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

\* LSLV-S100 is the official name for S100.

# **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**

# **▲** 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 multimeter 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 Protective Class 0. It means that the circuit protection level depends on the basic insulation. If there is no basic insulation is failed, it may cause electric shock accident. 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: AO, TO
- Digital Output: Q1, EG, 24, A1/C1/B1
- Communication: S+/S-/SG
- Fan
- The protection level of this equipment (inverter) is Protective Class 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.
- Do not operate Disconnect Switch when motor is operating.

#### 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.

#### Remarque

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	UTE100(E/N)	UTS150(N/H/L)	ABS33c	ABS53c	ABS63c	ABS103c
240V(50/60Hz)	50/65 kA	65/100/150 kA	30 kA	35 kA	35 kA	85 kA
480V(50/60Hz)	25/35 kA	35/65/100 kA	7.5 kA	10 kA	10 kA	26 kA

# **Table of Contents**

1	Prepa	arıng tn	e installation	T
	1.1	Produ	ct Identification	1
	1.2	Part N	ames	3
	1.3	Installa	ation Considerations	5
	1.4	Selecti	ing and Preparing a Site for Installation	6
	1.5	Cable	Selection	9
2	Insta	lling the	e Inverter	11
	2.1	Mount	ting the Inverter	13
	2.2	Cable '	Wiring	17
	2.3	Post-Ir	nstallation Checklist	32
	2.4	Test Ru	ın	33
3	Learı	ning to F	Perform Basic Operations	37
	3.1	About	the Keypad	37
		3.1.1	About the Display	38
		3.1.2	Operation Keys	39
		3.1.3	Control Menu	40
	3.2	Learni	ng to Use the Keypad	41
		3.2.1	Group and Code Selection	41
		3.2.2	Navigating Directly to Different Codes	42
		3.2.3	Setting Parameter Values	43
		3.2.4	Configuring the [ESC] Key	
	3.3	Actual	Application Examples	
		3.3.1	Acceleration Time Configuration	45
		3.3.2	Frequency Reference Configuration	
		3.3.3	Jog Frequency Configuration	
		3.3.4	Initializing All Parameters	
		3.3.5	Frequency Setting (Keypad) and Operation (via Terminal Input).	
		3.3.6	Frequency Setting (Potentiometer) and Operation (Terminal Inp	-
		3.3.7	Frequency Setting (Potentiometer) and Operation (Keypad)	52

	3.4	Monito	oring the Operation	54
		3.4.1	Output Current Monitoring	54
		3.4.2	Fault Trip Monitoring	55
4	Learn	ing Bas	ic Features	57
	4.1	Setting	g Frequency Reference	60
		4.1.1	Keypad as the Source (KeyPad-1 setting)	60
		4.1.2	Keypad as the Source (KeyPad-2 setting)	60
		4.1.3	V1 Terminal as the Source	61
		4.1.4	Setting a Frequency Reference with Input Voltage (Terminal I2)	68
		4.1.5	Setting a Frequency with TI Pulse Input	68
		4.1.6	Setting a Frequency Reference via RS-485 Communication	70
	4.2	Freque	ency Hold by Analog Input	70
	4.3	Chang	ing the Displayed Units (Hz←Rpm)	71
	4.4	Setting	g Multi-step Frequency	71
	4.5	Comm	and Source Configuration	73
		4.5.1	The Keypad as a Command Input Device	73
		4.5.2	Terminal Block as a Command Input Device (Fwd/Rev Run Commands)	74
		4.5.3	Terminal Block as a Command Input Device (Run and Rotation Direction Commands)	75
		4.5.4	RS-485 Communication as a Command Input Device	75
	4.6	Local/F	Remote Mode Switching	76
	4.7	Forwa	rd or Reverse Run Prevention	78
	4.8	Power-	-on Run	78
	4.9	Reset a	and Restart	79
	4.10	Setting	g Acceleration and Deceleration Times	80
		4.10.1	Acc/Dec Time Based on Maximum Frequency	80
		4.10.2	Acc/Dec Time Based on Operation Frequency	82
		4.10.3	Multi-step Acc/Dec Time Configuration	82
		4.10.4	Configuring Acc/Dec Time Switch Frequency	84
	4.11	Acc/De	ec Pattern Configuration	85
	4.12	Stoppi	ng the Acc/Dec Operation	88

4.13	V/F(Voltage/Frequency) Control88					
	4.13.1	Linear V/F Pattern Operation	88			
	4.13.2	Square Reduction V/F pattern Operation	89			
	4.13.3	User V/F Pattern Operation	90			
4.14	Torque	Boost	91			
	4.14.1	Manual Torque Boost	91			
	4.14.2	Auto Torque Boost-1	92			
	4.14.3	Auto Torque Boost-2	93			
4.15	Outpu	t Voltage Setting	93			
4.16	Start M	Node Setting	94			
	4.16.1	Acceleration Start	94			
	4.16.2	Start After DC Braking	94			
4.17	Stop M	Node Setting	95			
	4.17.1	Deceleration Stop	95			
	4.17.2	Stop After DC Braking	95			
	4.17.3	Free Run Stop	96			
	4.17.4	Power Braking	97			
4.18	Freque	ency Limit	98			
	4.18.1	Frequency Limit Using Maximum Frequency and Start Fred	Juency 98			
	4.18.2	Frequency Limit Using Upper and Lower Limit Frequency V	'alues 98			
	4.18.3	Frequency Jump	99			
4.19	2 <sup>nd</sup> Ope	eration Mode Setting	100			
4.20	Multi-f	unction Input Terminal Control	101			
4.21	P2P Se	tting	103			
4.22	Multi-k	keypad Setting	104			
4.23	User Se	equence Setting	105			
4.24	Fire Mo	ode Operation	112			
RS-48	5 Comr	munication Features	115			
5.1	Comm	unication Standards	115			
5.2	Comm	unication System Configuration	115			
	5.2.1	Communication Line Connection	116			
	5.2.2	Setting Communication Parameters	116			

5

		5.2.3	Setting Operation Command and Frequency	118
		5.2.4	Command Loss Protective Operation	119
		5.2.5	Setting Virtual Multi-Function Input	119
		5.2.6	Saving Parameters Defined by Communication	120
		5.2.7	Total Memory Map for Communication	121
		5.2.8	Parameter Group for Data Transmission	121
	5.3	Comm	unication Protocol	
		5.3.1	LS INV 485 Protocol	
		5.3.2	Modbus-RTU Protocol	
	5.4		atible Common Area Parameter	
	5.5	S100 E	xpansion Common Area Parameter	
		5.5.1	Monitoring Area Parameter (Read Only)	
		5.5.2	Control Area Parameter (Read/ Write)	
		5.5.3	Inverter Memory Control Area Parameter (Read and Write)	142
6	Table	of Fund	ctions	145
	6.1	Operat	tion Group	145
	6.2	Drive g	group (PAR→dr)	146
	6.3	Basic F	unction group (PAR→bA)	151
	6.4	Expand	ded Function group (PAR→Ad)	157
	6.5	Contro	ol Function group (PAR→Cn)	162
	6.6	Input T	erminal Block Function group (PAR→In)	169
	6.7	Outpu	t Terminal Block Function group (PAR→OU)	174
	6.8	Comm	unication Function group (PAR→CM)	179
	6.9	Applica	ation Function group (PAR→AP)	184
	6.10	Protec	tion Function group (PAR→Pr)	187
	6.11	2nd M	otor Function group (PAR→M2)	192
	6.12	User Se	equence group (US)	194
	6.13	User Se	equence Function group(UF)	198
	6.14	Group	s for LCD Keypad Only	218
		6.14.1	Trip Mode (TRP Last-x)	218
		6.14.2	Config Mode (CNF)	218

7	Troul	bleshoo	ting	223
	7.1	Trips a	nd Warnings	223
		7.1.1	Fault Trips	223
		7.1.2	Warning Messages	226
	7.2	Troubl	eshooting Fault Trips	227
	7.3	Troubl	eshooting Other Faults	229
8	Main	tenance	2	235
	8.1	Regula	ar Inspection Lists	235
		8.1.1	Daily Inspections	235
		8.1.2	Annual Inspections	236
		8.1.3	Bi-annual Inspections	238
	8.2	Storag	e and Disposal	238
		8.2.1	Storage	238
		8.2.2	Disposal	239
9	Tech	nical Sp	ecification	241
	9.1	Input a	and Output Specification	241
	9.2	Produc	ct Specification Details	245
	9.3	Extern	al Dimensions (IP 66 Type)	248
	9.4	Periph	eral Devices	253
	9.5	Fuse a	nd Reactor Specifications	254
	9.6	Termin	nal Screw Specification	255
	9.7	Brakin	g Resistor Specification	257
	9.8	Contin	nuous Rated Current Derating	258
	9.9	Heat E	mmission	260
Pro	oduct V	<b>Varrant</b>	y	261
Inc	lov	•	-	260

# 1 Preparing the Installation

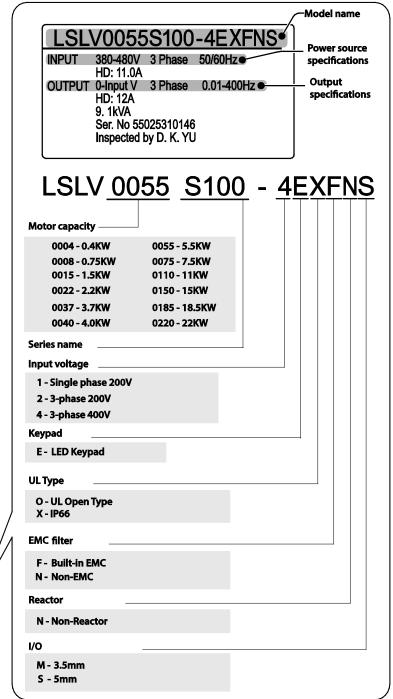
This chapter provides details on product identification, part names, correct installation and cable specifications. To install the inverter correctly and safely, carefully read and follow the instructions.

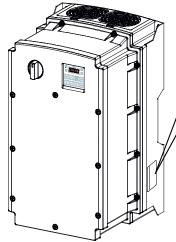
## 1.1 Product Identification

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 9.1 Input and Output Specification on page 241.

#### 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.

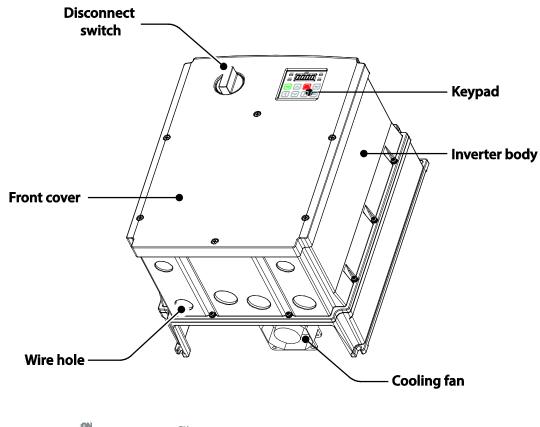


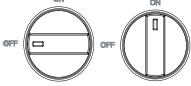


# 1.2 Part Names

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

## **Full product**

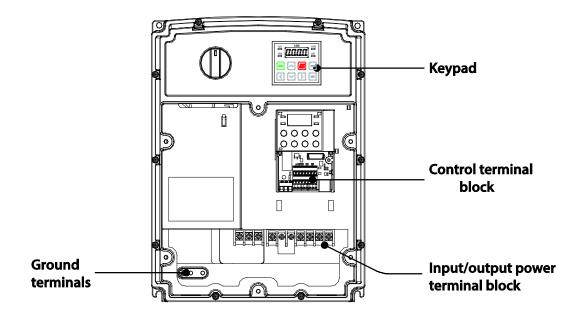




Do not operate Disconnect Switch when motor is operating.

Cooling fan is only supported to 5.5~7.5kW products.

### **Front cover removed**

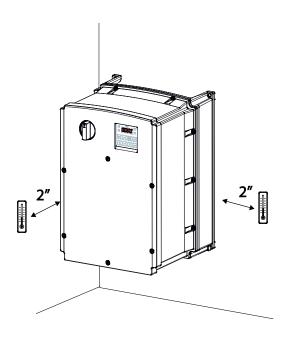


## 1.3 Installation Considerations

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: 14–122°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 1G (9.8m/sec <sup>2</sup> )
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.



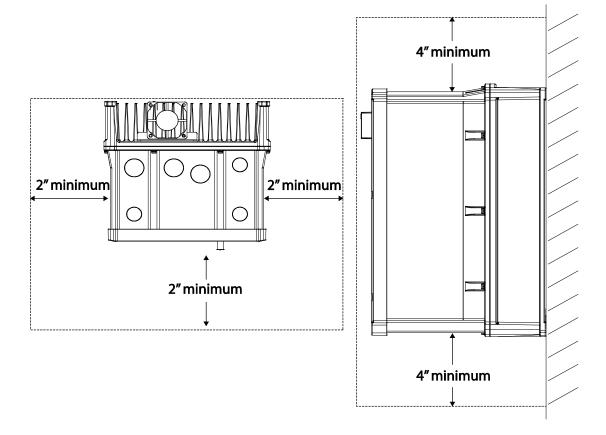
## ① Caution

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

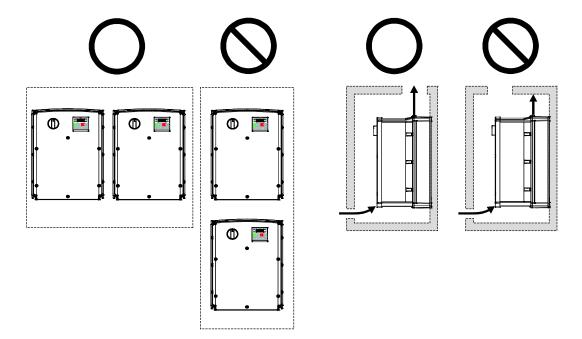
# 1.4 Selecting and Preparing a Site for Installation

When selecting an installation location consider the following points:

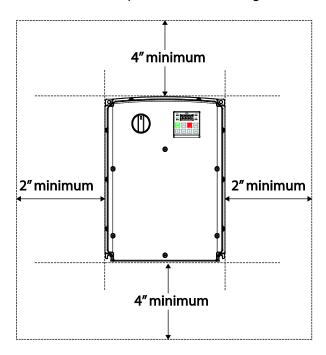
- The inverter must be installed on a wall that can support the inverter's weight.
- The location must be free from vibration. Vibration can adversely affect the operation of the inverter.
- The inverter can become very hot during operation. Install the inverter on a surface that is
  fire-resistant 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 600V, 75℃ for power terminal wiring.
- Use copper cables rated for 300V, 75℃ for control terminal wiring.

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

		Ground		Power I/O			
Load (kW)		mm <sup>2</sup>	AWG	mm <sup>2</sup>		AWG	
		111111	AWG	R/S/T	U/V/W	R/S/T	U/V/W
	0.4 0.75 1.5 2.2	4	12	2	2	14	14
3–Phase 200V	3.7 4	1		3.5	3.5	12	12
	5.5 7.5	5.5	10	6	6	10	10
	11	14	6	10	10	8	8
	15			16	16	6	6
3-Phase 400V	0.4 0.75 1.5 2.2 3.7 4	4	12	2	2	14	14
3-Phase 400V	5.5	4	12	2.5	2.5	14	14
	7.5 11	8	8	4	4	12	12
	15	0	0	6	6	10	10
	18.5 22	14	6	10	10	8	8

# Signal (Control) Cable Specifications

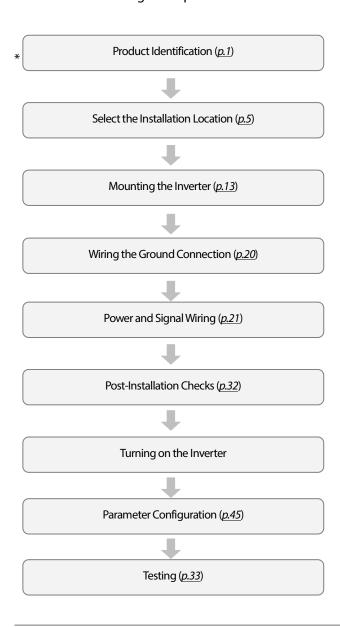
	Signal Cable					
Terminals	Without Crimp Term	inal Connectors	With Crimp Terminal Connectors			
Terminais	(Bare wire)		(Bootlace Ferrule)			
	mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG		
P1-P5/						
CM/VR/V1/I2/AO/Q1/	0.75	18	0.5	20		
EG/24/ SA,SB,SC/S+,S-	0.73	10	0.5	20		
,SG						
A1/B1/C1	1.0	17	1.5	15		

# 2 Installing the Inverter

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

#### **Installation Flowchart**

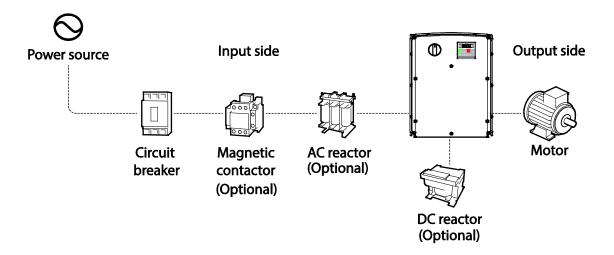
The flowchart lists the sequence to be followed during installation. The steps cover equipment installation and testing of the product. More information on each step is referenced in the steps.



#### **Basic Configuration Diagram**

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

Prior to installing the inverter, ensure that the product is suitable for the application (power rating, capacity, etc). Ensure that all of the required peripherals and optional devices (resistor brakes, contactors, noise filters, etc.) are available. For more details on peripheral devices, refer to <u>9.4</u> <u>Peripheral Devices</u> on page <u>253</u>.



## ① Caution

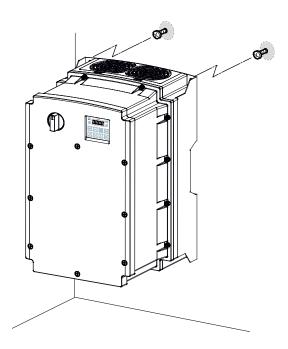
- Figures in this manual are shown with covers or circuit breakers removed to show a more detailed view of the installation arrangements. Install covers and circuit breakers before operating the inverter. Operate the product according to the instructions in this manual.
- Do not start or stop the inverter 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 10 times of inverter capacity. Refer to <u>9.5 Fuse and Reactor</u> Specifications on page <u>254</u> and carefully select a reactor that meets the requirements.

# 2.1 Mounting the Inverter

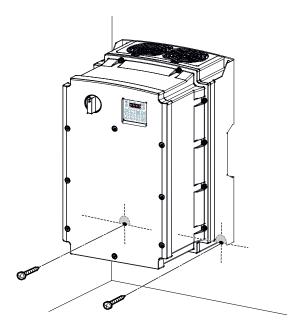
Mount the inverter on a wall or inside a panel following the procedures provided below. Before installation, ensure that there is sufficient space to meet the clearance specifications, and that there are no obstacles impeding the cooling fan's air flow.

Select a wall or panel suitable to support the installation. Refer to <u>9.3 External Dimensions (IP 66 Type)</u> on page <u>248</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.

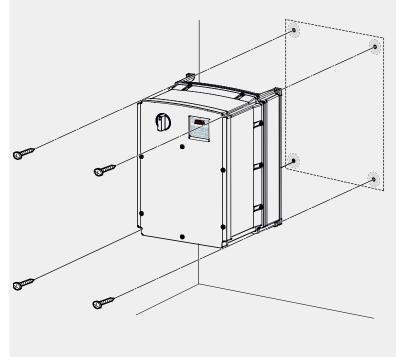


3 Mount the inverter on the wall or inside a panel using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the inverter is placed flat on the mounting surface, and that the installation surface can securely support the weight of the inverter.



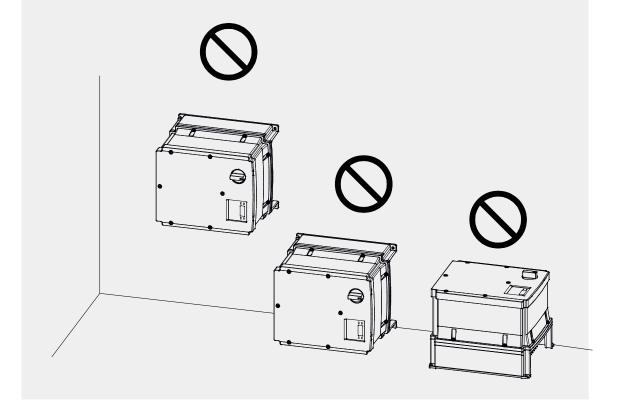
### Note

The quantity and dimensions of the mounting brackets vary based on frame size. Refer to <u>9.3 External</u> <u>Dimensions (IP 66 Type)</u> on page <u>248</u> for detailed information about your model.



## 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

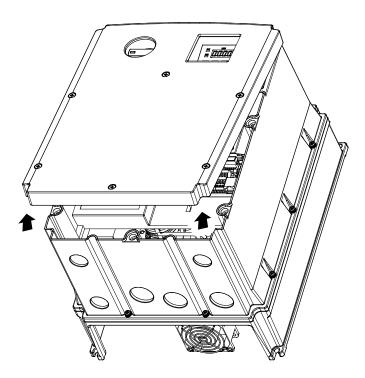
- Install the inverter before carrying out wiring connections.
- Ensure that no small metal debris, such as wire cut-offs, remain inside the inverter. Metal debris in the inverter may cause inverter failure.
- Tighten terminal screws to their specified torque. Loose terminal block screws may allow the
  cables to disconnect and cause short circuit or inverter failure. Refer to <u>9.6 Terminal Screw</u>
  <u>Specification</u> on page <u>255</u> 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 600V, 75°C for power terminal wiring.
- Use copper cables rated at 300V, 75 °C for control terminal wiring.
- Separate control circuit wires from the main sircuits and other high voltage circuits (200V relay sequence circuit).
- Check for short circuits or wiring failure in the control circuit. They could cause system failure or device malfunction.
- Use shielded cables when wiring the control circuit. Failure to do so may cause malfunction due to interference. If a ground is needed, use STP (Shielded Twisted Pair) cables.
- If you need to re-wire the terminals due to wiring-related faults, ensure that the 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**

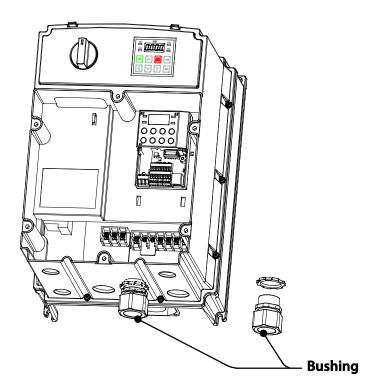
The front cover must be removed to install cables. Refer to the following procedures to remove the cover.

## 0.4~15kW (3-phase 2type), 0.4~22kW (3-phase 4type)

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



2 Set the bushing to every wiring hole before installing to power and I/O board terminals. Use the bushing that is NEMA 4X (IP66) or more.



3 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>9</u>.

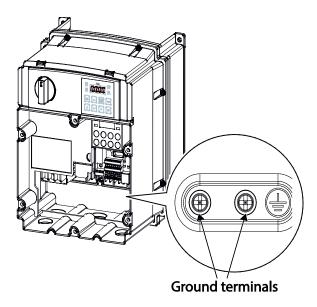
#### Note

To connect an LCD keypad, remove the plastic knock-out from the bottom of the front cover (right side) or from the control terminal cover. Then connect the signal cable to the RJ-45 port on the control board.

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

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

1 Locate the ground terminal and connect an appropriately rated ground cable to the terminals. Refer to <u>1.5 Cable Selection</u> on page <u>9</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

- 200 V products require Class 3 grounding. Resistance to ground must be  $< 100\Omega$ .
- 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>9</u> before installing them.

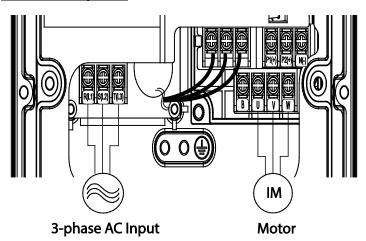
#### Caution

- Apply rated torques to the terminal screws. Loose screws may cause short circuits and malfunctions. Tightening the screw too much may damage the terminals and cause short circuits and malfuctions.
- Use copper wires only with 600V, 75°C rating for the power terminal wiring, and 300V, 75°C rating for the control terminal wiring.
- Do not connect two wires to one terminal when wiring the power.
- Power supply wirings must be connected to the R, S, and T terminals. Connecting them to the U, V, W terminals causes internal damages to the inverter. Motor should be connected to the U, V, and W Terminals. Arrangement of the phase sequence is not necessary.

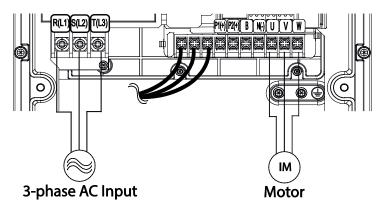
### Attention Attention

- 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 risqué 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 °C pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 °C 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.

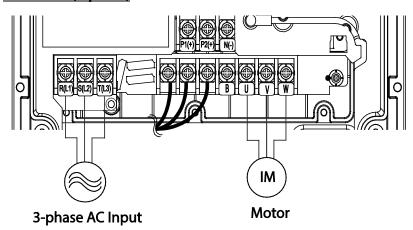
## 0.4~0.8kW (3-phase)



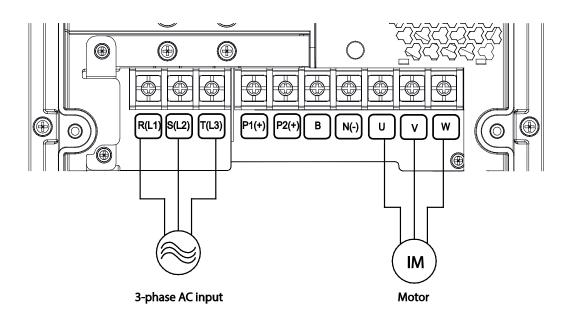
## 1.5~2.2kW (3-phase)



### 3.7~4.0kW (3-phase)



#### 5.5-22kW (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.
P1(+)/N(-)	DC link terminal	DC voltage terminals.
P1(+)/P2(+)	DC reactor terminal	DC reactor wiring connection. (Remove the short-bar when you use the DC reactor.)
P2(+)/B	Brake resistor terminals	Brake resistor wiring connection.
U/V/W	Motor output terminals	3-phase induction motor wiring connections.

#### Note

- Do not use 3 core cables to connect a remotely located motor with the inverter.
- When you operating Brake resistor, the motor may vibrate under the Flux braking operation. In this case, please turn off the Flux braking (Pr.50).
- Make sure that the total cable length does not exceed 665ft (202m). For inverters < = 4.0kW capacity, ensure that the total cable length does not exceed 165ft (50m).
- Long cable runs can cause reduced motor torque in low frequency applications due to voltage drop. Long cable runs also increase a circuit's susceptibility to stray capacitance and may trigger

over-current protection devices or result in malfunction of equipment connected to the inverter.

- Voltage drop is calculated by using the following formula: Voltage Drop (V) =  $[\sqrt{3} X \text{ cable resistance } (m\Omega/m) X \text{ cable length } (m) X \text{ current(A)}] / 1000$
- Use cables with the largest possible cross-sectional area to ensure that voltage drop is minimized over long cable runs. Lowering the carrier frequency and installing a micro surge filter may also help to reduce voltage drop.

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

# **⚠** Warning

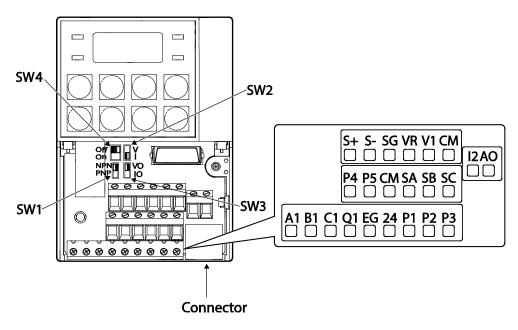
Do not connect power to the inverter until installation has been fully completed and the inverter is ready to be operated. Doing so may result in electric shock.

#### Caution

- Power supply cables must be connected to the R, S, and T terminals. Connecting power cables to other terminals will damage the inverter.
- Use insulated ring lugs when connecting cables to R/S/T and U/V/W terminals.
- The inverter's power terminal connections can cause harmonics that may interfere with other communication devices located near to the inverter. To reduce interference the installation of noise filters or line filters may be required.
- To avoid circuit interruption or damaging connected equipment, do not install phase-advanced condensers, surge protection, or electronic noise filters on the output side of the inverter.
- To avoid circuit interruption or damaging connected equipment, do not install magnetic contactors on the output side of the inverter.

## **Step 4 Control Terminal Wiring**

The illustrations below show the detailed layout of control wiring terminals, and control board switches. Refer to the detailed information provided below and 1.5 Cable Selection on page 9 before installing control terminal wiring and ensure that the cables used meet the required specifications.

