This operation manual is intended for users with basic knowledge of electricity and electric devices.

Safety Information

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

Safety symbols in this manual

⚠ Danger

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

⚠ Warning

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

ⓘ Caution

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

Safety information

⚠ Danger

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

⚠ Warning

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

ⓘ Caution

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

Note

Maximum allowed prospective short-circuit current at the input power connection is defined in IEC 60439-1 as 100 kA. The drive is suitable for use in a circuit capable of delivering not more than 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 typical and practical situations in the table to quickly and easily locate answers to your questions.

Situation	Reference
I want to run a slightly higher rated motor than the inverter's rated capacity.	p. 144
I want to configure the inverter to start operating as soon as the power source is applied.	p. 68
I want to configure the motor's parameters.	p.107
I want to set up sensorless vector control.	p.109
Something seems to be wrong with the inverter or the motor.	p. 155, p.208
What is auto tuning?	p.107
What are the recommended wiring lengths?	p. 20, p. 23
The motor is too noisy.	p. 115
I want to apply PID control on my system.	p. 102
What are the factory default settings for P1–P5 multi-function terminals?	p. 24
I want to view all of the parameters I have modified.	p. 130
I want to review recent fault trip and warning histories.	p. 187
I want to change the inverter's operation frequency using a potentiometer.	p. 46
I want to install a frequency meter using an analog terminal.	p. 25
I want to display the supply current to motor.	p. 49
I want to operate the inverter using a multi-step speed configuration.	p. 62
The motor runs too hot.	p. 143
The inverter is too hot.	p. 151
The cooling fan does not work.	p. 215
I want to change the items that are monitored on the keypad.	p. 136

Table of Contents

1 Preparing the Installation

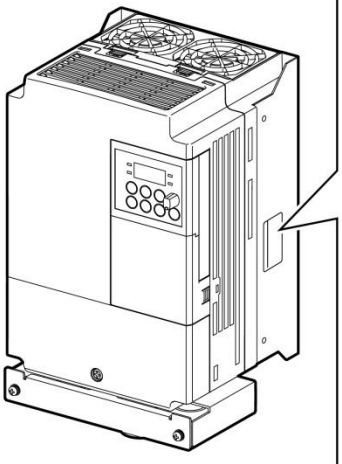
This chapter provides details on product identification, part names, correct installation and cable specifications. To install the inverter correctly and safely, carefully read and follow the instructions.

1.1 Product Identification

The C100 inverter is manufactured in a range of product groups based on drive capacity and power source specifications. Product name and specifications are detailed on the rating plate. The illustration on the next page shows the location of the rating plate. Check the rating plate before installing the product and make sure that the product meets your requirements. For more detailed product specifications, refer to *11.1 Input and Output Specification* on page *221*.

Note

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



Model name
Power source specifications
Output specifications

LSLV0040C100-4F
INPUT :380~480V 3 Phase 50/60Hz
H/D : 9.8A N/D : 10.8A
OUTPUT :0-nput V 3 Phase 0.1~400Hz
H/D : 9.0A N/D : 10.0A
5.4HP / 4.0KW
Ser. No P150803-XXXXXXX
Inspected by Q.Y 2015.08.06
LISTED
IND. CONT. EQ.
87Z4
MADE IN CHINA

LSLV 0040 C100 - 4 F

Motor capacity

0001-0.1kW	0002-0.2kW
0004-0.4kW	0008-0.75kW
0015-1.5kW	0022-2.2kW
0037-3.7kW	0055-5.5kW
0075-7.5kW	

Series name

Input voltage

1 - Single phase 200~240V
2 - 3-phase 200~240V
4 - 3-phase 380~480V

I/O type

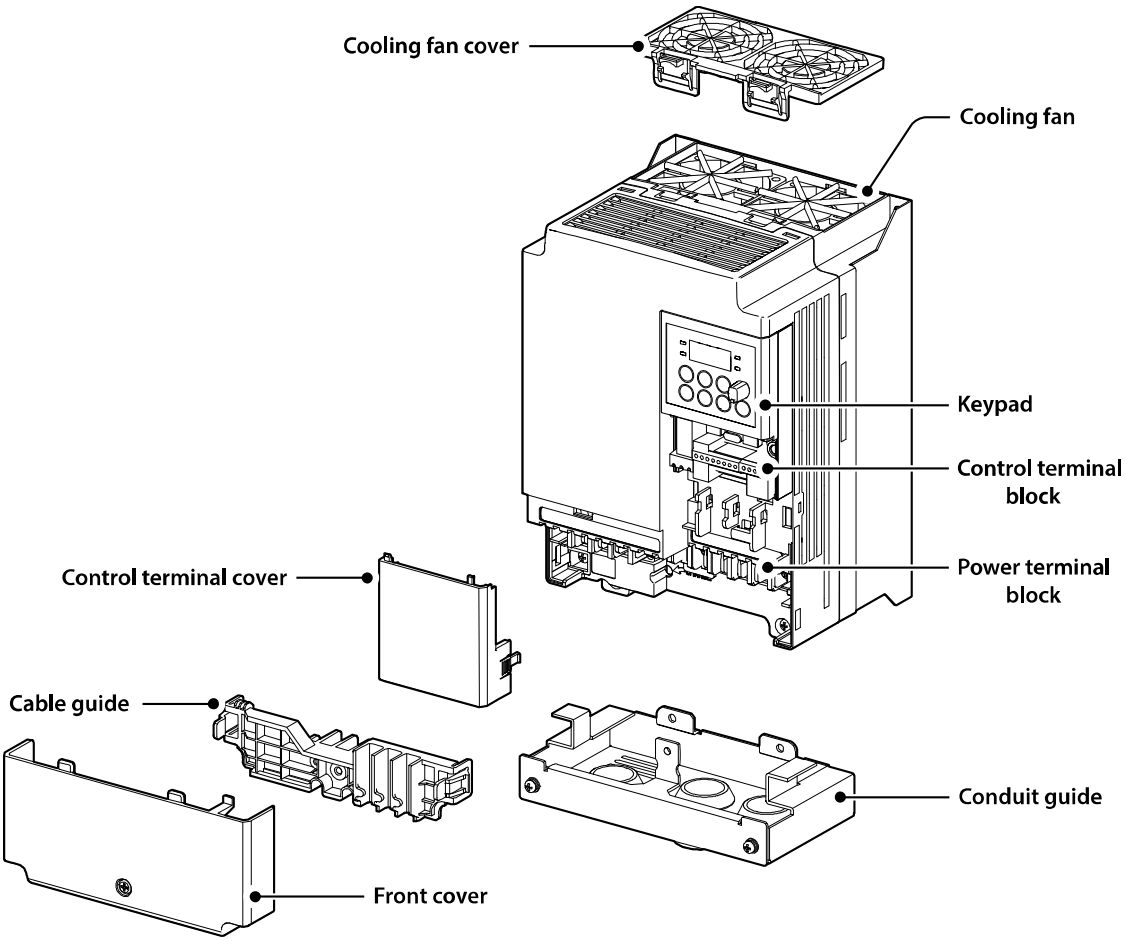
Blank - Standard I/O
A: Remote I/O

EMC filter

N: Not integrated
F : Intergrated

1.2 Part Names

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

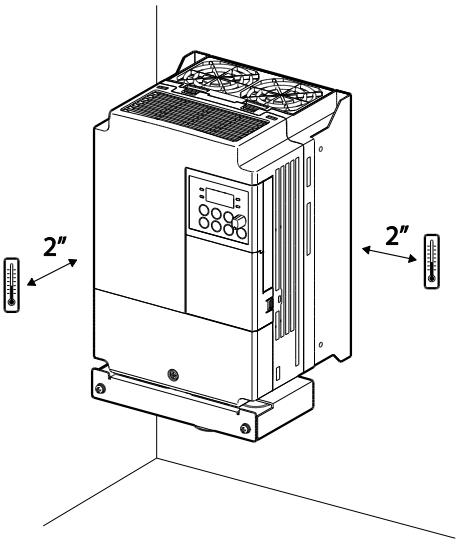


1.3 Installation Considerations

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

Items	Description
Ambient Temperature*	Heavy Duty: 14–104°F (-10–50°C) Normal Duty: 14–122°F (-10– 40°C)
Ambient Humidity	90% relative humidity (no condensation)
Storage Temperature	- 4–149°F (-20–65°C)
Environmental Factors	An environment free from corrosive or flammable gases, oil residue or dust
Altitude/Vibration	Lower than 3,280 ft (1,000 m) above sea level/less than 0.6G (5.9m/sec^2)
Air Pressure	70 –106kPa

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



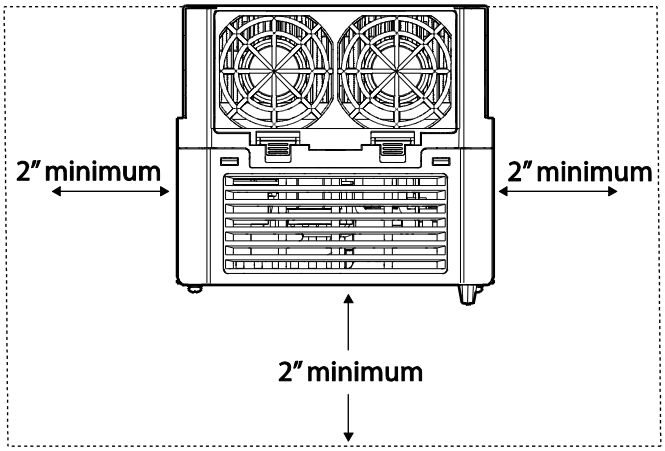
Caution

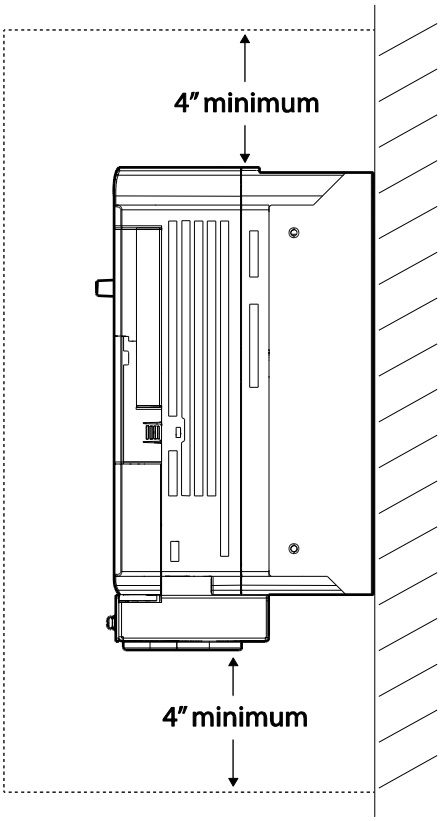
Do not allow the ambient temperature to exceed the allowable range while operating the inverter.

1.4 Selecting and Preparing a Site for Installation

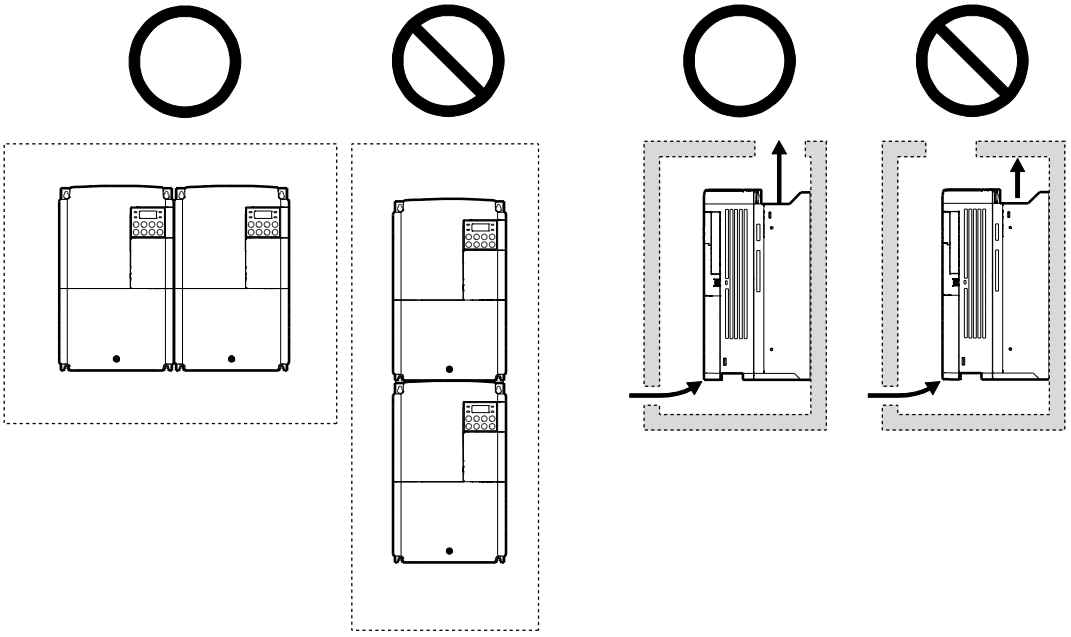
When selecting an installation location consider the following points:

- 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.
- 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 required installation clearances.

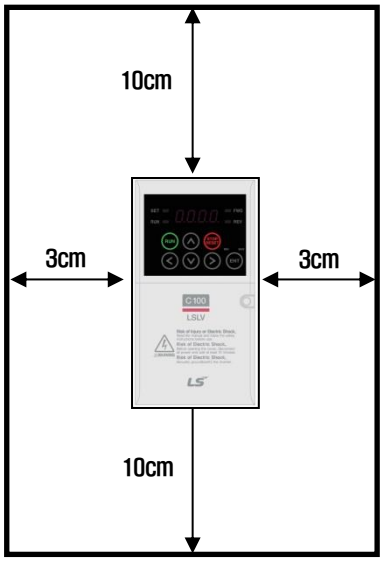


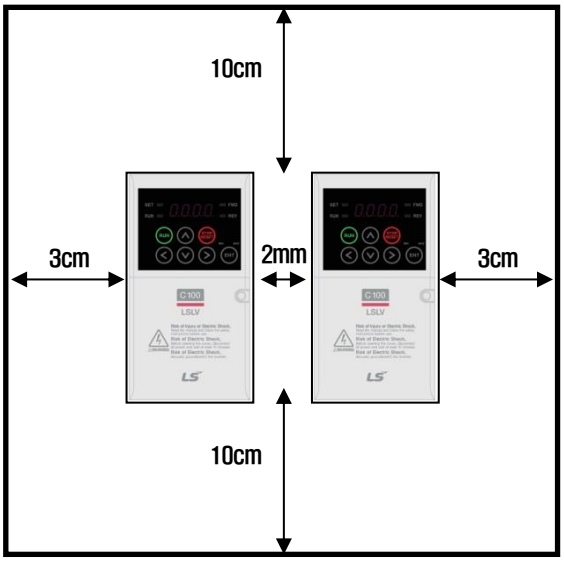


- Ensure sufficient air circulation is provided around the inverter when it is installed. If the inverter is to be installed inside a panel, enclosure, or cabinet rack, carefully consider the position of the inverter's cooling fan and the ventilation louver. The cooling fan must be positioned to efficiently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



- If you are installing multiple inverters in one location, arrange them side-by-side and remove the top covers. The top covers MUST be removed for side-by-side installations. Use a flat head screwdriver to remove the top covers.
- If you are installing multiple inverters, of different ratings, provide sufficient clearance to meet the clearance specifications of the larger inverter.





1.5 Cable Selection

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

ⓘ Caution

- Wherever possible use cables with the largest cross-sectional area for mains power wiring to ensure that voltage drop does not exceed 2%.
- Use copper cables rated for 600V, 90℃ for power terminal wiring.
- Use copper cables rated for 600V, 75℃ for control terminal wiring.

Ground Cable and Power Cable Specifications

Load (kW)		Ground		Power I/O			
		mm^2	AWG	mm^2		AWG	
				R/S/T	U/V/W	R/S/T	U/V/W
Single Phase 200V	0.1	3.5	12	2	2	14	14
	0.2						
	0.4						
	0.75						
	1.5						
	2.2			3.5	3.5	12	12
3–Phase 200V	0.1			2	2	14	14
	0.2						
	0.4						
	0.75						
	1.5						
	2.2						
	3.7			3.5	3.5	12	12
	5.5	5.5	10	6	6	10	10
	7.5						
3–Phase 400V	0.4	2	14	2	2	14	14
	0.75						
	1.5						
	2.2						
	3.7			3.5	3.5	12	12
	5.5	3.5	12				
	7.5						

Control Cable Specifications

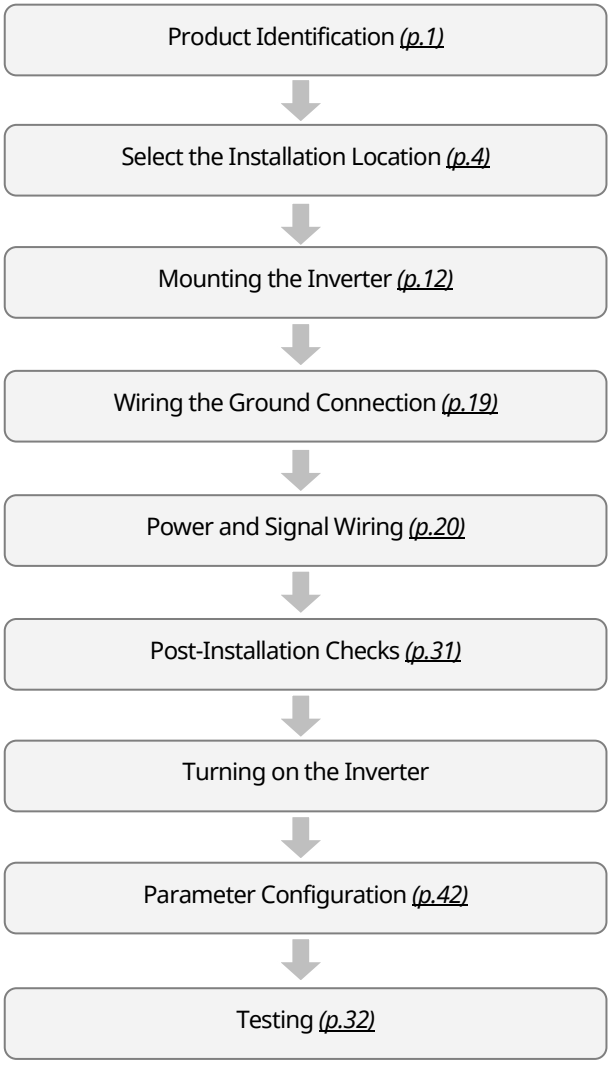
Terminals	Single Cable		Standard	
	mm^2	AWG	mm^2	AWG
P1-P5/CM/VR/AI/AM/S+, S-/24/SA,SB,SC	1.0	17	1.5	15
3A/3B/3C	1.0	17	1.5	15

2 Installing the Inverter

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

Installation Flowchart

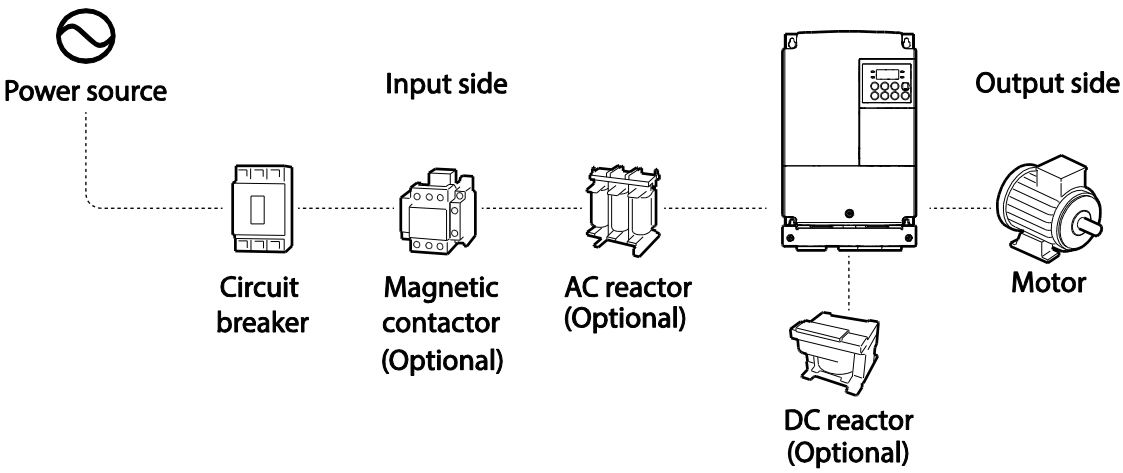
The flowchart lists the sequence to be followed during installation. The steps cover equipment installation and testing of the product. More information on each step is referenced in the steps.



Basic Configuration Diagram

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

Prior to 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 *11.5 Peripheral Devices* on page *238*.



Caution

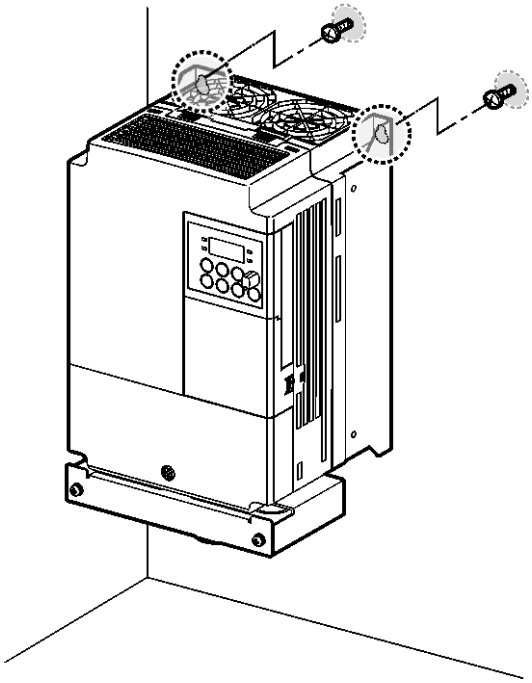
- Figures in this manual are shown with covers or circuit breakers removed to show a more detailed view of the installation arrangements. Install covers and circuit breakers before operating the inverter. Operate the product according to the instructions in this manual.
- Do not start or stop the inverter using a magnetic contactor, installed on the input power supply.
- If the inverter is damaged and loses control, the machine may cause a dangerous situation. Install an additional safety device such as an emergency brake to prevent these situations.
- High levels of current draw during power-on can affect the system. Ensure that correctly rated circuit breakers are installed to operate safely during power-on situations.
- Reactors can be installed to improve the power factor. Note that reactors may be installed within 30 ft (9.14 m) from the power source if the input power exceeds 1000KVA. Refer to *11.6 Fuse and Reactor Specification* on page *239* and carefully select a reactor that meets the requirements.

2.1 Mounting the Inverter

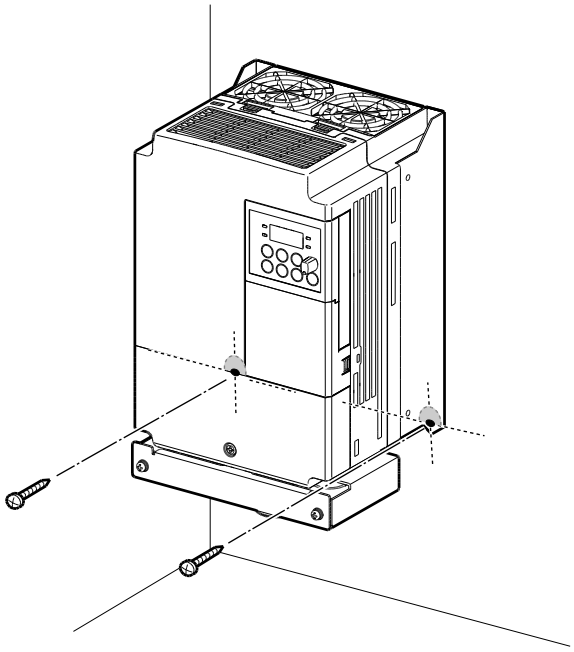
Mount the inverter on a wall or inside a panel following the procedures provided below. Before installation, ensure that there is sufficient space to meet the clearance specifications, and that there are no obstacles impeding the cooling fan's air flow.

Select a wall or panel suitable to support the installation. Refer to *11.4 External Dimensions and Weight* on page *231* and check the inverter's mounting bracket dimensions.

1. Use a level to draw a horizontal line on the mounting surface, and then carefully mark the fixing points.
2. Drill the two upper mounting bolt holes, and then install the mounting bolts. Do not fully tighten the bolts at this time. Fully tighten the mounting bolts after the inverter has been mounted.

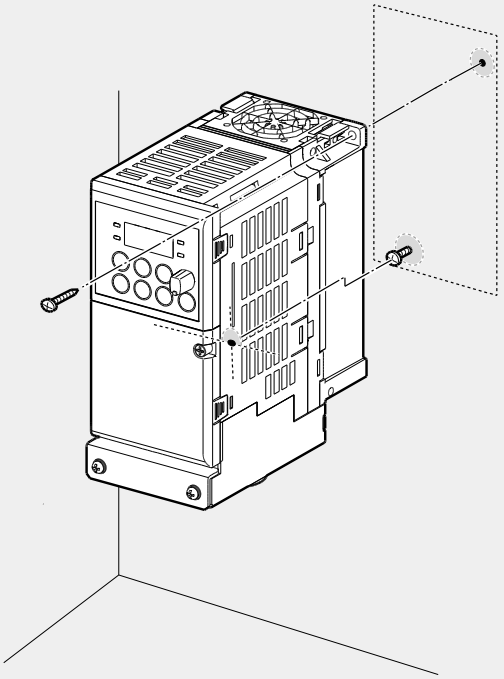


3 Mount the inverter on the wall or inside a panel using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the inverter is placed flat on the mounting surface, and that the installation surface can securely support the weight of the inverter.



Note

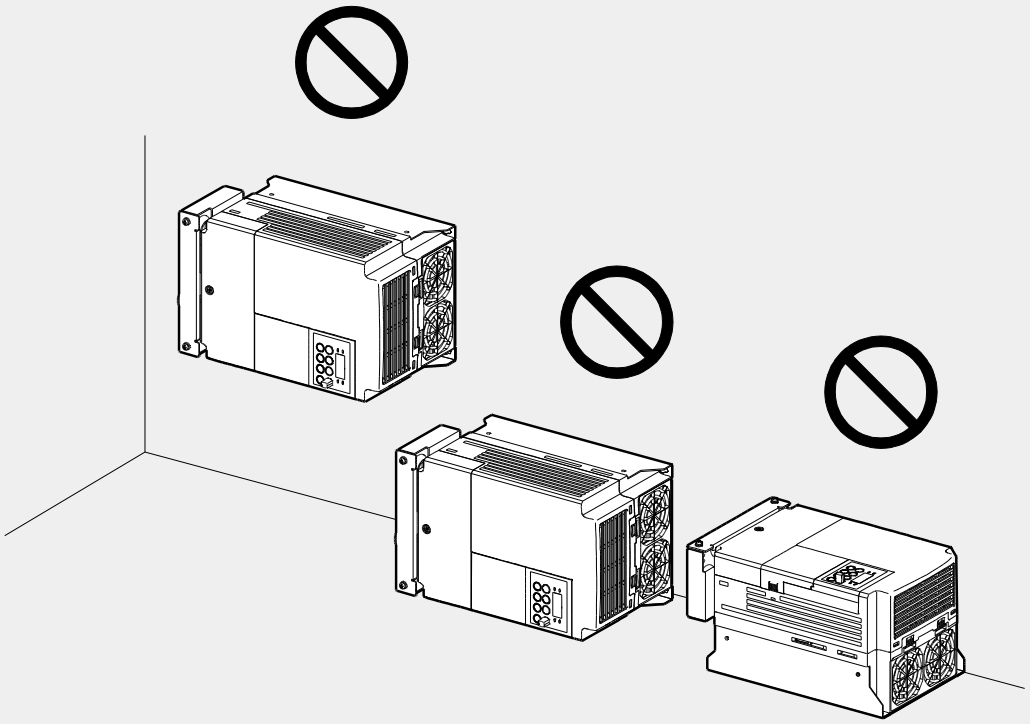
The quantity and dimensions of the mounting brackets vary based on frame size. Refer to *11.4 External Dimensions and Weight* on page *231* for detailed information about your model.



Inverters with small frames (0.1–0.75kW) have only two mounting brackets. Inverters with large frames have 4 mounting brackets.

ⓘ Caution

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



2.2 Cable Wiring

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

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

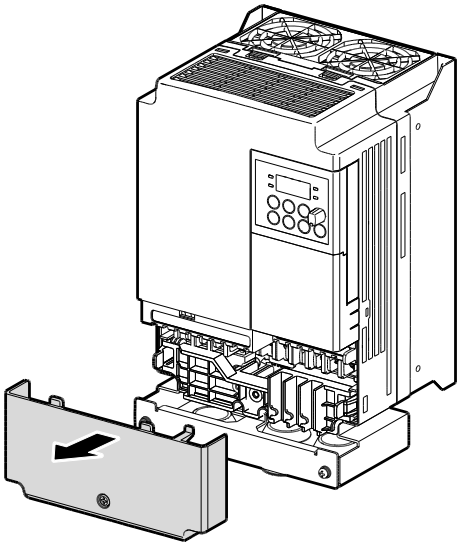
Caution

- Install the inverter before carrying out wiring connections.
- Ensure that no small metal debris, such as wire cut-offs, remain inside the inverter. Metal debris in the inverter may cause inverter failure.
- Tighten terminal screws to their specified torque. Loose terminal block screws may allow the cables to disconnect and cause short circuit or inverter failure. Refer to *11.7 Terminal Screw Specification* on page *240* for torque specifications.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in electric shock.
- Use cables with the largest cross-sectional area, appropriate for power terminal wiring, to ensure that voltage drop does not exceed 2%.
- Use copper cables rated at 600V, 90℃ for power terminal wiring.
- Use copper cables rated at 600V, 75℃ for control terminal wiring.
- If you need to re-wire the terminals due to wiring-related faults, ensure that the inverter keypad display is turned off and the charge lamp under the front cover is off before working on wiring connections. The inverter may hold a high voltage electric charge long after the power supply has been turned off.

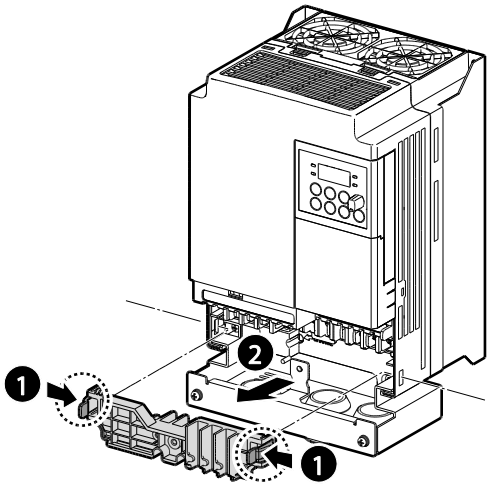
Step 1 Front Cover, Control Terminal Cover and Cable Guide

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

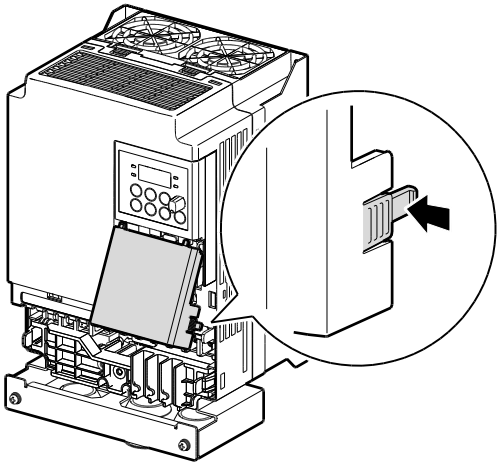
1 Loosen the bolt that secures the front cover. Then remove the cover by lifting it from the bottom and away from the front.



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



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

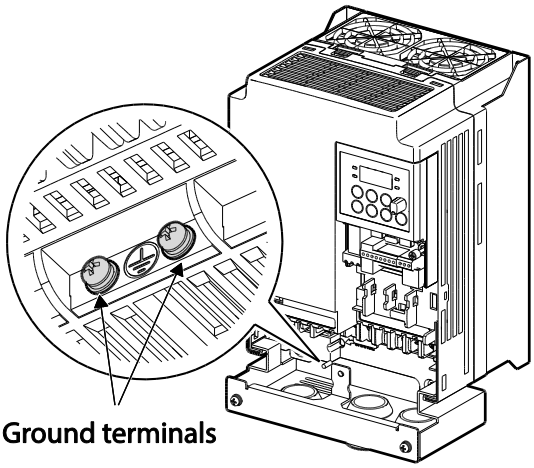


4 Connect the cables to the power terminals and the control terminals. For cable specifications, refer to *1.5 Cable Selection* on page *8*.

Step 2 Ground Connection

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

1 Locate the ground terminal and connect an appropriately rated ground cable to the terminals. Refer to *1.5 Cable Selection* on page *8* to find the appropriate cable specification for your installation.



Ground terminals

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

Note

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

Inverter Capacity	200 V Class		400 V Class	
	Wire Size	Terminal Screw	Wire Size	Terminal Screw
0.1–3.7kW	3.5mm^2	M3	2.0 mm^2	M3
5.5–7.5kw	5.5mm^2	M4	3.5 mm^2	M4

⚠ Warning

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

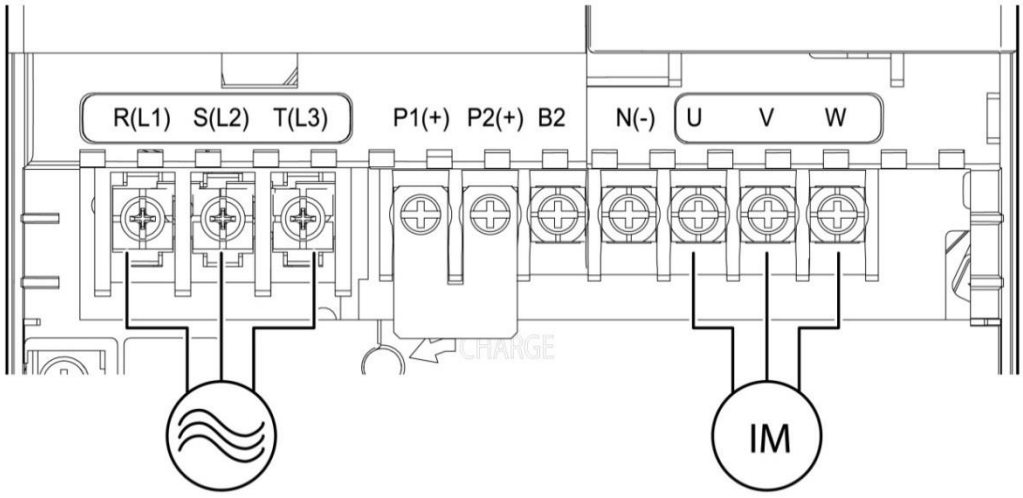
Step 3 Power Terminal Wiring

The following illustration shows the terminal layout on the power terminal block. Refer to the detailed descriptions to understand the function and location of each terminal before making wiring connections. Ensure that the cables selected meet or exceed the specifications in *1.5 Cable Selection* on page *8* before installing them.

ⓘ Caution

- Tighten terminal screws to their specified torque. Loose terminal screws may allow the cables to disconnect and cause short circuit or inverter failure. Over tightening terminal screws may damage the terminals and cause short circuits and malfunctions.
- Use copper cables rated for 600V, 90℃ for power terminal wiring.
- Use copper cables rated for 600V, 75℃ for control terminal wiring.
- Power supply cables must be connected to the R, S, and T terminals. Connecting power cables to the U, V, and W terminals will cause internal damage to the inverter. Connect motors to the U, V, and W terminals. Phase sequence arrangement is not necessary.

0.4-7.5kW (3-phase) with built-in EMC



0.1KW-0.4KW (single phase 200V)

R		T	P1	P2	N
B	U	V	W		

0.75KW-1.5KW (single phase 200V)

R		T	B	P1	P2	N	U	V	W

2.2KW (single phase 200V)

P1	P2	N

R		T	B	U	V	W

0.1KW-0.75KW (three phase 200V/400V)

R	S	T	P1	P2	N
B	U	V	W		

1.5KW-2.2KW (three phase 200V/400V)

R	S	T	B	P1	P2	N	U	V	W

3.7kW (three phase 200V/400V)

P1	P2	N

R	S	T	B	U	V	W

5.5KW-7.5KW (three phase 200V/400V)

R	S	T	P1	P2	B	N	U	V	W

C100 With built-in EMC

0.4KW-0.75KW (three phase 400V)

R	S	T	P1	P2	N
B	U	V	W		

1.5KW-2.2KW (three phase 400V)
4.0kW (three phase 400V)
5.5KW-7.5KW (three phase 400V)

R	S	T	P1	P2	B	N	U	V	W

Power Terminal Labels and Descriptions

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

Note

- Use STP (Shielded Twisted Pair) cables to connect a remotely located motor with the inverter. Do not use 3 core cables.
- Make sure that the total cable length does not exceed 492ft (150m). For inverters <= 3.7kW capacity, ensure that the total cable length does not exceed 165ft (50m).
- 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 over-current protection devices or result in malfunction of equipment connected to the inverter.
- Voltage drop is calculated by using the following formula:
  Voltage Drop (V) = [$\sqrt{3}$ 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.

Distance	< 165ft (50m)	< 330ft (100m)	> 330ft (100m)
Allowed Carrier Frequency	< 15 kHz	< 5 kHz	< 2.5 kHz

⚠ Warning

Do not connect power to the inverter until installation has been fully completed and the inverter is ready to be operated. Doing so may result in electric shock.

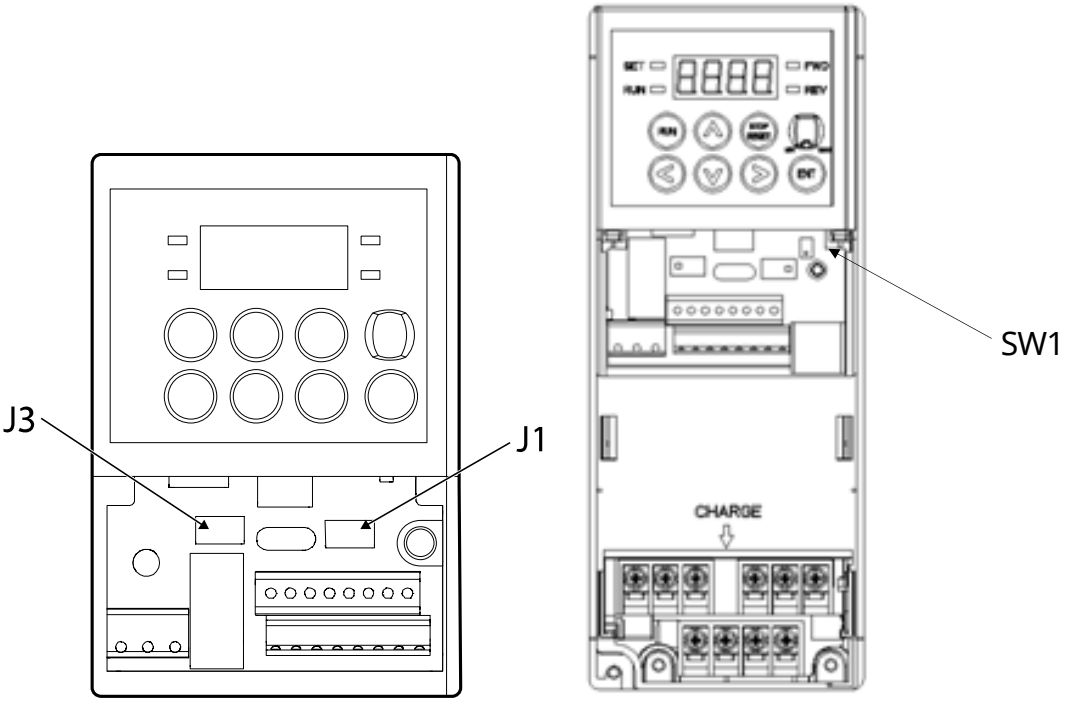
ⓘ Caution

- 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 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 damaging 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 damaging connected equipment, do not install magnetic

contactors on the output side of the inverter.

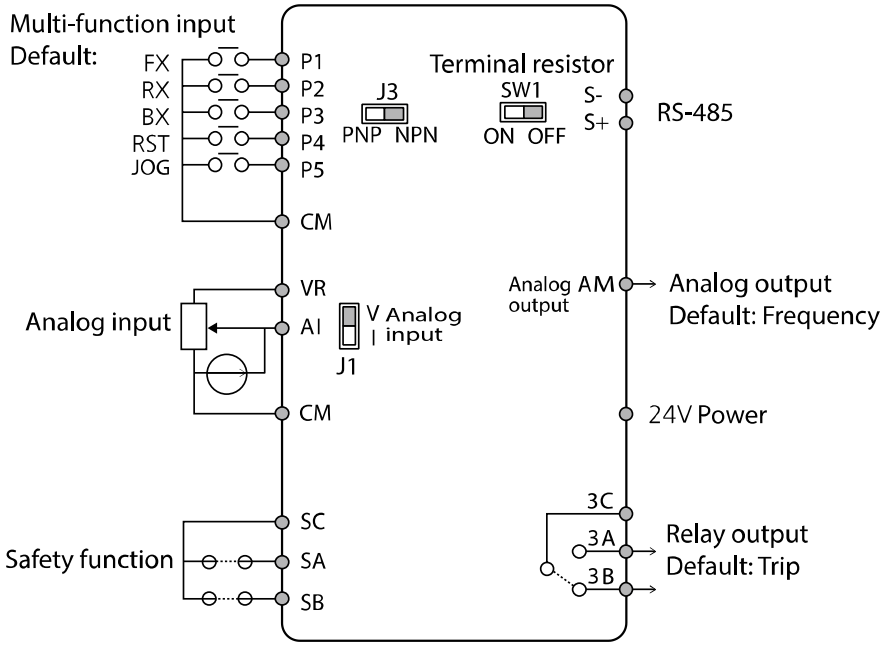
Step 4 Control Terminal Wiring

The illustrations below show the detailed layout of control wiring terminals, and control board switches. Refer to the detailed information provided below and *1.5 Cable Selection* on page *8* before installing control terminal wiring and ensure that the cables used meet the required specifications.



Control Board Switches

Switch	Description
J3	PNP/NPN mode selection switch
J1	analog voltage/current input terminal selection switch
SW1	Terminal resistor on/off switch Terminal resistor is the function to prevent distortion of signal caused by reflected wave of cable in case of long distance communication. The same resistor as characteristic impedance of cable must be connected to terminal of network.



Control Terminal Labels and Descriptions

Function	Label	Description	
Multi-function input configuration	P1	Multi-function input (Factory setting)	FX: Forward run
	P2		RX: Reverse run
	P3		BX: Emergency stop
	P4		RST: Trip reset
	P5		JOG: Jog operation
	CM	Common sequence: Common terminal for signal input	
Analog input configuration	VR	Potentiometer frequency reference input: 10V power supply • Maximum voltage output: 12V • Maximum current output: 100mA, • Potentiometer: 1– 5kΩ	
	AI	Used to setup or modify a frequency reference via analog voltage or current input. Switch between voltage (V) and current (I) modes using a control board switch (J1). • Freq. setting voltage signal input: 0–10V • Freq. setting current signal input: 0–20mA • Input resistance: 250Ω	
	CM	Common sequence: Common terminal for signal input	
Safety functionality	SC	Safe stop connection with public power source (24V)	
	SA	Safe stop terminal A (and SC) When terminals closed, inverter displays	

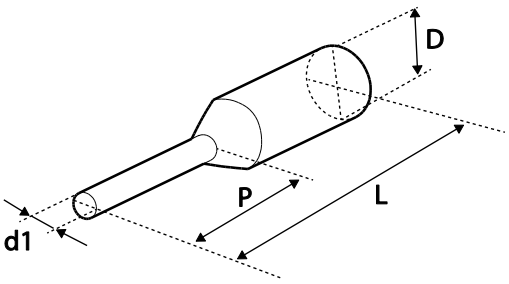
Function	Label	Description	
configuration		"SAFA".	
	SB	Safe stop terminal B (and SC) When terminals closed, inverter displays "SAFB".	
Digital output	3A	Multi-function relay output terminal AC 250V <1A, DC 30V < 1A	A contact output
	3B		B contact output
	3C		A/B contact common
	24V	24V Output Maximum output current: 100mA	
Analog output	AM	Used to send inverter output information to external devices. Multi-function analog output signal: 0–10V Maximum output voltage/current: 11V/10mA	
Communication	S+	Used to send or receive RS-485 signals. Operate switch (SW1) to turn on or off the function. Refer to *7 RS-485 Communication Features* on page *157* for more details.	
	S-		

Note

When you use an external power supply (24V) for the multi-function input terminals (P1–P5), they will be activated at 12V or higher. Be careful not to drop the voltage level below 12V.

Preinsulated Crimp Terminal Connectors (Bootlace Ferrule)

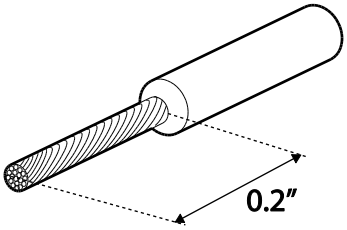
Use preinsulated crimp terminal connectors to increase reliability of the control terminal wiring. Refer to the specifications below to determine the crimp terminals to fit various cable sizes.



P/N	Cable Spec.		Dimensions (inches/mm)				Manufacturer
	AWG	mm^2	L*	P	d1	D	
CE002506	26	0.25	10.4	0.4 / 6.0	0.04 / 1.1	0.1 / 2.5	JEONO (Jeono Electric, http://www.jeono.com/)
CE002508			12.4	0.5 / 8.0			
CE005006	22	0.50	12.0	0.45 / 6.0	0.05 / 1.3	0.125 / 3.2	
CE007506	20	0.75	12.0	0.45 / 6.0	0.06 / 1.5	0.13 / 3.4	

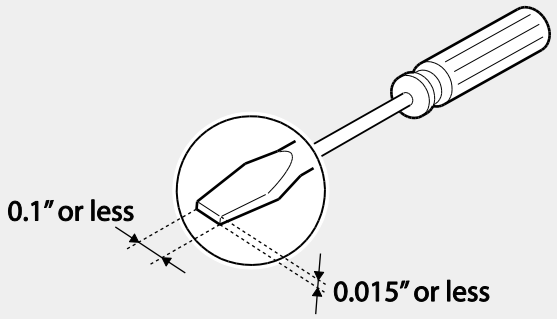
* If the length (L) of the crimp terminals exceeds 0.5" (12.7mm) after wiring, the control terminal cover may not close fully.

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



Note

- While making wiring connections at the control terminals, ensure that the total cable length does not exceed 492ft (150m).
- Ensure that the length of any safety related wiring does not exceed 100ft (30m).
- Use ferrite material to protect signal cables from electro-magnetic interference.
- Take care when supporting cables using cable ties, to apply the cable ties no closer than 6 inches (15 cm) from the inverter. This provides sufficient access to fully close the front cover.
- When making control terminal cable connections, use a small flat-tip screw driver (0.1in wide (2.5mm) and 0.015in thick (0.4mm) at the tip).

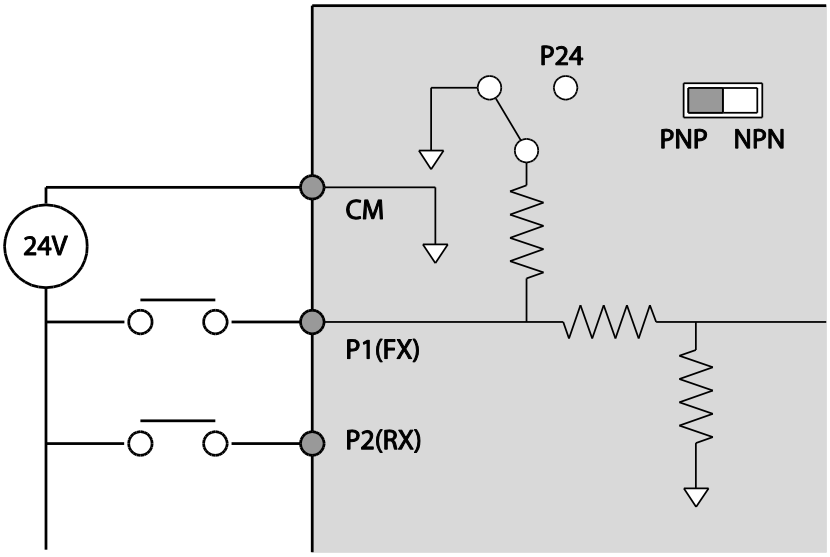


Step 5 PNP/NPN Mode Selection

The C100 inverter supports both PNP (Source) and NPN (Sink) modes for sequence inputs at the terminal. Select an appropriate mode to suit requirements using the PNP/NPN selection switch (J3) on the control board. Refer to the following information for detailed applications.

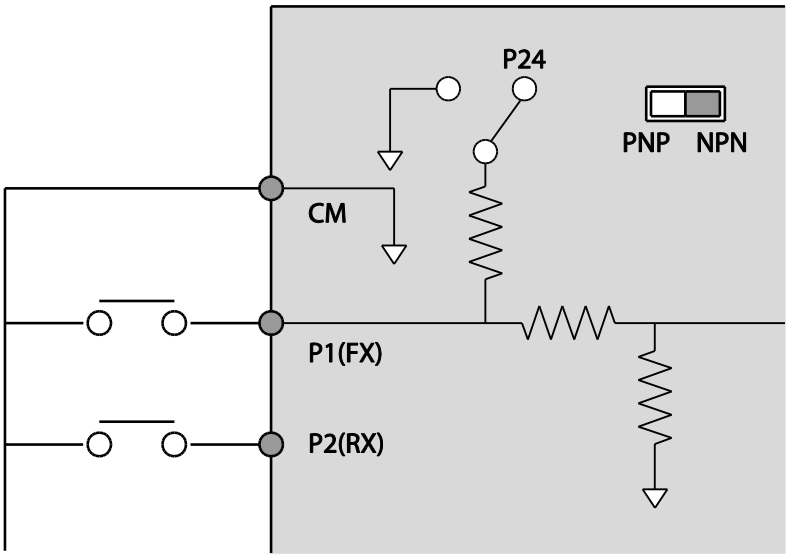
PNP Mode (Source)

Select PNP using the PNP/NPN selection switch (J3). Note that the factory default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal, and P24 is 24V internal source. If you are using an external 24V source, build a circuit that connects the external source (-) and the CM terminal.



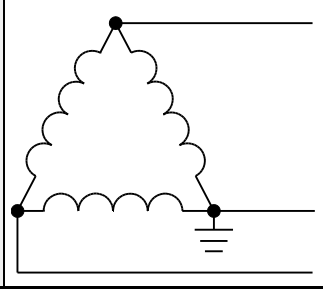
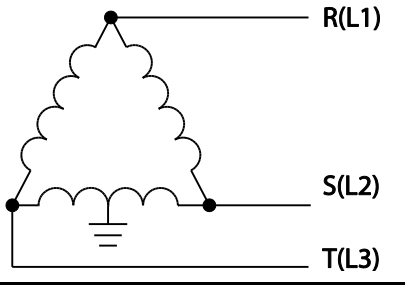
NPN Mode (Sink)

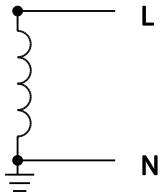
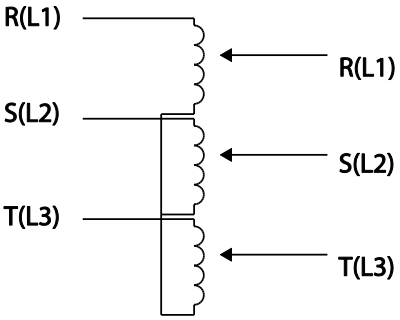
Select NPN using the PNP/NPN selection switch (J3). Note that the factory default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal, and P24 is 24V internal source.



Step 6 Disabling the EMC Filter for Power Sources with Asymmetrical Grounding

C100, 400V (3 phase) inverters have EMC filters built-in and activated as a factory default design. An EMC filter prevents electromagnetic interference by reducing radio emissions from the inverter. EMC filter use is not always recommended, as it increases leakage current. If an inverter uses a power source with an asymmetrical grounding connection, the EMC filter MUST be turned off.

Asymmetrical Grounding Connection			
One phase of a delta connection is grounded		Intermediate grounding point on one phase of a delta connection	

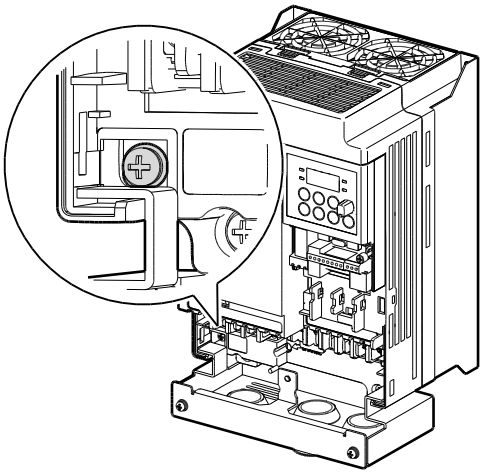
Asymmetrical Grounding Connection			
The end of a single phase is grounded		A 3-phase connection without grounding	

⚠ Danger

- Do not activate the EMC filter if the inverter uses a power source with an asymmetrical grounding structure, for example a grounded delta connection. Personal injury or death by electric shock may result.
- 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.

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

Steel bolt	Plastic bolt
	
EMC ON	EMC OFF



Step 7 Re-assembling the Covers and Routing Bracket

Re-assemble the cable routing bracket and the covers after completing the wiring and basic configurations. Note that the assembly procedure may vary according to the product group or frame size of the product.

