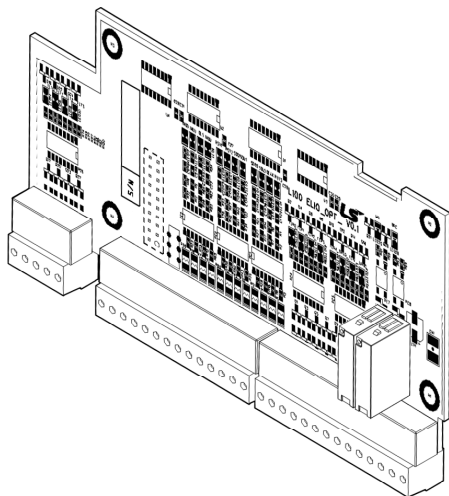The right choice for the ultimate yield!

**LS ELECTRIC strives to maximize your profits in gratitude for choosing us as your partner.**

# ELIO(Elevator I/O)
# Add-on Module

LSLV-L100 series

# User Manual



## ⚠ Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.

- Keep this manual within easy reach for quick reference.

**LS ELECTRIC**

# Safety Information

Read and follow all safety instructions in this manual precisely to avoid unsafe operating conditions, property damage, personal injury, or death.

## Safety symbols in this manual

**⚠ Danger**

Indicates an imminently hazardous situation which, if not avoided, will result in severe injury or death.

**⚠ Warning**

Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

**⚠ Caution**

Indicates a potentially hazardous situation that, if not avoided, could result in minor injury or property damage.

**Safety information**

Thoroughly read this user manual to safely use the features provided by the L100 ELIO add-on module and keep the operating instructions handy for quick reference.

ⓘ Caution

- Be careful not to damage the IC elements on the add-on module. Static charge may cause the product to malfunction.
- Ensure that the inverter is turned off before making changes to cable connections for encoder signals. Otherwise, the module may be damaged or abnormal operation may result.
- Correctly install the add-on module and ensure that it is firmly connected to the inverter. Otherwise, the module may be damaged or abnormal operation may result.

# Table of Contents

# 1    Overview

The L100 ELIO add-on module, dedicated optional board for elevator applications, allows for more efficient elevator operations utilizing the L100 series inverters.

## 1.1    Operating environment

| Item | Specifications |
|------|----------------|
| Operating temperature | 14℉ −104℉  (-10℃ − 40℃) |
| Storage temperature | -4℉ −149℉  (-20℃ − 65℃) |
| Ambient humidity | 95% relative humidity or less (no condensation) |
| Altitude/vibration | Less than 3,280 ft (1,000 m) above sea level / less than 9.8 m/s² (1 G) |
| Environment factors | An environment free from corrosive or flammable gases, oil residue, and dust. |

## 1.2    Hardware specifications

| Item | Specifications |
|------|----------------|
| Installation type | Installed and fixed to the connector on the left side of the inverter's control board. |
| Power | 24 VDC |
| Digital input signal | Car operation input signal 12 EA, photocoupler insulation input signal |
| Digital output and terminal output signal | Car position output signal, insulation open collector output signal 8 EA, Form A contact output 2 EA |
| Fault output signal | Fault output signal 4 EA, Insulation open collector output signal |

## 1.3 Terminal diagram

### 1.3.1 Combining ELIO with the Inc Pulse Encoder add-on module



**Note**

Multifunction input terminals P1 – P7 are automatically set when the configuration for elevator applications is used.
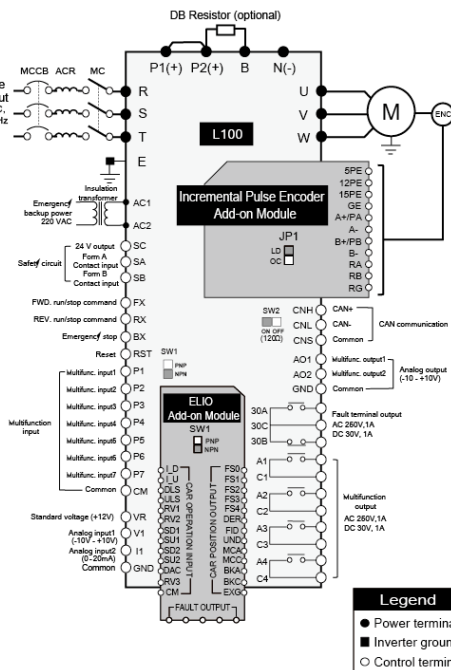
## 1.3.2 Combining ELIO with the Endat Encoder add-on module



**DB Resistor (optional)**

MCCB ACR MC

3 phase
AC input
380/440VAC,
50/60Hz

P1(+) P2(+) B N(-)

R
S
T
E

U
V
W

M

ENC

Insulation
transformer

Emergency
backup power
220 VAC

AC1
AC2

**L100**

**EnDat Encoder
Add-on Module**

5PE
GE
SIN+
SIN -
COS+
COS -
DATA+
DATA -
CLK+
CLK -
RA
RB
RG

24 V output
Form A
Safety circuit Contact input
Form B
Contact input

SC
SA
SB

FWD. run/stop command
REV. run/stop command
Emergency stop
Reset

FX
RX
BX
RST

SW2
ON OFF
(120Ω)

CNH
CNL
CNS

CAN+
CAN-
Common

CAN communication

SW1
PNP
NPN

AO1
AO2
GND

Multifunc. output1
Multifunc. output2
Common

Analog output
(-10 - +10V)

Multifunc. input1
Multifunc. input2
Multifunc. input3
Multifunction Multifunc. input4
input Multifunc. input5
Multifunc. input6
Multifunc. input7
Common

P1
P2
P3
P4
P5
P6
P7
CM

**ELIO
Add-on Module**
SW1
PNP
NPN

30A
30C
30B

Fault terminal output
AC 260V,1A
DC 30V, 1A

Standard voltage (+12V)

Analog input1
(-10V - +10V)
Analog input2
(0 - 20mA)
Common

VR
V1
I1
GND

LD
LU
DLS
ULS
RV1
RV2
SD1
SU1
SD2
SU2
DAC
RV3
CM

FS0
FS1
FS2
FS3
FS4
DFR
FID
UND
MCA
MCC
BKA
BKC
EXG

A1
C1
A2
C2
A3
C3
A4
C4

Multifunction
output
AC 260V,1A
DC 30V, 1A

CAR OPERATION INPUT

CAR POSITION OUTPUT

FAULT OUTPUT

**Legend**
- ● Power terminal
- ■ Inverter ground
- ○ Control terminal

### 1.3.3 Combining ELIO with the SIN/COS add-on module
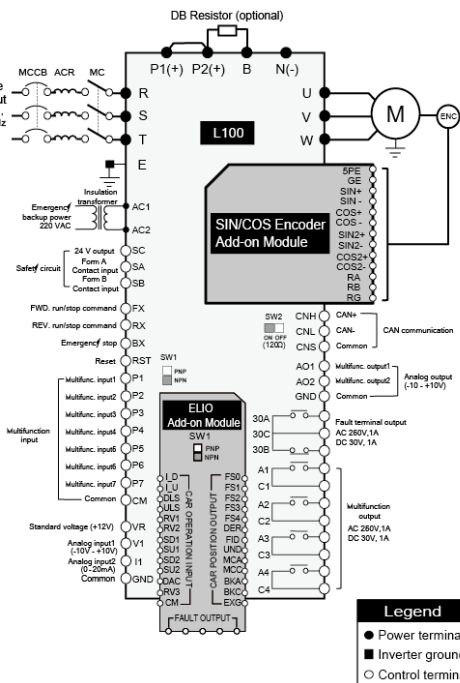
# 2   Installation and cable connection

Refer to the following information to install the ELIO add-on module to the control board inside the L100inverter and connect the power and signal cables to the terminal block.

## 2.1   Installing the ELIO add-on module

1   Loosen the fix screw at the bottom of the front cover (A) and remove the front cover from the L100 inverter by pulling the bottom part of the cover (1) and lifting it (2).
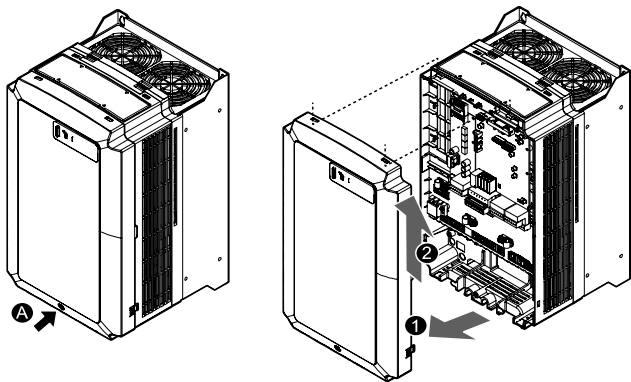


2   Refer to the following figure to replace the four M3 screws on the inverter's control board with the four M3 x 18 brass studs.
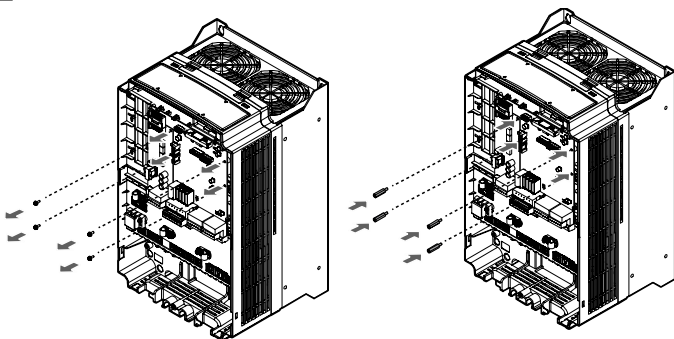
3 Properly install the ELIO add-on module after aligning its connectors to those on the inverter's control board, then secure it to the brass studs by installing the four M3 x 8 fix bolts (torque: 12 kgf-cm).
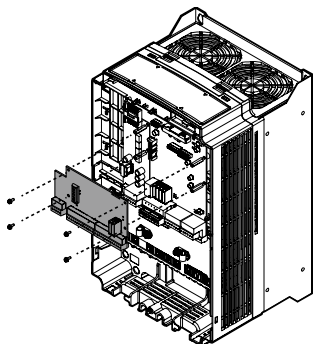
## 2.2 Terminal block layout and functions

Refer to the following information to properly connect the power and signal cables after installing the add-on modules to the inverter.

### 2.2.1 L100 inverter

**Control board terminal block layout**
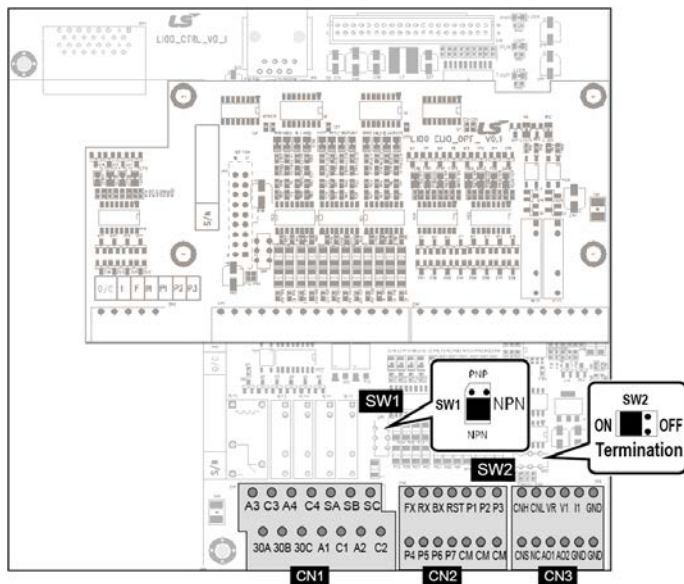
**- CN1**

| A3 | C3 | A4 | C4 | SA | SB | SC |
|----|----|----|----|----|----|----|
| 30A | 30B | 30C | A1 | C1 | A2 | C2 |

**- CN2**

| FX | RX | BX | RST | P1 | P2 | P3 |
|----|----|----|----|----|----|----|
| P4 | P5 | P6 | P7 | CM | CM | CM |

**- CN3**

| CHN | CNL | VR | V1 | I1 | GND |
|-----|-----|----|----|----|-----|
| CNS | NC | AO1 | AO2 | GND | GND |

**- SW1**

PNP/NPN input mode switch for terminal inputs P1 – P7

**- SW2**

Network termination switch (termination resistor)

**Terminal block functions**

| Item | Indication | Name | Description |
|------|-----------|------|-------------|
| Terminal input | FX | Forward operation / stop command | Turned ON when connected to the CM terminal in NPN input mode |
| | RX | Reverse operation / stop command | Stops when both FX and RX are simultaneously turned ON or OFF. |
| | BX | Emergency stop | Turned ON when connected to the CM terminal in NPN input mode. Free-run stop and decelerating stop are available. Fault signal is not output. |
| | RST | Fault reset | Turn it ON after resolving the cause of the fault to reset the fault. |

| Item | Indication | Name | Description |
|------|-----------|------|-------------|
| | P1 | Multifunction input terminal | When elevator mode is selected, the following nine functions become available in addition to the conventional inverter functions. |
| | P2 | | • Manual operation mode 0, 1 (MM0, MM1) |
| | P3 | | • High speed operation command (ATO) <br> • Floor height measurement command (FHM) |
| | P4 | | • Battery operation command (BAT) <br> • Brake terminal input (BRC) |
| | P5 | | • Contactor terminal input (MCC) <br> • High speed2 operation |
| | P6 | | • Initial pole estimation (only available with PM motor) |
| | P7 | | When elevator mode is selected, the multifunction input terminals are set as follows: P1 (MM0), P2 (MM1), P3 (ATO), P4 (FHM), P5 (BAT), P6 (BRC), P7 (MCC) |
| | CM | COMMON | • Turned ON when each terminal input is connected to CM terminal in NPN input mode. <br> • Turned ON when external 24 V power is supplied to each terminal input in PNP input mode. |
| Switch | SW1 | PNP/NPN input mode | Select PNP/NPN input mode for the terminal inputs above. |
| Communication | CNH | CAN High | CAN communication High signal |
| | CNL | CAN Low | CAN communication Low signal |
| | CNS | COMMON | CAN communication COMMON |
| Analog input | VR | Analog power | Standard voltage when a potentiometer is used (+ 12V): 10kΩ |

| Item | Indication | Name | Description |
|------|-----------|------|-------------|
| | V1 | Voltage input | ● Voltage input (-10 → 10 V, 10 → -10 V, 0 → 10 V, 10 → 0 V) Select one of the following functions: (speed reference, torque bias) |
| | I1 | Current input | ● Current input (0 → 20 mA, 20 → 0 mA) Used for the speed reference. |
| | GND | COMMON | COMMON terminal for analog input |
| Analog output | AO1 | Analog output 1 | ● -10 V – +10 V output Select one of the following functions: (Motor speed, speed reference, torque distribution current, magnetic flux command, magnetic flux current, inverter output current, inverter output voltage, motor temperature, DC voltage) |
| | AO2 | Analog output 2 | |
| | GND | COMMON | COMMON terminal for analog output |
| Terminal Output | A1 | Multifunction terminal output 1 | Select one of the following functions: (Zero speed search, speed search (with polarity), speed search (w/o polarity), Speed reached, identical speed, torque search, torque limit, motor overheat signal, inverter overheat signal, low voltage, inverter operation signal, inverter regeneration signal, inverter ready, timer output, base floor / nearest floor operation mode status [1], base floor / nearest floor operation complete [1], elevator-related fault signal [1] ) |
| | C1 | | |
| | A2 | Multifunction terminal output 1 | |
| | C2 | | |
| | A3 | Multifunction terminal output 1 | |
| | C3 | | |
| | A4 | Multifunction terminal output 1 | |
| | C4 | | |
| | 30A | Fault signal(Form A) | Output signal is generated when a fault occurs. Does not output when the emergency stop is activated. |
| | 30B | Fault signal(Form B) | |
| | 30C | COMMON | Common terminal for output contacts A and B. |

Note (1) This function can be configured only in elevator mode when the ELIO add-on module has been installed.

