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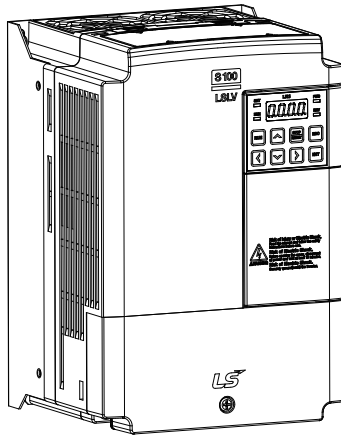
AC Variable Speed Drive

LSLV-S100L series

User's 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

This user manual has been prepared to describe the open loop elevator market based on S100.
LSLV-S100L is the official name for S100L.

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

⚠ Danger

- Do not open the cover of the equipment while it is on or operating. Likewise, do not operate the drive while the cover is open. Exposure of high voltage terminals or charging area to the external environment may result in an electric shock. Do not remove any covers or touch the internal circuit boards (PCBs) or electrical contacts on the product when the power is on or during operation. Doing so may result in serious injury, death, or serious property damage.
- Do not open the cover of the equipment even when the power supply to the drive has been turned off unless it is necessary for maintenance or regular inspection. Opening the cover may result in an electric shock even when the power supply is off.
- The equipment may hold charge long after the power supply has been turned off. Use a multi-meter to make sure that there is no voltage before working on the drive, motor or motor cable.

⚠ Warning

- This equipment must be grounded for safe and proper operation.
- Do not supply power to a faulty drive. If you find that the drive is faulty, disconnect the power supply and have the drive professionally repaired.
- The drive becomes hot during operation. Avoid touching the drive until it has cooled to avoid burns.
- Do not allow foreign objects, such as screws, metal chips, debris, water, or oil to get inside the drive. Allowing foreign objects inside the drive may cause the drive to malfunction or result in a fire.
- Do not operate the drive with wet hands. Doing so may result in electric shock.

- Check the information about the protection level for the circuits and devices.

  The following connection terminals and devices are the Protective Class 0. It means that the circuit protection level depends on the basic insulation. If there is no basic insulation is failed, it may cause electric shock accident.

  - Multi-function Input: P1-P7, CM
  - Safety Function: SA, SB, SC
  - Analog Output: AO
  - Digital Output: Q1, EG,Q2, EG2, 24, A1, B1, C1, A2, C2
  - Communication: S+/ S-/ SG

- The protection level of this equipment (drive) is the Electrical Protective Class I.

Contents

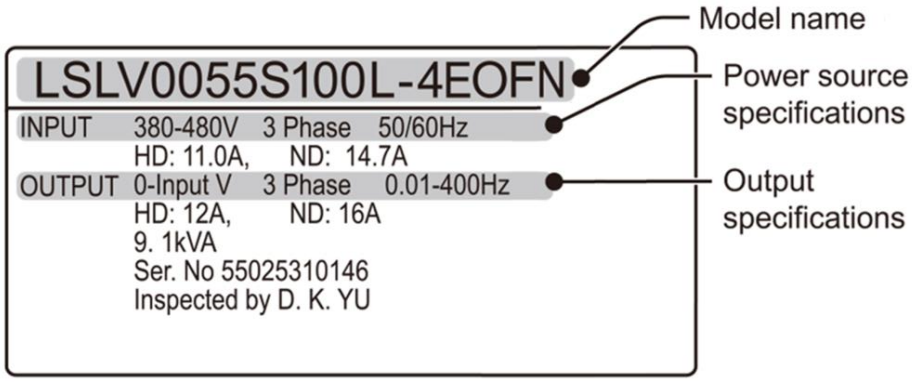
1 Preparing the Installation

1.1 Product Identification

The S100L Drive is manufactured in a range of product groups based on drive capacity and power source specifications. Product name and specifications are detailed on the rating plate. The illustration on the next page shows the location of the rating plate. Check the rating plate before installing the product and make sure that the product meets your requirements.

Note

Check the product name, open the packaging, and then confirm that the product is free from defects. Contact your supplier if you have any issues or questions about your product.



LSLV 0055 S100L - 4EOFN

Motor capacity

0055 - 5.5KW
0075 - 7.5KW
0110 - 11KW
0150 - 15KW

Series name

Input voltage

2 - 3-phase 200V
4 - 3-phase 400V

Keypad

E - LED Keypad

UL Type

O - UL Open Type

EMC filter

N - Non-EMC
F - Built-in EMC

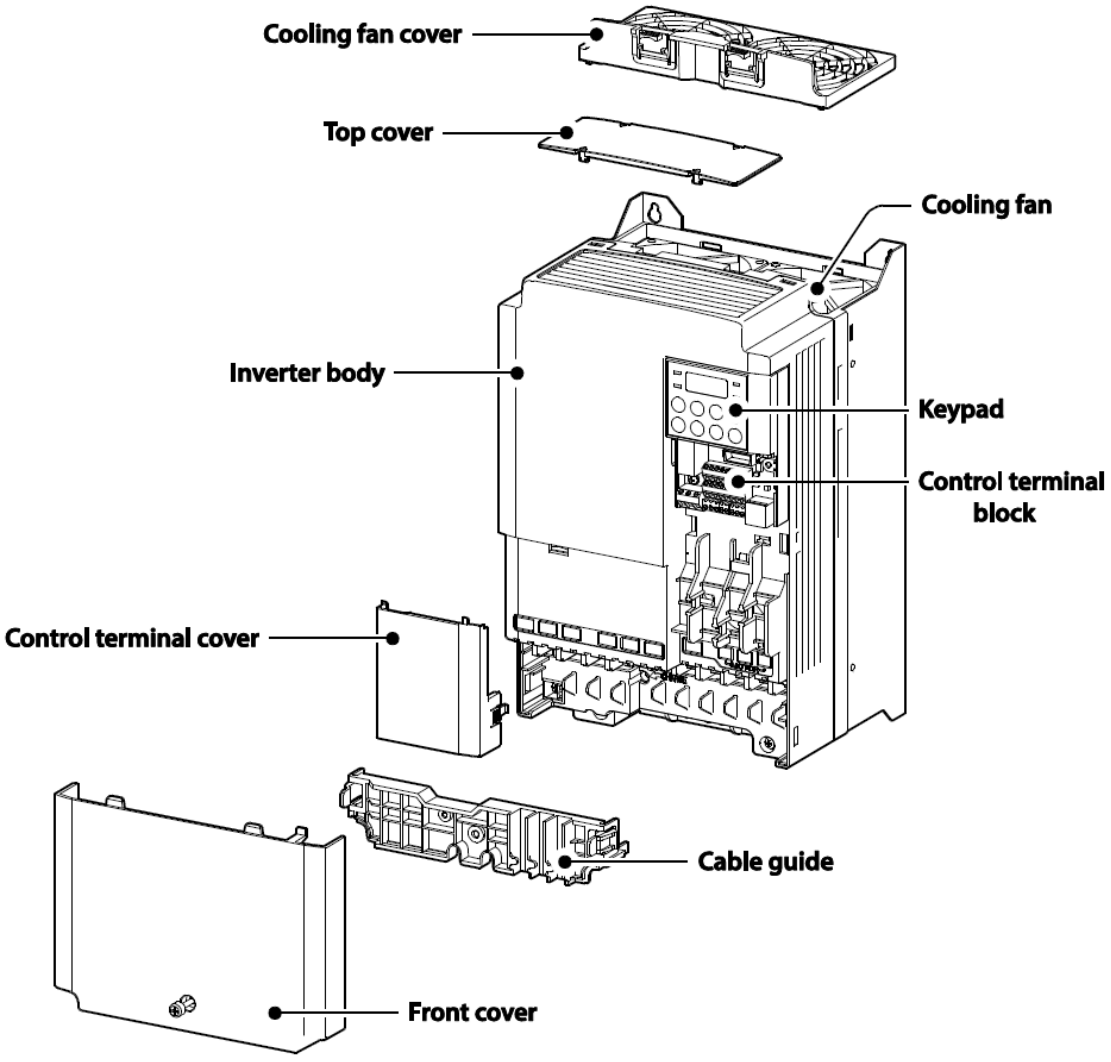
Reactor

N - Non-Reactor

1.2 Part Names

The illustration below displays part names. Details may vary between product groups.

5.5~15kW(3–Phase)

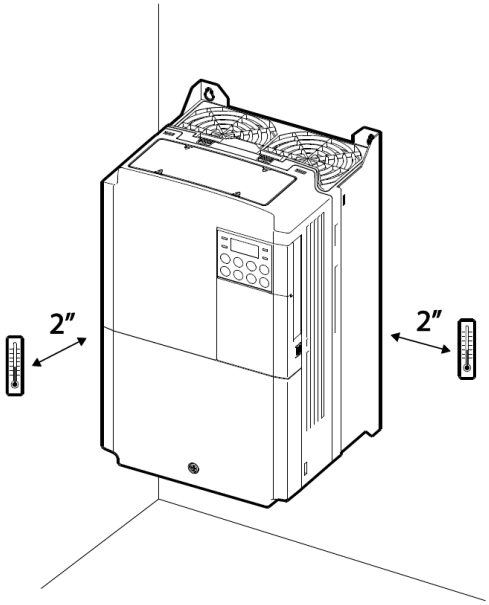


1.3 Installation Considerations

Drives are composed of various precision, electronic devices, and therefore the installation environment can significantly impact the lifespan and reliability of the product. The table below details the ideal operation and installation conditions for the drive.

Items	Description
Ambient Temperature*	Heavy Duty: 14–104°F (-10–50°C) Normal Duty: 14–122°F (-10– 40°C)
Ambient Humidity	90% relative humidity (no condensation)
Storage Temperature	- 4–149°F (-20–65°C)
Environmental Factors	An environment free from corrosive or flammable gases, oil residue or dust
Altitude / Vibration	Maximum 1000m above sea level for standard operation. From 1000 to 4000m, the rated input voltage and rated output current of the drive must be derated by 1% for every 100m. / less than 1G (9.8m/sec^2)
Air Pressure	70 –106kPa

* The ambient temperature is the temperature measured at a point 2" (5 cm) from the surface of the drive.



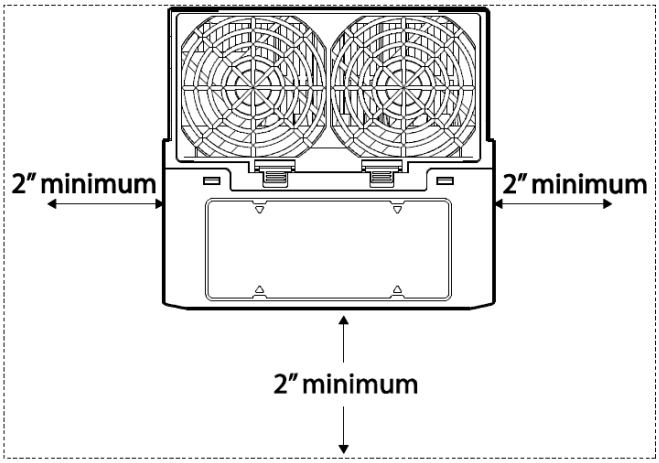
⚠ Caution

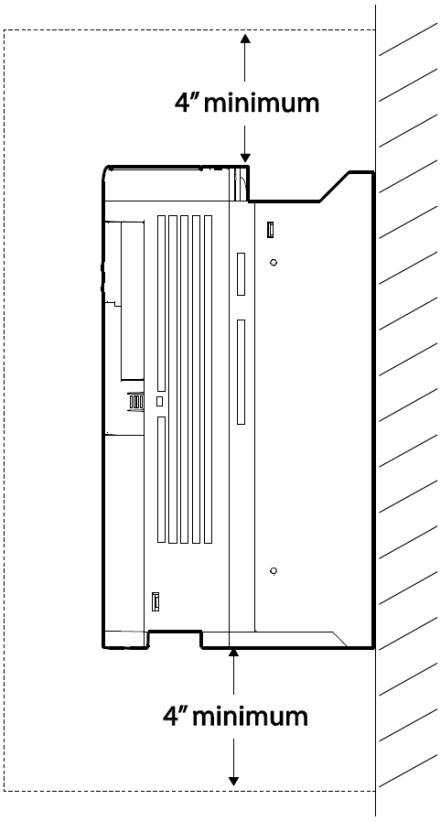
Do not allow the ambient temperature to exceed the allowable range while operating the drive.

1.4 Selecting and Preparing a Site for Installation

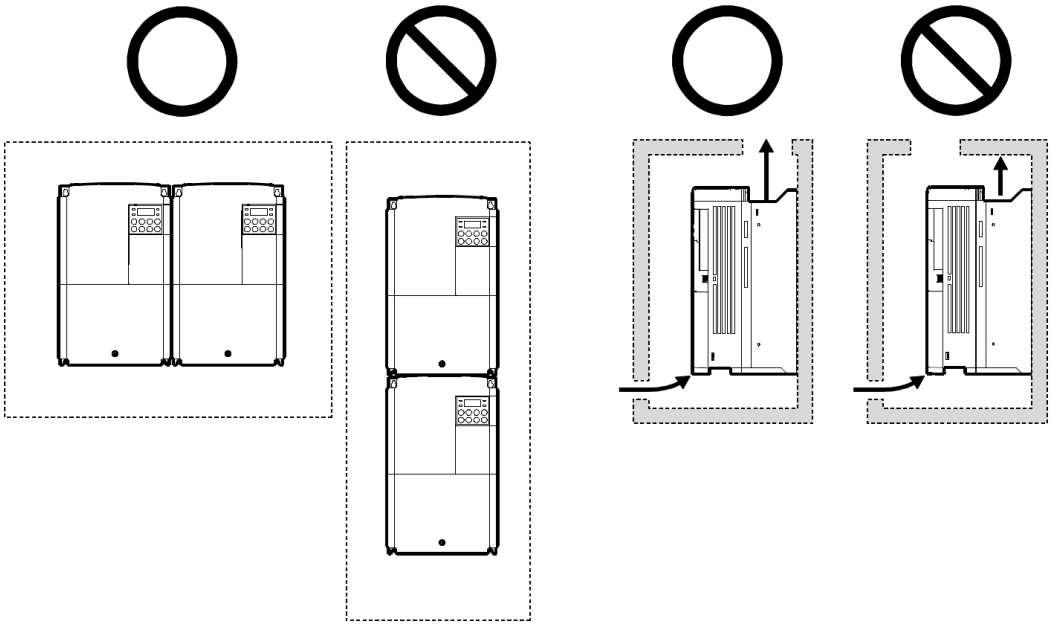
When selecting an installation location consider the following points:

- The location must be free from vibration, and the drive must be installed on a wall that can support the drive's weight.
- The drive can become very hot during operation. Install the drive on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the drive to allow air to circulate. The illustrations below detail the required installation clearances.





- Ensure sufficient air circulation is provided around the drive when it is installed. If the drive is to be installed inside a panel, enclosure, or cabinet rack, carefully consider the position of the drive's cooling fan and the ventilation louver. The cooling fan must be positioned to efficiently transfer the heat generated by the operation of the drive.



1.5 Cable Selection

When you install power and signal cables in the terminal blocks, only use cables that meet the required specification for the safe and reliable operation of the product. Refer to the following information to assist you with cable selection.

Caution

Wherever possible use cables with the largest cross-sectional area for mains power wiring, to ensure that voltage drop does not exceed 2%.

Use copper cables rated for 600V, 75℃ for power terminal wiring.

Use copper cables rated for 300V, 75℃ for control terminal wiring.

Ground Cable and Power Cable Specifications (5.5-15kW)

Load (kW)		Ground		Power I/O			
		mm²	AWG	mm²		AWG	
				R/S/T	U/V/W	R/S/T	U/V/W
3–Phase 200V	5.5	6	10	6	6	10	10
	7.5						
	11	16	6	10	10	8	8
	15			16	16	6	6
3–Phase 400V	5.5	4	12	2.5	2.5	14	14
	7.5			4	4	12	12
	11	10	8				
	15			6	6	10	10

Signal (Control) Cable Specifications

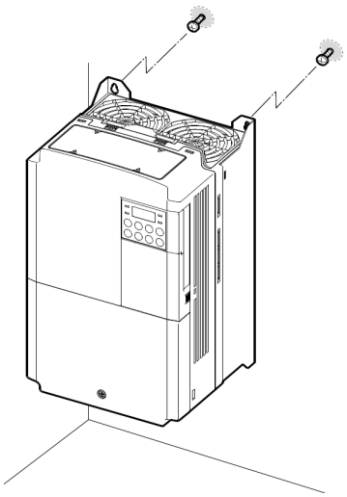
Terminals	Signal Cable			
	Without Crimp Terminal Connectors (Bare wire)		With Crimp Terminal Connectors (Bootlace Ferrule)	
	mm²	AWG	mm²	AWG
P1~P7/CM/Q1/Q2/EG/EG2/24/SA,SB,SC/S+, S-,SG	0.75	18	0.5	20
A1/B1/C1/A2/C2	1.0	17	1.5	15

1.6 Mounting the Drive

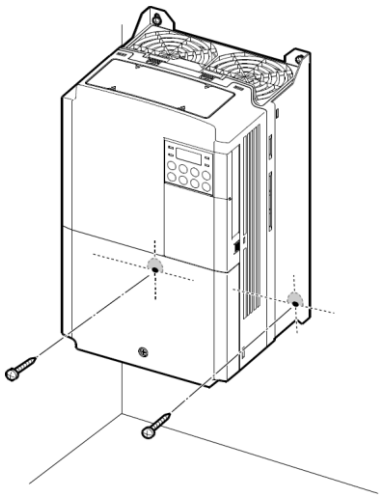
Mount the drive on a wall or inside a panel following the procedures provided below. Before installation, ensure that there is sufficient space to meet the clearance specifications, and that there are no obstacles impeding the cooling fan's air flow.

1 Use a level to draw a horizontal line on the mounting surface, and then carefully mark the fixing points.

2 Drill the two upper mounting bolt holes, and then install the mounting bolts. Do not fully tighten the bolts at this time. Fully tighten the mounting bolts after the drive has been mounted.

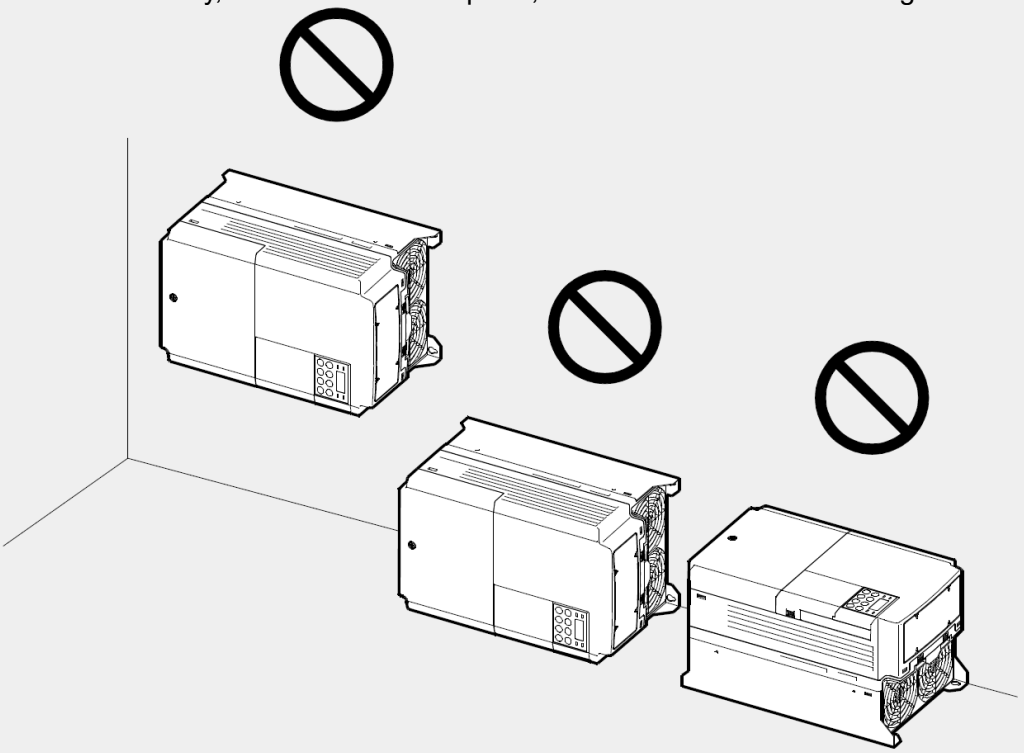


3 Mount the drive on the wall or inside a panel using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the drive is placed flat on the mounting surface, and that the installation surface can securely support the weight of the drive.



Caution

- Do not transport the drive by lifting with the drive's covers or plastic surfaces. The drive may tip over if covers break, causing injuries or damage to the product. Always support the drive using the metal frames when moving it.
- High-capacity drives are very heavy and bulky. Use an appropriate transport method that is suitable for the weight.
- Do not install the drive on the floor or mount it sideways against a wall. The drive MUST be installed vertically, on a wall or inside a panel, with its rear flat on the mounting surface.



1.7 Cable Wiring

Open the front cover, remove the cable guides and control terminal cover, and then install the ground connection as specified. Complete the cable connections by connecting an appropriately rated cable to the terminals on the power and control terminal blocks.

Read the following information carefully before carrying out wiring connections to the drive. All warning instructions must be followed.

ⓘ Caution

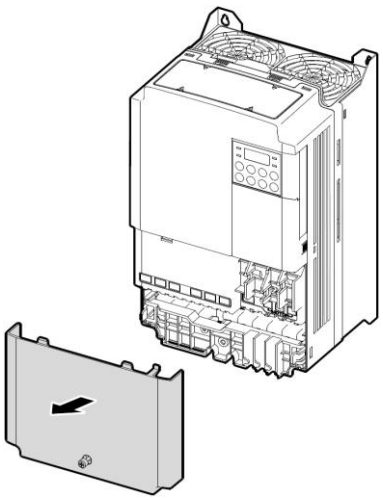
- Install the drive before carrying out wiring connections.
- Ensure that no small metal debris, such as wire cut-offs, remain inside the drive. Metal debris in the drive may cause drive failure.
- Tighten terminal screws to their specified torque. Loose terminal block screws may allow the cables to disconnect and cause short circuit or drive failure.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in electric shock.
- The power supply system for this equipment (drive) is a grounded system. Only use a grounded power supply system for this equipment (drive). Do not use a TT, TN, IT, or corner grounded system with the drive.
- The equipment may generate direct current in the protective ground wire. When installing the residual current device (RCD) or residual current monitoring (RCM), only Type B RCDs and RCMs can be used.
- Use cables with the largest cross-sectional area, appropriate for power terminal wiring, to ensure that voltage drop does not exceed 2%.
- Use copper cables rated at 600V, 75℃ for power terminal wiring.
- Use copper cables rated at 300V, 75℃ for control terminal wiring.
- Separate control circuit wires from the main circuits and other high voltage circuits (200V relay sequence circuit).
- Check for short circuits or wiring failure in the control circuit. They could cause system failure or device malfunction.
- Use shielded cables when wiring the control circuit. Failure to do so may cause malfunction due to interference. If a ground is needed, use STP (Shielded Twisted Pair) cables.
- If you need to re-wire the terminals due to wiring-related faults, ensure that the drive keypad display is turned off and the charge lamp under the front cover is off before working on wiring connections. The drive may hold a high voltage electric charge long after the power supply has been turned off.

Step 1 Front Cover, Control Terminal Cover and Cable Guide

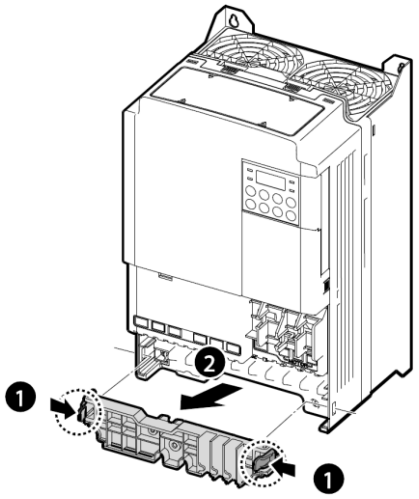
The front cover, control terminal cover and cable guide must be removed to install cables. Refer to the following procedures to remove the covers and cable guide. The steps to remove these parts may vary depending on the drive model.

5.5~15kW (3-phase)

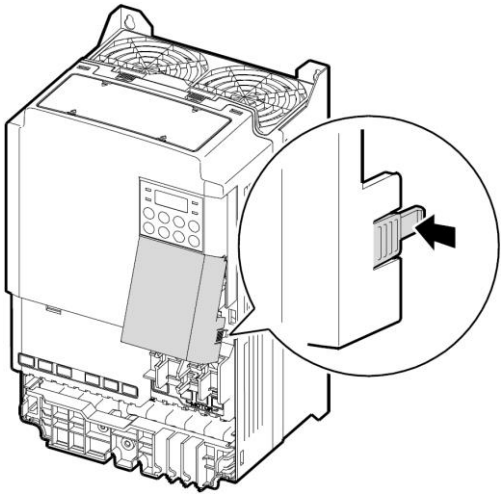
1. Loosen the bolt that secures the front cover. Then remove the cover by lifting it from the bottom and away from the front.



2. Push and hold the levers on both sides of the cable guide (❶) and then remove the cable guide by pulling it directly away from the front of the drive (❷). In some models where the cable guide is secured by a bolt, remove the bolt first.



3. Push and hold the tab on the right side of the control terminal cover. Then remove the cover by lifting it from the bottom and moving it away from the front of the drive.