2.3 Post-Installation Checklist

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

Items	Check Point	Ref.	Result
Installation Location/Power I/O Verification	Is the installation location appropriate?	p.4	
	Does the environment meet the inverter's operating conditions?	p.5	
	Does the power source match the inverter's rated input?	p.221	
	Is the inverter's rated output sufficient to supply the equipment? (Degraded performance will result in certain circumstances. Refer to *11.9 Continuous Rated Current Derating* on page 242 for details.)	p.221	
Power Terminal Wiring	Is a circuit breaker installed on the input side of the inverter?	p.11	
	Is the circuit breaker correctly rated?	p.221	
	Are the power source cables correctly connected to the R/S/T terminals of the inverter? (Caution: connecting the power source to the U/V/W terminals may damage the inverter.)	p.20	
	Are the motor output cables connected in the correct phase rotation (U/V/W)? (Caution: motors will rotate in reverse direction if three phase cables are not wired in the correct rotation.)	p.20	
	Are the cables used in the power terminal connections correctly rated?	p.8	
	Is the inverter grounded correctly?	p.19	
	Are the power terminal screws and the ground terminal screws tightened to their specified torques?	p. 20	
	Are the overload protection circuits installed correctly on the motors (if multiple motors are run using one inverter)?	-	
	Is the inverter separated from the power source by a magnetic contactor (if a braking resistor is in use)?	p.11	
	Are advanced-phase capacitors, surge protection and electromagnetic interference filters installed correctly? (These devices MUST not be installed on the output side of the inverter.)	p.20	
Control Terminal Wiring	Are STP (shielded twisted pair) cables used for control terminal wiring?	-	
	Is the shielding of the STP wiring properly grounded?	-	
	If 3-wire operation is required, are the multi-function input terminals defined prior to the installation of the control wiring connections?	p.23	

Items	Check Point	Ref.	Result
	Are the control cables properly wired?	p.23	
	Are the control terminal screws tightened to their specified torques?	p.16	
	Is the total cable length of all control wiring < 492ft (150m)?	p.26	
	Is the total length of safety wiring < 100ft (30m)?	p.26	
Miscellaneous	Are optional cards connected correctly?	-	
	Is there any debris left inside the inverter?	p.16	
	Are any cables contacting adjacent terminals, creating a potential short circuit risk?	-	
	Are the control terminal connections separated from the power terminal connections?	-	
	Have the capacitors been replaced if they have been in use for > 2 years?	-	
	Has a fuse been installed for the power source?	p.239	
	Are the connections to the motor separated from other connections?	-	

Note

STP (Shielded Twisted Pair) cable has a highly conductive, shielded screen around twisted cable pairs. STP cables protect conductors from electromagnetic interference.

2.4 Test Run

After the post-installation checklist has been completed, follow the instructions below to test the inverter.

1 Turn on the power supply 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 V is selected as the frequency reference source, does the reference change according to the input voltage at VR?
- If V is selected as the frequency reference source, is the voltage/current selector switch (J1) set to voltage, and does the reference change according to the input voltage?
- If I is selected as the frequency reference source, is the voltage/current selector switch (J1) set to current, and does the reference change according to the input current?

4 Set the acceleration and deceleration time.

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 according to the set times, and that the motor speed reaches the frequency reference.

Note

If the forward command (Fx) 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.

Verifying the Motor Rotation

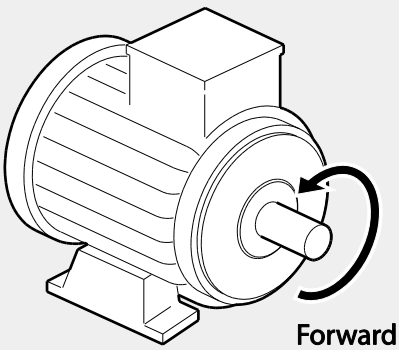
1 On the keypad, set the drv (Drive mode) code in the Drive group to 0 (Keypad).

2 Set a frequency reference.

3 Press the [RUN] key. Motor starts forward operation.

4 Observe the motor's rotation from the load side and ensure that the motor rotates counterclockwise (forward).

If the motor rotates in the reverse direction, two of the U/V/W terminals need to be switched.



Forward operation

⚠ Caution

- Check the parameter settings before running the inverter. Parameter settings may have 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

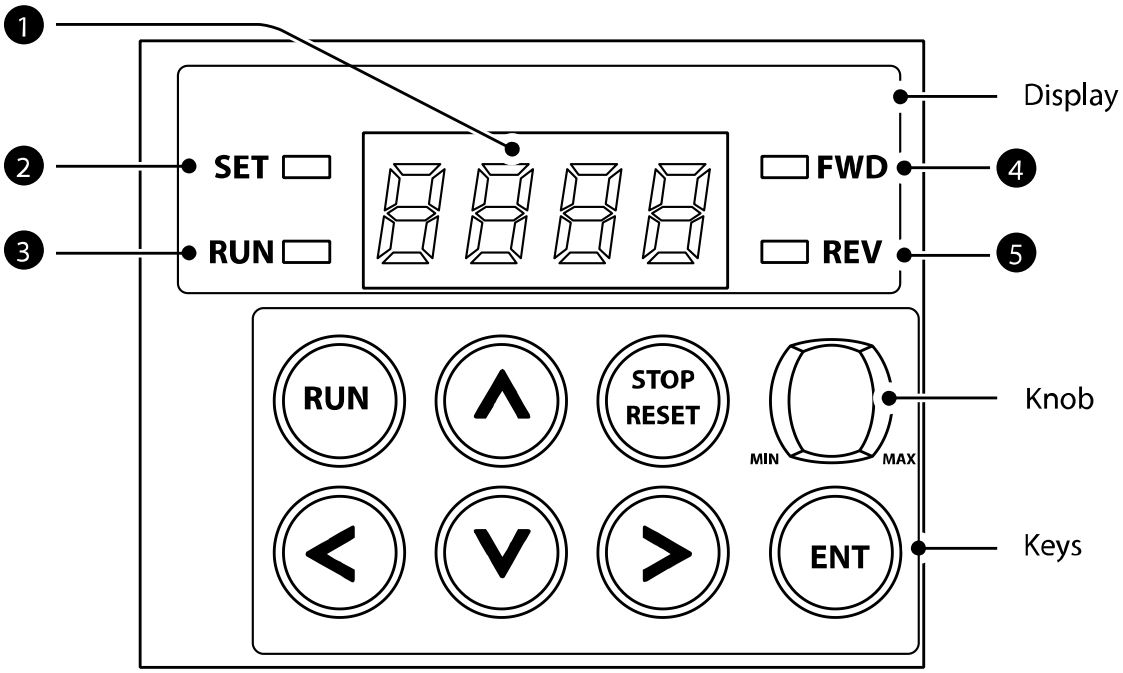
can be used to easily increase motor speed, use caution to ensure that motor speeds do not accidently exceed the motor's rated capacity.

3 Learning to Perform Basic Operations

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

3.1 About the Keypad

The keypad is composed of three main components – the display, the operation (input) keys and the knob. Refer to the following illustration to identify part names and functions.



3.1.1 About the Display

The following table lists display part names and their functions.

No.	Name	Function
❶	7-Segment Display	Displays current operational status and parameter information.
❷	SET Indicator	LED flashes during parameter configuration.
❸	RUN Indicator	LED turns on (steady) during an operation, and flashes during acceleration or deceleration.
❹	FWD Indicator	LED turns on (steady) during forward operation.
❺	REV Indicator	LED turns on (steady) during reverse operation.

The table below lists the way that the keypad displays characters (letters and numbers).

0	0	A	A	K	K	U	U
1	1	b	B	L	L	v	V
2	2	C	C	n	M	w	W
3	3	d	D	n	N	x	X
4	4	E	E	O	O	y	Y
5	5	F	F	P	P	z	Z
6	6	G	G	q	Q	-	-
7	7	H	H	r	R	-	-
8	8	I	I	S	S	-	-
9	9	J	J	t	T	-	-

3.1.2 Operation Keys and Knob

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

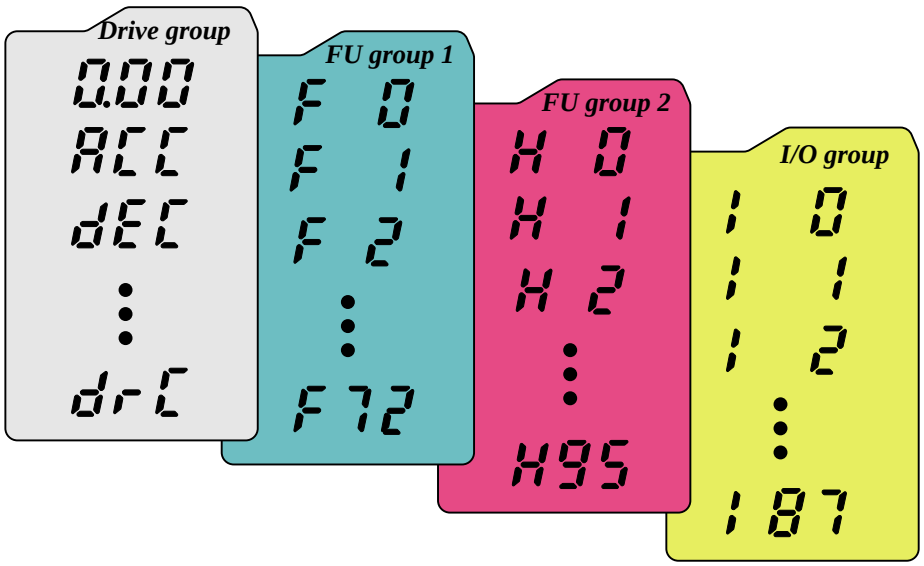
Key/Knob	Name	Description
	[RUN] key	Used to run the inverter (inputs a RUN command).
	[STOP/RESET] key	STOP: stops the inverter. RESET: resets the inverter following fault or failure condition.
	[▲] key, [▼] key	Switch between codes, or to increase or decrease parameter values.
	[◄] key, [►] key	Switch between groups, or to move the cursor during parameter setup or modification.
	[ENT] key	Used to select, confirm, or save a parameter value.
Knob	Volume	The keypad potentiometer V2 is used for frequency setting.

ⓘ Caution

Install a separate emergency stop switch in the circuit. The [STOP/RESET] key on the keypad works only when the inverter has been configured to accept an input from the keypad.

3.1.3 Control Menu

The C100 inverter control menu uses the following groups.



Group	Description
Drive group	Set basic parameters necessary for inverter operation, including target frequency, Accel/Decel time and so on.
Function group 1	Set basic function parameters, such as adjustment of input frequency, voltage and so on.
Function group 2	Set advanced function parameters, for example, set application functions such as PID operation, second motor operation and so on.
I/O (input/output) terminal function group	Set multi-function input/output terminals and analog input/output parameters.

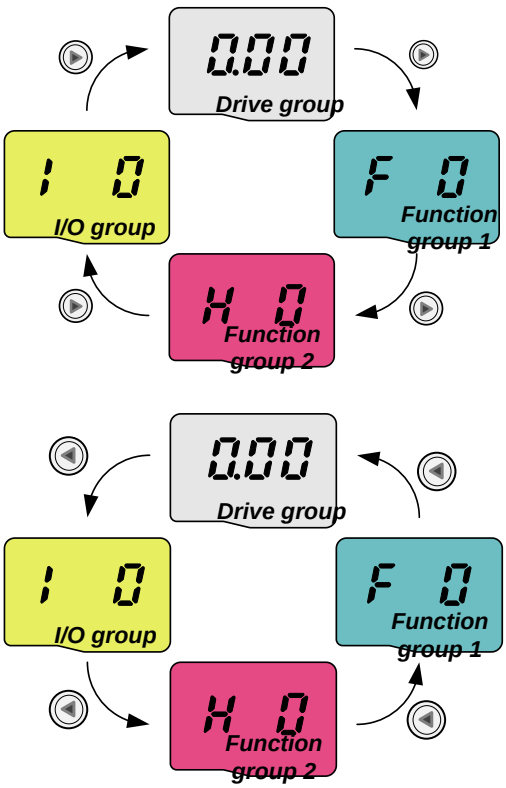
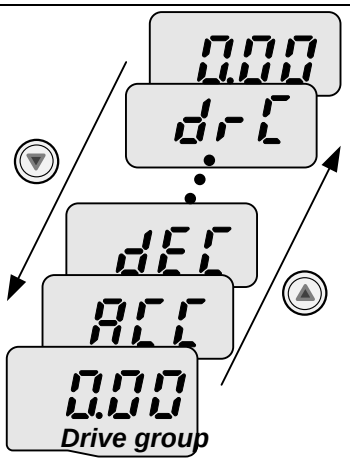
3.2 Learning to Use the Keypad

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 to turn on or off specific functions, or decide how the functions will be used. Refer to *8. Table of Functions* on page *178* to find the functions you need.

Confirm the correct values (or the correct range of the values), and then follow the examples below to configure the inverter with the keypad.

3.2.1 Group and Code Selection

Follow the examples below to learn how to switch between groups and codes.

Step	Instruction	Keypad Display
1	Move to the group you want using the [◄] and [►] keys. (I0, F0, H0)	
2	Move up and down through the codes using the [▲] and [▼] keys until you locate the code that you require.	
3	Press the [ENT] key to save the change.	-

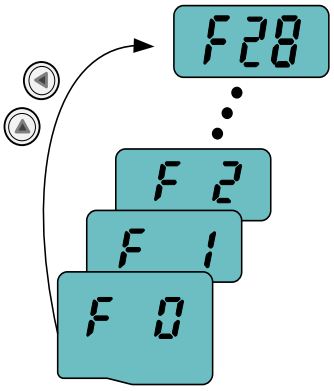
Note

For some settings, pressing the [▲] or [▼] key will not increase or decrease the code number by 1. Code numbers may be skipped and not be displayed. This is because certain code numbers have been intentionally left blank (or reserved) for new functions to be added in the future. Also some features may have been hidden (disabled) because a certain code has been set to disable the functions for relevant codes.

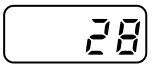
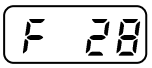
As an example, if F24 (Frequency high/low limit select) is set to 0 (No), the next codes, F25 (Frequency high limit) and F26 (Frequency low limit), will not be displayed. If you set code F24 to 1 (Yes) and enable the frequency limit feature, codes F25 and 26 will appear to allow the maximum and minimum frequency limitations to be set up.

3.2.2 Navigating Directly to Different Codes

The following example details navigating to code F28, from the initial code in the Function group 1. This example applies to all groups whenever you would like to navigate to a specific code number.

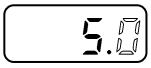
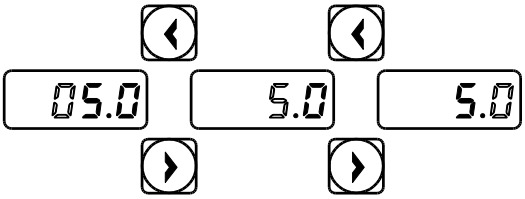
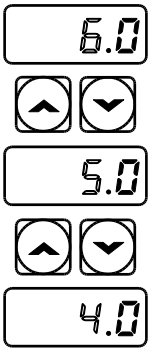


Step	Instruction	Keypad Display
1	Ensure that you are currently at the first code of the Function group 1 (F0).	F 0
2	Press the [ENT] key. Number '1' is displayed.	1
3	Press the [▲] key to display '8.'	8
4	Press the [◄] key to move to the 10s' place. The cursor will move to the left and '08' will be displayed. This time, the number '0' will be flashing.	08

Step	Instruction	Keypad Display
5	Press the [▲] key to increase the number from '0' to '2,' the 10s place digit of the destination, '28.'	
6	Press the [ENT] key. Code F28 is displayed.	

3.2.3 Setting Parameter Values

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

Step	Instruction	Keypad Display
1	Select the group and code to setup or modify parameter settings, and then press the [ENT] key. The first number on the right side of the display will flash.	
2	Press the [◄] or [►] key to move the cursor to the number that you would like to modify.	
3	Press the [▲] or [▼] key to adjust the value, and then press the [ENT] key to confirm it. The selected value will flash on the display.	
4	Press the [ENT] key again to save the change.	-

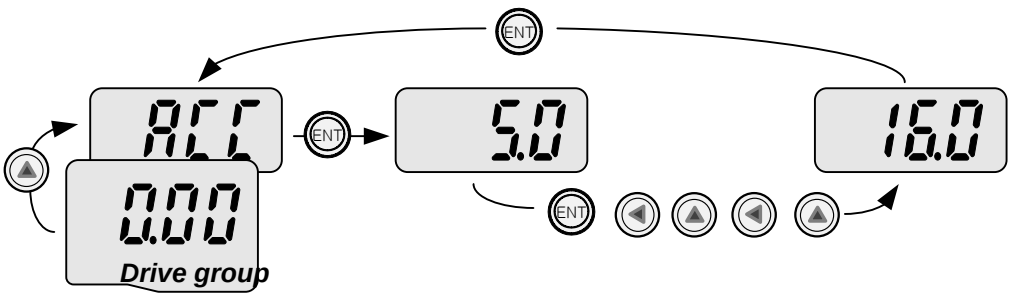
Note

- A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes will be saved when the [ENT] key is pressed while the number is flashing. The setting change will be canceled if you press any other key.
- Each code's parameter values have default features and ranges specified. Refer to *8 Table of Functions* on page *178* for information about the features and ranges before setting or modifying parameter values.

3.3 Actual Application Examples

3.3.1 Acceleration Time Configuration

The following is an example demonstrating how to modify the ACC (Accel time) code value (from 5.0 to 16.0) from the Drive group.

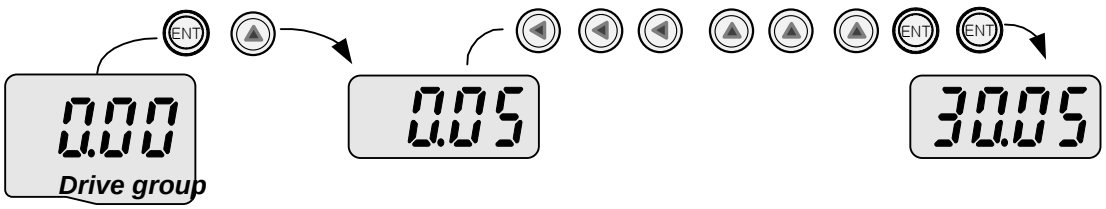


Step	Instruction	Keypad Display
1	Ensure that the first code of the Drive group is selected, and code 0.00 (Frequency command) is displayed.	0.00
2	Press the [▲] key. The display will change to the second code in the Drive group, the ACC (Accel time)code.	ACC
3	Press the [ENT] key. The number '5.0' will be displayed, with '0' flashing. This indicates that the current acceleration time is set to 5.0 seconds. The flashing value is ready to be modified by using the keypad.	5.0
4	Press the [◄] key to change the first place value.	5.0

Step	Instruction	Keypad Display
	'5' will be flashing now. This indicates the flashing value, '5' is ready to be modified.	
5	Press the [▲] key to change the number '5' into '6,' the first place value of the target number '16.'	6.0
6	Press the [◄] key to move to the 10s, place value. The number in the 10s position, '0' in '06' will start to flash.	06.0
7	Press the [▲] key to change the number from '0' to '1,' to match the 10s place value of the target number'16,' and then press the [ENT] key. Both digits will flash on the display.	16.0
8	Press the [ENT] key once again to save changes. 'ACC' will be displayed. The change to the acceleration time setup has been completed.	ACC

3.3.2 Frequency Reference Configuration

The following is an example to demonstrate configuring a frequency reference of 30.05 (Hz) from the first code in the Drive group (0.00).



Step	Instruction	Keypad Display
1	Ensure that the first code of the Drive group is selected, and the code 0.00 (Frequency command) is displayed.	0.00
2	Press the [ENT] key. The value, 0.00 will be displayed with the '0' in the 1/100s place value flashing.	0.00
3	Press the [◄] key 3 times to move to the 10s place value. The '0' at the 10s place value will start to flash.	00.00
4	Press the [▲] key to change it to '3,' the 10s place value of the target frequency, '30.05.'	30.00
5	Press the [►] key 3 times. The '0' at the 1/100s place position will flash.	30.00
6	Press the [▲] key to change it to '5,' the 1/100 place value of the target frequency, '30.05,' and then press the [ENT] key. The parameter value will flash on the display.	30.05

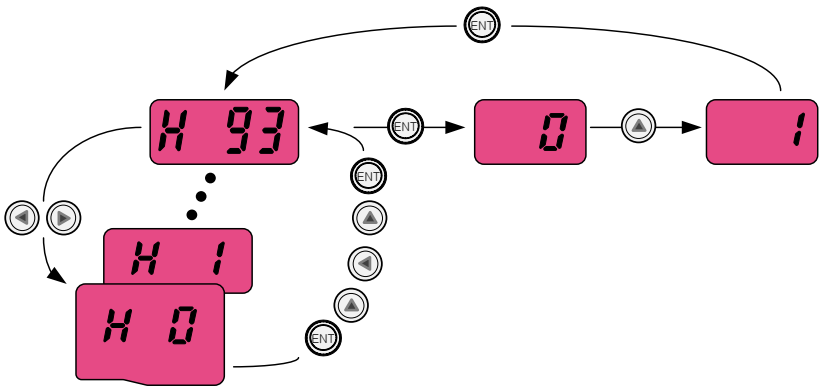
Step	Instruction	Keypad Display
7	Press the [ENT] key once again to save changes. Flashing stops. The frequency reference has been configured to 30.05 Hz.	30.05

Note

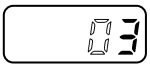
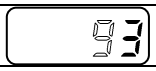
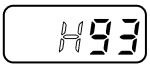
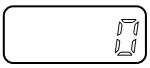
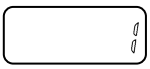
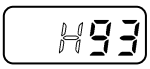
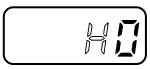
- A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes are saved when the [ENT] key is pressed while the value is flashing. Changes will be canceled if any other key is pressed.
- The C100 inverter keypad display can display up to 4 digits. However, 5-digit figures can be used and are accessed by pressing the [◄] or [►] key, to allow keypad input.

3.3.3 Initializing All Parameters

The following example demonstrates parameter initialization using code H93 (Parameter initialize) in the Function group 2. Once executed, parameter initialization will delete all modified values for all codes and groups.



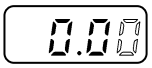
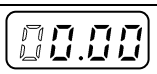
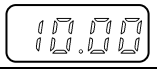
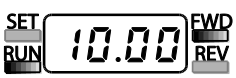
Step	Instruction	Keypad Display
1	Go to code H0 (Jump code) in the Function group 2.	H0
2	Press the [ENT] key. The current parameter value (1) will be displayed.	1
3	Press the [▲] key to change the first place value to '3' of the target code, '93'.	3

Step	Instruction	Keypad Display
4	Press the [◄] key to move to the 10s place position. '03' will be displayed.	
5	Press the [▲] or [▼] key to change the '0' to '9' of the target code, '93.'	
6	Press the [ENT] key. Code H93 will be displayed.	
7	Press the [ENT] key once again. The current parameter value for code H93 is set to 0 (Do not initialize).	
8	Press the [▲] key to change the value to 1 (All Grp), and then press the [ENT] key. The parameter value will flash.	
9	Press the [ENT] key once again. Parameter initialization begins. Parameter initialization is complete when code H93 reappears on the display.	
10	Press the [◄] or [►] key to return to the first code of the Function group 2.	

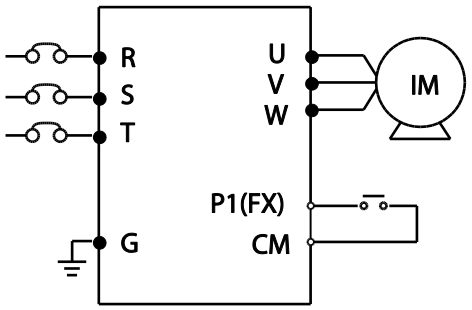
Note

Following parameter initialization, all parameters are reset to factory default values. Ensure that parameters are reconfigured before running the inverter again after an initialization.

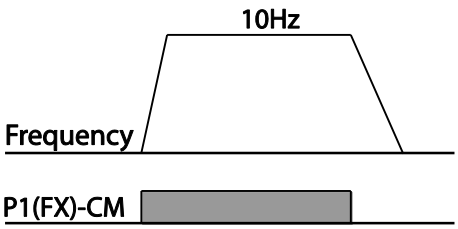
3.3.4 Frequency Setting (Keypad) and Operation (via Terminal Input)

Step	Instruction	Keypad Display
1	Turn on the inverter.	-
2	Ensure that the first code of the Drive group is selected, and code 0.00 (Frequency command) is displayed, then press the [ENT] key. The first digit on the right will flash.	
3	Press the [◄] key 3 times to go to the 10s place position. The number '0' at the 10s place position will flash.	
4	Press the [▲] key to change it to 1, and then press the [ENT] key. The parameter value (10.00) will flash.	
5	Press the [ENT] key once again to save changes. A change of reference frequency to 10.00 Hz has been completed.	
6	Refer to the wiring diagram at the bottom of the table, and close the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	

Step	Instruction	Keypad Display
7	When the frequency reference is reached (10Hz), open the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0Hz, the RUN and FWD indicator lights turn off, and the frequency reference (10.00Hz) is displayed again.	



[Wiring Diagram]

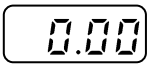
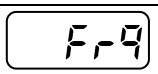
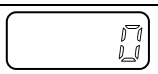
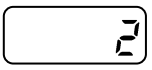


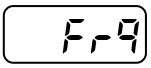
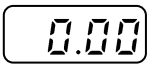
[Operation Pattern]

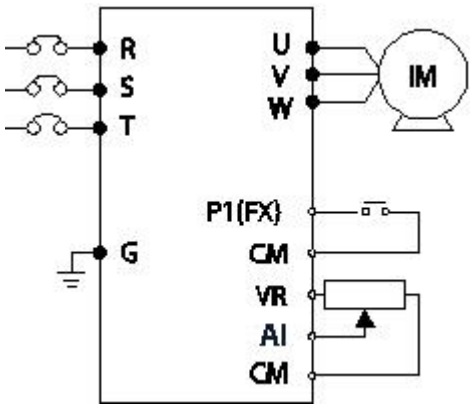
Note

The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the values to factory default parameter settings before following the instructions in the table (refer to *5.23 Parameter Initialization* on page *128*).

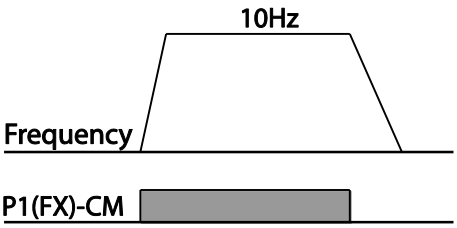
3.3.5 Frequency Setting (Potentiometer) and Operation (Terminal Input)

Step	Instruction	Keypad Display
1	Turn on the inverter.	-
2	Ensure that the first code of the Drive group is selected, and the code 0.00 (Frequency command) is displayed.	
3	Press the [▲] key 4 times to go to the Frq (Frequency setting method) code.	
4	Press the [ENT] key. The Frq code in the Drive group is currently set to 0 (Keypad).	
5	Press the [▲] key to change the parameter value to 2 (Potentiometer), and then press the [ENT] key. The new parameter value will flash.	

Step	Instruction	Keypad Display
6	Press the [ENT] key once again. The Frq code will be displayed again. The frequency input has been configured for the potentiometer.	
7	Press the [▼] key 4 times. Returns to the first code of the Drive group (0.00). From here frequency setting values can be monitored.	
8	Adjust the potentiometer to increase or decrease the frequency reference to 10Hz.	-
9	Refer to the wiring diagram at the bottom of the table, and close the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	
10	When the frequency reference is reached (10Hz), open the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0Hz, the RUN and FWD indicators turn off, and the frequency reference (10.00Hz) is displayed again.	



[Wiring Diagram]

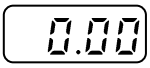
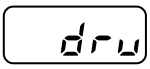
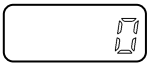
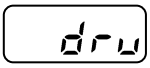
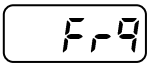
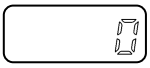
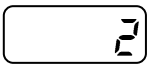
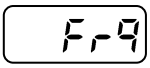
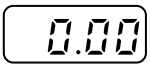


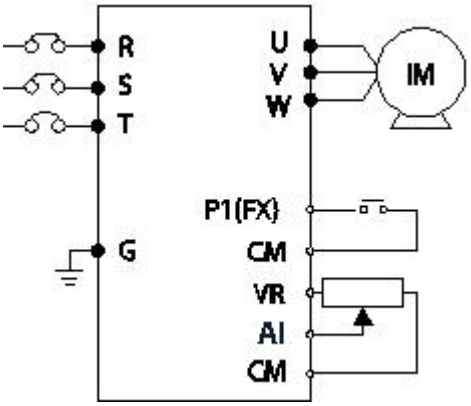
[Operation Pattern]

Note

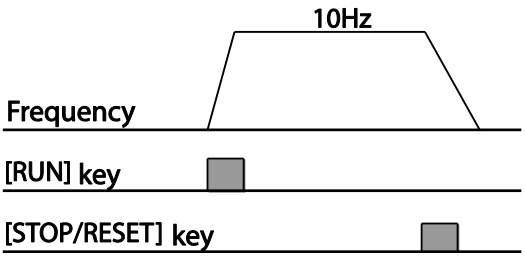
The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the factory default parameter settings before following the instructions in the table (refer to *5.23 Parameter Initialization* on page *128*).

3.3.6 Frequency Setting (Potentiometer) and Operation (Keypad)

Step	Instruction	Keypad Display
1	Turn on the inverter.	-
2	Ensure that the first code of the Drive group is selected, and the code 0.00 (Frequency command) is displayed.	
3	Press the [▲] key 3 times to go to the drv code.	
4	Press the [ENT] key. The drv code in the Drive group is currently set to 1 (Operation of inverter terminal).	
5	Press the [▼] key to change the parameter value to 0 (Keypad), and then press the [ENT] key. The new parameter value will flash.	
6	Press the [ENT] key once again. The drv code is displayed again. The frequency input has been configured for the keypad.	
7	Press the [▲] key. To move to the Frq (Frequency setting method) code.	
8	Press the [ENT] key. The Frq code in the Drive group is set to 0 (Keypad).	
9	Press the [▲] key to change it to 2 (Potentiometer), and then press the [ENT] key. The new parameter value will flash.	
10	Press the [ENT] key once again. The Frq code is displayed again. The frequency input has been configured for potentiometer.	
11	Press the [▼] key 4 times. Returns to the first code of the Drive group (0.00). From here frequency setting values can be monitored.	
12	Adjust the potentiometer to increase or decrease the frequency reference to 10Hz.	-
13	Press the [RUN] key on the keypad. The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	
14	When the frequency reaches the reference (10Hz), press the [STOP/RESET] key on the keypad. The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0Hz, the RUN and FWD indicator lights turn off, and the frequency reference (10.00Hz) is displayed again.	



[Wiring Diagram]



[Operation Pattern]

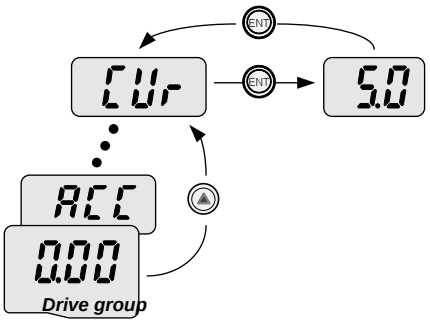
Note

The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the factory default parameter settings before following the instructions in the table (refer to *5.23 Parameter Initialization* on page *128*).

3.4 Monitoring the Operation

3.4.1 Output Current Monitoring

The following example demonstrates how to monitor the output current in the Drive group using the keypad.



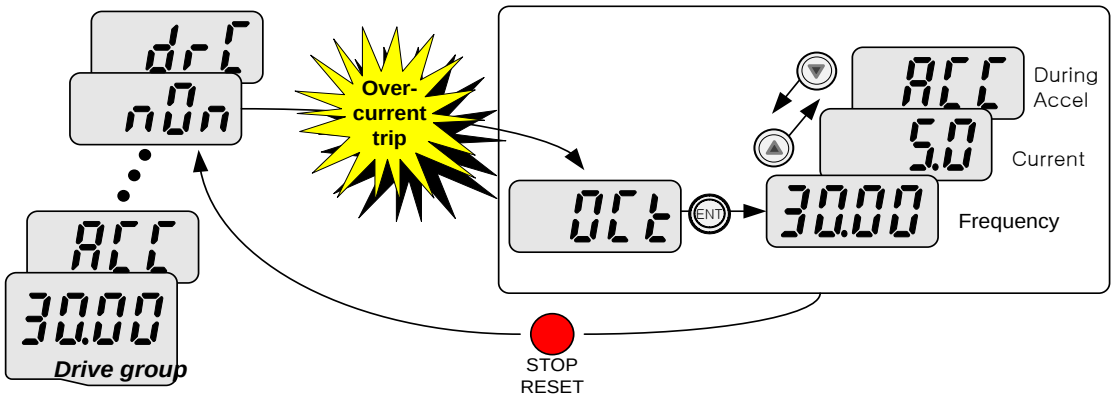
Step	Instruction	Keypad Display
1	Ensure that the first code of the Drive group is selected, and the code 0.00 (Frequency command) is displayed.	0.00
2	Press the [▲] or [▼] key to move to the Cur code.	CUr
3	Press the [ENT] key. The output current (5.0A) is displayed.	5.0
4	Press the [ENT] key again. Returns to the Cur code.	CUr

Note

You can use the dCL (DC link voltage) and vOL (Output voltage) codes in the Drive group in exactly the same way as shown in the example above, to monitor each function's relevant values.

3.4.2 Fault Trip Monitoring

The following example demonstrates how to monitor fault trip conditions in the Drive group using the keypad.

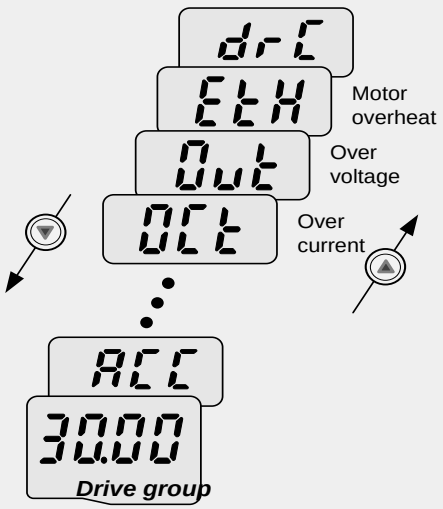


Step	Instruction	Keypad Display
1	Refer to the example keypad display. An over current trip fault has occurred.	OCt
2	Press the [ENT] key, and then the [▲] key. The operation frequency at the time of the fault (30.00Hz) is displayed.	30.00
3	Press the [▲] key. The output current at the time of the fault (5.0A) is displayed.	5.0

Step	Instruction	Keypad Display
4	Press the [▲] key. The operation status at the time of the fault is displayed. ACC on the display indicates that the fault occurred during acceleration.	ACC
5	Press the [STOP/RESET] key. The inverter resets and the fault condition is cleared. The frequency reference is displayed on the keypad.	n0n

Note

If multiple fault trips occur at the same time, a maximum of 3 fault trip records can be retrieved as shown in the following example.



4 Learning Basic Features

This chapter describes the basic features of the C100 inverter. Check the reference page in the table to see the detailed description for each of the advanced features.

Basic Tasks	Description	Ref.
Frequency reference source configuration for the keypad	Configures the inverter to allow you to setup or modify frequency reference using the Keypad.	p.55
Frequency reference source configuration for the terminal block (input voltage)	Configures the inverter to allow input voltages at the terminal block (VR, AI) and to setup or modify a frequency reference.	p.57 p.59
Frequency reference source configuration for the terminal block (input current)	Configures the inverter to allow input currents at the terminal block (I2) and to setup or modify a frequency reference.	p.58
Frequency reference source configuration for RS-485 communication	Configures the inverter to allow communication signals from upper level controllers, such as PLCs or PCs, and to setup or modify a frequency reference.	p.61
Frequency control using analog inputs	Enables the user to hold a frequency using analog inputs at terminals.	p.61
Multi-step speed (frequency) configuration	Configures multi-step frequency operations by receiving an input at the terminals defined for each step frequency.	p.62
Command source configuration for keypad buttons	Configures the inverter to allow the manual operation of the [FWD], [REV] and [Stop] keys.	p.64
Command source configuration for terminal block inputs	Configures the inverter to accept inputs at the FX/RX terminals.	p.65
Command source configuration for RS-485 communication	Configures the inverter to accept communication signals from upper level controllers, such as PLCs or PCs.	p.67
Motor rotation control	Configures the inverter to limit a motor's rotation direction.	p.67
Automatic start-up at power-on	Configures the inverter to start operating at power-on. With this configuration, the inverter begins to run and the motor accelerates as soon as power is supplied to the inverter. To use automatic start-up configuration, the operation command terminals at the terminal block must be turned on.	p.68

Basic Tasks	Description	Ref.
Automatic restart after reset of a fault trip condition	Configures the inverter to start operating when the inverter is reset following a fault trip. In this configuration, the inverter starts to run and the motor accelerates as soon as the inverter is reset following a fault trip condition. For automatic start-up configuration to work, the operation command terminals at the terminal block must be turned on.	p.69
Acc/Dec time configuration based on the Max. Frequency	Configures the acceleration and deceleration times for a motor based on a defined maximum frequency.	p.70
Acc/Dec time configuration based on the frequency reference	Configures acceleration and deceleration times for a motor based on a defined frequency reference.	p.72
Multi-stage Acc/Dec time configuration using the multi-function terminal	Configures multi-stage acceleration and deceleration times for a motor based on defined parameters for the multi-function terminals.	p.73
Acc/Dec pattern configuration	Enables modification of the acceleration and deceleration gradient patterns. Basic patterns to choose from include linear and S-curve patterns.	p.75
Acc/Dec stop command	Stops the current acceleration or deceleration and controls motor operation at a constant speed. Multi-function terminals must be configured for this command.	p.77
Linear V/F pattern operation	Configures the inverter to run a motor at a constant torque. To maintain the required torque, the operating frequency may vary during operation.	p.78
Square reduction V/F pattern operation	Configures the inverter to run the motor at a square reduction V/F pattern. Fans and pumps are appropriate loads for square reduction V/F operation.	p.79
User V/F pattern configuration	Enables the user to configure a V/F pattern to match the characteristics of a motor. This configuration is for special-purpose motor applications to achieve optimal performance.	p.80
Manual torque boost	Manual configuration of the inverter to produce a momentary torque boost. This configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	p.81
Automatic torque boost	Automatic configuration of the inverter that provides “auto tuning” that produces a momentary torque boost. This configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	p.82
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.	p.81

Basic Tasks	Description	Ref.
Start after DC braking	Configures the inverter to perform DC braking before the motor starts rotating again. This configuration is used when the motor will be rotating before the voltage is supplied from the inverter.	p.90
Deceleration stop	Deceleration stop is the typical method used to stop a motor. The motor decelerates to 0Hz and stops on a stop command, however there may be other stop or deceleration conditions defined.	p.83
Stopping by DC braking	Configures the inverter to apply DC braking during motor deceleration. The frequency at which DC braking occurs must be defined and during deceleration, when the motor reaches the defined frequency, DC braking is applied.	p.83
Free-run stop	Configures the inverter to stop output to the motor using a stop command. The motor will free-run until it slows down and stops.	p.84
Power braking	Configures the inverter to provide optimal, motor deceleration, without tripping over-voltage protection.	p.84
Start/maximum frequency configuration	Configures the frequency reference limits by defining a start frequency and a maximum frequency.	p.85
Upper/lower frequency limit configuration	Configures the frequency reference limits by defining an upper limit and a lower limit.	p.85
Frequency jump	Configures the inverter to avoid running a motor in mechanically resonating frequencies.	p.86

4.1 Setting Frequency Reference

The C100 inverter provides several methods to setup and modify a frequency reference for an operation. The keypad, an optional remote keypad, analog inputs, or RS-485 (digital signals from higher-level controllers, such as PC or PLC) can be used.

Group	Code	Name	Setting Range		Unit
Drive	Frq	Frequency setting method	0	Keypad–1	-
			1	Keypad–2	
			2	V2	
			3	V	
			4	I	
			5	V2+I	
			6	V2+V	
			7	Int 485	
			8	Digital (up/down) rotation	

4.1.1 Keypad as the Source (Keypad–1 setting)

You can modify frequency reference by using the keypad and apply changes by pressing the [ENT] key. To use the keypad as a frequency reference input source, go to the Frq (Frequency setting method) code in the Drive group and change the parameter value to 0 (Keypad–1). Input the frequency reference for an operation at the 0.00 (Frequency command) code in the Drive group. The entered values should not exceed the maximum frequency configured at F21.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive	0.00	Frequency command	-	0–400	0.00	Hz
	Frq	Frequency setting method	0	0–8	0	-

Note

When the remote keypad is connected, keypad keys on the body are deactivated and the inverter is controlled by the keys on the remote keypad.

4.1.2 Keypad as the Source (KeyPad–2 setting)

You can use the [▲] and [▼] keys to modify a frequency reference. To use this as a second option, set the keypad as the source of the frequency reference, by going to the Frq (Frequency setting method) code in the Drive group and changing the parameter value to 1 (Keypad–2). This allows frequency reference values to be increased or decreased by pressing the [▲] and [▼] keys. The entered values should not exceed the maximum frequency configured at F21.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	1	0–8	0	-

Note

When the remote keypad is connected, keypad keys on the body are deactivated and the inverter is controlled by the keys on the remote keypad.

4.1.3 Keypad Potentiometer V2: 0–5V Input

You can modify frequency reference by using the knob. To use the knob as a frequency reference input source, go to the Frq (Frequency setting method) code in the Drive group and change the parameter value to 2 (Panel Potentiometer V2).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	2	0–8	0	
I/O group	I 1	V2 input wave filtering time constant	-	0–9999	10	
	I 2	V2 input Min voltage	-	0.00–5.00	0.00	V
	I 3	V2 input Min voltage corresponding frequency	-	0.00–400.00	0.00	Hz
	I 4	V2 input Max. voltage	-	0.00–5.00	5.00	V
	I 5	V2 input Max. voltage corresponding frequencyvoltage	-	0.00–400.00	60.00	Hz

4.1.4 AI Terminal as the Source (J1 to V terminal): 0–10V Input

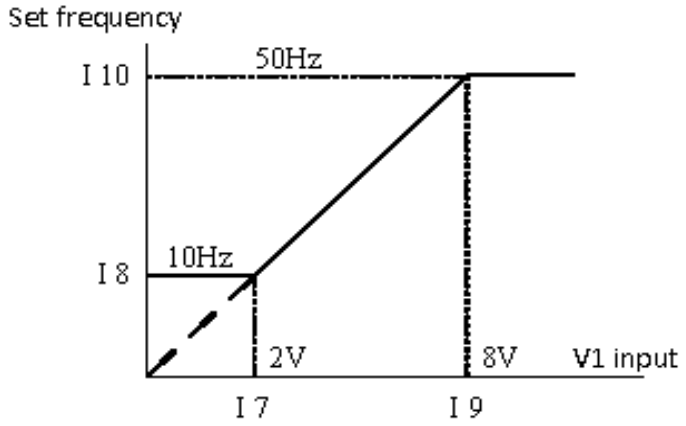
You can set and modify a frequency reference by setting voltage inputs or current inputs with the voltage/current selector switch (J1).

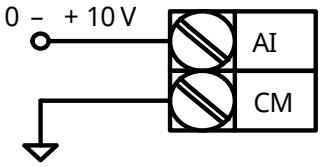
Set the voltage/current selector switch (J1) to voltage. Go to the Frq (Frequency setting method) code in the Drive group and change the parameter value to 3 (Terminal AI (J1 to V)) to use voltage inputs ranging from 0 to 10V.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	3	0–8	0	-
I/O	I 6	Filter time constant for V1 input	-	0–9999	10	-
	I 7	V1 input Min. voltage	-	0.00–10.00	0.00	V
	I 8	V1 input Min. voltage corresponding frequency	-	0.00–400.00	0.00	Hz
	I 9	V1 input Max. voltage	-	0.00–10.00	10.00	V
	I 10	V1 input Max. voltage corresponding frequency	-	0.00–400.00	60.00	Hz

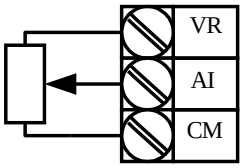
Voltage Input Setting Details

Code	Description
I7 V1 input Min. voltage I10 V1 input Max. voltage corresponding frequency	Set the V1 terminal's input voltage value and corresponding frequency at I 7–I 10. These parameters are used to configure the gradient level and offset values of the output frequency, based on the input voltage.

Code	Description
	



[V terminal wiring]



[Internal source (potentiometer) wiring]

4.1.5 AI Terminal as the Source (J1 to I terminal): 0–20mA Input

Set the voltage/current selector switch (J1) to I. Go to the Frq (Frequency setting method) code in the Drive group and change the parameter value to 4 (Terminal AI (J1 to I)) to use current inputs ranging from 0 to 20mA.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	4	0–8	0	
I/O group	I11	I input	-	0–9999	10	
	I12	I input Min current	-	0.00–20.00	4.00	mA
	I13	I input Min. current corresponding frequency	-	0.00–400.00	0.00	Hz
	I14	I input Max current	-	0.00–20.00	20.00	mA

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
	I15	I input Max. current corresponding frequency	-	0.00–400.00	60.00	Hz

4.1.6 Keypad Potentiometer V2 and AI Terminal as the Source (J1 to I terminal): 0–20mA Input

Set the voltage/current selector switch (J1) to I. Go to the Frq (Frequency setting method) code in the Drive group and change the parameter value to 5 (Panel potentiometer V2 + Terminal AI (J1 to I)).

Frequency references can be configured with various calculated conditions that use the main and auxiliary frequency references simultaneously. The main frequency reference is used as the operating frequency, while auxiliary references are used to modify and fine-tune the main reference.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	5	0–8	0	

*Relevant parameters: I 2– I 5, I 11– I 15

Refer to the below table when the main reference frequency is between 0–20 mA and the auxiliary frequency from the keypad potentiometer is between 0–5 V. Select the main and auxiliary frequencies according to loads used.

Group	Code	Name	Parameter Setting	Unit
I/O group	I 2	V2 input minimum voltage	0.00	V
	I 3	Corresponding frequency of V2 input minimum voltage	0.00	Hz
	I 4	V2 input maximum voltage	5.00	V
	I 5	Corresponding frequency of V2 input maximum voltage	5.00	Hz
	I12	I input minimum voltage	4.00	mA
	I13	Corresponding frequency of I input minimum current	0.00	Hz
	I14	I input maximum current	20.00	mA

Group	Code	Name	Parameter Setting	Unit
	I15	Corresponding frequency of I input maximum current	60.00	Hz

After the values are set as above, if 2.5 V is applied to the V2 terminal and 12 mA is given to the I terminal, the output frequency would be 32.5 Hz. If 2.5 V is applied to the V2 terminal and 5 V is given to the V1 terminal, the output frequency would be 32.5 Hz as well.

4.1.7 Keypad Potentiometer V2 and AI Terminal as the Source (J1 to V terminal): 0–10V

Set the voltage/current selector switch (J1) to V. Go to the Frq (Frequency setting method) code in the Drive group and change the parameter value to 6 (Panel potentiometer V2 + Terminal AI (J1 to V)).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	6	0–8	0	

*Relevant parameters: I 2– I 5, I 6– I 10

Group	Code	Name	Parameter Setting	Unit
I/O group	I 2	V2 input min. voltage	0.00	V
	I 3	Corresponding frequency of V2 input min. voltage	0.00	Hz
	I 4	V2 input max. voltage	5.00	V
	I 5	Corresponding frequency of V2 input max. voltage	5.00	Hz
	I6	Filter time constant for V1 input	10	
	I7	V1 input min. voltage	0.00	V
	I8	Corresponding frequency of V1 input min. voltage	0.00	Hz
	I9	V1 input max. voltage	10.00	V
	I10	Corresponding frequency of V1 input max. voltage	60.00	Hz

4.1.8 Setting a Frequency Reference via RS-485 Communication

Control the inverter with upper–level controllers, such as PCs or PLCs, via RS-485 communication. Set the Frq (Frequency setting method) code in the Drive group to 7 (RS-485 communication) and use the RS-485 signal input terminals (S+/S-) for communication. Refer to *7 RS-485 Communication Features on page 157*.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	7	0–8	0	

*Relevant parameters: I 59–I 61

4.1.9 Setting a Frequency Reference via Digital Potentiometer (Up/Down)

Set the Frq (Frequency setting method) code in the Drive group to 8 (Digital (Up/Down) rotation). Refer to *Up-down Storage Function* in *5.2 Up-down Operation* on page *95*.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	8	0–8	0	

*Relevant parameters: I 17–I 21

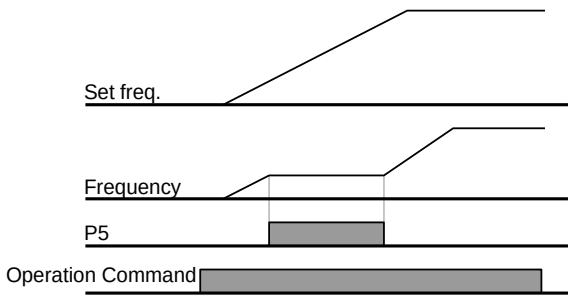
4.2 Frequency Hold by Analog Input

If you set a frequency reference via analog input at the control terminal block, you can hold the operation frequency of the inverter by assigning a multi-function input as the analog frequency hold terminal. The operation frequency will be fixed upon an analog input signal.

An analog input signal is available when the Frq (Frequency setting method) code in the Drive group is set to 2–7. Select one terminal from multi-function input terminals (P1–P5).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	Frq	Frequency setting method	2–7	0–8	0	
I/O group	I17	Multifunction input terminal P1 define	-	0– 27	0	
	–	–				
	I21	Multifunction input terminal P5 define	23		7	

This is the action when P5 terminal is selected.



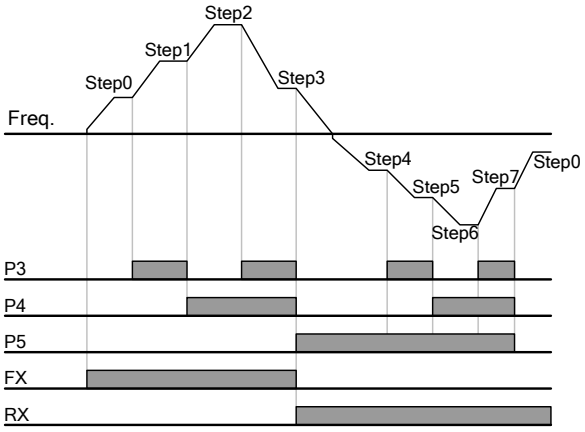
4.3 Setting Multi-step Frequency

Multi-step operations can be carried out by assigning different speeds (or frequencies) to the Px terminals. Select one terminal from multi-function input terminals (P1–P5). If terminals P3–P5 are selected, set the I19–I21 codes of I/O group to 5–7 respectively. Multi-step frequency 0 is set by frequency setting method (Frq) and frequency command (0.00) in Drive group. Multi-step frequency 1–3 are set at the St1–St3 codes in Drive group, and multi-step frequency 4–7 are set at the I30–I33 codes.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	0.00	Frequency command	-	0.00–400.00	0.00	Hz
	Frq	Frequency setting method	0	0–8	0	-
	St1	Multi-step frequency 1	-	0.00–400.00	10.00	Hz
	St2	Multi-step frequency 2	-		20.00	
	St3	Multi-step frequency 3	-		30.00	

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I19	Multi-function input terminal P3 define	5	0–27	2	-
	I20	Multi-function input terminal P4 define	6		3	
	I21	Multi-function input terminal P5 define	7		4	
	I30	Multi-step frequency 4	-	0.00–400.00	30.00	Hz
	I31	Multi-step frequency 5	-		25.00	
	I32	Multi-step frequency 6	-		20.00	
	I33	Multi-step frequency 7	-		15.00	

Provided that terminals P3, P4 and P5 have been set to Speed–L, Speed–M and Speed–H respectively, the following multi–step operation will be available.



[An example of a multi–step operation]

Step freq	FX or RX	P5	P4	P3
0	✓	-	-	-
1	✓	-	-	✓
2	✓	-	✓	-
3	✓	-	✓	✓
4	✓	✓	-	-
5	✓	✓	-	✓
6	✓	✓	✓	-
7	✓	✓	✓	✓

4.4 Command Source Configuration

Various devices can be selected as command input devices for the C100 inverter. Input devices available to select include keypad, multi-function input terminal, and RS-485 communication.

