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AC Variable Speed Drive

5.5~22 kW [400VAC]

LSLV-IV5L User Manual
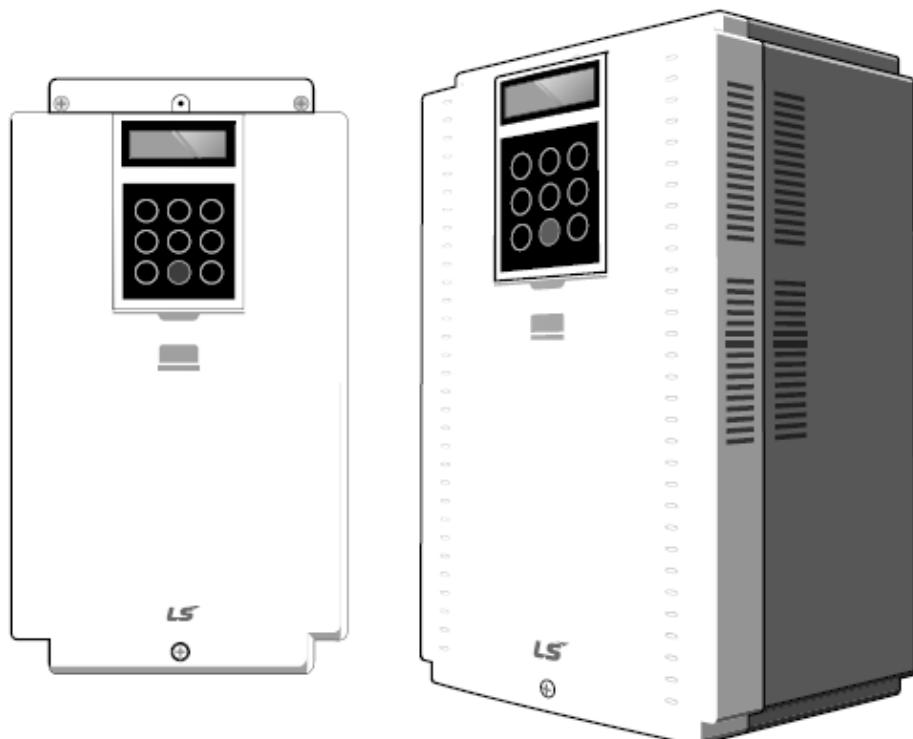
⚠ **Safety Instructions**

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

- Keep this manual within easy reach for quick reference.

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This operation manual is intended for users with general knowledge of electrical theory and installation. Ensure that the end user and the maintenance technician receive this user manual.
* LSLV-iV5L is the official name for the iV5L series of inverters.

Before installing and using the LSLV-iV5L series inverter, carefully read this manual to understand the inverter's features and to learn the essential information required to properly install and operate the inverter.

User manuals for optional add-on boards

The following is a list of user manuals that are supplied with the corresponding add-on boards. These optional add-on boards are compatible with the SV-iV5 and the LSLV-iV5L series products. You can download the PDF versions of these user manuals by visiting www.lsis.com (go to [Customer support]–[Download center]).

• iV5 EL (Elevevator) I/O option board User Manual (English)
• iV5 Sin/Cos Encoder option board User Manual (English)
• iV5 Sin/Cos EnDat encoder option board User Manual (English)

After reading this manual, store it in a location accessible to users at any time.

Safety information

Read and follow all safety instructions in this manual 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 which, if not avoided, could result in minor injury or property damage.

Safety information

⚠ Danger

- Do not open the equipment cover while it is on or operating. Likewise, do not operate the inverter while the cover is open. Contact with high voltage terminals or the charging area may result in an electric shock. Do not remove any covers or touch the printed circuit boards (PCBs) or electrical contacts when the power is on or during operation. Doing so may result in serious injury, death, or serious property damage.
- Do not open the equipment cover even when the power supply to the inverter 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 store a charge after the power supply has been turned off. Use a multimeter to make sure that there is no voltage present before working on the inverter, motor, or output cables.
- Supply earthing system: TT, TN not suitable for corner-earthed systems
- Wait at least 10 minutes before opening the covers and exposing the terminal connections. Before starting work on the inverter, test the connections to ensure all DC voltage has been fully discharged. Personal injury or death by electric shock may result.

⚠ Warning

- Do not install this equipment on or near combustible material. Doing so may cause a fire.
- This equipment must be electrically grounded for safe and proper operation.
- Do not use or supply power to a faulty inverter. If the inverter is faulty, disconnect the power supply and arrange for qualified technical support.
- The inverter will become hot during normal operation. To avoid burns, do not touch the inverter until it has cooled.
- Do not allow foreign objects, such as screws, metal filings, debris, water, or oil to enter the inverter. Foreign objects inside the inverter may cause the inverter to malfunction or result in a fire.
- Do not touch the inverter with wet hands. Doing so may result in electric shock.

ⓘ Caution

- Do not modify the inverter. Doing so will void the warranty.
- The inverter is designed to operate 3-phase motors. Do not use the inverter to operate single phase motors.
- Do not place heavy objects on top of electric cables. Doing so may damage the cable and result in electric shock.

Note

The maximum allowable prospective short-circuit current at the inverter's input connection is specified in IEC 60439-1 as 100 kA. The drive is rated for a power supply capable of delivering up to 100 kA RMS at the drive's maximum rated voltage.

Quick reference table

The following table contains situations frequently encountered by users while working with inverters. Refer to the situations listed in the table to quickly locate answers to your questions.

Situation	Reference
I want to configure the inverter to start operating as soon as the power source is applied.	p. 225
I want to configure motor parameters.	p. 138
The inverter or the motor does not seem to working properly.	p. 321
What is auto-tuning?	p. 138
What are the recommended cable lengths?	p. 22
The motor is making a loud noise.	p. 134
I want to review the recent history of fault trips and warnings.	p. 321
I want to use a potentiometer to change the inverter's operating frequency.	p. 58
I want to install a frequency meter using an analog terminal.	p. 91
I want to operate the inverter using a multistep speed configuration.	p. 209
The motor is running too hot.	p. 266
I want to change the items that are monitored on the keypad.	p. 118

Table of contents

About the LSLV-iV5L inverter series

This instruction manual includes information required to perform installation, test run, and basic operation of the LSLV-iV5L inverter. The LSLV-iV5L inverter provides precision vector control of motor speed and torque while driving 3-phase induction and synchronous motors.

Main features

The following are the main features of the LSLV-iV5L inverter series:

- IGBT type inverter, a speed sensor (encoder) can be installed for vector control

- Open-loop speed control (V/F, slip compensation mode)

- Closed-loop speed control (synchronized speed mode)

- Error detection for hardware or software encoder

- Power system redundancy and emergency backup power

- Designed specifically for load lifting applications (elevators)

1 Preparing the installation

This chapter provides details about product identification, part names, correct installation procedures, and cable specifications. To install the inverter correctly and safely, carefully read and follow these instructions.

> ⚠ Caution
>
> To safely transport the inverter for installation:
> - Do not stack product packages in excess of allowed weight, or allowed number of layers.
> - Do not open the packaging during transportation.

1.1 Product identification

The LSLV-iV5L inverter comes from a product range suitable for various drive capacities and power supplies. Each model in the range has its specifications detailed on the rating plate. Check the rating plate before installing the product to ensure that the product meets your requirements. For more detailed product specifications, refer to *10.1 Input and output specifications* on page *347*.

> **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 questions about your product.

LSLV ☐☐☐☐iV5L-4CNNN — Model name

INPUT	380-480V	3 Phase
	16A	50/60Hz
OUTPUT	0-Input V	3 Phase
	☐☐A	0-3600 rpm
	☐☐HP / ☐☐kW (D)	
	Ser. NO 550 ☐☐☐☐☐☐☐☐	
	Inspected by H.S.LEE	
	KCC-REM-LSR-XXXXXXX	

Power source specifications

Output specifications

Rated output current and operation frequency

Output capacity

Serial number

LS is   Made in KOREA

LSLV ☐☐☐☐ iV5L - 4CNNN

Motor capacity

0055 - 5.5kW
0075 - 7.5kW
0110 - 11kW
0150 - 15kW
0185 - 18.5kW
0220 - 22kW

Series name

Input voltage

4 - 3-phase 400V

Keypad type

C - LCD Keypad

UL type

N - Non UL Type

EMC filter

F - Built-in EMC
N - Non EMC

Reactor

D - Biilt-in DCL
N - Non DCL
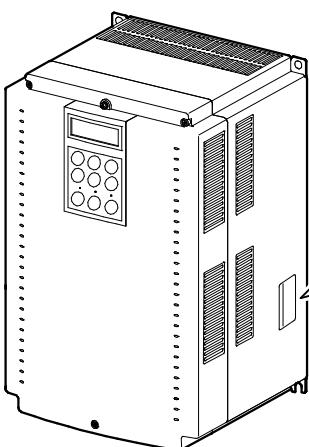
1.2 Part names

The diagram below displays names for the inverter's parts. Details may vary between inverter models.

Keypad

Control terminal block

Cable guide

Front cover

Cooling fan

Bottom view
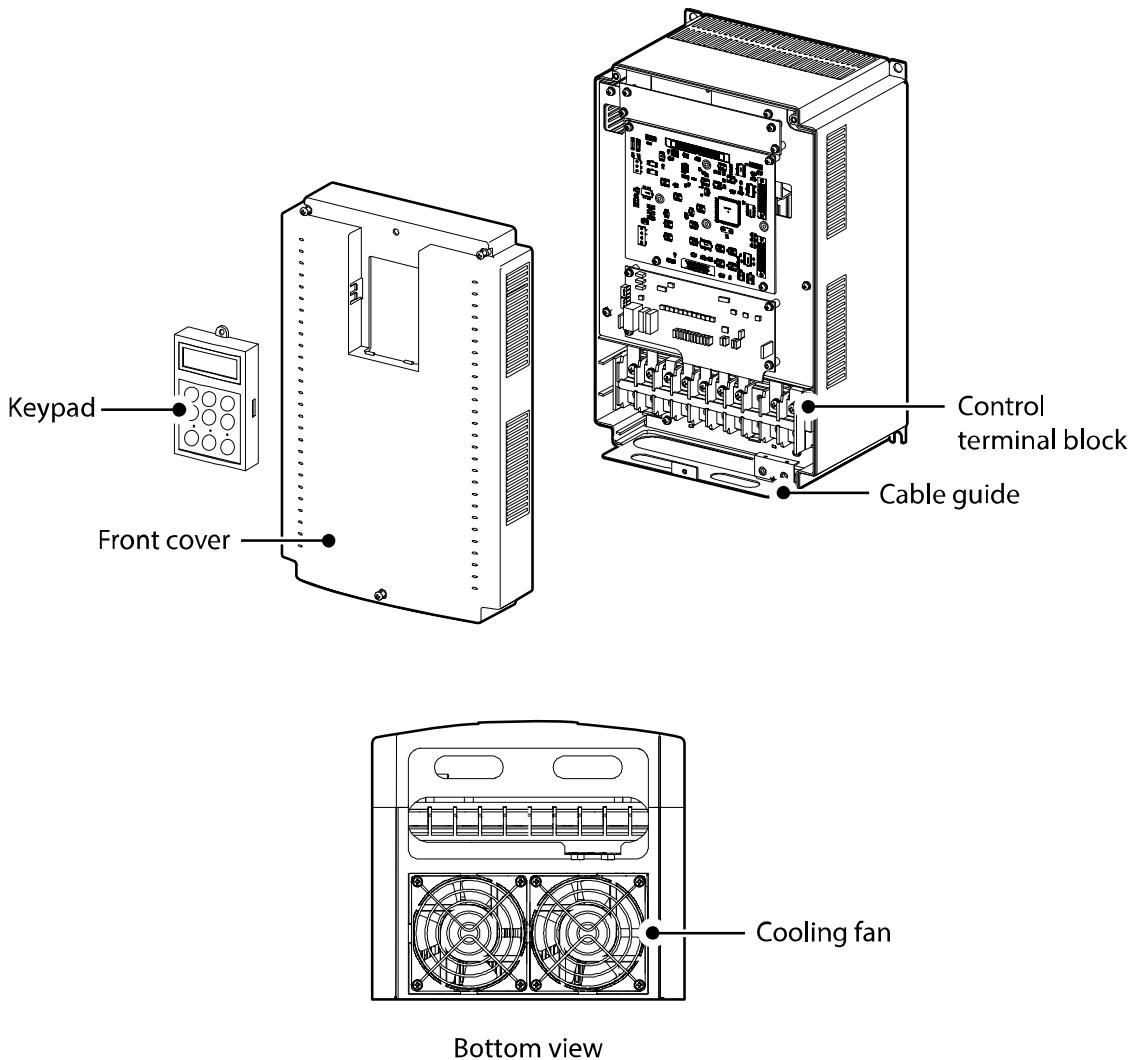
1.3 Installation considerations

Inverters contain various precision, electronic components. 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 inverter.

Item	Description
Ambient humidity	90% relative humidity (no condensation)
Storage temperature	- 4–149 °F (-20–65℃)
Environmental factors	An environment free from corrosive or flammable gases, oil residue, and dust.
Altitude/vibration	Less than 3,280 ft (1,000 m) above sea level / less than 0.6 G (5.9 m/sec2)
Air pressure	70 –106 kPa
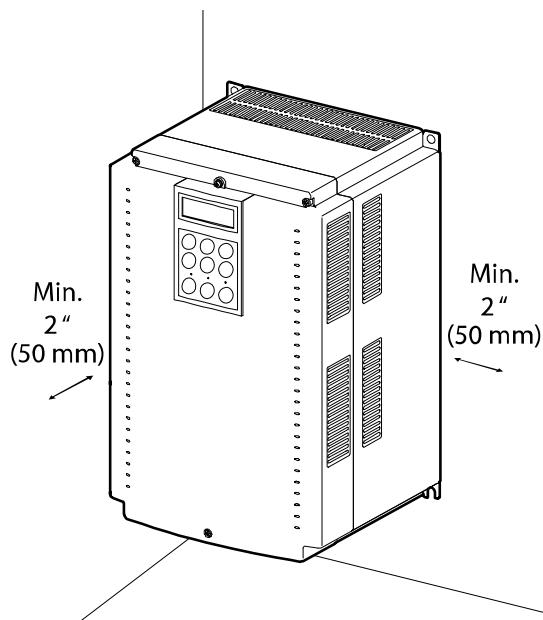
⊙ Caution

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

1.4 Selecting and preparing a site for installation

When selecting an installation location consider the following points:

- The inverter must be installed on a wall that can support the inverter's weight.
- The location must be free from vibration. Vibration can adversely affect the operation of the inverter.
- Do not install the inverter in a location exposed to direct sunlight, high temperature, or high humidity.
- Do not install the inverter near oil residue, flammable gas, or dust. Install the inverter in a clean location or inside an equipment cabinet. The air flow must be clean and free of conductive dust.
- The inverter can become very hot during operation. Install the inverter on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the inverter to allow air to circulate. The illustrations below detail the minimum installation clearances.

Min. 2" (50 mm)   Min. 2" (50 mm)

Min. 2" (50 mm)

Plan view

Min. 4" (100 mm)

Min. 4" (100 mm)
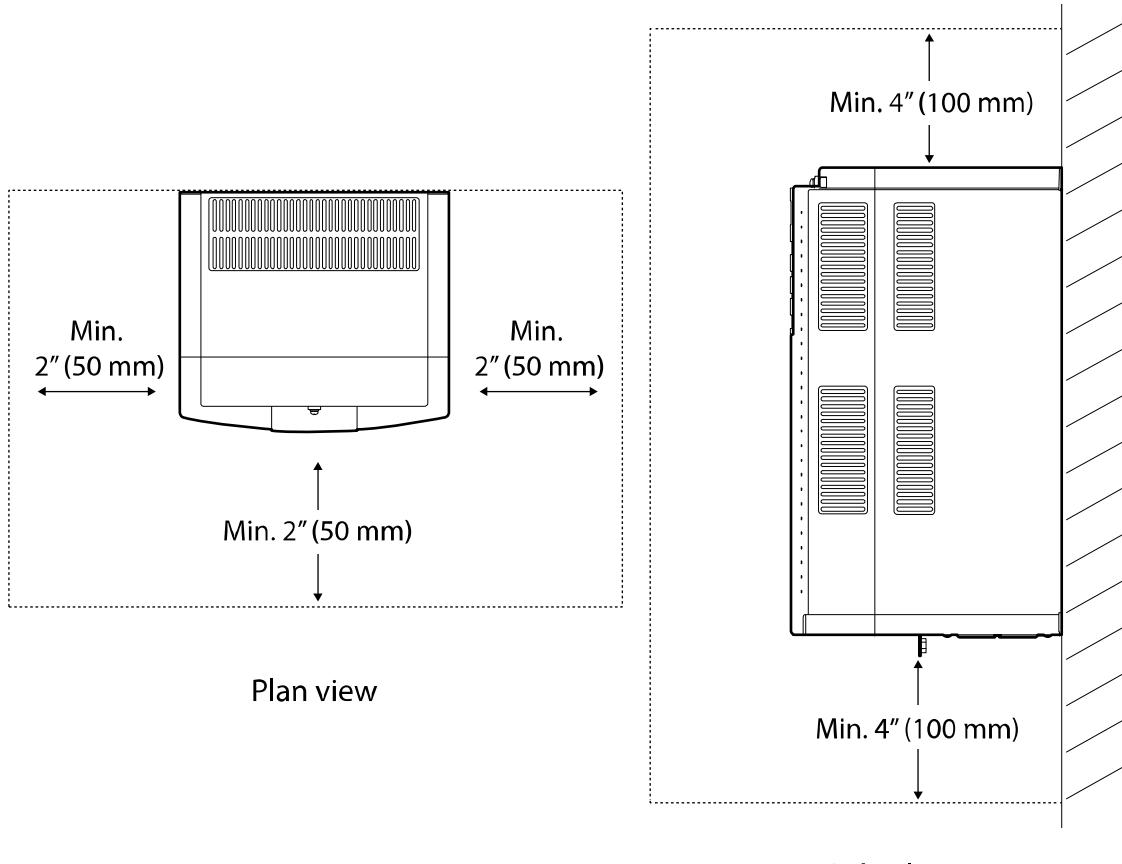
Side elevation

- Ensure sufficient air circulation is provided around the inverter when it is installed. If the inverter is to be installed inside a cabinet, enclosure, or equipment rack, allow for the position of the inverter's cooling fan and the ventilation grilles. The cooling fan must be positioned to efficiently transfer the heat generated by the inverter's operation.
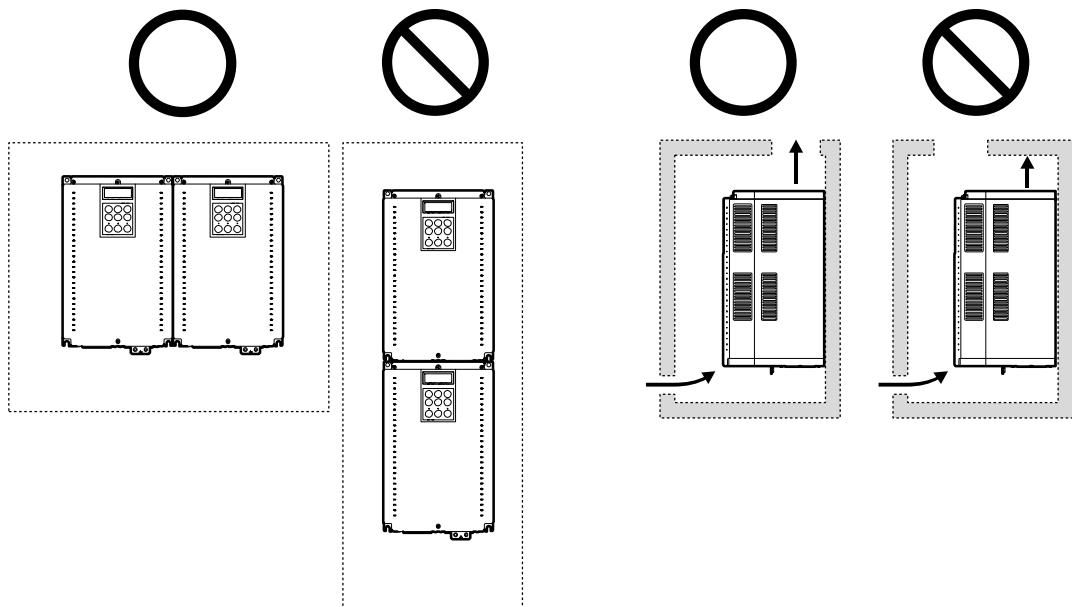
⊙ Caution

- Do not expose the inverter to rain, snow, fog, or dust.
- Do not block the inverter's air vents. Doing so may cause the inverter to overheat.

- If you are installing multiple inverters in one location, arrange them side-by-side.
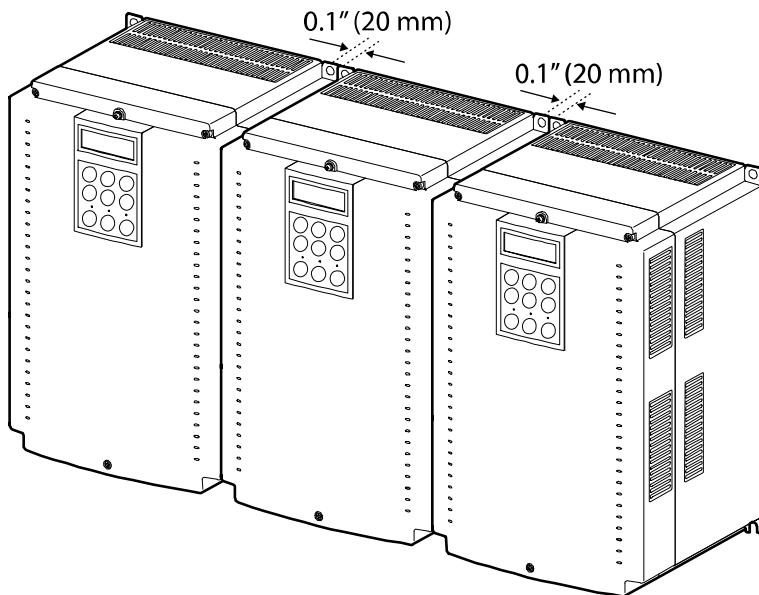
- If you are installing multiple inverters of different ratings, provide sufficient clearance to meet the clearance specifications for the inverter with the highest rating.

Min. 4″ (100 mm)

Min. 2″(50 mm)

Min. 2″(50 mm)

Min 4″ (100 mm)
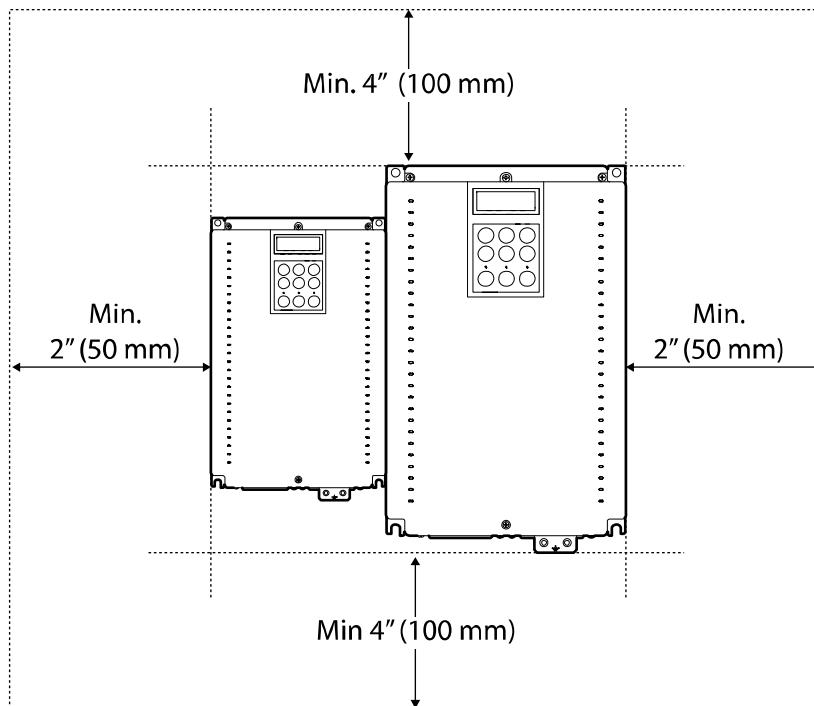
1.5 Cable selection

When you install power and control cables for the inverter, use cables that meet the required specifications for the safe and reliable operation of the product. Refer to the following information to assist you with cable selection.