### 2.2.2 ELIO add-on module

**Exterior and terminal block layout**
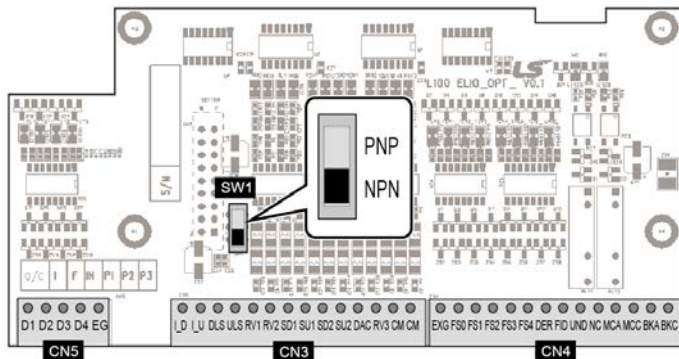


**- CN3**

| I_D | I_U | DLS | ULS | RV1 | RV2 | SU1 | SD1 | SD2 | SU2 | DAC | RV3 | CM | CM |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|

**- CN4**

| EXG | FS0 | FS1 | FS2 | FS3 | FS4 | DER | FID | UND | NC | MCA | MCB | BRA | BRB |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|

**- CN5**

| D1 | D2 | D3 | D4 | EG |
|----|----|----|----|----|

**- SW1**

PNP/NPN input mode switch for terminal inputs P1 – P7.

**Terminal block functions**

| Item | Indication | Name | Description |
|------|-----------|------|-------------|
| Elevator terminal input | I_D | Downside inductor signal | Downside inductor signal for detecting car position |
| | I_U | Upside inductor signal | Upside inductor signal for detecting car position |
| | DLS | Down Limit Switch | Car descent limit switch. Descending of a car is prohibited when the switch is turned on. |
| | ULS | Up Limit Switch | Car ascent limit switch. The car is prohibited from ascending when the switch is turned on. |
| | RV1 | Reserved | |
| | RV2 | Reserved | |
| | SD1 | Downside Deceleration Switch 1 | 1st Deceleration Switch for forced deceleration while descending |
| | SU1 | Upside Deceleration Switch 1 | 1st Deceleration Switch for forced deceleration while ascending |
| | SD2 | Downside Deceleration Switch 2 | 2nd Deceleration Switch for forced deceleration while descending |
| | SU2 | Upside Deceleration Switch 2 | 2nd Deceleration Switch for forced deceleration while ascending |
| | DAC | Deceleration approval signal | Deceleration approval signal for the controller |
| | RV3 | Reserved | |
| | CM | COMMON | Turned ON when each terminal input is connected to CM (24G). |

| Item | Indication | Name | Description |
|------|-----------|------|-------------|
| Elevator terminal output | EXG | COMMON | Common ground for each terminal output. |
| | FS0 | Requested floor for stop / current floor bit 0 | Data format for requested floor for stop / current floor (Floors 1 – 32)<br>Bit4  Bit3  Bit2  Bit1  Bit0<br>FS4  FS3  FS2  FS1  FS0<br>Floor 1: OFF OFF OFF OFF OFF<br>Floor 32: ON ON ON ON ON |
| | FS1 | Requested floor for stop / current floor bit 1 | |
| | FS2 | Requested floor for stop / current floor bit 2 | |
| | FS3 | Requested floor for stop / current floor bit 3 | |
| | FS4 | Requested floor for stop / current floor bit 4 | |
| | DER | Signal for requesting deceleration approval | When this signal is input, the controller outputs the deceleration approval signal (DAC) if the requested floor for a stop matches the calling floor. |
| | FID | Floor identification signal | ON: Requested floor for a stop (previous floor), OFF: Current floor |
| | UND | Deceleration signal | Turns ON when the motor is decelerating. |
| | MCA/MCC | Contactor operation relay Form A contact | Operates the contactor for shutting down the inverter output. |
| | BKA/BKC | Brake operation relay Form A contact | Operates the traction machine brake. |

| Item | Indication | Name | Description |
|---|---|---|---|
| Fault output | D1 | Fault information BIT0 (LSB) | Outputs 4-bit fault data when the inverter is malfunctioning. Elevator faults have priority in the output over inverter faults.<br><br>Set one of the multifunction outputs AX1 – AX4 to "E/L Fault" to distinguish elevator faults from inverter faults. When a fault occurs, it is an elevator fault if the multifunction terminal set to "E/L Fault" is ON; it is an inverter fault if the multifunction terminal set to "E/L Fault" is OFF.<br><br><Output codes for elevator faults> |
| | D2 | Fault data BIT 1 | |

<Output codes for elevator faults>

| Fault | D4 | D3 | D2 | D1 |
|---|---|---|---|---|
| No Fault | OFF | OFF | OFF | OFF |
| FHM RUN Fail | OFF | OFF | OFF | ON |
| Flr Data Fail | OFF | OFF | ON | OFF |
| ChkSum Err | OFF | OFF | ON | ON |
| NotRdy (E/L) | OFF | ON | OFF | OFF |
| Decel | OFF | ON | OFF | ON |
| Acc/Dec | OFF | ON | ON | OFF |
| SDS Error | OFF | ON | ON | ON |
| IND Reverved | ON | OFF | OFF | OFF |

| Item | Indication | Name | Description | | | | |
|---|---|---|---|---|---|---|---|
| | | | Indicator Fail | ON | OFF | OFF | ON |
| | | | CmdSrc | ON | OFF | ON | OFF |
| | | | NotRdy (FHM) | ON | OFF | ON | ON |
| | | | <Output codes for inverter faults> | | | | |
| | | | Fault | D4 | D3 | D2 | D1 |
| | D3 | Fault data BIT 2 | No Fault | OFF | OFF | OFF | OFF |
| | | | Arm Short | OFF | OFF | OFF | ON |
| | | | FAN Error | OFF | OFF | ON | OFF |
| | | | Ground Fault | OFF | OFF | ON | ON |
| | | | Over Current | OFF | ON | OFF | OFF |
| | | | Over Voltage | OFF | ON | OFF | ON |
| | D4 | Fault data BIT 3(MSB) | Encoder Err EnDat Error | OFF | ON | ON | OFF |
| | | | Low Voltage Low Voltage2 | OFF | ON | ON | ON |
| | | | Inv OverHeat | ON | OFF | OFF | OFF |
| | | | E-Thermal Over Load | ON | OFF | OFF | ON |

| Item | Indication | Name | Description | | | | |
|------|-----------|------|-------------|---|---|---|---|
| | | | Input PO Output PO | ON | OFF | ON | OFF |
| | | | Ext.Trip-B | ON | OFF | ON | ON |
| | | | Inv. OLT | ON | ON | OFF | OFF |
| | | | Mag Det Err | ON | ON | OFF | ON |
| | | | InvThem OP | ON | ON | ON | OFF |
| | | | Over Speed Spd Dev Err | ON | ON | ON | ON |
| | EG | COMMON | Common ground for open collector outputs for faults. | | | | |

### 2.2.3 Incremental Pulse Encoder add-on module

**Exterior and terminal block layout**
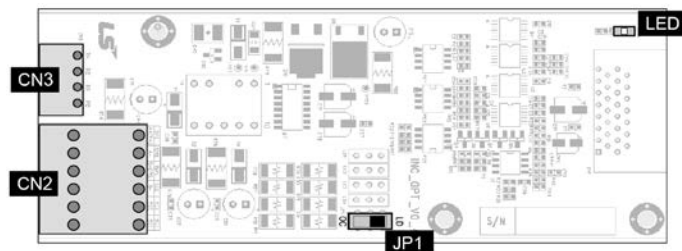


**- CN2**

| 5PE | 12PE | 15PE | GE | GE | GE |
|------|------|--------|-----|-----|-----|
| A+[PA] | A- | B+[PB] | B- | GE | GE |

**- CN3**

| RA | RG | RB | RG |
|-----|-----|-----|-----|

**- JP1**

Line Drive/Open Collector (LD/OC) selector switch

**- LED**

| Status | Indication |
|--------|-----------|
| Normal | Flashes in 1 second intervals. |
| Abnormal configuration | Flashes in 0.5 second intervals. |

**Terminal block functions**

| Item | | Indication | Name | Description |
|------|---|-----------|------|-------------|
| Encoder signal | Input pulse (CN2) | 5PE | +5 V power | +5 V line drive power for encoder |
| | | 12PE | +12 V power | +12 V open collector power for encoder |
| | | 15PE | +15 V power | +15 V open collector power for encoder |
| | | GE | Ground | Ground for encoder power |
| | | A+ [PA] / A- | Encoder phase A signal | For a line drive encoder, connect output signal cables for phases A+ and A-. Open collector (or complementary) encoders utilize A+[PA] signals and GE. |
| | | B+ [PB] / B- | Encoder phase B signal | For a line drive encoder, connect output signal cables for phases B+ and B-. Open collector (or complementary) encoders utilize B+[PB] signals and GE. |
| | Output pulse (CN3) | RA | Encoder phase A return signal | Terminal for encoder phase A return signal |
| | | RB | Encoder phase B return signal | Terminal for encoder phase B return signal |
| | | RG | Ground | Ground for encoder return signals |

### 2.2.4 EnDat Encoder add-on module

**Exterior and terminal block layout**



**- CN2**
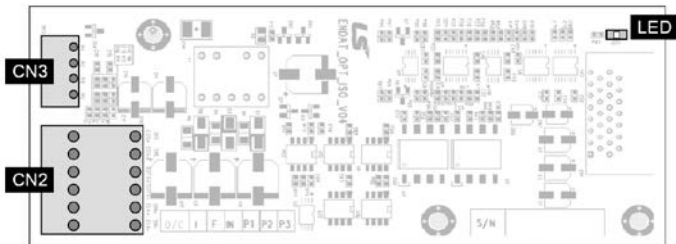
| 5PE | 5PE | GE | GE | SIN+ | SIN- |
|------|------|-------|-------|------|------|
| COS+ | COS- | DATA+ | DATA- | CLK+ | CLK- |

**- CN3**

| RA | RG | RB | RG |
|----|----|----|----|

**- LED**

| Status | Indication |
|--------|------------|
| Normal | Flashes in 1 second intervals. |
| Abnormal configuration | Flashes in 0.5 second intervals. |

**Terminal block functions**

| Item | Indication | | Name | Description |
|------|------------|---|------|-------------|
| EnDat Encoder input (CN2) | 5PE | | Encoder power | +5 V encoder power |
| | GE | | | 0 V |
| | SIN+ | SIN- | Encoder SIN signal | Encoder's SIN+/SIN- signal |
| | COS+ | COS- | Encoder COS signal | Encoder's COS+/COS- signal |
| EnDat Communication (CN2) | DATA+ | DATA- | Encoder data | Data input and output signals for receiving pole position data from the EnDat encoder. Used in ECN413 and ECN1313 encoders. |
| | CLK+ | CLK- | Encoder clock | Clock signal for receiving data from the EnDat encoder. Used in ECN413 and ECN1313 encoders. |
| Encoder output (CN3) | RA | | Encoder output phase A | Encoder A/B phase output signal Open collector output |
| | RB | | Encoder output phase B | |
| | RG | | Common output terminal | |

### 2.2.5 SIN/COS Encoder add-on module

**Exterior and terminal block layout**



**- CN2**
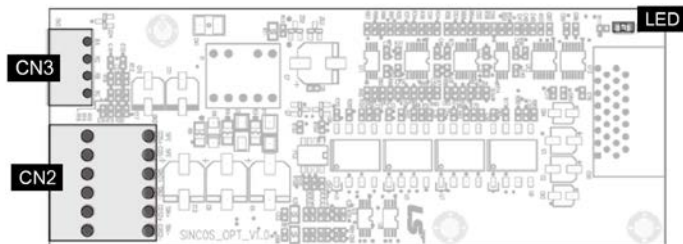
| 5PE | 5PE | GE | GE | SIN+ | SIN- |
|------|------|-------|-------|-------|-------|
| COS+ | COS- | SIN2+ | SIN2- | COS2+ | COS2- |

**- CN3**

| RA | RG | RB | RG |
|----|----|----|----|

**- LED**

| Status | Indication |
|--------|-----------|
| Normal | Flashes in 1 second intervals. |
| Abnormal configuration | Flashes in 0.5 second intervals. |

**Terminal block functions**

| Item | Indication | | Name | Description |
|------|-----------|---|------|-------------|
| SIN/COS Encoder input (CN2) | 5PE | | Encoder power | +5 V encoder power |
| | GE | | | 0 V |
| | SIN+ | SIN- | Encoder SIN signal | Encoder's SIN+/SIN- signal |
| | COS+ | COS- | Encoder COS signal | Encoder's COS+/COS- signal |
| | SIN2+ | SIN2- | Encoder SIN2 signal | Encoder's SIN2+/SIN2- signal |
| | COS2+ | COS2- | Encoder COS2 signal | Encoder's COS2+/COS2- signal |
| Encoder output (CN3) | RA | | Encoder output phase A | Encoder A/B phase output signal Open collector output |
| | RB | | Encoder output phase B | |
| | RG | | Common output terminal | |

# 3 Pre-operation procedures and operation

## 3.1 Changing to elevator mode

After installing the ELIO add-on module, an I/O module dedicated to elevator applications, set PAR_08 (Application) to "Elevator". As shown in the following figure, the home screen of the LCD keypad will change to display elevator mode. Refer to the User Manual provided with the L100 series inverter for the key functions of the keypad.
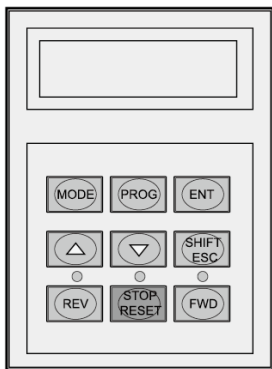


1 Go to PAR_08. (PAR_08 parameter can be configured only when the ELIO add-on module has been installed).

```
PAR► Application
08 General Use
```

**2** Press the [PROG] key. "General Use" will be displayed with a cursor (■).

```
CON► Application
02 General Use■
```

**3** Press the [▲(Up)] key to change to "Elevator" mode.

```
CON► Application
02    Elevator ■
```

**4** Press the [ENT] key to set the mode (Elevator mode).

```
CON► Application
02    Elevator
```

### Note

Some basic parameters for elevator operation will be automatically configured when you change the operation mode to elevator mode.