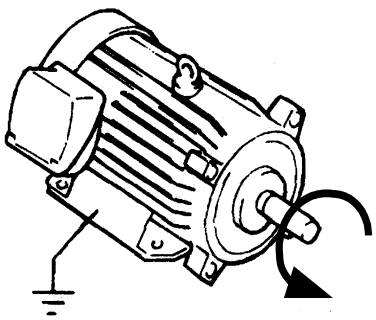
Group	Code	Name	Setting Range		Unit
Drive	drv	Drive mode	0	Run/stop key	–
			1	Forward run/Reverse run	
			2	Run/stop enable/reverse rotation	
			3	RS-485 communication	

4.4.1 The Keypad as a Command Input Device

The keypad can be selected as a command input device to send command signals to the inverter. This is configured by setting the drv (Drive mode) code to 0 (Run/stop key). Press the [RUN] key on the keypad to start an operation, and the [STOP/RESET] key to end it. Set the drC (Direction of motor rotation) code to set the rotation direction.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	drv	Drive mode	0	0–3	1	
	drC	Direction of motor rotation	-	F, r	F	

drC	Direction of motor rotation	F	Forward
		r	Reverse

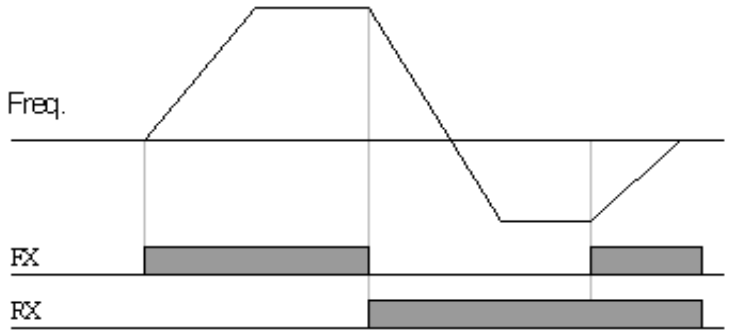


Counter-clockwise direction

4.4.2 Terminal Block as a Command Input Device (Fwd/Rev Run Commands)

Multi-function terminals can be selected as a command input device. This is configured by setting the drv (Drive mode) code in the Drive group to 1 (Forward run/Reverse run). Select P1 and P2 terminals for the forward and reverse operations, and then set 0 and 1 at I17 and I18 for FX and RX respectively. This application enables both terminals to be turned on or off at the same time, constituting a stop command that will cause the inverter to stop operation.

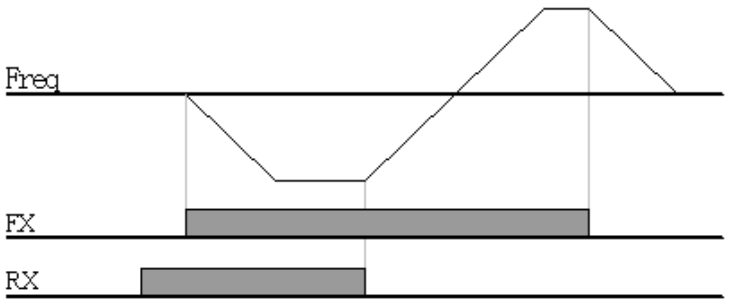
Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	drv	Drive mode	1	0–3	1	
I/O group	I17	Multi-function input terminal P1 define	0	0–27	0	
	I18	Multi-function input terminal P2 define	1	0–27	1	



4.4.3 Terminal Block as a Command Input Device (Run and Rotation Direction Commands)

Multi-function terminals can be selected as a command input device. This is configured by setting the drv (Drive mode) code in the Drive group to 2 (Run/stop enable/reverse rotation). Select P1 and P2 terminals for run and rotation direction commands, and then set 0 and 1 at I17 and I18 for FX and RX respectively. This application uses an Fx input as a run command, and an Rx input to change a motor's rotation direction (On–Rx, Off–Fx).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	drv	Drive mode	2	0–3	1	
I/O group	I17	Multi-function input terminal P1 define	0	0–27	0	
	I18	Multi-function input terminal P2 define	1	0–27	1	



4.4.4 RS-485 Communication as a Command Input Device

Internal RS-485 communication can be selected as a command input device by setting the drv (Drive mode) code in the Drive group to 3 (RS-485 communication). This configuration uses upper level controllers such as PCs or PLCs to control the inverter by transmitting and receiving signals via the S+ and S- terminals at the terminal block. For more details, refer to *7 RS-485 Communication Features on page 157*.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	drv	Drive mode	3	0–3	1	
I/O group	I59	Communication protocol select	-	0–1	0	
	I60	Inverter number	-	1–250	1	
	I61	Baud rate	-	0–5	3	

4.5 Forward or Reverse Run Disable

The rotation direction of motors can be configured to prevent motors to only run in one direction.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	drC	Direction of motor rotation	-	F, r	F	
Function group1	F1	Forward/reverse run disable	-	0–2	0	

Set Forward or Reverse Run Disable Details

Configuration	Description
0	Starts forward and reverse operation.
1	Disables forward operation.
2	Disables reverse operation.

4.6 Power-on Start

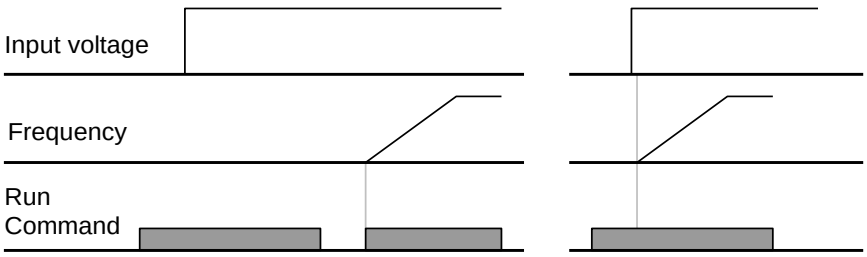
A power–on command can be setup to start an inverter operation after powering up, based on terminal block operation commands (if they have been configured).

To enable power–on run set the drv (Drive mode) code to 1(Fx/Rx–1) or 2 (Fx/Rx–2) in the Drive group.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	drv	Drive mode	1,2	0–3	1	
Function group 2	H20	Power on start select	1	0–1	0	

Caution

Use caution when operating the inverter with Power-on start enabled as the motor will begin rotating when the inverter starts up.



When H20 is 0 When H20 is 1

4.7 Reset and Restart

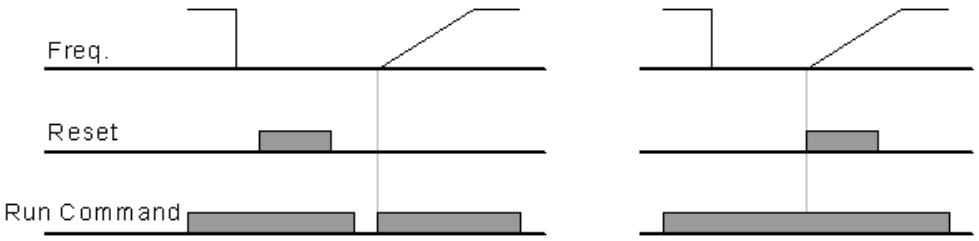
Reset and restart operations can be setup for inverter operation following a fault trip, based on the terminal block operation command (if it is configured). When a fault trip occurs, the inverter cuts off the output and the motor will free-run. Another fault trip may be triggered if the inverter begins its operation while motor load is in a free-run state.

To enable restart after fault trip reset, set the drv (Drive mode) code to 1(Fx/Rx–1) or 2 (Fx/Rx–2) in the Drive group.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	drv	Drive mode	1, 2	0–3	1	
Function group 2	H21	Restart after fault reset selection	1	0–1	0	

⚠ Warning

Use caution when operating the inverter with Reset and restart enabled as the motor will begin rotating when the fault is solved via terminal or keypad.



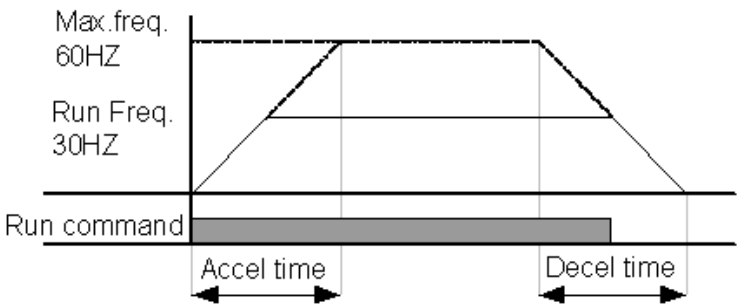
4.8 Setting Acceleration and Deceleration Times

4.8.1 Acc/Dec Time Based on Maximum Frequency

Acc/Dec time values can be set based on maximum frequency, not on inverter operation frequency. To set Acc/Dec time values based on maximum frequency, set the H70 (Frequency reference for Accel/Decel) code in the Function group 2 to 0 (Max frequency). Acceleration time set at the ACC (Accel time) code in the Drive group refers to the time required for the inverter to reach the maximum frequency from a stopped (0Hz) state. Likewise, the value set at the dEC (Decel time) code in the Drive group refers to the time required to return to a stopped state (0Hz) from the maximum frequency.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	ACC	Accel time	-	0.0–6000.0	5.0	Sec
	dEC	Decel time	-	0.0–6000.0	10.0	Sec
Function group1	F21	Max frequency	-	40.00–400.00	60.00	Hz
Function group2	H70	Frequency reference for accel/decel	0	0–1	0	
	H71	Accel/Decel time scale	-	0–2	1	

Acc/Dec Time Based on Maximum Frequency – Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H70
Frequency reference for accel/decel</td><td>
Set the frequency reference for accel/decel to 0 (Max frequency) to setup Acc/Dec time based on maximum frequency.
<table>
<tr><th colspan="2">Configuration</th><th>Description</th></tr>
<tr><td>0</td><td>Max Freq</td><td>Set the Acc/Dec time based on maximum frequency.</td></tr>
<tr><td>1</td><td>Delta Freq</td><td>Set the Acc/Dec time based on operating frequency.</td></tr>
</table>
If, for example, maximum frequency is 60.00Hz, the Acc/Dec times are set to 5 seconds, and the frequency reference for operation is set at 30Hz (half of 60Hz), the time required to reach 30Hz therefore is 2.5 seconds (half of 5 seconds).


</td></tr>
<tr><td>H71
Accel/Decel time scale</td><td>
Use the time scale for all time–related values. It is particularly useful when a more accurate Acc/Dec times are required because of load characteristics, or when the maximum time range needs to be extended.
<table>
<tr><th colspan="2">Configuration</th><th>Description</th></tr>
<tr><td>0</td><td>0.01sec</td><td>Sets 0.01 second as the minimum unit.</td></tr>
<tr><td>1</td><td>0.1sec</td><td>Sets 0.1 second as the minimum unit.</td></tr>
<tr><td>2</td><td>1sec</td><td>Sets 1 second as the minimum unit.</td></tr>
</table>
</td></tr>
</table>

ⓘ Caution

Note that the range of maximum time values may change automatically when the units are changed. If for example, the acceleration time is set at 6000 seconds, a time scale change from 1 second to 0.01 second will result in a modified acceleration time of 60.00 seconds.

4.8.2 Acc/Dec Time Based on Operation Frequency

Acc/Dec times can be set based on the time required to reach the next step frequency from the existing operation frequency. To set the Acc/Dec time values based on the existing operation frequency, set the H70 code (Frequency reference for accel/decel) in the Function group 2 to 1 (Delta frequency).

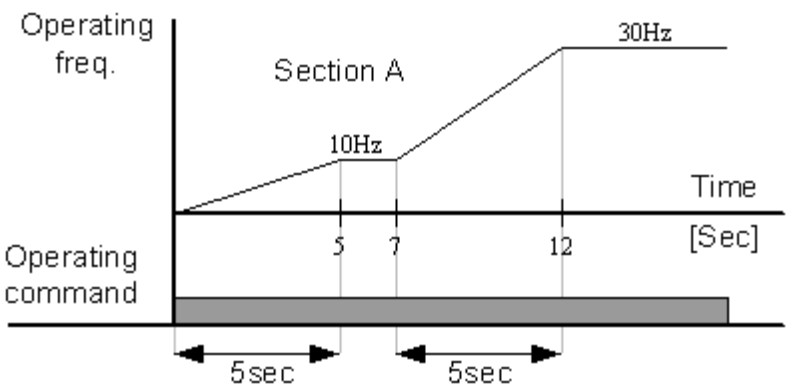
Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	ACC	Accel time	-	0.0–6000.0	5.0	Sec
	dEC	Decel time	-	0.0–6000.0	10.0	Sec
Function group 2	H70	Frequency reference for accel/decel	1	0–1	0	

Acc/Dec Time Based on Operation Frequency – Setting Details

Code	Description
H70 Frequency reference for accel/decel	Set the parameter value to 1 (Delta Freq) to set Acc/Dec times based on delta frequency.

Configuration		Description
0	Max Freq	Set the Acc/Dec time based on Maximum frequency.
1	Delta Freq	Set the Acc/Dec time based on Operation frequency.

If Acc/Dec times are set to 5 seconds, and multiple frequency references are used in the operation in 2 steps, at 10Hz and 30 Hz, each acceleration stage will take 5 seconds (refer to the graph below).



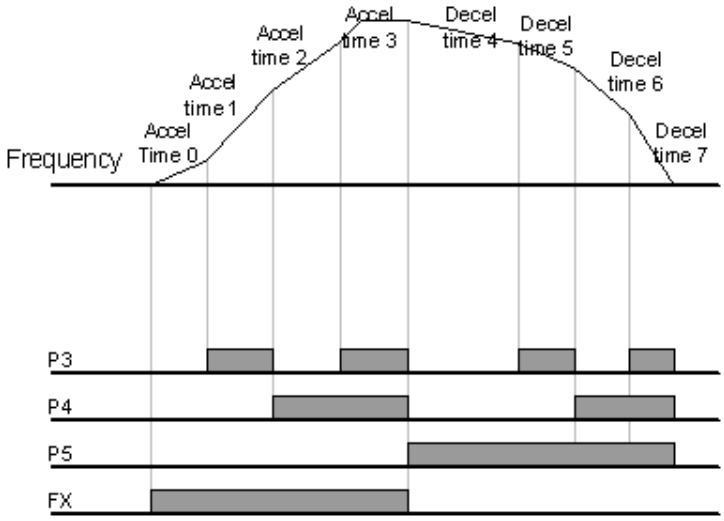
4.8.3 Multi-step Acc/Dec Time Configuration

Acc/Dec times can be configured via a multi-function terminal by setting the ACC (Accel time) and dEC (Decel time) codes in the Drive group.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	ACC	Accel time	-	0.0–6000.0	5.0	Sec
	dEC	Decel time	-	0.0–6000.0	10.0	Sec
I/O group	I17	Multi-function input terminal P1 define	0	0–27	0	Sec
	I18	Multi-function input terminal P2 define	1		1	
	I19	Multi-function input terminal P3 define	8		2	
	I20	Multi-function input terminal P4 define	9		3	
	I21	Multi-function input terminal P5 define	10		4	
	I34	Multi-Accel time 1	-	0.0–6000.0	3.0	Sec
	–	-				
	I47	Multi-Decel time 7	-		9.0	

Acc/Dec Time Setup via Multi-function Terminals – Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>I17–I21
Multi-function input terminal P1–P5 define</td><td>If Accel/Decel time is set via multi-function input terminal P3–P5, the I19–I21 codes are set to 8, 9, and 10 respectively.

Acc/Dec commands are recognized as binary code inputs and will control the acceleration and deceleration based on parameter values set with I34–I40 and I41–I47.
 

<table>
<tr><th>Accel / Decel time</th><th>P5</th><th>P4</th><th>P3</th></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>✓</td></tr>
<tr><td>2</td><td>-</td><td>✓</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>4</td><td>✓</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td>✓</td><td>-</td><td>✓</td></tr>
<tr><td>6</td><td>✓</td><td>✓</td><td>-</td></tr>
<tr><td>7</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>I34–I40
Acc Time 1–7</td><td>Set multi-step acceleration time 1 – 7.</td></tr>
<tr><td>I41–I47
Dec Time 1–7</td><td>Set multi-step deceleration time 1 – 7.</td></tr>
</table>

4.9 Acc/Dec Pattern Configuration

Acc/Dec gradient level patterns can be configured at the F2 (Accel pattern) and F3 (Decel pattern) codes in the Function group 1 to enhance and smooth the inverter's acceleration and deceleration curves.

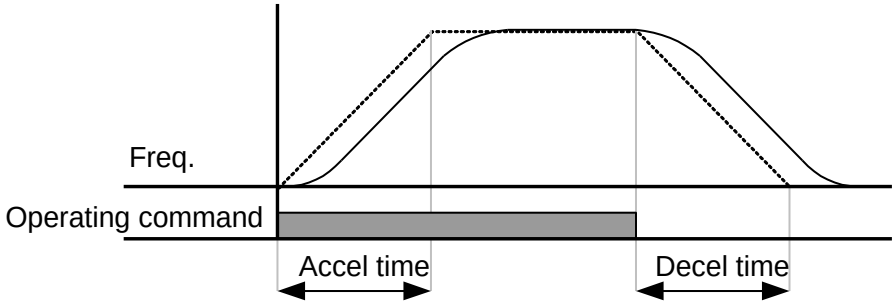
Linear pattern features a linear increase or decrease of output frequency, at a fixed rate. It is used for constant torque.

S-curve pattern features a smoother and more gradual increase or decrease of output frequency, ideal for lift-type loads or elevator doors, etc. S-curve gradient level can be adjusted using the H17 and H18 codes in the Function group 2.

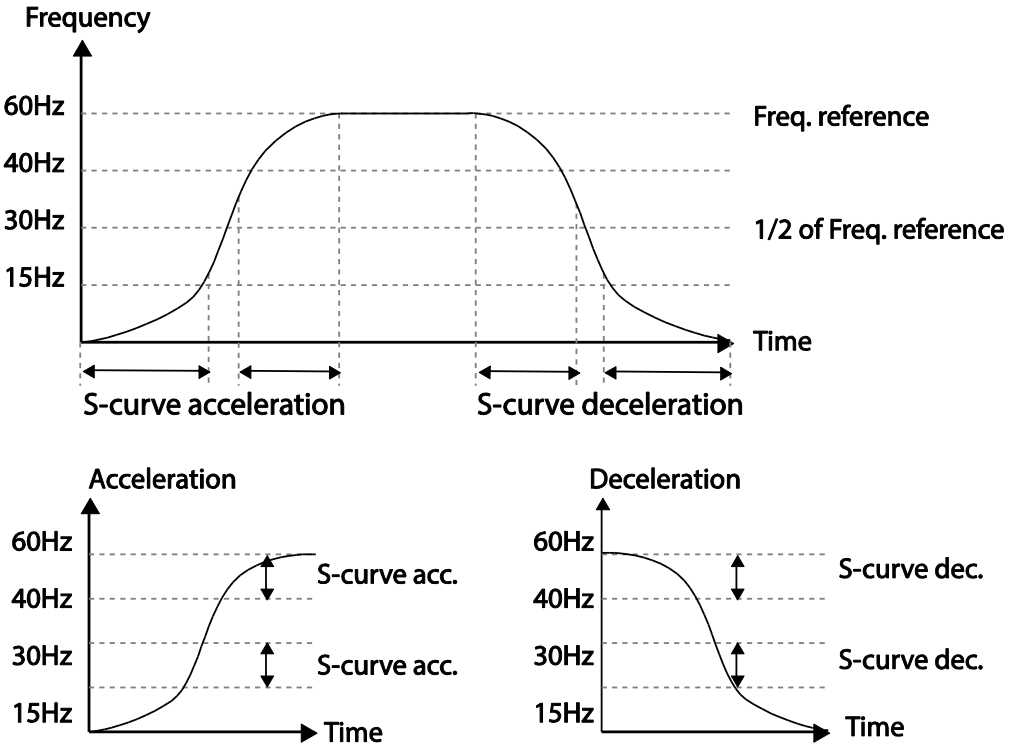
Group	Code	Name	Parameter Setting		Initial Value	Unit
Function group 1	F 2	Accel pattern	0	Linear curve operation	0	
	F 3	Decel pattern	1	S curve operation		
Function group 2	H17	S-curve accel/decel start side	0–100		40	%
	H18	S-curve accel/decel end side			40	%

Acc/Dec Pattern Setting Details

Code	Description
H17 S-curve accel/decel start side	Sets the gradient level as acceleration starts when using an S-curve, Acc/Dec pattern. H17 defines S-curve gradient level as a percentage, up to half of total acceleration. If the frequency reference and maximum frequency are set at 60Hz and H17 is set to 50%, H17 configures acceleration up to 30Hz (half of 60Hz).The inverter will operate S-curve acceleration in the 0–15Hz frequency range (50% of 30Hz). Linear acceleration will be applied to the remaining acceleration within the 15–30Hz frequency range.
H18 S-curve accel/decel end side	Sets the gradient level as acceleration ends when using an S-curve Acc/Dec pattern. H18 defines S-curve gradient level as a percentage, above half of total acceleration. If the frequency reference and the maximum frequency are set at 60Hz and H18 is set to 50%, setting H18 configures acceleration to increase from 30Hz (half of 60Hz) to 60Hz (end of acceleration). Linear acceleration will be applied within the 30–45Hz frequency range. The inverter will perform an S-curve acceleration for the remaining acceleration in the 45–60Hz frequency range.



[Acceleration / deceleration pattern configuration]



[Acceleration / deceleration S-curve pattern configuration]

Note

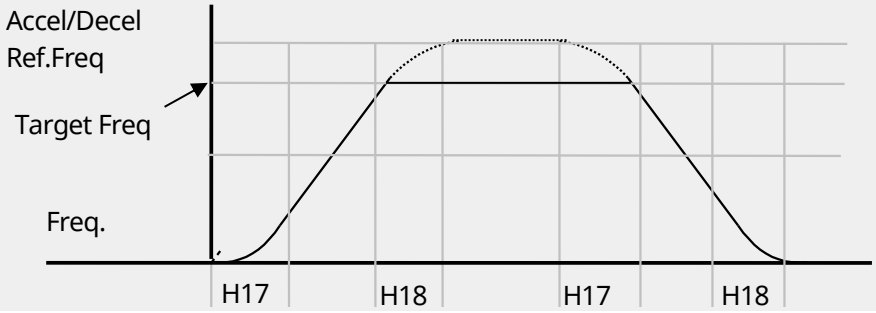
The Actual Acc/Dec time during an S-curve application
Actual acceleration time = user–configured acceleration time + user–configured acceleration time x starting gradient level/2 + user–configured acceleration time x ending gradient level/2.
Actual deceleration time = user–configured deceleration time + user–configured deceleration time x starting gradient level/2 + user–configured deceleration time x ending gradient level/2.

ⓘ Caution

Note that actual Acc/Dec times become greater than user defined Acc/Dec times when S-curve Acc/Dec patterns are in use.

Note

If the frequency command is lower than the max frequency and, the waveform will be distorted and appear with the top portion cut out.

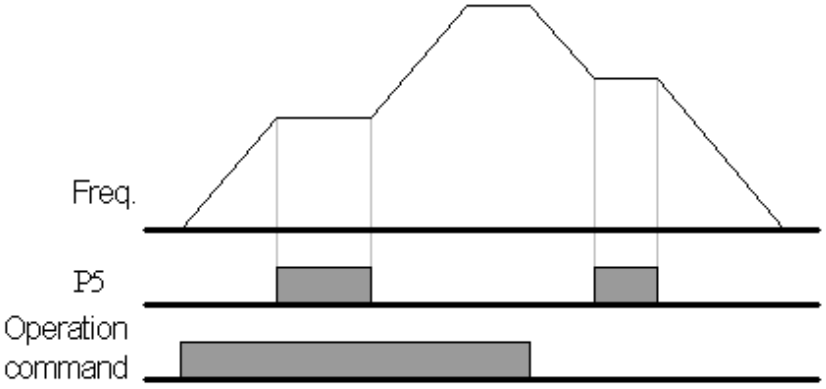


4.10 Stopping the Acc/Dec Operation

Configure the multi-function input terminals to stop accele

ration or deceleration and operate the inverter at a fixed frequency. Select one multi-function input terminal (P1–P5) and if P5 terminal is selected, set the I24 code to 24.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I17	Multi-function input terminal P1 define	-	0–27	0	
	–	–				
	I21	Multi-function input terminal P5 define	24		4	



4.11 V/F (Voltage/Frequency) Control

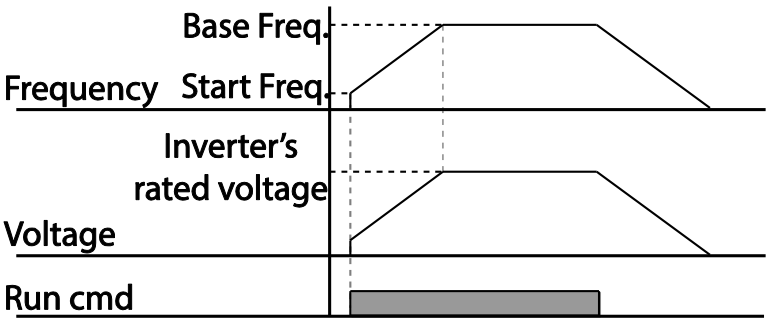
Configure the inverter's output voltages, gradient levels and output patterns to achieve a target output frequency with V/F control. The amount of torque boost used during low frequency operations can also be adjusted.

4.11.1 Linear V/F Pattern Operation

A linear V/F pattern configures the inverter to increase or decrease the output voltage at a fixed rate for different operation frequencies based on V/F characteristics. A linear V/F pattern is particularly useful when a constant torque load is applied. Set the F30 code (V/F pattern) in the Function group 1 to 0 (Linear).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F22	Base frequency	-	30.00–400.00	60.00	Hz
	F23	Start frequency	-	0.10–10.00	0.50	Hz
	F30	V/F pattern	0	0–2	0	
Function group 2	H40	Control mode select	-	0–3	0	

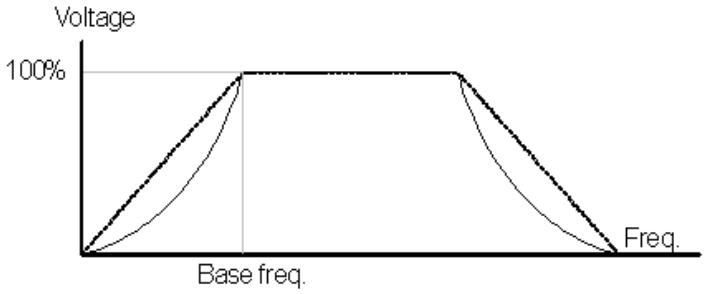
Linear V/F Pattern Setting Details

Code	Description
F22 Base frequency	Sets the base frequency. A base frequency is the inverter's output frequency when running at its rated voltage. Refer to the motor's rating plate to set this parameter value.
F23 Start frequency	Sets the start frequency. A start frequency is a frequency at which the inverter starts voltage output. The inverter does not produce output voltage while the frequency reference is lower than the set frequency. However, if a deceleration stop is made while operating above the start frequency, output voltage will continue until the operation frequency reaches a full–stop (0Hz). 

4.11.2 Square Reduction V/F pattern Operation

Square reduction V/F pattern is ideal for loads such as fans and pumps. It provides non–linear acceleration and deceleration patterns to sustain torque throughout the whole frequency range. Set the F30 code (V/F pattern) in the Function group 1 to 1 (Square).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F30	V/F pattern	1	0–2	0	



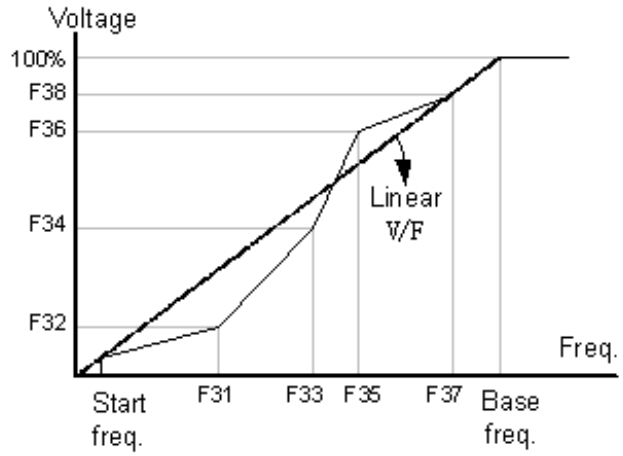
4.11.3 User V/F Pattern Operation

The C100 inverter allows the configuration of user–defined V/F patterns to suit the load characteristics of special motors. Set the F30 code (V/F pattern) in the Function group 1 to 2 (User V/F).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F30	V/F pattern	2	0–2	0	
	F31	User V/F frequency 1	-	0.00–400.00	15.00	Hz
	–	–				
	F38	User V/F voltage 4	-	0–100	100	%

User V/F pattern Setting Details

Code	Description
F31 User V/F frequency 1– F38 User V/F voltage 4	Set the parameter values to assign arbitrary frequencies (User V/F frequency 1–4) for start and maximum frequencies. Voltages can also be set to correspond with each frequency, and for each user voltage (User voltage 1–4).



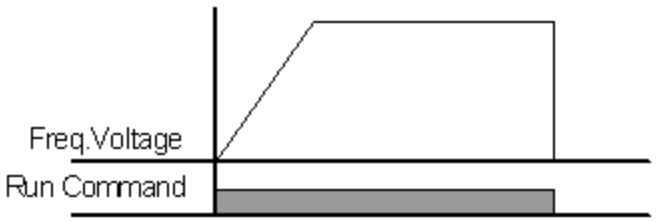
Caution

- When a normal induction motor is in use, care must be taken not to configure the output pattern away from a linear V/F pattern. Non-linear V/F patterns may cause insufficient motor torque or motor overheating due to over-excitation.
- When a user V/F pattern is in use, forward torque boost (F28) and reverse torque boost (F29) do not operate.

4.12 Output Voltage Setting

Output voltage settings are required when a motor's rated voltage differs from the input voltage to the inverter. Set the F39 (Output voltage adjustment) code to configure the motor's rated operating voltage. The set voltage becomes the output voltage of the inverter's base frequency. When the inverter operates above the base frequency, and when the motor's voltage rating is lower than the input voltage at the inverter, the inverter adjusts the voltage and supplies the motor with the voltage set at the F39 (Output voltage adjustment) code. If the motor's rated voltage is higher than the input voltage at the inverter, the inverter will supply the inverter input voltage to the motor.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F39	Output voltage adjustment	-	40–110	100	%



4.13 Torque Boost

4.13.1 Manual Torque Boost

Manual torque boost enables users to adjust output voltage during low speed operation or motor start. Increase low speed torque or improve motor starting properties by manually increasing output voltage. Configure manual torque boost while running loads that require high starting torque, such as lift–type loads. Set the F27 (Torque boost select) code to 0 (Manual torque boost).

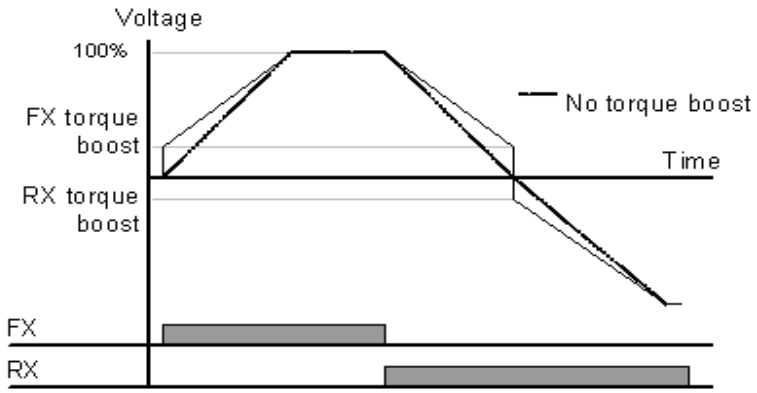
Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F27	Torque boost select	0	0–1	0	
	F28	Torque boost in forward direction	-	0–20	3	%
	F29	Torque boost in reverse direction				

Manual Torque Boost Setting Details

Code	Description
F28 Torque boost in forward direction	Set torque boost for forward operation.
F29 Torque boost in reverse direction	Set torque boost for reverse operation.

Caution

Excessive torque boost will result in over-excitation and motor overheating .



4.13.2 Auto Torque Boost

Auto torque boost enables the inverter to automatically calculate the amount of output voltage required for torque boost based on the entered motor parameters. Because auto torque boost requires motor-related parameters such as stator resistance (H42), inductance, and no-load current (H34), auto tuning (H41) has to be performed before auto torque boost can be configured. Refer to *5.7 Auto Tuning* on page *107*. Similarly to manual torque boost, configure auto torque boost while running a load that requires high starting torque, such as lift-type loads. Set the F27 (Torque boost select) code to 1 (Auto torque boost).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F27	Torque boost select	1	0–1	0	
Function group 2	H34	No load motor current	-	0.1–50	-	A
	H41	Auto tuning	0	0–1	0	
	H42	Stator resistance (Rs)	-	0–56	-	Ω

4.14 Stop Mode Setting

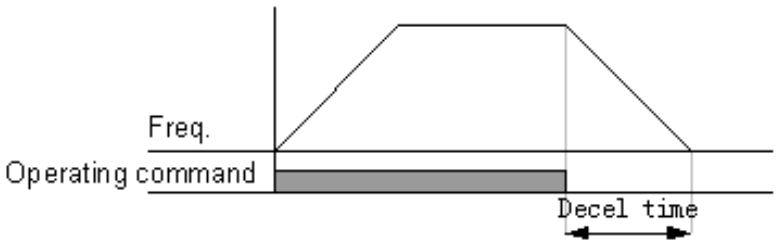
Select a stop mode to stop the inverter operation.

Group	Code	Name	Setting Range		Unit
Function group 1	F4	Stop mode select	0	Decelerates to stop	–
			1	DC brakes to stop	
			2	Free runs to stop	
			3	Power braking stop	

4.14.1 Deceleration Stop

Deceleration stop is a general stop mode. If there are no extra settings applied, the motor decelerates down to 0 Hz and stops, as shown in the figure below.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F4	Stop mode select	0	0–3	0	



4.14.2 Stop After DC Braking

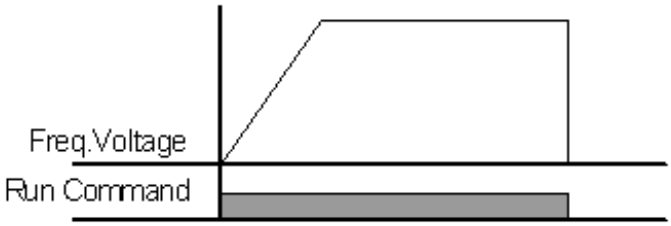
When the operation frequency reaches the set value during deceleration (DC braking frequency), the inverter stops the motor by supplying DC power to the motor. Refer to *4.16.1 Stop After DC Braking* on page *88*.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F4	Stop mode select	1	0–3	0	

4.14.3 Free Run Stop

When the operation command is off, the inverter output turns off, and the load stops due to residual inertia.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F4	Stop mode select	2	0–3	0	



Caution

Note that when there is high inertia on the output side and the motor is operating at high speed, the load's inertia will cause the motor to continue rotating even if the inverter output is blocked.

4.14.4 Power Braking

When the inverter's DC voltage rises above a specified level due to motor regenerated energy, a control is made to either adjust the deceleration gradient level or reaccelerate the motor in order to reduce the regenerated energy. Power braking can be used when short deceleration times are needed without brake resistors, or when optimum deceleration is needed without causing an over voltage fault trip.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F4	Stop mode select	3	0–3	0	

4.15 Frequency Limit

Operation frequency can be limited by setting maximum frequency, start frequency, upper limit frequency and lower limit frequency.

4.15.1 Frequency Limit Using Maximum Frequency and Start Frequency

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F21	Max frequency	-	0.00–400.00	60.00	Hz
	F23	Start frequency	-	0.10–10.00	0.50	Hz

Frequency Limit Using Maximum Frequency and Start Frequency – Setting Details

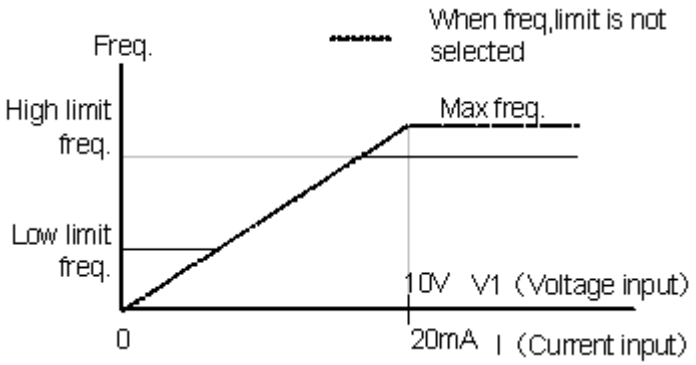
Code	Description
F21 Max frequency	Set the highest limit value for speed unit parameters that are expressed in Hz. Any value higher than the max frequency cannot be entered except for F22 (Base frequency).
F23 Start frequency	Set the lowest limit value for speed unit parameters that are expressed in Hz. If an input frequency is lower than the start frequency, the parameter value will be 0.00.

4.15.2 Frequency Limit Using Upper and Lower Limit Frequency Values

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F24	Frequency high/low limit select	1	0–1	0	
	F25	Frequency high limit	-	0.00–400.00	60.00	Hz
	F26	Frequency low limit	-	0.00–400.00	0.50	Hz

Frequency Limit Using Upper and Lower Limit Frequencies – Setting Details

Code	Description
F24 Frequency high/low limit select	The initial setting is 0(No). Changing the setting to 1(Yes) allows the setting of frequencies between the lower limit frequency (F26) and the higher limit frequency (F25). When the setting is 0(No), codes F25 and F26 are not visible.
F25 Frequency high limit F26 Frequency low limit	Set a higher limit frequency to all speed unit parameters that are expressed in Hz, except for the base frequency (F22). Frequency cannot be set higher than the high limit frequency.

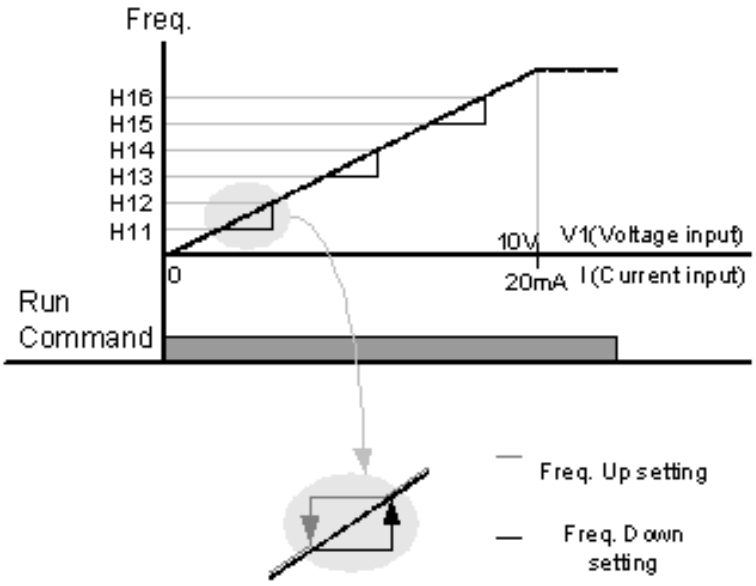


4.15.3 Frequency Jump

Use frequency jump to avoid mechanical resonance frequencies. Jump through frequency bands when a motor accelerates and decelerates. Operation frequencies cannot be set within the pre-set frequency jump band.

When a frequency setting is increased, while the frequency parameter setting value (voltage, current, RS-485 communication, keypad setting, etc.) is within a jump frequency band, the frequency will be maintained at the lower limit value of the frequency band. Then, the frequency will increase when the frequency parameter setting exceeds the range of frequencies used by the frequency jump band.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 2	H10	Skip frequency select	1	0–1	0	
	H11	Skip frequency low limit 1	-	0.10–400.00	10.00	Hz
	–	–				
	H16	Skip frequency high limit 3	-	0.10–400.00	35.00	Hz


Freq.
H16
H15
H14
H13
H12
H11
0
10V
V1(Voltage input)
20mA
I(Current input)
Run
Command
Freq. Up setting
Freq. Down
setting

4.16 DC braking

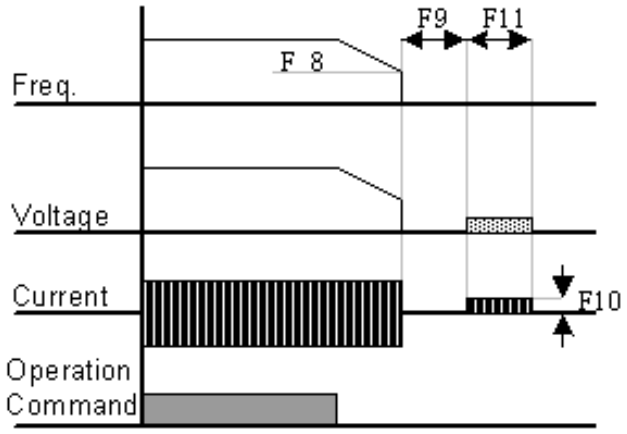
4.16.1 Stop After DC Braking

When the operation frequency reaches the set value during deceleration (DC braking frequency), the inverter stops the motor by supplying DC power to the motor. With a stop command input, the inverter begins decelerating the motor. When the frequency reaches the DC braking frequency set at F8, the inverter supplies DC voltage to the motor and stops it.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F 4	Stop mode select	1	0–3	0	
	F 8	DC brake start frequency	-	0.10–60.00	5.00	Hz
	F 9	DC brake wait time	-	0.00–60.00	0.10	sec
	F10	DC brake voltage	-	0–200	50	%
	F11	DC brake time	-	0.0–60.0	1.0	sec

DC Braking After Stop Setting Details

Code	Description
F8 DC brake start frequency	Set the frequency to start DC braking. When the frequency is reached, the inverter starts deceleration. If the dwell frequency is set lower than the DC braking frequency, dwell operation will not work and DC braking will start instead.
F9 DC brake wait time	Set the time to block the inverter output before DC braking. If the inertia of the load is great, or if DC braking frequency (F8) is set too high, a fault trip may occur due to overcurrent conditions when the inverter supplies DC voltage to the motor. Prevent overcurrent fault trips by adjusting the output block time before DC braking.
F10 DC brake voltage	Set the amount of DC braking to apply. The parameter setting is based on the rated current of the motor. Selecting 0 will disable DC braking.
F11 DC brake time	Set the time duration for the DC voltage supply to the motor. Selecting 0 will disable DC braking.



ⓘ Caution

- Note that the motor can overheat or be damaged if excessive amount of DC braking is applied to the motor, or DC braking time is set too long.
- DC braking is configured based on the motor's rated current. To prevent overheating or damaging motors, do not set the current value higher than the inverter's rated current.

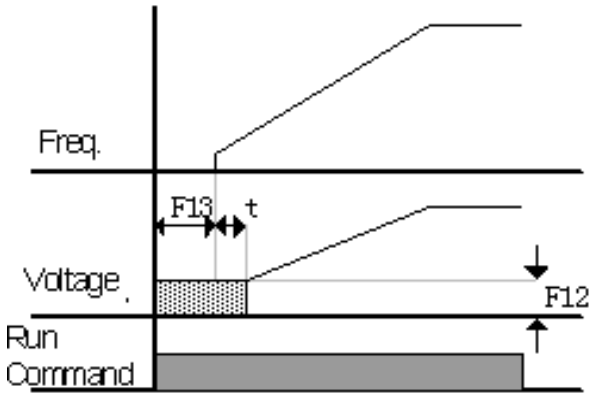
When DC braking starts at high load inertia and frequency, change the DC brake controller gain based on the H37 code.

Code	Name	Setting Range	
H37	Load inertia ratio	0	Less than 10 times
		1	About 10 times
		2	More than 10 times

4.16.2 Start After DC Braking

This start mode supplies a DC voltage for a set amount of time to provide DC braking before an inverter starts to accelerate a motor. If the motor continues to rotate due to its inertia, DC braking will stop the motor, allowing the motor to accelerate from a stopped condition. DC braking can also be used with a mechanical brake connected to a motor shaft when a constant torque load is applied, if a constant torque is required after the mechanical brake is released. Setting values of F12 and F13 to 0 will disable starting DC braking.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F12	Brake start voltage	-	0–200	50	%
	F13	DC brake start time	-	0.0–60.0	0.0	sec



t: The inverter starts to accelerate after the time set in F13.

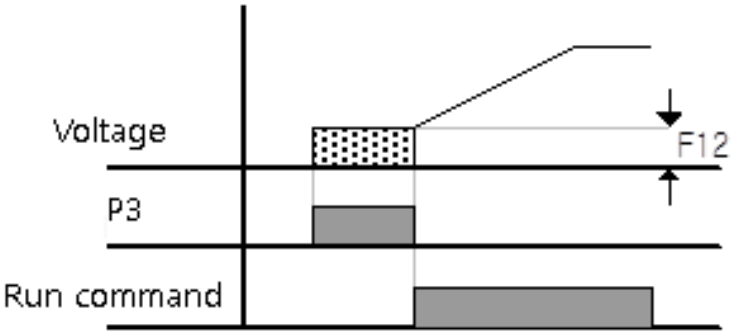
ⓘ Caution

The amount of DC braking required is based on the motor's rated current. Do not use DC braking resistance values that can cause current draw to exceed the rated current of the inverter. If the DC braking resistance is too high or brake time is too long, the motor may overheat or be damaged.

4.16.3 DC Braking at A Stop

Set on the basis of the rated current of the motor at H33. One of the multi-function input terminals (P1–P5) may be set as a signal to stop DC braking. If the P3 terminal is set for this function, set the I19 code in the I/O group to 11 (DC brakes during a stop).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F12	Brake start voltage	-	0–200	50	%
I/O group	I19	Multi-function input terminal P3 define	11	0–25	2	



ⓘ Caution

Note that the motor can overheat or be damaged if excessive amount of DC braking is applied to the motor, or DC braking time is set too long.

5 Learning Advanced Features

This chapter describes the advanced features of the C100 inverter. Check the reference page in the table to see the detailed description for each of the advanced features.

Advanced Tasks	Description	Ref.
Jog operation	Jog operation is a kind of a manual operation. The inverter operates to a set of parameter settings predefined for Jog operation, while the Jog command button is pressed.	*p.93*
Up-down operation	Uses the upper and lower limit value switch output signals (i.e. signals from a flow meter) as Acc/Dec commands to motors.	*p.95*
3-wire operation	3-wire operation is used to latch an input signal. This configuration is used to operate the inverter by a push button.	*p.98*
Dwell operation	Use this feature for the lift-type loads such as elevators, when the torque needs to be maintained while the brakes are applied or released.	*p.99*
Slip compensation	This feature ensures that the motor rotates at a constant speed, by compensating for the motor slip as a load increases.	*p.100*
PID control	PID control provides constant automated control of flow, pressure, and temperature by adjusting the output frequency of the inverter.	*p.102*
Auto-tuning	Used to automatically measure the motor control parameters to optimize the inverter's control mode performance.	*p.107*
Sensorless vector control	An efficient mode to control magnetic flux and torque without special sensors. Efficiency is achieved through the high torque characteristics at low current when compared with the V/F control mode.	*p.108*
Energy saving operation	Used to save energy by reducing the voltage supplied to motors during low-load and no-load conditions.	*p.110*
Speed search operation	Used to prevent fault trips when the inverter voltage is output while the motor is idling or free-running.	*p.111*
Auto restart operation	Auto restart configuration is used to automatically restart the inverter when a trip condition is released, after the inverter stops operating due to activation of protective devices (fault trips).	*p.113*
2nd motor operation	Used to switch equipment operation by connecting two motors to one inverter. Configure and operate the second motor using the terminal input defined for the second motor operation.	*p.116*
2nd operation mode settings	Used to configure the second operation mode and switch between the operation modes according to your requirements.	*p.118*
Brake control	Used to control the On/Off operation of the load's electronic braking system.	*p.122*
Energy buffering operation	Used to maintain the DC link voltage for as long as possible by controlling the inverter output frequency during power interruptions, thus to delay a low voltage fault trip.	*p.123*

Advanced Tasks	Description	Ref.
Draw operation	This feature enables fine-tuning of operation speeds using operation frequencies that are proportional to a ratio of the main frequency reference.	p.125
Cooling fan control	Used to control the cooling fan of the inverter.	p.126

5.1 Jog Operation

The jog operation allows for a temporary control of the inverter. You can enter a jog operation command using the multi-function terminals.

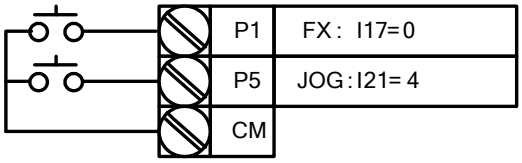
The jog operation is the second highest priority operation, after the dwell operation. If a jog operation is requested while operating the multi-step, up-down, or 3-wire operation modes, the jog operation overrides all other operation modes.

5.1.1 Jog Operation 1-Forward Jog by Multi-function Terminal

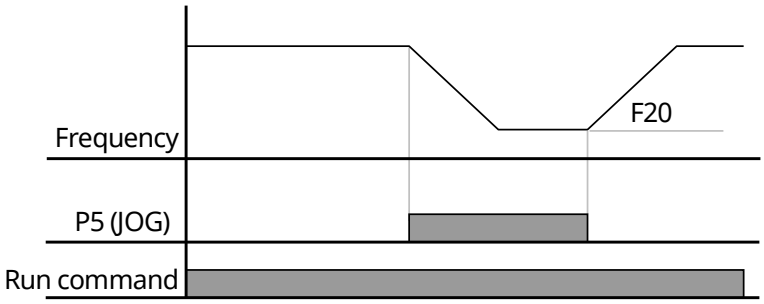
The jog operation is available in either forward or reverse direction, using the keypad or multi-function terminal inputs.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F20	Jog frequency	-	0.00–400.00	10.00	Hz
I/O group	I21	Multi-function input terminal P5 define	4	0–27	4	

Forward Jog Description Details

Code	Description
I21 Multi-function input terminal P5 define	Select the jog frequency from P1– P5. If P5 is set for jog operation, set the I21 code to 4 (Jog operation command).  [Terminal settings for jog operation]
F21 Max frequency F23 Start frequency	Set the operation frequency.

If a signal is entered at the jog terminal while an FX operation command is on, the operation frequency changes to the jog frequency and the jog operation begins.



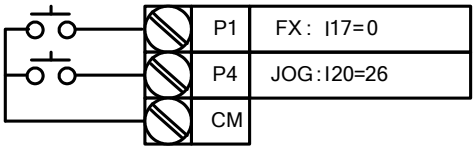
5.1.2 Jog Operation 2-Fwd/Rev Jog by Multi-function Terminal

For jog operation 1, an operation command must be entered to start operation, but while using jog operation 2, a terminal that is set for a forward or reverse jog also starts an operation.

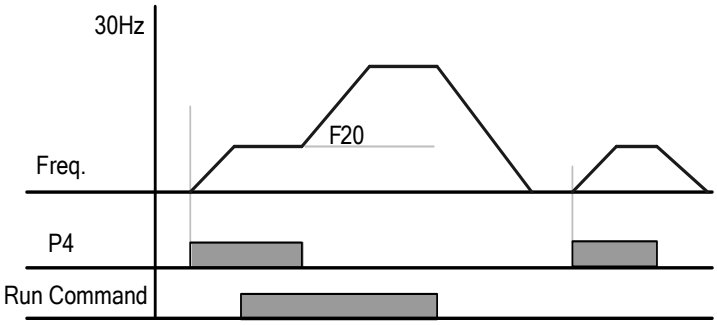
If P4 is set for jog FX, set the I20 code to 26 (JOG-FX) in the I/O group.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 1	F20	Jog frequency	-	0.00– 400.00	10.00	Hz
I/O group	I20	Multi-function input terminal P4 define	26	0–27	3	
	I21	Multi-function input terminal P5 define	27	0–27	4	

Forward Jog Description Details

Code	Description
I20 Multi-function input terminal P4 define	Select the jog frequency from P1- P5. If P4 is set for jog operation, set the I20 code to 26 (JOG-FX).  [Terminal settings for jog operation]
F21 Max frequency F23 Start frequency	Set the operation frequency.

The following diagram is an example when frequency command is 30 Hz and Jog frequency is 10 Hz.



5.2 Up-down Operation

5.2.1 Up-down Storage Function

The Acc/Dec time can be controlled through input at the multi-function terminal block. Similar to a flowmeter, the up-down operation can be applied easily to a system that uses the upper-lower limit switch signals for Acc/Dec commands.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	Frq	Frequency setting method	8	0–8	0	
I/O group	I17	Multi-function input terminal P1 define	0	0–27	0	
	I19	Multi-function input terminal P3 define	25		2	
	I20	Multi-function input terminal P4 define	15		3	
	I21	Multi-function input terminal P5 define	16		4	
Function group 1	F63	Save up/down frequency select	-	0–1	0	
	F64	Save up/down frequency	-		0.00	

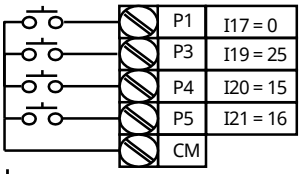
Up-down Operation Setting Details

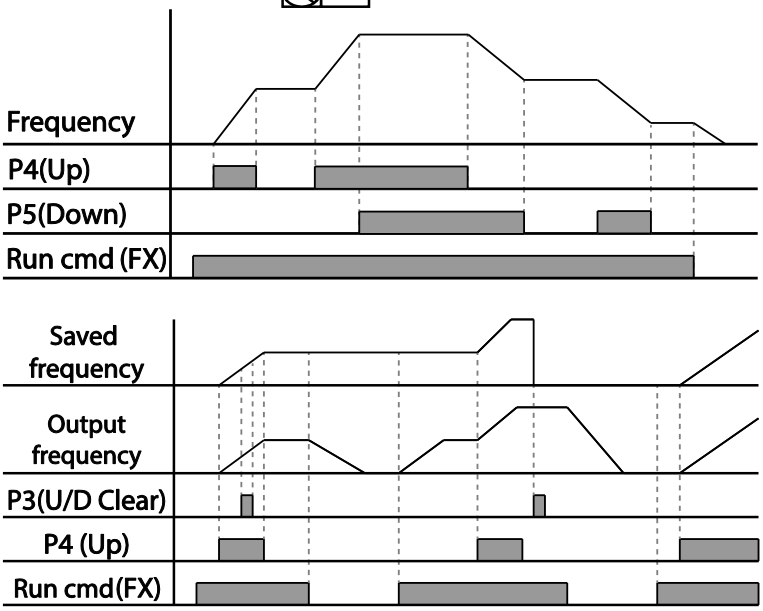
Code	Description
I19 Multi-function input terminal P3 define	Set 25 (Up/Down save freq.initialization) if you select P3 terminal as an up-down save initial terminal.
I20 Multi-function input terminal P4 define I21 Multi-function input terminal P5 define	Set P4 and P5 to 15 (Increase frequency command (UP)) and 16 (Decrease frequency command (DOWN)) if P4 and P5 are two terminals for up-down operation.
F63 Save up/down frequency select	If F63 is set to 0, you can initialize the saved up-down frequency. If F63 is set to 1, the inverter stops or decelerates after the frequency saved at F64.
F64 Save up/down frequency	Set the frequency to stop or decelerate the inverter.