⚠ Caution

- Use mains power cables with sufficient cross-sectional area to prevent voltage drop exceeding 2%.

- Use copper cables rated at 600 V, 75 ℃ for mains power wiring.

- Use copper cables rated at 300 V, 75 ℃ for control circuit wiring.

- The inverters in the range between 5.5 kW and 22 kW must be grounded with industrial connector according to IEC60309.

- The minimum size of the protective earthing conductor shall comply with the local safety regulations for high protective earthing conductor current equipment.

- Only one conductor per terminal should be simultaneously connected.

- The accessible connections and parts listed below are of protective class o. It meas that the protection of these circuits relies only upon basic insulation and becomes hazardous in the evnet of a failure of the basic insulation. Therefore, devices connected to these circuits must provide electrical-shock protection as if the device was connected supply mains voltage. In addition, during installation these parts must be considered, in relation with electrical-shock, as supply mains voltage circuits.

  [Class o circuits]

  ➜ RUN/STOP COMMAND: FX, RX, BX, RST, CM

  ➜ MULTIFUNCTION INPUT: P1–P7, CM

  ➜ ANALOG INPUT: AI1, AI2, AI3
  ➜ ANALOG OUTPUT: AO1, AO2
  ➜ ENCODER INPUT: PE, GE, A+, A-, B+, B-, PA, PB, Z+, Z-
  ➜ ECONDER OUTPUT: RA, GE, RB, GE

- CONTACT: OC1, EG, A1, B1, A2, B2, 30A, 30B, 30C

Ground and power cable specifications

Load (kW)		Ground cable	Power cables (input and output)			
		mm²	mm²		AWG	
			R/S/T	U/V/W	R/S/T	U/V/W
3-Phase 400 V	5.5	4	4	4	10	10
	7.5		4	4	10	10
	11	10	6	6	8	8
	15		10	10	6	6
	18.5	16	16	16	4	4
	22		16	16	4	4

Control cable specifications

Cross-sectional area/diameter	
mm²	AWG
0.2-0.8	18–26

* Use STP (Shielded Twisted Pair) cables for control wiring.

Installation

2 Installing the inverter

This chapter describes the physical and electrical installation of the iV5 inverter, including mounting and wiring the product. Refer to the flowchart and the basic configuration diagram provided below to understand the procedures and installation instructions to be followed to install the product correctly.

Installation flowchart

The following flowchart lists the installation sequence. The steps cover equipment installation and testing. More information about each step is referenced in the steps.
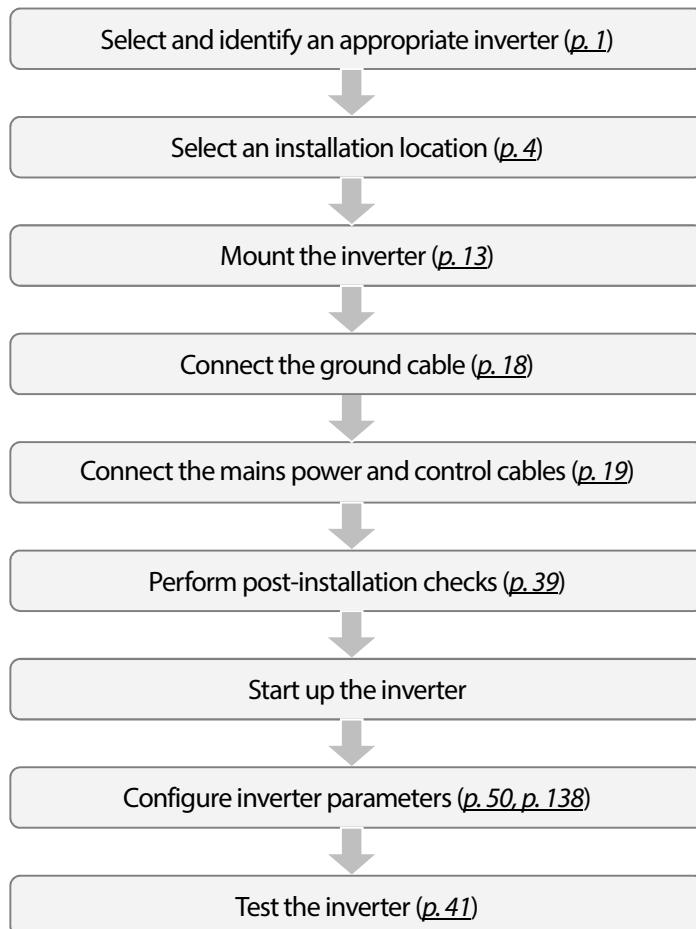
⊘ Caution

Synchronous motors may not operate properly without a parameter tuning (pole position estimation, especially).

Basic configuration diagram

The reference diagram below shows the configuration for a typical system including the inverter and peripheral devices.

Before installing the inverter, ensure that the product is suitable for the application (power rating, capacity, etc). Ensure that all of the required peripherals and optional devices (resistor brakes, contactors, noise filters, etc.) are available. For more details on peripheral devices, refer to *10.4 Peripheral devices* on page *352*.
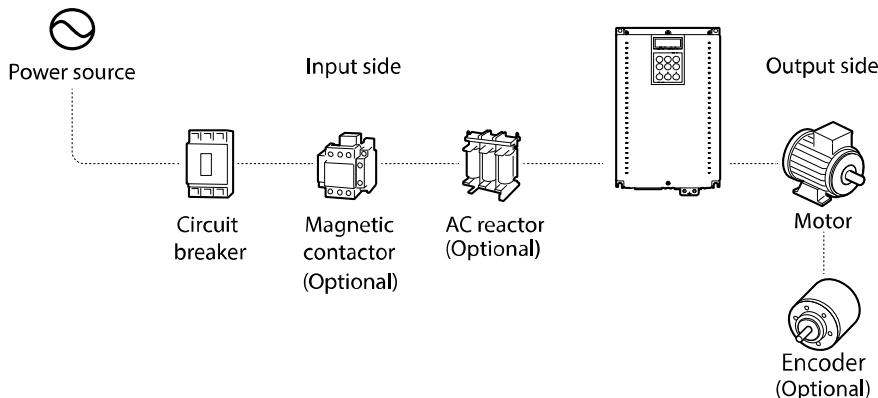
⊘ Caution

- Diagrams in the manual are sometimes drawn with covers or circuit breakers removed to show a more detailed view of the installation arrangements. Ensure that all covers and circuit breakers are installed before operating the inverter.
- Do not use the magnetic contactor on the input side of the inverter to start or stop the inverter.
- Install an additional safety device, such as an emergency brake to prevent the inverter losing control if it is damaged.
- Install a separate emergency stop switch. The STOP key on the keypad works only when the keypad is connected to the inverter.
- When the inverter powers up, high levels of current are present that can affect the circuit. Ensure that correctly rated circuit breakers are installed to operate the circuit safely while the inverter powers up.
- Reactors can be installed to improve power factor. If the input power exceeds 600 kVA, reactors can be installed within 32.8 ft (10 m) of the power supply. Refer to *10.5 Fuse and reactor specifications* on page *353* and ensure that reactors meet the specifications.

2.1 Mounting the inverter

Follow the procedures below when mounting the inverter on a wall or inside an equipment cabinet. Before installing the inverter, ensure that the space meets the clearance specifications and that there are no obstacles that will restrict air flow.

Select a wall or equipment cabinet suitable to support the inverter. Refer to *10.3 External dimensions* on page *351* and confirm the dimensions for the mounting holes.

1   Identify the position where the inverter will be mounted and then use a pencil to mark the top of the inverter.

2   Use a spirit level and draw a horizontal line on the mounting surface at the pencil mark. Mark the two top mounting points on the line.

3   Measure down the mounting surface to the position of the lower mounting points. Use the spirit level again and draw another horizontal line on the mounting surface. Mark the two lower mounting points on the line.

4   Drill holes for the two upper and two lower mounting points. If fixing is not available, insert wall anchors into the four holes. Insert and start to tighten the two lower mounting bolts. Do not fully tighten the bolts at this time.

5   Mount the inverter on the two lower bolts and then fully tighten them.
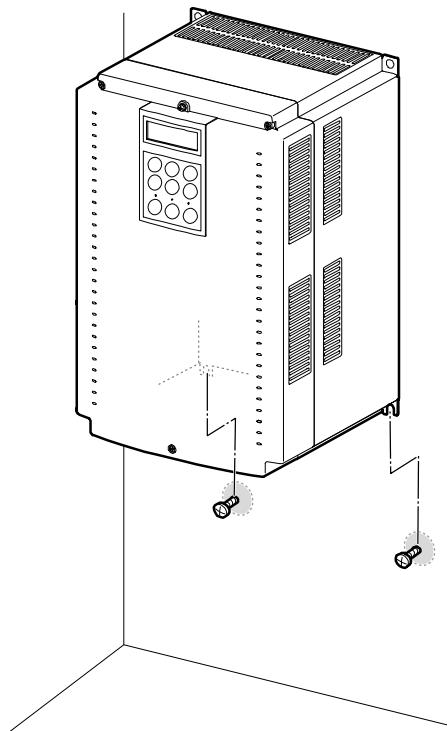
6 Use one hand to support the inverter against the mounting surface and insert and tighten one of the upper mounting bolts. Then, insert and tighten the other upper mounting bolt.
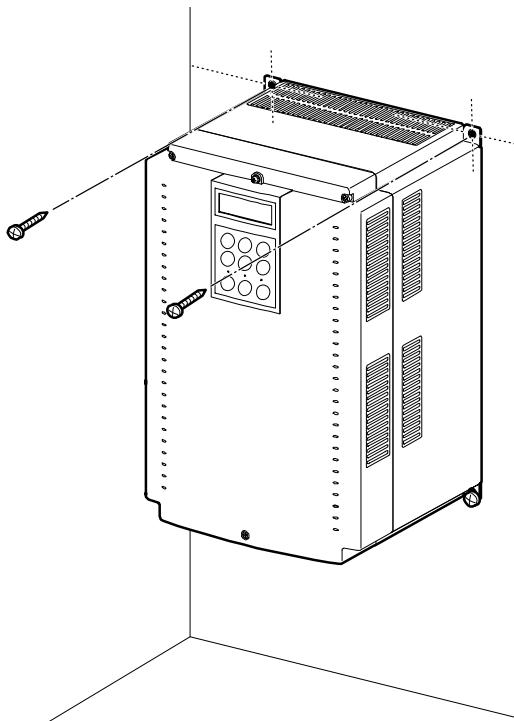

⊙ Caution

• Do not expose the inverter to rain, snow, fog, or dust.
• Do not block the inverter's air vents. Doing so may cause the inverter to overheat.

⚠ Caution

- Do not use the covers or plastic fittings on the outside of the inverter to lift the inverter. If the cover or plastic fitting breaks, the inverter may drop and cause injury or damage. Always use appropriate lifting devices when moving the inverter.

- Inverter equipment can be heavy and bulky. Use appropriately rated equipment to lift and transport the inverter.

- Do not install the inverter on the floor, or mount it sideways. The inverter must be installed vertically on a wall or inside a cabinet, with its rear side flat against the mounting surface. Mount the inverter upright on a wall and secure it using bolts to ensure that it does not move.
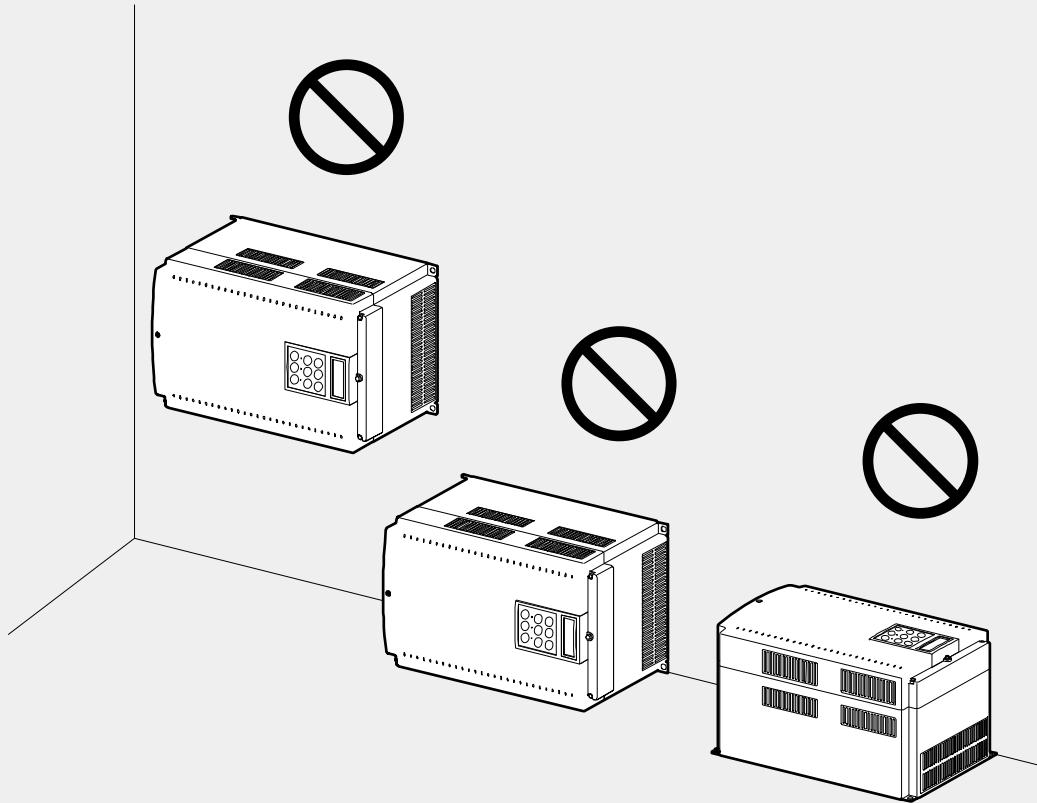
2.2 Cable connections

Open the front cover and connect the ground cable. Connect appropriately rated cables to the power and control terminal blocks.

Read the following information carefully before making cable connections. All warning instructions must be followed.

⚠ Warning

- All cables must be installed by certified technicians.
- Do not modify cable connections, or install/uninstall optional add-on boards while the inverter is operating.

ⓘ Caution

- Mount the inverter before connecting cables. Before installation, ensure that the inverter is not connected to a power source.
- Use cables of specified ratings or higher and run the cables according to the recommended cable length. Using inferior cables may result in fire or electric shock.
- Ensure no metal debris, such as wire offcuts, remain inside the inverter. Metal debris in the inverter may cause inverter failure.
- Tighten terminal screws to their specified torque. Loose terminal screws may result in cable disconnection, cause a short circuit, or inverter failure. Refer to page *353*.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in electric shock.
- Install a reactor if the input voltage to the inverter produces imbalance between the phases. High frequency emission from the inverter's power source may overheat and damage phase advance capacitors or alternators.
- Use mains power cables with sufficient cross-sectional area to prevent voltage drop exceeding 2%.
- Use copper cables rated at 600 V, 167°F (75℃) for mains power wiring.
- Use copper cables rated at 300 V, 167°F (75℃) for control circuit wiring.
- If cable connections are worked on after the inverter is installed, ensure the inverter keypad display and the charge lamp under the terminal cover is turned off before commencing work. The inverter may store an electric charge after the power supply has been turned off.

Note

Do not disconnect the motor cable while the inverter output is alive. Improper cable disconnection may lead to product damage.

Step 1 Front cover

The front cover must be removed to access the cable connections. Refer to the following procedures to remove the front cover. The steps to remove the cover may vary depending on the inverter model.

1   Loosen the keypad screw and the three front cover screws. Remove the keypad and cover by pulling it away from the inverter.
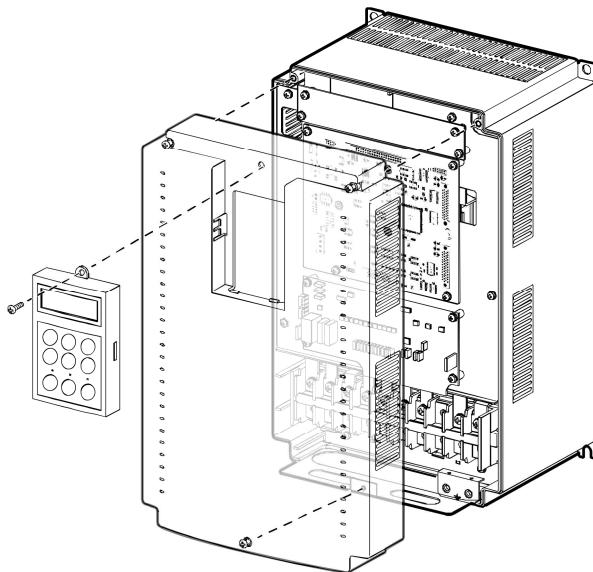
2   Follow the instructions that follow when connecting the grounding, mains power, and control cables to the terminal blocks. For cable specifications, refer to *1.5 Cable selection* on page *9*.

Installation

Step 2 Ground connection

Remove the front cover. Then, follow the instructions below to connect the inverter's ground cable.

1 Locate the ground terminal and connect an appropriately rated ground cable to the terminals. Refer to *1.5 Cable selection* on page *9* to determine the correct grounding cable for your installation.

Note

- Connect the ground cables to the ground terminals. Do not connect the ground cables to the inverter's case bolts.
- Use cables with as large cross-sectional area as possible for grounding. Ground cables must meet or exceed the specifications listed in the *1.5 Cable selection* on page *9*. Keep the ground cable as short as possible and ground termination as close as possible to the inverter.

Ground terminal
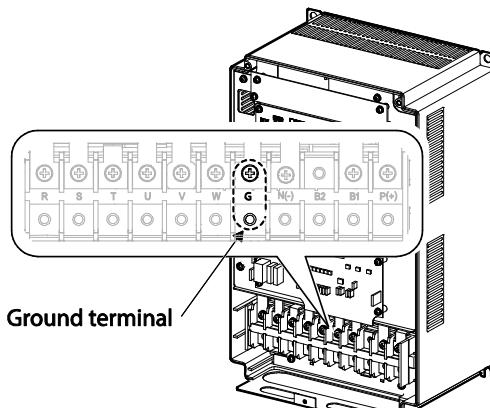
5.5–7.5 kW (3-Phase)
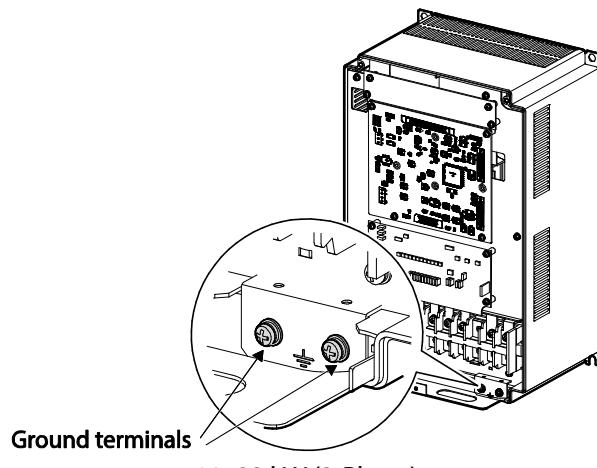
Ground terminals

11–22 kW (3-Phase)

2   Connect the other end of all ground cables to an earth (ground) terminal.

Note

The product requires Class 1 grounding. Resistance to ground must be ≤ 10 Ω.

⚠ Warning

- Install ground connections for the inverter and the motor in accordance with the local codes and specifications to ensure safe and accurate operation. Using the inverter and the motor without the specified grounding connections may result in electric shock.
- This product can cause a DC current in the protective earthing conductor. If a RCD or monitoring (RCM) device is used for protection, only RCD or RCM of Type B is allowed on supply side of this product.
- Large amount of leakage current is generated around the inverter due to high-speed switching operation. The inverter and the motor must be properly grounded to prevent electric shock.

Step 3 Power terminal wiring

The following diagram 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. Ensure that the cables selected meet or exceed the specifications in *1.5 Cable selection* on page *9* before installing them.

⚠ Caution

- Tighten the terminal screws to the rated torque. Loose or over tightened terminal screws may cause short circuits and equipment malfunction.
- Use copper stranded cables only. Power cables must be rated at 600 V, 167°F (75℃) and control circuit cables rated at 300 V, 167°F (75℃).
- For the inverter control circuit, use STP (Shielded Twisted Pair) cables. Do not route the control cables in the same conduit where the power cables are routed.
- Incoming power cables must be connected to the R, S, and T terminals. Connecting incoming power cables to other terminals will cause internal damage to the inverter. Motor cables must be connected to the U, V, and W terminals. The correct phase rotation is not necessary.
- Do not install phase advance capacitors in the inverter output and uninstall them if they had been previously installed. Phase advance capacitors in the inverter output causes inverter overcurrent fault trip.
- B1 and B2 terminals on the main terminals block are for connecting braking resistors only. Do not connect any other device to these terminals.

5.5–7.5 kW (3-Phase)
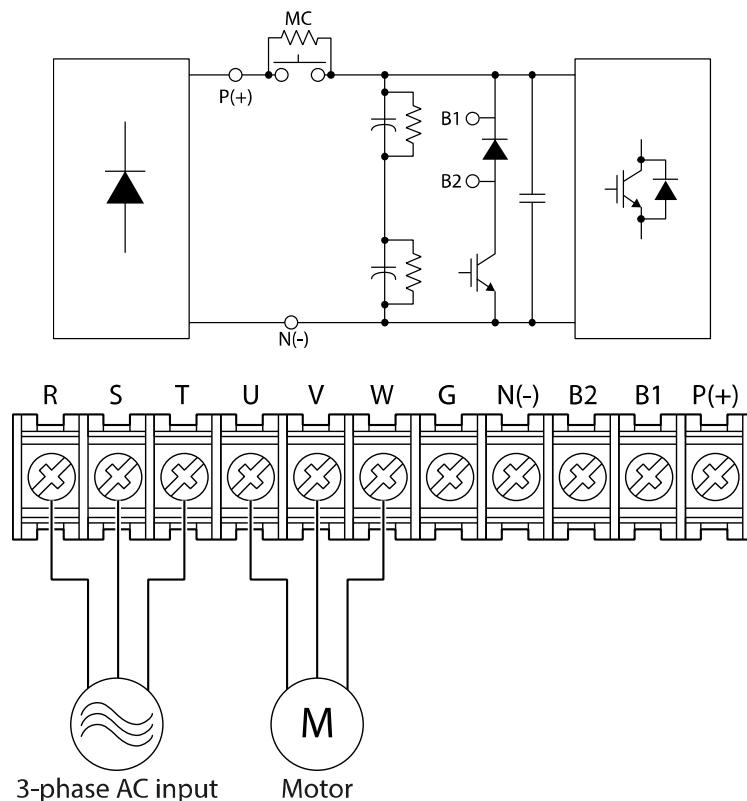
3-phase AC input   Motor

Power terminal descriptions

Terminal	Name	Description
R/S/T	AC power input terminals	3-phase AC power connection.
U/V/W	Motor output terminals	3-phase motor (induction motor, synchronous motor) wiring connections.
G	Ground terminal	Inverter frame ground connection (⏚).
B1/B2	Brake resistor terminals	Brake resistor wiring connections. .
P (+)	DC link terminal P(+)	DC link wiring connections.
N (-)	DC link terminal N(-)	

Note

Apply a DC input to the P (+) and N (-) terminals to operate the inverter on DC current input.