4. Connect the cables to the power terminals and the control terminals.

Note

To connect an LCD loader, remove the plastic knock-out from the bottom of the front cover (right side). Connect the signal cable of the LCD loader to the RJ-45 port on the control board. (5.5-15kW models only)

Step 2 Ground Connection

Remove the front cover(s), cable guide, and the control terminal cover. Then follow the instructions below to install the ground connection for the drive.

Note

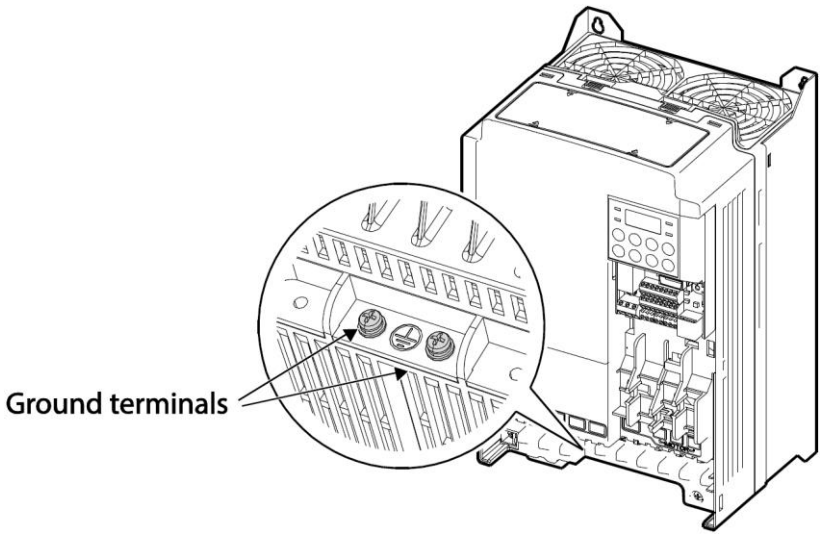
- 200 V products require Class 3 grounding. Resistance to ground must be < 100Ω.
- 400 V products require Special Class 3 grounding. Resistance to ground must be < 10Ω.

⚠ Warning

Install ground connections for the drive and the motor by following the correct specifications to ensure safe and accurate operation. Using the drive and the motor without the specified grounding connections may result in electric shock.

5.5~15kW (3-phase)

1 Locate the ground terminal and connect an appropriately rated ground cable to the terminals.



2 Connect the other ends of the ground cables to the supply earth (ground) terminal.

Step 3 Power Terminal Wiring

The following illustration shows the terminal layout on the power terminal block. Refer to the detailed descriptions to understand the function and location of each terminal before making wiring connections.

Caution

Apply rated torques to the terminal screws. Loose screws may cause short circuits and malfunctions. Tightening the screw too much may damage the terminals and cause short circuits and malfunctions.

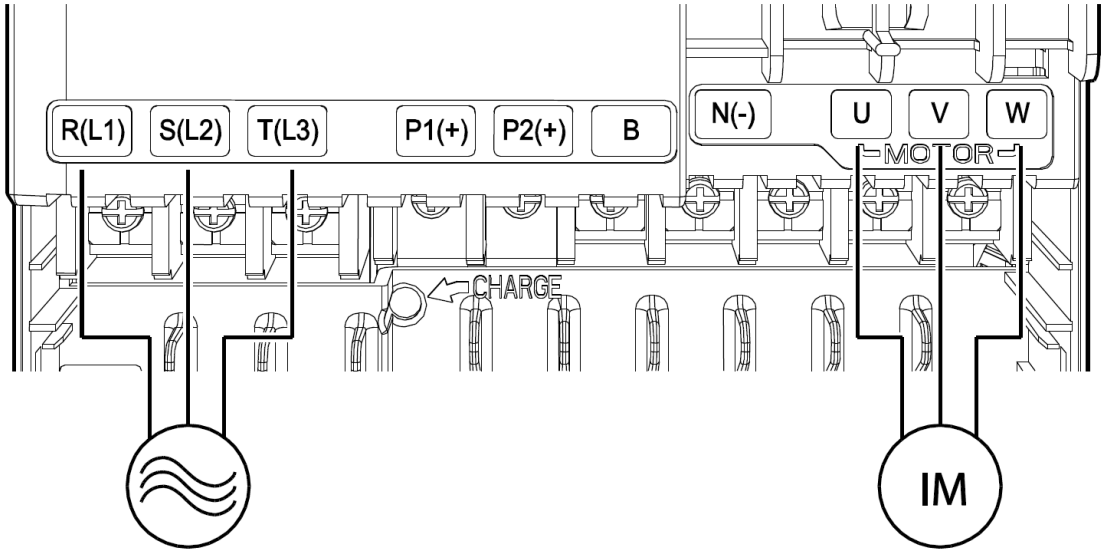
Use copper wires only with 600V, 75℃ rating for the power terminal wiring, and 300V,

75℃rating for the control terminal wiring.

Do not connect two wires to one terminal when wiring the power.

Power supply wirings must be connected to the R, S, and T terminals. Connecting them to the U, V, W terminals causes internal damages to the drive. Motor should be connected to the U, V, and W Terminals. Arrangement of the phase sequence is not necessary.

5.5~15kW (3-phase)



3-phase AC input

Motor

Power Terminal Labels and Descriptions (5.5-15kW)

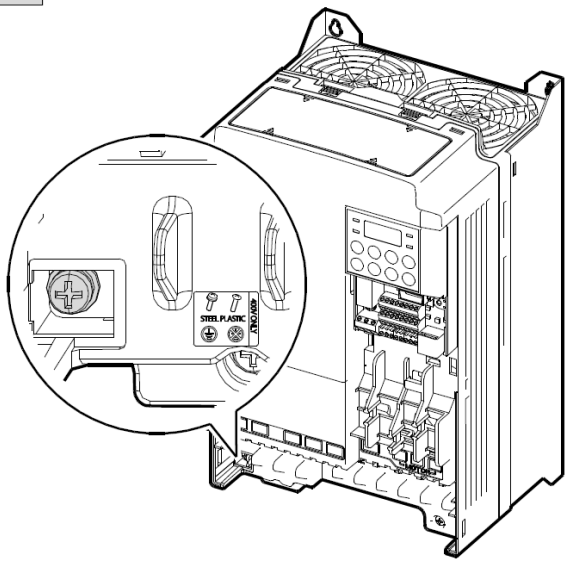
Terminal Labels	Name	Description
R(L1)/S(L2)/T(L3)	AC power input terminal	Mains supply AC power connections.
P1(+)/N(-)	DC link terminal	DC voltage terminals.
P1(+)/P2(+)	DC reactor terminal	DC reactor wiring connection. (When you use the DC reactor, must remove short-bar)
P2(+)/B	Brake resistor terminals	Brake resistor wiring connection.
U/V/W	Motor output terminals	3-phase induction motor wiring connections.

Step 4 Disabling the Built-in EMC Filter

5.5~15kW (3-phase)

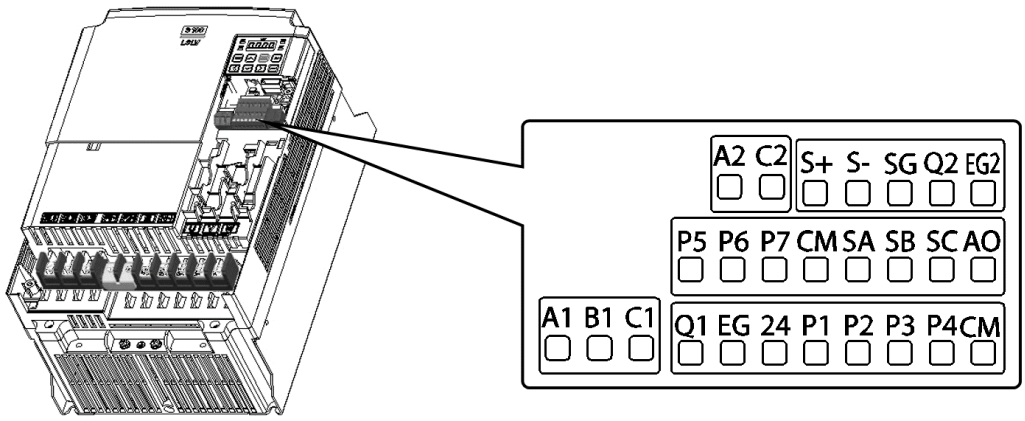
Before using the drive, confirm the power supply's grounding system. Disable the EMC filter if the power source has an asymmetrical grounding connection. Refer to the figures below to locate the EMC filter on/off terminal and replace the metal bolt with the plastic bolt. If the EMC filter is required in the future, reverse the steps and replace the plastic bolt with the metal bolt to reconnect the EMC filter.

Steel bolt	Plastic bolt
	
EMC ON	EMC OFF



Step 5 Control Terminal Wiring

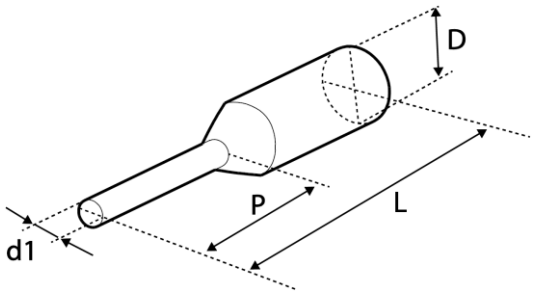
The illustrations below show the detailed layout of control wiring terminals, and control board switches. Refer to the detailed information provided below.



Control Terminals		Terminal	Descriptions
Input	Digital	P1 ~ P7	Multi-functional Input1~7
		CM	Common
	Safety	SC,SA,SB	Safety terminals
Output	Digital	Q1,	Multi-functional output (Open-Collector) : RUN
		EG	Common (for Q1)
		Q2	Multi-functional output (Open-Collector) : Drive Steady
		EG2	Common (for Q2)
		24	External 24V
		A1,C1,B1	Relay signal (N.O. / N.C.) : Brake Control
		A2, C2	Relay signal(N.O) : ALLS
		S+, S-, SG	RS-485 (Modbus-RTU)

Preinsulated Crimp Terminal Connectors (Bootlace Ferrule) .

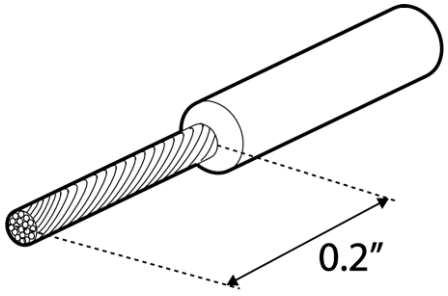
Use preinsulated crimp terminal connectors to increase reliability of the control terminal wiring. Refer to the specifications below to determine the crimp terminals to fit various cable sizes.



P/N	Cable Spec.		Dimensions (inches/mm)				Manufacturer
	AWG	mm^2	L*	P	d1	D	
CE002506	26	0.25	10.4	6.0	1.1	2.5	JEONO (Jeono Electric, http://www.jeono.com/)
CE002508			12.4	8.0			
CE005006	22	0.50	12.0	6.0	1.3	3.2	
CE007506	20	0.75	12.0	6.0	1.5	3.4	

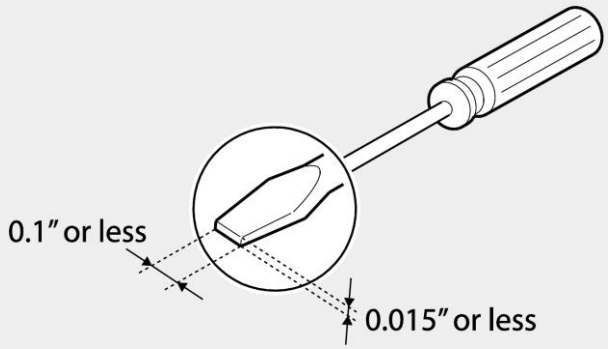
* If the length (L) of the crimp terminals exceeds 0.5" (12.7mm) after wiring, the control terminal cover may not close fully.

To connect cables to the control terminals without using crimp terminals, refer to the following illustration detailing the correct length of exposed conductor at the end of the control cable.



Note

- While making wiring connections at the control terminals, ensure that the total cable length does not exceed 165ft (50m).
- Ensure that the length of any safety related wiring does not exceed 100ft (30m).
- Ensure that the cable length between an LCD keypad and the drive does not exceed 10ft (3.04m). Cable connections longer than 10ft (3.04m) may cause signal errors.
- Use ferrite material to protect signal cables from electro-magnetic interference.
- Take care when supporting cables using cable ties, to apply the cable ties no closer than 6 inches from the drive. This provides sufficient access to fully close the front cover.
- When making control terminal cable connections, use a small flat-tip screw driver (0.1in wide (2.5mm) and 0.015in thick (0.4mm) at the tip).



⚠ Warning

SA, SB, SC, they are shorted, have 24V voltage. Do not connect power to the drive until installation has been fully completed and the drive is ready to be operated. Doing so may result in electric shock.

2 Open-Loop Elevator Commissioning

2.1 Characteristic of Elevator

The counter weight of elevator changes characteristic of elevator is changeable according to the passenger's ride of the elevator. Assuming that there is elevator which has maximum five passengers rating as shown in the following figures, if the weight of 2.5 persons is loaded on the elevator car, the counter weight is balanced with it. Even if the motor brake is opened, the elevator car does not fall.

1) No person, down operation (Fig 1)

Since the counterweight which is heavier than the elevator car must be raised, the motor becomes a full load motoring operation.

2) Full persons, down operation (Fig 2)

Since the elevator car which is heavier than the counter weight must be lowered, the motor becomes a full load regenerating operation.

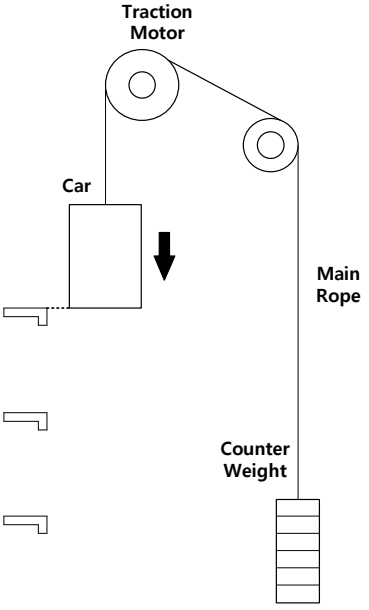


Fig. 1

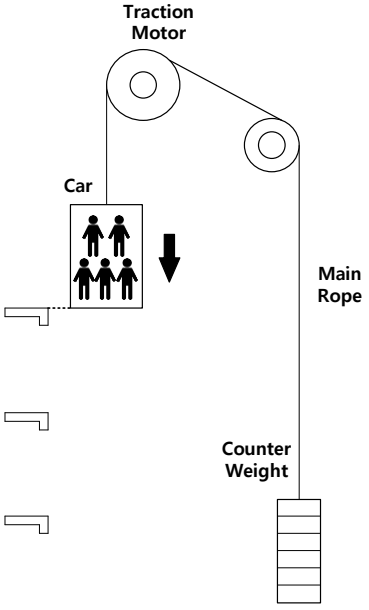


Fig. 2

3) No person, up operation (Fig 3)

Since the counter weight which is heavier than the elevator car must be lowered, the motor becomes a full load regenerating operation.

4) Full persons, up operation (Fig 4)

Since the elevator car which is heavier than the counter weight must be raised, the motor becomes a full load motoring operation.

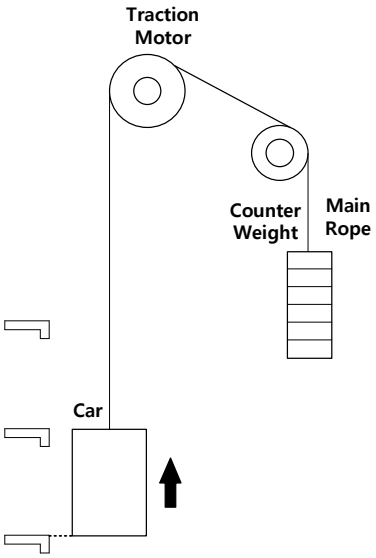


Fig. 3

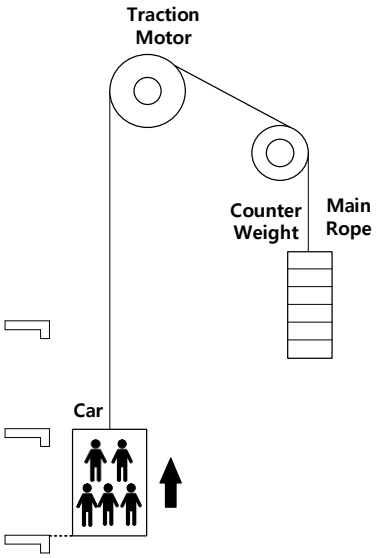


Fig. 4

2.2 Inspection Procedure of Elevator

1) Make sure elevator car is in the middle layer based on the top layer.

2) Set the manual / automatic operation selection switch as manual on the control panel.

3) Start the motor by turning on the operation command (FX or RX) in the control panel. If the up / down direction of the elevator car does not match the running command, change the wiring between the FX terminal block and the RX terminal block or change the wiring of the drive output (ex. U, V, W → U, W, V) Of the car.

4) If there is a tachometer capable of measuring the motor speed, set the manual speed command value to the creep speed and measure the motor speed while operating with no person in elevator car.

   As the elevator car goes down, it is motoring operation. The output frequency displayed on the initial screen of the keypad is a value that is larger than the command frequency due to the addition of the slip compensation frequency. At that time, measure the motor speed with the tachometer and adjust [ADV-93 Slip (+) Gain-L] so that the motor speed could be same as command frequency. Refer to Example of how to set [ADV-93 Slip(+) Gain-L] (page 37)

   As the elevator car goes up, it is regenerating operation. The output frequency displayed on the initial screen of the keypad is a value that is smaller than the command frequency due to the subtraction of the slip compensation frequency. At that time, measure the motor speed with the tachometer and adjust [ADV-95 Slip (-) Gain-L] so that the motor speed could be same as command frequency. Refer to Example of how to set [ADV-95 Slip(-) Gain-L](page 38)

5) After matching the motor speed between real motor speed and drive output frequency, set the creep frequency in [BAS-50 Step Freq-1] ~ [BAS-56 Step Freq-7].

6) Set the manual / automatic operation selection switch as automatic on the control panel.

2.3 Commissioning Set-up Procedure

1. Check the software version

● Check if the S/W version is for the Open loop Elevator control

2. Set-up the operation mode and motor specification

● Setup the motor control mode parameters

● Check the nameplate of the motor and set up the motor parameters

3. Set auto-tuning

● Run auto-tuning to confirm a time constant of the motor

4. Set-up the parameters for normal operation

● Setup parameters – Acceleration/Deceleration time

● Setup parameters – Operation pattern and S-curve

● Setup parameters – Input & Output terminals

● Setup parameters – Operation speed

5. Set the initial torque parameters for elevator

● Setup parameters – automatic torque boost

6. Set leveling parameters for elevator

● Setup parameters – Slip compensation control

● Setup parameters – 2nd deceleration time, 2nd S-curve

7. Set riding quality parameters for elevator

● Setup parameters – DC injection, Motor brake control

2.4 Basic Set-up Procedure

2.4.1 Setup the operation mode and motor specification

Grp	Code	7-segment	Parameter	Range	Unit
DRV	14	dr.14	Motor Capacity	Motor name-plate Data	kW
BAS	10	bA.10	60/50 Hz Sel	1: 50Hz	-
	11	bA.11	Pole Number	Motor name-plate Data	-
	12	bA.12	Rated Slip		rpm
	13	bA.13	Rated Curr		A
	15	bA.15	Rated Volt		V
	19	bA.19	AC Input Volt		V

Ex) Motor Name Plate	Grp	Code	Parameter	Value	Unit
	DRV	14	Motor Capacity	5.5	kW
	BAS	11	Pole Number	4 pole	-
		12	Rated Slip	130* (1500-1370)	rpm
		13	Rated Curr	13	A
		15	Rated Volt	380	V

Note

*bA.12 Rated Slip : Setup the value through the calculation of “Synchronous speed – Rated speed”

Ex) If the synchronous speed is the below which is 50[Hz] 4-pole motor, and the rated speed is 1,370[rpm], then the rated slip is 130[rpm] :

$$\text{rpm} = \frac{120\ X\ f}{P} = \frac{120\ X}{4} = 1500[\text{rpm}]$$

$$\text{rpm} = 1500 - 1370 = 130\ [\text{rpm}]$$

2.4.2 Auto-tuning

1) Set auto-tuning of the motor after setup the control mode and motor parameters

2) If there is a M/C(Magnetic Contactor) between the S100L and the motor, the M/C should be ON during the auto-tuning. Otherwise, auto-tuning is not possible to run.

3) Confirm if the motor brake is NOT to open during the auto-tuning.

4) If the rope is not equipped to the motor sheave, setup [BAS-20 Auto Tuning] as '1 All' to run 'Rotational auto tuning'.

5) With the rope on the motor sheave, [BAS-20 Auto Tuning] as '2 All (Stdstl)' to run 'Static auto tuning'.

6) We recommend you to do the auto tuning more than 2 times. And check the results if they are more than 10[%] gap.

Grp	Code	7-segment	Parameter	Range	Unit
BAS	20	bA.20	Auto Tuning	1: All or 2: All(Stdstl)	-
	14	bA.14	Noload Curr	Measured Value	A
	21	bA.21	Rs		Ohm
	22	bA.22	Lsigma		mH
	23	bA.23	Ls		mH
	24	bA.24	Tr		ms

3 Parameters Related to Open Loop Elevator

3.1 Drive Group (PAR -> dr)

Those parameters of drive group below are related to elevator performance.

Grp	No	Description	LCD Display	Default	Unit
DRV	01	Target frequency	Cmd Frequency	0.00	Hz
	03	Acceleration time	Acc Time	2.5	sec
	04	Deceleration time	Dec Time	2.2	sec
	06	Command source	Cmd Source	1:Fx/Rx-1	-
	07	Frequency reference source	Freq Ref Src	0:Keypad-1	-
	09	Control mode selection	Control Mode	2:Sip Compen	-
	15	Torque boost options	Torque Boost	3:Auto3	-
	16	Forward Torque boost	Fwd Boost	4.0	%
	17	Reverse Torque boost	Rev Boost	4.0	%
	18	Base frequency	Base Freq	50.00	Hz
	19	Start frequency	Start Freq	0.01	Hz
	20	Maximum frequency	Max Freq	50.00	Hz
	26	Auto torque boost filter	ATB3 Filter	100	%
	27	Auto torque boost-motoring gain	ATB3 M_Gain	50.0	%
	28	Auto torque boost-generating gain	ATB3 G_Gain	50.0	%

1) [DRV-03 ACC Time] and [DRV-04 Dec Time] are set by considering ride comfort and generally set to 1.5 ~ 2.5 [sec]. If [DRV-04 Dec Time] value is set too small, a shock may occur at the point of transition from high speed operation to creep speed operation. In this case, increase the [DRV-04 Dec Time] by 0.1 [sec] to check ride comfort. As the [DRV-04 Dec Time] increases, the moving distance of the elevator car increases, which may reduce the creep speed operation holding time. Therefore, the creep speed operation holding time should be at least 4 [sec] or higher set the time of [DRV-04 Dec Time] to maintain creep speed operation.

If the distance between floors is too short to maintain less than 4 [sec], decrease high frequency operation so that creep speed operation holding time is 4 [sec] or longer.

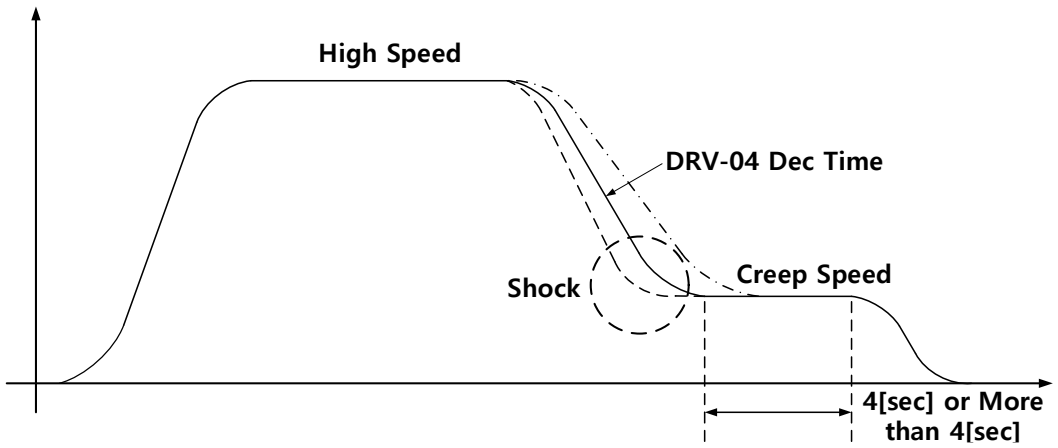


Fig. 5 Creep speed operation

2) [DRV-09 Control Mode] should be set to "Slip Compen". When [DRV-09 Control Mode] is set to "Slip Compen", command frequency and output frequency are output as figure 6 and figure 7 shown below according to the motor load. The frequency displayed on the initial screen of the keypad is the output frequency. The value of the command frequency plus the slip compensation frequency (command frequency + slip compensation frequency) is displayed during the motoring operation. During regenerating operation, the slip compensation frequency is subtracted from the command frequency (command frequency - slip compensation frequency).

