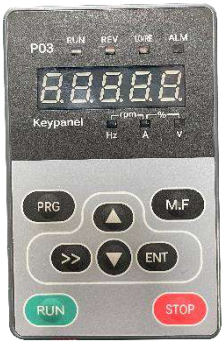


Table 5-1 Key description of keypad

Key	Description
PRG	Entry or exit programming key
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
ENTER	a. Enter lower menu b. Confirm saving the data

5.2.2 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).**

Table 5-2 Switching four-level description of the key

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	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

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.

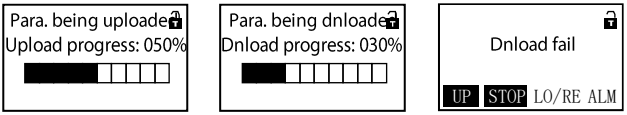


Figure 5-1 Display upload and download parameters

Note:

1. When downloading parameters, it displays "dFAiL" which means that the EEPROM storage parameters of keypad do not match with function parameters of NLV6-M.
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.

Chapter 6 Function Introduction

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

Display Parameters:

General Function Parameters:

6.1 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.

6.1.1 D00: System Status Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>D00.00</td><td>Controller series</td><td>[actual value]</td></tr>
<tr><td></td><td>Display controller series.</td><td></td></tr>
<tr><td>D00.01</td><td>Software version of DSP</td><td>[actual value]</td></tr>
<tr><td></td><td>Display software version of DSP.</td><td></td></tr>
<tr><td>D00.02</td><td>Special software version of DSP</td><td>[actual value]</td></tr>
<tr><td></td><td>Display special software version of DSP.</td><td></td></tr>
<tr><td>D00.03</td><td>Software version of keypad</td><td>[actual value]</td></tr>
<tr><td></td><td>Display software version of keypad.</td><td></td></tr>
<tr><td>D00.04</td><td>Elevator running status</td><td>[actual value]</td></tr>
<tr><td></td><td>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><td></td></tr>
<tr><td>D00.05</td><td>Rated current of NLV6-M</td><td>[actual value]</td></tr>
<tr><td></td><td>Display rated current of NLV6-M.</td><td></td></tr>
<tr><td>D00.06</td><td>Controller status</td><td>[actual value]</td></tr>
<tr><td></td><td>Display NLV6-M 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>Bit7: Zero-speed running
0: Not at zero-speed
1: At zero-speed</td><td>Bit6: Zero-speed signal
0: Invalid
1: Valid</td><td colspan="2">Bit5&Bit4: Acceleration/Deceleration/Constant
00: Constant 01: Acceleration
11: Unused 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><td></td></tr>
</table>

6.1.2 D01: Drive Status Parameters

Ref. Code	Function Description	Setting Range [Default]
D01.00	**Control mode**	**[actual value]**

Ref. Code	Function Description	Setting Range [Default]
	Display cotrol mode.	
D01.01	**Setting speed (m/s)**	[actual value]
	Display setting speed.	
D01.02	**Setting speed (after Acc / Dec) (m/s)**	[actual value]
	Display speed which is calculated by Acc / Dec S curve.	
D01.03	**Feedback speed (m/s)**	[actual value]
	Display actual speed of elevator.	
D01.04	**Setting frequency**	[actual value]
	Display setting frequency.	
D01.05	**Setting frequency (after Acc / Dec)**	[actual value]
	Display frequency (after Acc / Dec).	
D01.06	**Output frequency**	[actual value]
	Display output frequency.	
D01.07	**Setting Rpm**	[actual value]
	Display setting Rpm.	
D01.08	**Running Rpm**	[actual value]
	Display running Rpm.	
D01.09	**Unused**	
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 - D01.16 Unused		

6.1.3 D02: Analogue Status Display Parameters

Ref. Code	Function Description	Setting Range [Default]
D02.00	**AI voltage**	[actual value]
	Display AI1 input voltage.	
D02.01	**AI voltage (after calculating)**	[actual value]
	Display A1 input voltage which is calculated by the gain, bias and filter.	

6.1.4 D03: Running Status Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>D03.00</td><td>Heatsink temperature</td><td>[actual value]</td></tr>
<tr><td></td><td colspan="2">Display heatsink temperature.</td></tr>
<tr><td>D03.01</td><td>Input terminal status</td><td>[actual value]</td></tr>
<tr><td></td><td colspan="2">Display input terminal status. Each bit(binary) of this parameter stands for different physical channels which are in the below table.
• 0: Digital input terminals disconnects with common terminals.
• 1: Digital input terminals connects with common terminals.
<table>
<tr><td>Bit11</td><td>Bit10</td><td>Bit9</td><td>Bit8</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>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>D03.02</td><td>Output terminal status</td><td>[actual value]</td></tr>
<tr><td></td><td colspan="2">Display output terminal status. Each bit(binary) of this parameter stands for different physical channels which are in the below table.
• Positive logic: 0 stands for invalid while 1 stands for valid.
• Negative logic: 0 stands for valid while 1 stands for invalid.
<table>
<tr><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>RLY4</td><td>RLY3</td><td>RLY2</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>D03.03</td><td>MODBUS status</td><td>[actual value]</td></tr>
<tr><td></td><td colspan="2">Display MODBUS communication status.
0: Normal.
1: Communication timeout.
2: Incorrect data frame head.
3: Incorrect data frame checking.
4: Incorrect data frame content.</td></tr>
<tr><td>D03.04</td><td>Total time at power-on</td><td>[actual value]</td></tr>
<tr><td>D03.05</td><td>Total running time</td><td>[actual value]</td></tr>
<tr><td></td><td colspan="2">D03.04 displays total time at power-on; D03.05 displays total running time. The unit is hour.</td></tr>
<tr><td>D03.06</td><td>Running times</td><td>[actual value]</td></tr>
<tr><td></td><td colspan="2">Display the running times of the NLV6-M.</td></tr>
<tr><td>D03.07</td><td>Present fault</td><td>[actual value]</td></tr>
<tr><td></td><td colspan="2">Display present fault.</td></tr>
</table>

6.1.5 D04: Encoder Status Parameters

Ref. Code	Function Description	Setting Range [Default]
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 - 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 - D04.11 Unused		

6.2 Group F: General Function Parameters

6.2.1 F00: Basic Parameters

Ref. Code	Function Description	Setting Range [Default]
F00.00	**Motor type**	**0,1 [0]**
	0: Asyn. motor. 1: syn. motor.	
F00.01	**Control mode**	**0 - 2 [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]**
	Refers to nominal rated speed of elevator. • All speed setting value in the parameters must < F00.02.	
F00.03	**Max. output frequency of NLV6-M**	**5.00 - 100.00 [50.00Hz]**
	Defines the max. frequency that NLV6-M is allowed to output. • Be careful to set reasonable parameters according to the nameplate of the motor and the actual operating conditions.	
F00.04	**Mechanical parameters of motor**	**10.0 - 6000.0 [60.0]**
	Defines the relationship between the elevator speed and the motor rotary speed. • The mechanical parameters are calculated based on the motor parameters. They determine the control precision and must be correctly set. The relationship of elevator speed and rotary speed of motor is: $$\text{Elevator speed (m/s)} = \frac{\text{Rotary speed of motor (rpm)}}{60} \times \frac{\text{F00.04}}{1000}$$ The formula for calculating F00.04 is: $$\text{F00.04} = \frac{\pi \times D}{i \times \text{Winding mode}}$$ *D: Diameter of motor (mm);* *i: Dec. rate;* *Winding mode: The way that the hoist cable is wound, set according to the actual elevator setting.*	