11–22 kW (3-Phase)
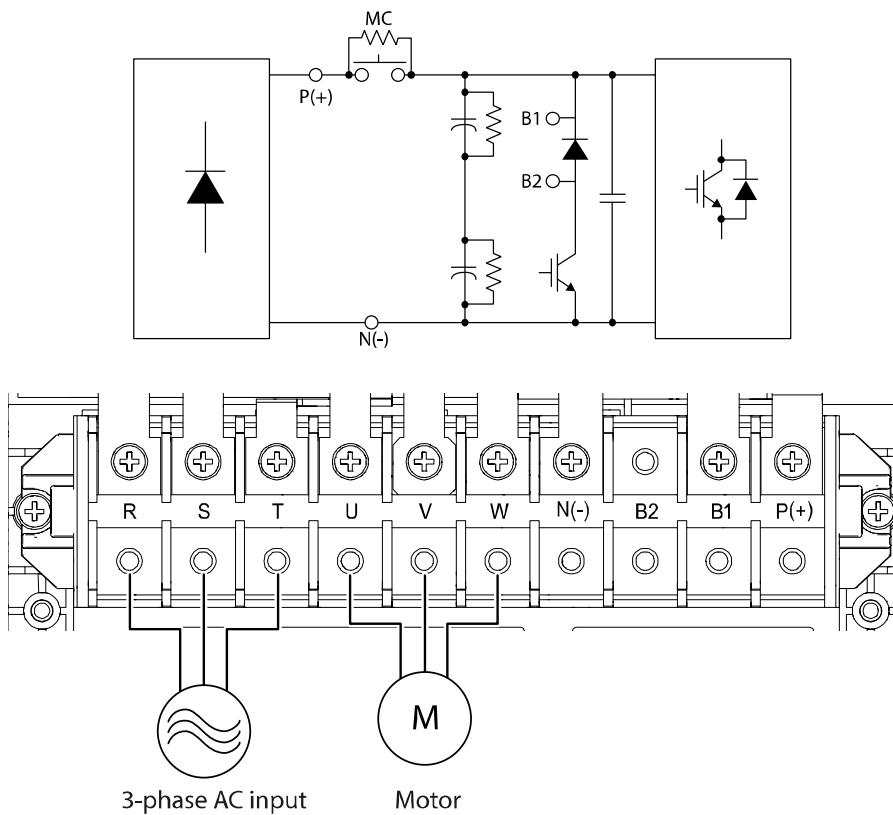
3-phase AC input   Motor

Power terminal descriptions

Terminal	Name	Description
R/S/T	AC power input terminals	3-phase AC power connections.
U/V/W	Motor output terminals	3-phase motor (induction and synchronous motor) wiring connections.
B1/B2	Brake resistor terminals	Brake resistor wiring connections.
P (+)	DC link terminal P(+)	DC link wiring connections.
N (-)	DC link terminal N(-)	

Note

- Apply a DC input to the P (+) and N (-) terminals to operate the inverter on DC current input.

- Use STP cables to connect remotely located motors to the inverter. Do not use 3 core cables.

- Make sure that the total cable length does not exceed 328 ft (100 m).

- Long cable runs can cause reduced motor torque in low frequency applications due to voltage drop. Long cable runs also increase a circuit's susceptibility to stray capacitance and may trigger overcurrent protection devices or result in the malfunction of equipment connected to the inverter.

- Voltage drop is calculated by using the following formula:
  Voltage drop (V) = [√3 X cable resistance (mΩ/m) X cable length (m) X current (A)] / 1000

- Use cables with the largest possible cross-sectional area to ensure that voltage drop is minimized over long cable runs. Lowering the carrier frequency and installing a micro surge filter may also help to reduce voltage drop.

- The permitted cable lengths for the combinations of motor type and switching frequency are listed in the table below.

Motor type	Motor switching frequency	Maximum cable length
Induction	2.5-5 kHz	< 330 ft (100 m)
Induction	2.5-10 kHz	< 165 ft (50 m)
Synchronous	2.5-5 kHz	< 330 ft (100 m)
Synchronous	2.5-8 kHz	< 165 ft (50 m)

⚠ Warning

Do not connect power to the inverter until the inverter is completely installed and the inverter is ready to operate. Doing so may result in electric shock.

⊘ Caution

- Power supply cables must be connected to the R, S, and T terminals. Connecting power cables to other terminals will damage the inverter.

- Use insulated ring lugs when connecting cables to the R/S/T and U/V/W terminals.

- The inverter's power terminal connections can cause harmonics that may interfere with other communication devices located near to the inverter. To reduce interference, the installation of noise filters or line filters may be required.

- To avoid circuit interruption or damage to connected equipment, do not install phase-advanced condensers, surge protection, or electronic noise filters on the output side of the inverter.

- To avoid circuit interruption or damage to connected equipment, do not install magnetic contactors on the output side of the inverter.

Step 4 Control circuit connections

The illustrations below show the detailed layout of the control circuit connections and the control board switches. Ensure that the control cables meet the required specifications and refer to the detailed information provided below and *1.5 Cable selection* on page *9* before installing and connecting control circuits.
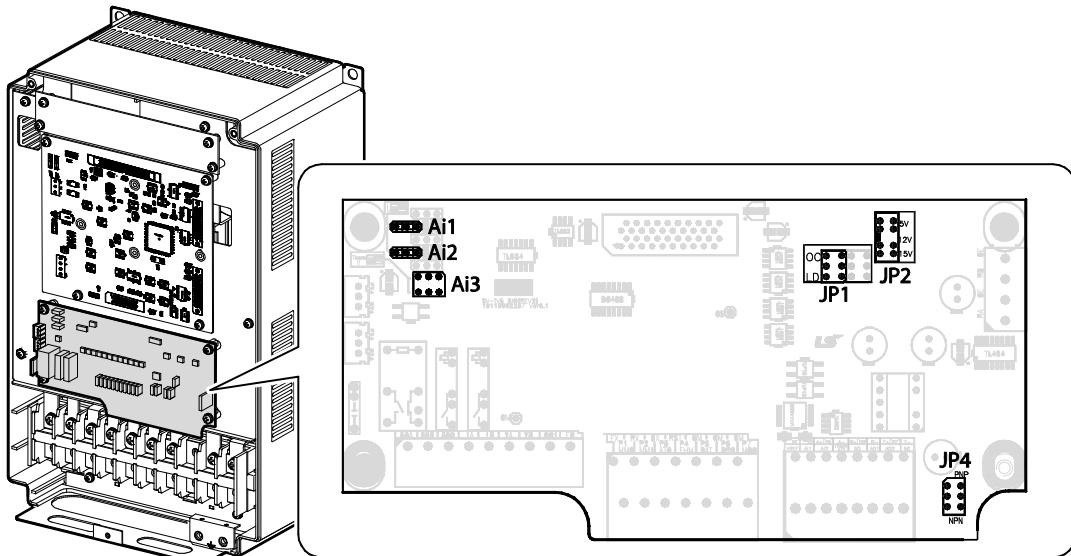
Jumper labels and descriptions

Jumper	Description	Default setting
Ai1	Analog input 1 selection jumper (Left: Voltage input, Right: Current input)	Left: Voltage input
Ai2	Analog input 2 selection jumper (Left: Voltage input, Right: Current input)	Left: Voltage input
Ai3	Analog input 3 selection jumper (Left: Voltage input, Right: Motor NTC)	Left: Voltage input
JP1	Encoder type selection jumper (Up: OC (Open collector), Down: LD (Lin drive))	Down: LD
JP2	Encoder power supply selection jumper (5 V: 5 V encoder power supply, 12 V: 12 V encoder power supply, 15 V: 15 V encoder power supply)	5 V
JP4	NPN/PNP mode selection switch (Up: PNP, Down: NPN)	Down: NPN

Power terminal and control terminal wiring diagram
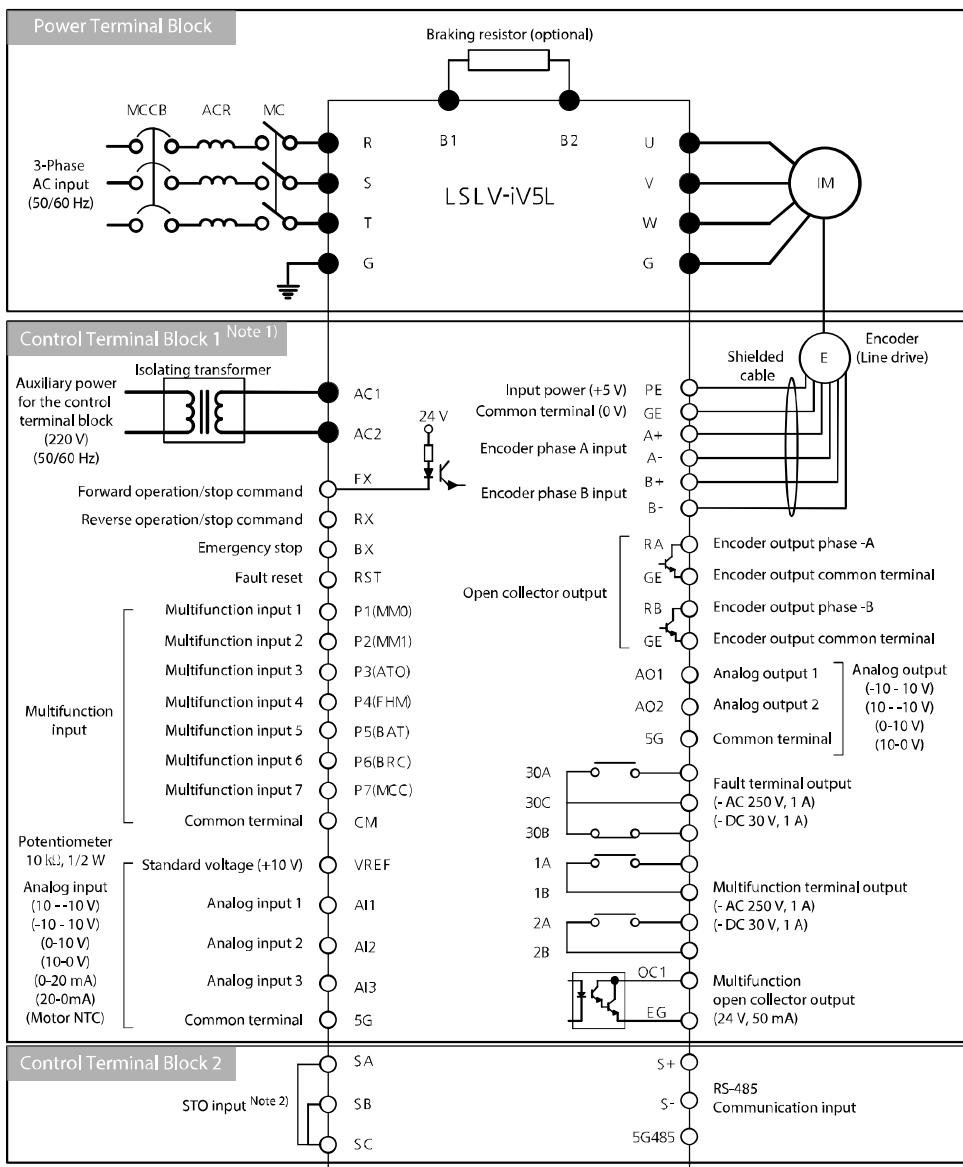
Note) ● : Power terminal block, ○ : Control terminal block

Note1) Used to run the control circuit on a separate auxiliary power source (220 VAC), without the main power supply.

Note2) STO (Safety Torque OFF) input terminal

⚠ Caution

Install an isolation transformer (rated for > 100 VA) for the auxiliary control power source. Otherwise, the inverter may be damaged.

CN2

CN1

CN2

ON OFF

Terminating resister: ON (Default)

Terminating resister: OFF

CNG

CN4

CN5

LSLV-iV5L Control
5.5 ~ 22kW-4
10110003799 Ver.1.1

TMS320F28335
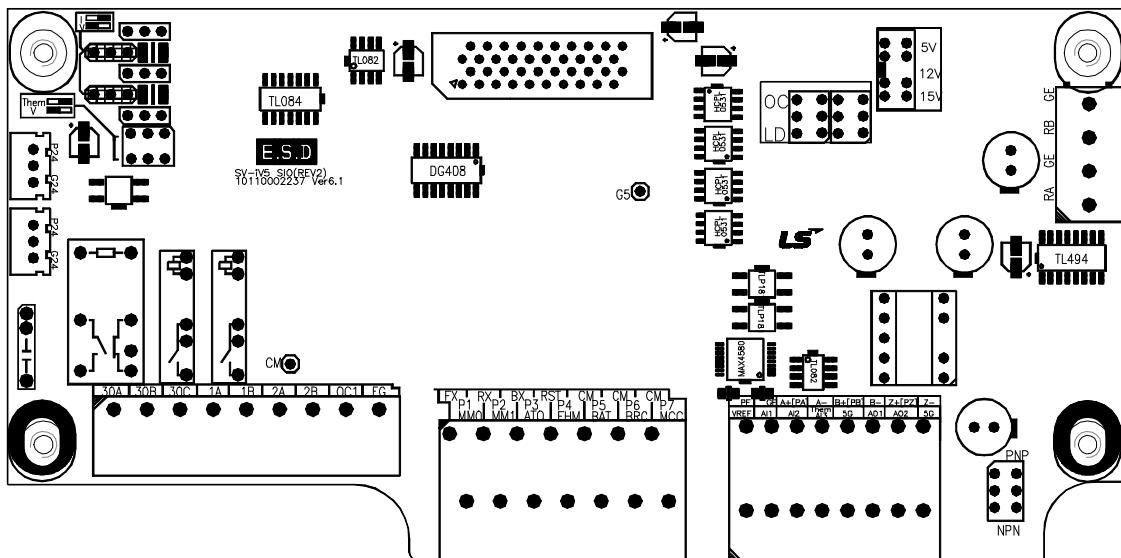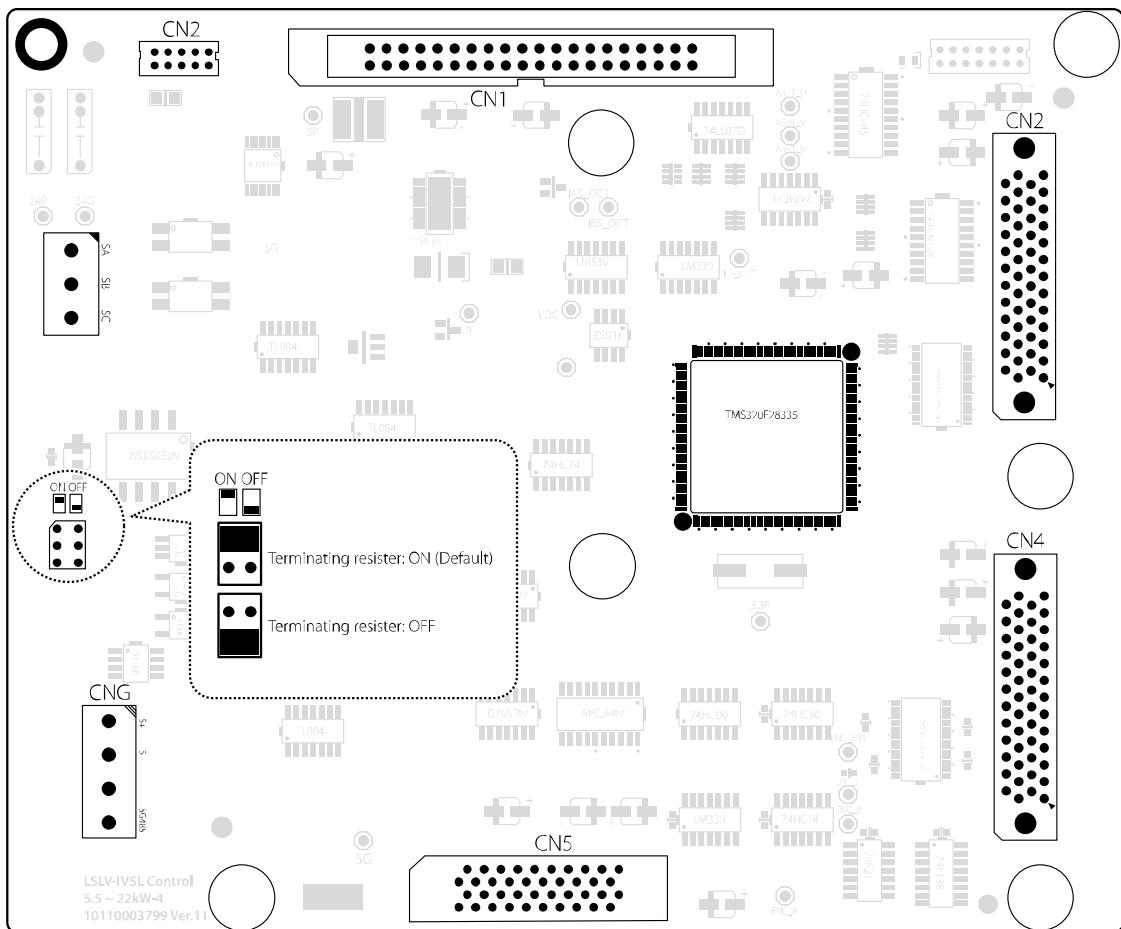
Control board labels and descriptions

Function	Label	Name	Description	
Control board	CN1	SMPS connector	Connects to Drive SMPS.	
	CN2	Keypad connector	Connects to keypad.	
	CN3	Option board and D/A card	Use these connectors when using option boards.	
	CN4			
	CN5	SIO board connector	Connects to SIO board.	
	CN6	Communication terminal	Terminals for the built-in 485 communication.	
			S+/S-	Connects the communication cable.
			5G485	Connects the communication ground cable.
	J2	Communication terminating resister switch	Turns the terminating resister ON when connected to the end of communication line. Up: Terminating resister ON Down: Terminating resister OFF ※ Initial setting: Up (terminating resister ON)	
	TB2	Safety terminal	Hardware connection terminal for the Safety function. The inverter operates normally when SA-SC and SB-SC are connected, and the trip occurs when disconnected.	
			SA/SB	Terminal for Safety A/B connection. The SAFETY A/B trip occurs when disconnected from SC.
			SC	Terminal for Safety trip detection.

Input terminal labels and descriptions

Function	Label	Name	Description
Multifunction terminal configuration	FX	Forward operation/stop command	Stops when FX and RX are ON/OFF at the same time.
	RX	Reverse operation/stop command	
	BX	Emergency stop	Includes free run stop and deceleration stop.
	RST	Fault clearance	Fault status clears when the inverter is ON after the cause of the fault is removed.
	P1 (MM0) P2 (MM1) P3 (AT0) P4 (FHM) P5 (BAT) P6 (BRC) P7 (MCC)	Multifunction input terminals	Configurable for multifunction input.
	CM	Common	Common terminal for analog terminal input and output. Function is ON when each multifunction terminal and CM terminal are connected in NPN input mode.
Analog input configuration	VREF	Potentiometer for analog input	Used to setup or modify a frequency reference via analog voltage or input current. Maximum output voltage: 10 V Potentiometer: 1–10 k Ω

	Ai1	Voltage input	Used for input voltage and current applications, or motor NTC. Set jumper to change between voltage, current, or motor NTC input.
			• For input voltage
			  Ai1, Ai2, Ai3: left side
			• For input current
			  Ai1, Ai2: right side
			• For input motor NTC
			  Ai3: right side

	Ai2	Current input	
	Ai3/Them	Voltage input Motor NTC input	
	5G	Common	Common terminal for analog terminal input.
Encoder input configuration	PE	Encoder power [Note 1)]	+15 V open collector power.
	GE		0 V

Function	Label		Name	Description
	A+	A-	Encoder Phase A power	Phase A and B signals for the line drive encoder. Set the JP2 switch on the I/O board to "5V" and the JP4 switch to "LD".
	B+	B-	Encoder Phase B power	
	PE		Encoder power	+15 V open collector power.
	GE			0 V
	PA		Encoder Phase A power	Phase A and B signals for the complementary and open collector encoder. Set the JP2 switch on the I/O board to "15V" and the JP4 switch to "OC".
	PB		Encoder Phase B power	
	Z+ (PZ)		Encoder Phase Z power	Available only when using an encoder that provides a Phase Z pulse. Line drive type: Using Z+ and Z-. Set JP5 to "LD". Open collector output: Using PZ. Set JP5 to "OC".
	Z-			

Note1) Connect positive encoder power (+) to PE terminal, and negative (-) to GE terminal.

Output/communication terminal labels and descriptions

Function	Label	Name	Description
Encoder output	RA	Encoder output Phase -A	The encoder output signals at Phases A and B are open collector outputs.
	GE	Encoder output common	
	RB	Encoder output Phase -B	
	GE	Encoder output common	
Analog output	AO1	Analog output 1	Output voltage range: - -10 V–10 V - 10 V– -10 V - 0 V– 10 V - 10 V– 0 V. Select one of the following: - Analog input value - Command before and after acceleration/deceleration - Speed control input command - Motor speed - Speed deviation - Motor speed follow-up - Speed control output - Torque bias - Forward direction torque limit - Reverse direction torque limit - Torque limit during regeneration - Torque command - Torque current command - Torque current - Speed command - Speed current command - Speed current - Q-axis current control output - D-axis current control output - D-axis voltage - Q-axis voltage - Output current - Output voltage - Output power - DC-link voltage - Motor temperature (NTC) - Inverter temperature.
	AO2	Analog output 2	
	5G	Common	Common terminal for analog terminal inputs.

Function	Label		Name	Description
Output contacts	1A	1B	Multifunction output contact 1 (Form A contact)	Select one of the following: - Inverter operation available - Zero velocity detection - Speed detection - Speed detection (non-polar) - Speed arrival - Timer output - Low voltage alert - In operation - In regeneration - Motor overheat alert - Inverter overheat alert - Speed agreement - Torque detection - Torque limit detection - Overheat alert - Stopping - MC output - Fan fault - ALLS status - At constant speed, brake output
	2A	2B	Multifunction output contact 2 (Form A contact)	
	OC1	EG	Multifunction open collector output	
	30A		Fault signal (Form A contact)	Output signal is generated when a fault occurs. Does not output when the emergency stop is activated.
	30B		Fault signal (Form B contact)	
	30C		Common	Common terminal for output contacts A and B.
Switch	JP1		Input pulse encoder	LD (Line Drive) / OC (open collector or complementary)
	JP2		Input voltage encoder	Select between DC +5 V, DC +12 V, and DC +15 V.
	JP4 Note 1)		PNP/NPN input mode	Select PNP/NPN input mode.

Note 1) Example of encoder output connection
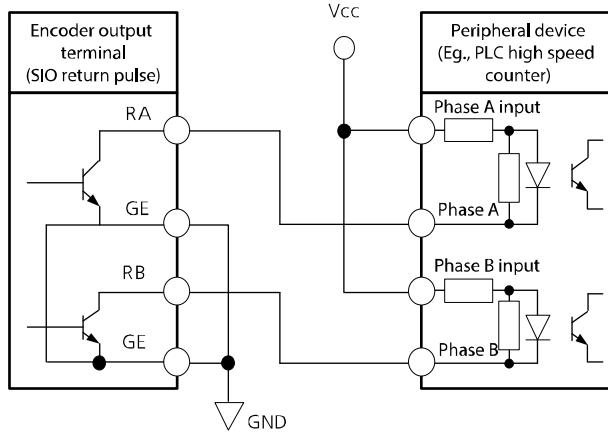
⚠ **Caution**

The encoder output is in open collector type. Consider the input circuit configurations when making the cable connections. The following is an example for using the encoder output as the input to an LSIS high-speed counter module for PLCs.

Note

- Use shielded cable or plastic insulated cable for all control circuit connections.
- Use twisted shield cable if the length of circuit is long.
- Use 0.2 to 0.8 mm² (18 to 26 AWG) cables.
- When tightening bolts, do not allow the torque to exceed 5.2 lb-in.
- The auxiliary relay terminal output 1 and 2 must be below AC 250 V/1 A and DC 30 V/1 A.
- The trip output relay terminal must be below AC 250 V/1 A and DC 30 V/ 1A.
- The open collector output 1 and encoder output must be below 24 V/100 mA.
- While running control circuits, ensure that the total cable length does not exceed 165 ft (50 m).
- Ensure that the length of any safety related circuits does not exceed 100 ft (30 m).
- Do not run the control cable with the mains power cable inside the terminal block area. If the control cable crosses a mains power cable, they must cross each other at a right angle.
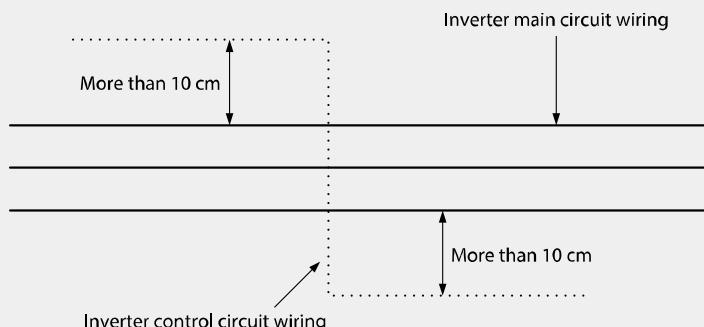
Step 5 Auxiliary power terminals

The LSLV-iV5L inverter includes an auxiliary power terminal block. The auxiliary terminals enable the control board to operate without mains power (R/S/T) using auxiliary control power (220 V AC). The following diagram shows the terminals on the auxiliary power terminal block. Refer to the detailed descriptions to understand the functions and locations of the terminals before connecting cables.