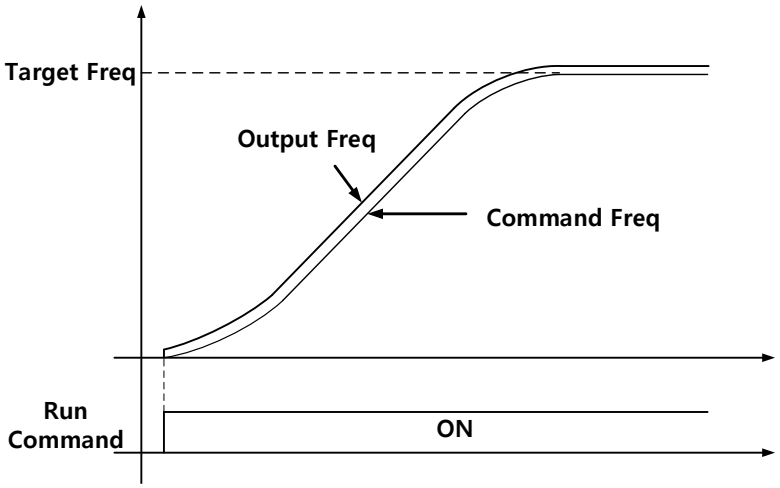


Fig. 6 Output Freq at Motoring Load

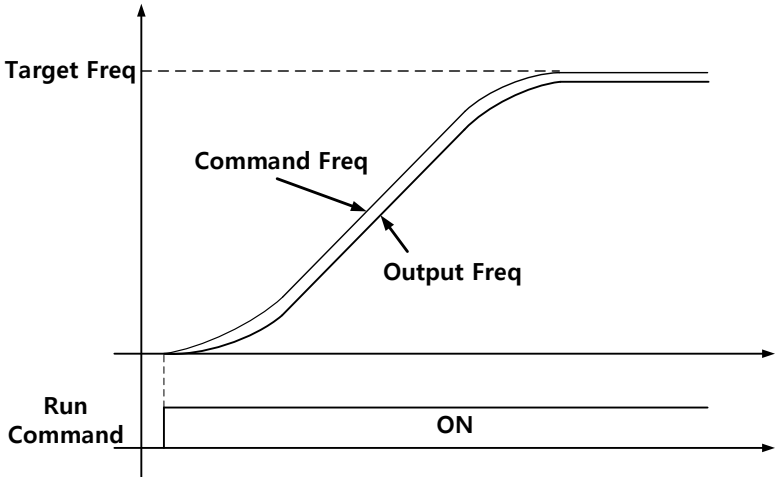


Fig. 7 Output Freq at Generating Load

3) [DRV-15 Torque Boost] should be set to "Auto 3".

4) When [DRV-09 Control Mode] set to "Slip Compen" and [DRV-15 Torque Boost] set to "Auto 3", [DRV-16 Fwd Boost] is the boost amount of motoring operation and [DRV-17 Rev Boost] is the boost amount of generating operation basically applied.

[DRV-27 ATB3 M_Gain] and [DRV-28 ATB3 G_Gain] are the auto torque boost gain applied depending on the load. If excessive current flows to the motor during initial start-

up under full load of motoring and full load of generating, decrease [DRV-16 Fwd Boost] and [DRV-17 Rev Boost] by 0.5[%] with observation and adjustment of drive output current. At this time, it is possible to lower those 2 parameters until tripping does not occur. Also [DRV-27 ATB3 M_Gain] and [DRV-28 ATB3 G_Gain] can be used by increasing or decreasing by 5% as the same way of [DRV-16 Fwd Boost] and [DRV-17 Rev Boost] parameters.

5) [DRV-18 Base Freq] should be set from motor name plate.

6) [DRV-19 Start Freq] should be set to 0.01Hz.

7) [DRV-20 Max Freq] should be set to the same value as [DRV-18 Base Freq].

3.2 Basic Function Group (PAR -> bA)

Those parameters of base group below are related to elevator performance.

Grp	No	Description	LCD Display	Default	Unit
DRV	50	Multi-step speed frequency1	Step Freq-1	0.00(6.00)*	Hz
	51	Multi-step speed frequency2	Step Freq-2	0.00	Hz
	52	Multi-step speed frequency3	Step Freq-3	0.00(13.00)*	Hz
	53	Multi-step speed frequency4	Step Freq-4	0.00	Hz
	54	Multi-step speed frequency5	Step Freq-5	0.00(40.00)*	Hz
	55	Multi-step speed frequency6	Step Freq-6	0.00	Hz
	56	Multi-step speed frequency7	Step Freq-7	0.00	Hz

1) Frequency reference should be decided by multi-function input for the elevator. (Speed-L, Speed-M, Speed-H)

2) Frequency reference can be divided by 3 speeds, manual operation speed, automatic high operation speed and automatic creep operation speed in elevator system.

Ex) Reference for open loop elevator application

* 6.00 Hz = Automatic creep operation speed

* 13.00 Hz = manual operation speed

* 40.00 Hz = Automatic high operation speed

3.3 Expanded Function Group (PAR -> Ad)

Those parameters of advance group below are related to elevator performance.

Grp	No	Description	LCD Display	Default	Unit
ADV	01	Acceleration pattern	Acc Pattern	S-curve	-
	02	Deceleration pattern	Dec Pattern	S-curve	-
	03	S-curve acceleration start point gradient	Acc S Start	70	%
	04	S-curve acceleration end point gradient	Acc S End	40	%
	05	S-curve deceleration start point gradient	Dec S Start	60	%
	06	S-curve deceleration end point gradient	Dec S End	40	%
	07	Start Mode	Start Mode	Acc	-
	08	Stop Mode	Stop Mode	DC-Brake	-
	12	DC braking time at startup	Dc-Start Time	0.00	sec
	13	Amount of applied DC	Dc Inj Level	150	%
	15	DC braking time	Dc-Brake Time	0.50	sec
	16	DC braking rate	Dc-Brake Level	150	%
	17	DC braking frequency	Dc-Brake Freq	0.02	Hz
	18	S-curve deceleration start point gradient in low speed	Stop S Start	55	%
	19	S-curve deceleration end point gradient in low speed	Stop S End	45	%
	41	Brake release current	BR Rls Curr	0.0	%
	42	Brake release delay time	BR Rls Dly	0.00	sec
	44	Brake release Forward frequency	BR Rls Fwd Fr	0.20	Hz
	45	Brake release Reverse frequency	BR Rls Rev Fr	0.20	Hz
	46	Brake engage delay time	BR Eng Dly	0.60	Sec

Grp	No	Description	LCD Display	Default	Unit
	47	Brake engage motoring frequency	BR Eng Fr	0.20	Hz
	48	Brake engage generating frequency	BR Eng Fr G	0.20	Hz
	91	Slip compensation frequency	Slip(+) Freq	8	Hz
	92	Slip compensation high gain for motoring	Slip(+) Gain-H	100	%
	93	Slip compensation low gain for motoring	Slip(+) Gain-L	110	%
	94	Slip compensation high gain for regenerating	Slip(-) Gain-H	100	%
	95	Slip compensation low gain for regenerating	Slip(-) Gain-L	90	%
	96	Low pass filter for slip compensation frequency	Slip Filter	700	msec
	98	Deceleration time selection for leveling tuning	ZeroDec1Sel	Yes	-

1) To make better ride comfort performance, [ADV-01 Acc Pattern] and [ADV-02 Dec Pattern] should be set to “S-curve”. And appropriate values for [ADV-03 Acc S Start], [ADV-04 Acc S End], [ADV-05 Dec S Start], [ADV-06 Dec S End] should be considered for ride comfort. S-curve graph is shown in the following Fig. 8.

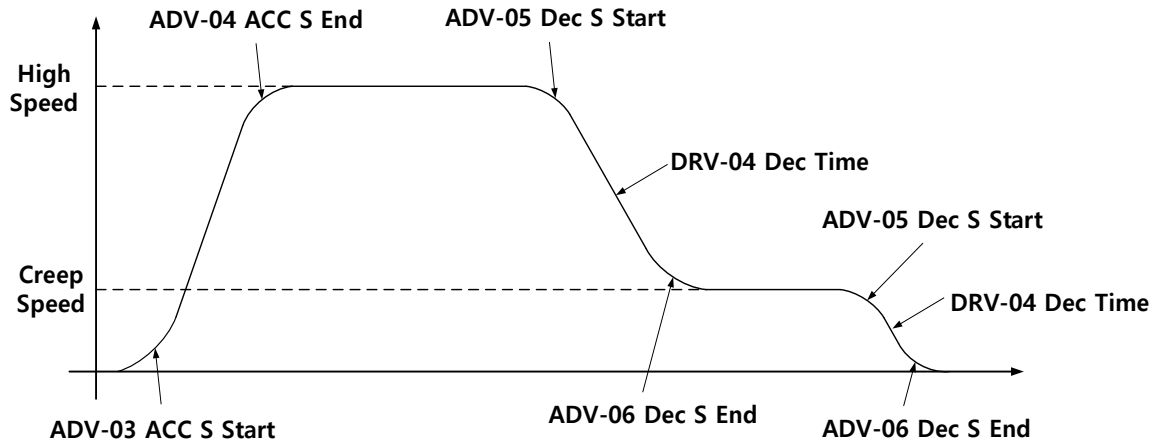


Fig. 8 S-curve operation

2) [ADV-07 Start Mode] should be set “Acc” or “DC-Start” depending on the sites. In most case, “Acc” can be used but when motor rotation speed is delayed compared to the command frequency as a shown below, “DC-Start” should be set.

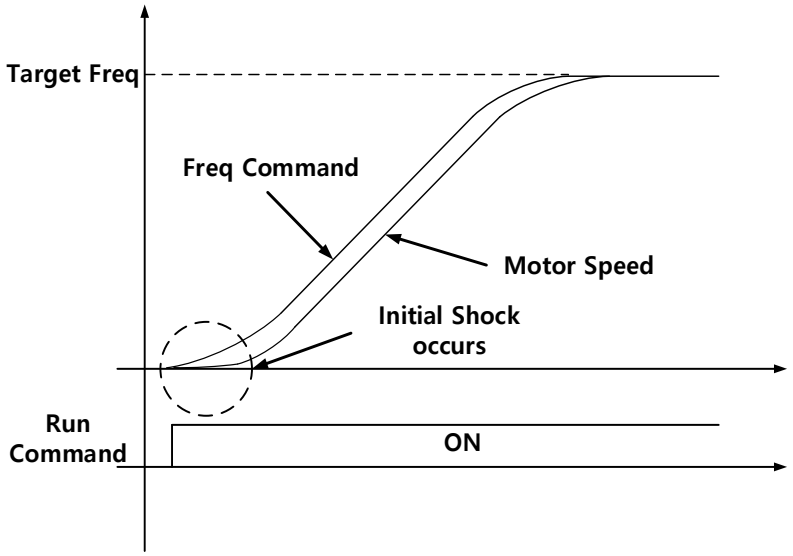


Fig. 9 Start mode operation

[ADV-07 Start Mode] is set to “DC-Start” with adjustment of [ADV-12 Dc-Start Time] and [ADV-13 Dc Inj Level], initial shock will be reduced as shown below.

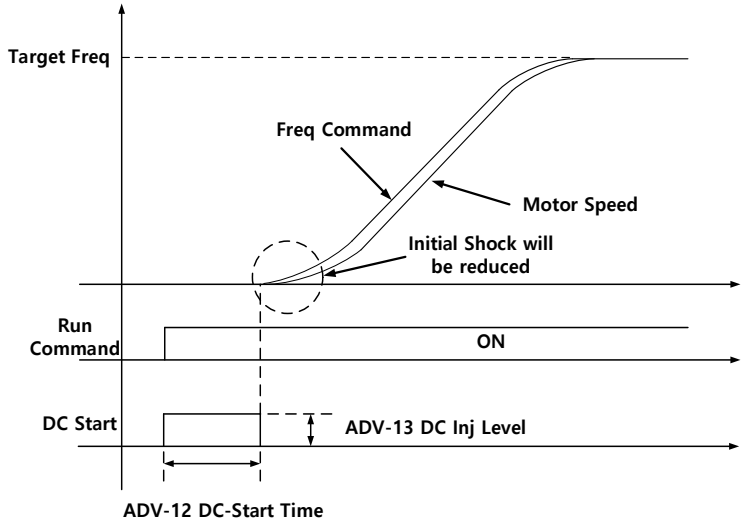


Fig. 10 Start mode2 operation

3) [ADV-08 Stop Mode] should be set to “DC-Brake” to mitigate shocks at stop operation.

The shock at stop may occur in the following cases as below.

① When the motor brake is closed while the motor is not stopping completely

② When motor brake is closed while the motor is rotating due to rollback occurring with drive output off

4) In order to reduce the shock when the motor is stopped, the shock can be mitigated by using the appropriate brake close control and DC-Brake function. The procedure is as follows.

① Basically parameters related to elevator brake control should be set as below in elevator system. With performance observation, those parameters can be changed.

[ADV-15 Dc-Brake Time] = 1[sec]

[ADC-16 Dc-Brake Level] = 150[%]

[ADV-17 Dc-Brake Freq] = 0.2[Hz]

The excessive setting of [ADC-16 Dc-Brake Level] can affect the stability of system, so it can be adjusted to less than 150[%] by monitoring the elevator car. At this time, it needs to be checked if the motor closes after motor stopping.

② After DC Brake function setting is complete, Brake close function should be set. When the [OUT-31 Relay 1] or [OUT-33 Q1 Define] is set to “BR control”, [ADV-41 BR Rls Curr] ~ [ADV-48 BR Eng Fr G] is activated.

[ADV-46 BR Eng Dly], [ADV-47 BR Eng Fr] and [ADV-48 BR Eng Fr G] should be adjusted for the Brake close function. [ADV-47 BR Eng Fr] and [ADV-48 BR Eng Fr G] are the Brake close frequencies applied during motoring and regenerating operation.

Drive gives relay output signal for close when the creep frequency is lower than [ADV-47 BR Eng Fr] or [ADV-48 BR Eng Fr G] as shown below. There will be a mechanical output delay between the electric brake relay output and the actual motor brake signal. If an impact occurs when the mechanical brake is closed first, such as a red line, set the brake close frequency [ADV-47 BR Eng Fr] or [ADV-48 BR Eng Fr G] lower than the set value. If the mechanical brake is closed late, such as the blue line, after the PWM of drive will be shut off and brake closed, the roll back will occur. In this case, set brake close frequency [ADV-47 BR Eng Fr] or [ADV-48 BR Eng Fr G] higher so that the mechanical brake output closes more quickly.

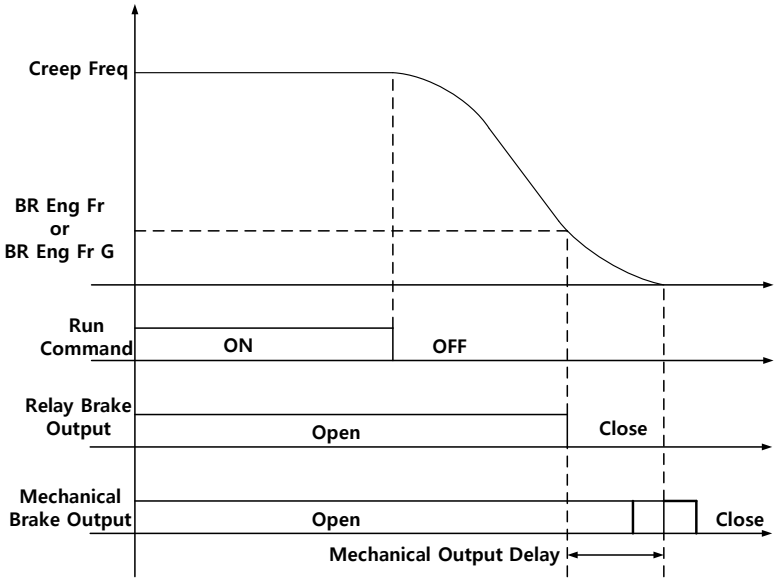


Fig. 11 Stop mode operation

③ Since the DC brake and brake close functions are interrelated, observe the motor stoppage and set the brake close frequency [ADV-47 BR Eng Fr] or [ADV-48 BR Eng Fr G] and [ADV-15 Dc-Brake Time] appropriately. It is possible to mitigate the shock when stopped. At this time, it is recommended that [ADV-17 Dc-Brake Freq] should be lower than [ADV-47 BR Eng Fr] or [ADV-48 BR Eng Fr G] as shown below.

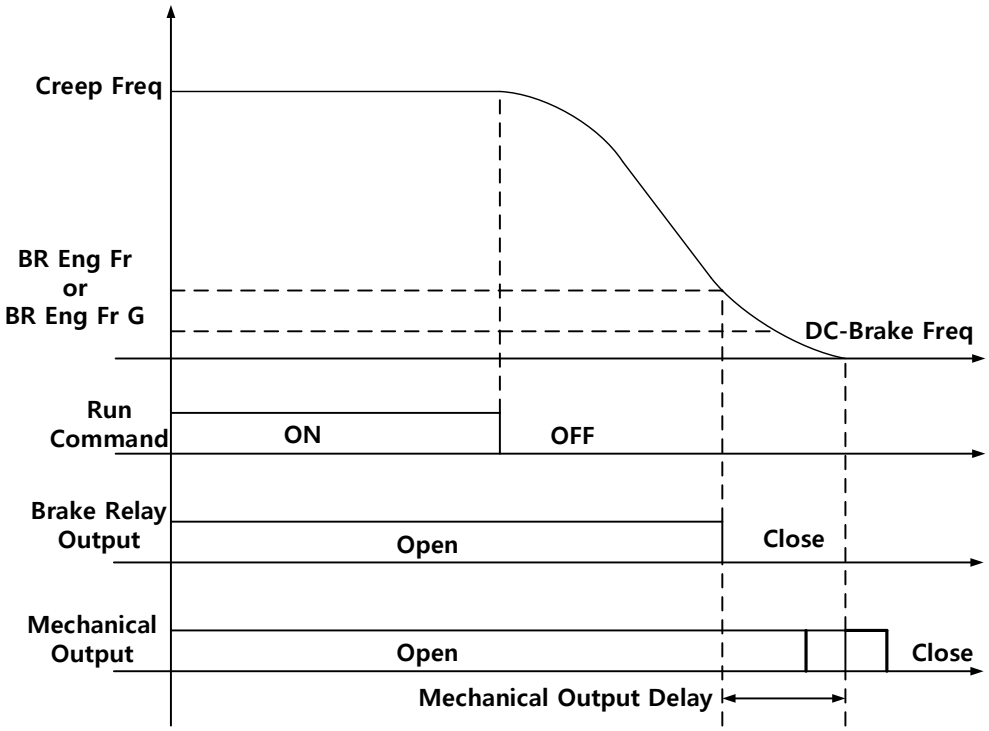
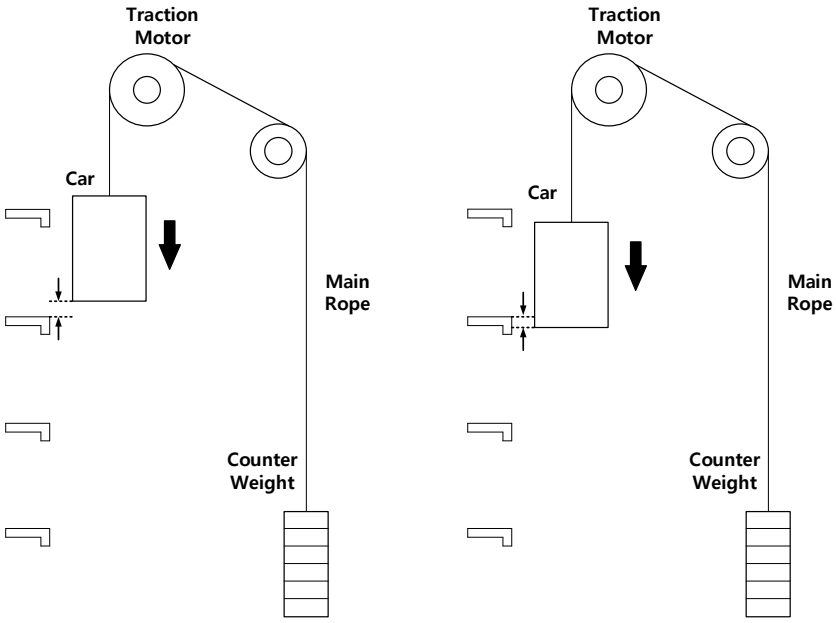


Fig. 12 Stop mode2 operation

5) [ADV-91 Slip(+) Freq] is standard slip compensation frequency to apply slip compensation gain values differently according to the value of this parameter. Normally, [ADV-91 Slip(+) Freq] should be more than creep frequency(Multi-step input).

6) [ADV-93 Slip(+) Gain-L] is slip compensation frequency gain value for motoring operation below [ADV-91 Slip(+) Freq] and [ADV-95 Slip(-) Gain-L] is slip compensation frequency gain value for generating operation below [ADV-91 Slip(+) Freq]. Those two parameters can be used to match leveling in elevator application as shown below.

● Example of how to set [ADV-93 Slip(+) Gain-L]

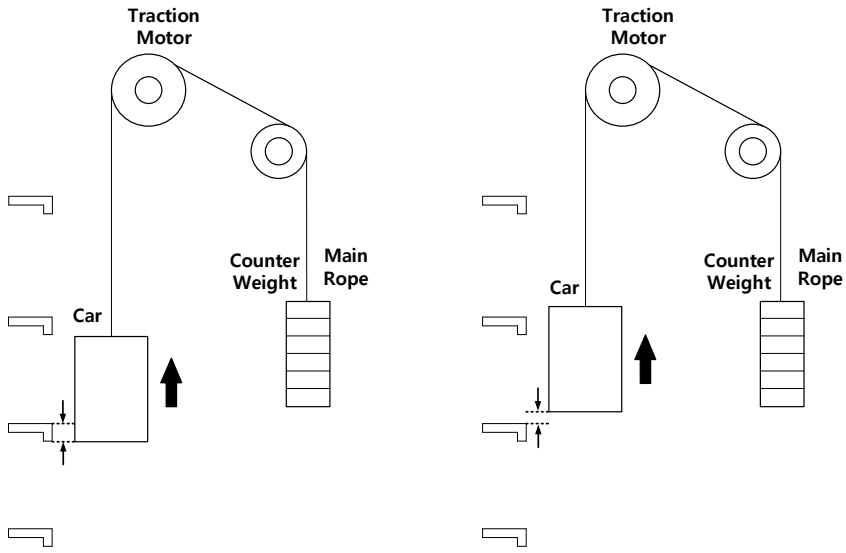


Increase ADV-93 Slip(+) Gain-L **Decrease ADV-93 Slip(+) Gain-L**

Fig. 13 motoring operation for E/L System

When the elevator car is going down without a passenger, this operation mode will be motoring operation. If the elevator car does not reach the floor and stops when elevator is going down, increase [ADV-93 Slip(+) Gain-L] value. And if the elevator car stops passing through the floor when elevator is going down, decrease [ADV-93 Slip(+) Gain-L] value to align the floor.

● Example of how to set [ADV-95 Slip(-) Gain-L]



Decrease ADV-95 Slip(-) Gain-L **Increase ADV-95 Slip(-) Gain-L**

Fig. 13 Generating operation for E/L System

When the elevator car is going up without a passenger, this operation mode will be generating operation. If the elevator car does not reach the floor and stops when elevator is going up, decrease [ADV-95 Slip(-) Gain-L] value. And if the elevator car stops passing through the floor when elevator is going up, increase [ADV-95 Slip(-) Gain-L] value to align the floor.

7) [ADV-96 Slip filter] is low pass filter for slip compensation frequency applied to the slip calculated by the slip compensation control and as the set values increases, response becomes slower but the stability increases. Conversely, the lower the set values, the faster the response but the less the stability. If the vertical vibration of the elevator car occurs during high-speed operation and low-speed operation, an appropriate value should be set for reducing vibration. However, mechanical vibration which requires mechanical repair could not be reduced by drive parameter tuning.

8) [ADV-92 Slip(+) Gain-H] is slip compensation frequency gain value for motoring operation above [ADV-91 Slip(+) Freq] and [ADV-94 Slip(-) Gain-H] is slip compensation frequency gain value for generating operation above [ADV-91 Slip(+) Freq]. Those two parameters can be used to improve ride comfort during acceleration and automatic high speed operation.

9) [ADV-98 Zero Dec Sel] should be set to " 1: Zero Dec Mode1". When run command is off, [BAS-71 Dec Time-1] of deceleration, [ADV-18 Stop S Start] and [ADV-19 Stop S End] of s-curve will be applied from creep speed operation to stopping as shown below.

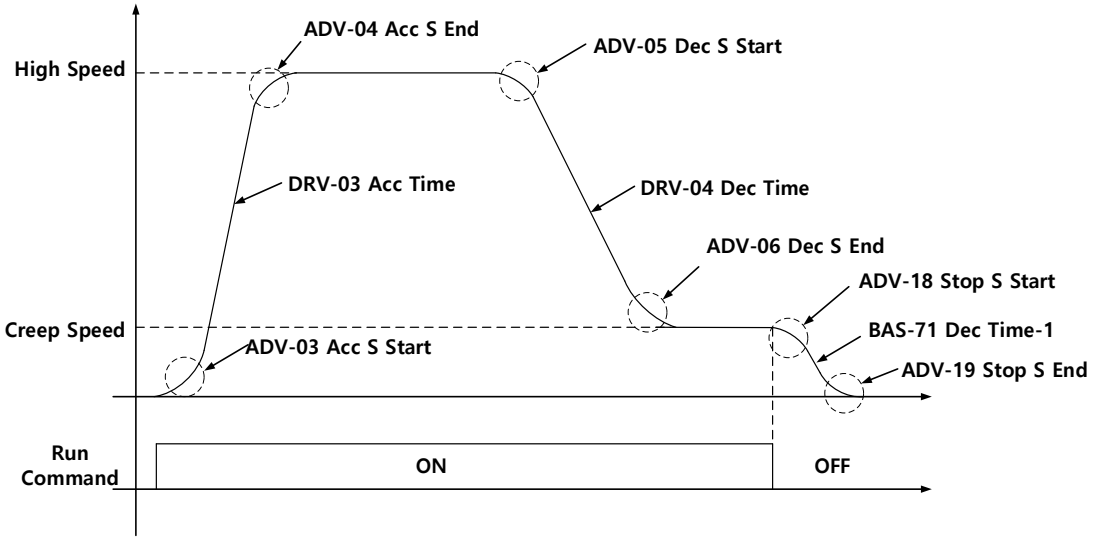


Fig.14 Zero Dec Mode1 operation

3.4 Input Terminal Block Function group (PAR→In)

Those parameters of input terminal group below are related to elevator performance.