6

Ref. Code	Function Description	Setting Range [Default]
F00.05	**Operating mode**	**0 - 5 [0]**
	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: Unused. 1: UP / DN switch. Switch the UP / DN of motor with **M** key on the keypad.	
F00.07	**Speed setting of keypad**	**0.000 - F00.02 [1.500m/s]**
	F00.05 = 0, it sets the objective speed at running.	
F00.08	**Run direction**	**0,1 [0]**
	0: The same as run command. 1: Opposite to run command.	

6.2.2 F01: Protection of Parameters

Ref. Code	Function Description	Setting Range [Default]
F01.00	**User's password**	**00000 - 65535 [00000]**
	XXXXX: To enable the password protection function, set any non-zero number as the password. • Once the password is set, 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 5.2.2.	
F01.01	**Menu mode**	**0,1 [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: No operation. NLV6-M 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 NLV6-M. 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 (ENTER) 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: No operation. NLV6-M 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.*	

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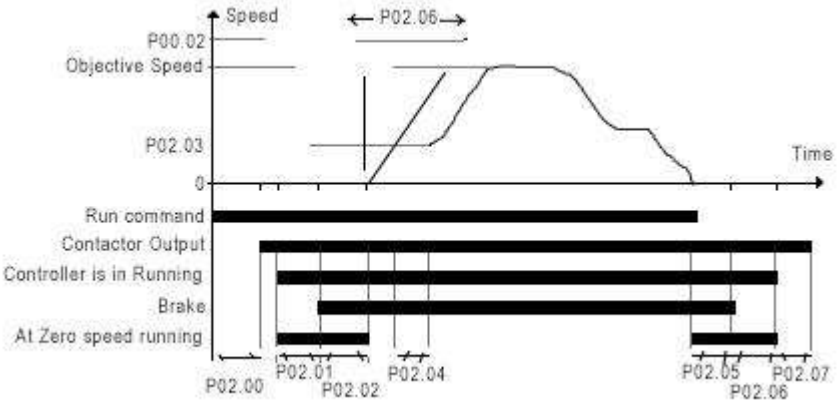
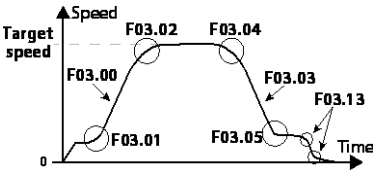
6.2.3 F02: Start & Stop Parameters



Ref. Code	Function Description	Setting Range [Default]
F02.00	**Start delay time**	**0.000 - 4.999 [0.000s]**
	When NLV6-M 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]**
	Defines the time from zero-speed running to output brake-open command. • F02.01 enables NLV6-M 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]**
	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]**
	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]**
	Defines the time in whichNLV6-M runs at start speed (F02.03).	
F02.05	**Brake close delay time**	**0.000 - 4.999 [0.000s]**
	Defines the time interval from zero-speed running to output brake-closed command.	
F02.06	**Retention time of stop zero-speed**	**0.000 - 4.999 [0.000s]**
	Defines the time during which the motor runs at zero-speed and has output torgue at stop, which makes more comfortable.	
F02.07	**Contactor close delay time**	**0.000 - 4.999 [0.000s]**
	Defines the running contactor delay release time after the run command is revoked.	
F02.08	**Start ramp time**	**0.000 – 2.000 [0.000s]**
	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**	

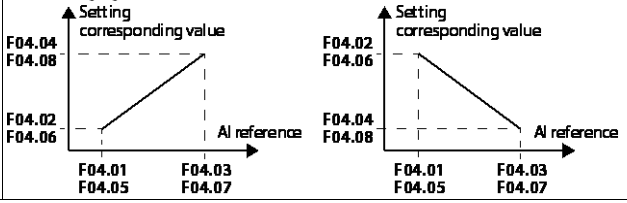
6.2.4 F03: Acc / Dec Parameters

Ref. Code	Function Description	Setting Range [Default]

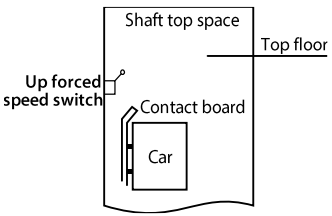
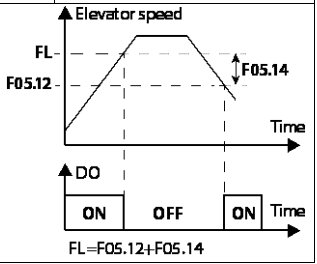
Ref. Code	Function Description	Setting Range [Default]
F03.00	**Acc speed**	0.020 - 9.999 [0.700m/s²]
F03.01	**Start Acc jerk**	0.020 - 9.999 [0.350m/s³]
F03.02	**End Acc jerk**	0.020 - 9.999 [0.600m/s³]
F03.03	**Dec speed**	0.020 - 9.999 [0.700m/s²]
F03.04	**Start Dec jerk**	0.020 - 9.999 [0.600m/s³]
F03.05	**End Dec jerk**	0.020 - 9.999 [0.350m/s³]
	F03.00 - F03.05 adjust the elevator speed via S-curve which can cushion the shock at elevator start/stop and improve riding comfort. • Acc jerk: The change ratio of Acc. • See the right figure for the adjustment of S-curve. • The S-curve becomes steeper when parameter values are raised; • The S-curve becomes slower when parameter values are decreased. 	
F03.06	**Inspection Acc speed**	0.020 - 9.999 [0.200m/s²]
	Defines the Acc speed of elevator at inspection run mode.	
F03.07	**Inspection Dec speed**	0.020 - 9.999 [1.000m/s²]
	Defines the Dec speed of elevator at inspection run mode.	
F03.08	**Battery driven Acc speed**	0.020 - 9.999 [1.000m/s²]
	Defines the Acc speed of elevator at battery driven mode.	
F03.09	**Battery driven Dec speed**	0.020 - 9.999 [1.000m/s²]
	Defines the Dec speed of elevator at battery driven mode.	
F03.10	**Asyn. motor auto-tuning Acc speed**	0.020 - 9.999 [0.100m/s²]
	Defines the acceleration speed at auto-tuning of motor.	
F03.11	**Asyn. motor auto-tuning Dec speed**	0.020 - 9.999 [0.100m/s²]
	Defines the deceleration speed at auto-tuning of motor.	
F03.12	**Abnormal Dec speed**	0.020 - 9.999 [1.000m/s²]
	Defines the deceleration speed at valid forced or wrong run mode.	
F03.13	**Stop Dec jerk**	0.020 - 9.999 [0.350m/s²]
	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: 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]
F03.16	**Field-weakening Ki**	0 - 5000 [1000]
F03.17	**Field-weakening voltage limit**	4000 - 5000 [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**	