⚠ Caution

• Separate auxiliary power and mains power circuits, and connect auxiliary power circuits via an isolating transformer.

• Use insulated cable lugs for all auxiliary power cable connections.

• Use cables with a cross-sectional area greater than 0.5 mm^2 (20 AWG).
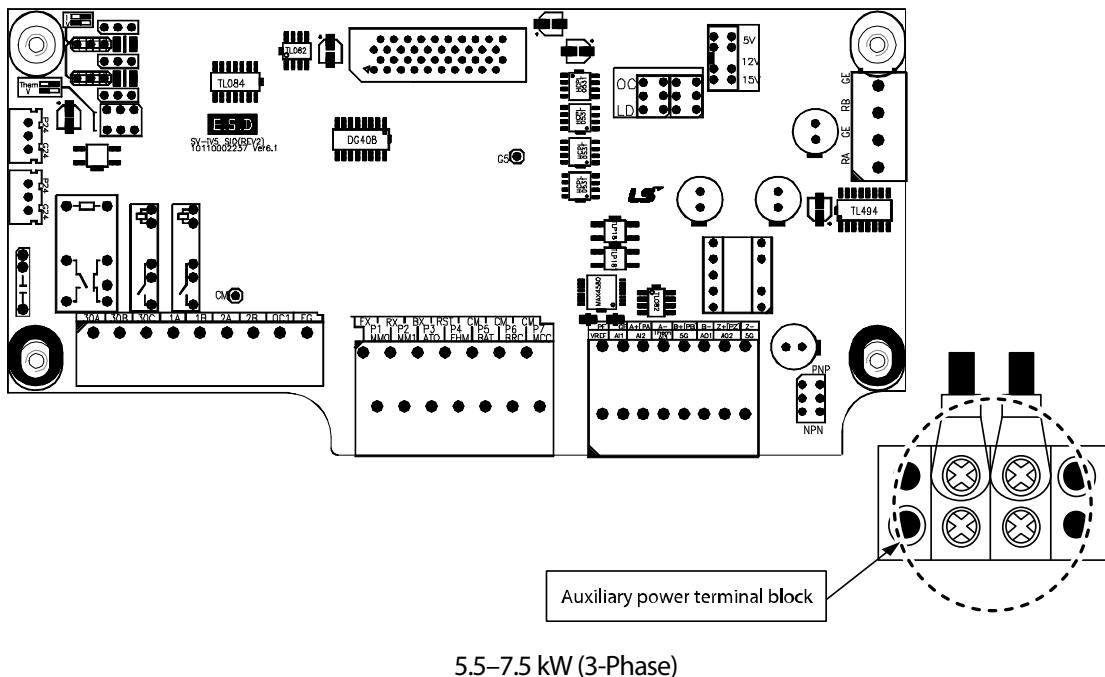
5.5–7.5 kW (3-Phase)

11–22 kW (3-Phase)
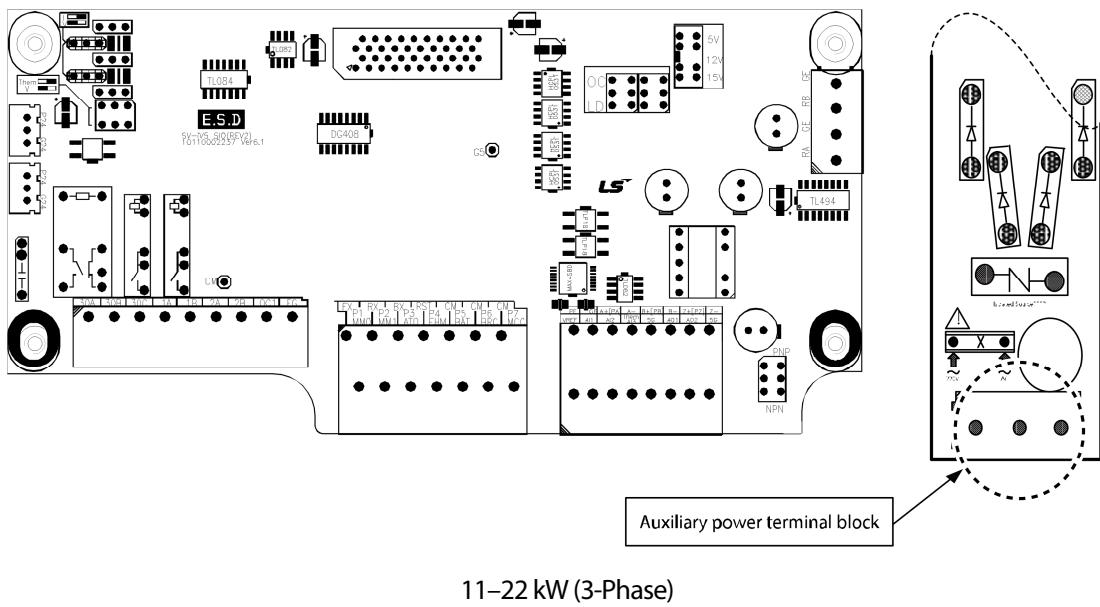
Auxiliary power terminal labels and descriptions

Label	Name	Description	Voltage
AC1 AC2	Auxiliary input voltage	Used to connect to single phase AC input voltage.	220 V (-10-+10%), 50/60 Hz

Installation

Step 6 Encoder wiring and jumper settings

Install an encoder on the motor's rotor or on a spindle that rotates at the same speed as the motor's rotor. Refer to the diagrams below for the jumper settings and encoder connections (Eg., Line side of a motor, or the other side of the motor axis from a traction machine). If there is a slip between the motor and encoder axis, the motor may generate severe vibration, or it may not operate at all.

+15 V Complementary or open collector

PE	GE	A+[PA]	A-	B+[PB]	B-	Z+[PZ]	Z-
VREF	AI1	AI2	NTC AI3	5G	AO1	AO2	5G

+5 V Line drive

+5 V Line Drive [LD]

STP cable

PE	GE	A+[PA]	A-	B+[PB]	B-	Z+[PZ]	Z-
VREF	AI1	AI2	NTC AI3	5G	AO1	AO2	5G
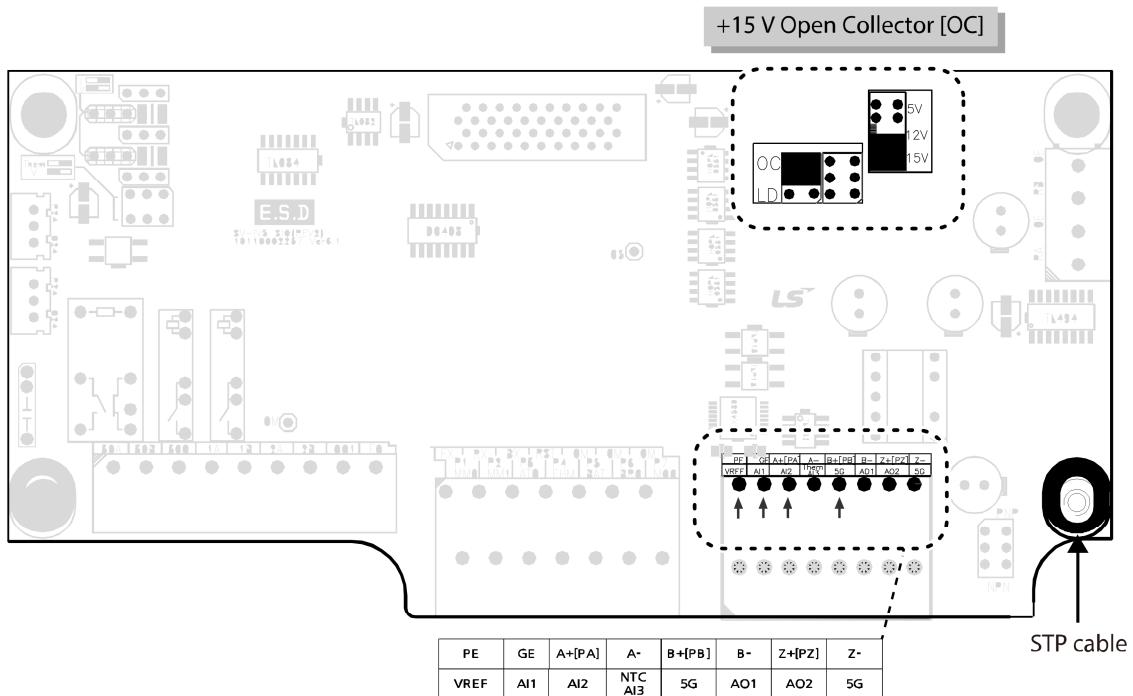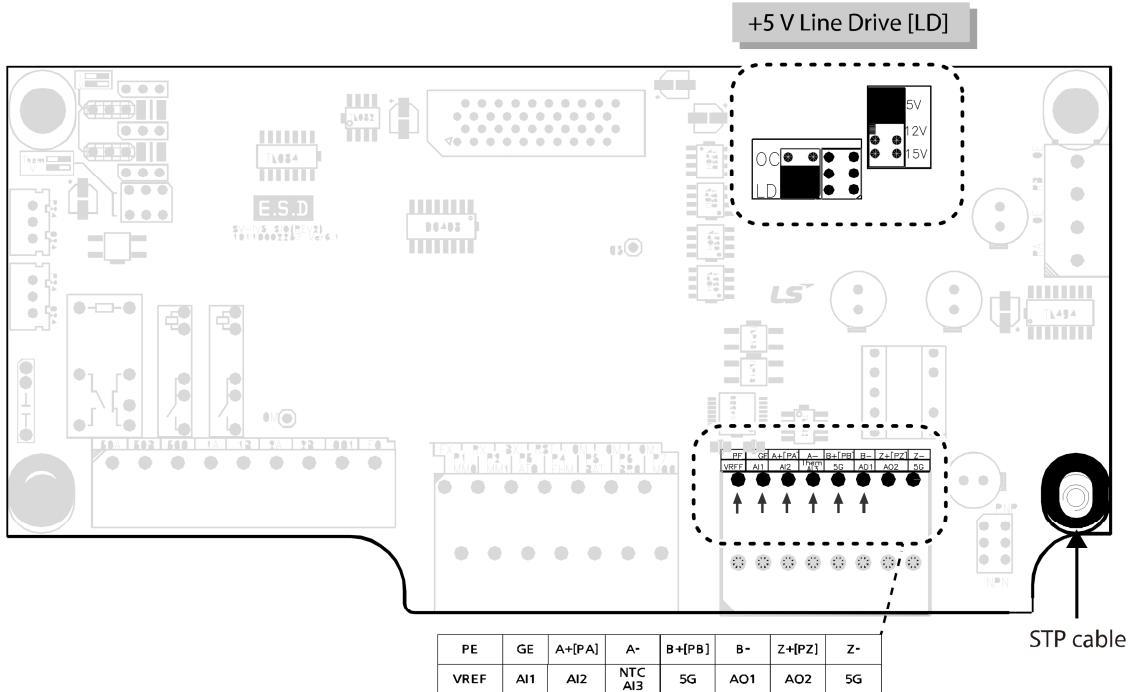
⊙ Caution

Ensure that the encoder type is properly set before operating the inverter. Do not change the encoder type settings while the inverter is operating. Doing so may adversely affect the system and the inverter operation may stop with a fault trip.

Note

- The motor may operate incorrectly or vibrate if the rotor and the encoder's spindle are not connected correctly.
- Use STP cables and connect the shielding to the PCB's grounding screw.
- Do not run encoder signal cables near inverter mains power cables. Electronic interference may affect encoder output signals.

Installation

Step 7 Analog input jumper settings

After installing an encoder, set the analog input jumper.

The default analog input setting is voltage input.
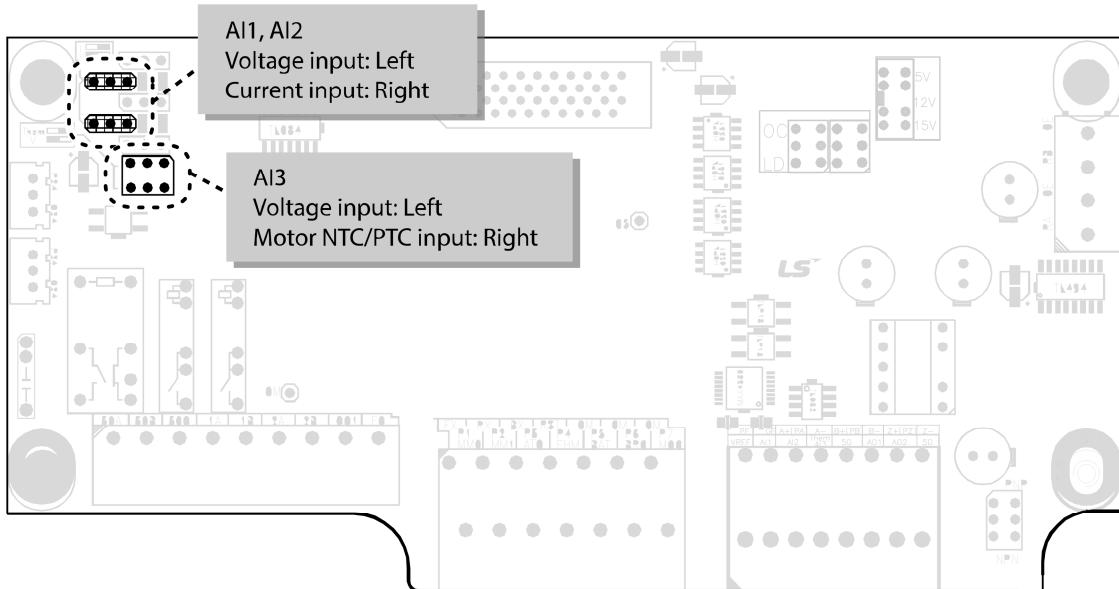
Caution

- Do not change the analog input jumper settings while the inverter is running. Doing so may change the inverter's reference speed or input value at the terminals.
- The motor NTC input is available only when using HIGEN motors.

Step 8 PNP/NPN mode selection

The LSLV-iV5L inverter supports PNP (Source) and NPN (Sink) modes to sequence input current at the terminal. Select an appropriate mode to suit the circuit by switching the PNP/NPN jumper (JP4) on the control board. Refer to the following information for more details.

PNP mode (Source)

Select PNP mode at the PNP/NPN jumper (JP4). The default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal block and P24 is the internal DC 24 V supply. If you are using an external DC 24 V supply, build a circuit that connects the external power supply (-) and the CM terminal.

The guaranteed input voltages in the PNP mode (when using an external DC 24 V supply) are DC 19 to 25.2 V when the inverter is ON and below DC 7 V when the inverter is OFF.
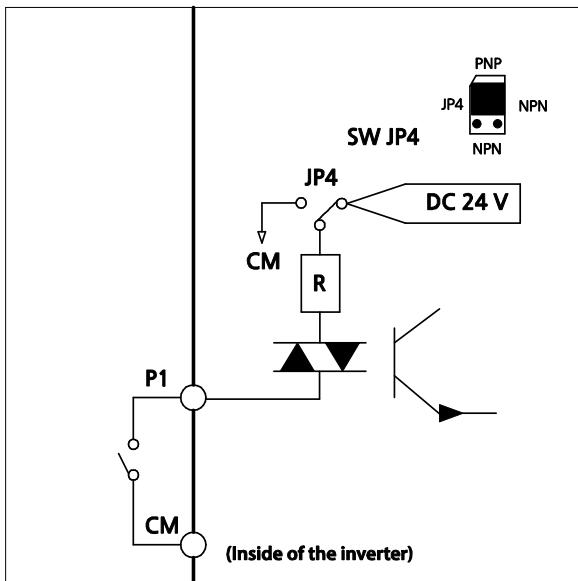
NPN mode (Sink)

Select NPN mode at the PNP/NPN jumper (JP4). The default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal block and P24 is the DC 24 V internal power supply.
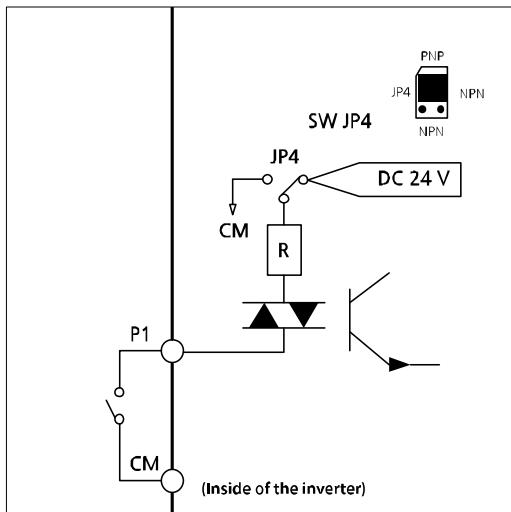
Caution

Do not change the PNP/NPN input jumper settings while the inverter is running. Doing so may change the inverter's input value at the terminals.

Step 9 Replacing the front cover

Replace the front cover immediately after work on the inverter is completed.

2.3 Post-installation checklist

After completing the installation, check the items in the table below to make sure that the inverter has been safely and correctly installed.

Item	Description	Page ref.	Result
Installation location/I/O power rating verification	Is the location for the inverter installation appropriate?	_p. 4_	
	Does the operating environment meet the inverter's specifications?	_p. 5_	
	Does the main power supply meet the inverter's rated input?	_p. 347_	
	Is the inverter's rated output sufficient to supply the equipment? (In certain circumstances, insufficient output will result in degraded performance.)	_p. 347_	
Electrical connections	Is a circuit breaker installed on the input side of the inverter?	_p. 12_	
	Is the circuit breaker correctly rated?	_p. 352_	
	Are the incoming power cables correctly connected to the inverter's R/S/T terminals? (Caution: connecting the incoming power supply to the U/V/W terminals may damage the inverter.)	_p. 19_	
	Are the motor output cables connected in the correct phase rotation (U/V/W)? (Caution: motors will rotate in the reverse direction if the phase rotation is incorrect.)	_p. 19_	
	Are the incoming power cables rated correctly?	_p. 9_	
	Is the inverter grounded correctly?	_p. 18_	
	Are the power terminal screws and the ground terminal screws tightened to the specified torque?	_p. 19_	
	Is overload protection installed correctly in the motor circuits (if multiple motors are supplied from one inverter)?	-	
	Is the inverter separated from the power source by a magnetic contactor (if a braking resistor is in use)?	_p. 12_	
Control circuit connections	Are STP cables used for all control circuit wiring?	-	
	Is the shielding of all STP cables properly grounded?	-	
	If 3-wire operation is required, confirm the multifunction input terminals are defined before control cables are connected?	_p. 23_	

Item	Description	Page ref.	Result
	Are the control cables properly connected?	_p. 23_	
	Are the control terminal screws tightened to the specified torque?	_p. 353_	
	Is the total cable length of all control cables < 165 ft (50 m)?	_p. 31_	
	Is the total length of safety cables < 100 ft (30 m)?	_p. 31_	
Miscellaneous	Are optional circuit boards connected correctly?	-	
	Is there any debris inside the inverter?	-	
	Check cable connections for short circuit risks, such as conductors contacting adjacent terminals?	-	
	Are the control circuit connections separated from the mains power connections?	-	
	Have the capacitors been in use for more than two years? If so, replace them.	-	
	Has a fuse been installed in the main power supply circuit?	_p. 353_	
	Are the connections to the motor separated from other connections?	-	

Note

STP cables have a highly conductive, shielded screen around the twisted pairs. STP cables protect conductors from electromagnetic interference.

2.4 Test run

After the post-installation checklist has been completed, perform a test-run of the inverter.

1   Supply mains power to the inverter. Ensure that the keypad display light is on.

2   Select the command source.

3   Set a frequency reference and then check the following:

- If Ai1 or Ai2 is selected as the frequency reference input, confirm that the jumper is over the left pin and that the frequency changes when the input voltage changes.

- If Ai1 or Ai2 is selected as the frequency reference input, confirm that the jumper is over the right pin and that the frequency changes when the input current changes.

- If Ai3 is selected as the frequency reference input, confirm that the jumper is over the left pin and that the frequency changes when the input voltage changes.

4   Set the acceleration and deceleration times.

5   Start the motor and check the following:

- Ensure that the motor rotates in the correct direction (refer to the note below).

- Ensure that the motor accelerates and decelerates for the set time and that the motor speed reaches the frequency reference.

⚠ Warning

To avoid electrocution, ensure that the MCCBs and MCs are turned off before connecting power to the inverter.

Note

- When the forward (FX) signal is ON, the motor should rotate counterclockwise when viewed from the load side of the motor. If the motor rotates in the reverse direction, switch the cables at the U and V terminals.

- For a safe operation, install and use micro-surge filters for the products operating with 400 V class motors. Otherwise, ensure that all 400 V class motors operated with this product have reinforced insulation. Micro-surge voltage inside the motor may result in motor damage.

Installation

Verifying motor rotation

1   Set FUN_01 to 'Keypad'.

2   Set FUN_02 to 'Keypad 1'.

3   Set a frequency reference.

4   Press [FWD] on the keypad to operate the inverter in the forward direction.

5   Observe the motor's rotation from the load side and ensure that the motor rotates counterclockwise.

Forward operation
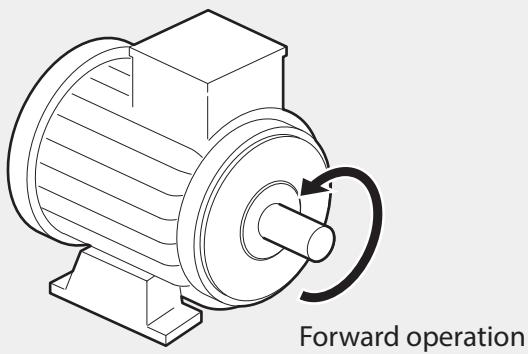
⚠ Caution

• Before operating the inverter for the first time, check the control cables to ensure that all cables are connected properly, and no damages to the cables or short circuit conditions exist.

• Check the parameter settings before running the inverter. Parameter settings may need to be adjusted depending on the load.

• To avoid damaging the inverter, do not supply the inverter with an input voltage that exceeds the rated voltage for the equipment.

• Before running the motor at maximum speed, confirm the motor's rated capacity. As inverters can be used to easily increase motor speed, use caution to ensure that motor speed does not inadvertently exceed the motor's rated capacity.

3 Performing basic operations

This chapter describes the keypad layout, keypad functions, and introduces the parameter groups and codes required to perform basic operations. The chapter also outlines the basic operation of the inverter before advancing to more complex operations. Examples are provided to demonstrate the inverter's operation.

3.1 About the keypad

The keypad has two main components – the operation keys and the display.

On the Keypad display, you can view the parameter setting values. It displays up to 32 alphanumeric characters.

3.1.1 Operation keys

The table below lists the names and functions of the keypad's operation keys.

Basic Ops.

Key	Name	Description
MODE	[MODE]	Switches between groups. Moves to upper codes in a group.
PROG	[PROG]	Changes parameter values.
ENT	[ENT]	Switches between modes. Saves parameter values.
▲ ▼	[UP] [DOWN]	Switches between codes, or increases or decreases parameter values.
SHIFT ESC	[SHIFT/ESC]	Moves to the default screen. In settings mode, moves the cursor to the next digit position.
REV	[REV]	Starts reverse operation.
STOP RESET	[STOP/RESET]	Stops the current operation. (Valid when FUN_01 is set to "Keypad".) Clears fault status.
FWD	[FWD]	Starts forward operation.

