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

- \* LSLV-S100 is the official name for S100.
- \* Visit us at http://www.lsis.com for detailed the user manual(Standard).

# **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



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.

## ① Caution

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

#### **Safety information**

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

The following connection terminals and devices are the Electrical Protection level 0. It means that the circuit protection level depends on the basic insulation. If there is no basic insulation is failed, it may cause electric shock accident. When installing or wiring the connection terminals and devices, take the same protective action as with the power wire.

- Multi-function Input: P1-P7, CM
- Analog Frequency Input: VR, V1, I2, TI
- Safety Function: SA, SB, SC
- Analog Output: AO1, AO2, TO
- -Contact: Q1, EG, 24, A1, B1, C1, A2, C2, S+, S-, SG
- -Fan

The protection level of this equipment (inverter) is the Electrical Protection level I.

#### ① 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. Depending on the selected MCCB, the LSLV-S100 Series is suitable for use in circuits capable of delivering a maximum of 100 kA RMS symmetrical amperes at the drive's maximum rated voltage. The following table shows the recommended MCCB for RMS symmetrical amperes.

#### Note

Le courant maximum de court-circuit présumé autorisé au connecteur d'alimentation électrique est défini dans la norme IEC 60439-1 comme égal à 100 kA. Selon le MCCB sélectionné, la série LSLV-S100 peut être utilisée sur des circuits pouvant fournir un courant RMS symétrique de 100 kA maximum en ampères à la tension nominale maximale du variateur. Le tableau suivant indique le MCCB recommandé selon le courant RMS symétrique en ampères.

Working Voltage	UTS150 (N/H/L)	UTS250 (N/H/L)	UTS400 (N/H/L)	ABS103c	ABS203c	ABS403c
480V(50/60Hz)	35/65/100	35/65/100	35/65/100	26kA	26kA	35kA

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# 1 Preparing the Installation

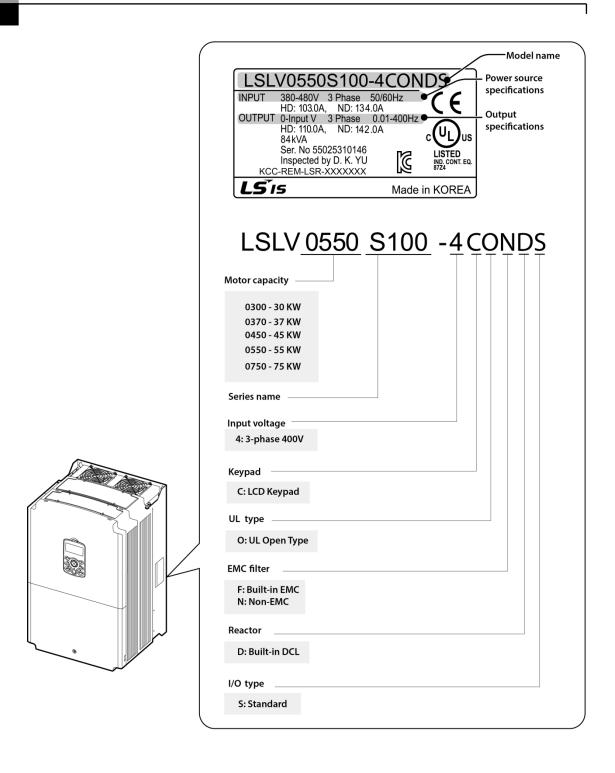
This chapter provides details on product identification, part names, correct installation and cable specifications. To install the inverter correctly and safely, carefully read and follow the instructions.

### 1.1 Product Identification

The S100 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 <u>9.1 Input and Output Specification</u> on page <u>249</u>.

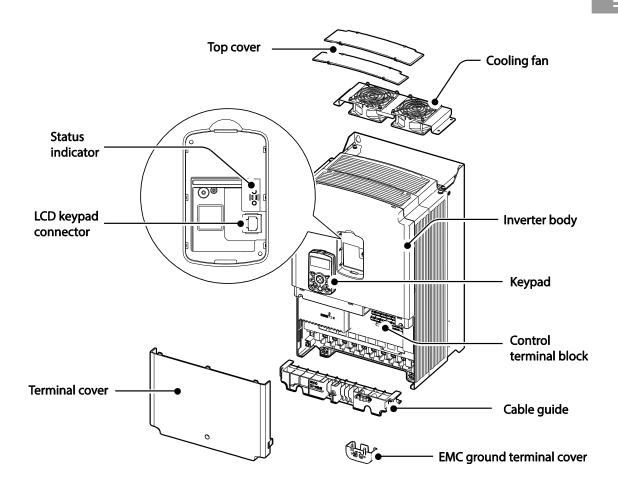
#### Note

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.



# 1.2 Part Names

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



#### Note

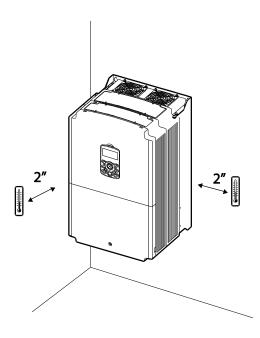
The grounding terminal cover of EMC is not existed in the 55-75kW inverters.

# 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 9.8m/sec <sup>2</sup> (1G)
Air Pressure	70 – 106kPa

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



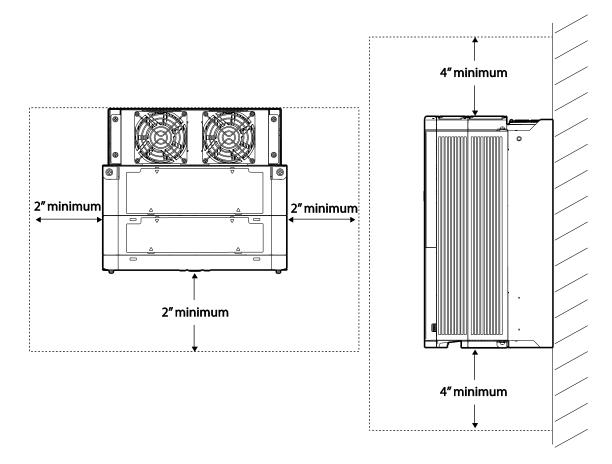
## ① Caution

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

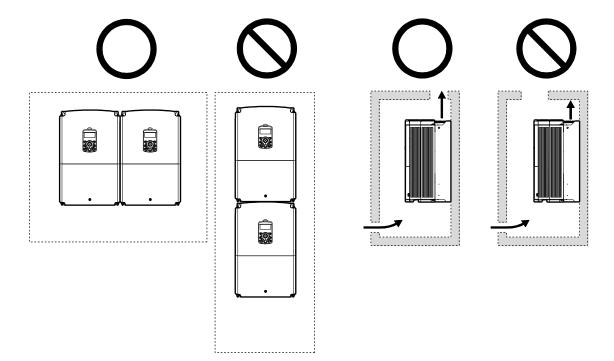
# 1.4 Selecting and Preparing a Site for Installation

When selecting an installation location consider the following points:

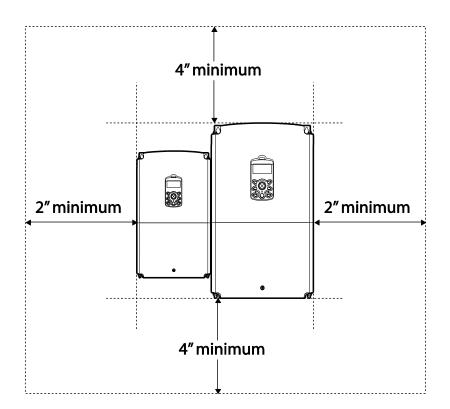
- The inverter must be installed on a wall that can support the inverter's weight.
- The location must be free from vibration. Vibration can adversely affect the operation of the inverter.
- The inverter can become very hot during operation. Install the inverter on a surface that is
  fire-resistant 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, 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.

#### ① 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 600 V, 90℃ for power terminal wiring.
- Use copper cables rated for 300 V, 75℃ for control terminal wiring.

#### **Ground Cable and Power Cable Specifications**

		Ground		Power I/O			
Load (kW	)		AVAIC	mm²		AWG	
		mm²	AWG	R/S/T	U/V/W	R/S/T	U/V/W
	30			25	25	4	4
	37	16	5	25	23	4	4
3-Phase 400 V	45						
	55	25	3	70	70	1/0	1/0
	75	35	2				

Signal (Control) Cable Specifications

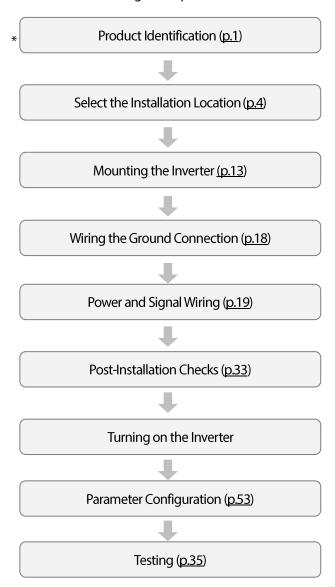
	Recommended	l wire thickness			
Terminal	mm²(, Without Crimp Terminal Connections (Bare wire)		Terminal screw	Torque [Nm]	Electrical Specifications
P1-P7, CM		, c			-
VR					Output current/voltage: 12V, 20 mA volume resistance: 1-5 k $\Omega$
V1					Maximum input voltage: -12V - +12V
12					0-24 mA input (internal
12					resistance: 249 Ω)
AO1, AO2					Maximum output current/voltage: 12 V, 24 mA
Q1	1.0 (17)	1.5 (15)	M2 <del>-</del> 6	0.4	Less than DC 26 V, 100 mA
EG	(17)	1.5 (15)	77.2 0		-
24					Maximum output current: 100 mA
TI					0-32 kHz, 0-12 V
ТО					0-32 kHz, 0-12 V
SA, SB, SC					Less than DC 24V, 25 mA
S+, S-, SG					Less than AC 250 V, 1 A Less than DC 30 V, 1 A
A1, B1, C1 A2, C2					Less than AC 250 V, 5 A Less than DC 30 V, 5 A

# 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**

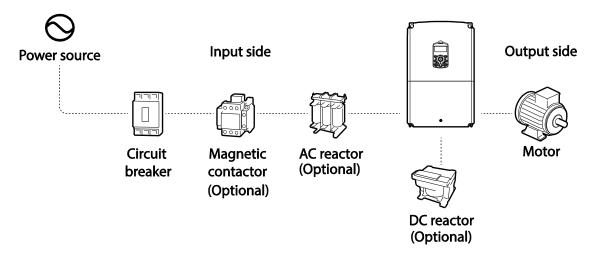
The flowchart lists the sequence to be followed during installation. The steps cover equipment installation and testing of the product. More information on each step is referenced in the steps.



#### **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 <u>9.4</u> Peripheral Devices on page 255.



#### ① Caution

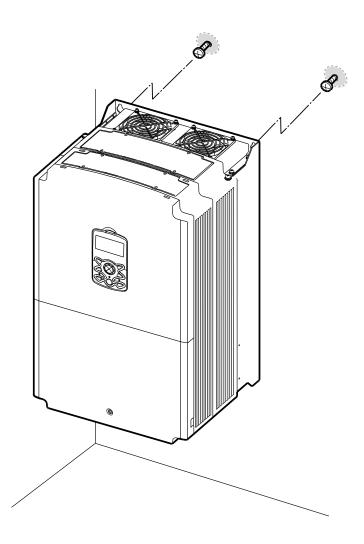
- Figures in this manual are shown with covers or circuit breakers removed to show a more detailed view of the installation arrangements. Install covers and circuit breakers before operating the inverter. Operate the product according to the instructions in this manual.
- Do not start or stop the inverter 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 <u>9.5 Fuse</u> and Reactor Specifications on page <u>255</u> and carefully select a reactor that meets the requirements.

# 2.1 Mounting the Inverter

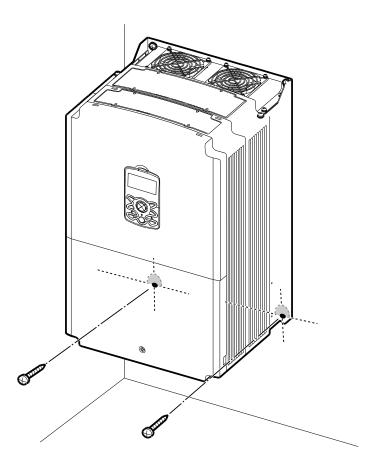
Mount the inverter on a wall or inside a panel following the procedures provided below. Before installation, ensure that there is sufficient space to meet the clearance specifications, and that there are no obstacles impeding the cooling fan's air flow.

Select a wall or panel suitable to support the installation. Refer to <u>9.3 External Dimensions (IP 20 Type)</u> on page <u>253</u> 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.

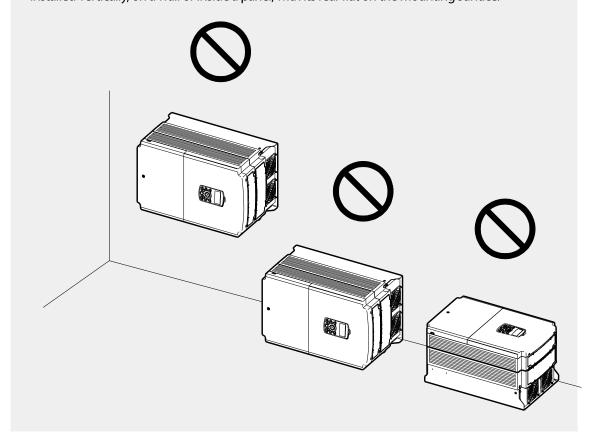


3 Mount the inverter on the wall or inside a panel using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the inverter is placed flat on the mounting surface, and that the installation surface can securely support the weight of the inverter.



#### ① 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.

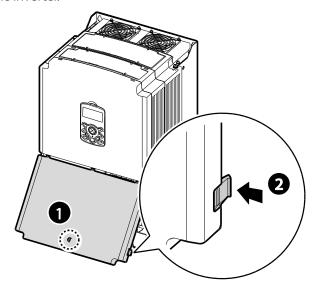
#### ① Caution

- 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 <u>9.6 Terminal Screw Specification</u> on page 256 for torque specifications.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in electric shock.
- The power supply system for this equipment (inverter) is a grounded system. Only use a grounded power supply system for this equipment (inverter). Do not use a TT, TN, IT, or corner grounded system with the inverter.
- The equipment may generate direct current in the protective ground wire. When installing the residual current device (RCD) or residual current monitoring (RCM), only Type B RCDs and RCMs can be used.
- Use cables with the largest cross-sectional area, appropriate for power terminal wiring, to ensure that voltage drop does not exceed 2%.
- Use copper cables rated at 600 V, 90 <sup>∞</sup> for power terminal wiring.
- Use copper cables rated at 300 V, 75 °C for control terminal wiring.
- Check for short circuits or wiring failure in the control circuit. They could cause system failure or device malfunction.
- Use shielded cables when wiring the control circuit. Failure to do so may cause malfunction due to interference. If a ground is needed, use STP (Shielded Twisted Pair) cables.
- If you need to re-wire the terminals due to wiring-related faults, ensure that the 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 terminal cover (●). Push and hold the latch on the right side of the cover (●). Then remove the cover by lifting it from the bottom and moving it away from the front of the inverter.

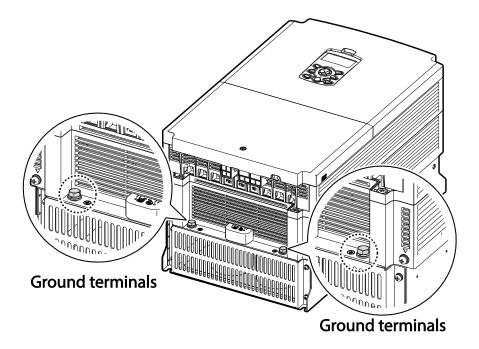


2 Connect the cables to the power terminals and the control terminals. For cable specifications, refer to <u>1.5 Cable Selection</u> on page <u>8</u>.

#### **Step 2 Ground Connection**

Remove the front cover, 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 <u>1.5 Cable Selection</u> on page <u>8</u> to find the appropriate cable specification for your installation.



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

#### Note

400 V products require Special Class 3 grounding. Resistance to ground must be  $< 10 \Omega$ .

## **⚠** 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 <u>1.5 Cable Selection</u> on page <u>8</u> before installing them.

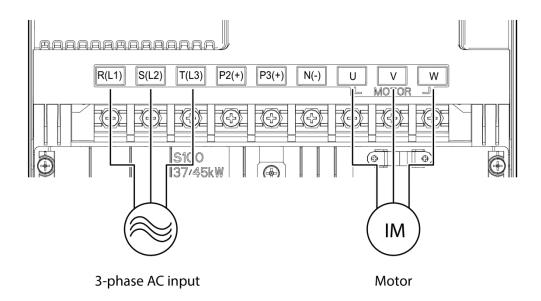
#### ① Caution

- 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 600 V, 90℃ for power terminal wiring.
- Use copper cables rated for 300 V, 75℃ for control terminal wiring.
- Do not connect two wires in a single terminal for power cable connections.
- 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.

#### Attention

- Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risque d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements.
- Utiliser uniquement des fils de cuivre avec une valeur nominale de 600 V, 75 ℃ pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 ℃ pour le câblage de la borne de commande.
- Ne jamais connecter deux câbles à une borne lors du câblage de l'alimentation.
- Les câblages de l'alimentation électrique doivent être connectés aux bornes R, S et T. Leur connexion aux bornes U, V et W provoque des dommages internes à l'onduleur. Le moteur doit être raccordé aux bornes U, V et W. L'arrangement de l'ordre de phase n'est pas nécessaire.

## 30~75kW (3-phase)



# **Power Terminal Labels and Descriptions**

Terminal Labels	Name	Description
R(L1)/S(L2)/T(L3)	AC power input terminal	Mains supply AC power connections.
P2(+)/N(-)	DC link terminal	DC voltage terminals.
P3(+)/N(-)	Brake unit terminals	Brake unit wiring connection.
U/V/W	Motor output terminals	3-phase induction motor wiring
U/ V/ VV		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 665ft (202m).
- 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) =  $[\sqrt{3} \text{ X cable resistance (m}\Omega/\text{m}) \text{ X cable length (m) X current(A)]} / 1000$ 

• 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	<330ft (100m)	>330ft (100m)
Allowed Carrier Frequency	< 5 kHz	< 2.5 kHz

## **⚠** Warning

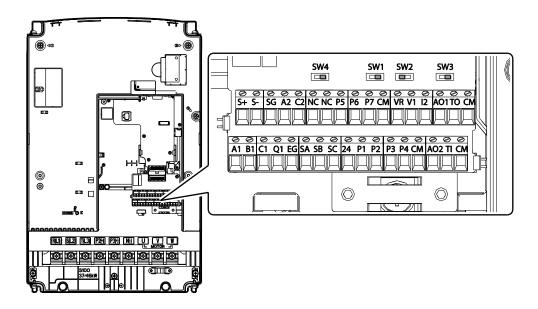
Do not connect power to the inverter until installation has been fully completed and the inverter is ready to be operated. Doing so may result in electric shock.

#### ① 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.

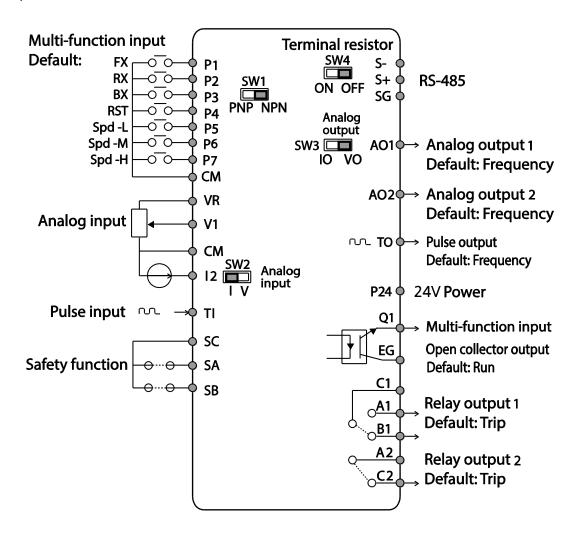
## **Step 4 Control Terminal Wiring**

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
SW	PNP/NPN mode selection switch
SW2	analog voltage/current input terminal selection switch
SW3	analog voltage/current output terminal selection switch
SW4	Terminal resistor DIP switch



# Input Terminal Labels and Descriptions

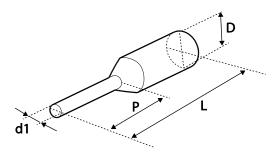
Function	Label	Name	Description			
Multi- function	P1–P7	Multi-function Input 1-7	Configurable for multi-function input terminals.			
terminal configuration	СМ	Common Sequence	Common terminal for analog terminal inputs and outputs.			
Analog input configuration	VR	Potentiometer frequency reference input	Used to setup or modify a frequency reference via analog voltage or current input.  • Maximum Voltage Output: 12 V  • Maximum Current Output: 100 mA,  • Potentiometer: 1–5 kΩ			
	V1	Voltage input for frequency reference input	Used to setup or modify a frequency reference via analog voltage input terminal.  • Unipolar: 0–10 V (12 V Max.)  • Bipolar: -10–10 V (±12 V Max.)			
	12	Voltage/current input for frequency reference input	Used to setup or modify a frequency reference via analog voltage or current input terminals.  Switch between voltage (V2) and current (I2) modes using a control board switch (SW2).  V2 Mode:  • Unipolar: 0–10 V (12 V Max.)  I2 Mode  • Input current: 4–20 mA  • Maximum Input current: 24 mA  • Input resistance: 249 Ω			
	TI	Pulse input for frequency reference input (pulse train)	Setup or modify frequency references using pulse inputs from 0 to 32 kHz.  • Low Level: 0–0.8 V  • High Level: 3.5–12 V			
	SA	Safety input A	Used to block the output from the inverter in an			
Safety functionality configuration	SB	Safety input B	<ul> <li>emergency.</li> <li>Conditions:</li> <li>Normal Operation: Both the SA and SB terminals are connected to the SC terminal.</li> <li>Output Block: One or both of the SA and SB terminals lose connection with the SC terminal.</li> </ul>			
	SC	Safety input power source	DC 24 V, < 25 mA			

# **Output/Communication Terminal Labels and Descriptions**

Function	Label	Name	Description			
Analog output	AO1	Voltage/Current Output	Used to send inverter output information to external devices: output frequency, output current, output voltage, or a DC voltage.  Operate switch (SW2) to select the signal output type (voltage or current) at the AO terminal.  Output Signal Specifications:  Output voltage: 0–10 V  Maximum output voltage/current: 12 V/10 mA  Output current: 0–20 mA (Load resistance: Less than 500 Ω)  Maximum output current: 24 mA			
	AO2	Analog voltage output terminal	Use to send inverter output information, such as output frequency, output current, output voltage, or DC voltage to external devices.  • Output voltage: 0-10 V  • Maximum output voltage/current: 12V/10 mA			
	то	Pulse Output	Sends pulse signals to external devices to provide a single output value from the inverter of either: output frequency, output current, output voltage, or DC voltage. Output Signal Specifications: Output frequency: 0–32 kHz Output voltage: 0–12V			
	Q1	Multi-functional (open collector)	DC 26V, 100 mA or less			
	EG	Common	Common ground contact for an open collector (with external power source)			
	24	External 24V power source	Maximum output current: 150 mA			
Terminal contacts	A1/C1/B1	Fault signal output	<ul> <li>Sends out alarm signals when the inverter's safety features are activated (AC 250 V &lt; 1A, DC 30 V &lt; 1A).</li> <li>Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection)</li> <li>Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection)</li> </ul>			
	A2, C2	Multi-functional relay output terminal	The signal is generated while operating. Define and use the multi-functional relay output terminal (Less than AC250 V 5A, Less than DC30 V 5A).			
	S+/S-/SG	RS-485 signal line	Used to send or receive RS-485 signals. Refer to 5 <u>RS-485</u> <u>Communication Features</u> on page <u>125</u> for more details.			
	NC	NC	Not in use.			

#### Preinsulated Crimp Terminal Connectors (Bootlace Ferrule).

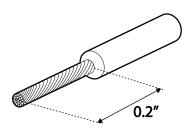
Use preinsulated crimp terminal connectors to increase reliability of the control terminal wiring. Refer to the specifications below to determine the crimp terminals to fit various cable sizes.



P/N	Cable Spec.		Dimensions (inches/mm)				Manufacturer
	AWG	mm <sup>2</sup>	L*	P	d1	D	Manufacturer
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	

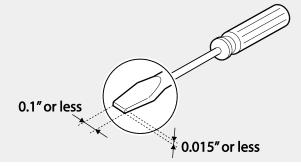
<sup>\*</sup> If the length (L) of the crimp terminals exceeds 0.5"(12.7mm) after wiring, the control terminal cover may not close fully.

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



#### Note

- While making wiring connections at the control terminals, ensure that the total cable length does not exceed 165ft (50m).
- Ensure that the length of any safety related wiring does not exceed 100ft (30m).
- Ensure that the cable length between an LCD keypad and the inverter does not exceed 10ft (3.04m). Cable connections longer than 10ft (3.04m) may cause signal errors.
- Use ferrite material to protect signal cables from electro-magnetic interference.
- Take care when supporting cables using cable ties, to apply the cable ties no closer than 6 inches from the 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).

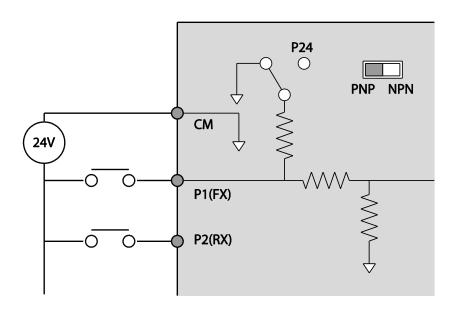


### **Step 5 PNP/NPN Mode Selection**

The S100 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 (SW1) on the control board. Refer to the following information for detailed applications.

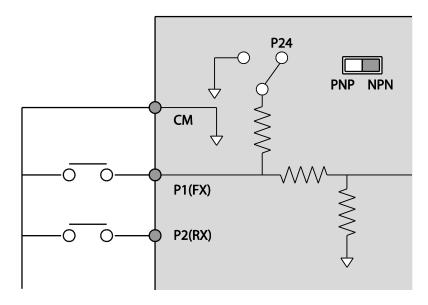
### PNP Mode (Source)

Select PNP using the PNP/NPN selection switch (SW1). Note that the factory default setting is NPN mode. CM is 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 (SW1). Note that the factory default setting is NPN mode. CM is 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

S100, 400 V 30–45 kW (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.

#### Note

S100, 400 V, 55-75 kW products do not have built-in EMC filters.

Asymmetrical G	Asymmetrical Grounding Connection						
One phase of a delta connection is grounded	R(L1)  S(L2)  T(L3)	Intermediate grounding point on one phase of a delta connection	S(L2) T(L3)				
The end of a single phase is grounded	L N	A 3-phase connection without grounding	R(L1)				

## 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.

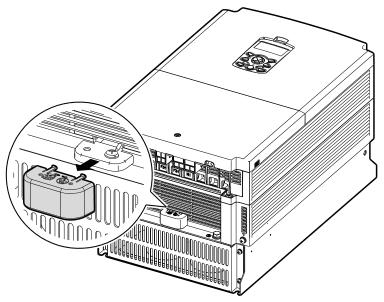
Before using the inverter, confirm the power supply's grounding system. Disable the EMC filter if the power source has an asymmetrical grounding connection.

### **Disabling the Built-in EMC Filter**

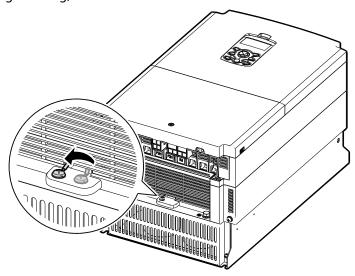
Refer to the figures below to locate the EMC filter on/off terminal and replace the metal bolt with the plastic bolt. If the EMC filter is required in the future, reverse the steps and replace the plastic bolt with the metal bolt to reconnect the EMC filter.

Follow the instructions listed below to disable the EMC filters.

1 Remove the EMC ground cover located at the bottom of the inverter.



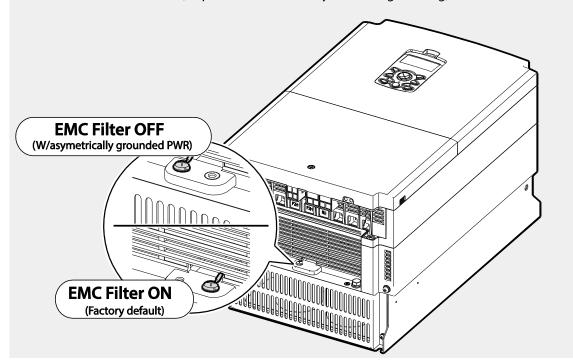
2 Remove the EMC ground cable from the right terminal (EMC filter-ON / factory default), and connect it to the left terminal (EMC filter-OFF / for power sources with asymmetrical grounding).



If the EMC filter is required in the future, reverse the steps and connect the EMC ground cable to the right terminal to enable the EMC filter.

#### Note

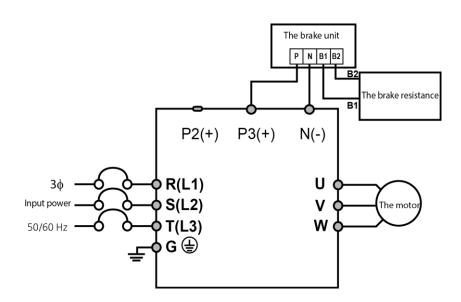
The terminal on the right is used to ENABLE the EMC filter (factory default). The terminal on the left is used to DISABLE the EMC filter (for power sources with asymmetrical grounding).



### Step 7 Selecting the brake unit

Select the brake unit as following:

UL type	Applicable motor capacity	Brake unit	
	30-37 kW	SV037DBH-4	
Non-UL Type	45-55 kW	SV075DBH-4	
	75 kW		
	30-37 kW	SV370DBU-4U	
ULType	45-55 kW	SV550DBU-4U	
	75 kW	SV750DBU-4U	



## Step 8 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 Check Point	Ref.	Result
	Is the installation location appropriate?	<u>p.4</u>	
	Does the environment meet the inverter's operating	<u>p.5</u>	
	conditions?	-	
Installation	Does the power source match the inverter's rated input?	p.249	
Location/Power	Is the inverter's rated output sufficient to supply the		
I/O Verification	equipment?		
	(Degraded performance will result in certain circumstances.	<u>p.249</u>	
	Refer to <u>9.8 Continuous Rated Current Derating</u> on page <u>257</u> for		
	details.		
	Is a circuit breaker installed on the input side of the inverter?	<u>p.12</u>	
	Is the circuit breaker correctly rated?	<u>p.249</u>	
	Are the power source cables correctly connected to the R/S/T		
	terminals of the inverter?	<u>p.19</u>	
	(Caution: connecting the power source to the U/V/W		
	terminals may damage the inverter.)		
	Are the motor output cables connected in the correct phase		
	rotation (U/V/W)?	<u>p.19</u>	
	(Caution: motors will rotate in reverse direction if three phase		
	cables are not wired in the correct rotation.)		<del> </del>
Power Terminal	Are the cables used in the power terminal connections correctly rated?		
Wiring	Is the inverter grounded correctly?	p.18	1
	Are the power terminal screws and the ground terminal		+
	screws tightened to their specified torques?		
	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	40	
	contactor (if a braking resistor is in use)?	<u>p.12</u>	
	Are advanced-phase capacitors, surge protection and	10	
	electromagnetic interference filters installed correctly?		
	(These devices MUST not be installed on the output side of	<u>p.19</u>	
	the inverter.)		
	Are STP (shielded twisted pair) cables used for control		
	terminal wiring?		
Control Terminal	Is the shielding of the STP wiring properly grounded?	-	
Wiring	If 3-wire operation is required, are the multi-function input		
vviilig	terminals defined prior to the installation of the control wiring		
	connections?		
	Are the control cables properly wired?	<u>p22</u>	

Items	Check Point	Ref.	Result
	Are the control terminal screws tightened to their specified torques?		
	Is the total cable length of all control wiring < 165ft (100m)?	<u>p.27</u>	
	Is the total length of safety wiring < 100ft (30m)?	<u>p.27</u>	
	Are optional cards connected correctly?	=	
	Is there any debris left inside the inverter?	<u>p.16</u>	
	Are any cables contacting adjacent terminals, creating a potential short circuit risk?		
	Are the control terminal connections separated from the power terminal connections?		
Miscellaneous	If capacitors have been in use for more than two years, have they been replaced?		
	Has a fuse been installed for the power source?	<u>p.255</u>	
	Are the connections to the motor separated from other connections?		
	If the fans have been in operation for more than three years, have they been replaced?	<u>p. 246</u>	

#### 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 Before starting a test drive, check the wiring conditions.
- 2 Turn on the power supply to the inverter. Ensure that the keypad display light is on.
- 3 Select the command source (Set the DRV code).
- **4** Set a frequency reference, and then check the following:
  - If V1 is selected as the frequency reference source, does the reference change according to the input voltage at VR?
  - If V2 is selected as the frequency reference source, is the voltage/current selector switch (SW2) set to voltage, and does the reference change according to the input voltage?
  - If I2 is selected as the frequency reference source, is the voltage/current selector switch (SW2) set to current, and does the reference change according to the input current?
- **5** Set the acceleration (ACC) time and deceleration (Dec) time.
- **6** 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.

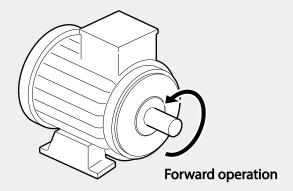
#### Note

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-06 (Frequency reference source) code 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.



### ① 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

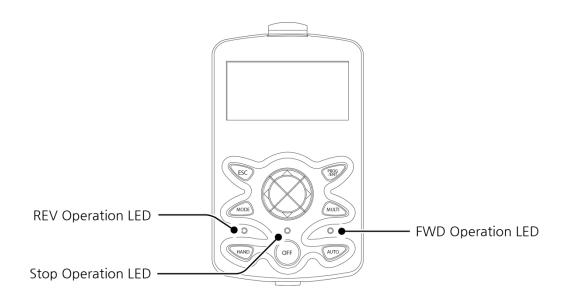
This chapter describes the keypad layout and functions. It also introduces parameter groups and codes required to perform basic operations. The chapter also outlines the correct operation of the inverter before advancing to more complex applications. Examples are provided to demonstrate how the inverter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

# 3.1 About the Keypad

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

## 3.1.1 Operation Keys

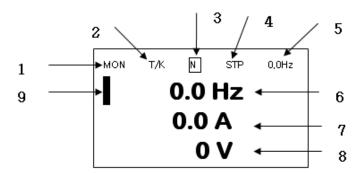
The following table lists the names and functions of the keypad's operation keys.



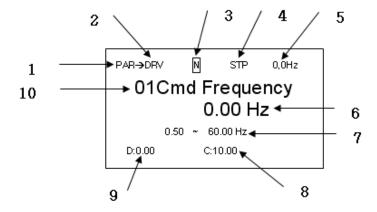
Key	Name	Description	
MODE	[MODE] Key	Used to switch between modes.	
PROG /ENT	[PROG / Ent] Key	Used to select, confirm, or save a parameter value.	
	[UP] key [DOWN] key	Switch between codes or increase or decrease parameter values.	
	[LEFT] key [RIGHT] key	Switch between groups or move the cursor during parameter setup or modification.	
MULTI	[MULTI] Key	Used to perform special functions, such as user code registration.	
ESC	[ESC] Key	<ul> <li>Used to cancel an input during parameter setup.</li> <li>Pressing the [ESC] key before pressing the [PROG / ENT] key reverts the parameter value to the previously set value.</li> <li>Pressing the [ESC] key while editing the codes in any function group makes the keypad display the first code of the function group.</li> <li>Pressing the [ESC] key while moving through the modes makes the keypad display Monitor mode.</li> </ul>	
FWD	[FWD] Key	Used to operate the motor in the forward direction.	
REV	[REV] Key	Used to operate the motor in the reversed direction.	
STOP /RESET	[STOP/RESET] Key	Used to stop motor operation. Used to reset the inverter following fault or failure condition.	

# 3.1.2 About the Display

### Monitor mode display



### **Parameter settings display**



## Names displayed in monitor mode and parameter settings

No.	Names displayed in monitor mode	No.	Names displayed in parameter settings
1	Mode	1	Mode
2	Operating/frequency command	2	Group
3	Multi-functional key settings	3	Multi-functional key settings
4	Inverter operation status	4	Inverter operation status
5	Items displayed in the status window	5	Items displayed in the status window
6	Monitor mode display 1	6	Display parameters
7	Monitor mode display 2	7	Available settings range
8	Monitor mode display 3	8	Existing setting values
9	Monitor mode cursor	9	Factory default values
		10	Code numbers and names

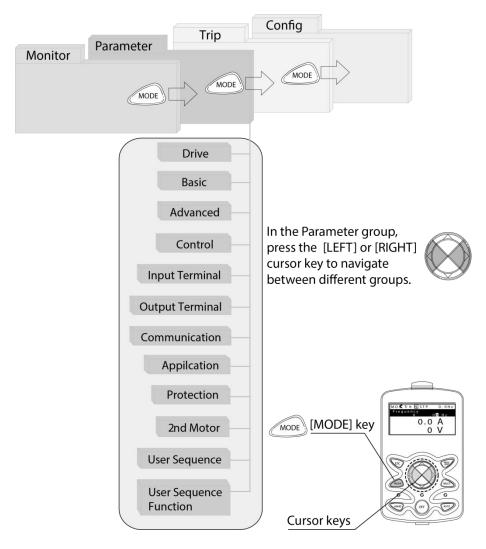
## **Display details**

No.	Name	Display	Description	
		MON	Monitor Mode	
1	Mada	PAR	Parameter Mode	
ı	Mode	TRP	Trip Mode	
		CNF	Config Mode	
		K	Keypad operation command	
		0	Field Bus communication option operation command	
	Operation commands	Α	Application option operation command	
	Communicis	R	Internal 485 operation command	
		Т	Terminal operation command	
		K	Keypad frequency command	
2		V	V1 input frequency command	
_		Р	Pulse input frequency command	
	Frequency	U	Frequency command for UP operation (Up - Down operation)	
	commands	D	Frequency command for DOWN operation (Up - Down operation)	
		S	Frequency command for STOP operation (Up - Down operation)	
		0	FBus Option frequency command	

No.	Name	Display	Description	
		J	Jog frequency command	
		R	Int 485 frequency command	
1		1~9, A~F	Multi-step frequency command	
	A A Ist	JOG Key	Keypad JOG operation mode	
3	Multi- functional key	Local/Remote	Able to select either local or remote operation	
3	settings	UserGrpSelKey	Register or delete user group parameters in parameter mode	
		STP	Motor stopped	
		FWD	Operating in forward direction	
		REV	Operating in reverse direction	
		DC	DC output	
4	Inverter	WAN	Warning	
4	operation status	STL	Stall	
		SPS	Speed Search	
		OSS	S/W overcurrent protective function is on	
		OSH	H/W overcurrent protective function is on	
		TUN	Auto Tuning	

## 3.1.3 Display Modes

The S100 inverter uses 5 modes to monitor or configure different functions. The parameters in Parameter mode are divided into smaller groups of relevant functions. Press the [Mode] key to change to Parameter mode.



## **Table of Display Modes**

The following table lists the 5 display modes used to control the inverter functions.

Mode Name	Keypad Display	Description
Monitor mode	MON	Displays the inverter's operation status information. In this mode, information including the inverter's frequency reference, operation frequency, output current, and voltage may be monitored.
Parameter mode	PAR	Used to configure the functions required to operate the inverter. These functions are divided into 14 groups based on purpose and complexity.
Trip mode	TRP	Used to monitor the inverter's fault trip information, including the previous fault trip history.  When a fault trip occurs during inverter operation, the operation frequency, output current, and output voltage of the inverter at the time of the fault may be monitored.  This mode is not displayed if the inverter is not at fault and fault trip history does not exist.
Config mode	CNF	Used to configure the inverter features that are not directly related to the operation of the inverter. The settings you can configure in the Config mode include keypad display language options, monitor mode environment settings, communication module display settings, and parameter duplication and initialization.

# Parameter Setting Mode

The following table lists the functions groups under Parameter mode.