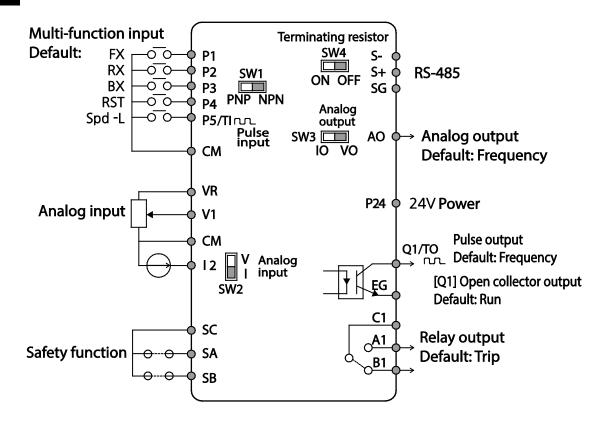


#### **Control Board Switches**

Switch	Description
SW1	NPN/PNP mode selection switch
SW2	analog voltage/current input terminal selection switch
SW3	analog voltage/current output terminal selection switch
SW4	Terminating Resistor selection switch

#### Connector

Name	Description
Connector	Connect to LCD Loader or Smart Copier



### **Input Terminal Labels and Descriptions**

Function	Label	Name	Description
Multi- function terminal configuration	P1-P5	Multi-function Input 1-5	Configurable for multi-function input terminals. Factory default terminals and setup are as follows: P1: Fx P2: Rx P3: BX P4: RST P5: Speed-L
	СМ	Common Sequence	Common terminal for analog terminal inputs and outputs.
Analog input configuration	VR	Potentiometer frequency reference input	<ul> <li>Used to setup or modify a frequency reference via analog voltage or current input.</li> <li>Maximum Voltage Output: 12V</li> <li>Maximum Current Output: 100mA,</li> <li>Potentiometer: 1–5kΩ</li> </ul>
	V1	Voltage input for frequency reference input	Used to setup or modify a frequency reference via analog voltage input terminal.  Unipolar: 0–10V (12V Max.)  Bipolar: -10–10V (±12V Max.)

Function	Label	Name	Description
	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: 0–10V (12V Max.)  I2 Mode  • Input current: 4–20mA  • Maximum Input current: 24mA  • Input resistance: 249Ω
	П	Pulse input for frequency reference input (pulse train)	Setup or modify frequency references using pulse inputs from 0 to 32kHz.  Low Level: 0–2.5V  High Level: 3.5–12V (Pulse input TI and Multi-function terminal P5 share the same terminal. Sel the In.69 P5 Define to 54(TI).)
Safety functionality configuration	SA	Safety input A	Used to block the output from the inverter in an emergency. Conditions:
	SB	Safety input B	<ul> <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 24V, < 25mA

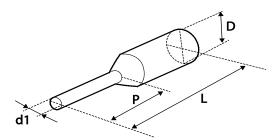
# **Output/Communication Terminal Labels and Descriptions**

Function	Label	Name	Description	
Analog output	AO	Voltage/Current Output	Used to send inverter output information to external devices: output frequency, output current, output voltage, or a DC voltage.  Operate switch (SW3) to select the signal output type (voltage or current) at the AO terminal.  Output Signal Specifications:  Output voltage: 0–10V  Maximum output voltage/current: 12V/10mA  Output current: 0–20mA  Maximum output current: 24mA  Factory default output: Frequency	

Function	Lahel	Name	Description
Function	TO 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: 0–32kHz  Output voltage: 0–12V  Factory default output: Frequency (Pulse output TO and Multi-function output Q1 share the same terminal. Sel the OU.33Q1 Define to 38(TO).) When connecting to a pulse between the S100 inverters,  Multiple I/O<-> Multiple I/O: Connect to TO->TI, CM-> CM  Standard I/O <-> Standard I/O: Connect to Q1-> P5, EG-> CM  Multiple I/O<-> Standard I/O: Do not support.
	Q1 Multi-functional (open collector)		DC 26V, 100mA or less Factory default output: Run
	EG	Common	Common ground contact for an open collector (with external power source)
District and the	24	External 24V power source	Maximum output current: 150mA
Digital output	A1/C1/B1	Fault signal output	<ul> <li>Sends out alarm signals when the inverter's safety features are activated (AC 250V &lt;1A, DC 30V &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>
Communication	mmunication S+/S-/SG RS-485 signal line		Used to send or receive RS-485 signals. Refer to <u>5</u> <u>RS-485 Communication Features</u> on page <u>115</u> for more details.

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

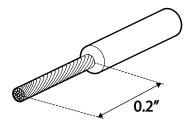
Use preinsulated crimp terminal connectors to increase reliability of the control terminal wiring. Refer to the specifications below to determine the crimp terminals to fit various cable sizes.



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

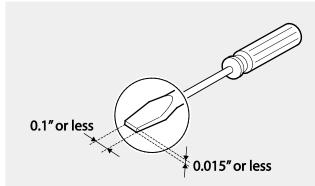
<sup>\*</sup> If the length (L) of the crimp terminals exceeds 0.5" (12.7mm) after wiring, the control terminal cover may not close fully.

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).



### 

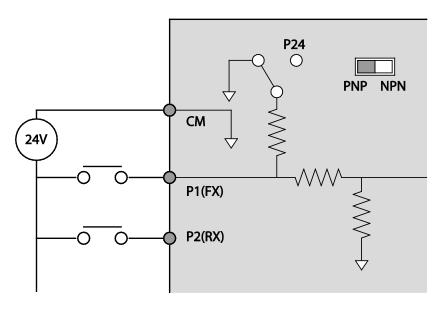
SA,SB, SC, they are shorted, have 24V voltage. Do not connect power to the inverter until installation has been fully completed and the inverter is ready to be operated. Doing so may result in electric shock.

### **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.

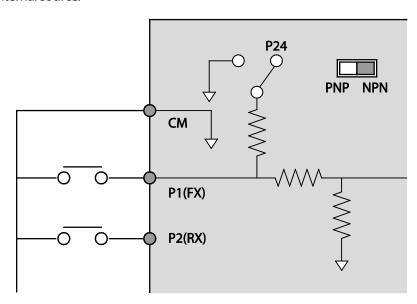
#### PNP Mode (Source)

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 Re-assembling the Cover

Re-assemble the cover after completing the wiring and basic configurations.

# 2.3 Post-Installation Checklist

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

Items	Check Point	Ref.	Result
	Is the installation location appropriate?	<u>p.5</u>	
	Does the environment meet the inverter's operating conditions?	<u>p.6</u>	
Installation	Does the power source match the inverter's rated input?	p.241	
Location/Power I/O Verification	Is the inverter's rated output sufficient to supply the equipment? (Degraded performance will result in certain circumstances. Refer to <u>9.8 Continuous Rated Current Derating</u> on page <u>258</u> for details.	<u>p.241</u>	
	Is a circuit breaker installed on the input side of the inverter?	p.12	
	Is the circuit breaker correctly rated?	p.241	
	Are the power source cables correctly connected to the R/S/T terminals of the inverter?  (Caution: connecting the power source to the U/V/W terminals may damage the inverter.)		
	Are the motor output cables connected in the correct phase rotation (U/V/W)? (Caution: motors will rotate in reverse direction if three phase cables are not wired in the correct rotation.)		
Power Terminal	Are the cables used in the power terminal connections correctly rated?	<u>p.9</u>	
Wiring	Is the inverter grounded correctly?	<u>p.20</u>	
	Are the power terminal screws and the ground terminal screws tightened to their specified torques?	<u>p. 21</u>	
	Are the overload protection circuits installed correctly on the motors (if multiple motors are run using one inverter)?	-	
	Is the inverter separated from the power source by a magnetic contactor (if a braking resistor is in use)?		
	Are advanced-phase capacitors, surge protection and electromagnetic interference filters installed correctly? (These devices MUST not be installed on the output side of the inverter.)	<u>p.21</u>	
	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 terminals defined prior to the installation of the control wiring connections?	<u>p.24</u>	

Items	Check Point	Ref.	Result
	Are the control cables properly wired?	<u>p24</u>	
	Are the control terminal screws tightened to their specified torques?	<u>p.17</u>	
	Is the total cable length of all control wiring < 165ft (100m)?	<u>p.29</u>	
	Is the total length of safety wiring < 100ft (30m)?	<u>p.29</u>	
	Are optional cards connected correctly?	-	
	Is there any debris left inside the inverter?	<u>p.17</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	Have the capacitors been replaced if they have been in use for > 2 years?	-	
	Have the fans been replaced if they have been in use for > 3 years?		
	Has a fuse been installed for the power source?	p.254	
	Are the connections to the motor separated from other connections?	-	

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

# 2.4 Test Run

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

- 1 Turn on the power supply to the inverter. Ensure that the keypad display light is on.
- 2 Select the command source.
- **3** Set a frequency reference, and then check the following:
  - If 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?
- **4** Set the acceleration and deceleration time.
- 5 Start the motor and check the following:
  - Ensure that the motor rotates in the correct direction (refer to the note below).
  - Ensure that the motor accelerates and decelerates according to the set times, and that the motor speed reaches the frequency reference.

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.

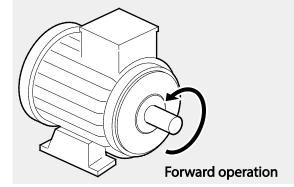
#### Remarque

Si la commande avant (Fx) est activée, le moteur doit tourner dans le sens anti-horaire si on le regarde côté charge du moteur. Si le moteur tourne dans le sens inverse, inverser les câbles aux bornes U et V.

### **Verifying the Motor Rotation**

- On the keypad, set the drv (Frequency reference source) code in the Operation group to 0 (Keypad).
- **2** Set a frequency reference.
- 3 Press the [RUN] key. Motor starts forward operation.
- 4 Observe the motor's rotation from the load side and ensure that the motor rotates counterclockwise (forward).

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



### ① Caution

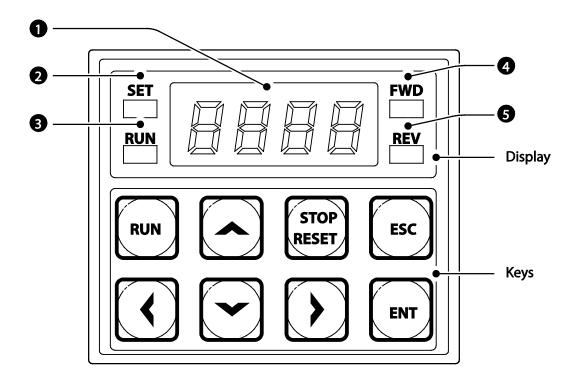
- Check the parameter settings before running the inverter. Parameter settings may have to be adjusted depending on the load.
- To avoid damaging the inverter, do not supply the inverter with an input voltage that exceeds the rated voltage for the equipment.
- Before running the motor at maximum speed, 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 About the Display

The following table lists display part names and their functions.

No.	Name	Function
0	7-Segment Display	Displays current operational status and parameter
U	7 Segment Display	information.
2	SET Indicator	LED flashes during parameter configuration and when the
•	3ET ITICICATO	ESC key operates as the multi-function key.
•	DLINIndicator	LED turns on (steady) during an operation, and flashes
8	RUN Indicator	during acceleration or deceleration.
FWD Indicator		LED turns on (steady) during forward operation.
6	REV Indicator	LED turns on (steady) during reverse operation.

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

<i>[</i> ]	0	R	А	Ä	К	Ħ	U
<b>!</b>	1	Ь	В	1	L	ń	V
2	2	[	С	,,	М	11	W
3	3	ď	D	ה	N	1	Х
4	4	E	Е		0	וינ	Υ
5	5	F	F	P	Р	11	Z
5	6	7	G	4	Q	-	-
7	7	H	Н	,-	R	-	-
8	8	}	I	5	S	-	-
9	9	_1	J	Ŀ	Т	-	-

# 3.1.2 Operation Keys

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

Key	Name	Description		
RUN	[RUN] key	Used to run the inverter (inputs a RUN command).		
(STOP) RESET	[STOP/RESET] key	STOP: stops the inverter. RESET: resets the inverter following fault or failure condition.		
<b>△</b> , <b>⊙</b>	[▲] key, [▼] key	Switch between codes, or to increase or decrease parameter values.		
<b>(</b> ), <b>(</b> )	[ <b>◀</b> ] key, [ <b>▶</b> ] key	Switch between groups, or to move the cursor during parameter setup or modification.		
ENT	[ENT] key	Used to select, confirm, or save a parameter value.		
ESC	[ESC] key	<ul> <li>A multi-function key used to configure different functions, such as:</li> <li>Jog operation</li> <li>Remote/Local mode switching</li> <li>Cancellation of an input during parameter setup</li> </ul>		

### ① Caution

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

# 3.1.3 Control Menu

The S100 inverter control menu uses the following groups.

Group	Display	Description
Operation	-	Configures basic parameters for inverter operation. These include reference frequencies and acceleration or deceleration times. Frequencies will only be displayed if an LCD keypad is in use.
Drive	dr	Configures parameters for basic operations. These include jog operation, motor capacity evaluation, torque boost, and other keypad related parameters.
Basic	ЬÄ	Configures basic parameters, including motor- related parameters and multi-step frequencies.
Advanced	Rd	Configure acceleration or deceleration patterns and to setup frequency limits.
Control	[	Configures sensorless vector - related features.
Input Terminal	1 n	Configures input terminal–related features, including digital multi–functional inputs and analog inputs.
Output Terminal	ПП	Configures output terminal–related features such as relays and analog outputs.
Communication	]	Configures communication features for RS-485 or other communication options.
Application	AP	Configures PID control–related sequences and operations.
Protection	Pr	Configures motor or inverter protection features.
Motor 2 (Secondary Motor)	ارات	Configures secondary motor related features. The secondary motor (M2) group appears on the keypad only when one of the multi-function input terminals (In.65–In.69) has been set to 26 (Secondary motor).
User Sequence User Sequence Function		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 on or off specific functions, or decide how the functions will be used. Refer to 6 <u>Table of Functions</u> on page <u>145</u> to find the functions you need.

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

### 3.2.1 Group and Code Selection

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

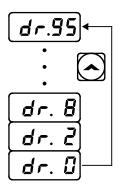
Step	Instruction	Keypad Display
1	Move to the group you want using the [◀] and [▶] keys.	
2	Move up and down through the codes using the [▲] and [▼] keys until you locate the code that you require.	
3	Press the [ENT] key to save the change.	-

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

As an example, if Ad.24 (Frequency Limit) is set to 0 (No), the next codes, Ad.25 (Freq Limit Lo) and Ad.26 (Freg Limit Hi), will not be displayed. If you set code Ad.24 to 1 (Yes) and enable the frequency limit feature, codes Ad.25 and 26 will appear to allow the maximum and minimum frequency limitations to be set up.

# 3.2.2 Navigating Directly to Different Codes

The following example details navigating to code dr. 95, from the initial code in the Drive group (dr. 0). This example applies to all groups whenever you would like to navigate to a specific code number.



Step	Instruction	Keypad Display
1	Ensure that you are currently at the first code of the Drive group	4 _ 17
•	(dr.0).	בר.בו
2	Press the [ENT] key.	
	Number'9' will flash.	
_	Press the [▼] key to display '5,' the first 1s' place of the group	
3	destination, '95.'	
	Press the [◀] key to move to the 10s' place.	
4	The cursor will move to the left and '05' will be displayed. This time,	5 <b>5</b>
	the number '0' will be flashing.	

Step	Instruction	Keypad Display
5	Press the [▲] key to increase the number from '0' to '9,' the 10s	
	place digit of the destination, '95.'	
6	Press the [ENT] key. Code dr.95 is displayed.	7-25
6	Code dr.95 is displayed.	[ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [

# 3.2.3 Setting Parameter Values

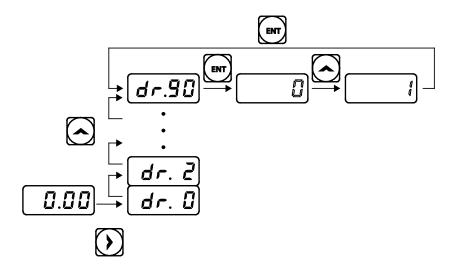
Enable or disable features by setting or modifying parameter values for different codes. Directly enter setting values, such as frequency references, supply voltages, and motor speeds. Follow the instructions below to learn to set or modify parameter values.

Step	Instruction	Keypad Display
1	Select the group and code to setup or modify parameter settings, and then press the [ENT] key. The first number on the right side of the display will flash.	5.)
2	Press the [◀] or [▶] key to move the cursor to the number that you would like to modify.	() () () () () () () () () () () () () () () (
3	Press the [▲] or [▼] key to adjust the value, and then press the [ENT] key to confirm it. The selected value will flash on the display.	5.0 5.0 5.0 4.0
4	Press the [ENT] key again to save the change.	-

- A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes will be saved when the [ENT] key is pressed while the number is flashing. The setting change will be canceled if you press any other key.
- Each code's parameter values have default features and ranges specified. Refer to 6 <u>Table of</u>
   <u>Functions</u> on page <u>145</u> for information about the features and ranges before setting or modifying parameter values.

# 3.2.4 Configuring the [ESC] Key

The [ESC] key is a multi-functional key that can be configured to carry out a number of different functions. Refer to <u>4.6 Local/Remote Mode Switching</u> on page <u>76</u> for more information about the other functions of the [ESC] key. The following example shows how to configure the [ESC] key to perform a jog operation.



Step	Instruction	Keypad Display
1	Ensure that you are currently at the first code of the Operation group, and that code 0.00 (Command Frequency) is displayed.	0.00
2	Press the [▶] key. You have moved to the initial code of the Drive group (dr.0).	dr.Ū
3	Press the [▲] or [▼] key to select code 90 (ESC key configuration), and then press the [ENT] key.	dr.90

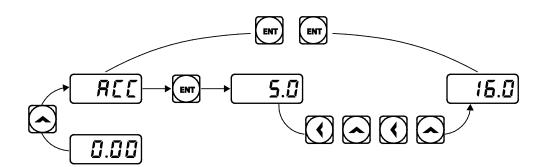
Step	Instruction	Keypad Display
	Code dr.90 currently has an initial parameter value of, 0 (adjust to the initial position).	
4	Press the [A] key to modify the value to 1 (Jog key) and then press the [ENT] key. The new parameter value will flash.	
5	Press the [ENT] key again to save changes.	-

- If the code dr. 90 (ESC key configuration) is set to 1 (JOG Key) or 2 (Local/Remote), the SET indicator will flash when the [ESC] key is pressed.
- The factory default setting for code dr. 90 is 0 (move to the initial position). You can navigate back to the initial position (code 0.00 of the Operation group) immediately, by pressing the [ESC] key while configuring any codes in any groups.

# 3.3 Actual Application Examples

# **3.3.1 Acceleration Time Configuration**

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



Step	Instruction	Keypad Display
1	Ensure that the first code of the Operation group is selected, and code 0.00 (Command Frequency) is displayed.	
2	Press the [▲] key.  The display will change to the second code in the Operation group, the ACC (Acceleration Time) code.	ALL
3	Press the [ENT] key. The number '5.0' will be displayed, with '0' flashing. This indicates that the current acceleration time is set to 5.0 seconds. The flashing value is ready to be modified by using the keypad.	5.5
4	Press the [◀] key to change the first place value. '5' will be flashing now. This indicates the flashing value, '5' is ready to be modified.	5.0
5	Press the [▲] key to change the number '5' into '6', the first place value of the target number '16.'	[.I]
6	Press the [◀] key to move to the 10s, place value.  The number in the 10s position, '0' in '06' will start to flash	[ <b>5.</b> 0
7	Press the [A] key to change the number from '0' to '1', to match the 10s place value of the target number'16,' and then press the [ENT] key. Both digits will flash on the display.	
8	Press the [ENT] key once again to save changes.  'ACC' will be displayed. The change to the acceleration time setup has been completed.	REE

# 3.3.2 Frequency Reference Configuration

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

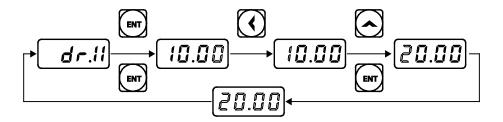
$$\begin{array}{c|c} & & & & \\ \hline & & \\$$

Step	Instruction	Keypad Display
1	Ensure that the first code of the Operation group is selected, and the code 0.00 (Command Frequency) is displayed.	
2	Press the [ENT] key. The value, 0.00 will be displayed with the '0' in the 1/100s place value flashing.	
3	Press the [◀] key 3 times to move to the 10s place value.  The '0' at the 10s place value will start to flash.	
4	Press the [▲] key to change it to '3,' the 10s place value of the target frequency, '30.05.'	
5	Press the [▶] key 3 times. The '0' at the 1/100s place position will flash.	
6	Press the [▲] key to change it to '5,' the 1/100 place value of the target frequency, '30.05,' and then press the [ENT] key.  The parameter value will flash on the display.	
7	Press the [ENT] key once again to save changes. Flashing stops. The frequency reference has been configured to 30.05 Hz.	30.05

- A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes are saved when the [ENT] key is pressed while the value is flashing. Changes will be canceled if any other key is pressed.
- The S100 inverter keypad display can display up to 4 digits. However, 5-digit figures can be used and are accessed by pressing the [◀] or [▶] key, to allow keypad input.

# 3.3.3 Jog Frequency Configuration

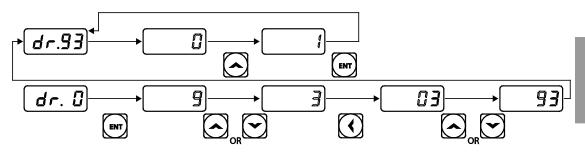
The following example demonstrates how to configure Jog Frequency by modifying code 11 in the Drive group (Jog Frequency) from 10.00(Hz) to 20.00(Hz). You can configure the parameters for different codes in any other group in exactly the same way.



Step	Instruction	Keypad Display
1	Go to code 11(Jog Frequency) in the Drive group.	dr. 1 1
2	Press the [ENT] key. The current Jog Frequency value (10.00) for code dr.11 is displayed.	
3	Press the [◀] key 3 times to move to the 10s place value.  Number'1'at the 10s place position will flash.	
4	Press the [A] key to change the value to '2,' to match the 10s place value of the target value'20.00,' and then press the [ENT] key.  All parameter digits will flash on the display.	
5	Press the [ENT] key once again to save the changes. Code dr.11 will be displayed. The parameter change has been completed.	dr. 11

# 3.3.4 Initializing All Parameters

The following example demonstrates parameter initialization using code dr.93 (Parameter Initialization) in the Drive group. Once executed, parameter initialization will delete all modified values for all codes and groups.



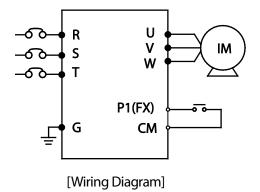
Step	Instruction	Keypad Display
1	Go to code 0 (Jog Frequency) in the Drive group.	dr.Ū
2	Press the [ENT] key. The current parameter value (9) will be displayed.	
3	Press the [q] key to change the first place value to '3' of the target code, '93.'	
4	Press the [◀] key to move to the 10s place position. '03' will be displayed.	
5	Press the [▲] or [▼] key to change the '0' to '9' of the target code, '93.'	
6	Press the [ENT] key. Code dr.93 will be displayed.	dr.53
7	Press the [ENT] key once again. The current parameter value for code dr.93 is set to 0 (Do not initialize).	
8	Press the [A] key to change the value to 1 (All Grp), and then press the [ENT] key. The parameter value will flash.	T d d
9	Press the [ENT] key once again. Parameter initialization begins. Parameter initialization is complete when code dr.93 reappears on the display.	dr.93

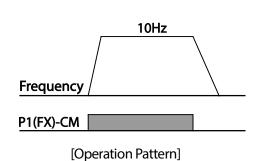
### Note

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

# 3.3.5 Frequency Setting (Keypad) and Operation (via Terminal Input)

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

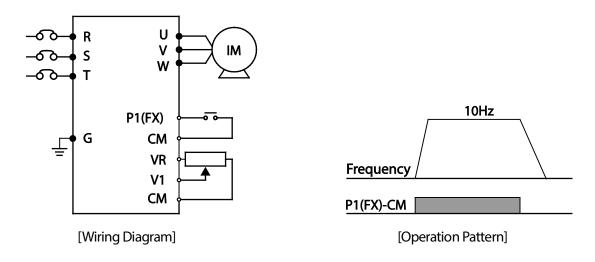




The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the values to factory default parameter settings before following the instructions in the table.

# 3.3.6 Frequency Setting (Potentiometer) and Operation (Terminal Input)

Step	Instruction	Keypad Display
		Reypau Display
1	Turn on the inverter.	-
2	Ensure that the first code of the Operation group is selected, and the code 0.00 (Command Frequency) is displayed.	
	Press the [▲] key 4 times to go to the Frq (Frequency reference	
3	source) code.	F-9
4	Press the [ENT] key.	
4	The Frq code in the Operation group is currently set to 0 (keypad).	
	Press the [▲] key to change the parameter value to 2	
5	(Potentiometer), and then press the [ENT] key.	
	The new parameter value will flash.	
	Press the [ENT] key once again.	
6	The Frq code will be displayed again. The frequency input has	
	been configured for the potentiometer.	
	Press the [▼] key 4 times.	
7	Returns to the first code of the Operation group (0.00).From here	
	frequency setting values can be monitored.	
8	Adjust the potentiometer to increase or decrease the frequency	_
-	reference to 10Hz.	
	Refer to the wiring diagram at the bottom of the table, and close	SETFWD
9	the switch between the P1 (FX) and CM terminals.	RUN I I I I I REV
	The RUN indicator light flashes and the FWD indicator light comes	
	on steady. The current acceleration frequency is displayed.	
	When the frequency reference is reached (10Hz), open the switch between the P1 (FX) and CM terminals.	
	The RUN indicator light flashes again and the current deceleration	SET FWD
10	frequency is displayed. When the frequency reaches 0Hz, the RUN	RUN 10.00 REV
	and FWD indicators turn off, and the frequency reference	
	(10.00Hz) is displayed again.	
	( · · · · · · · · · · · · · · · · · · ·	

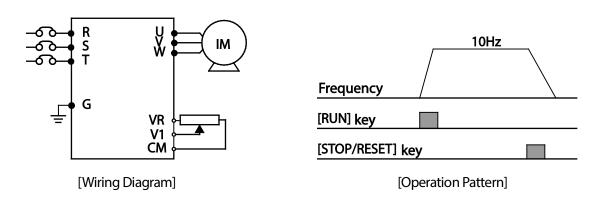


The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the factory default parameter settings before following the instructions in the table.

### 3.3.7 Frequency Setting (Potentiometer) and Operation (Keypad)

Step	Instruction	Keypad Display
1	Turn on the inverter.	-
2	Ensure that the first code of the Operation group is selected, and the code 0.00 (Command Frequency) is displayed.	<b>0.00</b>
3	Press the [▲] key 4 times to go to the drv code.	מרש
4	Press the [ENT] key. The drv code in the Operation group is currently set to 1 (Analog Terminal).	a d
5	Press the [▼] key to change the parameter value to 0 (Keypad), and then press the [ENT] key. The new parameter value will flash.	
6	Press the [ENT] key once again. The drv code is displayed again. The frequency input has been configured for the keypad.	gru
7	Press the [▲] key.  To move to the Frq (Frequency reference source) code.	Frq

Step	Instruction	Keypad Display
8	Press the [ENT] key. The Frq code in the Operation group is set to 0 (Keypad).	
9	Press the [A] key to change it to 2 (Potentiometer), and then press the [ENT] key.  The new parameter value will flash.	
10	Press the [ENT] key once again. The Frq code is displayed again. The frequency input has been configured for potentiometer.	F-9
11	Press the [▼] key 4 times.  Returns to the first code of the Operation group (0.00). From here frequency setting values can be monitored.	0.00
12	Adjust the potentiometer to increase or decrease the frequency reference to 10Hz.	-
13	Press the [RUN] key on the keypad. The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	SET 1 FWD
14	When the frequency reaches the reference (10Hz), press the [STOP/RESET] key on the keypad.  The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0Hz, the RUN and FWD indicator lights turn off, and the frequency reference (10.00Hz) is displayed again.	SET I II II FWD REV

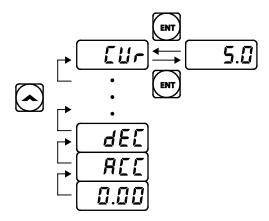


The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the factory default parameter settings before following the instructions in the table.