3.1.2 About the display

Speed and Speed (Sync) mode display
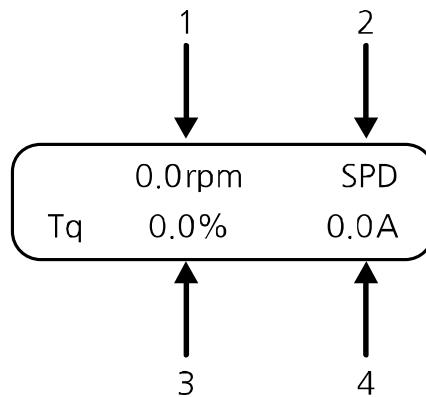
The following table lists the names and functions of the items displayed in this mode. Refer to the corresponding number in the illustration above.

No.	Name	Description
1	Motor speed	Displays motor speed in rpm.
2	Motor control mode	Displays one of the following motor control modes: SPD: Speed control mode BX: Emergency stop status BAT: Battery operation mode
3	Torque	Displays the generated torque when the motor operates at its full rated output.
4	Inverter output current	Displays the effective output current of the inverter.

V/F and Slip Comp mode display

```
      1       2            3

   DIS ▶ T/K           0.0 A
   00    STP        60.00HZ

      4     5            6
```

The following table lists the names and functions of the items displayed in this mode. Refer to the corresponding number in the illustration above.

No.	Name	Description
1	Parameter group	Displays the parameter group.
2	Operation/speed commands	Displays the operation and speed commands. Operation commands T: Terminal command K: Keypad command O: Internal RS-485 communication command Speed commands K: Keypad command A: Analog command O: Internal RS-485 communication command
3	Inverter output current	Displays the effective output current of the inverter.
4	Code number	Displays the code number.
5	Operating status	Displays the current operating status: STP: Stop FWD: Forward operation REV: Reverse operation
6	Target frequency/operating frequency	Displays the target frequency at stop condition and displays the output frequency during operation.

Group display
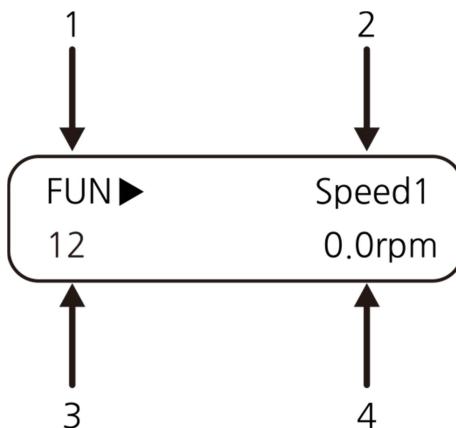
The following table lists the names and functions of the items displayed in this mode. Refer to the corresponding number in the illustration above.

No.	Name	Description
1	Parameter group	Displays one of following parameter groups: DIS, PAR, DIO, AIO, FUN, CON, E/L[Note 1], PRT, COM, M2[Note 2], USR.
2	Code type	Displays the code type to setup.
3	Code number	Displays the code number to setup.
4	Code data and unit	Displays the code data and unit to setup.

Note 1) Displays only when "PAR_08" is set to "Elevator" and an EL I/O card is installed.

Note 2) Displays only when Motor 2 is configured for use at the multifunction inputs (P1-P3).

3.1.3 Control menu

The LSLV-iV5L inverter's control menu has the following groups.

Group	Display	Description
Display	**DIS**	Configure display settings for motor speed, motor control mode, torque, inverter output, current, user selection display, and fault status display.
Parameter	**PAR**	Configure parameter settings, including parameter initialization, parameter read/write/lock/password settings, motor constants, auto-tuning, switching frequency, and control mode.
Digital input/output	**DIO**	Configure digital input/output settings, including digital input and output parameters.
Analog input/output	**AIO**	Configure analog input/output settings, including analog input and output parameters.
Function	**FUN**	Configure function settings, including operation frequency, operation method, stop method, and acceleration/deceleration time and pattern.
Elevator operation	E/L Note 1)	Configure elevator operation function settings. The elevator operation group (E/L) appears on the keypad only when "PAR_08" is set to "Elevator" and an EL I/O card is installed.
Control	**CON**	ASR PI Gain
Protection	**PRT**	Configure parameters related to inverter faults.
Communication	**COM**	Configure communication features for RS-485 and other communication options.
Motor 2	M2 Note 2)	Configure secondary motor features. M2 appears on the keypad only when a second motor is configured for use at the multifunction inputs (P1-P3).
User	USR	Configure user macro settings.

- The groups in bold in the Display column are default parameter groups. Refer to 6 *Detailed operation by the function groups* on page *117* for details.
- Note1) Displayed when an optional add-on board is installed. Refer to the user manual supplied with the add-on board.
- Note2) Displayed when one of the multifunction inputs in DIO group has been set to "2nd Motor." The second motor operation does not work when the inverter control mode is set to Speed (Sync).

3.2 Using the keypad

The keypad enables movement between groups and codes. It also enables users to select and configure functions. At code level, you can set parameter values, turn specific functions on or off, and decide how functions will be used. Refer to 5 *Table of functions* on page *69* to find the functions you need.

3.2.1 Group and code selection

The example below shows how to switch between groups and codes.

1 Press [MODE] to move to the group you require.

2 Move up and down through the codes using [▲] or [▼] until you locate the code that you require.
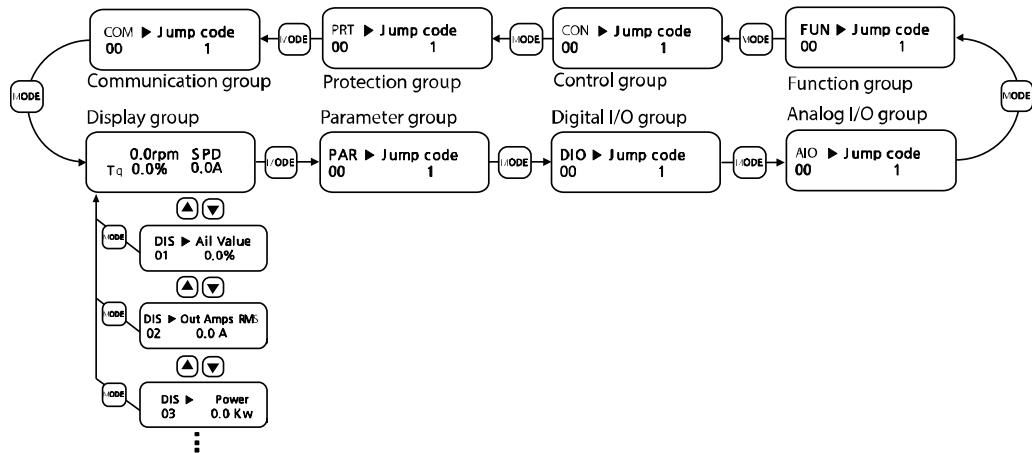
Note

For some settings, pressing [▲] or [▼] will not increase or decrease to the next numerical code. Code numbers may be skipped or not be displayed as certain codes have been intentionally left blank or reserved for new functions to be added in the future. Also, some features are hidden because functions for a certain code have been disabled.

3.2.2 Navigating directly to different codes

The following example shows how to navigate to code PAR_56 from the initial code in the group (PAR_00). This example applies to all groups.

Step	Instruction	Keypad display
1	Go to the first code of the parameter group (PAR_00).	
2	Press [PROG].	
3	Press [SHIFT/ESC], [▲], or [▼] until '56' is displayed.	
4	Press [ENT]. PAR_56 screen is displayed. If you select an unavailable code, details for the next available code are displayed.	PAR ▶ Rs 56 0.346 ohm
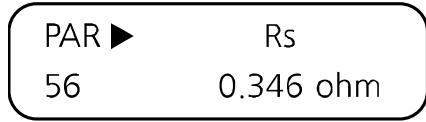
Read-only parameters cannot be changed. The parameter values for those parameters with "read-only during operation" attribute cannot be changed during an inverter operation.

3.2.3 Setting parameter values

Enable or disable features by setting or modifying parameter values for different codes. Directly enter values, such as frequency references, supply voltages, and motor speeds. The instructions below list the steps to set or modify parameter values.

1   Select the group and code to configure or modify.

2   Press [PROG].

   The cursor will flash.

3   Press [SHIFT/ESC], [▲], or [▼] to adjust the value.

4   Press [ENT] to save the changes.

Note

Each code's parameter values have default features and a specified range. Refer to 6 *Detailed operation by the function groups* on page *117* for information about the features and ranges before configuring or modifying parameter values.

3.2.4 Setting parameter labels

Set labels for the parameters in groups, such as DIS (Display), DIO (Multifunction input/output), and AIO (Analog input/output).

The following is an example to label DIO_02 to "Speed-L."

Step	Keypad instructions	Keypad display
1	Set PAR 07 to 'V/F.'	-
2	Select a group and code you want to set a label for.	-
3	Select a label.	DIO ▶ P2 Define 02 Speed-█
4	Press [ENT].	DIO ▶ P2 Define 02 Speed-L

Note

You cannot set labels for parameters with '#' next to the parameter number.

Basic Ops.

3.2.5 Configuring acceleration time on the keypad

The following example demonstrates how to modify the ACC (acceleration time) value from 10 seconds to 15 seconds in the operation group.

Step	Keypad instructions	Keypad display
1	Press [MODE] to move to FUN group.	FUN▶ Jump Code 00 1
2	Press [PROG], and then press [SHIFT/ESC], [▲], or [▼] until '41' is displayed.	FUN▶ Jump Code 00 41
3	Press [ENT]. The current acceleration time is displayed.	FUN▶ Acc Time-1 41 10.00 sec
4	Press [PROG]. The cursor appears.	FUN▶ Acc Time-1 41 ▮ 10.00
5	Press [SHIFT/ESC] to move the cursor.	FUN▶ Acc Time-1 41 10.00 sec
6	Press [▲] or [▼] to change the value.	FUN▶ Acc Time-1 41 15.00 sec
7	Press [ENT] to save the changes. The cursor disappears.	FUN▶ Acc Time-1 41 15.00 sec

3.3 Confirming the encoder operation

3.3.1 Definition of forward and reverse operations

When looking at the motor from the load side, the motor rotates counterclockwise in the forward operation.
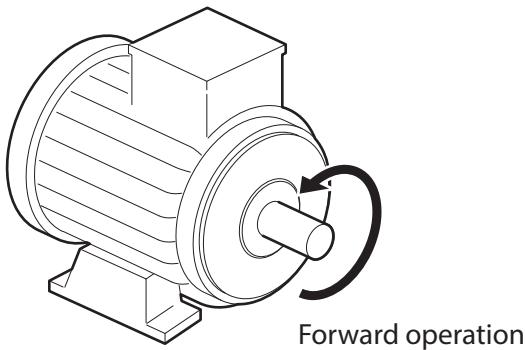
Forward operation

3.3.2 Confirming the forward and reverse operations

Forward operation

Confirm that the speed display in the initial display group screen is positive (+) when the inverter is ON and rotating the motor's spindle.

```
     +[][].[]rpm    SPD
Tq        %        A
```
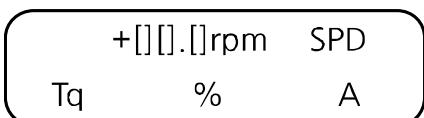
Reverse operation

Confirm that the speed display in the initial display group screen is nagative (-) when the inverter is ON and rotating the motor's spindle.

```
     -[][].[]rpm     SPD
Tq          %          A
```
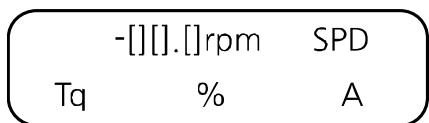
Note

- When "0.0 rpm" is keep displayd or (+) and (-) are displayed reversly, confirm the encoder connections.
- When you are not able to manually rotate the motor, see *3.4 Operating the inverter with the keypad* or *3.5 Operating the inverter using the control terminal block*.

3.4 Operating the inverter with the keypad

3.4.1 Setting parameter values for keypad operation

Step	Keypad instructions	Keypad display
1	Set FUN 01 to 'Keypad'.	FUN ▶ Run/Stop Src 01 Keypad
2	Set FUN 02 to 'Keypad 1'.	FUN ▶ Run/Stop Src 02 Keypad1
3	Press [▲] to adjust the operation speed.	FUN ▶ Spped 0 12 100.0rpm

3.4.2 Forward and reverse operations

Low speed operation

Configure FUN12 to '100.0 rpm' and then follow the instructions in the table below.

Direction	Keypad instructions	Keypad display
Forward	Press [FWD] on the keypad. The motor speed '+100.0 rpm' is displayed as the motor speed.	+100.0rpm SPD Tq % A
Reverse	Press [REV] on the keypad. The motor speed '-100.0 rpm' is displayed as the motor speed.	-100.0rpm SPD Tq % A

When selecting low speed from the keypad, the operating status for various current encoder and motor connections are listed in the table below.

Encoder/Motor connections	Keypad command	Direction of motor rotation	Speed display on the keypad	Torque display on the keypad	Operation status
Encoder and motor connection is normal.	FWD	Forward	+100.0 rpm	Lower than +10%	Normal
	REV	Reverse	-100.0 rpm	Lower than -10%	
Encoder connection has been changed.	FWD	Forward	-10 - -40 rpm	150% (torque limit)	Abnormal
	REV	Reverse	10-40 rpm	-150% (torque limit)	
Motor connection has been changed.	FWD	Forward	-10 - -40 rpm	150% (torque limit)	Abnormal
	REV	Reverse	10-40 rpm	-150% (torque limit)	
Encoder and motor connections have been changed.	FWD	Forward	+100.0 rpm	Lower than +10%	Abnormal
	REV	Reverse	-100.0 rpm	Lower than -10%	

If the encoder's Phase A and B are reversed or the motor connection has been changed, reverse the positions of Phase A and B, or change the connections at the inverter's output.

The torque display on the keypad is based on no load operation.

High speed operation

Configure FUN12 to '1000.0 rpm' and then follow the instructions in the table below.

Direction	Keypad instructions	Keypad Display
Forward	Press [FWD] on the keypad. '+1000.0 rpm' is displayed as the motor speed.	+1000.0rpm SPD Tq % A
Reverse	Press [REV] on the keypad. '-1000.0 rpm' is displayed as the motor speed.	-1000.0rpm SPD Tq % A

3.5 Operating the inverter using the control terminal block

3.5.1 Setting parameter values for control terminal block operation

Step	Keypad instructions	Keypad display
1	Set FUN 01 to 'Terminal 1'.	FUN ▶ Run/Stop Src 01 Terminal 1
2	Set FUN 02 to 'Analog'.	FUN ▶ Spd Ref Sel 02 Analog
3	Set the maximum motor speed.	PAR ▶ Max Speed 11 1800.0 rpm
4	Define Ai1.	AIO ▶ Ai1 Define 01 Speed Ref
5	Select a range for the Ai1 input source: - -10–10 V / 10–-10 V - 0–10 V / 10–0 V - 0–20 mA / 20–0 mA	AIO ▶ Ai1 Source 02

Basic Ops.

3.5.2 Cable connections for potentiometer speed control

The diagram below shows the cable connections to use when a potentiometer is connected to Ai1.
Connect the potentiometer to the VREF, Ai1, and 5G terminals on the control terminal block.
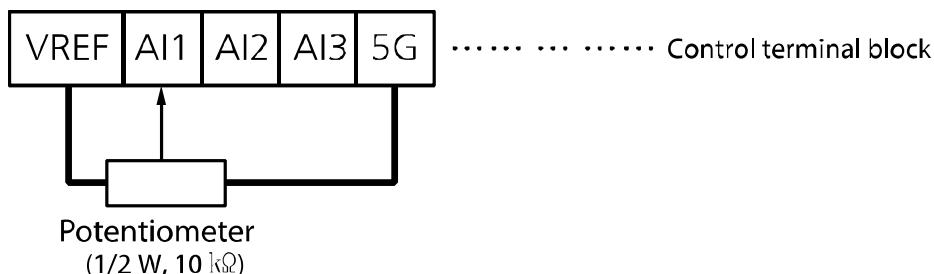
3.5.3 Adjusting the analog input bias and gain

Adjusting the Out Y1 (bias) for analog inputs

Step	Instruction	Keypad display
1	Connect the voltage source (0 V) or current source (0 mA) to the multifunction analog inputs Ai1–5G on the standard input/output board.	-
2	When a potentiometer is connected, adjust the resistance to the minimum value.	-
3	From the initial screen, press [PROG]. The input/output proportion that the controller detects is displayed at the top right of the screen. The configured bias value is displayed at the bottom right of the screen.	AIO ▶ AI1 0.18％ 04 Bias 0.00％
4	Press [▲] to adjust the value.	AIO ▶ AI1 0.00％ 04 Bias 0.18％
5	Press [ENT] to save the value. The saved value is displayed.	AIO ▶ AI1 Out Y1 04 0.18％

Adjusting the Out Y2 (gain) for analog inputs

Step	Instruction	Keypad display
1	Connect the voltage source (10 V) or current source (20 mA) to the multifunction analog inputs Ai1–5G on the standard input/output board.	-
2	When a potentiometer is connected, adjust the resistance to the maximum value.	-
3	From the initial screen, press [PROG]. The input/output proportion that the controller detects is displayed at the top right of the screen. The configured bias value is displayed at the bottom right of the screen.	AIO ▶ AI1 98.00% 06 Gain 100.00%
4	Press [▲] to adjust the value.	AIO ▶ AI1 0.00% 06 Gain 102.00%
5	Press [ENT] to save the value. The saved value is displayed.	AIO ▶ AI1 Out Y2 06 102.00%

3.5.4 Operating in forward and reverse directions

FX operation from the control terminal block

1   Connect an input voltage (0 V) across Ai1 and 5G.

2   If a potentiometer is connected, adjust the resistance to the minimum value.

3   Close the motor circuit by connecting the FX and CM terminals together at the control terminal block, and then confirm that '+0.0 rpm' is displayed as the motor speed.

4   Gradually increase the voltage at Ai1 and then confirm that the motor speed increases.

5   If a potentiometer is connected, gradually increase the resistance value.

6   Remove the connection between the FX and CM terminals to open the motor circuit.

Basic Ops.

RX operation from the control terminal block

1   Connect an input voltage (0V) across Ai1 and 5G.

2   If a potentiometer is connected, adjust the resistance to the minimum value.

3   Close the motor circuit by connecting the RX and CM terminals together at the control terminal block, and then confirm that '-0.0 rpm' is displayed as the motor speed.

4   Gradually increase the voltage at Ai1 and then confirm that the motor speed increases.

5   If a potentiometer is connected, gradually increase the resistance value.

6   Remove the connection between the RX and CM terminals to open the motor circuit.

Operation status according to the encoder when operating at low speed via the control terminal block

Encoder/Motor connections	Keypad command	Direction of motor rotation	Speed display on the keypad	Torque display on the keypad	Operation status
Encoder and motor connection is normal.	FWD	Forward	+100.0 rpm	Lower than +10%	Normal
	REV	Reverse	-100.0 rpm	Lower than -10%	
Encoder connection has been changed.	FWD	Forward	-10 - -40 rpm	150% (torque limit)	Abnormal
	REV	Reverse	10-40 rpm	-150% (torque limit)	
Motor connection has been changed.	FWD	Forward	-10 - -40 rpm	150% (torque limit)	Abnormal
	REV	Reverse	10-40 rpm	-150% (torque limit)	
Encoder and motor connections have been changed.	FWD	Forward	+100.0 rpm	Lower than +10%	Abnormal
	REV	Reverse	-100.0 rpm	Lower than -10%	

If Phase A and B of the encoder are reversed or the motor connections have been changed, reverse the Phase A and B connections, or change the inverter output connection.

The torque display on the keypad is based on no load operation.

Example of an operation (1) Speed reference from the keypad + run signal at the terminal block

Operation conditions

- Control mode: Speed control (Speed)
- Speed reference: Set the speed to 1,500 rpm from the keypad
- Acceleration/deceleration time: 10 sec. / 20 sec.
- Run command: RUN/STOP command at the terminal block

Wiring diagram

Parameter setting

Step	Procedure	Function code	Discription
1	Set the RUN/STOP command source	FUN_01	Set Run/Stop Src to "Terminal 1."
2	Set the speed reference source	FUN_02	Set Speed Ref Sel to "Keypad 1."
3	Set speed reference	FUN_12	Set Speed 0 to "1500.0 (rpm)"
4	Set acc/dec times	FUN_41 FUN_41	Set the acceleration time (FUN_41) to "10.00 (Sec)," and the deceleration time (FUN_42) to "20.00 (Sec)."
5	Run FX operation at the terminal block	-	When the FX terminal input is ON, the inverter accelerates the motor for 10 seconds, and then runs it at 1,500 rpm, in the forward direction. When the input is OFF, the inverter decelerates the motor for 20 seconds, and then stops.
6	Run RX operation at the terminal block	-	When the RX terminal input is ON, the inverter accelerates the motor for 10 seconds, and then runs it at 1,500 rpm,in the reverse direction. When the input is OFF, the inverter decelerates the motor for 20 seconds, and then stops.

Example of an operation (2) Speed reference from the potentiometer (Ai1) + run signal at the terminal block

Operation conditions

- Control mode: Speed control (Speed)
- Speed reference: Set the speed to 1,500 rpm using the potentiometer (connected to Ai1).
- Acceleration/deceleration time: 10 sec. / 20 sec.
- Run command: RUN/STOP command at the terminal block

Wiring diagram
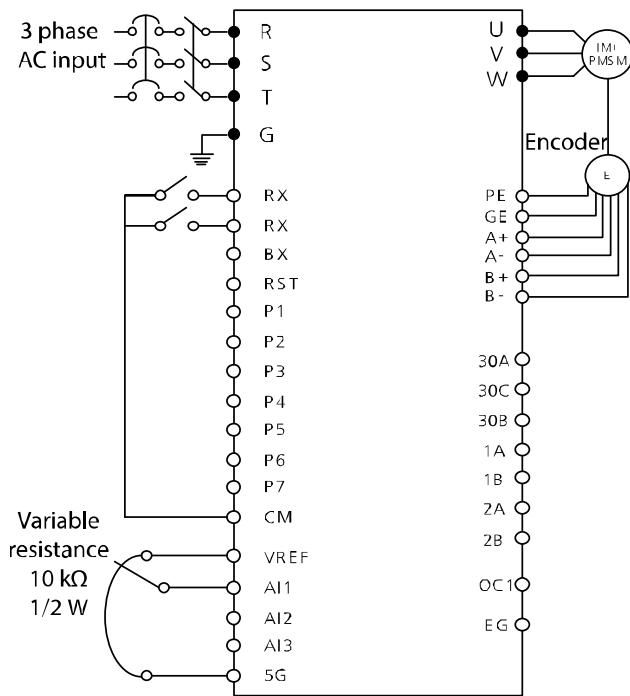
Parameter setting

Step	Procedure	Function code	Discription
1	Set the RUN/STOP command source	FUN_01	Set Run/Stop Src to "Terminal 1."
2	Set the speed reference source	FUN_02	Set Speed Ref Sel to "Analog."
3	Define analog input	AIO_01	Set Ai1 Define to "Speed Ref."
4	Define analog input type	AIO_02	Set Ai1 Source to "0 -> 10 V."
5	Set the speed reference	DIS_01	Adjust the potentiometer to set PreRamp Ref (DIS_01) to "1500.0 (rpm)"
6	Set acc/dec times	FUN_41 FUN_42	Set the acceleration time (FUN_41) to "10.00 (Sec)," and the deceleration time (FUN_42) to "20.00 (Sec)."

Basic Ops.

Step	Procedure	Function code	Discription
7	Run FX operation at the terminal block	-	When the FX terminal input is ON, the inverter accelerates the motor for 10 seconds, and then runs it at 1,500 rpm, in the forward direction. When the input is OFF, the inverter decelerates the motor for 20 seconds, and then stops it.
8	Run RX operation at the terminal block	-	When the RX terminal input is ON, the inverter accelerates the motor for 10 seconds, and then runs it at 1,500 rpm, in the reverse direction. When the input is OFF, the inverter decelerates the motor for 20 seconds, and then stops it.