Ref. Code	Function Description	Setting Range [Default]
F03.19	**Sincos encoder CD phase learning**	0,1 [0]
	0: Learning. 1: Not learning.	
F03.20	**Unused**	

6.2.5 F04: Analogue Curve Parameters

Ref. Code	Function Description	Setting Range [Default]
F04.00	**Setting curve**	0000 - 1111 [0000]
	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.	
F04.01	**Line 1 min. setting**	0.0 - F04.03 [0.0%]
F04.02	**Corresponding value of line 1 min. setting**	0.0 - 100.0 [0.0%]
F04.03	**Line 1 max. setting**	F04.01 - 100.0 [100.0%]
F04.04	**Corresponding value of line 1 max. setting**	0.0 - 100.0 [100.0%]
F04.05	**Line 2 min. setting**	0.0 - F04.07 [0.0%]
F04.06	**Corresponding value of line 2 min. setting**	0.0 - 100.0 [0.0%]
F04.07	**Line 2 max. setting**	F04.05 - 100.0 [100.0%]
F04.08	**Corresponding value of line 2 max. setting**	0.0 - 100.0 [100.0%]
	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. 	

6.2.6 F05: Speed Parameters

Ref. Code	Function Description	Setting Range [Default]
F05.00	**Multi-speed 0**	0.000 - F00.02 [0.000m/s]
F05.01	**Multi-speed 1**	0.000 - F00.02 [0.000m/s]
F05.02	**Multi-speed 2**	0.000 - F00.02 [0.000m/s]
F05.03	**Multi-speed 3**	0.000 - F00.02 [0.000m/s]
F05.04	**Multi-speed 4**	0.000 - F00.02 [0.000m/s]
F05.05	**Multi-speed 5**	0.000 - F00.02 [0.000m/s]
F05.06	**Multi-speed 6**	0.000 - F00.02 [0.000m/s]
F05.07	**Multi-speed 7**	0.000 - F00.02 [0.000m/s]
	F05.00 - F05.07 define the MS running speed which 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]
	Defines the running speed of elevator in the inspection mode.	
F05.09	**Battery driven run speed**	0.000 - F00.02 [0.100m/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%]
	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. 	
F05.11	**Down forced speed switch detection value**	0.0 - 100.0 (F00.02) [97.0%]
	To avoid plunging elevator at elevator down. Refer to F05.10.	
F05.12	**FDT1**	0.0 - 100.0 (F00.02) [90.0%]
F05.13	**FDT2**	0.0 - 100.0 (F00.02) [90.0%]
F05.14	**FDT1 delay level**	0.0 - 100.0 (F00.02) [1.0%]
F05.15	**FDT2 delay level**	0.0 - 100.0 (F00.02) [1.0%]
	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. 	

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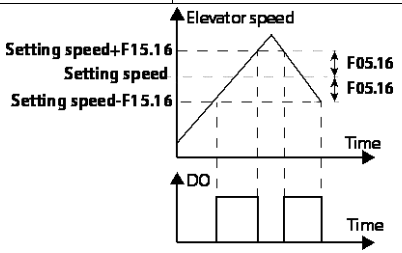
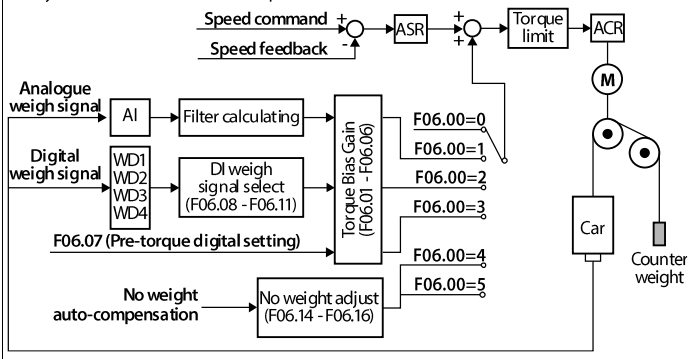
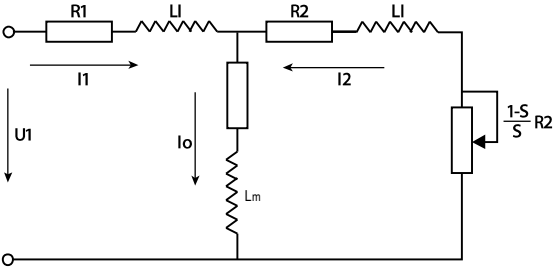
Ref. Code	Function Description	Setting Range [Default]
F05.16	**Speed within FAR range**	0.0 - 20.0 [1.0%]
	The pulse signal will output if elevator speed is within the FAR range. As shown in the right figure. 	
F05.17	**Over-speed setting**	80.0 - 120.0 (F00.02) [115.0%]
F05.18	**Over-speed detection time**	0.0 - 2.0 [0.2s]
	When the actual elevator speed exceeds F05.17 and the duration time exceeds F05.18, NLV6-M alarms E0032 fault (motor over speed). • F05.18 = 0, NLV6-M does not detect motor over speed fault.	
F05.19	**Detected value of speed deviation**	0.0 - 30.0 (F00.02) [20.0%]
F05.20	**Detected time of speed deviation**	0.0 - 2.0 [1.0s]
	When the deviation of setting speed (after Acc/Dec) and actual run speed of motor exceeds F05.19 and the duration time exceeds F05.20, NLV6-M alarms E0018 fault (excessive speed deviation). • F05.19 or F05.20 = 0, NLV6-M does not detect the excessive speed deviation fault of motor.	
F05.21	**Unused**	
F05.22	**Creeping speed**	0.000 - 0.400 [0.050m/s]
	Defines the running speed at the forced Dec run.	
F05.23 - F05.25	**Unused**	

6.2.7 F06: Weighing Compensation Parameters

Ref. Code	Function Description	Setting Range [Default]
F06.00	**Pre-torque selection**	**0 – 5 [4]**
	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 analogueweight 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%]**
F06.02	**Down pre-torque bias**	**0.0 - 100.0 [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]**
F06.04	**Up brake pre-torque gain**	**0.000 - 9.000 [1.000]**
F06.05	**Down electrical pre-torque gain**	**0.000 - 9.000 [1.000]**
F06.06	**Down brake pre-torque gain**	**0.000 - 9.000 [1.000]**
F06.07	**Pre-torque digital setting**	**-100.0 - 100.0 [10.0%]**
	At no weighing device, set the pre-torque value via changing F06.07.	
F06.08	**DI weighing signal 1**	**0.0 - 100.0 [10.0%]**
F06.09	**DI weighing signal 2**	**0.0 - 100.0 [30.0%]**
F06.10	**DI weighing signal 3**	**0.0 - 100.0 [70.0%]**
F06.11	**DI weighing signal 4**	**0.0 - 100.0 [90.0%]**
	When digital weighing signal termianl 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]**
F06.15	**No weighing speed-loop KP**	**1 - 9999 [2000]**
F06.16	**No weighing speed-loop KI**	**1 - 9999 [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	