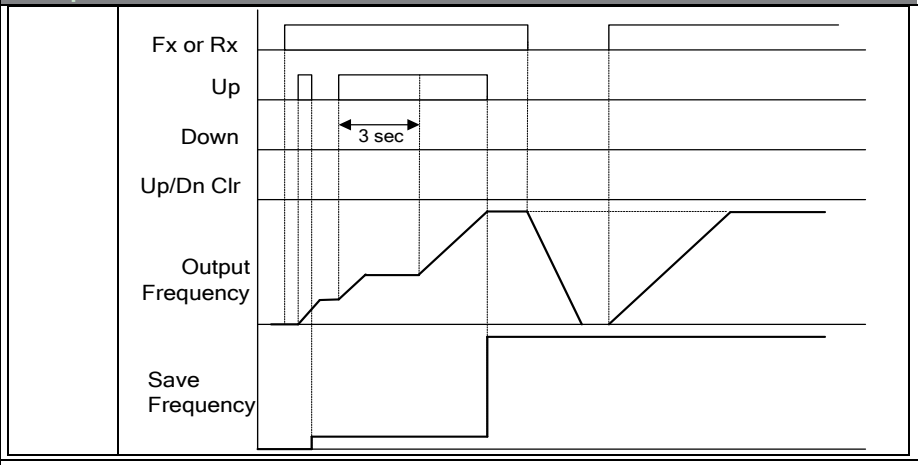
5.2.2 Up-down Mode Setting

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	Frq	Frequency setting method	8	0–8	0	
I/O group	I17	Multi-function input terminal P1 define	0	0–27	0	
	I20	Multi-function input terminal P4 define	15		3	
	I21	Multi-function input terminal P5 define	16		4	
Function group 1	F65	Up-down mode select	-	0–2	0	
	F66	Up-down step frequency	-	0.00– 400.00	0.00	Hz

Up-down Mode Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>F65 Up-down mode select</td><td>
<table>
<tr><th>Setting</th><th>Function</th></tr>
<tr><td>0</td><td>The reference frequency is increased and decreased by the max and min frequency. If a frequency limit is set, speed is increased or decreased to the limit.
 


</td></tr>
<tr><td>1</td><td>The frequency is increased as much as the step frequency configured at F66 when the rising edge of the multi-function input terminal is set to Up. The frequency is decreased as much as the step frequency configured at F66 when the falling edge of the multi-function input terminal is set to Down.
When the multi-function input terminals are set to up and down, the inverter saves the frequency of the falling edge when a stop command is entered.</td></tr>
<tr><td>2</td><td>Combination of 0 and 1 values.
The frequency is increased or decreased as much as the step frequency and is activated for 3 seconds, and then the inverter operates as if the Acc/Dec time is set to 0.</td></tr>
</table>
</td></tr>
</table>

Code	Description
	
F66 Up-down step frequency	Set the up-down step frequency.

Caution

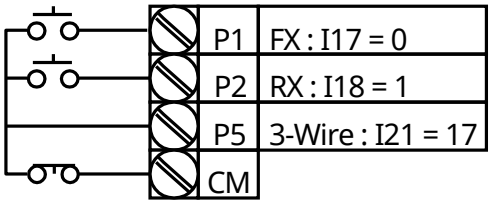
Because of the up-down operation, when the inverter receives the power source before the frequency is increased as much as the one step frequency, the power source is ignored and it saves the frequency of the inactive state.

5.3 3-Wire Operation

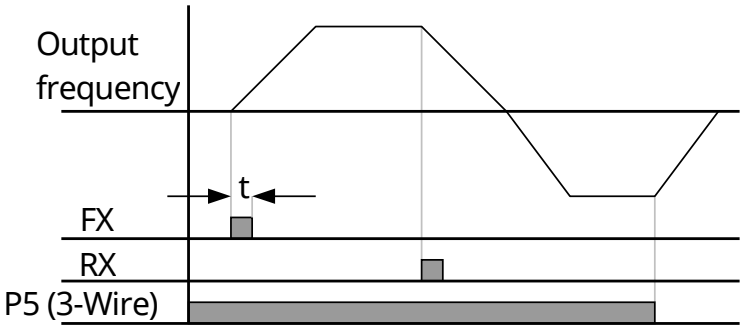
The 3-wire operation latches the signal input (the signal stays on after the button is released), and is used when operating the inverter with a push button.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I17	Multi-function Input terminal P1 define	0	0–27	0	
	–	–				
	I21	Multi-function Input terminal P5 define	17		4	

To enable the 3-wire operation, the following circuit sequence is necessary. The input time (t) for 3-wire operation should be less than 50ms, and the operation stops when both forward and reverse operation commands are entered at the same time.



[Terminal connections for 3-wire operation]



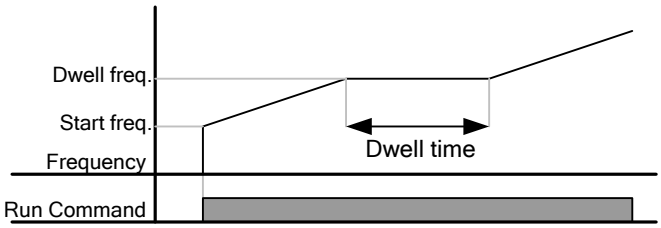
[3-wire operation]

5.4 Dwell Operation

The dwell operation is used to maintain torque during the application and release of the brakes on lift-type loads. Inverter dwell operation is based on the dwell frequency and the dwell time set by the user.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 2	H 7	Dwell frequency	-	0.10–400.00	5.00	Hz
	H 8	Dwell time	-	0.0–10.0	0.0	sec

When an operation command runs, acceleration continues until the acceleration dwell frequency and constant speed is reached within the acceleration dwell operation time (Dwell time). After the dwell time has passed, acceleration is carried out based on the acceleration time and the operation speed that was originally set.



Caution

When a dwell operation is carried out for a lift - type load before its mechanical brake is released, motors can be damaged or their lifecycle reduced due to overflow current in the motor.

5.5 Slip Compensation Operation

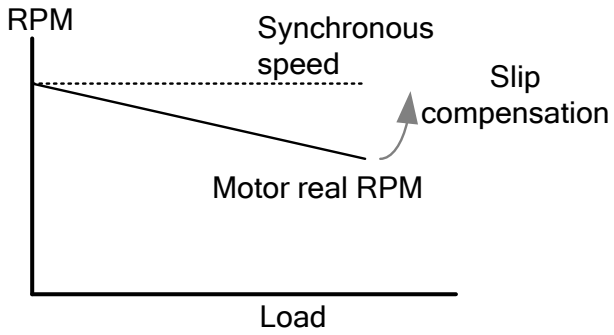
Slip refers to the variation between the setting frequency (synchronous speed) and motor rotation speed. As the load increases there can be variations between the setting frequency and motor rotation speed. Slip compensation is used for loads that require compensation of these speed variations.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 2	H30	Motor type select	-	0.1 0–11.00	0.75	
	H31	Number of motor poles	-	2–12	4	
	H32	Rated slip frequency	-	0.00–10.00	2.33	Hz
	H33	Motor-rated current	-	0.5–150.0	26.3	A
	H34	No load motor current	-	0.1–50.0	11.0	A
	H36	Motor efficiency	-	50–100	87	%
	H37	Load inertia rate	-	0–2	0	
	H40	Control mode select	1	0–3	0	

Slip Compensation Operation Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H30 Motor type</td><td>Set the type of the motor connected to the inverter.
<table>
<tr><td>0.1</td><td>0.1 kW</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td>11.0</td><td>11.0 kW</td></tr>
</table></td></tr>
<tr><td>H31 Pole number</td><td>Enter the number of poles from the motor rating plate.</td></tr>
<tr><td>H32 Rated slip</td><td>Enter the slip frequency in accordance with the following formula and from the motor rating plate.
$$f_s = f_r - \frac{Rpm \times P}{120}$$
f_s=Rated slip frequency
f_r=Rated frequency
rpm=Number of the rated motor rotations
P=Number of motor poles
Ex) Rated freq.: 60Hz, Rated RPM: 1740rpm, Poles: 4,
$$f_S = 60 - \left(\frac{1740 \times 4}{120}\right) = 2\text{Hz}$$</td></tr>
<tr><td>H33 Rated Curr</td><td>Enter the rated current from the motor rating plate.</td></tr>
<tr><td>H34 Noload Curr</td><td>Enter the measured current when the load on the motor axis is removed and when the motor is operated at the rated frequency. If no-load current is difficult to measure, enter a current equivalent to 50% of the rated motor current.</td></tr>
<tr><td>H36 Efficiency</td><td>Enter the efficiency from the motor rating place.</td></tr>
<tr><td>H37 Inertia Rate</td><td>Select load inertia based on motor inertia.
<table>
<tr><td>Setting</td><td>Function</td></tr>
<tr><td>0</td><td>Less than 10 times motor inertia</td></tr>
<tr><td>1</td><td>10 times motor inertia</td></tr>
<tr><td>2</td><td>More than 10 times motor inertia</td></tr>
</table></td></tr>
<tr><td>H40 Control mode select</td><td>Set H40 to 1 (Slip compensation) to carry out the slip compensation operation.</td></tr>
</table>

As the loads are heavier, the speed gap between the rated RPM and synchronous speed widens (see the figure below). This function compensates for this inherent slip.



5.6 PID Control

PID control is one of the most common auto-control methods. It uses a combination of proportional, integral, and differential (PID) control that provides more effective control for automated systems. The functions of PID control that can be applied to the inverter operation are as follows:

Purpose	Function
Speed control	Controls speed by using feedback about the existing speed level of the equipment or machinery to be controlled. Control maintains consistent speed or operates at the target speed.
Pressure control	Controls pressure by using feedback about the existing pressure level of the equipment or machinery to be controlled. Control maintains consistent pressure or operates at the target pressure.
Flow control	Controls flow by using feedback about the amount of existing flow in the equipment or machinery to be controlled. Control maintains consistent flow or operates at a target flow.
Temperature control	Controls temperature by using feedback about the existing temperature level of the equipment or machinery to be controlled. Control maintains a consistent temperature or operates at a target temperature.

5.6.1 PID Basic Operation

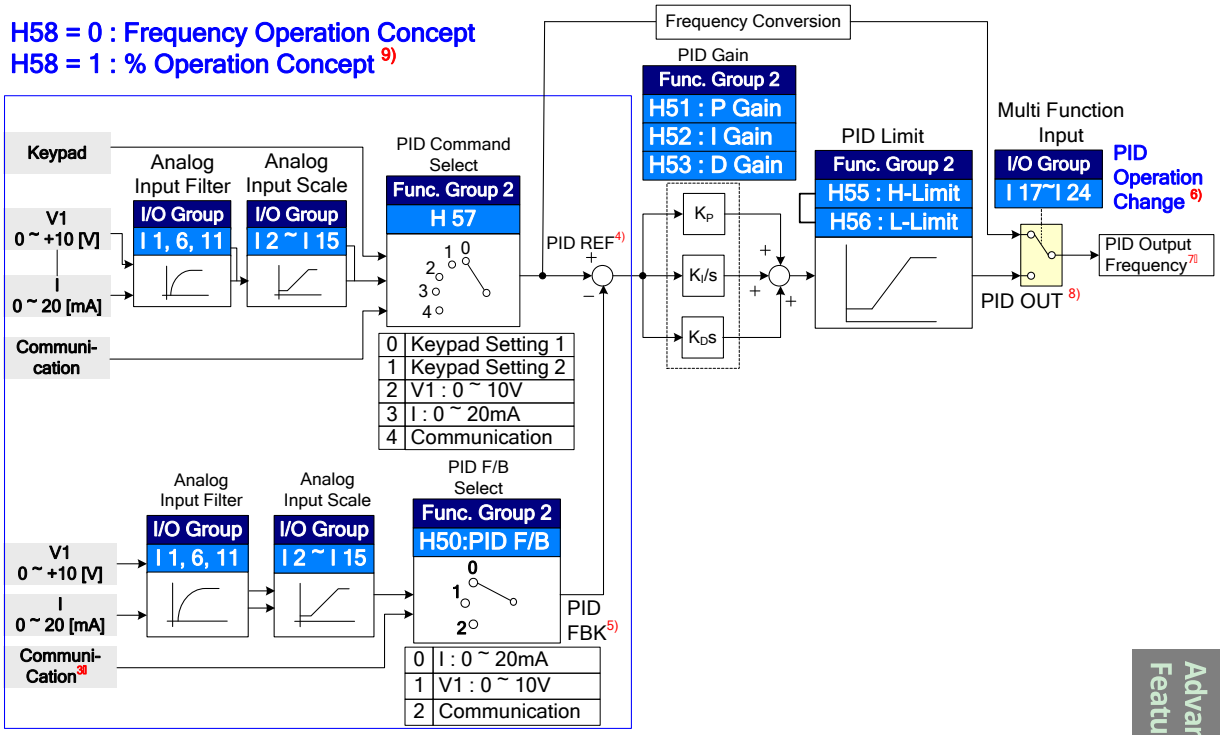
PID operates by controlling the output frequency of the inverter, through automated system process control to maintain speed, pressure, flow, temperature and tension.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 2	H49	PID select	1	0–1	0	-
	H50	PID F/B select	-	0–2	0	-
	H51	P gain for PID	-	0.0–999.9	300.0	%
	H52	Integral time for PID	-	0.1–32.0	1.0	sec
	H53	Differential time for PID (D gain)	-	0.0–30.0	0	sec
	H54	PID control mode select	-	0–1	0	-
	H55	PID output frequency high limit	-	0.1–400.0	60.0	Hz
	H56	PID output frequency low limit	-	0.10–400.00	0.50	Hz
	H57	PID standard value select	-	0–4	0	-
	H58	PID control unit select	-	0–1	0	-
	H61	Sleep delay time	-	0.0–2000.0	60.0	sec
	H62	Sleep frequency	-	0.00–400.00	0.00	Hz
	H63	Wake-up level	-	0.0–100.0	35.0	%
I/O group	I17	Multi-function input terminal P1 define	21	0–27	-	-
Drive group	rEF	PID control standard value setting	-	0.00–400.00 / 0.0–100.0	0.00 / 0.0	Hz / %
	FbK	PID control Feedback amount	-	0.00– 400.00 / 0.0–100.0	0.00 / 0.0	Hz / %

PID Basic Operation Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H49 PID select</td><td>Set the code to 1 to select functions for the process PID. Then, the rEF and FbK codes in the Drive group appear.</td></tr>
<tr><td>H50 PID F/B select</td><td>Select the feedback type of the PID controller.
<table>
<tr><td>Setting</td><td>Function</td></tr>
<tr><td>0</td><td>Terminal I input (0–20[mA])</td></tr>
<tr><td>1</td><td>Terminal AI(V input) (0–10[V])</td></tr>
<tr><td>2</td><td>Communication RS-485</td></tr>
</table></td></tr>
<tr><td>H51 P gain for PID</td><td>Sets the output ratio for differences (errors) between reference and feedback. If the P-gain is set to 50%, then 50% of the error is output.</td></tr>
<tr><td>H52 Integral time for PID</td><td>Sets the time to output accumulated errors. When the error is 100%, the time taken for 100% output is set. When the integral time is set to 1 second, 100% output occurs after 1 second of the error remaining at 100%. Differences in a normal state can be reduced by the integral time.</td></tr>
<tr><td>H53 Differential time for PID (D gain)</td><td>Sets the output volume for the rate of change in errors. If the differential time is set to 1ms and the rate of change in errors per sec is 100 %, output occurs at 1 % per 10 ms.</td></tr>
<tr><td>H54 PID control mode select</td><td>Select 0 (Normal PID) or 1 (Process PID).</td></tr>
<tr><td>H55 PID output frequency high limit
H56 PID output frequency low limit</td><td>Limit the output of the controller.</td></tr>
<tr><td>H57 PID standard value select</td><td>Select the PID reference source.</td></tr>
<tr><td>H58 PID control unit select</td><td>Set the unit of the control variable (available only on the keypad display).
<table>
<tr><td colspan="2">Setting</td><td>Function</td></tr>
<tr><td>0</td><td>Hz</td><td>Displays the inverter output frequency or the motor rotation speed.</td></tr>
<tr><td>1</td><td>%</td><td>Displays a percentage without a physical quantity given.</td></tr>
</table></td></tr>
<tr><td>I17 Multi-function input terminal P1 define</td><td>To exchange PID to V/F control, set one of P1-P5 terminal to 21 (switch between PID control and V/F control).</td></tr>
<tr><td>rEF PID control standard value setting</td><td>Set PID controller’s value at rEF.</td></tr>
<tr><td>FbK PID control Feedback amount</td><td>Feedback amount set at H50 is converted to motor frequency.</td></tr>
</table>

Normal PID drive



1 Adds RS-485 communications to the PID feedback category.

2 PID REF value can be changed and checked at the rEF code of the Drive group. The unit is Hz when H58 is set to 0, or % when H58 is set to 1.

3 The PID feedback value can be checked at the Fbk code of the Drive group. The unit is same with the rEF code.

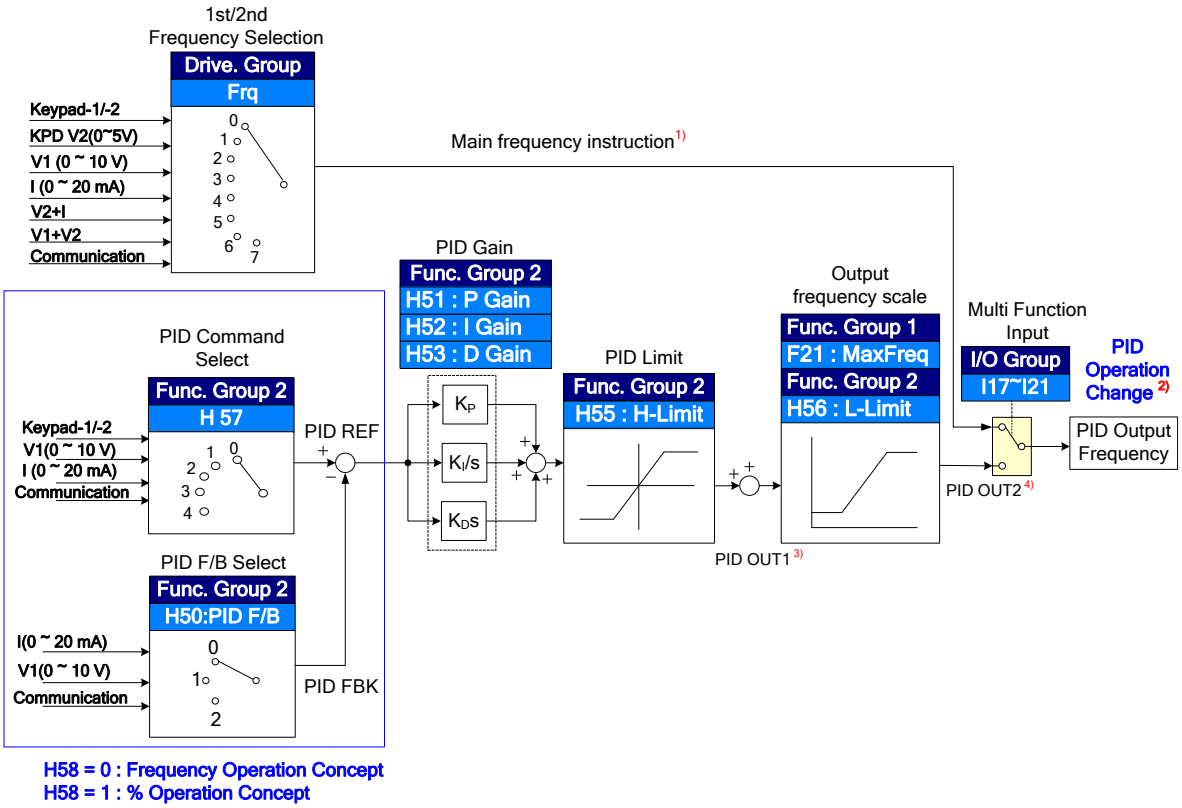
4 When PID switching is set to the multi-function input terminal (P1–P5), the % unit is converted to Hz even though H58 is set to 1 (%).

5 The output frequency is displayed at the SPD code of the Drive group.

6 The PID output of the normal PID is single polarity and it is limited by H55 (PID output frequency high limit) and H56 (PID output frequency low limit).

7 The F21 code (Max frequency) is set to 100 %.

Process PID drive



1 The speed command is the frequency (FRQ=8, except Up/Down) set at FRQ and FRQ2. The real output frequency is the sum of the speed command, PID output1, and PID output2.

2 If PID switching drive is selected, the actual output frequency is speed.

3 Differing from normal PID, PID OUT1's polarity is double in the module, and it is limited by H55 (PID output frequency high limit).

4 The real output frequency PID OUT2 is limited by F21 (Max frequency) and H56 (PID output frequency low limit).

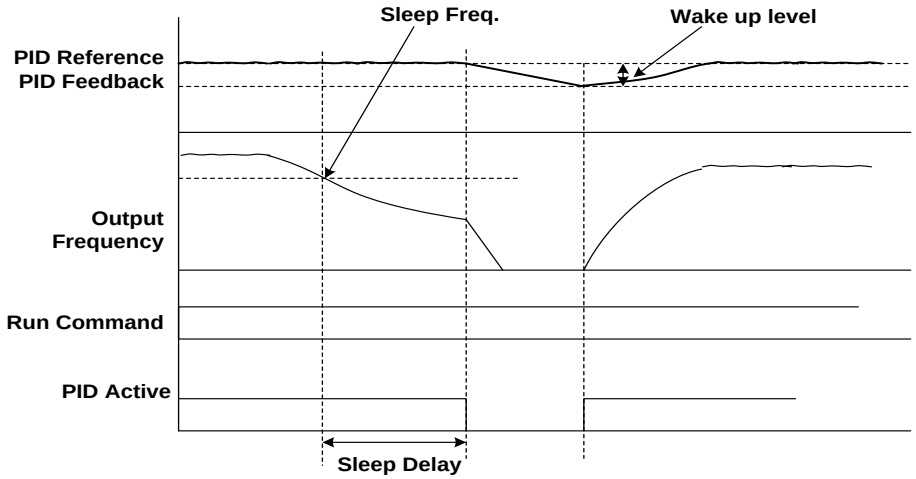
Other operations are same as normal PID.

5.6.2 PID Operation Sleep Mode

If the operation continues at a frequency lower than the set condition for PID operation, the PID operation sleep mode starts. When PID operation sleep mode starts, the operation will stop until the feedback exceeds the parameter value set at H63 (Wake up Level).

PID Operation Sleep Mode Setting Details

Code	Description
H61 Sleep delay time H62 Sleep frequency	If an operation frequency lower than the value set at H62 is maintained for the time set at H61, the operation stops and the PID operation sleep mode starts.
H63 Wake up level	Starts the PID operation when in PID operation sleep mode.



5.7 Auto Tuning

The motor parameters can be measured automatically and can be used for auto torque boost or sensorless vector control.

Auto Tuning Default Parameter Setting

Motor Capacity (kW)		Rated Current (A)	No-load Current (A)	Rated Slip Frequency(Hz)	Stator Resistor (Ω)	Leakage Inductance (mH)
200V	0.1	0.6	0.4	2.00	30.00	240.00
	0.2	1.1	0.6	2.33	14.00	122.00
	0.4	1.8	1.2	3.00	6.7	61.00

Motor Capacity (kW)		Rated Current (A)	No-load Current (A)	Rated Slip Frequency(Hz)	Stator Resistor (Ω)	Leakage Inductance (mH)
	0.75	3.5	2.1	2.33	2.46	28.14
	1.1	4.8	2.1	2.33	2.46	28.14
	1.5	6.5	3.0	2.33	1.13	14.75
	2.2	8.8	4.4	2.00	0.869	11.31
	3.0	11.6	4.4	2.00	0.869	11.31
	3.7	12.9	4.9	2.33	0.5	5.41
	4.0	14.6	4.9	2.33	0.5	5.41
	5.5	19.7	6.6	2.33	0.314	3.6
	7.5	26.3	11.0	2.33	0.196	2.89
	11.0	37.0	12.5	1.33	0.120	2.47
400V	0.1	0.4	0.3	2.00	56.00	600.00
	0.2	0.7	0.4	2.33	28.00	300.00
	0.4	1.1	0.7	3.00	14.00	177.86
	0.75	2.0	1.3	2.33	7.38	88.44
	1.1	2.4	1.3	2.33	7.38	88.44
	1.5	3.7	2.1	2.33	3.39	44.31
	2.2	5.1	2.6	2.00	2.607	34.21
	3.0	5.8	2.6	2.00	2.607	34.21
	3.7	6.5	3.3	2.33	1.5	16.23
	4.0	8.4	3.3	2.33	1.5	16.23
	5.5	11.3	3.9	2.33	0.94	10.74
	7.5	15.2	5.7	2.33	0.52	8.80
	11.0	22.6	7.5	1.33	0.36	7.67

Auto Tuning Parameter Setting Details

Code	Description
H41 Auto tuning	Press the [STOP/RESET] key on the keypad for 5 seconds to start the auto tuning. Press the [STOP/RESET] key or turn on the EST terminal to stop the auto tuning.
H42 Stator resistance (Rs) H44 Leakage inductance (Lσ)	The values of motor stator resistance and leakage inductance detected at H41 are displayed, respectively. When auto tuning is skipped or H93 (Parameter initialize) is performed, the default value corresponding to motor type (H30) will be displayed.

ⓘ Caution

- Perform auto tuning ONLY after the motor has completely stopped running.
- Before you perform auto tuning, check the motor pole number, rated slip, rated current, rated voltage, and efficiency on the motor's rating plate and enter the data. The default parameter

setting is used for values that are not entered.

- If auto tuning is interrupted, the default value will be set. If auto tuning of inductance leakage is interrupted, the measured value is used and the default of inductance leakage is set.
- Do not enter any incorrect values for stator resistance and leakage inductance. Otherwise, the function of sensorless vector control and auto torque boost may deteriorate.

5.8 Sensorless Vector Control

Sensorless vector control is an operation to carry out vector control without the rotation speed feedback from the motor but with an estimation of the motor rotation speed calculated by the inverter. Compared to V/F control, sensorless vector control can generate greater torque at a lower level of current.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H40	Control mode select	3	0–3	0	-
	H30	Motor type select	-	0.1–11.0	-	Kw
	H32	Rated slip frequency	-	0–10	-	Hz
	H33	Motor-rated current	-	0.5–150	-	A
	H34	No load motor current	-	0.1–50	-	A
	H42	Stator resistance (Rs)	-	0–56	-	Ω
	H44	Leakage inductance (Lσ)	-	0–600.0	-	mH
Function Group 1	F14	Time for magnetizing a motor	-	0.0–60.0	0.5	sec

ⓘ Caution

For high-performance operation, the parameters of the motor connected to the inverter output must be measured. Use auto tuning (H41) to measure the parameters before you run sensorless vector operation. To run high-performance sensorless vector control, the inverter and the motor must have the same capacity. If the motor capacity is smaller than the inverter capacity by more than two levels, control may be inaccurate. In that case, change the control mode to V/F control. When operating with sensorless vector control, do not connect multiple motors to the inverter output.

Sensorless Vector Control Operation Setting Details

Code	Description
H40 Control mode	Set H40 to 3 to enable sensorless vector control mode.
H30 Motor type	Set the motor type connected to the inverter output.
H32 Rated slip frequency	Enter the rated slip frequency based on the motor nameplate RPM and

Code	Description
	rated frequency. If the speed is too slow or fast, increase or decrease H32 by 5% each time.
H33 Motor-rated curr	Enter the motor nameplate rated current.
H34 No load motor curr	To measure the motor current in the no-load state, remove the load from the motor shaft, set H40 to 0, and then run the motor at 60 Hz. Enter the displayed current in CUr (Output current) at H34. (If it is difficult to remove the load, enter the estimated value, which is either 40–50% of H33 or the factory default). If torque riffle occurs during high-speed driving, lower H34 to 30%. If the output torque is too low, increase H34 by 0.1A each time.
H42 Stator resistance (Rs) H44 Leakage inductance (Lσ)	Enter the value of the parameter measured at H41 (Auto tuning) or the factory default.
F14 Time for magnetizing a motor	This parameter accelerates the motor after pre-exciting the motor for the set time. The amount of pre-exciting current is set at H34.

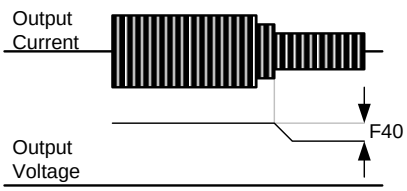
Note

Excitation Current
A motor can be operated only after magnetic flux is generated by current flowing through a coil. The power supply used to generate the magnetic flux is called the excitation current. The stator coil that is used with the inverter does not have a permanent magnetic flux, so the magnetic flux must be generated by supplying an excitation current to the coil before operating the motor.

5.9 Energy Saving Operation

If the inverter output current is lower than the current which is set at H34, the output voltage must be reduced as low as the level set at F40. The voltage before the energy saving operation starts will become the base value of the percentage. The energy saving operation will not be carried out during acceleration and deceleration.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F40	Energy-saving level	-	0–30	0	%



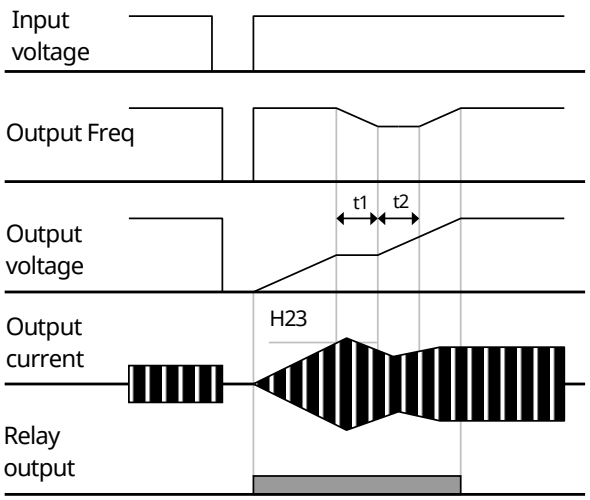
5.10 Speed Search Operation

This operation is used to prevent fault trips that can occur while the inverter output voltage is disconnected and the motor is idling. Because this feature estimates the motor rotation speed based on the inverter output current, it does not give the exact speed.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H22	Speed search select	-	0–15	0	
	H23	Current level during speed search	-	80–200	150	%
	H24	P gain during speed search	-	0–9999	100	
	H25	I gain during speed search	-	0–9999	200	
I/O Group	I55	Multi-function relay select	15	0–19	17	

Speed Search Operation Setting Details

Code	Description
H22 Speed search select	Speed search can be selected from the following 4 options. **Type and Functions of Speed Search Setting** Setting (bit3 / bit2 / bit1 / bit0) — Function bit0 ✓ — Speed search for general acceleration bit1 ✓ — Initialization after a fault trip bit2 ✓ — Restart after instantaneous power interruption bit3 ✓ — Starting with power-on • **Speed search for general acceleration**: If bit 0 is set to 1 or another odd parameter setting and the inverter operation command runs, acceleration starts with the speed search operation. When the motor is rotating under load, a fault trip may occur if the operation command is run for the inverter to provide output voltage. The speed search function prevents such fault trip from occurring. • **Initialization after a fault trip**: If bit 1 is set to 2, 3, 6, 7, 10, 11, 14, or 15 and H21 [Restart after fault reset] is set to 1, the speed search operation automatically accelerates the motor to the operation frequency used before the fault trip, when the [STOP/RESET] key is

Code	Description
	pressed (or the terminal block is initialized) after a fault trip. • **Automatic restart after reset of a fault trip**: If bit 2 is set to 4–7 or 12–15, and if a low voltage trip occurs due to a power interruption but the power is restored before the internal power shuts down, the speed search operation accelerates the motor back to its frequency reference before the low voltage trip. If an instantaneous power interruption occurs and the input power is disconnected, the inverter generates a low voltage trip and blocks the output. When the input power returns, the operation frequency before the low voltage trip and the voltage is increased by the inverter's inner PI control. If the current increases above the value set at H23, the voltage stops increasing and the frequency decreases (t1 zone). If the current decreases below the value set at H23, the voltage increases again and the frequency stops decelerating (t2 zone). When the normal frequency and voltage are resumed, the speed search operation accelerates the motor back to its frequency reference before the fault trip.  • **Starting with power-on:** Set bit 3 to 8–15 and H20 [Power ON Start] to 1. If inverter input power is supplied while the inverter operation command is on, the speed search operation will accelerate the motor up to the frequency reference.
H23 Current level during speed search	The amount of current flow is controlled during speed search operation based on the motor's rated current.
H24 P gain during speed search H25 I gain during speed	The P/I gain of the speed search controller can be adjusted.

Code	Description
search	

Note

- If operated within the rated output, the C100 series inverter is designed to withstand instantaneous power interruptions within 15 ms and maintain normal operation. Based on the rated heavy load current, safe operation during an instantaneous power interruption is guaranteed for 200V and 400V inverters (whose rated input voltages are 200–230 VAC and 380–460 VAC respectively).
- The DC voltage inside the inverter may vary depending on the output load. If the power interruption time is longer than 15 ms, a low voltage trip may occur.

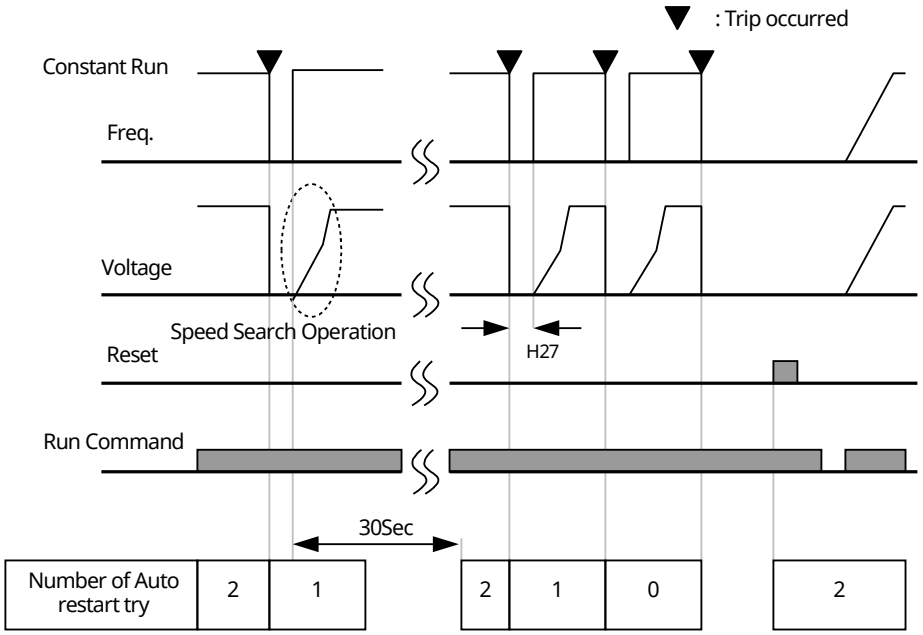
5.11 Auto Restart Settings

When inverter operation stops due to a fault and a fault trip is activated, the inverter automatically restarts based on the parameter settings.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H26	Number of auto restart try	-	0–10	0	
	H27	Auto restart time	-	0.0–60.0	1.0	sec

Auto Restart Setting Details

Code	Description
H26 Number of auto restart try, H27 Auto restart time	The number of attempts to try the auto restart is set at H26. If a fault trip occurs during operation, the inverter automatically restarts after the set time programmed at H27. At each restart, the inverter counts the number of tries and subtracts it from the number set at H26 until the retry number count reaches 0. After an auto restart, if a fault trip does not occur within 30 sec, it will increase the restart count number. The maximum count number is limited by the number set at H26. If the inverter stops due to low voltage, an emergency stop (Bx), the inverter overheating, or hardware diagnosis, an auto restart is not activated. At auto restart, the acceleration options are identical to those of speed search operation. Codes H22–25 can be set based on the load. Information about the speed search function can be found at *5.10 Speed Search Operation* on page *111*.



[Example of auto restart with a setting of 2]

ⓘ Caution

If the auto restart number is set, be careful when the inverter resets after a fault trip. The motor may automatically start to rotate.

5.12 Operational Noise Settings (carrier frequency settings)

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H39	Carrier Frequency	-	1–15	5 (0.1–3.7KW) 3 (5.5–7.5KW)	kHz
	H48	PWM* mode select	1	0–1	0	-

* PWM: Pulse width modulation

Operational Noise Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H39 Carrier Frequency</td><td>Adjust motor operational noise by changing carrier frequency settings. Power transistors (IGBT) in the inverter generate and supply high-frequency switching voltage to the motor. The switching speed in this process refers to the carrier frequency. If the carrier frequency is set high, it reduces operational noise from the motor, and if the carrier frequency is set low, it increases operational noise from the motor.
<table>
<tr><td rowspan="2">Item</td><td colspan="2">Carrier frequency</td></tr>
<tr><td>1.0 kHz</td><td>15.0 kHz</td></tr>
<tr><td>Low Carrier Frequency</td><td>High Carrier Frequency</td></tr>
<tr><td>Motor noise</td><td>↑</td><td>↓</td></tr>
<tr><td>Heat generation</td><td>↓</td><td>↑</td></tr>
<tr><td>Noise generation</td><td>↓</td><td>↑</td></tr>
<tr><td>Leakage current</td><td>↓</td><td>↑</td></tr>
</table></td></tr>
<tr><td>H48 PWM mode select</td><td>The heat loss and leakage current from the inverter can be reduced by changing the load rate option at H48. Selecting 1 (2 phase PWM mode) reduces heat loss and leakage current, compared to when 0 (Normal PWM mode) is selected. However, it increases the motor noise.</td></tr>
</table>

Note

Carrier Frequency at Factory Default Settings (0.1–7.5 Kw)

- Heavy load: 5 kHz (Max 15 kHz)
- Normal load: 2 kHz (Max 5 kHz)

C100 Series Inverter Derating Standard

- The C100 inverter is designed to respond to two types of load rates: heavy load (heavy duty) and

normal load (normal duty). The overload rate represents an acceptable load amount that exceeds the rated load, and is expressed in a ratio based on the rated load and the duration. The overload capacity on the C100 series inverter is 150%/1min for heavy loads, and 110%/1min for normal loads.

- Guaranteed carrier frequency for current rating by load.

Inverter capacity	Normal load	Heavy load
0.1–7.5 kW	2 kHz	5 kHz

5.13 2nd Motor Operation

The second motor operation is used when a single inverter switch operates two motors. Using the second motor operation, a parameter for the second motor is set. The second motor is operated when a multi-function terminal input defined as a second motor function is turned on.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O Group	I17–I20	Multi-function input terminal (P1–P4) define	-	0–27	0	-
	I21	Multi-function input terminal P5 define	12		4	-

Second Motor Operation Setting Details

Code	Description
I17–21	Set one of the multi-function input terminals (P1–P5) to display M2 (second motor group) group. An input signal sent to a multi-function terminal set as the second motor will operate the motor according to the code settings listed below. However, if the inverter is in operation, input signals to the multi-function terminals will not read as a second motor parameter. To define terminal P5 as second motor operation, set I21 to 12 in the I/O group.

Parameter Setting at Multi-function Terminal Input on a Second Motor

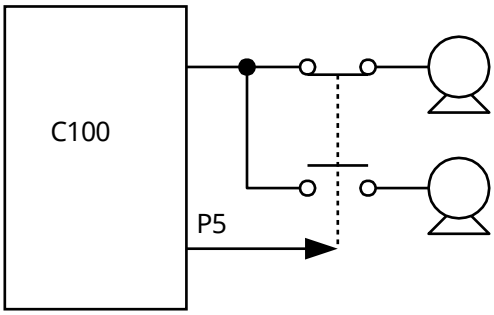
Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H81	2nd motor Accel time	-	0.0–6000.0	5.0	sec
	H82	2nd motor Decel time	-	0.0–6000.0	10.0	sec
	H83	2nd motor base frequency	-	30.00–400.00	60.00	Hz
	H84	2nd motor V/F pattern	-	0–2	0	
	H85	2nd motor forward	-	0–15	5	%

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
		Torque boost				
	H86	2nd motor reverse Torque boost	-	0–15	5	%
	H87	2nd motor Stall prevention level	-	30–150	150	%
	H88	2nd motor Electronic thermal level for 1 min	-	50–200	150	%
	H89	2nd motor Electronic thermal level for continuous	-	50–150	100	%
	H90	2nd motor rated current	-	0.1–100.0	26.3	A

Example - 2nd Motor Operation

When using two motors with an inverter by exchanging them, select one motor from the two connected motors. When the first selected motor operation is stopped, select a terminal for the second motor and define H81-90 parameters to drive the second motor. Define the second motor parameters when a motor is stopped.

Use the second motor operation when switching operation between a 7.5 kW motor and a secondary 3.7 kW motor connected to terminal P3. Refer to the following settings.



5.14 Load Level Settings

This inverter is designed to respond to two types of load rates: heavy load (heavy duty) and normal load (normal duty).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F72	ND/HD selection	-	0–1	0	

Load Level Setting Details

Code	Description
F72 ND/HD selection	Select the load level.

Setting		Function
0	HD (CT) heavy load	Used in heavy loads, like hoists, cranes, and parking devices (overload tolerance: 150% of rated heavy load current for 1 minute).
1	ND (VT) light load	Used in underloads, like fans and pumps (overload tolerance: 110% of rated underload current for 1 minute).

Caution

Depending on the load level (F72), the overload capacity and rated current of three-phase inverters are different. A single-phase inverter is only applicable for HD.

5.15 2nd Operation Mode Settings

Apply two types of operation modes and switch between them as required. For both the first and second command source, set the frequency after shifting operation commands to the multi-function input terminal. Mode switching can be used to stop remote control during an operation using the communication option and to switch operation mode to operate via the local panel, or to operate the inverter from another remote control location.

Select one of the multi-function terminals from codes I17–21 and set the parameter value to 22 (2nd source).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive Group	drv	Drive mode	-	0–3	1	
	Frq	Frequency setting method	-	0–8	0	
	drv2	Drive mode 2	-	0–3	1	
	Frq2	Frequency setting method 2	-	0–7	0	
I/O Group	I17–21	Multi-function input terminal (P1–P5) define	22	0–27		

2nd Operation Mode Setting Details

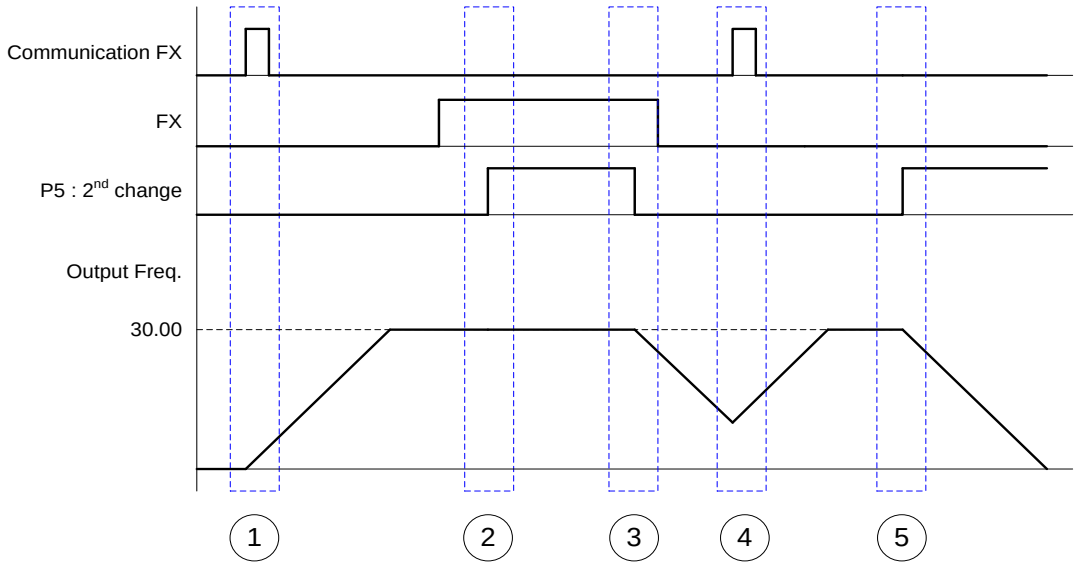
<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>drv2 Drive mode 2</td><td>If signals are provided to the multi-function terminal set as the second command source, the operation can be performed using the set value from drv2 instead of the set value from the drv code.
<table>
<tr><td colspan="2">Setting</td><td>Function</td></tr>
<tr><td>0</td><td>-</td><td>Operation via [Run/Stop] key on the keypad</td></tr>
<tr><td rowspan="2">1</td><td rowspan="4">Terminal Operation</td><td>FX: Forward run command</td></tr>
<tr><td>RX: Reverse run command</td></tr>
<tr><td rowspan="2">2</td><td>FX: Run/Stop command</td></tr>
<tr><td>RX: Forward/Reverse command</td></tr>
<tr><td>3</td><td>-</td><td>Operation via communication RS-485</td></tr>
</table></td></tr>
<tr><td>Frq2 Frequency setting method 2</td><td>If signals are provided to the multi-function terminal set as the second command source, the operation can be performed using the set value from Frq2 instead of the set value from the Frq code.
<table>
<tr><td colspan="2">Setting</td><td>Function</td></tr>
<tr><td>0</td><td rowspan="2">Digital</td><td>Keypad digital frequency mode 1</td></tr>
<tr><td>1</td><td>Keypad digital frequency mode 2</td></tr>
<tr><td>2</td><td rowspan="5">Analog</td><td>V2 potentiometer: 0–5V</td></tr>
<tr><td>3</td><td>AI terminal (J1 to V): 0–10V</td></tr>
<tr><td>4</td><td>AI terminal (J1 to I): 0–20Ma</td></tr>
<tr><td>5</td><td>V2 potentiometer + AI terminal (J1 to I) set</td></tr>
<tr><td>6</td><td>V2 potentiometer + AI terminal (J1 to V) set</td></tr>
<tr><td>7</td><td>-</td><td>Operates via communication RS-485</td></tr>
</table></td></tr>
</table>

Example - 2nd operation mode

When using two motors with an inverter by exchanging them, select one motor from the two connected motors. When the first selected motor operation is stopped, select a terminal for the second motor and define H81–90 parameters to drive the second motor. Define the second motor parameters when a motor is stopped.
Use the second motor operation when switching operation between a 7.5 kW motor and a secondary 3.7 kW motor connected to terminal P3. Refer to the following settings.

The following is an example of switching from drive 1 to 2. Refer to the following settings in the table below and the figure that indicates the second operation based on the parameter settings of the table. (Command frequency=30 Hz, F4=0)

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive Group	drv	Drive mode	3	0–3	1	
	Frq	Frequency setting method	0	0–8	0	
	drv2	Drive mode 2	1	0–3	1	
	Frq2	Frequency setting method 2	0	0–7	0	
I/O Group	I21	Multi-function input terminal P5 define	22	0–27	7	



- ①: Inputs the run command (Communication FX signal) and starts accelerating up to the setting frequency (30 Hz) in Drive mode 1.
- ②: Drives continuously in Drive mode 1 and changes into Drive mode 2 when the P5 terminal input (second command) is on.
- ③: Changes into Drive mode 1 and stops gradually when the P5 terminal input (second command) is off.
- ④: Accelerates again up to the setting frequency (30Hz) in Drive mode 1 when the run command (Communication FX signal, first command) is on.
- ⑤: Changes into Drive mode 2 and stops gradually when the P5 terminal input (second command) is on.

Caution

- When setting the multi-function terminal to the 2nd command source and input (On) signal, operation state is changed because the frequency setting and the operation command will be changed to the 2nd command. Before shifting input to the multi-function terminal, ensure that the 2nd command is correctly set. Note that if the deceleration time is too short or inertia of the load is too high, an overvoltage fault trip may occur.
- Depending on the parameter settings, the inverter may stop operating when you switch the command modes.

5.16 Overvoltage Trip Prevention During Deceleration and Power Braking

The inverter has a protective function that prevents overvoltage trip when reducing speed. Also, when the inverter's DC voltage rises above a specified level due to motor regenerated energy, a control is made to either adjust the deceleration gradient level or reaccelerate the motor in order to reduce the regenerated energy. Power braking can be used when short deceleration times are needed without brake resistors, or when optimum deceleration is needed without causing an overvoltage fault trip.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F 4	Stop mode select	3	0–3	0	
	F59	Stall prevention select	-	0–7	0	
	F61	When stall prevention during deceleration, voltage limit select	-	0–1	0	

Power Braking and Stall Prevention Function Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>F 4 Stop mode select</td><td>Set F 4 to 3 to enable power braking.</td></tr>
<tr><td>F59 Stall prevention select</td><td>Stall prevention can be configured for acceleration, deceleration, or while operating a motor at constant speed.
<table>
<tr><th colspan="3">Setting</th><th rowspan="2">Function</th></tr>
<tr><th>bit 2</th><th>bit 1</th><th>bit 0</th></tr>
<tr><td></td><td></td><td>✓</td><td>Stall protection during acceleration</td></tr>
<tr><td></td><td>✓</td><td></td><td>Stall protection while operating at a constant speed</td></tr>
<tr><td>✓</td><td></td><td></td><td>Stall protection during deceleration</td></tr>
</table></td></tr>
</table>

Code	Description
F61 When stall prevention during deceleration, voltage limit select	Visible only when F59 is set to bit 2.

Caution

- To prevent overheating or damaging the motor, do not apply power braking to the loads that require frequent deceleration.
- Stall prevention and power braking only operate during deceleration, and power braking takes priority over stall prevention. In other words, when both F59 and F 4 (Power braking) are both set, power braking will take precedence and operate.
- Note that if deceleration time is too short or inertia of the load is too great, an overvoltage fault trip may occur.
- Note that if a free run stop is used, the actual deceleration time can be longer than the pre-set deceleration time.

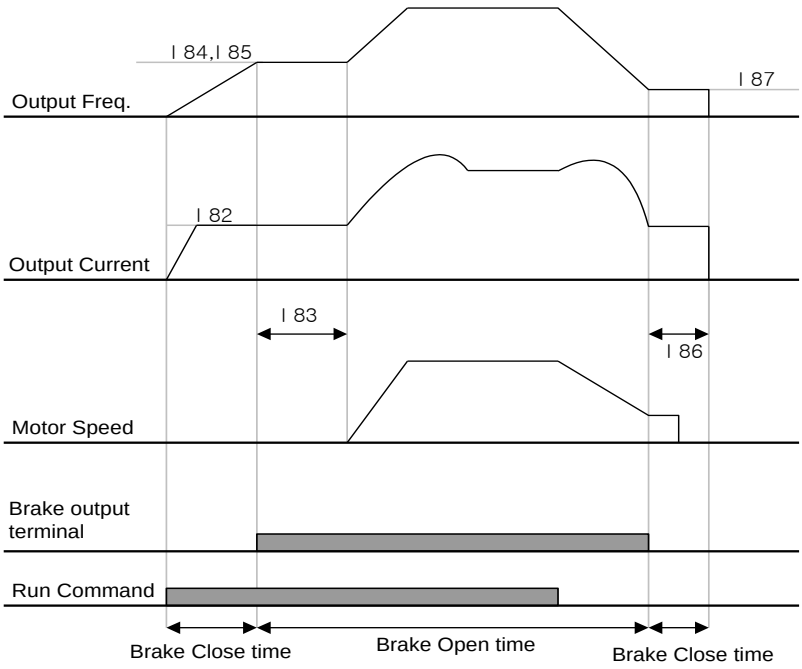
5.17 Brake Control

Brake control is used to control the On/Off operation of the electronic brake load system. The parameter setting will be 0 (V/F control) for the control pattern (H40). The control pattern and order shall be confirmed before use.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H40	Control mode select	0	0–3	0	
I/O Group	I82*	Brake open current	-	0.0–180.0	50.0	%
	I83*	Brake open delay time	-	0.00–10.00	1.00	sec
	I84*	Brake open FX frequency	-	0.00–400.00	1.00	Hz
	I85*	Brake open RX frequency	-	0.00–400.00	1.00	Hz
	I86*	Brake close delay time	-	0.00–10.00	1.00	sec
	I87*	Brake close frequency	-	0.00–400.00	2.00	Hz
	I55	Multi-function relay select	19	0–19	17	

*I82–87 is visible only when I55 is set to 19.

- **Brake release sequence:** During the motor stop state, if an operation command is entered, the inverter accelerates up to the brake release frequency (I84, I85) in a forward or in a reverse direction. After reaching the brake release frequency, if the motor current reaches the brake release current (I82), the output relay or multi-function output terminal for brake control sends a release signal. Once the signal has been sent, acceleration will begin after maintaining the frequency for brake release delay time.
- **Brake engage sequence:** If a stop command is sent during operation, the motor decelerates. Once the output frequency reaches the brake engage frequency (I87), the motor stops decelerating and sends out a brake engage signal to a preset output terminal. The frequency is maintained for the brake engage delay time (I86) and will become 0 afterwards. If DC braking time (F11) and DC braking resistance (F12) are set, inverter output is blocked after DC braking. For DC braking, refer to *4.16.2 Start After DC Braking* on page *90*.