4 Basic and advanced features

4.1 Introduction of basic features

Feature	Description	Page ref.
Speed reference source configuration at the keypad	Setup or modify a speed reference using the keypad.	
Speed reference source configuration at the terminal block (input voltage)	Enable, setup, or modify speed reference input voltage at terminals Ai1–Ai3.	
Speed reference source configuration at the terminal block (input current)	Enable, setup, or modify speed reference input current at terminals Ai1– Ai2.	
Speed reference source configuration for RS-485 communication	Enable, setup, or modify speed reference communication signals from upper level controllers, such as PLCs or PCs.	
Multistep speed configuration	Configures multistep speed operations by defining the terminal input.	
Command source configuration for terminal block inputs	Configures the inverter to accept inputs at the FX/RX terminals.	
Command source configuration for RS-485 communication	Configures the inverter to accept communication signals from upper level controllers, such as PLCs and PCs.	
Motor rotation control	Configures the inverter to limit a motor's direction of rotation.	
Automatic start-up at power-on	Configures the inverter to start operating at power-on. In this configuration, the inverter begins to run and the motor accelerates as soon as power is supplied to the inverter. To use this feature, the operation command terminals at the terminal block must be enabled.	

Feature	Description	Page ref.
Automatic restart after a fault trip condition is reset	Configures the inverter to resume operation when the inverter is reset following a fault trip. In this configuration, the inverter starts to run again and the motor accelerates when the inverter is reset following a fault trip condition. To use this feature, the operation command terminals at the terminal block must be enabled.	<u>*p. 268*</u>
Acc/Dec time configuration based on maximum speed	Configures the acceleration and deceleration times for a motor based on a defined maximum speed.	<u>*p. 215*</u>
Acc/Dec time configuration based on speed reference	Configures acceleration and deceleration times for a motor based on a defined speed reference.	
Multistage Acc/Dec time configuration at the multifunction terminals	Configures multistage acceleration and deceleration times for a motor based on defined parameters at the multifunction terminals.	<u>*p. 219*</u>
Acc/Dec pattern configuration	Enables modification of the acceleration and deceleration gradient patterns. Basic patterns include linear and S-curve.	<u>*p. 216*</u>
Encoder error detection configuration	Configures the inverter to detect hardware encoder errors.	<u>*p. 273*</u>
Encoder software error detection configuration	Configures the inverter to detect acceleration errors during the operation due to connection changes between the encoder and motor.	<u>*p. 273*</u>
Output voltage adjustment	Adjusts the output voltage to the motor when the power supply to the inverter differs from the motor's rated input voltage.	<u>*p. 259*</u>
Accelerating start	Accelerating start is the standard motor starting method. Typically, motors accelerate to a target frequency in response to a run command. Other start or acceleration conditions may also be defined.	-
Deceleration stop	Deceleration stop is the standard stopping method for motors. After receiving a stop command, the motor decelerates to 0 Hz and stops. Other stop or deceleration conditions may also be defined.	<u>*p. 206*</u>
Free-run stop	Configures a stop command that stops the inverter output to the motor. The motor will free-run, slows down, and then stops.	
Reverse the multifunction terminal input	Reverses the input terminal position from Form A contact to Form B contact.	<u>*p. 170*</u>

Feature	Description	Page ref.
Multifunction input terminal time	Configures the input terminal time constant to improve tolerance to electronic interference.	-
Reversing the multifunction terminal output	Reverses the output terminal from Form A contact to Form B contact.	p. 171

4.2 Introduction of advanced features

Task	Description	Page ref.
Jog	The Jog feature allows users to temporarily override the current settings and manually operate the inverter. The inverter operates based on a set of predefined parameter settings for Jog operation that are active while the Jog command button is pressed.	p. 209 p. 155
MOP up-down	Uses upper and lower limit value output signals from control devices (such as a flow meter) to provide Acc/Dec commands to motors.	p. 155
3-wire	Latches a push button input signal in a 3- wire system to operate the inverter.	p. 162
Dwell	Provides constant torque while braking is applied or released for lifting loads such as elevators.	p. 209 p. 212
Auto-tuning	Automatically adjusts motor control parameters to optimize the performance of the inverter's control mode.	p. 138
Auto restart	Automatically restarts the inverter when a trip condition is released following an inverter stoppage due to the activation of a protective function (fault trip).	p. 81
Second motor	Switches operation between two motors that are connected to one inverter. The second motor is configured to operate via the input terminals defined for the second motor.	p. 284
Timer	Turn on or off a multifunction output, including connected relays, after a specific time.	p. 155
Disable soft start (SoftStartCnCl)	Bypass the selected acceleration/deceleration time and accelerate/decelerate in the shortest time.	p. 155
Speed controller gain switch	Select between two PI controller combinations.	p. 242

Task	Description	Page ref.
Speed controller P/PI switch	Switch the speed controller from PI control to P control.	*p. 167*
Speed command switch	Select either an external analog input or the rated speed as the speed controller's calculation method.	-
Pre-excitation	Improve response characteristics during motor acceleration.	*p. 167*
Using maximum torque	Set the torque limit to the maximum value.	*p. 168*
Using torque bias	Apply a torque bias.	*p. 168*
Using the battery operation mode	Operate the motor using the battery power supply when the main power supply is unavailable, eg. during a power failure.	*p. 169*
Disable low voltage trip detection	Detect hardware errors, except for low voltage trips, by operating the control board using auxiliary power before turning on the main power supply.	*p. 169*
Brake control	Enable or disable the braking system.	*p. 180*
Short floor operation	Improve elevator floor position when operating an elevator up and down short distances.	*p. 226*
Low voltage 2	Detects low voltage trips when an instantaneous interruption occurs during operation.	*p. 108* *p. 123*
MC ON/OFF control	Enable or disable the magnetic contactor installed as safety device in the inverter's output circuit.	*p. 171*
Auto load cell configuration	Simplify the load cell's configuration for initial elevator commissioning.	*p. 240*
Anti rollback control	Compensates for load in the initial load when the load cell is not used.	*p. 263*
Preventing speed overshoot	Prevents speed overshoot during elevator operation.	*p. 245*
Initial pole position estimation	Detects the initial pole position of a synchronous motor	*p. 146*
Anti-hunting	Prevents mechanical resonance while motors are operating.	*p. 230*
ALLS (Automatic Light Load Search)	Detects light load conditions when the battery power supply is operating and directs the elevator to the nearest floor.	*p. 234*

5 Table of functions

5.1 Display (DIS) group

* SV: Speed for Async, V/F: V/F, Slip: Slip Compensation, SPfS: Speed Mode for Sync, EL: EL Mode for Async, ELfS: EL Mode for Sync

* O: Displayed, X: Not displayed, #: Not available

On the Keypad, "#" indicates not available and "" indicates a duplicate setting.

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VVF	Slip	SPfS	EL	ELfS	Page ref.
DIS_00	-	Motor speed/ control mode/ torque/ output current	0.0 rpm SPD Tq 0.0% 0.0A				O	O	O	O	O	O	p. 117
DIS_01	-	User define 1	Ai1 Value		%	PreRamp Ref	O	O	O	O	O	O	p. 119
			Ai2 Value		%		O	O	O	O	O	O	
			Ai3 Value		%		O	O	O	O	O	O	
			PreRamp Ref		rpm		O	O	O	O	O	O	
			PostRamp Ref		rpm		O	O	O	O	O	O	
			ASR Inp Ref		rpm		O	O	O	O	O	O	
			Output Freq		Hz		O	O	O	O	O	O	
			Motor Speed		rpm		O	O	O	O	O	O	
			Speed Dev		rpm		O	X	X	O	O	O	
			ASR Out		%		O	X	X	O	O	O	
			Torque Bias		%		O	X	X	O	O	O	
			PosTrq Limit		%		O	X	X	O	O	O	

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
			NegTrq Limit		- %		○	X	X	○	○	○	
			RegTrq Limit		%		○	X	X	○	○	○	
			Torque Ref		%		○	X	X	○	○	○	
			IqeRef		A		○	X	X	○	○	○	
			Iqe		A		○	○	○	○	○	○	
			Flux Ref		%		○	X	X	○	○	○	
			Ide Ref		A		○	X	X	○	○	○	
			Ide		A		○	○	○	○	○	○	
			ACR_Q Out		V		○	X	X	○	○	○	
			ACR_D Out		V		○	X	X	○	○	○	
			VdeRef		V		○	○	○	○	○	○	
			VqeRef		V		○	○	○	○	○	○	
			Out Amps RMS		A		○	○	○	○	○	○	
			Out Volt RMS		V		○	○	○	○	○	○	
			Power		kW		○	○	○	○	○	○	
			DC Bus Volt		V		○	○	○	○	○	○	
			MotTemp NTC		deg		○	○	○	○	○	○	
			Inv Temp		deg		○	○	○	○	○	○	
			Ctrl Mode				○	○	○	○	○	○	
			Run Time		Sec		○	○	○	○	○	○	
			Terminal In		Bit		○	○	○	○	○	○	
			Terminal Opt		Bit		○	○	○	○	○	○	
			Terminal Out		Bit		○	○	○	○	○	○	
			Run Status				○	○	○	○	○	○	
			PhInOpenLvl		%		○	○	○	○	○	○	
			Iup/Ium		A		X	X	X	○	X	○	

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
			Ivp/Ivm		A		X	X	X	○	X	○	
			Iwp/Iwm		A		X	X	X	○	X	○	
DIS_02	-	User define 2	Refer to DIS_01.			DC Bus Volt	○	○	○	○	○	○	p. 119
DIS_03	-	User define 3	Refer to DIS_01.			Terminal In	○	○	○	○	○	○	p. 119
DIS_05	7005	Fault status[Note 1]	Faults				○	○	○	○	○	○	p. 123
DIS_06	7506	Software version	SW Version				○	○	○	○	○	○	p. 125
DIS_10	710A	User group display	User Grp Disp	0 (Not Used)		0 (Not Used)	○	○	○	○	○	○	p. 125
				1 (Dis+User Grp)									
				2 (Display All)									

- Note 1) When accessing DIS-05 via the communication, fault status is not displayed and only deleting communication history is available.

5.2 Parameter (PAR) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
PAR_00	-	Jump to codes	Jump Code	1–98			○	○	○	○	○	○	*p. 126*
PAR_01	7201	Reset to default setting	Para. init	0 (No)	Msg	0 (No)	○	○	○	○	○	○	*p. 127*
				1 (All Groups)			○	○	○	○	○	○	
				2 (DIS)			○	○	○	○	○	○	
				3 (PAR)			○	○	○	○	○	○	
				4 (DIO)			○	○	○	○	○	○	
				5 (AIO)			○	○	○	○	○	○	
				6 (FUN)			○	○	○	○	○	○	
				7 (CON)			○	○	○	○	○	○	
				8 (E/L)			#	#	#	#	○	○	
				9 (PRT)			○	○	○	○	○	○	
				10 (COM)			○	○	○	○	○	○	
				11 (M2)			○	○	○	#	○	#	
				13 (USR)			○	○	○	○	○	○	
PAR_02	-	Read all codes	Para. read	0 (No) / 1 (Yes)		0 (No)	○	○	○	○	○	○	*p. 128*
PAR_03	-	Write all codes	Para. write	0 (No) / 1 (Yes)		0 (No)	○	○	○	○	○	○	*p. 128*
PAR_04	7204	Lock codes	Para. lock	0–255		0	○	○	○	○	○	○	*p. 130*
PAR_05	-	Password	Password	0–9999		0	○	○	○	○	○	○	*p. 130*
PAR_07	7207	Control mode options	Control Mode	2 (Speed)	Msg		○	○	○	○	○	○	*p. 131*
				4 (V/F)			○	○	○	○	○	○	
				5 (Slip comp)			○	○	○	○	○	○	
				6 (Speed for sync) [Note 8)]			○	○	○	○	○	○	

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
PAR_08	7208	Application	Application	0 (General vector)	Msg	0	○	○	○	○	○	○	_p. 131_
				1 (Elevator)			○	X	X	○	○	○	
PAR_09	7209	Motor capacity Note 1)	Motor select	0 (2.2)	Msg	7.5	○	○	○	○	○	○	_p. 131_
				1 (3.7)			○	○	○	○	○	○	
				2 (5.5)			○	○	○	○	○	○	
				3 (7.5)			○	○	○	○	○	○	
				4 (11.0)			○	○	○	○	○	○	
				5 (15.0)			○	○	○	○	○	○	
				6 (18.5)			○	○	○	○	○	○	
				7 (22.0)			○	○	○	○	○	○	
				8 (User Define) Note 1)			○	○	○	○	○	○	
PAR_10	720A	User defined motor capacity	User MotorSel	2.2–22.0	Msg	7.5	○	○	○	○	○	○	_p. 131_
PAR_11	720B	Maximum speed	Max Speed	10.0–3600.0 Note 2)	rpm/ Hz	1800.0	○	○	○	○	○	○	_p. 132_
PAR_12	720C	Minimum speed	Min Speed	0.5–10.00 Note3)	Hz	0.5	X	○	○	X	○	X	_p. 132_
PAR_13	720D	Base frequency	Base Freq	30.00–120.00	Hz	60.00	X	○	○	X	X	X	_p. 133_
PAR_14	720E	Base speed	Base Speed	10.0–3600.0	rpm	1800.0	○	X	X	○	○	○	_p. 133_
PAR_15	720F	Rated voltage	Rated Volt	240–560	V	440	○	○	○	○	○	○	_p. 133_
PAR_16	7210	Motor pole number	Pole Number	2–128		4	○	○	○	○	○	○	_p. 133_

Function Table

Code	Comm. address	Name	Keypad display	Range		Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
PAR_17	7211	Motor efficiency	Efficiency	70.0–100.0		%	86.0	○	○	○	X	○	○	*p. 134*
PAR_18	7212	Motor rated slip	Rated-Slip	10–250		rpm	70	○	○	○	X	○	X	*p. 134*
PAR_19	7213	Motor rated current	Rated-Curr	1.0–1000.0		A	19.7	○	○	○	○	○	○	*p. 134*
PAR_20	7214	Input voltage	AC In Volt	320–480		V	380	○	○	○	○	○	○	*p. 134*
PAR_21	7215	Switching frequency	PWM Freq	Induction motor	2.5–10.0	kHz	8.0	○	○	○	○	○	○	*P. 134*
				Sync. motor	2.5–8.0									
PAR_22	7216	Motor cooling options	Cooling Mtd	0 (Self-cool) 1 (Forced-cool)			1 (Forced-cool)	○	○	○	○	○	○	*p. 135*
PAR_23	7217	Encoder type	Enc Type	0 (Normal) 1 (EnDat) 2 (Sin/Cos)			0 (Normal)	X	X	X	○	X	○	*p. 137*
PAR_24	7218	Encoder pulse number	Enc Pulse	360–32768			1024	○	○	○	○	○	○	*p. 136*
PAR_25	7219	Encoder directions	Enc Dir Set	0 (A Phase Lead) 1 (B Phase Lead)			0 (A Phase Lead)	○	○	○	○	○	○	*p. 136*
PAR_26	721A	EnDat directions [Note 4)]	EnDat Dir	0 (CW) 1 (CCW)			0 (CW)	X	X	X	○	X	○	*p. 137*
PAR_27	721B	Encoder scale [Note 5)]	Enc Scale	0 (x1) 1 (x16) 2 (x32) 3 (x64)			0	○	○	○	○	○	○	
PAR_28	721C	Encoder tuning [Note 4)]	Enc Tuning	0 (No) 1 (Yes)			0	X	X	X	○	X	○	*p. 137*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
PAR_31	721F	Auto-tuning options [Note 6]	AutoTune Type	0 (Rotational) 1 (Standstill)		1(Standstill)	○	○	○	○	○	○	*p. 139*
PAR_32	7220	If tuning error protection P gain	Kp for If	1–1000		20	○	X	X	X	○	X	*p. 139*
PAR_33	7221	If tuning error protection I gain	Ki for If	1–1000		40	○	X	X	X	○	X	*p. 139*
PAR_34	7222	Motor inertia tuning options	Inertia Tune	0 (No) / 1 (Yes)		0 (No)	○	X	X	X	○	X	*p. 139*
PAR_35	7223	Acc/dec time inertia tuning	J Spd Time	0.500–10.000	sec	0.500	○	X	X	X	○	X	*p. 139*
PAR_36	7224	Inertia LPF	Inertia LPF	0.010–50.000	msec	0.100	○	X	X	X	○	X	*p. 139*
PAR_41	7229	Induction motor auto-tuning options	AsynAuto Tune	PAR_31=0 0 (None) 1 (ALL1) 2 (ALL2) 3 (Encoder Test) 4 (Rs Tuning) 5 (Lsigma) 6 (Flux Curr) 7 (Ls Tuning) 8 (Tr Tuning) PAR_31=1 0 (None) 1 (ALL 1) 4 (Rs Tuning) 5 (Lsigma) 8 (if/Tr/Ls Tune)	Msg	None	○	○	○	X	○	X	*P. 139*
PAR_42	722A	Number of detected initial pole positions	ReDet Num	0–65535		0	X	X	X	○	X	○	*p. 146*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPrS	EL	ELfS	Page ref.
PAR_43	722B	Average number of detected initial pole positions	DetAve Num	1–30		5	X	X	X	○	X	○	*p. 146*
PAR_44	722C	Voltage at detected pole positions	MagDet Volt	5–500	V	60	X	X	X	○	X	○	*p. 146*
PAR_45	722D	Pole position detection current	MagDet Curr	10–150	%	40	X	X	X	○	X	○	*p. 146*
PAR_46	722E	Ld Lq detection level	TuneLvl_ LdLq	20.0–50.0	%	33.3	X	X	X	○	X	○	*p. 148*
PAR_47	722F	Ld Lq detection frequency	TuneHz_ LdLq	100.0–200.0	%	150.0	X	X	X	○	X	○	*p. 148*
PAR_51	7233	Synchronous motor auto-tuning options	SynAuto Tune	0 (None) 1 (All) 2 (Rs Tuning) 3 (Ld/Lq Tuning) 4 (Mag Pole Est)	Msg	None	X	X	X	○	X	○	*p. 148*
PAR_52	7234	Motor flux current	Flux-Curr	0.0–70% of [PAR_19]	A	Varies depending on the motor capacity	○	○	○	X	○	X	*p. 150*
PAR_53	7235	Rotor time constant	Tr	30–3000	msec		○	○	○	X	○	X	*p. 150*
PAR_54	7236	Motor stator inductance	Ls	0.00–500.00	mH		○	○	○	X	○	X	*p. 150*
PAR_55	7237	Leakage factor	Lsigma	0.00–300.00	mH		○	○	○	X	○	X	*p. 150*
PAR_56	7238	Motor stator resistance	Rs	0.000–15.000	ohm		○	○	○	○	○	○	*p. 150*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
PAR_57	7239	Motor inertia constant	Inertia	0.001–60.000	kg· m²		○	○	○	○	○	○	*p. 150*
PAR_58	723A	Motor D-axis inductance	Ld	0.00–500.00	mH		X	X	X	○	X	○	*P. 150*
PAR_59	723B	Motor Q-axis inductance	Lq	0.00–500.00	mH		X	X	X	○	X	○	*P. 150*
PAR_60	723C	Initial pole position	Init Theta	0–360	deg	0	X	X	X	○	X	○	*p. 150*

- Note 1) A motor capacity that exceeds the inverter capacity cannot be selected.
- Note 2) PAR_10 (UserMotorSel) is displayed when PAR_09 (Motor select) is set to "User Define".
- Note 3) Max Speed is 3600.0 rpm in "Speed" mode, and 30.00–120.00 Hz in "V/F" and "Slip Compensation" modes.
- Note 4) Min Speed is available when the control mode is "V/F" or "Slip Compensation". When FUN_23 is selected to "Yes", the maximum value that can be set for Min Speed is the value set in FUN_24.
- Note 5) This option is displayed only when PAR-23 is set to "EndatMode".
- Note 6) Refer to the user manual supplied with the Sin/Cos encoder. This option is available in "Speed" mode.
- Note 7) This option is not displayed during battery supply operations.
- Note 8) Speed (for Sync) feature is not available when selecting the second motor feature.
- The Elevator message in PAR_08 is available when the ELIO card is installed to the inverter.
- PAR_35 is available when PAR_34 (Inertia Tune) is set to "Yes".
- PAR_23 is available when the optional encoder is installed.

Function Table

5.3 Digital input and output (DIO) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
DIO_00	-	Jump to codes	Jump Code	1–98			○	○	○	○	○	○	*p. 154*
DIO_01	7301	Define multi-function input terminal P1	P1 Define	0 (Not Used)	Msg	0 (Not Used)	○	○	○	○	○	○	*p. 155*
				1 (Speed-L)			○	○	○	○	○	○	
				2 (Speed-M)			○	○	○	○	○	○	
				3 (Speed-H)			○	○	○	○	○	○	
				4 (Jog Speed)			○	○	○	○	○	○	
				5 (MOP Up)			○	○	○	○	○	○	
				6 (MOP Down)			○	○	○	○	○	○	
				7 (MOP Clear)			○	○	○	○	○	○	
				8 (MOP Save)			○	○	○	○	○	○	
				9 (2nd Motor)			○	○	○	#	○	#	
				10 (Xcel-L)			○	○	○	○	○	○	
				11 (Xcel-H)			○	○	○	○	○	○	
				12 (3-Wire)			○	○	○	○	○	○	
				13 (EXT Trip-B)			○	○	○	○	○	○	
				14 (Prohibit FWD)			○	○	○	○	○	○	
				15 (Prohibit REV)			○	○	○	○	○	○	
				17 (Timer Input)			○	○	○	○	○	○	
				18 (SoftStrtCncl)			○	#	#	○	#	#	
				19 (ASR Gain Sel)			○	#	#	○	○	○	
				20 (ASR P/PI Sel)			○	#	#	○	○	○	
				21 (Flux Ref Sel)			○	#	#	#	○	#	
				22 (PreExcite)			○	#	#	#	○	#	
				24 (Use Max Trq)			○	#	#	○	○	○	
				25 (Use Trq Bias)			○	#	#	○	○	○	

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
				26 (A3 Safety)			○	○	○	○	○	○	
				27 (LVT Disable)			○	○	○	○	○	○	
				28 (Battery Run)			○	○	○	○	○	○	
DIO_02	7302	Define multi-function input terminal P2	P2 Define	Refer to DIO_01		0 (Not Used)	○	○	○	○	○	○	*p. 155*
DIO_03	7303	Define multi-function input terminal P3	P3 Define	Refer to DIO_01		0 (Not Used)	○	○	○	○	○	○	*p. 155*
DIO_04	7304	Define multi-function input terminal P4	P4 Define	Refer to DIO_01		0 (Not Used)	○	○	○	○	○	○	*p. 155*
DIO_05	7305	Define multi-function input terminal P5	P5 Define	Refer to DIO_01		0 (Not Used)	○	○	○	○	○	○	*p. 155*
DIO_06	7306	Define multi-function input terminal P6	P6 Define	Refer to DIO_01		0 (Not Used)	○	○	○	○	○	○	*p. 155*
DIO_07	7307	Define multi-function input terminal P7	P7 Define	Refer to DIO_01		0 (Not Used)	○	○	○	○	○	○	*p. 155*
DIO_08	7308	Reverse operation for multi-function terminal input	Neg Func. In	00000000000–11111111111	bit	00000000000	○	○	○	○	○	○	*p. 170*

Function Table

Code	Comm. address s	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
DIO_09	7309	Low-pass filter time constant for multi-function terminal input	Terminal LPF	0–2000	msec	5	○	○	○	○	○	○	*p. 170*
DIO_10	730A	Reverse operation for multi-function output	Neg Func. Out	000–111	bit	000	○	○	○	○	○	○	*p. 171*
DIO_11	730B	Define multi-function aux output AX1	AX1 Define	0 (Not Used)		0 (Not Used)	○	○	○	○	○	○	*p. 171*
				1 (INV Ready)			○	○	○	○	○	○	
				2 (Zero Spd Det)			○	#	#	○	○	○	
				3 (Spd Det)			○	○	○	○	○	○	
				4 (Spd Det(ABS))			○	○	○	○	○	○	
				5 (Spd Arrival)			○	○	○	○	○	○	
				6 (Timer Out)			○	○	○	○	○	○	
				7 (LV Warn)			○	○	○	○	○	○	
				8 (Run)			○	○	○	○	○	○	
				9 (Regenerating)			○	#	#	○	○	○	
				10 (Mot OH Warn)			○	○	○	○	○	○	
				11 (Inv OH Warn)			○	○	○	○	○	○	
				12 (Spd Agree)			○	#	#	○	○	○	
				13 (Trq Det)			○	#	#	○	○	○	
				14 (Trq Lmt Det)			○	#	#	○	○	○	
				15 (OverLoad)			○	○	○	○	○	○	
				16 (Stop)			○	○	○	○	○	○	
				17 (MC on/off)			○	○	○	○	○	○	
				18 (FAN Status)			○	○	○	○	○	○	
				19 (ALLS Status)			○	○	○	○	○	○	