Ref. Code	Function Description	Setting Range [Default]
	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 - F06.20 Unused		

6.2.8 F07: Asyn. motor Parameters



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

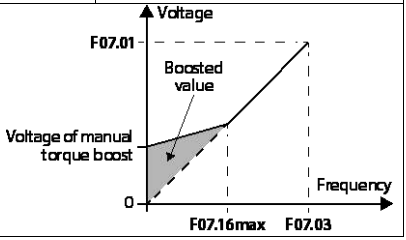
The relationship between rated torque current, excitation current and rated current of motor is:

Rated torque current = F07.05 × F07.02

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

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

Ref. Code	Function Description	Setting Range [Default]
F07.00	Rated power of asyn. motor	0.2 - 400.0kW [Depend on NLV6-M]
F07.01	Rated voltage of asyn. motor	0V - Controller rated voltage [Depend on NLV6-M]
F07.02	Rated current of asyn. motor	0.0 - 999.9A [Depend on NLV6-M]
F07.03	Rated frequency of asyn. motor	1.00 - 100.00 [50.00Hz]
F07.04	Rated Rpm of asyn. motor	1 - 24000 [1440rpm]
F07.05	Power factor of asyn. motor	0.001 - 1.000 [Depend on NLV6-M]

Ref. Code	Function Description	Setting Range [Default]
F07.06	**Parameter auto-tuning of asyn. motor**	**0 – 2 [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". 4. 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 NLV6-M]**
F07.08	**Rotor resistance of a syn. motor**	**0.000 - 65.535Ω [Depend on NLV6-M]**
F07.09	**Leakage inductance of asyn. motor**	**0.0 - 6553.5mH [Depend on NLV6-M]**
F07.10	**Mutual inductance of asyn. motor**	**0.0 - 6553.5mH [Depend on NLV6-M]**
F07.11	**Excitation current of asyn. motor**	**0.0 - 999.9A [Depend on NLV6-M]**
F07.12	**Core saturation coefficient 1 of asyn. motor**	**0.00 - 0.50 [0.50]**
F07.13	**Core saturation coefficient 2 of asyn. motor**	**0.00 - 0.75 [0.75]**
F07.14	**Core saturation coefficient 3 of asyn. motor**	**0.00 - 1.20 [1.20]**
F07.15	**Asyn. motor torque boost**	**0.1 - 30.0 [0.1%]**
F07.16	**Torque boost end-point of asyn. motor**	**0.1 - 50.0 (F07.03) [2.0%]**
	To compensate the torque drop at low frequency, NLV6-M can boost the voltage so as to boost the torque. F07.16 is relative to percentage of rated frequency of motor (F07.03).	

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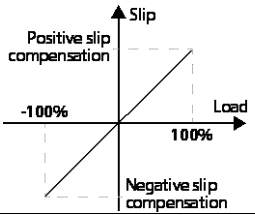
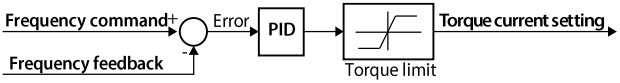
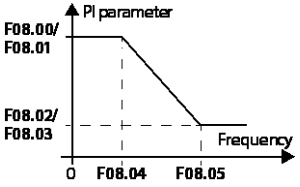
Ref. Code	Function Description	Setting Range [Default]
F07.17	**Slip compensation gain of asyn. motor**	0.0 - 300.0 [100.0%]
F07.18	**Slip compensation filter time of asyn. motor**	0.1 - 10.0 [0.1s]
F07.19	**Slip compensation limit of asyn. motor**	0.0 - 250.0 [200.0%]
	The slip of motor changes with the load torque, which results in the variance of motor speed. Through slip compensation (NLV6-M 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]
	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: Depend on exciting component. 1: Depend on torque component.	
F07.22	**Oscillation-suppression coefficient of asyn. motor**	0 - 200 [100]
	This function is used to damp oscillation when output current is continually unstable. This function helps to keep the motor running smoothly through correctly adjusting the setting of F07.22.	

6.2.9 F08: Motor Vector Control Speed-loop Parameters

Ref. Code	Function Description	Setting Range [Default]
F08.00	Low speed ASR Kp	1 – 9999 [500]
F08.01	Low speed ASR KI	0 – 9999 [500]
F08.02	High speed ASR Kp	1 – 9999 [500]
F08.03	High speed ASR KI	0 – 9999 [500]
F08.04	ASR PI switching frequency 1	0.00 - 50.00 [10.00Hz]
F08.05	ASR PI switching frequency 2	0.00 - 50.00 [15.00Hz]
	F08.00 - F08.05 and F08.07 confirm the PID parameters of ASR. The structure of ASR is shown in figure.  As the right figure: • When NLV6-M operates with 0 - F08.04, the PI parameters of vector control are F08.00 and F08.01; • WhenNLV6-M operates above F08.05, the PI parameters of vector control are F08.02 and F08.03; • When NLV6-M 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.	
F08.06	ASR integral limit	0.0 - 200.0 (F07.02) [180.0%]
	It is used to limit the max. value of the vector control speed-loop integral.	
F08.07	ASR differential time	0.000 - 1.000 [0.000s]
	Defines the vector control speed-loop differential time. • Generally, it doesn't need to set F08.07 except for expediting the dynamic response. • F08.07 = 0, there is no speed-loop differential.	
F08.08	ASR output filter time	0.000 - 1.000 [0.008s]
	It is used to filter the output of ASR regulator. • F08.08 = 0, the speed-loop filter is unused.	

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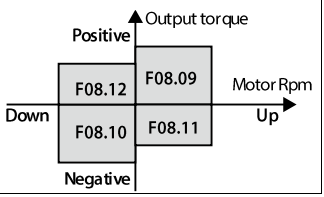
Ref. Code	Function Description	Setting Range [Default]
F08.09	UP electrical torque limit	0.0 - 200.0 (F07.02) [180.0%]
F08.10	DN electrical torque limit	
F08.11	UP regenerative torque limit	
F08.12	DN regenerative torque limit	
	F08.09 - F08.12 are the relative percentage of motor rated current (F07.02). 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.	