Grp	No	Description	LCD Display	Default	Unit
IN	65	P1 terminal function setting	P1 Define	Fx	-
	66	P2 terminal function setting	P2 Define	Rx	
	67	P3 terminal function setting	P3 Define	RUN Enable	
	68	P4 terminal function setting	P4 Define	ARD Run	
	69	P5 terminal function setting	P5 Define	Speed-L	
	70	P6 terminal function setting	P6 Define	Speed-M	
	71	P7 terminal function setting	P7 Define	Speed-H	

1) In the IN group, the forward / reverse operation commands (FX, RX), emergency stop (BX), trip reset (RST), and multi-step speeds (Speed-L, Speed-M, Speed-H) can be set.

2) When the multi-step speed (Speed-L, Speed-M, Speed-H) is set, the manual operation speed should be set to the appropriate speed command frequency of [DRV-01 Cmd Frequency]. [BAS- 50 Step Freq1] ~ [BAS- 56 Step Freq7] will decide the automatic high and low speed operation.

3.5 Output Terminal Block Function group (PAR→Out)

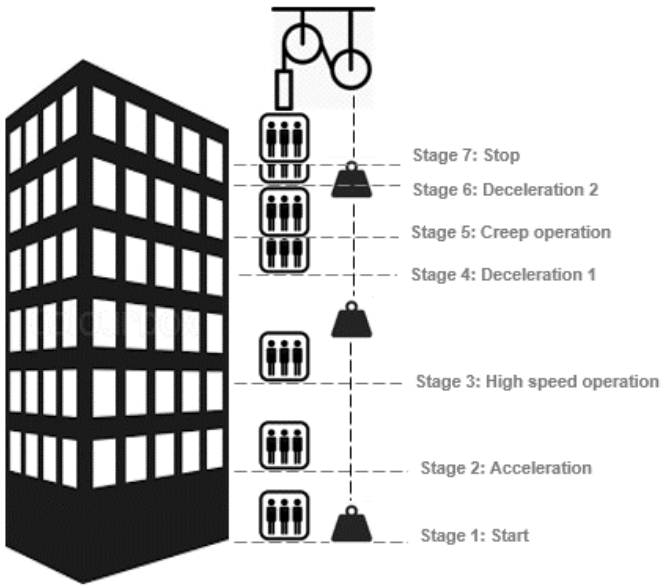
Those parameters of output terminal group below are related to elevator performance.

Grp	No	Description	LCD Display	Default	Unit
OUT	31	Multi-function relay 1 item	Relay 1	BR Control	-
	33	Multi-function output1 item	Q1 Define	Run	
	34	Multi-function relay 2 item	Relay 2	ALLS	
	35	Multi-function output2 item	Q2 Define	Steady	

1) [OUT-31 Relay 1], [OUT-33 Q1 Define], [OUT-33 Relay 2] and [OUT-35 Q2 Define] can be defined respectively. When the setting values is set to “BR Control”, [ADV-41 BR Rls Curr] ~ [ADV-47 BR Eng Fr] are activated.

4 Making Exact Floor Alignment and Smooth Ride

In the elevator system, there are 7 sequence of stages operations.



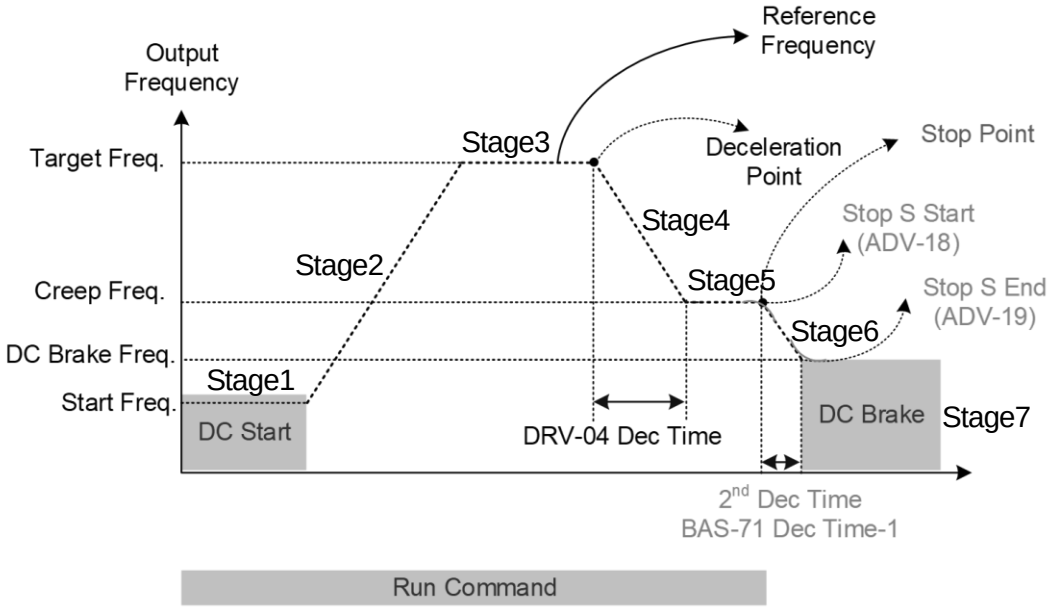


Fig.15 Typical elevator configuration

1. Stage 1: Start

1) When a shock occurs at start-up

Decrease the setting of [ADV-44 BR Rls Fwd Fr] and [ADV-45 BR Rls Rev Fr] with adjustment of [ADV-13 Dc Inj Level] after confirming that the motor brake is opening later than the motor speed.

Also set [ADV-07 Start Mode] to “DC-Start” and adjustment of [ADV-03 Acc S Start], [ADV-04 Acc S End] could be other ways.

2) When roll back occurs at start-up

Increase the setting value of [ADV-44 BR Rls Fwd Fr] and [ADV-45 BR Rls Rev Fr] after confirming that the motor brake is opened early.

3) When excessive current flows to the motor at start-up

Decrease the setting of [DRV-16 Fwd Boost] and [DRV-17 Rev Boost] by 0.5[%] as well as [DRV-27 ATB3 M_Gain] and [DRV-28 ATB3 G_Gain] by 5[%].

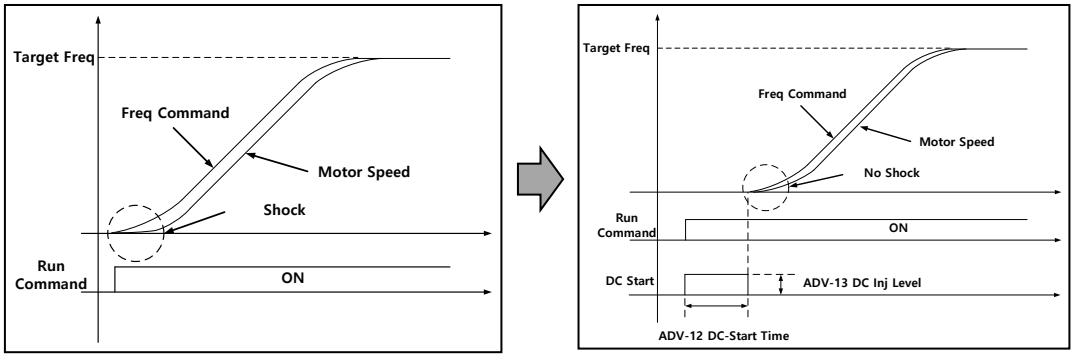


Fig.16 Start mode operation

2. Stage 2: Acceleration

1) When a vibration occurs at acceleration

Increase the [AVD-96 Slip Filter] by 100[msec]. And also decrease [ADV-92 Slip(+) Gain-H] and [ADV-94 Slip(-) Gain-H] by 30[%] or set both to 0[%] to make ride smooth as shown below.

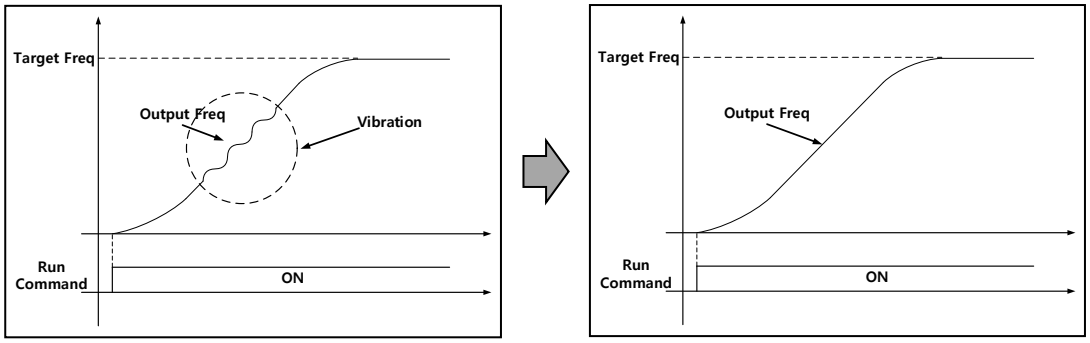


Fig.17 In case of vibration at acceleration operation

3. Stage 3: High speed operation

1) When a vibration occurs at high speed operation

Increase the [AVD-96 Slip Filter] by 100[msec]. And also set both [ADV-92 Slip(+) Gain-H] and [ADV-94 Slip(-) Gain-H] to 0[%] to make ride smooth as shown below

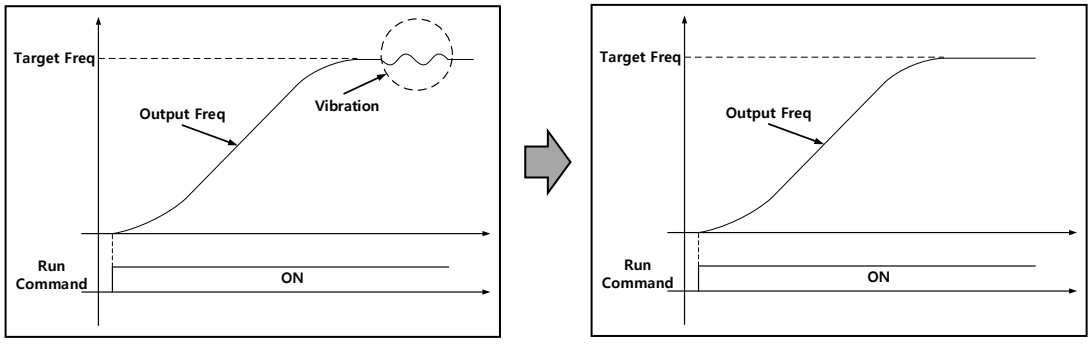


Fig.18 In case of vibration at high speed operation

4. Stage 4: Deceleration 1

1) When a vibration occurs at deceleration 1

Decrease the setting of [DRV-16 Fwd Boost] and [DRV-17 Rev Boost] and adjust the setting of [ADV-05 Dec S Start] and [ADV-06 Dec S End].

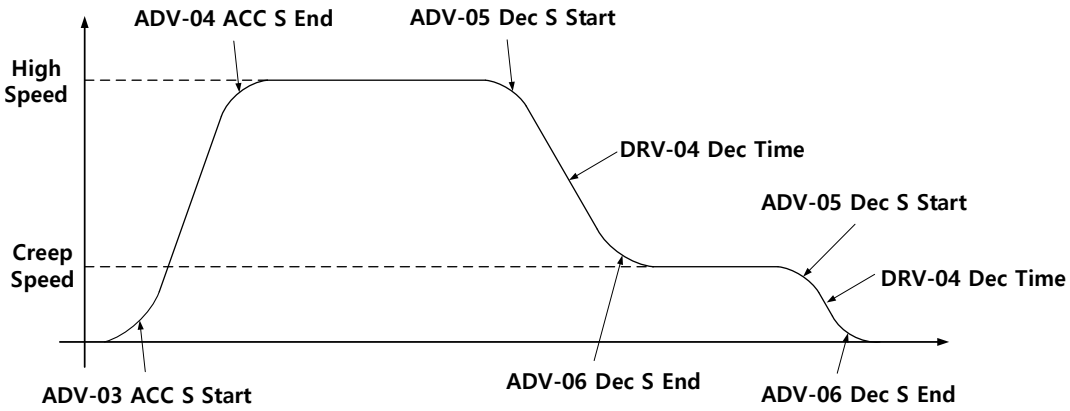


Fig.19 S-curve configuration

2) When a shock occurs during speed change from high speed operation to creep speed operation

In this case, a change occurs from motoring operation to regenerating operation. Increase the setting value of [ADV-96 Slip Filter]. Excessive setting value of [ADV-96 Slip Filter] can cause slow response due to the amount of slip compensation, which can shorten the normal operating time of creep speed. Also decrease [DRV-04 Dec Time] by 0.1[sec] with observation.

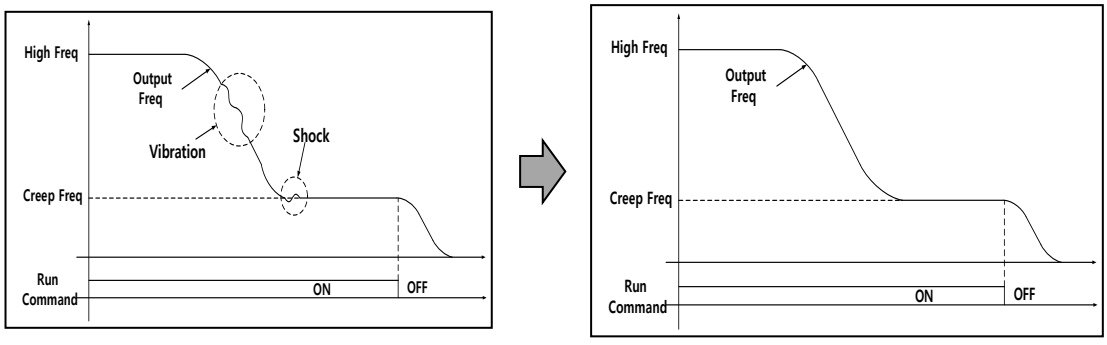


Fig.20 In case of vibration and shock at deceleration operation

5. Stage 5: Creep operation

1) When wrong floor alignment happened by creep operation

Increase the [AVD-96 Slip Filter] by 100[msec] and increase [DRV-04 Dec Time] by 0.1[sec]. Also there is another try to decrease the setting of [DRV-16 Fwd Boost] and [DRV-17 Rev Boost] by 0.5[%].

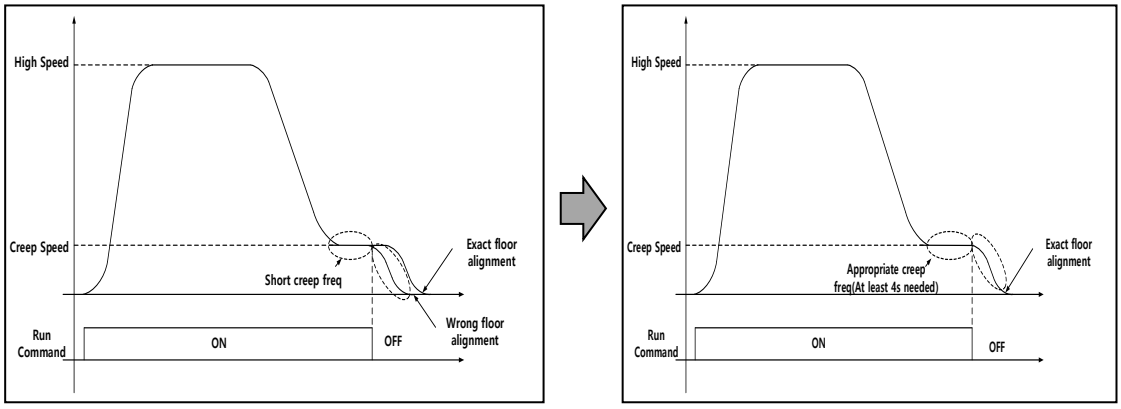


Fig.21 Adjust floor alignment

6. Stage 6: Deceleration 2

1) When wrong floor alignment happened by deceleration 2-1 (In case the run command is off at creep frequency)

[ADV-98 ZeroDec1Sel] should be set to “1: Zero Dec Mode1” when run command is off.

Adjustment of [BAS-71 Dec Time-1], [ADV-18 Stop S Start] and [ADV-19 Stop S End] are required. As the setting value increases, the implantation distance becomes longer. As the setting value decreases, the implantation distance decreases as shown below.

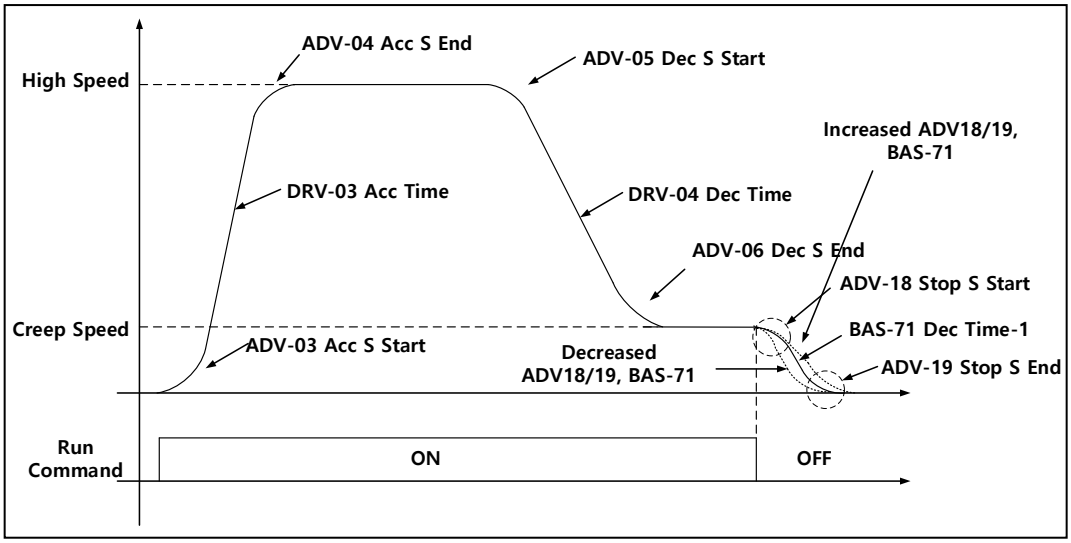


Fig.22 Deceleration2-1 Operation

2) When wrong floor alignment happened by deceleration 2-2 (In case the run command at creep frequency is on)

[ADV-98 ZeroDec1Sel] should be set to “2: Zero Dec Mode2” when run command is off.

Adjustment of [BAS-73 Dec Time-2], [ADV-18 Stop S Start] and [ADV-19 Stop S End] are required. As the setting value increases, the implantation distance becomes longer. As the setting value decreases, the implantation distance decreases as shown below.

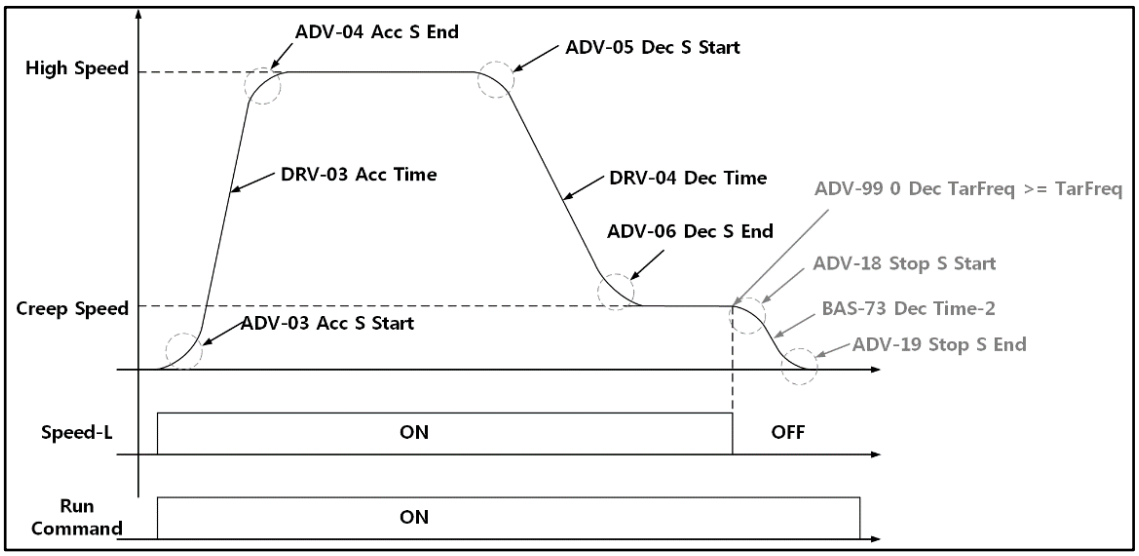


Fig.23 Deceleration2-2 Operation

7. Stage 7: Stop

1) When a shock occurs at stop

After confirming that the motor brake is closing early, decrease the setting value of [ADV-47 BR Eng Fr] and [ADV-48 BR Eng Fr G]. However, the DC Brake function can also be used and the [ADV-17 Dc-Brake Freq] should be set lower than [ADV-47 BR Eng Fr] and [ADV-48 BR Eng Fr G].

2) When roll back occurs at stop

After confirming that the motor brake is closing late, increase the setting value of [ADV-47 BR Eng Fr] and [ADV-48 BR Eng Fr G]. However, the DC Brake function is used and the [ADV-17 Dc-Brake Freq] is set lower than [ADV-47 BR Eng Fr] and [ADV-48 BR Eng Fr G].

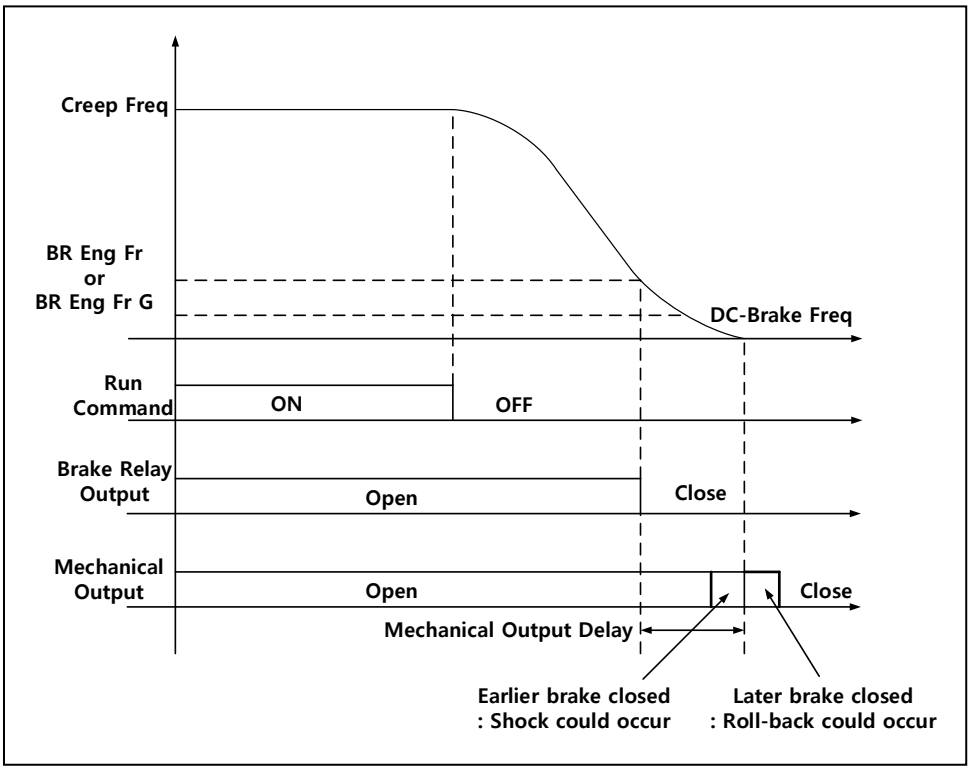


Fig.24 Brake control operation

3) When wrong floor alignment happened at stop

Refer to the example of how to set [ADV-93 Slip(+) Gain-L], [ADV-95 Slip(-) Gain-L].

Also [ADV-98 ZeroDec1Sel] function with [BAS-71 Dec Time-1], [ADV-18 Stop S Start] and [ADV-19 Stop S End] can be used. (Refer to Deceleration 2 part)

It is assumed that there is no slack in the rope due to the load and the installation positions of shield plates or magnets installed in the respective layers are provided at the same position for each layer. Even if the car of the elevator stops at another position in each layer and if the conception level error due to the load variation is within a certain range, the position of the shield plate or magnet is adjusted to finally adjust the level of the conception. The mechanical leveling error caused by the sagging of the rope is considered to take action of changing the position of the shield plate or magnet because there is no way to solve it by the electrical control.

5 Function of Open Loop Elevator

This chapter explains the elevator functions in detail.