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
				20 (Steady)			○	○	○	○	○	○	
				21 (Brake Output)			○	○	○	○	#	#	
DIO_12	730C	Define multi-function aux output AX2	AX2 Define	Same as DIO_11		0 (Not Used)	○	○	○	○	○	○	_p. 171_
DIO_13	730D	Define multi-function aux output OC1	OC1 Define	Same as DIO_11		0 (Not Used)	○	○	○	○	○	○	_p. 171_
DIO_16	7310	Fault relay terminal (A, B, C)	Relay Mode	000-111	bit	011	○	○	○	○	○	○	_p. 185_
DIO_17	7311	Zero-speed detection level	ZSD Level	0.0–480.0	rpm	10.0	○	X	X	○	○	○	_p. 173_
DIO_18	7312	Zero-speed detection band	ZSD Band	0.1–10.0	%	0.5	○	X	X	○	○	○	
DIO_19	7313	Speed detection level	SD Level	-3600–3600	rpm	0	○	○	○	○	○	○	_p. 174_
DIO_20	7314	Speed detection band	SD Band	0.1–10.0	%	0.5	○	○	○	○	○	○	
DIO_21	7315	Speed arrival detection band	SA Band	0.1–10.0	%	0.5	○	○	○	○	○	○	_p. 174_
DIO_22	7316	Equal speed detection band	SEQ Band	0.1–10.0	%	0.5	○	X	X	○	○	○	_p. 175_
DIO_23	7317	Torque detection level	TD Level	0.0–250.0	%	0.0	○	X	X	○	○	○	_p. 177_
DIO_24	7318	Torque	TD Band	0.1–10.0	%	0.5	○	X	X	○	○	○	

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V\F	Slip	SPfS	EL	ELfS	Page ref.
		detection band											
DIO_25	7319	Timer On delay	TimerOn Dly	0.1–3600.0	sec	0.1	○	○	○	○	○	○	_p. 176_
DIO_26	731A	Timer Off delay	TimerOff Dly	0.1–3600.0	sec	0.1	○	○	○	○	○	○	
DIO_28	731C	MC On delay[Note 1)]	MC On Time	100–60000	msec	1000	○	○	○	○	○	○	_p. 178_
DIO_29	731D	MC Off delay[Note 1)]	MC Off Time	100–60000	msec	1000	○	○	○	○	○	○	
DIO_30	731E	Brake open delay[Note 3)]	BK On Delay	0–FUN_11	msec	0	X	○	○	X	X	X	_p. 180_
DIO_31	731F	Brake open time[Note 2)]	BKOpen Time	0.01–30.00	sec	0.00	○	○	○	○	○	○	
DIO_32	7320	Brake open speed[Note 2)]	BKOpen Spd	0.0–500.0	rpm	0.0	○	○	○	○	○	○	
DIO_33	7321	Brake open current[Note 2)]	Release Curr	0.0–15.0	%	2.0	○	○	○	X	○	X	
DIO_34	7322	Brake off delay[Note 2)]	BK Off Delay	0–FUN_11	msec	0	○	○	○	○	○	○	
DIO_36	7324	Brake close speed[Note 2)]	BKClose Spd	0.0–500.0	rpm	0.0	○	○	○	○	○	○	

- Note 1) This option is displayed when AX1, AX2, or OC1 is set to "MC on/off".
- Note 2) This option is displayed when AX1, AX2, or OC1 is set to "Brake output".
- Note 3) This option is displayed when AX1, AX2, or OC1 is set to "Brake output" and the stop method is set to DC-Brake.

5.4 Analog input and output (AIO) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
AIO_00	-	Jump to codes	Jump Code	1–81			○	○	○	○	○	○	*p. 186*
AIO_01	7401	Define multi-function analog input Ai1	Ai1 Define	0 (Not Used)	Msg	0 (Not Used)	○	○	○	○	○	○	*p. 187*
				1 (Speed Ref)			○	○	○	○	○	○	
				5 (Flux Ref)			○	#	#	#	○	#	
				6 (Torque Bias)			○	#	#	○	○	○	
				7 (Torque Limit)			○	#	#	○	○	○	
				8 (Use Mot NTC) Note 1)			○	○	○	○	○	○	
AIO_02	7402	Define multi-function analog input Ai1 input source Note 2)	Ai1 Source	0 (-10 → 10V) 1 (10 → -10V) 2 (0 → 10V) 3 (10 → 0V) 4 (0 → 20 mA) 5 (20 → 0 mA)	Msg	0 (-10 → 10V)	○	○	○	○	○	○	*p. 187*
AIO_03	7403	Define multi-function analog input Ai1 minimum voltage Note 2)	Ai1 In X1	AIO_07– AIO_05	%	0.00	○	○	○	○	○	○	*p. 187*
AIO_04	7404	Define multi-function analog input Ai1 min. voltage bias Note 2)	Ai1 Out Y1	AIO_08–AIO_06	%	0.00	○	○	○	○	○	○	*p. 191*

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPFS	EL	ELfS	Page ref.
AIO_05	7405	Define multi-function analog input Ai1 maximum voltage Note 2)	Ai1 In X2	0.00–100.00	%	100.00	○	○	○	○	○	○	*p. 187*
AIO_06	7406	Define multi-function analog input Ai1 maximum voltage gain Note 2)	Ai1 Out Y2	0.00–250.00	%	100.00	○	○	○	○	○	○	*p. 187*
AIO_07	7407	Define multi-function analog input Ai1 minimum voltage Note 3)	Ai1 -In X1	AIO_09– AIO_03	%	0.00	○	○	○	○	○	○	*p. 187*
AIO_08	7408	Define multifunction analog input Ai1 min. voltage bias Note 3)	Ai1 -Out Y1	AIO_10– AIO_04	%	0.00	○	○	○	○	○	○	*p. 187*
AIO_09	4709	Define multi-function analog input Ai1 maximum voltage Note 3)	Ai1 -In X2	-100.00–0.00	%	-100.00	○	○	○	○	○	○	*p. 187*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPFS	EL	ELfS	Page ref.
AIO_10	740A	Define multi-function analog input Ai1 max. voltage gain Note 3)	Ai1 -Out Y2	-250.00–0.00	%	-100.00	○	○	○	○	○	○	p. 187
AIO_11	740B	Ai1 input LPF time constant Note 2)	Ai1 LPF	0–2000	msec	0	○	○	○	○	○	○	p. 194
AIO_12	740C	Define multi-function analog input Ai1 lost command conditions Note 2)	Ai1 Wbroken	0 (None) 1 (Half x1) 2 (Less than x1)	Msg	0 (None)	○	○	○	○	○	○	p. 187
AIO_13	740D	Define multi-function analog input Ai2	Ai2 Define	Refer to AIO_01–12									
AIO_14	740E	Multi-function analog input Ai2 input source	Ai2 Source										
AIO_15	740F	Multi-function analog input Ai2 minimum voltage	Ai2 In X1										

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
AIO_16	7410	Multi-function analog input Ai2 minimum voltage bias	Ai2 Out Y1										
AIO_17	7411	Multi-function analog input Ai2 maximum voltage	Ai2 In X2										
AIO_18	7412	Multi-function analog input Ai2 maximum voltage gain	Ai2 Out Y2										
AIO_19	7413	Multi-function analog input Ai2 - minimum voltage	Ai2 -In X1										
AIO_20	7414	Multi-function analog input Ai2 - minimum voltage bias	Ai2 -Out Y1										

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
AIO_21	7415	Multi-function analog input Ai2 - maximum voltage	Ai2 -In X2										
AIO_22	7416	Multi-function analog input Ai2 - maximum voltage gain	Ai2 -Out Y2										
AIO_23	7417	Ai2 input LPF time constant	Ai2 LPF										
AIO_24	7418	Multi-function analog input Ai2 lost command conditions	Ai2 Wbroken										
AIO_25	7419	Define multi-function analog input Ai3	Ai3 Define	Refer to AIO_01 Motor NTC is available 8 (Use Mot NTC)		0 (Not Used)	○	○	○	○	○	○	<u>*p. 187*</u>
AIO_26	741A	Multi-function analog input Ai3 input source	Ai3 Source	0 (-10 → 10V) 1 (10 → -10V) 2 (0 → 10V) 3 (10 → 0V)	Msg	0 (-10 → 10V)	○	○	○	○	○	○	<u>*p. 187*</u>

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
AIO_27	741B	Multi-function analog input Ai3 minimum voltage	Ai3 In X1	Refer to AIO_03–12									
AIO_28	741C	Multi-function analog input Ai3 minimum voltage bias	Ai3 Out Y1										
AIO_29	741D	Multi-function analog input Ai3 maximum voltage	Ai3 In X2										
AIO_30	741E	Multi-function analog input Ai3 maximum voltage gain	Ai3 Out Y2										
AIO_31	741F	Multi-function analog input Ai3 - minimum voltage	Ai3 -In X1										

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
AIO_32	7420	Multi-function analog input Ai3 - minimum voltage bias	Ai3 -Out Y1										
AIO_33	7421	Multi-function analog input Ai3 - maximum voltage	Ai3 -In X2										
AIO_34	7422	Multi-function analog input Ai3 - maximum voltage gain	Ai3 -Out Y2										
AIO_35	7423	Ai3 input LPF time constant	Ai3 LPF										
AIO_36	7424	Multi-function analog input Ai3 lost command conditions	Ai3 Wbroken										
AIO_37	7425	Multi-function analog input lost command time	Time out	0.1–120.0	sec	1.0	○	○	○	○	○	○	*p. 195*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
AIO_38	7426	Analog input lost command options	Ai Lost Comm	0 (None)	Msg	None	○	○	○	○	○	○	*p. 195*
				1 (Free Run)									
				2 (Decel)									
AIO_40	7428	Define multi-function analog output AO1	AO1 Define	0 (Not Used)	Msg	0 (Not Used)	○	○	○	○	○	○	*p. 197*
				1 (Ai1 Value)			○	○	○	○	○	○	
				2 (AI2 Value)			○	○	○	○	○	○	
				3 (AI3 Value)			○	○	○	○	○	○	
				4 (PreRamp Ref)			○	○	○	○	○	○	
				5 (PostRamp Ref)			○	○	○	○	○	○	
				6 (ASR Inp Ref)			○	○	○	○	○	○	
				7 (Output Freq)			○	○	○	○	○	○	
				8 (Motor Speed)			○	#	#	○	○	○	
				10 (Speed Dev)			○	#	#	○	○	○	
				11 (ASR Out)			○	#	#	○	○	○	
				12 (Torque Bias)			○	#	#			○	
				13 (PosTrq Limit)			○	#	#	○	○	○	
				14 (NegTrq Limit)			○	#	#	○	○	○	
				15 (RegTrq Limit)			○	#	#	○	○	○	
				17 (IqeRef)			○	#	#	○	○	○	
				18 (Iqe)			○	#	#	○	○	○	
				19 (Flux Ref)			○	#	#	#	○	#	
				20 (IdeRef)			○	#	#	○	○	○	
				21 (Ide)			○	#	#	○	○	○	
				22 (ACR_Q Out)			○	#	#	○	○	○	
				23 (ACR_D Out)			○	#	#	○	○	○	

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
				24 (VdeRef)			○	○	○	○	○	○	
				25 (VqeRef)			○	○	○	○	○	○	
				26 (Out Amps RMS)			○	○	○	○	○	○	
				27 (Out Volt RMS)			○	○	○	○	○	○	
				28 (Power)			○	○	○	○	○	○	
				29 (DC Bus Volt)			○	○	○	○	○	○	
				33 (MotNTC Temp)			○	○	○	○	○	○	
				34 (Inv Temp)			○	○	○	○	○	○	
AIO_41	7429	Define multi-function analog output AO1 output source Note 4)	AO1 Source	0 (-10 → 10V) 1 (10 → -10V) 2 (0 → 10V) 3 (10 → 0V)	Msg	0 (-10 → 10V)	○	○	○	○	○	○	_p. 197_
AIO_42	742A	Define multi-function analog output AO1 bias Note 4)	AO1 Bias	0.0–AIO_43	%	0.0	○	○	○	○	○	○	_p. 197_
AIO_43	742B	Define multi-function analog output AO1 gain Note 4)	AO1 Gain	0.0–500.0	%	100.0	○	○	○	○	○	○	_p. 197_

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
AIO_44	742C	Define multi-function analog output AO1 - bias Note 4)	AO1 -Bias	AIO_45–0.0	%	0.0	○	○	○	○	○	○	_p. 197_
AIO_45	742D	Define multi-function analog output AO1 - gain Note 4)	AO1 -Gain	0.0–-500.0	%	-100.0	○	○	○	○	○	○	_p. 197_
AIO_46	742E	Define multi-function analog output AO1 absolute value Note 4)	AO1 ABS	0 (No) / 1 (Yes)	Msg	0 (No)	○	○	○	○	○	○	_p. 197_
AIO_47	742F	Define multi-function analog output AO2	AO2 Define	Refer to AIO_41–46									

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
AIO_48	7430	Define multi-function analog output AO2 output source Note 5)	AO2 Source										
AIO_49	7431	Define multi-function analog output AO2 bias Note 5)	AO2 Bias										
AIO_50	7432	Define multi-function analog output AO2 gain Note 5)	AO2 Gain										
AIO_51	7433	Define multi-function analog output AO2 - bias Note 5)	AO2 -Bias										
AIO_52	7434	Define multi-function analog output AO2 - gain Note 5)	AO2 -Gain										

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V/F	Slip	SPfS	EL	ELfS	Page ref.
AIO_53	7435	Define multi-function analog output AO2 absolute value Note 5)	AO2 ABS										

- ■ Note 1) This option is displayed with "AI3Define" only. It is not available with "Ai1Define" or "AI2Define" settings.
- ■ Note 2) This option is not displayed when AIxDefine (x=0,1, 2) is set to "Not Used".
- ■ Note 3) This option is displayed only when AIxDefine (x=0,1, 2) is not set to "Not Used" and AIxSource (x=0,1, 2) is set to "Bipolar".
- ■ Note 4) This option is not displayed when AO1Define is set to "Not Used".
- ■ Note 5) This option is not displayed when AO2Define is set to "Not Used".

5.5 Function (FUN) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
FUN_00	-	Jump to codes	Jump code	1–85			○	○	○	○	○	○	<u>*p. 204*</u>
FUN_01	7501	RUN/STOP command source	Run/Stop Src	0 (Terminal 1) 1 (Terminal 2) 2 (Keypad) 4 (Int485)	Msg	0 (Terminal 1)	○	○	○	○	○	○	<u>*p. 205*</u>
FUN_02	7502	Speed reference source	Spd Ref Sel	0 (Analog) 1 (Keypad1) 2 (Keypad2) 4 (Int485)	Msg	1 (Keypad1)	○	○	○	○	X	X	<u>*p. 206*</u>
FUN_03	7503	Stop options	Stop mode	0 (Decel)	Msg	0 (Decel)	○	○	○	○	X	X	<u>*p. 206*</u>
				1 (Free-run)			○	○	○	○	X	X	
				2 (DC-Brake)			#	○	○	#	X	X	
FUN_06	7506	DC-braking frequency ^{Note 1)}	DcBr Freq	0.5–60.00	Hz	5.00	X	○	○	X	X	X	<u>*p. 207*</u>
FUN_07	7507	Block time before DC-braking ^{Note 1)}	DcBlk Time	0.01–60.00	sec	0.10	X	○	○	X	X	X	<u>*p. 207*</u>
FUN_08	7508	DC-braking amount ^{Note 1)}	DcBr Value	0–200	%	10	X	○	○	X	X	X	<u>*p. 207*</u>
FUN_09	7509	DC-braking time ^{Note 1)}	DcBr Time	0.1–60.0	sec	1.0	X	○	○	X	X	X	<u>*p. 207*</u>
FUN_10	750A	DC-start value ^{Note 1)}	DcSt Value	0–200	%	10	X	○	○	X	X	X	<u>*p. 208*</u>
FUN_11	750B	DC-start time ^{Note 1)}	DcSt Time	0.0–60.0	sec	0	X	○	○	X	X	X	<u>*p. 208*</u>
FUN_12	750C	Multistep speed 0 ^{Note 2)}	Speed 0	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	<u>*p. 209*</u>
FUN_13	750D	Multistep speed 1 ^{Note 2)}	Speed 1	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	<u>*p. 209*</u>

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
FUN_14	750E	Multistep speed 2 Note 2)	Speed 2	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	*p. 209*
FUN_15	750F	Multistep speed 3 Note 2)	Speed 3	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	*p. 209*
FUN_16	7510	Multistep speed 4 Note 2)	Speed 4	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	*p. 209*
FUN_17	7511	Multistep speed 5 Note 2)	Speed 5	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	*p. 209*
FUN_18	7512	Multistep speed 6 Note 2)	Speed 6	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	*p. 209*
FUN_19	7513	Multistep speed 7 Note 2)	Speed 7	0.0–PAR_11	rpm	0.0	○	○	○	○	○	○	*p. 209*
FUN_20	7514	JOG speed Note 2)	Jog Speed	0.0–PAR_11	rpm	100.0	○	○	○	○	X	X	*p. 209*
FUN_21	7515	Dwell speed Note 2)	Dwell Speed	0.0–PAR_11	rpm	100.0	○	○	○	○	X	X	*p. 212*
FUN_22	7516	Dwell time	Dwell Time	0.00–100.00	sec	0.00	○	○	○	○	X	X	*p. 212*
FUN_23	7517	Frequency limit	Speed Limit	0(No) 1(Yes)	Msg	0	X	○	○	X	X	X	*p. 213*
FUN_24	7518	Frequency low limit Note 3)	Spd Limit L	0–FUN_25	Hz	0.5	X	○	○	X	X	X	*p. 213*
FUN_25	7519	Frequency high limit Note 3)	Spd Limit H	FUN_24– MaxFreq	Hz	60.00	X	○	○	X	X	X	*p. 213*
FUN_26	751A	Frequency jump	Jump Speed	0 (No) 1 (Yes)	Msg	0	X	○	○	X	X	X	*p. 213*
FUN_27	751B	Jump frequency low limit1 Note 4)	Jump Lo 1	0.00–FUN_28	Hz	10.00	X	○	○	X	X	X	*p. 213*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
FUN_28	751C	Jump frequency high limit1 Note 4)	Jump Hi 1	FUN_27–FUN_29	Hz	15.00	X	○	○	X	X	X	*p. 213*
FUN_29	751D	Jump frequency low limit2 Note 4)	Jump Lo 2	FUN_28–FUN_30	Hz	20.00	X	○	○	X	X	X	*p. 213*
FUN_30	751E	Jump frequency high limit2 Note 4)	Jump Hi 2	FUN_29–FUN_31	Hz	25.00	X	○	○	X	X	X	*p. 213*
FUN_31	751F	Jump frequency low limit3 Note 4)	Jump Lo 3	FUN_30–FUN_32	Hz	30.00	X	○	○	X	X	X	*p. 213*
FUN_32	7520	Jump frequency high limit3 Note 4)	Jump Hi 3	FUN_31–PAR_11	Hz	35.00	X	○	○	X	X	X	*p. 213*
FUN_33	7521	Acc/dec reference speed	Acc/Dec Ref	0 (Max Speed) 1 (Ref Speed)		0 (Max Speed)	○	○	○	○	X	X	*p. 215*
FUN_36	7524	S-curve gradient at acceleration 1	Acc S Start	0.0–50.0	%	0.0	○	○	○	○	○	○	*p. 216*
FUN_37	7525	S-curve gradient at acceleration 2	Acc S End	0.0–50.0	%	0.0	○	○	○	○	○	○	*p. 216*
FUN_38	7526	S-curve gradient at deceleration 1	Dec S Start	0.0–50.0	%	0.0	○	○	○	○	○	○	*p. 216*
FUN_39	7527	S-curve gradient at deceleration 2	Dec S End	0.0–50.0	%	0.0	○	○	○	○	○	○	*p. 216*

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VfF	Slip	SPfS	EL	ELfS	Page ref.
FUN_40	7528	Acc/dec time scale	Time scale	0 (0.01 sec) 1 (0.1 sec)		0 (0.01 sec)	○	○	○	○	○	○	*p. 216*
FUN_41	7529	Acceleration time 1	Acc Time-1	0.00–600.0	sec	2.00	○	○	○	○	○	○	*p. 219*
FUN_42	752A	Deceleration time 1	Dec Time-1	0.00–600.0	sec	2.00	○	○	○	○	○	○	*p. 219*
FUN_43	752B	Acceleration time 2	Acc Time-2	0.00–600.0	sec	3.00	○	○	○	○	○	○	*p. 219*
FUN_44	752C	Deceleration time 2	Dec Time-2	0.00–600.0	sec	3.00	○	○	○	○	○	○	*p. 219*
FUN_45	752D	Acceleration time 3	Acc Time-3	0.00–600.0	sec	4.00	○	○	○	○	○	○	*p. 219*
FUN_46	752E	Deceleration time 3	Dec Time-3	0.00–600.0	sec	4.00	○	○	○	○	○	○	*p. 219*
FUN_47	752F	Acceleration time 4	Acc Time-4	0.00–600.0	sec	5.00	○	○	○	○	○	○	*p. 219*
FUN_48	7530	Deceleration time 4	Dec Time-4	0.00–600.0	sec	5.00	○	○	○	○	○	○	*p. 219*
FUN_49	7531	Zero-speed deceleration time options	Use 0 Dec T	0 (No) / 1 (Yes)		0 (No)	○	○	○	○	○	○	*p. 221*
FUN_50	7532	Zero-speed deceleration time	0 Dec Time	0.00–600.00	sec	3.00	○	○	○	○	○	○	*p. 221*
FUN_51	7533	Emergency stop deceleration time	BX Time	0.0–6000.0	sec	0.0	○	○	○	○	X	X	*p. 221*
FUN_52	-	Emergency stop terminal filter time	BX Termi LPF	0.0–2000	msec	0	○	○	○	○	○	○	*p. 221*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
FUN_53	7535	Motor pre-excitation time	PreExct Time	0–10000	msec	0	○	X	X	X	X	X	*p. 223*
FUN_54	7536	Hold time at zero-speed	Hold Time	10–10000	msec	1000	○	X	X	○	X	X	*p. 224*
FUN_55	7537	Power-on run options	Power-on Run	0 (No) / 1 (Yes)		0 (No)	○	○	○	○	X	X	*p. 225*
FUN_56	7538	Short floor operation speed	ShortFlr Spd	0.0–PAR_11	rpm	0.0	○	○	○	○	X	X	*p. 226*
FUN_57	7539	Short floor operation time	ShortFlrTi me	0.00–100.00	sec	0.00	○	○	○	○	X	X	*p. 226*
FUN_58	753A	Anti-hunting regulator options	NewAHR Sel	0 (No) 1 (Yes)			X	○	○	X	X	X	*p. 230*
FUN_59	753B	Anti-hunting regulator P gain	NewAHR Pgain	0.00–100.00		3.00	X	○	○	X	X	X	*p. 230*
FUN_60	753C	AHR start frequency	AHRLow Freq	0–60.00	Hz	300	X	○	○	X	X	X	*p. 230*
FUN_61	753D	AHR end frequency	AHRHi Freq	FUN_60–PAR_11	Hz	70.00	X	○	○	X	X	X	*p. 230*
FUN_67	7543	Battery operation speed [Note 5]	Batt. Speed	DIO_32–200.0	rpm	50.0	○	○	○	○	○	○	*p. 231*
FUN_68	7544	Battery input voltage [Note 5]	Batt. Volt	12–PAR_15	V	48	○	○	○	○	○	○	*p. 231*
FUN_69	7545	Automatic Light Load Search options [Note 5]	ALLS Enable	0 (No) 1 (Yes)	Msg	No	○	○	○	○	○	○	*p. 234*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
FUN_70	7546	Hold time at FX/RX direction switching Note 6)	ALLS DirChgT	1.0–10.0	sec	5.0	○	○	○	○	○	○	*p. 234*
FUN_71	7547	Light load search time Note 6)	ALLS Time	FUN_72–10.00	sec	5.0	○	○	○	○	○	○	*p. 234*
FUN_72	7548	Light load detection time Note 6)	ALLS LoadCkT	1.0–5.0	sec	2.0	○	○	○	○	○	○	*p. 234*
FUN_73	7549	Load cell options	Use LoadCell	Yes/No		No	○	X	X	○	○	○	*p. 237*
FUN_74	754A	Full-load climb torque Note 7)	FullLoad Trq	-250.0–250.0	%	100.0	○	X	X	○	○	○	*p. 237*
FUN_75	754B	Full-load climb AI Note 7)	FullLoad AI	-100.0–100.0	%	100.0	○	X	X	○	○	○	*p. 237*
FUN_76	754C	No-load descent torque Note 7)	Noload Trq	-250.0–250.0	%	0.0	○	X	X	○	○	○	*p. 237*
FUN_77	754D	No-load descent AI Note 7)	Noload AI	-100.0–100.0	%	0.0	○	X	X	○	○	○	*p. 237*

- ▪ Note 1) This option is displayed when FUN_03 is set to "DC-Brake".
- ▪ Note 2) When control mode is set to "V/F" or "Slip Compensation", the range is 0.50–120.00 Hz.
- ▪ Note 3) This option is displayed when FUN_23 is set to "Yes".
- ▪ Note 4) This option is displayed when FUN_26 is set to "Yes".
- ▪ Note 5) This option is displayed when one of the multifunction inputs is set for battery operation.
- ▪ Note 6) This option is displayed when FUN_69 is set to "Yes".
- ▪ Note 7) This option is displayed when FUN_73 is set to "Yes".