Function Group Name	Keypad Display	Description	
Drive	DRV	Configures basic operation parameters. These include ACC/Dec time settings, operation command settings, and functions necessary for operation.	
Basic	BAS	Configures basic operation parameters. These parameters include motor parameters and multi-step frequency parameters.	
Advanced	ADV	Configures acceleration or deceleration patterns, frequency limits, energy saving features, and, regeneration prevention features.	
Control	CON	Configures the features related to speed search and KEB (kinetic energy buffering).	
Input Terminal	IN	Configures input terminal–related features, including digital multi–functional inputs and analog inputs.	
Output Terminal	OUT	Configures output terminal-related features, including digital multi-functional outputs and analog outputs.	
Communication	СОМ	Configures the USB-related features and communication features for the RS-485, Modbus-RTU, LS Bus, Metasys N2, and BACnet. Optional communication module related features may be configured as well, if one is installed.	
Application	APP	Configures functions related to auto sequence operation and PID control.	
Protection	PRT	Configures motor and inverter protection features.	
Motor 2 (Secondary motor)	M2	Configures the secondary motor-related features.	
User Sequence	USS	Used to implement simple sequences with verious	
User Sequence Function	USF	Used to implement simple sequences with various function blocks.	

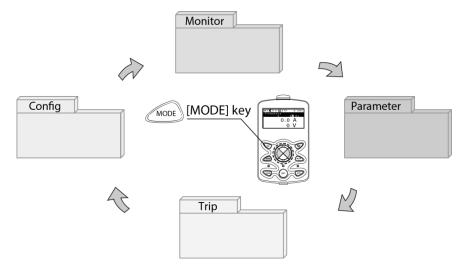
# 3.2 Learning to Use the Keypad

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 specific functions on or off or decide how the functions will be used. For detailed information on the codes in each function group, refer to 6. *Table of Functions* on page 157. Confirm the correct values (or the correct range of the values), then follow the examples below to configure the inverter with the keypad.

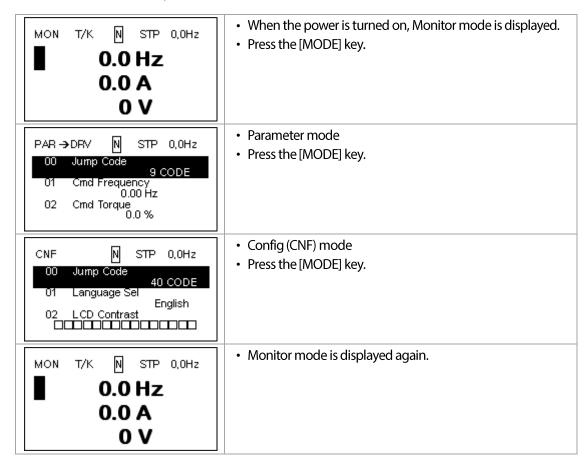
## 3.2.1 Display Mode Selection

The following figure illustrates how the display modes change when you press the [Mode] button on the keypad. You can continue to press the [Mode] key until you get to the desired mode.

User mode and Trip mode are not displayed when all the inverter settings are set to the factory default (User mode must be configured before it is displayed on the keypad, and Trip mode is displayed only when the inverter is at fault, or has previous trip fault history).

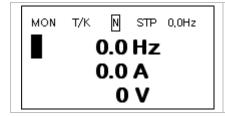


### Mode selection in factory default condition

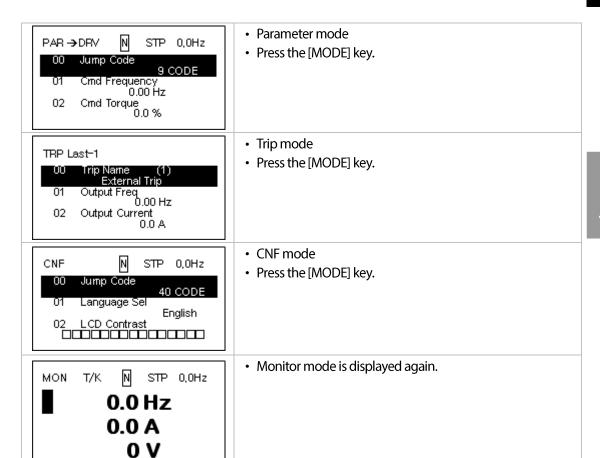


### Switching between groups when Trip mode is added

Trip mode is accessible only when the inverter has trip fault history. Refer to 4 *Learning Basic* <u>Features</u> on page <u>63</u> for information about monitoring faults.

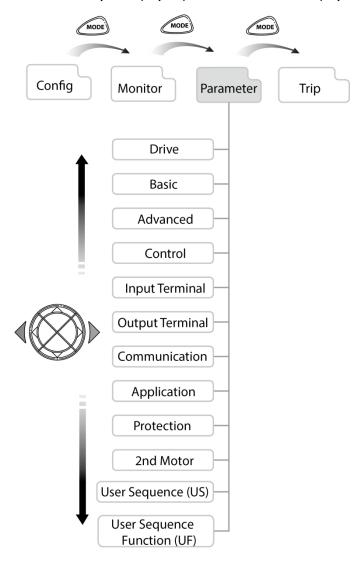


- When the power is turned on, Monitor mode is displayed.
- Press the [MODE] key.



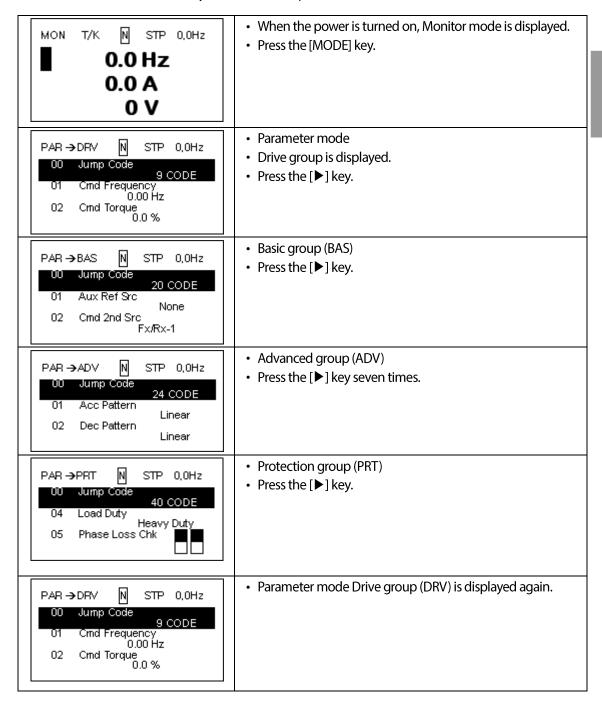
## **3.2.2 Switching Groups**

Press the [MODE] key to display a specific mode. Modes displayed change in the following order:



### Switching between Groups in Parameter Display Mode

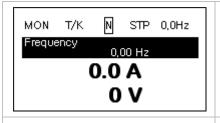
After entering Parameter mode from Monitor mode, press the  $[\triangleright]$  key to change the display as shown below. Press the  $[\blacktriangleleft]$  key to return to the previous mode.



## 3.2.3 Navigating through the Codes (Functions)

### **Code Navigation in Monitor mode**

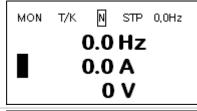
In monitor mode, press the  $[\blacktriangle]$ ,  $[\blacktriangledown]$  key to display frequency, the output current, or voltage according to the cursor position.



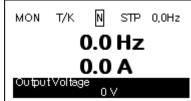
- When the power is turned on, Monitor mode is displayed.
- The cursor appears to the left of the frequency information.
- Press the [▼] key.



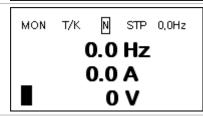
- Information about the second item in Monitor mode (Output Current) is displayed.
- Wait for 2 seconds until the information on the display disappears.



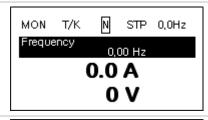
- Information about the second item in Monitor mode (Output Current) disappears and the cursor reappears to the left of the second item.
- Press the [▼] key.



- Information about the third item in Monitor mode (Output Voltage) is displayed.
- Wait for 2 seconds until the information on the display disappears.



- Information about the third item in Monitor mode (Output Voltage) disappears and the cursor appears to the left of the third item.
- Press the [▼] key twice.



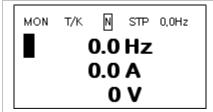
• Information about the first item in Monitor mode (Frequency) is displayed.



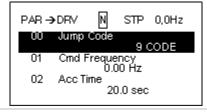
 Information about the first item in Monitor mode (Frequency) disappears and the cursor appears to the left of the first item.

### **Code Navigation in Parameter mode**

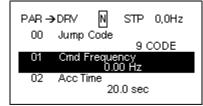
The following examples show you how to move through codes in different function groups (Drive group and Basic group) in Parameter mode. In parameter mode, press the  $[\blacktriangle]$  or  $[\blacktriangledown]$  key to move to the desired functions.



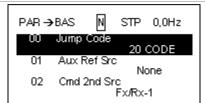
- When the power is on, monitor mode is displayed.
- Press the [MODE] key.



 Drive group (DRV) in Parameter mode is displayed. If any other group is displayed, press the [MODE] key until the Drive group is displayed, or press the [ESC] key.



- Press the [▼] key to move to the second code (DRV-01) of Drive group.
- Press the [▶] key



- Basic group is displayed.
- Press the [▲] or [▼] key to move to the desired codes and configure the inverter functions.

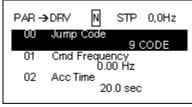
## 3.2.4 Navigating Directly to Different Codes

Parameter mode and Config mode allow direct jumps to specific codes. The code used for this feature is called the Jump Code. The Jump Code is the first code of each mode. The Jump Code feature is convenient when navigating for a code in a function group that has many codes.

The following example shows how to navigate directly to code DRV-09 from the initial code (DRV-00 Jump Code) in the Drive group.



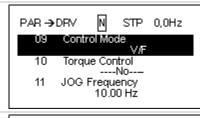
- The Drive group (DRV) is displayed in Parameter mode. Make sure that the fist code in the Drive group (DRV 00 Jump Code) is currently selected.
- Press the [PROG/ENT] key.



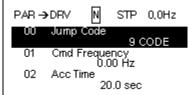
 The Code input screen is displayed and the cursor flashes. A flashing cursor indicates that it is waiting for user input.



 Press the [▲] key to increase the number to 9, and then press the [PROG/ENT] key.



DRV-09 (Control Mode) is displayed.

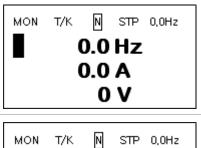


• Press the [ESC] key to go back to the initial code of the Drive group.

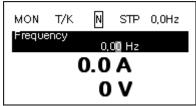
## 3.2.5 Parameter settings

### Parameter settings available in Monitor mode

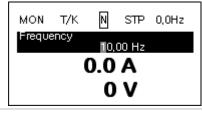
The S100 inverter allows basic parameters to be modified in Monitor mode. The following example shows how to set the frequency.



- Make sure that the cursor is at the frequency reference item and that the frequency setting is set to 'Keypad' in DRV-09.
- Press the [PROG/ENT] key.



- When the cursor is on the frequency reference item, detailed information is displayed and the cursor flashes on the input line.
- Press the shift key to go to the desired frequency.



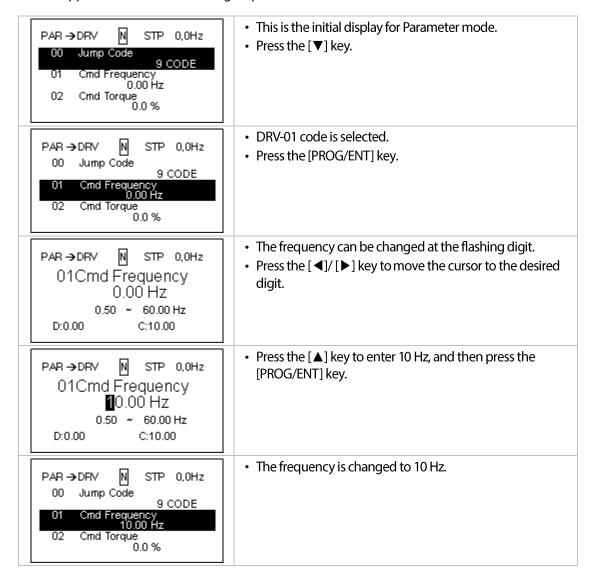
- Press the [▲] key to set the frequency to 10 Hz.
- Press the [PROG/ENT] key.



• The frequency is set to 10 Hz.

### Parameter settings in other modes and groups

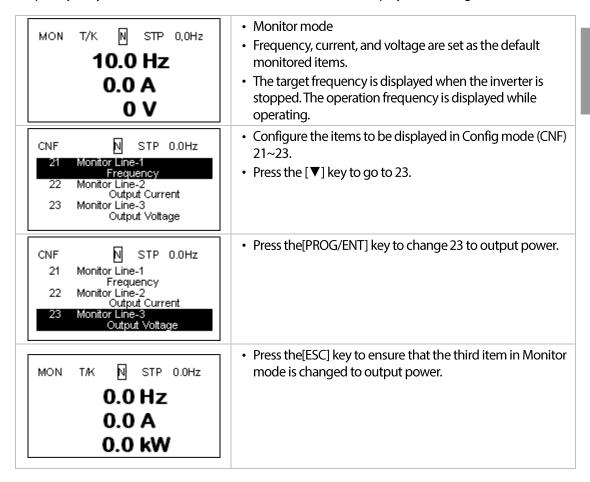
The following example shows how to change the frequency in the Drive group. This example can also be applied to other modes and groups.



## 3.2.6 Monitoring the Operation

#### How to use Monitor mode

There are 3 types of items that may be monitored in Monitor mode. Some items, including frequency, may be modified. Users can select the items to be displayed in Config mode (CNF).

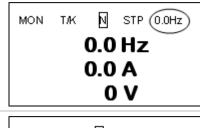


## Items available for monitoring

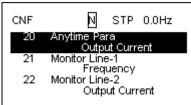
Mode	Number	Display	Setting Range		Initial value
	20	Anytime Para	0	Frequency	0: Frequency
	21	Monitor Line-1	1	Speed	0: Frequency
	22	Monitor Line-2	2	Output Current	2:Output Current
			3	Output Voltage	
			4	Output Power	
			5	WHour Counter	
			6	DCLink Voltage	
			7	DI State	
		23 Monitor Line-3	8	DO State	
			9	V1 Monitor[V]	
CNF			10	V1 Monitor[%]	
CIVI			13	V2 Monitor[V]	
	23		14	V2 Monitor[%]	3:Output Voltage
			15	I2 Monitor[mA]	
			16	I2 Monitor[%]	
			17	PID Output	
			18	PID ref Value	
			19	PID Fbk Value	
			20	Torque	
			21	Torque Limit	
			22	Trq Bias Ref	
			23	Speed Limit	

#### How to use the status bar

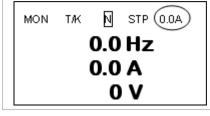
On the top-right corner of the display, there is a display item. This item is displayed as long as the inverter is on, regardless of the mode the inverter is operating in.



- Monitor mode
- In the top-right corner of the display, the frequency reference is displayed (factory default).



- Enter Config mode and go to CNF-20 to select the item to display.
- Press the [PROG/ENT] key to change the item to 'Output Current'.
- On the top-right corner of the display, the unit changes from 'Frequency' to 'Current'.

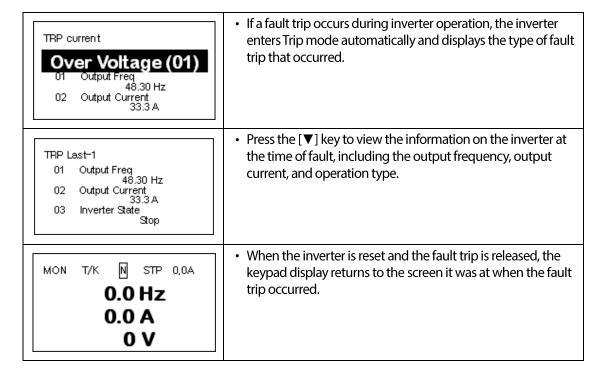


 In monitor mode, the status bar item is changes to 'Current'.

# 3.3 Fault Monitoring

## 3.3.1 Monitoring Faults during Inverter Operation

The following example shows how to monitor faults that occurred during inverter operation.



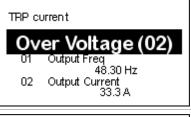
## 3.3.2 Monitoring Multiple Fault Trips

The following example shows how to monitor multiple faults that occur at the same time.

• If multiple fault trips occur at the same time, the number of TRP current fault trips occurred is displayed on the right side of the fault trip type. Over Voltage (02) • Press the [PROG/ENT] key. 48.30 Hz 02 Output Current 33.3 A • The types of fault trips that occurred are displayed. TRP current • Press the [PROG/ENT] key. 00 Trip Name (02) Over Voltage External Trip • The display returns to the screen it was at when the fault trip TRP current occurred. Over Voltage (02) Output Freq 48.30 Hz 02 Output Current 33.3 A

### Fault trip history saving and monitoring

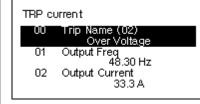
When fault trips occur, the trip mode saves the content. Up to five fault trips are saved in the history. Trip mode saves when the inverter is reset, and when a Low Voltage fault trip occurs due to power outages. If a trip occurs more than five times, the information for the five previous trips are automatically deleted.



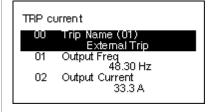
• If a fault trip occurs during inverter operation, the inverter enters Trip mode automatically and displays the type of fault trip that occurred.



- After the [RESET] key or terminal is pressed, the fault trip is saved automatically and returns to the screen it was on before the fault trip occurred.
- Press the [MODE] key toenterTrip mode.



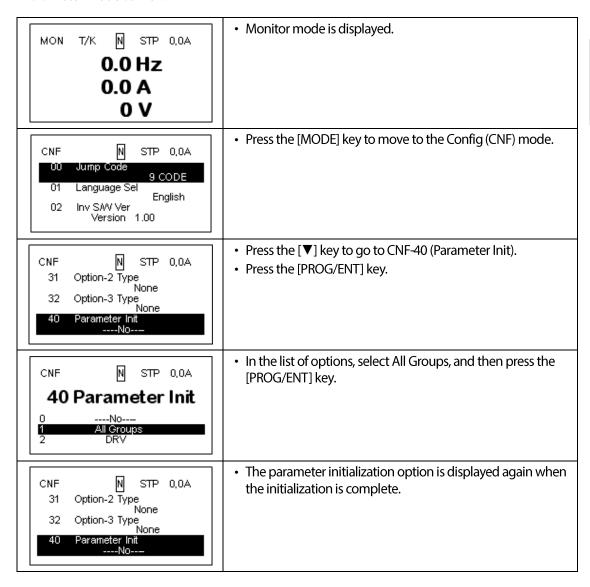
- The most recent fault trip is saved in Last-1 code.
- Press the [▶] key.



- The fault trip changes position and is saved in Last-2 code.
- When a fault trip occurs again, the content in Last-2 is moved to Last-3.

## 3.4 Parameter Initialization

The following example demonstrates how to revert all the parameter settings back to the factory default (Parameter Initialization). Parameter initialization may be performed for separate groups in Parameter mode as well.



# **4 Learning Basic Features**

This chapter describes the basic features of the S100 inverter. Check the reference page in the table to see the detailed description for each of the advanced features.

BasicTasks	Description	Ref.
Frequency reference source	Configures the inverter to allow you to setup or modify	<u>p.66</u>
configuration for the keypad	frequency reference using the Keypad.	<u>p.00</u>
Frequency reference source configuration for the terminal block (input voltage)	Configures the inverter to allow input voltages at the terminal block (V1, V2) and to setup or modify a frequency reference.	<u>p.67</u> , <u>p.75</u>
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.	<u>p.74</u>
Frequency reference source configuration for the terminal block (input pulse)	Configures the inverter to allow input pulse at the terminal block (TI) and to setup or modify a frequency reference.	<u>p.76</u>
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.	<u>p.77</u>
Frequency control using analog inputs	Enables the user to hold a frequency using analog inputs at terminals.	<u>p.78</u>
Motor operation display options	Configures the display of motor operation values. Motor operation is displayed either in frequency (Hz) or speed (rpm).	<u>p.78</u>
Multi-step speed (frequency) configuration	Configures multi-step frequency operations by receiving an input at the terminals defined for each step frequency.	<u>p.79</u>
Command source configuration for keypad buttons	Configures the inverter to allow the manual operation of the [FWD], [REV] and [Stop] keys.	<u>p.81</u>
Command source configuration for terminal block inputs	Configures the inverter to accept inputs at the FX/RX terminals.	<u>p.81</u>
Command source configuration for RS-485 communication	Configures the inverter to accept communication signals from upper level controllers, such as PLCs or PCs.	<u>p.83</u>
Local/remote switching via the [ESC] key	Configures the inverter to switch between local and remote operation modes when the [ESC] key is pressed.  When the inverter is operated using remote inputs (any input other than one from the keypad), this configuration can be used to perform maintenance on the inverter, without losing or altering saved parameter settings. It can also be used to override remotes and use the keypad immediately in emergencies.	<u>p.84</u>

BasicTasks	Description	Ref.
Motor rotation control	Configures the inverter to limit a motor's rotation direction.	<u>p.86</u>
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.	<u>p.87</u>
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.	<i>p.</i> 88
Acc/Dec time configuration based on the Max. Frequency	Configures the acceleration and deceleration times for a motor based on a defined maximum frequency.	<u>p.89</u>
Acc/Dec time configuration based on the frequency reference	Configures acceleration and deceleration times for a motor based on a defined frequency reference.	<u>p.90</u>
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.	<u>p.91</u>
Acc/Dec time transition speed (frequency) configuration	Enables modification of acceleration and deceleration gradients without configuring the multi-functional terminals.	<u>p.93</u>
Acc/Dec pattern configuration	Enables modification of the acceleration and deceleration gradient patterns. Basic patterns to choose from include linear and S-curve patterns.	<u>p.94</u>
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.	<u>p.96</u>
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.	<u>p.97</u>
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.	<u>p.98</u>
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.	<u>p.99</u>
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.	<u>p.101</u>
Automatic torque boost	Automatic configuration of the inverter that provides "auto tuning" that produces a momentary torque boost. This	<u>p.102</u>

BasicTasks	Description	Ref.
	configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	
Output voltage adjustment	Adjusts the output voltage to the motor when the power supply to the inverter differs from the motor's rated input voltage.	<u>p.102</u>
Accelerating start	Accelerating start is the general way to start motor operation. The typical application configures the motor to accelerate to a target frequency in response to a run command, however there may be other start or acceleration conditions defined.	<u>p.103</u>
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.	<u>p.103</u>
Deceleration stop	Deceleration stop is the typical method used to stop a motor. The motor decelerates to 0 Hz and stops on a stop command, however there may be other stop or deceleration conditions defined.	<u>p.104</u>
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.	<u>p.104</u>
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.	<u>p.106</u>
Power braking	Configures the inverter to provide optimal, motor deceleration, without tripping over-voltage protection.	<u>p.107</u>
Start/maximum frequency configuration	Configures the frequency reference limits by defining a start frequency and a maximum frequency.	<u>p.108</u>
Upper/lower frequency limit configuration	Configures the frequency reference limits by defining an upper limit and a lower limit.	<u>p.108</u>
Frequency jump	Configures the inverter to avoid running a motor in mechanically resonating frequencies.	<u>p.110</u>
2 <sup>nd</sup> Operation Configuration	Used to configure the 2 <sup>nd</sup> operation mode and switch between the operation modes according to your requirements.	<u>p.111</u>
Multi-function input terminal control configuration	Enables the user to improve the responsiveness of the multi- function input terminals.	p.112
P2P communication	Configures the inverter to share input and output devices with	p.113
configuration  Multi-keypad configuration	other inverters.  Enables the user to monitor multiple inverters with one monitoring device.	<u>p.113</u>
User sequence configuration	Enables the user to implement simple sequences using various function blocks.	<u>p.115</u>

# **4.1 Setting Frequency Reference**

The S100 inverter provides several methods to setup and modify a frequency reference for an operation. The keypad, analog inputs [for example voltage (V1, V2) and current (I2) signals], or RS-485 (digital signals from higher-level controllers, such as PC or PLC) can be used.

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit				
				0	KeyPad-1						
DRV			Ref Freq Src	1	KeyPad-2						
		Frequency reference source		2	V1	0-12					
	07			4	V2						
				5	12		_				
					l			l	6 Int 485		
				8	Field Bus						
				12	Pulse						

## 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 07 (Frequency reference source) code in the DRV group and change the parameter value to 0 (Keypad-1). Input the frequency reference for an operation.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	0	KeyPad-1	0–12	

<sup>\*</sup> You cannot set a frequency reference that exceeds the Max. Frequency, as configured with DRV-20.

## 4.1.2 Keypad as the Source (KeyPad-2 setting)

You can use the  $[\blacktriangle]$  and  $[\blacktriangledown]$  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 07 (Frequency reference source) code in the DRV group and change the parameter value to 1 (Keypad-2). This allows frequency reference values to be increased or decreased by pressing the  $[\blacktriangle]$  and  $[\blacktriangledown]$  keys.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	1	KeyPad-2	0–12	-

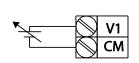
<sup>\*</sup> You cannot set a frequency reference that exceeds the Max. Frequency, as configured with DRV-20.

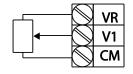
#### 4.1.3 V1 Terminal as the Source

You can set and modify a frequency reference by setting voltage inputs when using the V1 terminal. Use voltage inputs ranging from 0 to 10 V (unipolar) for forward only operation. Use voltage inputs ranging from -10 to +10 V (bipolar) for both directions, where negative voltage inputs are used reverse operations.

#### 4.1.3.1 Setting a Frequency Reference for 0–10 V Input

Set code 06 (V1 Polarity) to 0 (unipolar) in the Input Terminal group (IN). Use a voltage output from an external source or use the voltage output from the VR terminal to provide inputs to V1. Refer to the diagrams below for the wiring required for each application.





[External source application]

[Internal source (VR) application]

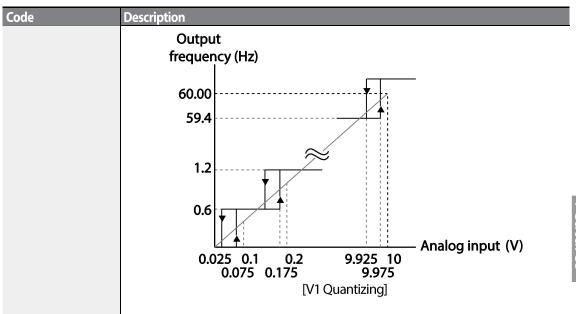
Group	Code	Name	LCD Display	Para	meter Setting	<b>Setting Range</b>	Unit
DRV	07	Frequency reference source	Freq Ref Src	2	V1	0–12	-
	01	Frequency at maximum analog input	Freq at 100%		kimum uency	0.00– Max. Frequency	Hz
	05	V1 input monitor	V1 Monitor [V]	0.00	)	0.00–12.00	V
	06	V1 polarity options	V1 Polarity	0	Unipolar	0-1	-
	07	V1 input filter time constant	V1 Filter	10		0–10000	ms
ln	08	V1 minimum input voltage	V1 volt x1	0.00		0.00–10.00	V
	09	V1 output at minimum voltage (%)	V1 Perc y1	0.00	)	0.00–100.00	%
	10	V1 maximum input voltage	V1 Volt x2	10.0	00	0.00–12.00	V
	11	V1 output at maximum voltage (%)	V1 Perc y2	100	.00	0–100	%
	16	Rotation direction options	V1 Inverting	0	No	0–1	_
	17	V1 Quantizing level	V1 Quantizing	0.04	ļ	0.00*, 0.04– 10.00	%

<sup>\*</sup> Quantizing is disabled if '0' is selected.

## 0-10 V Input Voltage Setting Details

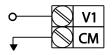
0-10 v iliput voita	
Code	Description
IN-01 Freq at 100%	<ul> <li>Configures the frequency reference at the maximum input voltage when a potentiometer is connected to the control terminal block. A frequency set with code IN-01 becomes the maximum frequency only if the value set in code IN-11 (or IN-15) is 100(%).</li> <li>Set code IN-01 to 40.00 and use default values for codes IN-02–IN-16. Motor will run at 40.00 Hz when a 10 V input is provided at V1.</li> <li>Set code IN-11 to 50.00 and use default values for codes IN-01–IN-16. Motor will run at 30.00 Hz (50% of the default maximum frequency–60 Hz) when a 10 V input is provided at V1.</li> </ul>
IN-05 V1 Monitor[V]	Configures the inverter to monitor the input voltage at V1.
IN-07 V1 Filter	V1 Filter may be used when there are large variations between reference frequencies. Variations can be mitigated by increasing the time constant, but this will require an increased response time.  The value t (time) indicates the time required for the frequency to reach 63% of the reference, when external input voltages are provided in multiple steps.  V1 input from external source  Frequency 100% 63%  V1 Filter(t)  [V1 Filter]
IN-08 V1 Volt x1- IN-11 V1 Perc y2	These parameters are used to configure the gradient level and offset values of the Output Frequency, based on the Input Voltage.

Code	Description
	Frequency reference
	IN-09 V1 input
	[Volt x1–IN-11 V1 Perc y2]
IN-16V1 Inverting	nverts the direction of rotation. Set this code to 1 (Yes) if you need the motor to run in the opposite direction from the current rotation.
IN-17 V1 Quantizing	Quantizing may be used when the noise level is high in the analog input (V1 terminal) signal.  Quantizing is useful when you are operating a noise-sensitive system, because it suppresses any signal noise. However, quantizing will diminish system sensitivity (resultant power of the output frequency will decrease based on the analog input).  You can also turn on the low-pass filter using code IN-07 to reduce the noise, but increasing the value will reduce responsiveness and may cause pulsations (ripples) in the output frequency.  Parameter values for quantizing refer to a percentage based on the maximum input. Therefore, if the value is set to 1% of the analog maximum input (60 Hz), the output frequency will increase or decrease by 0.6 Hz per 0.1V difference.  When the analog input is increased, an increase to the input equal to 75% of the set value will change the output frequency, and then the frequency will increase according to the set value. Likewise, when the analog input decreases, a decrease in the input equal to 75% of the set value will make an initial change to the output frequency.  As a result, the output frequency will be different at acceleration and deceleration, mitigating the effect of analog input changes over the output frequency.

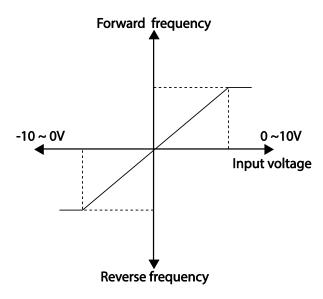


#### 4.1.3.2 Setting a Frequency Reference for -10-10 V Input

Set the 07 (Frequency reference source) code in the DRV group to 2 (V1), and then set code 06 (V1 Polarity) to 1 (bipolar) in the Input Terminal group (IN). Use the output voltage from an external source to provide input to V1.



[V1 terminal wiring]



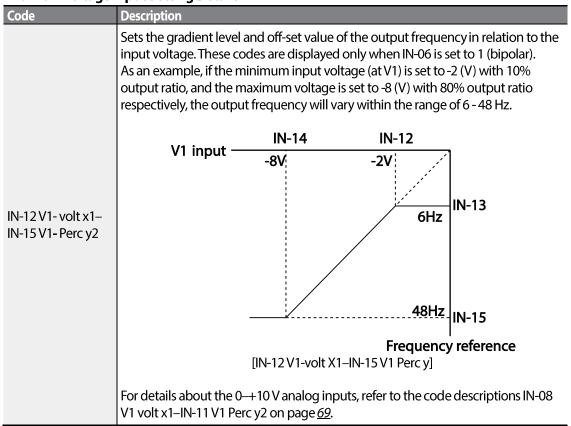
[Bipolar input voltage and output frequency]

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
DRV	07	Frequency reference source	Freq Ref Src	2	V1	0–12	-
	01	Frequency at maximum analog input	Freq at 100%	60.00		0– Max Frequency	Hz
	05	V1 input monitor	V1 Monitor	0.00		0.00-12.00 V	V
	06	V1 polarity options	V1 Polarity	1	Bipolar	0–1	-
In	12	V1 minimum input voltage	V1-volt x1	0.00		10.00-0.00 V	V
In ·	13	V1 output at minimum voltage (%)	V1-Perc y1	0.00		-100.00-0.00%	%
	14	V1maximum input voltage	V1-Volt x2	-10.00		-12.00 –0.00 V	V
	15	V1 output at maximum voltage (%)	V1-Perc y2			-100.00-0.00%	%

#### **Rotational Directions for Different Voltage Inputs**

Command / Voltage	Input voltage			
Input	0-10 V	-10-0 V		
FWD	Forward	Reverse		
REV	Reverse	Forward		

#### -10-10 V Voltage Input Setting Details



## 4.1.3.3 Setting a Reference Frequency using Input Current (I2)

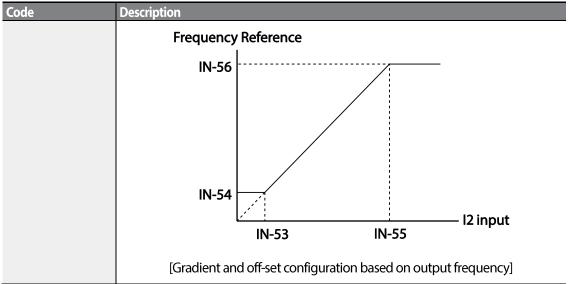
You can set and modify a frequency reference using input current at the I2 terminal after selecting current input at SW 2. Set the 07 (Frequency reference source) code in the DRV group to 5 (I2) and apply 4–20 mA input current to I2.

Group	Code	Name	LCD Display	Param	eter Setting	Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	5	12	0-12	_
	01	Frequency at maximum analog input	maximum Freq at 100% 60.00		0- Maximum Frequency	Hz	
	50	I2 input monitor	12 Monitor	0.00		0.00-24.00	mA
	52	12 input filter time constant	I2 Filter	10		0-10000	ms
	53	12 minimum input current   12 Curr x		4.00		0.00-20.00	mA
IN	54	l2 output at minimum current (%)	I2 Perc y1	0.00		0-100	%
	55	I2 maximum input current	I2 Curr x2	20.00		0.00-24.00	mA
	56	I2 output at maximum current (%)	I2 Perc y2	100.00		0.00-100.00	%
	61	I2 rotation direction options	12 Inverting	0	No	0-1	_
	62	I2 Quantizing level	I2 Quantizing	0.04		0*,0.04–10.00	%

<sup>\*</sup> Quantizing is disabled if '0' is selected.

#### Input Current (I2) Setting Details

Code	Description
IN-01 Freq at 100%	<ul> <li>Configures the frequency reference for operation at the maximum current (when IN-56 is set to 100%).</li> <li>If IN-01 is set to 40.00 Hz, and default settings are used for IN-53–56, 20 mA input current (max) to I2 will produce a frequency reference of 40.00 Hz.</li> <li>If IN-56 is set to 50.00 (%), and default settings are used for IN-01 (60 Hz) and IN-53–55, 20 mA input current (max) to I2 will produce a frequency reference of 30.00 Hz (50% of 60 Hz).</li> </ul>
IN-50 I2 Monitor	Used to monitor input current at I2.
IN-52 I2 Filter	Configures the time for the operation frequency to reach 63% of target frequency based on the input current at I2.
IN-53 I2 Curr x1–IN- 56 I2 Perc y2	Configures the gradient level and off-set value of the output frequency.



# 4.1.4 Setting a Frequency Reference with Input Voltage (Terminal I2)

Set and modify a frequency reference using input voltage at I2 (V2) terminal by setting SW2 to V2. Set the Frq (Frequency reference source) code in the DRV group to 4 (V2) and apply 0-12V input voltage to I2 (=V2, Analog current/voltage input terminal). Codes IN-35-47 will not be displayed when I2 is set to receive current input (07 code parameter is set to 5).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	4	V2	0–12	_
	35	V2 input display	V2 Monitor	0.00		0.00-12.00	٧
	37	V2 input filter time constant	V2 Filter	10		0–10000	ms
	38	Minimum V2 input voltage	V2 Volt x1	0.00		0.00–10.00	V
IN	39	Output% at minimum V2 voltage	V2 Perc y1	0.00		0.00-100.00	%
IIN	40	Maximum V2 input voltage	V2 Volt x2	10.00		0.00-10.00	V
	41	Output% at maximum V2 voltage	V2 Perc y2	100.00		0.00-100.00	%
	46	InvertV2 rotational direction	V2 Inverting	0	No	0-1	_
	47	V2 quantizing level	V2 Quantizing	0.04	-	0.00*, 0.04–10.00	%

<sup>\*</sup> Quantizing is disabled if '0' is selected.

# 4.1.5 Setting a Frequency with TI Pulse Input

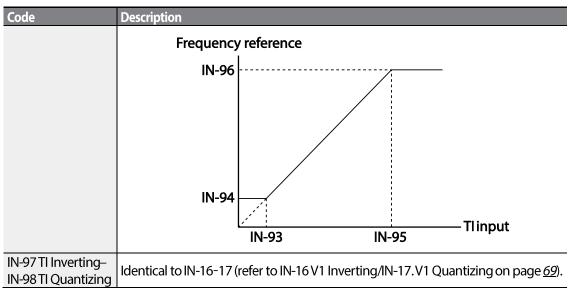
Set a frequency reference by setting the 07 (Frequency reference source) code in the DRV group to 12 (Pulse) and providing 0–32.00 kHz pulse frequency to Tl.

Group	Code	Name	LCD Display	Para	ameter Setting	<b>Setting Range</b>	Unit
DRV	07	Frequency reference source	Freq Ref Src	12	Pulse	0–12	-
	01	Frequency at maximum analog input	Freq at 100%	60.0	00	0.00– Maximum frequency	Hz
	91	Pulse input display	Pulse Monitor	0.00	)	0.00-50.00	kHz
	92	TI input filter time constant	TI Filter	10		0–9999	ms
	iuk i ·	TI input minimum pulse	TI Pls x1	0.00	)	0.00–32.00	kHz
IN	94	Output% at TI minimum pulse	TI Perc y1	0.00	)	0.00–100.00	%
	95	TI Input maximum pulse	TI Pls x2	32.0	00	0.00–32.00	kHz
	96	Output% at TI maximum pulse	TI Perc y2	100	100.00	0.00-100.00	%
	97	Invert TI direction of rotation	TI Inverting	0	No	0-1	_
	98	TI quantizing level	TI Quantizing	0.04	1	0.00*, 0.04– 10.00	%

<sup>\*</sup>Quantizing is disabled if '0' is selected.

#### **TI Pulse Input Setting Details**

Code	Description
IN-01 Freq at 100%	Configures the frequency reference at the maximum pulse input. The frequency reference is based on 100% of the value set with IN-96.  • If IN-01 is set to 40.00 and codes IN-93–96 are set at default, 32 kHz input to TI yields a frequency reference of 40.00 Hz.
	• If IN-96 is set to 50.00 and codes IN-01, IN-93–95 are set at default, 32 kHz input to the TI terminal yields a frequency reference of 30.00 Hz.
IN-91 Pulse Monitor	Displays the pulse frequency supplied at TI.
IN-92 TI Filter	Sets the time for the pulse input at TI to reach 63% of its nominal frequency (when the pulse frequency is supplied in multiple steps).
IN-93 TI Pls x1– IN-96 TI Perc y2	Configures the gradient level and offset values for the output frequency.



# 4.1.6 Setting a Frequency Reference via RS-485 Communication

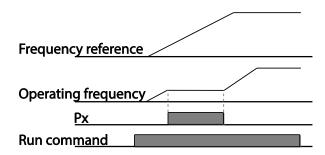
Control the inverter with upper-level controllers, such as PCs or PLCs, via RS-485 communication. Set the 07 (Frequency reference source) code in the DRV group to 6 (Int 485) and use the RS-485 signal input terminals (S+/S-/SG) for communication. Refer to 5 <u>RS-485 Communication Features</u> on page <u>125</u>.