# 3.4 Monitoring the Operation

# 3.4.1 Output Current Monitoring

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



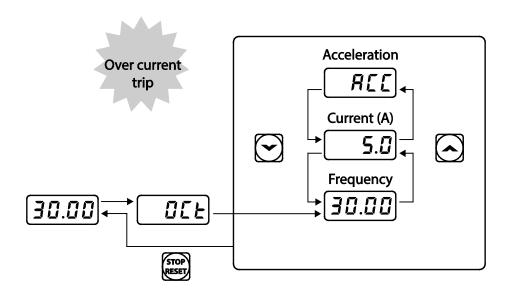
Step	Instruction	Keypad Display
1	Ensure that the first code of the Operation group is selected, and the code 0.00 (Command Frequency) is displayed.	0.00
2	Press the [▲] or [▼] key to move to the Cur code.	
3	Press the [ENT] key. The output current (5.0A) is displayed.	5.0
4	Press the [ENT] key again.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

#### Note

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

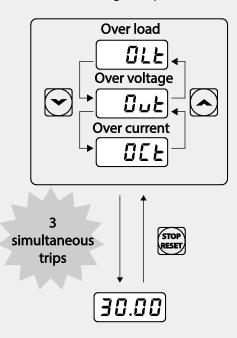
# 3.4.2 Fault Trip Monitoring

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



Step	Instruction	Keypad Display
1	Refer to the example keypad display. An over current trip fault has occurred.	Image: Control of the
2	Press the [ENT] key, and then the [A] key.  The operation frequency at the time of the fault (30.00Hz) is displayed.	30.00
3	Press the [▲] key. The output current at the time of the fault (5.0A) is displayed.	5.0
4	Press the [A] key.  The operation status at the time of the fault is displayed. ACC on the display indicates that the fault occurred during acceleration.	ALL
5	Press the [STOP/RESET] key. The inverter resets and the fault condition is cleared. The frequency reference is displayed on the keypad.	(30.00)

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



If a warning condition occurs while running at a specified frequency, the current frequency and the ''Brn signal will be displayed alternately, at 1 second intervals.

# **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.

Basic Tasks	Description	Ref.	
Frequency reference source	Configures the inverter to allow you to setup or modify	p.60	
configuration for the keypad	frequency reference using the Keypad.	<u> </u>	
Frequency reference source			
configuration for the	Configures the inverter to allow input voltages at the terminal	<u>p.61</u> ,	
terminal block (input	block (V1, V2) and to setup or modify a frequency reference.	<u>p.68</u>	
voltage)			
Frequency reference source			
configuration for the	Configures the inverter to allow input currents at the terminal block (I2) and to setup or modify a frequency reference.	<u>p.66</u>	
terminal block (input current)	block (12) and to setup or modify a frequency reference.		
Frequency reference source			
configuration for the	Configures the inverter to allow input pulse at the terminal	p.68	
terminal block (input pulse)	block (TI) and to setup or modify a frequency reference.	<u>p.00</u>	
Frequency reference source	Configures the inverter to allow communication signals from		
configuration for RS-485	upper level controllers, such as PLCs or PCs, and to setup or	p.70	
communication	modify a frequency reference.	<u> </u>	
Frequency control using	Enables the user to hold a frequency using analog inputs at		
analog inputs	terminals.	<u>p.70</u>	
Motor operation display	Configures the display of motor operation values. Motor		
options	operation is displayed either in frequency (Hz) or speed (rpm).		
Multi-step speed (frequency)	Configures multi-step frequency operations by receiving an	p.71	
configuration	input at the terminals defined for each step frequency.	<u>p.7 1</u>	
Command source	Configures the inverter to allow the manual operation of the		
configuration for keypad	[FWD], [REV] and [Stop] keys.	<u>p.73</u>	
buttons			
Command source		74	
configuration for terminal	Configures the inverter to accept inputs at the FX/RX terminals.	<u>p.74</u>	
block inputs Command source			
configuration for RS-485	Configures the inverter to accept communication signals from	p.75	
communication	upper level controllers, such as PLCs or PCs.	<u>p.75</u>	
communication	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		
Local/remote switching via	other than one from the keypad), this configuration can be	n 76	
the [ESC] key	used to perform maintenance on the inverter, without losing	<u>p.76</u>	
	or altering saved parameter settings. It can also be used to		
	override remotes and use the keypad immediately in		
	emergencies.		

Basic Tasks	Description	Ref.
Motor rotation control	Configures the inverter to limit a motor's rotation direction.	<u>p.78</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.	p.78
Automatic restart after reset of a fault trip condition	Configures the inverter to start operating when the inverter is reset following a fault trip. In this configuration, the inverter starts to run and the motor accelerates as soon as the inverter is reset following a fault trip condition.  For automatic start-up configuration to work, the operation command terminals at the terminal block must be turned on.	p.79
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.80</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.82</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.82</u>
Acc/Dec time transition speed (frequency) configuration	Enables modification of acceleration and deceleration gradients without configuring the multi-functional terminals.	<u>p.84</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.85</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.88</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.88</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.89</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.90</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.91</u>
Automatic torque boost	Automatic configuration of the inverter that provides "auto tuning" that produces a momentary torque boost. This	<u>p.92</u>

		Ref.	
configuration is for loads that r	equire a large amount of		
starting torque, such as elevator	ors or lifts.		
Adjusts the output voltage to t	he motor when the power		
Output voltage adjustment supply to the inverter differs from	om the motor's rated input	<u>p.93</u>	
voltage.			
Accelerating start is the genera	al way to start motor operation.		
ACCOLORATION START	The typical application configures the motor to accelerate to a		
target frequency in response to		<u>p.94</u>	
there may be other start or acc			
Configures the inverter to perfe	3		
Start after DC braking motor starts rotating again. The	_	p.94	
the motor will be rotating before	re the voltage is supplied from	<u>p.54</u>	
the inverter.			
Deceleration stop is the typical	-		
Deceleration stop  The motor decelerates to 0Hz a	•	<u>p.95</u>	
nowever there may be other st	op or deceleration conditions	<u>p.23</u>	
defined.			
Configures the inverter to appl	, , ,		
Stopping by Draking 1	which DC braking occurs must	<u>p.95</u>	
be defined and during deceier	ation, when the motor reaches	<u>p.93</u>	
the defined frequency, DC brake			
Configures the inverter to stop			
Free-run stop stop command. The motor will	free-run until it slows down and	<u>p.96</u>	
stops.			
POWAR praking .	ide optimal, motor deceleration,	p.97	
without tripping over-voltage	protection.	<u>p.57</u>	
Start/maximum frequency   Configures the frequency refer	ence limits by defining a start	p.98	
configuration frequency and a maximum free	quency.	<u>p.50</u>	
Upper/lower frequency limit   Configures the frequency refer	ence limits by defining an upper	p.98	
configuration limit and a lower limit.		<u>p.50</u>	
Frequency jump Configures the inverter to avoid	3	p.99	
mechanically resonating frequ		<u>p.77</u>	
J™ (Indration (Intidi Iration	ation mode and switch between	p.100	
the operation modes according	g to your requirements.	<u>p.100</u>	
Multi-function input Enables the user to improve th	e responsiveness of the multi-		
terminal control function input terminals.	e responsiveness of the matt	<u>p.101</u>	
configuration			
9	e input and output devices with	p.103	
configuration other inverters.		<u>p.105</u>	
Multi-keypad configuration	ultiple inverters with one	p.104	
monitoring device.		<u>μ. 104</u>	
User sequence configuration Enables the user to implement	simple sequences using various	n 105	
User sequence configuration function blocks.		<u>p.105</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. If UserSeqLink is selected, the common area can be linked with user sequence output and can be used as frequency reference.

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
				0	KeyPad-1		
				1	KeyPad-2		
				2	V1		
		Fue su com su c		4	V2		
Operation	Frq	Frequency reference source	Ref Freq Src	5	12	0-12	-
				6	Int 485		
				8	Field Bus		
				9	UserSeqLink		
				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 the Frq (Frequency reference source) code in the Operation group and change the parameter value to 0 (Keypad-1). Input the frequency reference for an operation at the 0.00(Command Frequency) code in the Operation group.)

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	0	KeyPad-1	0–12	
	0.00	Frequency reference		0.00		Min to Max Frq*	Hz

<sup>\*</sup> You cannot set a frequency reference that exceeds the Max. Frequency, as configured with dr.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 the Frq (Frequency reference source) code in the Operation 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
Operation	Frq	Frequency reference source	Freq Ref Src	1	KeyPad-2	0–12	-
	0.00	Frequency reference		0.00		Min to Max Frq*	Hz

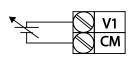
<sup>\*</sup> You cannot set a frequency reference that exceeds the Max. Frequency, as configured with dr.20.

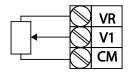
### 4.1.3 V1 Terminal as the Source

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

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

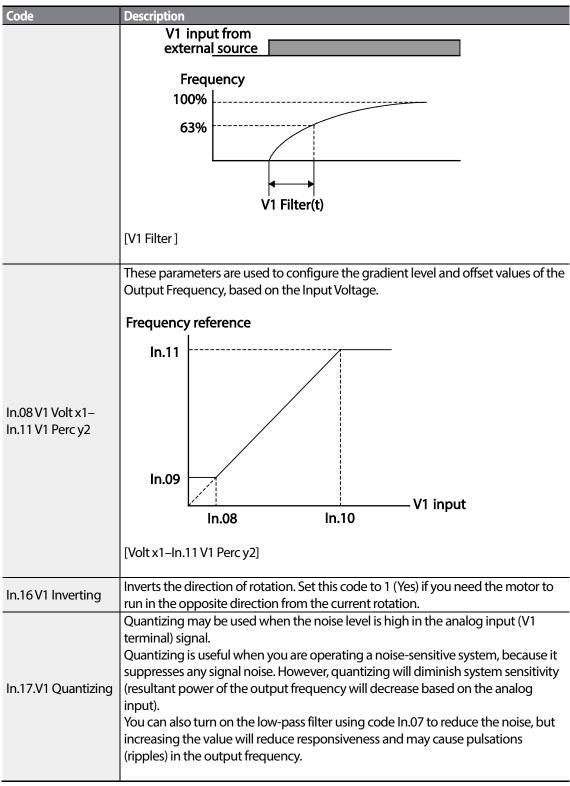
Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	2	V1	0–12	-
ln	01	Frequency at maximum analog input	Freq at 100%	Maximum frequency		0.00– Max. Frequency	Hz
	05	V1 input monitor	V1 Monitor [V]	0.00	١	0.00–12.00	V
	06	V1 polarity options	V1 Polarity	0	Unipolar	0-1	-

Group	Code	Name	LCD Display	Para	meter Setting	<b>Setting Range</b>	Unit
	07	V1 input filter time constant	V1 Filter	10		0–10000	ms
	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	0	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		0.00*, 0.04– 10.00	%

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

### 0-10V Input Voltage Setting Details

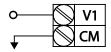
Code	Description
	Configures the frequency reference at the maximum input voltage when a potentiometer is connected to the control terminal block. A frequency set with code In.01 becomes the maximum frequency only if the value set in code In.11 (or In.15) is 100(%).
In.01 Freq at 100%	<ul> <li>Set code In.01 to 40.00 and use default values for codes In.02–In.16. Motor will run at 40.00Hz when a 10V input is provided at V1.</li> <li>Set code In.11 to 50.00and use default values for codes In.01–In.16. Motor will run at 30.00Hz (50% of the default maximum frequency–60Hz) when a</li> </ul>
	10V input is provided at V1.
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.



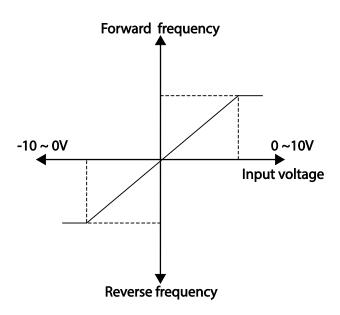
Description Parameter values for quantizing refer to a percentage based on the maximum input. Therefore, if the value is set to 1% of the analog maximum input (60Hz), the output frequency will increase or decrease by 0.6Hz per 0.1V difference. When the analog input is increased, an increase to the input 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. Output frequency (Hz) 60.00 59.4 1.2 0.6 Analog input (V) 9.925 10 0.025 0.1 0.075 0.175 9.975 [V1 Quantizing]

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

Set the Frq (Frequency reference source) code in the Operation 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	Par	ameter Setting	<b>Setting Range</b>	Unit
Operation	Frq	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		0.00-12.00V	V
	06	V1 polarity options	V1 Polarity	1	Bipolar	0–1	-
In	12	V1 minimum input voltage	V1- volt x1	0.00		10.00-0.00V	V
	13	V1 output at minimum voltage (%)	V1- Perc y1	0.0	0	-100.00-0.00%	%
	14	V1maximum input voltage	V1-Volt x2	-10.00		-12.00 –0.00V	V
	15	V1 output at maximum voltage (%)	V1- Perc y2	-100.00		-100.00-0.00%	%

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

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

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

Code	Description				
	Sets the gradient level and off-set value of the output frequency in relation to the input voltage. These codes are displayed only when In.06 is set to 1 (bipolar). As an example, if the minimum input voltage (at V1) is set to -2 (V) with 10% output ratio, and the maximum voltage is set to -8 (V) with 80% output ratio respectively, the output frequency will vary within the range of 6 - 48 Hz.				
	V1 input In.14 In.12				
In.12 V1 - volt x1 – In.15 V1 - Perc y2	-8V -2V In.13				
	48Hz In.15				
	Frequency reference				
	[In.12 V1-volt X1–In.15 V1 Perc y] For details about the 0–+10V analog inputs, refer to the code descriptions In.08 V1 volt x1–In.11 V1 Perc y2 on page <u>63</u> .				

#### 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 Frq (Frequency reference source) code in the Operation group to 5 (I2) and apply 4–20mA input current to I2.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	5	12	0-12	-
	01	Frequency at maximum analog input	Freq at 100%	60.00		0- Maximum Frequency	Hz
	50	I2 input monitor	I2 Monitor	0.00		0.00-24.00	mA
In	52	I2 input filter time constant	I2 Filter	10		0-10000	ms
	53	I2 minimum input current	I2 Curr x1	4.00		0.00-20.00	mA

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
	54	I2 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	12 rotation direction options	I2 Inverting	0	No	0-1	-
	62	12 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 40.00Hz, and default settings are used for In.53–56, 20mA input current (max) to I2 will produce a frequency reference of 40.00Hz.</li> <li>If In.56 is set to 50.00 (%), and default settings are used for In.01 (60Hz) and In.53–55, 20mA input current (max) to I2 will produce a frequency reference of 30.00Hz (50% of 60Hz).</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	Frequency Reference In.56 In.53 In.55 In.64 In.65 In.6				

#### 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 Operation 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 (Frq code parameter is set to 5).

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	4	V2	0–12	-
	35	V2 input display	V2 Monitor	0.00		0.00-12.00	V
	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
	39	Output% at minimum V2 voltage	V2 Perc y1	0.00		0.00-100.00	%
In	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	Invert V2 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 Frq (Frequency reference source) code in Operation group to 12 (Pulse). Set the In.69 P5 Define to 54(TI) and providing 0–32.00kHz pulse frequency to P5.

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	12	Pulse	0–12	-
ln	69	P5 terminal function setting	P5 Define	54	П	0-54	-
	01	Frequency at maximum analog input	Freq at 100%	60.0	00	0.00– Maximum frequency	Hz

Group	Code	Name	LCD Display	Para	ameter Setting	Setting Range	Unit
	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
	93	TI input minimum pulse	TI Pls x1	0.00		0.00–32.00	kHz
	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	.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		0.00*, 0.04– 10.00	%

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

## TI Pulse Input Setting Details

Code	Description			
In.69 P5 Define	Pulse input TI and Multi-function terminal P5 share the same therminal.			
	Set the In.69 P5 Define to 54(TI).			
	Configures the frequency reference at the maximum pulse input. The frequency reference is based on 100% of the value set with In.96.			
In.01 Freq at 100%	• If In.01 is set to 40.00 and codes In.93–96 are set at default, 32kHz input to TI yields a frequency reference of 40.00Hz.			
	If In.96 is set to 50.00 and codes In.01, In.93–95 are set at default, 32kHz input			
	to the TI terminal yields a frequency reference of 30.00Hz.			
In.91 Pulse Monitor	Displays the pulse frequency supplied at TI.			
In OOTI Filtor	Sets the time for the pulse input at TI to reach 63% of its nominal frequency			
In.92 TI Filter	(when the pulse frequency is supplied in multiple steps).			
	Configures the gradient level and offset values for the output frequency.			
	Frequency reference			
	In.96			
In O2 TI Dia v.1				
In.93TI Pls x1–				
In.96 TI Perc y2				
	In.94			
	In.93 In.95			

Code	Description
In.97Tl Inverting- In.98Tl Quantizing	Identical to In.16-17 (refer to In.16 V1 Inverting/In.17.V1 Quantizing on page <u>63</u> ).

### 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 Frq (Frequency reference source) code in the Operation group to 6 (Int 485) and use the RS-485 signal input terminals (S+/S-/SG) for communication. Refer to <u>5 RS-485 Communication</u> Featureson page 115.

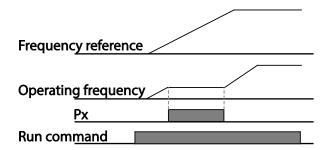
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Frq	Frequency reference	Freg Ref Src	6	Int 485	0–12	
Operation	114	source	ried her sic	Ů.	1110-105	0-12	
		Integrated RS-485					
	01	communication	Int485 St ID	-	1	1-250	-
		inverter ID					
	02	Integrated		0	ModBus RTU	0-2	
		communication	Int485 Proto	1	Reserved		
l.a.		protocol		2	LS Inv 485		
ln	03	Integrated	Int485 BaudR	3	9600 bps	0-7	
	05	communication speed	IIIC-105 Daudin	,	9000 pps	0 7	
		Intogratod		0	D8/PN/S1		
	04	Integrated communication frame configuration	Int485 Mode	1	D8/PN/S2	0-3	
	04			2	D8/PE/S1		
				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
Operation Frq Frequency reference		0	Keypad-1				
			1	Keypad-2			
	Гиси	Frequency reference	Troa Dof Cra	2	V1	0-12	-
Operation	riq	source	ried kei sic	4	V2		
	5 I2 6 Int 485	12					
				6	Int 485		

group	Code	Name	LCD Display	Par	ameter Setting	<b>Setting Range</b>	Unit
				8	Field Bus		
				12	Pulse		
In	65–69	Px terminal configuration	Px Define(Px: P1–P5)	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
dr	dr 21	Speed unit	Hz/Rpm Sel	0	Hz Display	0.1	
ui		selection	пи/кріп зеі	1	1 Rpm Display 0-1	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 Frq code in the Operation 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. The inverter operates according to the frequencies set with St.1–3 (multi-step frequency 1–3), bA.53–56 (multi-step frequency 4–7) and the binary command combinations.

Group	Code	Name	LCD Display	Parameter Setting	<b>Setting Range</b>	Unit
Operation	St1-St3	Multi-step frequency	Step Freq - 1-3		0-Maximum	Hz
		1–3		-	frequency	П
bA	53–56	Multi-step frequency	Step Freq - 4-7		0-Maximum	LI-
		4–7		-	frequency	Hz

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
In	65–69		Px Define (Px: P1–P5)	7	Speed-L		-
				8	Speed-M	0~54	-
		Corniguration	F 1-F3)	9	Speed-H		-
	89	Multi-step command delay time	InCheck Time	1		1–5000	ms

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

Code	Description
Operation group	Configure multi-step frequency1–3.
St 1-St3	If an LCD keypad is in use, bA.50–52 is used instead of St1–St3 (multi-step
Step Freq - 1–3	frequency 1-3).
bA.53-56	Configure multi-step frequency 4–7.
Step Freq - 4-7	
In.65–69 Px Define	Choose the terminals to setup as multi-step inputs, and then set the relevant codes (In.65-69) 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.  Step 0  P3  P4  P5  FX  RX

Code	Description								
	[An evample of	[An example of a multi-step operation]							
	Speed	Fx/Rx	P5	P4	P3				
	0	√ ·	-	-	-				
	1	✓	-	-	✓				
	2	✓	-	✓	-				
	3	✓	-	✓	✓				
	4	✓	✓	-	-				
	5	✓	✓	-	✓				
	6	✓	✓	✓	-				
	7	✓	✓	✓	✓				
	Set a time intervafter receiving a	val for the inverte in input signal.	r to check for ac	dditional termina	al block inputs				
In.89 InCheck Ti	After adjusting I will search for in	n.89 to 100ms ar puts at other ter celerate based o	minals for 100m	ns, before procee					

## **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	Parameter Setting		Setting Range	Unit
			0	Keypad			
Operation day Command			1	Fx/Rx-1			
	dni	Command Source	Cmd Courses*	2	Fx/Rx-2	0.5	-
Operation	Operation drv Command	Command Source	Cina source	3	Int 485	0-5	-
				4	Field Bus		
				5	UserSeqLink		

<sup>\*</sup> Displayed under DRV-06 on the LCD keypad.

### 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
Operation	drv	Command source	Cmd Source*	0	KeyPad	0-5	-

<sup>\*</sup> Displayed under DRV-06 on the LCD keypad.

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

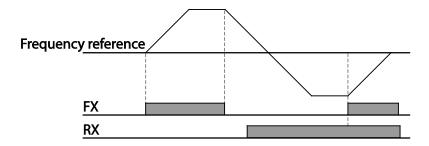
Multi-function terminals can be selected as a command input device. This is configured by setting the drv (command source) code in the Operation group to 1(Fx/Rx). Select 2 terminals for the forward and reverse operations, and then set the relevant codes (2 of the 5 multi-function terminal codes, In.65-69 for P1-P5) 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	meter Setting	<b>Setting Range</b>	Unit
Operation	drv	Command source	Cmd Source*	1	Fx/Rx-1	0-5	-
In	65-69	Px terminal	Px Define(Px: P1-	1	Fx	0~54	
In		configuration	P5)	2	Rx	0~34	

<sup>\*</sup> Displayed under DRV-06 on the LCD keypad.

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

Code	Description
Operation group drv– Cmd Source	Set to 1(Fx/Rx-1).
In.65–69 Px Define	Assign a terminal for forward (Fx) operation. Assign a terminal for reverse (Rx) operation.



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

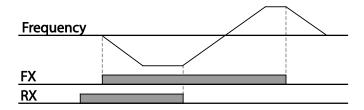
Multi-function terminals can be selected as a command input device. This is configured by setting the drv (command source) code in the Operation group to 2(Fx/Rx-2). Select 2 terminals for run and rotation direction commands, and then select the relevant codes (2 of the 5 multi-function terminal codes, In.65-69 for P1-P5) 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	Parameter Setting		Setting Range	Unit
Operation	Drv	Command source	Cmd Source*	2	Fx/Rx-2	0-5	-
l <sub>m</sub>	65-69	Px terminal	Px Define (Px: P1	1	Fx	0~54	
In		configuration	– P5)	2	Rx	0~5 <del>4</del>	-

<sup>\*</sup> Displayed under DRV-06 on the LCD keypad.

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

Code	Description
Operation group drv Cmd Source	Set to 2(Fx/Rx-2).
In.65–69 Px Define	Assign a terminal for run command (Fx). 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 drv (command source) code in the Operation 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  $\underline{5}$ 

RS-485 Communication Features on page 115.

Group Co	Code	Name	LCD Display	<b>Parameter Setting</b>	Setting Range	Unit
----------	------	------	-------------	--------------------------	---------------	------

Group	Code	Name	LCD Display	Parame	eter Setting	<b>Setting Range</b>	Unit
Operation	drv	Command source	Cmd Source*	3	Int 485	0-5	-
01		Integrated communication inverter ID	Int485 St ID	1		1-250	-
CM	02	Integrated communication protocol	Int485 Proto	0	ModBus RTU	0-2	-
	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0-7	-
	04	Integrated communication frame setup	Int485 Mode	0	D8/PN/ S1	0-3	-

<sup>\*</sup> Displayed under DRV-06 on the LCD keypad.

## 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. For more details, refer to 3.2.4 Configuring the [ESC] Key on page 44.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
dr	90	[ESC] key functions	-	2	Local/Remote	0–2	-
Operation	drv	Command source	Cmd	1	Fx/Rx-1	0–5	_
			Source*				

<sup>\*</sup> Displayed under DRV-06 on the LCD keypad.

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

Code	Description
dr.90 [ESC] key functions	Set dr.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–P5 multi-function terminals (codes In.65–69) 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 Ad.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 Ad.10 (power-on run) is set to O(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 0Hz and stop. The inverter will remain on.

Group	Code	Name	LCD Display	Para	meter Setting	<b>Setting Range</b>	Unit
				0	None		
Ad	09	Run prevention options	Run Prevent	1	Forward Prev	0–2	-
				2	Reverse Prev		

#### Forward/Reverse Run Prevention Setting Details

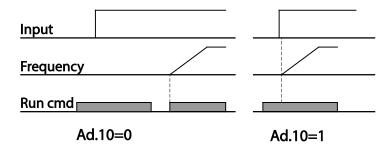
Code	Description						
	Choose a direction to prevent.						
	Setting		Description				
Ad OO Dun Drovont	0 None		Do not set run prevention.				
Ad.09 Run Prevent	1	Forward Prev	Set forward run prevention.				
	2	Reverse Prev	Set reverse run prevention.				
		•	<u>.                                      </u>				

#### 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 Operation group.

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
Operation	drv	Command source	Cmd Source*	1, 2	Fx/Rx-1 or Fx/Rx-2	0–5	-
Ad	10	Power-on run	Power-on Run	1	Yes	0–1	-

<sup>\*</sup> Displayed under DRV-06 on the LCD keypad.



#### 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 Cn. 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

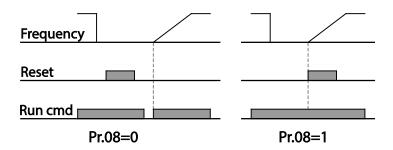
Use caution when operating the inverter with Power-on Run enabled as the motor will begin rotating when the inverter starts up.

#### 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
Operation	drv	Command source	Cmd	1	Fx/Rx-1 or	0–5	
Operation			Source*	2	Fx/Rx-2		_
	80	Reset restart setup	RST Restart	1	Yes	0–1	
Pr	09	No. of auto restart	Retry Number	0		0–10	
-	10	Auto restart delay time	Retry Delay	1.0		0–60	sec

<sup>\*</sup> Displayed under DRV-06 in an LCD keypad.



#### Note

- To prevent a repeat fault trip from occurring, set Cn.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 bA. 08 (Acc/Dec reference) in the Basic group to 0 (Max Freq).

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

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ACC dEC	ACC	Acceleration time	AccTime	20.0		0.0-600.0	sec
	dEC	Deceleration time	Dec Time	30.0		0.0-600.0	sec
Operation	20	Maximum frequency	Max Freq	60.00		40.00-400.00	Hz
bA	bA 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	Description
bA.08	Set the parameter value to 0 (Max Freq) to setup Acc/Dec time based on

Code	Descripti	on			
Ramp T Mode	maximuı	m frequency.			
	Configu	ıration	Description		
	0	Max Freq	Set the Acc/Dec time based on maximum frequency.		
	1	Delta Freq	Set the Acc/Dec time based on operating frequency.		
	If, for example, maximum frequency is 60.00Hz, the Acc/Dec times are set to 5 seconds, and the frequency reference for operation is set at 30Hz (half of 60Hz), the time required to reach 30Hz therefore is 2.5 seconds (half of 5 seconds).  Max. Freq.  Frequency Run cmd  Dec. time				
	accurate		elated values. It is particularly useful when a more uired because of load characteristics, or when the be extended.		
bA.09 Time scale	Configu	uration	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 bA. 08 (acc/dec reference) in the Basic group to 1 (Delta Freq).

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
Onswation		Acceleration time	Acc Time	20.0		0.0-600.0	sec
Operation	dEC	Deceleration time	Dec Time	30.0		0.0-600.0	sec
bA	08	Acc/Dec reference	Ramp T Mode	1	Delta Freq	0–1	-

Code	Description			
	Set the parameter value to 1 (Delta Freq) to set Acc/Dec times based on Maximum frequency.			
	Configuration	on	Description	
	0 Ma	ax Freq	Set the Acc/Dec time based on Maximum frequency.	
	1 Del	lta Freq	Set the Acc/Dec time based on Operation frequency.	
bA.08 Ramp T Mode  If Acc/Dec times are set to 5 seconds, and multiple frequency reference in the operation in 2 steps, at 10Hz and 30 Hz, each acceleration stage seconds (refer to the graph below).			Hz and 30 Hz, each acceleration stage will take 5	
	Frequency	1	30Hz	
	Run cmd	10Hz 5 7 5 sec 5 s	12 time	

Acc/Dec Time Based on Operation Frequency – Setting Details

### 4.10.3 Multi-step Acc/Dec Time Configuration

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

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
Operation	ACC	Acceleration time	Acc Time	20.0	0.0-600.0	sec
Operation	dEC	Deceleration time	DecTime	30.0	0.0-600.0	sec
bA	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	65-69	Px terminal configuration	Px Define (Px: P1–P5)	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	Descripti	ion			
bA. 70–82 Acc Time 1–7	Set mult	Set multi-step acceleration time1-7.			
bA.71-83 Dec Time 1-7	Set mult	i-step deceleration tir	me1-7.		
	Choose and configure the terminals to use for multi-step Acc/Dec time inputs.				
	Config	uration	Description		
	11	XCEL-L	Acc/Dec command-L		
	12	XCEL-M	Acc/Dec command-M		
In.65-69	49	XCEL-H	Acc/Dec command-H		
Px Define (P1–P5)	Acc/Dec commands are recognized as binary code inputs and will control the acceleration and deceleration based on parameter values set with bA.70-82 and bA.71-83.  If, for example, the P4 and P5 terminals are set as XCEL-L and XCEL respectively, the following operation will be available.				