5.1 Dedicated parameter defaults

Grp	No	Description	LCD Display	Range	Default
dr	03	Acceleration time	Acc Time	0.0~600.0(s)	2.5 sec
	04	Deceleration time	Dec Time	0.0~600.0(s)	2.2 sec
	09	Command source	Control Mode	0 V/F 2 Slip Compen 4 IM Sensorless	2: Slip Compen
	15	Torque boost options	Torque Boost	0 Manual 1 Auto1 2 Auto2 3 Auto3	3: Auto3
	19	Start frequency	Start Freq	0.01~10.00	0.01Hz
	26	Auto torque boost filter	ATB3 filter	100~1000	100msec
	27	Auto torque boost monitoring gain	ATB3 M Gain	0.0~300.0	50.0%
	28	Auto torque boost generating gain	ATB3 G Gain	0.0~300.0	50.0%
bA	10	Input power frequency	60/50 Hz Sel	0 60Hz 1 50Hz	1: 50Hz
	15	Motor rated	Rated Volt	170~480(V)	380V
	19	Input power	AC Input Volt	170~480(V)	380V
	70	Multi-step acceleration time1	Acc Time – 1	0.0~600.0(s)	2.5 sec
	71	Multi-step deceleration time1	Dec Time – 1	0.0~600.0(s)	2.2 sec
Ad	01	Acceleration pattern	Acc Pattern	0 Linear 1 S-curve	1: S-curve
	02	S-curve acceleration start point gradient	Dec Pattern	0 Linear 1 S-curve	1: S-curve
	03	S-curve acceleration start point gradient	Acc S Start	1~100(%)	70 %
	04	S-curve acceleration end point gradient	Acc S End	1~100(%)	40 %

Grp	No	Description	LCD Display	Range	Default
	05	S-curve deceleration start point gradient	Dec S Start	1~100(%)	60 %
	06	S-curve deceleration end point gradient	Dec S End	1~100(%)	40 %
	08	Stop Mode	Stop Mode	0 Dec 1 Dc-Brake 2 Free-Run 4 Power Braking	1: DC-Brake
	12	DC braking time at startup	Dc-Start Time	0.00~60.00(s)	0.0 sec
	13	Amount of applied DC	Dc Inj Level	0~200(%)	150%
	18	S-curve operation starts at stop	Stop S Start	1~200(%)	55%
	19	S-curve operation ends at stop	Stop S End	1~200(%)	45%
	91	Slip compensation comparison frequency	Slip (+) Freq	0.00~60.00(Hz)	8Hz
	92	Motoring high speed slip compensation frequency gain	Slip(+) Gain-H	0~1000(%)	100%
	93	Motoring low Speed slip compensation frequency gain	Slip(+) Gain-L	-1000~1000(%)	110%
	94	Regenerating high speed slip compensation frequency gain	Slip(-) Gain-H	0~1000(%)	100%
	95	Regenerating low-speed slip compensation frequency gain	Slip(-) Gain-L	-1000~1000(%)	90%
	96	Slip compensation frequency LPF filter	Slip Filter	0~10000(msec)	700msec
	98	Selection of zero deceleration	Zero Dec Sel	0 None 1 Zero Dec Mode1 2 Zero Dec Mode2	1: Zero Dec mode1

Grp	No	Description	LCD Display	Range	Default
Cn	04	Carrier frequency	Carrier Freq.	2.0~ 13.0(kHz)	7kHz
In	65	P1 terminal function setting	P1 Define	0~52 (Refer to 6.Table of Functions)	1:FX
	66	P2 terminal function setting	P2 Define		2:RX
	67	P3 terminal function setting	P3 Define		13: Run Enable
	68	P4 terminal function setting	P4 Define		29: ARD Run
	69	P5 terminal function setting	P5 Define		7: Speed-L
	70	P6 terminal function setting	P6 Define		8: Speed-M
	71	P7 terminal function setting	P7 Define		9: Speed-H
OU	31	Multi-function relay 1 item(Relay 2)	Relay 1	0~40 (Refer to 6.Table of Functions)	35: BR Control
	33	Multi-function open collector output 1 item(Q1)	Q1 Define		14: Run
	36	Multi-function relay 5 item(Relay 5)	Relay 5		29: Trip
	37	Multi-function open collector output 2 item(Q2)	Q2 Define		29: Trip
Pr	05	Input/output open-phase protection	Phase Loss Chk	bit 00~11 01 Output open phase 10 Input open phase	00

5.2 Slip compensation function for elevator

Slip is the deviation between the set frequency (synchronous speed) and the actual rotation speed of the motor. When operating an open-loop elevator, if the operating load increases due to an increase in the number of passengers, etc., a difference may occur between the rotation speed of the motor and the set frequency, so the output error is compensated through the slip compensation function. In order to estimate the position and speed information for use of the elevator-specific slip compensation function, setting the motor name plate information (Rated Volt, Base Freq, Rated Slip, Pole Number) and perform a stationary Auto Tuning (Lsigma, Rs, Tr) first to obtain those information is required.

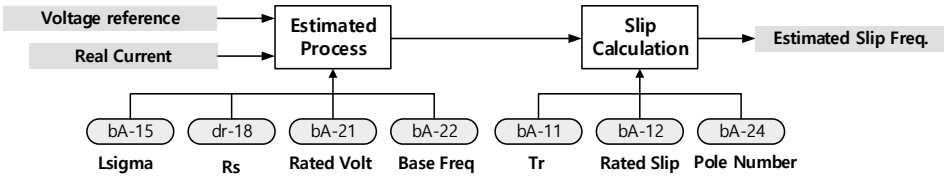
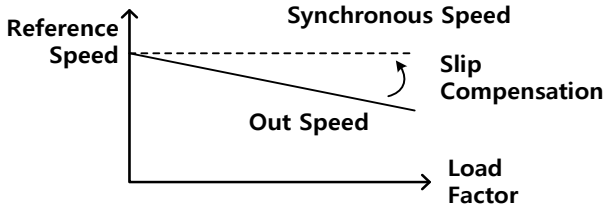


Fig. 25 Slip compensation estimation block diagram

Grp	No	Description	LCD Display	Range		Default	Unit
dr	09	Control mode	Control Mode	2	Slip Compen.	-	-
Ad	91	Slip compensation comparison frequency	Slip(+) Freq.	8.00		0.00~60.00	Hz
	92	Motoring high speed slip compensation frequency gain	Slip(+) Gain-H	100		0~1000	%
	93	Motoring low speed slip compensation frequency gain	Slip(+) Gain-L	110		1000~1000	%
	94	Regenerating high speed slip compensation frequency gain	Slip(-) Gain-H	100		0~1000	%
	95	Regenerating low-speed slip compensation frequency gain	Slip(-) Gain-L	90		1000~1000	%
	96	Slip compensation frequency LPF filter	Slip Filter	700		0~10000	msec
bA	20	Selection of auto tuning	Auto Tuning	2	All(Stdstl)	-	-

Elevator dedicated slip compensation operation setting details

Parameter	Description
dr.09 Control Mode	To use the elevator-only slip compensation operation, set the dr.09 to 2 (Slip Compen.). Refer to the slip compensation estimation block above, and motor nameplate information and static auto-tuning parameter information are required.  Fig. 6 Slip Compensation
bA.20 Auto Tuning	To obtain the motor parameters required for slip compensation, set 2 (Stdstl) to perform stationary auto tuning.
Ad.91 Slip (+) Freq.	Set the elevator slip frequency value.
Ad.92 Slip(+) Gain-H	This is a high-speed slip compensation frequency gain value during motoring operation. This parameter is applied within the range exceeding the frequency set in Ad.98 Slip Gain Freq. Since it is set for the elevator motor, set it to the default value of 100%.
Ad.93 Slip(+) Gain-L	This is the low-speed slip compensation frequency gain value during motoring operation. This parameter is applied within the range below the frequency set in Ad-98 Slip Gain Freq. Since it is set for the elevator motor, set it to the default value of 110%.
Ad.94 Slip(-) Gain-H	This is a high-speed slip compensation frequency gain value during regenerative operation. This parameter is applied within the range exceeding the frequency set in Ad-98 Slip Gain Freq. Since it is set for the elevator motor, set it to the default value of 100%.
Ad.95 Slip(-) Gain-L	This is the low-speed slip compensation frequency gain value during regenerative operation. This parameter is applied within the range below the frequency set in Ad-98 Slip Gain Freq. Since it is set for the elevator motor, set it to the default value of 90%.
Ad.96 Slip(-) Gain-L	When applying the low pass filter (LPF) of the slip compensation frequency, set the filter time constant.

5.3 Brake sequence function

If the speed command is changed to 0 to stop the elevator in normal operation, the elevator may be pushed when the elevator is stopped due to mechanical delay factors, etc., which may reduce the ride comfort of passengers on elevator. Therefore, when the elevator is stopped, a brake sequence suitable for elevator operation is supported to ensure a comfortable ride. There are two supported brake sequences 1 and 2. They are selected and used according to the type of the upper controller of the operating system.

5.3.1 Brake sequence 1 operation

Elevator operation is operated while the operation command and speed command are simultaneously applied. When the operation command is off, the drive starts to decelerate to 0Hz. During deceleration, when the driving speed reaches the frequency of BR Eng Fr(Ad.47), the closing signal outputs to the brake control after the Engage delay(Ad.46) time.

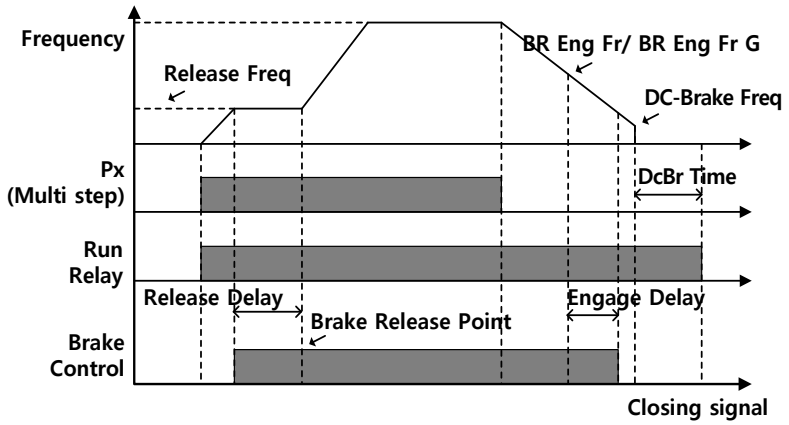


Fig. 26 Brake Sequence 1

If the Brake Eng Fr(Ad.47) value higher than DC Brake Fr(Ad.17) is set and the brake closing delay time (BR Eng Dly) is adjusted as user set, the brake control closing signal outputs before the decelerated frequency reaches the DC brake start frequency (DC Brake Freq). Therefore, even if there is a mechanical delay, it is possible to reduce the elevator's being pushed or roll-back when the brake is closed. If the brake closing delay time (BR Eng Dly) continues even after DC Brake Freq, the drive supplies DC voltage to the motor for the time set in DC BR Time(Ad.15).

Grp	No	Description	LCD Display	Range		Default	Unit
dr	50	Brake control selection	BR Con Sel	0	BR ConMode1	0~1	-

Detailed information about brake sequence 1

Parameter	Description
dr.50 BR Con Sel	Select the brake control mode. To use Break Sequence 1, set this value to 0:BR ConMode1.
Ad.15 Dc-Brake Time	The time set to supply DC voltage to the motor
Ad.16 Dc-Brake Level	DC braking amount can be adjusted. The setting value is based on the motor rated current.
Ad.17 Dc-Brake Freq	DC braking frequency
Ad.46 BR Eng Dly	Sets the brake closing delay time.
Ad.47 BR Eng Fr	Sets the brake closing frequency. When this frequency is reached at the brake closing frequency after drive starts deceleration, DC braking starts.
Ad.48 BR Eng Fr G	Sets the brake closing frequency during regeneration. When this frequency is reached at the brake closing frequency after the drive starts deceleration, DC braking starts.
Ad.98 ZeroDecMode	Select the brake control mode.

5.3.2 Brake sequence 2 operation

When operating an elevator, it is common for both run command and speed command to be applied at the same time. But in some controllers, those two commands are applied separately. In the case of using such a host controller, if the operation command is turned on without the speed command, the brake may be open and it may be a safety problem. Provides this DC brake sequence while retaining the existing sequence so that it can also be applied to crane loads using the same sequence.

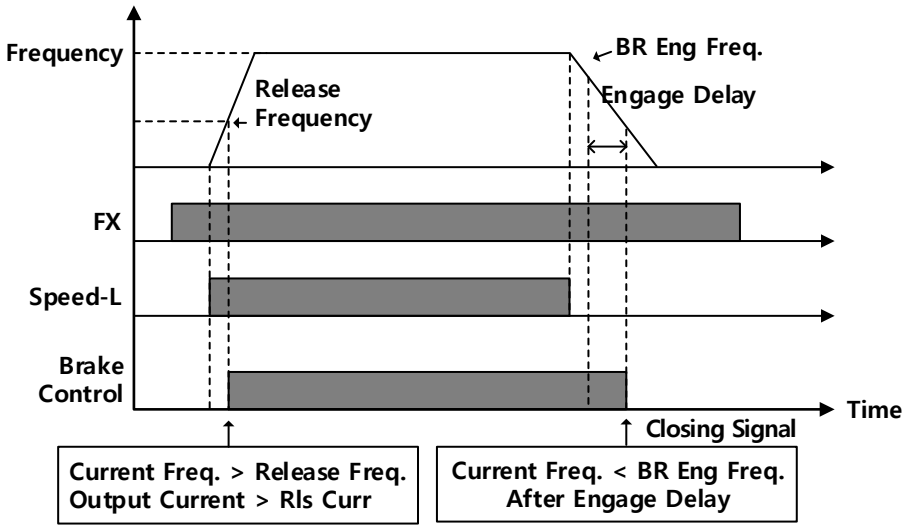


Fig. 27 Brake Sequence 2

When the operating frequency command Speed-L is turned off while the signal FX is On during operation and the speed decreases to 0Hz, if the current operating frequency is less than the value of Brake Eng Fr(Ad.76), the brake control is closed after the brake closing delay time (BR Eng Dly) and the signal is output.

Grp	No	Description	LCD Display	Range		Default	Unit
dr	50	Brake control selection	BR Con Sel	1	BR ConMode2	0~1	-

Detailed information about brake sequence 2

Parameter	Description
dr.50 BR Con Sel	Select 1:BR ConMode2 in the brake control mode to use Break Sequence 2.
Ad.46 BR Eng Dly	Set the brake closing delay time.

5.4 Zero Dec Sel function

This is a function that enables smooth deceleration when the elevator stops operating to ensure the comfort of the elevator passengers. The drive decelerates to zero speed to stop elevator operation. And when the operating frequency reaches the creep frequency set in the drive, it decelerates for a time corresponding to Dec Time-1 set in bA-71.

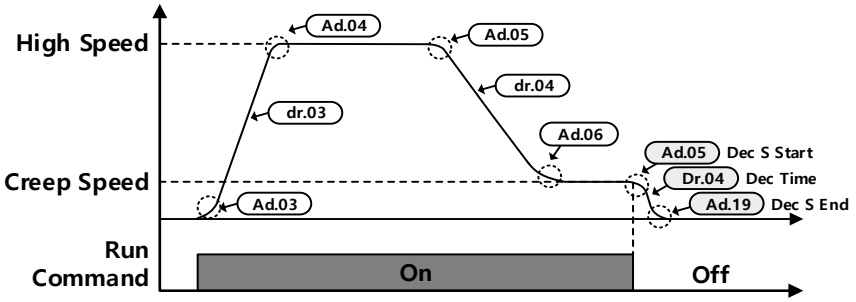


Fig. 28 Zero Dec Sel(None)

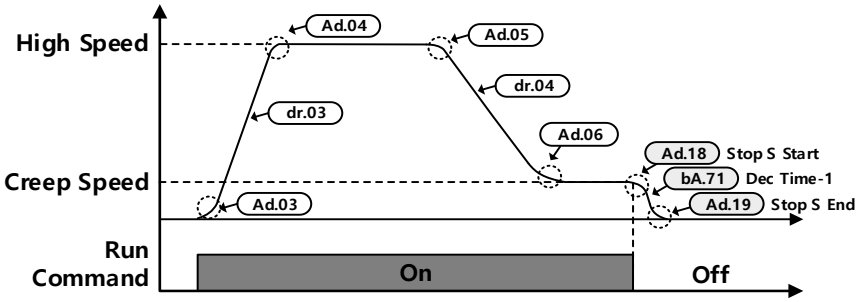


Fig. 29 Zero Dec Sel(Mode 1)

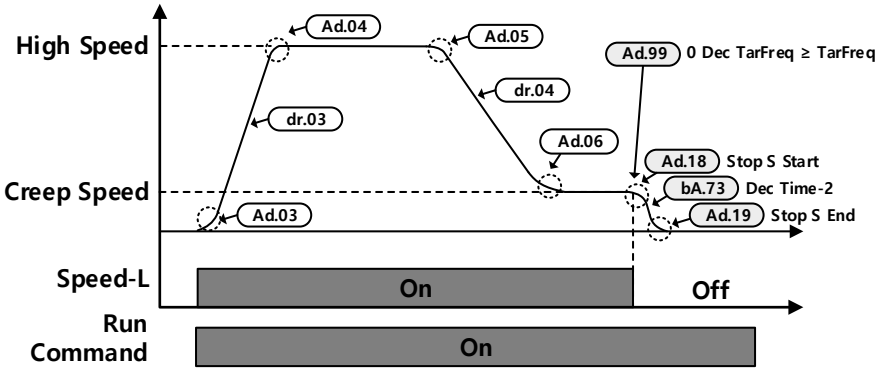


Fig. 30 Zero Dec Sel(Mode 2)

Grp	No	Description	LCD Display	Range		Default	Unit
Ad	98	Selection of zero deceleration	Zero Dec Sel	0	None	0~2	-
				1	Zero Dec Mode1		
				2	Zero Dec Mode2		
	99	zero deceleration frequency setting	0 Dec TarFreq.	0.00		0~maxFreq	Hz

Detailed information about Zero Dec Sel

Parameter	Description	
dr.50 BR Con Sel	Select the brake control mode.	
bA.71 Dec Time-1	Set the deceleration time in Zero Dec Mode 1.	
bA.73 Dec Time-2	Set the deceleration time in Zero Dec Mode 2.	
Ad.98 ZeroDec Sel	0: None	Select the normal brake control mode.
	1: Zero Del Mode 1	Select the Zero Del Mode1 brake control mode.
	2: Zero Del Mode 2	Select the Zero Del Mode2 brake control mode.
Ad.99 0 Dec TarFreq. (Only for Zero Del Mode2)	Set the target frequency reference for zero speed deceleration. This parameter can be set only when Ad.98-ZeroDecMode is set to 2-Zero Dec Mode2.	

5.5 ARD(Auto Rescue Device) function

ARD (Auto Rescue Device) is the operation to move to the nearest floor by switching to emergency power such as UPS when the elevator stops because the main power is not supplied due to a power outage. When the ARD operation signal is given from the external controller to the drive, operation is possible without a low voltage trip at 220Vac power according to the Fx/Rx command, and an ARD operation warning display appears on the keypad. During ARD operation, because the torque boost required for normal operation is used, a low voltage trip may occur due to a drop in DC link voltage, so the torque boost parameter required for ARD Run start can be independently set.

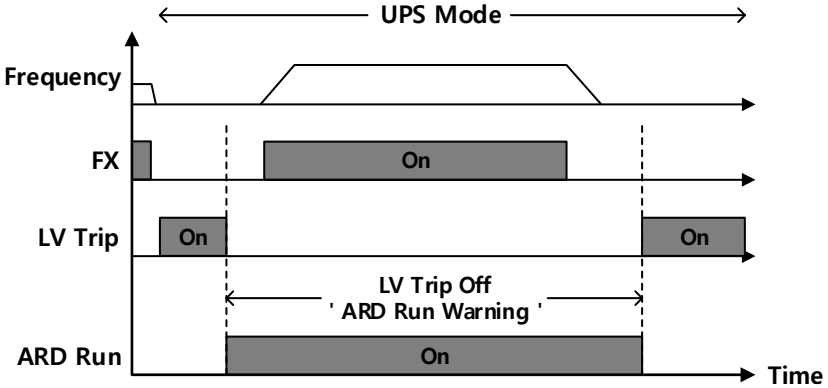


Fig. 31 ARD Run Time Chart

Grp	No	Description	LCD Display	Range	Default	Unit
dr	30	ARD torque boost	ARD Torque Boost	Auto3	Manual~Auto3	-
	31	ARD forward boost	ARD Fwd Boost	4.0	4.0~15.0	%
	32	ARD reverse boost	ARD Rev Boost	4.0	4.0~15.0	%
	33	ARD auto torque boost filter	ARD ATB3 Filter	100	100~1000	ms
	34	ARD auto torque boost motoring gain	ARD ATB3 M_Gain	50	0.0~300.0	%
	35	ARD auto torque boost regenerating gain	ARD ATB3 G_Gain	50	0.0~300.0	%
	36	ARD acceleration time	ARD Acc Time	2.5	0.0~600.0	sec
	37	ARD deceleration time	ARD Dec Time	2.2	0.0~600.0	sec
bA	38	No load current	ARD Noload Curr	-	-	-
Ad	39	ARD Start mode	ARD Start Mode	Acc	Acc~DC-	Msg

Grp	No	Description	LCD Display	Range		Default	Unit
						start	
	40	ARD Stop Mode	ARD Stop Mode	DC-Brake		Dec~Power Braking	Msg
	52	ARD operating speed	ARD Freq	5		Start Freq~6.67	Hz
	57	ARD Priority	ARD Priority	1	Yes	0~1	Msg

Detailed information about ARD operation

Parameter	Description
Ad.52 ARD Freq.	Set ARD operating speed.
Ad.57 ARD Priority	Set ARD priority.

Caution

The voltage range available for ARD&ALLS function operation is AC input voltage 200~240Vac.

5.6 ALLS function

ALLS (Automatic Light Load Search) operation is a function to find lighter load direction and operate the nearest floor the load is applied when the elevator is operating ARD. User can use this function by enabling Ad.52 (ALLS Enable). When the ALLS function is activated, the drive operates the elevator in the forward and reverse directions during ARD operation, then compares the magnitude of the output current and performs the elevator operation in the direction where the current is small.

In case of ALLS operation (T1), after 2 seconds, the drive performs random operation (T2) in the forward and reverse directions. During forward/reverse operation, it operates at constant speed as long as the time set in Ad.57 (ALLS Time) and detects the load size during that time. When the load size detection is completed (T3) and the ALLS process is completed (T4), the drive starts operating in the direction of light load. If the command is lost during operation (T5), the drive stops ALLS operation and decelerates the motor to stop.

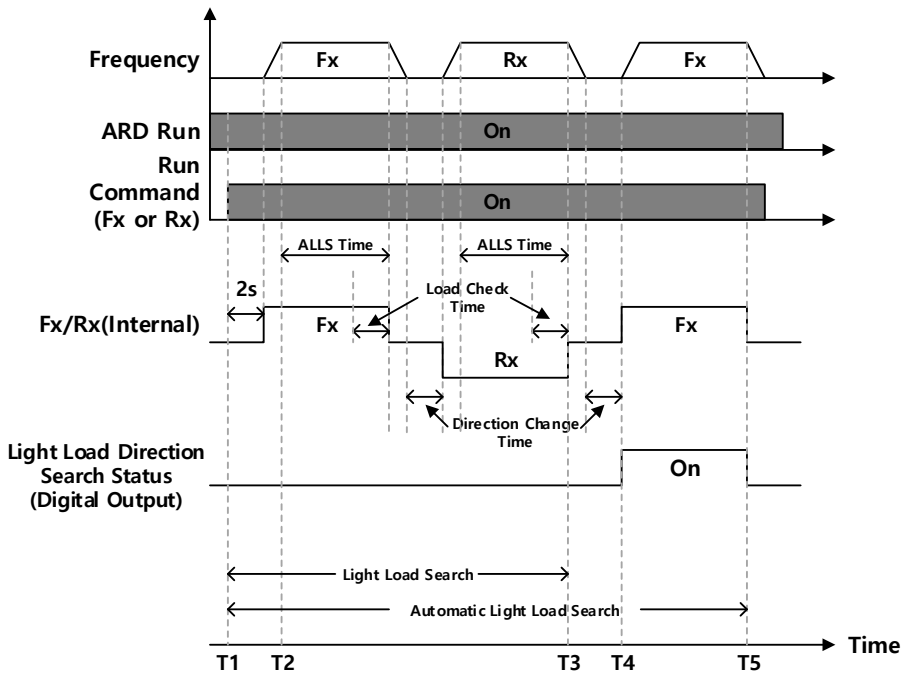


Fig. 32 The light load is in the Fx direction when performing ALLS.