Group	Code	Name	LCD Display	Para	ameter Setting	Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	6	Int 485	0–12	-
	01	Integrated RS-485 communication inverter ID	Int485 St ID	-	1	1–250	-
		Integrated		0	ModBus RTU		
	02	communication	Int485 Proto	1	Reserved	0–2	
COM		protocol		2	LS Inv 485		
COM	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0–7	_
		Integrated		0	D8/PN/S1		
04	04	Integrated	Int40F Mada	1	D8/PN/S2	0–3	
		Int485 Mode	2	D8/PE/S1		_	
		configuration		3	D8/PO/S1		

# 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.

group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
		Frequency reference source		0	Keypad-1		
				1	Keypad-2	]	
				2	V1		
DDV	07		Freq Ref Src	4	V2	0–12	
DRV	07			5	12		-
				6	Int 485		
				8	Field Bus		
				12	Pulse		
IN	65–71	Px terminal configuration	Px Define(Px: P1–P7)	21	Analog Hold	0–54	-



# **4.3 Changing the Displayed Units (Hz**←Rpm)

You can change the units used to display the operational speed of the inverter by setting Dr. 21 (Speed unit selection) to 0 (Hz) or 1 (Rpm). This function is available only with the LCD keypad.

Group	Code	Name	LCD Display	Param	eter Setting	Setting Range	Unit
DRV	Speed	Speed unit	Hz/Rpm Sel	0	Hz Display	0-1	
שט		selection	mz/npi ii sei	1	Rpm Display	0-1	[

# 4.4 Setting Multi-step Frequency

Multi-step operations can be carried out by assigning different speeds (or frequencies) to the Px terminals. Step 0 uses the frequency reference source set with the 07 code in the DRV group. Px terminal parameter values 7 (Speed-L), 8 (Speed-M) and 9 (Speed-H) are recognized as binary commands and work in combination with Fx or Rx run commands. Select the frequency set in the BAS-50-BAS-60 (Multi-step frequency 1-7) code to operate the system.

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
BAS	50–56	Multi-step frequency 1–7	Step Freq - 1-7	-		0-Maximum frequency	Hz
	65–71	Px terminal configuration	Px Define (Px: P1–P7)	7	Speed-L		-
				8	Speed-M	0–54	_
IN		coringulation	, ,	9	Speed-H		_
	89	Multi-step command delay time	InCheck Time	1		1–5000	ms

#### **Multi-step Frequency Setting Details**

Code	Description
BAS-50-56 Step Freq - 1-7	Configure multi-step frequency 1–7.
IN-65–71 Px Define	Choose the terminals to setup as multi-step inputs, and then set the relevant codes (IN-65-71) to 7(Speed-L), 8(Speed-M), or 9(Speed-H).
	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.

Code	Description				
		Step 0	2		
				4 5 6 7/	0
	<u>P5</u>				
	<u>P6</u>				
	<u>P7</u> FX				
	RX				
	_ <u></u>	[Δη ονομη	le of a multi-ste	on operation]	
		[Allexallip	ie oi a muiti-ste	ер орегацогіј	
	Speed	Fx/Rx	P7	P6	P5
	0	✓	-	-	-
	1	✓	_	-	✓
	2	✓	_	✓	-
	3	✓	-	✓	✓
	4	✓	✓	-	-
	5	✓	✓	-	✓
	6	✓	✓	<b>√</b>	
	7	✓	✓	✓	✓
	Set a time intervafter receiving a		r to check for a	dditional termina	l block inputs
IN-89 InCheck Time		puts at other ter	minals for 100r	ınal is received at I ms, before procee ation.	

# 4.5 Command Source Configuration

Various devices can be selected as command input devices for the S100 inverter. Input devices available to select include keypad, multi-function input terminal, RS-485 communication and field bus adapter.

Group	Code	Name	LCD Display	Parar	meter Setting	Setting Range	Unit
				0	Keypad		
		06 Command Source Cmd Source		1	Fx/Rx-1		
DRV	06		Cmd Source*	2	Fx/Rx-2	0-4	_
				3 Int 48	Int 485		
				4	Field Bus		

## 4.5.1 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 (command source) code to 0 (Keypad). Press the [RUN] key on the keypad to start an operation, and the [STOP/RESET] key to end it.

group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	0	KeyPad	0-4	-

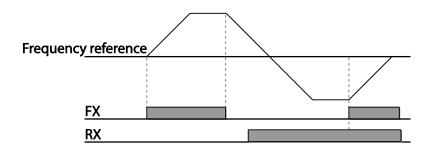
# 4.5.2 Terminal Block as a Command Input Device (Fwd/Rev Run Commands)

Multi-function terminals can be selected as a command input device. This is configured by setting the 06 (command source) code in the DRV group to 1(Fx/Rx). Select 2 terminals for the forward and reverse operations, and then set the relevant codes (2 of the 7 multi-function terminal codes, IN-65-71 for P1-P7) to 1(Fx) and 2(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	LCD Display	Parar	neter Setting	Setting Range	Unit
DRV	06	Command source	Cmd Source*	1	Fx/Rx-1	0-4	-
IN	65-71	Px terminal	Px Define(Px: P1-	1	Fx	0-54	
IIN		configuration	P7)	2	Rx	0-34	_

#### Fwd/Rev Command by Multi-function Terminal – Setting Details

Code	Description		
DRV-06	Sat to 1/5v/Dv 1)		
Cmd Source	Set to 1(Fx/Rx-1).		
	Assign a terminal for forward (Fx) operation.		
IN-05-7 I PX Deline	Assign a terminal for reverse (Rx) operation.		



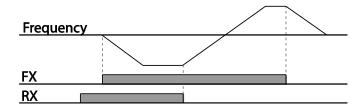
# 4.5.3 Terminal Block as a Command Input Device (Run and Rotation **Direction Commands**)

Multi-function terminals can be selected as a command input device. This is configured by setting the 06 (command source) code in the DRV group to 2 (Fx/Rx-2). Select 2 terminals for run and rotation direction commands, and then select the relevant codes (2 of the 7 multi-function terminal codes, IN-65-71 for P1-P7) to 1(Fx) and 2(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	LCD Display	Para	ameter Setting	<b>Setting Range</b>	Unit
DRV	06	Command source	Cmd Source*	2	Fx/Rx-2	0-4	-
IN	65-71	Px terminal	Px Define (Px: P1	1	Fx	0-54	
IIN		configuration	– P7)	2	Rx	0-34	_

#### Run Command and Fwd/ Rev Change Command Using Multi-function Terminal – Setting Details

Code	Description			
DRV-06	Sat to 2 (Ev/Dv 2)			
Cmd Source	Set to 2 (Fx/Rx-2).			
IN 6E 71 Dy Dofino	Assign a terminal for run command (Fx).			
IN-65–71 Px Define	Assign a terminal for changing rotation direction (Rx).			



# 4.5.4 RS-485 Communication as a Command Input Device

Internal RS-485 communication can be selected as a command input device by setting the 06 (command source) code in the DRV group to 3(Int 485). This configuration uses upper level controllers such as PCs or PLCs to control the inverter by transmitting and receiving signals via the S+, S-, and Sg terminals at the terminal block. For more details, refer to 5 <u>RS-485 Communication</u> <u>Features</u> on page <u>125</u>.

Group	Code	Name	LCD Display	Param	eter Setting	<b>Setting Range</b>	Unit
DRV	06	Command source	Cmd Source*	3	Int 485	0-4	-
	01	Integrated communication inverter ID	Int485 St ID	1		1-250	-
СОМ	02	Integrated communication protocol	Int485 Proto	0	ModBus RTU	0-2	
COIVI	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0-7	-
	04	Integrated communication frame setup	Int485 Mode	0	D8/PN/ S1	0-3	-

# 4.6 Local/Remote Mode Switching

Local/remote switching is useful for checking the operation of an inverter or to perform an inspection while retaining all parameter values. Also, in an emergency, it can also be used to override control and operate the system manually using the keypad.

The [ESC] key is a programmable key that can be configured to carry out multiple functions.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	90	[ESC] key functions	-	2	Local/Remote	0–2	-
DRV	06	Command source	Cmd Source*	1	Fx/Rx-1	0–4	_

#### **Local/Remote Mode Switching Setting Details**

Code	Description
DRV-90 [ESC] key functions	Set DRV-90 to 2(Local/Remote) to perform local/remote switching using the [ESC] key. Once the value is set, the inverter will automatically begin operating in remote mode. Changing from local to remote will not alter any previously configured parameter values and the operation of the inverter will not change. Press the [ESC] key to switch the operation mode back to "local." The SET light will flash, and the inverter will operate using the [RUN] key on the keypad. Press the [ESC] key again to switch the operation mode back to "remote." The SET light will turn off and the inverter will operate according to the previous dry code configuration.

#### Note

#### **Local/Remote Operation**

- Full control of the inverter is available with the keypad during local operation (local operation).
- During local operation, jog commands will only work if one of the P1–P7 multi-function terminals (codes IN-65–71) is set to 13 (RUN Enable) and the relevant terminal is turned on.
- During remote operation (remote operation), the inverter will operate according to the previously set frequency reference source and the command received from the input device.
- If ADV-10 (power-on run) is set to 0 (No), the inverter will NOT operate on power-on even when the following terminals are turned on:
  - Fwd/Rev run (Fx/Rx) terminal
  - Fwd/Rev jog terminal (Fwd jog/Rev Jog)
  - Pre-Excitation terminal

To operate the inverter manually with the keypad, switch to local mode. Use caution when switching back to remote operation mode as the inverter will stop operating. If ADV-10 (power-on run) is set to 0 (No), a command through the input terminals will work ONLY AFTER all the terminals listed above have been turned off and then turned on again.

If the inverter has been reset to clear a fault trip during an operation, the inverter will switch to local
operation mode at power-on, and full control of the inverter will be with the keypad. The inverter
will stop operating when operation mode is switched from "local" to "remote". In this case, a run
command through an input terminal will work ONLY AFTER all the input terminals have been turned
off.

#### **Inverter Operation During Local/Remote Switching**

Switching operation mode from "remote" to "local" while the inverter is running will cause the inverter to stop operating. Switching operation mode from "local" to "remote" however, will cause the inverter to operate based on the command source:

- Analog commands via terminal input: the inverter will continue to run without interruption based
  on the command at the terminal block. If a reverse operation (Rx) signal is ON at the terminal block
  at startup, the inverter will operate in the reverse direction even if it was running in the forward
  direction in local operation mode before the reset.
- Digital source commands: all command sources except terminal block command sources (which are analog sources) are digital command sources that include the keypad, LCD keypad, and communication sources. The inverter stops operation when switching to remote operation mode, and then starts operation when the next command is given.

#### ① Caution

Use local/remote operation mode switching only when it is necessary. Improper mode switching may result in interruption of the inverter's operation.

## 4.7 Forward or Reverse Run Prevention

The rotation direction of motors can be configured to prevent motors to only run in one direction. Pressing the [REV] key on the LCD keypad when direction prevention is configured, will cause the motor to decelerate to 0 Hz and stop. The inverter will remain on.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
				0	None		
ADV	09	Run prevention options	Run Prevent	1	Forward Prev	0–2	_
				2	Reverse Prev		

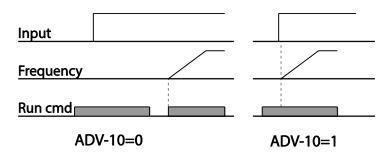
#### Forward/Reverse Run Prevention Setting Details

Code	Description							
	Choose a							
151/005	Setting		Description					
ADV-09 Run	0	None	Do not set run prevention.					
Prevent	1	Forward Prev	Set forward run prevention.					
	2	Reverse Prev	Set reverse run prevention.					

## 4.8 Power-on Run

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 dry (command source) code to 1(Fx/Rx-1) or 2 (Fx/Rx-2) in the DRV group.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	1, 2	Fx/Rx-1 or Fx/Rx-2	0–4	-
ADV	10	Power-on run	Power-on Run	1	Yes	0–1	_



#### Note

- A fault trip may be triggered if the inverter starts operation while a motor's load (fan-type load) is in free-run state. To prevent this from happening, set bit4 to 1 in CON-71 (speed search options) of the Control group. The inverter will perform a speed search at the beginning of the operation.
- If the speed search is not enabled, the inverter will begin its operation in a normal V/F pattern and accelerate the motor. If the inverter has been turned on without power-on run enabled, the terminal block command must first be turned off, and then turned on again to begin the inverter's operation.

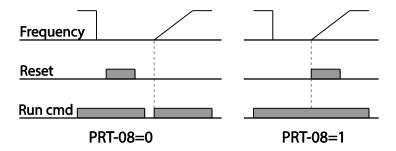
## ① Caution

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

## 4.9 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.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	1	Fx/Rx-1 or Fx/Rx-2	0–4	-
0	08	Reset restart setup	RST Restart	1	Yes	0–1	
PRT	09	No. of auto restart	Retry Number	0		0–10	
	10	Auto restart delay time	Retry Delay	1.0		0–60	sec



#### Note

- To prevent a repeat fault trip from occurring, set CON-71 (speed search options) bit 2 equal to 1. The inverter will perform a speed search at the beginning of the operation.
- If the speed search is not enabled, the inverter will start its operation in a normal V/F pattern and accelerate the motor. If the inverter has been turned on without reset and restart enabled, the terminal block command must be first turned off, and then turned on again to begin the inverter's operation.

#### ① Caution

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

# 4.10 Setting Acceleration and Deceleration Times

## 4.10.1 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 BAS- 08 (Acc/Dec reference) in the Basic group to 0 (Max Freq).

Acceleration time set at the ACC (Acceleration time) code in the DRV group (DRV-03 in an LCD keypad) refers to the time required for the inverter to reach the maximum frequency from a stopped (0 Hz) state. Likewise, the value set at the Dec (deceleration time) code in the DRV group (DRV-04 in an LCD keypad) refers to the time required to return to a stopped state (0 Hz) from the maximum frequency.

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
	03	Acceleration time	Acc Time	20.0		0.0-600.0	sec
DRV	04	Deceleration time	Dec Time	30.0		0.0-600.0	sec
DNV	20	Maximum frequency	Max Freq	60.00		40.00–400.00	Hz
BAS	08	Acc/Dec reference frequency	Ramp T Mode	0	Max Freq	0–1	_
	09	Time scale	Time scale	1	0.1sec	0–2	_

## Acc/Dec Time Based on Maximum Frequency – Setting Details

Code	Descri	ption					
		Set the parameter value to 0 (Max Freq) to setup Acc/Dec time based on maximum frequency.					
	Conf	iguration	Description				
BAS-08	Mode 0 Max Freq 1 Delta Freq		Set the Acc/Dec time based on maximum frequency.				
Ramp T Mode			Set the Acc/Dec time based on operating frequency.				
	secon	If, for example, maximum frequency is 60.00 Hz, the Acc/Dec times are set to 5 seconds, and the frequency reference for operation is set at 30 Hz (half of 60 Hz), the time required to reach 30 Hz therefore is 2.5 seconds (half of 5 seconds).					

Code	Descripti	on	
		Max. Freq.	
		F <u>requency</u>	
		Run cmd	
		<b>—</b>	
		Ac	cc. time Dec. time
	accurate		related values. It is particularly useful when a more quired because of load characteristics, or when the obe extended.
BAS-09 Time scale	Configu	ıration	Description
	0	0.01sec	Sets 0.01 second as the minimum unit.
	1	0.1sec	Sets 0.1 second as the minimum unit.
	2	1sec	Sets 1 second as the minimum unit.

#### ① 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.

## 4.10.2 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 BAS-08 (acc/dec reference) in the Basic group to 1 (Delta Freq).

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
DDV	03 Acceleration time Acc Time		20.0		0.0-600.0	sec	
DRV	04 Deceleration time		Dec Time	30.0		0.0-600.0	sec
BAS	08	Acc/Dec reference	Ramp T Mode	1	Delta Freq	0–1	-

#### Acc/Dec Time Based on Operation Frequency – Setting Details

Code	Description			
	Set the parar Maximum fre		elta Freq) to set Acc/Dec times based on	
	Configuration	on	Description	
	0 Ma	ax Freq	Set the Acc/Dec time based on Maximum frequency.	
	1 De	elta Freq	Set the Acc/Dec time based on Operation frequency.	
BAS-08 Ramp T Mode	in the operat		onds, and multiple frequency references are used Hz and 30 Hz, each acceleration stage will take 5 w).	
		Frequency	30Hz	
		Run cmd	10Hz 5 7 12 time 5 sec 5 sec	

## 4.10.3 Multi-step Acc/Dec Time Configuration

Acc/Dec times can be configured via a multi-function terminal by setting the DRV-03 (Acceleration time) and DRV-04 (Deceleration time) codes in the DRV group.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
DRV	03	Acceleration time	Acc Time	20.0	0.0-600.0	sec
שמע	04	Deceleration time	Dec Time	30.0	0.0-600.0	sec
BAS	70-82	Multi-step acceleration time1-7	Acc Time 1-7	x.xx	0.0–600.0	sec
	71-83	Multi-step deceleration time1-7	Dec Time 1-7	x.xx	0.0-600.0	sec
IN	65-71	Px terminal configuration	Px Define (Px: P1–P7)	11 XCEL-L 12 XCEL-M 49 XCEL-H	0–54	-
	89	Multi-step command delay time	In Check Time	1	1–5000	ms

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

Code	Description	Terminais	Jetting Details			
BAS- 70–82 Acc Time	Description					
1–7	Set multi-step acceleration time1-7.					
BAS-71–83 Dec Time 1– 7	Set multi-step dec	Set multi-step deceleration time1-7.				
	Choose and configure inputs.	gure the terr	minals to use for multi-	-step Acc/Dec time		
	Configuration		Description			
	11 XCEL-L		Acc/Dec command-	L		
	12 XCEL-M		Acc/Dec command-	M		
	49 XCEL-H		Acc/Dec command-	Н		
IN-65–71 Px Define (P1–P7)	Acc/Dec commands are recognized as binary code inputs and will control the acceleration and deceleration based on parameter values set with BAS-70-82 and BAS-71-83.  If, for example, the P6 and P7 terminals are set as XCEL-L and XCEL respectively, the following operation will be available.  Acc3  Dec0  Dec1  Acc2  Acc1  P6					
	P7					
	Run cmd					
	Acc/Dec tim	ne	P7	P6		
	0		_	-		
	1		-	✓		
	2		<b>√</b>	-		
	3		<b>√</b>	✓		
IN-89 In Check Time	set to 100ms and for other inputs o	a signal is su /er the next		nal block inputs. If IN-89 is nal, the inverter searches e expires, the Acc/Dec		

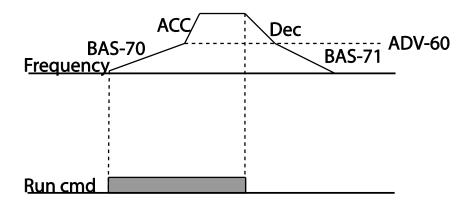
# 4.10.4 Configuring Acc/Dec Time Switch Frequency

You can switch between two different sets of Acc/Dec times (Acc/Dec gradients) by configuring the switch frequency without configuring the multi-function terminals.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
DRV	03	Acceleration time	Acc Time	10.0	0.0–600.0	sec
	04	Deceleration time	Dec Time	10.0	0.0-600.0	sec
BAS	70	Multi-step acceleration time1	AccTime-1	20.0	0.0-600.0	sec
	71	Multi-step deceleration time1	Dec Time-1	20.0	0.0-600.0	sec
ADV	60	Acc/Dec time switch frequency	Xcel Change Frq	30.00	0-Maximum frequency	Hz

**Acc/Dec Time Switch Frequency Setting Details** 

Code	Description
Code	
	After the Acc/Dec switch frequency has been set, Acc/Dec gradients configured at
	BAS-70 and 71 will be used when the inverter's operation frequency is at or below
	the switch frequency. If the operation frequency exceeds the switch frequency,
ADV-60	the configured gradient level, configured for the ACC and Dec codes, will be used.
Xcel Change Fr	If you configure the P1-P7 multi-function input terminals for multi-step Acc/Dec
	gradients (XCEL-L, XCEL-M, XCEL-H), the inverter will operate based on the
	Acc/Dec inputs at the terminals instead of the Acc/Dec switch frequency
	configurations.



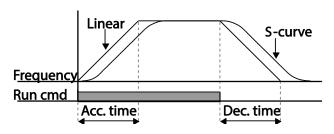
# 4.11 Acc/Dec Pattern Configuration

Acc/Dec gradient level patterns can be configured to enhance and smooth the inverter's acceleration and deceleration curves. Linear pattern features a linear increase or decrease to the output frequency, at a fixed rate. For an S-curve pattern 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 codes ADV-03-06 in the Advanced group.

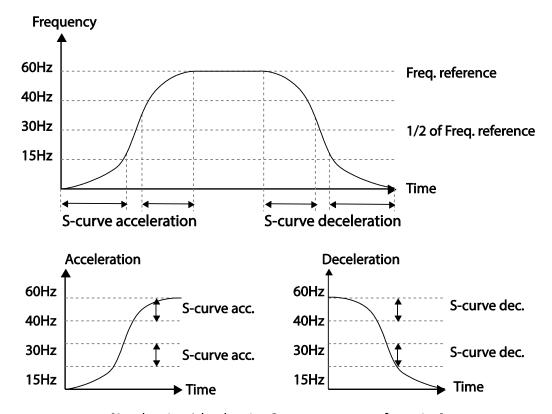
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
BAS	08	Acc/Dec reference	Ramp T mode	0	Max Freq	0–1	-
	01	Acceleration pattern	Acc Pattern	0	Linear	0–1	-
ADV (	02	Deceleration pattern	Dec Pattern	1	S-curve	0-1	-
	03	S-curve Acc start gradient	Acc S Start	40		1-100	%
	04	S-curve Acc end gradient	Acc S End	40		1-100	%
	05	S-curve Dec start gradient	Dec S Start	40		1–100	%
	06	S-curve Dec end gradient	Dec S End	40		1–100	%

#### **Acc/Dec Pattern Setting Details**

Code	Description
ADV-03 Acc S Start	Sets the gradient level as acceleration starts when using an S-curve, Acc/Dec pattern. ADV- 03 defines S-curve gradient level as a percentage, up to half of total acceleration.  If the frequency reference and maximum frequency are set at 60 Hz and ADV-03 is set to 50%, ADV-03 configures acceleration up to 30 Hz (half of 60 Hz). The inverter will operate S-curve acceleration in the 0-15 Hz frequency range (50% of 30 Hz). Linear acceleration will be applied to the remaining acceleration within the 15-30 Hz frequency range.
ADV-04 Acc S End	Sets the gradient level as acceleration ends when using an S-curve Acc/Dec pattern. ADV- 03 defines S-curve gradient level as a percentage, above half of total acceleration.  If the frequency reference and the maximum frequency are set at 60 Hz and ADV-04 is set to 50%, setting ADV-04 configures acceleration to increase from 30 Hz (half of 60 Hz) to 60 Hz (end of acceleration). Linear acceleration will be applied within the 30-45 Hz frequency range. The inverter will perform an S-curve acceleration for the remaining acceleration in the 45-60 Hz frequency range.
ADV-05 Dec S Start –	Sets the rate of S-curve deceleration. Configuration for codes ADV-05 and ADV-
ADV-06 Dec S End	06 may be performed the same way as configuring codes ADV-03 and ADV-04.



[Acceleration / deceleration pattern configuration]



[Acceleration / deceleration S-curve parrten 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.

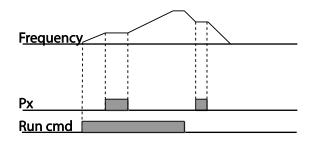
#### ① Caution

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

# 4.12 Stopping the Acc/Dec Operation

Configure the multi-function input terminals to stop acceleration or deceleration and operate the inverter at a fixed frequency.

Grou	ıp Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
IN	65-71	Px terminal configuration	Px Define(Px: P1- P7)	25	XCEL Stop	0-54	-



# 4.13 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 of torque boost used during low frequency operations can also be adjusted.

## 4.13.1 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 partcularly useful when a constant torque load is applied.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
	09	Control mode	Control Mode	0	V/F	0–4	-
DRV	18	Base frequency	Base Freq	60.00		30.00-400.00	Hz
	19	Start frequency	Start Freq	0.50		0.01-10.00	Hz
BAS	07	V/F pattern	V/F Pattern	0	Linear	0–3	-

#### **Linear V/F Pattern Setting Details**

Code	Description				
DRV-18 Base Freq	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.				
DRV-19 Start Freq	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 (0 Hz).  Base Freq Inverter's rated voltage  Voltage  Run cmd				

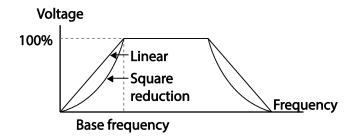
## 4.13.2 Square Reduction V/F pattern Operation

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.

Group	Code	Name	LCD Display	Par	ameter Setting	Setting Range	Unit
BAS C	07	V/F pattern	V/F Pattern	1	Square	0–3	-
				3	Square2		

#### **Square Reduction V/F pattern Operation - Setting Details**

Code	Description					
	Sets the parameter value to 1(Square) or 3(Square2) according to the load's start characteristics.					
	Setting		Function			
BAS-07 V/F Pattern	1	Square	The inverter produces output voltage proportional to 1.5 square of the operation frequency.			
	3 Square2	Square2	The inverter produces output voltage proportional to 2 square of the operation frequency. This setup is ideal for variable torque loads such as fans or pumps.			



# 4.13.3 User V/F Pattern Operation

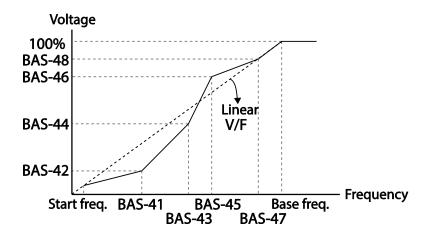
The S100 inverter allows the configuration of user-defined V/F patterns to suit the load characteristics of special motors.

Group	Code	Name	LCD Display	Parameter Se	tting   Setting Range	Unit
	07	V/F pattern	V/F Pattern	2 User V/F	0-3	-
	41	User Frequency1	User Freq 1	15.00	0-Maximum frequency	Hz
	42	User Voltage 1	User Volt 1	25	0–100	%
	43	User Frequency2	User Freq 2	30.00	0-Maximum frequency	Hz
BAS	44	User Voltage2	User Volt 2	50	0–100	%
	45	User Frequency3	User Freq 3	45.00	0-Maximum frequency	Hz
	46	User Voltage3	User Volt 3	75	0–100	%
,	47	User Frequency4	User Freq 4	Maximum frequency	0-Maximum frequency	Hz
	48	User Voltage4	User Volt 4	100	0-100%	%

#### **User V/F pattern Setting Details**

Code	Description
	Set the parameter values to assign arbitrary frequencies (User Freq 1-4) for start and maximum frequencies. Voltages can also be set to correspond with each
DAS-46 USEI VOIL4	frequency, and for each user voltage (User Volt 1-4).

The 100% output voltage in the figure below is based on the parameter settings of BAS-15 (motor rated voltage). If BAS-15 is set to 0 it will be based on the input voltage.



### 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 (DRV-16) and reverse torque boost (DRV-17) do not operate.

# 4.14 Torque Boost

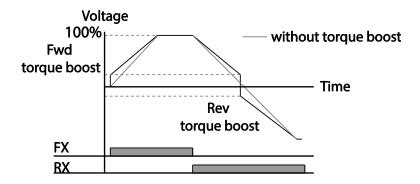
### 4.14.1 Manual Torque Boost

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.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
	15	Torque boost options	Torque Boost	0	Manual	0–1	-
DRV	16	Forward torque boost	Fwd Boost 2.0			0.0–15.0	%
	17	Reverse torque boost	Rev Boost	2.0		0.0-15.0	%

#### **Manual Torque Boost Setting Details**

Code	Description
DRV-16 Fwd Boost	Set torque boost for forward operation.
DRV-17 Rev Boost	Set torque boost for reverse operation.



## ① Caution

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

### 4.14.2 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, inductance, and no-load current, auto tuning (BAS-20) has to be performed before auto torque boost can be configured. Similarly to manual torque boost, configure auto torque boost while running a load that requires high starting torque, such as lift-type loads.

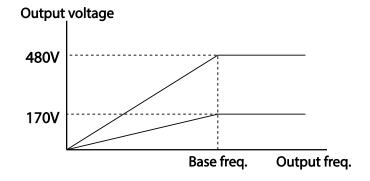
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	15	torque boost mode	Torque Boost	1	Auto	0–1	_
BAS	20	auto tuning	Auto Tuning	3	Rs+Lsigma	0–6	_

# 4.15 Output Voltage Setting

Output voltage settings are required when a motor's rated voltage differs from the input voltage to the inverter. Set BAS-15 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 BAS-15 (motor rated voltage). 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.

If BAS-15 (motor rated voltage) is set to 0, the inverter corrects the output voltage based on the input voltage in the stopped condition. If the frequency is higher than the base frequency, when the input voltage is lower than the parameter setting, the input voltage will be the inverter output voltage.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
BAS	15	Motor rated voltage	Rated Volt	0	0, 170-480	٧



# 4.16 Start Mode Setting

Select the start mode to use when the operation command is input with the motor in the stopped condition.

### 4.16.1 Acceleration Start

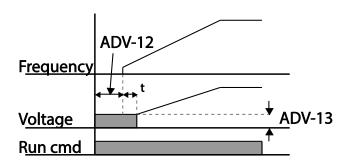
Acceleration start is a general acceleration mode. If there are no extra settings applied, the motor accelerates directly to the frequency reference when the command is input.

Group	Code	Name	LCD Display	Paramet	er Setting	Setting Range	Unit
ADV	07	Start mode	Start mode	0	Acc	0-1	-

### 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 the mechanical brake is released.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
	07	Start mode	Start Mode	1	DC-Start	0–1	-
ADV	12	Start DC braking time	DC-Start Time	0.00		0.00-60.00	sec
	13	DC Injection Level	DC Inj Level	50		0–200	%



### ① 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.

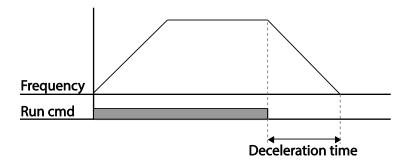
## 4.17 Stop Mode Setting

Select a stop mode to stop the inverter operation.

## 4.17.1 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	LCD Display	Parameter :	Setting	Setting Range	Unit
ADV	08	Stop mode	Stop Mode	0	Dec	0-4	-



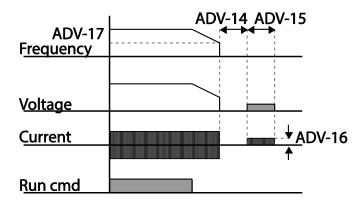
## 4.17.2 Stop After DC Braking

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. With a stop command input, the inverter begins decelerating the motor. When the frequency reaches the DC braking frequency set at ADV-17, the inverter supplies DC voltage to the motor and stops it.

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
	08	Stop mode	Stop Mode	0 Dec 0		0-4	-
ADV	14	Output block time before braking	DC-Block Time	0.10		0.00-60.00	sec
ADV	15	DC braking time	DC-Brake Time	1.00		0–60	sec
	16	DC braking amount	DC-Brake Level	50		0–200	%
	17	DC braking frequency	DC-Brake Freq	5.00	•	0.00-60.00	Hz

### **DC Braking After Stop Setting Details**

Code	Description
ADV-14 DC-Block 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 (ADV-17) 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.
ADV-15 DC-Brake Time	Set the time duration for the DC voltage supply to the motor.
ADV-16 DC-Brake	Set the amount of DC braking to apply. The parameter setting is based on the
Level	rated current of the motor.
ADV-17 DC-Brake Freq	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.



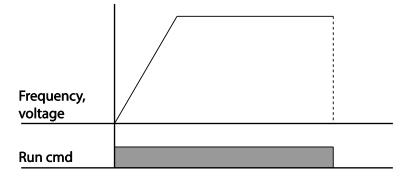
### ① Caution

- 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.

## 4.17.3 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	LCD Display	Param	eter Setting	Setting Range	Unit
ADV	08	Stop Method	Stop Mode	2	Free-Run	0-4	-



# ① 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.

## 4.17.4 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	LCD Display	Param	eter Setting	Setting Range	Unit
ADV	08	Stop mode	Stop Mode	4	Power Braking	0–4	_

#### ① 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 PRT-50 (stall prevention and flux braking) and ADV-08 (power braking) are 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.

# 4.18 Frequency Limit

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

# 4.18.1 Frequency Limit Using Maximum Frequency and Start Frequency

Group	Code	Name	LCD Display	<b>Parameter Setting</b>	Setting Range	Unit
DBV	19	Start frequency	Start Freq	0.50	0.01-10.00	Hz
DRV	20	Maximum frequency	Max Freq	60.00	40.00-400.00	Hz

#### Frequency Limit Using Maximum Frequency and Start Frequency - Setting Details

Code	Description
DRV-19 Start Freq	Set the lower limit value for speed unit parameters that are expressed in Hz or rpm. If an input frequency is lower than the start frequency, the parameter value will be 0.00.
DRV-20 Max Freq	Set upper and lower frequency limits. All frequency selections are restricted to frequencies from within the upper and lower limits.  This restriction also applies when you in input a frequency reference using the keypad.

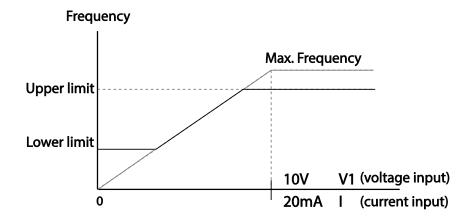
## 4.18.2 Frequency Limit Using Upper and Lower Limit Frequency Values

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
	24	Frequency limit	Freq Limit	0	No	0–1	_
ADV	25	Frequency lower limit value	Freq Limit Lo	0.50		0.0-maximum frequency	Hz
	26	Frequency upper limit value	Freq Limit Hi	Maxin freque	num	minimum- maximum frequency	Hz

### Frequency Limit Using Upper and Lower Limit Frequencies - Setting Details

Code	Description
ADV-24 Freq Limit	The initial setting is 0 (No). Changing the setting to 1 (Yes) allows the setting of frequencies between the lower limit frequency (ADV-25) and the upper limit frequency (ADV-26). When the setting is 0 (No), codes ADV-25 and ADV-26 are not visible.
ADV-25 Freq Limit	Set an upper limit frequency to all speed unit parameters that are expressed in
Lo,	Hz or rpm, except for the base frequency (DRV-18). Frequency cannot be set
ADV-26 Freq Limit Hi	higher than the upper limit frequency.

### without upper / lower limits

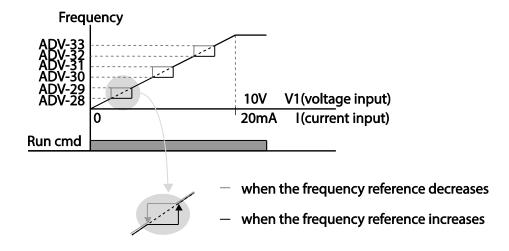


### 4.18.3 Frequency Jump

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	LCD Display	Paramete	er Setting	Setting Range	Unit
	27	Frequency jump	Jump Freq	0	No	0–1	-
	28	Jump frequency lower limit1	Jump Lo 1	10.00		0.00–Jump frequency upper limit 1	Hz
	29	Jump frequency upper limit1	Jump Hi 1	15.00		Jump frequency lower limit 1-Maximum frequency	Hz
ADV	30	Jump frequency lower limit 2	Jump Lo 2	20.00		0.00–Jump frequency upper limit 2	Hz
	31	Jump frequency upper limit 2	Jump Hi 2	25.00		Jump frequency lower limit 2-Maximum frequency	Hz
	32	Jump frequency lower limit 3	Jump Lo 3	30.00		0.00–Jump frequency upper limit 3	Hz
	33	Jump frequency upper limit 3	Jump Hi 3	35.00		Jump frequency lower limit 3-Maximum frequency	Hz



# 4.19 2<sup>nd</sup> Operation Mode Setting

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 multifunction input terminal. Mode swiching 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 IN-65-71 and set the parameter value to 15 (2nd Source).

Group	Code	Name	LCD Display	Para	meter Setting	<b>Setting Range</b>	Unit
	06	Command source	Cmd Source*	1	Fx/Rx-1	0–4	-
DRV (	07	Frequency reference source	Freq Ref Src	2	V1	0–12	-
BAS	04	2 <sup>nd</sup> Command source	Cmd 2nd Src	0	Keypad	0–4	-
	05	2 <sup>nd</sup> Frequency reference source	Freq 2nd Src	0	KeyPad-1	0–12	-
IN	65-71	Px terminal configuration	Px Define (Px: P1-P7)	15	2nd Source	0–54	_

### **2nd Operation Mode Setting Details**

Code	Description
Src RAS-05 Frea 2nd	If signals are provided to the multi-function terminal set as the 2 <sup>nd</sup> command source (2nd Source), the operation can be performed using the set values from BAS-04-05 instead of the set values from the 06 and 07 codes in the DRV group. The 2nd command source settings cannot be changed while operating with the 1 <sup>st</sup> command source (Main Source).

## ① Caution

- When setting the multi-function terminal to the 2<sup>nd</sup> command source (2nd Source) and input (On) the signal, operation state is changed because the frequency setting and the Operation command will be changed to the 2<sup>nd</sup> command. Before shifting input to the multi-function terminal, ensure that the 2<sup>nd</sup> 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.

# 4.20 Multi-function Input Terminal Control

Filter time constants and the type of multi-function input terminals can be configured to improve the response of input terminals

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	85	Multi-function input terminal On filter	DI On Delay	10	0-10000	ms
IN	86	Multi-function input terminal Off filter	DI Off Delay	3	0-10000	ms
IIN	87	Multi-function input terminal selection	DI NC/NO Sel	000 0000*	-	-
	90	Multi-function input terminal status	DI Status	000 0000*	-	-

### **Multi-function Input Terminal Control Setting Details**

Description	Description						
•	If the input terminal's state is not changed during the set time, when the terminal receives an input, it is recognized as On or Off.						
indicator light of With the botton terminal (Norm terminal is cont	corresponds to the segment that is on as shown in the table below. om segment on, it indicates that the terminal is configured as a A nally Open) contact. With the top segment on, it indicates that the nfigured as a B terminal (Normally Closed) contact. Terminals are						
Туре	B terminal status (Normally Closed)	A terminal status (Normally Open)					
LCD keypad							
terminal using on. The Off con contacts are co Terminals are n	DRV-87, the On condition is indic dition is indicated when the bott nfigured as B terminals, the segm umbered P1-P7, from right to lef	ated by the top segment turning om segment is turned on. When nent lights behave conversely. it.					
Туре	A terminal setting (On)	A terminal setting (Off)					
LCD keypad							
	If the input terr receives an input services an input services and input services and indicator light of With the botton terminal (Norm terminal is continumbered P1-  Type  LCD keypad  Display the conterminal using on. The Officon contacts are conterminals are not the content of the content	If the input terminal's state is not changed durin receives an input, it is recognized as On or Off.  Select terminal contact types—for each input te indicator light corresponds to the segment that With the bottom segment on, it indicates that the terminal (Normally Open) contact. With the top terminal is configured as a B terminal (Normally numbered P1-P7, from right to left.  Type—B terminal status (Normally Closed)  LCD keypad————————————————————————————————————					

# 4.21 P2P Setting

The P2P function is used to share input and output devices between multiple inverters. To enable P2P setting, RS-485 communication must be turned on .

Inverters connected through P2P communication are designated as either a master or slaves . The Master inverter controls the input and output of slave inverters. Slave inverters provide input and output actions. When using the multi-function output, a slave inverter can select to use either the master inverter's output or its own output. When using P2P communication, first designate the slave inverter and then the master inverter. If the master inverter is designated first, connected inverters may interpret the condition as a loss of communication.

#### Master Parameter

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
COM	95	P2P Communication selection	Int 485 Func	1	P2P Master	0-3	-
	80	Analog input1	P2P In V1	0		0-12,000	%
	81	Analog input2	P2P In I2	0		-12,000-12,000	%
USS	82	Digital input	P2P In DI	0		0-0x7F	bit
	85	Analog output	P2P Out AO1	0		0-10,000	%
	88	Digital output	P2P Out DO	0		0-0x03	bit

#### Slave Parameter

Group	Code	Name	LCD Display	Parai	neter Setting	Setting Range	Unit
COM	95	P2P Communication selection	Int 485 Func	2	P2P Slave	0-3	-
COM	96	P2P DO setting selection	P2P OUT Sel	0	No	0-2	bit

#### **P2P Setting Details**

Code	Description
COM-95 Int 485 Func	Set master inverter to 1(P2P Master), slave inverter to 2(P2P Slave).
USS-80–82 P2P Input Data	Input data sent from the slave inverter.
USS-85, 88 P2P Output Data	Output data transmitted to the slave inverter.