6.2.10 F09: Current-loop Parameters

Ref. Code	Function Description	Setting Range [Default]
F09.00	Current-loop KP	1 - 4000 [500]
F09.01	Current-loop KI	1 - 4000 [500]
	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]
F09.03 - F09.07 Unused		

6.2.11 F10: Syn. motor Parameters

Ref. Code	Function Description	Setting Range [Default]
F10.00	Syn. motor type	0,1 [0]
	0: IPM. 1: SPM.	
F10.01	Rated power of syn. motor	0.2 - 400.0kW [Depend on NLV6-M]
F10.02	Rated voltage of syn. motor	0 - Rated voltage of NLV6-M [Depend on NLV6-M]
F10.03	Rated current of syn. motor	0.0 - 999.9A [Depend on HD5]
F10.04	Rated frequency of syn. motor	1.00 - 100.00 [19.20Hz]
F10.05	Rated rpm of syn. motor	1 - 24000 [96rpm]
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 NLV6-M [380V]
F10.10	Angle auto-tuning of syn. motor	0 - 2 [0]
	0: No action. 1: Stationary auto-tuning. 2: Rotary auto-tuning. • Refer to section 7.1.3 about parameter auto-tuning.	
F10.11	Stationary auto-tuning voltage setting of syn. motor	0.0 - 100.0 (F10.02) [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°]
F10.13	Z pulse start angle of syn. motor	0.0 - 359.9 [0.0°]
F10.14	SINCOS encoder C amplitude of syn. motor	0 - 9999 [2048]
F10.15	SINCOS encoder C zero-bias of syn. motor	0 - 9999 [2048]
F10.16	SINCOS encoder D amplitude of syn. motor	0 - 9999 [2048]
F10.17	SINCOS encoder D zero-bias of syn. motor	0 - 9999 [2048]
F10.18	Sincos encoder CD phase	0,1 [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 whitout manual changes.*	
F10.20	Synchronous performance optimization	0 - 65535 [0]
	Bit0 - Bit1: Unused **Bit2: Optimization for detecting speed** 0: No optimization. 1: Optimization. **Bit3 - Bit15: Unused**	

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6.2.12 F11: PG Parameters

In elevator application, the PG is necessary for the motor. Please refer to section 4.5 for PG.

Ref. Code	Function Description	Setting Range [Default]
F11.00	**NLV6-M PG interface board**	**1 - 4 [4]**
	1: NL-PG1-ABZ, is valid. Only for asyn. motor. 3: NL-PG2-SINCOS is valid. Only for syn. motor.	
F11.01	**PG P/R**	**1 - 9999 [2048]**
F11.02	**PG direction setting**	**0,1 [0]**
	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]**
	Units: Low-speed filter coefficient. Tens: High-speed filter coefficient.	
F11.04	**The protocol of serial communication PG**	**0 - 9 [0]**
	0: Endat. 1: Rotary transformer protocol. 2 - 9: Unused.	
F11.05	**Detecting time of PG wire disconnection**	**0.00 - 2.00 [1.00s]**
	F11.05 specifies the duration time for detecting PG wire disconnection fault. NLV6-M 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.	

6.2.13 F12: Digital I/O Terminal Parameters

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

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

0: Unused. Terminal function is unused. NLV6-M 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, NLV6-M is enabled to run;
- When unused, NLV6-M is unused to run and will be in coasts to stop status.
- When no terminal selects this function, it defaults that NLV6-M is at enabled status.

2, 3: UP / DN.

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

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

4 - 6: MS1 - MS3.

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

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

Ref. Code	Function Description	Setting Range [Default]
	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, NLV6-M 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 NLV6-M 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 NLV6-M can monitor that equipment and respond accordingly. NLV6-M alarms E0024 fault (external fault) when receives the EXT signal.	
F12.13	**Filter time of multi-speed terminal**	**0.000 - 2.000 [0.010s]**
	Defines the MS filter time to make up for the time error of MS input terminals. • Change F12.13 according to the change asynchronous level of numbers of MS input terminals.	
F12.14	**Unused**	
F12.15	**DO1 function**	**0 - 20 [2]**
F12.16	**DO2 function**	**0 - 20 [3]**
F12.17	**RLY function**	**0 - 20 [14]**
F12.18	**RLY1 function**	**0 - 20 [0]**
F12.19	**RLY2 function**	**0 - 20 [0]**
F12.20	**RLY3 function**	**0 - 20 [0]**
	0: Unused. 1: Controller is ready. • Signal ON will output if NLV6-M has no fault. 2: Controller is running. • NLV6-M is in running status and outputs indicating signal. 3: Zero-speed running. • ON signal will output if output speed of NLV6-M is zero but NLV6-M is in run status. 4: Zero-speed. • ON signal will output if output speed of NLV6-M is zero.	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td colspan="2">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 NLV6-M 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 NLV6-M is in under-voltage status.
13: Unused.
14: Controller fault.
• ON signal will output when NLV6-M has fault.
15: Elevator stop signal.
• When the elevator stops, NLV6-M will stop and outputs 2s pulse signal, according to which NLV6-M revokes run command.
16 - 19: Unused.
20: Speed outputs.</td></tr>
<tr><td>F12.21</td><td>Output terminal logic setting</td><td>00 - 0x3F [0]</td></tr>
<tr><td></td><td colspan="2">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 colspan="2">F12.22 - F12.24 Unused</td><td></td></tr>
</table>

6.2.14 F13: Analogue I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F13.00	**AI1 function**	**0 - 2 [0]**

6.2.15 F14: SCI Communication Parameters

Refer to Appendix B (Page Error! Bookmark not defined.) for the communication function.

Ref. Code	Function Description	Setting Range [Default]
F14.00	**Data format**	**0 – 5 [0]**
	0: 1-8-2 format, no parity, RTU. 1: 1-8-1 format, even parity, RTU. 2: 1-8-1 format, odd parity, RTU. 3: 1-7-2 format, no parity, ASCII. 4: 1-7-1 format, even parity, ASCII. 5: 1-7-1 format, odd parity, ASCII.	
F14.01	**Baud rate**	**0 – 5 [3]**
	0: 1200bps. 1: 2400bps. 2: 4800bps. 3: 9600bps. 4: 19200bps. 5: 38400bps.	
F14.02	**Local address**	**0 – 247 [2]**
	F14.02 = 0, it means broadcast address.	
F14.03	**Host PC response time**	**0 – 1000 [0ms]**
F14.04	**Detection time of communication timeout**	**0.0 - 1000.0 [0.0s]**
	Time at no communication data > setting time of F14.04, 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]**
	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 - F14.47 Unused		

6.2.16 F15: Display Control Parameters

Ref. Code	Function Description	Setting Range [Default]
F15.00	**Language selection**	**0,1 [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]**
	To select LCD display contrast.	
F15.02	**Set parameter 1 of run status**	**0 – 32 [5]**
F15.03	**Set parameter 2 of run status**	**0 – 32 [6]**
F15.04	**Set parameter 3 of run status**	**0 – 32 [10]**
F15.05	**Set parameter 4 of run status**	**0 – 32 [11]**
F15.06	**Set parameter 5 of run status**	**0 – 32 [0]**
F15.07	**Set parameter 6 of run status**	**0 – 32 [0]**
F15.08	**Set parameter 1 of stop status**	**0 – 32 [4]**
F15.09	**Set parameter 2 of stop status**	**0 – 32 [14]**
F15.10	**Set parameter 3 of stop status**	**0 – 32 [16]**
F15.11	**Set parameter 4 of stop status**	**0 – 32 [26]**
F15.12	**Set parameter 5 of stop status**	**0 – 32 [27]**
F15.13	**Set parameter 6 of stop status**	**0 – 32 [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 NLV6-M. 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, 32: Unused.	