## 3.2 Elevator mode keypad display

**Home screen**
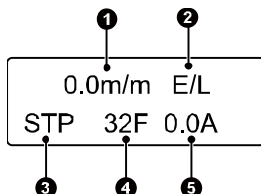


The figure above shows the "Initial screen of display group" or "Home screen". The home screen is displayed when you press the SHIFT/ESC key on the keypad. Each item on the screen displays information related to elevator operation as follows.

| Item | Name | Function |
|------|------|----------|
| 1 | Elevator position and speed (Can be set with E/L_58) | • m/m: Car speed per minute, m/s: Car speed per second<br>• rpm: Actual rotation speed of the motor<br>• mm: Current position of the car<br>• Motor's output torque (%), limit switch input status, remaining distance when the 1st inductor has been detected. |
| 2 | Elevator operation mode | • E/L: Automatic operation mode<br>• MAN: Manual operation mode<br>• FHM: Floor height measuring mode<br>• N/A: Operation mode not defined (not operable). |
| 3 | Current operating direction of the car | • UP: Car is ascending.<br>• DN: Car is descending.<br>• STP: Car is stopped. |
| 4 | Current floor (F) | Displays the current floor. |
| 5 | Inverter output current (A) | Displays the volume of current supplied to the motor at the moment. |

## 3.3 Changing parameter groups

When you select elevator mode, E/L (elevator) group will be added after COM (communication) group.

| Group | Display | Description |
|---|---|---|
| Display group | DIS | Displays motor speed, control mode, torque, inverter output current, user selections, fault status, user group options, etc. |
| Parameter group | PAR | Used for initializing, reading, writing, locking parameter values or motor-related constants, setting the password and performing auto tuning. |
| Digital Input/Output group | DIO | Used to configure digital input and output parameters. |
| Analog Input/Output group | AIO | Used to configure analog input and output parameters. |
| Function group | FUN | Used to set reference frequency, source of operation and stop commands, acceleration and deceleration times and patterns, carrier frequency, and the E-thermal (overheating protection) function. |
| Control group | CON | Used to set parameters related to control mode, ASR PI Gain, Process PID Gain, draw control options, droop control constants, torque control constants, and parameters related to V/F operation. |
| E/L group | E/L | Used to set parameters related to elevator speed patterns and parameters for controlling positions. |
| Protection group | PRT | Used to set inverter protection functions. |
| Communication group | COM | Used to set parameters related to CAN and 485 communication. |
| User group | USR | Used to define, store, and recall custom macros. |

Refer to "6. Detailed operation by the function groups" of the User Manual provided with the L100series inverter for detailed information about each group other than the E/L group.

## 3.4 Setting motor parameters

You can allow the elevator to provide advanced ride quality by setting the motor parameters in the following order and fine-tuning the parameter values with **auto tuning**.

| Keypad display | Description |
|---|---|
| PAR► Motor Select<br>09    kW | Set the motor capacity.<br>The default value is identical to the inverter's rated capacity.<br>If your motor's capacity is not on the list, select "User Define" and manually set the motor capacity at PAR_10. |
| PAR► UserMotorSel<br>10    kW | If you selected "User Define" at PAR_09, manually set the motor capacity at PAR_10.<br>☞ (PAR_10 is displayed only when you have selected "User Define" at PAR_09) |
| PAR► Enc Pulse<br>24    □□□□ | Set the number of pulses for the encoder installed in the motor. |
| PAR► Sync Speed<br>14    rpm | Set the synchronous speed of the motor.<br>**Note**<br>The synchronous speed is not the rated speed on the rating plate. |
| PAR► Rated Volt<br>15    V | Set the rated voltage of the motor. (Voltage on the motor's rating plate) |
| PAR► Pole number<br>16    □ | Set the number of poles for the motor. |
| PAR► Efficiency<br>17    % | Set the efficiency of the motor.<br>Use the default value if the motor efficiency is not listed on the rating plate. |
| PAR► Rated-Slip<br>18    rpm | Set the rated slip of the motor.<br>(Rated slip of a motor = synchronous motor speed – rated motor speed) |
| PAR► Rated-Curr<br>19    A | Set the rated current for the motor. |

## 3.5  Auto tuning

Auto tuning allows for automatic detection of factors that play important roles in vector control, such as stator resistance, stator inductance, flux current, and the time constance of the motor's 2nd circuit, without actually running the motor to provide precise control characteristics.

### 3.5.1  Preparation

Turn off the brake on the traction machine and fix the motor's axis so it does not move.

**Auto tuning procedures**

| Keypad display | Description | Tuning time |
|---|---|---|
| PAR► AutoTuneType<br>31    StandStill | Make sure to select **"Standstill"** as the auto tuning type. | - |
| PAR► IM Auto Tune<br>41    ALL1 | Auto tuning begins immediately if you select **"ALL1"** as the auto tuning type. | - |
| PAR► IM Auto Tune<br>41    Rs Tuning | Detects the motor's stator resistance without rotating the motor. | 20 – 30 (seconds) |
| PAR► IM Auto Tune<br>41    sL Tuning | Detects the motor's leakage inductance without rotating the motor. | 90 – 150 (seconds) |
| PAR► IM Auto Tune<br>41 If/Tr/Ls Tuning | Detects the motor's flux current, time constance of the second circuit, and inductance of the first circuit without rotating the motor, by supplying a direct current pulse to the motor. | 40 – 70 (seconds) |
| PAR► IM Auto Tune<br>41    None | **"None"** will be displayed if the parameter values have been successfully detected. **"□□ Error"** will be displayed if the parameter | Total elapsed time<br>2.5 – 5 (minutes) |

| Keypad display | Description | Tuning time |
|---|---|---|
| PAR► IM Auto Tune<br>41    [][] Error | values could not be detected. If an error occurs, check to ensure that the motor and encoder parameters have been correctly set and run the procedures above once again. Contact the retailer or LS ELECTRIC customer service center if **"[][] Error"** message is displayed again. | |

### 3.5.2 Setting the elevator specifications (for 1500 rpm, 120 m/min, 32 floor)

**1) Set the number of stops**

Set the total number of stops where the sensing plates have been installed, which includes the number of basement floors (not the highest floor number).

```
E/L► Floor Number
02      32F
```

**2) Set the car speed of the elevator**

```
E/L► Car Speed
03      120m/m
```

### 3) Set the rated speed of the elevator

Set the motor speed for when the elevator car is operated at the rated speed set at E/L_03. The inverter calculates the distance with the set values at E/L_03 and E/L_04. Therefore, parameter values for E/L_03 and E/L_04 must be precisely set.

<u>Refer to "3.7 Floor height measuring operation" for details. You must perform another floor height measuring operation after making any changes to the set values at E/L_03 and E/L_04</u>. Because the inverter internally controls motor speed in rpm (lengths in mm are converted to rpm values), you must increase the E/L_04 parameter value to increase the car speed.

```
E/L ► Motor Speed
04     1500rpm
```

### 3.5.3  Setting operation mode and multifunction I/O

When elevator mode operation is in use, the following operation modes may be set via multifunction I/O terminals: high speed operation, manual operation, and floor height measuring operation.

By default, multifunction input terminal functions are set as "Not Used". When you set PAR_08 to "Elevator", multifunction input terminals P1 – P4 are automatically set for MM0/P1, MM1/P2, ATO/P3, and FHM/P4 functions, which are for deciding the elevator's operation mode.

<u>However, the automatic setting change will not take place if the multifunction input terminals DIO_01 – DIO_04 have been already set to</u>

any other values than "Not Used".

| DIO ► P1 define   | DIO ► P2 define   |
|-------------------|-------------------|
| 01  Manual Spd-L  | 02  Manual Spd-H  |

| DIO ► P3 define   | DIO ► P4 define   |
|-------------------|-------------------|
| 03  HighSpeed Run | 04  FHM Run       |

After setting the multifunction input terminals according to the examples above, the operation mode is defined as in the following table, based on the inputs at terminals P1 – P4. If two different operation mode inputs have been simultaneously provided, only one of the two inputs that is detected first will be accepted.

If an input for floor height measuring operation is provided during a manual operation, the operation mode will change to floor height measuring mode.

If the signals have not been provided after defining the multifunction input terminals, or if the multifunction input terminals have not been defined after the cable connection, "N/A" will be displayed on the keypad, the STOP/RESET indicator will flash red, and operation will not be available even when an operation command has been provided.

| Signal status (1: On, o: Off) | | | | Operation mode | Keypad display |
|------|------|------|------|----------------------|------|
| P1 | P2 | P3 | P4 | | |
| 1 | o | o | o | Manual operation | MAN |
| o | 1 | o | o | Manual operation | MAN |
| 1 | 1 | o | o | Manual operation | MAN |
| o | o | 1 | o | High speed operation | E/L |

| Signal status (1: On, o: Off) | | | | Operation mode | Keypad display |
|---|---|---|---|---|---|
| P1 | P2 | P3 | P4 | | |
| o | o | o | 1 | Floor height measuring operation | FHM |
| o | o | o | o | No mode | N/A |

High-speed and floor height measuring operation signals via multifunction terminals P1 – P7 must be provided before the start of operation prior to the Up/Down operation commands, and the terminal input signals must be stopped after the up/down operation commands have been completed.

The elevator car may abruptly stop or the measuring operation may fail if high-speed or floor height measuring operation signals are stopped while an up/down operation is still in progress. In the meantime, one of the multifunction auxiliary relay terminal outputs (AX1, AX2, AX3, or AX4) should be set to "RUN", as in the following examples, for the ON/OFF signal operation of the traction machine brake.

```
DIO ► AX1 define
11      Run
```
or
```
DIO ► AX2 define
12      Run
```

## 3.6 Verifying encoder operation via low-speed manual operation

### 3.6.1 Definition of UP operation

As shown in the figure, UP operation refers to an operation that allows the elevator car to ascend in the hoistway. On the keypad, UP operation is indicated when the forward operation command terminal input (FX) is turned on.
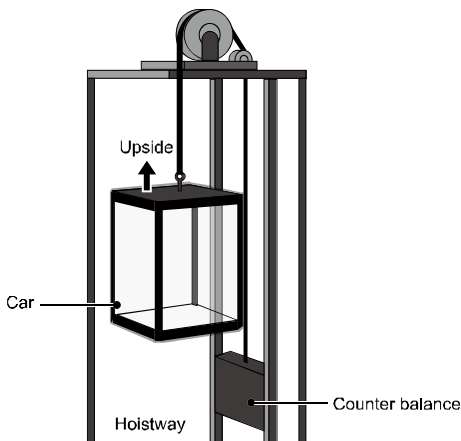
### 3.6.2 Parameter settings for controlling terminal operation

**(Ex. Low-speed manual operation at 15m/min)**

Check the settings in the following table before starting low-speed manual operation. Also, check the multifunction terminal input in the DIS group while in manual operation mode (Refer to "4. Display group" for details).

| Multifunction input terminal on control board | Elevator mode definition | Multifunction input function setting | Input from the control | DIS_03 Terminal input status |
|---|---|---|---|---|
| P1 | MM0 | Manual Spd-L | One of the two terminals must be turned "ON" | 00001000000 (When P1 is ON, P2 is OFF) |
| P2 | MM1 | Manual Spd-H | | |

1 Go to FUN group. Run/stop command by terminal input is selected. (On the keypad, "Err–CmdSrc" is indicated and operation becomes unavailable).

```
FUN ► Run/Stop Src
 01    Terminal 1
```

2 Select speed reference by keypad input.

```
FUN ► Spd Ref Sel
 02    Keypad1
```

3 Go to E/L group and set the manual operation speed. (Speed reference when P1 is ON and P2 is OFF).

```
E/L ► Manual Spd1
 22    15.0m/m
```

### 3.6.3    Operation to UP/DOWN directions

**Low-speed manual operation**

● On the initial DIS group screen, ensure that the motor speed is "15 m/m" and the operating direction is "UP", while pressing the [UP] button for low-speed manual operation in the control board. The floor will be indicated as "—F" if the operation is not set for a floor measuring operation.

```
    15.0m/m  MAN
UP    - - F    4.6A
```

● On the initial DIS group screen, ensure that the motor speed is "15 m/m (not -15 m/m)" and the operating direction is "DN", while pressing the [DOWN] button for low-speed manual operation in the control board.

```
    15.0m/m  MAN
DN    - - F    4.6A
```

During low-speed manual operation by terminal input, encoder or motor cable connection malfunctions will result in the following operation.

| Operation command | Car Operating direction | Speed indication on keypad | Torque indication on keypad [1] | Operating status |
|---|---|---|---|---|
| FWD | UP direction | +15.0 m/m | More than -10% | Normal operation |
| REV | DOWN direction | -15.0 m/m | More than -10% | |
| FWD | UP direction | -4.5 – 10.5 m/m | 150% | Encoder cable connection is wrong |
| REV | DOWN direction | 4.5 – 10.5 m/m | -150% | |
| FWD | DOWN direction | -4.5 – -10.5 m/m | 150% | Motor cable connection is wrong |
| REV | UP direction | 4.5 – 10.5 m/m | -150% | |

| Operation command | Car Operating direction | Speed indication on keypad | Torque indication on keypad [1] | Operating status |
|---|---|---|---|---|
| FWD | DOWN direction | +15.0 m/m | More than +10% | Encoder and motor cable connections are wrong |
| REV | UP direction | -15.0 m/m | More than +10% | |

Note (1) Torque indication is based on low-speed manual operation without a load. Speed and torque cannot be displayed simultaneously. Set E/L_58 to "Trq Output" to display torque.

Check the encoder's cable connection for correct phase order and switch phases A and B if they are reversed.

- Check the encoder's output cable connections to the motor and switch two of the three phases if they are misconnected. For example, switch the connection for phases U and W of the U, V, and W phases.

- If the encoder fault check time has been set at PRT_11, the encoder and motor cable connection faults are detected as encoder errors.

- If the indications for operation direction on the keypad (UP/DOWN) are reversed, check the FX and RX input signal cables for misconnection. If the indications for operation direction on the keypad (UP/DOWN) are correct but the actual operation directions appear reversed, change the motor direction setting at E/L_05. Adjust the setting to ensure that the UP direction operation is performed when the FX input terminal is "ON".

- If UP operation is not available while DOWN operation is normal, check the braking resistor for the cable connection and resistance value. If "0.0 m/m" is constantly displayed for the operation speed, check the encoder cable connections and multifunction terminal settings again.

- When providing ULS/DLS signal input to the inverter, be careful about the settings at E/L_39 because Up operation will not be available while the ULS signal is input, and DOWN operation will not be available while the DLS signal is input (see floor height measuring operation).

- When stopping the manual operation, deceleration time must be adjusted if severe vibration occurs with abrupt deceleration or if over voltage fault occurs. Adjust the setting value at E/L_31 (ManZeroDec T) to around 1.0 second.

```
E/L ► ManZeroDec T
31    1.0  sec
```

## 3.7  Floor height measuring operation

### 1)  Check the cable connection and switch settings

Check to ensure that the switches for inverter operation and forced deceleration in the hoistway have been connected to the ELIO add-on module. Most limit switches in the hoistway use Form B contacts. Check the switches for the contact types and set E/L_39 accordingly.

The setting values at E/L_39 are for the ELIO add-on module, I_D, I_U, DLS, and ULS on CN3 connector (from left to right). Set each value to "0" for Form A, and "1" for Form B contact. The following is an example of E/L_39 settings when ULS/DLS and SD1/SU1 switches operate in Form B contacts.

```
E/L ► ELIO In Neg
39  001100110000
```

**2) Set limit switch conditions**

If the floor height measuring must start when the DLS is ON and end when ULS is ON, set the floor height measuring conditions at E/L_61 to "DLS ON/SD1-ON". For such an operation, the DLS/ULS signals must also be connected to the inverter.

```
E/L ► FHM Start
61   DLS ON/SD1-ON
```

**3) Check the input signals**

Ensure that the inductor, forced deceleration switch, and ULS/DLS signals are correctly input, while manually operating the car. Ensure that the forced deceleration switch signals are correctly provided. Automatic deceleration will not be performed when the car arrives at the top floor if the forced deceleration switch at the top floor fails to provide signal input to the inverter.

**4) Adjust the car position to meet the start conditions**

In manual operation mode, move the car to the base floor to satisfy the start condition set at E/L_61. If E/L_61 is set to "ID-OFF/IU-ON", the car will be stopped with the upside inductor placed within the sensing plate and the downside inductor outside of the sensing plate. If E/L_61 is set to "DLS ON/SD1-ON", manually move the car until the DLS signal is turned ON.
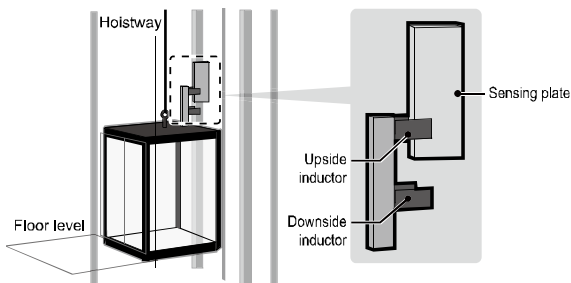
**5) Check the parameter setting for the number of floors**

Ensure that the floor number setting at E/L_02 matches the total number of all floors.