Control method: V/F constant speed operation

5.18 Kinetic Energy Buffering Operation

When the input power supply is disconnected, the inverter's DC link voltage decreases, and a low voltage trip occurs and blocks the output. A kinetic energy buffering operation uses regenerative energy generated by the motor during the blackout to maintain the DC link voltage. This extends the time for a low voltage trip to occur after an instantaneous power interruption.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H64	KEB drive select	1	0–1	0	
	H65	KEB action start level	-	110.0–140.0	130.0	-
	H66	KEB action stop level	-	110.0–145.0	135.0	%
	H67	KEB action gain	-	1–20000	50	-
	H37	Load inertia rate	0	0–2	0	-

Kinetic Energy Buffering Operation Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H64 KEB drive select</td><td>Select the kinetic energy buffering operation when the input power is disconnected.
<table>
<tr><td colspan="2">Setting</td><td>Function</td></tr>
<tr><td>0</td><td>No</td><td>General deceleration is carried out until a low voltage trip occurs.</td></tr>
<tr><td>1</td><td>Yes</td><td>The inverter power frequency is controlled and the regeneration energy from the motor is charged by the inverter.</td></tr>
</table></td></tr>
<tr><td>H65 KEB action start level, H66 KEB action stop level</td><td>Sets the start and stop points of the kinetic energy buffering operation. The set values must be based on the low voltage trip level as 100%, and the stop level (H66) must be set higher than the start level (H65).</td></tr>
<tr><td>H67 KEB action gain</td><td>This is the gain used to control the kinetic energy buffering operation using the amount of load-side inertia. If the load inertia is high, use a lower gain value, and if the load inertia is low, use a higher gain value.
If input power is disconnected and the motor vibrates severely while the kinetic energy buffering operation is carried out, set the gain (H67) at half of the previously set value. If the gain is lowered too much, a low voltage trip may occur during the kinetic energy buffering operation (KEB).</td></tr>
</table>

ⓘ Caution

Depending on the duration of instantaneous power interruptions and the amount of load-side inertia, a low voltage trip may occur even during a kinetic energy buffering operation. Motors may vibrate during the kinetic energy buffering operation for some loads except variable torque load (for example, fan or pump loads).

5.19 Draw Operation

Draw operation is an open loop tension control. This feature allows a constant tension to be applied to the material that is drawn by a motor-driven device by fine-tuning the motor speed using operation frequencies that are proportional to a ratio of the main frequency reference.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F70	Draw run mode select	-	0–3	0	-
	F71	Draw rate	-	0.0–100.0	0.0	%

Draw Operation Setting Details

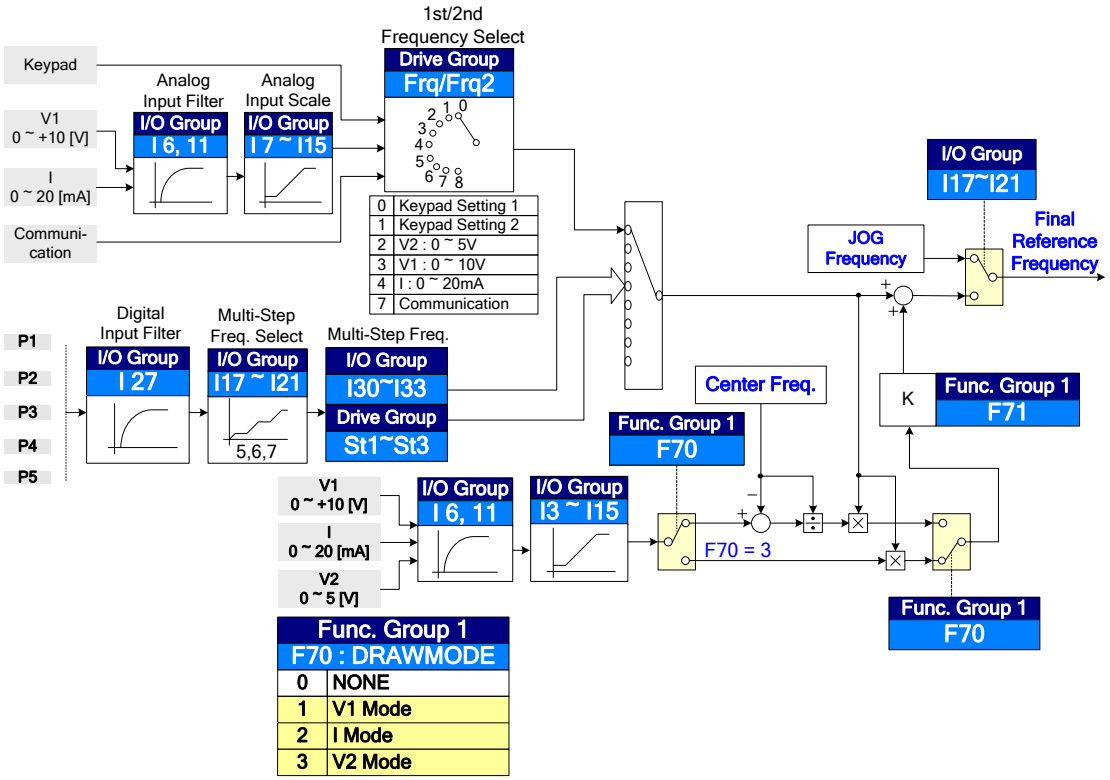
Code	Description
F70 Draw run mode select	Set the input type to be used for the Draw operation. Depending on the input type, the output frequency is determined.

Setting		Function
0	None	Draw operation is disabled.
1	V1	Sets the V1 (voltage, 0–10 V) terminal as the source of Draw operation.
2	I	Sets the I (current, 0–20 mA) terminal as the source of Draw operation.
3	V2	Sets the V2 (voltage, 0–5 V) terminal as the source of Draw operation.

Example - Draw Operation

Refer to the table to see how the calculations apply to an example where Draw operation mode has been set to 0, and the inverter is operating at a main reference frequency of 30.00 Hz. Signals at -10–+10V are received at terminal V1, with the Draw ratio set at 10%. In this example, the resulting reference frequency is fine-tuned within the range of 27.00–33.00 Hz.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F70	Draw run mode select	1	0–3	0	-
	F71	Draw rate	10	0.0–100.0	0.0	%



Note

Draw operation command does not work if the settings for Frq or Frq2 are selected.

5.20 Cooling Fan Control

This function turns the inverter's heat-sink cooling fan on and off. It is used in situations where the load stops and starts frequently, or when noise-free environment is required. Correct usage of cooling fan control can extend the cooling fan's life.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H77	Cooling fan control	1	0–1	0	-

Cooling Fan Control Detail Settings

Code	Description
H77 Cooling fan control	Settings: 0 (Always on) — Cooling fan runs constantly if the power is supplied to the inverter. Settings: 1 (During run) — Cooling fan runs when the power is supplied to the inverter and the operation command is on. The cooling fan stops when the power is supplied to the inverter and the operation command is off. When the inverter heat sink temperature is higher than its set value, the cooling fan operates automatically regardless of its operation status.

Note

Even if you set H77 to 0, if the heat sink temperature reaches a set level by current input harmonic wave or noise, the cooling fan may run as a protection function.

5.21 Fan Fault Detection

Set the cooling fan operation mode when a cooling fan error is detected.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H78	Operation method when cooling fan malfunctions	-	0–1	0	-
I/O group	I55	Multi-function relay select	18	0–19	17	

Fan Fault Detection Setting Details

Code	Description
H78 Operation method when cooling fan malfunctions	Set the cooling fan fault mode. 0: Inverter output is blocked and the fan error signal is output when a cooling fan error is detected. 1: When I55 is set to 17 (Fault output) or 18 (Fan alarm), the fan error signal is output and operation continues.
I55 Multi-function relay select	When the code value is set to 17 (Fault output) or 18 (Fan alarm), the fan error signal is output and operation continues. If I55 is set to 17, the fault message is displayed on the keypad display. If I55 is set to 18, the fault alarm signal is output. However, when the inverter's internal temperature rises above a certain level, output is blocked due to the activation of overheat protection.

5.22 Input Voltage Settings

Set the inverter input power voltage at F67 or F68. The low-voltage fault trip level changes automatically to the set voltage standard.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F67	200V input voltage	-	170–240	220	V
	F68	400V input voltage	-	320–480	380	V

5.23 Parameter Initialization

User changes to parameters can be initialized (reset) to the factory default settings on all groups or just selected groups. However, during a fault trip or operation, parameters cannot be initialized.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H93	Parameter initialize	-	0–5	0	-

Parameter Initialization Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H93 Parameter initialize</td><td>
<table>
<tr><th colspan="2">Setting</th><th>Function</th></tr>
<tr><td>0</td><td>No</td><td>-</td></tr>
<tr><td>1</td><td>Initialize all groups</td><td>Initialize all data. Select 1 and press the [Enter] key to start initialization. On completion, 0 will be displayed.</td></tr>
<tr><td>2</td><td>Initialize drive group</td><td rowspan="4">Initialize data by groups. Select a group to initialize and press the [Enter] key to start initialization. On completion, 0 will be displayed.</td></tr>
<tr><td>3</td><td>Initialize function group 1</td></tr>
<tr><td>4</td><td>Initialize function group 2</td></tr>
<tr><td>5</td><td>Initialize I/O group</td></tr>
</table>
</td></tr>
</table>

Note

If "TUNW and RSER" or "TUNW and LSER" is shown on the panel alternatively, turn off the inverter's power and check that the motor is connected properly.

5.24 Parameter Lock

Use parameter lock to prevent the unauthorized modification of parameter settings. To enable parameter lock, register and enter a user password first.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H94	Password register	-	0–FFFF	0	-
	H95	Parameter lock	-	0–FFFF	0	-

Parameter Lock Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H94 Password register</td><td>Register a password to prohibit parameter modifications.
Follow the procedures below to register a password for the first time.

<table><tr><td>No</td><td>Procedures</td></tr><tr><td>1</td><td>Press the [Enter] key twice at H94.</td></tr><tr><td>2</td><td>Register a new password and press the [Enter] key. The entered password will blink.</td></tr><tr><td>3</td><td>Press the [Enter] key. After registration, H94 will be displayed.</td></tr></table>
Follow the procedures below to change the password.
<table><tr><td>No</td><td>Procedures</td></tr><tr><td>1</td><td>Press the [Enter] key at H94.</td></tr><tr><td>2</td><td>Enter the saved password and press the [Enter] key. (If the entered password does not match the saved password, 0 will be displayed and the process will not move to next stage until the user enters a valid password).</td></tr><tr><td>3</td><td>Register a new password and press the [Enter] key. The entered password will blink.</td></tr><tr><td>4</td><td>Press the [Enter] key. After registration, H94 will be displayed.</td></tr></table></td></tr>
<tr><td>H95 Parameter lock</td><td>To enable parameter lock, enter the registered password. [L] will be displayed on the keypad to indicate that the lock is enabled. Once enabled, pressing the [Enter] key on function code will not allow display edit mode to run. To disable the parameter modification lock, re-enter the password. [L] will disappear and [UL] will be displayed.</td></tr>
</table>

Note

The password must be a combination of hexadecimal characters (0-9, A, B, C, D, E, F).

Caution

If the parameter lock function is enabled, no inverter operation-related function changes can be made. It is very important that you memorize the password.

5.25 Dynamic Braking Start Voltage

Set the start voltage for dynamic braking to improve braking performance.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F73	200V DB start voltage	-	300–400	390	V
	F74	400V DB start voltage	-	600–800	780	V

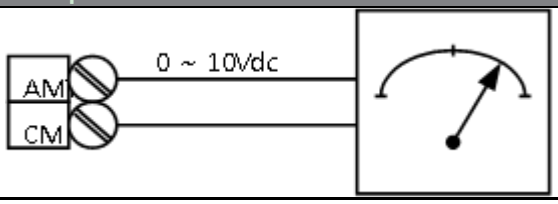
5.26 Analog Output

Select the output item and adjust the output level from an analog output terminal.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I50	Analog output item select	-	0–3	0	-
	I51	Analog output level adjustment	-	10–200	100	%

Analog Output - Setting Detail

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>I50 Analog output item select</td><td>Outputs the selected item to the analog output terminal.
<table>
<tr><td colspan="2" rowspan="2">Setting</td><td colspan="2">Output to 10 [V]</td></tr>
<tr><td>200 V</td><td>400 V</td></tr>
<tr><td>0</td><td>Output frequency</td><td colspan="2">Maximum frequency</td></tr>
<tr><td>1</td><td>Output current</td><td colspan="2">150% of inverter rated current</td></tr>
<tr><td>2</td><td>Output voltage</td><td>282 Vac</td><td>564 Vac</td></tr>
<tr><td>3</td><td>Inverter DC link voltage</td><td>410 Vdc</td><td>820 Vdc</td></tr>
</table></td></tr>
<tr><td>I51 Analog output level adjustment</td><td>You can adjust the analog output value according to the gauge specifications if you use the value as a gauge input.</td></tr>
</table>

Code	Description
	

5.27 Digital Output

5.27.1 Multi-function Output Terminal and Relay Settings

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I52	Frequency detection level	-	0–400	30	Hz
	I53	Frequency detection bandwidth	-	0–400	10	Hz
	I55	Multi-function relay select	-	0–19	17	-

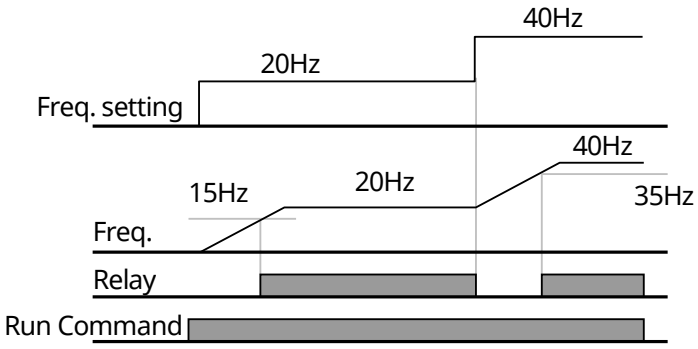
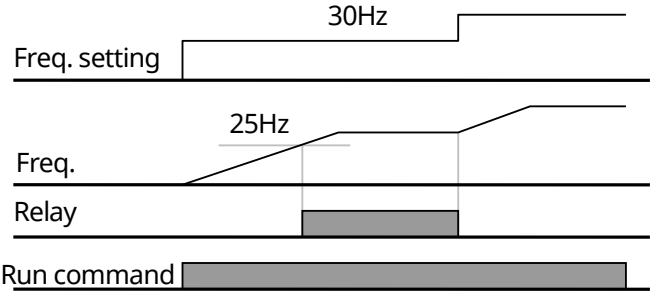
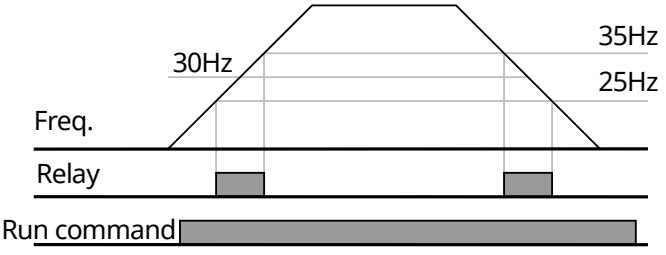
Note

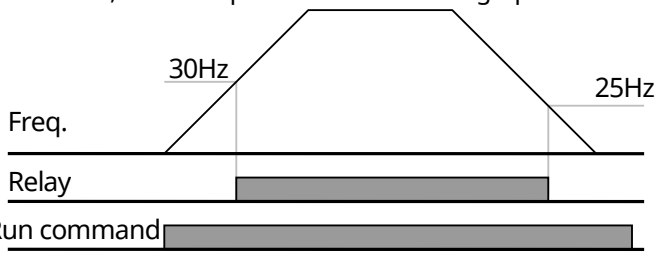
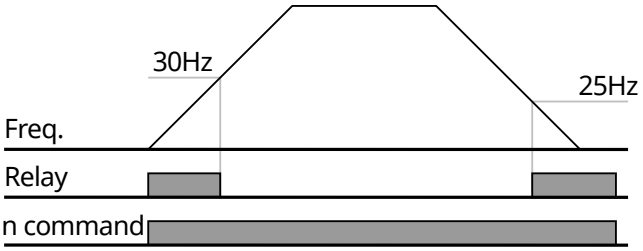
I52 and I53 should not be higher than Max frequency (F21) value.

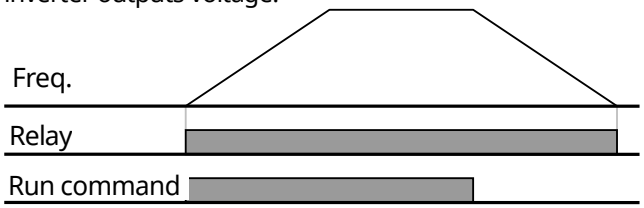
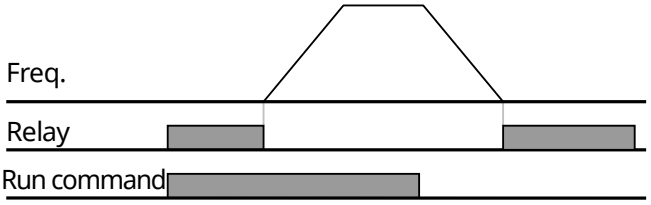
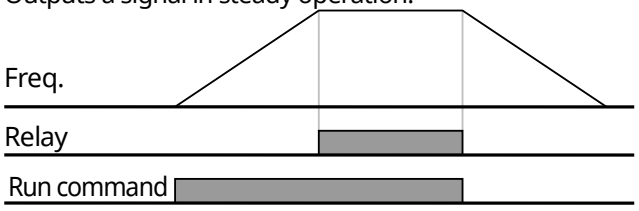
Multi-function Output Terminal and Relay Setting Details

Code	Description
I55 Multi-function relay select	Set output terminal and multi-functions according to I52, I 53 settings, and fault trip conditions.

Setting		Function
0	FDT-1	Detects inverter output frequency reaching the user set frequency. Outputs a signal when the absolute value (set frequency - output frequency) ≤ detected frequency width / 2. When detected frequency width is 10Hz, FDT-1 output is as shown in the graph below.

Code	Description		
			
	1	FDT-2	Outputs a signal when the user set frequency and detected frequency (FDT level) are equal, and fulfills FDT-1 condition at the same time. [Absolute value (set frequency - detected frequency) ≤ detected frequency width / 2]&[FDT-1] Detected frequency width is 10Hz. When the detected frequency is set to 30Hz, FDT-2 output is as shown in the graph below. 
	2	FDT-3	Outputs a signal when the Absolute value (output frequency - operation frequency) < detected frequency width / 2. Detected frequency width is 10Hz. When detected frequency is set to 30Hz, FDT-3 output is as shown in the graph below. 
	3	FDT-4	Output signal can be separately set for acceleration and deceleration conditions.

Code	Description		
			• In acceleration: Operation frequency ≥ Detected frequency level • In deceleration: Operation frequency > (Detected frequency level - Detected frequency width / 2) Detected frequency width is 10Hz. When detected frequency is set to 30Hz, FDT-4 output is as shown in the graph below. 
	4	FDT-5	Output signal can be separately set for acceleration and deceleration conditions contrary to FDT-4 conditions. • In acceleration: Operation frequency ≤ Detected frequency level • In deceleration: Operation frequency > (Detected frequency level - Detected frequency width / 2) Detected frequency width is 10Hz. When detected frequency is set to 30Hz, FDT-5 output is as shown in the graph below. 
	5	Overload	Outputs a signal at motor overload. For details, refer to *6.1.2 Overload Early Warning* and *Trip* on page *144*.
	6	Inverter Overload (IOL)	Outputs a signal when a fault is triggered from a protective function operation by inverter overload inverse proportion. For details, refer to *6.2.3 Inverter Overload Protection* on page *151*.
	7	Stall	Outputs a signal when a motor is overloaded and stalled. For details, refer to *6.1.3 Stall Prevention* on page *146*.
	8	Over voltage trip (Ovt)	Outputs a signal when the inverter's DC link voltage rises above 400 V DC for the 200 V class and 820 V DC for the 400 V class.
	9	Low voltage trip (Lvt)	Outputs a signal when the inverter's DC link voltage drops below 180 V DC for the 200 V class and 360 V DC for the 400 V class.

Code	Description		
	10	Overheat (OHt)	Outputs signal when the inverter overheats.
	11	Command loss	Outputs a signal when there is a loss of analog input terminal (V1, I) and RS-485 communication command at the terminal block.
	12	RUN	Outputs a signal when operation command is entered and the inverter outputs voltage. 
	13	Stop	Outputs a signal at operation command off, and when there is no inverter output voltage. 
	14	Steady	Outputs a signal in steady operation. 
	15	Speed search	Outputs a signal during inverter speed search operation. For details, refer to *5.10 Speed Search Operation* on page *111*.
	16	Ready	Outputs signal when the inverter is in stand by operation and ready to receive an external operation command.
	17	Fault output	Outputs fault relay signal when the parameter set at I56 is activated.
	18	Warning for cooling fan trip	Outputs alarm signal when H78 is set to 0 (During Run). For details, refer to 5.20 *Cooling Fan Control* on page *126*.
	19	BR Control	Outputs a brake release signal. For details, refer to 5.17 *Brake Control* on page *122*.

5.27.2 Fault Trip Output using Multi-function Output Terminal and Relay

The inverter can output fault trip state using multi-function output terminal and relay.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I56	Fault relay output		0–7	2	-

Fault Trip Output by Multi-function Output Terminal and Relay Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>I56 Fault relay output</td><td>Fault trip relay operates based on the fault trip output settings.
Select fault trip output terminal/relay and select 17(Trip Mode) at codes I55. When a fault trip occurs in the inverter, the relevant terminal and relay will operate.
Depending on the fault trip type, terminal and relay operation can be configured as shown in the table below.
<table>
<tr><td colspan="4">Setting</td><td rowspan="2">Function</td></tr>
<tr><td>Value</td><td>bit2</td><td>bit1</td><td>bit0</td></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td><td></td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>✓</td><td>Operates when low voltage fault trips occur</td></tr>
<tr><td>2</td><td>-</td><td>✓</td><td>-</td><td>Operates when fault trips other than low voltage occur</td></tr>
<tr><td>3</td><td>-</td><td>✓</td><td>✓</td><td>Operates when fault trips other than low voltage and low voltage fault trips occur</td></tr>
<tr><td>4</td><td>✓</td><td>-</td><td>-</td><td>Operates when auto restart fails (H26)</td></tr>
<tr><td>5</td><td>✓</td><td>-</td><td>✓</td><td>Operates when auto restart fails (H26) and low voltage fault trips occur</td></tr>
<tr><td>6</td><td>✓</td><td>✓</td><td>-</td><td>Operates when auto restart fails (H26) and fault trips other than low voltage occur</td></tr>
<tr><td>7</td><td>✓</td><td>✓</td><td>✓</td><td>Operates when auto restart fails (H26), and fault trips other than low voltage and low voltage fault trips occur</td></tr>
</table></td></tr>
</table>

5.28 Operation State Monitor

The inverter's operation condition can be monitored using the keypad display. The monitoring option can be selected in the Drive group, Function group 2, and I/O group. Monitoring mode displays three different items on the keypad display, but only one item can be displayed in the status window at a time.

5.28.1 Output Current Monitor

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	CUr	Output current	-	-	-	-

Output Current Monitor Setting Details

Code	Description
CUr Output current	The output current of inverter can be monitored via the CUr code in the Drive group

5.28.2 Motor RPM Monitor

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	rPM	Motor RPM	-	-	-	-
Function group 2	H31	Number of motor poles	-	2–12	4	-
	H49	PID select	-	0–1	0	-
	H74	Gain for Motor rpm display	-	1–1,000	100	%

Motor RPM Monitor - Setting Details

Code	Description
rPM Motor RPM	**Displays the number of the motor's RPM.** If H40 is set to "0" (V/F) control, the inverter's output frequency (f) is displayed in this code using the formula below. Motor slip is considered. $RPM = \left(\frac{120 \times f}{H31}\right) \times \frac{H74}{100}$
H31 Number of motor poles	Enter the number of rated motor axes.
H49 PID select	Sets whether to use PID control or not. If the code is set to "1" (PID control), the feedback amount is converted into frequency.
H74 Gain for Motor rpm display	Changes the motor speed display to mechanical speed.

5.28.3 Inverter DC Link Voltage Monitor

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	dCL	DC link voltage	-	-	-	-

Output Current Monitor - Setting Details

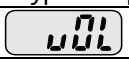
Code	Description
dCL DC link voltage	Displays the DC link voltage inside the inverter. $\sqrt{2}$ times the value of the input voltage is displayed while the motor is not operating.

5.28.4 User Display Selection

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	vOL	User display select	-	-	-	-
Function group 2	H73	Monitoring item select	-	0–2	0	-

User Display Selection Details

Code	Description
vOL User display select	Displays the item selected at H73.
H73 Monitoring item select	Select one of the following settings.

Setting	Keypad Display	Function
0		Output voltage [V]
1		Output power [kW]
2		Torque [kgf · m]

Note

Enter motor efficiency indicated on motor nameplate to H36 to display correct torque.

5.28.5 Power-on Display

You can select a display on the keypad when the power is first supplied to the inverter.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	H72	Power on display	-	0–17	0	-

Power-on Display - Setting Details

Code	Description
H72 Power on display	Select the parameter to be displayed on the keypad when the power is first supplied to the inverter. If the Output current, motor RPM, DC link voltage, and User display selection parameters are already set at H72, the 14–17 parameters are displayed as set at H72

Setting	Function
0	Frequency command
1	Accel time (ACC)
2	Decel time (DEC)
3	Drive mode (drv)
4	Frequency mode (Frq)
5	Multi-step frequency 1 (St1)
6	Multi-step frequency 2 (St2)
7	Multi-step frequency 3 (St3)

Code		Description
	8	Output current (CUr)
	9	Motor rpm (rPM)
	10	Inverter DC link voltage (dCL)
	11	User display select (vOL)
	12	Fault display 1(nOn)
	13	Operating direction select (drC)
	14	Output current 2
	15	Motor rpm 2
	16	Inverter DC link voltage 2
	17	User display select 2 (set at H73)

5.29 I/O Terminal Monitor

The inverter's I/O terminal condition can be monitored using the keypad display. The monitoring option can be selected in the I/O group.

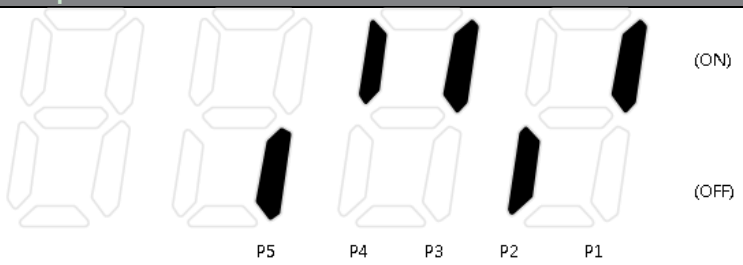
5.29.1 Input Terminal State Monitor

Input terminal condition that is ON or OFF can be monitored in I25.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I25	Input terminal status display	-	-	-	-

Input Terminal State Monitor Setting Detail

Code	Description
I25 Input terminal status display	The corresponding terminals for each bit are as follows: Bit 4 3 2 1 0 Terminal P5 P4 P3 P2 P1 The display when P1,P3, and P4 are ON and P2, P5 are OFF is as follow:

Code	Description
	

5.29.2 Output Terminal State Monitor

The multi-function relay condition for ON or OFF can be monitored in I26.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O group	I26	Output terminal status display	-	-	-	-

Output Terminal State Monitor Setting Detail

Code	Description
I26 Output terminal status display	The display when multi-function relay is ON is as follow: 

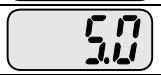
5.30 Fault Condition Monitor

5.30.1 Current Fault State Monitor

Faults that occurred during inverter operation are displayed at the nOn code. Up to three types of faults can be monitored.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive group	nOn	Fault display	-	-	-	-

Current Fault State Monitor Setting Detail

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>nOn Fault display</td><td>This parameter gives information about inverter's operating state when a fault occurred. Refer to 3.4.2 Fault Trip Monitoring on page 50 or 142 for keypad settings. The display when multi-function relay is ON is as follow:
<table>
<tr><th>Fault Type</th><th>Keypad Display</th><th>Description</th></tr>
<tr><td>Frequency</td><td>  </td><td>-</td></tr>
<tr><td>Current</td><td>  </td><td>-</td></tr>
<tr><td>Accel/Decel Information</td><td>  </td><td>Fault during acceleration</td></tr>
<tr><td></td><td>  </td><td>Fault during deceleration</td></tr>
<tr><td></td><td>  </td><td>Fault during constant run</td></tr>
</table></td></tr>
</table>

Note

For fault types, refer to *9.1 Trips and Warnings* on page 206.

5.30.2 Fault History Monitor

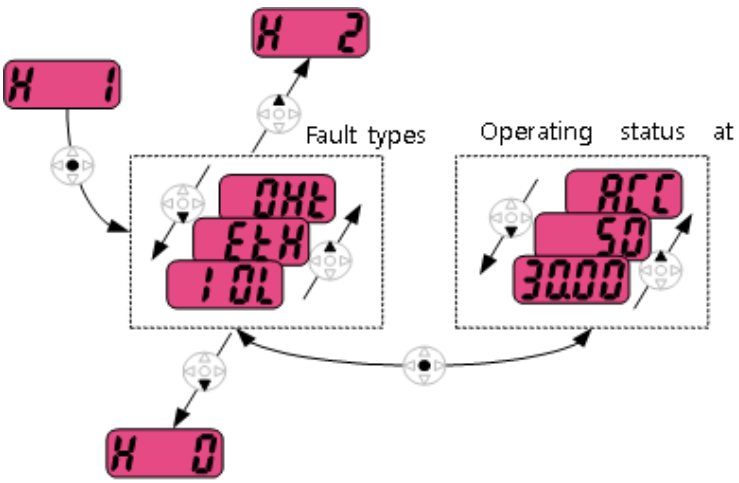
The archived fault history is displayed at codes H1-H6. If more than one fault occurs simultaneously, the fault history is stored in a single code (H1-H5).

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 2	H1	Fault history 1	-	-	nOn	
	H2	Fault history 2	-		nOn	
	H3	Fault history 3	-		nOn	
	H4	Fault history 4	-		nOn	
	H5	Fault history 5	-		nOn	
	H6	Reset fault history	-	0–1	0	

Fault History Monitor Setting Detail

Code	Description
H1–H5 Fault history 1–5	When a fault condition is reset via the [STOP/RESET] key or multi-function terminal, information displayed at the nOn code is moved to H1 and the previous fault information stored in H1 is automatically moved to H2. The updated fault information is stored in H1. Data in H1–H5 is initialized during parameter initialization.
H6 Reset fault history	When H6 is set to "1," the data at H1–H5 is initialized as well.

After confirmation of the fault, the fault information is moved to other codes as follows:



6 Learning Protection Features

Protection features provided by the C100 series inverter are categorized into two types: protection from overheating damage to the motor, and protection against the inverter malfunction.

6.1 Motor Protection

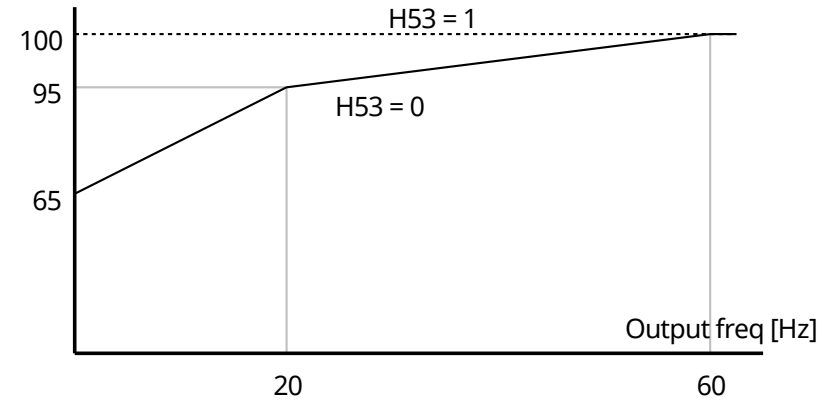
6.1.1 Electronic Thermal Motor Overheating Prevention (ETH)

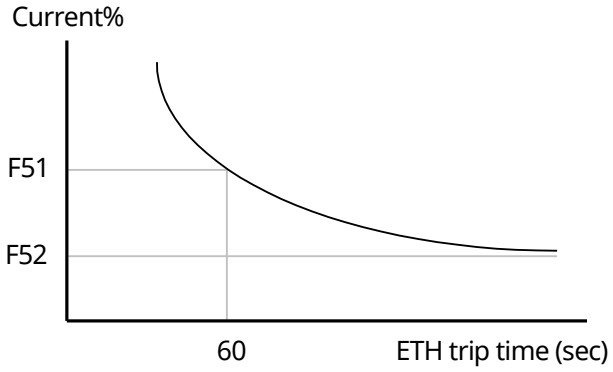
ETH is a protective function that uses the output current of the inverter without a separate temperature sensor, to predict a rise in motor temperature to protect the motor based on its heat characteristics.

Group	Code	Name	Parameter Setting	Setting range	Initial Value	Unit
Function Group 1	F50	Electronic thermal select	1	0–1	0	-
	F51	Electronic thermal level for 1 minute	-	100–200	150	%
	F52	Electronic thermal level for continuous	-	50–150	100	%
	F53	Motor cooling method	-	0–1	0	-

Electronic Thermal (ETH) Prevention Function Setting Details

Code	Description
F50 Electronic thermal select	This code can be selected to provide motor thermal protection. The screen displays "F50." If the amount of set current is greater than the current set at F51, the inverter will be turned off for the time that is preset at F51.
F51 Electronic thermal level for 1 minute	The amount of input current that can be continuously supplied to the motor for 1 minute, based on the motor-rated current. The input current value should not be lower than the current value set at F52.
F52 Electronic thermal level for continuous	Sets the amount of current when the ETH function activated. The range below details the set values that can be used during continuous operation. The current value should not be greater than the value set at F51.

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td></td><td>Current for continuous operation [%]
 
</td></tr>
<tr><td>F53 Motor cooling method</td><td>Select the drive mode of the cooling fan, attached to the motor.

<table>
<tr><th colspan="2">Setting</th><th>Function</th></tr>
<tr><td>0</td><td>Self-cool</td><td>As the cooling fan is connected to the motor axis, the cooling effect varies, based on motor speed. Most universal induction motors have this design.</td></tr>
<tr><td>1</td><td>Forced-cool</td><td>Additional power is supplied to operate the cooling fan. This provides extended operation at low speeds. Motors designed for inverters typically have this design.</td></tr>
</table>

</td></tr>
</table>

6.1.2 Overload Early Warning and Trip

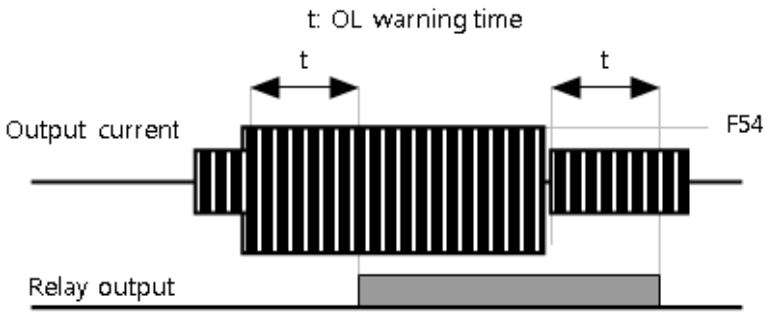
A warning or fault 'trip' (cut-off) occurs when the motor reaches an overload state, based on the motor's rated current. The amount of current for warnings and trips can be set separately.

Group	Code	Name	Parameter Setting		Setting Range	Initial Value	Unit
Function Group 1	F54	Overload warning level	-		30–150	150	%
	F55	Overload warning time	-		0–30	10	s
	F56	Overload trip select	1		0–1	1	-
	F57	Overload trip level	-		30–200	180	%
	F58	Overload trip time	-		0–60	60	s
I.O Group	I55	Multi-function relay select	5	Over Load (OL)	0–19	17	-

Overload Early Warning and Trip Setting Details

Code	Description
F54 Overload warning level F55 Overload warning time	When the input current to the motor is greater than the overload warning level and continues at that level during the overload warning time, the multi-function output sends a warning signal. When Over Load is selected at I55, the multi-function output terminal or relay outputs a signal. The the signal output does not block the inverter output.
F56 Overload trip select	Select the inverter protective action in the event of an overload fault trip.
F57 Overload trip level F58 Overload trip time	When the current supplied to the motor is greater than the preset value at the overload trip level and continues to be supplied during the overload trip time, the inverter output is either blocked according to the preset mode from I55 or slows to a stop after deceleration.

Setting		Function
0	None	No protective action is taken.
1	Free-Run	In the event of an overload fault, inverter output is blocked and the motor will free-run due to inertia.
3	Dec	If a fault trip occurs, the motor decelerates and stops.



Note

Overload warnings warn of an overload before an overload fault trip occurs. The overload warning signal may not work in an overload fault trip situation, if the overload warning level (F54) and the

overload warning time (F55) are set higher than the overload trip level (F57) and overload trip time (F58).

6.1.3 Stall Prevention

The stall prevention function is a protective function that prevents motor stall caused by overloads. If a motor stall occurs due to an overload, the inverter operation frequency is adjusted automatically. When stall is caused by overload, high currents are induced in the motor may cause motor overheat or damage the motor and interrupt operation of the motor-driven devices.

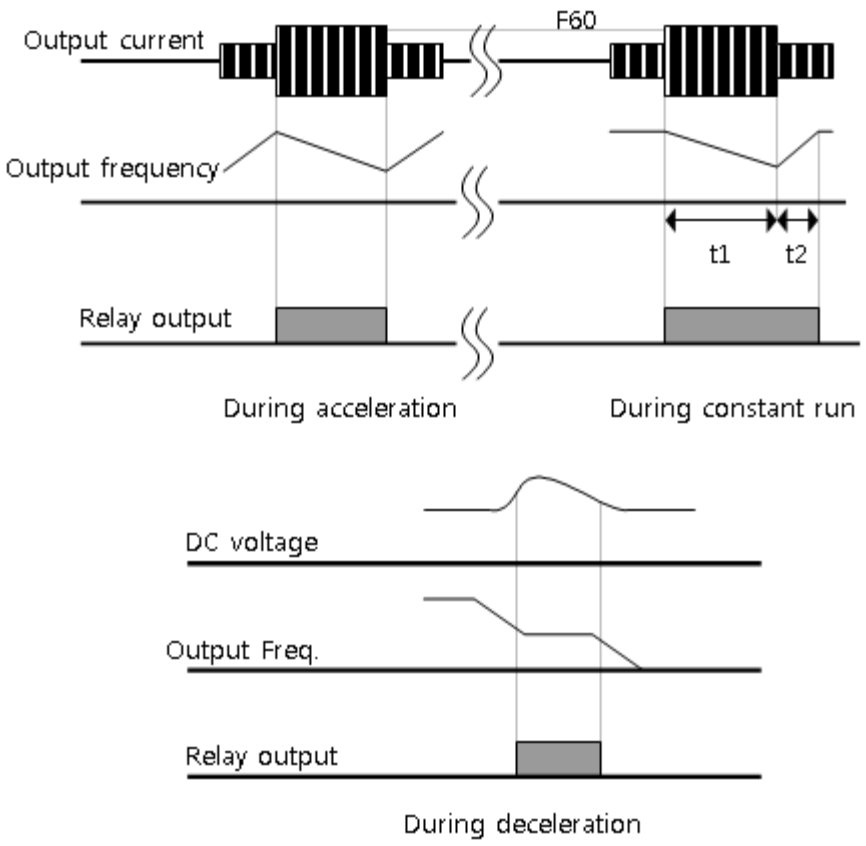
To protect the motor from overload faults, the inverter output frequency is adjusted automatically, based on the size of load.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 1	F59	Stall prevention select	-	0–7	0	-
	F60	Stall prevention level	-	30–200	150	%
I/O Group	I55	Multi-function relay select	7	0–19	17	-

Stall Prevention Function and Flux Braking Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>F59 Stall prevention select</td><td>Set the parameter value to “3” to activate stall prevention during acceleration, operation at a constant speed, or deceleration. If stall prevention is executed during acceleration, operation at a constant speed, or deceleration, the acceleration and deceleration time may be longer than the user-set time.
<table>
<tr><th colspan="4">Setting</th><th rowspan="2">Function</th></tr>
<tr><th>Value</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>✓</td><td>Stall protection during acceleration</td></tr>
<tr><td>2</td><td>-</td><td>✓</td><td>-</td><td>Stall protection while operating at a constant speed</td></tr>
<tr><td>3</td><td>-</td><td>✓</td><td>✓</td><td>Stall protection during acceleration and operation at a constant speed</td></tr>
<tr><td>4</td><td>✓</td><td>-</td><td>-</td><td>Stall protection during deceleration</td></tr>
<tr><td>5</td><td>✓</td><td>-</td><td>✓</td><td>Stall protection during acceleration and deceleration</td></tr>
<tr><td>6</td><td>✓</td><td>✓</td><td>-</td><td>Stall protection during operation at a constant speed and deceleration</td></tr>
<tr><td>7</td><td>✓</td><td>✓</td><td>✓</td><td>Stall protection during acceleration, operation at a constant speed, and deceleration</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>F59 Stall prevent</td><td>
<table>
<tr><th colspan="2">Setting</th><th>Function</th></tr>
<tr><td>1</td><td>Stall protection during acceleration</td><td>If inverter output current exceeds the preset stall level (F60) during acceleration, the motor stops accelerating and starts decelerating. If current level stays above the stall level, the motor decelerates to the start frequency (F23). If the current level causes deceleration below the preset level while operating the stall protection function, the motor resumes acceleration.</td></tr>
<tr><td>2</td><td>Stall protection while operating at constant speed</td><td>Similar to stall protection function during acceleration, the output frequency automatically decelerates when the current level exceeds the preset level (F60) while operating at constant speed. When the load current decelerates below the preset level, it resumes acceleration.</td></tr>
<tr><td>3</td><td>Stall protection during acceleration and operation at a constant speed</td><td></td></tr>
<tr><td>4</td><td>Stall protection during deceleration</td><td>If inverter DC link voltage exceeds a certain level during deceleration, the motor stops decelerating to prevent an over voltage fault trip during deceleration. As a result, deceleration times can be longer than the set time depending on the load.</td></tr>
<tr><td>5</td><td>Stall protection during acceleration and deceleration</td><td></td></tr>
<tr><td>6</td><td>Stall protection during operation at a constant speed and deceleration</td><td></td></tr>
<tr><td>7</td><td>Stall protection during acceleration, operation at a constant speed, and deceleration</td><td></td></tr>
</table>
When stall prevention is activated during operation at a constant speed, t1 and t2 are executed based on the value set at ACC (Accel time) and dEC (Decel time).
</td></tr>
</table>

Code	Description
	
F60 Stall prevention level	The stall prevention level is set based on the motor-rated current (H33).
I55 Multi-function relay select	The multi-function relay can transmit the stall status to external devices. The output can be achieved if the motor is connected even if F59 is not selected for stall prevention.

ⓘ Caution

- Use caution when decelerating while using stall protection as depending on the load, the deceleration time can take longer than the time set. Acceleration stops when stall protection operates during acceleration. This may make the actual acceleration time longer than the preset acceleration time.
- When the motor is operating, F60 (Stall prevention level) applies and determines the operation of stall protection.

6.2 Inverter and Sequence Protection

6.2.1 Open-phase Protection

Open-phase protection is used to prevent overcurrent levels induced at the inverter inputs due to an open-phase within the input power supply. Open-phase output protection is also available. An open-phase at the connection between the motor and the inverter output may cause the motor to stall due to a lack of torque.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function group 2	H19	Input/output phase loss protection select	1	0–3	0	-

Input and Output Open-phase Protection Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>H19
Input/output phase loss protection select</td><td>If the output phase loss protection is selected, inverter output is shut off in the event of more than one phase loss from the 3 phase output (U, V, and W). If the input phase loss protection is selected, inverter output is blocked in the event of more than one phase loss from R, S, and T.
<table>
<tr><td colspan="3">Setting</td><td rowspan="2">Function</td></tr>
<tr><td>Value</td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td></td><td>✓</td><td>Inverter output loss phase selection</td></tr>
<tr><td>2</td><td>✓</td><td></td><td>Inverter input loss phase selection</td></tr>
<tr><td>3</td><td>✓</td><td>✓</td><td>Inverter input/output loss phase selection</td></tr>
</table>
</td></tr>
</table>

Caution

Set the motor-rated current (H33) correctly. If the actual motor-rated current and the value of H33 are different, the output phase loss protection function may not be activated.

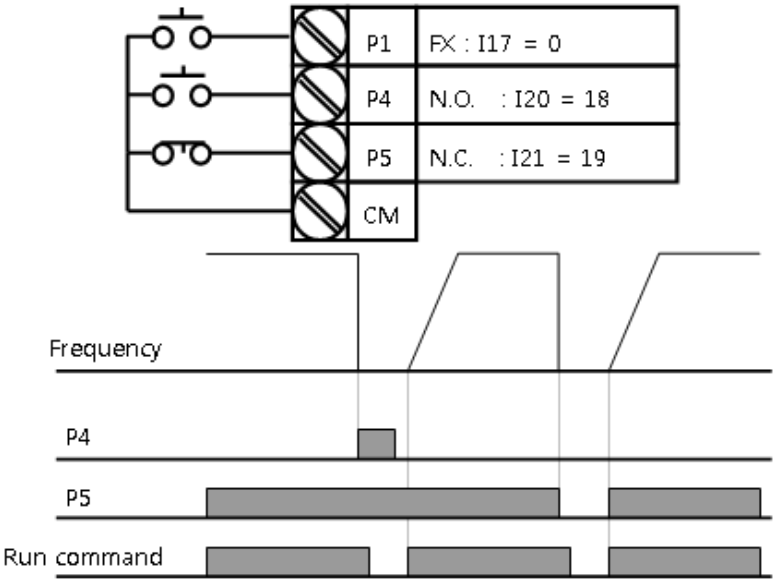
6.2.2 External Trip Signal

Set one of the multi-function input terminals to 4 (External Trip) to allow the inverter to stop operation when abnormal operating conditions arise.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O Group	I17	Multi-function input terminal P1 define	-	0–27	0	-
	I18	Multi-function input terminal P2 define	-	0–27	1	-
	I19	Multi-function input terminal P3 define	-	0–27	2	-
	I20	Multi-function input terminal P4 define	18	0–27	3	-
	I21	Multi-function input terminal P5 define	19	0–27	4	-

External Trip Signal Setting Details

Code	Description
I20 Multi-function input terminal P4 define I21 Multi-function input terminal P5 define	Selects the type of input contact. If P4 terminal is set to the external A contact, (Normally Open), the fault is displayed and inverter turns off its output. If P5 terminal is set to the external B contact, (Normally Closed), the fault is displayed and inverter turns off its output. The corresponding terminals for each bit are as follows: Bit 4 3 2 1 0 Terminal P5 P4 P3 P2 P1



6.2.3 Inverter Overload Protection

When the inverter input current exceeds the rated current, a protective function is activated to prevent damages to the inverter based on inverse proportional characteristics.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O Group	I55	Multi-function relay select	6	0–19	17	-

Note

A warning signal output can be provided in advance by the multi-function output terminal before the inverter overload protection function (IOLT) operates.

6.2.4 Speed Command Loss

When setting operation speed using an analog input at the terminal block, communication options, or the keypad, speed command loss setting can be used to select the inverter operation for situations when the speed command is lost due to the disconnection of signal cables.

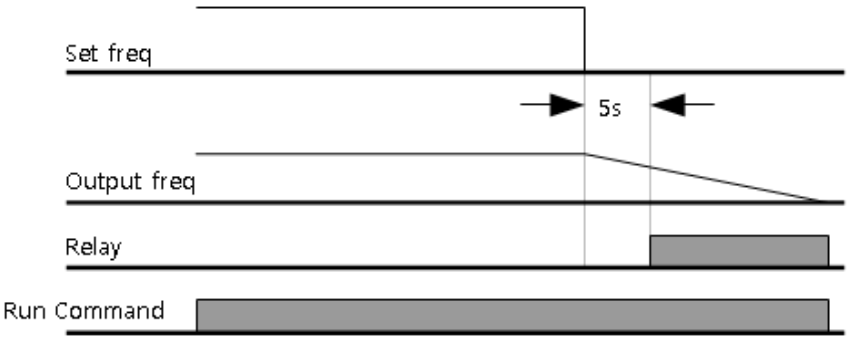
Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
I/O Group	I16	Criteria for analog input signal loss	0	0–2	0	-
	I62	Drive mode select after loss of frequency command	-	0–2	0	-
	I63	Wait time after loss of frequency command	-	0.1–120	1	s
	I55	Multi-function relay select	11	0–19	17	-

Speed Command Loss Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>I16 Criteria for analog input signal loss</td><td>You can select criteria for analog speed command loss:
<table>
<tr><td colspan="2">Function</td></tr>
<tr><td>0</td><td>Do not use.</td></tr>
<tr><td>1</td><td>When half the value set at I2, I7, or I12 is entered.</td></tr>
<tr><td>2</td><td>When less than the value set at I2, I7, or I12 is entered.</td></tr>
</table>
For example, when the DRV-Frq is set to “3” (Analog V input), I16 to “1,” and the analog input signal is less than half the value set at I7, the inverter determines that the frequency reference is lost. When DRV-Frq is set to “5” (V2+1), I16 to “2,” and V2 input signal is either below the value set at I2 or I input is less than the I12 value, the inverter determines that the frequency reference is lost.</td></tr>
<tr><td>I62 Drive mode select after loss of frequency command</td><td>In situations where the frequency references set via the Analog (V, I) input terminal or the communication option is lost, the inverter can be configured to operate in a specific mode.

When the frequency command is not given during the time set at I63, set the drive mode as shown in the table below.
<table>
<tr><td colspan="2">Function</td></tr>
<tr><td>0</td><td>Inverter operates continuously with the frequency before command loss occurs.</td></tr>
<tr><td>1</td><td>The inverter blocks output. The motor performs in free-run condition.</td></tr>
<tr><td>2</td><td>The motor decelerates and then stops at the time set at dEC.</td></tr>
</table></td></tr>
<tr><td>I63 Wait time after loss of frequency command</td><td>During the time set at this code, the inverter determines whether the input frequency command is present or not. If there is no frequency command input during this time, the inverter will start operation via the mode selected at I62.</td></tr>
<tr><td>I55 Multi-function relay select</td><td>The multi-function relay is used to output information about the loss of frequency command to an external sequence.</td></tr>
</table>

Set I16 to 2, I62 to 2, I63 to 5 sec, and I55 to 11. Then it operates as follows:



Note

If speed command is lost while using communication options or the integrated RS-485 communication, the protection function operates after the command loss decision time set at I63 is passed.

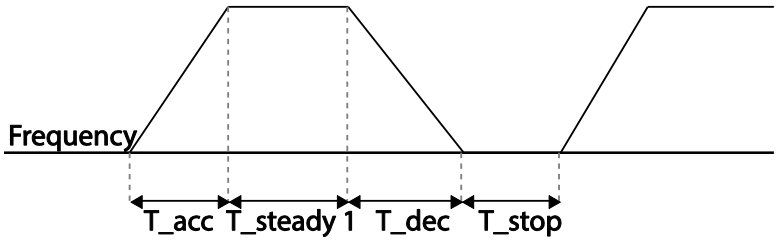
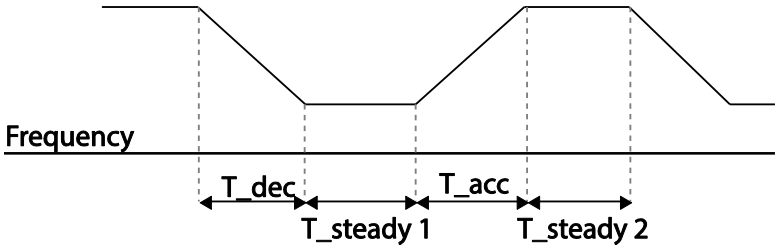
6.2.5 Dynamic Braking (DB) Resistor Configuration

For C100 series, the braking resistor circuit is integrated inside the inverter.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Function Group 2	H75	DB resistor operating rate limit select	1	0–1	1	-
	H76	DB resistor operating rate	-	0–30	10	%

Dynamic Braking Resistor Setting Details

Code	Description
H75 DB resistor operating rate limit select	Enable duty limit of dynamic braking resistor can be configured: Function 0 No limit for use of DB resistor 1 DB is limited to the value set at H76.
H76 DB resistor operating rate	Set braking resistor configuration (%ED: Duty Cycle). Braking resistor configuration sets the rate at which the braking resistor operates for one operation cycle. The maximum time for continuous braking is 15 sec and the

Code	Description
	braking resistor signal is not output from the inverter after the 15 sec period has expired. An example of braking resistor set up is as follows: $$H76 = \frac{T\_dec}{T\_acc + T\_steady + T\_dec + T\_stop} \times 100\%$$  [Example 1] $$H76 = \frac{T\_dec}{T\_dec + T\_steady1 + T\_acc + T\_steady2} \times 100\%$$  [Example 2] • T_acc: Acceleration time to set frequency • T_steady: Constant speed operation time at set frequency • T_dec: Deceleration time to a frequency lower than constant speed operation or the stop time from constant speed operation frequency • T_stop: Stop time until operation resumes

Note

- The inverter capacity varies according to dynamic braking resistor. For more information, please refer to page *242*.
- For 200 V inverter, the DB resistor is activated when DC link voltage reaches to the value set at F73.
- For 400 V inverter, the DB resistor is activated when DC link voltage reaches to the value set at F74.

Caution

Do not set the braking resistor to exceed the resistor's power rating. If overloaded, it can overheat and cause a fire. When using a resistor with a heat sensor, the sensor output can be used as an external trip signal for the inverter's multi-function input.