### ① Caution

- P2P features work only with code version 1.00, IO S/W version 0.11, and keypad S/W version 1.07 or higher versions.
- Set the user sequence functions to use P2P features.

# 4.22 Multi-keypad Setting

Use multi-keypad settings to control more than one inverter with one keypad. To use this function, first configure RS-485 communication.

The group of inverters to be controlled by the keypad will include a master inverter. The master inverter monitors the other inverters, and slave inverter responds to the master inverter's input. When using multi-function output, a slave inverter can select to use either the master inverter's output or its own output. When using the multi keypad, first designate the slave inverter and then the master inverter. If the master inverter is designated first, connected inverters may interpret the condition as a loss of communication.

#### Master Parameter

Group	Code	Name	LCD Display	Para	ameter Setting	<b>Setting Range</b>	Unit
COM	95	P2P Communication selection	Int 485 Func	3	KPD-Ready	0-3	-
O3 Multi-keypad ID		Multi-keypad ID	Multi KPD ID	3		3-99	-
CNF 42	42	Multi-function key selection	Multi Key Sel	4	Multi KPD	0-4	-

#### Slave Parameter

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
COM	01	Station ID	Int485 St ID	3		3-99	_
COM	95	P2P communication options	Int 485 Func	3	KPD-Ready	0-3	-

#### Multi-keypad Setting Details

Code	Description
COM-01 Int485 St ID	Prevents conflict by designating a unique identification value to an inverter.
COM-01 INT485 STID	Values can be selected from numbers between 3-99.
COM-95 Int 485 Func	Set the value to 3 (KPD-Ready) for both master and slave inverter
CNF-03 Multi KPD ID	Select an inverter to monitor from the group of inverters.
CNF-42 Multi key Sel	Select a multi-function key type 4 (Multi KPD) .

### ① Caution

- Multi-keypad (Multi-KPD) features work only with code version 1.00, IO S/W version 0.11, and keypad S/W version 1.07 or higher versions.
- The multi-keypad feature will not work when the multi-keypad ID (CNF-03 Multi-KPD ID) setting is identical to the RS-485 communication station ID (CM-01 Int485 st ID) setting.
- The master/slave setting cannot be changed while the inverter is operating in slave mode.

# 4.23 User Sequence Setting

User Sequence creates a simple sequence from a combination of different function blocks. The sequence can comprise of a maximum of 18 steps using 29 function blocks and 30 void parameters.

1 Loop refers to a single execution of a user configured sequence that contains a maximum of 18 steps. Users can select a Loop Time of between 10-1,000 ms.

The codes for user sequences configuration can be found in the USS group (for user sequence settings) and the USF group (for function block settings).

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
APP	02	User sequence activation	User Seq En	0	0–1	-
	01	User sequence operation command	User Seq Con	0	0–2	-
	02	User sequence operation time	User Loop Time	0	0–5	_
	11- 28	Output address link 1-18	Link UserOut1- 18	О	0-0xFFFF	_
USS	31- 60	Input value setting 1-30	Void Para1-30	0	-9999-9999	_
	80	Analog input 1	P2P In V1(-10-10 V)	0	0–12,000	%
	81	Analog input 2	P2P In I2	0	-12,000	%
	82	Digital input	P2P In D	0	-12,000	bit
	85	Analog output	P2P Out AO1	0	0-0x7F	%
	88	Digital output	P2P Out DO	0	0-0x03	bit
	01	User function 1	User Func1	0	0-28	-
	02	User function input 1-A	User Input 1-A	0	0-0xFFFF	-
	03	User function input 1-B	User Input 1-B	0	0-0xFFFF	-
	04	User function input 1-C	User Input 1-C	0	0-0xFFFF	-
	05	User function output 1	User Output 1	0	-32767-32767	-
	06	User function 2	User Func2	0	0-28	-
USF	07	User function input 2-A	User Input 2-A	0	0-0xFFFF	-
	08	User function input 2-B	User Input 2-B	0	0-0xFFFF	-
	09	User function input 2-C	User Input 2-C	0	0-0xFFFF	-
	10	User function output 2	User Output 2	0	-32767-32767	-
	11	User function 3	User Func3	0	0-28	-
	12	User function input 3-A	User Input 3-A	0	0-0xFFFF	-
	13	User function input 3-B	User Input 3-B	0	0-0xFFFF	-

Group	Code	Name	LCD Display	Parameter Setting	<b>Setting Range</b>	Unit
	14	User function input 3-C	User Input 3-C	0	0-0xFFFF	-
	15	User function output 3	User Output 3	0	-32767-32767	-
	16	Uer function 4	User Func4	0	0-28	-
	17	User function input 4-A	User Input 4-A	0	0-0xFFFF	-
	18	User function input 4-B	User Input 4-B	0	0-0xFFFF	-
	19	User function input 4-C	User Input 4-C	0	0-0xFFFF	-
	20	User function output 4	User Output 4	0	-32767-32767	-
	21	User function 5	User Func5	0	0-28	-
	22	User function input 5-A	User Input 5-A	0	0-0xFFFF	-
	23	User function input 5-B	User Input 5-B	0	0-0xFFFF	-
	24	User function input 5-C	User Input 5-C	0	0-0xFFFF	-
	25	User function output 5	User Output 5	0	-32767-32767	-
	26	User function 6	User Func6	0	0-28	-
	27	User function input 6-A	User Input 6-A	0	0-0xFFFF	-
	28	User function input 6-B	User Input 6-B	0	0-0xFFFF	-
	29	User function input 6-C	User Input 6-C	0	0-0xFFFF	-
	30	User function output 6	User Output 6	0	-32767-32767	-
	31	User function 7	User Func7	0	0-28	-
	32	User function input 7-A	User Input 7-A	0	0-0xFFFF	-
	33	User function input 7-B	User Input 7-B	0	0-0xFFFF	-
	34	User function input 7-C	User Input 7-C	0	0-0xFFFF	-
	35	User function output 7	User Output 7	0	-32767-32767	-
	36	User function 8	User Func8	0	0-28	-
	37	User function input 8-A	User Input 8-A	0	0-0xFFFF	-
	38	User function input8-B	User Input 8-B	0	0-0xFFFF	-
	39	User function input 8-C	User Input 8-C	0	0-0xFFFF	-
	40	User function output 8	User Output 8	0	-32767-32767	-
	41	User function 9	User Func9	0	0-28	-
	42	User function input 9-A	User Input 9-A	0	0-0xFFFF	-
	43	User function input 9-B	User Input 9-B	0	0-0xFFFF	-
	44	User function input 9-C	User Input 9-C	0	0-0xFFFF	-
	45	User function output 9	User Output 9	0	-32767-32767	_
	46	User function 10	User Func10	0	0-28	-
	47	User function input 10-A	User Input 10-A	0	0-0xFFFF	-
	48	User function input 10-B	User Input 10-B	0	0-0xFFFF	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	49	User function input 10-C	User Input 10-C	0	0-0xFFFF	-
	50	User function output 10	User Output 10	0	-32767-32767	-
	51	User function 11	User Func11	0	0-28	_
	52	User function input 11-A	User Input 11-A	0	0-0xFFFF	-
	53	User function input 11-B	User Input 11-B	0	0-0xFFFF	_
	54	User function input 11-C	User Input 11-C	0	0-0xFFFF	_
	55	User function output 11	User Output 11	0	-32767-32767	_
	56	User function 12	User Func12	0	0-28	_
	57	User function input 12-A	User Input 12-A	0	0-0xFFFF	_
	58	User function input 12-B	User Input 12-B	0	0-0xFFFF	_
	59	User function input 12-C	User Input 12-C	0	0-0xFFFF	_
	60	User function output 12	User Output 12	0	-32767-32767	_
	61	User function 13	User Func13	0	0-28	_
	62	User function input 13-A	User Input 13-A	0	0-0xFFFF	_
	63	User function input 13-B	User Input 13-B	0	0-0xFFFF	_
	64	User function input 13-C	User Input 13-C	0	0-0xFFFF	_
	65	User function output 13	User Output 13	0	-32767-32767	-
	66	User function 14	User Func14	0	0-28	_
	67	User function input 14-A	User Input 14-A	0	0-0xFFFF	_
	68	User function input14-B	User Input 14-B	0	0-0xFFFF	-
	69	User function input 14-C	User Input 14-C	0	0-0xFFFF	-
	70	User function output 14	User Output 14	0	-32767-32767	-
	71	User function 15	User Func15	0	0-28	_
	72	User function input 15-A	User Input 15-A	0	0-0xFFFF	-
	73	User function input 15-B	User Input 15-B	0	0-0xFFFF	_
	74	User function input 15-C	User Input 15-C	0	0-0xFFFF	-
	75	User function output 15	User Output 15	0	-32767-32767	_
	76	User function 16	User Func16	0	0-28	_
	77	User function input 16-A	User Input 16-A	0	0-0xFFFF	_
	78	User function input 16-B	User Input 16-B	0	0-0xFFFF	-
	79	User function input 16-C	User Input 16-C	0	0-0xFFFF	_
	80	User function output 16	User Output 16	0	-32767-32767	-
	81	User function 17	User Func17	0	0-28	_
	82	User function input 17-A	User Input 17-A	0	0-0xFFFF	_
	83	User function input 17-B	User Input 17-B	0	0-0xFFFF	_

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	84	User function input 17-C	User Input 17-C	0	0-0xFFFF	-
	85	User function output 17	User Output 17	0	-32767-32767	-
	86	User function 18	User Func18	0	0-28	-
	87	User function input 18-A	User Input 18-A	0	0-0xFFFF	-
	88	User function input 18-B	User Input 18-B	0	0-0xFFFF	-
	89	User function input 18-C	User Input 18-C	0	0-0xFFFF	-
	90	User function output 18	User Output 18	0	-32767-32767	_

### **User Sequence Setting Details**

Code	Description
APP-02 User Seq En	Display the parameter groups related to a user sequence.
	Set Sequence Run and Sequence Stop with the keypad.
USS-01 User Seq Con	Parameters cannot be adjusted during an operation. To adjust parameters,
	the operation must be stopped.
USS-02 User Loop Time	Set the user sequence Loop Time.
033-02 03ei L00p IIIIle	User sequence loop time can be set to 0.01s/0.02s/ 0.05s/0.1s/0.5s/1s.
	Set parameters to connect 18 Function Blocks. If the input value is 0x0000,
USS-11-28	an output value cannot be used.
Link UserOut1–18	To use the output value in step 1 for the frequency reference (Cmd
LITIK OSCIOULI-10	Frequency), input the communication address (0x1101) of the Cmd
	frequency as the Link UserOut1 parameter.
USS-31–60 Void Para1–	Set 30 void parameters. Use when constant (Const) parameter input is
30	needed in the user function block.
	Set user defined functions for the 18 function blocks.
USF-01-90	If the function block setting is invalid, the output of the User Output@is-1.
031-01-30	All the outputs from the User Output@are read only, and can be used with
	the user output link@ (Link UserOut@) of the USS group.

### **Function Block Parameter Structure**

Туре	Description
User Func @*	Choose the function to perform in the function block.
User Input @-A	Communication address of the function's first input parameter.
User Input @-B	Communication address of the function's second input parameter.
User Input @-C	Communication address of the function's third input parameter.
User Output @	Output value (Read Only) after performing the function block.

<sup>\* @</sup> is the step number (1-18).

# **User Function Operation Condition**

	-	
Number		Description
0	NOP	No Operation.
1	ADD	Addition operation, $(A + B) + C$
	7,00	If the C parameter is 0x0000, it will be recognized as 0.
2	SUB	Subtraction operation, (A - B) - C
	300	If the C parameter is 0x0000, it will be recognized as 0.
2	V D D CI ID	Addition and subtraction compound operation, (A + B) - C
3	ADDSUB	If the C parameter is 0x0000, it will be recognized as 0.
4	AAINI	Output the smallest value of the input values, MIN(A, B, C).
4	MIN	If the C parameter is 0x0000, operate only with A, B.
5	MAX	Output the largest value of the input values, MAX(A, B, C).
<u> </u>	IVIAX	If the C parameter is 0x0000, operate only with A, B.
6	ABS	Output the absolute value of the A parameter,   A  .
	ADS	This operation does not use the B, or C parameter.
7	NEGATE	Output the negative value of the A parameter, -( A ).
	NLGAIL	This operation does not use the B, or C parameter.
8	REMAINDER	Remainder operation of A and B, A % B
<u> </u>	NEMAINDEN	This operation does not use the C parameter.
9	MPYDIV	Multiplication, division compound operation, (A x B)/C.
		If the C parameter is 0x0000, output the multiplication operation of (A x B).
	COMPARE-GT	Comparison operation: if $(A > B)$ the output is C; if $(A  the output is 0.$
10		If the condition is met, the output parameter is C. If the condition is not met,
10	(greater than)	the output is 0(False). If the C parameter is 0x0000 and if the condition is
		met, the output is 1 (True).
	COMPARE-	Comparison operation; if $(A >/= B)$ output is C; if $(A < B)$ the output is 0.
11	GTEQ	If the condition is met, the output parameter is C. If the condition is not met,
	(great than or	the output is 0(False). If the C parameter is 0x0000 and if the condition is
	equal to)	met, the output is 1 (True).
		Comparison operation, if $(A == B)$ then the output is C. For all other values
	COMPARE-	the output is 0.
12	EQUAL	If the condition is met, the output parameter is C. if the condition is not met,
		the output is 0(False). If the C parameter is 0x0000 and if the condition is
		met, the output is 1(True).
		Comparison operation, if (A!= B) then the output is C. For all other values the
10	COMPARE-	output is 0.
13	NEQUAL	If the condition is met, the output parameter is C. If the condition is not met,
		the output is 0(False). If the C parameter is 0x0000 and if the condition is
		met, the output is 1(True).
		Adds 1 each time a user sequence completes a loop.
		A: Max Loop, B: Timer Run/Stop, C: Choose output mode.
14	TIMER	If input of B is 1, timer stops (output is 0). If input is 0, timer runs.
		If input of C is 1, output the current timer value.
		If input of C is 0, output 1 when timer value exceeds A(Max) value.
		If the C parameter is 0x0000, C will be recognized as 0.

Number	Type	Description
Number	Турс	Timer overflow Initializes the timer value to 0.
		Sets a limit for the A parameter.
		If input to A is between B and C, output the input to A.
15	LIMIT	If input to A is larger than B, output B. If input of A is smaller than C, output
13	LIIVIII	C.
		B parameter must be greater than or equal to the C parameter.
		Output the AND operation, (A and B) and C.
16	AND	If the C parameter is 0x0000, operate only with A, B.
		Output the OR operation, (A   B)   C.
17	OR	If the C parameter is 0x0000, operate only with A, B.
4.0	V05	Output the XOR operation, (A ^ B) ^ C.
18	XOR	If the C parameter is 0x0000, operate only with A, B.
10	AND/OD	Output the AND/OR operation, (A andB)   C.
19	AND/OR	If the C parameter is 0x0000, operate only with A, B.
		Output a value after selecting one of two inputs, if (A) then B otherwise C.
20	SWITCH	If the input at A is 1, the output will be B. If the input at A is 0, the output
		parameter will be C.
	BITTEST	Test the B bit of the A parameter, BITTEST(A, B).
21		If the B bit of the A input is 1, the output is 1. If it is 0, then the output is 0.
21		The input value of B must be between 0-16. If the value is higher than 16, it
		will be recognized as 16. If input at B is 0, the output is always 0.
		Set the B bit of the A parameter, BITSET(A, B). Output the changed value
		after setting the B bit to input at A.
22	BITSET	The input value of B must be between 0-16. If the value is higher than 16, it
		will be recognized as 16. If the input at B is 0, the output is always 0. This
		operation does not use the C parameter.
		Output the input at A as the B filter gain time constant, B x US-02 (US Loop
		Time).
23	BITCLEAR	In the above formula, set the time when the output of A reaches 62.2%
		of the B parameter $=$ an input greater than 0.
		C stands for the filter operation. If it is 0, the operation is started.
		Output the input at A as the B filter gains time constant, B x US-02 (US Loop
24	LOWPASSFILTER	Time.
	LO WI / ISSI ILI LIK	In the above formula, set the time when the output of A reaches 62.2%
		C stands for the filter operation. If it is 0, the operation is started.
		P, I gain = A, B parameter input, then output as C.
25		Conditions for PI_PROCESS output: C = 0: Const PI,
	PI_CONTROL	C = 1: PI_PROCESS-B >= PI_PROCESS-OUT >= 0,
	T _commot	C = 2: PI_PROCESS-B >= PI_PROCESS-OUT >= -(PI_PROCESS-B),
		P gain = A/100, I gain = 1/(Bx Loop Time),  If there is an expression B least tings, output, 1
-		If there is an error with PI settings, output -1.  A is an input error, B is an output limit, C is the value of Const PI output.
26	PI_PROCESS	
	_	Range of C is 0-32,767.
27	UPCOUNT	Upcounts the pulses and then output the value- UPCOUNT(A, B, C).

Number	Туре	Description
		After receiving a trigger input (A), outputs are upcounted by C conditions. If the B inputs is 1, do not operate and display 0. If the B inputs is 0, operate. If the C parameter is 0, upcount when the input at A changes from 0 to 1. If the C parameter is 1, upcount when the input at A is changed from 1 to 0. If the C parameter is 2, upcount whenever the input at A changes.
		Output range is: 0-32767
28	DOWNCOUNT	Downcounts the pulses and then output the value- DOWNCOUNT(A, B, C). After receiving a trigger input (A), outputs are downcounted by C conditions. If the B input is 1, do not operate and display the initial value of C. If the B input is 0, operate.  Downcounts when the A parameter changes from 0 to 1.

#### Note

The PI process block (PI\_PROCESS Block) must be used after the PI control block (PI\_CONTROL Block) for proper PI control operation. PI control operation cannot be performed if there is another block between the two blocks, or if the blocks are placed in an incorrect order.

### ① Caution

User sequence features work only with code version 1.00, IO S/W version 0.11, and keypad S/W version 1.07 or higher versions.

# **4.24 Fire Mode Operation**

This function is used to allow the inverter to ignore minor faults during emergency situations, such as fire, and provides continuous operation to fire pumps.

When turned on, Fire mode forces the inverter to ignore all minor fault trips and repeat a Reset and Restart for major fault trips, regardless of the restart trial count limit. The retry delay time set at PRT-10 (Retry Delay) still applies while the inverter performs a Reset and Restart.

#### **Fire Mode Parameter Settings**

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
401/	80	Fire Mode selection	Fire Mode Sel	2	Fire Mode	0–3	-
	81	Fire Mode frequency	Fire Mode Freq	0-60		0–60	
ADV	82	Fire Mode run direction	Fire Mode Dir	0–1		0–1	
	83	Fire Mode operation count	Fire Mode Cnt	Not	configurable	0–3	-
IN	65– 71	Px terminal configuration	Px Define (Px: P1– P7)	51	Fire Mode	0–54	-

The inverter runs in Fire mode when ADV-80 (Fire Mode Sel) is set to '2 (Fire Mode)', and the multifunction terminal (IN-65–71) configured for Fire mode (51: Fire Mode) is turned on. The Fire mode count increases by 1 at ADV-83 (Fire Mode Count) each time a Fire mode operation is run.

### ① Caution

Fire mode operation may result in inverter malfunction. Note that Fire mode operation voids the product warranty - the inverter is covered by the product warranty only when the Fire mode count is **'**0.'

### **Fire Mode Function Setting Details**

Code	Description	Details
ADV-81 Fire Mode frequency	Fire mode frequency reference	The frequency set at ADV-81 (Fire mode frequency) is used for the inverter operation in Fire mode. The Fire mode frequency takes priority over the Jog frequency, Multi-step frequencies, and the keypad input frequency.
DRV-03 Acc Time / DRV-04 Dec Time	Fire mode Acc/Dec times	When Fire mode operation is turned on, the inverter accelerates for the time set at DRV-03 (Acc Time), and then decelerates based on the deceleration time set at DRV-04 (Dec Time). It stops when the Px terminal input is turned off (Fire mode operation is turned off).
	Fault trip process	Some fault trips are ignored during Fire mode operation. The fault trip history is saved, but trip outputs are disabled even when they are configured at the multi-function output terminals.
		Fault trips that are ignored in Fire mode  BX, External Trip, Low Voltage Trip, Inverter Overheat, Inverter  Overload, Overload, Electrical Thermal Trip, Input/Output Open  Phase, Motor Overload, Fan Trip, No Motor Trips, and other minor fault trips.
PRT-10 Retry Delay		For the following fault trips, the inverter performs a Reset and Restart until the trip conditions are released. The retry delay time set at PRT-10 (Retry Delay) applies while the inverter performs a Reset and Restart.
		Fault trips that force a Reset Restart in Fire mode Over Voltage, Over Current1(OC1), Ground Fault Trip
		The inverter stops operating when the following fault trips occur:
		Fault trips that stop inverter operation in Fire mode  H/W Diag, Over Current 2 (Arm-Short)

# **5 RS-485 Communication Features**

This section in the user manual 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.

### 5.1 Communication Standards

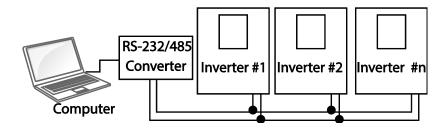
Following the RS-485 communication standards, S100 products exchange data with a PLC and computer. The RS-485 communication standards support the Multi-drop Link System and offer an interface that is strongly resistant to noise. Please refer to the following table for details about the communication standards.

Item	Standard
Communication method/ Transmission type	RS-485/Bus type, Multi-drop Link System
Inverter type name	S100
Number of connected inverters/Transmission distance	Maximum of 16 inverters / Maximum 1,200 m (recommended distance: within 700 m)
Recommended cable size	0.75 mm², (18AWG), Shielded Type Twisted-Pair (STP) Wire
Installation type	Dedicated terminals (S+/S-/SG) on the control terminal block
Power supply	Supplied by the inverter - insulated power source from the inverter's internal circuit
Communication speed	1,200/2,400/9,600/19,200/38,400/57,600/115,200 bps
Control procedure	Asynchronous communications system
Communication system	Half duplex system
Character system	Modbus-RTU: Binary / LS Bus: ASCII
Stop bit length	1-bit/2-bit
Frame error check	2 bytes
Parity check	None/Even/Odd

## 5.2 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.



### 5.2.1 Communication Line Connection

Make sure that the inverter is turned off completely, and then connect the RS-485 communication line to the S+/S-/SG terminals of the terminal block. The maximum number of inverters you can connect is 16. For communication lines, use shielded twisted pair (STP) cables.

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.

### ① Caution

When wiring the communication line, make sure that the SG terminals on the PLC and inverter are connected. SG terminals prevent communication errors due to electronic noise interference.

# **5.2.2 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	LCD Display	Par	ameter Setting	Setting range	Unit
COM	01	Built-in communication inverter ID	Int485 St ID	1		1-250	_
	02	Built-in communication protocol	Int485 Proto	0	ModBus RTU	0, 2	_
	03	Built-in communication speed	Int485 BaudR	3	9600 bps	0-7	_
	04	Built-in communication frame setting	Int485 Mode	0	D8/PN/S1	0-3	_
	05	Transmission delay after reception	Resp Delay	5		0-1000	ms

**Communication Parameters Setting Details** 

Code	Description	escription			
COM-01 Int485 St ID	Set the inverter station ID I	et the inverter station ID between 1 and 250.			
	Select one of the two built	in protocols: Modbus-RTU or LS INV 485.			
COM-02 Int485 Proto	Setting	Function			
	0 Modbus-RTU	Modbus-RTU compatible protocol			
	2 LS INV 485	Dedicated protocol for the LS inverter			
	Set a communication setti	ng speed up to 115,200 bps.			
	Setting	Function			
	0	1,200 bps			
	1	2,400 bps			
COM-03 Int485 BaudR	2	4,800 bps			
	3	9,600 bps			
	4	19,200 bps			
	5	38,400 bps			
	6	56Kbps			
	7	115 Kbps			
COM-04 Int485 Mode	Set a communication conf and the number of stop bi	guration. Set the data length, parity check method,			
	Setting	Function			
	0 D8/PN/S1	8-bit data/no parity check/1 stop bit			

Code	Description					
	1 D8/P	N/S2	8-bit data/no parity check/2 stop bits			
	2 D8/P	E/S1	8-bit data / e	ven parity / 1 st	op bit	
	3 D8/P	O/S1	8-bit data/o	dd parity / 1 sto	pp bit	
	Set the response time for the slave (inverter) to react to the request from the master. Response time is used in a system where the slave device response is too fast for the master device to process. Set this code to an appropriate value for smooth master-slave communication.					
COM-05 Resp Delay	Master	Request	Response		••• sponse  OM-5 Resp Delay	

## **5.2.3 Setting Operation Command and Frequency**

To select the built-in RS485 communication as the source of command, set the DRV-06 code to 3 (Int485). Then, set common area parameters for the operation command and frequency via communication.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
	06	Command source	Cmd Source	3	Int 485	0-4	-
DRV	07	Frequency setting method	Freq Ref Src	6	Int 485	0-12	-

# **5.2.4 Command Loss Protective Operation**

Configure the command loss decision standards and protective operations run when a communication problem lasts for a specified period of time.

#### **Command Loss Protective Operation Setting Details**

Command Loss Pro		<u> </u>	9 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -					
Code	Descrip	Description						
		he operation to ru exceeding the time	un when a communication error has occurred and e set at PRT- 13.					
	Settin	g	Function					
PRT-12 Lost Cmd Mode, PRT-13 Lost Cmd Time	0	None	The speed command immediately becomes the operation frequency without any protection function.					
	1	Free-Run	The inverter blocks output. The motor performs in free-run condition.					
	2	Dec	The motor decelerates and then stops at the time set at PRT-07 (Trip Dec Time).					
	3	Hold Input	The inverter calculates the average input value for 10 seconds before the loss of the speed command and uses it as the speed reference.					
	4	Hold Output	The inverter calculates the average output value for 10 seconds before the loss of the speed command and uses it as the speed reference.					
	5	Lost Preset	The inverter operates at the frequency set at PRT-14 (Lost Preset F).					

## 5.2.5 Setting Virtual Multi-Function Input

Multi-function input can be controlled using a communication address (0h0385). Set codes COM-70–77 to the functions to operate, and then set the BIT relevant to the function to 1 at 0h0322 to operate it. Virtual multi-function operates independently from IN-65-71 analog multi-function inputs and cannot be set redundantly. Virtual multi-function input can be monitored using COM-86 (Virt DI Status). Before you configure the virtual multi-function inputs, set the DRV-06 code according to the command source.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
	70-77	Communication multi- function input x	Virtual DI x (x: 1-8)	0	None	0-49	-
COM	86	Communication multi- function input monitoring	Virt DI Status	-	-	-	_

**Example:** When sending an Fx command by controlling virtual multi-function input in the common area via Int485, set COM-70 to FX and set address 0h0322 to 0h0001.

#### Note

The following are values and functions that are applied to address 0h0322:.

Setting	Function
0h0001	Forward operation (Fx)
0h0003	Reverse operation (Rx)
0h0000	Stop

## 5.2.6 Saving Parameters Defined by Communication

If you turn off the inverter after setting the common area parameters or keypad parameters via communication and operate the inverter, the changes are lost and the values changed via communication revert to the previous setting values when you turn on the inverter.

Set CNF-48 to 1 (Yes) to allow all the changes over comunication to be saved, so that the inverter retains all the existing values even after the power has been turned off.

Setting address 0h03E0 to 0 and then setting it again to 1 via communication allows the existing parameter settings to be saved. However, setting address 0h03E0 to 1 and then setting it to 0 does not carry out the same function.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
CNIE 40	40	Cay to to a various attacks	Parameter Save	0	No	0.1	
CNF	48	Save parameters		1	Yes	0-1	_

## 5.2.7 Total Memory Map for Communication

Communication Area	Memory Map	Details		
Communication common compatible area	0h0000-0h00FF	iS5, iP5A, iV5, iG5A compatible area		
Parameter registration type	0h0100-0h01FF	Areas registered at COM-31–38 and COM-51–58		
Parameter registration type area	0h0200-0h023F	Area registered for User Group		
alea	0h0240-0h027F	Area registered for Macro Group		
	0h0280-0h02FF	Reserved		
	0h0300-0h037F	Inverter monitoring area		
	0h0380-0h03DF	Inverter control area		
	0h03E0-0h03FF	Inverter memory control area		
	0h0400-0h0FFF	Reserved		
	0h1100	DRV Group		
	0h1200	BAS Group		
S100 communication	0h1300	ADV Group		
common area	0h1400	CON Group		
	0h1500	IN Group		
	0h1600	OUT Group		
	0h1700	COM Group		
	0h1800	APP Group		
	0h1B00	PRT Group		
	0h1C00	M2 Group		

### 5.2.8 Parameter Group for Data Transmission

By defining a parameter group for data transmission, the communication addresses registered in the communication function group (COM) can be used in communication. Parameter group for data transmission may be defined to transmit multiple parameters at once, into the communication frame.

Group		Name	LCD Display	Param	eter Setting	Setting range	Unit
COM	31-38	Output communication address x	Para Status-x	_	-	0000-FFFF	Hex
COM	51-58	Input communication address x	Para Control-x	_	-	0000-FFFF	Hex

#### **Currently Registered CM Group Parameter**

Address	Parameter	Assigned content by bit
0b0100.0b0107	Status Parameter-1- Status Parameter-8	Parameter communication code value registered at COM-31-
0110100-0110107	Status Parameter-8	38 (Read-only)
0b0110 0b0117	Control Parameter-1-	Parameter communication code value registered at COM-51-58 (Read/Write access)
0110110-0110117	Control Parameter-8	58 (Read/Write access)

#### Note

When registering control parameters, register the operation speed (0h0005, 0h0380, 0h0381) and operation command (0h0006, 0h0382) parameters at the end of a parameter control frame. For example, when the parameter control frame has 5 parameter control items (Para Control - x), register the operation speed at Para Control-4 and the operation command to Para Control-5.

### 5.3 Communication Protocol

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

#### 5.3.1 LS INV 485 Protocol

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

#### Request

ENQ	Station ID	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n bytes	2 bytes	1 byte

#### **Normal Response**

ACK	Station ID	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

#### **Error Response**

NAK	Station ID	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 station ID indicates the inverter 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  $\rightarrow$  '0"B"B"8'h  $\rightarrow$  30h 42h 42h 38h)
- Error code: ASCIHEX (refer to 5.3.1.4 Error Code on page 137)

- Transmission/reception buffer size: Transmission=39 bytes, Reception=44 bytes
- Monitor registration buffer: 8 Words
- SUM: Checks communication errors via sum.

SUM=a total of the lower 8 bits values for station ID, command and data (Station ID+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 (the control value is not included: ENQ, ACK, NAK, etc.).

ENQ	Station ID	CMD	Address	Number of Addresses	SUM	EOT
05h	<b>'</b> 01'	'R'	'3000'	<b>'1'</b>	'A7'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

#### Note

#### **Broadcasting**

Broadcasting sends commands to all inverters connected to the network simultaneously. When commands are sent from station ID 255, each inverter acts on the command regardless of the station ID. However no response is issued for commands transmitted by broadcasting.

### 5.3.1.1 Detailed Read Protocol

**Read Request**: Reads successive n words from address XXXX.

ENQ	Station ID	CMD	Address	Number of Addresses	SUM	EOT
05h	'01'-'FA'	'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 Normal Response**

ACK	Station ID	CMD	Data	SUM	EOT
06h	'01'-'FA'	'R'	'XXXX'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes=  $(7 \times n \times 4)$ : a maximum of 39

### **Read Error Response**

NAK	Station ID	CMD	Error code	SUM	EOT
15h	'01'-'FA'	'R'	/ <del>**</del> /	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

#### **5.3.1.2** Detailed Write Protocol

**Write Request**: Writes successive n words to address XXXX.

ENQ	Station ID	CMD	Address	Number of Addresses	Data	SUM	EOT
05h	'01'-'FA'	'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=  $(12 + n \times 4)$ : a maximum of 44

### **Write Normal Response**

ACK	Station ID	CMD	Data	SUM	EOT
06h	'01'-'FA'	'W'	'XXXX'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes=  $(7 + n \times 4)$ : a maximum of 39

### **Write Error Response**

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-'FA'	'W'	/ <del>**</del> /	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

## **5.3.1.3** 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	Station ID	( MID	Number of Addresses	Address	SUM	EOT
05h	'01'-'FA'	'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=  $(8 + n \times 4)$ : a maximum of 40

### **Monitor Registration Normal Response**

ACK	Station ID	CMD	SUM	EOT
06h	'01'-'FA'	'X'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes=7

#### **Monitor Registration Error Response**

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-'FA'	'X'	/ <del>**</del> /	'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	Station ID	CMD	SUM	EOT
05h	'01'-'FA'	Ύ′	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes=7

#### **Monitor Registration Execution Normal Response**

ACK	Station ID	CMD	Data	SUM	EOT
06h	'01'-'FA'	Ύ′	'XXXX'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes=  $(7 + n \times 4)$ : a maximum of 39

## **Monitor Registration Execution Error Response**

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-'FA'	Ύ′	/ <del>**</del> /	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

## 5.3.1.4 Error Code

Code	Abbreviation	Description
ILLEGAL FUNCTION	IF	The requested function cannot be performed by a slave
ILLEGALTONCTION	П	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.
		Tried writing (W) to a parameter that does not allow writing
WRITE MODE ERROR	WM	(read-only parameters, or when writing is prohibited during
		operation)
FRAME ERROR	FE	The frame size does not match.

## 5.3.1.5 ASCII Code

Character	Hex	Character	Hex	Character	Hex
Α	41	q	71	@	40
В	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
Н	48	x	78	{	7B
1	49	у	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
0	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
Т	54	9	39	DEL	7F

Character	Hex	Character	Hex	Character	Hex	
U	55	space	20 DLE		10	
V	56	! 21 EM		EM	19	
W	57	п	22	ACK	06	
Χ	58	#	23	ENQ	05	
Υ	59	\$	24	EOT	04	
Z	5A	%	25	ESC	1B	
a	61	&	26	ETB	17	
b	62	1	27	ETX	03	
c	63	(	28	FF	0C	
d	64	)	29	FS	1C	
e	65	*	2A	GS	1D	
f	66	+	2B	HT	09	
g	67	,	2C	LF	0A	
g h	68	-	2D	NAK	15	
i	69		2E	NUL	00	
j	6A	/	2F	RS	1E	
k	6B	:	3A	S1	OF	
1	6C	;	3B	SO	0E	
m	6D	<	3C	SOH	01	
n	6E	=	3D	STX	02	
0	6F	>	3E	SUB	1A	
p	70	?	3F	SYN	16	
				US	1F	
				VT	OB	

## 5.3.2 Modbus-RTU Protocol

## **5.3.2.1** Function Code and Protocol (unit: byte)

In the following section, station ID is the value set at COM-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 5.4 Compatible Common Area Parameter on page 142.

## Function Code #03: Read Holding Register

Query Field Name				
Station ID				
Function(0x03)				
Starting Address Hi				
Starting Address Lo				
# of Points Hi				
# of Points Lo				
CRC Lo				
CRC Hi				

Response Field Name	
Station ID	_
Function (0x03)	_
Byte Count	_
Data Hi	
Data Lo	
•••	- # w. wash ay of Dainsta
	# number of Points
Data Hi	_
Data Lo	
CRC Lo	ノ -
CRC Hi	_

## Function Code #04: Read Input Register

Query Field Name
Station ID
Function(0x04)
Starting Address Hi
Starting Address Lo
# of Points Hi
# of Points Lo
CRC Lo
CRC Hi

Response Field Name	
Station ID	
Function (0x04)	
Byte Count	_
Data Hi	
Data Lo	
•••	# number of Points
•••	
Data Hi	
Data Lo	
CRC Lo	
CRC Hi	

## Function Code #06: Preset Single Register

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

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

## Function Code #16 (hex 0h10): Preset Multiple Register

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

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

# number of Points

## **Exception Code**

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

#### Response

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

<sup>\*</sup> The function value uses the top level bit for all query values.

## **Example of Modbus-RTU Communication in Use**

When the Acc time (Communication address 0x1103) is changed to 5.0 sec and the Dec time (Communication address 0x1104) is changed to 10.0 sec.

#### Frame Transmission from Master to Slave (Request)

Item	Station ID	Function	Starting Address	# of Register	Byte Count	Data 1	Data 2	CRC
Hex	0x01	0x10	0x1102	0x0002	0x04	0x0032	0x0064	0x1202
Description		Preset Multiple Register	Starting Address -1 (0x1103-1)	-	ı	50 (ACC time 5.0sec)	100 (DEC time 10.0sec)	-

Frame Transmission from Slave to Master (Response)

Item	Station ID	Function	Starting Address	# of Register	CRC
Hex	0x01	0x10	0x1102	0x0002	0xE534
Description	COM-01	Preset Multiple	Starting Address -1		
Description	Int485 St ID	Register	(0x1103-1)	_	_

# **5.4 Compatible Common Area Parameter**

The following are common area parameters compatible with iS5, iP5A, iV5, and iG5A.