**6) Switch to floor height measuring mode**

Then, provide ON signal to a multifunction input terminal defined for "FHM Run (floor height measuring operation)", or set E/L_62 to "Yes" to switch to floor height measuring operation mode.

```
E/L ► KeyPad FHM
62      Yes
```

- When switching to floor height measuring mode, if the car position does not satisfy the floor height measuring start condition set at E/L_61, or if the downside forced deceleration switch (SD1 on ELIO) is at the bottom of the hoistway, the "NotRdy" message will be displayed on the keypad's initial screen and the STOP/RESET LED (red) on the keypad will flash.

- Floor height measuring operation is not available in such a state. Switch to

manual operation mode, switch back to floor height measuring mode, and then try to operate again after satisfying the start condition set at E/L_61.

- Ensure that E/L 62 is set to "OFF" before switching to manual operation mode because the operation mode will be fixed to floor height measuring mode during manual operation if E/L_62 has been set to "Yes".

- The car must be operated in manual mode because, in floor height measuring mode, the motor will not rotate when the DOWN (RX) signal is provided.

```
E/L ▶ 0.0m/m  FHM
Err     1F  NotRdy
```

### 7) Start floor height measuring

Start floor height measuring operation by providing forward operation (FX) and floor height measuring (FHM) operation signals to the inverter's control terminal block. Then, maintain the UP operation signal until the car arrives at the top floor. In this state, operation speed of the car may be adjusted by providing signals to terminals defined for manual 0 (MM0) or manual 1 (MM1) operation. (Refer to "6.2.15. Setting car speeds 1 – 3 for manual operation" for details).

- If E/L_61 has been set to "ID-OFF/IU-ON", the inverter automatically decelerates the car to zero when it arrives at the top floor and holds it there. In this state, stop the FX command to complete the floor height measuring operation. The car does not stop automatically if E/L_61 has been set to "DLS ON/SD1-ON", and it stops when ULS signal input is provided. Stopping the FX command in this state completes the floor height measuring operation.

- Ensure that E/L 62 is set to "OFF" after completing the floor height measuring operation because the operation mode will be fixed to the floor height measuring mode regardless of the terminal input signals while E/L_62 is set to "'Yes".

- If the upside/downside inductor signal cables are reversed on the ELIO add-on module inside the inverter, the operation stops as soon as the car leaves the base floor during the floor height measuring operation, and the following fault message will be displayed. In such a case, correctly change the inductor signal cable connections to the inverter. After changing the cable connections, switch to manual operation, move the car to satisfy the condition set at E/L_61, and then perform the floor height measuring operation again.

```
DIS ► Faults
05   Ind Reserved
```

- After starting the floor height measuring operation, when the car leaves the base floor, the following fault message will be displayed if both the upside and downside inductor signals for sensing plate detection are not simultaneously provided. If this happens, adjust the position of the inductors. After adjusting the positions, switch to manual operation, move the car to the state described in the previous page, and perform the floor height measuring operation again.

```
DIS ► Faults
05   IND'TOR Fail
```

- If the floor height measuring operation fails, the floor indication will not be correctly displayed on the initial screen of the keypad (--F). The fault message may not be displayed even when the floor height measuring operation failed if

the operation mode has been switched to manual mode following the operation because the fault may be automatically reset.

```
   0.0m/m  FHM
STP  - - F   0.0A
```

● The following indication will be displayed on the keypad after a successful floor height measuring operation. The current floor will be the top floor (E/L_02). The E/L_02 indicates the total number of floors including both the floors below and above the ground level.

```
   0.0m/m  FHM
STP  32F   0.0A
```

**Fault messages and causes**

● When the car arrives at the top floor, a fault message will be displayed upon stopping the Fx command if the number of sensing plate detections by the upside/downside inductors is less than the setting value at E/L_02, or if the measured floor height data is faulty.

| Keypad display | Cause |
|---|---|
| DIS ► Faults<br>05  FHM Run Fail | The number of sensing plate detections does not match the setting at E/L_02 (Max. stop floors). |
| DIS ► Faults<br>05  Flr Data Fail | The measured floor height data is faulty. |

● If the floor height measuring fails, troubleshoot the faults by checking the sensing plates for correct installation and verifying inductor signals for interference by noise or faulty inductors. Then, switch to manual operation

mode, move the car to the base floor, and resume floor height measuring operation.

● When the floor height measuring operation fails, the fault message will be displayed on the initial screen unless the [STOP/RESET] has been pressed. Press the [MODE] key instead of the [SHIFT/ESC] key to go to the initial screen when the fault message is displayed.

| Keypad display | Cause |
|---|---|
| 0.0m/m FHM<br>Err  - - F  Fcount<br><br>DIS ► Faults<br>05  FHM Run Fail | The number of sensing plate detections does not match the setting at E/L_02 (Max. stop floors / FHM Run Fail fault). |
| 0.0m/m FHM<br>Err  - - F  Fdata<br><br>DIS ► Faults<br>05  Flr Data Fail | The height of a certain floor is shorter than the previous floor's height or if the height is excessively short. (Flr Data Fail fault occurs if the height is less than 1000 mm). |

● If the floor height measuring is successful, the floor height data for each floor and the floor height data checksum will be stored on the inverter's internal memory. Then, when the inverter is turned on, a fault message will be displayed as shown in the following figure if the checksum calculated with the stored floor height data and the previously stored checksum do not match. If this happens, you must perform the floor height measuring operation again.

```
DIS ► Faults
05  Checksum Err
```

**8) View the result of floor height measuring operation.**

After a successful floor height measuring operation, you can view the height of each floor measured in millimeters at E/L_60.

1 Go to E/L_60 and press the [PROG] key.

```
E/L►Show FlrPosi
60          1F
```

2 Press [UP]/[DOWN] Keys to increase/decrease the floor number.

```
E/L►POSI   0mm
60          1F
```

The height of each floor will be displayed as the floor number changes.

```
E/L►POSI 45000mm
60         16F
```

3 Press the [MODE] or [ENT] key to exit.

```
E/L►POSI  3000mm
60          2F
```

**9) View the installation position for forced deceleration switches (SD1, SU1)**

During floor height measuring operation, measure the installation location of the forced deceleration switch (SD1) at the base floor based on the bottom level. Likewise, measure the top of the installation position of the forced deceleration switch (SU1) on the top floor based on the top floor

level.

You can view the measurements by setting DIS_01 – DIS_03 to "SDSD1 Posi" or "SDSU1 Posi".

| DIS ► SDSD1 Posi |
| 01    1200.0 mm |

| DIS ► SDSU1 Posi |
| 01    1200.0 mm |

## 3.8  High-speed automatic operation

High-speed automatic operation becomes available after the floor height measuring operation has been successfully completed. During the floor height measuring operation, the car stops when it arrives at the top floor, when the upside inductor (IND_U) has passed the top floor's sensing plate.

However, if the start condition for high-speed operation at E/L_50 has been set to "Inductor ON", the car does not respond to a call because the upside inductor (IND_U) is placed outside the sensing plate on the top floor. Therefore, before you can start high-speed manual operation, you must move the car down in manual mode to activate both the upside/downside inductors by placing them within the sensing plate.

### 3.8.1  Adjusting the speed control gain and torque limit

If the deviance from the floor level is large when the car stops at a floor, or if the ride is uncomfortable during acceleration or deceleration, adjust the speed control gain and torque limit values. The speed control gain becomes greater as ASR P Gain1 at CON_03 is set higher, and smaller as ASR I Gain1 at CON_04 is set lower. To adjust the torque limit, set Pos Trq

Lmt (CON_34), Neg Trq Lmt (CON_35), and Reg Trq Lmt (CON_36) to 150 – 200% depending on the size of the load and the comfortability of the ride. If you need to apply different gains for starting/stopping and constant speed operations (for example, to set low-speed gain to high and high-speed gain to low), use the gain switching feature to adjust the comfortability of ride (Refer to section 6.5.4).

### 3.8.2 Setting overload trip level and time

To protect the motor from overload, set the OLT Level (PRT_23) to 150 – 190% (approximately 10% smaller than the torque limit), and set the OLT Time (PRT_24) to "60" seconds.

### 3.8.3 Adjusting comfortability at car start

High-speed manual operation is performed in the order of repetitive round trips to 1, 2, and 3 floors, and trips between the top and base floors to verify the comfortability of the ride when it is starting, stopping, and during constant speed operations. Especially at the start, if an abrupt drop is observed due to the static friction at the traction machine, set E/L_51 to "U-curve" and increase the time set at E/L_08.

```
E/L ▶ AccStartType
51    U-Curve
```
```
E/L ▶ Acc  Start  T
08         2.00  Sec
```

If the abrupt drop is still present after adjusting the settings at E/L_51 and E/L_08, adjust the settings at E/L_52 – E/L_54 for the optimal comfortability of the ride.

| E/L ► StartUpAccel | E/L ► StartUpAcc. T | E/L ► StartUp Wait |
|---|---|---|
| 52    0.01m/s2 | 53    0.50 Sec | 54    0.20 Sec |

Recommended range of adjustment: (0.01 – 0.03 m/s2) / (0.3 – 0.8 sec) / (0.2 – 0.4 sec)

### 3.8.4 Adjusting the acceleration and deceleration speed, the time before and after acceleration and deceleration, and verifying floor height

The rated acceleration and deceleration speed, the time before and after acceleration and deceleration at E/L_06 – E/L_11 are the setting values appropriate for an operation speed of 60 m/m. If the car's rated speed is slower than 60 m/m, and if the car's rated speed is 30 m/m, specifically, the rated acceleration speed (E/L_06) and acceleration speed (E/L_07) must be set to smaller than the default value ("0.5").

Set one of DIS_01 – DIS_03 to "MinSpdAcc (minimum speed for acceleration)" and "MinSpdDec (minimum speed for deceleration)" to view the setting values and check the rated speed of the car (E/L_03).

The "MinSpd Acc" indicates the minimum speed required for the ramps before and after the acceleration set with E/L_06, E/L_08, and E/L_09. This is also the speed required for the S curve operation that will last for the times set at E/L_08 and E/L_09 for ensuring smooth ride quality. Therefore, the setting value at E/L_03 must be larger than this value to ensure a single floor operation without an operation shock.

Likewise, set DIS_01 – DIS_03 to check the "Min.FlrDist (smallest floor-to-

floor distance after floor height measuring)" value and ensure that the "Min.RunDist (shortest high-speed operation distance without shock)" setting is appropriate for the floor distance.

```
DIS ► Min. Spd Acc
01      30 . 0  m/m
```
```
DIS ► Min. Run Dist
01         1400  m/m
```

### 3.8.5  Base floor / Nearest floor operation

If high-speed operation fails with the car stopped between floors due to a trouble such as power interruption, the inverter moves the car to the nearest floor to evacuate the passengers before moving the car to the base floor, resetting the information about the higher floors that may have been affected by the incident, and resuming high-speed operation.

You can also move the car in manual mode to a near floor or to the base floor. However, the base floor / nearest floor operation allows you to move the car to the nearest floor or to the base floor and automatically decelerate the car to zero at the target floor simply by setting the mode and providing a command.

The base floor / nearest floor operation is available only during high-speed operation. After setting multifunction inputs P1 – P7 to "Base Floor Run" / "Near Floor Run", while the car is stopped in high-speed operation mode, you can turn on the multifunction terminal to switch to the base floor or nearest floor operation mode, then provide a run command to perform base floor or nearest floor operation to the direction of the run command (Down command performs top floor operation). After starting operation, the high-speed operation and base floor / nearest floor operation signals

must be maintained until the end of the operation.

To move the car to the nearest floor, provide the nearest floor operation signal via the multifunction terminal input in high-speed operation mode, then, provide an UP or DOWN run command toward in the direction nearer to the floor. The inverter moves the car to the nearest floor and decelerates to zero after the time set at E/L_55 when the upside or downside inductor signal is first detected. Then, you can stop the run command to end the nearest floor operation.

After the car has stopped at the nearest floor, stop the nearest floor operation signal in high-speed operation mode before moving the car to the base floor to reset the stored floor information. Then, provide the base floor operation signal and provide a Down command (Up command send the car to the top floor). The inverter moves the car to the base floor and decelerates to zero after the time set at E/L_55 when all of forced deceleration switch, upside, and downside inductor signals are detected (see figure on the next page).

Then, you can stop the base floor operation signal and run command to end base floor operation. During this process, the current position of the car and the floor information are updated using the forced deceleration switch and the upside/downside inductor signals.

The following table lists multifunction input P1 – P5 for DIO_01 – DIO_05 settings and operation modes according to the input status. To perform base floor/nearest floor operation, an input for high-speed operation must be provided. During base floor operation, "E/L" and "BFR" indications are displaced alternately. During nearest floor operation, the "E/L" and "NFR"

indications are displaced alternately.

```
DIO►  P4 define
04  BaseFloorRun
```

```
DIO►  P5 define
04  NearFloorRun
```

```
   0.0m/m  E/L
STP   3 F   0.0A
```
◄►
```
   0.0m/m  BFR
STP   3 F   0.0A
```
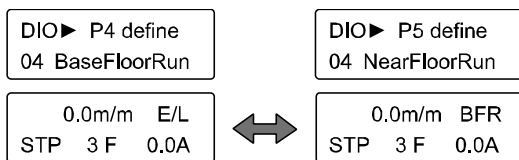
**Multifunction input terminal setting for DIO group**

| Code | Multifunction input terminal | Set value | Description |
|------|------------------------------|-----------|-------------|
| DIO_01 | P1 | Manual Spd-L | manual operation speed 0 |
| DIO_02 | P2 | Manual Spd-H | manual operation speed 1 |
| DIO_03 | P3 | HighSpeedRun | high-speed operation |
| DIO_04 | P4 | BaseFloor Run | Base floor operation |
| DIO_05 | P5 | NearFloor Run | Nearest floor operation |

**Multifunction input operation mode**

| Operation mode indication | Multifunction input status (1: ON, 0: OFF) | | | | |
|---------------------------|------|------|------|------|------|
|  | P1 | P2 | P3 | P4 | P5 |
| N/A | 0 | 0 | 0 | 0 | 0 |
| MAN | 1 | 0 | 0 | 0 | 0 |
| MAN | 0 | 1 | 0 | 0 | 0 |
| MAN | 1 | 1 | 0 | 0 | 0 |
| E/L | 0 | 0 | 1 | 0 | 0 |
| BFR (Base floor operation) | 0 | 0 | 1 | 1 | 0 |
| NFR (Nearest floor operation) | 0 | 0 | 1 | 0 | 1 |

The acceleration and deceleration speeds during base floor operation are identical to those in manual operation mode. The synchronous motor's

reference speed changes according to the limit switch input as shown in the figure. And the actual speed of the car will follow the reference speed according to the acceleration and deceleration speed.

The reference speed until the car reaches the forced deceleration switch is set at E/L_20. The car speed changes to 5 m/m when it reaches the forced deceleration switch, to 2 m/m when it detects one inductor signal, then the reference speed becomes "0" after the time set at E/L_55 has passed. The reference speed of 5 m/m and 2 m/m after the car reaches the inductor cannot be changed.