6.3 Fault/Warning List

The following list shows the types of faults and warnings that can occur while using the C100 inverter. Please refer to *6 Learning Protection Features* on page *143* for details about faults and warnings.

Category	Keypad Display	Details
Major fault	Over current	Over current trip
	Short circuit	Short circuit trip
	Over voltage	Over voltage trip
	Overload protection	Motor overload trip
	External trip	Trip due to an external signal
	NTC disconnection	Temperature sensor fault trip
	Inverter overheat	Over heat fault trip
	Output phase loss	Output open-phase fault trip
	Input phase loss	Input open-phase fault trip
	Inverter overload	Inverter overload fault trip
	Ground fault	Ground fault trip
	Electronic thermal protection	Motor overheat fault trip
	Brake control abnormality	Brake fault trip
	Low Voltage	Low voltage fault trip during operation
	Parameter save abnormality	Parameter save fault trip
	Hardware abnormality	Hardware fault trip
	Emergency stop	Emergency stop fault trip
	Panel communication abnormality	Panel communication fault trip
	Hardware abnormality	Hardware fault trip
	Contract A fault signal	Output terminal (18) malfunction
	Contract B fault signal	Output terminal (19) malfunction

Category	Keypad Display	Details
	Panel communication abnormality	Panel communication fault trip
Minor fault	Panel abnormality	Panel display time error
Warning	Frequency command loss	Command loss trip
	Safe stop Terminal A disconnection	Safe stop required
	Safe stop Terminal B disconnection	
	Relay abnormality	Relay breakage
	Cooling fan abnormality	Fan fault trip

7 RS-485 Communication Features

This chapter explains how to control the inverter with a PLC or a computer over a long distance using the RS-485 communication features. To use the RS-485 communication features, connect the communication cables and set the communication parameters on the inverter. Refer to the communication protocols and parameters to configure and use the RS-485 communication features.

7.1 Communication Standards

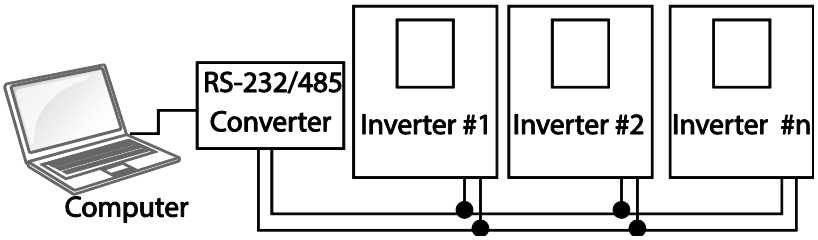
Following the RS-485 communication standards, C100 products exchange data with a PLC and computer. The RS-485 communication standards support the Multi-drop Link System and offer an interface that is strongly resistant to noise. Please refer to the following table for details about the communication standards.

Name	Standard
Communication method/ Transmission type	RS-485/Bus type, Multi-drop Link System
Inverter type name	C100
Converter	RS-485 converter
Number of connected inverters/ Transmission distance	Maximum of 16 inverters / Maximum1,200m (recommended distance: within 700m)
Installation type	Dedicated terminals (S+/S-) on the keypad
Power supply	Supplied by the inverter - insulated power source from the inverter's internal circuit
Communication speed	1,200/2,400/4,800/9,600/19,200/38,400bps
Control procedure	Asynchronous communications system
Communication system	Half duplex system
Symbol system	ASCII (8 bits)
Stop bit length	Modbus-RTU: 2 bits, LS Bus: 1-bit
Sum check	2 bits
Parity check	None/Even/Odd
Power supply	Separated from inverter

7.2 Communication System Configuration

In an RS-485 communication system, the PLC or computer is the master device and the inverter is the slave device. When using a computer as the master, the RS-232 converter must be integrated with the computer, so that it can communicate with the inverter through the RS-232/RS-485 converter. Specifications and performance of converters may vary depending on the manufacturer, but the basic functions are identical. Please refer to the converter manufacturer's user manual for details about features and specifications.

Connect the wires and configure the communication parameters on the inverter by referring to the following illustration of the communication system configuration.



7.2.1 Communication Line Connection

Make sure that the inverter is turned off completely, and then connect the RS-485 communication line to the S+/S- terminals of the terminal block. The maximum number of inverters you can connect is 16.

The maximum length of the communication line is 1,200 meters, but it is recommended to use no more than 700 meters of communication line to ensure stable communication. Please use a repeater to enhance the communication speed when using a communication line longer than 1,200 meters or when using a large number of devices. A repeater is effective when smooth communication is not available due to noise interference.

7.2.2 Setting Communication Parameters

Before proceeding with setting communication configurations, make sure that the communication lines are connected properly. Turn on the inverter and set the communication parameters.

Group	Code	Name	Parameter Setting	Setting Range	Initial Value	Unit
Drive Group	drv	Drive mode	3	0–3	1	-
	Frq	Frequency setting method	7	0–8	0	-
I/O Group	I59	Communication protocol select	-	0–1	0	-
	I60	Inverter number	-	1–250		
	I61	Baud rate	3	0–5		-
	I62	Drive mode select after loss of frequency command	5	0–2		
	I63	Wait time after loss of frequency command	1	0.1–0.12		s

Communication Parameters Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>drv Drive mode</td><td>Set a drive mode.</td></tr>
<tr><td>Frq Frequency setting method</td><td>Select a frequency setting method.</td></tr>
<tr><td>I59 Communication protocol select</td><td>Set communication protocol.
<table>
<tr><th colspan="2">Setting</th><th>Function</th></tr>
<tr><td>0</td><td>Modbus-RTU</td><td>Modbus-RTU compatible protocol</td></tr>
<tr><td>1</td><td>LS BUS</td><td>Dedicated protocol for the LS inverter</td></tr>
</table></td></tr>
<tr><td>I60 Inverter number</td><td>Set for RS485 communication.</td></tr>
<tr><td>I61 Baud rate</td><td>Set a communication setting speed up to 38,400 bps.
<table>
<tr><th>Setting</th><th>Function</th></tr>
<tr><td>0</td><td>1,200 bps</td></tr>
<tr><td>1</td><td>2,400 bps</td></tr>
<tr><td>2</td><td>4,800 bps</td></tr>
<tr><td>3</td><td>9,600 bps</td></tr>
<tr><td>4</td><td>19,200 bps</td></tr>
<tr><td>5</td><td>38,400 bps</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>I62 Drive mode select after loss of frequency command</td><td>In situations where the frequency references set via the Analog (V, I) input terminal or communication option is lost, the inverter can be configured to operate in a specific mode.

When the frequency command is not given during the time set at I63, set the drive mode as shown in the table below.
<table>
<tr><td colspan="2">Function</td></tr>
<tr><td>0</td><td>Inverter operates continuously with the frequency before command loss occurs.</td></tr>
<tr><td>1</td><td>The inverter blocks output. The motor performs in free-run condition.</td></tr>
<tr><td>2</td><td>The motor decelerates and then stops at the time set at dEC.</td></tr>
</table>
</td></tr>
<tr><td>I63 Wait time after loss of frequency command</td><td>During the time set at this code, the inverter determines whether the input frequency command is present or not. If there is no frequency command input during this time, the inverter will start operation via the mode selected at I62.</td></tr>
</table>

7.2.3 Operation

Follow the instructions below to operate the inverter. Refer to *7.5 Troubleshooting* on page *172* if the communication does not operate normally.

1. Check whether the computer and the inverter are connected.
2. Turn on the inverter but do not connect the load initial stable communication between the computer and the inverter is verified.
3. Start operating the program supplied from LS industrial systems can be used as the operating program for the inverter.

Note

A user-made program for the “DriveView” program supplied form LS Industrial Systems can be used as the operating program for the inverter.

7.3 Communication Protocol

The built-in RS-485 communication supports LS INV 485 and Modbus-RTU protocols.

7.3.1 LS INV 485 Protocol

The slave device (inverter) responds to read and write requests from the master device (PLC or PC).

Request

ENQ	Drive No	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n bytes	2 bytes	1 byte

Acknowledge Response

ACK	Drive No	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Error Response

NAK	Drive No	CMD	Error code	SUM	EOT
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

- A request starts with ENQ and ends with EOT.
- A normal response starts with ACK and ends with EOT.
- An error response starts with NAK and ends with EOT.
- A drive No indicates the drive number and is displayed as a two-byte ASCII-HEX string that uses characters 0–9 and A–F.
- CMD: Uses uppercase characters (returns an IF error if lowercase characters are encountered)—please refer to the following table.

Character	ASCII-HEX	Command
'R'	52h	Read
'W'	57h	Write
'X'	58h	Request monitor registration
'Y;	59h	Perform monitor registration

- Data: ASCII-HEX (for example, when the data value is 3000: 3000 → '0"B"B"8'h → 30h 42h 42h 38h)
- Error code: ASCII (20h –7Fh)(refer to *7.3.1.4 Error Code* on page *165*)

- Transmission/reception buffer size: Transmission=44 bytes, Reception=39 bytes
- Monitor registration buffer: 8 bytes
- SUM: Checks communication errors via sum.
  SUM=a total of the lower 8 bits values for drive number, command and data (Drive No + CMD + Data) in ASCII-HEX.
  For example, a command to read 1 address from address 3000: SUM='0'+'1'+'R'+'3'+'0'+'0'+'0'+'1' = 30h+31h+52h+33h+30h+30h+30h+31h = 1**A7**h (the control value is not included: ENQ, ACK, NAK, etc.).

ENQ	Drive No	CMD	Address	Number of Addresses	SUM	EOT
05h	'01'	'R'	'3000'	'1'	'A7'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

7.3.1.1 Detailed Read Protocol

Read Request: Reads successive n words from address XXXX.

ENQ	Drive No	CMD	Address	Number of Addresses	SUM	EOT
05h	'01'–'1F'	'R'	'XXXX'	'1'–'8' = n	'XX'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

Total bytes=12. Characters are displayed inside single quotation marks (').

Read Acknowledge Response

ACK	Drive No	CMD	Data	SUM	EOT
06h	'01'–'1F'	'R'	'XXXX'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (7 + *n* x 4): a maximum of 39

Read Error Response

NAK	Drive No	CMD	Error code	SUM	EOT
15h	'01'–'1F'	'R'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

7.3.1.2 Detailed Write Protocol

Write Request: Writes successive n words to address XXXX.

ENQ	Drive No	CMD	Address	Number of Addresses	Data	SUM	EOT
05h	'01'–'1F	'W'	'XXXX'	'1'–'8' = n	'XXXX…'	'XX'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (12 + *n* x 4): a maximum of 44

Write Acknowledge Response

ACK	Drive No	CMD	Data	SUM	EOT
06h	'01'–'1F'	'W'	'XXXX…'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (7 + *n* x 4): a maximum of 39

Write Error Response

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'–'1F'	'W'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

Note

When Write Request or Write Acknowledge Response is transmitted to inverter from PC for the first time, previously save data is returned. From the second transmission, the current data will be returned.

7.3.1.3 Monitor Registration Detailed Protocol

Monitor registration request is made to designate the type of data that requires continuous monitoring and periodic updating.

Monitor Registration Request: Registration requests for *n* addresses (where *n* refers to the number of addresses. The addresses do not have to be contiguous.)

ENQ	Drive No	CMD	Number of Addresses	Address	SUM	EOT
05h	'01'–'1F'	'X'	'1'–'8'=n	'XXXX…'	'XX'	04h
1 byte	2 bytes	1 byte	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (8 + *n* x 4): a maximum of 40

Monitor Registration Acknowledge Response

ACK	Drive No	CMD	SUM	EOT
06h	'01'–'1F'	'X'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes=7

Monitor Registration Error Response

NAK	Drive ID	CMD	Error Code	SUM	EOT
15h	'01'–'1F'	'X'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

Monitor Registration Perform Request: A data read request for a registered address, received from a monitor registration request

ENQ	Drive No	CMD	SUM	EOT
05h	'01'–'1F'	'Y'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes=7

Monitor Registration Execution Acknowledge Response

ACK	Drive No	CMD	Data	SUM	EOT
06h	'01'–'1F'	'Y'	'XXXX…'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (7 + *n* x 4): a maximum of 39

Monitor Registration Execution Error Response

NAK	Drive No	CMD	Error Code	SUM	EOT
15h	'01'–'1F'	'Y'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

7.3.1.4 Error Code

Code	Abbreviation	Description
ILLEGAL FUNCTION	IF	The requested function (R, W, X, Y) cannot be performed by a slave because the corresponding function does not exist.
ILLEGAL DATA ADDRESS	IA	The received parameter address is invalid at the slave.
ILLEGAL DATA VALUE	ID	The received parameter data is invalid at the slave.
WRITE MODE ERROR	WM	Tried writing (W) to a parameter that does not allow writing (read-only parameters, or when writing is prohibited during operation)
FRAME ERROR	FE	The frame size does not match.

7.3.1.5 ASCII Code

Character	Hex	Character	Hex	Character	Hex
A	41	q	71	@	40
B	42	r	72	[	5B
C	43	s	73	\	5C
D	44	t	74	]	5D
E	45	u	75	^	5E
F	46	v	76	_	5F
G	47	w	77	`	60
H	48	x	78	{	7B
I	49	y	79	|	7C
J	4A	z	7A	}	7D
K	4B	0	30	~	7E
L	4C	1	31	BEL	07
M	4D	2	32	BS	08
N	4E	3	33	CAN	18
O	4F	4	34	CR	0D
P	50	5	35	DC1	11
Q	51	6	36	DC2	12
R	52	7	37	DC3	13
S	53	8	38	DC4	14
T	54	9	39	DEL	7F
U	55	space	20	DLE	10
V	56	!	21	EM	19
W	57	"	22	ACK	06
X	58	#	23	ENQ	05
Y	59	$	24	EOT	04
Z	5A	%	25	ESC	1B
a	61	&	26	ETB	17
b	62	'	27	ETX	03
c	63	(	28	FF	0C
d	64	)	29	FS	1C

Character	Hex	Character	Hex	Character	Hex
e	65	*	2A	GS	1D
f	66	+	2B	HT	09
g	67	,	2C	LF	0A
h	68	-	2D	NAK	15
i	69	.	2E	NUL	00
j	6A	/	2F	RS	1E
k	6B	:	3A	SI	0F
l	6C	;	3B	SO	0E
m	6D	<	3C	SOH	01
n	6E	=	3D	STX	02
o	6F	>	3E	SUB	1A
p	70	?	3F	SYN	16
				US	1F
				VT	0B

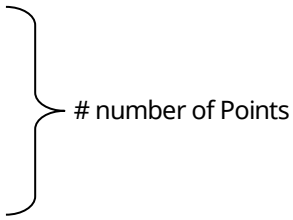
7.3.2 Modbus-RTU Protocol

7.3.2.1 Function Code and Protocol (unit: byte)

In the following section, station ID is the value set at CM.01 (Int485 St ID), and starting address is the communication address (starting address size is in bytes). For more information about communication addresses, refer to *7.4 C100 Common Area Parameter* on page *169*.

Function Code #03: Read Holding Register

Query Field Name		Response Field Name
Station ID		Station ID
Function(0x03)		Function (0x03)
Starting Address Hi		Byte Count
Starting Address Lo		Data Hi
# of Points Hi		Data Lo
# of Points Lo		...
CRC Lo		...
CRC Hi		Data Hi
		Data Lo
		CRC Lo
		CRC Hi



Function Code #04: Read Input Register

Query Field Name		Response Field Name
Station ID		Station ID
Function(0x04)		Function (0x04)
Starting Address Hi		Byte Count
Starting Address Lo		Data Hi
# of Points Hi		Data Lo
# of Points Lo		...
CRC Lo		...
CRC Hi		Data Hi
		Data Lo
		CRC Lo
		CRC Hi

number of Points

Function Code #06: Preset Single Register

Query Field Name		Response Field Name
Station ID		Station ID
Function (0x06)		Function (0x06)
Starting Address Hi		Register Address Hi
Register Address Lo		Register Address Lo
Preset Data Hi		Preset Data Hi
Preset Data Lo		Preset Data Lo
CRC Lo		CRC Lo
CRC Hi		CRC Hi

Function Code #16: Preset Multiple Register

Query Field Name		Response Field Name
Station ID		Station ID
Function (0x10)		Function (0x10)
Starting Address Hi		Starting Address Hi
Starting Address Lo		Starting Address Lo
# of Register Hi		# of Register Hi
# of Register Lo		# of Register Lo
Byte Count		CRC Lo

Query Field Name		Response Field Name
Data Hi		CRC Hi
Data Lo		
...	# number of Points	
...		
Data Hi		
Data Lo		
CRC Lo		
CRC Hi		

Exception Code

Code
01: ILLEGAL FUNCTION
02: ILLEGAL DATA ADRESS
03: ILLEGAL DATA VALUE
06: SLAVE DEVICE BUSY

User-define Code

Code	
14	Write Disable (The value of 0x0004 is 0)
	Read Only or No Program during operation

Response

Field Name
Station ID
Function*
Exception Code
CRC Lo
CRC Hi

* The function value uses the top level bit for all query values.

7.4 C100 Common Area Parameter

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
0x0000	Inverter model	-	-	R	C: LSLV-C100	
0x0001	Inverter capacity	-	-	R	0000:0.1kW-1, 0001:0.2kW-1, 0002:0.4kW-1, 0003:0.8kW-1, 0004:1.5kW-1, 0005:2.2kW-1, 0006:0.1kW-2, 0007:0.2kW-2, 0008:0.4kW-2, 0009:0.8kW-2, 000A:1.5kW-2, 000B:2.2kW-2, 000C:3.7kW-2, 000D:5.5kW-2, 000E:7.5kW-2, 000F:0.4kW-4, 0010:0.8KW-4, 0011:1.5KW-4, 0012:2.2KW-4, 0013:3.7KW-4, 0014:5.5KW-4, 0015:7.5KW-4	
0x0002	Inverter input voltage	-	-	R	0: 1P 220V	
					1: 3P 220V	
					2: 3P 440V	
0x0003	Version	-	-	R	Example 0x0010: Version 1.0	
0x0004	Parameter lock	-	-	R/W	0 : Lock(default)	
					1: Unlock	
0x0005	Frequency reference	0.01	Hz	R/W	Starting freq. – Max. freq.	
0x0006	Operation command	-	-	R	B15, B14, B13	Reserved
					B12, B11, B10, B9, B8	Freq. command
					0	DRV-00
					1	Reserved
					2	Multi-step speed 1
					3	Multi-step speed 2
					4	Multi-step speed 3
					5	Multi-step speed 4
					6	Multi-step speed 5
					7	Multi-step speed 6
					8	Multi-step speed 7
					9	UP
					10	DN
					11	UP/DN stop
					12	V2 (knob)
					13	V1
					14	I
					15	V2+I
					16	V2+V1
					17	JOG
				R/W	18	PID
					19	Communication
					B7, B6	Drive type
					0	Terminal
					1	Keypad

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
					3	Communication
					B5	Reversed
					B4	Emergency stop
					B3	Reset
					B2	Reverse
					B1	Forward
					B0	Stop
0x0007	Acceleration time	0.1	s	R/W	-	
0x0008	Deceleration time	0.1	s	R/W	-	
0x0009	Output current	0.1	A	R	-	
0x000A	Output frequency	0.01	Hz	R	-	
0x000B	Output voltage	1	V	R	-	
0x000C	DC link voltage	1	V	R	-	
0x000D	Output power	0.1	kW	R	-	
0x000E	Operation status	-	-	R	B15	Reversed
					B14	REM. Freq
					B13	REM. R/S
					B12	Reverse operation command
					B11	Forward operation command
					B10	Brake release signal
					B9	- (Not used)
					B8	Drive stopped.
					B7	DC Braking
					B6	Speed reached
					B5	Decelerating
					B4	Accelerating
					B3	Fault trip
					B2	Operating in reverse direction
					B1	Operating in forward direction
					B0	Stopped
0x000F	Trip information-A	-	-	R	B15	LVT
					B14	IOLT
					B13	POT
					B12	FAN
					B11	EEP
					B10	EXT-B
					B9	Reserved
					B8	OLT
					B7	ETH
					B6	OHT
					B5	GFT
					B4	COL
					B3	EST
					B2	EXT-A
					B1	OVT

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit					
					B0	OCT				
0x0010	Input terminal information	-	-	R	B15-B5	Reserved				
					B4	P5				
					B3	P4				
					B2	P3				
					B1	P2				
					B0	P1				
0x0011	Output terminal information	-	-	R	B4	3ABC				
					B3	Reserved				
					B2	Reserved				
					B1	Reserved				
					B0	Reserved				
0x0012	V1	-	-	R	0-10V keypad terminal AI V (0x0000-0x03FF)					
0x0013	V2	-	-	R	0-5V keypad potentiometer (0x0000-0x03FF)					
0x0014	I	-	-	R	0–20mA keypad terminal AI I (0x0000–0x03FF)					
0x0015	RPM	-	-	R	Displays existing motor synchronous speed					
0x001A	Unit Display	-	-	R	- (Not used)					
0x001B	Pole number	-	-	R	- (Not used)					
0x001C	User verion	-	-	R	- (Not used)					
0x001D	Trip information-B	-	-	R			B7	SAFB	B6	SAFA
					B5	NBR	B4	OC2	B3	REEP
					B2	NTC	B1	Reserved	B0	COM
0x001E	PID feedback	0.1	%	W	Sets PID feedback by communication					
0x0100–0x0107	Read address register	-	-	R	0x0100 : I66, 0x0101 : I67, 0x0102 : I68, 0x0103 : I69, 0x0104 : I70, 0x0105 : I71, 0x0106 : I72, 0x0107 : I73					
0x0108–0x010F	Write address register			W	0x0108 : I74, 0x0109 : I75, 0x010A : I76, 0x010B : I77, 0x010C : I78 ,0x010D : I79, 0x010E : I80, 0x010F : I81					

Note

- Changing the parameter value in common area changes the inverter setting. However, the setting returns to the previous setting before changing the parameter value if power is cycled or inverter is reset. In other parameter groups, changing value is immediately reflected even when cycling or resetting inverter.
- S/W version of common area is displayed in hexadecimal, while the version of parameter area is displayed in decimal.

7.5 Troubleshooting

Problem	Troubleshooting
Is the power provided to the RS-485?	Provide electric power to the converter
Are the connections between converter and computer correct?	Refer to converter manual
Does the Drive start communication?	Start communication
Is baud rate of inverter correctly set?	Set the correct value as provided on page *159*
Is the data format of user-made software correct?	Revise the software
Is the connection between converter and communication card right?	Refer to the correct wiring provided on page *159*

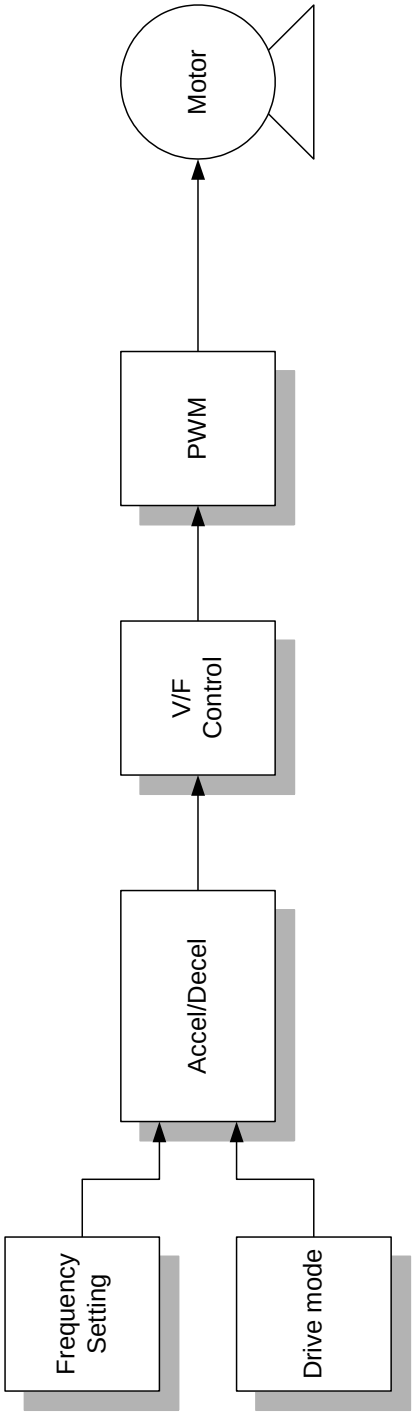
Note

- When setting parameters in the inverter memory control area, the values are reflected to the inverter operation and saved. Parameters set in other areas via communication are reflected to the inverter operation, but are not saved. All set values are cleared following an inverter power cycle and revert back to its previous values. When setting parameters via communication, ensure that a parameter save is completed prior to shutting the inverter down.
- Set parameters very carefully. After setting a parameter to 0 via communication, set it to another value. If a parameter has been set to a value other than 0 and a non-zero value is entered again, an error message is returned. The previously-set value can be identified by reading the parameter when operating the inverter via communication.

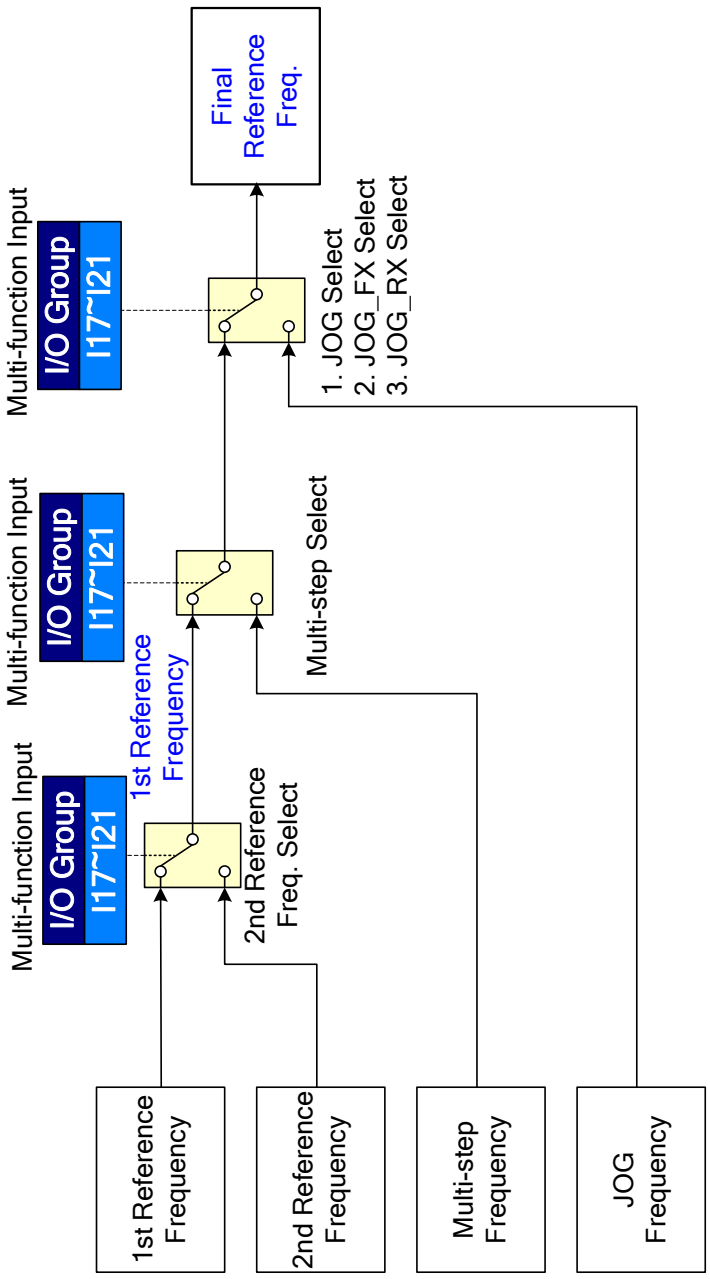
Caution

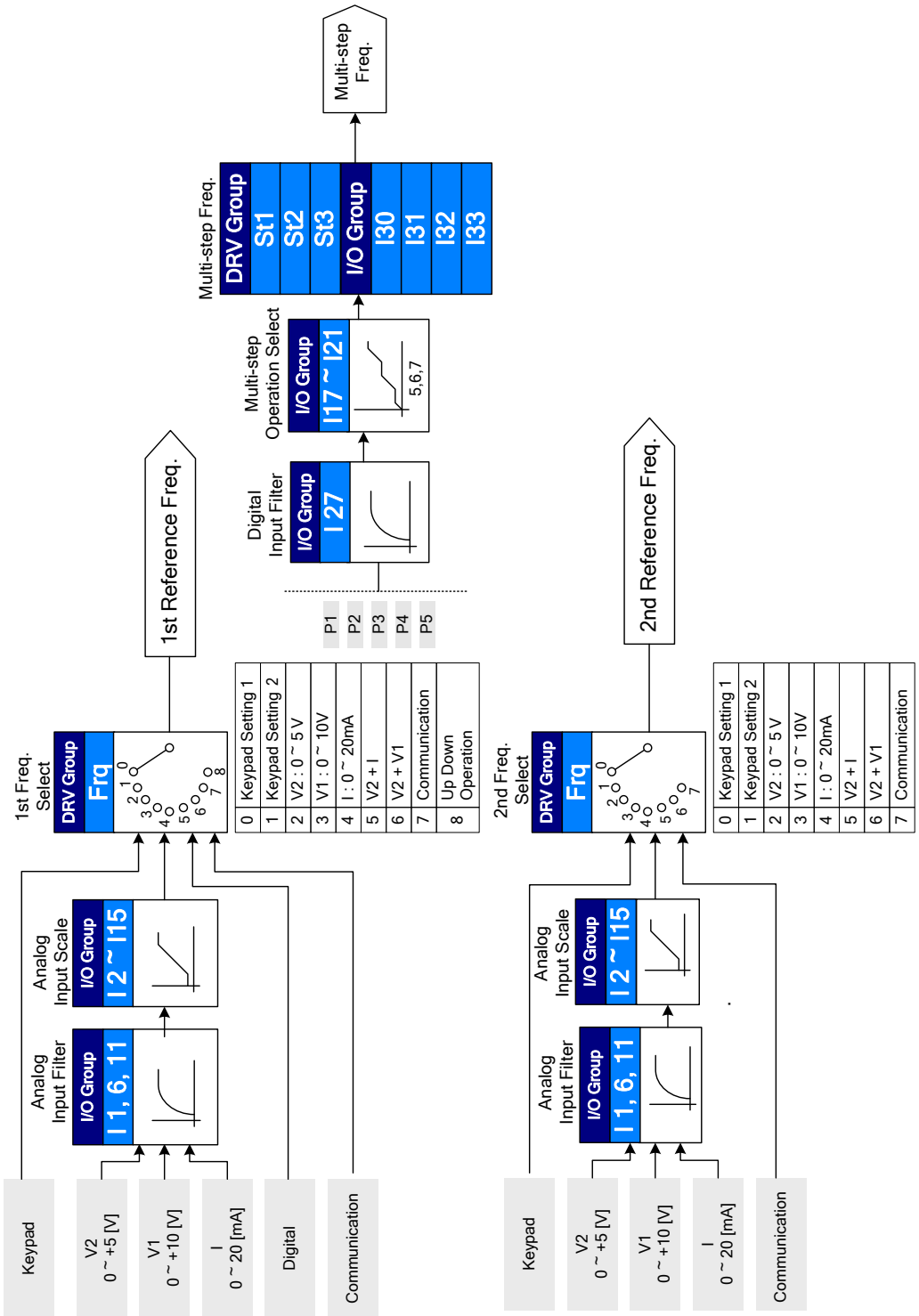
It may take longer to set the parameter values in the inverter memory control area because all data is saved to the inverter. Be careful as communication may be lost during parameter setup if parameter setup is continues for an extended period of time.

7.6 Control Block Diagram

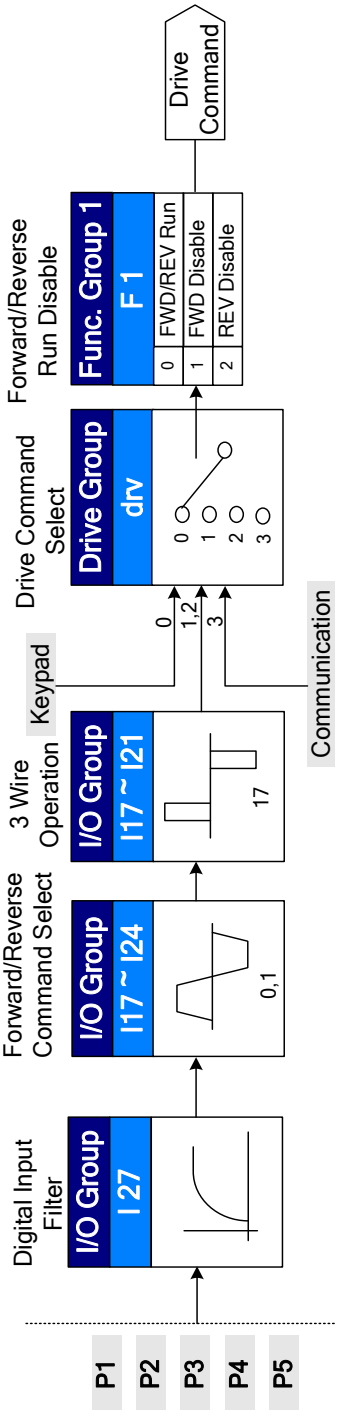


7.6.1 Frequency Setting

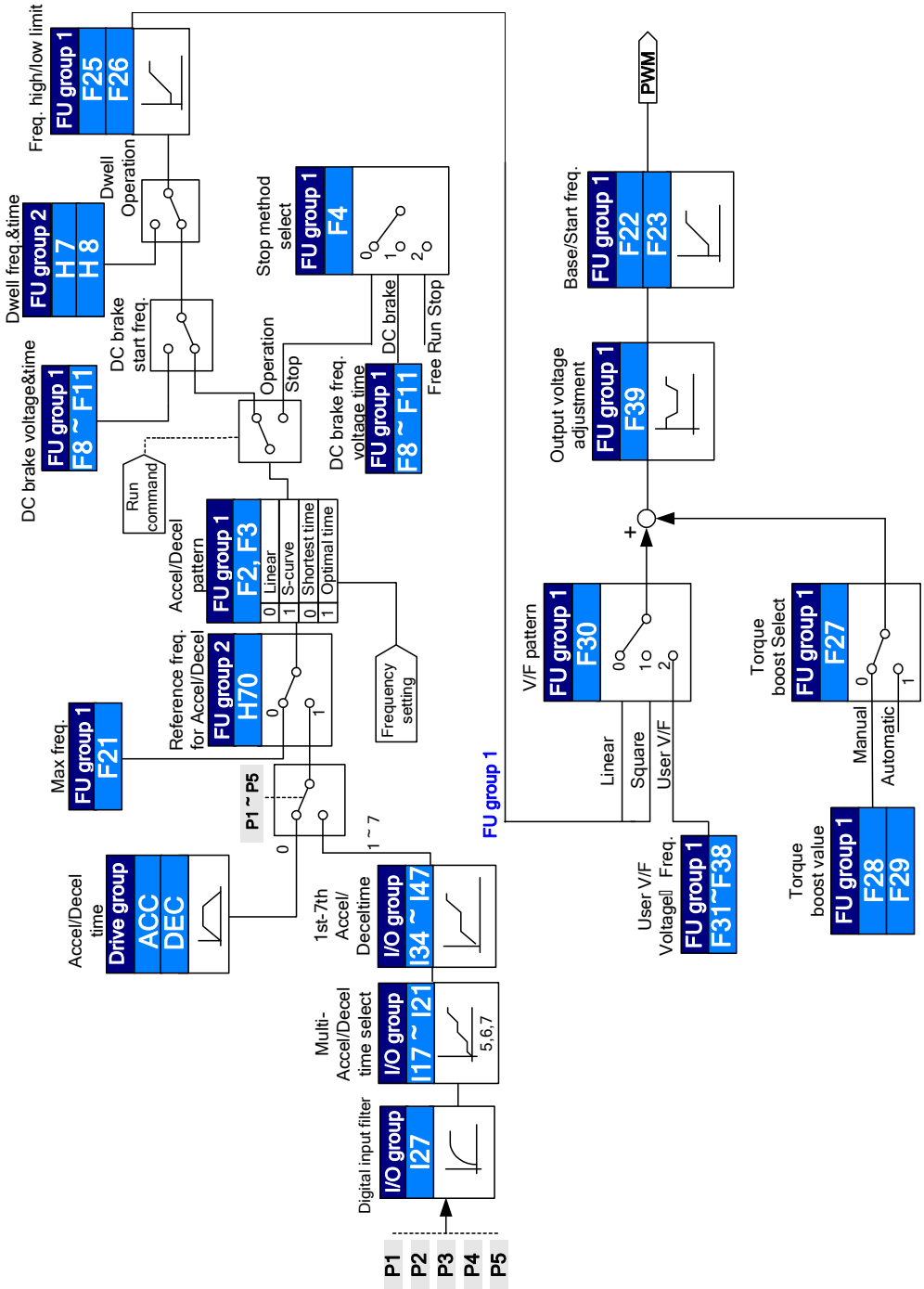



Keypad
V2
0 ~ +5 [V]
V1
0 ~ +10 [V]
I
0 ~ 20 [mA]
Digital
Communication
Analog
Input Filter
I/O Group
I 1, 6, 11
Analog
Input Scale
I/O Group
I 2 ~ I15
1st Freq.
Select
DRV Group
Frq
0 Keypad Setting 1
1 Keypad Setting 2
2 V2 : 0 ~ 5 V
3 V1 : 0 ~ 10V
4 I : 0 ~ 20mA
5 V2 + I
6 V2 + V1
7 Communication
8 Up Down Operation
1st Reference Freq.
Digital
Input Filter
I/O Group
I 27
P1
P2
P3
P4
P5
Multi-step
Operation Select
I/O Group
I17 ~ I21
5,6,7
Multi-step Freq.
DRV Group
St1
St2
St3
I/O Group
I30
I31
I32
I33
Multi-step
Freq.
Keypad
V2
0 ~ +5 [V]
V1
0 ~ +10 [V]
I
0 ~ 20 [mA]
Communication
Analog
Input Filter
I/O Group
I 1, 6, 11
Analog
Input Scale
I/O Group
I 2 ~ I15
2nd Freq.
Select
DRV Group
Frq
0 Keypad Setting 1
1 Keypad Setting 2
2 V2 : 0 ~ 5 V
3 V1 : 0 ~ 10V
4 I : 0 ~ 20mA
5 V2 + I
6 V2 + V1
7 Communication
2nd Reference Freq.

7.6.2 Drive Command Setting



7.6.3 Accel/Decel Setting and VF Control



8 Table of Functions

This chapter lists all the function settings for C100 series inverter. Set the parameters required according to the following references.

8.1 Drive Group

The Drive group is used only in the basic keypad mode.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
0.00	1100	Frequency command	0.00–400.00 (Hz)	This parameter sets the frequency output by the inverter. During stop: Frequency command During run: Output frequency During multi-step operation: It cannot be set greater than F21 (Max. frequency)	0.00	O	p.55
ACC	1101	Accel time	0.0–6000.0 (s)	During Multi-Accel/Decel operation, this parameter serves as the Accel/Decel time baseline.	5.0	O	p.70
dEC	1102	Decel time			10.0	O	p.70
drv	1103	Drive mode	0–3	0 Starts or stops the inverter using the [RUN] or [STOP/RESET] key on the keypad.	1	X	p.64
				1 Terminal operation: FX: Forward operation, RX: Reverse operation			p.65
				2 Terminal operation: FX: Run/Stop, RX: Reverse rotation			p.66
				3 RS-485 communication			p.67
Frq	1104	Frequency setting method	0–8	0 Digital: Keypad setting 1	0	X	p.55
				1 Digital: Keypad setting 2			p.56
				2 Analog: Panel Potentiometer V2 set: 0-5 (V)			p.56
				3 Analog: Terminal AI (J1 to V): 0-+10 (V)			p.57
				4 Analog: Terminal AI set (J1 to I): 0-20 (mA)			p.58
				5 Panel Potentiometer V2 +			p.59

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
				Terminal AI (J1 to I) setting			
				6 Panel Potentiometer V2 + Terminal AI (J1 to V) setting			p.60
				7 RS-485 communication			p.61
				8 Digital (UP/DOWN) rotation			p.95
St1	1105	Multi-step frequency 1	0.00 – 400.00 (Hz)	Sets multi-step frequency 1 during multi-step operation.	10.00	O	p. 62
St2	1106	Multi-step frequency 2		Sets multi-step frequency 2 during multi-step operation.	20.00	O	p.62
St3	1107	Multi-step frequency 3		Sets multi-step frequency 3 during multi-step operation.	30.00	O	p.62
CUr	1108	Output current	(A)	Displays the output current sent to the motor.	-	-	p.136
rPM	1109	Motor RPM	(rPM)	Displays the motor's RPM.	-	-	p.136
dCL	110A	DC link voltage	(V)	Displays the inverter's DC link voltage.	-	-	p.137
vOL	110B	User display select	-	This parameter displays the item selected at H73 (Monitoring item select).	vOL	-	p.137
				vOL Output voltage			
				POr Output power			
				tOr Torque			
nOn	110C	Fault display	-	Displays the fault type, frequency, and the operating status at the time of the fault	-	-	p.141
drC	110D	Direction of motor rotation	F, r	Direction of motor rotation when drv (Drive mode) is set to 0.	F	O	p.64
				F Forward			
				r Reverse			
drv2[1]	110E	Drive mode 2	0 – 3	0 Starts or stops the inverter with the [RUN] or [STOP/RESET] key on the keypad.	1	X	p.119

[1] Displayed when one of the Multi-function input terminals 1–5 [I17–I21] is set to 22.

LED Display	Comm. Address	Name	Setting Range	Description			Initial Value	Adj. during Run	Ref.
				1	Terminal operation	FX: Forward operation RX: Reverse operation			
				2		FX: Run/Stop RX: Reverse rotation			
				3	RS-485 communication				
Frq2[1]	110F	Frequency setting method 2	0–7	0	Digital	Keypad setting 1	0	X	p.119
				1		Keypad setting 2			
				2	Analog	Panel Potentiometer V2: 0–5 (V)			
				3		Terminal A set (J1 to V): 0–10 (V)			
				4		Terminal AI set (J1 to 1): 0–20 (mA)			
				5		Panel Potentiometer V2 +Terminal AI (J1 to 1) setting			
				6		Panel potentiometer V2 + Terminal AI (J1 to V) setting			
				7	RS-485 communication				
rEF[2]	1110	PID control standard value setting	0.00–400.00 (Hz) or 0–100(%)		If H58 is 0, it is expressed as a hertz (Hz) unit. If H58 is 1, it is expressed as a percentage (%) unit. With a (Hz) unit, you cannot set the Max. frequency more than (F21). With a (%) unit, 100% is the Max. frequency.		0.00	0	p.103
Fbk[2]	1111	PID control feedback amount	0.00–400.00 (Hz) or 0–100(%)		Indicates a feedback amount of the PID control. If H58 is 0, it is expressed as a hertz (Hz) unit. If H58 is 1, it is expressed as a percentage (%) unit.		-	-	p.103

[2] Displayed when H49 (PID select) is set to 1.

8.2 Function Group 1

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

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
F 0	1200	Jump code	0–72	Sets the parameter code number to jump.	1	O	p.39
F 1	1201	Forward/ reverse run disable	0–2	0 Starts forward and reverse operation 1 Disables forward operation 2 Disables reverse operation	0	X	p.67
F 2	1202	Accel pattern	0–1	0 Linear 1 S-curve	0	X	p.75
F 3	1203	Stop mode select					
F 4	1204	Stop mode select	0–3	0 Decelerates to stop 1 DC brakes to stop 2 Free runs to stop 3 Power braking stop	0	X	p.83
F 8[3]	1208	DC brake start frequency	0.10–60.00 (Hz)	Sets the DC brake start frequency. It cannot be set below the Start frequency (F23).	5.00	X	p.88
F 9	1209	DC brake wait time	0.00–60.00 (s)	When the DC brake frequency is reached, the inverter holds the output for the setting time before starting DC brake.	0.10	X	
F10	120A	DC brake voltage	0 – 200(%)	Sets the amount of DC voltage applied to a motor. It is set as a percentage of the motor-rated current (H33).	50	X	
F11	120B	DC brake time	0.0–60.0 (s)	Sets the time taken to apply DC current to a motor while motor is at a stop.	1.0	X	
F12	120C	Brake start voltage	0–200(%)	Sets the amount of DC voltage required before starting motor operation. It is set in percent of motor-rated current (H33).	50	X	p.90

[3] Displayed when F4 (Stop mode select) is set to 1.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
F13	120D	DC brake start time	0.0–60.0(s)	DC voltage is applied to the motor for the length of the DC brake start time before motor acceleration begins.	0.0	X	
F14	120E	Time for magnetizing a motor	0.0–60.0(s)	Applies the current to a motor for the set time before motor accelerates during sensorless vector control.	0.5	X	p.109
F20	1214	Jog frequency	0.00–400.00 (Hz)	This parameter sets the frequency for the jog operation. It cannot be set above the Max. frequency (F21).	10.00	O	p.93
F21[4]	1215	Max frequency	40.00–400.00 (Hz)	The highest frequency the inverter can output. It is the frequency reference for accel/decel (H70) ⚠ **Caution** Except F22 (Base frequency), any frequency set above F21 will automatically turn to the value set at F21.	60.00	X	p.70
F22	1216	Base frequency	30.00–400.00 (Hz)	The inverter outputs its rated voltage to the motor at this frequency (see *Motor nameplate*).	60.00	X	p.78
F23	1217	Start frequency	0.10–10.00 (Hz)	The inverter outputs its voltage at this frequency. It is the frequency's lowest setting.	0.50	X	p.78
F24	1218	Frequency high/low limit select	0–1	Sets the upper and lower limits of the run frequency.	0	X	p. 85
F25[5]	1219	Frequency high limit	0.00–400.00 (Hz)	Sets the upper limit of the run frequency. It cannot be set above the Max. frequency (F21).	60.00	X	
F26	121A	Frequency low limit	0.00–400.00 (Hz)	Sets the lower limit of the run frequency. It cannot be set above the Frequency high limit (F25) or below the Start frequency (F23).	0.50	X	
F27	121B	Torque	0–1	0 Manual torque boost	0	X	p.81

[4] If H40 is set to 3 (sensorless vector), Max frequency is settable up to 120Hz.

[5] Displayed when F24 (Frequency high/low limit select) is set to 1.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
		boost select		1 Auto torque boost			
F28	121C	Torque boost in forward direction	0.0–20.0 (%)	Sets the amount of torque boost applied to a motor during forward operation. It is set as a percentage of the Max. output voltage.	3.0	X	
F29	121D	Torque boost in reverse direction	0.0–20.0 (%)	Sets the amount of torque boost applied to a motor during reverse operation. It is set as a percentage of the Max. output voltage.	3.0	X	
F30	121E	V/F pattern	0–2	0 Linear 1 Square 2 User V/F	0	X	p.79
F31[6]	121F	User V/F frequency 1	0.00–400.00 (Hz)	Used only when the V/F pattern is set to 2 user/V/F. It cannot be set above the Max. frequency (F21). The value of the voltage is set as a percentage of the motor-rated voltage. The values of lower-numbered parameters cannot be set above higher-numbered parameters.	15.00	X	p.80
F32	1220	User V/F voltage 1	0–100 (%)		25	X	
F33	1221	User V/F frequency 2	0.00–400.00 (Hz)		30.00	X	
F34	1222	User V/F voltage 2	0 – 100 (%)		50	X	
F35	1223	User V/F frequency 3	0.00–400.00 (Hz)		45.00	X	
F36	1224	User V/F voltage 3	0 – 100 (%)		75	X	
F37	1225	User V/F frequency 4	0.00–400.00 (Hz)		60.00	X	
F38	1226	User V/F voltage 4	0 – 100 (%)		100	X	
F39	1227	Output voltage adjustment	40.0–110.0 (%)	Adjusts the amount of output voltage. The set value is a percentage of the input voltage.	100.0	X	p.81

[6] Set F30 to 2(User V/F) to display this parameter

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
F40	1228	Energy-saving level	0 – 30(%)	Decreases the output voltage according to the load status.	0	0	p.110
F50	1232	Electronic thermal select	0–1	Activates when the motor overheats (time-inverse).	0	0	p.143
F51[7]	1233	Electronic thermal level for 1 minute	100–200(%)	Sets the maximum current able to flow to the motor continuously for 1 minute. The set value is a percentage of the Motor-rated current (H33). It cannot be set below the Electronic thermal level for continuous (F52).	150	0	p.143
F52	1234	Electronic thermal level for continuous	50 – 150(%)	Sets the amount of current required to keep the motor running continuously. It cannot be set higher than the Electronic thermal level for 1 minute (F51).	100	0	
F53	1235	Motor cooling method	0–1	0 Standard motor with a cooling fan directly connected to the shaft 1 A motor using a separate motor to power a cooling fan	0	0	
F54	1236	Overload warning level	30–150(%)	Sets the amount of current required to issue an alarm signal at a relay or multifunction output terminal (I55). The set value is a percentage of the Motor-rated current (H33).	150	0	p.145
F55	1237	Overload warning time	0.0–30.0 (s)	Issues an alarm signal when the current exceeds the Overload warning level (F54) and flows to the motor for the time set at the Overload warning time (F55).	10.0	0	p.145
F56	1238	Overload trip select	0–1	Stops the inverter output when motor is overloaded.	1	0	p.145

[7] Set F50 to 1 to display this parameter.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
F57	1239	Overload trip level	30–200(%)	Sets the amount of overload current. The value is a percentage of the Motor-rated current (H33).	180	0	
F58	123A	Overload trip time	0.0–60.0 (s)	Stops the inverter output when the current exceeds the Overload trip level (F57) and flows to the motor for the time set at the Overload trip time (F58).	60.0	0	
F59	123B	Stall prevention select	0–7	Stops acceleration while accelerating, deceleration during constant speed run, and stops deceleration while decelerating. During Decel / During constant run / During Accel Bit 2 / Bit 1 / Bit 0 0: - / - / - 1: - / - / ✓ 2: - / ✓ / - 3: - / ✓ / ✓ 4: ✓ / - / - 5: ✓ / - / ✓ 6: ✓ / ✓ / - 7: ✓ / ✓ / ✓	0	X	p.146
F60	123C	Stall prevention level	30–200(%)	Sets the amount of current to activate stall prevention function during Accel, Constant, or Decel operations. The set value is a percentage of the Motor-rated current (H33).	150	X	p.146
F61[8]	123D	When stall prevention during deceleration, voltage limit select	0–1	Select 1 if you want to limit the output voltage during a Stall prevention run while decelerating.	0	X	p.121
F63	123F	Save up/down frequency select	0–1	Decides whether to save the specified frequency during up/down operation. When 1 is selected, the up/down	0	X	p.95

[8] Displayed when setting bit 2 of F59 is set to 1.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
				frequency is saved at F64.			
F64[9]	1240	Save up/down frequency	-	If the Save up/down frequency is selected at F63, this parameter saves the frequency before the inverter stops or decelerates.	0.00	X	p.95
F65	1241	Up-down mode select	0–2	There are three up-down modes available. 0 Increases the goal frequency as a standard of Max. frequency/Min. frequency. 1 Increases step frequency according to edge input at F66. 2 Combine 0 and 1.	0	X	p.96
F66	1242	Up-Down step frequency	0.00–400.00 (Hz)	When choosing 1 or 2 at F65, this increases or decreases the frequency according to the up-down input.	0.00	X	p.96
F67[10]	1243	200V input voltage	170 – 240(V)	Sets inverter input voltage to 200 V.	220	0	p.128
F68[10]	1244	400V input voltage	320 – 480(V)	Set inverter input voltage to 400 V.	380	0	p.128
F70	1246	Draw run mode select	0–3	0 Inverter does not run in a draw mode. 1 Analog terminal AI V terminal (0–10 V) input drawn run 2 Analog terminal AIV terminal (0–20 mA) input drawn run 3 Panel potentiometer V2 (0–5 V) input draw run	0	X	p.125
F71	1247	Draw rate	0 – 100(%)	Sets the rate of draw.	0.0	O	p.125
F72[11]	1248	ND/HD selection	0–1	0: HD (CT) heavy load 1: ND (VT) light load	0	X	p.118
F73[12]	1249	200V DB start voltage	300–400(V)	Sets the DB start voltage of a 200V class inverter	390	0	p.130

[9] Displayed when F63 is set to 1.

[10] 200 V inverter displays F67 and 400 V inverter displays F68.

[11] Only HD selection is available for single phase 200V inverter.