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6.2.17 F16: Function-boost Parameters

Ref. Code	Function Description	Setting Range [Default]
F16.00	**Zero-speed running signal delay time**	**0.00 - 10.00 [0.30s]**
	Defines the delay time of NLV6-M from zero-speed run status to zero-speed run signal output.	
F16.01	**Zero-speed signal delay time**	**0.00 - 10.00 [0.30s]**
	Defines the delay time of NLV6-M from zero-speed status to zero-speed signal output.	
F16.02	**Current keep time after stop**	**0 - 9999 [0ms]**
	To eliminate the current noise of motor at stop, when the brake 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]**
	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 NLV6-M is in run status. After NLV6-M 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 NLV6-M is in running status, but stops when NLV6-M stops. 2: Run when power on. • The fan runs continuously after NLV6-M is switched on.	
F16.04	**Fan control delay time**	**0.0 - 600.0 [30.0s]**
F16.05	**Brake unit action voltage**	**380 - 750V [Depend on NLV6-M]**
	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 NLV6-M.*	
F16.06	**Contactor fault detect time**	**0.1 - 10.0 [2.0s]**
F16.07	**Multi-speed inspection**	**0 - 7 [0]**
	When the DI terminals are not enough, the MS1 - MS3 can achieve 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]**
	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.	
F16.09	**Selection at motor overheat fault**	**0,1 [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]**
	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%]**
F16.12	**Delay time of run output signal**	**0.00 - 10.00 [0.00s]**
	Note: F16.12 is used to delay the controller running signal (output = No. 2 function) so as to control NLV6-M to open the brake.	

Ref. Code	Function Description	Setting Range [Default]
F16.13	UPS running direction auto-determine enable	0,1 [0]
	0: Not enable. 1: Enable. In the UPS mode, NLV6-M will not run in the direction given by the terminal and auto-detemine the the elevator light-load running direction. In the UPS mode, NLV6-M will automatically up, and down, and then run according to the light-load direction of detemining.	
F16.14	Running minimum current limit	0 - 100 (F07.11) [20%]
F16.15	Running minimum detect time	0.0 - 5.0 [0.0s]
	When the elevator run current is less than F16.14 and duration exceed F16.05, NLV6-M will alarm E0025 fault (too small running current).	
F16.16	Governor fault detection time	0.0 - 2.0 [1.0s]
	When the detection terminal of governor detects signal and exceed F16.16, NLV6-M alarms E0037 fault (governor fault).	
F16.17	DC braking current at stop	0 - 150 [100%]
F16.18	Starting frequency of DC braking current at stop	0.20 - 10.00 [0.50Hz]
F16.19	Brake release frequency	0.00 - 10.00 [0.00Hz]
F16.20 - F16.24 Unused		

6.2.18 F17: Fault Protect Parameters

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

Ref. Code	Function Description	Setting Range [Default]
F17.00	Input voltage at motor overheat	0.00 - 10.00 [0.00V]
F17.01	Thermistor type	0 - 2 [0]
	0: Not detect the motor overheat (NC). 1: Positive charateristic (PTC). • When AI4 input exceeds F17.00, NLV6-M alarms E0020 fault (motor overheat). 2: Negative charateristic (NTC). • When AI4 input is less than F17.00, NLV6-M 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]

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

Ref. Code	Function Description	Setting Range [Default]
F17.03	The detection base of lack of input	0 - 100 [30%]
F17.04	The detection time of lack of input	0.0 - 5.0 [1.0s]
	F17.03 is a percentage of rated voltage of NLV6-M. When NLV6-M detects certain input voltage does not hit the detection base (F17.03) and exceeds the preset detection time (F17.04), NLV6-M alarms E0015 fault (lack of input). • F17.03 or F17.04 = 0 or in the battery driven run mode, NLV6-M will not detect input phase loss fault.	
F17.05	The detection base of lack of output	0 - 100 [20%]
F17.06	The detection time of lack of output	0.0 - 20.0 [3.0s]
	F17.05 is a percentage of rated current of NLV6-M. When NLV6-M detects certain output current does not hit the detection base (F17.05) and exceeds the detection time (F17.06), NLV6-M alarms E0016 fault (lack of output). • F17.05 or F17.06 = 0, NLV6-M will not detect output phase loss fault.	

Motor fault (F17.07)

Ref. Code	Function Description	Setting Range [Default]
F17.07	Motor overload protect factor	20.0 - 110.0 [100.0%]
	The motor overload protection factor can be set as 100% when NLV6-M 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:	

	$\text{Motor overload protect factor (F17.07)} = \frac{\text{Rated current of motor(F07.02/F10.03)}}{\text{Rated output current of NLV6 – M}} \times 100\%$

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

Auto reset function enables NLV6-M 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]
F17.08	**Fault auto reset times**	**0 - 100 [0]**
F17.09	**Fault auto reset interval**	**2.0 - 20.0 [5.0s/times]**
	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]**
	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]
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**	
F17.24	**NO.2 fault type**	
F17.25	**NO.2 fault interval**	
F17.26	**NO.1 fault type**	
F17.27	**NO.1 fault interval**	
	F17.12 - F17.19 record status parameters of NLV6-M 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.	

6.2.19 F18: PWM Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F18.00</td><td>Carrier frequency</td><td>1 - 16kHz [depend on NLV6-M]</td></tr>
<tr><td></td><td colspan="2">Defines the carrier frequency of PWM output wave.
<table>
<tr><th>Controller power</th><th>Setting range</th><th>Factory setting</th></tr>
<tr><td>0.2 - 22kW</td><td>1 - 16kHz</td><td>8kHz</td></tr>
<tr><td>30 - 45kW</td><td>1 - 12kHz</td><td>6kHz</td></tr>
</table>
• 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, NLV6-M should be derated by 5% when per 1kHz is increased compared to the factory setting.</td></tr>
<tr><td>F18.01</td><td>Carrier freqency auto adjust selection</td><td>0,1 [0]</td></tr>
<tr><td>F18.02</td><td>PWM overmodulation enable</td><td>0,1 [1]</td></tr>
<tr><td></td><td colspan="2">0: Disable.
1: Enable.</td></tr>
<tr><td>F18.03</td><td>PWM overmodulation mode</td><td>0,1 [0]</td></tr>
<tr><td></td><td colspan="2">0: Two phase / Three phase swtich.
1: Three phase.</td></tr>
</table>

6.2.20 F19: Unused

6.2.21 F20: Unused

6.3 Group Y: Manufacturer Function Parameters

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

Chapter 7 Elevator Application Guidance

7.1 Basic Commissioning Procedures

7.1.1 System Analysis and Wire

It is recommended to analyze the actual application requirements before the wiring design.