The acceleration and deceleration speeds during nearest floor operation are also identical to those in manual operation mode. During base floor operation, the change of reference speed is similar to that of base floor operation. However, the car operates at 5 m/m as soon as the operation starts, without the operation at the speed set at E/L_20, then it operates at 2 m/m when it detects the first inductor signal, then when it detects the second inductor signal, the reference speed becomes "0" after the time set at E/L_55 has passed. As with the bottom floor operation, the reference speeds cannot be changed.
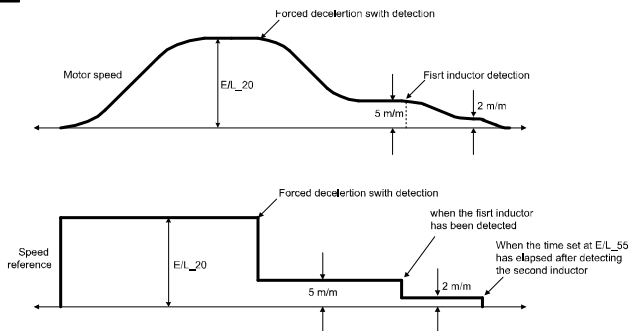
To precisely stop the car at the floor height level during base floor or nearest floor operation, appropriately adjust the setting at E/L_55, which is the delay time until the speed reference becomes "0" after the car meets two inductors. Be careful not to set the time at E/L_55 too long because it may cause the car to miss the floor height level.

# 4 Display group (DIS)

## 4.1 Setting user defined functions (DIS_01 – 03)

You can set user defined functions 1, 2, and 3 to display one of the items listed in the following table.

If the ELIO add-on module dedicated for elevator applications has been installed to the inverter, the following additional items become available when PAR_08 of CON group (inverter application options) is set to "Elevator".

| Function code | Keypad display | Function name | Unit | Description |
|---|---|---|---|---|
| DIS _01 – DIS_03 | Car Speed | Rated car speed per minute | m/min | Car's moving speed per minute |
| | Car Speed | Rated speed of the car per second | m/sec | Car's moving speed per second |
| | Car Position | Car's current position | mm | Car's current position in millimeters |
| | ELIO IN | ELIO input signal | - | Signals for inductors, hoistway limit switches, and permission for deceleration<br>Input ON/OFF status: 1-Enabled, 0-Disabled<br><table><tr><td>LSB</td><td colspan="10"></td><td>MSB</td></tr><tr><td>I_D</td><td>I_U</td><td>DLS</td><td>ULS</td><td>RV1</td><td>RV2</td><td>SD1</td><td>SU1</td><td>SD2</td><td>SU2</td><td>DAC</td><td>RV3</td></tr></table> |
| | Limit S/W In | Limit switch status | - | The switch On/OFF state is indicated according to the ELIO input contact setting at E/L_39 (Form A or Form B). "1": S/W ON, "0": S/W OFF. Bit indications are identical to those for ELIO IN settings. |
| | ELIO Out | ELIO output signal | - | Displays floor information (current floor, previous floor), floor identification, deceleration request, in |

| | | | deceleration, contactor operation, and brake signal ON/OFF status. |
|---|---|---|---|
| | | | LSB                                 MSB |
| | | | FS0 \| FS1 \| FS2 \| FS3 \| FS4 \| DER \| FID \| UND \| MC \| BR |
| Tuning Dist | Remaining distance at inductor operation | mm | Remaining distance when the 1st inductor (UP: IN_U, Down: IN_D) operated. |
| Cur Floor | Current floor | F | The floor number where the car is currently at |
| Adv Floor | A floor where the car can stop (previous stop) | F | The floor number where the car can stop |
| Remain Dist | Remaining distance to the floor level | mm | Displays the remaining distance to the level of the target floor after deceleration has started. |
| SDS1 Speed | 1st SDSD,U car speed | m/m | SDSD1 (- value), SDSU1 (+ value) Car speed per minute is displayed when operated. |
| SDS2 Speed | 2nd SDSD,U car speed | m/m | SDSD2 (- value), SDSU2 (+ value) Car speed per minute is displayed when operated. |
| SDS3 Speed | 3rd SDSD,U car speed | m/m | SDSD3, SDSU3 Car speed per minute is displayed when operated (will be available soon). |
| Min.FlrDist | Minimum floor height | mm | Displays the shortest floor height of the building. |
| Min.RunDist | Minimum run distance required. | mm | Distance required for the ramps before and after acceleration. |
| DecelDist | Rated deceleration distance | mm | Distance required for deceleration to the level position |
| Min.SpdAcc | Minimum speed for completing acceleration | m/m | Minimum speed required for the ramps before and after acceleration |
| Min.SpdDec | Minimum speed for starting | m/m | Minimum speed required for the ramps before and after deceleration |

| | | | |
|---|---|---|---|
| | deceleration | | |
| Dec.End Dist | Distant required after deceleration | mm | Distance required for the ramp after deceleration |
| SDSD1 Dist | 1st SDSD position | mm | Distance between the base level and the installation position for SDSD1 |
| SDSU1 Dist | 1st SDSU position | mm | Distance between the top level and the installation position for SDSU1 |
| SDSD2 Dist | 2nd SDSD position | mm | Distance between the base level and the installation position for SDSD2 |
| SDSU2 Dist | 2nd SDSU position | mm | Distance between the top level and the installation position for SDSU2 |
| SDSD3 Dist | 3rd SDSD position | mm | Distance between the base level and the installation position for SDSD3 (will be available soon) |
| SDSU3 Dist | 3rd SDSU position | mm | Distance between the top level and the installation position for SDSU3 (will be available soon) |

## 4.2 Setting fault status display (DIS_05)

This function displays the current trip status, history of the two previous faults, and the number of previous faults. Also, it allows you to reset (clear) the stored fault history. You can switch between the functions by pressing the [SHIFT/ESC] key after selecting DIS_05.

| Function code | Keypad display | Function name | Description |
|---|---|---|---|
| DIS_05 | Faults | Trip status display | When the inverter is operating normally, "No Fault" is displayed. If a trip fault occurs, the relevant fault information is displayed (see "[3] Fault display"). |
| | Last Fault1 | Displays the previous fault | Refer to the troubleshooting information for the inverter. |
| | Last Fault2 | Displays the fault | |

| Function code | Keypad display | Function name | Description |
|---|---|---|---|
| | | before the previous fault. | |
| | Fault Count | Total number of faults | Displays the total number of faults after a previous fault reset. |
| | Fault Clear | Clears the number of faults. | Initializes the total number of faults to "0". |

You can press the [PROG], [▲ (Up)] and [▼ (Down)] keys to view the fault information, speed reference before the fault, speed feedback, output frequency/current/voltage, torque current and the actual torque, DC voltage, input/output terminal status, operation status, and the time of operation before pressing the [RESET] key.

Press the [ENT] key to go back to the previous screen. The fault information will be saved as Last Fault1 [previous fault history] when you press the [RESET] key. Refer to "Chapter 8 Troubleshooting" for detailed information about utilizing the DIS_05 functions.

| No | Trip type | Keypad display | No | Trip type | Keypad display |
|----|-----------|----------------|----|-----------|----------------|
| 1 | IGBT short circuit | Arm Short | 17 | Inverter thermal open | Inv THR Open |
| 2 | Ground fault | Ground Fault | 18 | Motor speed failure | Over Speed |
| 3 | Over current | OCT | 19 | Floor height failure[1] | Flr/FHM Data |
| 4 | Over voltage | Over Voltage | 20 | Forced deceleration switch failure[1] | SDS Error |
| 5 | FAN failure | FAN Error | 21 | A3 safety error | A3 Safety |
| 6 | Fault during a battery operation | BatRun Fault | 22 | LV2 safety error | Low Voltage 2 |
| 7 | Encoder failure | Encoder Err | 23 | Safety failure A | SAFETY A |
| 8 | Low voltage | Low Voltage | 24 | Safety failure B | SAFETY B |
| 9 | Heatsink failure | Inv OverHeat | 25 | Speed deviation detection failure | Spd Dev Err |
| 10 | E-thermal failure | E-Thermal | 26 | ADC failure | ADC Error |
| 11 | Overload trip fault | Over Load | 27 | Pole detection failure | Mag Det Err |
| 12 | Hardware failure | HW-Diag | 28 | EnDat add-on module failure | EnDat Error |
| 13 | External trip input B | Ext-B Trip | 29 | Dater saving error | EEP Error |
| 14 | Output phase open | Output PO | 30 | CPU Error | CPU Error |
| 15 | Inverter overload | Inv OLT | 31 | ADC offset failure | ADC Offset |
| 16 | Input phase open failure | Input PO | 32 | Pole detection failure | Mag Det Err |

Note (1) This failure is detected only in elevator application mode.

**Note**

If multiple faults occur simultaneously, faults with higher priority are displayed on the keypad. Other faults may be viewed in the fault information.

As you can see in the table of faults, elevator application faults displayed with DIS_05 are faults with high priority: floor height-related faults and forced deceleration switch faults. Other faults than those listed in the table are displayed at the bottom-left corner of the Home screen (not on DIS_05 screen) as "'Err", and the detailed information is provided at the bottom-right corner.

```
    0.0m/m    E/L
Err   1 F  CmdSrc
```

Floor height-related faults and forced deceleration switch faults may be viewed on both the Home and DIS_05 screens.

Faults that are detected only in elevator application mode are as follows.

| Protection function | Keypad display | Description |
|---|---|---|
| Floor height measuring failed | FHM Run Fail | • After floor height measuring operation, the number of sensing plate detection by the upside/downside inductors do not match the number of stops (E/L_02). (Saved at E/L_21). <br> • During an initialization, the setting value at E/L_21 is not "the maximum floor height (E/L_02) * 10 + 1". <br> • "Fcount" is displayed on the home screen (it can also be viewed at DIS_05). |
| Floor height data fault | Flr Data Fail | • There is a floor with negative (-) height among the all floors, from the base to the top. <br> • If two adjacent floors have heights less than 2000 mm, or if there is a floor that is higher than the next floor among all floors, from the base to the top. <br> • "Fdata" is displayed on the home screen (it can also be viewed at DIS_05). |
| Floor height data checksum error | Chksum Err | • After a floor height measuring operation, floor height data for each floor and floor data checksum are saved on EEPROM. Checksum error occurs if the data and its checksum do not match. <br> • Checksum error is automatically detected at initialization or before starting an automatic operation. <br> • "CHKSUM" is displayed on the home screen (it can also be viewed at DIS_05). |

| Protection function | Keypad display | Description |
|---|---|---|
| High-speed automatic operation start condition error | NotRdy | • If start condition for high-speed automatic operation (E/L_50) is set to "Inductor ON", an error occurs if both the upside/downside inductors are not placed with the sensing plate.<br>• This error is displayed only on the home screen. |
| Deceleration error | Decel | • If the run command (FX/RX) does not stop for a set time after a deceleration, a deceleration error occurs.<br>• This error is displayed only on the home screen. |
| Speed pattern control error | Acc/Dec | • If a speed pattern is not completed within the set time after operation has started, a speed pattern control error occurs.<br>• This error is displayed only on the home screen. |
| Forced deceleration switch error | SDS Error | • When SDS-D1 and SDS-U1 (or SDS-D1 and SDS-D2) signals are detected at the same time.<br>• At the base (or top) floor, if SDS-D1 (SDS-U1) input cannot be detected, or SDS-U1 (SDS-D1) input has been detected.<br>• If SDS-D1 (SDS-U1) input has been detected but the car is not at the base (top) floor.<br>• "SDS" is displayed on the home screen (it can also be viewed at DIS_05). |
| Upside/downside inductors inductor has been reversed. | Ind Reversed | • After floor height measuring has started, this error occurs if the downside inductor signal is not detected when the upside inductor leaves the sensing plate.<br>• Immediately after the floor height measuring, "IND Reversed" is displayed at<br>• DIS_05. However, it will be indicated as a floor height measuring error (FHM Run Fail) after turning off the inverter and turning it back on. |

| Protection function | Keypad display | Description |
|---|---|---|
| Inductor fault | Ind'tor Fail | • After floor height measuring has started, this error occurs if the upside inductor signal is not detected when the downside inductor meets the sensing plate (when both inductors cannot detect the sensing plate simultaneously).<br>• Immediately after the floor height measuring, "IND'TOR FAIL" is displayed at DIS_05. However, it will be indicated as floor height measuring error (FHM Run Fail) after turning off the inverter and turning it back on. |
| Run command source fault | CmdSrc | • In elevator application mode, operations are available only via terminal block inputs. This error occurs if the source of RUN/STOP command (FUN_01) has been set to "Keypad".<br>• This fault will be automatically released when FUN_01 is set to "'Terminal1". |
| Floor height measuring cannot be started | NotRdy | • In floor height measuring mode, this error occurs if the start condition set at E/L_61 is not met.<br>• The same indication as the high-speed automatic operation error is displayed (although the operation modes are different). |

# 5 Digital I/O group (DIO)

## 5.1 Setting multifunction inputs (DIO_01 – 07)

If the ELIO add-on module dedicated for elevator applications has been installed to the inverter, the following additional items become available for functions DIO_01 – DIO_07 (define multifunction inputs P1 - P7) when PAR_08 of CON group (inverter application options) is set to "Elevator".

| Function code | Keypad display | Function name | Functions |
|---|---|---|---|
| DIO_01 – DIO_07 | Manual Spd-L | Low-speed manual operation command bit 0 | Combinations of low-speed manual operation command bits 0 and 1 may be used for selecting one of the three low-speed manual operation speeds. |
| | Manual Spd-H | Low-speed manual operation command bit 1 | |
| | HighSpeed Run | High-speed manual operation command | Select the high-speed manual operation command |
| | FHM Run | Floor height measuring operation command | Select the floor height measuring operation command |
| | BaseFloor Run | Base floor operation command | In high-speed automatic operation mode, you can move the car to the base floor and adjust the positions if the elevator stops due to a power interruption or an emergency stop. |
| | NearFloor Run | Nearest floor operation command | In high-speed automatic operation mode, you can move the car to the nearest floor and evacuate the passengers if the elevator stops due to a power interruption or an emergency stop. |

| Function code | Keypad display | Function name | Functions |
|---|---|---|---|
| | Motor M/C State | Output contactor terminal input | If a contactor has been installed between the inverter and the motor, do not operate the inverter if the terminal input cannot be turned on after setting it as a Form A contact input to verify the contactor operation. |
| | CarBrake State | Terminal input for brake operation | Do not operate the inverter if the terminal input cannot be turned on after setting it for operating a brake relay or the brake itself. |
| | MagDet Run[1] | Initial magnetic pole detection | Initial magnetic pole detection will be performed when the multifunction input is On. |
| | 2ndAutoRun | Secondary speed reference for automatic operation | If the multifunction input set in high-speed manual operation mode is On, the inverter operates with the speed reference set at E/L_67 (2ndAutoSpd), instead of the speed reference set at E/L_04 (Motor Speed). |

(1)This function does not work if PAR_23 (EncType) has been set to "Endat" or "Sincos_1387".