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit
0h0000	Inverter model	-	-	R	6: S100
0h0001	Inverter capacity	-	-	R	0: 0.75 kW, 1: 1.5 kW, 2: 2.2 kW 3: 3.7 kW, 4: 5.5 kW, 5: 7.5 kW 6: 11 kW, 7: 15 kW, 8: 18.5 kW 9: 22 kW 10: 30 kW, 11: 37 kW 12: 45 kW 13: 55 kW, 14: 75 kW 256: 0.4 kW, 257: 1.1 kW, 258: 3.0 kW 259: 4.0 kW
0h0002	Inverter input voltage	_	-	R	0: 220 V product 1: 440 V product
0h0003	Version	_	-	R	Example 0h0100: Version 1.00 Example 0h0101: Version 1.01
0h0004	Reserved	-	-	R/W	
0h0005	Command frequency	0.01	Hz	R/W	
0h0006	Operation command (option)	-	-	R/W	B15 Reserved B14 0: Keypad Freq, B13 1: Keypad Torq B12 2-16: Terminal block multistep speed B10 17: Up, 18: Down 19: STEADY 22: V1, 24: V2, 25: I2, 26: Reserved 27: Built-in 485 28: Communication option 30: JOG, 31: PID  B8 0: Keypad B7 1: Fx/Rx-1 2: Fx/Rx-2 3: Built-in 485 4: Communication option B5 Reserved B4 Emergency stop W: Trip initialization (0→1), R: Trip status B2 Reverse operation (R)
					B1 Forward operation (F) B0 Stop (S)
0h0007	Acceleration time	0.1	S	R/W	- -

Comm. Address	Parameter	Scale	Unit	R/W	Assigne	d Content by Bit
0h0008	Deceleration time	0.1	S	R/W	-	
0h0009	Output current	0.1	Α	R	-	
0h000A	Output frequency	0.01	Hz	R	-	
0h000B	Output voltage	1	٧	R	-	
0h000C	DC link voltage	1	V	R	-	
0h000D	Output power	0.1	kW	R	-	
					B15	0: Remote, 1: Keypad Local
						1: Frequency command
					B14	source by communication
						(built-in, option)
						1:Operation command
					B13	source by communication
						(built-in, option)
					B12	Reverse operation command
					B11	Forward operation command
				R	B10	Brake release signal
0h000E	Operation status	_	-		B9	Jog mode
OHOOOL	Operation status				B8	Drive stopped.
					B7	DC Braking
					B6	Speed reached
					B5	Decelerating
					B4	Accelerating
					B3	Fault Trip - operates
						according to PRT-30 setting
					B2	Operating in reverse direction
					B1	Operating in forward
						direction
					B0	Stopped
					B15	Reserved
					B14	Reserved
					B13	Reserved
					B12	Reserved
					B11	Reserved
					B10	H/W-Diag
01 0005	Fault trip				B9	Reserved
0h000F	information	-	-	R	B8	Reserved
					B7	Reserved
					B6	Reserved
					B5	Reserved
					B4	Reserved
					B3	Level Type trip
					B2	Reserved
					B1	Reserved

Comm. Address	Parameter	Scale	Unit	R/W	Assigned C	ontent by Bit
Commi. Address	T didiffeter	Scale	Offic	10,00	B0	Latch Type trip
					B15-	
					B7	Reserved
					B6	P7
	langut tayanin al				B5	P6
0h0010	Input terminal information	_	_	R	B4	P5
	Iniomation				B3	P4
					B2	P3
					B1	P2
					B0	P1
					B15	Reserved
					B14	Reserved
					B13	Reserved
				R	B12	Reserved
	Output terminal information	-	-		B11	Reserved
					B10	Reserved
					B9	Reserved
060011					B8	Reserved
0h0011					B7	Reserved
					B6	Reserved
					B5	Reserved
					B4	Reserved
					B3	Reserved
					B2	Reserved
					B1	MO
					B0	Relay 1
0h0012	V1	0.01	%	R	V1 input v	oltage
0h0013	V2	0.01	%	R	V2 input v	oltage
0h0014	12	0.01	%	R	12 input cu	rrent
0h0015	Motor rotation speed	1	rpm	R	Displays ex	kisting motor rotation speed
0h0016 -0h0019	Reserved	-	-	-	-	
0h001A	Select Hz/rpm	-	-	R	0: Hz unit,	1: rpm unit
0h001B	Display the number of poles for the selected motor	-	-	R		e number of poles for the

# **5.5 S100 Expansion Common Area Parameter**

## **5.5.1 Monitoring Area Parameter (Read Only)**

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
0h0300	Inverter model	-	-	S100: 0006h	
				0.4 kW: 1900h, 0.75 kW: 3200h	
				1.1 kW: 4011h, 1.5 kW: 4015h	
				2.2 kW: 4022h, 3.0 kW: 4030h	
				3.7 kW: 4037h, 4.0 kW: 4040h	
0h0301	Inverter capacity	-	-	5.5 kW: 4055h, 7.5 kW: 4075h	
				11 kW: 40B0h, 15 kW: 40F0h	
				18.5 kW: 4125h, 22 kW: 4160h	
				30 kW: 41E0h, 37 kW: 4250h	
				45 kW: 42D0h, 55 kW: 4370h	
				75 kW: 44B0h	
				100 V single phase self cooling: 0120h, 200 V	
	las sautau ia as st			3-phase forced cooling: 0231h 100 V single phase forced cooling: 0121h, 400	
	Inverter input voltage/power (Single phase, 3- phase)/cooling		-	V single phase self cooling: 0420h	
				200 V single phase self cooling: 0220h, 400 V	
0h0302		-		3-phase self cooling: 0430h	
	method			200 V 3-phase self cooling: 0230h, 400 V single	
				phase forced cooling: 0421h	
				200 V single phase forced cooling: 0221h, 400	
				V 3-phase forced cooling: 0431h	
0h0303	Inverter S/W			(Ex) 0h0100: Version 1.00	
0110303	version	_	_	0h0101: Version 1.01	
0h0304	Reserved	-	-	-	
				B15 0: Normal state	
				8: Fault assured Forestes	
				8: Fault occurred [operates according to PRT- 30 (Trip Out	
0h0305	Inverter operation	-	-	B12 Mode) setting.]	
	state			B11-	
				B8 -	
				B7 1: Speed searching	

Comm. Address	Parameter	Scale	Unit	Assigned	content by bit
				B6	2: Accelerating
				B5	3: Operating at constant rate
				B4	<ul><li>4: Decelerating</li><li>5: Decelerating to stop</li><li>6: H/W OCS</li><li>7: S/W OCS</li><li>8: Dwell operating</li></ul>
				B3	
				B2	0: Stopped
				B1	1: Operating in forward direction 2: Operating in reverse direction
					3: DC operating (0 speed control)
				B0	
0h0306	Inverter operation frequency command source	-	-	B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1	Operation command source 0: Keypad 1: Communication option 3: Built-in RS 485 4: Terminal block  Frequency command source 0: Keypad speed 1: Keypad torque 2-4: Up/Down operation speed 5: V1, 7: V2, 8: I2 9: Pulse 10: Built-in RS 485 11: Communication option 13: Jog 14: PID
0h0307	LCD keypad S/W version	-	-	(Ex.) 0h0	25-39: Multi-step speed frequency 100: Version 1.00
0h0308	LCD keypad title version	-	_	(Ex.) 0h0	101: Version 1.01
0h0309-0h30F	Reserved	-	-	_	
0h0310	Output current	0.1	Α	-	
0h0311	Output frequency	0.01	Hz	-	
0h0312	Output rpm	0	rpm	-	
0h0313	Motor feedback speed	0	rpm	-32768 rp	om-32767 rpm (directional)
0h0314	Output voltage	1	V	-	
0h0315	DC Link voltage	1	V	-	

Comm. Address	Parameter	Scale	Unit	Assigned co	ntent by bit
0h0316	Output power	0.1	kW	-	
0h0317	Output torque	0.1	%	-	
0h0318	PID reference	0.1	%	-	
0h0319	PID feedback	0.1	%	-	
	Display the			Displays the	number of poles for the first
0h031A	number of poles	-	-	motor	e number of poles for the first
	for the 1st motor			IIIOIOI	
	Display the			Displays the	e number of poles for the 2nd
0h031B	number of poles	-	-	motor	e flutfiber of poles for the 2flu
	for the 2 <sup>nd</sup> motor			motor	
	Display the				
0h031C	number of poles	_	_		e number of poles for the selected
011051C	for the selected			motor	
	motor				
0h031D	Select Hz/rpm	-	-	0: Hz, 1: rpm	1
0h031E	Reserved	_	_	_	
-0h031F	110001100				
				BI5	Reserved
	Digital input information			-	-
				B7	Reserved
				B6	P7(I/O board)
0h0320				B5	P6(I/O board)
				B4	P5(I/O board)
				B3	P4(I/O board)
				B2	P3(I/O board)
				B1	P2(I/O board)
				B0	P1(I/O board)
				BI5	Reserved
				-	Reserved
	Digital output			B4	Reserved
0h0321	information	-	-	B3	Reserved
				B2	Reserved
				B1	Q1
				B0	Relay 1
				B15	Reserved
				-	Reserved
				B8	Reserved
	Virtual digital input			B7	Virtual DI 8(COM-77)
0h0322	information	-	-	B6	Virtual DI 7(COM-76)
				B5	Virtual DI 6(COM-75)
				B4	Virtual DI 5(COM-74)
				B3	Virtual DI 4(COM-73)
				B2	Virtual DI 3(COM-72)

Comm. Address	Parameter	Scale	Unit	Assigned co	ntent by bit
				B1	Virtual DI 2(COM-71)
				B0	Virtual DI 1(COM-70)
0h0323	Display the selected motor	-	-	0:1st motor	/1: 2nd motor
0h0324	Al1	0.01	%	Analog inpu	ut V1 (I/O board)
0h0325	Reserved	0.01	%		
0h0326	Al3	0.01	%	Analog inpu	ut V2 (I/O board)
0h0327	Al4	0.01	%	Analog inpu	ut I2 (I/O board)
0h0328	AO1	0.01	%	Analog out	out 1 (I/O board)
0h0329	AO2	0.01	%	Analog out	put 2 (I/O board)
0h032A	AO3	0.01	%	Reserved	
0h032B	AO4	0.01	%	Reserved	
0h032C	Reserved	-	-	-	
0h032D	Reserved	-	-	_	
0h032E	Reserved	-	-	_	
0h032F	Reserved	-	-	-	
				BI5	Fuse Open Trip
				BI4	Over Heat Trip
			-	BI3	Arm Short
				BI2	External Trip
				BI1	Overvoltage Trip
				BIO	Overcurrent Trip
				B9	NTC Trip
01 0220	Latch type trip			B8	Reserved
0h0330	information - 1	-		B7	Reserved
				B6	Input open-phase trip
				B5	Output open-phase trip
				B4	Ground Fault Trip
				B3	E-Thermal Trip
				B2	Inverter Overload Trip
				B1	Underload Trip
				ВО	Overload Trip
				BI5	Reserved
				BI4	Reserved
					Safety option to block inverter
				DIO	output at the terminal block
				BI3	input (only for products rated at
0h0331	Latch type trip	-	_		90 kW and above).
	information - 2			BI2	Reserved
				BI1	Reserved
				BIO	Bad option card
				B9	No motor trip
				B8	External brake trip

Comm. Address	Parameter	Scale	Unit	Assigned co	· · · · · · · · · · · · · · · · · · ·
				B7	Bad contact at basic I/O board
				B6	Pre PID Fail
				B5	Error while writing parameter
				B4	Reserved
				B3	FANTrip
				B2	PTC (Thermal sensor) Trip
				B1	Reserved
				B0	MC Fail Trip
				B15	Reserved
				-	<u> -</u>
				B8	Reserved
				B7	Reserved
-1	Level type trip			B6	Reserved
0h0332	information	-	-	B5	SafetyB
				B4	SafetyA
				B3	Keypad Lost Command
				B2	Lost Command
				B1	LV
				B0	BX
	H/W Diagnosis Trip		-	B15	Reserved
				-	Reserved
				B6	Reserved
01 0222				B5	Queue Full
0h0333	information	-		B4	Reserved
				B3	Watchdog-2 error
				B2	Watchdog-1 error
				B1	EEPROM error
				B0 B15	ADC error
				כום	Reserved
				-	Reserved
				B10	Reserved
				B9	Auto Tuning failed
				B8	Keypad lost
0h0334	Warning			B7	Encoder disconnection
0110354	information			B6	Wrong installation of encoder
				B5	DB
				B4	FAN running
				B3	Lost command
				B2	Inverter Overload
				B1	Underload

Comm. Address	Parameter	Scale	Unit	Assigned content by bit
				BO Overload
0h0335 -0h033F	Reserved	-	-	-
0h0340	On Time date	0	Day	Total number of days the inverter has been powered on
0h0341	On Time minute	0	Min	Total number of minutes excluding the total number of On Time days
0h0342	Run Time date	0	Day	Total number of days the inverter has driven the motor
0h0343	Run Time minute	0	Min	Total number of minutes excluding the total number of Run Time days
0h0344	Fan Time date	0	Day	Total number of days the heat sink fan has been running
0h0345	Fan Time minute	0	Min	Total number of minutes excluding the total number of Fan Time days
0h0346 -0h0348	Reserved	-	-	-
0h0349	Reserved	-	-	-
0h034A	Option 1	-	-	0: None, 9: CANopen
0h034B	Reserved	-	-	
0h034C	Reserved			

## **5.5.2 Control Area Parameter (Read/Write)**

Comm. Address	Parameter	Scale	Unit	Assigne	ed Content by Bit	
0h0380	Frequency command	0.01	Hz	Comma	and frequency setting	
0h0381	RPM command	1	rpm	Comma	and rpm setting	
				B7	Reserved	
				B6	Reserved	
				B5	Reserved	
				B4	Reserved	
				B3	0 → 1: Free-run stop	
060202	Operation			B2	0 → 1:Trip initialization	
0h0382	command	_	-	B1	0: Reverse command, 1: Forward command	
				ВО	0: Stop command, 1: Run command	
					e: Forward operation command 0003h,	
					e operation command 0001h.	
0h0383	Acceleration time	0.1	s	Acceler	ation time setting	
0h0384	Deceleration time	0.1	s	Deceleration time setting		
				BI5	Reserved	
				-	Reserved	
				B8	Reserved	
				B7	Virtual DI 8(COM-77)	
	Virtual digital			B6	Virtual DI 7(COM-76)	
0h0385	input control (0:	-	-	B5	Virtual DI 6(COM-75)	
	Off, 1:On)			B4	Virtual DI 5(COM-74)	
				B3	Virtual DI 4(COM-73)	
				B2	Virtual DI 3(COM-72)	
				B1	Virtual DI 2(COM-71)	
				B0	Virtual DI 1(COM-70)	
				BI5	Reserved	
				BI4	Reserved	
				BI3	Reserved	
				BI2	Reserved	
	Digital output			BI1	Reserved	
0h0386	control	-	-	BIO	Reserved	
	(0:Off, 1:On)			B9	Reserved	
				B8	Reserved	
				B7	Reserved	
				B6	Reserved	
				B5	Reserved	

Comm. Address	Parameter	Scale	Unit	Assigne	d Content by Bit	
				B4	Reserved	
				B3	Reserved	
				B2	Reserved	
				B1	Q1 (I/O board, OUT-33: None)	
				BO	Relay 1 (I/O board, OUT-31: None)	
0h0387	Reserved	-	-	Reserve	d	
0h0388	PID reference	0.1	%	PID refe	rence command	
0h0389	PID feedback value	0.1	%	PID feed	lback value	
0h038A	Motor rated current	0.1	А	-		
0h038B	Motor rated voltage	1	V	-		
0h038C- 0h038F	Reserved			-		
0h0390	Torque Ref	0.1	%	Torque	command	
0h0391	Fwd Pos Torque Limit	0.1	%	Forward	d motoring torque limit	
0h0392	Fwd Neg Torque Limit	0.1	%	Forward	d regenerative torque limit	
0h0393	Rev Pos Torque Limit	0.1	%	Reverse	motoring torque limit	
0h0394	Rev Neg Torque Limit	0.1	%	Reverse	regenerative torque limit	
0h0395	Torque Bias	0.1	%	Torque	bias	
0h0396-0h399	Reserved	_	-	-		
0h039A	Anytime Para	_	-	Set the	CNF-20 value	
0h039B	Monitor Line-1	-	-	Set the	CNF-21 value	
0h039C	Monitor Line-2	_	-	Set the CNF-22 value		
0h039D	Monitor Line-3	_	-	Set the CNF-23 value		

#### Note

A frequency set via communication using the common area frequency address (0h0380, 0h0005) is not saved even when used with the parameter save function. To save a changed frequency to use after a power cycle, follow these steps:

- 1 Set DRV-07 to Keypad-1 and select a random target frequency.
- 2 Set the frequency via communication into the parameter area frequency address (0h1101).
- Perform the parameter save (0h03E0: '1') before turning off the power. After the power cycle, the frequency set before turning off the power is displayed.

# **5.5.3 Inverter Memory Control Area Parameter (Read and Write)**

Comm. Address	Parameter	Scale	Unit	Changeable During Operation	Function
0h03E0	Save parameters	-	-	Χ	0: No, 1:Yes
0h03E1	Monitor mode initialization	-	-	О	0: No, 1:Yes
0h03E2	Parameter initialization	-	-	X	0: No, 1: All Grp, 2: DRV Grp 3: BAS Grp, 4: ADV Grp, 5: CON Grp 6: IN Grp, 7: OUT Grp, 8: COM Grp 9: APP Grp, 12: PRT Grp, 13: M2 Grp Setting is prohibited during fault trip interruptions.
0h03E3	Display changed parameters	-	_	О	0: No, 1: Yes
0h03E4	Reserved	-	-	-	-
0h03E5	Delete all fault history	-	-	0	0: No, 1: Yes
0h03E6	Delete user- registrated codes	-	-	О	0: No, 1: Yes
0h03E7	Hide parameter mode	0	Hex	0	Write: 0-9999 Read: 0: Unlock, 1: Lock
0h03E8	Lock parameter mode	0	Hex	0	Write: 0-9999 Read: 0: Unlock, 1: Lock
0h03E9	Easy start on (easy parameter setup mode)	-	-	0	0: No, 1: Yes
0h03EA	Initializing power consumption	-	_	О	0: No, 1: Yes
0h03EB	Initialize inverter operation accumulative time	-	-	0	0: No, 1: Yes
0h03EC	Initialize cooling fan accumulated operation time	-	-	0	0: No, 1: Yes

#### 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.
- The addresses 0h03E7 and 0h03E8 are parameters for entering the password. When the password is entered, the condition will change from Lock to Unlock, and vice versa. When the same parameter value is entered continuously, the parameter is executed just once. Therefore, if the same value is entered again, change it to another value first and then re-enter the previous value. For example, if you want to enter 244 twice, enter it in the following order: 244 → 0 → 244.

### ① 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.

## **6 Table of Functions**

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

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

## **6.1 Drive group (PAR→DRV)**

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

**SL**: Sensorless vector control (DRV-09)

\*O/X: Write-enabled during operation

<u> </u>	· VVIICE CITE	abled duffing op	Ciation							
Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-9	9	9	0	0	0	<u>p.52</u>
01	0h1101	Target frequency	Cmd Frequency	- Ma	rt frequency aximum quency(Hz)	0.00	0	0	0	<u>p.66</u>
02	0h1102	Torque command	Cmd Torque	-18	0~180[%]	0.0	0	X	0	-
03	0h1103	Acceleration time	Acc Time	0.0-	-600.0(s)	20.0	0	0	0	<u>p.89</u>
04	0h1104	Deceleration time	Dec Time	0.0-	-600.0(s)	30.0	0	0	0	<u>p.89</u>
06	0h1106	Command source	Cmd Source	0 1 2 3 4	Keypad Fx/Rx-1 Fx/Rx-2 Int 485 Field Bus	1: Fx/Rx-1	x	0	0	<u>p.81</u>
07	0h1107	Frequency reference source	Freq Ref Src	0 1 2 4 5 6 8	Keypad-1 Keypad-2 V1 V2 I2 Int 485 Field Bus	0: Keypad-1	х	О	0	<u>p.66</u>

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial value	Property*	V/F	SL	Ref.
	Madicss			12	Pulse	value				
				0	Keypad-1					
				1	Keypad-2					
				2	V1					
	01 4400	Torque	T 0.66	4	V2	0: Keypad-1		l.,		
80	0h1108	Reference	Trq Ref Scr	5	12	4	id-1 X X	Х	SL O O O O O O	
		Setting		6	Int485	]				
				8	Fieldbus	-				
				12	Pulse					
				0	V/F					p.97,
					Slip	-				
09	0h1109	Control mode	Control Mode	2	Compen	0: V/F	Х	0	0	
					IM .	-				
				4	Sensorless					
10	Ol- 110 A	T	Torque	0	No	O NI-	V	V		,
10	0h110A	Torque Control	Control	1	Yes	0: No	Х	Х	0	
				0.00	), Start					
1.1	01 1100		Jog		uency-	10.00				
11	0h110B	Jog frequency	Frequency		kimum	10.00	0	0	О	
			. ,	freq	uency(Hz)					
		Jog run								,
12	0h110C	acceleration	Jog Acc Time	0.0-	600.0(s)	20.0	0	0	0	
		time								
		Jog run								
13	0h110D	deceleration	Jog Dec Time	0.0	600.0(s)	30.0	0	0	0	
		time								
					2 kW,					
				1:0.	4 kW					
				2:0.	75 kW,					
				3: 1.	1 kW					
				4: 1.	5 kW,					
				5: 2.	2 kW					
				6:3.	0 kW,					
			Motor	7:3.	7 kW	Varies by				
14	0h110E	Motor capacity	Motor	8:4.	0 kW,	Motor	Χ	0	0	
			Capacity	9:5.	5 kW	capacity				
				10: 7	7.5 kW,					
				11:	11.0 kW					
					15.0 kW,					
					18.5 kW				0	
					22.0 kW					
					30.0 kW					
					37 kW					
	<u> </u>	l		10.3	· / I\VV	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial value	Property*	V/F	SL	Ref.
				18:5 19:7	15.0 kW 55.0 kW 75 kW 90 kW					
15	0h110F	Torque boost options	Torque Boost	0	Manual Auto	0: Manual	х	0	Х	
16 <sup>1</sup>	0h1110	Forward Torque boost	Fwd Boost	0.0-	15.0(%)	2.0	Х	0	Х	<u>p.101</u>
17 <sup>1</sup>	0h1111	Reverse Torque boost	Rev Boost	0.0-	15.0(%)	2.0	Х	0	Χ	<u>p.101</u>
18	0h1112	Base frequency	Base Freq	30.0 400	)0- .00(Hz)	60.00	Х	0	0	<u>p.97</u>
19	0h1113	Start frequency	Start Freq	0.01	I-10.00(Hz)	0.50	Х	0	0	<u>p.97</u>
20	0h1114	Maximum frequency	Max Freq	Slip 40.0 120	.00(Hz)[V/F, Compen]	60.00	Х	О	0	p.108
21	0h1115	Select speed unit	Hz/Rpm Sel	1	Hz Display Rpm Display	0:Hz Display	0	0	0	<u>p.78</u>
<b>22</b> <sup>2</sup>	0h1116	(+) Torque Gain	(+) Trq Gain	50.0	)-150.0[%]	100[%]	0	Х	0	-
<b>23</b> <sup>2</sup>	0h1117	(-)Torque Gain	(-) Trq Gain	50.0	)-150.0[%]	80.0[%]	0	Χ	0	-
<b>24</b> <sup>2</sup>	0h1118	(-)Torque Gain0	(-) Trq Gain0	50.0	)-150.0[%]	80.0[%]	0	Х	0	-
<b>25</b> <sup>2</sup>	0h1119	(-)Torque Offset	(-) Trq Offset	0.0-	100.0[%]	40.0[%]	0	Х	0	-
80	0h1150	Select ranges at power input	-	inve disp	ect ranges erter olays at ver input Run frequency Acceleratio n time Decelerati	0: run frequency	Ο	Ο	0	-

<sup>&</sup>lt;sup>1</sup> Displayed when DRV-15 is set to 0 (Manual)

 $<sup>^{2}\,</sup>$  Displayed when DRV-10 is set to 1 (Yes)

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial value	Property*	V/F	SL	Ref.
				3	on time Command source					
				4	Frequency reference source					
				5	Multi-step speed frequency1					
				6	Multi-step speed frequency2					
				7	Multi-step speed frequency3					
				8	Output current Motor RPM					
				10	Inverter DC voltage					
				11	User select signal (DRV-81)					
				12	Currently out of order					
				13	Select run direction output					
				14 15	current2 Motor					
				16	RPM2 Inverter DC voltage2					
				17	User select signal2 (DRV-81)					
					nitors user					
				sele	ected code	0:				
81	0h1151	Select monitor code	-	0	Output voltage(V)	U:	0	0	0	-
				1	Output electric	_				

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial value	Property*	V/F	SL	Ref.
					power(kW)					
				2	Torque(kgf					
					•m)					
		Display		0	View All	0:				
89	0h03E3	changed	-	1	View	View All	0	0	0	
		parameter		<u>'</u>	Changed	VICW/III				
					Move to					
				0	initial					
90	0h115A	[ESC] key	_		position	0:	Χ	0	0	
50	01111371	functions		1	JOG Key	None			ľ	
				2	Local/Rem					
					ote					
				0	No					
				1	All Grp					
				2	DRV Grp					
				3	BAS Grp					
				4	ADV Grp					
93	0h115D	Parameter		5	CON Grp	0:No	Χ	0	0	
,,,	0111132	initialization		6	IN Grp	010				
				7	OUTGrp					
				8	COM Grp					
				9	APP Grp					
				12	PRT Grp					
				13	M2 Grp					
		Password		0-						
94	0h115E	registration		99		-	0	0	0	
				99						
0.5	01.4455	Parameter lock		0-						
95	0h115F	settings		99		-	0	0	0	
				99						
97	0h1161	Software version	-			-	-	0	0	-
98	0h1162	Display I/O	IO S/W Ver			_	_	0	0	
		board version		_	N.A.   1.1.				Ĺ	
				0	Multiple					
		Display I/O		-	IO Charadanal	Chan				
99	0h1163	board HW	IO H/W Ver	1	Standard	Standard	_	0	0	-
		version			IO Charadanal	Ю				
				2	Standard					
				<u> </u>	IO (M)				<u> </u>	

# **6.2 Basic Function group (PAR→BAS)**

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

**SL**: Sensorless vector control function (DRV-09)

\*O/X: Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-9	9	20	0	0	0	<u>p.52</u>
				0	None					
		Auxiliary		1	V1					
01	0h1201	reference	Aux Ref Src	3	V2	0:None	Χ	0	О	
		source		4	12					
				6	Pulse					
				0	M+(G*A)					
				1	Mx (G*A)					
				2	M/(G*A)					
				3	M+[M*(G*A)]					
		Auxiliary		4	M+G*2(A-	0:				
<b>02</b> <sup>3</sup>	0h1202	command	Aux Calc Type		50%)	M+(GA	Х	0	0	
		calculation type	,	5	Mx[G*2(A-	)				
					50%) M/[G*2(A-					
				6	50%)]					
					M+M*G*2(A-					
				7	50%)					
03 <sup>3</sup>	01-1202	Auxiliary	A D ( C t	20		100.0	_			
03	0h1203	command gain	Aux Ref Gain	-20	0.0-200.0(%)	100.0	0	0	U	
				0	Keypad					
		2nd command		1	Fx/Rx-1	1:				
04	0h1204	source	Cmd 2nd Src	2	Fx/Rx-2	Fx/Rx-1	Х	0	Ο	<u>p.111</u>
		Source		3	Int 485					
				4	FieldBus					
				0	Keypad-1					
				1	Keypad-2					
		2nd frequency		2	V1	0:				
05	0h1205	source	Freq 2nd Src 4		V2	Keypad	0	0	0	<u>p.111</u>
		334166			12	-1				
			6	Int 485						
				8	FieldBus					

<sup>&</sup>lt;sup>3</sup> Displayed when BAS-01 is not set to 0 (None)

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				12	Pulse					
				0	Keypad-1					
				1	Keypad-2					
		On al Tarray va		2	V1	٦,				
06 <sup>4</sup>	0h1206	2nd Torque	Tray 2nd Cres	4	V2	0:		V	SL O O O O O O O O O O O O O O O O O O O	
06	0h1206	command	Trq 2 <sup>nd</sup> Src	5	12	Keypad	0	Х		
		source		6	Int 485	<b></b>				
				8	FieldBus					
				12	Pulse					
				0	Linear					
07	01 1207	V/F pattern	V/E D	1	Square	0:	\ ,			0.7
07	0h1207	options	V/F Pattern	2	User V/F	Linear	Х	0	X	<u>p.97</u>
		•		3	Square 2					
		Acc/dec		0	Max Freq	0:				
08	0h1208	standard	Ramp T Mode			Max	х	0	0	p.89
		frequency	·	1	Delta Freq	Freq				
				0	0.01 sec					
09	0h1209	Time scale	Time Scale	1	0.1 sec	1:0.1	Х	0	0	p.89
		settings		2	1 sec	sec				
	01 4004	Input power	10/5011 6 1	0	60 Hz	0.4011	.,			
10	0h120A	frequency	60/50 Hz Sel	1	50 Hz	0:60 Hz	Х	0	О	
	01.4000	Number of			-		.,			
11	0h120B	motor poles	Pole Number	2-4	8		Х	0	0	
10	01 1206	Rated slip	D + IGI:		2000(D )	Depen	,,			
12	0h120C	speed	Rated Slip	0-3	000(Rpm)	dent	Х	0	0	
12	0l-120D	Motor rated	D. L. J.C.	1.0	1000 0(4)	on	V			
13	0h120D	current	Rated Curr	1.0	-1000.0(A)	motor	Х	0	0	
	01.4205	Motor noload	N 1 16		1000 0(4)	setting	,,			
14	0h120E	current	Noload Curr	0.0	-1000.0(A)		Х	0	0	
15	0l- 120E	Motor rated	D-+IV-I+	17/	2.400(1.1)		V			- 103
15	0h120F	voltage	Rated Volt	170	0-480(V)	0	Х	0	0	<u>p.102</u>
		9				Depen				
		Motor				dent				
16	0h1210	Motor	Efficiency	70-	-100(%)	on	Х	0	0	
		efficiency				motor				
						setting				
17	0h1211	Load inertia	Inortia Pata	0-8	)		Х	0		
	0h1211	rate	Inertia Rate	U-8				0		
18	0h1212	Trim power	Trim Power %	70	-130(%)		0	0		
10	UIIIZIZ	display	minrower %	/0-	130(70)					

 $<sup>^4\,</sup>$  Displayed when DRV-09 is set to 4(IM Sensorless)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
19	0h1213	Input power voltage	AC Input Volt	170-480 V	220/38 0 V	0	0	0	
20	-	Auto Tuning	Auto Tuning	0 None 1 All (Rotation type) 2 ALL (Static type) Rs+Lsigma 3 (Rotation type) 6 Tr (Static type)	0:None	Х	Х	0	
21	-	Stator resistor	Rs		Depen	Χ	Χ	0	
22	-	Leakage inductance	Lsigma	Dependent on motor setting	dent on	X	Х	0	
23	_	Stator inductance	Ls	motor setting	motor setting	X	Х	0	
24 <sup>4</sup>	-	Rotor time constant	Tr	25-5000(ms)	-	Х	Х	0	
25 <sup>4</sup>	-	Stator inductance scale	Ls Scale	50-150(%)	100	X	Х	0	-
26 <sup>4</sup>	-	Rotor time constant scale	Tr Scale	50-150(%)	100	Х	Х	0	-
31 <sup>4</sup>		Regeneration inductance scale	Ls Regen Scale	70 ~ 100[%]	80	X	х	0	=
<b>41</b> <sup>5</sup>	0h1229	User frequency1	User Freq 1	0.00-Maximum frequency(Hz)	15.00	Х	0	Х	<u>p.99</u>
42 <sup>5</sup>	0h122A	User voltage1	User Volt 1	0-100(%)	25	Х	0	Χ	<u>p.99</u>
43 <sup>5</sup>	0h122B	User frequency2	User Freq 2	0.00-0.00- Maximum frequency(Hz)	30.00	х	0	х	<u>p.99</u>
<b>44</b> <sup>5</sup>	0h122C	User voltage2	User Volt 2	0-100(%)	50	Х	0	Χ	<u>p.99</u>
<b>45</b> <sup>5</sup>	0h122D	User frequency3	User Freq 3	0.00-Maximum frequency(Hz)	45.00	Х	0	Х	<u>p.99</u>
<b>46</b> <sup>5</sup>	0h122E	User voltage3	User Volt 3	0-100(%)	75	Х	0	Χ	<u>p.99</u>
47 <sup>5</sup>	0h122F	User frequency4	User Freq 4	0.00-Maximum frequency(Hz)	Maxim um freque	х	0	х	<u>p.99</u>

 $<sup>^5\,</sup>$  Displayed when either BAS-07 or M2-25 is set to 2 (User V/F)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
					ncy				
<b>48</b> <sup>5</sup>	0h1230	User voltage4	User Volt 4	0-100(%)	100	Х	0	Χ	<u>p.99</u>
50 <sup>6</sup>	0h1232	Multi-step speed frequency1	Step Freq-1	0.00-Maximum frequency(Hz)	10.00	О	0	o	<u>p.79</u>
51 <sup>6</sup>	0h1233	Multi-step speed frequency2	Step Freq-2	0.00-Maximum frequency(Hz)	20.00	0	0	O	<u>p.79</u>
52 <sup>6</sup>	0h1234	Multi-step speed frequency3	Step Freq-3	0.00-Maximum frequency(Hz)	30.00	0	0	O	<u>p.79</u>
53 <sup>6</sup>	0h1235	Multi-step speed frequency4	Step Freq-4	0.00-Maximum frequency(Hz)	40.00	О	0	0	<u>p.79</u>
54 <sup>6</sup>	0h1236	Multi-step speed frequency5	Step Freq-5	0.00-Maximum frequency(Hz)	50.00	О	0	0	<u>p.79</u>
55 <sup>6</sup>	0h1237	Multi-step speed frequency6	Step Freq-6	0.00-Maximum frequency(Hz)	Maxim um freque ncy	0	0	0	<u>p.79</u>
56 <sup>6</sup>	0h1238	Multi-step speed frequency7	Step Freq-7	0.00-Maximum frequency(Hz)	Maxim um freque ncy	0	0	0	<u>p.79</u>
70	0h1246	Multi-step acceleration time1	Acc Time-1	0.0-600.0(s)	20.0	0	0	0	<u>p.91</u>
71	0h1247	Multi-step deceleration time1	Dec Time-1	0.0-600.0(s)	20.0	0	0	O	<u>p.91</u>
<b>72</b> <sup>7</sup>	0h1248	Multi-step acceleration time2	Acc Time-2	0.0-600.0(s)	30.0	0	0	O	<u>p.91</u>
73 <sup>7</sup>	0h1249	Multi-step deceleration time2	Dec Time-2	0.0-600.0(s)	30.0	О	0	0	<u>p.91</u>
<b>74</b> <sup>7</sup>	0h124A	Multi-step acceleration	Acc Time-3	0.0-600.0(s)	40.0	0	0	0	<u>p.91</u>

 $<sup>^{6}\,</sup>$  Displayed when one of IN-65-71 is set to Speed-L/M/H

 $<sup>^{7}\,</sup>$  Displayed when one of IN-65-71 is set to Xcel-L/M/H

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		time3							
75 <sup>7</sup>	0h124B	Multi-step deceleration time3	Dec Time-3	0.0-600.0(s)	40.0	0	0	0	<u>p.91</u>
<b>76</b> <sup>7</sup>	0h124C	Multi-step acceleration time4	Acc Time-4	0.0-600.0(s)	50.0	0	0	0	<u>p.91</u>
<b>77</b> <sup>7</sup>	0h124D	Multi-step deceleration time4	Dec Time-4	0.0-600.0(s)	50.0	0	0	0	<u>p.91</u>
<b>78</b> <sup>7</sup>	0h124E	Multi-step acceleration time5	Acc Time-5	0.0-600.0(s)	40.0	0	0	0	<u>p.91</u>
79 <sup>7</sup>	0h124F	Multi-step deceleration time5	Dec Time-5	0.0-600.0(s)	40.0	0	0	0	<u>p.91</u>
80 <sup>7</sup>	0h1250	Multi-step acceleration time6	Acc Time-6	0.0-600.0(s)	30.0	0	О	0	<u>p.91</u>
81 <sup>7</sup>	0h1251	Multi-step deceleration time6	Dec Time-6	0.0-600.0(s)	30.0	0	0	0	<u>p.91</u>
82 <sup>7</sup>	0h1252	Multi-step acceleration time7	Acc Time-7	0.0-600.0(s)	20.0	0	0	0	<u>p.91</u>
83 <sup>7</sup>	0h1253	Multi-step deceleration time7	Dec Time-7	0.0-600.0(s)	20.0	0	0	0	<u>p.91</u>

# **6.3 Advanced Function group (PAR→ADV)**

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

**SL**: Sensorless vector control (DRV-09)

\*O/X: Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
00	_	Jump Code	Jump Code	1-9	9	24	0	0	0	<u>p.52</u>
01	0h1301	Acceleration pattern	Acc Pattern	0	Linear	0:	X	0	0	<u>p.94</u>
02	0h1302	Deceleration pattern	Dec Pattern	1	S-curve	Linear	X	0	0	<u>p.94</u>
03 <sup>8</sup>	0h1303	S-curve acceleration start point gradient	Acc S Start	1-1	00(%)	40	Х	0	0	<u>p.94</u>
<b>04</b> <sup>8</sup>	0h1304	S-curve acceleration end point gradient	Acc S End	1-1	00(%)	40	Х	0	0	<u>p.94</u>
05 <sup>9</sup>	0h1305	S-curve deceleration start point gradient	Dec S Start	1-1	00(%)	40	Х	0	0	<u>p.94</u>
<b>06</b> <sup>9</sup>	0h1306	S-curve deceleration end point gradient	Dec S End	1-1	00(%)	40	Х	0	0	<u>p.94</u>
07	0h1307	Start Mode	Start Mode	0	Acc	0:Acc	Х	0	0	p.103
	0111307	Start Mode	Start Wode	1	DC-Start	0.Acc	^	<u> </u>	0	<u>p.103</u>
				0	Dec					
	01.4000	G. 14 I	G. 14 I	1	DC-Brake		.,			
80	0h1308	Stop Mode	Stop Mode	2	Free-Run	0:Dec	Х	0	0	<u>p.104</u>
				4	Power Braking					
		Selection of		0	None					
09	0h1309	prohibited	Run Prevent	1	Forward Prev	0:	Χ	0	0	<u>p.86</u>
	57.1303	rotation direction		2	Reverse Prev	None	- 1	J		<u> </u>

<sup>&</sup>lt;sup>8</sup> Displayed when ADV- 01 is set to 1 (S-curve)

<sup>&</sup>lt;sup>9</sup> Displayed when ADV- 02 is set to 1 (S-curve)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
10	0h130A	Starting with power on	Power-on Run	0 No 1 Yes	0:No	0	0	0	<u>p.87</u>
12 <sup>10</sup>	0h130C	DC braking time at startup	DC-Start Time	0.00-60.00(s)	0.00	X	0	0	<u>p.103</u>
13	0h130D	Amount of applied DC	DC Inj Level	0-200(%)	50	X	0	0	<u>p.103</u>
14 <sup>11</sup>	0h130E	Output blocking time before DC braking	DC-Block Time	0.00- 60.00(s)	0.10	X	0	0	<u>p.104</u>
15 <sup>11</sup>	0h130F	DC braking time	DC-Brake Time	0.00-60.00(s)	1.00	X	0	0	<u>p.104</u>
16 <sup>11</sup>	0h1310	DC braking rate	DC-Brake Level	0-200(%)	50	X	0	0	<u>p.104</u>
17 <sup>11</sup>	0h1311	DC braking frequency	DC-Brake Freq	Start frequency- 60 Hz	5.00	X	0	0	<u>p.104</u>
20	0h1314	Dwell frequency on acceleration	Acc Dwell Freq	Start frequency- Maximum frequency(Hz)	5.00	Х	0	0	
21	0h1315	Dwell operation time on acceleration	Acc Dwell Time	0.0-60.0(s)	0.0	Х	0	0	
22	0h1316	Dwell frequency on deceleration	Dec Dwell Freq	Start frequency- Maximum frequency(Hz)	5.00	х	0	0	
23	0h1317	Dwell operation time on deceleration	Dec Dwell Time	0.0-60.0(s)	0.0	Х	0	0	
24	0h1318	Frequency limit	Freq Limit	0 No 1 Yes	0:No	Х	0	0	<u>p.108</u>
<b>25</b> <sup>12</sup>	0h1319	Frequency lower limit value	Freq Limit Lo	0.00-Upper limit frequency(Hz)	0.50	0	0	0	<u>p.108</u>
26 <sup>12</sup>	0h131A	Frequency upper limit value	Freq Limit Hi	Lower limit frequency- Maximum frequency(Hz)	maxim um freque ncy	Х	0	0	<u>p.108</u>
27	0h131B	Frequency jump	Jump Freq	0 No 1 Yes	0:No	Х	0	0	<u>p.110</u>
28 <sup>13</sup>	0h131C	Jump frequency	Jump Lo 1	0.00-Jump	10.00	0	0	0	<u>p.110</u>

<sup>&</sup>lt;sup>10</sup> Displayed when ADV- 07 is set to 1 (DC-Start)

<sup>&</sup>lt;sup>11</sup> Displayed when ADV- 08 is set to 1 (DC-Brake)

<sup>&</sup>lt;sup>12</sup> Displayed when ADV- 24 is set to 1 (Yes)

Code	Comm.	Name	LCD Display	Set	ting Range	Initial	Property*	V/F	SL	Ref.
	Address	lower limit1		frequency upper limit1(Hz)		Value				
<b>29</b> <sup>13</sup>	0h131D	Jump frequency upper limit1	Jump Hi 1	Jur Iow Ma	np frequency ver limit1- ximum quency(Hz)	15.00	0	0	0	<u>p.110</u>
30 <sup>13</sup>	0h131E	Jump frequency lower limit2	Jump Lo 2	free	0-Jump quency upper it2(Hz)	20.00	0	0	0	<u>p.110</u>
31 <sup>13</sup>	0h131F	Jump frequency upper limit2	Jump Hi 2	low Ma	np frequency ver limit2- ximum quency(Hz)	25.00	0	0	0	<u>p.110</u>
32 <sup>13</sup>	0h1320	Jump frequency lower limit3	Jump Lo 3	free	0-Jump quency upper it3(Hz)	30.00	0	0	0	<u>p.110</u>
<b>33</b> <sup>13</sup>	0h1321	Jump frequency upper limit3	Jump Hi 3	low Ma	np frequency ver limit3- ximum quency(Hz)	35.00	0	0	0	<u>p.110</u>
<b>41</b> <sup>14</sup>	0h1329	Brake release current	BR Rls Curr		-180.0(%)	50.0	0	0	0	
<b>42</b> <sup>14</sup>	0h132A	Brake release delay time	BR RIs Dly	0.0	0-10.00(s)	1.00	Х	0	0	
44 <sup>14</sup>	0h132C	Brake release Forward frequency	BR RIs Fwd Fr	0.00-Maximum frequency(Hz)		1.00	х	0	0	
45 <sup>14</sup>	0h132D	Brake release Reverse frequency	BR RIs Rev Fr	0.00-Maximum frequency(Hz)		1.00	Х	0	0	
46 <sup>14</sup>	0h132E	Brake engage delay time	BR Eng Dly	0.00-10.00(s)		1.00	Х	0	0	
<b>47</b> <sup>14</sup>	0h132F	Brake engage frequency	BR Eng Fr	0.00-Maximum frequency(Hz)		2.00	Х	O	0	
50	0h1332	Energy saving operation	E-Save Mode	0 None 1 Manual 2 Auto		0:Non e	х	0	Х	
<b>51</b> <sup>15</sup>	0h1333	Energy saving	Energy Save	0-30(%)		0	0	0	Х	