Basic configuration for elevator system with NLV6-M is shown in Figure 7-1.

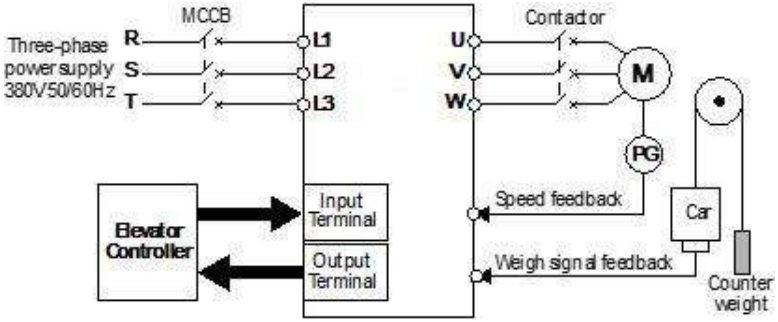

Figure 7-1 Elevator system

7.1.2 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 NLV6-M catch the speed command of elevator controller.

7.1.3 Motor Auto-tuning

Note:

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

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Syn. motor rotary auto-tuning(Without Rope) 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(With rope) 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 of 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.*

Note:

1. During step 2 and step 3, it needs manually open the run contactor.

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 6 finishes, 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 of 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 of low speed 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 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.

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Asyn. motor parameter auto-tuning

1. Set F00.05 as 0 (keypad control).

2. Set F07.06 as 1 (stationary auto-tuning with rope) or 2 (rotary auto-tuning without rope), 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.

7.1.4 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.

7.1.5 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 leveling precision, Acc / Dec curve (Group F03) can adjust terminal MS control (F00.05 = 2) to unify level and adjust F03.13 (stop Dec jerk) to make leveling precision.

7.2 Terminal MS Run Application

The elevator controller can calculate the motor present running direction (digital) and objective speed (digital) according to the elevator control logic and send them to NLV6-M. NLV6-M receives the objective speed of MS form and calculate the speed curve according to the S-curve parameter setting, then control the motor to run.

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

The brake and the contactor are controlled by the controller. The controller receives output signal of NLV6-M at drive zero-speed running and controls the brake to close.

The inspection running is controlled by drive's INS MS command, and the running speed is obtained by MS terminal's speed combination.

Set Parameter

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

Table 7-1 General parameter

Ref. Code	Function	Value	Remark
F00.00	Motor type	Depend on actual value	
F00.01	Control mode	Depend on actual value	
F00.02	Rated speed of elevator	Depend on actual value	
F00.03	Max output freqency	Depend on actual value	
F00.04	Mechanical parameters of motor	Depend on actual calculate value	
F07.00 / F10.01	Rated power of motor	Depend on actual value	Motor nameplate parameters.
F07.01 / F10.02	Rated voltage of motor	Depend on actual value	
F07.02 / F10.03	Rated current of motor	Depend on actual value	
F07.03 / F10.04	Rated frequency of motor	Depend on actual value	
F07.04 / F10.05	Rated rpm of motor	Depend on actual value	
F08.00	ASR proportional gain 1	500	Adjust according to running effect. Generally use the default value.
F08.01	ASR integral coefficient 1	500	
F08.02	ASR proportional gain 2	500	
F08.03	ASR integral coefficient 2	500	
F08.04	ASR swithcing frequency 1	10.00Hz	
F08.05	ASR swithcing frequency 2	15.00Hz	
F08.09	UP electrical torque limit	180.0%	Adjust according to running effect. Generally use the default value.
F08.10	DN electrical torque limit	180.0%	
F08.11	UP regenerative torque limit	180.0%	
F08.12	DN regenerative torque limit	180.0%	
F11.00	NLV6-M PG board	Depend on actual value	
F11.01	PG P/R	Depend on actual value	
F11.02	PG direction setting	Depend on actual value	

Ref. Code	Function	Value	Remark
F03.00	Acc speed	0.700m/s²	If the controller can not fast-track speed command of the elevator controller, increase the values of F03.00 - F03.05.
F03.01	Start Acc jerk	0.350m/s³	
F03.02	End Acc jerk	0.600m/s³	
F03.03	Deceleration speed	0.700m/s²	
F03.04	Start Dec jerk	0.600m/s³	
F03.05	End Dec jerk	0.350m/s³	
F04.00	Setting curve	00000	Change according to the characteristics of analoguecurve.
F04.01	Line 1 min. setting	0.0%	
F04.02	Corresponding value of line 1 min.setting	0.0%	
F04.03	Line 1 max. setting	100.0%	
F04.04	Corresponding value of line 1 max. setting	100.0%	
F04.05	Line 2 min. setting	0.0%	
F04.06	Corresponding value of line 2 min. setting	0.0%	
F04.07	Line 2 maxi. setting	100.0%	
F04.08	Corresponding value of line 2 max. setting	100.0%	
F06.00	Pre-torque selection	1	Analogue weighing feedback.
F06.01	Up pre-torque bias	50.0%	Set according to actual situation and debug according to running effect.
F06.02	Down pre-torque bias	50.0%	
F06.03	Up electrical pre-torque gain	1.000	
F06.04	Up brake pre-torque gain	1.000	
F06.05	Down electrical pre-torque gain	1.000	
F06.06	Down brake pre-torque gain	1.000	
F12.01	DI1 function	1	Controller enabled (EN)
F12.02	DI2 function	2	UP
F12.03	DI3 function	3	DN
F12.15	DO1 function	2	Controller is running
F12.16	DO2 function	3	Controller is at zero-speed running
F12.17	RLY1 function	14	Controller fault
F13.00	AI function	1	Speed setting

7.3 Power-off Battery Driven Run Application

During using elevator, if the system power is off, passengers will be shut in car.

NLV6-M provide battery driven run mode to resolve this problem.

Connection

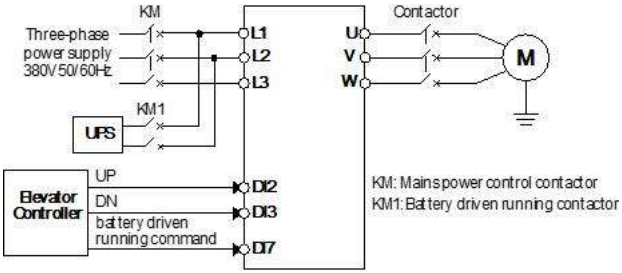

Figure 7-2 Battery driven run connection

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 NLV6-M receives the command, the running contactor will be closed and the brake will be opened. NLV6-M 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 NLV6-M 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 NLV6-M 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.