## 5.2 Setting multifunction outputs (DIO_11 – 14)

If the ELIO add-on module dedicated for elevator applications has been installed to the inverter, the following additional items become available for functions DIO_11 – DIO_14 (define multifunction outputs AX1 – AX4) when PAR_o8 of CON group (inverter application options) is set to "Elevator".

| Function code | Keypad display | Function name | Functions |
|---------------|----------------|---------------|-----------|
| DIO_11 – DIO_14 | BFR/NFR Mode | Base floor/Nearest floor operation status | The terminal is On if the current operation is in base floor mode or nearest floor operation mode. |
| | BFR/NFR End | Base floor/Nearest floor operation ended | The terminal is On when a base floor or nearest floor operation has ended (when the car has arrived to the target floor). |
| | E/L Fault | Elevator-related errors. | The terminal is On when an elevator-related fault has occurred. |

# 6 Elevator group (E/L)

## 6.1 E/L group function table

| Func. code | Comm. Addr. | Function name | Keypad display | Range | Unit | Default | Setting change during a run[6] | Page |
|---|---|---|---|---|---|---|---|---|
| E/L_00 | - | Jump to function code | Jump Code | 1 – 72 | | 1 | Yes | 79 |
| E/L_01 | | Speed reference pattern type | Spd RefType | 0 (DecelReq-D/B) 1 (DecelReq-T/B) | | 0 (DecelReq-D/B) | No | 79 |
| E/L_02 | | Number of floors | Floor Number | 1 – 32 | FLOOR | 32 | No | 81 |
| E/L_03 | | Rated car speed | Car Speed | 30 – 420 | m/m | 60 | No | 81 |
| E/L_04 | | Motor speed at rated car speed | Motor Speed | 20.0 – 3600.0 | rpm | 1500 | No | 81 |
| E/L_05 | | Direction of motor operation | UP Direction | 0 (FX-CCW) 1 (FX-CW) | | 0 (FX-CCW) | No | 82 |
| E/L_06 | | Rated acceleration speed | Rated Accel | 0.10 – 1.00 | m/sec² | 0.50 | No | 82 |
| E/L_07 | | Rated deceleratio | Rated Decel | 0.10 – 1.00 | m/sec² | 0.50 | No | 82 |

|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  | n speed |  |  |  |  |  |
| E/L_08 |  | Acceleratio n start time | Acc Start T | 0.50 – 2.50 | sec | 1.00 | No | 82 |
| E/L_09 |  | Acceleratio n end time | Acc End T | 0.50 – 2.50 | Sec | 1.00 | No | 82 |
| E/L_10 |  | Deceleratio n start time | Dec Start T | 0.50 – 2.50 | sec | 1.00 | No | 82 |
| E/L_11 |  | Deceleratio n end time | Dec End T | 0.50 – 2.50 | sec | 1.00 | No | 82 |
| E/L_12 |  | Distance for compensati on of communica tion delay | CommDlyDist | 100 – 1000 | mm | 400 | No | 83 |
| E/L_13 |  | Adjustment for deceleratio n start distance | DecStart Adj | -10 – 100 | mm | 0 | No | 84 |
| E/L_14 |  | Motor excitation time | PreExct Time | 100 – 10000 | msec | 300 | No | 84 |
| E/L_15 |  | Brake release time | Brake Time | 0 – 10000 | msec | 300 | No | 85 |
| E/L_16 |  | Hold time at zero speed | Hold Time | 0 – 10000 | msec | 300 | No | 85 |
| E/L_17 |  | Hold time for a restart | Restart Time | 0.00 – 100.00 | sec | 1.00 | No | 85 |
| E/L_18 |  | Sensing plate length | Plate Length | E/L_19 – 1000.0 | mm | 200.0 | Yes | 87 |
| E/L_19 |  | Distance between position | InductorEdge | 0.0 – E/L_18 | mm | 20.0 | Yes | 87 |

| | | sensor and sensing plate at floor level | | | | | | |
|---|---|---|---|---|---|---|---|---|
| E/L_20 | | Car speed for floor height measuring | FHM/BFR Speed | 0.0 – 60.0 | m/m | 15.0 | No | 88 |
| E/L_21 | | Floor height measuring result | FHM DATA | 0 – 321 | | 0 | Yes | 88 |
| E/L_22 | | Car speed 1 for manual operation | Manual Spd1 | 0.0– 60.0 | m/m | 15.0 | No | 90 |
| E/L_23 | | Car speed 2 for manual operation | Manual Spd2 | 0.0 – 60.0 | m/m | 10.0 | No | 90 |
| E/L_24 | | Car speed 3 for manual operation | Manual Spd3 | 0.0 – 60.0 | m/m | 3.0 | No | 90 |
| E/L_25 | | Acceleration for manual operation | MAN Accel. | 0.01 – 5.00 | m/sec² | 0.25 | No | 91 |
| E/L_26 | | Deceleration for manual operation | MAN Decel. | 0.01 – 5.00 | m/sec² | 0.25 | No | 91 |
| E/L_27 | | Acceleration start time for manual operation | ManAccStartT | 0.01 – 2.00 | sec | 0.50 | No | 91 |
| E/L_28 | | Acceleration end time | Man AccEnd T | 0.01 – 2.00 | sec | 0.50 | No | 91 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | for manual operation | | | | | | |
| E/L_29 | | Deceleration start time for manual operation | ManDecStartT | 0.01 – 2.00 | sec | 0.50 | No | 91 |
| E/L_30 | | Deceleration end time for manual operation | Man DecEndT | 0.01 – 2.00 | sec | 0.50 | No | 91 |
| E/L_31 | | Deceleration time for manual operation | ManZero DecT | 0.00 – 600.00 | sec | 2.00 | No | 91 |
| E/L_32 | | Minimum distance compensation | DistComp.Min | 0.0 – 2×E/L_19 | mm | 0.0 | No | 93 |
| E/L_33 | | Maximum distance compensation | DistComp.Max | 0.0 – 100.0 | mm | 0.0 | No | 93 |
| E/L_34 | | Distance compensation at floor level[1] | DistComp.Lev | -E/L_19 – E/L_19 | mm | 0 | No | 94 |
| E/L_35 | | Car speed for creep operation[2] | Creep Speed | 1.0 – 60.0 | m/m | 3.0 | No | 95 |
| E/L_36 | | Creep speed distance[2] | Creep Dist. | 0 – 500 | mm | 50 | No | 95 |

| E/L_37 | | Distance for ending position control and starting zero speed deceleration[1] | D/B End Dist | 0 – E/L_19 | mm | 0 | No | 96 |
|---|---|---|---|---|---|---|---|---|
| E/L_38 | | Zero speed deceleration time after position control ends[1] | SpdZeroTime | 0.01 – 10.00 | sec | 2.00 | No | 96 |
| E/L_39 | | Reversed operation for ELIO input signal | ELIO In Neg | 0000000 00000 – 11111111 1111 | - | 0000000 00000 | No | 97 |
| E/L_40 | | Inductor input filter time | IND Filter | 0 – 50 | ms | 5 | No | 98 |
| E/L_41 | | SDS input filter time | SDS Filter | 50 – 500 | ms | 250 | No | 98 |
| E/L_42 | | Forced deceleration start speed for SDS-1 input | ForcedDecSpd | 0.0 – 420.0 | m/m | 0.0 | No | 98 |
| E/L_43 | | Deceleration for SDS-1 forced deceleration[3] | ForcedDecel | 0.01 – 1.50 | m/sec² | 1.50 | No | 98 |
| E/L_44 | | Creep speed for | ForcedCrpSpd | 0.0 – 60.0 | m/m | 3.0 | No | 98 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | forced deceleration[3] | | | | | |
| E/L_45 | | Zero speed wait time for forced deceleration[3] | Frcd.DecWait | 0 – 10000 | ms | 300 | No | 98 |
| E/L_46 | | Use SDS-2 | Use FrcdDcl2 | 0 (No) 1 (Yes) | | 0 (No) | No | 99 |
| E/L_47 | | Forced deceleration start speed for SDS-2 input[4] | Frcd.DecSpd2 | 0.0 – 420.0 | m/m | 0.0 | No | 99 |
| E/L_48 | | Use SDS-3 | Use FrcdDcl3 | 0(No) 1 (Yes) | | 0 (No) | No | 100 |
| E/L_49 | | Forced deceleration start time for SDS-3 input[5] | Frcd.DecSpd3 | 0.0 – 420.0 | m/m | 0.0 | No | 100 |
| E/L_50 | | Start condition for high-speed automatic operation | HighSpdStart | 0 (Inductor ON) 1 (Always) | - | 0 (Inductor ON) | No | 101 |
| E/L_51 | | Acceleration start type | AccStartType | 0 (Linear) 1 (U-Curve) | - | 0 (Linear) | No | 101 |
| E/L_52 | | Startup acceleration compensati | StartupAccel | 0.00 – 1.00 | m/sec² | 0.00 | No | 102 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | on | | | | | | |
| E/L_53 | | Startup acceleration compensation time | StartupAccT | 0.01 – 5.00 | sec | 0.50 | No | 102 |
| E/L_54 | | Startup compensation wait time | StartupWait | 0.00 – 5.00 | sec | 0.50 | No | 102 |
| E/L_55 | | Wait time before stopping for base floor / nearest floor operation | BFR/NFR Wait | 0.00 – 5.00 | Sec | 0.30 | No | 103 |
| E/L_58 | | Select information to display on keypad | Display Sel. | 0 (Car Spd (m/m)) 1 (Car Spd (M/S)) 2 (Car Spd (RPM)) 3 (Car Position) 4 (Trq Output) 5 (Lmt.S/W State) 6 (Tuning Dist) | | 0 (Car Spd (m/m)) | Yes | 104 |
| E/L_59 | | Reset car position | Clear Posi. | 0 (No) 1 (Yes) | | 0 (No) | No | 105 |

| E/L_60 | | Show floor position | Show FlrPosi | 1 – E/L_02 | FLOOR | 1 | Yes | 105 |
|---|---|---|---|---|---|---|---|---|
| E/L_61 | | Set start condition for floor height measuring | FHM Start | ID-OFF/IU-ON DLS ON/SD1-ON | - | ID-OFF/IU-ON | No | 106 |
| E/L_62 | | Floor height measuring mode setting by keypad | KeyPad FHM | No Yes | | No | No | 107 |
| E/L_63 | | Upside direction distance compensation by floor | UpDir Level | -E/L_19 – E/L_19 | mm | 0 | No | 108 |
| E/L_64 | | Downside direction distance compensation by floor | DnDir Level | -E/L_19 – E/L_19 | mm | 0 | No | 108 |
| E/L_67 | | Secondary speed reference for automatic operation | 2ndAutoSpd | 30 – 420 | m/m | 30 | No | 110 |
| E/L_68 | | Secondary acceleration for automatic operation | 2ndRatedAcc | 0.1 – 1 | m/s2 | 0.5 | No | 110 |
| E/L_69 | | Secondary deceleratio | 2ndRatedDec | 0.1 – 1 | m/s2 | 0.5 | No | 110 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | n for automatic operation | | | | | | |
| E/L_70 | | Free run speed | Free Run Spd | 1 – 20 | m/m | 2 | No | 111 |
| E/L_71 | | MC On delay time | ELMC On Time | 100 – 5000 | ms | 1000 | No | 111 |
| E/L_72 | | MC Off delay time | ELMC Off Time | 100 – 50000 | ms | 1000 | No | 111 |

Note (1) Displayed only when E/L_01 is set to "DecelReq-D/B".

Note (2) Displayed only when E/L_01 is set to "DecelReq-T/B".

Note (3) Displayed only when E/L_42 or E/L_47 is set to a value other than "0".

Note (4) Displayed only when E/L_46 is set to "Yes".

Note (5) Displayed only when E/L_48 is set to "Yes".

Note (6) Setting change during inverter operation (Yes: Available, No: Not available)

## 6.2 E/L group functions

### 6.2.1 Jumping to a function code (E/L_oo)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_oo | Jump Code | Jump to function code | 1–72 | - | 1 |

E/L_oo allows you to jump directly to a code (Ex. Jumping to E/L_03).

Press the [PROG] key, press the [SHIFT/ESC] / [▲ UP] / [▼ DOWN] keys to change the code number to "3", and then press the [ENT] key.

```
E/L ▶ Car Speed
03    120m/m
```

After the jump, you can press the [▲ UP] / [▼ DOWN] keys to move to other codes.

### 6.2.2 Selecting a speed reference pattern (E/L_01)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_01 | Spd Ref Type | Speed reference pattern type | DecelReq-D/B DecelReq-T/B | - | DecelReq-D/B |

As shown in the following figure, speed reference pattern types for elevator applications include a remaining distance-based floor level

stopping (DecelReq-D/B) pattern, which depends on a deceleration permission request before passing the floor where the car can be stopped, and a time-based floor level stopping (DecelReq-T/B) pattern.

Remaining distance-based floor level stopping pattern based on a permission request for deceleration (DecelReq-D/B).
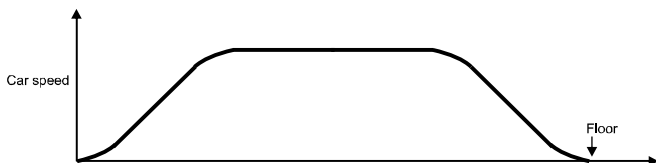


When the elevator starts operation, the position controller inside the inverter generates signals for stoppable floors (terminals FS0, FS1, FS2, FS3, FS4, and FID on the ELIO module). Immediately before such signals are updated, the inverter sends a signal to the operation controller requesting permission to stop (DER terminal on the ELIO module).

The operation controller receives the request signal and verifies if there is a call for a stop that matches the request. Then, it sends a deceleration permission signal to the inverter (DAC terminal on the ELIO module) if a match is found. When the inverter receives this signal, it prepares for deceleration and begins deceleration when the remaining distance to the target floor matches the deceleration start distance and adjusts the speed reference to stop the elevator at the target floor.

Time-based floor level stopping pattern based on a permission request for deceleration (DecelReq-T/B)
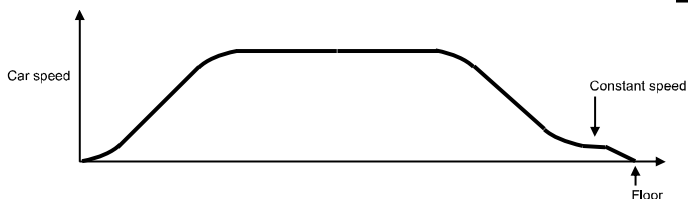
This type of speed pattern is almost identical to the previously explained "DecelReq-D/B" pattern, except that a constant speed zone may be configured before stopping the elevator, and the stopping is made based on time instead of distance.

### 6.2.3 Setting the number of floors and rated car and motor speeds (E/L_02 – E/L_04)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_02 | Floor Number | Number of floors | 1 – 32 | Floor | 32 |
| E/L_03 | Car Speed | Rated car speed | 30 – 420 | m/min | 60 |
| E/L_04 | Motor Speed | Motor speed at rated car speed | 20.0 – 3600.0 | rpm | 96.0 |

These functions allow you to set the number of floors, rated car speed, and motor speed at rated car speed. Enter the total number of all floors for the elevator to stop including the number of all overground and underground floors at E/L_02, and enter the motor speed at E/L_04 for when the car is moving at the rated car speed (E/L_03).

### 6.2.4 Setting the direction of motor operation (E/L_05)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_05 | UP Direction | Direction of motor operation | FX-CCW FX-CW | - | FX-CCW |

This function is used to configure the forward operation (FX) of the motor. The default setting is configured to move up the elevator with counterclockwise (CCW) motor rotation. Set E/L_05 to "FX-CCW" to move up the elevator with counterclockwise (CCW) motor rotation. Set E/L_05 to "FX-CW" to move up the elevator with clockwise (CW) motor rotation.