5.6 Control (CON) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V/F	Slip	SPfS	EL	ELfS	Page ref.
CON_00	-	Jump to codes	Jump Code	1–99			○	○	○	○	○	○	*p. 241*
CON_02	7602	Speed controller gain ratio	ASR PI Ratio	1.0–500.0	%	100.0	X	X	X	○	X	○	*p. 241*
CON_03	7603	Speed controller proportional gain 1	ASR P Gain1	0.1–500.0	%	50.0	○	X	X	○	○	○	*p. 241*
CON_04	7604	Speed controller integral time 1	ASR I Gain1	0–50000	msec	300	○	X	X	○	○	○	*p. 241*
CON_05	7605	Speed controller input LPF time constant 1	ASR LPF1	0–20000	msec	0	○	X	X	○	○	○	*p. 242*
CON_06	7606	Speed controller proportional gain 2	ASR P Gain2	0.1–500.0	%	50.0	○	X	X	○	○	○	*p. 242*
CON_07	7607	Speed controller integral time 2	ASR I Gain2	0–50000	msec	300	○	X	X	○	○	○	*p. 242*
CON_08	7608	Speed controller input LPF time constant 2	ASR LPF2	0–20000	msec	0	○	X	X	○	○	○	*p. 242*
CON_09	7609	Overshoot prevention gain	ASR FF Gain	0–1000	%	0	X	X	X	○	X	○	*p. 245*
CON_10	760A	Ramp time at speed controller gain switching	ASR RAMP	10–10000	msec	1000	○	X	X	○	○	○	*p. 242*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V/F	Slip	SPfS	EL	ELfS	Page ref.
CON_11	760B	Speed controller gain switching speed	ASR TarSpd	0.0–3600.0	rpm	0.0	○	X	X	○	○	○	p. 242
CON_33	7621	Torque limit source options	Trq Lmt Src	0 (Kpd Kpd Kpd) 1 (Kpd Kpd Ax) 2 (Kpd Ax Kpd) 3 (Kpd Ax Ax) 4 (Ax Kpd Kpd) 5 (Ax Kpd Ax) 6 (Ax Ax Kpd) 7 (Ax Ax Ax) 9 (485 485 485)		0 (Kpd Kpd Kpd)	○	X	X	○	○	○	p. 246
CON_34	7622	FX torque limit	Pos Trq Lmt	0.0–250.0	%	150.0	○	X	X	○	○	○	p. 246
CON_35	7623	RX torque limit	Neg Trq Lmt	0.0–250.0	%	150.0	○	X	X	○	○	○	p. 246
CON_36	7624	Regeneration torque limit	Reg Trq Lmt	0.0–250.0	%	150.0	○	X	X	○	○	○	p. 246
CON_37	7625	Torque bias options	Trq Bias Src	0 (None) 1 (Analog) 2 (Keypad) 4 (Int485)		0 (None)	○	X	X	○	○	○	p. 248
CON_38	7626	Torque bias amount	Trq Bias	-150.0–150.0	%	0.0	○	X	X	○	○	○	p. 248
CON_39	7627	Torque bias compensation for friction loss	Trq Bias FF	-150.0–150.0	%	0.0	○	X	X	○	○	○	p. 249
CON_40	7628	Torque balance amount	Trq Balance	0.0–100.0	%	50.0	○	X	X	○	○	○	p. 249

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
CON_41	7629	Torque boost options Note 1)	Torque Boost	0 (Manual) 1 (Auto torque boost)		Varies depending on the control mode Note2)	X	○	○	X	X	X	p. 250
CON_42	762A	Forward torque boost Note 1)	Fwd Boost	0.0–20.0	%	2.0	X	○	○	X	X	X	p. 250
CON_43	762B	Reverse torque boost Note 1)	Rev Boost	0.0–20.0	%	2.0	X	○	○	X	X	X	p. 250
CON_45	762D	Auto torque boost filter Note 1)	ATB FilterGain	1–10000		200	X	○	○	X	X	X	p. 252
CON_46	762E	Auto torque boost motor voltage gain Note 1)	voltGainAt bM	0–300.0	%	15.0	X	○	○	X	X	X	p. 252
CON_47	762F	Auto torque boost generating voltage gain Note 1)	voltGainAt bG	0–300.0	%	10.0%	X	○	○	X	X	X	p. 252
CON_48	7630	V/F pattern Note 1)	V/F pattern	0 (Linear) 2 (User V/F)		0	X	○	○	X	X	X	p. 256
CON_49	7631	User frequency 1 Note 3)	User Freq 1	0.00– CON_51	Hz	15.00	X	○	○	X	X	X	p. 257
CON_50	7632	User voltage 1 Note 3)	User Volt 1	0–100	%	25	X	○	○	X	X	X	p. 257
CON_51	7633	User frequency 2 Note 3)	User Freq 2	CON_49 – CON_53	Hz	30.00	X	○	○	X	X	X	p. 257
CON_52	7634	User voltage 2 Note 3)	User Volt 2	0–100	%	50	X	○	○	X	X	X	p. 257

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
CON_53	7635	User frequency 3 Note 3)	User Freq 3	CON_51 – CON_55	Hz	45.00	X	○	○	X	X	X	*p. 257*
CON_54	7636	User voltage 3 Note 3)	User Volt 3	0–100	%	75	X	○	○	X	X	X	*p. 257*
CON_55	7637	User frequency 4 Note 3)	User Freq 4	CON_53 – PAR_11	Hz	60.00	X	○	○	X	X	X	*p. 257*
CON_56	7638	User voltage 4 Note 3)	User Volt 4	0–100	%	100	X	○	○	X	X	X	*p. 257*
CON_57	7639	Output voltage adjustment	Volt Control	40–150	%	100	X	○	○	X	X	X	*p. 259*
CON_63	763F	Slip compensation frequency	SlipCompFreq	0–120.00	Hz	5.00	X	X	○	X	X	X	*p. 260*
CON_64	7640	Slip compensation motoring gain H	SlipGain_MH	0–5000		500	X	X	○	X	X	X	*p. 260*
CON_65	7641	Slip compensation generating gain H	SlipGain_GH	0–5000		500	X	X	○	X	X	X	*p. 260*
CON_66	7642	Slip compensation gain switching frequency	SlipGainFrq	0–120.00	Hz	0.5	X	X	○	X	X	X	*p. 260*
CON_67	7643	Slip compensation motoring gain L	SlipGain_ML	0–3000		100	X	X	○	X	X	X	*p. 260*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
CON_68	7644	Slip compensation generating gain L	SlipGain_GL	0–3000		100	X	X	○	X	X	X	*p. 260*
CON_69	7645	Slip compensation filter time constant	Slip Filter	100–10000	msec	500	X	X	○	X	X	X	*p. 260*
CON_71	7647	Anti rollback time	ARF Time	0–10000	msec	0	X	X	X	○	X	○	*p. 263*
CON_72	7648	Anti rollback speed Pgain	ARF ASR P	1–3000	%	100	X	X	X	○	X	○	*p. 263*
CON_73	7649	Anti rollback speed I gain	ARF ASR I	0–50000	msec	5	X	X	X	○	X	○	*p. 263*
CON_74	764A	Anti rollback position gain	ARF APR P	1–10000	%	200	X	X	X	○	X	○	*p. 263*

- Note 1) This mode is displayed when the control mode is "V/F" or "Slip Comp".
- Note 2) The default setting when the control mode is "V/F" is "0 (Manual)" and the default setting when the control mode is "Slip Comp" is "1 (Auto Torque Boost)".
- Note 3) This option is displayed when CON_48 is set to "User V/F". This option is displayed when M2 V/F in M2_32 is set to "User V/F" and the multifunction input is selected to second motor.

Function Table

5.7 Protection (PRT) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
PRT_00	-	Jump to codes	Jump code	1–34		1	○	○	○	○	○	○	p. 265
PRT_01	7801	E-thermal options	ETH Select	0 (No) / 1 (Yes)		0 (No)	○	○	○	○	○	○	p. 266
PRT_02	7802	E-thermal 1 min level Note 1)	ETH 1 min	PRT_03–200	%	150	○	○	○	○	○	○	p. 266
PRT_03	7803	E-thermal continuous operation level Note 1)	ETH Cont	50–PRT_02 (150% max)	%	100	○	○	○	○	○	○	p. 266
PRT_04	7804	Reset restart options	RST Restart	0 (No) / 1 (Yes)		0 (No)	○	○	○	○	○	○	p. 268
PRT_05	7805	Number of restart attempts	Retry Number	0–10		0	○	○	○	○	○	○	p. 269
PRT_06	7806	Delay before retry	Retry Delay	0.0–60.0	sec	1.0	○	○	○	○	○	○	p. 269
PRT_07	7807	Hold time after stop Note 2)	Restart Time	0.00–10.00	sec	0.00	○	○	○	○	○	○	p. 271
PRT_08	7808	EnDat options fault / pole position detection settings	EnDat Func	1111–0000	bit	0011	X	X	X	○	X	○	p. 272
PRT_09	7809	Encoder error check options	Enc Err Chk	0 (No) 1 (Yes)		1 (Yes)	○	X	X	○	○	○	p. 273
PRT_10	780A	Encoder LPF time constant	Enc LPF	0–100	msec	1	○	X	X	○	○	○	p. 273

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
PRT_11	780B	Motor error detection time	EncFaultTime	0.00–10.00	sec	0.00	○	X	X	○	○	○	*p. 273*
PRT_12	780C	Motor error reference speed	EncFaultPerc	0.0–50.0	%	25.0	○	X	X	○	○	○	*p. 273*
PRT_13	780D	Speed deviation detection level	SpdErrLevel	0–100	rpm	Async: 100 Sync: 10	○	X	X	○	○	○	*p. 276*
PRT_14	780E	Speed deviation detection time	SpdErrTime	0–1000	msec	Async: 100 Sync: 10	○	X	X	○	○	○	*p. 276*
PRT_15	780F	Overspeed error detection level	OverSpdLevel	100.0–130.0	%	110.0	○	X	X	○	○	○	*p. 276*
PRT_16	7810	Overspeed error detection time	OverSpd Time	0.00–2.00	sec	0.00	○	X	X	○	○	○	*p. 276*
PRT_17	7811	Missing input phase detection	PhInOpenChk	Yes/No		No	○	○	○	X	○	X	*p. 277*
PRT_18	7812	Missing input phase detection voltage level Note 3)	PhInOpenLvl	2–100	V	3	○	○	○	○	○	○	*p. 277*
PRT_19	7813	Missing output phase detection	PhOutOpenChk	Yes/No		No	○	○	○	○	○	○	*p. 277*
PRT_20	7814	Overload warning level	OL Level	30–250	%	150	○	○	○	○	○	○	*p. 277*

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
PRT_21	7815	Overload warning time	OL Time	0–30	sec	10	○	○	○	○	○	○	*p. 277*
PRT_22	7816	Overload fault trip options	OLT Select	0 (No) / 1 (Yes)		1 (Yes)	○	○	○	○	○	○	*p. 279*
PRT_23	7817	Overload fault trip level Note 4)	OLT Level	30–250	%	180	○	○	○	○	○	○	*p. 279*
PRT_24	7818	Overload fault trip time Note 4)	OLT Time	0–60	sec	60	○	○	○	○	○	○	*p. 279*
PRT_25	7819	Inverter overheat detection temperature Note 5)	IH Warn Temp	5.5/7.5 kW: 50-110	deg	95	○	○	○	○	○	○	*p. 279*
				11–22 kW: 50–85	deg	75							
PRT_26	781A	Inverter overheat detection band	IH Warn Band	0–10	deg	5	○	○	○	○	○	○	*p. 279, 280*
PRT_27	781B	Motor overheat detection temperature	MH Warn Temp	75–130	deg	120	○	○	○	○	○	○	*p. 280*
PRT_28	781C	Motor overheat detection temperature band	MH Warn Band	0–10	deg	5	○	○	○	○	○	○	*p. 280*
PRT_29	781D	Low Voltage 2 options	LV2 Enable	0 (No) / 1 (Yes)		0 (No)	○	○	○	○	○	○	*p. 280*
PRT_30	781E	A3 start time Note 6)	A3 StartTime	0–6000	msec	1500	○	○	○	○	○	○	*p. 281*
PRT_31	781F	A3 stop time Note 6)	A3 StopTime	0–6000	msec	1500	○	○	○	○	○	○	*p. 281*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
PRT_32	7820	Cooling fan control	Fan Control	0 (During Run) 1 (Always On) 2 (Temp Control)	Msg	0	○	○	○	○	○	○	*p. 282*
PRT_33	7821	Cooling fan fault trip options	Fan Trip Mode	0 (Trip) 1 (Warning)	Msg	1 (Warning)	○	○	○	○	○	○	*p. 282*
PRT_34	7822	Safety options	Safety Type	0 (Latch) 1 (Level)	Msg	0 (Latch)	○	○	○	○	○	○	*p. 283*

- Note 1) This option is displayed when PRT_02 is set to "Yes".
- Note 2) This option is displayed when FUN_03 is set to "Free-Run".
- Note 3) This option is displayed when PRT-17 is set to "Yes".
- Note 4) This option is displayed when PRT-22 is set to "Yes".
- Note 5) For 5.5/7.5 kW inverters, the range is 50–110 and the default setting is 95.
- Note 6) This option is displayed when a multifunction input terminal is set to "A3 Safety".

Function Table

5.8 Communication (COM) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPFS	EL	ELfS	Page ref.
COM_00	-	Jump to codes	Jump Code	1–37		1	○	○	○	○	○	○	-
COM_32	7920	Built-in RS 485 inverter station ID	Int485 St ID	1–250		1	○	○	○	○	○	○	p. 295
COM_33	7921	Built-in RS 485 comm. speed	Int485 Baud	0 (1200 bps) 1 (2400 bps) 2 (4800 bps) 3 (9600 bps) 4 (19200 bps) 5 (38400 bps)	Msg	3 (9600 bps)	○	○	○	○	○	○	p. 295
COM_34	7922	Built-in RS 485 comm. options	Int485 Mode	0 (8None/1Stop) 1 (8None/2Stop) 2 (8Even/1Stop) 3 (8Odd/1Stop)	Msg	0 (8None/1Stop)	○	○	○	○	○	○	p. 295
COM_35	7923	Built-in RS 485 time delay	Int485 Delay	2–1000	msec	5	○	○	○	○	○	○	p. 295
COM_36	7924	Built-in RS 485 lost command options	Int485 LostC	0 (None) 1 (FreeRun) 2 (Decel)	Msg	0 (None)	○	○	○	○	○	○	p. 295
COM_37	7925	Built-in RS 485 lost command decision time	Int485 LostT	1.0–30.0	sec	1.0	○	○	○	○	○	○	p. 295

5.9 Second motor (M2) group [Note 1]

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
M2_00	-	Jump to codes	Jump Code	1–36		1	○	○	○	X	○	X	*p. 284*
M2_01	7A01	Second motor control mode	M2 Cntl Mode	2 (Speed) 4 (V/F) 5 (Slip Comp)		2 (Speed)	○	○	○	X	○	X	*p. 285*
M2_02	7A02	Second motor capacity	Motor select	0 (2.2) 1 (3.7) 2 (5.5) 3 (7.5) 4 (11.0) 5 (15.0) 6 (18.5) 7 (22.0) 8 (UserDefine)	kW	3 (7.5)	○	○	○	X	○	X	*p. 286*
M2_03	7A03	Second motor user defined motor capacity	UserMotor Sel [Note 2]	2.2 –22	kW	7.5	○	○	○	X	○	X	*p. 286*
M2_04	7A04	Second motor maximum speed	M2 Max Spd	10.0–3600.0	rpm/ Hz	1800.0	○	○	○	X	○	X	*p. 285*
M2_05	7A05	Second motor minimum speed	M2 Min Spd	0.01–10.00	Hz	0.50	○	X	X	X	○	X	*p. 285*
M2_06	7A06	Second motor multistep speed 0	M2 Spd 0	0.0–M2_02	rpm/ Hz	0.0	○	○	○	X	○	X	*p. 285*

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VIF	Slip	SPfS	EL	ELfS	Page ref.
M2_07	7A07	S-curve gradient for second motor acceleration 1	M2 Acc S St	0.0–50.0	%	0.0	○	○	○	X	○	X	*p. 285*
M2_08	7A08	S-curve gradient for second motor acceleration 2	M2 Acc S Ed	0.0–50.0	%	0.0	○	○	○	X	○	X	*p. 285*
M2_09	7A09	S-curve gradient for second motor deceleration 1	M2 Dec S St	0.0–50.0	%	0.0	○	○	○	X	○	X	*p. 285*
M2_10	7A0A	S-curve gradient for second motor deceleration 2	M2 Dec S Ed	0.0–50.0	%	0.0	○	○	○	X	○	X	*p. 285*
M2_11	7A0B	Second motor acc/dec time scale	Time scale2	0 (0.01 sec) 1 (0.1 sec)		0 (0.01 sec)	○	○	○	X	○	X	*p. 285*
M2_12	7A0C	Second motor acceleration time	M2 Acc time	0.00–6000.0	sec	10.00	○	○	○	X	○	X	*p. 285*
M2_13	7A0D	Second motor deceleration time	M2 Dec time	0.00–6000.0	sec	10.00	○	○	○	X	○	X	*p. 285*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V/F	Slip	SPfS	EL	ELfS	Page ref.
M2_14	7A0E	Second motor base frequency	M2 BaseFreq	0.00–120.00	Hz	120.00	X	○	○	X	○	X	*p. 286*
M2_15	7A0F	Second motor base speed	M2 BaseSpd	300.0–3600.0	rpm	1800.0	○	X	X	X	○	X	*p. 286*
M2_16	7A10	Second motor rated voltage	M2 R-Volt	300–528	V	380	○	○	○	X	○	X	*p. 286*
M2_17	7A11	Second motor number of poles	M2 Pole #	2–12		4	○	○	○	X	○	X	*p. 286*
M2_18	7A12	Second motor efficiency	M2 Mot Eff.	70–100	%	Varies depending on the motor capacity	○	○	○	X	○	X	*p. 286*
M2_19	7A13	Second motor rated slip	M2 R-Slip	10–250	rpm/Hz		○	○	○	X	○	X	*p. 286*
M2_20	7A14	Second motor rated current	M2 R-Curr	1.0–1000.0	A		○	○	○	X	○	X	*p. 286*
M2_21	7A15	Second motor flux current	M2 Flx Cur	0.0–70% of M2_20	A		○	○	○	X	○	X	*p. 286*
M2_22	7A16	Second motor rotor time constant	M2 Mot Tr	30–3000	msec		○	○	○	X	○	X	*p. 286*
M2_23	7A17	Second motor stator inductance	M2 Mot Ls	0.00–500.00	mH		○	○	○	X	○	X	*p. 286*

Function Table

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	V/F	Slip	SPfS	EL	ELfS	Page ref.
M2_24	7A18	Second motor leakage factor	M2 Mot sLs	0.00–300.00	mH		○	○	○	X	○	X	*p. 286*
M2_25	7A19	Second motor stator resistance	M2 Mot Rs	0.000–15.000	ohm		○	○	○	X	○	X	*p. 286*
M2_26	7A1A	Second motor inertia constant	Inertia	0.001–60.000	kg·m^2	0.072	○	○	○	X	○	X	*p. 286*
M2_27	7A1B	Second motor cooling options	M2 Cool Mtd	0 (Self-cool) 1 (Forced-cool)		1 (Forced-cool)	○	○	○	X	○	X	*p. 288*
M2_28	7A1C	Second motor encoder pulse number	M2 Enc #	360–4096		1024	○	○	○	X	○	X	*p. 287*
M2_29	-	Second motor encoder direction	M2 Enc Dir	0 (A Phase Lead) 1 (B Phase Lead)		0 (A Phase Lead)	○	○	○	X	○	X	*p. 287*
M2_30	7A1E	Second motor encoder error check options	M2 Enc chk	0 (No) / 1 (Yes)		1 (Yes)	○	○	○	X	○	X	*p. 287*
M2_31	7A1F	Second motor encoder LPF time constant	M2 Enc LPF	0–100	msec	1	○	○	○	X	○	X	*p. 287*

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
M2_32	7A20	Second motor V/F mode	M2 V/F	0 (Linear) 2 (User V/F)	Msg	0	X	○	○	X	○	X	*p. 287*
M2_33	7A21	Forward torque boost	M2 F-boost	0.0–20.0	%	2.0	X	○	○	X	○	X	*p. 287*
M2_34	7A22	Reverse torque boost	M2 R-boost	0.0–20.0	%	2.0	X	○	○	X	○	X	*p. 287*
M2_35	7A23	Second motor E-thermal 1 min. level Note 3)	M2 ETH 1min	M2_36–150	%	150	○	○	○	X	○	X	*p. 288*
M2_36	7A24	Second motor E-thermal continuous operation level Note 3)	M2 ETH cont	50–M2_35	%	100	○	○	○	X	○	X	*p. 288*

- Note 1) This option is displayed when one of the multifunction input terminals is set to "2nd Motor". M2 function is not available when control mode is set to "Speed (Sync)".
- Note 2) M2_03 (user defined motor capacity) is displayed when M2_02 (motor capacity) is set to "User Define".
- Note 2) This option is displayed when PRT_01 (ETH Select) is set to "Yes".

Function Table

5.10 User (USR) group

Code	Comm. address	Name	Keypad display	Range	Unit	Default setting	SV	VlF	Slip	SPfS	EL	ELfS	Page ref.
USR_00	-	Jump to codes	Jump Code	1–67[Note 1]			○	○	○	○	○	○	*p. 288*
USR_01	-	Reset parameter settings to application specific default values	Macro Init	User Define E/L		User Define	○	○	○	○	○	○	*p. 289*
USR_02	-	Save user data	User Save	No / Yes		No	○	○	○	○	○	○	*p. 289*
USR_03	-	Load user data	User Recall	No / Yes		No	○	○	○	○	○	○	*p. 289*
USR_04	-	User group data	User Grp				○	○	○	○	○	○	*p. 291*

▪ Note1) Only previously defined codes between USR_04–USR_67 can use the Jump Code feature.