[12] 200 V inverter displays F73 and 400 V inverter displays F74.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
F74[12]	124A	400V DB start voltage	600 – 800(V)	Sets the DB start voltage of a 400V class inverter	780	0	p.130

8.3 Function Group 2

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

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
H 0	1300	Jump code	0–95	Sets the Jump code number.	1	O	p.39
H 1	1301	Fault history 1	-	Stores information on the types of faults, the frequency, the current, and the Accel/Decel condition at the time of a fault. The most recent fault is automatically stored in Fault history 1.	nOn	-	p.142
H 2	1302	Fault history 2	-		nOn	-	
H 3	1303	Fault history 3	-		nOn	-	
H 4	1304	Fault history 4	-		nOn	-	
H 5	1305	Fault history 5	-		nOn	-	
H 6	1306	Reset fault history	0–1	Clears the fault history saved in H1–5.	0	O	
H 7	1307	Dwell frequency	0.10–400.00 (Hz)	When the run frequency is issued, the motor starts to accelerate after the Dwell frequency is applied to the motor during the Dwell time (H8). The Dwell frequency can be set within the range of Max. frequency (F21) and Start frequency (F23).	5.00	X	p.99
H 8	1308	Dwell time	0.0–10.0(s)	Sets the time for the Dwell operation.	0.0	X	
H10	130A	Skip frequency select	0–1	Sets the frequency range to skip to prevent undesirable resonance and vibration on the structure of the machine.	0	X	p.86

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
H11[13]	130B	Skip frequency low limit 1	0.10–400.00 (s)	The run frequency cannot be set within the range of H11–16. The frequency values of the low-numbered parameters cannot be set above those of the high-numbered ones. The settable range is F21 and F23.	10.00	X	
H12	130C	Skip frequency high limit 1			15.00	X	
H13	130D	Skip frequency low limit 2			20.00	X	
H14	130E	Skip frequency high limit 2			25.00	X	
H15	130F	Skip frequency low limit 3			30.00	X	
H16	1310	Skip frequency high limit 3			35.00	X	
H17[14]	1311	S-Curve accel/decel start side	1–100(%)	Sets the speed reference value to form a curve at the start of an accel/decel operation. If it is set higher, linear zone becomes smaller.	40	X	p.75
H18[14]	1312	S-Curve accel/decel end side	1 – 100(%)	Set the speed reference value to form a curve at the end of an accel/decel operation. If it is set higher, the linear zone becomes smaller.	40	X	
H19	1313	Input/output phase loss protection select	0–3	Selects inverter input/output loss phase protection Bit0: Inverter output loss phase selection Bit1: Inverter input loss phase selection	0	O	p.149

[13] Displayed when H10 is set to 1.

[14] Displayed when F2, F3 are set to 1 (S-curve).

<table>
<tr><th>LED Display</th><th>Comm. Address</th><th>Name</th><th>Setting Range</th><th>Description</th><th>Initial Value</th><th>Adj. during Run</th><th>Ref.</th></tr>
<tr><td>H20</td><td>1314</td><td>Power on start select</td><td>0–1</td><td>Activates when drv is set to 1 or 2 (Run/Stop via the Control terminal). Motor accelerates after AC power is applied while the FX or RX terminal is ON.</td><td>0</td><td>O</td><td><u>p.68</u></td></tr>
<tr><td>H21</td><td>1315</td><td>Restart after fault reset selection</td><td>0–1</td><td>Activates when drv is set to 1 or 2 (Run/Stop via the Control terminal). Motor accelerates after the fault condition is reset while the FX or RX terminal is ON.</td><td>0</td><td>O</td><td><u>p.69</u></td></tr>
<tr><td>H22[15]</td><td>1316</td><td>Speed search select</td><td>0–15</td><td>Activates to prevent any possible fault when the inverter outputs its voltage to the running motor.
<table>
<tr><th></th><th>Power On start</th><th>Restart after instant power failure</th><th>Operation after fault</th><th>Normal accel</th></tr>
<tr><td></td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>-</td><td>✓</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>✓</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>4</td><td>-</td><td>✓</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td>-</td><td>✓</td><td>-</td><td>✓</td></tr>
<tr><td>6</td><td>-</td><td>✓</td><td>✓</td><td>-</td></tr>
<tr><td>7</td><td>-</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>8</td><td>✓</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>✓</td><td>-</td><td>-</td><td>✓</td></tr>
<tr><td>10</td><td>✓</td><td>-</td><td>✓</td><td>-</td></tr>
<tr><td>11</td><td>✓</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>12</td><td>✓</td><td>✓</td><td>-</td><td>-</td></tr>
</table></td><td>0</td><td>X</td><td><u>p.111</u></td></tr>
</table>

[15] H22 Normal acceleration has first priority. It has no relation with others. In acceleration, speed tracking works.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
				13 ✓ ✓ - ✓ 14 ✓ ✓ ✓ - 15 ✓ ✓ ✓ ✓			
H23	1317	Current level during speed search	80 – 200(%)	This parameter limits the amount of current during speed search. The set value is the percentage of Motor-rated current (H33).	150	O	
H24	1318	P gain during speed search	0 – 9999	It is the Proportional gain used for Speed Search PI controller.	100	O	p.111
H25	1319	I gain during speed search	0 – 9999	It is the Integral gain used for Speed search PI controller.	200	O	
H26	131A	Number of auto restart try	0–10	This parameter sets the number of restart tries after a fault occurs. Auto Restart is deactivated if the fault outnumbers the restart tries. This function is active when drv is set to 1 or 2 (Run/Stop via control terminal). Deactivated during active protection function (OHT, LVT, EXT, HWT etc.).	0	O	p.113
H27	131B	Auto restart time	0 – 60(s)	This parameter sets the time between restart tries.	1.0	O	p.113
H30	131E	Motor type select	0.1 – 11.0	0.1 0.1kW - - 11.0 11.0kW	0.75[16]	X	p.100
H31	131F	Number of motor poles	2–12	This setting accords to nameplate of motor.	4	X	

[16] H30 is preset based on inverter rating.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
H32	1320	Rated slip frequency	0.00–10.00 (Hz)	Motor nameplate rated rotation speed conversion is frequency. The difference between input power frequency and this value.	2.33[17]	X	
H33	1321	Motor-rated current	0.1–150.0 (A)	Enter motor rated current on the nameplate.	1.8	X	
H34	1322	No load motor current	0.1–100.0 (A)	Enter the current value detected when the motor is rotating in rated rpm after the load connected to the motor shaft is removed. Enter the 50% of the rated current value when it is difficult to measure no Load Motor Current.	0.7	X	p.100
H36	1324	Motor efficiency	50 – 100(%)	Enter the motor efficiency (see motor nameplate).	72	X	
H37	1325	Load inertia rate	0–2	Select one of the following according to motor inertia. 0 Less than 10 times 1 About 10 times 2 More than 10 times	0	X	p.100
H39	1327	Carrier frequency	1.0–15.0 [kHz]	This parameter affects the audible sound of the motor, noise emission from the inverter, inverter temperature, and leakage current. If the value is set higher, the motor sound becomes quieter but the noise from the inverter and leakage current will become louder.	5.0[18] 3.0[18]	O	p.115
H40	1328	Control mode select	0–3	0 V/F Control} 1 Slip compensation control 2 Reserved 3 Sensorless vector control	0	X	p.122 p.100 p.109

[17] H32–H36 factory default values are set based on 200V/400V HIGEN motor.

[18] Default carrier frequency of 0.1–3.7KW series is 5KHz, and default carrier frequency of 5.5–7.5KW series is 3 KHz.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
H41	1329	Auto tuning	0–1	If this parameter is set to 1, it automatically measures the parameters of H42 and H44.	0	X	p.108
H42	132A	Stator resistance (Rs)	0.000–56.000 [Ω]	This is the value of the motor stator resistance.	-	X	
H44	132C	Leakage inductance (Lσ)	0.00–600.00 (mH)	This is the leakage inductance of the stator and rotor of the motor.	-	X	
H45[19]	132D	Sensorless P gain	0–32767	P gain for Sensorless control	1000	O	
H46	132E	Sensorless I gain		I gain for Sensorless control	100	O	
H47	132F	Sensorless torque limit	100.0–220.0 (%)	Limits output torque in sensorless mode.	180.0	X	
H48	1330	PWM mode select	0–1	If you want to limit an inverter leakage current, select 2 phase PWM mode. It makes more noise than normal PWM mode. 0 Normal PWM mode 1 2 phase PWM mode	0	X	p.115
H49	1331	PID select	0–1	Selects whether the PID control is used or not.	0	X	p.103
H50[20]	1332	PID F/B select	0–2	0 Analog input terminal AI (I: 0-20 mA) 1 Analog input terminal AI (V: 0-10 V) 2 RS-485 communication	0	X	p.103
H51	1333	P gain for PID	0.0–999.9 (%)	Sets the gains for the PID controller.	300.0	O	

[19] Displayed when H40 is set to 3 (Sensorless vector control).

[20] Displayed when H49 is set to 1 (PID control).

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
H52	1334	Integral time for PID	0.10–32.00 (s)		1.00	O	
H53	1335	Differential time for PID (D gain)	0.00–30.00 (s)		0.00	O	
H54	1336	PID control mode select	0–1	Selects PID control mode. 0 Normal PID control 1 Process PID control	0	X	<u>p.103</u>
H55[21]	1337	PID output frequency high limit	0.10–400.00 (Hz)	Limits the output frequency through the PID control. The value can be set between the Max. frequency (F21) and Start frequency (F23).	60.00	O	<u>p.103</u>
H56	1338	PID output frequency low limit	0.10–400.00 (Hz)		0.50	O	
H57	1339	PID standard value select	0–4	Selects the PID standard value. The standard value is indicated in "rEF" of the Drive group. 0 Loader digital setting 1 1 Loader digital setting 2 2 AI terminal setting: 0-10 V 3 I terminal setting: 0-20 mA 4 Setting as a RS-485 communication	0	X	<u>p.103</u>
H58	133A	PID control unit select	0–1	Selects a unit for the standard value or feedback amount. 0 Frequency (Hz) 1 Percentage (%)	0	X	
H61	133D	Sleep delay time	0.0–2000.0 (s)	Sets a sleep delay time for the PID drive.	60.0	X	<u>p.103</u>

[21] Displayed when H49 is set to 1.

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
H62	133E	Sleep frequency	0.00–400 (Hz)	Sets a sleep frequency when executing a sleep function for the PID control drive. You cannot set it above the Max. frequency (F21).	0.00	O	
H63	133F	Wake up level	0.0–100.0 (%)	Sets a wake up level for the PID control drive.	35.0	O	
H64	1340	KEB drive select	0–1	Sets the KEB drive.	0	X	*p.124*
H65[22]	1341	KEB action start level	110.0–140.0 (%)	Sets the KEB action start level.	125.0	X	
H66[22]	1342	KEB action stop level	110.0–145.0 (%)	Sets the KEB action stop level.	130.0	X	*p.124*
H67	1343	KEB action gain	1 – 20000	Sets the KEB action gain.	50	X	
H70	1346	Frequency reference for accel/decel	0–1	0 Based on Max. frequency (F21) 1 Based on Delta frequency	0	X	*p.70*
H71	1347	Accel/decel time scale	0–2	0 Sets minimum unit as 0.01 second 1 Sets minimum unit as 0.1 second 2 Sets minimum unit as 1 second	1	O	*p.70*
H72	1348	Power on display	0–17	Selects the parameter to be displayed on the keypad when the input power is first applied. 0 Frequency command 1 Accel time 2 Decel time 3 Drive mode 4 Frequency mode 5 Multi-step frequency 1 6 Multi-step frequency 2	0	O	*p.138*

[22] Displayed when H64 is set to 1. KEB does not operate when power is cut after loading the ting input (about 10%).

LED Display	Comm. Address	Name	Setting Range	Description		Initial Value	Adj. during Run	Ref.
				7	Multi-step frequency 3			
				8	Output current			
				9	Motor rpm			
				10	Inverter DC link voltage			
				11	User display select (H73)			
				12	Fault display			
				13	Direction of motor rotation select			
				14	Output current 2			
				15	Motor rpm 2			
				16	Inverter DC link voltage 2			
				17	User display select 2 (H73 set)			
H73	1349	Monitoring item select	0–2	One of the following can be monitored via vOL(User display select):		0	O	p.137
				0	Output voltage (V)			
				1	Output power (kW)			
				2	Torque (kgf × m)			
H74	134A	Gain for Motor rpm display	1–1000 (%)	This parameter is used to change the motor rotation speed (r/min) to mechanical speed (m/mi) and display it.		100	O	p.136
H75	134B	DB resistor operating rate limit select	0–1	0	Unlimited	1	O	p.153
				1	Use the DB resistor at the rate set in H76.			
H76	134C	DB resistor operating rate	0–30 (%)	Set the percentage of the DB resistor operating rate to be activated during one sequence of operation.		10	O	
H77[23]	134D	Cooling fan control	0–1	0	The cooling fan is always on.	0	O	p.126
				1	Keeps ON when its temperature is higher than the inverter protection limit temperature. Activated only during operation when its			

[23] Single phase 0.1/0.2kW, three phase 200V 0.1/0.2/0.4KW and three phase 400V 0.4KW are NO FAN TYPE, so this parameter is not displayed.

LED Display	Comm. Address	Name	Setting Range	Description		Initial Value	Adj. during Run	Ref.
					temperature is below that of the inverter protection limit.			
H78	134E	Operating method select when cooling fan mal-functions	0–1	0	Continuous operation when the cooling fan malfunctions.	0	O	p.127
				1	Operation stops when the cooling fan malfunctions.			
H79	134F	S/W version	X.X	Displays the inverter software version.		X.X	X	-
H81[24]	1351	2nd motor accel time	0.0–6000.0 (s)	This parameter activates when the selected terminal is ON after I17–I21 is set to 12 (2nd motor is select).		5.0	O	p.116
H82	1352	2nd motor decel time				10.0	O	
H83	1353	2nd motor base frequency	30.00–400.00 (Hz)			60.00	X	
H84	1354	2nd motor V/F pattern	0–2			0	X	
H85	1355	2nd motor forward torque boost	0.0–15.0 (%)			5.0	X	
H86	1356	2nd motor reverse torque boost				5.0	X	
H87	1357	2nd motor stall preventio n level	30–150 (%)	Multi-function terminal (I17-I21). When one set is 12 (2nd motor select), switch on the terminal. The 2nd motor parameter activates.		150	X	p.117
H88	1358	2nd motor electronic thermal level for 1 min	50–200 (%)			150	O	

[24] Displayed when I17–I21 are set to 12 (2nd motor select).

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
H89	1359	2nd motor electronic thermal level for continuous	50–150 (%)		100	O	
H90	135A	2nd motor rated current	0.1–100.0 (A)		1.8	X	
H93	135D	Parameter initialize	0–5	Initializes parameters with their factory default values. 0 - 1 All parameter groups are initialized with their factory default values. 2 Only Drive group is initialized with its factory default values. 3 Only Function group 1 is initialized with its factory default values. 4 Only Function group 2 is initialized with its factory default values. 5 Only I/O group is initialized with its factory default values.	0	X	*p.128*
H94	135E	Password register	0–FFFF	Password for H95 (Parameter lock). Set as hex value.	0	O	*p.129*
H95	135F	Parameter lock	0–FFFF	Locks or unlocks parameters when the password registered in H94 is entered. UL (Unlock) Enables parameter change. L (Lock) Disables parameter change.	0	X	*p.129*

8.4 Input/Output Group

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

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
I 0	1400	Jump code	0–87	Sets the Jump code number.	1	O	p.39
I 1	1401	V2 input wave filtering time constant	0 – 9999	Sets the input filtering wave time constant of the panel potentiometer V2.	10	O	
I 2	1402	V2 input Min voltage	0.00–5.00(V)	Sets the minimum voltage of the V2 input.	0.00	O	
I 3	1403	V2 input Min voltage corresponding frequency	0.00–400.00 (Hz)	Sets the minimum input voltage of panel potentiometer V2 and the corresponding frequency.	0.00	O	p.56
I 4	1404	V2 input Max. voltage	0.00–5.00(V)	Sets the maximum input voltage of panel potentiometer V2.	5.00	O	
I 5	1405	V2 input Max. voltage corresponding frequency	0.00–400.00 (Hz)	Sets the maximum input voltage of panel potentiometer V2 and the corresponding frequency.	60.00	O	
I 6	1406	Filter time constant for V1 input	0–9999	Sets the input filtering wave time constant of simulation input AI (terminal V).	10	O	
I 7	1407	V1 input Min. voltage	0.00–10.00 (V)	Sets the minimum voltage of the V1 Input.	0.00	O	
I 8	1408	V1 input Min. voltage corresponding frequency	0.00–400.00 (Hz)	Sets the minimum input voltage of simulation input AI (terminal V) and the corresponding frequency.	0.00	O	p.57
I 9	1409	V1 input Max. voltage	0.00–10.00 (V)	Sets the maximum input voltage of simulation input AI (terminal V).	10.00	O	
I10	140A	V1 input Max. voltage corresponding frequency	0.00–400.00 (Hz)	Sets the maximum input voltage of simulation input AI (terminal V) and the corresponding frequency.	60.00	O	
I11	140B	I input	0 – 9999	Sets the input filtering wave time constant of simulation input AI (terminal I).	10	O	p.58
I12	140C	I input Min. current	0.00–20.00 (mA)	Sets the minimum input current of simulation input AI (terminal I).	4.00	O	

LED Display	Comm. Address	Name	Setting Range	Description	Initial Value	Adj. during Run	Ref.
I13	140D	I input Min. current correspondin g frequency	0.00–400.00 (Hz)	Sets the minimum input current of simulation input AI (terminal I) and the corresponding frequency.	0.00	O	
I14	140E	I input Max. current	0.00–20.00 (mA)	Sets the maximum input current of the I input.	20.00	O	
I15	140F	I input Max. current correspondin g frequency	0.00–400.00 (Hz)	Sets the maximum input current of simulation input AI (terminal I) and the corresponding frequency.	60.00	O	
I16	1410	Criteria for analog input signal loss	0–2	0: Disabled 1: Activated below half of set value. 2: Activated below set value.	0	O	p.152

LED Display	Comm. Address	Name	Setting Range	No.	Description	Initial Value	Adj. during Run	Ref.
I17[25]	1411	Multi-function input terminal P1 define	0–27	0	Forward run command	0	O	p.62
				1	Reverse run command			
I18[25]	1412	Multi-function input terminal P2 define		2	Emergency stop trip	1	O	
				3	Resets when a fault occurs.			
I19[25]	1413	Multi-function input terminal P3 define		4	Jog operation command	2	O	p.91
				5	Multi-step freq – low			
I20[25]	1414	Multi-function input terminal P4 define		6	Multi-step freq – mid	3	O	p.63
				7	Multi-step freq – high			
I21[25]	1415	Multi-function input terminal P5 define		8	Multi Acc/Dec – low	4	O	p.73
				9	Multi Acc/Dec – mid			

[25] For I17–I21, two or more multi-function input terminal cannot be set, which has the same function. Refer to page *210* for fault signal input display information.

LED Display	Comm. Address	Name	Setting Range	No.	Description	Initial Value	Adj. during Run	Ref.
				10	Multi Acc/Dec – high			
				11	DC brakes during a stop.			p.93
				12	2nd motor select			p.116
				13	-Reserved-			
				14	-Reserved-			
				15	Up-Down: Increase frequency command (UP)			p.95
				16	Up-Down: Decrease frequency command (DOWN)			p.95
				17	3-wire operation			p.98
				18	External trip: A Contact (EtA)			p.150
				19	External trip: B Contact (EtB)			p.150
				20	-Reserved-			-
				21	Change from PID operation to V/F operation			p.104
				22	2nd source			p.118
				23	Analog hold			p.62
				24	Disable Acc/Dec			p.77
				25	Up/Down save freq. initialization			p.95
				26	JOG-FX			p.94
				27	JOG-RX			p.94

I25	1419	Input terminal status display		BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	-	-	p.139
				P5	P4	P3	P2	P1			
I26	141A	Output terminal status display					BIT 0		-	-	p.140
							3AC				

I27	141B	Filtering time constant for multi-function input terminal	1–15	The responsiveness of the Input terminal gets slower as the value is increased.	4	O
I30	141E	Multi-step frequency 4	0.00–400.00 (Hz)	It cannot be set higher than F21 (Max frequency).	30.00	O
I31	141F	Multi-step frequency 5			25.00	O

LED Display	Comm. Address	Name	Setting Range	No.	Description	Initial Value	Adj. during Run	Ref.
I32	1420	Multi-step frequency 6				20.00	O	
I33	1421	Multi-step frequency 7				15.00	O	
I34	1422	Multi-accel time 1	0.0–6000.0 (s)			3.0	O	p.73
I35	1423	Multi-decel time 1				3.0	O	
I36	1424	Multi-accel time 2				4.0	O	
I37	1425	Multi-decel time 2				4.0	O	
I38	1426	Multi-accel time 3				5.0	O	
I39	1427	Multi-decel time 3				5.0	O	
I40	1428	Multi-accel time 4				6.0	O	
I41	1429	Multi-decel time 4				6.0	O	
I42	142A	Multi-accel time 5				7.0	O	
I43	142B	Multi-decel time 5				7.0	O	
I44	142C	Multi-accel time 6				8.0	O	
I45	142D	Multi-decel Time 6				8.0	O	
I46	142E	Multi-accel time 7				9.0	O	
I47	142F	Multi-decel time 7				9.0	O	
I50	1432	Analog output item select	0–3		Output item	Output to 10 V	0	O	p.130
						200 V / 400 V			
				0	Output freq.	Max. frequency			
				1	Output current	150% of the inverter rated current			
				2	Output voltage	AC 282 V / AC 564 V			

LED Display	Comm. Address	Name	Setting Range	No.	Description			Initial Value	Adj. during Run	Ref.
				3	DC link voltage	DC 410 V	DC 820 V			
I51	1433	Analog output level adjustment	10–200(%)	Based on 10 V				100	O	p.130
I52	1434	Frequency detection level	0.00–400.00 (Hz)	Used when I55 is set to 0-4. Cannot be set higher than F21.				30.00	O	p.131
I53	1435	Frequency detection bandwidth						10.00	O	
I55	1437	Multi -function relay select	0–19	0	FDT-1			17	O	p.131
				1	FDT-2					p.132
				2	FDT-3					p.133
				3	FDT-4					p.133
				4	FDT-5					p.134
				5	Overload (OL)					p.134
				6	Inverter overload (IOL)					
				7	Motor stall (STALL)					
				8	Over voltage trip (Ovt)					
				9	Low voltage trip (Lvt)					
				10	Inverter overheat (OHt)					
				11	Command loss					
				12	During Run					
				13	During Stop					
				14	During constant run					
				15	During speed searching					
				16	Wait time for run signal input					
				17	Fault output					
				18	Warning for cooling fan trip					
				19	Brake signal select					
I56	1438	Fault relay output	0–7		When setting the auto restart try number (H26)	When a trip other than a low voltage trip occurs	When a low voltage trip occurs	2	O	p.135

LED Display	Comm. Address	Name	Setting Range	No.	Description			Initial Value	Adj. during Run	Ref.
					bit 2	bit 1	bit 0			
				0	-	-	-			
				1	-	-	✓			
				2	-	✓	-			
				3	-	✓	✓			
				4	✓	-	-			
				5	✓	-	✓			
				6	✓	✓	-			
				7	✓	✓	✓			
I59	143B	Communication protocol select	0–1	Sets the communication protocol.				0	X	p.67
				0	Modbus RTU					
				1	LS BUS					
I60	143C	Inverter number	1–250	Sets the RS485 communication type.				1	O	p.67
I61	143D	Baud rate	0–5	Sets the communication speed.				3	O	p.67
				0	1200 bps					
				1	2400 bps					
				2	4800 bps					
				3	9600 bps					
				4	19200 bps					
				5	38400 bps					
I62	143E	Drive mode select after loss of frequency command	0–2	It is used when a frequency command is given via the AI terminal or RS485.				0	O	p.152
				0	Continuous operation at the frequency before its command is lost.					
				1	Free Run stop (Output cut-off)					
				2	Decelerates to a stop.					
I63	143F	Wait time after loss of frequency command	0.10–120.0 (s)	This is the duration that the inverter waits to determine whether there is an input frequency command or not. If there is no frequency command input during this time, the inverter starts operation via the mode selected at I62.				1.0	O	p.152
I64	1440	Communicati	2–	Frame communication time				5	O	

LED Display	Comm. Address	Name	Setting Range	No.	Description	Initial Value	Adj. during Run	Ref.
		on time setting	100 [ms]					
I65	1441	Parity/stop bit setting	0–3	When the protocol is set, the communication format can be set.		0	O	p.157
				0	Parity: None, Stop Bit: 1			
				1	Parity: None, Stop Bit: 2			
				2	Parity: Even, Stop Bit: 1			
				3	Parity: Odd, Stop Bit: 1			
I66	1442	Read address register 1	0 – 42239	The user can register up to 8 discontinuous addresses and read them all with one Read command.		5	O	p.171
I67	1443	Read address register 2				6		
I68	1444	Read address register 3				7		
I69	1445	Read address register 4				8		
I70	1446	Read address register 5				9		
I71	1447	Read address register 6				10		
I72	1448	Read address register 7				11		
I73	1449	Read address register 8				12		
I74	144A	Write address register 1	0 – 42239	The user can register up to 8 discontinuous addresses and write them all with one Write command.		5	O	p.171
I75	144B	Write address register 2				6		
I76	144C	Write address register 3				7		
I77	144D	Write address register 4	0– 42239	The user can register up to 8 discontinuous addresses and write them all with one Write command.		8	O	p.171
I78	144E	Write address register 5				5		
I79	144F	Write address register 6				6		
I80	1450	Write address register 7				7		
I81	1451	Write address				8		

LED Display	Comm. Address	Name	Setting Range	No.	Description	Initial Value	Adj. during Run	Ref.
		register 8						
I82[26]	1452	Brake open current	0.0 – 180.0 (%)		Sets the current level to open the brake. It is set according to H33's (Motor-rated current) size.	50.0	O	p.122
I83	1453	Brake open delay time	0.00–10.00(s)		Sets the Brake open delay time.	1.00	X	
I84	1454	Brake open FX frequency	0.00–400.00 (Hz)		Sets the FX frequency to open the brake.	1.00	X	
I85	1455	Brake open RX frequency	0.00–400.00 (Hz)		Sets the RX frequency to open the brake.	1.00	X	
I86	1456	Brake close delay time	0.00–10.00(s)		Sets the delay time to close the brake.	1.00	X	
I87	1457	Brake close frequency	0.00–400.00 (Hz)		Sets the frequency to close the brake.	2.00	X	

[26] Displayed when I55 is set to 19 (Brake signal select).

9 Troubleshooting

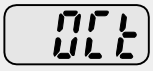
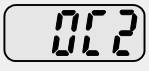
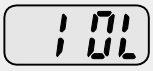
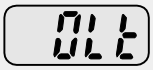
This chapter explains how to troubleshoot a problem when inverter protective functions, fault trips, warning signals, or a fault occurs. If the inverter does not work normally after following the suggested troubleshooting steps, please contact the LSIS customer service center.

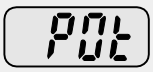
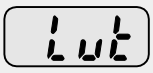
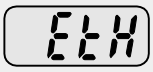
9.1 Trips and Warnings

When the inverter detects a fault, it stops the operation (trips) or sends out a warning signal. When a trip or warning occurs, the keypad displays the information briefly. Users can read the warning message.

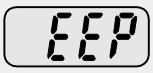
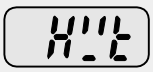
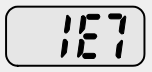
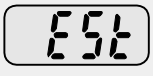
9.1.1 Fault Trips

Protection Functions for Output Current and Input Voltage

Keypad Display	Definition	Description
	Over current	The inverter stops output when its output current is greater than the inverter-rated current.
	Short circuit	When the IGBT experiences an arm short and an output short circuit occurs, the inverter stops output.
	Ground fault	The inverter stops output when a ground fault occurs and the ground fault current is greater than the inverter's internally set value.
	Inverter overload	The inverter stops output when its output current is greater than the rated level (150% for 1 minute).
	Overload protection	When HD is used, the inverter stops output if its output current flows at 150% of the inverter-rated current for more than the current limit time (1 min). When ND is used, the inverter stops output if its output current flows at 110% of the inverter-rated current for more than the current limit time (1 min). When OLT parameter F56 is set to 1, the output current exceeds the value configured at F57 and lasts for the time configured at F58.
	Overheating	The inverter detects the temperature of the heat sink and stops output if the heat sink overheats due to a damaged cooling fan or a foreign substance in the cooling fan.

Keypad Display	Definition	Description
	Output phase loss	The inverter stops output when the one or more output phase (U, V, W) is open. The inverter detects the output current to check the output's phase loss.
	Over voltage	The inverter stops output if the main circuit's DC voltage becomes greater than the voltage specified (200 V level is 410 Vdc; 400 V level is 820 Vdc) when the motor decelerates. This fault can also occur due to a surge generated by the power supply system.
	Low voltage	The inverter stops output if the DC voltage is lower than the voltage specified, which is 400 V (three phase 440 V)/346 V (three phase 380 V) /170 V (single phase 220 V). Insufficient torque or overheating of the motor can occur when the input voltage of the inverter drops.
	Electronic thermal protection	The inverter's thermostat determines if the motor is overheating. If the motor is overloaded, the inverter stops output. The inverter cannot protect the motor when driving a motor with more than 4 poles or multi motors.
	Input phase loss	Inverter output is blocked when one of the output phases (R, S, T) is open or the electrolytic capacitor needs to be replaced.

Internal Loop and Exteranl Fault Terminal of Inverter

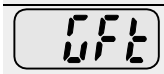
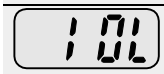
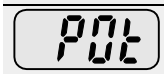
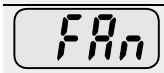
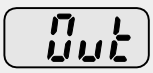
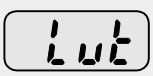
Keypad Display	Definition	Description
	Parameter save abnormality	This occurs when the parameters changed by a user fail to be saved in the inverter and power is applied.
	Hardware abnormality	This occurs when there is an error in the software. If the faults cannot be cleared by the [STOP/RESET] key or by resetting the terminal on the panel, the input power supply of the inverter is cut off and the power is not applied again until the panel power disperses completely.
	Panel communication abnormality	This occurs when the communication between the inverter and panel are abnormal. If the faults cannot be cleared by the [STOP/RESET] key or by resetting the terminal on the panel, the input power supply of the inverter is cut off and the power is not applied until the panel power disperses completely.
	Panel abnormality	This occurs when there is an error in the inverter panel which lasts for more than a certain amount of time.
	Cooling fan abnormality	This occurs when there is an error in the inverter's cooling fan. The cooling fan can run consecutively or stop (refer to *5.20 Cooling Fan Control* on page *126*).
	Emergency stop	If the emergency stop terminal (EST) closes, the inverter output is stopped. If the operation command signal (FX or RX) of the terminal closes, it can run again by shutting off the EST terminal.

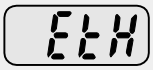
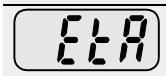
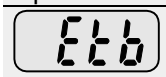
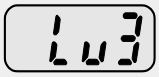
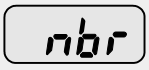
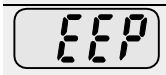
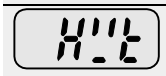
Keypad Display	Definition	Description
EtA	Contract A fault signal	For functions I17-I21 of the multifunction output terminal of the group I/O, when the terminal set to 18 (external fault signal input: contact A) closes, the inverter output is turned off.
Etb	Contract B fault signal	For functions I17-I21 of the multifunction output terminal of the group I/O, when the terminal set to 19 (external fault signal input: contact B) closes, the inverter output is turned off.
_ _ I	Frequency command loss	When the inverter runs through an analog input (0-10 V or 0-20 mA) or RS-485 communications, the signals cannot be input if the operation method set is chosen according to an operation method when the speed command is lost.
ntC	NTC disconnection	The output is stopped when the NTC is disconnected.
nbr	Brake control abnormality	If the brake control is used and the output current is lower than the rated current value of the motor set (I82) and lasts for more than 10 seconds, the inverter stops output and the brake is not opened.
SAFA	Safe stop Terminal A disconnection	If a safe stop is required, turn off panel SA and SC and stop the inverter output.
SAFb	Safe stop Terminal B disconnection	If a safe stop is required, turn off panel SA and SC and stop the inverter output.
Lv3	Relay abnormality	If the charging circuit relay breaks off, the inverter trip occurs and the output stops.

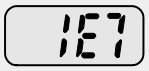
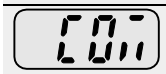
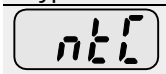
9.2 Troubleshooting Fault Trips

When a fault trip or warning occurs due to a protection function, refer to the following table for possible causes and remedies.

Type	Cause	Remedy
OCt Over Current	Acc/Dec time is too short, compared to load inertia (GD2).	Increase Acc/Dec time.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The inverter supplied an output while the motor was idling.	Operate the inverter after the motor has stopped or use the speed search function (H22).
	Output wiring is short-circuited and ground fault occurs.	Check the output wiring.
	The mechanical brake of the motor is operating too fast.	Check the mechanical brake.

Type	Cause	Remedy
 Short Circuit	Short circuit between upper and lower IGBT arms occurs.	Check IGBT.
	Output wiring is short-circuited.	Check the output wiring.
	Acc/Dec time is too short, compared to load inertia (GD2).	Increase Acc/Dec time.
 Ground Fault	A ground fault has occurred in the inverter output wiring.	Check the output wiring.
	The motor insulation is damaged.	Replace the motor.
 Inverter Overload/	The load is greater than the rated motor capacity.	Replace the motor and inverter with models that have increased capacity.
 Overload Protection	The torque boost level is too high.	Reduce the torque boost level.
 Inverter Overheat	There is a problem with the cooling system.	Determine if a foreign object is obstructing the air inlet, outlet, or vent.
	The inverter cooling fan has been operated for an extended period.	Replace the cooling fan.
	The ambient temperature is too high.	Keep the ambient temperature below 50°C.
 Output Phase Loss	The magnetic contactor on the output side has a connection fault.	Check the magnetic contactor on the output side.
	The output wiring is faulty.	Check the output wiring.
 Cool Fan Abnormity	A foreign object is obstructing the fan's air vent.	Remove the foreign object from the air inlet or outlet.
	The cooling fan needs to be replaced.	Replace the cooling fan.
 Over Voltage	Deceleration time is too short for the load inertia (GD2).	Increase the acceleration time.
	A generative load occurs at the inverter output.	Use the braking unit.
	The input voltage is too high.	Determine if the input voltage is above the specified value.
 Low Voltage	The input voltage is too low.	Determine if the input voltage is below the specificed value.
	A load greater than the power capacity is connected to the system (e.g., a welder, direct motor connection, etc.)	Increase the power capacity.
	The magnetic contactor connected to the power source has a faulty connection.	Replace the magnetic contactor.

Type	Cause	Remedy
 Electronic Thermal Protection	The motor has overheated.	Reduce the load or operation frequency.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The set value for electronic thermal protection is too low.	Set an appropriate electronic thermal level.
	The inverter capacity is set incorrectly.	Set the inverter capacity correctly.
	The inverter has been operated at low speed for an extended duration.	Replace the motor with a model that supplies extra power to the cooling fan.
 Contract A fault signal input	The terminal with the function choice (I17-I21) of the multifunction input terminal set to 18 is closed. The terminal with the function choice (I17-I21) of the multifunction input terminal set with 19 is open.	Remove the abnormality from the loop connected to the external fault terminal and check the cause for external faults.
 Contract B fault signal input		
 Charging circuit relay abnormality	There is an error in the charging circuit relay. The input power decreased suddenly.	Restart the inverter, then operate the inverter again. If LV3 occurs, please contact the LSIS customer service center.
 Frequency command loss	Inverter terminal VR and AI have no frequency commands.	Check the connection wiring of the AI terminal and command grade.
 Brake control abnormality	Operation is not available if there is no brake current.	Check the motor's capacity and wiring.
 Parameter Save Error		Contact the retailer or the LSIS customer service center.
 Hardware Fault Communication Error		

Type	Cause	Remedy
 Error Between Panel and Inverter		
 Keypad Error		
 NTC Error		

Note

"Over speed Protection" is not provided with the inverter.

9.3 Troubleshooting Other Faults

When a fault other than those identified as fault trips or warnings occurs, refer to the following table for possible causes and remedies.

Type	Cause	Remedy
Parameters cannot be set.	The inverter is in operation (driving mode).	Stop the inverter to change to program mode and set the parameter.
	The parameter access is incorrect.	Check the correct parameter access level and set the parameter.
	The password is incorrect.	Check the password, disable the parameter lock and set the parameter.
	Low voltage is detected.	Check the power input to resolve the low voltage and set the parameter.
The motor does not rotate.	The frequency command source is set incorrectly.	Check the frequency command source setting.
	The operation command source is set incorrectly.	Check the operation command source setting.
	Power is not supplied to the terminal R/S/T.	Check the terminal connections R/S/T and U/V/W.
	The charge lamp is turned off.	Turn on the inverter.
	The operation command is off.	Turn on the operation command (RUN).

Type	Cause	Remedy
	The motor is locked.	Unlock the motor or lower the load level.
	The load is too high.	Operate the motor independently.
	An emergency stop signal is input.	Reset the emergency stop signal.
	The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
	The input option for the frequency command is incorrect.	Check the input option for the frequency command.
	The input voltage or current for the frequency command is incorrect.	Check the input voltage or current for the frequency command.
	The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode setting.
	The frequency command value is too low.	Check the frequency command and input a value above the minimum frequency.
	The [STOP/RESET] key is pressed.	Check that the stoppage is normal, if so resume operation normally.
	Motor torque is too low.	Change the operation modes (V/F, IM, and Sensorless). If the fault remains, replace the inverter with a model with increased capacity.
The motor rotates in the opposite direction to the command.	The wiring for the motor output cable is incorrect.	Determine if the cable on the output side is wired correctly to the phase (U/V/W) of the motor.
	The signal connection between the control circuit terminal (forward/reverse rotation) of the inverter and the forward/reverse rotation signal on the control panel side is incorrect.	Check the forward/reverse rotation wiring.
The motor only rotates in one direction.	Reverse rotation prevention is selected.	Remove the reverse rotation prevention.
	The reverse rotation signal is not provided, even when a 3-wire sequence is selected.	Check the input signal associated with the 3-wire operation and adjust as necessary.
The motor is overheating.	The load is too heavy.	Reduce the load. Increase the Acc/Dec time.
		Check the motor parameters and set the correct values.
		Replace the motor and the inverter with models with appropriate capacity for the load.
	The ambient temperature of the motor is too high.	Lower the ambient temperature of the motor.

Type	Cause	Remedy
	The phase-to-phase voltage of the motor is insufficient.	Use a motor that can withstand phase-to-phase voltages surges greater than the maximum surge voltage.
		Only use motors suitable for applications with inverters.
		Connect the AC reactor to the inverter output (set the carrier frequency to 2 kHz).
	The motor fan has stopped or the fan is obstructed with debris.	Check the motor fan and remove any foreign objects.
The motor stops during acceleration or when connected to load.	The load is too high.	Reduce the load.
		Replace the motor and the inverter with models with capacity appropriate for the load.
The motor does not accelerate. /The acceleration time is too long.	The frequency command value is low.	Set an appropriate value.
	The load is too high.	Reduce the load and increase the acceleration time. Check the mechanical brake status.
	The acceleration time is too long.	Change the acceleration time.
	The combined values of the motor properties and the inverter parameter are incorrect.	Change the motor related parameters.
	The stall prevention level during acceleration is low.	Change the stall prevention level.
	The stall prevention level during operation is low.	Change the stall prevention level.
	Starting torque is insufficient.	Change to vector control operation mode. If the fault is still not corrected, replace the inverter with a model with increased capacity.
Motor speed varies during operation.	There is a high variance in load.	Replace the motor and inverter with models with increased capacity.
	The input voltage varies.	Reduce input voltage variation.
	Motor speed variations occur at a specific frequency.	Adjust the output frequency to avoid a resonance area.
The motor rotation is different from the setting.	The V/F pattern is set incorrectly.	Set a V/F pattern that is suitable for the motor specification.
The motor deceleration time is too long even with Dynamic Braking	The deceleration time is set too long.	Change the setting accordingly.
	The motor torque is insufficient.	If motor parameters are normal, it is likely to be a motor capacity fault. Replace the motor with a model with increased capacity.

Type	Cause	Remedy
(DB) resistor connected.	The load is higher than the internal torque limit determined by the rated current of the inverter.	Replace the inverter with a model with increased capacity.
Operation is difficult in underload applications.	The carrier frequency is too high.	Reduce the carrier frequency.
	Over-excitation has occurred due to an inaccurate V/F setting at low speed.	Reduce the torque boost value to avoid over-excitation.
While the inverter is in operation, a control unit malfunctions or noise occurs.	Noise occurs due to switching inside the inverter.	Change the carrier frequency to the minimum value.
		Install a micro surge filter in the inverter output.
When the inverter is operating, the earth leakage breaker is activated.	An earth leakage breaker will interrupt the supply if current flows to ground during inverter operation.	Connect the inverter to a ground terminal.
		Check that the ground resistance is less than 100Ω for 200V inverters and less than 10Ω for 400V inverters.
		Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter.
		Lower the carrier frequency.
		Make the cable length between the inverter and the motor as short as possible.
The motor vibrates severely and does not rotate normally.	Phase-to-phase voltage of 3-phase power source is not balanced.	Check the input voltage and balance the voltage.
		Check and test the motor's insulation.
The motor makes humming, or loud noises.	Resonance occurs between the motor's natural frequency and the carrier frequency.	Slightly increase or decrease the carrier frequency.
	Resonance occurs between the motor's natural frequency and the inverter's output frequency.	Slightly increase or decrease the carrier frequency.
		Use the frequency jump function to avoid the frequency band where resonance occurs.
The motor vibrates/hunts.	The frequency input command is an external, analog command.	In situations of noise inflow on the analog input side that results in command interference, change the input filter time constant (I1).
	The wiring length between the inverter and the motor is too long.	Ensure that the total cable length between the inverter and the motor is less than 200m (50m for motors rated 3.7 kW or lower).
The motor does	It is difficult to decelerate sufficiently,	Adjust the DC braking parameter.

Type	Cause	Remedy
not come to a complete stop when the inverter output stops.	because DC braking is not operating normally.	Increase the set value for the DC braking current.
		Increase the set value for the DC braking stopping time.
The output frequency does not increase to the frequency reference.	The frequency reference is within the jump frequency range.	Set the frequency reference higher than the jump frequency range.
	The frequency reference is exceeding the upper limit of the frequency command.	Set the upper limit of the frequency command higher than the frequency reference.
	Because the load is too heavy, the stall prevention function is working.	Replace the inverter with a model with increased capacity.
The cooling fan does not rotate.	The control parameter for the cooling fan is set incorrectly.	Check the control parameter setting for the cooling fan.

10 Maintenance

This chapter explains how to replace the cooling fan, the regular inspections to complete, and how to store and dispose of the product. An inverter is vulnerable to environmental conditions and faults also occur due to component wear and tear. To prevent breakdowns, please follow the maintenance recommendations in this section.

Caution

- Before you inspect the product, read all safety instructions contained in this manual.
- Before you clean the product, ensure that the power is off.
- Clean the inverter with a dry cloth. Cleaning with wet cloths, water, solvents, or detergents may result in electric shock or damage to the product.

10.1 Regular Inspection Lists

10.1.1 Daily Inspections

Inspection Area	Inspection Item	Inspection Details	Inspection Method	Judgment Standard	Inspection Equipment
All	Ambient environment	Is the ambient temperature and humidity within the design range, and is there any dust or foreign objects present?	Refer to *1.3 Installation Considerations* on page *4*.	No icing (ambient temperature: -10 – +40) and no condensation (ambient humidity below 50%)	Thermometer, hygrometer, recorder
	Inverter	Is there any abnormal vibration or noise?	Visual inspection	No abnormality	
	Power voltage	Are the input and output voltages normal?	Measure voltages between R/ S/ T-phases in. the inverter terminal block.	Refer to *11.1 Input and Output Specification* on page *221*.	Digital multimeter tester
Input/Output circuit	Smoothing capacitor	Is there any leakage from the inside?	Visual inspection	No abnormality	-

Inspection Area	Inspection Item	Inspection Details	Inspection Method	Judgment Standard	Inspection Equipment
		Is the capacitor swollen?			
Cooling system	Cooling fan	Is there any abnormal vibration or noise?	Turn off the system and check operation by rotating the fan manually.	Fan rotates smoothly	-
Display	Measuring device	Is the display value normal?	Check the display value on the panel.	Check and manage specified values.	Voltmeter, ammeter, etc.
Motor	All	Is there any abnormal vibration or noise?	Visual inspection	No abnormality	-
		Is there any abnormal smell?	Check for overheating or damage.		

10.1.2 Annual Inspections

Inspection Area	Inspection Item	Inspection Details	Inspection Method	Judgment Standard	Inspection Equipment
Input/Output circuit	All	Megger test (between input/output terminals and and earth terminal)	Disconnect inverter and short R/S/T/U/V/W terminals, and then measure from each terminal to the ground terminal using a Megger.	Must be above 5 MΩ	DC 500 V Megger
		Is there anything loose in the device?	Tighten up all screws.	No abnormality	
		Is there any evidence of parts overheating?	Visual inspection		
	Cable connections	Are there any corroded cables?	Visual inspection	No abnormality	-

Inspection Area	Inspection Item	Inspection Details	Inspection Method	Judgment Standard	Inspection Equipment
		Is there any damage to cable insulation?			
	Terminal block	Is there any damage?	Visual inspection	No abnormality	-
	Smoothing condenser	Measure electrostatic capacity.	Measure with capacity meter.	Rated capacity over 85%	Capacity meter
	Relay	Is there any chattering noise during operation?	Visual inspection	No abnormality	-
		Is there any damage to the contacts?	Visual inspection		
	Braking resistor	Is there any damage from resistance?	Visual inspection	No abnormality	Digital multimeter /anaog tester
		Check for disconnection.	Disconnect one side and measure with a tester.	Must be within ±10% of the rated value of the resistor.	
Control circuit Protection circuit	Operation check	Check for output voltage imbalance while the inverter is in operation.	Measure voltage between the inverter output terminal U/ V/ W.	Balance the voltage between phases: within 4V for 200V series and within 8V for 400V series.	Digital multimeter or DC voltmeter
		Is there an error in the display circuit after the sequence protection test?	Test the inverter output protection in both short and open circuit conditions.	The circuit must work according to the sequence.	
Cooling system	Cooling fan	Are any of the fan parts loose?	Check all connected parts and tighten all screws.	No abnormality	-

Inspection Area	Inspection Item	Inspection Details	Inspection Method	Judgment Standard	Inspection Equipment
Display	Display device	Is the display value normal?	Check the command value on the display device.	Specified and managed values must match.	Voltmeter, Ammeter, etc.

10.1.3 Bi-annual Inspections

Inspection Area	Inspection Item	Inspection Details	Inspection Method	Judgment Standard	Inspection Equipment
Motor	Insulation resistance	Megger test (between the input, output and earth terminals).	Disconnect the cables for terminals U/V/W and test the wiring.	Must be above 5 MΩ	DC 500 V Megger

Caution

Do not run an insulation resistance test (Megger) on the control circuit as it may result in damage to the product.

10.2 Storage and Disposal

10.2.1 Storage

If you are not using the product for an extended period, store it in the following way:

- Store the product in the same environmental conditions as specified for operation (refer to *1.3 Installation Considerations* on page *4*).
- When storing the product for a period longer than 3 months, store it between 10˚C and 30˚C, to prevent depletion of the electrolytic capacitor.
- Do not expose the inverter to snow, rain, fog, or dust.
- Package the inverter in a way that prevents contact with moisture. Keep the moisture level below 70% in the package by including a desiccant, such as silica gel.

10.2.2 Disposal

When disposing of the product, categorize it as general industrial waste. Recyclable materials are included in the product, so recycle them whenever possible. The packing materials and all metal parts can be recycled. Although plastic can also be recycled, it can be incinerated under contolled conditions in some regions.

Caution

If the inverter has not been operated for a long time, capacitors lose their charging characteristics and are depleted. To prevent depletion, turn on the product once a year and allow the device to operate for 30-60 min. Run the device under no-load conditions.

10.3 Parts Replacement

The inverter consists of electronic parts with semiconductors. Due to service limits of parts, the inverter's performance may decrease and faults may increase over time. Therefore, some parts should be replaced periodically.

Part Name	Change Period	Method of Replacement
Cooling fan	3 years	New part
DC link capacitor	4 years	New part
Control board electrolytic capacitor	4 years	New part
Relay	-	Decide after assessment

11 Technical Specification

11.1 Input and Output Specification

Single Phase 200V (0.1-2.2 kW)

Model□□□□C100-1□			0001	0002	0004	0008	0015	0022
Applied motor		HP	0.125	0.25	0.5	1	2	3
		kW	0.1	0.2	0.4	0.75	1.5	2.2
Rated output	Rated capacity (kVA)		0.3	0.5	1.0	1.9	3.0	4.2
	Rated current (A)		0.8	1.4	2.5	5.0	8.0	11.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)					
	Output voltage (V)		3-phase 200-240 V					
Rated input	Working voltage (V)		Single phase 200-240 V AC (-15% to +10%)					
	Input frequency		50-60 Hz (±5%)					
	Rated current (A)		1.4	2.8	5.5	11.0	14.1	24.0
Cooling type			Natural cooling		Forced cooling			
Weight (kg)			0.55	0.55	0.8	1.22	1.42	1.97

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage.
- The standard used for rated output current is heavy load current.
- The rated output current is limited based on the carrier frequency set at H39.
- The max. frequency setting range can be extended to 120Hz when H40 is set to 3 (sensorless vector control).
- The max. output voltage cannot be higher than the input voltage.

3 Phase 200V (0.1-7.5 kW)

Model□□□□C100-2□			0001	0002	0004	0008	0015	0022	0037	0055	0075
Applied motor	Heavy load	HP	0.125	0.25	0.5	1	2	3	5	7.5	10
		kW	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
	Normal load	HP	0.25	0.5	1	1.5	3	4	5.4	10	14
		kW	0.2	0.4	0.75	1.5	2.2	3.7	4.0	7.5	11
Rated output	Rated capacity (kVA)	Heavy load	0.3	0.5	1.0	1.9	3.0	4.2	6.1	9.1	12.2
		Normal load	0.4	0.7	1.3	2.4	3.8	5.2	7.6	12.1	16.3
	Rated current (A)	Heavy load	0.8	1.4	2.5	5.0	8.0	11.0	16.0	24.0	32.0
		Normal load	1.1	1.8	3.1	6.0	10.0	12.0	18.0	30.0	40.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)								
	Output voltage (V)		3-phase 200-240 V								
Rated input	Working voltage (V)		3-phase 200-240 VAC (-15% to +10%)								
	Input frequency		50-60 Hz (±5%)								
	Rated current (A)	Heavy load	0.7	1.5	2	5.8	7.5	11	18.9	22.1	28.6
		Normal load	1.1	1.9	3.9	7.3	10.8	13.9	24	28.6	41.2
Cooling type			Natural cooling			Forced cooling					
Weight (kg)			0.55	0.55	0.8	0.8	1.22	1.42	1.97	3.3	3.3

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage
- The standard used for rated output current is heavy load current.
- The rated output current is limited based on the carrier frequency set at H39.
- The max. frequency setting range can be extended to 120Hz when H40 is set to 3 (sensorless vector control).
- The max. output voltage cannot be higher than the input voltage.

3-Phase 400V (0.4-7.5 kW)

Model□□□□C100–4N			0004	0008	0015	0022	0037	0055	0075
Applied motor	Heavy load	HP	0.5	1	2	3	5	7	10
		kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5
	Normal load	HP	1	1.5	3	4	5.4	10	15
		kW	0.75	1.5	2.2	3.7	4.0	7.5	11.0
Rated output	Rated capacity (kVA)	Heavy load	1.0	1.9	3.0	4.2	6.1	9.1	12.2
		Normal load	1.2	2.4	3.8	5.2	7.6	12.1	16.3
	Rated current (A)	Heavy load	1.25	2.5	4.0	5.5	8.0	12.0	16.0
		Normal load	2.0	3.1	5.1	6.9	10.0	16.0	23.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)						
	Output voltage (V)		3-phase 380-480V						
Rated input	Working voltage (V)		3-phase 380-480VAC (-15% to +10%)						
	Input frequency		50-60 Hz (±5%)						
	Rated current (A)	Heavy load	1.8	3.2	4.4	6	10.4	11	14.4
		Normal load	2.1	4.3	5.9	8.1	14	14.7	21.9
Cooling type			Natural cooling	Forced cooling					
Weight (kg)			0.8	0.8	1.22	1.42	1.97	3.3	3.4

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage
- The standard used for rated output current is heavy load current.
- The rated output current is limited based on the carrier frequency set at H39.
- The max. frequency setting range can be extended to 120Hz when H40 is set to 3 (sensorless vector control).
- The max. output voltage cannot be higher than the input voltage.

3-Phase 400V (0.4-7.5 kW) with built-in EMC

Model□□□□C100–4F			0004	0008	0015	0022	0040	0055	0075
Applied motor	Heavy load	HP	0.5	1	2	3	5.4	7.5	10
		kW	0.4	0.75	1.5	2.2	4.0	5.5	7.5
	Normal load	HP	1	1.5	3	4	7.5	10	15
		kW	0.75	1.5	2.2	3.7	5.5	7.5	11.0
Rated output	Rated capacity (kVA)	Heavy load	1.0	1.9	3.0	4.2	6.5	9.1	12.2
		Normal load	1.2	2.4	3.8	5.2	7.6	12.1	16.3
	Rated current (A)	Heavy load	1.25	2.5	4.0	5.5	9.0	12.0	16.0
		Normal load	2.0	3.1	5.1	6.9	10.0	16.0	23.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)						
	Output voltage (V)		3-phase 380-480V						
Rated input	Working voltage (V)		3-phase 380-480VAC (-15% to +10%)						
	Input frequency		50-60 Hz (±5%)						
	Rated current (A)	Heavy load	1.1	2.4	4.2	5.9	9.8	12.9	17.5
		Normal load	2.0	3.3	5.5	7.5	10.8	17.5	25.4
Cooling type			Forced cooling						
Weight (kg)			1.18	1.18	1.80	1.80	2.23	3.3	3.4

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage. The standard used for rated output current is heavy load current.
- The rated output current is limited, based on the carrier frequency set at H39.
- The max. frequency setting range can be extended to 120Hz when H40 is set to 3 (sensorless vector control).
- The max. output voltage cannot be higher than the input voltage.