Chapter 8 Troubleshooting and Maintenance

8.1 Troubleshooting

If a fault occurs, the keypad will display the fault alarm status. Meanwhile, faulty relay acts, accordingly NLV6-M 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 Table 8-1. If technical help is needed, contact the suppliers or directly call Naqsh-e-Lasani Electronics

After the fault is eliminated, reset NLV6-M 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 NLV6-M after completely power off.

Table 8-1 Fault and counter-measures

Fault		Fault reasons	Counter-measures
-Lu-	DC bus undervoltage	• At the begining of power on and at the end of power off • Input voltage is too low • Improper wiring leads to undervoltage of hardware	• It is normal status of power on and power off • Check input power voltage • Check wiring and wire NLV6-M properly
E0001	Acc overcurrent	• Improper connection between controller and motor • Improper motor parameters • The rating of the used NLV6-M is too small • Acc / Dec time is too short	• Connect NLV6-M 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 NLV6-M properly
E0005	Dec over voltage		
E0006	Constant speed over voltage		
E0008	Power module fault	• Short circuit between phases output or the ground • Output current is too high • Power module is damaged	• Check the connection and connect the wire properly • Check the connection and mechanism • Contact the supplier for repairing
E0009	Heatsink overheat	• Ambient temperature is too high • Poor external ventilation of NLV6-M • Fan fault • Fault occurs to temperature detection circuit	• Use controller with higher power capacity • Improve the ventilation around NLV6-M • Replace the cooling fan • Seek technical support
E0010	Braking unit fault	• Circuit fault of braking unit	• Seek technical support

Fault		Fault reasons	Counter-measures
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

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Fault		Fault reasons	Counter-measures
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 NLV6-M, 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 NLV6-M is severely unbalanced	• Check the connection between NLV6-M 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
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

Fault		Fault reasons	Counter-measures
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 NLV6-M and motor • Detect NLV6-M whether output • Detect whether the output contactor work is normal

Fault		Fault reasons	Counter-measures
E0028	SCI communication timeout	• Connection fault of Communication cable • Disconnected or not well connected	• Check the connection
E0029	SCI communication error	• Connection fault of communication cable • Disconnected or not well connected • Communication setting error • Communication data error	• Check the connection • Check the connection • Correctly set the communication format 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.

8

8.2 Maintenance

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

- If NLV6-M has been transported for a long distance, check whether the components of NLV6-M are complete and the screws are well tightened.
- Periodically clean the dust inside NLV6-M and check whether the screws are loose.

Danger

- Only a trained and qualified professional person can maintain the controller.
- Maintenance personnel should take off all metal jewellery before carrying out maintenance or internal measurements in the controller. Suitable clothes and tools must be used.
- High voltage exists when the controller is powered up or running.
- Checking and maintaining can only be done after AC power of NLV6-M is cut off and wait for at least 10 minutes. The cover maintenance can only be done after ensured that the charge indicator inside NLV6-M and the indicators

on the keypad are off and the voltage between power terminals (+) and (-) is below 36V.

Warning

- For NLV6-M with more than 2 years storage, please use voltage regulator to increase the input voltage gradually.
- Do not leave metal parts like screws or pads inside NLV6-M.
- Do not make modification on the inside of controller without instruction from the supplier.
- There are IC components inside the controller, which are sensitive to stationary electricity. Directly touch the components on the PCB board is forbidden.

Daily Maintenance

NLV6-M must be operated in the specified environment (refer to section 3.2, on page 11). Besides, some unexpected accidents may occur during running.

Therefore maintain it according to the Table 8-2. To prolong the lifetime of NLV6-M, keep good running environment, record the daily run data and detect any abnormal behavior.

Table 8-2 Daily checking items

Items	Content	Criteria
Running environment	Temperature and humidity	-10 - +40℃, derating at 40 - 50℃ Less than 95%RH, non-condensing
	Dust and water dripping	No conductive dust accumulating, no water dripping
	Gas	No strange smell
NLV6-M	Oscillation and heating	Stable oscillation and proper temperature
	Noise	No abnormal sound
Motor	Heating	No overheat
	Noise	Low and regular noise
Running status parameters	Output current	Within rated range
	Output voltage	Within rated range

Periodical Maintenance

Customer should check NLV6-M in every 3 to 6 months according to the actual environment so as to avoid hidden problems and make sure NLV6-M runs well for a long time.

General Inspection:

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

Note:

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

2. If insulation test to the motor is necessary, it should be done after the input terminals U/V/W of motor have been detached from NLV6-M. Otherwise, NLV6-M will be damaged.

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

Replacing Damaged Parts

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

Cooling fan

Life: 60,000 hours.

Possible cause of damages: Wear of the bearing, aging of the fan vanes.

Criteria: After the controller is switched off, check if the abnormal conditions such as crack existing on fan vanes and other parts. When the controller is switched on, check if controller running is normal, and check if there is any abnormal oscillation.

Electrolytic capacitors

Life: 50,000 hours

Possible cause of damages: High ambient temperature, aging of electrolyte and large pulse current induced by rapid changing loads.

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

Unwanted Controller Recycling

When disposing NLV6-M, pay attention to the following factors:

The capacitors may explode if they are burnt.

Poisonous gas may be generated when the plastic parts like front covers are burnt.

Disposing method: Dispose unwanted controllers as industrial waste.

Chapter 9

The braking resistor selection is listed as Table 0-1.

Table 0-1 Braking resistor selection

Model	Motor (kW)	Recommend value (Ω)			Recommend power (kW)	
		Min	Max	Recommended	Synchronous	Asynchronous
NLV6-M-2R2T2B	2.2	26	130	50	1	1
NLV6-M-3R7T2B	3.7	26	50	30	1.6	1.2
NLV6-M-5R5T2B	5.5	17	27	20	2.0	1.6
NLV6-M-7R5T2B	7.5	11	20	15	3.2	2.0
NLV6-M-2R2T4B	2.2	56	210	100	1	1
NLV6-M-3R7T4B	3.7	56	144	80	1.6	1.2
NLV6-M-5R5T4B	5.5	56	100	70	2	1.6
NLV6-M-7R5T4B	7.5	56	72	64	3.2	2
NLV6-M-011RT4B	11	34	48	40	4	3.2
NLV6-M-015RT4B	15	34	41	36	5	4
NLV6-M-018RT4B	18.5	17	31	24	6.4	5
NLV6-M-022RT4B	22	17	27	20	8	6.4
NLV6-M-030RT4B	30	11	20	15	10	8
NLV6-M-4T037	37	10	16	12	12	10
NLV6-M-4T045	45	7	10	9	18	15

Note:

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

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

8.3 Power Regenerative Unit

Please refer to"HDRU Series Power Regenerative Unit User Manual"for m

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