<sup>13</sup> Displayed when ADV- 27 is set to 1 (Yes)

<sup>&</sup>lt;sup>14</sup> Displayed when either OUT-31 or OUT-33 is set to 35 (BR Control)

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
		level								
60	0h133C	Acc/Dec time transition frequency	Xcel Change Fr		0-Maximum quency(Hz)	0.00	X/A	0	0	<u>p.93</u>
64	0h1340	Cooling fan control	FAN Control	<ul><li>0 During Run</li><li>1 Always ON</li><li>2 Temp Control</li></ul>		0:Duri ng Run	O/A	0	0	
65	0h1341	Up/down operation frequency save	U/D Save Mode	0 No 1 Yes		0:No	O/A	0	0	
66	0h1342	Output contact On/Off control options	On/Off Ctrl Src	0 None 1 V1 3 V2 4 I2 6 Pulse		0:Non e	X/A	0	0	
67	0h1343	Output contact On level	On-Ctrl Level	Output contact off level- 100.00%		90.00	X/A	0	0	
68	0h1344	Output contact Off level	Off-Ctrl Level	-100.00-output contact on level (%)		10.00	X/A	0	0	
70	0h1346	Safe operation selection	Run En Mode	0 Always Enable 1 DI Dependent		0:Alwa ys Enable	X/A	0	0	
<b>71</b> <sup>16</sup>	0h1347	Safe operation stop options	Run Dis Stop	0 1 2	Pree-Run Q-Stop Q-Stop Resume	0:Free- Run	X/A	0	0	
<b>72</b> <sup>16</sup>	0h1348	Safe operation deceleration time	Q-Stop Time	0.0-600.0(s)		5.0	O/A	0	0	
74	0h134A	Selection of regeneration evasion function for press		0	No					
			n134A evasion function for	RegenAvd Sel	1	Yes	0:No	X/A	0	0
75	0h134B	Voltage level of	RegenAvd		V:300-400 V	350	X/A	0	0	
		regeneration	Level	400	V:600-800 V	700			Ĺ	

<sup>15</sup> Displayed when ADV-50 is not set to 0 (None)

<sup>16</sup> Displayed when ADV-70 is set to 1 (DI Dependent)

Code	Comm. Address	Name	LCD Display	Sett	ting Range	Initial Value	Property*	V/F	SL	Ref.
		evasion motion for press								
<b>76</b> <sup>17</sup>	0h134C	Compensation frequency limit of regeneration evasion for press	CompFreq Limit	0.00	)- 10.00 Hz	1.00	X/A	0	0	
<b>77</b> <sup>17</sup>	0h134D	Regeneration evasion for press P gain	RegenAvd Pgain	0.0-	100.0%	50.0	O/A	0	0	
78 <sup>17</sup>	0h134E	Regeneration evasion for press I gain	RegenAvd Igain	20-3	30000(ms)	500	O/A	0	0	
80	0h1350	Fire Mode Selection	Fire Mode Sel	1	None Fire Mode Fire Mode Test	0:Non e	х	0	Х	<u>p.122</u>
81 <sup>18</sup>	0h1351	Fire Mode operation frequency	Fire Mode Freq	0.00	)-60.00[Hz]	60.00	Х	0	Х	<u>p.122</u>
40		Fire Mode		0	Forward	0:				
82 <sup>18</sup>	0h1352	operation direction	Fire Mode Dir	1	Reverse	Forwar d	Х	0	Х	<u>p.122</u>
83 <sup>18</sup>	-	Fire Mode Count	Fire Mode Cnt		able to dify	-	-	-	ı	<u>p.122</u>

 $<sup>^{\</sup>rm 17}\,$  Displayed when ADV-74 is set to 1 (Yes)

<sup>&</sup>lt;sup>18</sup> Displayed when ADV-80 is set to 1(Yes)

# **6.4 Control Function group (PAR→CON)**

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

**SL**: Sensorless vector control (DRV-09)

Code	Comm. Address	Name	LCD Display	Sett	ing Ran	ge	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99	)		4	0	0	0	<u>p.52</u>
				HD	30-45 kW	V/F: 1.0– 10.0 [kHz] SL: 2.0–10.0 [kHz]	3.0	0	0	0	
04	0h1404	Carrier	Carrier Freq	טח	55-75 kW	V/F: 1.0– 7.0 [kHz] SL: 2.0–7.0 [kHz]	13.0	O	O	U	
04	0111404	frequency	Camer Freq	ND	30-45 kW	V/F: 1.0–5.0 [kHz] SL: 2.0–5.0 [kHz]	-2.0	0	0	0	
				IND	55-75 kW	V/F: 1.0-3.0 [kHz] SL: 2.0-3.0 [kHz]	2.0				
05	0h1405	Switching	PWM	0		Normal PWM	0:Normal	x	0	0	
	0111103	mode	Mode	1		Lowleakage PWM	PWM	^			
09	0h1409	Initial excitation time	PreExTime	0.00	)-60.00(:	5)	1.00	х	Х	0	
10	0h140A	Initial excitation amount	Flux Force	100	.0-300.0	(%)	100.0	x	Х	0	
11	0h140B	Continued operation duration	Hold Time	0.00	)-60.00(	5)	0.00	х	Х	0	
20	0h1414	Sensorless	SL2 G View	0	0 No		0:No	0	Χ	0	

Code	Comm. Address	Name	LCD Display	Setting Range	<u> </u>	Initial Value	Property*	V/F	SL	Ref.
		2 <sup>nd</sup> gain display setting	Sel	1	Yes					
21	0h1415	Sensorless speed controller proportion al gain1	ASR-SL P Gain1	0-5000(%)		Depende nt on	0	х	0	
22	0h1416	Sensorless speed controller integral gain1	ASR-SL I Gain1	10-9999(ms)		motor setting	0	х	0	
<b>23</b> <sup>19</sup>	0h1417	Sensorless speed controller proportion al gain2	ASR-SL P Gain2	1.0-1000.0(%)	)		0	х	0	
<b>24</b> <sup>19</sup>	0h1418	Sensorless speed controller integral gain2	ASR-SL I Gain2	1.0-1000.0(%)	)		0	х	0	
<b>25</b> <sup>19</sup>	0h1419	Sensorless speed controller integral gain0	ASR-SL I Gain0	1.0-999.9(%)		Depende nt on motor	0	х	0	
<b>26</b> <sup>19</sup>	0h141A	Flux estimator proportion al gain	Flux P Gain	10-200(%)		setting	0	х	0	
27 <sup>19</sup>	0h141B	Flux estimator integral gain	Flux I Gain	10-200(%)			0	х	0	
28 <sup>19</sup>	0h141C	Speed estimator proportion al gain	S-Est P Gain1	0-32767			0	х	0	

 $<sup>^{19}\,</sup>$  Displayed when DRV-09 is set to 4 (IM Sensorless) and CIN-20 is set to 1 (YES)

Code	Comm. Address	Name	LCD Display			Initial Value	Property*	V/F	SL	Ref.
<b>29</b> <sup>19</sup>	0h141D	Speed estimator integral gain1	S-Est I Gain1	100-1000			0	Х	0	
<b>30</b> <sup>19</sup>	0h141E	Speed estimator integral gain2	S-Est I Gain2	100-10000			0	Х	0	
<b>31</b> <sup>19</sup>	0h141F	Sensorless current controller proportion al gain	ACR SL P Gain	10-1000			0	х	0	
32 <sup>19</sup>	0h1420	Sensorless current controller integral gain	ACR SL I Gain	10 -1000			0	Х	0	
48	-	Current controller P gain	ACR P Gain	0-10000		1200	0	Х	0	
49	-	Current controller I gain	ACR I Gain	0-10000		120	0	Х	0	
52	0h1434	Torque controller output filter	Torque Out LPF	0-2000(ms)		0	X	X	0	
53	0h1435	Torque limit setting options	Torque Lmt Src	0 Keyp 1 Keyp 2 V1 4 V2 5 I2 6 Int 48 8 Field 12 Pulse	ad-2 35 Bus	0: Keypad-1	X	Х	0	
<b>54</b> <sup>20</sup>	0h1436	Positive- direction reverse torque	FWD +Trq Lmt	0.0-200.0(%)		180	0	Х	0	

 $<sup>^{\</sup>rm 20}\,$  Displayed when DRV-09 is set to 1 (Yes). This will change the initial value of the parameter at ADV-74 (Torque limit) to 150%.

Code	Comm. Address	Name	LCD Display	Setting	Range	Initial Value	Property*	V/F	SL	Ref.
		limit Positive-								
55 <sup>20</sup>	0h1437	direction regenerati on torque limit	FWD -Trq Lmt	0.0-200	0(%)	180	0	х	0	
<b>56</b> <sup>20</sup>	0h1438	Negative- direction reverse torque limit	REV +Trq Lmt	0.0-200.0(%)		180	О	х	0	
57 <sup>20</sup>	0h1439	Negative- direction regenerati on torque limit	REV -Trq Lmt	0.0-200.0(%)		180	0	х	0	
62 <sup>20</sup>	0h143E	Speed limit setting	Speed Lmt Src	0 1 3 4 5 6 7	Keypad-2 V1 V2 I2 Int 485 FieldBus Keypad-2	0:Keypad -1	Х	Х	0	
63 <sup>20</sup>	0h143F	Positive- direction speed limit	FWD Speed Lmt	0.00-M frequer	aximum acy [Hz]	60.00	О	Х	0	
<b>64</b> <sup>20</sup>	0h1440	Negative- direction speed limit	REV Speed Lmt	0.00-M frequer	aximum acy [Hz]	60.00	0	Х	0	
<b>65</b> <sup>20</sup>	0h1441	Speed limit operation gain	Speed Lmt Gain	100~5000(%)		500	0	х	0	
		Speed		0 Flying Start-1 <sup>21</sup>		0:				
70	0h1446	search mode selection	SS Mode	1 Flying Start-2		Flying Start-1	Х	0	0	
71	0h1447	Speed	Speed	bit 0000-1111		0000	Χ	0	0	

 $<sup>^{21}\,</sup>$  Will not be Displayed when DRV-09 is set to 4 (IM Sensorless)

Code	Comm. Address	Name	LCD Display	Setting	Range	Initial Value	Property*	V/F	SL	Ref.
		search operation selection	Search	0001	Selection of speed search on acceleration					
				0010	When starting on initialization after fault trip					
				0100	power interruption					
				1000	When starting with power on					
<b>72</b> <sup>22</sup>	0h1448	Speed search reference current	SS Sup- Current	80-200(%)		150	0	0	0	
<b>73</b> <sup>23</sup>	0h1449	Speed search proportion al gain	SS P-Gain	0-9999		Flying Start-1:100 Flying Start-2:600 <sup>24</sup>	0	0	0	
<b>74</b> <sup>23</sup>	0h144A	Speed search integral gain	SS I-Gain	0-9999		Flying Start-1 : 200 Flying Start-2	0	0	0	
<b>75</b> <sup>23</sup>	0h144B	Output blocking time before speed search	SS Block Time	0.0-60.0(s)		1.0	Х	0	0	
76 <sup>23</sup>	0h144C	Speed search Estimator gain	Spd Est Gain	50-150(%)		100	О	0	0	

<sup>&</sup>lt;sup>22</sup> Displayed when any of the CON-71 code bits are set to 1 and CON-70 is set to 0 (Flying Start-1)

 $<sup>^{23}</sup>$  Displayed when any of the CON-71 code bits are set to 1

 $<sup>^{24}\,</sup>$  The initial value is 1200 when the motor-rated capacity is less than 7.5 kW

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		Energy		0	No					
77	0h144D	buffering selection	KEB Select	1	Yes	0:No	Х	0	0	
<b>78</b> <sup>25</sup>	0h144E	Energy buffering start level	KEB Start Lev	110.0-140.0(9	%)	125.0	х	0	0	
<b>79</b> <sup>25</sup>	0h144F	Energy buffering stop level	KEB Stop Lev	125.0-145.0(%)		130.0	х	0	0	
<b>80</b> <sup>25</sup>	0h1450	Energy buffering gain	KEB Gain	1-20000		1000	o	0	0	
85 <sup>26</sup>	0h1455	Flux estimator proportion al gain1	Flux P Gain1	100-700		370	О	х	0	
86 <sup>26</sup>	0h1456	Flux estimator proportion al gain2	Flux P Gain2	0-100		0	О	Х	0	
87 <sup>26</sup>	0h1457	Flux estimator proportion al gain3	Flux P Gain3	0-500		100	О	Х	0	
<b>88</b> <sup>26</sup>	0h1458	Flux estimator integral gain1	Flux I Gain1	0-200		50	О	Х	0	
<b>89</b> <sup>26</sup>	0h1459	Flux estimator integral gain2	Flux I Gain2	0-200		50	О	х	0	
<b>90</b> <sup>26</sup>	0h145A	Flux estimator integral gain3	Flux I Gain3	0-200		50	О	х	0	
<b>91</b> <sup>26</sup>	0h145B	Sensorless voltage compensat ion1	SL Volt Comp1	0-60		Depende nt on motor setting	0	х	0	

<sup>&</sup>lt;sup>25</sup> Displayed when CON-77 is set to 1 (Yes)

 $<sup>^{26}\,</sup>$  Displayed when CON-20 is set to 1 (Yes)

#### **Table of Functions**

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
<b>92</b> <sup>26</sup>	0h145C	Sensorless voltage compensat ion2	SL Volt Comp2	0-60		0	Χ	0	
<b>93</b> <sup>26</sup>	0h145D	Sensorless voltage compensat ion3	SL Volt Comp3	0-60		0	X	0	
<b>94</b> <sup>26</sup>	0h145E	Sensorless field weakening start frequency	SL FW Freq	80.0-110.0(%)	100.0	х	X	0	
<b>95</b> <sup>26</sup>	0h145F	Sensorless gain switching frequency	SL Fc Freq	0.00-8.00(Hz)	2.00	Х	X	0	

# **6.5 Input Terminal Block Function group (PAR→IN)**

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

**SL**: Sensorless vector control (DRV-09)

									_	
Code	Comm. Address	Name	LCD Display		tting Range	Initial Value	Property*	V/F	SL	Ref.
00 -	-	Jump Code	Jump Code	1-9	9	65	0	0	О	<u>p.52</u>
01	0h1501	Frequency for maximum analog input	Freq at 100%	Ma	nrt frequency- nximum quency(Hz)	Maxim um freque ncy	0	0	0	<u>p.67</u>
02	0h1502	Torque at maximum analog input	Torque at100%	0.0	-200.0(%)	100.0	0	Х	Х	-
05	0h1505	V1 input voltage display	V1 Monitor(V)	-12	2.00-12.00(V)	0.00	0	0	0	<u>p.67</u>
		V1 input		0	Unipolar	0:				
06	0h1506	polarity selection	V1 Polarity	1	Bipolar	Unipol ar	X	0	0	<u>p.67</u>
07	0h1507	Time constant of V1 input filter	V1 Filter	0-1	0000(ms)	10	0	0	0	<u>p.67</u>
08	0h1508	V1 Minimum input voltage	V1 Volt x1	0.0	0-10.00(V)	0.00	0	0	0	<u>p.67</u>
09	0h1509	V1 output at Minimum voltage (%)	V1 Perc y1	0.0	0-100.00(%)	0.00	О	0	0	<u>p.67</u>
10	0h150A	V1 Maximum input voltage	V1 Volt x2	0.0	0-12.00(V)	10.00	0	0	0	<u>p.67</u>
11 (	0h150B	V1 output at Maximum voltage (%)	V1 Perc y2	0.0	0-100.00(%)	100.00	О	0	0	<u>p.67</u>
12 <sup>27</sup>	0h150C	V1 Minimum input voltage	V1 -Volt x1'	-10	0.00-0.00(V)	0.00	0	0	0	<u>p.72</u>
	0h150D	V1output at Minimum voltage (%)	V1 -Perc y1'	-10	00.00-0.00(%)	0.00	О	0	0	<u>p.72</u>
14 <sup>27</sup>	0h150E	V1 Maximum	V1 -Volt x2'	-12	2.00-0.00(V)	-10.00	0	0	0	<u>p.72</u>

 $<sup>^{\</sup>rm 27}\,$  Displayed when IN-06 is set to 1 (Bipolar)

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		input voltage								
15 <sup>27</sup>	0h150F	V1 output at Maximum voltage (%)	V1 -Perc y2'	-10	0.00-0.00(%)	-100.00	0	0	0	<u>p.72</u>
		V1 rotation		0	No					
16	0h1510	direction change	V1 Inverting	1	Yes	0: No	0	0	0	<u>p.67</u>
17	0h1511	V1 quantization level	V1 Quantizing		0 <sup>28</sup> , 0.04- 00(%)	0.04	х	0	0	<u>p.67</u>
<b>35</b> <sup>29</sup>	0h1523	V2 input voltage display	V2 Monitor(V)	0.0	0-12.00(V)	0.00	0	0	0	<u>p.75</u>
37 <sup>29</sup>	0h1525	V2 input filter time constant	V2 Filter	0-1	0000(ms)	10	0	0	0	<u>p.75</u>
<b>38</b> <sup>29</sup>	0h1526	V2 Minimum input voltage	V2 Volt x1	0.0	0-10.00(V)	0.00	0	Х	Х	<u>p.75</u>
<b>39</b> <sup>29</sup>	0h1527	V2 output at Minimum voltage (%)	V2 Perc y1	0.0	0-100.00(%)	0.00	0	0	0	<u>p.75</u>
40 <sup>29</sup>	0h1528	V2 Maximum input voltage	V2 Volt x2	0.0	0-10.00(V)	10	0	Х	Х	<u>p.75</u>
<b>41</b> <sup>29</sup>	0h1529	V2 output at Maximum voltage (%)	V2 Perc y2	0.0	0-100.00(%)	100.00	0	0	0	<u>p.75</u>
20		V2 rotation		0	No					
46 <sup>29</sup>	0h152E	direction change	V2 Inverting	1	Yes	0:No	0	0	0	<u>p.75</u>
<b>47</b> <sup>29</sup>	0h152F	V2 quantization level	V2 Quantizing		0 <sup>28</sup> , 0.04- 00(%)	0.04	0	0	0	<u>p.75</u>
<b>50</b> <sup>30</sup>	0h1532	l2 input current display	I2 Monitor (mA)	0-24(mA)		0.00	0	0	0	<u>p.74</u>
<b>52</b> <sup>30</sup>	0h1534	I2 input filter time constant	12 Filter	0-10000(ms)		10	0	0	0	<u>p.74</u>
<b>53</b> <sup>30</sup>	0h1535	I2 minimum input current	I2 Curr x1	0.0	0-20.00(mA)	4.00	0	0	0	<u>p.74</u>

<sup>&</sup>lt;sup>28</sup> Quantizing is not used when set to 0.

 $<sup>^{29}\,</sup>$  Displayed when V is selected on the analog current/voltage input circuit selection switch (SW2

<sup>&</sup>lt;sup>30</sup> Displayed when I is selected on the analog current/voltage input circuit selection switch (SW2)

Code	Comm.	Name	LCD Display	Sat	ting Range	Initial	Property*	V/F	SL	Ref.
-coue	Address		ECD Display	Set	ting Kange	Value	r toperty"	V/I	JL.	nei.
<b>54</b> <sup>30</sup>	0h1536	I2 output at Minimum current (%)	I2 Perc y1	0.0	0-100.00(%)	0.00	0	0	0	<u>p.74</u>
<b>55</b> <sup>30</sup>	0h1537	I2 maximum input current	I2 Curr x2	0.0	0-24.00(mA)	20.00	0	0	0	<u>p.74</u>
<b>56</b> <sup>30</sup>	0h1538	I2 output at Maximum current (%)	I2 Perc y2	0.00-100.00(%)		100.00	0	0	0	<u>p.74</u>
61 <sup>30</sup>	0h153D	Changing rotation direction of I2	I2 Inverting	1	No Yes	0:No	0	0	0	<u>p.74</u>
<b>62</b> <sup>30</sup>	0h153E	l2 quantization level	I2 Quantizing		0 <sup>28</sup> ,0.04- 00(%)	0.04	0	0	0	<u>p.74</u>
				0	None					
65	0h1541	P1 terminal function setting	P1 Define	1	Fx	1:Fx	X	0	0	<u>p.81</u>
66	0h1542	P2 terminal function setting	P2 Define	2	Rx	2:Rx	х	0	0	<u>p.81</u>
67	0h1543	P3 terminal function setting	P3 Define	3	RST	5:BX	х	0	0	
68	0h1544	P4 terminal function setting	P4 Define	4	External Trip	3:RST	х	0	0	
69	0h1545	P5 terminal function setting	P5 Define	5	BX	7:Sp-L	Х	0	0	
70	0h1546	P6 terminal function setting	P6 Define	6	JOG	8:Sp-M	х	0	0	
71	0h1547	P7 terminal function setting	P7 Define	7	Speed-L	9:Sp-H	х	0	0	<u>p.79</u>
				8	Speed-M					<u>p.79</u>
				9	Speed-H					<u>p.79</u>
				_	XCEL-L					<u>p.91</u>
					XCEL-M					<u>p.91</u>
					RUN Enable	4				
					3-Wire 2nd Source					p.111
		1	1	נון	Zilu Jouice		<u> </u>	<u> </u>	]	<u>μ.ι ι ι</u>

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				16	Exchange					
				17	Up					
				18	Down					
				20	U/D Clear					
				21	Analog Hold					<u>p.78</u>
				22	I-Term Clear					
				23	PID Openloop					,
				24	P Gain2					,
				25	XCEL Stop					p.96
				26	2nd Motor					,
				34	Pre Excite					
				38	Timer In					
				40	dis Aux Ref					
				46	FWD JOG					
				47	REV JOG	1				
				49	XCEL-H					
				50	User Seg					0.1
				51	Fire Mode					<u>p.91</u>
				54	TI					
85	0h1555	Multi-function input terminal On filter	DI On Delay		0000(ms)	10	0	0	0	<u>p.112</u>
86	0h1556	Multi-function input terminal Off filter	DI Off Delay	0-1	0000(ms)	3	0	0	0	<u>p.112</u>
		Multi-function		P7	– P1					
87	0h1557	input contact	DI NC/NO Sel	0	A contact (NO)	000 0000	х	0	0	<u>p.112</u>
		selection		1	B contact (NC)					
89	0h1559	Multi-step command delay time	InCheck Time	1-5	000(ms)	1	x	0	0	<u>p.79</u>
				P7	– P1					
		Multi-function		0	release(Off)	000	_	_	_	
90	0h155A	input terminal status	DI Status	1	Connection (On)	0000	0	0	0	<u>p.112</u>
91	0h155B	Pulse input amount display	Pulse Monitor (kHz)	0.0	0-50.00(kHz)	0.00	0	0	0	<u>p.76</u>
92	0h155C	TI input filter time constant	TI Filter	0-9	9999(ms)	10	0	0	0	<u>p.76</u>
93	0h155D	TI Minimum input pulse	TI Pls x1	0.0	0-32.00(kHz)	0	O/A	0	0	<u>p.76</u>

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
94	0h153E	TI output at Minimum pulse (%)	TI Perc y1	0.00-100.00(%)		0.00	O/A	0	0	<u>p.76</u>
95	0h155F	TI Maximum input pulse	TI Pls x2	0.00-32.00(kHz)		32.00	O/A	0	0	<u>p.76</u>
96	0h1560	TI Output at Maximum pulse (%)	TI Perc y2	0-100(%)		100.00	O/A	0	0	<u>p.76</u>
97	0h1561	TI rotation direction change	TI Inverting	0	No Yes	0:No	O/A	0	0	<u>p.76</u>
98	0h1562	TI quantization level	TI Quantizing		0 <sup>28</sup> , 0.04- 00(%)	0.04	O/A	О	0	<u>p.76</u>
99	0h1563	SW1(NPN/PNP)/ SW2(V2[I2]) Status display	IO SW State	Bit 00~11 00 V2, NPN 01 V2, PNP 10 I2, NPN 11 I2, PNP		00	0	Ο	0	-

# **6.6 Output Terminal Block Function group (PAR→OUT)**

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

**SL**: Sensorless vector control (DRV-09)

Code	Comm. Address	Name	LCD Display		ng Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	JumpCode	1-99		30	0	0	0	<u>p.52</u>
				0	Frequency					
				1	Output Current					
				2	Output Voltage					
				3	DCLink Voltage					
				4	Torque					
				5	Output Power					
		Analog output				0:				
01	0h1601	1 item	AO1 Mode			Frequenc	0	0	0	
		T ICCITI				У				
				9 Ramp Freq						
				10 Speed Fdb						
				12 PID Ref Value						
				13 PID Fdb Value						
				14 PID Output						
				15	Constant					
02	0h1602	Analog output 1 gain	AO1 Gain	-100	0.0-1000.0(%)	100.0	0	0	0	
03	0h1603	Analog output 1 bias	AO1 Bias	-100	.0-100.0(%)	0.0	0	0	0	
04	0h1604	Analog output 1 filter	AO1 Filter	0-10	000(ms)	5	0	0	0	
05	0h1606	Analog constant output 1	AO1 Const %	0.0-1	00.0(%)	0.0	0	0	0	
06	0h1606	Analog output 1 monitor	AO1 Monitor	0.0-1	000.0(%)	0.0		0	0	
				0 Frequency						,
				1	Output Current					
				2 Output Voltag						
07	0h1607	Analog output	AO2 Mode	3	DCLink Voltage					
		2 item		4	Torque					
				5	Output Power					
				6	Idse					
				6 Idse	1430					

Code	Comm. Address	Name	LCD Display	Setting Range  7		Initial Value	Property*	V/F	SL	Ref.
			. ,	7	lqse					
				8	Target Freq					
				9	Ramp Freq					
				10	Speed Fdb					
				12	PID Ref Value					
				13	PID Fdb Value					
				14	PID Output					
				15	Constant					
08	0h1608	Analog output 2 gain	AO2 Gain	-100	0.0~1000.0(%)	100.0	0	0	0	
09	0h1609	Analog output 2 bias	AO2 Bias	-100	.0~100.0(%)	0.0	0	0	0	
10	0h160A	Analog output 2 filter	AO2 Filter	0~10	0000(ms)	5	0	0	0	
11	0h160B	Analog constant output 2	AO2 Const %	0.0~	100.0(%)	0.0	0	o	0	
12	0h160C	Analog output 2 monitor	AO2 Monitor	0.0~	1000.0(%)	0.0		0	0	
				bit	000-111					
				1	Low voltage					
30	0h161E	Fault output item	Trip Out Mode	2	Any faults other than low voltage	010	0	0	0	
				3	Automatic restart final failure					
				0	None					
				1	FDT-1	]				
				2	FDT-2					
				3	FDT-3	4				
				4	FDT-4	-				
				5	Over Load					
31	0h161F	Multi-function	Polov 1	6 7	IOL Under Load	20.Trip			0	
31	UIIIOIF	relay 1 item	Relay 1	8	Fan Warning	29:Trip	0	0		
				9	Stall	1				
				10	Over Voltage	1				
				11	Low Voltage	†				
				12	Over Heat	1				
				13	Lost Command	1				
				14	Run	1				

Code	Comm.	Name	LCD	Sett	ing Range	Initial	Property*	V/F	SL	Ref.
Couc	Address	Name	Display			Value	Troperty	•/•	<b>J</b> L	iici.
				15	Stop					
				16	Steady					
				17	Inverter Line					
				18	Comm Line					
				19	Speed Search					
				22	Ready Timer Out					
				28 29	Timer Out Trip					
				31	DB Warn%ED					
				34	On/Off Control					
				35	BR Control					
				36	CAP. Warning					
				37	Fan Exchange					
				38	Fire Mode					
				0	None					
				1	FDT-1					
				2	FDT-2					
				3	FDT-3					
				4	FDT-4					
				5	Over Load					
				6	IOL					
				7	Under Load					
				8	Fan Warning					
				9	Stall					
				10	Over Voltage					
				11	Low Voltage					
				12	Over Heat					
32	0h1620	Multi-function	Relay 2	13	Lost Command	14: Run	0	0	0	
32	0111020	relay 2 item	nciay 2	14	Run	17.11011				
				15	Stop					
				16	Steady					
				17	Inverter Line					
				18	Comm Line					
				19	Speed Search					
				22						
				-	Ready Timer Out					
				28						
				29	Trip DB Warn%ED					
				31						
			34	On/Off Control	itrol					
				35	BR Control					
			<u> </u>	36	CAP. Warning					

Code	Comm. Address	Name	LCD Display	37 Fan Exchange		Initial Value	Property*	V/F	SL	Ref.
				37	Fan Exchange					
				38	Fire Mode					
				0	None					
				1	FDT-1					
				2	FDT-2					
				3	FDT-3					
				4	FDT-4					
				5	Over Load					
				6	IOL					
				7	Under Load					
				8	Fan Warning					
				9	Stall					
				10	Over Voltage					
				11	Low Voltage					
				12	Over Heat					
				13	Lost Command					
33	0h1621	Multi-function	Q1 Define	14	Run	14:Run	0	0	0	
33	0111021	output1 item	Q1 Deline	15	Stop	14.Nuii	١٥			
				16	Steady					
				17	Inverter Line					
				18	Comm Line					
				19	Speed Search					
				22	Ready					
				28	Timer Out					
				29	Trip					
				31	DB Warn%ED					
				34	On/Off Control					
				35	BR Control					
				36	CAP. Warning					
				37	Fan Exchange					
				38	Fire Mode					
				39	TO					
		Multi-function								
41	0h1629	output	DO Status	-		00	X	-	-	
		monitor								
		Multi-function	DO On						_	
50	0h1632	output	Delay	0.00	-100.00(s)	0.00	0	0	0	
		On delay								
		Multi-function	DO Off							
51	0h1633	output	Delay	0.00	-100.00(s)	0.00	0	0	0	
	01.150:	Off delay	·	01	D   4	00	\			
52	0h1634	Multi-function	DO	Q1,	Relay1	00	Χ	0	О	

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		output	NC/NO Sel	0	A contact (NO)					
		contact selection		1	B contact (NC)					
53	0h1635	Fault output On delay	TripOut OnDly	0.00	-100.00(s)	0.00	0	0	0	
54	0h1636	Fault output Off delay	TripOut OffDly	0.00-100.00(s)		0.00	0	0	0	
55	h1637	Timer On delay	TimerOn Delay	0.00-100.00(s)		0.00	0	0	0	
56	0h1638	Timer Off delay	TimerOff Delay	0.00-100.00(s)		0.00	0	0	0	
57	0h1639	Detected frequency	FDT Frequency	0.00-Maximum frequency(Hz)		30.00	0	0	0	
58	0h163A	Detected frequency band	FDT Band	0.00-Maximum frequency(Hz)		10.00	0	0	0	
61	0h163D	Pulse output gain	TO Mode	0 1 2 3 4 5 6 7 8 9 10 12 13 14 15	Frequency Output Current Output Voltage DCLink Voltage Torque Output Power Idse Iqse Target Freq Ramp Freq Speed Fdb PID Ref Value PID Output Constant	0	O/A	0	0	
62	0h163E	Pulse output gain	TO Gain	-100	0.0-1000.0(%)	100.0	0	0	0	
63	0h163F	Pulse output bias	TO Bias	-100.0-100.0(%)		0.0	0	0	0	
64	0h1640	Pulse output filter	TO Filter	0-10000(ms)		5	0	0	0	
65	0h1641	Pulse output constant output 2	TO Const %	0.0-100.0(%)		0.0	0	0	0	
66	0h1642	Pulse output monitor	TO Monitor	0.0-1000.0(%)		0.0	0	0	0	

### **6.7 Communication Function group (PAR→COM)**

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

**SL**: Sensorless vector control (DRV-09)

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-9	9	20	0	0	0	<u>p.52</u>
01	0h1701	Built-in communication inverter ID	Int485 St ID	1-250		1	0	0	0	<u>p.127</u>
02 <sup>31</sup>	0h1702	Built-in communication protocol	Int485 Proto	<ul><li>0 ModBus RTU</li><li>2 LS Inv 485</li></ul>		0: ModBus RTU	0	0	0	<u>p.127</u>
				0	1200 bps					
				1 2400 bps						
		Built-in		2 4800 bps						
<b>03</b> <sup>31</sup>	0h1703	communication	Int485	3 9600 bps		3:	0	0	0	n 127
03	0111703	speed	BaudR	4 19200 bps		9600 bps		١		<u>p.127</u>
		speed		5 38400 bps						
				6	56 Kbps					
				7	115 Kbps <sup>32</sup>					
		Built-in		0	D8/PN/S1					
<b>04</b> <sup>31</sup>	0h1704	communication	Int485	1	D8/PN/S2	0:	0	0	0	p.127
04	0111704	frame setting	Mode	2	D8/PE/S1	D8/PN/S1				<u>p.127</u>
				3	D8/PO/S1					
05 <sup>31</sup>	0h1705	Transmission delay after reception	Resp Delay	0-1	000(ms)	5ms	0	0	0	<u>p.127</u>
06 <sup>33</sup>	0h1706	Communication option S/W version	FBus S/W Ver	-		0.00	0	0	0	-
07 <sup>33</sup>	0h1707	Communication option inverter ID	FBus ID	0-255		1	О	0	0	-
08 <sup>33</sup>	0h1708	FIELD BUS communication	FBUS BaudRate	-		12Mbps	_	0	0	-

<sup>&</sup>lt;sup>31</sup> Will not be displayed when P2P and Multi KPD is set

<sup>&</sup>lt;sup>32</sup> 115,200 bps

<sup>&</sup>lt;sup>33</sup> Displayed only when a communication option card is installed

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
09 <sup>33</sup>	0h1709	speed Communication option LED status	FieldBus LED	-	-	0	0	0	-
30	0h171E	Number of output parameters	ParaStatus Num	0-8	3	0	0	0	<u>p.132</u>
<b>31</b> <sup>34</sup>	0h171F	Output Communication address1	Para Stauts-	0000-FFFF Hex	000A	0	0	0	<u>p.132</u>
32 <sup>34</sup>	0h1720	Output Communication address2	Para Stauts- 2	0000-FFFF Hex	000E	0	0	0	<u>p.132</u>
<b>33</b> <sup>34</sup>	0h1721	Output Communication address3	Para Stauts-	0000-FFFF Hex	000F	0	0	0	<u>p.132</u>
<b>34</b> <sup>34</sup>	0h1722	Output Communication address4	Para Stauts-	0000-FFFF Hex	0000	0	0	0	<u>p.132</u>
<b>35</b> <sup>34</sup>	0h1723	Output Communication address5	Para Stauts- 5	0000-FFFF Hex	0000	0	0	0	<u>p.132</u>
<b>36</b> <sup>34</sup>	0h1724	Output Communication address6	Para Stauts-	0000-FFFF Hex	0000	0	0	0	<u>p.132</u>
<b>37</b> <sup>34</sup>	0h1725	Output Communication address7	Para Stauts-	0000-FFFF Hex	0000	0	0	0	<u>p.132</u>
<b>38</b> <sup>34</sup>	0h1726	Output Communication address8	Para Stauts-	0000-FFFF Hex	0000	0	0	0	<u>p.132</u>
50	0h1732	Number of input parameters	Para Ctrl Num	0-8	2	0	0	0	<u>p.132</u>
<b>51</b> <sup>35</sup>	0h1733	Input Communication address1	Para Control-1	0000-FFFF Hex	0005	х	0	0	<u>p.132</u>
<b>52</b> <sup>35</sup>	0h1734	Input Communication address2	Para Control-2	0000-FFFF Hex	0006	Х	О	0	<u>p.132</u>

 $<sup>^{\</sup>rm 34}\,$  Only the range of addresses set at COM-30 is displayed.

<sup>&</sup>lt;sup>35</sup> Only the range of addresses set at COM-50 is displayed.