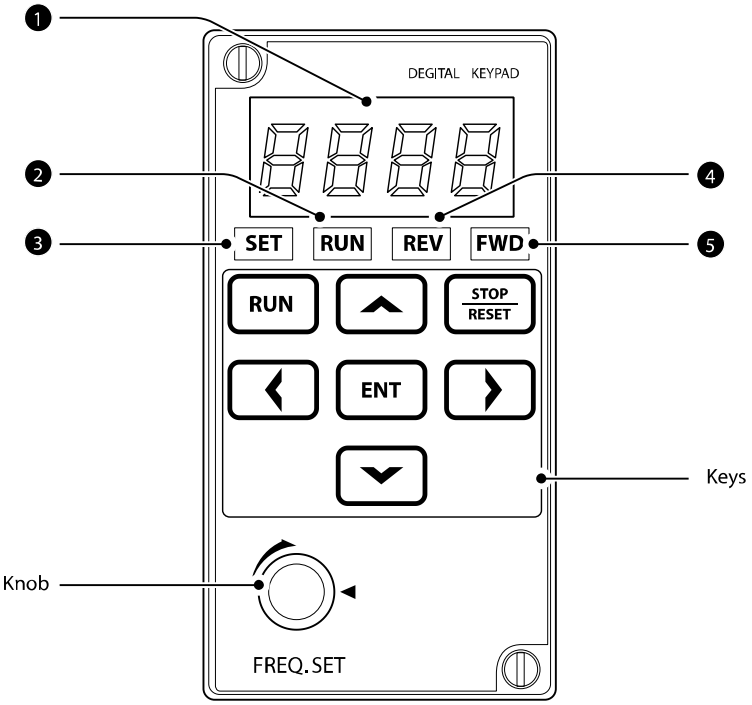
11.2 Product Specification Details

Items			Description	
Control	Control method		V/F control, sensorless vector	
	Frequency settings power resolution		Digital command: 0.01 Hz Analog command: 0.06 Hz (Max. frequency 60 Hz)	
	Frequency accuracy		Digital command: 0.01 % of maximum output frequency Analog command: 1% of maximum output frequency	
	V/F pattern		Linear, square reduction, user V/F	
	Overload capacity		Heavy load rated current: 150% 1 min, normal load rated current: 110% 1 min	
	Torque boost		Manual torque boost, automatic torque boost	
	Dynamic torque braking		Maximum brake torque: 20%, average braking torque from deceleration to stop of a motor Time/%ED: 120% when using optional DB resistor	
Operation	Operation type		Select key pad, terminal strip, or communication operation	
	Frequency settings		Analog type: 0–10 V, 4–20 mA Digital type: key pad, pulse train input	
	Operation function		• PID control • Up-down operation • 3-wire operation	
	Input	Multi function terminal (5EA) P1-P5	Select PNP (Source) or NPN (Sink) mode.	
			• Forward direction operation • Reverse direction operation • Emergency stop • Reset • Jog operation • Multi step speed frequency-high/med/low • Multi step acc/dec-high/med/low • DC braking during stop • Second motor selection • Up/down operation (Increase/decrease frequency)	• 3-wire operation • Exteranl fault signal input (Contrast A/B) • Transtion from PID to general operation • Second source • Analog holding • Acc/dec stop • Fix analog command frequency • Jog forward/reverse direction operation
	Output	Multi function relay terminal	Fault output and inverter operation status output	Less than (N.O., N.C.) AC250V 1A, Less than DC 30V, 1A

Items			Description	
		Analog output	0-10Vdc (less than 10mA): Select output frequency, output current, output voltage, DC terminal voltage and others	
Protection function	Trip		• Over voltage trip • Low voltage trip • Over current trip • Short current trip • Ground trip • Inverter over heat • Motor over heat • Input and output phase loss	• Inverter overload protection • Communication error • Frequency command loss trip • Hardware fault • Cool fan trip • Break error
	Alarm		Stall prevention alarm, overload alarm	
	Instantaneous blackout		Heavy load less than16 ms: continue operation (must be within the rated input voltage and rated output range) Heavy load more than 16 ms: auto restart operation	
Structure/ working environment	Protection structure		IP 20: Opening IP 40: Ambient temperature 40℃ (under development)	
	Ambient temperature		Heavy load: -10-50℃ (14–122°F), normal load: -10-40℃ (14–104°F) No ice or frost should be present. Working under normal load at 50℃ (122°F), it is recommended that less than 80% load is applied.	
	Ambient humidity		Relative humidity less than 90% RH (to avoid condensation forming)	
	Storage temperature.		-20°C-65°C (-4–149°F)	
	Surrounding environment		Prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants (Pollution Degree 2 Environment).	
	Operation altitude/oscillation		No higher than 3280ft (1,000m). Less than 5.9m/sec^2 (0.6G).	
	Pressure		70-106 kPa	

11.3 Remote Keypad (Optional)

The C100 inverter is provided with an optional remote keypad.



About the Display

The following table lists display part names and their functions.

No.	Name	Function
❶	7-Segment Display	Displays current operational status and parameter information.
❷	RUN Indicator	LED turns on (steady) during an operation, and flashes when a fault coours.
❸	SET Indicator	LED flashes during parameter configuration, and flashes when a fault coours.
❹	REV Indicator	LED turns on (steady) during reverse operation, and flashes when a fault coours.
❺	FWD Indicator	LED turns on (steady) during forward operation, and flashes when a fault coours.

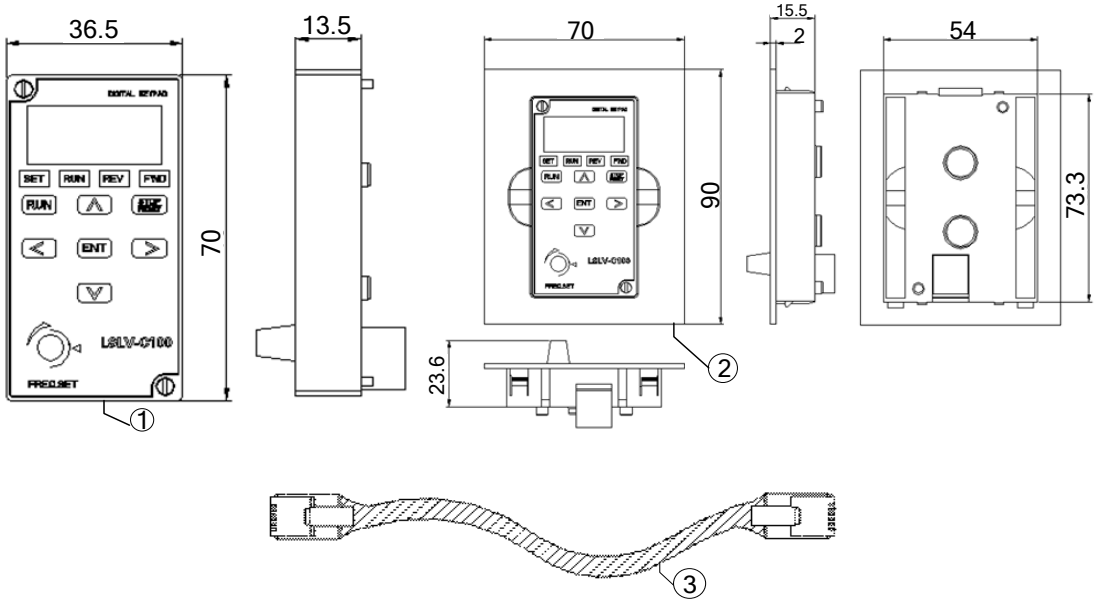
Operation Keys and Knob

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

Key/Knob	Name	Description
RUN	[RUN] key	Used to run the inverter (inputs a RUN command).
STOP RESET	[STOP/RESET] key	STOP: stops the inverter. RESET: resets the inverter following fault or failure condition.
▲, ▼	[▲] key, [▼] key	Switch between codes, or to increase or decrease parameter values.
◀, ▶	[◀] key, [▶] key	Switch between groups, or to move the cursor during parameter setup or modification.
ENT	[ENT] key	Used to select, confirm, or save a parameter value.
Knob	Volume	The keypad potentiometer V2 is used for frequency setting.

Optional Remote Kyepad Set

The optional remote keypad set is consist of a remote keypad (①), installation panel (②), and a connection cable (③).

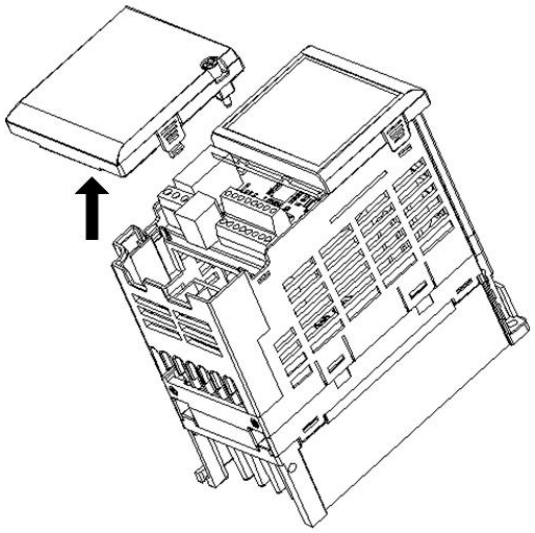


Connection Cables

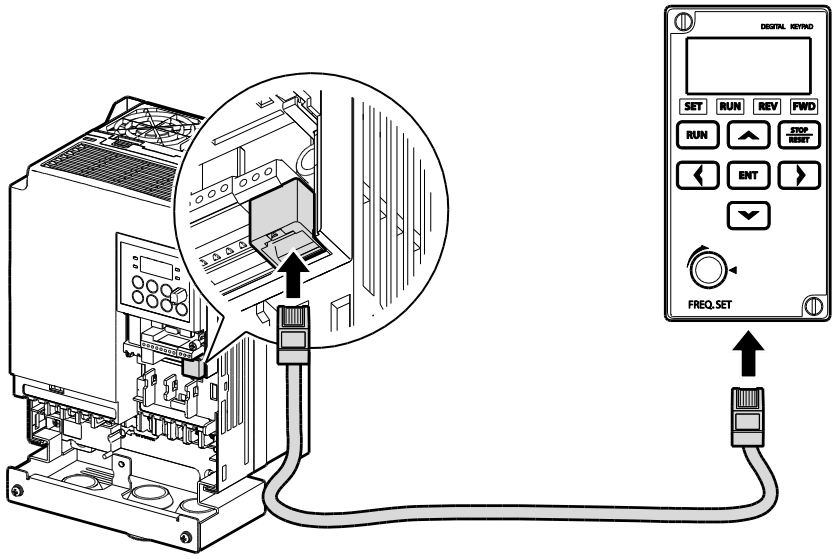
P/N	Description
60210147W0	Remote 2m, SV-C100 (①+②+③ connection cable 2m)
60210145W0	Remote 3m, SV-C100 (①+②+③ connection cable 3m)
60210146W0	Remote 5m, SV-C100 (①+②+③ connection cable 5m)

Installation

1 Remove the front cover.



2 Connect I/O PCB to the remote keypad with the connection cable.

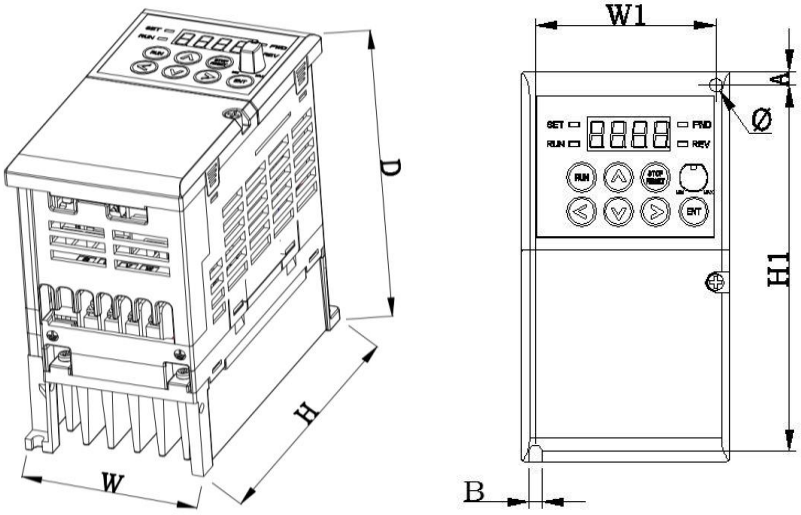


Caution

- Do not use the connection cable other than LSIS's standard cables. Otherwise, malfunctions may occur due to noise input or voltage drop in the keypad.
- Check the poor cable connection if '----' is displayed on the 7-segment display of the keypad.

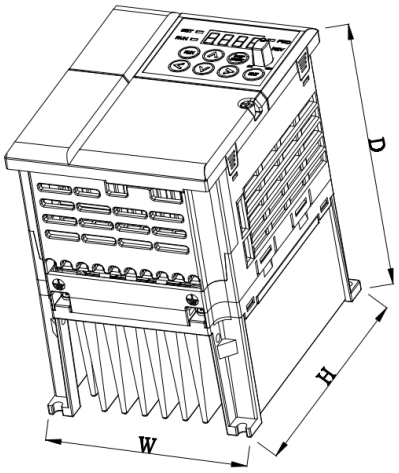
11.4 External Dimensions and Weight

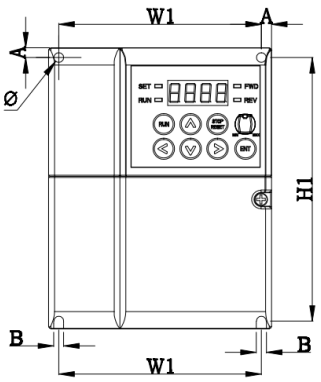
0.1-0.4 kW (Single Phase), 0.1-0.75 kW (3-Phase)



Inverter	Power [kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ [mm]	A [mm]	B [mm]	Weight [kg]
LSLV0001C100-1N	0.1	68	59	128	119	93	4.2	4.5	4.2	0.55
LSLV0002C100-1N	0.2	68	59	128	119	93	4.2	4.5	4.2	0.55
LSLV0004C100-1N	0.4	68	59	128	120	128	4.2	4.5	4.2	0.8
LSLV0001C100-2N	0.1	68	59	128	119	93	4.2	4.5	4.2	0.55
LSLV0002C100-2N	0.2	68	59	128	119	93	4.2	4.5	4.2	0.55
LSLV0004C100-2N	0.4	68	61.1	128	119	128	4.2	4.5	4.2	0.8
LSLV0008C100-2N	0.75	68	59	128	120	128	4.2	4.5	4.2	0.8
LSLV0004C100-4N	0.4	68	61.1	128	119	128	4.2	4.5	4.2	0.8
LSLV0008C100-4N	0.75	68	59	128	120	128	4.2	4.5	4.2	0.8

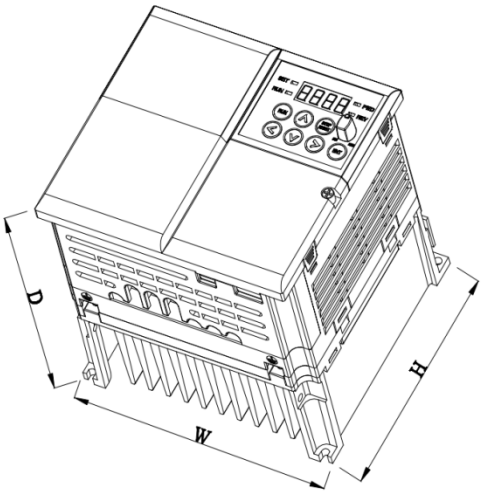
0.75-1.5 kW (Single Phase), 1.5-2.2 kW (3-Phase)

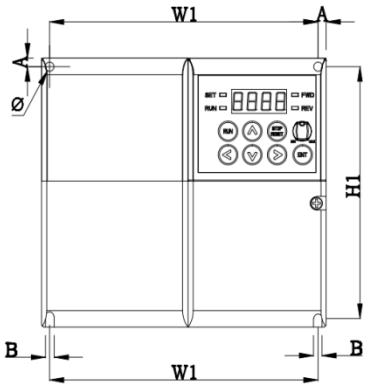




Inverter	Power [kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ [mm]	A [mm]	B [mm]	Weight [kg]
LSLV0008C100-1N	0.75	100	91	128	120	130	4.5	4.5	4.5	1.22
LSLV0015C100-1N	1.5	100	91	128	120	145	4.5	4.5	4.5	1.42
LSLV0015C100-2N	1.5	100	91	128	120	130	4.5	4.5	4.5	1.22
LSLV0022C100-2N	2.2	100	91	128	120	145	4.5	4.5	4.5	1.42
LSLV0015C100-4N	1.5	100	91	128	120	130	4.5	4.5	4.5	1.22
LSLV0022C100-4N	2.2	100	91	128	120	145	4.5	4.5	4.5	1.42

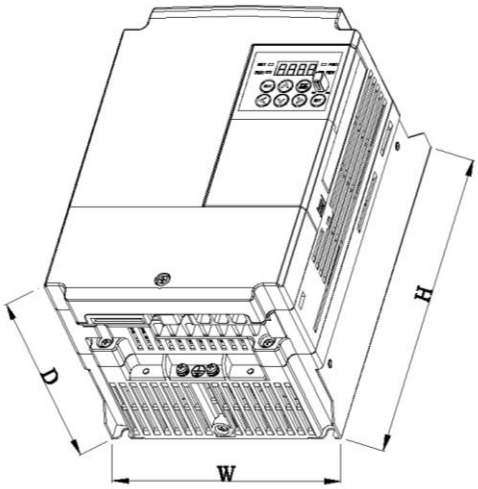
2.2 kW (Single Phase), 3.7 kW (3-Phase)

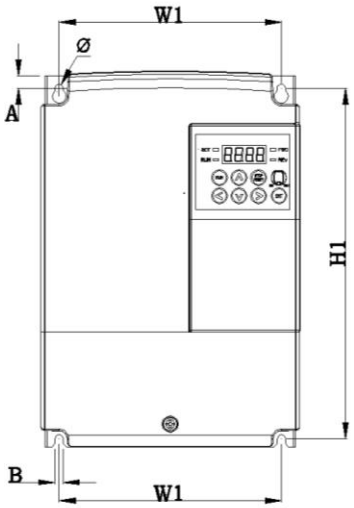




Inverter	Power [kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ [mm]	A [mm]	B [mm]	Weight [kg]
LSLV0022C100-1N	2.2	140	132.2	128	120.7	145	4.5	4	4.5	1.97
LSLV0037C100-2N	3.7	140	132.2	128	120.7	145	4.5	4	4.5	1.97
LSLV0037C100-4N	3.7	140	132.2	128	120.7	145	4.5	4	4.5	1.97

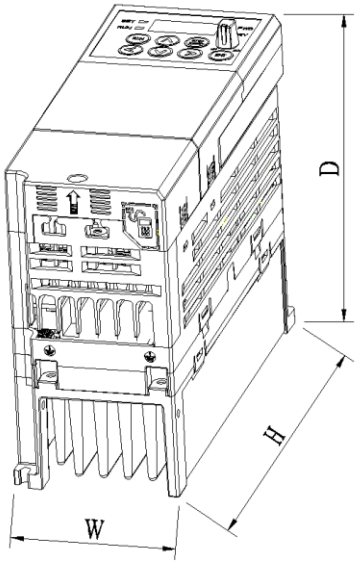
5.5-7.5 kW (3-Phase/3-Phase with built-in EMC)

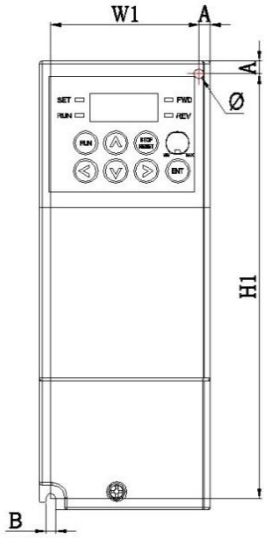




Inverter	Power [kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ [mm]	A [mm]	B [mm]	Weight [kg]
LSLV0055C100-2N	5.5	160	137	232	216.5	141	5	10.5	5	3.3
LSLV0075C100-2N	7.5	160	137	232	216.5	141	5	10.5	5	3.3
LSLV0055C100-4N	5.5	160	137	232	216.5	141	5	10.5	5	3.3
LSLV0075C100-4N	7.5	160	137	232	216.5	141	5	10.5	5	3.4
LSLV0055C100-4F	5.5	160	137	232	216.5	141	5	10.5	5	3.3
LSLV0075C100-4F	7.5	160	137	232	216.5	141	5	10.5	5	3.4

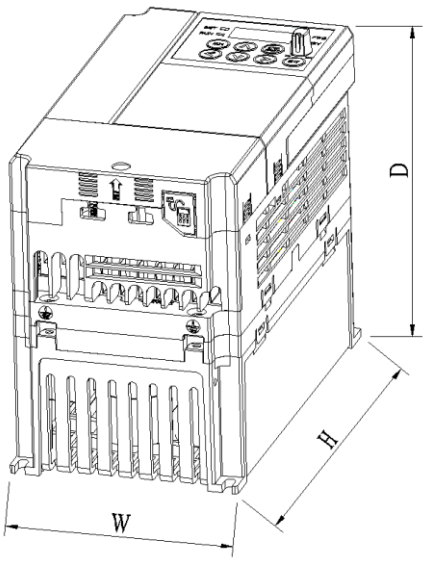
0.4-0.8 kW (3-Phase with built-in EMC)

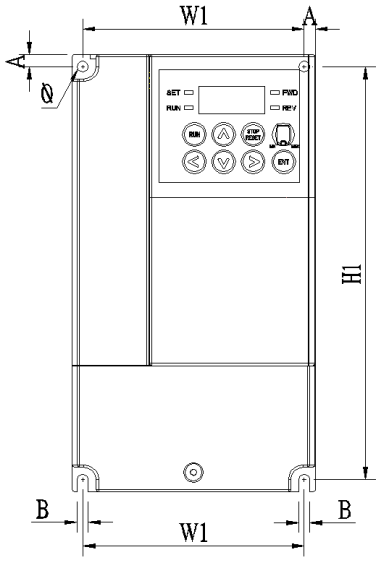




Inverter	Power [kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ [mm]	A [mm]	B [mm]	Weight [kg]
LSLV0004C100-4F	0.4	68	59	180	170.5	131	4	5	4	1.18
LSLV0008C100-4F	0.8	68	59	180	170.5	131	4	5	4	1.18

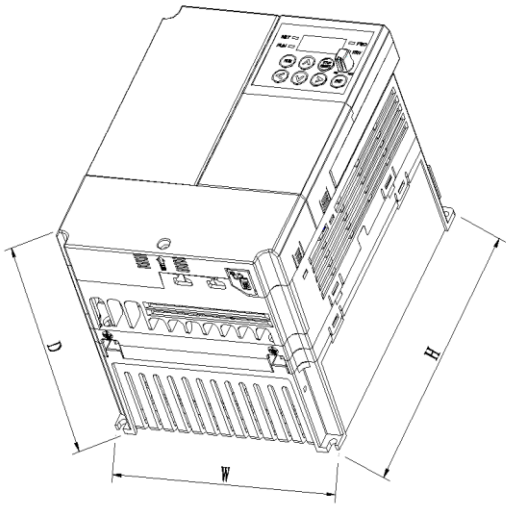
1.5-2.2 kW (3-Phase with built-in EMC)

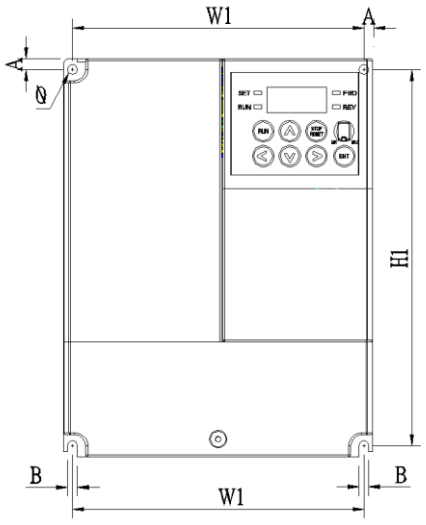




Inverter	Power [kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ [mm]	A [mm]	B [mm]	Weight [kg]
LSLV0015C100-4F	1.5	100	91	180	170	141	4.2	5	4.5	1.80
LSLV0022C100-4F	2.2	100	91	180	170	141	4.2	5	4.5	1.80

4.0 kW (3-Phase with built-in EMC)





Inverter	Power [kW]	W [mm]	W1 [mm]	H [mm]	H1 [mm]	D [mm]	Φ [mm]	A [mm]	B [mm]	Weight [kg]
LSLV0040C100-4F	4.0	140	132	180	170	141	4.5	5	4.5	2.0

11.5 Peripheral Devices

Compatible Circuit Breaker, Leakage Breaker and Magnetic Contactor Models (manufactured by LSIS)

Product (kW)		Leakage Breaker	Magnetic Contactor
Single phase 200V	LSLV0001C100-1	ABS33b, EBS33	GMC-9
	LSLV0002C100-1		
	LSLV0004C100-1		
	LSLV0008C100-1		
	LSLV0015C100-1		GMC-12
	LSLV0022C100-1		GMC-18
3-phase 200V	LSLV0001C100-2	ABS33b, EBS33	GMC-9
	LSLV0002C100-2		
	LSLV0004C100-2		
	LSLV0008C100-2		
	LSLV0015C100-2		GMC-12
	LSLV0022C100-2		GMC-18
	LSLV0037C100-2		GMC-32
	LSLV0055C100-2	ABS53b, EBS53	GMC-40
	LSLV0075C100-2	ABS103b, EBS53	GMC-50
3-phase 400V	LSLV0004C100-4	ABS33b, EBS33	GMC-9
	LSLV0008C100-4		
	LSLV0015C100-4		
	LSLV0022C100-4		GMC-12
	LSLV0037C100-4		GMC-18
	LSLV0055C100-4		GMC-32
	LSLV0075C100-4		

Note

- The current of the selected breaker should be 1.5 to 2 times of the rated current.
- To prevent the damage of AC equipment due to fault current, use MCCB to replace overload protection device (150% for 1 min).

11.6 Fuse and Reactor Specification

Product (kW)		AC Input Fuse		AC Reactor		DC Reactor	
		Current (A)	Voltage (V)	Inductance (mH)	Current(A)	Inductance (mH)	Current (A)
Single phase 200V	LSLV0001C100-1	10	600	1.20	10	4	8.67
	LSLV0002C100-1						
	LSLV0004C100-1						
	LSLV0008C100-1						
	LSLV0015C100-1	15		0.88	14	3	13.05
	LSLV0022C100-1	20		0.56	20	1.3	18.45
3-phase 200V	LSLV0001C100-2	10		1.20	10	4	8.67
	LSLV0002C100-2						
	LSLV0004C100-2						
	LSLV0008C100-2						
	LSLV0015C100-2	15		0.88	14	3	13.05
	LSLV0022C100-2	20		0.56	20	1.3	18.45
	LSLV0037C100-2	32		0.39	30		26.35
	LSLV0055C100-2	50		0.30	34	1.6	32
	LSLV0075C100-2	63		0.22	45	1.25	43
3-phase 400V	LSLV0004C100-4	10		4.81	4.8	16	4.27
	LSLV0008C100-4						
	LSLV0015C100-4			3.23	7.5	12	6.41
	LSLV0022C100-4	15		2.34	10	8	8.9
	LSLV0037C100-4	20		1.22	15	5.4	13.2
	LSLV0055C100-4	32		1.12	19	3.2	17
	LSLV0075C100-4	35		0.78	27	2.5	25

Caution

Only use Class H or RK5, UL listed input fuses and UL listed circuit breakers. See the table above for the voltage and current ratings for fuses and circuit breakers.

11.7 Terminal Screw Specification

Input/Output Terminal Screw Specification

Product (kW)		Terminal Screw Size	Screw Torque (Kgf·cm/Ib-in)
Single phase 200-240V	0.1	M3.5	10/8.7
	0.2		
	0.4		
	0.75		
	1.5		
	2.2	M4	12.2/10.6
3-phase 200-240V	0.1	M3.5	10/8.7
	0.2		
	0.4		
	0.75		
	1.5		
	2.2		
	3.7	M4	12.2/10.6
	5.5		15/13
	7.5		
3-phase 380-480V	0.4	M3.5	10/8.7
	0.75		
	1.5		
	2.2		
	3.7	M4	12.2/10.6
	4		
	5.5		13.8/12
	7.5		

Control Circuit Terminal Screw Specification

Terminal	Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
P1-P5/CM/VR/AI/AM/S+,S-/24/SA,SB,SC	M2	2.0/0.2
3A/3B/3C	M2.6	4.0/0.4

Caution

Apply the rated torque when tightening terminal screws. Loose screws may cause short circuits and malfunctions. Overtightening terminal screws may damage the terminals and cause short circuits and malfunctions. Use copper conductors only, rated at 600V, 90℃ for power terminal wiring, and rated at 600V, 75℃ for control terminal wiring.

11.8 Braking Resistor Specification

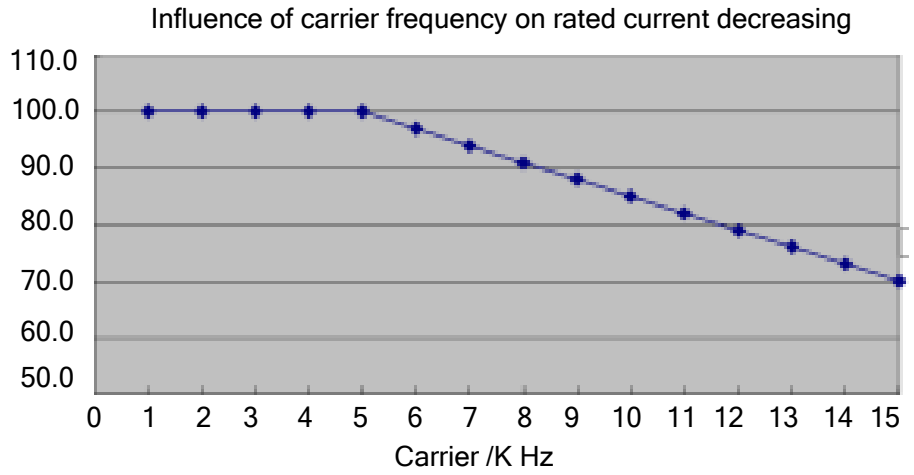
Product (kW)		100% Braking		150% Braking	
		Resistance (Ω)	Rated Capacity (W)	Resistance (Ω)	Rated Capacity (W)
200V	0.1	1200	20	1000	20
	0.2	700	25	500	35
	0.4	400	50	300	100
	0.75	200	100	150	150
	1.5	100	200	60	300
	2.2	60	300	50	400
	3.7	40	500	33	600
	5.5	30	700	20	800
	7.5	20	1000	15	1,200
400V	0.4	1800	50	1,200	100
	0.75	900	100	600	150
	1.5	450	200	300	300
	2.2	300	300	200	400
	3.7	200	500	130	600
	5.5	120	700	85	1,000
	7.5	90	1000	60	1,200

- The standard for braking torque is 150% and the working rate (%ED) is 5%. If the working rate is 10%, the rated capacity for braking resistance must be calculated at twice the standard.

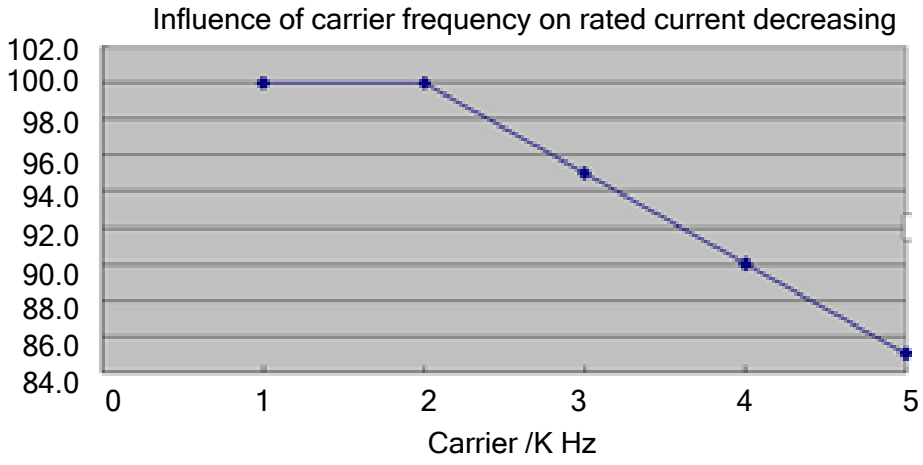
11.9 Continuous Rated Current Derating

Derating by Carrier Frequency

The continuous rated current of the inverter is limited based on the carrier frequency. Refer to the following graph.



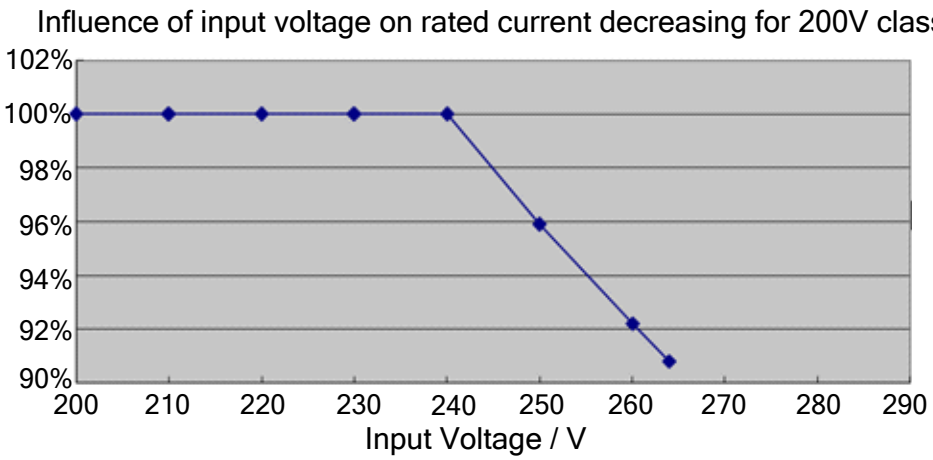
Operating as CT



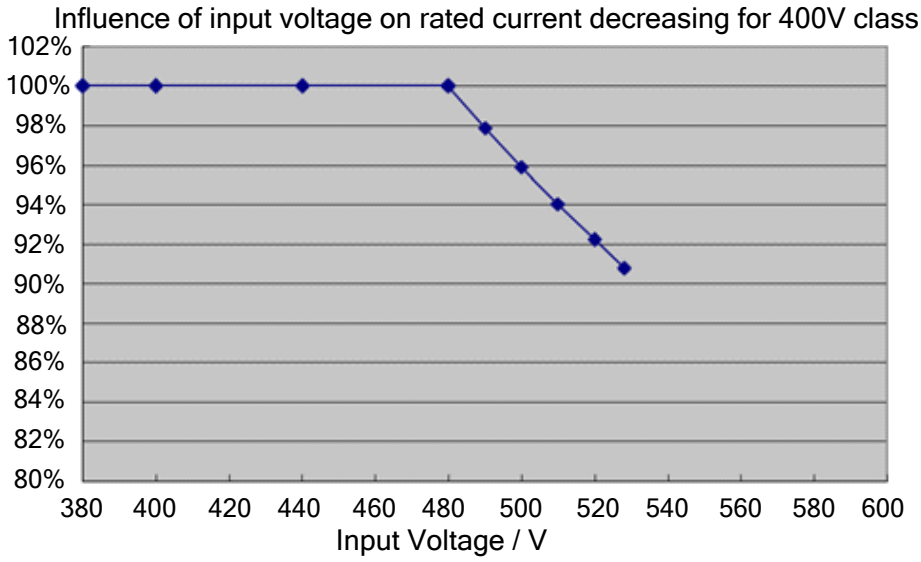
Operating as VT

Derating by Input Voltage

- The continuous rated current of the inverter is limited based on the input voltage. Refer to the following graph.



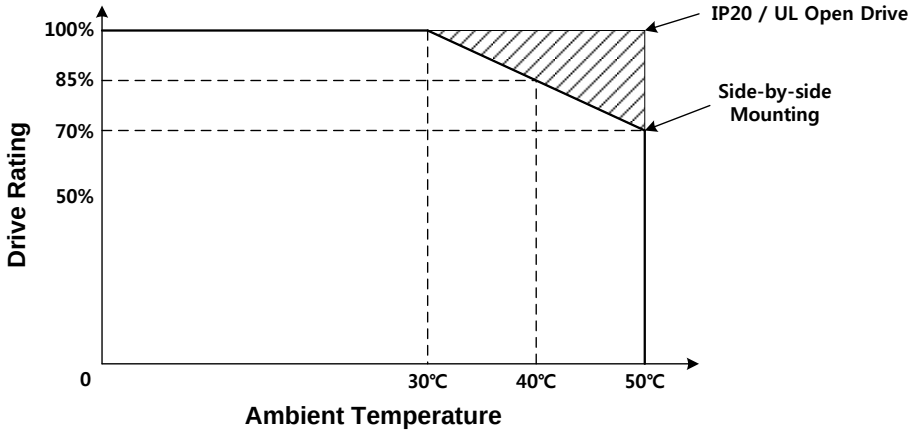
Current decreasing for 200V class inverter



Current decreasing for 400V class inverter

Derating by Ambient Temperature and Installation Type

The constant-rated current of the inverter is limited based on the ambient temperature and installation type. Refer to the following graph.



EC DECLARATION OF CONFORMITY

We, the undersigned,

Representative:	**LSIS Co., Ltd.**
Address:	**LS Tower, 127, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea**
Manufacturer:	**LSIS Co., Ltd.**
Address:	**102-A. National High & New Tech Industrial Development Area. Wuxi. Jiangsu. 214028. P.R. China**

Certify and declare under our sole responsibility that the following apparatus:

Type of Equipment:	**Inverter (Power Conversion Equipment)**
Model Name:	**LSLV-C100 series**
Trade Mark:	**LSIS Co., Ltd.**

Conforms with the essential requirements of the directives:

2014/35/EU Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

2014/30/EU Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

Based on the following specifications applied:

EN 61800-3:2004/A1:2012
EN 61800-5-1:2007

and therefore complies with the essential requirements and provisions of the 2014/35/CE and 2014/30/CE Directives.

Place: **National High & New Tech Industrial Development Area.**

Wuxi. Jiangsu. P.R.China

EMI / RFI POWER LINE FILTERS
LSIS inverters, LSLV-C100 series

RFI FILTERS

THE POWER LINE FILTER , FEB(Standard) SERIES, HAVE BEEN SPECIALLY DESIGNED WITH HIGH FREQUENCY LSIS INVERTER. THE FOLLOWING INSTRUCTION WILL HELP TO ENSURE TROUBLE FREE USE ALONGSIDE SENSITIVE DEVICES, COMPLIANCE TO CONDUCTED EMISSION AND IMMUNITY STANDARD TO EN 50081

Caution

IN CASE OF A LEAKAGE CURRENT, PROTECTIVE DEVICE IS USED ON POWER SUPPLY. IT MAY BE FAULT AT POWER ON OR OFF.
IN ORDER TO AVOID THIS CASE, THE DETECTION CURRENT OF PROTECTIVE DIVICE SHOULD BE LARGER.

Recommended Installation Instructions

To conform to the EMC directive, it is necessary that these instructions should be followed as closely as possible. Follow the usual safety procedures when working with electrical equipment. All electrical connections to the filter, inverter and motor must be made by a qualified electrical technician.

1 Check the filter rating label to ensure that the current, voltage rating and part number are correct.

2 For best results, the filter should be fitted as closely as possible to the incoming mains supply of the wiring enclousure, usually directly after the enclousures circuit breaker or supply switch.

3 The back panel of the wiring cabinet of board should be prepared for the mounting dimensions of the filter. Care should be taken to remove any paint etc. from the mounting holes and face area of the panel to ensure the best possible earthing of the filter.

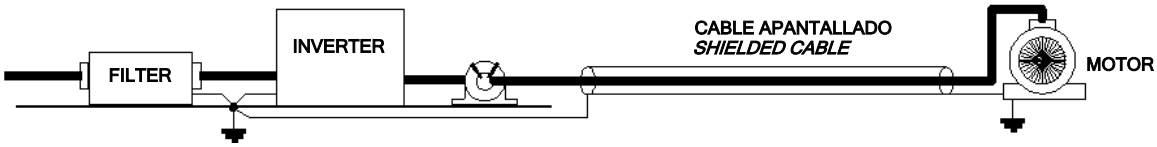
4 Mount the filter securely.

5 Connect the mains supply to the filter terminals marked LINE, connect any earth cables to the earth stud provided. Connect the filter terminals marked LOAD to the mains input of the inverter using short lengths of appropriate gauge cable.

6 Connect the motor and fit the ferrite core (output chokes) as close to the inverter as possible. Armoured or screened cable should be used with the 3 phase conductors only threaded twice through the center of the ferrite core. The earth conductor should be securely earthed at both inverter and motor ends. The screen should be connected to the enclousure body via and earthed cable gland.

7 Connect any control cables as instructed in the inverter instructions manual.

IT IS IMPORTANT THAT ALL LEAD LENGTH ARE KEPT AS SHORT AS POSSIBLE AND THAT INCOMING MAINS AND OUTGOING MOTOR CABLES ARE KEPT WELL SEPARATED.



092/096 Series (Standard)

Single Phase Filter Series(Standard) 200–240[V]

Power	Code	Current	Voltage	Leakage Current	Dimensions (L*W*H)	Mounting (Y*X)	Weight	FIG	Output Chock
SINGLE PHASE 200–240[V]				NOM. MAX.					
0001	092.00 623.03	6A	115/250 VAC	0.42mA@250VA C/50Hz balanced	62.7*52*38 mm	ΦØ4.8m m	238gr.	A	FS-3
0002	092.00 623.03	6A	115/250 VAC	0.42mA@250VA C/50Hz balanced	62.7*52*38 mm	ΦØ4.8m m	238gr.	A	FS-3
0004	092.00 623.03	6A	115/250 VAC	0.42mA@250VA C/50Hz balanced	62.7*52*38 mm	ΦØ4.8m m	238gr.	A	FS-3
0008	092.01 531.00	15A	115/250 VAC	0.21mA@250VA C/50Hz balanced	62.7*52*38 mm	ΦØ4.8m m	190gr.	A	FS-3
0015	092.01 531.00	15A	115/250 VAC	0.21mA@250VA C/50Hz balanced	62.7*52*38 mm	ΦØ4.8m m	190gr.	A	FS-3
0022	092.03 021.00	30A	115/250 VAC	0.45mA@250VA C/50Hz balanced	100*84*57 mm	6.5*4.5m m	820gr.	B	FS-3

Three Phase Filter Series(Standard)

Power	Code	Current	Voltage	Leakage Current	Dimensions (L*W*H)	Mounting (Y*X)	Weight	FIG	Output Chock
THREE PHASE 200–240[V]				NOM. MAX.					
0001	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70*49 .5mm	10.2*5.4 mm	650gr.	C	FS-3
0002	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70*49 .5mm	10.2*5.4 mm	650gr.	C	FS-3
0004	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70*49 .5mm	10.2*5.4 mm	650gr.	C	FS-3
0008	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70*49 .5mm	10.2*5.4 mm	650gr.	C	FS-3
0015	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70*49 .5mm	10.2*5.4 mm	650gr.	C	FS-3
0022	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70*49 .5mm	10.2*5.4 mm	650gr.	C	FS-3
0037	096B.030 02.02	30A	520VAC	46mA@3phase balanced	240*85*50 mm	10.2*5.4 mm	1100gr.	C	FS-3
0055	096B.030 02.02	30A	520VAC	46mA@3phase balanced	240*85*50 mm	10.2*5.4 mm	1100gr.	C	FS-3
0075	096B.040 05.00B	40A	520VAC	2mA@3phase balanced	140*94*94 mm	11*5.5mm	1700gr.	D	FS-3
THREE PHASE 380–480[V]				NOM. MAX.					
0004	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70* 49.5mm	10.2*5.4 mm	650gr.	C	FS-3
0008	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70* 49.5mm	10.2*5.4 mm	650gr.	C	FS-3
0015	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70* 49.5mm	10.2*5.4 mm	650gr.	C	FS-3
0022	096B.010 01.00B	10A	520VAC	3mA@3phase balanced	140*70* 49.5mm	10.2*5.4 mm	650gr.	C	FS-3
0037	096B.016 01.01	16A	520VAC	30mA@3phase balanced	240*85*50 mm	10.2*5.4 mm	1100gr.	C	FS-3
0055	096B.030 02.02	30A	520VAC	46mA@3phase balanced	240*85*50 mm	10.2*5.4 mm	1100gr.	C	FS-3
0075	096B.030 02.02	30A	520VAC	46mA@3phase balanced	240*85*50 mm	10.2*5.4 mm	1100gr.	C	FS-3

- LSLV****C100 EN 55011 CLASS A IEC/EN 61800-3 C2
- 3.7KW below: The EMC test is taken at 5 kHz carrier frequency.
- 3.7KW above: The EMC test is taken at 3 kHz carrier frequency.

Single Phase Filter Series(Standard)

FIG - A

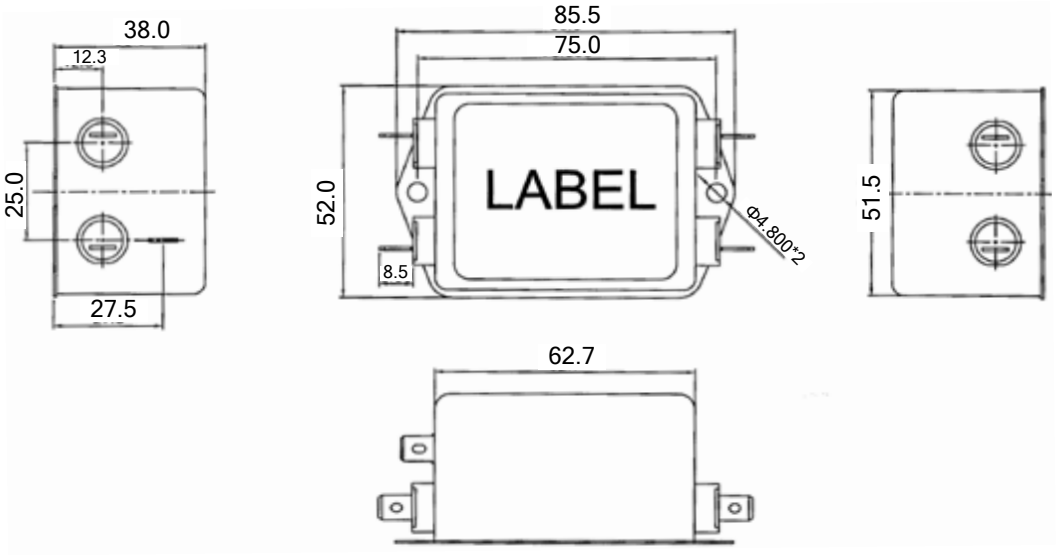
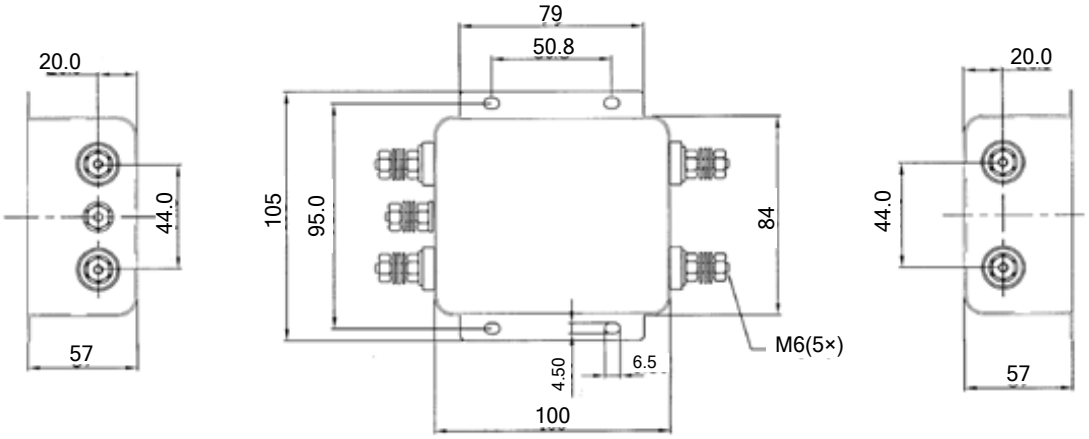
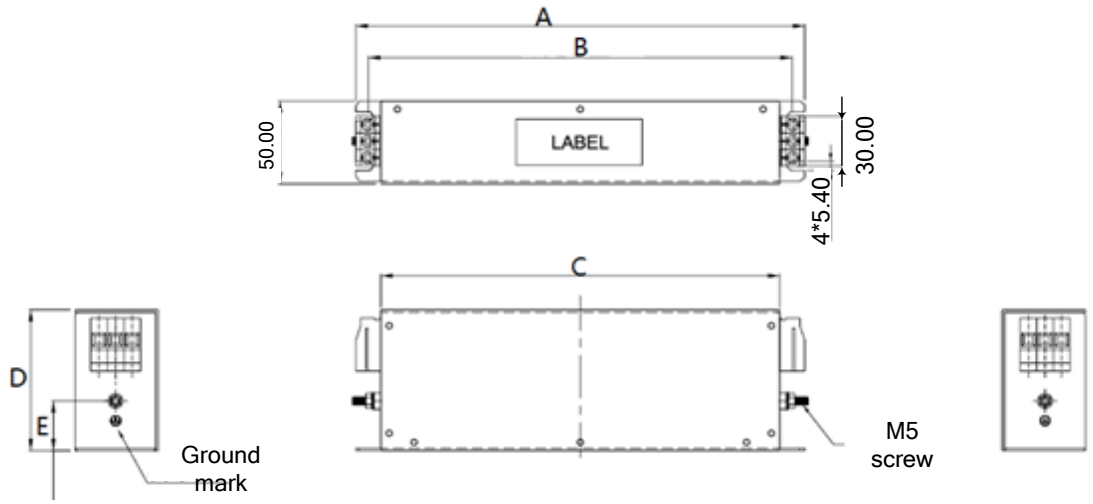


FIG – B



Three Phase Filter Series(Standard)

FIG - C

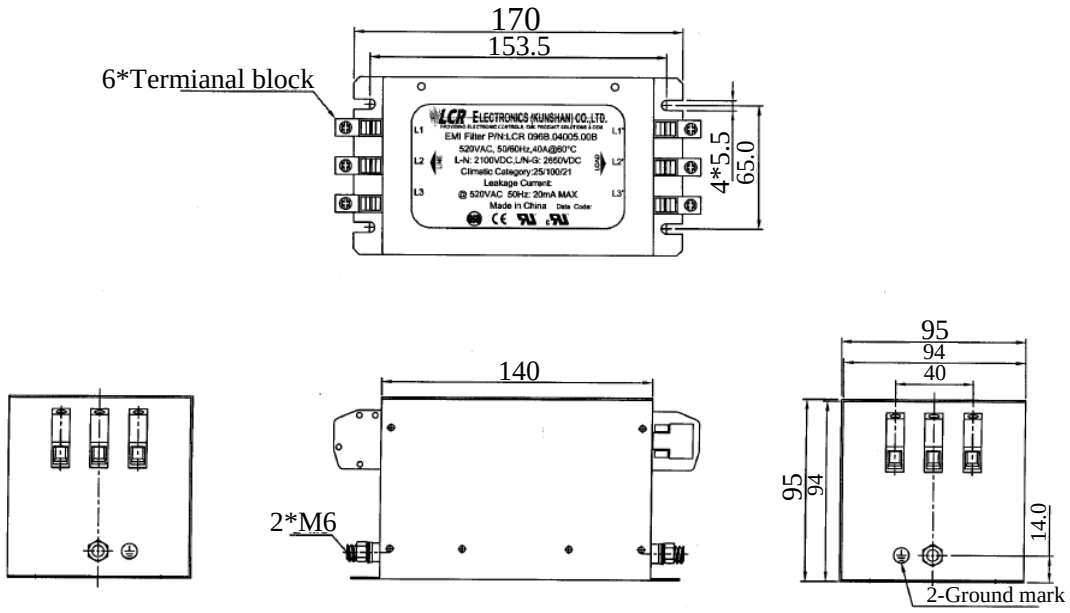


Size

Unit : mm

Type	A	B	C	D	E
096B.01001.00B	170	155	140	70	15
096B.01601.01	270	255	240	85	30
096B.03002.02	270	255	240	85	30

FIG - D



Output Chock

D=13mm
H=30mm

LCR Electronics (Kunshan) Co., Ltd
ADD: No. 601 Hengchangjing Road, Kunshan City,
Jiangsu, China
TEL: 86-512-57066178
FAX: 86-512-57627776
Website:www.lcr-china.com

Product Warranty

Warranty Information

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

Product Name	LSIS Compact Inverter	**Date of Installation**	
Model Name	LSLV-C100	**Warranty Period**	
Customer Info	Name (or company)		
	Address		
	Contact Info.		
Retailer Info	Name		
	Address		
	Contact info.		

Warranty Period

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

Warranty Service Information

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

Non-Warranty Service

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

- intentional abuse or negligence
- power supply problems or from other appliances being connected to the product
- acts of nature (fire, flood, earthquake, gas accidents etc.)
- modifications or repair by unauthorized persons
- missing authentic LSIS rating plates
- expired warranty period

Visit Our Website

Visit us at ***http://www.lsis.com*** for detailed service information.

UL mark

The UL mark applies to products in the United States and Canada. This mark indicates that UL has tested and evaluated the products and determined that the products satisfy the UL standards for product safety. If a product received UL certification, this means that all components inside the product had been certified for UL standards as well.

CE mark

The CE mark indicates that the products carrying this mark comply with European safety and environmental regulations. European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers and the EMC guidelines for safe noise control.

Low Voltage Directive

We have confirmed that our products comply with the Low Voltage Directive (EN 61800-5-1).

EMC Directive

The Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3) covers requirements stated for drives.

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