### 6.2.5 Setting the acceleration and deceleration (E/L_06 – E/L_11)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_06 | Rated Accel | Rated acceleration speed | 0.10 – 1.00 | m/sec² | 0.50 |
| E/L_07 | Rated Decel | Rated deceleration speed | 0.10 – 1.00 | m/sec² | 0.50 |
| E/L_08 | Acc Start T | Acceleration start time | 0.50 – 2.50 | sec | 1.00 |
| E/L_09 | Acc End T | Acceleration end time | 0.50 – 2.50 | sec | 1.00 |
| E/L_10 | Dec Start T | Deceleration start time | 0.50 – 2.50 | sec | 1.00 |
| E/L_11 | Dec End T | Deceleration end time | 0.50 – 2.50 | sec | 1.00 |

These functions are used to set the acceleration and deceleration of the elevator.
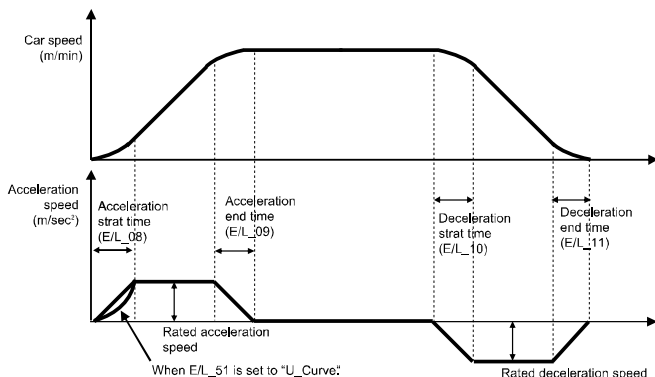


As shown in the figure above, linear acceleration (solid line) is made when E/L_51 is set to "Linear", and curved acceleration (dotted line) is made when E/L_51 is set to "U-curve". The setting at E/L_51 is applied only to the starting section of the acceleration, and a linear acceleration will be made for the remaining section regardless of the setting at E/L_51.

### 6.2.6 Setting compensation for communication delay (E/L_12)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_12 | CommDlyDist | Distance for compensation of communication delay | 100 – 1000 | mm | 400 |

This function is used to compensate for travel that is made while the inverter receives the deceleration permission signal from the operation controller after sending the request for permission to decelerate. The compensation distance is used to calculate the floor where the call for a stop has been made.

### 6.2.7 Adjusting deceleration start distance (E/L_13)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_13 | DecStartAdj | Adjustment for deceleration start distance | -10 – 20 | mm | 0 |

This function is used to fine-tune the deceleration start distance calculated by the inverter (distance from the start of deceleration to the target floor level) according to the speed controller characteristics and load size. The deceleration will start at the distance calculated by adding the distance set at E/L_13 to the deceleration start distance calculated by the inverter.

### 6.2.8 Setting motor excitation time (E/L_14)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_14 | PreExct Time | PreExct Time | 100 – 10000 | msec | 300 |

This function is used to set the time until the brake release signal for the traction machine is output via the BRA-BRB terminals on the ELIO module after an operation command (FX/RX) has been provided.

### 6.2.9  Setting brake release time (E/L_15)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_15 | Brake Time | Brake release time | 0 – 10000 | msec | 300 |

This function is used to set the time until the elevator speed reference is output after the brake release signal is output for the traction machine via the BRA-BRB terminals on the ELIO module following an operation command (FX/RX).

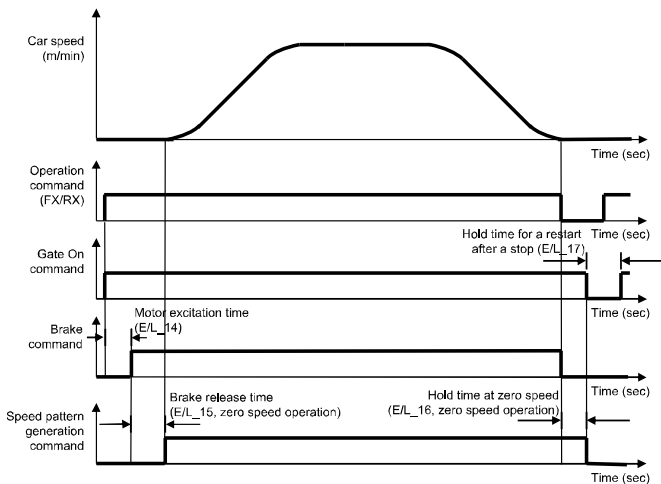### 6.2.10  Setting hold time at zero speed (E/L_16)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_16 | Hold Time | Hold time at zero speed | 0 – 10000 | msec | 300 |

This function is used to set the time for the elevator's car to maintain zero speed after reaching it. In general, there is a delay between the brake release following stopped operation signal and the actual operation of the traction machine brake. Without the zero speed hold torque output for the set time, the elevator's car will move up or down depending on the size of the load.

### 6.2.11  Setting hold time for a restart (E/L_17)

This function is used to set the time it takes until the car resumes operation after a stop. The minimum setting value is 1 second.
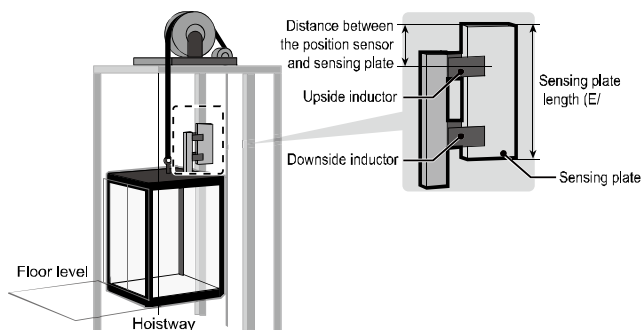
| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_14 | PreExct Time | Motor excitation time | 100 – 10000 | msec | 300 |
| E/L_15 | Brake Time | Brake release time | 0 – 10000 | msec | 300 |
| E/L_16 | Hold Time | Hold time at zero speed | 0 – 10000 | msec | 300 |
| E/L_17 | Restart Time | Hold time for a restart | 0.00 – 100.00 | sec | 1.00 |

### 6.2.12 Setting sensing plate length and distance between position sensor and sensing plate at floor level (E/L_18, E/L_19)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_18 | Plate Length | Sensing plate length | E/L_19 – 1000.0 | mm | 200.0 |
| E/L_19 | InductorEdge | Distance between the position sensor and the sensing plate at floor-height level | 0.0 – E/L_18 | mm | 20.0 |

During floor height measuring operation, the lengths of the sensing plates installed in the hoistway and the distance between the position sensors and sensing plates at each floor level are measured, as well as the floor heights. The measurement data is automatically saved when floor height measuring operation is successfully completed. The measurement data automatically saved after a floor height measuring operation must not be manually edited.

### 6.2.13 Setting car speed for floor height measuring (E/L_20)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_20 | FHM/BFR Speed | Car speed for floor height measuring operation | 0.0 – 60.0 | m/m | 15.0 |

During floor height measuring operation, the speed of the car is defined in meters per minutes (m/m). However, if a multifunction input terminal defined for manual operation is ON during a floor height measuring operation, the car speed set at one of the E/L_22 – E/L_24 functions will be used instead of the car speed set at E/L_21. The car speed set at E/L_20 is also used for base floor operation.

### 6.2.14 Viewing floor height measuring result (E/L_21)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_21 | FHM DATA | Floor height measuring result | 0 – 321 | | 0 |

This function displays result of a floor height measuring operation. The first two digits indicate the number of floors obtained from the floor height measuring, and the last digit indicates the result of the operation: "0 (Failed)" or "1 (Success)". For example, if "321" has been displayed after a floor height measuring operation of a 32-floor building, the first two digits ("32") indicate the number of floors, and the last digit ("1") indicates the successful completion of the floor height measuring operation. The measurement data automatically saved after a floor height measuring

operation must not be manually edited.

### 6.2.15 Setting car speeds 1 – 3 for manual operation (E/L_22 – E/L_24)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_22 | Manual Spd1 | Car speed 1 for manual operation | 0.0 – 60.0 | m/m | 15.0 |
| E/L_23 | Manual Spd2 | Car speed 2 for manual operation | 0.0 – 60.0 | m/m | 10.0 |
| E/L_24 | Manual Spd3 | Car speed 3 for manual operation | 0.0 – 60.0 | m/m | 3.0 |

These functions are used to utilize combinations of multifunction input terminals MM0/P1 and MM1/P2 by configuring various types of manual operations required for elevator applications, such as operations for elevator's maintenance, evacuation, and floor height measuring.

If multifunction input terminals P1 (MM0) and P2 (MM1) have been respectively set to "Man Speed-L" and "Man Speed-M", the speed reference during manual operation is as follows (1: ON, 0: OFF).

| Terminal status (1: On, 0: Off) | | Set speed |
|---|---|---|
| P1 (MM0) | P2 (MM1) | |
| 0 | 0 | N/A(1) |
| 1 | 0 | E/L_22 |
| 0 | 1 | E/L_23 |
| 1 | 1 | E/L_24 |

During manual operation, zero speed deceleration is performed if both P1 (MM0) and P2 (MM1) terminals are OFF at the same time. Not applicable when the car is stopped.

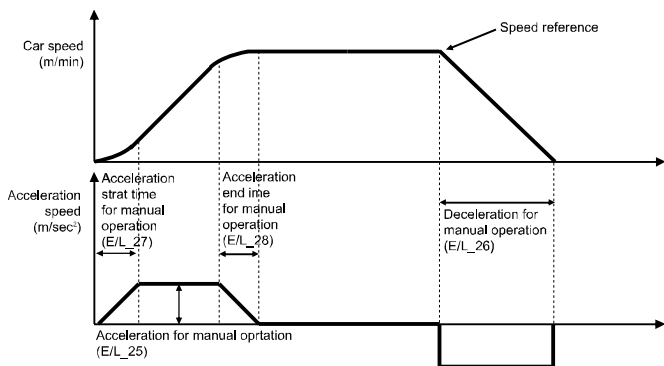### 6.2.16 Setting acceleration and deceleration for manual operation (E/L_25 – E/L_31)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_25 | MAN Accel. | Acceleration for manual operation | 0.01 – 5.00 | m/sec² | 0.50 |
| E/L_26 | MAN Decel. | Deceleration for manual operation | 0.01 – 5.00 | m/sec² | 0.50 |
| E/L_27 | ManAccStartT | manual operation Acceleration start time for manual operation | 0.01 – 2.00 | sec | 0.50 |
| E/L_28 | Man AccEndT | manual operation Acceleration end time for manual operation | 0.01 – 2.00 | sec | 0.50 |
| E/L_29 | ManDecStartT | manual operation Deceleration start time for manual operation | 0.01 – 2.00 | sec | 0.50 |
| E/L_30 | Man DecEndT | manual operation Deceleration end time for manual operation | 0.01 – 2.00 | sec | 0.50 |
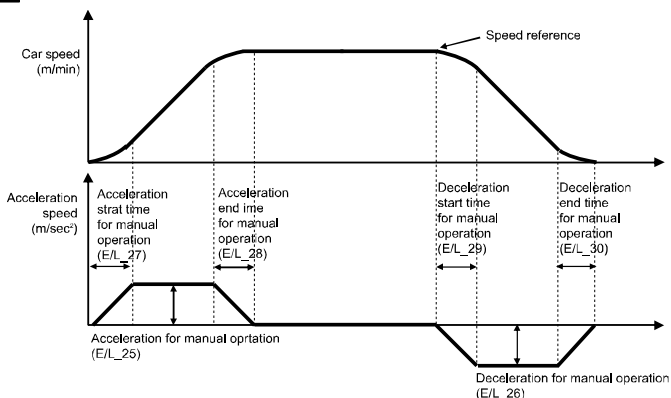
E/L_26, E/L_29, and E/L_30 define the deceleration conditions to perform an S-curve deceleration for maintaining comfortability of the ride when a deceleration results from the change of multifunction inputs for manual operation to a different speed reference (for example, 15 m/m → 3 m/m).

The deceleration time at E/L_31 is used for a linear deceleration to zero speed when the run command is stopped while the multifunction inputs for manual operation are maintained. The type of deceleration is used for quick deceleration when ride comfort is not important.

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_31 | ManZeroDecT | Deceleration time for manual operation | 0.00 – 2.00 | sec | 0.00 |

### 6.2.17 Setting maximum and minimum distance compensation (E/L_32, E/L_33)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_32 | DistComp.Min | Minimum distance compensation | 0 – 2×E/L_18 | mm | 0 |
| E/L_33 | DistComp.Max | Maximum distance compensation | 0 – 100 | mm | 0 |

These functions are used to perform a compensation operation for making up for the rope slip that occurs when the inductor above the car leaves the sensing plate during high-speed operation. The amount of compensation varies depending on the car speed. Therefore, the minimum and maximum values need to be set to provide appropriate compensation for the car speed. The setting value for E/L_32 is automatically set by default

after a floor height measuring operation. If the floor height is greater or if the slip is severe, adjust the setting at E/L_33 by a few millimeters.

### 6.2.18 Setting distance compensation at floor level (E/L_34)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_34 | DistComp.Lev | Distance compensation at floor level | -E/L_19 – E/L_19 | mm | 0 |

This function is used to compensate up for the current position when the car starts decelerating and reaches the floor level after the inductor has detected the sensing plate. The setting at E/L_34 is applied to all floors, regardless of the direction of operation. Therefore, it must be used when there are errors when the car reaches floor levels. If the car stops after the floor level, set it to a positive (+) value. If the car stops before the floor level, set it to a negative (-) value.

When there are floor level deviations, set E/L_34 to a small value (default: "0") first. Then, if there are other floors with different deviations, set E/L_63 and E/L_64 functions to correct them.

### 6.2.19 Setting car speed for creep operation (E/L_35)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_35 | Creep Speed | Car speed for creep operation | 1.0 – 60.0 | m/m | 3.0 |

Set this function to define the car speed for creep operation before it stops at the floor level if E/L_01 is set to "DecelReq-T/B (car stops at floor level after traveling at a specific speed)".

### 6.2.20 Setting creep speed distance (E/L_36)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_36 | Creep Dist. | Creep speed distance | 0 – 500 | mm | 50 |

Set this function to define the distance for the car to travel before it stops at the floor level if E/L_01 is set to "DecelReq-T/B (car stops at floor level after traveling at a specific speed)".

### 6.2.21 Setting distance for ending position control and starting zero speed deceleration at floor level (E/L_37, E/L_38)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_37 | D/B End Dist | Distance for ending position control and starting zero speed deceleration at floor level | 0 – E/L_19 | mm | 0 |
| E/L_38 | SpdZero Time | Zero speed deceleration time after position control ends | 0.01 – 10.00 | sec | 2.00 |

Set E/L_37 to define the distance for ending position control before the car stops at the floor level and set E/L_38 to define the deceleration time to zero speed after position control ends.

If E/L_37 is set to "0", the car decelerates based on the remaining distance to the floor level. If E/L_37 is set to any other value than "0", the car decelerates based on the remaining time to the floor level when it reaches the set distance from the floor level.

Even if E/L_37 is set to "0", the speed reference automatically becomes "0" when the time set at E/L_38 has been passed after all sensors have been detected for stopping at the floor level. Therefore, be careful not to set E/L_38 to an excessively small value if E/L_37 has been set to "0".

### 6.2.22 Setting reversed operation for ELIO input signal (E/L_39)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_39 | ELIO IN Neg | Reversed operation for ELIO input signal | 000000000000 – 111111111111 | - | 000000000000 |

The input terminals on the ELIO module are Form A contacts (normally open). Therefore, signals must be reversed by setting the first bit of E/L_39 setting to "1" if the inductors or limit switches for deceleration are using Form B contact (normally closed). However, the deceleration approval (DAC) cannot be operated with Form B contact signals even after setting the relevant bit to "1". After setting E/L_39 to work with Form B contacts, be careful when initializing the inverter settings. The setting will be reverted for operation with Form A contacts.

Each bit of the E/L_39 setting directly matches the input terminal on the ELIO module. Setting a bit to "1" will allow the terminal to work with Form B contact signals.

| MSB | | | | | | | | | | | LSB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I_D | I_U | DLS | ULS | RV1 | RV2 | SD1 | SU1 | SD2 | SU2 | DAC | RV3 |

### 6.2.23  Setting filter times for inductor and SDS inputs (E/L_40, E/L_41)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_40 | IND Filter | Inductor input filter time | 0 – 50 | ms | 5 |
| E/L_41 | SDS Filter | SDS input filter time | 50 – 500 | ms | 250 |

If input signals to the ELIO module (from inductors, SD1, SU1, SD2, SU2, etc). are affected by electronic interference noise, set these functions to adjust the filtering time for proper car operation.