Code	Description				
	Acc1 Frequency Acc0 P4 P5 Run cmd	Acc3 Dec0 Dec1	Dec3		
	Acc/Dec time	P5	P4		
	0	-	-		
	1	-	✓		
	2	✓	-		
	3	✓	✓		
In.89 In Check Time	set to 100ms and a signal	er to check for other terming is supplied to the P4 termin next 100ms. When the time the input received at P4.	nal, the inverter searches		

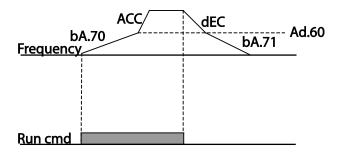
## **4.10.4 Configuring Acc/Dec Time Switch Frequency**

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	<b>Setting Range</b>	Unit
O	ACC	Acceleration time	Acc Time	10.0	0.0-600.0	sec
Operation	dEC	Deceleration time	Dec Time	10.0	0.0-600.0	sec
bA	70	Multi-step acceleration time1	Acc Time-1	20.0	0.0-600.0	sec
	71	Multi-step deceleration time1	Dec Time-1	20.0	0.0-600.0	sec
Ad	60	Acc/Dec time switch frequency	Xcel Change Frq	30.00	0-Maximum frequency	Hz

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

Code	Description
Ad.60 Xcel Change Fr	After the Acc/Dec switch frequency has been set, Acc/Dec gradients configured at bA.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, the configured gradient level, configured for the ACC and dEC codes, will be used. If you configure the P1-P5 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.



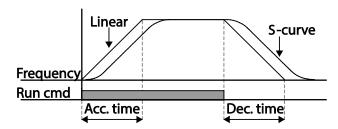
## 4.11 Acc/Dec Pattern Configuration

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 Ad. 03-06 in the Advanced group.

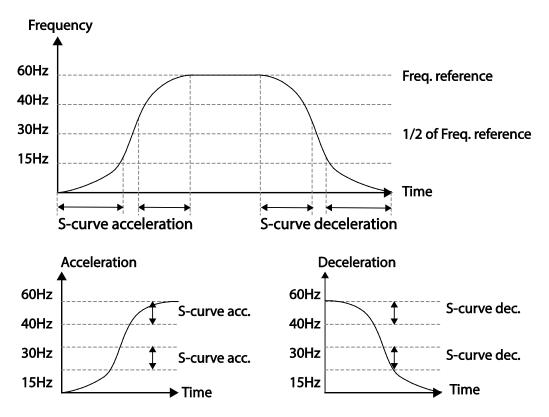
Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
bA	08	Acc/Dec reference	Ramp T mode	0	Max Freq	0–1	-
	01	Acceleration pattern	Acc Pattern	0	Linear	0–1	-
	02	Deceleration pattern	Dec Pattern	1	S-curve	0-1	-
	03	S-curve Acc start gradient	Acc S Start	40		1-100	%
Ad	04	S-curve Acc end 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
Ad.03 Acc S Start	Sets the gradient level as acceleration starts when using an S-curve, Acc/Dec pattern. Ad. 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 60Hz and Ad.03 is set to 50%, Ad. 03 configures acceleration up to 30Hz (half of 60Hz). The inverter will operate S-curve acceleration in the 0-15Hz frequency range (50% of 30Hz).  Linear acceleration will be applied to the remaining acceleration within the 15-
	30Hz frequency range.
	Sets the gradient level as acceleration ends when using an S-curve Acc/Dec pattern. Ad. 03 defines S-curve gradient level as a percentage, above half of total acceleration.
Ad.04 Acc S End	If the frequency reference and the maximum frequency are set at 60Hz and Ad.04 is set to 50%, setting Ad. 04 configures acceleration to increase from 30Hz (half of 60Hz) to 60Hz (end of acceleration). Linear acceleration will be applied within the 30-45Hz frequency range. The inverter will perform an S-curve acceleration for
	the remaining acceleration in the 45-60Hz frequency range.
Ad.05 Dec S Start –	Sets the rate of S-curve deceleration. Configuration for codes Ad.05 and Ad.06
Ad.06 Dec S End	may be performed the same way as configuring codes Ad.03 and Ad.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.

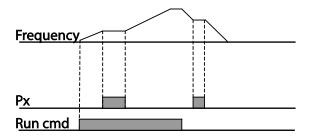
### ① Caution

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.

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
In	65-69	Px terminal	Px Define(Px: P1-	25	XCEL Stop	0~54	-
		configuration	P5)				



## 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	r Setting	Setting Range	Unit
dr	09	Control mode	Control Mode	0	V/F	0–4	-
	18	Base frequency	Base Freq	60.00		30.00-400.00	Hz
	19	Start frequency	Start Freq	0.50		0.01-10.00	Hz
bA	07	V/F pattern	V/F Pattern	0	Linear	0–3	-

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

Code	Description
dr.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.
dr.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 (0Hz).  Base Freq.  Inverter's rated voltage  Voltage  Run cmd

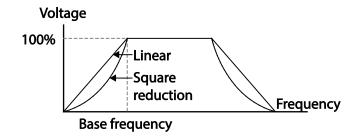
## 4.13.2 Square Reduction V/F pattern Operation

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	Parameter Setting		Setting Range	Unit
bA	07	V/E pattorn	V/E Dattorn	1	Square	0–3	
DA	07	V/F pattern V/F Pattern	V/F Pattern	3	Square2	0–3	_

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

Code	Description				
	Sets the characte		alue to 1(Square) or 3(Square2) according to the load's start		
	Setting		Function		
bA.07 V/F Pattern	1	Square	The inverter produces output voltage proportional to 1.5 square of the operation frequency.		
	3	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

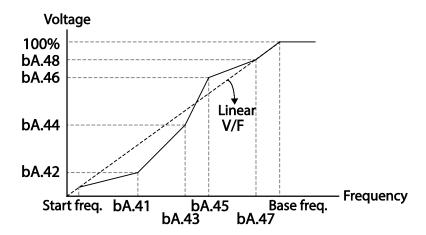
The S100 inverter allows the configuration of user-defined V/F patterns to suit the load characteristics of special motors.

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
	07	V/F pattern	V/F Pattern	2	User V/F	0-3	-
	41 User Frequency1		User Freq 1	15.0	0	0-Maximum frequency	Hz
	42	User Voltage1	User Volt 1	25		0–100	%
	43	User Frequency2	User Freq 2	30.00		0-Maximum frequency	Hz
bA	44	User Voltage2	User Volt 2	50		0–100	%
	45	User Frequency3	User Freq 3	45.0	0	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
hA 48 I Iser Volt 4	and maximum frequencies. Voltages can also be set to correspond with each
	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 bA.15 (motor rated voltage). If bA.15 is set to 0 it will be based on the input voltage.



#### ① 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 (dr.16) and reverse torque boost (dr.17) do not operate.

## 4.14 Torque Boost

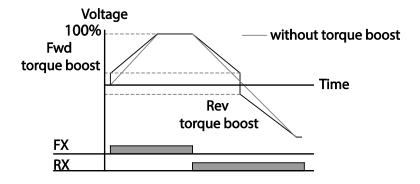
### 4.14.1 Manual Torque Boost

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		0–1	-
Dr	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
dr.16 Fwd Boost	Set torque boost for forward operation.
dr.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-1

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 (bA.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	<b>Parameter Setting</b>		Setting Range	Unit
Dr	15	torque boost mode	Torque Boost	1	Auto1	0–2	-
bA	20	auto tuning	Auto Tuning	3	Rs+Lsigma	0–6	-

#### 4.14.3 Auto Torque Boost-2

In V/F operation, this adjusts the output voltage if operation is unavailable due to a low output voltage. It is used when operation is unavailable, due to a lack of starting torque, by providing a voltage boost to the output voltage via the torque current.

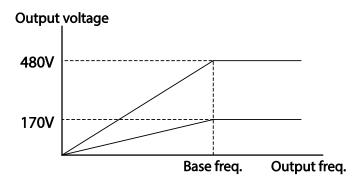
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Dr	15	torque boost mode	Torque Boost	2	Auto2	0–2	-

## 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 bA.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 bA.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 bA.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
bA	15	Motor rated voltage	Rated Volt	0	0, 170-480	V



## 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

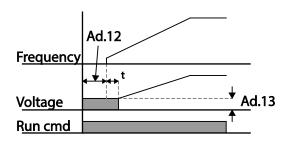
Acceleration start is a general acceleration mode. If there are no extra settings applied, the motor accelerates directly to the frequency reference when the command is input.

Group	Code	Name	LCD Display	Paramete	er Setting	Setting Range	Unit
Ad	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	-
Ad	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.

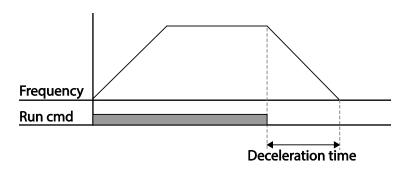
## 4.17 Stop Mode Setting

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 0Hz and stops, as shown in the figure below.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Ad	08	Stop mode	Stop Mode	0	Dec	0-4	-



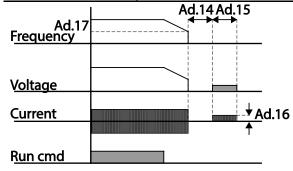
#### 4.17.2 Stop After DC Braking

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 Ad.17, the inverter supplies DC voltage to the motor and stops it.

Group	Code	Name	LCD Display	Parameter Setting		<b>Setting Range</b>	Unit
Ad	08	Stop mode	Stop Mode	0 Dec		0-4	-
	14	Output block time before braking	DC-Block Time	0.10		0.00-60.00	sec
	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
Ad.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 (Ad.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.
Ad.15 DC-Brake Time	Set the time duration for the DC voltage supply to the motor.
Ad.16 DC-Brake Level	Set the amount of DC braking to apply. The parameter setting is based on the rated current of the motor.
Ad.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.



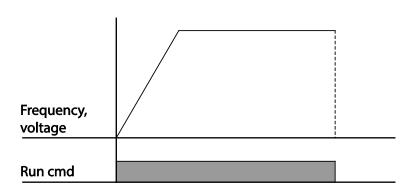
#### ① Caution

- 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
Ad	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	<b>Setting Range</b>	Unit
Ad	80	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 Pr.50 (stall prevention and flux braking) and Ad.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
dr	19	Start frequency	Start Freq	0.50	0.01-10.00	Hz
	20	Maximum frequency	Max Freq	60.00	40.00-400.00	Hz

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

Code	Description
dr.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.
dr.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.

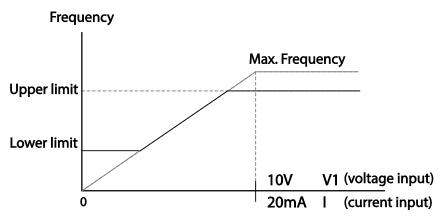
### 4.18.2 Frequency Limit Using Upper and Lower Limit Frequency Values

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

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

Code	Description
Ad.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 (Ad.25) and the upper limit frequency (Ad.26). When the setting is 0(No), codes Ad.25 and Ad.26 are not visible.
Ad.25 Freq Limit Lo, Ad.26 Freq Limit Hi	Set an upper limit frequency to all speed unit parameters that are expressed in Hz or rpm, except for the base frequency (dr.18). Frequency cannot be set higher than the upper limit frequency.





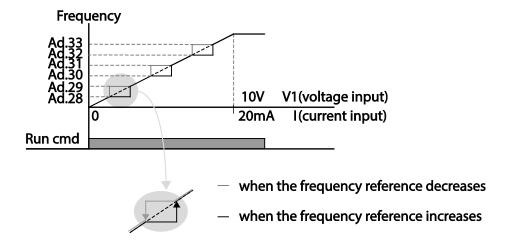
## 4.18.3 Frequency Jump

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	Parameter Setting		Setting Range	Unit
	27	Frequency jump	Jump Freq	0	No	0–1	-
Ad	28	Jump frequency lower limit1	Jump Lo 1	10.00		0.00–Jump frequency upper limit 1	Hz

Group	Code	Name	LCD Display	<b>Parameter Setting</b>	Setting Range	Unit
	29	Jump frequency upper limit1	Jump Hi 1	15.00	Jump frequency lower limit 1-Maximum frequency	Hz
	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. 65-69 and set the parameter value to 15 (2nd Source).

Group	Code	Name	LCD Display	Parai	neter Setting	Setting Range	Unit
Opera	drv	Command source	Cmd Source*	1	Fx/Rx-1	0–5	-
tion	Frq	Frequency reference source	Freq Ref Src	2	V1	0–12	-

Group	Code	Name	LCD Display	Para	meter Setting	Setting Range	Unit
	04	2 <sup>nd</sup> Command source	Cmd 2nd Src	0	Keypad	0–4	-
bA	05	2 <sup>nd</sup> Frequency reference source	Freq 2nd Src	0	KeyPad-1	0–12	-
In	65-69	Px terminal configuration	Px Define (Px: P1-P5)	15	2nd Source	0~54	-

<sup>\*</sup> Displayed under DRV-06 in an LCD keypad.

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

Code	Description
	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
	bA.04-05 instead of the set values from the drv and Frq codes in the Operation
bA.05 Freq 2nd Src	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
ln	86	Multi-function input terminal Off filter	DI Off Delay	3	0-10000	ms
	87	Multi-function input terminal selection	DI NC/NO Sel	0 0000*	-	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	90	Multi-function input	DI Status	0 0000*	-	-
		terminal status				

<sup>\*</sup> Displayed as on the keypad.

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

Code	Description	Description							
	Select whether	r or not to activate the time value	s set at In.85 and In.86. If						
	deactivated, th	e time values are set to the defau	It values at In.85 and In.86. If						
	activated, the set time values at In.85 and In.86 are set to the corresponding								
	terminals.								
In.84 DI Delay Sel	Туре	B terminal status (Normally	A terminal status (Normally						
		Closed)	Open)						
	Keypad								
	LCD keypad								
In.85 DI On Delay,	If the input terr	ninal's state is not changed durin	g the set time, when the terminal						
In.86 DI Off Delay	receives an inp	ut, it is recognized as On or Off.							
	Select terminal	contact types for each input te	rminal. The position of the						
	indicator light corresponds to the segment that is on as shown in the table below.								
	With the botto	m segment on, it indicates that th	ne terminal is configured as a A						
	terminal (Norm	nally Open) contact. With the top:	segment on, it indicates that the						
	terminal is con	figured as a B terminal (Normally	Closed) contact. Terminals are						
	numbered P1-	P5, from right to left.							
In.87 DI NC/NO Sel									
	Туре	B terminal status (Normally	A terminal status (Normally						
		Closed)	Open)						
	Keypad								
	LCD keypad								
	Display the cor	<u>ᄖ</u> nfiguration of each contact. When	a sogment is configured as A						
		_	ed by the top segment turning on.						
		on is indicated when the bottom	,						
In.90 DI Status		onfigured as B terminals, the segm	3						
		_	=						
	reminals are n	numbered P1-P5, from right to lef	ι.						

Code	Description		
	Туре	A terminal setting (On)	A terminal setting (Off)
	Keypad		
	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	Parai	meter Setting	Setting Range	Unit
CM	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	%
US	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	meter Setting	Setting Range	Unit
CM	95	P2P Communication selection	Int 485 Func	2	P2P Slave	0-3	-
	96	P2P DO setting selection	P2P OUT Sel	0	No	0-2	bit

### **P2P Setting Details**

Code	Description
CM.95 Int 485 Func	Set master inverter to 1(P2P Master), slave inverter to 2(P2P Slave).

Code	Description
US.80–82 P2P Input Data	Input data sent from the slave inverter.
US.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	nmeter Setting	Setting Range	Unit
CM	95	P2P Communication selection	Int 485 Func	3	KPD-Ready	0-3	-
	03	Multi-keypad ID	Multi KPD ID	3		3-99	-
CNF	42	Multi-function key selection	Multi Key Sel	4	Multi KPD	0-4	-

#### **Slave Parameter**

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

### **Multi-keypad Setting Details**

Code	Description
CM.01 Int485 St ID	Prevents conflict by designating a unique identification value to an inverter.
	Values can be selected from numbers between 3-99.

Code	Description
CM.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 10-1,000ms.

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

Group	Code	Name	LCD Display	Parameter Setting	<b>Setting Range</b>	Unit
AP	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 link1-18	Link UserOut1- 18	0	0-0xFFFF	-
US	31- 60	Input value setting1-30	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

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	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	-
	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	-
	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	-
UF	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	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	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	-
	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	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	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	-
	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
AP.02 User Seq En	Display the parameter groups related to a user sequence.
	Set Sequence Run and Sequence Stop with the keypad.
US.01 User Seq Con	Parameters cannot be adjusted during an operation. To adjust parameters,
	the operation must be stopped.
US.02 User Loop Time	Set the user sequence Loop Time.
03.02 Oser Loop Time	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,
US.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 OSCIOULT-TO	Frequency), input the communication address(0x1101) of the Cmd
	frequency as the Link UserOut1 parameter.
US.31–60 Void Para1–30	Set 30 void parameters. Use when constant (Const) parameter input is
03.31-00 Void Faia1-30	needed in the user function block.
UF.01-90	Set user defined functions for the 18 function blocks.
UF.U 1-90	If the function block setting is invalid, the output of the User Output@ is -1.

Code	Description
	All the outputs from the User Output@ are read only, and can be used with
	the user output link@ (Link UserOut@) of the US 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	Туре	Description
0	NOP	No Operation.
1	ADD	Addition operation, (A + B) + C
	ADD	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.
3	ADDSUB	Addition and subtraction compound operation, (A + B) - C
3	ADD300	If the C parameter is 0x0000, it will be recognized as 0.
4	MIN	Output the smallest value of the input values, MIN(A, B, C).
4	IVIIIN	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).
3	IVIAA	If the C parameter is 0x0000, operate only with A, B.
6	ABS	Output the absolute value of the A parameter,   A  .
0		This operation does not use the B, or C parameter.
7	NEGATE	Output the negative value of the A parameter, -( A ).
,		This operation does not use the B, or C parameter.
8	REMAINDER	Remainder operation of A and B, A % B
0	NEWAINDEN	This operation does not use the C parameter.
9	MPYDIV	Multiplication, division compound operation, (A x B)/C.
9	IVIFIDIV	If the C parameter is 0x0000, output the multiplication operation of (A x B).
		Comparison operation: if $(A > B)$ the output is C; if $(A  the output is 0.$
10	COMPARE-GT	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).
11	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,

Number	Туре	Description
-rumber	(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).
	COMPARE- EQUAL	Comparison operation, if (A == B) then the output is C. For all other values
		the output is 0.
12		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
	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. If input of B is 1, timer stops (output is 0). If input is 0, timer runs.
14	TIMER	If input of C is 1, output the current timer value.
1-7	THVIEN	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.
		Timer overflow Initializes the timer value to 0.
		Sets a limit for the A parameter.
	LIMIT	If input to A is between B and C, output the input to A.
15		If input to A is larger than B, output B. If input of A is smaller than C, output
		C.
		B parameter must be greater than or equal to the C parameter.
16	AND	Output the AND operation, (A and B) and C.
	7.1.10	If the C parameter is 0x0000, operate only with A, B.
17	OR	Output the OR operation, (A   B)   C.
		If the C parameter is 0x0000, operate only with A, B.
18	XOR	Output the XOR operation, (A ^ B) ^ C.
		If the C parameter is 0x0000, operate only with A, B.
19	AND/OR	Output the AND/OR operation, (A andB)   C. 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
20	SWITCH	parameter will be C.
		Test the B bit of the A parameter, BITTEST(A, B).
		If the B bit of the A input is 1, the output is 1. If it is 0, then the output is 0.
21	BITTEST	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.
		The state of the s

Number	Туре	Description
23	BITCLEAR	Clear the B bit of the A parameter, BITCLEAR(A, B). Output the changed value after clearing the B bit to input at A.  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.
24	LOWPASSFILTER	Output the input at A as the B filter gains time constant, B x US-02 (US Loop Time. In the above formula, set the time when the output of A reaches 63.3% C stands for the filter operation. If it is 0, the operation is started.
25	PI_CONTROL	P, I gain = A, B parameter input, then output as C. Conditions for PI_PROCESS output: C = 0: Const PI, C = 1: PI_PROCESS-B >= PI_PROCESS-OUT >= 0, 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 error with PI settings, output -1.
26	PI_PROCESS	A is an input error, B is an output limit, C is the value of Const PI output. Range of C is 0-32,767.
27	UPCOUNT	Upcounts the pulses and then output the value- UPCOUNT(A, B, C). 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 PR. 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
	80	Fire Mode selection	Fire Mode Sel	1	Fire Mode	0–2	-
Ad	81	Fire Mode frequency	Fire Mode Freq	0-60		0–60	
	82	Fire Mode run direction	Fire Mode Dir	0–1		0–1	
	83	Fire Mode operation count	Fire Mode Cnt	Not	configurable	-	-
ln	65– 69	Px terminal configuration	Px Define (Px: P1– P7)	51	Fire Mode	0~54	-

The inverter runs in Fire mode when Ad. 80 (Fire Mode Sel) is set to '2 (Fire Mode)', and the multifunction terminal (In. 65-69) configured for Fire mode (51: Fire Mode) is turned on. The Fire mode count increases by 1 at Ad. 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
Ad.81 Fire Mode frequency	Fire mode frequency reference	The frequency set at Ad. 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.
Dr.03 Acc		When Fire mode operation is turned on, the inverter accelerates for
Time /	Fire mode Acc/Dec	the time set at Dr.03 (Acc Time), and then decelerates based on the
Dr.04 Dec	times	deceleration time set at Dr.04 (Dec Time). It stops when the Px
Time		terminal input is turned off (Fire mode operation is turned off).
PR.10 Retry	Fault trip process	Some fault trips are ignored during Fire mode operation. The fault
Delay	Fault trip process	trip history is saved, but trip outputs are disabled even when they

Code	Description	Details
		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.
		For the following fault trips, the inverter performs a Reset and Restart until the trip conditions are released. The retry delay time set at PR. 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, \$100 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.

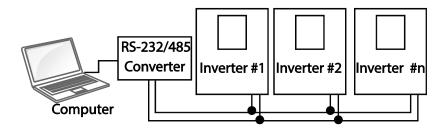
Item	Standard
Communication method/	RS-485/Bus type, Multi-drop Link System
Transmission type	
Inverter type name	S100
Number of connected	Maximum of 16 inverters / Maximum1,200m (recommended distance:
inverters/Transmission	within 700m)
distance	
Recommended cable size	0.75mm², (18AWG), Shielded Type 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.

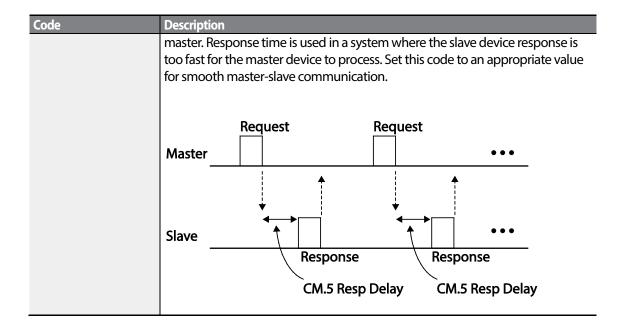
## **5.2.2 Setting Communication Parameters**

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
CM	01	Built-in communication inverter ID	Int485 St ID	1		1-250	-
	02 Built-in communication		Int485 Proto	0	ModBus RTU	0, 2	-
03		Built-in communication speed	Int485 BaudR	3	9600 bps	0-7	-
		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					
CM.01 Int485 St ID	Set the inverter station ID between 1 and 250.					
CM.02 Int485 Proto	Select c	one of the two built-ir	n protocols: Modbus-RTU or LS INV 485.			
	Settin	g	Function			
	0	Modbus-RTU	Modbus-RTU compatible protocol			
	2	LS INV 485	Dedicated protocol for the LS inverter			
CM.03 Int485 BaudR	Set a co	mmunication setting	g speed up to 115,200 bps.			
	Settin	g	Function			
	0		1,200 bps			
	1		2,400 bps			
	2		4,800 bps			
	3		9,600 bps			
	4		19,200 bps			
	5		38,400 bps			
	6		56K bps			
	7		115 Kbps			
CM.04 Int485 Mode		_	uration. Set the data length, parity check method,			
	and the	number of stop bits				
	Settin		Function			
	0	D8/PN/S1	8-bit data / no parity check / 1 stop bit			
	1	D8/PN/S2	8-bit data / no parity check / 2 stop bits			
	2	D8/PE/S1	8-bit data / even parity / 1 stop bit			
	3 D8/PO/S1 8-bit data / odd parity / 1 sto					
CM.05 Resp Delay	Set the	response time for the	e slave (inverter) to react to the request from the			



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

To select the built-in RS485 communication as the source of command, set the Frq code to 6 (Int485) on the keypad (basic keypad with 7-segment display). On an LCD keypad, set the DRV code to 3 (Int485). Then, set common area parameters for the operation command and frequency via communication.

Group	Code	Name	LCD Display	Parar	neter Setting	Setting range	Unit
Pr	12	Speed command loss operation mode	Lost Cmd Mode	1	Free-Run	0-5	-
	13	Time to determine speed command loss	Lost Cmd Time	1.0		0.1-120	S
	14	Operation frequency at speed command loss	Lost Preset F	0.00		Start frequency– Maximum frequency	Hz
OU	31	Multi-function relay 1	Relay 1	13	Lost	0-35	-
	33	Multi-function output 1	Q1 Define		Command		

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
Operation	DRV	Command source	Cmd Source*	3 Int 485		0-5	-
	Frq	Frequency setting method	Freq Ref Src	6	Int 485	0-12	-

<sup>\*</sup> Displayed in DRV-06 on an LCD keypad.

## **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**

Code	Descript	Description				
Pr.12 Lost Cmd Mode, Pr.13 Lost Cmd Time		ne operation to ru xceeding the time	n when a communication error has occurred and est at Pr. 13.			
	Setting	9	Function			
	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 Pr.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 Pr. 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 CM.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.65-69 analog multi-function inputs and cannot be set redundantly. Virtual multi-function input can be monitored using CM.86 (Virt DI Status). Before you configure the virtual multi-function inputs, set the DRV code according to the command source.

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

**Example**: When sending an Fx command by controlling virtual multi-function input in the common area via Int485, set CM.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. Parameters defined by communication can only be saved using an LCD keypad.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
CNF*	48	Save parameters	Parameter Save	0	No	0 -1	-
				1	Yes		

<sup>\*</sup>Available on an LCD keypad only.

## **5.2.7 Total Memory Map for Communication**

Communication Area	Memory Map	Details
Communication common compatible	0h0000-0h00FF	iS5, iP5A, iV5, iG5A compatible area
area		
Parameter registration type area	0h0100-0h01FF	Areas registered at CM.31-38 and CM.51-
		58
	0h0200-	Area registered for User Group
	0h023F	
	0h0240-	Area registered for Macro Group
	0h027F	
	0h0280-0h02FF	Reserved
S100 communication common area	0h0300-	Inverter monitoring area
	0h037F	
	0h0380-	Inverter control area
	0h03DF	
	0h03E0-0h03FF	Inverter memory control area
	0h0400-0h0FFF	Reserved
	0h1100	dr Group
	0h1200	bA Group
	0h1300	Ad Group
	0h1400	Cn Group
	0h1500	In Group
	0h1600	OU Group
	0h1700	CM Group
	0h1800	AP Group
	0h1B00	Pr 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 (CM) can be used in communication. Parameter group for data transmission may be defined to transmit multiple parameters at once, into the communication frame.

Group	Code	Name	LCD Display	Param	eter Setting	Setting range	Unit
CM	31-38	Output communication address x	Para Status-x	-	-	0000-FFFF	Hex
	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-	Parameter communication code value registered at CM.31-38		
0110100-0110107	Status Parameter-1- Status Parameter-8	(Read-only)		
0b0110 0b0117	Control Parameter-1-	Parameter communication code value registered at CM.51-58		
UNU110-UNU117	Control Parameter-8	(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
′Χ′	58h	Request monitor registration
Ύ;	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: ASCII-HEX (refer to 5.3.1.4 Error Code on page 127)

- 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	'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		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	CMD	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
		because the corresponding function does not exist.
ILLEGAL DATA ADDRESS	IA	The received parameter address is invalid at the slave.
ILLEGAL DATA VALUE	ID	The received parameter data is invalid at the slave.
WRITE MODE ERROR	WM	Tried writing (W) to a parameter that does not allow writing
		(read-only parameters, or when writing is prohibited during
		operation)
FRAME ERROR	FE	The frame size does not match.