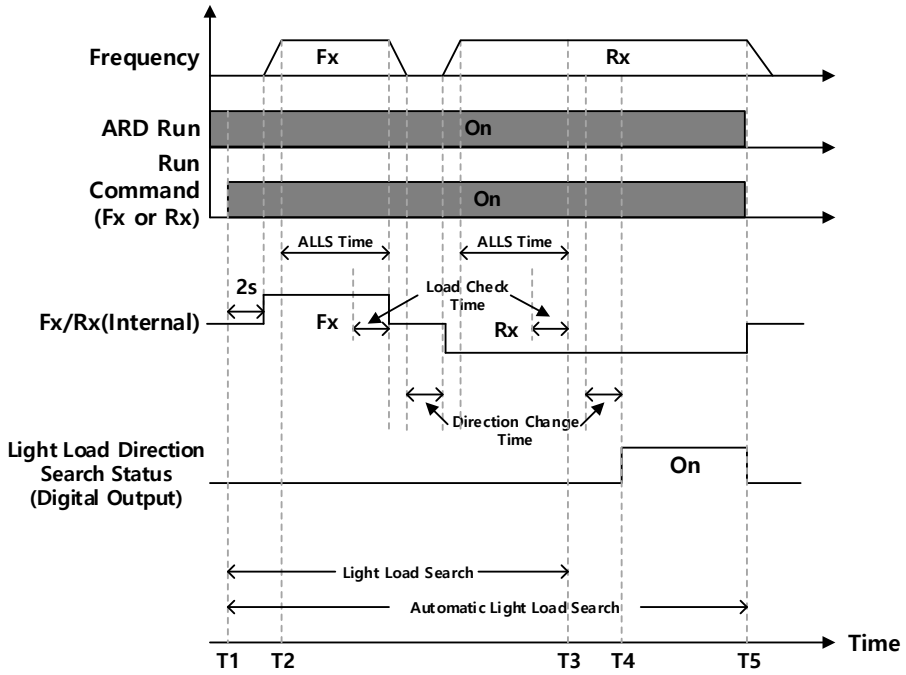


Fig. 33 The light load is in the Rx direction when performing ALLS.

Grp	No	Description	LCD Display	Range		Default	Unit
Ad	52	ARD operating frequency	ARD Freq	5		Start Freq~6.67	Hz
	53	Automatic Light Load Search enable selection	ALLS Enable	0	No	0~1	Msg
	54	Stop time when switching Fx to Rx or Rx to Fx	ALLS Time	3.0		1.0~5.0	sec
	55	Automatic Light Load Search time	ALLS LoadChk Tm	1.0		0.5~ALLS Time	sec
	56	Light Load judgment time	ALLS DirChgTm	1.0		1.0~3.0	sec
	57	ARD priority	ARD Priority	1	Yes	0~1	Msg

Detailed information about ARD&ALLS

Parameter	Description
Ad.52 ARD Freq	Set operation speed during ARD operation.
Ad.53 ALLS Enable	Set this value to 1 to use ALLS.
Ad.54 ALLS Time	In ALLS operation, stop time can be set to change the operation direction.
Ad.55 ALLS LoadChk Tm	During ALLS operation this time is required to determine load checking.
Ad.56 ALLS DirChgTm	During ALLS operation this time is required to determine direction.
Ad.57 ARD Priority	Set ARD priority

Caution

When the ARD&ALLS function is operated, it is recommended to apply the FX or RX operation after about 500ms after applying the multi-function input ARD Run. During ALLS function operation, Rx could operate exceptionally first in some cases .

5.7 Run multi-function output during auto tuning

When performing auto-tuning, the user can select whether to use Run Relay signal or not. When this function is activated, a multi-function output signal is generated even during auto tuning.

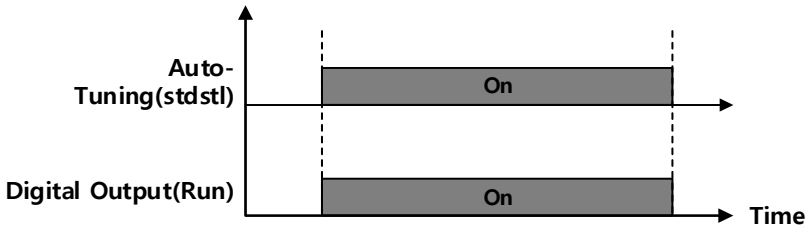


Fig. 34 Digital Output (Run) Time Chart

Grp	No	Description	LCD Display	Range		Default	Unit
dr	78	Selection of Run relay output during auto tuning	TuneRunRly Sel	0	No	0~1	Msg
				1	Yes		

5.8 Prohibited function

Please enable the Pr.60 Prohibit Sel to Yes to use the restricted use function. Counting is done by day. Please enter the date you want in Pr.61 Warning Day and Pr.62 Prohibit Day. For example, if you enter 3 days each, a warning alarm occurs 3 days later, and a trip occurs 3 additional days later.

This function calculates the time based on power given to the drive. A warning occurs when power is applied to the drive after Pr.61 date. When LCD keypad is used, “Prohibit Warn” is displayed and when LED keypad is mounted, “PHBW” is displayed. If the time exceeds Pr.61 + Pr.62 days, trip occurs. If drive is in operation, free-run stops and operation is not possible. At this time, when LCD keypad is used, “H/W-Diag” is displayed, Inveter State of detailed information is displayed as “Prohibit Trip”, and when LED keypad is used, “PBHT” is displayed. To cancel the use of this function, enter password in dr.79 (PH Lock) to make the UNLOCK state, then turn off the power of the drive and turn it on again to enable drive operation.

Pr.61~63 are displayed when Pr.60 is set to 1(Yes). Safety accident may occur.

Grp	No	Description	LCD Display	Range	Default	Unit
dr.	79	Parameter lock setting	PH Lock	0~65535	-	-
Pr	60	Selection to use the function	Prohibit Sel	0~1	0: No	-
Pr	61	Warning setting day	Warning Day	1~1440	365	-
Pr	62	Number of days for prohibition of operation	Prohibit Day	0~30	30	-
Pr	63	Number of operating days	Operate Day	-	-	-

Caution

When all the set periods have elapsed, the drive operation stops, and a safety accident may occur.

If a warning message occurs, please contact LS ELECTRIC distributor.

5.9 Multiple EL I/O

Grp	No	Description	LCD Display	Range	Default
In	65	P1 terminal function setting	P1 Define	0~52 (Refer to 6.Table of Functions)	1:FX
	66	P2 terminal function setting	P2 Define		2:RX
	67	P3 terminal function setting	P3 Define		13: Run Enable
	68	P4 terminal function setting	P4 Define		29: ARD Run
	69	P5 terminal function setting	P5 Define		7: Speed-L
	70	P6 terminal function setting	P6 Define		8: Speed-M
	71	P7 terminal function setting	P7 Define		9: Speed-H
OU	31	Multi-function relay 1 item(Relay 2)	Relay 1	0~40 (Refer to 6.Table of Functions)	35: BR Control
	33	Multi-function open collector output 1 item(Q1)	Q1 Define		14: Run
	36	Multi-function relay 5 item(Relay 5)	Relay 5		29: Trip
	37	Multi-function open collector output 2 item(Q2)	Q2 Define		29: Trip

Control Board Switches

Switch	Description
SW1	NPN/PNP mode selection switch
SW3	analog voltage/current output terminal selection switch
SW4	Terminating Resistor selection switch

Parameter	Description
OU.41 DO Status	Displays the output terminal status of the terminal block. It consists of 8 bits, the 7th bit is Relay5(A2,C2), and the 8th bit is Q2(Q2,EG2).
OU.52 DO NC/NO Sel	Select the bit to Normal Open or Close status. It consists of 8 bits, the 7th bit is Relay5 and the 8th bit is Q2.
dr99. IO H/W Type	The type of IO in the drive is automatically selected as 3-MultipleEL IO for elevator application. 3 | MultipleEL IO

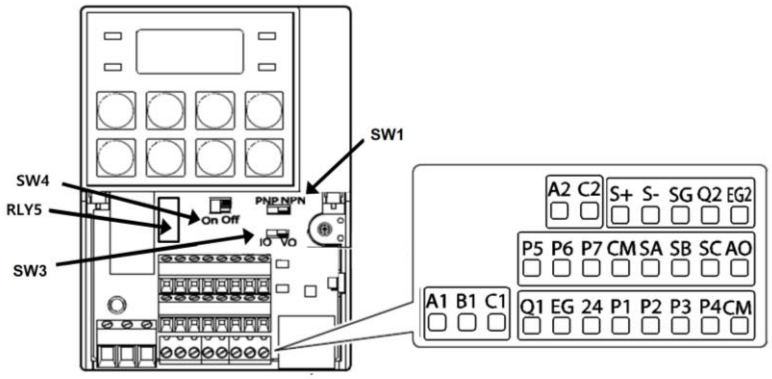


Fig. 35 Multiple EL I/O

5.10 Zero Run DC function

When the Zero Run DC function is activated, the drive performs DC operation even if the drive speed reaches 0Hz unless the operation command is turned off. When the sequence is different from the elevator controller, DC output is possible even if Run command is on.

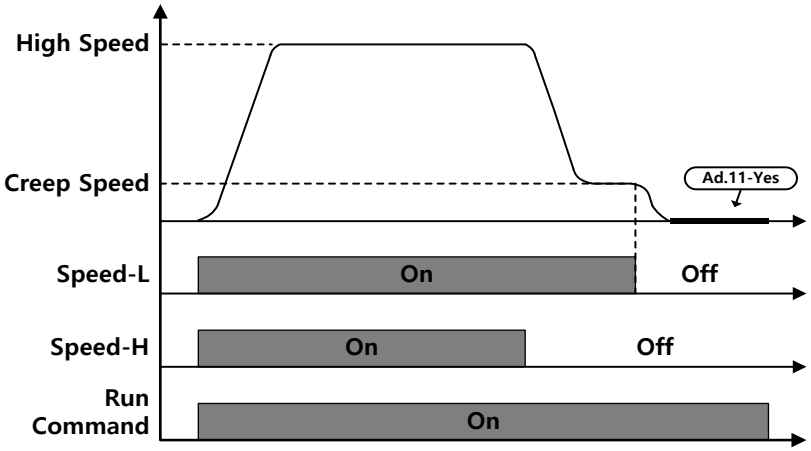


Fig. 36 Zero Run DC function Time Chart

Grp	No	Description	LCD Display	Range	Default	Unit
Ad	11	Selection of enable zero DC run	ZeroRunDC Sel	No	Yes/No	-

Detailed information about Zero Run DC function

Parameter	Description
dr.50 BR ConMode2	Set the brake operation mode.
Ad.11 ZeroRunDC	Set this value to 1:Yes to use DC operation at zero speed with run command.
Ad13. Dc-Inj Level	DC level setting during DC operation

6 Table of Functions

This chapter lists all the function settings for S100 series drive. Set the parameters required according to the following references. If a set value input is out of range, the following messages will be displayed on the keyboard. In these cases, the drive will not operate with the [ENT] key

- Set value not allocated: **rd**
- Set value repetition (multi-function input, PID reference, PID feedback related): **OL**
- Set value not allowed (select value, V2, I2): **no**

6.1 Operation Group

The Operation group is used only in the basic keypad mode. It will not be displayed on an LCD loader. If you connect the LCD keypad, the function is in the drive(dr) group.

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
-	0h1F00	Target frequency	0.00	0~ Maximum frequency (Hz)	6.00	O/7	O	O
-	0h1F01	Acceleration time	ACC	0.0~600.0(s)	2.5	O/7	O	O
-	0h1F02	Deceleration time	dEC	0.0~600.0(s)	2.2	O/7	O	O
-	0h1F03	Command source	drv	0 Keypad 1 Fx/Rx-1 2 Fx/Rx-2 3 Int 485 4 Field Bus[1]	1: Fx/Rx-1	X/7	O	O
-	0h1F04	Frequency reference source	Frq	0 Keypad-1 1 Keypad-2 2 V1 4 V2 5 I2 6 Int 485 8 Fied Bus 12 Pulse	0: Keypad-1	X/7	O	O
-	0h1F05	Multi-step speed frequency 1	St1	0.00-Maximum frequency(Hz)	0.00	O/7	O	O

[1] For optional items, refer to the separate optional instruction manual.

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
-	0h1F06	Multi-step speed frequency 2	St2	0.00-Maximum frequency(Hz)		0.00	O/7	O	O
-	0h1F07	Multi-step speed frequency 3	St3	0.00-Maximum frequency(Hz)		0.00	O/7	O	O
-	0h1F08	Output current	CUr				-/7	O	O
-	0h1F09	Motor revolutions per minute	Rpm				-/7	O	O
-	0h1F0A	Drive direct current voltage	dCL	-		-	-/7	O	O
-	0h1F0B	Drive output voltage	vOL				-/7	O	O
-	0h1F0C	Out of order signal	nOn				-/7	O	O
-	0h1F0D	Select rotation direction	drC	F	Forward run	F	O/7	O	O
				r	Reverse run				

6.2 Drive group (PAR→dr)

In the following table, data shaded in grey will be displayed when the related code has been selected.

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99		9	O/A	O	O
01[2]	0h1101	Target frequency	Cmd Frequency	Start frequency - Maximum frequency(Hz)		0.0	O/L	O	O
03[2]	0h1103	Acceleration time	Acc Time	0.0~600.0(s)		2.5[3]	O/L	O	O
04[2]	0h1104	Deceleration time	Dec Time	0.0~600.0(s)		2.2[3]	O/L	O	O
06[2]	0h1106	Command source	Cmd Source	0	Keypad	1: Fx/Rx-1	X/L	O	O
				1	Fx/Rx-1				
				2	Fx/Rx-2				
				3	Int 485				
				4	Field Bus				
07[2]	0h1107	Frequency reference source	Freq Ref Src	0	Keypad-1	0: Keypad-1	X/L	O	O
				1	Keypad-2				
				2	V1				
				4	V2				
				5	I2				
				6	Int 485				
				8	FieldBus				
				12	Pulse				
09[3]	0h1109	Control Mode	Control Mode	0	V/F	2: Slip Compen	X/A	O	O
				2	Slip Compen				
				4	IM Sensorless				
11	0h110B	Jog frequency	Jog Frequency	Start frequency-Maximum frequency(Hz)		10.0	O/A	O	O
12	0h110C	Jog run acceleration time	Jog Acc Time	0.0~600.0(s)		20.0	O/A	O	O
13	0h110D	Jog run deceleration	Jog Dec Time	0.0~600.0(s)		30.0	O/A	O	O

[2] Appears when using LCD loader.

[3] Default values have been changed.

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
		time						
14	0h110E	Motor capacity	Motor Capacity	0: 0.2kW 1: 0.4kW 2: 0.75kW 3: 1.1kW 4: 1.5kW 5: 2.2kW 6: 3.0kW 7: 3.7kW 8: 4.0kW 9: 5.5kW 10: 7.5kW 11: 11.0kW 12: 15.0kW	Varies by Motor capacity	X/A	O	O
15[4]	0h110F	Torque boost options	Torque Boost	0 Manual 1 Auto 1 2 Auto 2 3 Auto 3	3:Auto3	X/A	O	X
16[5]	0h1110	Forward Torque boost	Fwd Boost	0.0~15.0(%)	4.0	X/A	O	X
17[5]	0h1111	Reverse Torque boost	Rev Boost	0.0~15.0(%)	4.0	X/A	O	X
18	0h1112	Base frequency	Base Freq	30.00~400.00(Hz)	50.00	X/A	O	O
19[4]	0h1113	Start frequency	Start Freq	0.01~10.00(Hz)	0.01	X/A	O	O
20	0h1114	Maximum frequency	Max Freq	40.00~400.00(Hz) [V/F, Slip Compen] 40.00~120.00(Hz) [IM Sensorless]	50.00	X/A	O	O
21	0h1115	Select speed unit	Hz/Rpm Sel	0 Hz Display 1 Rpm Display	0:Hz Display	O/L	O	O
26[6]	0h111A	Auto Torque boost Filter	ATB3 Filter	1~1000(msec)	100	X/A	O	O
27[6]	0h111B	Auto Torque boost Motoring	ATB3 M_Gain	0.0~300.0(%)	50.0	O/A	O	O

[4] Default values have been changed.

[5] Displayed when dr.15 is set to 0 (Manual) or 3 (Auto3).

[6] Displayed when dr.15 is set to 3 (Auto3).

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
		Gain							
28[6]	0h111C	Auto Torque boost Regenerating Gain	ATB3 G_Gain	0.0~300.0(%)		50.0	X/A	O	O
30	0h111E	ARD Auto Torque boost options	ARD Trq Boost	0	Manual	3:Auto3	X/A	O	O
				1	Auto1				
				2	Auto2				
				3	Auto3				
31	0h111F	ARD Forward boost	ARD Fwd Boost	0.0~15.0(%)		3.0	O/A	O	O
32	0h1120	ARD Reverse boost	ARD Rev Boost	0.0~15.0(%)		3.0	X/A	O	O
33[7]	0h1121	ARD Auto Torque boost Gain	ARD ATB3 Filter	1~1000(msec)		100	X/A	O	O
34[7]	0h1122	ARD Auto Torque boost (+)Torque gain	ARD ATB3 M_Gain	0.0~300.0(%)		20.0	X/A	O	O
35[7]	0h1123	ARD Auto Torque boost (-)Torque gain	ARD ATB3 G_Gain	0.0~300.0(%)		20.0	X/A	O	O
36	0h1124	ARD acceleration time	ARD Acc Time	0.0~600.0(s)		2.5	X/A	O	O
37	0h1125	ARD deceleration time	ARD Dec Time	0.0~600.0(s)		2.2	X/A	O	O
38	0h1126	ARD noload current	ARD NoloadCurr	0.0~1000.0(A)		According to the capacity	X/A	O	O
39	0h1127	ARD Start Mode	ARD Start Mode	0	Acc	0:Acc	X/A	O	O
				1	Dc-Start				
40	0h1128	ARD Stop Mode	ARD Stop Mode	0	Dec	1:DC-Brake	X/A	O	O
				1	DC-Brake				

[7] Displayed when dr.30 is set to 3 (Auto3).

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
		selection		2	Free-Run				
				4	Power Braking				
50	0h1132	Brake Control Option	BR Con Sel	0	BR ConMode1	0: BR ConMode1	X/A	O	O
				1	BR ConMode2				
78[8]	0h114E	Select whether to use relay output signal during tuning	TuneRunRly Sel	0	No	1: Yes	O/A	O	O
				1	Yes				
79	0h114F	Parameter Lock settings	PH Lock	0~65535		0	-		-
91	0h115B	Smart copy	SmartCopy	0	None	0:None	X/A	O	O
				1	SmartDownload				
				3	SmartUpLoad				
98	0h1162	Display I/O board version	IO S/W Ver			-/A	O	O	O
99[8]	0h1163	Display I/O board H/W version	IO H/W Type	0	Multiple IO	3:MultipleEL IO	-/A	O	O
				1	Standard IO				
				2	Standard IO (M)				
				3	MultipleEL IO				

[8] Default values have been changed.

6.3 Basic Function group (PAR→bA)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99	20	O	O	O
01	0h1201	Auxiliary reference source	Aux Ref Src	0 None 1 V1 3 V2 4 I2 6 Pulse	0:None	X/A	O	O
02[9]	0h1202	Auxiliary command calculation type	Aux Calc Type	0 M+(G*A) 1 Mx (G*A) 2 M/(G*A) 3 M+[M*(G*A)] 4 M+G*2(A-50%) 5 Mx[G*2(A-50%) 6 M/[G*2(A-50%)] 7 M+M*G*2(A-50%)	0:M+(G*A)	X/A	O	O
03[9]	0h1203	Auxiliary command gain	Aux Ref Gain	-200.0~200.0(%)	100.0	O/A	O	O
04	0h1204	2nd command source	Cmd 2nd Src	0 Keypad 1 Fx/Rx-1 2 Fx/Rx-2 3 Int 485 4 FieldBus	1:Fx/Rx-1	O/A	O	O
05	0h1205	2nd frequency source	Freq 2nd Src	0 Keypad-1 1 Keypad-2 2 V1 4 V2 5 I2 6 Int 485 8 FieldBus 9 UserSeqLink 12 Pulse 13 V3 15 V4	0:Keypad-1	O/A	O	O

[9] Displayed when bA.01 is not set to 0(None)

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
				16	I4				
06	0h1206	2nd Torque command source	Trq 2nd Src	0	Keypad-1	0:Keypad-1	O/A	X	O
				1	Keypad-2				
				2	V1				
				4	V2				
				5	I2				
				6	Int 485				
				8	FieldBus				
				9	-				
				12	Pulse				
07	0h1207	V/F pattern options	V/F Pattern	0	Linear	0:Linear	X/A	O	X
				1	Square				
				2	User V/F				
				3	Square 2				
08	0h1208	Acc/dec standard frequency	Ramp T Mode	0	Max Freq	0:Max Freq	X/A	O	O
				1	Delta Freq				
09	0h1209	Time scale settings	Time Scale	0	0.01sec	1:0.1sec	X/A	O	O
				1	0.1sec				
				2	1sec				
10[10]	0h120A	Input line frequency	60/50Hz Sel	0	60Hz	1:50Hz	X/A	O	O
				1	50Hz				
11	0h120B	Number of motor poles	Pole Number	2~48		4	X/A	O	O
12	0h120C	Rated slip speed	Rated Slip	0~3000(rpm)		Dependent on motor setting	X/A	O	O
13	0h120D	Motor rated current	Rated Curr	1.0~1000.0(A)		Dependent on motor setting	X/A	O	O
14	0h120E	Motor noload current	Noload Curr	1.0~1000.0(A)		Dependent on motor setting	X/A	O	O
15[10]	0h120F	Motor rated voltage	Rated Volt	170~480(V)		380	X/A	O	O
16	0h1210	Motor efficiency	Efficiency	64~100(%)		Dependent on motor setting	X/A	O	O
17	0h1211	Load inertia rate	Inertia Rate	0~8		0	X/A	O	O

[10] Default values have been changed.

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
18	0h1212	Trim power display	Trim Power %	70~130(%)	100	O/A	O	O
19[10]	0h1212	Input power voltage	AC Input Volt	0~480(V)	380	O A	O	O
20	-	Auto Tuning options	Auto Tuning	0 None 1 All 2 All(Stdstl) 3 Rs+Lsigma 6 Tr(Stdstl)	0: None	X/A	X	O
21	-	Stator resistance	Rs	0.0~9.999(ohm)	Dependent on motor setting	X/A	X	O
22	-	Leakage inductance	Lsigma	0.0~99.99(mH)	Dependent on motor setting	X/A	X	O
23	-	Stator inductance	Ls	0~999.9(mH)	Dependent on motor setting	X/A	X	O
24	-	Rotor time constant	Tr	25~5000(msec)	Dependent on motor setting	X/A	X	O
41[11]	0h1229	User frequency1	User Freq 1	0.0~Max Freq(Hz)	12.50	X/A	O	X
42[11]	0h122A	User voltage1	User Volt 1	0~100(%)	25	X/A	O	X
43[11]	0h122B	User frequency2	User Freq 2	0.0~Max Freq(Hz)	25.00	X/A	O	X
44[11]	0h122C	User voltage2	User Volt 2	0~100(%)	50	X/A	O	X
45[11]	0h122D	User frequency3	User Freq 3	0.0~Max Freq(Hz)	37.50	X/A	O	X
46[11]	0h122E	User voltage3	User Volt 3	0~100(%)	75	X/A	O	X
47[11]	0h122F	User frequency4	User Freq 4	0.0~Max Freq(Hz)	50.00	X/A	O	X
48[11]	0h1230	User voltage4	User Volt 4	0~100(%)	100	X/A	O	X
50[12]	0h1232	Multi-step speed frequency1	Step Freq-1	0.00~ Maximum frequency(Hz)	0.0	O/A	O	O
51[12]	0h1233	Multi-step speed	Step Freq-2	0.00~ Maximum	0.0	O/A	O	O

[11] Displayed when bA.07 is set to User Freq

[12] Displayed if one of In.65-71 is set to Speed–L/M/H.

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
		frequency2		frequency(Hz)				
52[12]	0h1234	Multi-step speed frequency3	Step Freq-3	0.00~ Maximum frequency(Hz)	0.0	O/A	O	O
53[12]	0h1235	Multi-step speed frequency4	Step Freq-4	0.00~ Maximum frequency(Hz)	0.0	O/A	O	O
54[12]	0h1236	Multi-step speed frequency5	Step Freq-5	0.00~ Maximum frequency(Hz)	0.0	O/A	O	O
55[12]	0h1237	Multi-step speed frequency6	Step Freq-6	0.00~ Maximum frequency(Hz)	0.0	O/A	O	O
56[12]	0h1238	Multi-step speed frequency7	Step Freq-7	0.00~ Maximum frequency(Hz)	0.0	O/A	O	O
70[14]	0h1246	Multi-step acceleration time1	Acc Time-1	0.0~600.0(s)	2.5	O/A	O	O
71[14]	0h1247	Multi-step deceleration time1	Dec Time-1	0.0~600.0(s)	2.2	O/A	O	O
72[13]	0h1248	Multi-step acceleration time2	Acc Time-2	0.0~600.0(s)	30.0	O/A	O	O
73[15]	0h1249	Multi-step deceleration time2	Dec Time-2	0.0~600.0(s)	2.2	O/A	O	O
74[15]	0h124A	Multi-step acceleration time3	Acc Time-3	0.0~600.0(s)	40.0	O/A	O	O
75[15]	0h124B	Multi-step deceleration time3	Dec Time-3	0.0~600.0(s)	40.0	O/A	O	O
76[15]	0h124C	Multi-step acceleration time4	Acc Time-4	0.0~600.0(s)	50.0	O/A	O	O
77[15]	0h124D	Multi-step deceleration time4	Dec Time-4	0.0~600.0(s)	50.0	O/A	O	O

[13] Displayed one of In.65-71 is set to Xcel-L/M/H.