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
<b>53</b> <sup>35</sup>	0h1735	Input Communication address3	Para Control-3	000	0-FFFF Hex	0000	х	0	0	<u>p.132</u>
<b>54</b> <sup>35</sup>	0h1736	Input Communication address4	Para Control-4	000	0-FFFF Hex	0000	х	0	0	<u>p.132</u>
<b>55</b> <sup>35</sup>	0h1737	Input Communication address5	Para Control-5	000	0-FFFF Hex	0000	х	0	0	<u>p.132</u>
<b>56</b> <sup>35</sup>	0h1738	Input Communication address6	Para Control-6	000	0-FFFF Hex	0000	х	0	0	<u>p.132</u>
<b>57</b> <sup>35</sup>	0h1739	Input Communication address7	Para Control-7	000	0-FFFF Hex	0000	х	0	0	<u>p.132</u>
<b>58</b> <sup>35</sup>	0h173A	Input Communication address8	Para Control-8	000	0-FFFF Hex	0000	х	0	0	<u>p.132</u>
68	0h1744	Field bus data swap	FBus Swap Sel	0	No Yes	0	Х	0	0	-
70	0h1746	Communication multi-function input 1	Virtual DI 1	0	None	0:None	0	0	0	<u>p.151</u>
71	0h1747	Communication multi-function input 2	Virtual DI 2	1	Fx	0:None	0	0	0	<u>p.151</u>
72	0h1748	Communication multi-function input 3	Virtual DI 3	2	Rx	0:None	0	0	0	<u>p.151</u>
73	0h1749	Communication multi-function input 4	Virtual DI 4	3	RST	0:None	0	0	0	<u>p.151</u>
74	0h174A	Communication multi-function input 5	Virtual DI 5	4	External Trip	0:None	0	0	0	<u>p.151</u>
75	0h174B	Communication multi-function input 6	Virtual DI 6	5	BX	0:None	0	0	0	<u>p.151</u>
76	0h174C	Communication multi-function input 7	Virtual DI 7	6	JOG	0:None	0	0	0	<u>p.151</u>
77	0h174D	Communication multi-function	Virtual DI 8	7 Speed-L 8 Speed-M		0:None	0	0	0	<u>p.151</u>

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		input 8		9 11 12 13 14 15 16 17 18 20 21 22 23 24 25 26 34 38 40 46 47 49	Speed-H XCEL-L XCEL-M RUN Enable 3-Wire 2nd Source Exchange Up Down U/D Clear Analog Hold I-Term Clear PID Openloop P Gain2 XCEL Stop 2nd Motor Pre Excite Timer In dis Aux Ref FWD JOG REV JOG XCEL-H					
86	0h1756	Communication multi-function input monitoring	Virt DI Status	-		0	х	0	0	<u>p.130</u>
		Selection of data frame	Comm	0	Int485	-				
90	0h175A	communication monitor	Mon Sel	1	Keypad	0	0	0	0	-
91	0h175B	Data frame Rev count	Rev Frame Num	0-65	5535	0	0	0	0	-
92	0h175C	Data frame Err count	Err Frame Num	0-65	5535	0	0	0	0	-
93	0h175D	NAK frame count	NAK Frame Num	0-65	5535	0	0	0	0	-
<b>94</b> <sup>36</sup>	_	Communication	Comm	0	No	0:No	-	0	0	-
95	0h1760	data upload P2P communication	Update Int 485 Func	1 0 1	Yes Disable All P2P Master	0: Disable	X	0	0	<u>p.113</u>

 $<sup>^{\</sup>rm 36}\,$  Displayed only when a communication option card is installed

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property*	V/F	SL	Ref.
		selection		2	P2P Slave	All				
				3	KPD-Ready					
				0	No					
96 <sup>37</sup>	-	DO setting	P2P DO Sel	1	Multi- function setting	0:No	0	0	0	<u>p.113</u>
		selection		2	Multi- function output					,

# **6.8 Application Function group (PAR→APP)**

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

**SL**: Sensorless vector control (DRV-09)

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	=	Jump Code	Jump Code	1-99	)	20	0	0	0	<u>p.52</u>
01	0h1801	Application function	App Mode	0	None -	0: None	Х	0	0	
		selection		0	Proc PID No					
02	-	Enable user sequence	User Seq En	1	Yes	0:No	Х	0	0	<u>p.115</u>
16 <sup>38</sup>	0h1810	PID output monitor	PID Output	(%)		0.00		0	0	
17 <sup>38</sup>	0h1811	PID reference monitor	PID Ref Value	(%)		50.00		0	0	
18 <sup>38</sup>	0h1812	PID feedback monitor	PID Fdb Value	(%)		0.00		0	0	
19 <sup>38</sup>	0h1813	PID reference setting	PID Ref Set	-100 100.	).00- 00(%)	50.00	0	0	0	
20 <sup>38</sup>	0h1814	PID reference source	PID Ref Source	0 1 3	Keypad V1 V2	0: Keypad	Х	Ο	0	

<sup>&</sup>lt;sup>37</sup> Displayed when APP-01 is set to 2 (Proc PID)

<sup>&</sup>lt;sup>38</sup> Displayed when APP-01 is set to 2 (Proc PID)

21 <sup>38</sup>   Oh1815   PID feedback source   PID   Feedback source   PID   PID   Feedback source   PID   Feedback source   PID	Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
21 <sup>38</sup>										
21 <sup>38</sup>										
21 <sup>38</sup>										
2138										
21 <sup>38</sup>										
22  38										
Source   F/B Source   4	21 <sup>38</sup>	0h1815	PID feedback		<b>—</b>	0:V1	x	0	0	
PID controller proportional gain   PID P-Gain gain   PID P-Gain gain   PID controller integral time   PID controller integral time   PID controller differentiation time   PID controller differentiation time   PID controller differentiation gain   PID controller differentiation time   PID controller differentiation gain   PID p-Time   O-1000(ms)   O O O O O O O O O O O O O O O O O O		0111013	source	F/B Source	L	0.01				
22 <sup>38</sup>										
22 <sup>38</sup>					10   Pulse					
Gain   PID controller   PID HTime   O.0-200.0(s)   10.0   O   O   O   O	38			2022						
23 <sup>38</sup>	22	0h1816	•	PID P-Gain	0.0-1000.0(%)	50.0	O	О	O	
24 <sup>38</sup>   Oh1818   Oh1818   Oh1818   Oh1818   Oh1819   O										
24 <sup>38</sup>	<b>23</b> <sup>38</sup>	0h1817		PID I-Time	0.0-200.0(s)	10.0	0	0	0	
24 <sup>38</sup>										
time	24 <sup>38</sup>	0h1010		DID D.Timo	0-1000(ms)	0				
PID controller   Feed-forward compensation gain   PID F-Gain   PID F	24	0111010		PID D-IIIIle	0-1000(1118)	0				
25 <sup>38</sup>   Oh1819   feed-forward compensation gain   PID F-Gain   O.0-1000.0(%)   O.0   O   O   O   O   O   O   O   O   O			<del></del>							
26  28  0h181A   Proportional gain scale   P Gain Scale   0.0-100.0(%)   100.0   X   O   O   O	20									
Gain   Proportional gain scale   P Gain Scale   O.O-100.0(%)   100.0   X   O   O	25°°	0h1819		PID F-Gain	0.0-1000.0(%)	0.0	0	0	0	
26 <sup>38</sup>   Oh181A   Proportional gain scale   P Gain Scale   O.O-100.0(%)   100.0   X   O   O			•							
27 <sup>38</sup>   Oh181B   PID output filter   PID Out LPF   O-10000(ms)   O   O   O   O   O	2638	Ol- 101 A	•	D.C.: Cl.	0.0.100.0(0/)	100.0	V			
28 <sup>38</sup>   Oh181C   PID Mode   PID Mode   PID Mode   O   Process PID   O   X   O   O	26	ONIBIA	•	P Gain Scale	0.0-100.0(%)	100.0	X	O	O	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	27 <sup>38</sup>	0h181B	PID output filter	PID Out LPF		0	0	0	0	
28 <sup>38</sup>   Oh181C   PID Mode   PID Mode   PID Mode     PID   O					111					
1   Normal PID	28 <sup>38</sup>	0h181C	PID Mode	PID Mode	PID	0	x	0	0	
29 <sup>38</sup> 0h181D         PID upper limit frequency         PID Limit Hi         PID lower limit frequency-300.00(Hz)         60.00         O										
29 <sup>38</sup> Oh181D         Oh181D         PID upper limit frequency         PID Limit Hi         frequency-300.00(Hz)         60.00         O					<del></del>					
30   30   30   30   30   30   30   30	2038	0h101D	PID upper limit	DID Line H. L.		60.00				
30 <sup>38</sup>   0h181E   PID lower limit frequency   PID Limit Lo   -300.00 -PID   upper limit frequency(Hz)   -60.00   O   O   O	29	טואוטט	* *	PID LIMIT HI		60.00	0	0	O	
30 <sup>38</sup>   Oh181E   PID lower limit frequency   PID Limit Lo   upper limit frequency(Hz)   -60.00   O   O   O					, , , ,					
131   38   313	30 <sup>38</sup>	0h191E	PID lower limit	DID Limit Lo		-60.00				
31 <sup>38</sup> 0h181F         PID output inverse         PID Out Inv         0         No         No         X         O         O           32 <sup>38</sup> 0h1820         PID output scale         PID Out Scale         0.1-1000.0(%)         100.0         X         O         O           34 <sup>38</sup> 0h1822         PID controller motion frequency         Pre-PID Freq Pre-PID Freq frequency(Hz)         0.00 Maximum frequency(Hz)         0.00 Maximum frequency(Hz)         0.00 Maximum frequency(Hz)	30	OIIIOIL	frequency	FID LITTIC LO	1	-00.00				
1   Yes   0:NO   X   O   O	20		PID output		<del>                                     </del>					
32 <sup>38</sup> 0h1820         PID output scale         PID Out Scale         0.1-1000.0(%)         100.0         X         O         O           34 <sup>38</sup> 0h1822         PID controller motion frequency         Pre-PID Freq         0.00-Maximum frequency(Hz)         0.00         X         O         O	31 <sup>38</sup>	0h181F	•	PID Out Inv	<b></b>	0:No	X	0	0	
34 <sup>38</sup> Oh1822 motion frequency Pre-PID Freq Maximum frequency(Hz) O O	32 <sup>38</sup>	0h1820		PID Out Scale		100.0	Х	0	0	
34 <sup>38</sup> Oh1822 motion frequency Pre-PID Freq Maximum frequency(Hz) O.00 X O O			PID controller		0.00-					
frequency frequency(Hz)	<b>34</b> <sup>38</sup>	0h1822		Pre-PID Freq		0.00	Х	0	0	
20					frequency(Hz)					
55   UN 1823   PID CONTROLLER   PRE-PID EXIT   U.U-100.U(%)   U.U   X   U   U	<b>35</b> <sup>38</sup>	0h1823	PID controller	Pre-PID Exit	0.0-100.0(%)	0.0	Х	0	0	

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property*	V/F	SL	Ref.
36 <sup>38</sup>	0h1824	motion level PID controller motion delay time	Pre-PID Delay	0-99	999(s)	600	0	0	0	
37 <sup>38</sup>	0h1825	PID sleep mode delay time	PID Sleep DT	0.0-	999.9(s)	60.0	0	0	0	
<b>38</b> <sup>38</sup>	0h1826	PID sleep mode frequency	PID Sleep Freq		i- vimum uency(Hz)	0.00	0	0	0	
<b>39</b> <sup>38</sup>	0h1827	PID wake-up level	PIDWakeUp Lev	0-10	00(%)	35	0	0	0	
40 <sup>38</sup>	0h1828	PID wake-up mode setting	PID WakeUp Mod	0 1 2	Below Level Above Level Beyond Level	0:Below Level	0	0	0	
42 <sup>38</sup>	0h182A	PID controller unit selection	PID Unit Sel	0 1 2 3 4 5 6 7 8 9 10 11	% Bar mBar Pa kPa Hz rpm V I kW HP C	0:%	Ο	0	0	
<b>43</b> <sup>38</sup>	0h182B	PID unit gain	PID Unit Gain	0.00	.00(%)	100.00	0	0	0	
44 <sup>38</sup>	0h182C	PID unit scale	PID Unit Scale	0 1 2 3 4	x100 x10 x10 x1 x0.1 x0.01	2:x 1	О	0	0	
45 <sup>38</sup>	0h182D	PID 2nd proportional gain	PID P2-Gain	0.0-	1000.0(%)	100.0	Х	0	0	

# **6.9 Protection Function group (PAR→PRT)**

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

**SL**: Sensorless vector control (DRV-09)

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-9	9	40	0	0	0	<u>p.52</u>
04	0h1B04	Load level	Load Duty	0 Normal Duty		1:Heavy	Х	0	0	
	UITIDO4	setting	Load Duty	1	Heavy Duty	Duty	^			
				bit	00-11					
05	0h1B05	Input/output open-phase	Phase Loss Chk	01	Output open phase	00	X	0	0	
		protection	CHK	10	Input open phase					
06	0h1B06	Input voltage range during open-phase	IPO V Band	1-1	00(V)	15	x	0	0	
07	0h1B07	Deceleration time at fault trip	Trip Dec Time	0.0	-600.0(s)	3.0	0	0	0	
		Selection of		0	No					
08	0h1B08	startup on trip reset	RST Restart	1	Yes	0:No	0	0	0	
09	0h1B09	Number of automatic restarts	Retry Number	0-10		0	О	0	0	
10 <sup>39</sup>	0h1B0A	Automatic restart delay time	Retry Delay	0.0	-60.0(s)	1.0	О	0	0	
12	0h1B0C	Motion	Lost Cmd	0	None	0:None	O/A	0	0	
		at speed	Mode	1	Free-Run					

<sup>&</sup>lt;sup>39</sup> Displayed when PRT-09 is set higher than 0

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
		command loss		2	Dec					
				3	Hold Input					
				4	Hold Output					
				5	Lost Preset					
13 <sup>40</sup>	0h1B0D	Time to decide speed command loss	Lost Cmd Time	0.1	-120(s)	1.0	О	0	0	
14 <sup>40</sup>	0h1B0E	Operation frequency at speed command loss	Lost Preset F	Ma	rt frequency- ximum quency(Hz)	0.00	0	0	0	
15 <sup>40</sup>	0h1B0F	Analog input loss decision	Al Lost Level	0	Half x1	0:Half of	0	0	0	
		level		1	Below x1	x1				
		Overload	OL Warn	0	No					
17	0h1B11	warning selection	Select	1	Yes	0:No	0	0	0	
18	0h1B12	Overload alarm level	OL Warn Level	30-	180(%)	150	0	0	0	
19	0h1B13	Overload warning time	OL Warn Time	0.0	-30.0(s)	10.0	0	0	0	
				0	None					
20	0h1B14	Motion at	OL Trip	1	Free-Run	1:Free-	0	0	0	
		overload fault	Select	2	Dec	Run				
21	0h1B15	Overload fault level	OL Trip Level	30-	200(%)	180	0	0	0	
22	0h1B16	Overload fault time	OL Trip Time	0.0	-60.0(s)	60.0	0	0	0	
	_	Underload		0	No					
25	0h1B19	warning selection	UL Warn Sel	1	Yes	0:No	0	0	0	
26	0h1B1A	Underload warning time	UL Warn Time	0.0	-600.0(s)	10.0	0	0	0	
		Underload fault		0	None					
27	0h1B1B	selection	ULTrip Sel	1	Free-Run	0:None	0	0	Ο	
				2	Dec					

 $<sup>^{\</sup>rm 40}\,$  Displayed when PRT-12 is not set to 0 (NONE)

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
28	0h1B1C	Underload fault time	UL Trip Time	0.0-600.0(s)		30.0	0	0	0	
29	0h1B1D	Underload lower limit level	UL LF Level	10-	30(%)	30	0	0	0	
30	0h1B1E	Underload upper limit level	UL BF Level	30-	100(%)	30	О	0	0	
31	0h1B1F	No motor motion at	No Motor	0	None	0:None	0	0	0	
		detection	Trip	1	Free-Run					
32	0h1B20	No motor detection current level	No Motor Level	1-1	00(%)	5	0	0	0	
33	0h1B21	No motor detection delay	No Motor Time	0.1-	-10.0(s)	3.0	0	0	0	
		Electronic		0	None					
40	0h1B28	thermal fault	ETH Trip Sel	1	Free-Run	0:None	0	0	0	
		selection		2	Dec					
41	0l- 1 D20	Motor cooling	Motor	0	Self-cool	0:Self-				
41	0h1B29	fan type	Cooling	1	Forced-cool	cool	0	0	0	
42	0h1B2A	Electronic thermal 1 minute rating	ETH 1min	120	)-200(%)	150	О	0	0	
43	0h1B2B	Electronic thermal continuous rating	ETH Cont	50-	150(%)	120	0	0	0	
45	0h1B2D	BX trip mode	BX Mode	0	Free-Run	0	Х	0	0	
	OTTIBLE	bx trip mode	DX Wode	1	Dec	0	^			
				bit	0000-1111					
50	0h1B32	Stall prevention motion and flux braking	Stall Prevent	00 01	Accelerating	1000	x	0	0	
		- Carding		00 10	At constant speed					

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property*	V/F	SL	Ref.
				01 00	At deceleration					
51	0h1B33	Stall frequency1	Stall Freq 1	Stal	t frequency- I uency2(Hz)	60.00	0	0	0	
52	0h1B34	Stall level1	Stall Level 1	30-2	250(%)	180	Χ	0	0	
53	0h1B35	Stall frequency2	Stall Freq 2	Stal	l frequency1- I uency3(Hz)	60.00	0	0	0	
54	0h1B36	Stall level2	Stall Level 2	30-2	250(%)	180	Χ	0	0	
55	0h1B37	Stall frequency3	Stall Freq 3	Stal	l frequency2- l uency4(Hz)	60.00	0	0	0	
56	0h1B38	Stall level3	Stall Level 3	30-2	250(%)	180	Χ	0	0	
57	0h1B39	Stall frequency4	Stall Freq 4	Max	l frequency3- kimum uency(Hz)	60.00	0	0	0	
58	0h1B3A	Stall level4	Stall Level 4	30-2	250(%)	180	Χ	0	0	
59	0h1B3B	Flux braking gain	Flux Brake Kp	0~1	50	0	0	0	0	
60	0h1B3C	CAP diagnosis current level	CAP. DiagCurr Perc	10-	100(%)	0	0	0	0	
61 <sup>41</sup>	0h1B3D	CAP diagnosis mode	CAP. Diag	1 2	None Ref Diag Pre Diag Init Diag	0	X	0	-	
62 <sup>41</sup>	0h1B3E	CAP Exchange Level	CAP Exchange Level		)~95.0(%)	0	х	0	0	
63 <sup>41</sup>	0h1B3F	CAP Diag Level	CAP Diag Level	0.0~	-100.0(%)	100.0	-	0	0	
66	0h1B42	DB resistor warning level	DB Warn %ED	0-30	D(%)	0	0	0	0	
73	0h1B22	Speed deviation trip	Speed Dev Trip	0	No Yes	0:No	0	0	0	

 $<sup>^{41}\,</sup>$  The PRT-61–63 codes are displayed when the PRT-60 (CAP. DiagPerc) is set to more than 0.

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
74	0h1B23	Speed deviation band	Speed Dev Band	1~:	20	5	0	0	0	
75	0h1B24	Speed deviation decision time	Speed Dev Time	0~	120	60	0	0	0	
79	0h1B4F	Cooling fan fault selection	FAN Trip Mode	0	Trip Warning	0:Trip	0	0	0	
80	0h1B50	Motion selection at option trip	Opt Trip Mode	0 1 2	None Free-Run Dec	1:Free- Run	0	0	0	
81	0h1B51	Low voltage fault decision delay time	LVT Delay	0.0	-60.0(s)	0.0	х	0	0	
82	0h1B52	LV2 Selection	LV2 Enable	0	No Yes	0: No	Х	0	0	-
86	0h1B56	Accumulated percent of fan usage	Fan Time Perc	0.0	~100.0(%)	0.0	-	0	0	-
87	0h1B57	Fan exchange warning level	Fan Exchange	0.0	~100.0(%)	90.0	0	0	0	-
88	0h1B58	Fan reset time	Fan Time Rst	0	No Yes	0	Х	0	0	-
89	0h1B59	CAP, FAN Status	CAP, FAN State	Bit 00 01 10	00~10  - CAP Warning FAN Warning	00	-	0	0	-
90	0h1B5A	Warning information	-	-		-		0	0	-
91	0h1B5B	Fault history 1	-	-		-		0	0	-
92	0h1B5C	Fault history 2	-	-		-		0	0	_
93	0h1B5D	Fault history 3	-	-		-		0	0	-
94	0h1B5E	Fault history 4	-	-		-		0	0	-
95	0h1B5F	Fault history 5	-	-		-		0	0	-
96	0h1B60	Fault history deletion	-	0	No Yes	0:No		0	0	-

#### **6.10 2nd Motor Function group (PAR→M2)**

The 2nd Motor function group will be displayed if any of IN-65-71 is set to 26 (2nd MOTOR). In the following table, the data shaded in grey will be displayed when a related code has been selected.

**SL**: Sensorless vector control (DRV-09)

<u>U/A.</u> v	VIILE-EIIADI	ed during operat	.1011						
Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
00	_	Jump Code	Jump Code	1-99	14	0	0	0	<u>p.52</u>
04	0h1C04	Acceleration time	M2-Acc Time	0.0-600.0(s)	20.0	0	0	0	
05	0h1C05	Deceleration time	M2-Dec Time	0.0-600.0(s)	30.0	0	0	0	
06	0h1C06	Motor capacity	M2-Capacity	0 0.2 kW 1 0.4 kW 2 0.75 kW 3 1.1 kW 4 1.5 kW 5 2.2 kW 6 3.0 kW 7 3.7 kW 8 4.0 kW 9 5.5 kW 10 7.5 kW 11 11.0 kW 12 15.0 kW 13 18.5 kW 14 22.0 kW 15 30.0 kW 16 37.0 kW 17 45.0 kW 18 55.0 kW 20 90.0 kW		X	Ο	Ο	
07	0h1C07	Base frequency	M2-Base Freq	30.00- 400.00(Hz)	60.00	Х	0	0	
08	0h1C08	Control mode	M2-Ctrl Mode	0 V/F 2 Slip Compen 4 IM Sensorless	0:V/F	X	0	0	
10	0h1C0A	Number of motor poles	M2-Pole Num	2-48	Depen dent	Х	0	0	

Code	Comm. Address	Name	LCD Display	Set	tting Range	Initial Value	Property*	V/F	SL	Ref.
11	0h1C0B	Rated slip speed	M2-Rated Slip	0-3	000(rpm)	on motor	х	0	0	
12	0h1C0C	Motor rated current	M2-Rated Curr	1.0	-1000.0(A)	setting s	Х	0	0	
13	0h1C0D	Motor no-load current	M2-Noload Curr	0.5	-1000.0(A)		Х	0	0	
14	0h1C0E	Motor rated voltage	M2-Rated Volt	170	0-480(V)		Х	0	0	
15	0h1C0F	Motor efficiency	M2- Efficiency	70-	-100(%)		Х	0	0	
16	0h1C10	Load inertia rate	M2-Inertia Rt	9-0	3		Χ	0	0	
_17	-	Stator resistor	M2-Rs				Χ	0	0	
18	_	Leakage inductance	M2-Lsigma		pendent motor		Х	0	0	
19	_	Stator inductance	M2-Ls	set	tings		х	0	0	
20 <sup>42</sup>	-	Rotor time constant	M2-Tr	25-	-5000(ms)		Х	0	0	
				0	Linear					
25	0h1C19	V/F pattern	M2-V/F Patt	1	Square	0: Linear	Х	0	0	
				2	User V/F	Linear				
26	0h1C1A	Forward Torque boost	M2-Fwd Boost	0.0	-15.0(%)	- 2.0	Х	0	0	
27	0h1C1B	Reverse Torque boost	M2-Rev Boost	0.0	-15.0(%)	72.0	Х	0	0	
28	0h1C1C	Stall prevention level	M2-Stall Lev	30-	-150(%)	150	х	0	0	
29	0h1C1D	Electronic thermal 1 minute rating	M2-ETH 1min	10	0-200(%)	150	Х	0	0	
30	0h1C1E	Electronic thermal continuous rating	M2-ETH Cont	50-	-150(%)	100	х	0	0	

<sup>&</sup>lt;sup>42</sup> Displayed when M2-08 is set to 4 (IM Sensorless)

#### **6.11 User Sequence group (USS)**

This group appears when APP-02 is set to 1 (Yes) or COM-95 is set to 2 (P2P Master). The parameter cannot be changed while the user sequence is running.

**SL**: Sensorless vector control function (DRV-09)

Code	Comm.	Name	LCD Display	Setting	Initial	Property*	V/F	SL	Ref.
	Address			Range	Value				
00	-	Jump code	Jump Code	1-99	31	0	0	0	<u>p.52</u>
01	0h1D01	User sequence operation command	User Seq Con	0 Stop 1 Run 2 Digital In Run	- 0: Stop	x	0	0	<u>p.115</u>
02	0h1D02	User sequence operation loop time	US Loop Time	0 0.01s 1 0.02s 2 0.05s 3 0.1s 4 0.5s 5 1s	1:0.02s	х	0	0	<u>p.115</u>
11	0h1D0B	Output address link1	Link UserOut1	0-0xFFFF	0	Х	О	0	<u>p.115</u>
12	0h1D0C	Output address link2	Link UserOut2	0-0xFFFF	0	Х	0	0	<u>p.115</u>
13	0h1D0D	Output address link3	Link UserOut3	0-0xFFFF	0	Х	0	0	<u>p.115</u>
14	0h1D0E	Output address link4	Link UserOut4	0-0xFFFF	0	Х	0	0	<u>p.115</u>
15	0h1D0F	Output address link5	Link UserOut5	0-0xFFFF	0	Х	0	0	<u>p.115</u>
16	0h1D10	Output address link6	Link UserOut6	0-0xFFFF	0	Х	0	0	<u>p.115</u>
17	0h1D11	Output address link7	Link UserOut7	0-0xFFFF	0	Х	0	0	<u>p.115</u>
18	0h1D12	Output address link8	Link UserOut8	0-0xFFFF	0	Х	0	0	<u>p.115</u>
19	0h1D13	Output address link9	Link UserOut9	0-0xFFFF	0	Х	0	0	<u>p.115</u>
20	0h1D14	Output address link10	Link UserOut10	0-0xFFFF	0	Х	0	0	<u>p.115</u>
21	0h1D15	Output address link11	Link UserOut11	0-0xFFFF	0	Х	0	0	<u>p.115</u>
22	0h1D16	Output address link12	Link UserOut12	0-0xFFFF	0	Х	0	0	p.115

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
23	0h1D17	Output address link13	Link UserOut13	0-0xFFFF	0	Х	0	0	<u>p.115</u>
24	0h1D18	Output address link14	Link UserOut14	0-0xFFFF	0	х	0	0	<u>p.115</u>
25	0h1D19	Output address link15	Link UserOut15	0-0xFFFF	0	х	0	0	<u>p.115</u>
26	0h1D1A	Output address link16	Link UserOut16	0-0xFFFF	0	х	0	0	<u>p.115</u>
27	0h1D1B	Output address link17	Link UserOut17	0-0xFFFF	0	Х	0	0	<u>p.115</u>
28	0h1D1C	Output address link18	Link UserOut18	0-0xFFFF	0	Х	0	0	<u>p.115</u>
31	0h1D1F	Input constant setting1	Void Para1	-9999-9999	0	Х	0	0	<u>p.115</u>
32	0h1D20	Input constant setting2	Void Para2	-9999-9999	0	Х	0	0	<u>p.115</u>
33	0h1D21	Input constant setting3	Void Para3	-9999-9999	0	Х	0	0	<u>p.115</u>
34	0h1D22	Input constant setting4	Void Para4	-9999-9999	0	Х	0	0	<u>p.115</u>
35	0h1D23	Input constant setting5	Void Para5	-9999-9999	0	Х	0	0	<u>p.115</u>
36	0h1D24	Input constant setting6	Void Para6	-9999-9999	0	Х	0	0	<u>p.115</u>
37	0h1D25	Input constant setting7	Void Para7	-9999-9999	0	Х	0	0	<u>p.115</u>
38	0h1D26	Input constant setting8	Void Para8	-9999-9999	0	Х	0	0	<u>p.115</u>
39	0h1D27	Input constant setting9	Void Para9	-9999-9999	0	Х	0	0	<u>p.115</u>
40	0h1D28	Input constant setting10	Void Para10	-9999-9999	0	Х	0	0	<u>p.115</u>
41	0h1D29	Input constant setting11	Void Para11	-9999-9999	0	Х	0	0	<u>p.115</u>
42	0h1D2A	Input constant setting12	Void Para12	-9999-9999	0	Х	0	0	<u>p.115</u>
43	0h1D2B	Input constant setting13	Void Para13	-9999-9999	0	Х	0	0	<u>p.115</u>
44	0h1D2C	Input constant setting14	Void Para14	-9999-9999	0	Х	0	0	<u>p.115</u>
45	0h1D2D	Input constant setting15	Void Para15	-9999-9999	0	Х	0	0	<u>p.115</u>
46	0h1D2E	Input constant	Void Para16	-9999-9999	0	Χ	0	0	p.115

	Comm.			Setting	Initial				
Code	Address	Name	LCD Display	Range	Value	Property*	V/F	SL	Ref.
		setting16							
47	0h1D2F	Input constant setting17	Void Para17	-9999-9999	0	Х	0	0	<u>p.115</u>
48	0h1D30	Input constant setting18	Void Para18	-9999-9999	0	Х	0	0	<u>p.115</u>
49	0h1D31	Input constant setting19	Void Para19	-9999-9999	0	X	0	0	<u>p.115</u>
50	0h1D32	Input constant setting20	Void Para20	-9999-9999	0	X	0	0	<u>p.115</u>
51	0h1D33	Input constant setting21	Void Para21	-9999-9999	0	х	0	0	<u>p.115</u>
52	0h1D34	Input constant setting22	Void Para22	-9999-9999	0	X	0	0	<u>p.115</u>
53	0h1D35	Input constant setting23	Void Para23	-9999-9999	0	Х	0	0	<u>p.115</u>
54	0h1D36	Input constant setting24	Void Para24	-9999-9999	0	Х	0	0	<u>p.115</u>
55	0h1D37	Input constant setting25	Void Para25	-9999-9999	0	X	0	0	<u>p.115</u>
56	0h1D38	Input constant setting26	Void Para26	-9999-9999	0	X	0	0	<u>p.115</u>
57	0h1D39	Input constant setting27	Void Para27	-9999-9999	0	X	0	0	<u>p.115</u>
58	0h1D3A	Input constant setting28	Void Para28	-9999-9999	0	X	0	0	<u>p.115</u>
59	0h1D3B	Input constant setting29	Void Para29	-9999-9999	0	X	0	0	<u>p.115</u>
60	0h1D3C	Input constant setting30	Void Para30	-9999-9999	0	Х	0	0	<u>p.115</u>
80	0h1D50S	Analog input 1	P2P In V1	0-12,000			0	0	p.115
81	0h1D51	Analog input2	P2P In I2	-12,000- 12,000			0	0	<u>p.115</u>
82	0h1D52	Digital input	P2P In DI	0-0x7F			0	0	<u>p.115</u>
85	0h1D55	Analog output	P2P OutAO1	0-10,000	0	Х	0	0	<u>p.115</u>
89	0h1D58	Digital output	P2P OutDO	0-0x03	0	Χ	0	0	<u>p.115</u>

#### **6.12 User Sequence Function group(USF)**

This group appears when APP-02 is set to 1 (Yes) or COM-95 is set to 2 (P2P Master). The parameter cannot be changed while the user sequence is running.

**SL**: Sensorless vector control function (DRV-09)

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump code	Jump Code	1-99		41	0	0	0	<u>p.52</u>
01	0h1E01	User function1	User Func1	0	NOP		X	0	0	p.115
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE- EQUAL					
				13	COMPARE- NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				_	PI_PROCESS					
					UPCOUNT					
-		User function	User	28	DOWNCOUNT					
02	0h1E02	input1-A	Input1-A	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
03	0h1E03	User function input1-B	User Input1-B	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
04	0h1E04	User function input1-C	User Input1-C	0-0	xFFFF	0	Х	O	0	<u>p.115</u>
05	0h1E05	User function output1	User Output1	-32	767-32767	0		0	0	p.115
				0 NOP 1 ADD						
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
		User function 2		6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER		x			
				10	COMPARE-GT					
			Hann	11	COMPARE-GEQ					
06	0h1E06		User Func2	12	COMPARE- EQUAL	0: NOP		0	0	<u>p.115</u>
				13	COMPARE- NEQUAL	-				able
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
					BITTEST					
					BITSET					
				23	BITCLEAR					

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				24 LOWPASSFILTER					
				25 PI_CONTORL					
				26 PI_PROCESS					
				27 UPCOUNT					
				28 DOWNCOUNT					
07	0h1E07	User function input2-A	User Input2-A	0-0xFFFF	0	Х	0	0	<u>p.115</u>
08	0h1E08	User function input2-B	User Input2-B	0-0xFFFF	0	Х	0	0	<u>p.115</u>
09	0h1E09	User function input2-C	User Input2-C	0-0xFFFF	0	Х	0	0	<u>p.115</u>
10	0h1E0A	User function output2	User Output2	-32767-32767	0		0	0	<u>p.115</u>
				0 NOP					
				1 ADD					
				2 SUB	- - - - - - -				
				3 ADDSUB					
				4 MIN					
				5 MAX					
				6 ABS					
				7 NEGATE					
				8 MPYDIV		x			
				9 REMAINDER					
		_	User	10 COMPARE-GT	_				
11	0h1E0B	User function3	Func3	11 COMPARE-GEQ COMPARE-	0:NOP		0	0	<u>p.115</u>
				12 EQUAL					
				13 COMPARE-					
				NEQUAL					
				14 TIMER					
				15 LIMIT					
				16 AND					
				17 OR	_				
				18 XOR	_				
			19 20	19 ANDOR	-				
				20 SWITCH	-				
				21 BITTEST	<u> </u>				

Table	<b>Function</b>
	<b>5</b>

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS	1				
				27	UPCOUNT					
				28	DOWNCOUNT					
12	0h1E0C	User function input3-A	User Input3-A	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
13	0h1E0D	User function input3-B	User Input3-B	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
14	0h1E0E	User function input3-C	User Input3-C	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
15	0h1E0F	User function output3	User Output3	-32	767-32767	0		0	0	<u>p.115</u>
				0	NOP	- -				
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN	-				
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
			User	9	REMAINDER	-				
16	0h1E10	User function4	Func4		COMPARE-GT	0:NOP	Х	0	0	<u>p.115</u>
				11	7	-				
				12	COMPARE- EQUAL					
					COMPARE-					
				13	NEQUAL					
				14	TIMER	1				
				15	LIMIT					
				16	AND					
			17 18		OR					
					XOR					
				19	ANDOR					

Code	Comm.	Name	LCD	Setting Range		Initial	Property*	V/F	SL	Ref.
Code	Address	Name	Display			Value	rioperty	V/F	JL	nei.
					SWITCH	1				
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				_	PI_CONTORL					
				-	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
17	0h1E11	User function input4-A	User Input4-A	0-0	)xFFFF	0	Х	0	0	<u>p.115</u>
18	0h1E12	User function input4-B	User Input4-B	0-0	)xFFFF	0	Х	0	0	<u>p.115</u>
19	0h1E13	User function input4-C	User Input4-C	0-0	)xFFFF	0	Х	0	0	<u>p.115</u>
20	0h1E14	User function output4	User Output4	-32	2767-32767	0		0	0	<u>p.115</u>
21	Oh1E15	User function5	User Func5	14 15 16 17 18	NOP ADD SUB ADDSUB MIN MAX ABS NEGATE MPYDIV REMAINDER COMPARE-GT COMPARE-GEQ COMPARE-EQUAL COMPARE-NEQUAL TIMER LIMIT AND OR XOR ANDOR	0:NOP	X	0	Ο	<u>p.115</u>

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				20	SWITCH					
				21	BITTEST	1				
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
22	0h1E16	User function input5-A	User Input5-A	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
23	0h1E17	User function input5-B	User Input5-B	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
24	0h1E18	User function input5-C	User Input5-C	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
25	0h1E19	User function output5	User Output5	-32	767-32767	0		0	0	p.115
26	Oh1E1A	User function6	User Func6	11 12 13 14	COMPARE- NEQUAL TIMER	0: NOP	X	0	0	p.115
			15 16	LIMIT AND OR	_					

Function Table

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
					BITCLEAR	-				
				-	LOWPASSFILTER					
					PI_CONTORL					
					PI_PROCESS					
				27	UPCOUNT					
		11£	11	28	DOWNCOUNT					
27	0h1E1B	User function input6-A	User Input6-A	0-0	xFFFF	0	Χ	0	0	<u>p.115</u>
20	01-1516	User function	User	0.0		_	V			115
28	0h1E1C	input6-B	Input6-B	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
29	0h1E1D	User function input6-C	User Input6-C	0-0	xFFFF	0	X	0	0	<u>p.115</u>
20	01-1515	User function	User	22	27.7 227.7					115
30	0h1E1E	output6	Output6	-32767-32767		0		0	0	<u>p.115</u>
				0	NOP	_				
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
24	01.4545	6 1: 7	User	7	NEGATE	o Nion	V			115
31	Ohieir	User function7	Func7	8	MPYDIV	0:NOP	Х	0	0	<u>p.115</u>
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-					
					EQUAL	-				
					COMPARE-	_				
					TIMER	_				
				15	LIMIT					

tion
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Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				_	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
32	0h1E20	User function input7-A	User Input7-A	0-0	xFFFF	О	Х	0	0	<u>p.115</u>
33	0h1E21	User function input7-B	User Input7-B	0-0xFFFF		0	Х	0	0	<u>p.115</u>
34	0h1E22	User function input7-C	User Input7-C	0-0xFFFF		0	X	0	0	<u>p.115</u>
35	0h1E23	User function output7	User Output7	-32	767-32767	0		0	0	<u>p.115</u>
			σαιραίν	0	0 NOP					
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
36	0h1E24	User function8	User	7	NEGATE	0:NOP	Х	0	0	p.115
			Func8	8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
			1	12	COMPARE- EQUAL					
				13	COMPARE- NEQUAL					

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
					SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
37	0h1E25	User function input8-A	User Input8-A	0-0	xFFFF	0	X	0	0	<u>p.115</u>
38	0h1E26	User function input8-B	User Input8-B	0-0xFFFF		0	Х	0	0	<u>p.115</u>
39	0h1E27	User function input8-C	User Input8-C	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
40	0h1E28	User function output8	User Output8	-32	767-32767	0		0	0	<u>p.115</u>
				0	NOP					
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
41	0h1E29	User function9	User	6	ABS	0:NOP	Х	0	0	p.115
			Func9	7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
			11	11	COMPARE-GEQ					
				12	COMPARE-					
					EQUAL					

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				13	COMPARE- NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				_	SWITCH					
				21	BITTEST					
					BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
					PI_PROCESS					
				27	UPCOUNT					
		_		28	DOWNCOUNT					
42	0h1E2A	User function input9-A	User Input9-A	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
43	0h1E2B	User function input9-B	User Input9-B	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
44	0h1E2C	User function input9-C	User Input9-C	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
45	0h1E2D	User function output9	User Output9	-32	767-32767	0		0	0	<u>p.115</u>
				0	NOP					
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
46	0h1E2E	User function 10	User	5	MAX	0:NOP	Х	0	0	<u>p.115</u>
70	OTTILZE	Oser ranetion to	Func10	6	ABS	0.1101	^			<u>p.115</u>
				7	NEGATE					
				8	MPYDIV					
			9	-	REMAINDER	<del></del>				
					COMPARE-GT					
				11	COMPARE-GEQ					

Function Table

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				15 16 17 18 19 20 21 22 23 24 25 26 27	COMPARE-EQUAL COMPARE-NEQUAL TIMER LIMIT AND OR XOR ANDOR SWITCH BITTEST BITSET BITCLEAR LOWPASSFILTER PL_CONTORL PL_PROCESS UPCOUNT					
47	0h1E2F	User function input 10-A	User Input10- A		DOWNCOUNT	0	Х	0	0	<u>p.115</u>
48	0h1E30	User function input10-B	User Input10- B	0-0	xFFFF	0	х	0	0	<u>p.115</u>
49	0h1E31	User function input10-C	User Input10- C	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
50	0h1E32	User function output 10	User Output10	-32	767-32767	0		0	0	<u>p.115</u>
51	0h1E33	User function 11	User Func11	0 1 2 3 4	NOP ADD SUB ADDSUB MIN	0: NOP	x	0	0	p.115
					MAX ABS NEGATE					

Table	Functio
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Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE- EQUAL					
				13	COMPARE- NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
52	0h1E34	User function input 11-A	User Input11- A	0-0	xFFFF	0	Х	0	0	p.115
53	0h1E35	User function input11-B	User Input11- B	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
54	0h1E36	User function input11-C	User Input11- C	0-0	xFFFF	0	х	0	0	<u>p.115</u>
55	0h1E37	User function output11	User Output11		767-32767	0		0	0	<u>p.115</u>
				0	NOP					
56	0h1E38	User function 12	User	1	ADD	0:NOP	X	0	0	p.115
50	UIILSO	OSCI IUIICUUITZ	Func12	2	SUB	O.INOF	^			<u>p.113</u>
				3	ADDSUB					

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE- EQUAL					
				13	COMPARE- NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
57	0h1E39	User function input12-A	User Input12- A	0-0	xFFFF	0	х	0	0	<u>p.115</u>
58	0h1E3A	User function input12-B	User Input12- B	0-0	xFFFF	0	х	0	0	<u>p.115</u>
59	0h1E3B	User function input12-C	User Input12- C	0-0	xFFFF	0	х	0	0	<u>p.115</u>
60	0h1E3C	User function output12	User Output12	-32	767-32767	0		0	0	<u>p.115</u>

Table	Function

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				0	NOP					
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX	_				
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE- EQUAL					
61	0h1E3D	User function 13	User	13	COMPARE- NEQUAL	0: NOP	X	0	0	p.115
			Func13	14	TIMER	0.1101				
				15	LIMIT					
				16	AND					
				17		-				
					XOR	-				
					ANDOR					
					SWITCH					
					BITTEST	-				
					BITSET	-				
					BITCLEAR					
					LOWPASSFILTER					
				25	_	-				
					PI_PROCESS					
					UPCOUNT	-				
			L lcc"	28	DOWNCOUNT					
62	0h1E3E	User function input13-A	User Input13- A	0-0	xFFFF	0	Х	0	0	<u>p.115</u>
63	0h1E3F	User function input13-B	User Input13- B	0-0	xFFFF	0	х	0	0	<u>p.115</u>

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Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
64	0h1E40	User function input13-C	User Input13- C	0-0	xFFFF	0	х	0	0	<u>p.115</u>
65	0h1E41	User function output 13	User Output13	-32	767-32767	0		0	0	<u>p.115</u>
				0	NOP					
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
					COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE- EQUAL					
				13	COMPARE-					
66	0h1E42	User function 14	User Func14		NEQUAL	0: NOP	Х	0	0	p.115
			FullC14		TIMER					
					LIMIT					
					AND					
				17						
					XOR					
					ANDOR					
					SWITCH					
				21	BITTEST					
					BITSET	<u> </u>				
					BITCLEAR					
					LOWPASSFILTER					
					PI_CONTORL					
					PI_PROCESS					
					UPCOUNT					
67	0h1E42	Llear from eti	Llear		DOWNCOUNT	0	V			n 115
67	0h1E43	User function	User	0-0	xFFFF	0	Х	0	0	<u>p.115</u>