### **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	х	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
T	54	9	39	DEL	7F
				DLE	10

Character	Hex	Character	Hex	Character	Hex
U	55	space	20	EM	19
V	56	!	21	ACK	06
W	57	"	22	ENQ	05
Χ	58	#	23	EOT	04
Υ	59	\$	24	ESC	1B
Z	5A	%	25	ETB	17
a	61	&	26	ETX	03
b	62	•	27	FF	0C
С	63	(	28	FS	1C
d	64	)	29	GS	1D
e	65	*	2A	HT	09
f	66	+	2B	LF	0A
g	67	,	2C	NAK	15
h	68	-	2D	NUL	00
i	69		2E	RS	1E
j	6A	/	2F	S1	OF
k	6B	:	3A	SO	0E
1	6C	;	3B	SOH	01
m	6D	<	3C	STX	02
n	6E	=	3D	SUB	1A
0	6F	>	3E	SYN	16
p	70	?	3F	US	1F
۲	1, "	•	3.	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 CM.01 (Int485 St ID), and starting address is the communication address. (starting address size is in bytes). For more information about communication addresses, refer to 5.4 Compatible Common Area Parameter on page 132.

## 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

Desirence Field Name	İ
Response Field Name	
Station ID	
Function (0x03)	_
Byte Count	
Data Hi	
Data Lo	
•••	# number of Points
Data Hi	
Data Lo	
CRC Lo	
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

Station ID Function (0x06) Starting Address Hi Register Address Lo Preset Data Hi Preset Data Lo
Starting Address Hi Register Address Lo Preset Data Hi Preset Data Lo
Register Address Lo Preset Data Hi Preset Data Lo
Preset Data Hi Preset Data Lo
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	Function	Starting Address		- /	Data 1	Data 2	CRC
	ID			Register	Count			
Hex	0x01	0x10	0x1102	0x0002	0x04	0x0032	0x0064	0x1202
Description	CM.01	Preset	Starting	-	-	50	100	-
	Int485 St	Multiple	Address -1			(ACC	(DEC	
	ID	Register	(0x1103-1)			time	time	
						5.0sec)	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	CM.01	Preset Multiple	Starting Address -1	-	-
	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.

0h0000         Inverter model         -         -         R         6:5100           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, 258:3.0 kW 259:4.0 kW 25	Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit
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 256:0.4 kW, 257:1.1 kW, 258:3.0 kW 259:4.0 kW	0h0000	Inverter model	-	-	R	6: S100
Voltage	0h0001	Inverter capacity	-	-	R	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 256: 0.4 kW, 257: 1.1 kW, 258: 3.0 kW
Oh0003         Version         -         R         Example 0h0100: Version 1.00           0h0004         Reserved         -         -         R/W           0h0005         Command frequency         0.01 Hz         R/W           0h0006         Operation command (option)         -         -         R         B15 Reserved B14 O: Keypad Freq, B13 I: Keypad Torq B12 2-16: Terminal block multisep speed B10 I7: Up, 18: Down B9 I9: STEADY 22: V1, 24: V2, 25: 12, 26: Reserved 27: Built-in 485 28: Communication option 30: JOG, 31: PID B8 O: Keypad B7 I: Fx/Rx-1 B6 C: Fx/Rx-2 3: Built-in 485 4: Communication option B7 II Fx/Rx-1 B6 C: Fx/Rx-2 3: Built-in 485 4: Communication option B4 Emergency stop B3 W: Trip initialization (0→1), R: Trip status B2 Reverse operation (R) B1 Forward operation (F) B0 Stop (S)	0h0002	·	-	-	R	
Oh0005         Command frequency         0.01         Hz         R/W           0h0006         Operation command (option)         -         -         R         B15 Reserved B14 O: Keypad Freq, B13 I: Keypad Torq B12 2-16: Terminal block multistep speed B10 T: Up, 18: Down B10 T: Fx/Rx-1 B10 T: Fx/Rx-	0h0003		-	-	R	Example 0h0100: Version 1.00
Try   Try	0h0004	Reserved	-	-	R/W	
B14   0: Keypad Freq,   1: Keypad Torq   2-16: Terminal block multistep speed   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   88   0: Keypad   1: Fx/Rx-1   86   2: Fx/Rx-2   3: Built-in 485   4: Communication option   R/W   B5   Reserved   84   Emergency stop   B3   W: Trip initialization (0→1), R: Trip status   B2   Reverse operation (R)   B1   Forward operation (F)   B0   Stop (S)	0h0005		0.01	Hz	R/W	
	0h0006	-	-	-		B14
LIDULU   ACCHICATION TIME   LL   C   K/W   -	0h0007	Acceleration time	0.1	S	R/W	500p (5)

Comm. Address	Parameter	Scale	Unit	R/W	Assigned	l 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	-	
0h000E	Operation status	-	-	R	B15	0: Remote, 1: Keypad Local
					B14	1: Frequency command source by communication (built-in, option)
					B13	1: Operation command source by communication (built-in, option)
					B12	Reverse operation command
					B11	Forward operation command
					B10	Brake release signal
					B9	Jog mode
					B8	Drive stopped.
					B7	DC Braking
					B6	Speed reached
					B5	Decelerating
					B4	Accelerating
					B3	Fault Trip - operates according to OU.30 setting
					B2	Operating in reverse direction
					B1	Operating in forward direction
					BO	Stopped
0h000F	Fault trip	-	-	R	B15	Reserved
	information				B14	Reserved
					B13	Reserved
					B12	Reserved
					B11	Reserved
					B10	H/W-Diag
					B9	Reserved
					B8	Reserved
					B7	Reserved
					B6	Reserved
					B5	Reserved
					B4	Reserved
					B3	Level Type trip
					B2	Reserved
		1	1	1	B1	Reserved

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
					B0	Latch Type trip
0h0010	Input terminal	-	_	R	B15-	Reserved
	information				B7	
					B6	Reserved
					B5	Reserved
					B4	P5
					B3	P4
					B2	P3
					B1	P2
					B0	P1
0h0011	Output terminal	-	-	R	B15	Reserved
	information				B14	Reserved
					B13	Reserved
					B12	Reserved
					B11	Reserved
					B10	Reserved
					B9	Reserved
					B8	Reserved
					B7	Reserved
					B6	Reserved
					B5	Reserved
					B4	Reserved
					B3	Reserved
					B2	Reserved
					B1	MO
					B0	Relay 1
0h0012	V1	0.01	%	R	V1 input voltage	
0h0013	V2	0.01	%	R	V2 input voltage	
0h0014	12	0.01	%	R	I2 input current	
0h0015	Motor rotation	1	rpm	R	Displays ex	isting motor rotation speed
	speed					
0h0016	Reserved	-	-	-	-	
-0h0019						
0h001A	Select Hz/rpm	-	-	R	0: Hz unit, 1	
0h001B	Display the number	-	-	R	Display the number of poles for the	
	of poles for the				selected me	otor
	selected motor					

# **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		
0h0301	Inverter capacity	-	-	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		
				5.5 kW: 4055h, 7.5 kW: 4075h		
				11 kW: 40B0h, 15 kW: 40F0h		
				18.5 kW: 4125h, 22 kW: 4160h		
0h0302	Inverter input	-	-	100 V single phase self cooling: 0120h, 200 V		
	voltage/power (Single phase, 3-			3-phase forced cooling: 0231h 100 V single phase forced cooling: 0121h, 400		
	phase)/cooling			V single phase self cooling: 0420h		
	method			200 V single phase self cooling: 0220h, 400 V		
				3-phase self cooling: 0430h		
				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		
	version			0h0101:Version 1.01		
0h0304	Reserved	-	-	-		
0h0305	Inverter operation	-	-	B15 0: Normal state		
	state			4: Warning occurred 8: Fault occurred [operates		
				B13 according to Pr. 30 (Trip Out Mode)		
				B12 setting.]		
				B11		
				B8		
				B7 1: Speed searching		
				B6 2: Accelerating		
				3: Operating at constant rate 4: Decelerating		
				"Deceretating		

Comm. Address	Parameter	Scale	Unit	Assianed	content by bit
				B3 B2 B1 B0	5: Decelerating to stop 6: H/W OCS 7: S/W OCS 8: Dwell operating 0: Stopped 1: Operating in forward direction 2: Operating in reverse direction 3: DC operating (0 speed control)
0h0306	Inverter operation frequency command source	-	-	B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1 B0	Operation command source 0: Keypad 1: Communication option 2: User Sequence 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 12: User Sequence 13: Jog 14: PID 25-39: Multi-step speed frequency
0h0307	LCD keypad S/W version	-	-	(Ex.) 0h01	00: Version 1.00
0h0308	LCD keypad title version	-	-	(Ex.) 0h01	01: 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	m-32767 rpm (directional)
0h0314	Output voltage	1	٧	-	
0h0315	DC Link voltage	1	٧	-	
0h0316	Output power	0.1	kW	-	
0h0317	Output torque	0.1	%	-	

Comm. Address	Parameter	Scale	Unit	Assigned cor	atant by hit		
				Assigned Cor	itent by bit		
0h0318	PID reference	0.1	%	-			
0h0319	PID feedback	0.1	%	-			
0h031A	Display the	-	-	Displays the number of poles for the first			
	number of poles			motor			
01 0210	for the 1st motor			D: 1 11			
0h031B	Display the	-	-	Displays the number of poles for the 2nd			
	number of poles for the 2 <sup>nd</sup> motor			motor			
0h031C	Display the			Displays the	number of poles for the selected		
UNUSIC	number of poles	-	-	motor	number of poles for the selected		
	for the selected			motor			
	motor						
0h031D	Select Hz/rpm	_	-	0: Hz, 1: rpm			
0h031E	Reserved	-	-	-			
-0h031F							
0h0320	Digital input			BI5	Reserved		
	information			-	-		
				B7	Reserved		
				B6	Reserved		
				B5	Reserved		
				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)		
0h0321	Digital output	-	-	BI5	Reserved		
	information			-	Reserved		
				B4	Reserved		
				B3	Reserved		
				B2	Reserved		
				B1	Q1		
				B0	Relay 1		
0h0322	Virtual digital input	-	-	B15	Reserved		
	information			-	Reserved		
				B8	Reserved		
				B7	Virtual DI 8(CM.77)		
				B6	Virtual DI 7(CM.76)		
				B5	Virtual DI 6(CM.75)		
				B4	Virtual DI 5(CM.74)		
				B3	Virtual DI 4(CM.73)		
				B2	Virtual DI 3(CM.72)		
				B1	Virtual DI 2(CM.71)		
		]		B0	Virtual DI 1(CM.70)		

Comm. Address	Parameter	Scale	Unit	Assigned con	tent by bit	
0h0323	Display the selected motor	-	-	0: 1st motor/	1: 2nd motor	
0h0324	Al1	0.01	%	Analog input V1 (I/O board)		
0h0325	Reserved	0.01	%			
0h0326	Al3	0.01	%	Analog input	V2 (I/O board)	
0h0327	Al4	0.01	%	Analog input	12 (I/O board)	
0h0328	AO1	0.01	%	Analog outp	ut 1 (I/O board)	
0h0329	AO2	0.01	%		ut 2 (I/O board)	
0h032A	AO3	0.01	%	Reserved		
0h032B	AO4	0.01	%	Reserved		
0h032C	Reserved	-	-	-		
0h032D	Inverter module temperature	1	$^{\circ}$	-		
0h032E	Inverter power consumption	1	kWh	-		
0h032F	Inverter power consumption	1	MWh	-		
0h0330	Latch type trip	-	-	BI5	Fuse Open Trip	
	information - 1			BI4	Over Heat Trip	
				BI3	Arm Short	
				BI2	External Trip	
				BI1	Overvoltage Trip	
				BIO	Overcurrent Trip	
				B9	NTCTrip	
				B8	Reserved	
				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	
				B0	Overload Trip	
0h0331	Latch type trip	-	-	BI5	Reserved	
	information - 2			BI4	Reserved	
				BI3	Safety B	
				BI2	Safety A	
				BI1	Reserved	
				BIO	Bad option card	
				B9	No motor trip	

Comm. Address	Parameter	Scale	Unit	Assigned con	tent by bit
				B8	External brake trip
				B7	Bad contact at basic I/O board
				B6	Pre PID Fail
				B5	Error while writing parameter
				B4	Reserved
				B3	FANTrip
				B2	Reserved
				B1	Reserved
				ВО	Reserved
0h0332	0332 Level type trip		-	B15	Reserved
	information			-	-
				B8	Reserved
				B7	Reserved
				B6	Reserved
				B5	Reserved
				B4	Reserved
				B3	Keypad Lost Command
				B2	Lost Command
				B1	LV
			B0	BX	
0h0333	H/W Diagnosis Trip	-	1	B15	Reserved
	information			-	Reserved
				B6	Reserved
				B5	Queue Full
				B4	Reserved
				B3	Watchdog-2 error
				B2	Watchdog-1 error
				B1	EEPROM error
				B0	ADC error
0h0334	Warning	-	-	B15	Reserved
	information			-	Reserved
				B10	Reserved
				B9	Auto Tuning failed
				B8	Keypad lost
				B7	Encoder disconnection
				B6	Wrong installation of encoder
				B5	DB
				B4	FAN running
				B3	Lost command
				B2	Inverter Overload

Comm. Address	Parameter	Scale	Unit	Assigned cont	ent by bit			
				B1	Underload			
				B0	Overload			
0h0335 -0h033F	Reserved	-	-	-				
0h0340	On Time date	0	Day	Total number powered on	of days the inverter has been			
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 the motor	of days the inverter has driven			
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 been running	of days the heat sink fan has			
0h0345	Fan Time minute	0	Min	Total number number of Fa	of minutes excluding the total n Time days			
0h0346 -0h0348	Reserved	-	-	-				
0h0349	Reserved	-	-	-				
0h034A	Option 1	-	-	0: None, 9: CA	Nopen			
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	Command frequency setting			
0h0381	RPM command	1	rpm	Command rpm setting			
0h0382	Operation	-	-	B7	Reserved		
	command			B6	Reserved		
				B5	Reserved		
				B4	Reserved		
				B3	0 → 1: Free-run stop		
				B2	0 → 1:Trip initialization		
				B1	0: Reverse command, 1: Forward		
					command		

Comm. Address	Parameter	Scale	Unit	Assigne	ed Content by Bit
				B0	0: Stop command, 1: Run command
				Examp	le: Forward operation command 0003h,
					e operation command 0001h.
0h0383	Acceleration	0.1	S	Accelei	ration time setting
	time				-
0h0384	Deceleration	0.1	S	Decele	ration time setting
	time				<u>_</u>
0h0385	Virtual digital	-	-	BI5	Reserved
	input control			-	Reserved
	(0: Off, 1:On)			B8	Reserved
				B7	Virtual DI 8(CM.77)
				B6	Virtual DI 7(CM.76)
				B5	Virtual DI 6(CM.75)
				B4	Virtual DI 5(CM.74)
				В3	Virtual DI 4(CM.73)
				B2	Virtual DI 3(CM.72)
				B1	Virtual DI 2(CM.71)
				ВО	Virtual DI 1(CM.70)
0h0386	Digital output	-	-	BI5	Reserved
	control			BI4	Reserved
	(0:Off, 1:On)			BI3	Reserved
				BI2	Reserved
				BI1	Reserved
				BIO	Reserved
				В9	Reserved
				B8	Reserved
				В7	Reserved
				B6	Reserved
				B5	Reserved
				B4	Relay 4(Ext I/O, OUT-31: None)
				В3	Relay 3(Ext I/O, OUT-31: None)
				B2	Relay 2(30~75kW, OUT-31: None)
				B1	Q1(0.4~75kW, OUT-33: None)
				ВО	Relay 1(0.4~75kW, OUT-31: None)
0h0387	Reserved	-	-	Reserve	ed
0h0388	PID reference	0.1	%	PID refe	erence command
0h0389	PID feedback	0.1	%		dback value
	value				
0h038A	Motor rated	0.1	Α	-	
	current				
0h038B	Motor rated	1	٧	-	
	voltage				

Comm. Address	Parameter	Scale	Unit	Assigned Content by Bit
0h038C-	Reserved			-
0h038F				
0h0390	Torque Ref	0.1	%	Torque command
0h0391	Fwd Pos	0.1	%	Forward motoring torque limit
	Torque Limit			
0h0392	Fwd Neg	0.1	%	Forward regenerative torque limit
	Torque Limit			
0h0393	Rev Pos	0.1	%	Reverse motoring torque limit
	Torque Limit			
0h0394	Rev Neg	0.1	%	Reverse regenerative torque limit
	Torque Limit			
0h0395	Torque Bias	0.1	%	Torque bias
0h0396- 0h399	Reserved	-	-	-
0h039A	Anytime Para	-	-	Set the CNF.20* value
0h039B	Monitor Line-	-	-	Set the CNF.21* value
0h039C	Monitor Line-	-	-	Set the CNF.22* value
	2			
0h039D	Monitor Line-	_	-	Set the CNF.23* value
	3			

<sup>\*</sup> Displayed on an LCD keypad only.

#### 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 dr.07 to Keypad-1 and select a random target frequency.
- 2 Set the frequency via communication into the parameter area frequency address (0h1101).
- 3 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.	Parameter	Scale	Unit	Changeable	Function
Address				<b>During Operation</b>	
0h03E0	Save parameters	-	-	Χ	0: No, 1:Yes
0h03E1	Monitor mode	-	-	0	0: No, 1:Yes
	initialization				

Comm.	Parameter	Scale	Unit	Changeable	Function
Address 0h03E2	Parameter initialization	-	-	During Operation X	0: No, 1: All Grp, 2: Drv Grp 3: bA Grp, 4: Ad Grp, 5: Cn Grp 6: In Grp, 7: OU Grp, 8: CM Grp 9: AP Grp, 12: Pr Grp, 13: M2 Grp Setting is prohibited during fault trip interruptions.
0h03E3	Display changed parameters	-	-	0	0: No, 1: Yes
0h03E4	Reserved	-	-	-	-
0h03E5	Delete all fault history	-	-	0	0: No, 1: Yes
0h03E6	Delete user- registrated codes	-	-	0	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	-	-	0	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:  $244 \rightarrow 0 \rightarrow 244$ .

#### 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 Operation Group**

The Operation group is used only in the basic keypad mode. It will not be displayed on an LCD keypad. If the LCD keypad is connected, the corresponding functions will be found in the Drive(DRV) group.

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	Keypad Display	Settin	g Range	Initial Value	Property*	V/F	SL	Ref.
	0h1F00	Target frequency	0.00	0-Maximum frequency(Hz)		0.00	O/7	0	I/P	<u>p.42</u>
-	0h1F01	Acceleration time	ACC	0.0-600.0(s)		20.0	O/7	0	I/P	<u>p.80</u>
-	0h1F02	Deceleration time	dEC	0.0-600.0(s)		30.0	O/7	0	I/P	<u>p.80</u>
-	0h1F03	Command source	drv	0 1 2 3 4	Keypad Fx/Rx-1 Fx/Rx-2 Int 485 Field Bus <sup>1</sup>	1: Fx/Rx-1	X/7	0	I/P	p.73
-	0h1F04	Frequency reference source	Frq	0 1 2 4 5	Keypad-1 Keypad-2 V1 V2 I2 Int 485	0: Keypad-1	X/7	0	I/P	<u>p.60</u>

<sup>&</sup>lt;sup>1</sup> Table of options are provided separately in the option manual.

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				8 12	Field Bus Pulse					
-	0h1F05	Multi-step speed frequency 1	St1		Maximum ency(Hz)	10.00	O/7	0	I/P	<u>p.71</u>
-	0h1F06	Multi-step speed frequency 2	St2		Maximum ency(Hz)	20.00	O/7	0	I/P	<u>p.71</u>
-	0h1F07	Multi-step speed frequency 3	St3	0.00	Maximum ency(Hz)	30.00	O/7	0	I/P	<u>p.71</u>
-	0h1F08	Output current	CUr				-/7	0	I/P	p.54
-	0h1F09	Motor revolutions per minute	Rpm				-/7	0	I/P	-
-	0h1F0A	Inverter direct current voltage	dCL	-		-	-/7	0	I/P	<u>p.54</u>
-	0h1F0B	Inverter output voltage	vOL				-/7	0	I/P	<u>p.54</u>
-	0h1F0C	Out of order signal	nOn				-/7	0	I/P	-
-	0h1F0D	Select rotation direction	drC		rward run verse run	F	O/7	0	I/P	-

## **6.2** Drive group (PAR→dr)

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

SL: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	Setting Range	Initial value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99	9	O/A	0	I/P	p.42
<b>01</b> <sup>2</sup>	0h1101	Target frequency	Cmd Frequency	Start frequency - Maximum frequency(Hz)	0.00	O/L	0	I/P	<u>p.46</u>

<sup>&</sup>lt;sup>2</sup> Displayed when an LCD keypad is in use.

Code	Comm. Address	Name	LCD Display	Settir	ng Range	Initial value	Property*	V/F	SL	Ref.
02	0h1102	Torque command	Cmd Torque	-180-	~180[%]	0.0	O/A	Х	I	-
03 <sup>2</sup>	0h1103	Acceleration time	AccTime	0.0-6	00.0(s)	20.0	O/L	0	I/P	<u>p.80</u>
042	0h1104	Deceleration time	Dec Time	0.0-6	00.0(s)	30.0	O/L	0	I/P	<u>p.80</u>
06 <sup>2</sup>	0h1106	Command	Cmd Source	0	Keypad	1:	X/L	0	I/P	<u>p.73</u>
		source		1	Fx/Rx-1	Fx/Rx-1				
				2	Fx/Rx-2					
				3	Int 485					
				4	Field Bus					
				5	UserSeqLin					
0=2	01.440=		5 5 66		k		24.0			
07 <sup>2</sup>	0h1107	Frequency reference	Freq Ref Src	0	Keypad-1	0:	X/L	0	I/P	<u>p.60</u>
				1	Keypad-2	Keypad- 1				
		source		2	V1	<b>∤</b> '				
				4	V2 I2					
				5 6	Int 485					
				8	Field Bus					
				9	UserSeqLin					
					k					
				12	Pulse					
08	0h1108	Torque	Trq Ref Src	0	Keypad-1	0:	X/A	Х	ı	-
		reference		1	Keypad-2	Keypad-				
		setting		2	V1	1				
				4	V2					
				5	12	1				
				6	Int 485					
				8	FieldBus					
				9	UserSeqLin					
					k					'
				12	Pulse					
09	0h1109	Control mode	Control	0	V/F	0: V/F	X/A	0	I/P	<u>p.88</u>
			Mode	2	Slip Compen					
				4	IM .	1				
					Sensorless	-				
10	01.1101	T 6	<b>-</b>	6	PM S/L	0.11	V/6	V		
10	0h110A	Torque Control	•	0	No	0: No	X/A	Χ	I	-
	I		Control	1	Yes	<u> </u>				

Code	Comm. Address	Name	LCD Display	Settin	ng Range	Initial value	Property*	V/F	SL	Ref.
11	0h110B	Jog frequency	Jog Frequency	Maxir	ency-	10.00	O/A	Ο	I/P	-
12	0h110C	Jog run acceleration time	Jog Acc Time	0.0-60	00.0(s)	20.0	O/A	0	I/P	-
13	0h110D	Jog run deceleration time	Jog Dec Time	0.0-600.0(s)		30.0	O/A	0	I/P	-
14	0h110E	Motor capacity	Motor Capacity	12: 15 13: 18 14: 22	kW 5kW, kW kW, kW kW, kW,	Varies by Motor capacity	X/A	O	I/P	-
15	0h110F	Torque boost options	Torque Boost	0 1 2	Manual Auto1 Auto2	0: Manual	X/A	0	X	-
16 <sup>3</sup>	0h1110	Forward Torque boost	Fwd Boost	0.0-1	5.0(%)	2.0	X/A	0	Х	<u>p.91</u>
17³	0h1111	Reverse Torque boost	Rev Boost	0.0-1	5.0(%)	2.0	X/A	0	Х	<u>p.91</u>
		Base frequency	Base Freq	30.00~400.00(Hz) [V/F, Slip Compen] 40.00~120.00(Hz) [IM Sensorless] 30.00~180.00(Hz) [PM Sensorless]			X/A	О	I/P	
19	0h1113	Start frequency	Start Freq	0.01-	10.00(Hz)	0.50	X/A	0	I/P	<u>p.88</u>

<sup>&</sup>lt;sup>3</sup> Displayed when dr.15 is set to 0 (Manual) or 2(Auto2)

Code	Comm. Address	Name	LCD Display	Setti	ng Range	Initial value	Property*	V/F	SL	Ref.
20	Oh1114	Maximum frequency	Max Freq	[V/F, Com 40.00 [IM S 40.00	•	60.00	X/A	0	I/P	<u>p.98</u>
21	0h1115	Select speed unit	Hz/Rpm Sel	1	Hz Display Rpm Display	0:Hz Display	O/L	0	I/P	<u>p.71</u>
22 <sup>4</sup>	0h1116	(+)Torque gain	(+)Trq Gain	50.0	~ 150.0[%]	100.0	O/A	Х	I	-
23 <sup>4</sup>	0h1117	(-)Torque gain	(-)Trq Gain	50.0	~ 150.0[%]	100.0	O/A	Χ	I	-
<b>24</b> <sup>4</sup>	0h1118	(-)Torque gain 0	(-)Trq Gain0	50.0	~ 150.0[%]	80.0	O/A	Х	I	-
25 <sup>4</sup>	0h1119	(-)Torque offset	(-)Trq Offset	0.0 ~	100.0[%]	40.0	O/A	Х	I	-
<b>80</b> <sup>5</sup>	0h1150	Select ranges at power input		inver	tranges ter displays wer input Run frequency Acceleratio n time Deceleratio n time Command source Frequency reference source Multi-step speed frequency1 Multi-step speed frequency2 Multi-step speed frequency2 Multi-step speed frequency3	0: run frequenc y	O/7	O	I/P	

<sup>&</sup>lt;sup>4</sup> Displayed when dr.10 is set to 1 (YES)

<sup>&</sup>lt;sup>5</sup> Will not be displayed when an LCD keypad is in use

	ŀ		
O/7	0	I/P	-
O/7	0	I/P	-
X/7	0	I/P	<u>p44</u> ,
			<u>p.76</u>
X/A	0	I/P	-
	1	1	1
	X/7	O/7 O X/7 O	O/7 O I/P  X/7 O I/P

Code	Comm. Address	Name	LCD Display	Setti	ng Range	Initial value	Property*	V/F	SL	Ref.
93 <sup>5</sup>	0h115D	Parameter	_	0	No	0:No	X/7	0	I/P	-
		initialization		1	All Grp					
				2	dr Grp					
				3	bA Grp					
				4	Ad Grp					
				5	Cn Grp					
				6	In Grp					
				7	OU Grp					
				8	CM Grp					
				9	AP Grp					
				12	Pr Grp					
				13	M2 Grp					
				16	run Grp					
94 <sup>5</sup>	0h115E	Password registration		0-99	99		O/7	0	I/P	-
<b>95</b> ⁵	0h115F	Parameter lock settings		0-99	99		O/7	0	I/P	_
<b>97</b> <sup>5</sup>	0h1161	Software version	-				-/7	0	I/P	-
98	0h1162	Display I/O board version	IO S/W Ver				-/A	0	I/P	-
99	0h1163	Display I/O board H/W version	IO H/W Ver	0 1 2	Multiple IO Standard IO Standard IO (M)	Standard IO	-/A	0	I/P	-

# **6.3 Basic Function group (PAR→bA)**

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

**SL**: Sensorless vector control function (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	CD Display Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99	)	20	0	0	I/P	p.42
01	0h1201	Auxiliary reference source	Aux Ref Src	1 \\ 3 \\\	None V1 V2 I2 Pulse	0:None	X/A	0	I/P	-

Code	Comm. Address	Name	LCD Display	Settin	ng Range	Initial Value	Property*	V/F	SL	Ref.
02 <sup>6</sup>	0h1202	Auxiliary command calculation type	Aux Calc Type	1 M 2 M 3 M 4 S 5 M 5 M 5 M 6 M 5 M	M+(G*A) Mx (G*A) M(G*A) M+[M*(G*A)] M+G*2(A- 0%) Mx[G*2(A- 0%) M/[G*2(A- 0%)] M+M*G*2(A- 0%)	0: M+(GA )	X/A	0	I/P	-
<b>03</b> <sup>6</sup>	0h1203	Auxiliary command gain	Aux Ref Gain	-200.0	0-200.0(%)	100.0	O/A	0	I/P	-
04	0h1204	2nd command source	Cmd 2nd Src	1 F: 2 F: 3 In	eypad x/Rx-1 x/Rx-2 nt 485 ieldBus	1: Fx/Rx-1	X/A	0	I/P	<u>p.100</u>
05	0h1205	2nd frequency source	Freq 2nd Src	0 K 1 K 2 V 4 V 5 I2 6 Ir 8 Fi 9 U	eypad-1 eypad-2 /1	0: Keypad -1	O/A	0	I/P	<u>p.100</u>
06	0h1206	2nd Torque command source	Trq 2nd Src	1 K 2 V 4 V 5 I2 6 Ir 8 Fi 9 U	2	0: Keypad -1	O/A	х	I	
07	0h1207	V/F pattern options	V/F Pattern	0 Li 1 So 2 U	inear quare Iser V/F quare 2	0: Linear	X/A	0	Х	<u>p.88</u>

 $<sup>^{\</sup>rm 6}\,$  Displayed if bA.01 is not set to 0 (None).