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
78[15]	0h124E	Multi-step acceleration time5	Acc Time-5	0.0~600.0(s)	40.0	O/A	O	O
79[15]	0h124F	Multi-step deceleration time5	Dec Time-5	0.0~600.0(s)	40.0	O/A	O	O
80[15]	0h1250	Multi-step acceleration time6	Acc Time-6	0.0~600.0(s)	30.0	O/A	O	O
81[15]	0h1251	Multi-step deceleration time6	Dec Time-6	0.0~600.0(s)	30.0	O/A	O	O
82[15]	0h1252	Multi-step acceleration time7	Acc Time-7	0.0~600.0(s)	20.0	O/A	O	O
83[15]	0h1253	Multi-step deceleration time7	Dec Time-7	0.0~600.0(s)	20.0	O/A	O	O

6.4 Expanded Function group (PAR→Ad)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99		24	O/A	O	O
01[14]	0h1301	Acceleration pattern	Acc Pattern	0	Linear	1: S-curve	X/A	O	O
02[14]	0h1302	Deceleration pattern	Dec Pattern	1	S-curve		X/A	O	O
03[15]	0h1303	S-curve acceleration start point gradient	Acc S Start	1~100(%)		70[14]	X/A	O	O
04[15]	0h1304	S-curve acceleration end point gradient	Acc S End	1~100(%)		40[14]	X/A	O	O
05[16]	0h1305	S-curve deceleration start point gradient	Dec S Start	1~100(%)		60[14]	X/A	O	O
06[16]	0h1306	S-curve deceleration end point gradient	Dec S End	1~100(%)		40[20]	X/A	O	O
07	0h1307	Start Mode	Start Mode	0	Acc	0:Acc	X/A	O	O
				1	DC-Start				
08[17]	0h1308	Stop Mode	Stop Mode	0	Dec	1:DC-Brake	X/A	O	O
				1	DC-Brake				
				2	Free-Run				
				4	Power Braking				
09	0h1309	Selection of prohibited rotation direction	Run Prevent	0	None	0:None	X/A	O	O
				1	Forward Prev				
				2	Backward Prev				
10	0h130A	Starting with power on	Power-on Run	0	No	0:No	O/A	O	O
				1	Yes				
11	0h130	Selection of	ZeroRunDC	0	No	0:No	O/A	O	O

[14] Default values have been changed.
[15] Displayed when Ad. 01 is set to 1 (S-curve).
[16] Displayed when Ad. 02 is set to 1 (S-curve).
[17] Default values have been changed.

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
	B	enable zero DC run	Sel	1 Yes				
12[18]	0h130C	DC braking time at startup	Dc-Start Time	0.00~60.00(s)	0.00	X/A	O	O
13[17]	0h130D	Amount of applied DC	Dc Inj Level	0~200(%)	150	X/A	O	O
14[19]	0h130E	Output blocking time before DC braking	Dc-Block Time	0.00~ 60.00(s)	0.0	X/A	O	O
15[19]	0h130F	DC braking time	Dc-Brake Time	0.00~ 60.00(s)	0.5	X/A	O	O
16[19]	0h1310	DC braking rate	Dc-Brake Level	0~200(%)	150	X/A	O	O
17[19]	0h1311	DC braking frequency	Dc-Brake Freq	Start frequency ~ 60.00(Hz)	0.02	X/A	O	O
18[17]	0h1312	S-curve slope Start point gradient	Stop S Start	1~200(%)	55	X/A	O	O
19[17]	0h1313	S-curve slope end point gradient	Stop S End	1~200(%)	45	X/A	O	O
20	0h1314	Dwell frequency on acceleration	Acc Dwell Freq	Start frequency-Maximum frequency(Hz)	5.00	X/A	O	O
21	0h1315	Dwell operation time on acceleration	Acc Dwell Time	0.0~60.0(s)	0.0	X/A	O	O
22	0h1316	Dwell frequency on deceleration	Dec Dwell Freq	Start frequency-Maximum frequency(Hz)	5.00	X/A	O	O
23	0h1317	Dwell operation time on deceleration	Dec Dwell Time	0.0~60.0(s)	0.0	X/A	O	O
24	0h131	Frequency limit	Freq Limit	0 No 1 Yes	0:No	X/A	O	O
27	0h131B	Frequency jump	Jump Freq	0 No 1 Yes	0:No	X/A	O	O
28[20]	0h131C	Jump frequency lower limit1	Jump Lo 1	0.00-Jump frequency upper limit1(Hz)	10.00	O/A	O	O

[18] Displayed when Ad. 07 is set to 1 (DC-Start).
[19] Displayed when Ad. 08 is set to 1 (DC-Brake).
[20] Displayed when Ad. 27 is set to 1 (Yes).

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
29[20]	0h131D	Jump frequency upper limit1	Jump Hi 1	Jump frequency lower limit1-Maximum frequency(Hz)	15.00	O/A	O	O
30[20]	0h131E	Jump frequency lower limit2	Jump Lo 2	0.00-Jump frequency upper limit2(Hz)	20.00	O/A	O	O
31[20]	0h131F	Jump frequency upper limit2	Jump Hi 2	Jump frequency lower limit2-Maximum frequency(Hz)	25.00	O/A	O	O
32[20]	0h1320	Jump frequency lower limit3	Jump Lo 3	0.00-Jump frequency upper limit3(Hz)	30.00	O/A	O	O
33[20]	0h1321	Jump frequency upper limit3	Jump Hi 3	Jump frequency lower limit3-Maximum frequency(Hz)	35.00	O/A	O	O
41[21]	0h1329	Brake release current	BR Rls Curr	0.0~180.0(%)	0.0	O/A	O	O
42[21]	0h132A	Brake release delay time	BR Rls Dly	0.00~10.00(s)	0.00	X/A	O	O
44[21]	0h132C	Brake release Forward frequency	BR Rls Fwd Fr	0.00-Maximum frequency(Hz)	0.2	X/A	O	O
45[21]	0h132D	Brake release Reverse frequency	BR Rls Rev Fr	0.00-Maximum frequency(Hz)	0.2	X/A	O	O
46[21]	0h132E	Brake engage delay time	BR Eng Dly	0.00~10.00(s)	0.6	X/A	O	O
47[21]	0h132F	Brake engage frequency	BR Eng Fr	0.00-Maximum frequency(Hz)	0.2	X/A	O	O
48	0h1330	Brake close frequency setting in regeneration	BR Eng Fr G	0.00~ Maximum frequency(Hz)	0.2	X/A	O	O
50	0h1332	Energy saving operation	E-Save Mode	0 None 1 Manual 2 Auto	0:None	X /A	O	X
51[22]	0h1333	Energy saving level	Energy Save	0~30(%)	0	O/A	O	X

[21] Displayed if either AP.76, AP.77 is set to 35 (BR Control).

[22] Displayed if Ad.50 is not set to 0 (None)

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
52[23]	0h1334	ARD Frequency	ARD Freq	0.01~6.67(Hz)		4.0	O/A	O	X
53[23]	0h1335	Selection of Automatic Light Load Search function	ALLS Enable	0	No	0:No	O/A	O	X
				1	Yes				
54[24]	0h1336	Stop time when switching Fx to Rx or Rx to Fx	ALLS Time	1.0~5.0(sec)		3.0	O/A	O	X
55[24]	0h1337	Automatic Light Load Search enable selection	ALLS LoadChkTm	0.5~3.0(sec)		1.0	O/A	O	X
56[24]	0h1338	Stop time when switching Fx to Rx or Rx to Fx	ALLS DirChkTm	0.5~3.0(sec)		1.0	O/A	O	X
57[23]	0h1339	ARD priority	ALLS Priority	0	No	1:Yes	O/A	O	X
				1	Yes				
58	0h133A	ALLS carrier frequency	ALLS Carrier Fr	2.0~11.0(kHz)		4.0	O/A	O	X
60	0h133C	Acc/Dec time transition frequency	Xcel Change Fr	0.0~50.0(Hz)		0.0	X/A	O	O
61	0h133D	Rotation count speed gain	Load Spd Gain	0~6000.0[%]		100.0	O/A	O	O
62	0h133E	Rotation count speed scale	Load Spd Scale	0	x 1	0: x1	O/A	O	O
				1	x 0.1				
				2	x 0.01				
				3	x 0.001				
				4	x 0.0001				
63	0h133F	Rotation count speed unit	Load Spd Unit	0	Rpm	0: rpm	O/A	O	O
				1	mpm				
64	0h1340	Cooling fan control	FAN Control	0	During Run	0: During Run	O/A	O	O
				1	Always ON				
				2	Temp Control				
65	0h1341	Up/down operation frequency save	U/D Save Mode	0	No	0:No	O/A	O	O
				1	Yes				
66	0h134	Output contact	On/Off Ctrl	0	None	0:None	X/A	O	O

[23] Displayed if one of In.65-71 is set to 29 (ARD Run).
[24] Displayed if Ad.23 is set to 1 (Yes).

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
	2	On/Off control options	Src	1 V1 3 V2 4 I2 6 Pulse				
67	0h1343	Output contact On level	On-Ctrl Level	Output contact off level- 100.00%	90.00	X/A	O	O
68	0h1344	Output contact Off level	Off-Ctrl Level	-100.00-output contact on level (%)	10.00	X/A	O	O
70	0h1346	Safe operation selection	Run En Mode	0 Always Enable 1 DI Dependent	0: Always Enable	X/A	O	O
74	0h134A	Selection of regeneration evasion function for press	RegenAvd Sel	0 No 1 Yes	0:No	X/A	O	O
75	0h134B	Voltage level of regeneration evasion motion for press	RegenAvd Level	200V : 300~400V 400V : 600~800V	350 700	X/A	O	O
76[25]	0h134C	Compensation frequency limit of regeneration evasion for press	CompFreq Limit	0.00~ 10.00Hz	1.00	X/A	O	O
77[25]	0h134D	Regeneration evasion for press P gain	RegenAvd P gain	0.0~ 100.0%	50.0	O/A	O	O
78[25]	0h134E	Regeneration evasion for press I gain	RegenAvd I gain	20~30000(ms)	500	O/A	O	O
79	0h134F	DB Unit turn on voltage level	DB Turn On Lev	200V: Min~400[V] 400V: Min~800[V]	390[V] 780[V]	X/A	O	O
80	0h1350	Selection of zero speed slip enable	ZeroSlip Sel	0 No 1 Yes	0:No			
91[26]	0h135B	Slip compensation comparison frequency	Slip (+) Freq	0.00~60.00(Hz)	8.00	X/A	O	X
92[26]	0h135	Motoring high	Slip (+)	0~1000(%)	100	O/A	O	X

[25] Displayed when Ad.74 is set to 1 (Yes).

[26] Default values have been changed.

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
	C	speed slip compensation frequency gain	Gain-H					
93[26]	0h135D	Motoring low Speed slip compensation frequency gain	Slip (+) Gain-L	-1000~1000(%)	110	O/A	O	X
94[26]	0h135E	Regenerating high speed slip compensation frequency gain	Slip (-) Gain-H	0~1000(%)	100	O/A	O	X
95[26]	0h135F	Regenerating low-speed slip compensation frequency gain	Slip (-) Gain-L	-1000~1000(%)	90	O/A	O	X
96[26]	0h1360	Slip compensation frequency LPF filter	Slip Filter	0~10000(msec)	700	O/A	O	X
97[26]	0h1361	Magnetic flux estimation	Flux Est Ref	0~100(%)	50	O/A	O	X
98[26]	0h1362	Selection of zero speed deceleration mode	ZeroDecSel	0 None 1 Zero Dec Mode 1 2 Zero Dec Mode 2	1: Zero Dec Mode 1	X/A	O	X
99[27]	0h1363	Zero speed deceleration target frequency	0 Dec TarFreq	0~maxFreq(Hz)	0	X/A	O	X

[27] Displayed when Ad.98 is set to 2 (Zero Dec Mode 2).

6.5 Control Function group (PAR→Cn)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99		4	O/A	O	O
04	0h1404	Carrier frequency	Carrier Freq	2.0~11.0(kHz)		7	X/A	O	O
05	0h1405	Switching mode	PWM Mode	0	Normal PWM	0:Normal PWM	X/A	O	O
				1	Lowleakage PWM				
09	0h1409	Initial excitation time	PreExTime	0.00~60.00(s)		1.00	X/A	X	O
10	0h140A	Initial excitation amount	Flux Force	100.0~300.0(%)		100.0	X/A	X	O
11	0h140B	Continued operation duration	Hold Time	0.00~60.00(s)		0.00	X/A	X	O
20	0h1414	Sensorless 2nd gain display setting	SL2 G View Sel	0	No	0:No	O/A	X	O
				1	Yes				
21	0h1415	Sensorless speed controller proportional gain1	ASR-SL P Gain1	0~5000(%)		According to the drive capacity	O/A	X	O
22	0h1416	Sensorless speed controller integral gain1	ASR-SL I Gain1	10~9999(ms)			O/A	X	O
23	0h1417	Sensorless speed controller proportional gain2	ASR-SL P Gain2	1.0~1000.0(%)			O/A	X	O
24	0h1418	Sensorless speed controller integral gain2	ASR-SL I Gain2	1.0~1000.0(%)			O/A	X	O
25	0h1419	Sensorless speed	ASR-SL I Gain0	10~9999(ms)			O/A	X	O

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
		controller integral gain 0						
26	0h141A	Flux estimator proportional gain	Flux P Gain	10~200(%)		O/A	X	O
27	0h141B	Flux estimator integral gain	Flux I Gain	10~200(%)		O/A	X	O
28	0h141C	Speed estimator proportional gain	S-Est P Gain1	0~32767		O/A	X	O
29	0h141D	Speed estimator integral gain1	S-Est I Gain1	100~1000		O/A	X	O
30	0h141E	Speed estimator integral gain2	S-Est I Gain2	100~10000		O/A	X	O
31	0h141F	Sensorless current controller proportional gain	ACR SL P Gain	10~1000		O/A	X	O
32	0h1420	Sensorless current controller integral gain	ACR SL I Gain	10 ~1000		O/A	X	O
52	0h1434	Torque controller output filter	Torque Out LPF	0~2000(ms)	0	X/A	X	O
53	0h1435	Torque limit setting options	Torque Lmt Src	0 Keypad-1 1 Keypad-2 2 V1 4 V2 5 I2 6 Int 485 8 FieldBus 10 Pulse	0: Keypad-1	X/A	X	O
54[28]	0h1436	Positive-direction reverse	FWD+Trq Lmt	0.0~200.0(%)	180	O/A	X	O

[28] Displayed when dr.09 is set to 4 (IM Sensorless). This will change the initial value of the parameter at Ad.74 (Torque limit) to 150%

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
		torque limit						
55[28]	0h1437	Positive-direction regeneration torque limit	FWD–Trq Lmt	0.0~200.0(%)	180	O/A	X	O
56[28]	0h1438	Negative-direction regeneration torque limit	REV +Trq Lmt	0.0~200.0(%)	180	O/A	X	O
57[28]	0h1439	Negative-direction reverse torque limit	REV –Trq Lmt	0.0~200.0(%)	180	O/A	X	O
62[28]	0h143E	Speed limit Setting	Speed Lmt Src	0 Keypad-1 1 Keypad-2 2 V1 4 V2 5 I2 6 Int 485 7 FieldBus	0: Keypad-1	X/A	X	O
63[28]	0h143F	Positive-direction speed limit	FWD Speed Lmt	0.00~ Maximum frequency (Hz)	60.00	O/A	X	O
64[28]	0h1440	Negative-direction speed limit	REV Speed Lmt	0.00~ Maximum frequency (Hz)	60.00	O/A	X	O
65[28]	0h1441	Speed limit operation gain	Speed Lmt Gain	100~5000[%]	500	O/A	X	O
70	0h1446	Speed search mode selection	SS Mode	0 Flying Start-1 1 Flying Start-2	0: Flying Start-1	X/A	O	O
71	0h1447	Selection of speed search operation	Speed Search	bit 0000~1111 0001 Selection of speed search on acceleration 0010 When starting on initialization after fault trip 0100 When restarting after	0000	X/A	O	O

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
					instantaneous power interruption				
				1000	When starting with power on				
77	0h144D	Energy buffering selection	KEB Select	0	No	0:No	X/A	O	O
				1	KEB-1				
				2	KEB-2				
78[29]	0h144E	Energy buffering start level	KEB Start Lev	110.0~200.0(%)		125.0	X/A	O	O
79[29]	0h144F	Energy buffering stop level	KEB Stop Lev	125.0~210.0(%)		130.0	X/A	O	O
80[29]	0h1450	Energy buffering P gain	KEB P Gain	1~20000		1000	O/A	O	O
81[29]	0h1451	Energy buffering I gain	KEB I Gain	1~20000		500	O/A	O	O
82[29]	0h1452	Energy buffering Slip gain	KEB Slip Gain	0~2000.0%		30.0	O/A	O	O
83[29]	0h1453	Energy buffering acceleration time	KEB Acc Time	0.0~600.0(s)		10.0	O/A	O	O
85[30]	0h1455	Flux estimator proportional gain1	Flux P Gain1	100~700		370	O/A	X	O
86[30]	0h1456	Flux estimator proportional gain2	Flux P Gain2	0~100		0	O/A	X	O
87[30]	0h1457	Flux estimator proportional gain3	Flux P Gain3	0~500		100	O/A	X	O
88[30]	0h1458	Flux estimator integral gain1	Flux I Gain1	0~200		50	O/A	X	O
89[30]	0h1459	Flux estimator	Flux I Gain2	0~200		50	O/A	X	O

[29] Displayed if Cn.77 is not set to 0

[30] Displayed if Cn.20 is set to 1 (Yes)

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
		integral gain2						
90[30]	0h145A	Flux estimator integral gain3	Flux I Gain3	0~200	50	O/A	X	O
91[30]	0h145B	Sensorless voltage compensation1	SL Volt Comp1	0~60	Dependent on motor setting	O/A	X	O
92[30]	0h145C	Sensorless voltage compensation2	SL Volt Comp2	0~60		O/A	X	O
93[30]	0h145D	Sensorless voltage compensation3	SL Volt Comp3	0~60		O/A	X	O
94[30]	0h145E	Sensorless field weakening start frequency	SL FW Freq	80.0~110.0(%)	100.0	X/A	X	O
95[30]	0h145F	Sensorless gain switching frequency	SL Fc Freq	0.00~8.00(Hz)	2.00	X/A	X	O

6.6 Input Terminal Block Function group (PAR→In)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

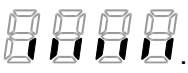
*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99		65	O/A	O	O
01	0h1501	Frequency for maximum analog input	Freq at 100%	Start frequency-Maximum frequency(Hz))		Maximum frequency	O/A	O	O
02	0h1502	Torque at maximum analog input	Torque at100%	0.0~200.0(%)		100.0	O/A	X	X
65	0h1541	P1 terminal function setting	P1 Define	0	None	1:Fx	X/A	O	O
66	0h1542	P2 terminal function setting	P2 Define	1	Fx	2:Rx	X/A	O	O
67[31]	0h1543	P3 terminal function setting	P3 Define	2	Rx	13: RUN Enable	X/A	O	O
68[31]	0h1544	P4 terminal function setting	P4 Define	3	RST	29:ARD Run	X/A	O	O
69	0h1545	P5 terminal function setting	P5 Define	4	External Trip	7: Speed-L	X/A	O	O
70	0h1546	P6 terminal function setting	P6 Define	5	BX	8: Speed-M	X/A	O	O
71	0h1547	P7 terminal function setting	P7 Define	6	JOG	9: Speed-H	X/A	O	O
				7	Speed-L				
				8	Speed-M				
				9	Speed-H				
				11	XCEL-L				
				12	XCEL-M				
				13	RUN Enable				
				14	3-Wire				
				15	2nd Source				
				16	Exchange				
				17	Up				
				18	Down				
				20	U/D Clear				
				21	Analog Hold				
				22	I-Term Clear				
				23	PID				

[31] Default values have been changed.

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
					Openloop				
				24	P Gain2				
				25	XCEL Stop				
				26	2nd Motor				
				29	ARDRUN[32]				
				34	Pre Excite				
				38	Timer In				
				40	dis Aux Ref				
				46	FWD JOG				
				47	REV JOG				
				48	XCEL-H				
				49	-				
				51	Fire Mode				
				52	KEB-1 Select				
84	0h1554	Multi-function input terminal On filter selection	DI Delay Sel	P7-P1		111 1111	O/A	O	O
				0	Disable(Off)				
				1	Enable(On)				
85	0h1555	Multi-function input terminal On filter	DI On Delay	0~10000(ms)		10	O/A	O	O
86	0h1556	Multi-function input terminal Off filter	DI Off Delay	0~10000(ms)		3	O/A	O	O
87	0h1557	Multi-function input contact selection	DI NC/NO Sel	P7 – P1		000 0000[33]	X/A	O	O
				0	A contact (NO)				
				1	B contact (NC)				
89	0h1559	Multi-step command delay time	InCheck Time	1~5000(ms)		1	X/A	O	O
90	0h155A	Multi-function input terminal status	DI Status	P7 – P1		000 0000[41]	O/A	O	O
				0	release(Off)				
				1	Connection (On)				

[32] Default values have been changed.

[33] The initial value 0000 will be displayed on the keypad as  .

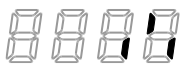
Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
91	0h155B	Pulse input amount display	Pulse Monitor (kHz)	0.00~50.00(kHz)		0.00	O/A	O	O
92	0h155C	TI input filter time constant	TI Filter	0~9999(ms)		10	O/A	O	O
93	0h155D	TI Minimum input pulse	TI Pls x1	0.00~32.00(kHz)		0	O/A	O	O
94	0h153E	TI output at Minimum pulse (%)	TI Perc y1	0.00~100.00(%)		0.00	O/A	O	O
95	0h155F	TI Maximum input pulse	TI Pls x2	0.00~32.00(kHz)		32.00	O/A	O	O
96	0h1560	TI Output at Maximum pulse (%)	TI Perc y2	0~100(%)		100.00	O/A	O	O
97	0h1561	TI rotation direction change	TI Inverting	0	No	0:No	O/A	O	O
				1	Yes				
98	0h1562	TI quantization level	TI Quantizing	0.00[45], 0.04~10.00(%)		0.04	O/A	O	O
99	0h1563	SW1(NPN/PNP) SW2(V1/V2 [I2]) status	IO SW State	Bit	00 ~ 11	01	-/A	O	O
				00	V2, NPN				
				01	V2, PNP				
				10	I2, NPN				
				11	I2, PNP				

6.7 Output Terminal Block Function group (PAR→OU)

In the following table, the data shaded in grey will be displayed when a related code has been selected

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

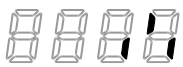
Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
00	-	Jump Code	JumpCode	1~99	30	O/A	O	O
01	0h1601	Analog output 1 item	AO1 Mode	0 Frequency 1 Output Current 2 Output Voltage 3 DCLink Voltage 4 Torque 5 Output Power 6 Idse 7 Iqse 8 Target Freq 9 Ramp Freq 10 Speed Fdb 12 PID Ref Value 13 PID Fdb Value 14 PID Output 15 Constant	0 : Frequency	O/A	O	O
02	0h1602	Analog output 1 gain	AO1 Gain	-1000.0~1000.0(%)	100.0	O/A	O	O
03	0h1603	Analog output 1 bias	AO1 Bias	-100.0~100.0(%)	0.0	O/A	O	O
04	0h1604	Analog output 1 filter	AO1 Filter	0~10000(ms)	5	O/A	O	O
05	0h1605	Analog constant output 1	AO1 Const %	0.0~100.0(%)	0.0	O/A	O	O
06	0h1606	Analog output 1 monitor	AO1 Monitor	0.0~1000.0(%)	0.0	-/A	O	O
30	0h161E	Fault output item	Trip Out Mode	bit 000~111 1 Low voltage 2 Any faults other than low	010[34]	O/A	O	O

[34]  is displayed in loader.

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
					voltage				
				3	Automatic restart final failure				
31	0h161F	Multi-function relay 1 item	Relay 1	0	None	35: BR Control	O/A	O	O
				1	FDT-1				
				2	FDT-2				
				3	FDT-3				
				4	FDT-4				
				5	Over Load				
				6	IOL				
				7	Under Load				
				8	Fan Warning				
				9	Stall				
				10	Over Voltage				
				11	Low Voltage				
				12	Over Heat				
				13	Lost Command				
				14	Run				
				15	Stop				
				16	Steady				
				17	Drive Line				
				18	Comm Line				
				19	Speed Search				
				22	Ready				
				28	Timer Out				
				29	Trip				
				31	DB Warn%ED				
				34	On/Off Control				
				35	BR Control				
				36	CAP.Exchange				
				37	FAN Exchange				
				38	Fire Mode				
				40	KEB Operating				
				42	Unbalance				
33	0h1621	Open Collector 1	Q1 Define	0~40		14:Run	O/A	O	O

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
36[35]	0h1624	Multi-function relay 5 item	Relay 5	0~40	29:Trip	O/A	O	O
37[35]	0h1625	Open Collector 2	Q2 Define	0~40	29:Trip	O/A	O	O
41	0h1629	Multi-function output monitor	DO Status	-	00	X/A	-	-
50	0h1632	Multi-function output On delay	DO On Delay	0.00~100.00(s)	0.00	O/A	O	O
51	0h1633	Multi-function output Off delay	DO Off Delay	0.00~100.00(s)	0.00	O/A	O	O
52	0h1634	Multi-function output contact selection	DO NC/NO Sel	Q1, Relay1 0 A contact (NO) 1 B contact (NC)	00[36]	X/A	O	O
53	0h1635	Fault output On delay	TripOut OnDly	0.00~100.00(s)	0.00	O/A	O	O
54	0h1636	Fault output Off delay	TripOut OffDly	0.00~100.00(s)	0.00	O/A	O	O
55	0h1637	Timer On delay	TimerOn Delay	0~100(s)	0	O/A	O	O
56	0h1638	Timer Off delay	TimerOff Delay	0~100(s)	0	O/A	O	O
57	0h1639	Detected frequency	FDT Frequency	0.00-Maximum frequency(Hz)	30.00	O/A	O	O
58	0h163A	Band of Frequency detection	FDT Band	0.00-Maximum frequency(Hz)	10.00	O/A	O	O

[35] Activated when IO(ELIO) is used.