Code	Comm.	Name	LCD	Set	ting Range	Initial	Property*	V/F	SL	Ref.
Code	Address		Display	36(	Amg hange	Value	Troperty	V/I	JL	nei.
		input14-A	Input14- A							
		User function	User							
68	0h1E44	input14-B	Input14-	0-0	xFFFF	0	X	0	0	<u>p.115</u>
			B User							
69	0h1E45	User function input 14-C	Input14-	0-0	xFFFF	0	Х	0	0	p.115
		·	C							
70	0h1E46	User function output 14	User Output14	-32	767-32767	0		0	0	<u>p.115</u>
		- Catpact r	очерист	0	NOP					
				1	ADD	1				
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX	1				
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER	1				
					COMPARE-GT					
				11	COMPARE-GEQ COMPARE-	1				
74	01.4547	6 15	User	12	EQUAL	0.1100	,,			445
71	0h1E47	User function 15	Func15	13	COMPARE-	0:NOP	X	0	0	<u>p.115</u>
					NEQUAL	-				
					TIMER LIMIT	-				
					AND	-				
					OR	1				
					XOR	1				
					ANDOR	†				
					SWITCH	1				
					BITTEST	1				
				22	BITSET	1				
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					

Code	Comm. Address	Name	LCD Display	Setting R	ange	Initial Value	Property*	V/F	SL	Ref.
				26 PI_PF						
				27 UPCO	/NCOUNT	1				
72	0h1E48	User function input15-A	User Input15- A	0-0xFFFF		0	X	0	0	<u>p.115</u>
73	0h1E49	User function input15-B	User Input15- B	0-0xFFFF	=	0	х	0	0	<u>p.115</u>
74	0h1E4A	User function input15-C	User Input15- C	0-0xFFFF	=	0	Х	0	0	<u>p.115</u>
75	0h1E4B	User function output 15	User Output15	-32767-3	2767	0		0	0	<u>p.115</u>
		·		0 NOP						
				1 ADD						
				2 SUB						
				3 ADD	SUB	_				
				4 MIN						
				5 MAX	· ·					
				6 ABS	ATE	-				
				7 NEG/		_				
				8 MPYI 9 REMA	AINDER					
					IPARE-GT	1				
7.	01.4546		User		IPARE-GEQ	-				445
76	0h1E4C	User function 16	Func16	12 COM	IPARE-	0:NOP	X	0	0	<u>p.115</u>
				13 COM NEQI	IPARE-					
				14 TIME	iR					
				15 LIMΠ		_				
				16 AND		1				
				17 OR		1				
				18 XOR		1				
				19 AND		-				
				20 SWIT		-				
				21 BITTI	<u> </u>					<u> </u>

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Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
77	0h1E4D	User function input16-A	User Input16- A	0-0	xFFFF	0	X	0	0	<u>p.115</u>
78	0h1E4E	User function input16-B	User Input16- B	0-0	xFFFF	0	х	0	0	<u>p.115</u>
79	0h1E4F	User function input16-C	User Input16- C	0-0	xFFFF	0	х	0	0	p.115
80	0h1E50	User function output 16	User Output16	-32	767–32767	0		0	0	<u>p.115</u>
				0	NOP					
				1	ADD	1				
				2	SUB	_				
				3	ADDSUB	_				
				4	MIN	-				
				5	MAX ABS	_				
				6 7	NEGATE	1				
				8	MPYDIV	_				ā
01	0h1FF1	Hannet wasting 17	User	9	REMAINDER	O. NOD	V			115
81	0h1E51	User function 17	Func17	-	COMPARE-GT	0: NOP	Х	0	0	<u>p.115</u>
					COMPARE-GEQ	1				
				12	COMPARE-	-				
				13	COMPARE- NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				18	XOR					
				19	ANDOR					
					SWITCH					
					BITTEST					
					BITSET	-				
					BITCLEAR					
				24	LOWPASSFILTER					
					PI_CONTORL					
					PI_PROCESS					
					UPCOUNT	-				
				28	DOWNCOUNT					
82	0h1E52	User function input17-A	User Input17- A	0-0	)xFFFF	0	Х	0	0	<u>p.115</u>
83	0h1E53	User function input17-B	User Input17- B	0-0	)xFFFF	0	х	0	0	<u>p.115</u>
84	0h1E54	User function input17-C	User Input17- C	0-0	)xFFFF	0	х	0	0	<u>p.115</u>
85	0h1E55	User function output 17	User Output17	-32	2767-32767	0		0	0	<u>p.115</u>
				0	NOP					
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX	-				
			l	6	ABS					
86	0h1E56	User function 18	User Func18	7	NEGATE	0: NOP	Χ	0	0	<u>p.115</u>
			Tuncto	8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT	-				
				11	COMPARE-GEQ					
				12	EQUAL					
				13	COMPARE- NEQUAL					

Table	Function
עו	

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
87	0h1E57	User function input18-A	User Input18- A	0-0xFFFF		0	X	0	0	<u>p.115</u>
88	0h1E58	User function input18-B	User Input18- B	0-0xFFFF		0	Х	0	0	<u>p.115</u>
89	0h1E59	User function input18-C	User Input18- C	0-0xFFFF		0	Х	0	0	<u>p.115</u>
90	0h1E5A	User function output 18	User Output18	-32	767-32767	0		0	0	<u>p.115</u>

# **6.13 Groups for LCD Keypad Only**

### 6.13.1 Trip Mode (TRP Last-x)

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

#### 6.13.2 Config Mode (CNF)

Code	Name	LCD Display	Setting Range	Initial Value	Ref.
00	Jump code	Jump Code	1-99	42	<u>p.52</u>
			0 English		
	Koynad languago		1 Russian		
01	Keypad language selection	Language Sel	2 Spanish	0 : English	
	Selection		3 Italian		
			4 Turkish		
02	LCD constrast adjustment LCD Contrast		-	-	
03	Multi keypad ID	Multi KPD ID	3-99	3	<u>p.113</u>
10	Inverter S/W version	Inv S/W Ver	-	-	
11	LCD keypad S/W version Keypad S/W Ver		-	-	
12	LCD keypad title version	KPD Title Ver	-	-	

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

Code	Name	LCD Display	Set	ting Range	Initial Value	Ref.
			8	COM Grp		
			9	APP Grp		
			12	PRT Grp		
			13	M2 Grp		
41	Display changed	Changed Para	0	View All	0:View All	
41	Parameter	Changed Fara	1	View Changed	O.VIEW AII	
			0	None		
			1	JOG Key		
42	Multi key item	Multi Key Sel	2	Local/Remote	0:None	
72	Wald Rey Term	ividiti (Cy Sci	3	UserGrp SelKey	O.I VOITE	
			4	Multi KPD		
43	Macro function item	Macro Select	0	None	0:None	
4.4	Trin history deletion	Fue es All Tribe	0	No	ONE	
44	Trip history deletion	Erase All Trip		Yes	0:No	
45	User registration code	LL C AUD I	0	No	ONG	
45	deletion	UserGrp AllDel		Yes	0:No	
46	Dood parameters	Parameter Read	0	No	0:No	
40	Read parameters		1	Yes	UINO	
47	Write parameters	Parameter Write	0	No	0: No	
4/	write parameters		1	Yes	0.110	
48	Savo paramotors	Parameter Save		No	0:No	
40	Save parameters	raiainetei save	1	Yes	0.110	
50	Hide parameter mode	View Lock Set	0-9	999	Un-locked	
51	Password for hiding parameter mode	View Lock Pw	0-9	999	Password	
52	Lock parameter edit	Key Lock Set	0-9	999	Un-locked	
53	Password for locking parameter edit	Key Lock Pw	0-9	999	Password	
60	Additional title update	Add Title Up	0	No	0:No	
	Additional title apaate	Add Title Up		Yes	0.110	
61	Simple parameter setting	Easy Start On	0	No	1:Yes	
	Simple parameter setting	Easy Start Off	1	Yes	1.103	
62	Power consumption	WHCount Reset	0	No	0:No	
	initialization	vvricount keset		Yes U:No		
70	Accumulated inverter motion time	On-time		ar/month/day ur:minute	-	

Function Table		
	Table	Function

Code	Name LCD Display		Setting Range		Initial Value	Ref.
71	Accumulated inverter operation time Run-time		Year/month/day hour:minute		-	
	Accumulated inverter		0	No	0:No	
72	operation time initialization	Time Reset		Yes		
74	Accumulated cooling fan operation time  Fan Time  Year/month/day hour:minute		•	-		
	Reset of accumulated		0	No		
75	cooling fan operation time	Fan Time Rst	1	Yes	0:No	

# Froubleshooting

## 7 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.

### 7.1 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, detailed information is shown on the LCD display. Users can read the warning message at PRT-90. When more than 2 trips occur at roughly the same time, the LCD keypad shows the information for the fault trip that occurred first.

The fault conditions can be categorized as follows:

- Level: When the fault is corrected, the trip or warning signal disappears and the fault is not saved in the fault history.
- Latch: When the fault is corrected and a reset input signal is provided, the trip or warning signal disappears.
- Fatal: When the fault is corrected, the fault trip or warning signal disappears only after the
  user turns off the inverter, waits until the charge indicator light goes off, and turns the inverter
  on again. If the the inverter is still in a fault condition after powering it on again, please
  contact the supplier or the LSIS customer service center.

#### 7.1.1 Fault Trips

#### **Protection Functions for Output Current and Input Voltage**

<b>LCD Display</b>	Туре	Description
Overload	Latch	Displayed when the motor overload trip is activated and the actual load level exceeds the set level. Operates when PRT-20 is set to a value other than 0.
Underload	Latch	Displayed when the motor underload trip is activated and the actual load level is less than the set level. Operates when PRT-27 is set to a value other than 0.
Over Current1	Latch	Displayed when inverter output current exceeds 200% of the rated current.
Over Voltage	Latch	Displayed when internal DC circuit voltage exceeds the specified value.
Low Voltage	Level	Displayed when internal DC circuit voltage is less than the specified value.

LCD Display	Туре	Description
Low	Latch	Displayed when internal DC circuit voltage is less than the specified value
Voltage2	Lateri	during inverter operation.
Ground		Displayed when a ground fault trip occurs on the output side of the inverter
Trip*	Latch	and causes the current to exceed the specified value. The specified value
шр		varies depending on inverter capacity.
E-Thermal	Latch	Displayed based on inverse time-limit thermal characteristics to prevent
E-IIIeIIIIai	Laten	motor overheating. Operates when PRT-40 is set to a value other than 0.
Out Phase	Latch	Displayed when a 3-phase inverter output has one or more phases in an
Open	Lateri	open circuit condition. Operates when bit 1 of PRT-05 is set to 1.
In Phase	Latch	Displayed when a 3-phase inverter input has one or more phases in an open
Open	Lateri	circuit condition. Operates only when bit 2 of PRT-05 is set to 1.
		Displayed when the inverter has been protected from overload and
		resultant overheating, based on inverse time-limit thermal characteristics.
Inverter OLT	Latch	Allowable overload rates for the inverter are 150% for 1 min and 200% for 4
		sec. Protection is based on inverter rated capacity, and may vary depending
		on the device's capacity.
No Motor	Latch	Displayed when the motor is not connected during inverter operation.
Trip	Latti	Operates when PRT-31 is set to 1.

<sup>\*</sup> S100 inverters rated for 4.0 kW or less do not support the ground fault trip (GFT) feature. Therefore, an over current trip (OCT) or over voltage trip (OVT) may occur when there is a lowresistance ground fault.

#### **Protection Functions Using Abnormal Internal Circuit Conditions and External Signals**

Туре	Description
Latch	Displayed when the tempertature of the inverter heat sink exceeds the specified value.
Latch	Displayed when the DC circuit in the inverter detects a specified level of excessive, short circuit current.
Latch	Displayed when an external fault signal is provided by the multi-function terminal. Set one of the multi-function input terminals at IN-65-71 to 4 (External Trip) to enable external trip.
Level	Displayed when the inverter output is blocked by a signal provided from the multi-function terminal. Set one of the multi-function input terminals at IN-65-71 to 5 (BX) to enable input block function.
Fatal	<ul> <li>Displayed when an error is detected in the memory (EEPRom), analog-digital converter output (ADC Off Set), or CPU watchdog (Watch Dog-1, Watch Dog-2).</li> <li>EEP Err. An error in reading/writing parameters due to keypad or memory (EEPRom) fault.</li> <li>ADC Off Set An error in the current sensing circuit (U/V/W terminal, current sensor, etc.).</li> </ul>
	Latch  Latch  Level

LCD Display	Туре	Description
NTC Open	Latch	Displayed when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT).
Fan Trip	Latch	Displayed when an error is detected in the cooling fan. Set PRT-79 to 0 to activate fan trip (for models below 22 kW capacity).
Pre-PID Fail	Latch	Displayed when pre-PID is operating with functions set at APP-34-APP-36. A fault trip occurs when a controlled variable (PID feedback) is measured below the set value and the low feedback continues, as it is treated as a load fault.
Ext-Brake	Latch	Operates when the external brake signal is provided by the multi-function terminal. Occurs when the inverter output starting current remains below the set value at ADV-41. Set either OUT31 or OUT32 to 35 (BR Control).
Safety A(B) Err	Level	Displayed when at least one of the two safety input signals is off.

#### **Protection Functions for Communication Options**

LCD Display	Туре	Description
Lost Command	Level	Displayed when a frequency or operation command error is detected during inverter operation by controllers other than the keypad (e.g., using a terminal block and a communication mode). Activate by setting PRT-12 to any value other than 0.
IO Board Trip	Latch	Displayed when the I/O board or external communication card is not connected to the inverter or there is a bad connection.  Displayed when the figure error code continues for more than 5 sec.
ParaWrite Trip	Latch	Displayed when communication fails during parameter writing. Occurs when using an LCD keypad due to a control cable fault or a bad connection.
Option Trip-1	Latch	Displayed when a communication error is detected between the inverter and the communication board. Occurs when the communication option card is installed.

### 7.1.2 Warning Messages

LCD Display	Description
Over Load	Displayed when the motor is overloaded. Operates when PRT-17 is set to 1. To operate, select 5. Set the digital output terminal or relay (OUT-31 or OUT-33) to 5 (Over Load) to receive overload warning output signals.
Under Load	Displayed when the motor is underloaded. Operates when PRT-25 is set to 1. Set the digital output terminal or relay (OUT-31 or OUT-33) to 7 (Under Load) to receive underload warning output signals.
INV Over Load	Displayed when the overload time equivalent to 60% of the inverter overheat protection (inverter IOLT) level, is accumulated. Set the digital output terminal or relay (OUT-31 or OUT-33) to 6 (IOL) to receive inverter overload warning output signals.
Lost Command	Lost command warning alarm occurs even with PRT-12 set to 0. The warning alarm occurs based on the condition set at PRT-13- 15. Set the digital output terminal or relay (OUT-31 or OUT-33) to 13 (Lost Command) to receive lost command warning output signals. If the communication settings and status are not suitable for P2P, a Lost Command alarm occurs.
Fan Warning	Displayed when an error is detected from the cooling fan while PRT-79 is set to 1. Set the digital output terminal or relay (OUT-31 or OUT-33) to 8 (Fan Warning) to receive fan warning output signals.
Fan Exchange	An alarm occurs when the value set at PRT-86 is less than the value set at PRT-87. To receive fan exchange output signals, set the digital output terminal or relay (OUT-31 or OUT-33) to 38 (Fan Exchange).
CAP Exchange	An alarm occurs when the value set at PRT-63 is less than the value set at PRT-62 (the value set at PRT-61 must be 2 (Pre Diag)). To receive CAP exchange signals, set the digital output terminal or relay (OUT-31 or OUT-33) to 36 (CAP Exchange).
DB Warn %ED	Displayed when the DB resistor usage rate exceeds the set value. Set the detection level at PRT-66.
Retry Tr Tune	Tr tune error warning alarm is activated when Dr.9 is set to 4. The warning alarm occurs when the motor's rotor time constant (Tr) is either too low or too high.

# **7.2 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	
	The load is greater than the motor's rated	Ensure that the motor and inverter have	
Over Load	capacity.	appropriate capacity ratings.	
Over Load	The set value for the overload trip level	Increase the set value for the overload	
	(PRT-21) is too low.	trip level.	
	There is a motor-load connection problem.	Replace the motor and inverter with	
l lodovl sod	·	models with lower capacity.	
Under Load	The set value for underload level (PRT-29, PRT-30) is less than the system's minimum	Reduce the set value for the underload	
	load.	level.	
	Acc/Dec time is too short, compared to load	Increase Acc/Dec time.	
	inertia (GD2).		
	The inverter load is greater than the rated	Replace the inverter with a model that	
	capacity.	has increased capacity.	
Over Current1	The inverter supplied an output while the	Operate the inverter after the motor has	
	motor was idling.	stopped or use the speed search function (CON-60).	
	The mechanical brake of the motor is		
	operating too fast.	Check the mechanical brake.	
	Deceleration time is too short for the load	Increase the acceleration time.	
	inertia (GD2).	increase the acceleration time.	
Over Voltage	A generative load occurs at the inverter	Use the braking unit.	
3	output.		
	The input voltage is too high.	Determine if the input voltage is above the specified value.	
		Determine if the input voltage is below	
	The input voltage is too low.	the specificed value.	
	A load greater than the power capacity is		
Low Voltage	connected to the system (e.g., a welder,	Increase the power capacity.	
	direct motor connection, etc.)		
	The magnetic contactor connected to the	Replace the magnetic contactor.	
	power source has a faulty connection.  The input voltage has decreased during the	Determine if the input voltage is above	
Low Voltage2	operation.	the specified value.	
	An input phase-loss has occurred.	Check the input wiring.	
	The power supply magnetic contactor is faulty.	Replace the magnetic contractor.	
Ground Trip	A ground fault has occurred in the inverter output wiring.  Check the output wiring.		

Туре	Cause	Remedy	
	The motor insulation is damaged.	Replace the motor.	
	The motor has overheated.	Reduce the load or operation frequency.	
	The inverter load is greater than the rated	Replace the inverter with a model that	
E-Thermal	Capacity.  The set value for electronic thermal	has increased capacity. Set an appropriate electronic thermal	
2 memai	protection is too low.	level.	
	The inverter has been operated at low	Replace the motor with a model that	
	speed for an extended duration.	supplies extra power to the cooling fan.	
Output Phase	The magnetic contactor on the output side	Check the magnetic contactor on the	
Open	has a connection fault.	output side.	
	The output wiring is faulty.	Check the output wiring.	
	The magnetic contactor on the input side has a connection fault.	Check the magnetic contactor on the input side.	
Input Phase	The input wiring is faulty.	Check the input wiring.	
Open	The DC link capacitor needs to be replaced.	Replace the DC link capacitor. Contact the retailer or the LSIS customer service center.	
I OIT	The load is greater than the rated motor capacity.	Replace the motor and inverter with models that have increased capacity.	
Inverter OLT	The torque boost level is too high.	Reduce the torque boost level.	
	The torque boost lever is too riigh.	Determine if a foreign object is	
	There is a problem with the cooling system.	obstructing the air inlet, outlet, or vent.	
Over Heat	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 wiring is short-circuited.	Check the output wiring.	
Over Current2	There is a fault with the electronic semiconductor (IGBT).	Do not operate the inverter. Contact the retailer or the LSIS customer service center.	
NTC Open	The ambient temperature is too low.	Keep the ambient temperature above - 10°C.	
NTC Open	There is a fault with the internal temperature sensor.	Contact the retailer or the LSIS customer service center.	
FAN Lock	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.	
IDE 4 EANITHS	The fan connector is not connected.	Connect the fan connector.	
IP54 FAN Trip	The fan connector needs to be replaced.	Replace the fan connector.	

# **7.3 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.

Туре	Cause	Remedy
	The inverter is in operation (driving	Stop the inverter to change to program
	mode).	mode and set the parameter.
	The parameter access is incorrect.	Check the correct parameter access
Parameters	The parameter access is incorrect.	level and set the parameter.
cannot be set.	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 frequency command source is set	Check the frequency command source
	incorrectly. The operation command source is set	setting. Check the operation command source
	incorrectly.	setting.
	Power is not supplied to the terminal	Check the terminal connections R/S/T
	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).
	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 motor does	The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
not rotate.	The input option for the frequency	Check the input option for the
	command is incorrect.	frequency command.
	The input voltage or current for the	Check the input voltage or current for
	frequency command is incorrect.	the frequency command.
	The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode setting.
		Check the frequency command and
	The frequency command value is too low.	input a value above the minimum
		frequency.
	The [STOP/RESET] key is pressed.	Check that the stoppage is normal, if so
	The [STOP/RESET] key is pressed.	resume operation normally.
		Change the operation modes (V/F, IM,
	Motor torque is too low.	and Sensorless). If the fault remains,
	motor torque is too low.	replace the inverter with a model with
		increased capacity.

Туре	Cause	Remedy
The motor rotates in the	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.
opposite direction to the command.	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	Reverse rotation prevention is selected.	Remove the reverse rotation prevention.
rotates in one direction.	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 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.
Th	The ambient temperature of the motor is too high.	Lower the ambient temperature of the motor.
The motor is overheating.	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 apllications 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 frequency command value is low.	Set an appropriate value.
The motor does not accelerate. /The acceleration	The load is too high.	Reduce the load and increase the acceleration time. Check the mechanical brake status.
time is too long.	The acceleration time is too long.	Change the acceleration time.
	The combined values of the motor	Change the motor related parameters.

Туре	Cause	Remedy
	properties and the inverter parameter are incorrect.	
	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	There is a high variance in load.	Replace the motor and inverter with models with increased capacity.
varies during	The input voltage varies.	Reduce input voltage variation.
operation.	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	The deceleration time is set too long.	Change the setting accordingly.
deceleration time is too long even with Dynamic	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.
Braking (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	The carrier frequency is too high.	Reduce the carrier frequency.
difficult in underload applications.	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		Change the carrier frequency to the minimum value.
operation, a control unit malfunctions or noise occurs.	Noise occurs due to switching inside the inverter.	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 100 $\Omega$ for 200 V inverters and less than 10 $\Omega$ for 400 V inverters.  Check the capacity of the earth leakage

Туре	Cause	Remedy	
		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	Phase-to-phase voltage of 3-phase power	Check the input voltage and balance the voltage.	
and does not rotate normally.	source is not balanced.	Check and test the motor's insulation.	
The motor makes	Resonance occurs between the motor's natural frequency and the carrier frequency.	Slightly increase or decrease the carrier frequency.	
humming, or loud noises.	Resonance occurs between the motor's	Slightly increase or decrease the carrier frequency.	
ioda rioises.	natural frequency and the inverter's output frequency.	Use the frequency jump function to avoid the frequency band where resonance occurs.	
The motor	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 (IN-07).	
vibrates/hunts.	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		Adjust the DC braking parameter.	
not come to a complete stop when the	It is difficult to decelerate sufficiently, because DC braking is not operating	Increase the set value for the DC braking current.	
inverter output stops.	normally.	Increase the set value for the DC braking stopping time.	
The output	The frequency reference is within the jump frequency range.	Set the frequency reference higher than the jump frequency range.	
frequency does not increase to the frequency reference.	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	Replace the inverter with a model with increased capacity.	
The cooling fan does not rotate.	prevention function is working.  The control parameter for the cooling fan is set incorrectly.	Check the control parameter setting for the cooling fan.	

#### 8 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.

### 8.1 Regular Inspection Lists

### 8.1.1 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 <u>1.3</u> <u>Installation</u> <u>Considerations</u> on page <u>4</u> .	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 <u>9.1</u> <u>Input and</u> <u>Output</u> <u>Specification</u> on page <u>249</u> .	Digital multimeter tester

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
Input/Output	Smoothing	Is there any leakage from the inside?	Visual	No abnormality	_
circuit	capacitor	Is the capacitor swollen?	inspection	NO abriormality	
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.		

## 8.1.2 Annual Inspections

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
area	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	
	Is there any evidence of parts overheating?		Visual inspection	abnormality	
Input/Output circuit	Cable connections	Are there any corroded cables? Is there any damage to cable insulation?	·Visual inspection	No abnormality	-
	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	-
		damage to the contacts?	inspection		
	Braking resistor	Is there any damage from resistance?	Visual inspection	No abnormality	Digital multimeter / anaog tester
		Check for	Disconnect	Must be	

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
		disconnection.	one side and measure with a tester.	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.  Test the inverter ouput	Balance the voltage between phases: within 4V for 200 V series and within 8V for 400 V series.	Digital multimeter or DC voltmeter
		in the display circuit after the sequence protection test?	protection in both short and open circuit conditions.	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	-
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.

## 8.1.3 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

#### ① Caution

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

## 8.2 Replacing Major Components

Refer to following for information on replacing major components.

## 8.2.1 Exchange Cycle for Major Components

Following table shows the cycles and information for major components.

Components	Exchange standard	Symptom	Action
Cooling fan	3 years	Spinning failure	Make inquiries to the A/S center and replace it with a new product.
Main circuit electrolytic condenser	3 years	Capacity reduction	Make inquiries to the A/S center and replace it with a new product.
Main circuit relay	-	Operation failure	Make inquiries to the A/S center.

#### Note

The life times of major components are based on the operating rated load consecutively. The lifetime may be different according to conditions and environment.

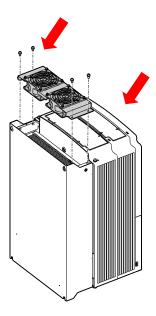
## 8.2.2 How to Replace the Cooling Fans

#### ① Caution

Turn off the power when replacing cooling fans.

Replace the cooling fans following the steps below:

- 1 Refer to the illustration and remove the 4 bolts securing the fan bracket.
- **2** Remove the fan bracket and disconnect the fan connector.
- **3** Connect the new fan's connector to the inverter's fan connector.
- 4 Reinsert the 4 bolts and secure the fan bracket.



## 8.3 Storage and Disposal

#### 8.3.1 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 <u>1.3</u> <u>Installation Considerations</u> on page <u>4</u>).
- 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.

#### 8.3.2 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.

#### ① 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.

# **9 Technical Specification**

## 9.1 Input and Output Specification

#### 3-Phase 400 V (30-75 kW)

Model □□□□S100-4□□□			0300	0370	0450	0550	0750		
Applied	HP		40	50	60	75	100		
motor	kW		30	37	45	55	75		
	Rated capacity	(kVA)	46	57	69	84	116		
Datad	Rated current	Heavy load	61	75	91	110	152		
Rated output	(A)	Normal load	75	91	107	142	169		
σαιραι	Output frequency		0-400 Hz	0-400 Hz (IM Sensorless: 0-120 Hz)					
	Output voltage (V)		3-phase 3	3-phase 380-480 V					
	Working voltag	je (V)	3-phase 3	3-phase 380-480 VAC (-15% to +10%)					
Datad input	Input frequenc	у	50-60 Hz	50-60 Hz (±5%)					
Rated input	Rated current	Heavy load	56	69	85	103	143		
	(A)	Normal load	69	85	100	134	160		
Weight (lb /k	(g)		26	35	35	43	43		

<sup>\*</sup>S100 inverters rated at 30 kW or more do not support I/O extensions or IP66 certification.

<sup>\*</sup>The 55-75 kW inverters do not have built-in EMC since they satisfy EMC standards even without it.

# **9.2 Product Specification Details**

Items			Description				
	Control me	ethod	V/F control, slip compensation	ion, sensorless vector			
	Frequency		Digital command: 0.01 Hz				
	power reso		Analog command: 0.06 Hz (6				
Control	Frequency	-	1% of maximum output free	•			
	V/F patterr	<u>1</u>	Linear, square reduction, use				
	Overload o	capacity	Heavy load rated current: 15 120% 1 min	50% 1 min, normal load rated current:			
	Torque bo	ost	Manual torque boost, autom	natic torque boost			
	Operation	type		p, or communication operation			
	Frequency	settings	Analog type: -10-10 V, 0-10 Digital type: key pad, pulse t				
	Operation	function	<ul> <li>PID control</li> <li>3-wire operation</li> <li>Frequency limit</li> <li>Second function</li> <li>Anti-forward and reverse direction rotation</li> <li>Commercial transition</li> <li>Speed search</li> <li>Power braking</li> <li>Leakage reduction</li> </ul>	<ul> <li>Up-down operation</li> <li>DC braking</li> <li>Frequency jump</li> <li>Slip compensation</li> <li>Automatic restart</li> <li>Automatic tuning</li> <li>Energy buffering</li> <li>Flux braking</li> <li>Fire Mode</li> </ul>			
Operation	Input	Multi function terminal (7EA) P1-P7	<ul> <li>according to IN-65–IN-71 color</li> <li>Forward direction operat</li> <li>Reset</li> <li>Emergency stop</li> <li>Multi step speed frequen high/med/low</li> <li>DC braking during stop</li> <li>Frequency increase</li> <li>3-wire</li> <li>Local/remote operation retransition</li> <li>Select acc/dec/stop</li> </ul>	<ul> <li>Reverse direction operation</li> <li>External trip</li> <li>Jog operation</li> <li>Multi step acc/dechigh/med/low</li> <li>Second motor selection</li> <li>Frequency reduction</li> <li>Fix analog command frequency</li> <li>Transtion from PID to general operation</li> </ul>			
		Pulse train Multi	0-32 kHz, Low Level: 0-0.8 V,	High Level: 3.5-12 V			
	Output	function open	Fault output and inverter operation status output	Less than DC 24 V, 50 mA			

Items		Description			
Items	collector terminal Multi function relay terminal Analog output Pulse train		• •		
Protection function	Trip  Alarm  Instantaneous	<ul> <li>Over current trip</li> <li>External signal trip</li> <li>ARM short circuit current trip</li> <li>Over heat trip</li> <li>Input imaging trip</li> <li>Ground trip</li> <li>Motor over heat trip</li> <li>I/O board link trip</li> <li>No motor trip</li> <li>Parameter writing trip</li> <li>Emergency stop trip</li> <li>Command loss trip</li> <li>External memory error</li> <li>CPU watchdog trip</li> <li>Motor normal load trip</li> <li>Command loss trip alarm, overlo inverter overload alarm, fan oper rate alarm, number of correction</li> <li>Heavy load less than 16 ms (norm continue operation (must be wit rated output range)</li> </ul>	ation alarm, resistance braking s on rotor tuning error nal load less than 8 ms):		
	blackout	Heavy load more than 16 ms (normal load more than 8 ms ): auto restart operation			
	Cooling type	Forced fan cooling structure  IP 20 (standard), UL Open & Enclo	osed Type 1 (option)		
	Protection structure	UL Enclosed Type 1 is satisfied by	, , , , , , , , , , , , , , , , , , ,		
Structure/ working environme nt	Ambient temperature	Heavy load: -10-50°C (14-122°F), normal load: -10-40°C (14-104°F) No ice or frost should be present. Working under normal load at 50°C (122°F), it is recommended that less than 80% load is applied.			
	Ambient humidity	Relative humidity less than 90% RH (to avoid condensation forming)			

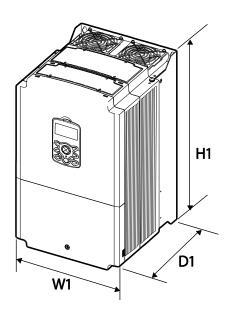
## **Technical Specification**

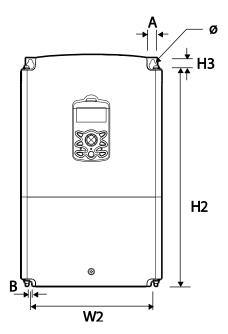
Items		Description
	Storage temperature.	-20°C-65°C (-4-149°F)
	Surrounding environment	Prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants (Pollution Degree 2 Environment).
	Operation altitude/oscillation	No higher than 3280ft (1,000m). Less than 9.8 m/sec <sup>2</sup> (0.6G).
	Pressure	70-106 kPa

# **Specification**

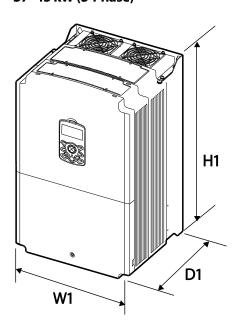
# 9.3 External Dimensions (IP 20 Type)

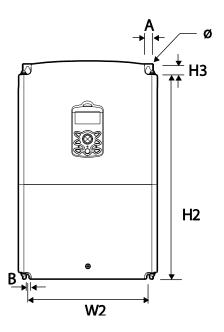
#### 30 kW (3-Phase)



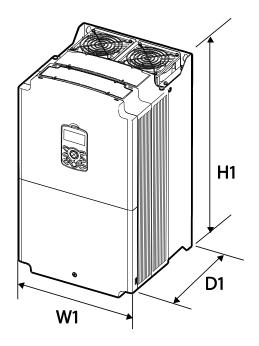


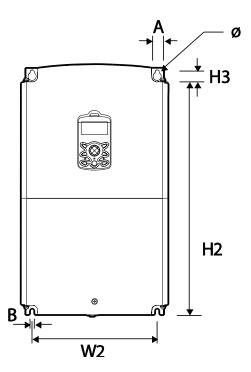
#### 37-45 kW (3-Phase)





#### 55-75 kW (3-Phase)





Items	W1	W2	H1	H2	H3	D1	A	В
0300S100-4	275 (10.8)	232	450 (17.7)	428.5	14	284	7	7
0370S100-4 0450S100-4	325	282	510 (20.1)	486.5	16	(11.2)	(0.28)	(0.28)
0550S100-4 0750S100-4	(12.8)	275	550 (21.7)	524.5	16	309 (12.2)	9	9

Units: mm (inches)

## 9.4 Peripheral Devices

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

Circuit Break		eaker	er		Leakage Breaker		Magnetic Contactor	
Product(kW)	Model Model	Current (A)	Model	Current (A)	Model	Current(A)	Model	Current (A)
30 kW-4	ABS103c	125	UTS150	125	EBS 103c	125	MC-100a	105
37 kW-4		150	013130	150		150	MC-130a	130
45 kW-4	ABS203c	175	LITCOEO	175	EBS203c	175	MC-150a	150
55 kW-4		225	UTS250	225		225	MC-185a	185
75 kW-4	ABS403c	300	UTS400	300	EBS 403c	300	MC-225a	225

## 9.5 Fuse and Reactor Specifications

Due do at (IsM)	AC Input Fuse				
Product (kW)	Current (A)	Voltage (V)			
30 kW-4	125 A	600			
37 kW-4	123 A				
45 kW-4	160 A				
55 kW-4	200 4				
75 kW-4	200 A				

#### ① 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.

## 9.6 Terminal Screw Specification

#### Input/Output Terminal Screw Specification

Product (kW)	Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
30~75 kW	M8	61.2~91.8

#### **Control Circuit Terminal Screw Specification**

Terminal	Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
P1~P7/CM/VR/V1/I2/AO1/AO2/ Q1/EG/24/TI/TO/SA,SB,SC/S+,S-	M2.6	0.4
,SG/A1,B1,C1/A2,C2		

#### ① 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 600 V, 90°C for power terminal wiring, and rated at 300 V, 75℃ for control terminal wiring.

## 9.7 Braking Resistor Specification

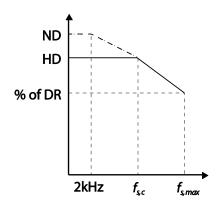
Product (kW)	Resistance ( $\Omega$ )	Rated Capacity (W)	
30 kW	12	5000	
37 kW	12	3000	
45 kW		10000	
55 kW	6		
75 kW			

<sup>•</sup> 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.

## 9.8 Continuous Rated Current Derating

#### **Derating by Carrier Frequency**

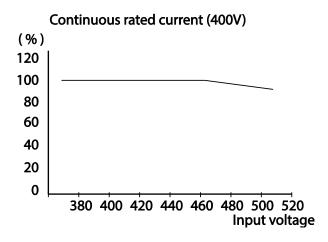
The continuous rated current of the inverter is limited based on the carrier frequency. Refer to the following graph.



Item	Unit	30 kW	37 kW	45 kW	55 kW	75 kW
$f_{s,ND}$				2		
$f_{s,c}$	[kHz]		6		4	4
f <sub>s, max</sub>			10		-	7
% of DR	[%]			70		

#### **Derating by Input Voltage**

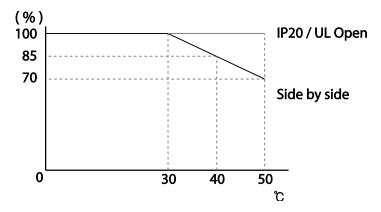
The continuous rated current of the inverter is limited based on the input voltage. Refer to the following graph.



#### Derating by Ambient Temperature and Installation Type

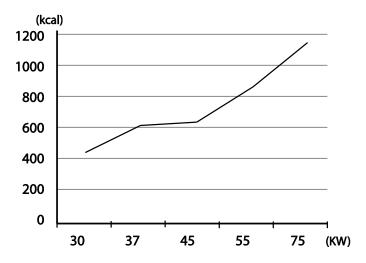
The constant-rated current of the inverter is limited based on the ambient temperature and installation type. Refer to the following graph.

#### Continuous rated current (400V)



## 9.9 Heat Emmission

The following graph shows the inverters' heat emission characteristics (by product capacity).



Heat emission data is based on operations with default carrier frequencysettings, under normal operating conditions. For detailed information on carrier frequency.

## **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 Standard Inverter	Date of Installation
Model Name	LSLV-S100	Warranty Period
	Name (or company)	·
CustomerInfo	Address	
	Contact Info.	
	Name	
Retailer Info	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.



#### **EC DECLARATION OF CONFORMITY**

We, the undersigned,

Representative:

LSIS Co., Ltd.

Address:

LS Tower, Hogye-dong, Dongan-gu,

Anyang-si, Gyeonggi-do 1026-6,

Korea

Manufacturer:

LSIS Co., Ltd.

Address:

181, Samsung-ri, Mokchon-Eup, Chonan, Chungnam, 330-845,

Korea

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

Type of Equipment:

**Inverter (Power Conversion Equipment)** 

Model Name:

LSLV-S100 series

Trade Mark:

LSIS Co., Ltd.

conforms with the essential requirements of the directives:

2006/95/EC Directive of the European Parliament and of the Council on the harmonisation of the laws of Member States relating to Electrical Equipment designed for use within certain voltage limits

2004/108/EC Directive of the European Parliament and of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility

based on the following specifications applied:

EN 61800-3:2004 EN 61800-5-1:2007

and therefore complies with the essential requirements and provisions of the 2006/95/CE and 2004/108/CE Directives.

Place:

Chonan, Chungnam,

**Korea** 

刻 红人

20/2.2.1

Mr. In Sik Choi / General Manager

(Full name / Position)

#### **EMI / RFI POWER LINE FILTERS**

LSIS inverters. S100 series



#### RFI FILTERS

THE LS RANGE OF POWER LINE FILTERS FEP (Standard) SERIES, HAVE BEEN SPECIFICALLY DESIGNED WITH HIGH FREQUENCY LISS INVERTERS, THE USE OF LS FILTERS, WITH THE INSTALLATION ADVICE OVERLEAF HLEP TO ENSURE TROUBLE FREE USE ALONG SIDE SENSITIVE DEVICES AND COMPLIANCE TO CONDUCTED EMISSION AND MINUNITY STANDARS TO BE 50081.

#### CAUTION

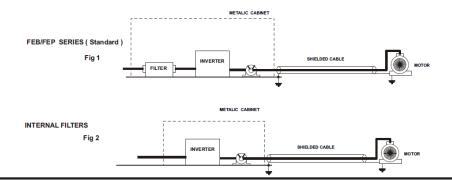
IN CASE OF A LEAKAGE CURRENT PROTECTIVE DEVICES IS USED ON POWER SUPPLY, IT MAY BE FAULT AT POWER-ON OR OFF. IN AVOID THIS CASE, THE SENSE CURRENT OF PROTECTIVE DEVICE SHOULD BE LARGER

#### RECOMMENDED INSTALLATION INSTRUCTIONS

To conform to the **EMC** directive, it is necessary that these instructions 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 <u>ferrite core</u> ( 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 enclosure body via and earthed cable gland.
- 7-) Connect any control cables as instructed in the inverter instructions manual.

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



PR0065

LSLV ser	ies /	Inte	rnal Filters	
NVERTER	POWER	FI G.	OUTP UT CHOKES	
THREE PHASE				
LSLV0300S100-4	30kW	2	FS-3	
LSLV0370S100-4	37kW	2	FS-3	
LSLV 04 50 S 10 0 - 4	45kW	2	FS-3	

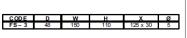




Vector Motor Control Ibérica S.L. C/ Mar del Carib, 10 Pol. Ind. La Torre del Rector 08130 Santa Perpètua de Mogoda (BARCELONA) ESPAÑA Tel. (+34) 935 748 206 Fax (+34) 935 748 248 info@vm.es www.vmc.es



FS SERIES ( output chokes )



PR0065

## **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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