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
08	0h1208	Acc/dec standard frequency	Ramp T Mode	0	Max Freq Delta Freq	0: Max Freq	X/A	0	I/P	<u>p.80</u>
09	0h1209	Time scale settings	Time Scale	0 1 2	0.01 sec 0.1 sec 1 sec	1:0.1 sec	X/A	0	I/P	<u>p.80</u>
10	0h120A	Input power frequency	60/50 Hz Sel	0	60Hz 50Hz	0:60Hz	X/A	0	I/P	-
11	0h120B	Number of motor poles	Pole Number	2-48		Depen	X/A	0	I/P	-
12	0h120C	Rated slip speed	Rated Slip	0-3000(Rpm)		dent	X/A	0	I	-
13	0h120D	Motor rated current	Rated Curr	1.0-1000.0(A)		motor setting	X/A	0	I/P	-
14	0h120E	Motor noload current	Noload Curr	0.0-1000.0(A)		3219	X/A	0	I	-
15	0h120F	Motor rated voltage	Rated Volt	170	)-480(V)	0	X/A	0	I/P	<u>p.93</u>
16	0h1210	Motor efficiency	Efficiency	64-	100(%)	Depen dent on motor setting	X/A	0	I/P	-
17	0h1211	Load inertia rate	Inertia Rate	0-8			X/A	0	I/P	-
18	0h1212	Trim power display	Trim Power %	70-	130(%)		O/A	0	I/P	-
19	0h1213	Input power voltage	AC Input Volt	170	)-480V	220/38 0V	O/A	0	I/P	-
20	-	Auto Tuning	Auto Tuning	<ul><li>0</li><li>1</li><li>2</li><li>3</li><li>6</li><li>7</li></ul>	None All (Rotation type) ALL (Static type) Rs+Lsigma (Rotation type) Tr (Static type) All PM	0:None	X/A	х	I/P	-
21	-	Stator resistance	Rs		pendent on otor setting	Depen dent	X/A	Х	I/P	-

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
22	-	Leakage inductance	Lsigma		on motor	X/A	х	I	-
23	-	Stator inductance	Ls		setting	X/A	Х	I	-
<b>24</b> <sup>7</sup>	-	Rotor time constant	Tr	25-5000(ms)	-	X/A	Х	I	-
25 <sup>7</sup>	-	Stator inductance scale	Ls Scale	50 ~ 150[%]	100	X/A	х	I	-
<b>26</b> <sup>7</sup>	-	Rotor time constant scale	Tr Scale	50 ~ 150[%]	100	X/A	Х	I	-
28 <sup>8</sup>	-	D-axis inductance	Ld (PM)	Settings vary	0	X/A	Х	Р	
29 <sup>8</sup>		Q-axis inductance	Lq (PM)	depending on the motor	0	X/A	Х	Р	
30 <sup>8</sup>		Flux reference	PM Flux Ref	specifications.	0.147	X/A	Х	Р	
31 <sup>7</sup>		Regeneration inductance scale	Ls Regen Scale	70 ~ 100[%]	80	X/A	Х	I	=
32 <sup>8</sup>	-	Q-axis inductance scale	Lq(PM) Scale	50–150[%]	100	X/A	х	Р	
34 <sup>8</sup>	-	PM auto tuning level	Ld,Lq Tune Lev	20.0–50.0[%]	33.3	X/A	Х	Р	
35 <sup>8</sup>	-	PM auto tuning frequency	Ld,Lq Tune Hz	80.0–150.0[%]	100.0	X/A	Х	Р	
<b>41</b> <sup>9</sup>	0h1229	User frequency1	User Freq 1	0.00-Maximum frequency(Hz)	15.00	X/A	0	Х	<u>p.90</u>
<b>42</b> <sup>9</sup>	0h122A	User voltage1	User Volt 1	0-100(%)	25	X/A	0	Χ	<u>p.90</u>
<b>43</b> <sup>9</sup>	0h122B	User frequency2	User Freq 2	0.00-0.00- Maximum frequency(Hz)	30.00	X/A	0	Х	<u>p.90</u>
<b>44</b> <sup>9</sup>	0h122C	User voltage2	User Volt 2	0-100(%)	50	X/A	0	Х	<u>p.90</u>
<b>45</b> <sup>9</sup>	0h122D	User frequency3	User Freq 3	0.00-Maximum frequency(Hz)	45.00	X/A	0	Х	<u>p.90</u>
<b>46</b> <sup>9</sup>	0h122E	User voltage3	User Volt 3	0-100(%)	75	X/A	0	Χ	<u>p.90</u>

<sup>&</sup>lt;sup>7</sup> Displayed when dr.09 is set to 4(IM Sensorless)

<sup>&</sup>lt;sup>8</sup> Displayed when dr.09 (Control Mode) is set to 6 (PM Sensorless).

 $<sup>^9\,</sup>$  Displayed if either bA.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.
47 <sup>9</sup>	0h122F	User frequency4	User Freq 4	0.00-Maximum frequency(Hz)	Maxim um freque ncy	X/A	0	х	<u>p.90</u>
<b>48</b> <sup>9</sup>	0h1230	User voltage4	User Volt 4	0-100(%)	100	X/A	0	Χ	<u>p.90</u>
<b>50</b> <sup>10</sup>	0h1232	Multi-step speed frequency1	Step Freq-1	0.00-Maximum frequency(Hz)	10.00	O/L	0	I/P	<u>p.71</u>
<b>51</b> <sup>10</sup>	0h1233	Multi-step speed frequency2	Step Freq-2	0.00-Maximum frequency(Hz)	20.00	O/L	0	I/P	<u>p.71</u>
<b>52</b> <sup>10</sup>	0h1234	Multi-step speed frequency3	Step Freq-3	0.00-Maximum frequency(Hz)	30.00	O/L	0	I/P	<u>p.71</u>
53 <sup>11</sup>	0h1235	Multi-step speed frequency4	Step Freq-4	0.00-Maximum frequency(Hz)	40.00	O/A	0	I/P	<u>p.71</u>
54 <sup>11</sup>	0h1236	Multi-step speed frequency5	Step Freq-5	0.00-Maximum frequency(Hz)	50.00	O/A	0	I/P	<u>p.71</u>
55 <sup>11</sup>	0h1237	Multi-step speed frequency6	Step Freq-6	0.00-Maximum frequency(Hz)	Maxim um freque ncy	O/A	0	I/P	<u>p.71</u>
56 <sup>11</sup>	0h1238	Multi-step speed frequency7	Step Freq-7	0.00-Maximum frequency(Hz)	Maxim um freque ncy	O/A	0	I/P	<u>p.71</u>
70	0h1246	Multi-step acceleration time1	Acc Time-1	0.0-600.0(s)	20.0	O/A	0	I/P	<u>p.82</u>
71	0h1247	Multi-step deceleration time1	Dec Time-1	0.0-600.0(s)	20.0	O/A	О	I/P	<u>p.82</u>
<b>72</b> <sup>12</sup>	0h1248	Multi-step acceleration time2	Acc Time-2	0.0-600.0(s)	30.0	O/A	О	I/P	<u>p.82</u>
<b>73</b> <sup>12</sup>	0h1249	Multi-step deceleration time2	Dec Time-2	0.0-600.0(s)	30.0	O/A	O	I/P	<u>p.82</u>

<sup>&</sup>lt;sup>10</sup> Displayed when an LCD keypad is in use.

 $<sup>^{11}\,</sup>$  Displayed if one of In.65-71 is set to Speed-L/M/H

<sup>&</sup>lt;sup>12</sup> Displayed 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.
<b>74</b> <sup>12</sup>	0h124A	Multi-step acceleration time3	AccTime-3	0.0-600.0(s)	40.0	O/A	0	I/P	<u>p.82</u>
<b>75</b> <sup>12</sup>	0h124B	Multi-step deceleration time3	Dec Time-3	0.0-600.0(s)	40.0	O/A	0	I/P	<u>p.82</u>
<b>76</b> <sup>12</sup>	0h124C	Multi-step acceleration time4	Acc Time-4	0.0-600.0(s)	50.0	O/A	0	I/P	<u>p.82</u>
<b>77</b> <sup>12</sup>	0h124D	Multi-step deceleration time4	Dec Time-4	0.0-600.0(s)	50.0	O/A	0	I/P	<u>p.82</u>
<b>78</b> <sup>12</sup>	0h124E	Multi-step acceleration time5	Acc Time-5	0.0-600.0(s)	40.0	O/A	0	I/P	<u>p.82</u>
<b>79</b> <sup>12</sup>	0h124F	Multi-step deceleration time5	Dec Time-5	0.0-600.0(s)	40.0	O/A	0	I/P	<u>p.82</u>
<b>80</b> <sup>12</sup>	0h1250	Multi-step acceleration time6	AccTime-6	0.0-600.0(s)	30.0	O/A	0	I/P	<u>p.82</u>
81 <sup>12</sup>	0h1251	Multi-step deceleration time6	Dec Time-6	0.0-600.0(s)	30.0	O/A	0	I/P	<u>p.82</u>
82 <sup>12</sup>	0h1252	Multi-step acceleration time7	Acc Time-7	0.0-600.0(s)	20.0	O/A	0	I/P	<u>p.82</u>
83 <sup>12</sup>	0h1253	Multi-step deceleration time7	Dec Time-7	0.0-600.0(s)	20.0	O/A	0	I/P	<u>p.82</u>

#### **6.4 Expanded Function group (PAR→Ad)**

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

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-9	9	24	O/A	0	I/P	p.42
01	0h1301	Acceleration pattern	Acc Pattern	0	Linear	0:	X/A	0	I/P	<u>p.85</u>
02	0h1302	Deceleration pattern	Dec Pattern	1	S-curve	Linear	X/A	0	I/P	<u>p.85</u>
03 <sup>13</sup>	0h1303	S-curve acceleration start point gradient	Acc S Start	1-100(%)		40	X/A	0	I/P	<u>p.85</u>
04 <sup>13</sup>	0h1304	S-curve acceleration end point gradient	Acc S End	1-100(%)		40	X/A	0	I/P	<u>p.85</u>
05 <sup>14</sup>	0h1305	S-curve deceleration start point gradient	Dec S Start	1-1	00(%)	40	X/A	0	I/P	<u>p.85</u>
<b>06</b> <sup>14</sup>	0h1306	S-curve deceleration end point gradient	Dec S End	1-1	00(%)	40	X/A	0	I/P	<u>p.85</u>
07	0h1307	Start Mode	Start Mode	0	Acc DC-Start	0:Acc	X/A	0	I/P	<u>p.94</u>
<b>08</b> <sup>15</sup>	0h1308	Stop Mode	Stop Mode	0 1 2 4	Dec DC-Brake Free-Run Power Braking	0:Dec	X/A	0	I/P	<u>p.95</u>

<sup>&</sup>lt;sup>13</sup> Displayed when Ad. 01 is set to 1 (S-curve).

<sup>&</sup>lt;sup>14</sup> Displayed when Ad. 02 is set to 1 (S-curve).

<sup>&</sup>lt;sup>15</sup> DC braking and power braking (Ad.08, stop mode options 1 and 4) are not available when dr.09 (Control Mode) is set to 6 (PM Sensorless).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
09	0h1309	Selection of prohibited rotation direction	Run Prevent	1 2	None Forward Prev Reverse Prev	0: None	X/A	0	I/P	p.78
10	0h130A	Starting with power on	Power-on Run	0	No Yes	0:No	O/A	О	I/P	<u>p.78</u>
12 <sup>16</sup>	0h130C	DC braking time at startup	DC-Start Time	0.0	0-60.00(s)	0.00	X/A	О	I/P	<u>p.94</u>
13	0h130D	Amount of applied DC	DC Inj Level	0-2	00(%)	50	X/A	0	I/P	<u>p.94</u>
14 <sup>17</sup>	0h130E	Output blocking time before DC braking	DC-Block Time	0.0	0- 60.00(s)	0.10	X/A	0	I/P	<u>p.95</u>
15 <sup>17</sup>	0h130F	DC braking time	DC-Brake Time	0.0	0-60.00(s)	1.00	X/A	0	I/P	<u>p.95</u>
16 <sup>17</sup>	0h1310	DC braking rate	DC-Brake Level	0-2	00(%)	50	X/A	0	I/P	<u>p.95</u>
<b>17</b> <sup>17</sup>	0h1311	DC braking frequency	DC-Brake Freq	Sta 60H	rt frequency- Iz	5.00	X/A	0	I/P	<u>p.95</u>
20	0h1314	Dwell frequency on acceleration	Acc Dwell Freq	Ma	rt frequency- ximum quency(Hz)	5.00	X/A	0	I/P	-
21	0h1315	Dwell operation time on acceleration	Acc Dwell Time	0.0	-60.0(s)	0.0	X/A	0	I/P	-
22	0h1316	Dwell frequency on deceleration	Dec Dwell Freq	Ma	rt frequency- ximum quency(Hz)	5.00	X/A	0	I/P	-
23	0h1317	Dwell operation time on deceleration	Dec Dwell Time	0.0	-60.0(s)	0.0	X/A	0	I/P	-
24	0h1318	Frequency limit	Freq Limit	0	No Yes	0:No	X/A	0	I/P	<u>p.98</u>
<b>25</b> <sup>18</sup>	0h1319	Frequency lower limit value	Freq Limit Lo	0.00-Upper limit frequency(Hz)		0.50	O/A	0	I/P	<u>p.98</u>
26 <sup>18</sup>	0h131A	Frequency upper limit value	Freq Limit Hi	Lower limit frequency- Maximum frequency(Hz)		maxim um frequen cy	X/A	0	I/P	<u>p.98</u>

<sup>&</sup>lt;sup>16</sup> Displayed when Ad. 07 is set to 1 (DC-Start).

 $<sup>^{17}\,</sup>$  Displayed when Ad. 08 is set to 1 (DC-Brake).

<sup>&</sup>lt;sup>18</sup> Displayed when Ad. 24 is set to 1 (Yes).

Code	Comm. Address	Name	LCD Display	Setting	g Range	Initial Value	Property*	V/F	SL	Ref.
27	0h131B	Frequency jump	Jump Freq	0 No 1 Ye		0:No	X/A	0	I/P	<u>p.99</u>
<b>28</b> <sup>19</sup>	0h131C	Jump frequency lower limit1	Jump Lo 1	limit1(	ncy upper Hz)	10.00	O/A	0	I/P	<u>p.99</u>
<b>29</b> <sup>19</sup>	0h131D	Jump frequency upper limit1	Jump Hi 1	lower l Maxim		15.00	O/A	0	I/P	<u>p.99</u>
<b>30</b> <sup>19</sup>	0h131E	Jump frequency lower limit2	Jump Lo 2	0.00-Ju freque limit2(	ncy upper	20.00	O/A	0	I/P	<u>p.99</u>
<b>31</b> <sup>19</sup>	0h131F	Jump frequency upper limit2	Jump Hi 2	lower l Maxim		25.00	O/A	0	I/P	<u>p.99</u>
<b>32</b> <sup>19</sup>	0h1320	Jump frequency lower limit3	Jump Lo 3	0.00-Ju freque limit3(	ncy upper	30.00	O/A	0	I/P	<u>p.99</u>
<b>33</b> <sup>19</sup>	0h1321	Jump frequency upper limit3	Jump Hi 3	lower l Maxim		35.00	O/A	0	I/P	<u>p.99</u>
<b>41</b> <sup>20</sup>	0h1329	Brake release current	BR Rls Curr	0.0-18		50.0	O/A	0	I/P	-
<b>42</b> <sup>20</sup>	0h132A	Brake release delay time	BR RIs Dly	0.00-10	0.00(s)	1.00	X/A	0	I/P	-
<b>44</b> <sup>20</sup>	0h132C	Brake release Forward frequency	BR RIs Fwd Fr		laximum ency(Hz)	1.00	X/A	0	I/P	-
<b>45</b> <sup>20</sup>	0h132D	Brake release Reverse frequency	BR RIs Rev Fr		laximum ency(Hz)	1.00	X/A	0	I/P	-
<b>46</b> <sup>20</sup>	0h132E	Brake engage delay time	BR Eng Dly	0.00-10.00(s)		1.00	X/A	0	I/P	-
<b>47</b> <sup>20</sup>	0h132F	Brake engage frequency	BR Eng Fr	0.00-Maximum frequency(Hz)		2.00	X/A	0	I/P	-
50	0h1332	Energy saving operation	E-Save Mode	1 M	one anual uto	0:None	X/A	0	Х	-

<sup>&</sup>lt;sup>19</sup> Displayed when Ad. 27 is set to 1 (Yes).

<sup>&</sup>lt;sup>20</sup> Displayed if either OU.31 or OU.33 is set to 35 (BR Control).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
<b>51</b> <sup>21</sup>	0h1333	Energy saving level	Energy Save	0-30(%)		0	O/A	0	Х	-
60	0h133C	Acc/Dec time transition frequency	Xcel Change Fr		0-Maximum quency(Hz)	0.00	X/A	0	I/P	<u>p.84</u>
61	0h133D	Rotation count speed gain	Load Spd Gain	0.1	~6000.0[%]	100.0	O/A	0	I/P	-
62	0h133E	Rotation count speed scale	Load Spd Scale	0 1 2 3 4	x 1 x 0.1 x 0.01 x 0.001 x 0.0001	0: x 1	O/A	0	I/P	-
63	0h133F	Rotation count speed unit	Load Spd Unit	0	Rpm mpm	0: rpm	O/A	0	I/P	-
64	0h1340	Cooling fan control	FAN Control	0 1 2	During Run Always ON Temp Control	0:Durin g Run	O/A	0	I/P	-
65	0h1341	Up/down operation frequency save	U/D Save Mode	0	No Yes	0:No	O/A	0	I/P	-
66	0h1342	Output contact On/Off control options	On/Off Ctrl Src	0 1 3 4 6	None V1 V2 I2 Pulse	0:None	X/A	0	I/P	-
67	0h1343	Output contact On level	On-Ctrl Level	off	tput contact level- ).00%	90.00	X/A	0	I/P	-
68	0h1344	Output contact Off level	Off-Ctrl Level		0.00-output ntact on level	10.00	X/A	0	I/P	-
70	0h1346	Safe operation selection	Run En Mode	0	Always Enable DI Dependent	0:Alway s Enable	X/A	0	I/P	-
<b>71</b> <sup>22</sup>	0h1347	Safe operation stop options	Run Dis Stop	0 Free-Run 1 Q-Stop 2 Q-Stop Resume		0:Free- Run	X/A	0	I/P	-
<b>72</b> <sup>22</sup>	0h1348	Safe operation deceleration time	Q-Stop Time	0.0-600.0(s)		5.0	O/A	0	I/P	-

<sup>&</sup>lt;sup>21</sup> Displayed if Ad.50 is not set to 0 (None).

<sup>&</sup>lt;sup>22</sup> Displayed when Ad.70 is set to 1 (DI Dependent).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
<b>74</b> <sup>23</sup>	0h134A	Selection of regeneration evasion function for press	RegenAvd Sel	1	No Yes	0:No	X/A	0	I	-
<b>75</b> <sup>23</sup>	0h134B	Voltage level of regeneration evasion motion for press	RegenAvd Level		0V:300-400V 0V:600-800V	700	X/A	0	I	-
<b>76</b> <sup>24</sup>	0h134C	Compensation frequency limit of regeneration evasion for press	CompFreq Limit	0.00	0- 10.00Hz	1.00	X/A	0	I	-
<b>77</b> <sup>24</sup>	0h134D	Regeneration evasion for press P gain	RegenAvd Pgain	0.0-	- 100.0%	50.0	O/A	0	I	-
<b>78</b> <sup>24</sup>	0h134E	Regeneration evasion for press I gain	RegenAvd Igain	20-	30000(ms)	500	O/A	0	I	-
79	0h134F	DB Unit turn on voltage level	DB Turn On Lev	400	<sup>25</sup> ~400[V]	390[V] 780[V]	X/A	0	I/P	-
80	0h1350	Fire mode selection	Fire Mode Sel	0 1 2	None Fire Mode Fire Mode Test	0:None	X/A	0	I/P	p.112
81 <sup>26</sup>	0h1351	Fire mode frequency	Fire Mode Freq	0.00~60.00(Hz]		60.00	X/A	0	I/P	<u>p.112</u>
82 <sup>26</sup>	0h1352	Fire mode direction	Fire Mode Dir	<ul><li>0 Forward</li><li>1 Reverse</li></ul>		0: Forwar d	X/A	0	I/P	<u>p.112</u>
<b>83</b> <sup>26</sup>		Fire Mode Count	Fire Mode Cnt	Can not be modified						<u>p.112</u>

 $<sup>^{\</sup>rm 23}$  Displayed when dr.09 (Control Mode) is not set to 6 (PM Sensorless).

<sup>&</sup>lt;sup>24</sup> Displayed when Ad.74 is set to 1 (Yes).

 $<sup>^{25}</sup>$  DC voltage value (convert bA.19 AC Input voltage) + 20V (200V type) or + 40V (400V type)

<sup>&</sup>lt;sup>26</sup> Displayed when Ad.80 is set to 1 (Yes).

# **6.5 Control Function group (PAR→Cn)**

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

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/ F	SL	Ref.
00	-	Jump Code	Jump Code	1-99		4	O/A	0	I/P	p.42
04 Oh	0h1404	Carrier frequency	Carrier Freq	Heavy Duty	V/F: 1.0- 15.0(kH z) <sup>27</sup> SL: 2.0- 15.0(kH z)	3.0	X/A	0	I/P	-
				Normal Duty <sup>28</sup>	V/F: 1.0- 5.0 (kHz) <sup>29</sup> SL: 2.0- 5.0(kHz)	2.0				-
05	0h1405	Switching mode	PWM Mode	1	Normal PWM Lowlea kage PWM	0:Norm al PWM	X/A	0	I	-
<b>09</b> <sup>30</sup>	0h1409	Initial excitation time	PreExTime	0.00-60	0.00(s)	1.00	X/A	Х	I	-
10 <sup>30</sup>	0h140A	Initial excitation amount	Flux Force	100.0-3	00.0(%)	100.0	X/A	Х	I	-

<sup>&</sup>lt;sup>27</sup> In case of 0.4 $\sim$ 4.0kW, the setting range is 2.0 $\sim$ 15.0(kHz).

<sup>&</sup>lt;sup>28</sup> PM synchronous motor sensorless vector control mode does not support normal duty operation [when dr.09 (Control Mode) is set to 6 (PM Sensorless)].

<sup>&</sup>lt;sup>29</sup> In case of 0.4 $\sim$ 4.0kW, the setting range is 2.0 $\sim$ 5.0(kHz).

 $<sup>^{\</sup>rm 30}$  Displayed when dr.09 (Control Mode) is not set to 6 (PM Sensorless).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/ F	SL	Ref.
11	0h140B	Continued operation duration	Hold Time	0.00-60.00(s)		0.00	X/A	х	ı	-
12 <sup>31</sup>	0h140D	PM S/L speed controller proportional gain1	ASR P Gain 1	0~5	5000	100	X/A	Х	Р	
13 <sup>31</sup>	0h140F	PM S/L speed controller integral gain1	ASR P Gain 1	0~5	5000	150	X/A	Х	Р	
15 <sup>31</sup>	0h1410	PM S/L speed controller proportional gain2	ASR P Gain 1	0~5	5000	100	X/A	х	Р	
16 <sup>31</sup>	0h1410	PM S/L speed controller integral gain2	ASR P Gain 1	0~9999		150	X/A	х	Р	
<b>20</b> <sup>30</sup>	0h1414	Sensorless 2 <sup>nd</sup> gain display setting	SL2 G View Sel	0	No Yes	0:No	O/A	Х	_	-
<b>21</b> <sup>30</sup>	0h1415	Sensorless speed controller proportional gain1	ASR-SL P Gain1	0-5	000(%)		O/A	х	I	-
<b>22</b> <sup>30</sup>	0h1416	Sensorless speed controller integral gain1	ASR-SL I Gain1	10-	9999(ms)		O/A	Х	_	-
<b>23</b> <sup>32</sup>	0h1417	Sensorless speed controller proportional gain2	ASR-SL P Gain2	1.0-1000.0(%)		Depen dent on motor setting	O/A	Х	ı	-
24 <sup>31</sup>	0h1418	Sensorless speed controller integral gain2	ASR-SL I Gain2	1.0-1000.0(%)		Jetting	O/A	Х	I	-
<b>25</b> <sup>32</sup>	0h1419	Sensorless speed controller integral gain 0	ASR-SL I Gain0	10~9999(ms)			O/A	Х	I	-
<b>26</b> <sup>32</sup>	0h141A	Flux estimator proportional gain	Flux P Gain	10-	200(%)		O/A	Х	I	-

<sup>&</sup>lt;sup>31</sup> Displayed when dr.09 (Control Mode) is set to 6 (PM Sensorless).

Displayed when dr.09 (Control Mode) is set to 4 (IM Sensorless), Cn.20 is set to 1(YES).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/ F	SL	Ref.
<b>27</b> <sup>32</sup>	0h141B	Flux estimator integral gain	Flux I Gain	10-200(%)		O/A	Х	I	-
<b>28</b> <sup>32</sup>	0h141C	Speed estimator proportional gain	S-Est P Gain1	0-32767		O/A	Х	I	-
<b>29</b> <sup>32</sup>	0h141D	Speed estimator integral gain1	S-Est I Gain1	100-1000		O/A	Х	I	-
<b>30</b> <sup>32</sup>	0h141E	Speed estimator integral gain2	S-Est I Gain2	100-10000		O/A	Х	I	-
<b>31</b> <sup>32</sup>	0h141F	Sensorless current controller proportional gain	ACR SL P Gain	10-1000		O/A	Х	I	-
<b>32</b> <sup>32</sup>	0h1420	Sensorless current controller integral gain	ACR SL I Gain	10 -1000		O/A	Х	I	-
<b>33</b> <sup>33</sup>	0h1421	PM D-axis back- EMF estimation gain [%]	PM EdGain Perc	0~300.0[%]	100.0	X/A	х	Р	
<b>34</b> <sup>33</sup>	0h1422	PM Q-axis back- EMF estimation gain [%]	PM EqGain Perc	0~300.0[%]	100.0	X/A	Х	Р	
<b>35</b> <sup>33</sup>	0h1423	Initial pole position detection retry number	PD Repeat Num	0~10	2	X/A	Х	Р	
36 <sup>33</sup>	0h1424	Initial pole position detection pulse interval	Pulse Interval	1~100	20	X/A	Х	Р	
37 <sup>33</sup>	0h1425	Initial pole position detection current level [%]	Pulse Curr %	10~100	15	X/A	Х	Р	
38 <sup>33</sup>	0h1426	Initial pole position detection voltage level [%]	Pulse Volt %	100~4000	500	X/A	Х	Р	
<b>39</b> <sup>33</sup>	0h1427	PM dead time range [%]	PMdeadBand Per	50.0~100.0	100.0	X/A	Х	Р	
<b>40</b> <sup>33</sup>	0h1428	PM dead time voltage [%]	PMdeadVolt Per	50.0~100.0	100.0	X/A	Х	Р	
<b>41</b> <sup>33</sup>	0h1429	Speed estimator P gain1	PM SpdEst Kp	0~32000	100	X/A	Х	Р	

 $<sup>^{\</sup>rm 33}$  Displayed when dr.09 (Control Mode) is set to 6 (PM Sensorless).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/ F	SL	Ref.
<b>42</b> <sup>33</sup>	0h142A	Speed estimator I gain1	PM SpdEst Ki			10	X/A	Х	Р	
<b>43</b> <sup>33</sup>	0h142B	Speed estimator P gain2	PM SpdEst Kp 2	0~32000		300	X/A	Х	Р	
<b>44</b> <sup>33</sup>	0h142C	Speed estimator I gain2	PM SpdEst Ki 2	0~3	32000	30	X/A	Χ	Р	
<b>45</b> <sup>33</sup>	0h142D	Speed estimator feed forward high speed rate [%]	PM Flux FF %	0~	100[%]	30.0	X/A	Х	Р	
22		Initial pole position		0 None						
<b>46</b> <sup>33</sup>	0h142E	detection	Init Angle Sel	1	Angle	1	X/A	Χ	Р	-
		options		2	Align					
48 <sup>33</sup>	0h1430	Current Controller P gain	ACR P Gain	0~	10000	1200	O/A	Х	I/P	
49 <sup>33</sup>	0h1431	Current Controller I gain	ACR I Gain	0~	10000	120	O/A	Х	I/P	
50 <sup>33</sup>	0h1432	Voltage controller limit	V Con HR	0~	100.0[%]	10.0	X/A	Х	Р	
51 <sup>33</sup>	0h1433	Voltage controller I gain	V Con Ki	0~	1000.0[%]	10.0	X/A	Х	Р	
52	0h1434	Torque controller output filter	Torque Out LPF	0-2	000(ms)	0	X/A	Χ	I/P	-
53	0h1435	Torque limit setting options	Torque Lmt Src	0 1 2 4 5 6 8 9	Keypad-1 Keypad-2 V1 V2 I2 Int 485 FieldBus UserSeqLin k	0: - Keypad 1	X/A	x	I/P	-

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/ F	SL	Ref.
<b>54</b> <sup>34</sup>	0h1436	Positive-direction reverse torque limit	FWD +Trq Lmt	0.0-200.0(%)		180	O/A	Х	I/P	-
<b>55</b> <sup>34</sup>	0h1437	Positive-direction regeneration torque limit	FWD -Trq Lmt	0.0-	200.0(%)	180	O/A	Х	I/P	-
<b>56</b> <sup>34</sup>	0h1438	Negative- direction regeneration torque limit	REV +Trq Lmt	0.0-	200.0(%)	180	O/A	Х	I/P	-
<b>57</b> <sup>34</sup>	0h1439	Negative- direction reverse torque limit	REV -Trq Lmt	0.0-	200.0(%)	180	O/A	х	I/P	-
62 <sup>34</sup>	0h143E	Speed limit Setting	Speed Lmt Src	0 1 2 4 5 6 7 8	Keypad-1 Keypad-2 V1 V2 I2 Int 485 FieldBus UserSeqLin k	0: Keypad -1	X/A	x	I/P	-
<b>63</b> <sup>34</sup>	0h143F	Positive-direction speed limit	FWD Speed Lmt		)~ ximum quency (Hz)	60.00	O/A	Х	I/P	-
<b>64</b> <sup>34</sup>	0h1440	Negative- direction speed limit	REV Speed Lmt		)~ ximum quency (Hz)	60.00	O/A	х	I/P	-
<b>65</b> <sup>34</sup>	0h1441	Speed limit operation gain	Speed Lmt Gain	100	~5000[%]	500	O/A	Х	I/P	-
<b>69</b> <sup>35</sup>		PM speed search current	SS Pulse Curr	15		10~100	O/A	Х	Р	
70	0h 1446	Speed search	SS Mode	0	Flying Start-1 <sup>36</sup>	0: Flying	X/A	0	I/P	
	OII I I IO	mode selection	33 Mode	1	Flying Start-2	Start-1	,,,,		4/1	

<sup>&</sup>lt;sup>34</sup> Displayed when dr.09 is set to 4 (IM Sensorless). This will change the initial value of the parameter at Ad.74 (Torque limit) to 150%.