[36]  is displayed in loader.

6.8 Communication Function group (PAR→CM)

In the following table, the data shaded in grey will be displayed when a related code has been selected

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99		20	O/A	O	O
01	0h1701	Built-in communication drive ID	Int485 St ID	1~250		1	O/A	O	O
02	0h1702	Built-in communication protocol	Int485 Proto	0	ModBus RTU	0: ModBus RTU	O/A	O	O
				2	LS Inv 485				
03	0h1703	Built-in communication speed	Int485 BaudR	0	1200 bps	3: 9600 bps	O/A	O	O
				1	2400 bps				
				2	4800 bps				
				3	9600 bps				
				4	19200 bps				
				5	38400 bps				
				6	56 Kbps				
				7	115 Kbps[37]				
04	0h1704	Built-in communication frame setting	Int485 Mode	0	D8/PN/S1	0: D8/PN/S1	O/A	O	O
				1	D8/PN/S2				
				2	D8/PE/S1				
				3	D8/PO/S1				
05	0h1705	Transmission delay after reception	Resp Delay	0~1000(ms)		5ms	O/A	O	O
06[38]	0h1706	Communication option S/W version	FBus S/W Ver	-		0.00	O/A	O	O
07[38]	0h1707	Communication option drive ID	FBus ID	0~255		1	O/A	O	O
08[38]	0h1708	FIELD BUS communication speed	FBUS BaudRate	-		12Mbps	-/A	O	O

[37] 115200bps

[38] Displayed only when a communication option card is installed.

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
09[38]	0h1709	Communication option LED status	FieldBus LED	-	-	O/A	O	O
30	0h171E	Number of output parameters	ParaStatus Num	0~8	3	O/A	O	O
31	0h171F	Output Communication address1	Para Stauts-1	0000~FFFF Hex	000A	O/A	O	O
32	0h1720	Output Communication address2	Para Stauts-2	0000~FFFF Hex	000E	O/A	O	O
33	0h1721	Output Communication address3	Para Stauts-3	0000~FFFF Hex	000F	O/A	O	O
34	0h1722	Output Communication address4	Para Stauts-4	0000~FFFF Hex	0000	O/A	O	O
35	0h1723	Output Communication address5	Para Stauts-5	0000~FFFF Hex	0000	O/A	O	O
36	0h1724	Output Communication address6	Para Stauts-6	0000~FFFF Hex	0000	O/A	O	O
37	0h1725	Output Communication address7	Para Stauts-7	0000~FFFF Hex	0000	O/A	O	O
38	0h1726	Output Communication address8	Para Stauts-8	0000~FFFF Hex	0000	O/A	O	O
50	0h1732	Number of input parameters	Para Ctrl Num	0~8	2	O/A	O	O
51	0h1733	Input Communication address1	Para Control-1	0000~FFFF Hex	0005	X/A	O	O
52	0h1734	Input Communication address2	Para Control-2	0000~FFFF Hex	0006	X/A	O	O
53	0h1735	Input Communication address3	Para Control-3	0000~FFFF Hex	0000	X/A	O	O
54	0h1736	Input Communication address4	Para Control-4	0000~FFFF Hex	0000	X/A	O	O
55	0h1737	Input	Para	0000~FFFF	0000	X/A	O	O

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
		Communication address5	Control-5	Hex					
56	0h1738	Input Communication address6	Para Control-6	0000~FFFF Hex		0000	X/A	O	O
57	0h1739	Input Communication address7	Para Control-7	0000~FFFF Hex		0000	X/A	O	O
58	0h173A	Input Communication address8	Para Control-8	0000~FFFF Hex		0000	X/A	O	O
68	0h1744	Field bus data swap	FBus Swap Sel	0	No	0:No	X/A	O	O
				1	Yes				
70	0h1746	Communication multi-function input 1	Virtual DI 1	0	None	0:None	O/A	O	O
71	0h1747	Communication multi-function input 2	Virtual DI 2	1	Fx	0:None	O/A	O	O
72	0h1748	Communication multi-function input 3	Virtual DI 3	2	Rx	0:None	O/A	O	O
73	0h1749	Communication multi-function input 4	Virtual DI 4	3	RST	0:None	O/A	O	O
74	0h174A	Communication multi-function input 5	Virtual DI 5	4	External Trip	0:None	O/A	O	O
75	0h174B	Communication multi-function input 6	Virtual DI 6	5	BX	0:None	O/A	O	O
76	0h174C	Communication multi-function input 7	Virtual DI 7	6	JOG	0:None	O/A	O	O
77	0h174D	Communication multi-function input 8	Virtual DI 8	7	Speed-L	0:None	O/A	O	O
				8	Speed-M				
				9	Speed-H				
				11	XCEL-L				
				12	XCEL-M				
				13	RUN Enable				
				14	3-Wire				
				15	2nd Source				
				16	Exchange				

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
				17	Up				
				18	Down				
				20	U/D Clear				
				21	Analog Hold				
				22	I-Term Clear				
				23	PID Openloop				
				24	P Gain2				
				25	XCEL Stop				
				26	2nd Motor				
				34	Pre Excite				
				38	Timer In				
				40	dis Aux Ref				
				46	FWD JOG				
				47	REV JOG				
				49	XCEL-H				
				51	Fire Mode				
				52	KEB-1 Select				
				54	TI				
86	0h1756	Communication multi-function input monitoring	Virt DI Status	-		0	X/A	O	O
90	0h175A	Selection of data frame communication monitor	Comm Mon Sel	0	Int485	0:Int485	O/A	O	O
				1	Keypad				
91	0h175B	Data frame Rev count	Rcv Frame Num	0~65535		0	O/A	O	O
92	0h175C	Data frame Err count	Err Frame Num	0~65535		0	O/A	O	O
93	0h175D	NAK frame count	NAK Frame Num	0~65535		0	O/A	O	O
94[39]	-	Communication data upload	Comm Update	0	No	0:No	-/A	O	O
				1	Yes				
95	0h1760	P2P communication selection	P2P Para	0	Disable All	0: Disable All	X/A	O	O
				1	P2P				

[39] Displayed only when a communication option card is installed.

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
					Master				
				2	P2P Slave				
				3	M-KPD-Ready				
96[40]	-	DO setting selection	P2P DO Sel	0	No	0:No	O/A	O	O
				1	Multi-function relay				
				2	Multi-function output				

[40] Appears only when CM.95 code is set to 2(P2P Slave).

6.9 Application Function group (PAR→AP)

In the following table, the data shaded in grey will be displayed when a related code has been selected

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99		20	O/A	O	O
01	0h1801	Application function selection	App Mode	0	None	0: None	X/A	O	O
				1	-				
				2	Proc PID				
02	0h1802	Enable user sequence	User Seq En	0	No	0: No			
				1	Yes				
16[41]	0h1810	PID output monitor	PID Output	(%)		0.00	-/A	O	O
17[41]	0h1811	PID reference monitor	PID Ref Value	(%)		50.00	-/A	O	O
18[41]	0h1812	PID feedback monitor	PID Fdb Value	(%)		0.00	-/A	O	O
19[41]	0h1813	PID reference setting	PID Ref Set	-100.00~100.00(%)		50.00	O/A	O	O
20[41]	0h1814	PID reference source	PID Ref Source	0	Keypad	0: Keypad	X/A	O	O
				1	V1				
				3	V2				
				4	I2				
				5	Int 485				
				7	FieldBus				
				11	Pulse				
21[41]	0h1815	PID feedback source	PID F/B Source	0	V1	0:V1	X/A	O	O
				2	V2				
				3	I2				
				4	Int 485				
				6	FieldBus				
				10	Pulse				
22[41]	0h1816	PID controller proportional gain	PID P-Gain	0.0~1000.0(%)		50.0	O/A	O	O
23[41]	0h1817	PID controller integral time	PID I-Time	0.0~200.0(s)		10.0	O/A	O	O
24[41]	0h1818	PID controller differentiation time	PID D-Time	0~1000(ms)		0	O/A	O	O

[41] Appears when AP.01 code is set to 2 (Proc PID).

Code	Comm. Address	Name	Keypad Display	Setting Range	Initial Value	Property*	V/F	SL
25[41]	0h1819	PID controller feed-forward compensation gain	PID F-Gain	0.0~1000.0(%)	0.0	O/A	O	O
26[41]	0h181A	Proportional gain scale	P Gain Scale	0.0~100.0(%)	100.0	X/A	O	O
27[41]	0h181B	PID output filter	PID Out LPF	0~10000(ms)	0	O/A	O	O
28[41]	0h181C	PID Mode	PID Mode	0 Process PID 1 Normal PID	0	X/A	O	O
29[41]	0h181D	PID upper limit frequency	PID Limit Hi	PID low limit frequency ~300.00(Hz)	60.00	O/A	O	O
30[41]	0h181E	PID lower limit frequency	PID Limit Lo	-300.00 ~PID high limit frequency (Hz)	-60.00	O/A	O	O
31[41]	0h181F	PID output inverse	PID Out Inv	0 No 1 Yes	0:No	X/A	O	O
32[41]	0h1820	PID output scale	PID Out Scale	0.1~1000.0(%)	100.0	X/A	O	O
34[41]	0h1822	PID controller motion frequency	Pre-PID Freq	0.00~Max frequency(Hz)	0.00	X/A	O	O
35[41]	0h1823	PID controller motion level	Pre-PID Exit	0.0~100.0(%)	0.0	X/A	O	O
36[41]	0h1824	PID controller motion delay time	Pre-PID Delay	0~9999(s)	600	O/A	O	O
37[41]	0h1825	PID sleep mode delay time	PID Sleep DT	0.0~999.9(s)	60.0	O/A	O	O
38[41]	0h1826	PID sleep mode frequency	PID Sleep Freq	0.00~Max Frequency(Hz)	0.00	O/A	O	O
39[41]	0h1827	PID wake-up level	PIDWakeUp Lev	0~100(%)	35	O/A	O	O
40[41]	0h1828	PID wake-up mode setting	PID WakeUp Mod	0 Below Level 1 Above Level 2 Beyond Level	0:Below Level	O/A	O	O
42[41]	0h182A	PID controller unit selection	PID Unit Sel	0 % 1 Bar 2 mBar 3 Pa 4 kPa	0:%	O/A	O	O

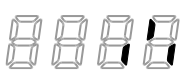
Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
				5	Hz				
				6	Rpm				
				7	V				
				8	I				
				9	kW				
				10	HP				
				11	℃				
				12	℉				
43[41]	0h182B	PID unit gain	PID Unit Gain	0.00~300.00(%)		100.00	O/A	O	O
44[41]	0h182C	PID unit scale	PID Unit Scale	0	x100	2:x 1	O/A	O	O
				1	x10				
				2	x 1				
				3	x 0.1				
				4	x 0.01				
45[41]	0h182D	PID 2nd proportional gain	PID P2-Gain	0.0~1000.0(%)		100.0	X/A	O	O

6.10 Protection Function group (PAR→Pr)

In the following table, the data shaded in grey will be displayed when a related code has been selected

*__O/X__: Write-enabled during operation, __7/L/A__: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
00	-	Jump Code	Jump Code	1~99		40	O/A	O	O
01	0h1B01	Selection of SW OCS	SwOCS select	0	No	1:Yes	O/A	O	O
				1	Yes				
03	0h1B03	Temperature	Temperature	-		-	O/A	O	O
04	0h1B04	Load level setting	Load Duty	0	Normal Duty	1:Heavy Duty	X/A	O	O
				1	Heavy Duty				
05	0h1B05	Input/output open-phase protection	Phase Loss Chk	bit	00~11	00[42]	X/A	O	O
				01	Output open phase				
				10	Input open phase				
06	0h1B06	Input voltage range during open-phase	IPO V Band	1~100(V)		15	X/A	O	O
07	0h1B07	Deceleration time at fault trip	Trip Dec Time	0.0~600.0(s)		3.0	O/A	O	O
08	0h1B08	Selection of startup on trip reset	RST Restart	0	No	0:No	O/A	O	O
				1	Yes				
09	0h1B09	Number of automatic restarts	Retry Number	0~10		0	O/A	O	O
10[43]	0h1B0A	Automatic restart delay time	Retry Delay	0.0~60.0(s)		1.0	O/A	O	O
12	0h1B0C	Motion at speed	Lost Cmd Mode	0	None	0:None	O/A	O	O
				1	Free-Run				

[42]  is displayed in loader.

[43] Appears when Pr.09 code is set to 0 or more than 0.

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
		command loss		2	Dec				
				3	Hold Input				
				4	Hold Output				
				5	Lost Preset				
13[44]	0h1B0D	Time to decide speed command loss	Lost Cmd Time	0.1~120(s)		1.0	O/A	O	O
14[44]	0h1B0E	Operation frequency at speed command loss	Lost Preset F	Start frequency-Maximum frequency(Hz)		0.00	O/A	O	O
15[44]	0h1B0F	Analog input loss decision level	AI Lost Level	0	Half of x1	0:Half of x1	O/A	O	O
				1	Below x1				
17	0h1B11	Overload warning selection	OL Warn Select	0	No	0:No	O/A	O	O
				1	Yes				
18	0h1B12	Overload alarm level	OL Warn Level	30~170(%)		150	O/A	O	O
19	0h1B13	Overload warning time	OL Warn Time	0.0~30.0(s)		10.0	O/A	O	O
20	0h1B14	Motion at overload fault	OL Trip Select	0	None	1:Free-Run	O/A	O	O
				1	Free-Run				
				2	Dec				
21	0h1B15	Overload fault level	OL Trip Level	30~200(%)		170	O/A	O	O
22	0h1B16	Overload fault time	OL Trip Time	0.0~60.0(s)		7.0	O/A	O	O
25	0h1B19	Underload warning selection	UL Warn Sel	0	No	0:No	O/A	O	O
				1	Yes				
26	0h1B1A	Underload warning time	UL Warn Time	0.0~600.0(s)		10.0	O/A	O	O
27	0h1B1B	Underload fault selection	UL Trip Sel	0	None	0:None	O/A	O	O
				1	Free-Run				
				2	Dec				
28	0h1B1C	Underload fault time	UL Trip Time	0.0~600.0(s)		30.0	O/A	O	O

[44] Appears when Pr.12 code is not 0(NONE).

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
29	0h1B1D	Underload lower limit level	UL LF Level	10~30(%)		30	O/A	O	O
30	0h1B1E	Underload upper limit level	UL BF Level	30~100(%)		30	O/A	O	O
31	0h1B1F	No motor motion at detection	No Motor Trip	0	None	0:None	O/A	O	O
				1	Free-Run				
32	0h1B20	No motor detection current level	No Motor Level	1~100(%)		5	O/A	O	O
33	0h1B21	No motor detection delay	No Motor Time	0.1~10.0(s)		3.0	O/A	O	O
40	0h1B28	Electronic thermal fault selection	ETH Trip Sel	0	None	0:None	O/A	O	O
				1	Free-Run				
				2	Dec				
41	0h1B29	Motor cooling fan type	Motor Cooling	0	Self-cool	0:Self-cool	O/A	O	O
				1	Forced-cool				
42	0h1B2A	Electronic thermal 1 minute rating	ETH 1min	120~200(%)		150	O/A	O	O
43	0h1B2B	Electronic thermal continuous rating	ETH Cont	50~150(%)		120	O/A	O	O
45	0h1b2D	BX trip mode	BX Mode	0	Free-Run	0	X/A	O	O
				1	Dec				
50	0h1B32	Stall prevention motion and flux braking	Stall Prevent	bit	0000~1111	0000	X/A	O	O
				0001	Acceleration				
				0010	constant speed				
				0100	deceleration				
51	0h1B33	Stall frequency1	Stall Freq 1	Start frequency-Stall frequency2(Hz)		50.00	O/A	O	O
52	0h1B34	Stall level1	Stall Level 1	30-250(%)		180	X/A	O	O
53	0h1B35	Stall frequency2	Stall Freq 2	Stall frequency1-Stall		50.00	O/A	O	O

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
				frequency3(Hz)					
54	0h1B36	Stall level2	Stall Level 2	30-250(%)		180	X/A	O	O
55	0h1B37	Stall frequency3	Stall Freq 3	Stall frequency2-Stall frequency4(Hz)		50.00	O/A	O	O
56	0h1B38	Stall level3	Stall Level 3	30-250(%)		180	X/A	O	O
57	0h1B39	Stall frequency4	Stall Freq 4	Stall frequency3-Maximum frequency(Hz)		50.00	O/A	O	O
58	0h1B3A	Stall level4	Stall Level 4	30-250(%)		180	X/A	O	O
59	0h1B3B	Flux braking gain	Flux Brake Kp	0 ~ 150(%)		0	O/A	O	O
60	0h1B3C	Selection to use the function Warning setting day	Prohibit Sel	0	No	0:No	O/A	O	O
				1	Yes				
61[45]	0h1B3D	Number of days for prohibition of operation	Warning Day	1~1440		365	O/A	O	O
62[45]	0h1B3E	Number of operating days	Prohibit Day	0~90		30			
63[45]	0h1B3F	Selection to use the function	Operate Day	-		-	-/A	O	O
66	0h1B42	DB resistor warning level	DB Warn %ED	0~30(%)		10	O/A	O	O
73	0h1B49	Speed deviation trip	Speed Dev Trip	0	No	0: No	O/A	O	O
				1	Yes				
74	0h1B4A	Speed deviation band	Speed Dev Band	1 ~ 20		5.0	O/A	O	O

[45] Appears when the Pr.60 code is 1 (Yes).

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL
75	0h1B4B	Speed deviation time	Speed Dev Time	0 ~ 120		60	O/A	O	O
79	0h1B4F	Cooling fan fault selection	FAN Trip Mode	0	Trip	1:Warning	O/A	O	O
				1	Warning				
80	0h1B50	Motion selection at option trip	Opt Trip Mode	0	None	1:Free-Run	O/A	O	O
				1	Free-Run				
				2	Dec				
81	0h1B51	Low voltage fault decision delay time	LVT Delay	0.0~60.0(s)		0.0	X/A	O	O
82	0h1B52	LV2 Selection	LV2 Enable	0	No	0: No	X/A	O	O
				1	Yes				
90	0h1B5A	Warning information	-	-		-	-/7	O	O
91	0h1B5B	Fault history 1	-	-		-	-/7	O	O
92	0h1B5C	Fault history 2	-	-		-	-/7	O	O
93	0h1B5D	Fault history 3	-	-		-	-/7	O	O
94	0h1B5E	Fault history 4	-	-		-	-/7	O	O
95	0h1B5F	Fault history 5	-	-		-	-/7	O	O
96	0h1B60	Fault history deletion	-	0	No	0:No	-/7	O	O
				1	Yes				

6.11 Groups for LCD Keypad Only

6.11.1 Trip Mode (TRP Last-x)

Code	Name	LCD Display	Setting Range		Initial Value
00	Trip type display	Trip Name(x)	-		-
01	Frequency reference at trip	Output Freq	-		-
02	Output current at trip	Output Current	-		-
03	Acceleration/Deceleration state at trip	Drive State	-		-
04	DC section state	DCLink Voltage	-		-
05	NTC temperature	Temperature	-		-
06	Input terminal state	DI State	-		0000 0000
07	Output terminal state	DO State	-		000
08	Trip time after Power on	Trip On Time	-		0/00/00
09	Trip time after operation start	Trip Run Time	-		0/00/00 00:00
10	Delete trip history	Trip Delete?	0	No	
			1	Yes	

6.11.2 Config Mode (CNF)

Code	Name	LCD Display	Setting Range		Initial Value
00	Jump code	Jump Code	1~99		42
01	Keypad language selection	Language Sel	0 : English		0 : English
02	LCD contrast adjustment	LCD Contrast	-		-
03	Multi keypad ID	Multi KPD ID	3~99		3
10	Drive S/W version	Inv S/W Ver	-		-
11	LCD keypad S/W version	KeypadS/W Ver	-		-
12	LCD keypad title version	KPD Title Ver	-		-
20	Status window display item	Anytime Para	0	Frequency	0: Frequency

Code	Name	LCD Display	Setting Range		Initial Value
21	Monitor mode display item1	Monitor Line-1	1	Speed	0: Frequency
22	Monitor mode display item2	Monitor Line-2	2	Output Current	2:Output Current
23	Monitor mode display item3	Monitor Line-3	3	Output Voltage	3:Output Voltage
			4	Output Power	
			5	WHour Counter	
			6	DCLink Voltage	
			7	DI State	
			8	DO State	
			9	V1 Monitor(V)	
			10	V1 Monitor(%)	
			13	V2 Monitor(V)	
			14	V2 Monitor(%)	
			15	I2	
			16	I2 Monitor(%)	
			17	PID Output	
			18	PID Ref Value	
			19	PID Fdb Value	
			20	Torque	
			21	Torque Limit	
			23	Speed Limit	
			24	Load Speed	
			25	Temperature	
24	Monitor mode initialization	Mon Mode Init	0	No	0:No
			1	Yes	
30	Option slot 1 type display	Option-1 Type	0	None	0:None
31	Option slot 2 type display	Option-2 Type	6	Ethernet	0:None
32	Option slot 3 type display	Option-3 Type	9	CANopen	0:None
40	Parameter initialization	Parameter Init	0	No	
			1	All Grp	
			2	DRV Grp	
			3	BAS Grp	
			4	ADV Grp	
			5	CON Grp	

Code	Name	LCD Display	Setting Range		Initial Value
			6	IN Grp	
			7	OUT Grp	
			8	COM Grp	
			9	APP Grp	
			11	APO Grp	
			12	PRT Grp	
			13	M2 Grp	
41	Display changed Parameter	Changed Para	0	View All	0:View All
			1	View Changed	
42	Multi key item	Multi Key Sel	0	None	0:None
			1	JOG Key	
			2	Local/Remote	
			3	UserGrp	
			4	Multi KPD	
43	Macro function item	Macro Select	0	None	0:None
44	Trip history deletion	Erase All Trip	0	No	0:No
			1	Yes	
45	User registration code deletion	UserGrp AllDel	0	No	0:No
			1	Yes	
46	Read parameters	Parameter Read	0	No	0:No
			1	Yes	
47	Write parameters	Parameter Write	0	No	0: No
			1	Yes	
48	Save parameters	Parameter Save	0	No	0:No
			1	Yes	
50	Hide parameter mode	View Lock Set	0~9999		Un-locked
51	Password for hiding parameter mode	View Lock Pw	0~9999		Password
52	Lock parameter edit	Key Lock Set	0~9999		Un-locked
53	Password for locking parameter edit	Key Lock Pw	0~9999		Password
60	Additional title update	Add Title Up	0	No	0:No
			1	Yes	
61	Simple parameter setting	Easy Start On	0	No	1:Yes
			1	Yes	
62	Power consumption initialization	WHCount Reset	0	No	0:No
			1	Yes	

Code	Name	LCD Display	Setting Range		Initial Value
70	Accumulated drive motion time	On-time	00000DAY 00:00		-
71	Accumulated drive operation time	Run-time	00000DAY 00:00		-
72	Accumulated drive operation time initialization	Time Reset	0	No	0:No
			1	Yes	
74	Accumulated cooling fan operation time	Fan Time	00000DAY 00:00		-
75	Reset of accumulated cooling fan operation time	Fan Time Rst	0	No	0:No
			1	Yes	

Product Warranty

1. Warranty Period

The warranty period is 24 months from the date of manufacture.

2. Scope of Warranty

1) The initial diagnosis of faults should be conducted by the user.
However, upon request, LS ELECTRIC or its representative(s) can undertake this task for a fee. If the cause of the fault is found to be the responsibility of LS ELECTRIC, this service will be free of charge.

2) This warranty only applies if the product is used under normal conditions according to the specifications and precautions described in the handling instructions, user manuals, catalogs, and caution labels.

3) During the warranty period, repairs shall be charged for the following cases:

(1) Replacement of consumable and life-limited parts (e.g. relays, fuses, electrolytic capacitors, batteries, fan, etc.).

(2) Failures or damage caused by improper storage, handling, negligence, or accidents by the user.

(3) Failures resulting from the user's hardware or software design.

(4) Failures caused by modifications made without LS ELECTRIC's consent.
(If modifications or repairs are not conducted by LS ELECTRIC or its representative(s), further repairs including paid services will be refused.)

(5) Failures that could have been avoided if the user's equipment, in which the product is incorporated, had safety devices required by legal regulations or common industry standards.

(6) Failures that could have been prevented if maintenance and replacement of consumable parts were performed normally according to the handling instructions or user manuals.

(7) Failures and damage to the product caused due to the connected equipment or use of inappropriate consumables.

(8) Failures caused by external factors such as fire, abnormal voltage, force majeure, and natural disasters such as earthquakes, lightning, salt damage, wind, flood damage, etc.

(9) Failures that cannot be predicted/solved by current scientific technology at the time of manufacture.

(10) Other failures, damage, or defects recognized as the responsibility of the user.

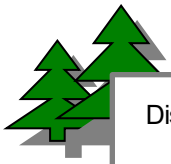
Manual Revision History

Revision History

No	Date	Edition	Changes
1	2021.01	1st Edition	
2	2024.06	2nd Edition	Warranty Modified

Eco-friendly business operation

At LS ELECTRIC, protecting the environment is the priority in operating our businesses.
We do our best to ensure a pleasant environment for all.



Disposal of the product

The LSELECTRIC inverter products are designed to be eco-friendly. They can be separately collected and recycled for the iron, aluminum, copper, and plastic (cover parts) materials.