### 6.2.24  Setting forced deceleration parameters (E/L_42 – E/L_45)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_42 | ForcedDecSpd | Forced deceleration start speed for SDS-1 input | 0.0 – 420.0 | m/m | 0.0 |
| E/L_43 | ForcedDecel | Deceleration for SDS-1 forced deceleration | 0.01 – 5.00 | m/sec² | 1.50 |
| E/L_44 | ForcedCrpSpd | Creep speed for forced deceleration | 0.0 – 60.0 | m/m | 3.0 |
| E/L_45 | Frcd.DecWait | Zero speed wait time for forced deceleration | 0 – E/L_16 | msec | 300 |

These functions are used to configure the settings for SDS-D1 and SDS-U1,

which are limit switches for forced deceleration installed at the base floor inside the hoistway.

When the car approaches the base floor, if the car speed at the moment the limit switches are operated is greater than the set value at E/L_42 (Forced deceleration start speed for SDS-1 input), the car will be forcefully decelerated according to the set value at E/L_43 (Deceleration for SDS-1 forced deceleration) and operated at the speed set at E/L_44 (Creep speed for forced deceleration) until the upside/downside inductors are detected, then the car will be stopped after the time set at E/L_45 (Zero speed wait time for forced deceleration) has elapsed.

E/L_43 and E/L_44 functions are displayed only if E/L_42 or E/L_47 is set to any other value than "0". The settings at E/L_43, E/L_44, and E/L_45 also apply to settings for SDS-D2 and SDS-U2.

### 6.2.25  Setting secondary SDS input and configuring its forced deceleration parameter (E/L_46, E/L_47)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_46 | Use FrcdDcl2 | Use SDS-2 | NO/Yes | - | No |
| E/L_47 | ForcedDecSpd | Forced deceleration start speed for SDS-2 input | 0.0 – 420.0 | m/m | 0.0 |

These functions are used to set whether the SDS-D2 and SDS-U2 limit switch inputs will be used and to set the forced deceleration start speed when the limit switches are operated. E/L_47 is displayed only when

E/L_46 is set to "Yes".

Around the base floor, if the car speed at the moment when the SDS-D2 or SDS-U2 limit switches are operated is greater than the set value at E/L_47 (Forced deceleration start speed for SDS-2 input), the car will be forcefully decelerated according to the set value at E/L_43 (Deceleration for SDS-1 forced deceleration) and operated at the speed set at E/L_44 (Creep speed for forced deceleration), then the car will be stopped after the time set at E/L_45 (Zero speed wait time for forced deceleration) has elapsed.

### 6.2.26 Setting tertiary SDS input and configuring its forced deceleration parameter (E/L_48, E/L_49)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_48 | Use FrcdDcl3 | Use SDS-3 | NO/Yes | - | No |
| E/L_49 | Frcd.DecSpd3 | Forced deceleration start speed for SDS-3 input | 0.0 – 420.0 | m/m | 0.0 |

These functions are used to set whether the SDS-D3 and SDS-U3 limit switch inputs will be used and set the forced deceleration start speed when the limit switches are operated. E/L_49 is displayed only when E/L_48 is set to "Yes".

Around the base floor, if the car speed at the moment when the SDS-D3 or SDS-U3 limit switches are operated is greater than the set value at E/L_49 (Forced deceleration start speed for SDS-3 input), the car will be forcefully decelerated according to the set value at E/L_43 (Deceleration for SDS-1

forced deceleration) and operated at the speed set at E/L_44 (Creep speed for forced deceleration), then the car will be stopped after the time set at E/L_45 (Zero speed wait time for forced deceleration) has elapsed.

### 6.2.27 Setting start condition for high-speed automatic operation (E/L_50)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_50 | HighSpdStart | Start condition for high-speed automatic operation | Inductor ON Always | - | Inductor ON |

Set E/L_50 to "Inductor ON" to allow the car to start (inverter to be operated) only while both the upside/downside inductors are sensing the sensing plate. Set it to "Always" to allow the car to start regardless of the inductor status.

### 6.2.28 Setting acceleration start type for highspeed automatic operation (E/L_51)

Set E/L_51 to select the acceleration type for high-speed operation. You can select either "Linear" or "U-Curve". The U-curve acceleration may be used to improve ride comfort when the car has poor ride quality.

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_51 | AccStartType | Acceleration start type for high-speed automatic | Linear U-Curve | - | Linear |

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| | | operation | | | |

### 6.2.29  Setting compensation for startup acceleration (E/L_52 – E/L_54)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_52 | StartupAccel | Startup acceleration compensation | 0.01 – 1.00 | m/sec² | 0.00 |
| E/L_53 | StartupAccT | Startup acceleration compensation time | 0.01 – 5.00 | sec | 0.01 |
| E/L_54 | StartupWait | Startup compensation wait time | 0.00 – 5.00 | sec | 0.50 |

Set these functions to improve ride comfort when the car has poor ride quality of ride due to abrupt ascents or descents during high-speed automatic operation. Try different settings and repeat testing until you find the optimal values.
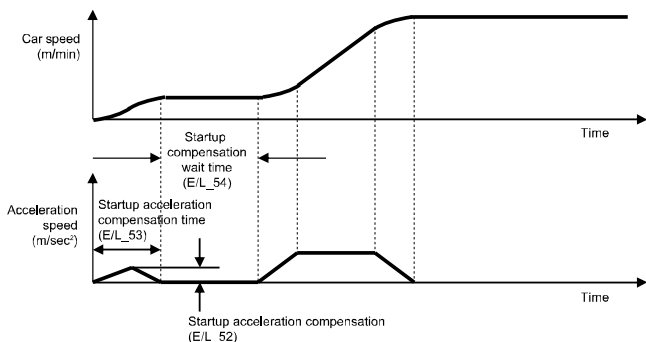
### 6.2.30 Setting wait time before base floor/nearest floor operation (E/L_55)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_55 | BFR/NFR Wait | Wait time before stopping for base floor/nearest floor operation | 0.00 – 5.00 | sec | 0.30 |

Set E/L_55 to set the time until the car is decelerated and stopped after the upside and downside inductors are operated and the speed reference has been changed to "0" when it approaches the base floor level during a base floor operation. If the car stops past the floor height level during a base floor or nearest floor operation, decrease the setting value. If the car stops before the floor height level, increase the setting value.

### 6.2.31 Selecting information to display on keypad (E/L_58)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_58 | Display Sel. | Current car speed per minute | Car Speed (m/m) | m/m | Car Speed (m/m) |
| | | Current car speed per second | Car Speed (m/s) | m/s | |
| | | Motor speed | Motor Speed | rpm | |
| | | Current car position | Car Position | mm | |
| | | Motor output torque | Trq Output | % | |
| | | Limit switch statusNote) | Lmt.S/W State | I--S-- S2-- | |
| | | Remaining distance when the 1st inductor is operated | Tuning Dist | mm | |

See section 2.2 for the elevator operation mode display on the keypad.

You can select the information that is displayed in the middle of the first line on the keypad after setting the application type at CON_02 to "Elevator". If you set E/L_58 to "Limit S/W State", the limit switch's activation status (On/Off) will be displayed based on the signal reversal settings at E/L_39.

Note) Limit switch status details

Ex). When the elevator car is stopped at the base level - IND_UP, IND_DN, SDS1, SDS2 ON (-: OFF, ○: ON)

| Inductor | Down | Up | SDS1 | Down | Up | SDS2 | Down | Up |
|----------|------|-----|------|------|-----|------|------|-----|
| I | ○ | ○ | S | ○ | - | S2 | ○ | - |

### 6.2.32  Resetting car position (E/L_59)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---------------|----------------|---------------|---------------|------|---------|
| E/L_59 | Clear Posi. | Reset car position | No Yes | - | No |

This function may be used to manually reset the current car position to "0 mm". The current position becomes the base level, and the current floor will be indicated as floor 1.

### 6.2.33  Showing floor position (E/L_60)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---------------|----------------|---------------|---------------|------|---------|
| E/L_60 | Show FlrPosi | Show floor position | 1 – E/L_02 | FLOOR | 1 |

This function may be used to show the floor height for each floor after a successful floor height measuring operation. Be careful because initializing the E/L group parameters with PAR_01 or changing floor numbers with E/L_02 will reset all floor height data to "0".

### 6.2.34 Setting start condition for floor height measuring (E/L_61)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_61 | FHM Start | Set start condition for floor height measuring | ID-OFF/IU-ON DLS ON/SD1-ON | - | ID-OFF/IU-ON |

This function may be used for a system that requires an independent floor height measuring operation, separate from in inverter which has upper-level controller, if the floor height measuring operation must start when the DLS is detected and stop when ULS is detected.

You can set E/L_61 to "DLS ON/SD1-ON" to perform floor height measuring on the elevator system and the inverter simultaneously (the inverter itself does not required DLS or ULS signals for floor height measuring).

If you set E/L_61 to "DLS ON/SD1-ON", the DLS and ULS signals must be provided to the inverter.

If you set E/L_61 to "ID-OFF/IU-ON", the inverter automatically decelerates to zero speed when the car reaches the top floor and the upper position sensor (IU) leaves the sensing plate. However, if you set E/L_61 to "DLS-ON/IU-ON", the inverter operates without deceleration until the ULS is detected.

Do not change the E/L_61 setting unless the upper controller performs calculations for deciding elevator positions.

### 6.2.35 Enabling floor height measuring mode setting by keypad (E/L_62)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---------------|----------------|---------------|---------------|------|---------|
| E/L_62 | Keypad FHM | Floor height measuring mode setting by keypad | No Yes | - | No |

Set E/L_61 to "Yes" to change the operation mode to "floor height measuring mode" regardless of the multifunction input terminal status. You can set E/L_62 to "Yes" after manually moving the car to a position that satisfies the condition set at E/L_61 in manual operation mode, to switch directly to floor height measuring mode without additional signal inputs.

Remember to set E/L_62 back to "No" after the floor height measuring operation because the floor height measuring mode will be maintained until you change the setting. Also, downside operation does not work in floor height measuring mode. Therefore, if floor height measuring fails, you must manually move the car to the base floor after setting E/L_62 to "No", then operate floor height measuring again.

### 6.2.36 Setting upside/downside distance compensation by floor (E/L_63, E/L_64)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_63 | UpDir Level | Upside direction distance compensation by floor | -E/L_19 – E/L_19 | mm | 0 |
| E/L_64 | DnDir Level | Downside direction distance compensation by floor | -E/L_19 – E/L_19 | mm | 0 |

You can set the distance compensation value for when the car stops at a floor level at E/L_34, but this compensation value will be applied to all floors. On the other hand, you can set the floor level compensation value for upside operation by floors with E/L_63, and set the floor level compensation value for downside operation by floors with E/L_64.

As with E/L_34, if the car stops past the floor height level, set it to a negative (-) value. If the car stops before the floor height level, set it to a positive (+) value. Instructions for defining the compensation distance for each floor is as follows. Be careful because initializing the E/L group parameters with PAR_01 or changing floor numbers with E/L_02 will reset all compensation values for each floor at E/_63 and E/L_64 to "0".

| Keypad display | Instruction |
|---|---|
| E/L ► Up 2F Level<br>63　　0mm ■ | Press the [PROG] key and the floor you want to set the compensation for will be displayed at the top, and the compensation value will be displayed at the bottom with a flashing cursor. Press the [▲], [▼] keys to adjust the compensation value for the floor, then press the [ENT] key to save it. |
| E/L ► Up 5F Level<br>63　　0mm ■ | Press the [PROG] key again to change the floor. Press the [▲], [▼] keys to change the floor at the top of the display, and the current compensation value for the floor will be displayed at the bottom. Press the [PROG] key again when the floor you want to set the compensation for is displayed. |
| E/L ► Up 5F Level<br>63　　2mm ■ | The compensation value will be displayed at the bottom with a flashing cursor. Press the [▲],[▼] keys to adjust the compensation value for the floor, then press the [ENT] key to save it. |
| E/L ► Up 5F Level<br>63　　2mm | To view the current compensation value for each floor, press the [PROG] key twice on the initial screen (cursor does not flash), then press the [▲]/[▼] keys to change floors. The current compensation value will be displayed at the bottom for each floor. |

### 6.2.37 Setting secondary speed reference for automatic operation (E/L_67)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_67 | 2ndAutoSpd | Secondary speed reference for automatic operation | 30 – E/L_03 | m/m | 30 |

In elevator systems for tall buildings, automatic operation speed reference may be additionally set for short-distance operation for one or two floors. After setting E/L_67 to "2ndAutoSpd", the elevator will be operated with the secondary speed reference for automatic operation when the multifunction input for "2ndAutoRun" is On. when the multifunction input signal for "2ndAutoRun" is Off, the elevator will be operated with the speed reference set at E/L_03.

### 6.2.38 Setting secondary acceleration and deceleration for automatic operation (E/L_68, E/L_69)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_68 | 2nd RatedAcc | Secondary acceleration for automatic operation | 0.1 – 1 | m/s² | 0.5 |
| E/L_69 | 2nd RatedDec | Secondary deceleration for automatic operation | 0.1 – 1 | m/s² | 0.5 |

When the elevator is operated with the secondary speed reference, E/L_68 is used to set the acceleration speed for the elevator to reach the secondary speed reference

When the elevator is operated with the secondary speed reference, E/L_69 is used to set the deceleration speed for the elevator to reach the zero speed.

### 6.2.39 Setting free run speed (E/L_70)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_70 | Free Run Spd | Free run speed | 1 – 20 | mm | 2 |

When the elevator is operated again following a stop, the operation will be allowed only if the elevator speed is at or below the speed set at E/L_70 (Free run speed).

### 6.2.40 Setting MC On/Off delay times (E/L_71, E/L_72)

| Function code | Keypad display | Function name | Setting range | Unit | Default |
|---|---|---|---|---|---|
| E/L_71 | ELMC On Time | MC On delay time | 100 – 5000 | ms | 1000 |
| E/L_72 | ELMC OffTime | MC Off delay time | 100 – 50000 | ms | 1000 |

If a magnetic contactor (MC) has been installed between the inverter and the motor, the current will be applied to the motor after the time set at E/L_71 (MC On delay time) has elapsed when the run command signal is On, to protect the CMOS elements inside the inverter.

If a magnetic contactor (MC) has been installed between the inverter and

the motor, the current to the motor will be cut off after the time set at E/L_72 (MC Off delay time) has elapsed when the run command signal is On, to protect the CMOS elements inside the inverter.

## Product warranty

Fill in this warranty information form and keep this page for future reference or when warranty service may be required.

| Product Name | LS ELECTRIC L100 ELIO Add-on Module | Date of Installation | |
|---|---|---|---|
| Model | XSIN-L100 | Warranty Period | |
| Customer Information | Name/Business name | | |
| | Address | | |
| | Telephone | | |
| Sales Office | Name/Business name | | |
| | Address | | |
| | Telephone | | |

**Warranty period**

The product warranty covers product malfunctions, under normal operating conditions, for 12 months from the date of installation. If the date of installation is unknown, the product warranty is valid for 18 months from the date of manufacture. Please note that the product warranty terms may vary depending on the purchase or installation contracts.

**Warranty Service Information**

During the product warranty period, warranty service (free of charge) is provided for product malfunctions caused under normal operating conditions. For warranty service, contact an official LS Electric agent or service center.

**Non-Warranty Service**

A service fee will be incurred for malfunctions in the following cases:

- intentional abuse or negligence

- power supply problems or from other appliances being connected to the product

- acts of nature (fire, flood, earthquake, gas accidents, etc).

- modifications or repair by unauthorized persons

- missing authentic LS ELECTRIC rating plates

- expired warranty period

**Visit Our Website**

Visit us at http://www.ls-electric.com for detailed service information.

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