<sup>&</sup>lt;sup>35</sup> Displayed when dr.09 (Control Mode) is set to 6 (PM Sensorless).

<sup>&</sup>lt;sup>36</sup> Will not be displayed if dr.09 is set to 4 (IM Sensorless).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/ F	SL	Ref.
				2	Flying Start-3 <sup>35</sup>					
				bit						
				00 01	Selection of speed search on acceleration					
71	0h1447	Speed search operation	Speed Search	00	When starting on initialization after fault trip	0000 <sup>37</sup>	X/A	0	I/P	_
		selection		01 00	When restarting after instantaneo us power interruption					
				10 00	When starting with power on					
<b>72</b> <sup>38</sup>	0h1448	Speed search reference current	SS Sup- Current	80-	200(%)	150	O/A	0	I	-
<b>73</b> <sup>39</sup>	0h1449	Speed search proportional gain	SS P-Gain	0-9	999	Flying Start-1:100 Flying Start-2:600 <sup>40</sup>	O/A	0	I	-
<b>74</b> <sup>39</sup>	0h144A	Speed search integral gain	SS I-Gain	0-9	999	Flying Start-1:200 Flying Start-2:1000	·O/A	0	I	-

The initial value 0000 will be displayed on the keypad as  $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$ .

<sup>&</sup>lt;sup>38</sup> Displayed when any of the Cn.71 code bits are set to 1 and Cn70 is set to 0 (Flying Start-1).

 $<sup>^{\</sup>rm 39}$  Displayed when any of the Cn.71 code bits are set to 1.

 $<sup>^{40}</sup>$  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.
<b>75</b> <sup>39</sup>	0h144B	Output blocking time before speed search	SS Block Time	0.0-60.0(s)	1.0	X/A	0	I/P	-
<b>76</b> <sup>39</sup>	0h144C	Speed search Estimator gain	Spd Est Gain	50-150(%)	100	O/A	0	I	-
77	0h144D	Energy buffering selection	KEB Select	0 No 1 KEB-1 2 KEB-2	0:No	X/A	0	I/P	-
<b>78</b> <sup>41</sup>	0h144E	Energy buffering start level	KEB Start Lev	110.0-200.0(%)	125.0	X/A	0	I/P	-
<b>79</b> <sup>41</sup>	0h144F	Energy buffering stop level	KEB Stop Lev	Cn78~210.0(%)	130.0	X/A	0	I/P	-
80 <sup>41</sup>	0h1450	Energy buffering P gain	KEB P Gain	0-20000	1000	O/A	0	I/P	-
81 <sup>41</sup>	0h1451	Energy buffering I gain	KEB I Gain	1~20000	500	O/A	0	I/P	-
82 <sup>41</sup>	0h1452	Energy buffering Slip gain	KEB Slip Gain	0~2000.0%	30.0	O/A	0	I	-
83 <sup>41</sup>	0h1453	Energy buffering acceleration time	KEB Acc Time	0.0~600.0(s)	10.0	O/A	0	I/P	-
85 <sup>42</sup>	0h1455	Flux estimator proportional gain1	Flux P Gain1	100-700	370	O/A	Х	I	-
86 <sup>41</sup>	0h1456	Flux estimator proportional gain2	Flux P Gain2	0-100	0	O/A	Х	I	-
87 <sup>41</sup>	0h1457	Flux estimator proportional gain3	Flux P Gain3	0-500	100	O/A	Х	I	-
88 <sup>41</sup>	0h1458	Flux estimator integral gain1	Flux I Gain1	0-200	50	O/A	Х	I	-
<b>89</b> <sup>42</sup>	0h1459	Flux estimator integral gain2	Flux I Gain2	0-200	50	O/A	Х	I	-
<b>90</b> <sup>42</sup>	0h145A	Flux estimator integral gain3	Flux I Gain3	0-200	50	O/A	Х	I	-
91 <sup>42</sup>	0h145B	Sensorless voltage compensation1	SL Volt Comp1	0-60	Depen dent on	O/A	Х	I	-
92 <sup>42</sup>	0h145C	Sensorless voltage compensation2	SL Volt Comp2	0-60	motor setting	O/A	X	I	-

 $<sup>^{\</sup>rm 41}\,$  Displayed when Cn.77 is not set to 0 (No).

 $<sup>^{\</sup>rm 42}\,$  Displayed when Cn.20 is set to 1 (Yes).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/ F	SL	Ref.
<b>93</b> <sup>42</sup>	0h145D	Sensorless voltage compensation3	SL Volt Comp3	0-60		O/A	Х	I	-
<b>94</b> <sup>42</sup>	0h145E	Sensorless field weakening start frequency	SL FW Freq	80.0-110.0(%)	100.0	X/A	х	I	-
<b>95</b> <sup>42</sup>	0h145F	Sensorless gain switching frequency	SL Fc Freq	0.00-8.00(Hz)	2.00	X/A	х	I	-

## **6.6 Input Terminal Block Function group (PAR→In)**

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

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

\*O/X: Write-enabled during operation, 7/L/A: Keypad/LCD keypad/Common

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.	
00	-	Jump Code	Jump Code	1-99		65	O/A	0	I/P	<u>p.42</u>	_
01	0h1501	Frequency for maximum analog input	Freq at 100%	Start frequency- Maximum frequency(Hz)		Maxim um freque ncy	O/A	0	I/P	<u>p.61</u>	
02	0h1502	Torque at maximum analog input	Torque at100%	0.0-200.0(%)		100.0	O/A	Х	Х	-	labi
05	0h1505	V1 input voltage display	V1 Monitor(V)	-12.00-12.00(V)		0.00	-/A	0	I/P	<u>p.61</u>	<b>መ</b>
	0h1506	V1 input		0 Unipolar		0:					_
06		polarity selection	V1 Polarity	1	Bipolar	Unipola r	X/A	0	I/P	<u>p.61</u>	
		Time constant		0-10000(ms)		10	O/A	0			_
07	0h1507	of V1 input filter	V1 Filter						I/P	<u>p.61</u>	
08	0h1508	V1 Minimum	V1 Volt x1	0.00	)-10.00(V)	0.00	O/A	0	I/P	P <i>p.61</i>	_
	0111300	input voltage	VIVOICXI	0.00	7 10.00(V)	0.00	0/7		1/1	<u>p.01</u>	_
	0h1509	V1 output at									
09		Minimum	V1 Perc y1	0.00-100.00(%)		0.00	O/A	0	I/P	<u>p.61</u>	
		voltage (%)								<u> </u>	_

Function Table

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
10	0h150A	V1 Maximum input voltage	V1 Volt x2	0.00	-12.00(V)	10.00	O/A	0	I/P	<u>p.61</u>
11	0h150B	V1 output at Maximum voltage (%)	V1 Perc y2	0.00-100.00(%)		100.00	O/A	0	I/P	<u>p.61</u>
12 <sup>43</sup>	0h150C	V1 Minimum input voltage	V1 -Volt x1'	-10.00- 0.00(V)		0.00	O/A	0	I/P	<u>p.64</u>
13 <sup>43</sup>	0h150D	V1output at Minimum voltage (%)	V1 -Perc y1'	-100.00-0.00(%)		0.00	O/A	0	I/P	<u>p.64</u>
14 <sup>43</sup>	0h150E	V1 Maximum input voltage	V1 -Volt x2'	-12.00- 0.00(V)		-10.00	O/A	0	I/P	<u>p.64</u>
15 <sup>43</sup>	0h150F	V1 output at Maximum voltage (%)	V1 -Perc y2'	-100.00-0.00(%)		-100.00	O/A	0	I/P	<u>p.64</u>
16	0h1510	V1 rotation direction change	V1 Inverting	0 No 1 Yes		0: No	O/A	0	I/P	<u>p.61</u>
17	0h1511	V1 quantization level	V1 Quantizing	0.00 <sup>44</sup> , 0.04- 10.00(%)		0.04	X/A	0	I/P	<u>p.61</u>
<b>35</b> <sup>45</sup>	0h1523	V2 input voltage display	V2 Monitor(V)	0.00-12.00(V)		0.00	-/A	0	I/P	<u>p.68</u>
<b>37</b> <sup>45</sup>	0h1525	V2 input filter time constant	V2 Filter	0-10000(ms)		10	O/A	0	I/P	<u>p.68</u>
<b>38</b> <sup>45</sup>	0h1526	V2 Minimum input voltage	V2 Volt x1	0.00-10.00(V)		0.00	O/A	х	I/P	<u>p.68</u>
<b>39</b> <sup>45</sup>	0h1527	V2 output at Minimum voltage (%)	V2 Perc y1	0.00-100.00(%)		0.00	O/A	О	I/P	<u>p.68</u>
<b>40</b> <sup>45</sup>	0h1528	V2 Maximum input voltage	V2 Volt x2	0.00-10.00(V)		10	O/A	Х	I/P	<u>p.68</u>
<b>41</b> <sup>45</sup>	0h1529	V2 output at Maximum voltage (%)	V2 Perc y2	0.00-100.00(%)		100.00	O/A	0	I/P	<u>p.68</u>

<sup>&</sup>lt;sup>43</sup> Displayed when In.06 is set to 1 (Bipolar).

 $<sup>^{\</sup>rm 44}\,$  Quantizing is not used when set to 0.

 $<sup>^{45}</sup>$  Displayed when V is selected on the analog current/voltage input circuit selection switch (SW2).

unction able

<sup>&</sup>lt;sup>46</sup> Displayed when I is selected on the analog current/voltage input circuit selection switch (SW2).

Code	Comm. Address	Name	LCD Display	Setti	ng Range	Initial Value	Property*	V/F	SL	Ref.
69	0h1545	P5 terminal function setting	P5 Define	5	вх	7:Sp-L	X/A	Ο	I/P	-
70	0h1546	P6 terminal function setting	P6 Define	6	JOG	8:Sp-M	X/A	0	I/P	-
71	0h1547	P7 terminal function setting	P7 Define	7	Speed-L	9:Sp-H	X/A	0	I/P	<u>p.71</u>
				8	Speed-M					<u>p.71</u>
				9	Speed-H					<u>p.71</u>
				11	XCEL-L					p.82
				12	XCEL-M					p.82
				13	RUN Enable					-
				14	3-Wire					-
				15	2nd Source					<u>p.100</u>
				16	Exchange					-
				17	Up					-
				18	Down					-
				20	U/D Clear					-
				21	Analog Hold					<u>p.70</u>
				22	I-Term Clear					-
				23	PID Openloop					-
				24	P Gain2					-
				25	XCEL Stop					<u>p.88</u>
				26	2nd Motor	-				-
				34	Pre Excite	-				-
				38	Timer In					-
				40	dis Aux Ref	-				-
				46 47	FWD JOG	-				-
					REV JOG XCEL-H	-				- n 02
				49 50		-				<u>p.82</u>
					User Seq	-				p.105
				51 52	Fire Mode KEB-1 Select	1				<u>p.112</u> -
					TI <sup>47</sup>	1				
				54	11 ''					-

 $<sup>^{\</sup>rm 47}\,$  Displayed when P5 is selected on Px terminal function.(Only Standard I/O)

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		Multi-function		P7 ~	· P1					
84	0h1554	input terminal	Dl Delay Sel	0	Disable(Off)	1	O/A	0	I/P	p.101
01	0111331	On filter selection	Di Delay Sei	1	Enable(On)	1111 <sup>48</sup>	0//1		.,,	<u>p.101</u>
		Multi-function								
85	0h1555	input terminal	DI On Delay	0-10	000(ms)	10	O/A	0	I/P	p.101
		On filter	,							
		Multi-function								
86	0h1556	input terminal	DI Off Delay	0-10000(ms)		3	O/A	О	I/P	<u>p.101</u>
		Off filter  Multi-function		P7 – P1						
		input		. A contact		0				
87	0h1557	contact	DI NC/NO Sel	0 (NO)		0000 <sup>49</sup>	X/A	0	I/P	<u>p.101</u>
		selection		1 B contact (NC)						
		Multi-step								
89	0h1559	command	InCheckTime	1-5000(ms)		1	X/A	0	I/P	<u>p.71</u>
		delay time		P7 – P1						
		Multi-function				-l <sub>0</sub>   ,				
90	0h155A	input terminal	DI Status		Connection	0000 <sup>49</sup>	-/A	0	I/P	<u>p.101</u>
		status		1	(On)					
		Pulse input	Pulse Monitor							
91	0h155B	amount	(kHz)	0.00	-50.00(kHz)	0.00	-/A	0	I/P	<u>p.68</u>
		display	()							
92	0h155C	TI input filter time constant	TI Filter	0-99	199(ms)	10	O/A	0	I/P	<u>p.68</u>
		TI Minimum								
93	0h155D	input pulse	TI Pls x1	0.00	-32.00(kHz)	0.00	O/A	0	I/P	<u>p.68</u>
		TI output at								
94	0h153E	Minimum	TI Perc y1	0.00	-100.00(%)	0.00	O/A	О	I/P	<u>p.68</u>
		pulse (%)								
95	0h155F	TI Maximum	TI Pls x2	0.00-32.00(kHz)		32.00	O/A	0	I/P	p.68
		input pulse		0.00-32.00(KI IZ)						
96	0h1560	Tl Output at Maximum	TI Perc y2	0-100(%)		100.00	O/A	0	I/P	p.68
70	311300	pulse (%)	111 CIC y2	0-100(%)		100.00	0,7		", "	<i>p.</i> 00
		Tirotation		0	No					
97	0h1561	direction	TI Inverting			0:No	O/A	0	I/P	<u>p.68</u>
		change		1 Yes						

<sup>&</sup>lt;sup>48</sup> The initial value 11111 will be displayed on the keypad as

Code	Comm. Address	Name	LCD Display	Setti	ng Range	Initial Value	Property*	V/F	SL	Ref.
98	0h1562	TI quantization level	TI Quantizing		<sup>44</sup> , 0.04- 0(%)	0.04	O/A	0	I/P	<u>p.68</u>
				Bit	00~11					
		SW1(NPN/PNP)		00	V2, NPN					
99	0h1563	1 ' 1	IO SW State	01	V2, PNP	00	-/A	0	I/P	-
				10	I2, NPN					
		11	I2, PNP							

## **6.7 Output Terminal Block Function group (PAR→OU)**

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

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	JumpCode	1-99	9	30	O/A	0	I/P	p.42
				0	Frequency					
				1	Output Current					
				2	Output Voltage					
				3	DCLink Voltage					
				4	Torque					
				5 Output Power 6 Idse						
		Analog				0.Eroguo				
01	0h1601	Analog output 1 item	AO1 Mode	7	lqse	0:Freque	O/A	0	I/P	-
		output ritem		8	Target Freq	ncy on				
				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	1		100.0	O/A	0	I/P	-
03	0h1603	Analog output 1 bias	AO1 Bias	-100.0-100.0(%)		0.0	O/A	0	I/P	-
04	0h1604	Analog output 1 filter	AO1 Filter	0-10000(ms)		5	O/A	0	I/P	-

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property*	V/F	SL	Ref.
05	0h1606	Analog constant output 1	AO1 Const %	0.0-	100.0(%)	0.0	O/A	0	I/P	-
06	0h1606	Analog output 1 monitor	AO1 Monitor	0.0-1000.0(%)		0.0	-/A	0	I/P	-
				bit 000-111  1 Low voltage  Any faults other  2 than low voltage  Automatic  3 restart final failure						
30	0h161E	Fault output item	Trip Out Mode			<b>010</b> <sup>50</sup>	O/A	0	I/P	-
				0	None					
				1	FDT-1					
		I		2	FDT-2					
				3	FDT-3					
				4	FDT-4	1				
				5	Over Load					
				6	IOL					
				7	Under Load					
				8	Fan Warning					
		Multi-		9	Stall					
31	0h161F	function relay	Relay 1	10	Over Voltage	29:Trip	O/A	О	I/P	-
		1 item		11	Low Voltage	1				
				12	Over Heat	_				
				13	Lost Command	-				
				14	Run	_				
				15 16	Stop Steady	1				
					Inverter Line	1				
					Comm Line	-				
				19	Speed Search	1				
				22	Ready					
		22 28		Timer Out	1					
				28 Timer Out 29 Trip		1				

 $<sup>^{50}\,</sup>$  The initial value 0010 will be displayed on the keypad as  $\, \Box \, \Box \, \Box \, \Box \, \Box \, .$ 



Code	Comm. Address	Name	LCD Display	/ Satting Panga		Initial Value	Property*	V/F	SL	Ref.
				31	DB Warn%ED					
				34	On/Off Control					
				35	BR Control					
				36	CAP.Exchange					
				37	FAN Exchange					
				38	Fire Mode					
				39	TO <sup>51</sup>					
				40	KEB Operating					
				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					
	_	Multi-		14	Run					
33	0h1621	function	Q1 Define	15	Stop	14:Run	O/A	0	I/P	-
		output1 item		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. Exchange					
				37	FAN Exchange					
				38	Fire Mode					
				39	TO <sup>51</sup>					
				40	KEB Operating					

<sup>&</sup>lt;sup>51</sup> Supprted only Standard I/O

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
41	0h1629	Multi- function output monitor	DO Status	-		00	-/A	-	-	-
50	0h1632	Multi- function output On delay	DO On Delay	0.00	D-100.00(s)	0.00	O/A	0	I/P	-
51	0h1633	Multi- function output Off delay	DO Off Delay	0.00	0-100.00(s)	0.00	O/A	0	I/P	-
52	0h1634	Multi- function output contact selection	DO NC/NO Sel	Q1, 0	Relay1 A contact (NO) B contact (NC)	00 <sup>52</sup>	X/A	0	I/P	-
53	0h1635	Fault output On delay	TripOut OnDly	0.00	D-100.00(s)	0.00	O/A	О	I/P	-
54	0h1636	Fault output Off delay	TripOut OffDly	0.00	D-100.00(s)	0.00	O/A	О	I/P	-
55	h1637	Timer On delay	TimerOn Delay	0.00	D-100.00(s)	0.00	O/A	0	I/P	-
56	0h1638	Timer Off delay	TimerOff Delay	0.00	D-100.00(s)	0.00	O/A	0	I/P	-
57	0h1639	Detected frequency	FDT Frequency		D-Maximum quency(Hz)	30.00	O/A	0	I/P	-
58	0h163A	Detected frequency band	FDT Band	0.00	D-Maximum quency(Hz)	10.00	O/A	0	I/P	-
61	0h163D	Pulse output gain	TO Mode	<ul> <li>Frequency</li> <li>Output Current</li> <li>Output Voltage</li> <li>DCLink Voltage</li> <li>Torque</li> <li>Output Power</li> <li>Idse</li> <li>Iqse</li> <li>Target Freq</li> <li>Ramp Freq</li> </ul>		0: Frequen cy	O/A	О	I/P	-

 $<sup>^{52}\,</sup>$  The initial value 0000 will be displayed on the keypad as  $\, \Box \, \Box \, \Box \, \Box \, \Box \, .$ 



#### **Table of Functions**

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property*	V/F	SL	Ref.
				10	Speed Fdb					
				12 PID Ref Value						
				13	PID Fdb Value					
				14 PID Output						
				15 Constant						
62	0h163E	Pulse output gain	TO Gain	-1000.0-1000.0(%)		100.0	O/A	0	I/P	-
63	0h163F	Pulse output bias	TO Bias	-100	0.0-100.0(%)	0.0	O/A	0	I/P	-
64	0h1640	Pulse output filter	TO Filter	0-10	0000(ms)	5	O/A	0	I/P	-
65	0h1641	Pulse output constant output 2	TO Const %	0.0-100.0(%)		0.0	O/A	0	I/P	-
66	0h1642	Pulse output monitor	TO Monitor	0.0-1000.0(%)		0.0	-/A	0	I/P	-

# **6.8 Communication Function group (PAR→CM)**

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

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

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	O/A	0	I/P	p.42
01	0h1701	Built-in communicatio n inverter ID	Int485 St ID	1-2	50	1	O/A	0	I/P	<u>p.116</u>
02 <sup>53</sup>	0h1702	Built-in communicatio n protocol	Int485 Proto	2	ModBus RTU LS Inv 485	0: ModBus RTU	O/A	0	I/P	<u>p.116</u>
03 <sup>53</sup>	0h1703 0h1704	Built-in communicatio n speed Built-in communicatio	Int485 BaudR	0 1 2 3 4 5 6 7 0 1	1200 bps 2400 bps 4800 bps 9600 bps 19200 bps 38400 bps 56 Kbps 115 Kbps <sup>54</sup> D8/PN/S1 D8/PN/S2 D8/PE/S1	3: 9600 bps 0: D8/PN/S	O/A	0		p.116
<b>05</b> <sup>53</sup>	0h1705	n frame setting  Transmission delay	Resp Delay	3	D8/PO/S1  000(ms)	1 5ms	O/A	0	I/P	p.116
05	011703	after reception Communicatio	nesp belay	U-1	000(1113)	51113	<i>5/A</i>		1/1	μ.ττο
<b>06</b> <sup>55</sup>	0h1706	n option S/W version	FBus S/W Ver	-		0.00	O/A	0	I/P	-
<b>07</b> <sup>55</sup>	0h1707	Communicatio n option inverter ID	FBus ID	0-255		1	O/A	0	I/P	-

<sup>&</sup>lt;sup>53</sup> Will not be displayed when P2P and MultiKPD is set.

<sup>&</sup>lt;sup>54</sup> 115,200bps

<sup>&</sup>lt;sup>55</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.
<b>08</b> <sup>55</sup>	0h1708	FIELD BUS communicatio n speed	FBUS BaudRate	-	12Mbps	-/A	0	I/P	-
<b>09</b> <sup>55</sup>	0h1709	Communicatio n option LED status	FieldBus LED	-	-	O/A	0	I/P	-
30	0h171E	Number of output parameters	ParaStatus Num	0-8	3	O/A	0	I/P	
31 <sup>56</sup>	0h171F	Output Communicatio n address1	Para Stauts-1	0000-FFFF Hex	000A	O/A	0	I/P	<u>p.121</u>
32 <sup>56</sup>	0h1720	Output Communicatio n address2	Para Stauts-2	0000-FFFF Hex	000E	O/A	0	I/P	<u>p.121</u>
<b>33</b> <sup>56</sup>	0h1721	Output Communicatio n address3	Para Stauts-3	0000-FFFF Hex	000F	O/A	0	I/P	<u>p.121</u>
<b>34</b> <sup>56</sup>	0h1722	Output Communicatio n address4	Para Stauts-4	0000-FFFF Hex	0000	O/A	0	I/P	<u>p.121</u>
<b>35</b> <sup>56</sup>	0h1723	Output Communicatio n address5	Para Stauts-5	0000-FFFF Hex	0000	O/A	0	I/P	<u>p.121</u>
<b>36</b> <sup>56</sup>	0h1724	Output Communicatio n address6	Para Stauts-6	0000-FFFF Hex	0000	O/A	0	I/P	<u>p.121</u>
37 <sup>56</sup>	0h1725	Output Communicatio n address7	Para Stauts-7	0000-FFFF Hex	0000	O/A	0	I/P	<u>p.121</u>
<b>38</b> <sup>56</sup>	0h1726	Output Communicatio n address8	Para Stauts-8	0000-FFFF Hex	0000	O/A	0	I/P	<u>p.121</u>
50	0h1732	Number of input parameters	Para Ctrl Num	0-8	2	O/A	0	I/P	
<b>51</b> <sup>57</sup>	0h1733	Input Communicatio n address1	Para Control- 1	0000-FFFF Hex	0005	X/A	0	I/P	<u>p.121</u>

 $<sup>^{\</sup>rm 56}\,$  Only the range of addresses set at COM-30 is displayed.

 $<sup>^{57}\,</sup>$  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>52</b> <sup>57</sup>	0h1734	Input Communicatio n address2	Para Control- 2	000	0-FFFF Hex	0006	X/A	0	I/P	<u>p.121</u>
<b>53</b> <sup>57</sup>	0h1735	Input Communicatio n address3	Para Control- 3	000	0-FFFF Hex	0000	X/A	0	I/P	<u>p.121</u>
<b>54</b> <sup>57</sup>	0h1736	Input Communicatio n address4	Para Control- 4	000	0-FFFF Hex	0000	X/A	0	I/P	<u>p.121</u>
<b>55</b> <sup>57</sup>	0h1737	Input Communicatio n address5	Para Control- 5	000	0-FFFF Hex	0000	X/A	0	I/P	<u>p.121</u>
<b>56</b> <sup>57</sup>	0h1738	Input Communicatio n address6	Para Control- 6	000	0-FFFF Hex	0000	X/A	0	I/P	<u>p.121</u>
<b>57</b> <sup>57</sup>	0h1739	Input Communicatio n address7	Para Control- 7	000	0-FFFF Hex	0000	X/A	0	I/P	<u>p.121</u>
<b>58</b> <sup>57</sup>	0h173A	Input Communicatio n address8	Para Control- 8	000	0-FFFF Hex	0000	X/A	0	I/P	<u>p.121</u>
68	0h1744	Field bus data swap	FBus Swap Sel	0	No Yes	0	X/A	О	I/P	<u>p.121</u>
70	0h1746	Communicatio n multi- function input 1	Virtual DI 1	0	None	0:None	O/A	0	I/P	p.141
71	0h1747	Communicatio n multi- function input 2	Virtual DI 2	1	Fx	0:None	O/A	0	I/P	<u>p.141</u>
72	0h1748	Communicatio n multi- function input 3	Virtual DI 3	2	Rx	0:None	O/A	0	I/P	p.141
73	0h1749	Communicatio n multi- function input 4	Virtual DI 4	3	RST	0:None	O/A	0	I/P	p.141
74	0h174A	Communicatio n multi- function input 5	Virtual DI 5	4	External Trip	0:None	O/A	0	I/P	<u>p.141</u>

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
75	0h174B	Communicatio n multi- function input 6	Virtual DI 6	5	вх	0:None	O/A	0	I/P	<u>p.141</u>
76	0h174C	Communicatio n multi- function input 7	Virtual DI 7	6	JOG	0:None	O/A	0	I/P	<u>p.141</u>
				7	Speed-L					
				8	Speed-M					
				9	Speed-H					
				11	XCEL-L					
				12	XCEL-M					
				13	RUN Enable					
				14	3-Wire					
				15	2nd Source					
				16	Exchange					
				17	Up					
				18	Down					
		<del> </del>	20	U/D Clear						
		Communicatio		21	Analog Hold	_				
77	0h174D	n multi-	Virtual DI 8	22	I-Term Clear	0:None	O/A	0	I/D	p.141
//	UIII/4D	function input	Virtual DI 6	23	PID	O.INOITE	O/A		1/ Γ	<u>p.141</u>
		8		24	Openloop P Gain2	1				
				25	XCEL Stop	-				
				26	2nd Motor	_				
				34	Pre Excite					
				38	Timer In	1				
				40	dis Aux Ref					
				46	FWD JOG					
				47	REV JOG	1				
				49	XCEL-H					
				50	User Seq	_				
				51	Fire Mode	1				
				52	KEB-1 Select	4				
				54	1155					
86	0h1756	Communicatio n multi- function input	Virt DI Status	-		0	X/A	0	I/P	<u>p.119</u>
	0111730	function input monitoring	VIIICDI Status				Λ/Λ		I/ F	ľ

 $<sup>^{58}\,</sup>$  Displayed when P5 is selected on Px terminal function

Code	Comm. Address	Name	LCD Display	Setti	ing Range	Initial Value	Property*	V/F	SL	Ref.
		Selection of		0	Int485					
90	0h175A	data frame	Comm Mon			0	O/A	0	I/P	_
		communicatio	Sel	1	KeyPad					
		n monitor Data frame Rev	Rcv Frame							
91	0h175B	count	Num	0~6	5535	0	O/A	0	I/P	-
	01.4756	Data frame Err	Err Frame	0.6		•	0 / 1	_		
92	0h175C	count	Num	0~6	5535	0	O/A	0	I/P	-
93	0h175D	NAK frame	NAK Frame	0~6	5535	0	O/A	0	I/P	_
	0111730	count	Num		_	0	O/A	0	1/1	
<b>94</b> <sup>59</sup>	_	Communicatio	Comm	0	No	0:No	-/A	0	I/P	_
		n data upload	Update	1	Yes		,		., .	
				0	Disable All					
		P2P		1	P2P Master	0:				
95	0h1760	communicatio	Int 485 Func	2	P2P Slave	Disable	X/A	0	I/P	<u>p.103</u>
		n selection		3	M-KPD	All				
					Ready					
				Bit	000~111					
				001	Analog					
				001	output					
60		DO setting			Multi-					
<b>96</b> <sup>60</sup>	-	selection	P2P OUT Sel	010	function	0:No	O/A	0	I/P	p.103
		Sciection			relay					
					Multi-					
			100	function						
					output					

 $<sup>^{59}\,</sup>$  Displayed only when a communication option card is installed.

 $<sup>^{60}\,</sup>$  Displayed when AP.01 is set to 2 (Proc PID).

# **6.9 Application Function group (PAR→AP)**

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

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property *	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99		20	O/A	0	I/P	<u>p.42</u>
		Application		0	None	0:				
01	0h1801	function	App Mode	1	-	None	X/A	0	I/P	-
		selection		2	Proc PID					
02	-	Enable user	User Seq En	0	No	0:No	X/A	0	I/P	p.105
		sequence	•	1	Yes					
<b>16</b> <sup>61</sup>	0h1810	PID output monitor	PID Output	(%)		0.00	-/A	0	I/P	-
		PID reference								
<b>17</b> <sup>61</sup>	0h1811	monitor	PID Ref Value	(%)		50.00	-/A	0	I/P	-
<b>18</b> <sup>61</sup>	0h1812	PID feedback monitor	PID Fdb Value	(%)		0.00	-/A	0	I/P	-
				400						
<b>19</b> <sup>61</sup>	0h1813	PID reference	PID Ref Set	-100		50.00	O/A	0	I/P	-
		setting		0	00(%)					
				1	Keypad V1					
				3	V2					
				4	12					
<b>20</b> <sup>61</sup>	0h1814	PID reference	PID	5	Int 485	0:	X/A	0	I/P	_
		source	Ref Source	7	FieldBus	Keypad				
					UserSeqL					
				8	ink					
				11	Pulse					
				0	V1					
				2	V2					
				3	12					
<b>21</b> <sup>61</sup>	0h1815	PID feedback	PID	4	Int 485	0:V1	X/A	0	I/P	_
	source F/B Source	F/B Source	6	FieldBus		, , , ,		,, .		
				7	UserSeqL					
			10	ink	-					
				10	Pulse					

<sup>&</sup>lt;sup>61</sup> Displayed when AP.01 is set to 2 (Proc PID).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property *	V/F	SL	Ref.
22 <sup>61</sup>	0h1816	PID controller proportional gain	PID P-Gain	0.0-1000.0(%)		50.0	O/A	0	I/P	-
23 <sup>61</sup>	0h1817	PID controller integral time	PID I-Time	0.0-2	200.0(s)	10.0	O/A	0	I/P	-
<b>24</b> <sup>61</sup>	0h1818	PID controller differentiation time	PID D-Time	0-10	00(ms)	0	O/A	O	I/P	-
25 <sup>61</sup>	0h1819	PID controller feed-forward compensation gain	PID F-Gain	0.0-1000.0(%)		0.0	O/A	0	I/P	-
<b>26</b> <sup>61</sup>	0h181A	Proportional gain scale	P Gain Scale	0.0-100.0(%)		100.0	X/A	0	I/P	-
<b>27</b> <sup>61</sup>	0h181B	PID output filter	PID Out LPF	0-10000(ms)		0	O/A	0	I/P	-
28 <sup>61</sup>	0h181C	PID Mode	PID Mode	0 Process PID		0	X/A	0	I/P	-
				1 Normal PID						
<b>29</b> <sup>61</sup>	0h181D	PID upper limit frequency	PID Limit Hi	frequ	ower limit uency- 00(Hz)	60.00	O/A	0	I/P	-
<b>30</b> <sup>61</sup>	0h181E	PID lower limit frequency	PID Limit Lo	upp	.00 -PID er limit uency(Hz)	-60.00	O/A	0	I/P	-
31 <sup>61</sup>	0h181F	PID output inverse	PID Out Inv	0	No Yes	0:No	X/A	0	I/P	-
32 <sup>61</sup>	0h1820	PID output scale	PID Out Scale	0.1-1	000.0(%)	100.0	X/A	0	I/P	-
<b>34</b> <sup>61</sup>	0h1822	PID controller motion frequency	Pre-PID Freq		- imum uency(Hz)	0.00	X/A	0	I/P	-
35 <sup>61</sup>	0h1823	PID controller motion level	Pre-PID Exit		00.0(%)	0.0	X/A	0	I/P	-
<b>36</b> <sup>61</sup>	0h1824	PID controller motion delay time	Pre-PID Delay	0-9999(s)		600	O/A	O	I/P	-
37 <sup>61</sup>	0h1825	PID sleep mode delay time	PID Sleep DT	0.0-999.9(s)		60.0	O/A	0	I/P	-
<b>38</b> <sup>61</sup>	0h1826	PID sleep mode frequency	PID Sleep Freq	0.00- Maximum frequency(Hz)		0.00	O/A	o	I/P	-
<b>39</b> <sup>61</sup>	0h1827	PID wake-up level	PIDWakeUp Lev	0-100(%)		35	O/A	0	I/P	-

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property *	V/F	SL	Ref.
				0	Below Level					
<b>40</b> <sup>61</sup>	0h1828	PID wake-up mode setting	PID WakeUp Mod	1	Above Level	0:Below Level	O/A	0	I/P	-
				2	Beyond Level					
				0	%					
				1	Bar					
				2	mBar					
				3	Pa					
				4	kPa					
C1		PID controller		5	Hz					
<b>42</b> <sup>61</sup>	0h182A	unit selection	PID Unit Sel	6 7	rpm	0:%	O/A	0	I/P	-
				8	V					
				9	kW					
				10	HP					
				11	°C	-				
				12	°F					
<b>43</b> <sup>61</sup>	0h182B	PID unit gain	PID Unit Gain	0.00	00(%)	100.00	O/A	0	I/P	-
				0	x100					
			PID Unit	1	x10					
<b>44</b> <sup>61</sup>	0h182C	PID unit scale	Scale	2	x 1	2:x 1	O/A	0	I/P	-
			Scale	3	x 0.1					
				4	x 0.01					
<b>45</b> <sup>61</sup>	0h182D	PID 2nd proportional gain	PID P2-Gain	0.0-	1000.0(%)	100.0	X/A	0	I/P	-

# **6.10 Protection Function group (PAR→Pr)**

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

**SL**: Sensorless vector control (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-9	9	40	O/A	0	I/P	<u>p.42</u>
04	0h1B04	Load level setting	Load Duty	1 Heavy Duty		1:Heavy Duty	X/A	0	I/P	-
				bi	00-11					
05	0h1B05	Input/output open-phase	Phase Loss Chk	01 Output open phase		<b>00</b> <sup>62</sup>	X/A	0	I/P	-
		protection	CIIIX	10 Input open phase						
06	0h1B06	Input voltage range during open-phase	IPO V Band	1-100(V)		15	X/A	О	I/P	-
07	0h1B07	Deceleration time at fault trip	Trip Dec Time	0.0	-600.0(s)	3.0	O/A	0	I/P	-
		Selection of		0	No					
08	0h1B08	startup on trip reset	RST Restart	1	Yes	0:No	O/A	0	I/P	-
09	0h1B09	Number of automatic restarts	Retry Number	0-10		0	O/A	0	I/P	-
10 <sup>63</sup>	0h1B0A	Automatic restart delay time	Retry Delay	0.0-60.0(s)		1.0	O/A	0	I/P	-

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



<sup>&</sup>lt;sup>63</sup> Displayed when Pr.09 is set higher than 0.

Code	Comm. Address	Name	LCD Display	Setting Range  O None		Initial Value	Property*	V/F	SL	Ref.
				0	None					
				1	Free-Run					
12	0h1B0C	Motion at speed	Lost Cmd	2	Dec	0:None	O/A	0	I/P	
12	OITIBOC	command loss	Mode	3	Hold Input	U.NOHE	0/1		1/ [	
				4	Hold					
				5	Lost Preset					
13 <sup>64</sup>	0h1B0D	Time to decide speed command loss	Lost Cmd Time	0.1	-120(s)	1.0	O/A	o	I/P	-
14 <sup>64</sup>	0h1B0E	Operation frequency at speed command loss	Lost Preset F	Ма	rt frequency- ximum quency(Hz)	0.00	O/A	0	I/P	-
15 <sup>64</sup>	0h1B0F	Analog input loss decision	Al Lost Level	0	Half x1	0:Half of	O/A	0	I/P	-
		level		1	Below x1	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				
		Overload	OL Warn	0	No					
17	0h1B11	warning selection	Select	1	Yes	0:No	O/A	0	I/P	-
18	0h1B12	Overload alarm level	OL Warn Level	30-	180(%)	150	O/A	0	I/P	-
19	0h1B13	Overload warning time	OL Warn Time	0.0	-30.0(s)	10.0	O/A	0	I/P	-
			0.7	0	None					
20	0h1B14	Motion at overload fault	OLTrip Select	1	Free-Run	1:Free- Run	O/A	0	I/P	-
		overioud ludic	Sciect	2	Dec	Tidii				
21	0h1B15	Overload fault level	OL Trip Level	30-	200(%)	180	O/A	0	I/P	-
22	0h1B16	Overload fault time	OL Trip Time	0.0	-60.0(s)	60.0	O/A	0	I/P	-
		Underload		0	No					
25	0h1B19	warning selection	UL Warn Sel	1	Yes	0:No	O/A	0	I/P	-
26	0h1B1A	Underload warning time	UL Warn Time	0.0-600.0(s)		10.0	O/A	О	I/P	-

 $<sup>^{\</sup>rm 64}\,$  Displayed when Pr.12 is not set to 0 (NONE).

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				0	None					
27	0h1B1B	Underload fault selection	UL Trip Sel	1	Free-Run	0:None	O/A	0	I/P	-
		Selection		2	Dec					
28	0h1B1C	Underload fault time	UL Trip Time	0.0-	-600.0(s)	30.0	O/A	0	I/P	-
29	0h1B1D	Underload lower limit level	UL LF Level	10-	30(%)	30	O/A	0	I/P	-
30	0h1B1E	Underload upper limit level	UL BF Level	30-	100(%)	30	O/A	0	I/P	-
		No motor	No Motor	0	None					
31	0h1B1F	motion at detection	Trip	1	Free-Run	0:None	O/A	0	I/P	-
32	0h1B20	No motor detection current level	No Motor Level	1-1	00(%)	5	O/A	Ο	I/P	-
33	0h1B21	No motor detection delay	No Motor Time	0.1-	-10.0(s)	3.0	O/A	0	I/P	-
		Electronic		0	None					
40	0h1B28	thermal fault	ETH Trip Sel	1	Free-Run	0:None	O/A	0	I/P	-
		selection		2	Dec					
		NA		0	Self-cool	0.0 10				
41	0h1B29	Motor cooling fan type	Motor Cooling	1	Forced-cool	0:Self- cool	O/A	0	I/P	-
42	0h1B2A	Electronic thermal 1 minute rating	ETH 1min	120	)-200(%)	150	O/A	0	I/P	-
43	0h1B2B	Electronic thermal continuous rating	ETH Cont	50-	150(%)	120	O/A	0	I/P	-
45	0h1B2D	BX trip mode	BX Mode	0	Free-Run	0	X/A	0	I/P	
	3111020	DA GIPTIOGC	D/ WIOGC	1	Dec		/ / / /		"'	
50	01.4533	Stall prevention	C. II.D.	bit	0000-1111	2000	V//			
50	0h1B32	motion and flux braking	Stall Prevent	000	Acceleratin g	0000	X/A	О	Х	-

Code	Comm. Address	Name	LCD Display	Sett	ing Range	Initial Value	Property*	V/F	SL	Ref.
				001 0	At constant speed					
				010 0	At deceleratio n					
				100 0	FluxBrakin g					
51	0h1B33	Stall frequency1	Stall Freq 1	Stall	t frequency-   uency2(Hz)	60.00	O/A	0	Х	-
52	0h1B34	Stall level1	Stall Level 1	30-2	250(%)	180	X/A	О	Χ	-
53	0h1B35	Stall frequency2	Stall Freq 2	Stall frequency1- Stall frequency3(Hz)		60.00	O/A	0	х	-
54	0h1B36	Stall level2	Stall Level 2		250(%)	180	X/A	0	Χ	-
55	0h1B37	Stall frequency3	Stall Freq 3	Stall frequency2- Stall frequency4(Hz)		60.00	O/A	0	Х	-
56	0h1B38	Stall level3	Stall Level 3	30-2	250(%)	180	X/A	0	Χ	-
57	0h1B39	Stall frequency4	Stall Freq 4	Max	l uency3- kimum uency(Hz)	60.00	O/A	0	Х	-
58	0h1B3A	Stall level4	Stall Level 4	30-2	250(%)	180	X/A	0	Χ	-
59	0h1B3B	Flux braking gain	Flux Brake Kp	0~	150[%]	0	O/A	0	I	-
60	0h1B3C	CAP diagnosis level	CAP. Diag Perc	10 ~	- 100[%]	0	O/A	0	I/P	-
				0	None					
61 <sup>65</sup>	061020	CAP diagnosis	CAD D:	1	Ref Diag		V/A		L/D	
61	0h1B3D	mode	CAP. Diag	2 Pre Diag		0	X/A	0	I/P	_
				3	Init Diag					
<b>62</b> <sup>65</sup>	0h1B3E	CAP Exchange Level	CAP Exchange Level	50.0 ~ 95.0[%]		0	X/A	0	I/P	-
<b>63</b> <sup>65</sup>	0h1B3F	CAP Diag Level	CAP Diag Level	0.0~100.0[%]		0.0	-/A	0	I/P	-

 $<sup>^{65}\,</sup>$  The Pr.61-63 codes are displayed when the Pr.60(CAP.DiagPrec) is set to more than 0.

190 | **LS**15

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
66	0h1B42	DB resistor warning level	DB Warn %ED	0-3	30(%)	0	O/A	0	I/P	-
73	0h1B22	Speed deviation trip	Speed Dev Trip	0	No Yes	0:No	O/A	0	I/P	
<b>74</b> <sup>66</sup>	0h1B23	Speed deviation band	Speed Dev Band	1~:	20	5	O/A	0	I/P	
<b>75</b> <sup>66</sup>	0h1B24	Speed deviation time	Speed Dev Time	0~	120	60	O/A	0	I/P	
79	0h1B4F	Cooling fan fault selection	FAN Trip Mode	0	Trip Warning	1:Warni ng	O/A	0	I/P	-
		Motion		0	None					
80	0h1B50	selection	Opt Trip Mode	1	Free-Run	1:Free- Run	O/A	0	I/P	-
		at option trip	IVIOUE	2	Dec	- Null				
81	0h1B51	Low voltage fault decision delay time	LVT Delay	0.0	-60.0(s)	0.0	X/A	О	I/P	-
82	0h1B52	LV2 Selection	LV2 Enable	0	No Yes	0	X/A	0	I/P	-
86	0h1B56	Accumulated percent of fan usage	Fan Time Perc	0.0	~100.0[%]	0.0	-/A	О	I/P	-
87	0h1B57	Fan exchange warning level	Fan Exchange level	0.0	~100.0[%]	90.0	O/A	0	I/P	-
88 <sup>67</sup>	0h1B58	Fan reset time	Fan Time Rst	0	No Yes	0	X/A	0	I/P	-
89	0h1B59	CAP, FAN Status	CAP, FAN State	Bit 00 01 10	- CAP Warning	0	-/A	0	I/P	-
<b>90</b> <sup>67</sup>	0h1B5A	Warning information	-	-		-	-/7	0	I/P	-
91 <sup>67</sup>	0h1B5B	Fault history 1	-	-		-	-/7	0	I/P	-

<sup>&</sup>lt;sup>66</sup> Displayed when Pr.73 is set to 1(YES)

 $<sup>^{\</sup>rm 67}\,$  Will not be displayed when an LCD keypad is in use.

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
<b>92</b> <sup>67</sup>	0h1B5C	Fault history 2	-	-		-	-/7	0	I/P	-
<b>93</b> <sup>67</sup>	0h1B5D	Fault history 3	-	-		-	-/7	0	I/P	-
<b>94</b> <sup>67</sup>	0h1B5E	Fault history 4	-	-		-	-/7	0	I/P	-
<b>95</b> <sup>67</sup>	0h1B5F	Fault history 5	-	-		-	-/7	0	I/P	-
<b>96</b> <sup>67</sup>	0h1B60	Fault history	_	0	No	0:No	-/7	C	I/P	_
	0111000	deletion		1	Yes	0.140	,,	)	1/1	

#### **6.11 2nd Motor Function group (PAR→M2)**

The 2nd Motor function group will be displayed if any of In.65-69 are 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 (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm. Address	Name	LCD Display	Set	tting Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-9	9	14	O/A	0	I	<u>p.42</u>
04	0h1C04	Acceleration time	M2-Acc Time	0.0	-600.0(s)	20.0	O/A	0	I	-
05	0h1C05	Deceleration time	M2-Dec Time	0.0	-600.0(s)	30.0	O/A	0	ı	-
				0	0.2 kW					
				1	0.4 kW					
				2 0.75 kW	0.75 kW					
		3	1.1 kW							
				4 1.5 kW						
				5	2.2 kW					
				6	3.0 kW					
06	0h1C06	Motor capacity	M2-Capacity	7	3.7 kW	_	X/A	0	ı	_
00	011100	Wiotor capacity	Wiz capacity	8	4.0 kW		7471			
				9	5.5 kW					
				10						
				11						
				12 15.0 kW 13 18.5 kW 14 22.0 kW						
					ł	_				
						4				
				15	30.0 kW					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
07	0h1C07	Base frequency	M2-Base Freq		00- 0.00(Hz)	60.00	X/A	0	I	-
08	0h1C08	Control mode	M2-Ctrl Mode	2	V/F Slip Compen IM	0:V/F	X/A	0	I	-
10	0h1C0A	Number of motor poles	M2-Pole Num	Sensorless 2-48			X/A	0	I	-
11	0h1C0B	Rated slip speed	M2-Rated Slip	0-3	000(rpm)		X/A	0	I	-
12	0h1C0C	Motor rated current	M2-Rated Curr	1.0	-1000.0(A)		X/A	0	I	-
13	0h1C0D	Motor no-load current	M2-Noload Curr	0.5-1000.0(A)		Dava a.a.	X/A	0	I	-
14	0h1C0E	Motor rated voltage	M2-Rated Volt	170-480(V)		Depen dent	X/A	0	I	-
15	0h1C0F	Motor efficiency	M2- Efficiency	64-100(%)		on motor setting	X/A	0	I	-
16	0h1C10	Load inertia rate	M2-Inertia Rt	0-8	3	_	X/A	0	I	-
17	-	Stator resistance	M2-Rs			S	X/A	0	I	-
18	-	Leakage inductance	M2-Lsigma		pendent on otor settings		X/A	0	I	-
19	-	Stator inductance	M2-Ls				X/A	0	I	-
20 <sup>68</sup>	-	Rotor time constant	M2-Tr	25-	-5000(ms)		X/A	0	I	-
				0	Linear	0.				
25	0h1C19	V/F pattern	M2-V/F Patt	1	Square	0: Linear	X/A	0	I	-
				2	User V/F					
26	0h1C1A	Forward Torque boost	M2-Fwd Boost	0.0-15.0(%)			X/A	0	I	-
27	0h1C1B	Reverse Torque boost	M2-Rev Boost	0.0-15.0(%)		2.0	X/A	0	I	-
28	0h1C1C	Stall prevention level	M2-Stall Lev	30-150(%)		150	X/A	0	I	-

 $<sup>^{\</sup>rm 68}\,$  Displayed when M2.08 is set to 4 (IM Sensorless).

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
29	0h1C1D	Electronic thermal 1 minute rating	M2-ETH 1min	100	)-200(%)	150	X/A	0	I	-
30	0h1C1E	Electronic thermal continuous rating	M2-ETH Cont	50-	150(%)	100	X/A	0	I	-
40	0h1C28	Rotation count speed gain	Load Spd Gain	0~6	5000.0[%]	100.0	O/A	0	I	-
				0	x 1					
		Rotation count	Load Spd	1	x 0.1					
41	0h1C29	speed scale	Scale	2	x 0.01	0: x 1	O/A	0	I	-
		speed scale	Scale	3	x 0.001					
				4	x 0.0001					
42	0h1C2A	Rotation count	Load Spd	0	Rpm	0: rpm	O/A	0		
42	UITICZA	speed unit	Unit	1	mpm	0: rpm	U/A	U	1	-

## 6.12 User Sequence group (US)

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

**SL**: Sensorless vector control function (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm.	Name	LCD Display	Setting		Initial	Property*	V/F	SL	Ref.
	Address			Ra	ange	Value				
00	-	Jump code	Jump Code	1-	99	31	O/A	0	I/P	<u>p.42</u>
01	0h1D01	User sequence	User Seq Con	0	Stop	0:Stop	X/A	0	I/P	p.105
		operation		1	Run					
		command		2	Digital In					
					Run					
02	0h1D02	User sequence	US Loop Time	0	0.01s	1:0.02s	X/A	0	I/P	p.105
		operation loop		1	0.02s					
		time		2	0.05s					
				3	0.1s					
				4	0.5s					
				5	1s					
11	0h1D0B	Output address	Link UserOut1	0-	0xFFFF	0	X/A	0	I/P	p.105
		link1								

Code	Comm.	Name	LCD Display	Setting	Initial	Property*	V/F	SL	Ref.
	Address			Range	Value				
12	0h1D0C	Output address link2	Link UserOut2	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
13	0h1D0D	Output address link3	Link UserOut3	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
14	0h1D0E	Output address link4	Link UserOut4	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
15	0h1D0F	Output address link5	Link UserOut5	0-0xFFFF	0	X/A	Ο	I/P	<u>p.105</u>
16	0h1D10	Output address link6	Link UserOut6	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
17	0h1D11	Output address link7	Link UserOut7	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
18	0h1D12	Output address link8	Link UserOut8	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
19	0h1D13	Output address link9	Link UserOut9	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
20	0h1D14	Output address link10	Link UserOut10	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
21	0h1D15	Output address link11	Link UserOut11	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
22	0h1D16	Output address link12	Link UserOut12	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
23	0h1D17	Output address link13	Link UserOut13	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
24	0h1D18	Output address link14	Link UserOut14	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
25	0h1D19	Output address link15	Link UserOut15	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
26	0h1D1A	Output address link16	Link UserOut16	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
27	0h1D1B	Output address link17	Link UserOut17	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
28	0h1D1C	Output address link18	Link UserOut18	0-0xFFFF	0	X/A	0	I/P	<u>p.105</u>
31	0h1D1F	Input constant setting1	Void Para1	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
32	0h1D20	Input constant setting2	Void Para2	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
33	0h1D21	Input constant setting3	Void Para3	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
34	0h1D22	Input constant setting4	Void Para4	-9999-9999	0	X/A	0	I/P	<u>p.105</u>

Code	Comm.	Name	LCD Display	Setting	Initial	Property*	V/F	SL	Ref.
	Address			Range	Value				
35	0h1D23	Input constant setting5	Void Para5	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
36	0h1D24	Input constant setting6	Void Para6	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
37	0h1D25	Input constant setting7	Void Para7	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
38	0h1D26	Input constant setting8	Void Para8	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
39	0h1D27	Input constant setting9	Void Para9	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
40	0h1D28	Input constant setting 10	Void Para10	-9999-9999	0	X/A	0	I/P	p.105
41	0h1D29	Input constant setting11	Void Para11	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
42	0h1D2A	Input constant setting12	Void Para12	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
43	0h1D2B	Input constant setting13	Void Para13	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
44	0h1D2C	Input constant setting14	Void Para14	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
45	0h1D2D	Input constant setting 15	Void Para15	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
46	0h1D2E	Input constant setting16	Void Para16	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
47	0h1D2F	Input constant setting 17	Void Para17	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
48	0h1D30	Input constant setting 18	Void Para18	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
49	0h1D31	Input constant setting 19	Void Para19	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
50	0h1D32	Input constant setting 20	Void Para20	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
51	0h1D33	Input constant setting21	Void Para21	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
52	0h1D34	Input constant setting22	Void Para22	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
53	0h1D35	Input constant setting23	Void Para23	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
54	0h1D36	Input constant setting24	Void Para24	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
55	0h1D37	Input constant setting25	Void Para25	-9999-9999	0	X/A	0	I/P	<u>p.105</u>

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
56	0h1D38	Input constant setting26	Void Para26	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
57	0h1D39	Input constant setting27	Void Para27	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
58	0h1D3A	Input constant setting28	Void Para28	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
59	0h1D3B	Input constant setting29	Void Para29	-9999-9999	0	X/A	Ο	I/P	<u>p.105</u>
60	0h1D3C	Input constant setting30	Void Para30	-9999-9999	0	X/A	0	I/P	<u>p.105</u>
80	0h1D50S	Analog input 1	P2P In V1	0-12,000		-/A	0	I/P	p.105
81	0h1D51	Analog input2	P2P In I2	-12,000- 12,000		-/A	0	I/P	<u>p.105</u>
82	0h1D52	Digital input	P2P In DI	0-0x7F		-/A	0	I/P	p.105
85	0h1D55	Analog output	P2P OutAO1	0-10,000	0	X/A	0	I/P	p.105
89	0h1D58	Digital output	P2P OutDO	0-0x03	0	X/A	0	I/P	p.105

#### **6.13 User Sequence Function group(UF)**

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

**SL**: Sensorless vector control function (dr.09), I – IM Sensorless, P – PM Sensorless

Code	Comm.	Name	LCD	Set	ting Range	Initial	Property*	V/F	SL	Ref.
00	Address -	Jump code	Display Jump	1-9	10	Value 41	O/A	0	I/P	n 12
00	_	Julip code	Code	ל־ו	77	41	O/A	U	1/17	<u>p.42</u>
01	0h1E01	User function1	User	0	NOP	0:NOP	X/A	0	I/P	p.105
			Func1	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-					
				14	NEQUAL TIMER					
					LIMIT					
					AND					
					OR					
					XOR					
					ANDOR					
					SWITCH					
					BITTEST					
					BITSET					
					BITCLEAR					
					LOWPASSFILTER					
					PI_CONTORL					
				23	I I_CONTONE					<u> </u>

Code	Comm. Address	Name	LCD Display	Set	tting Range	Initial Value	Property*	V/F	SL	Ref.
	Address		Display	26	PI_PROCESS	value				
					UPCOUNT					
					DOWNCOUNT	-				
02	0h1E02	User function	User		)xFFFF	0	X/A	0	I/P	p.105
02	OTTLOZ	input1-A	Input1-A		Z. 1 1 1		/ / / /		1/1	<u>p.103</u>
03	0h1E03	User function	User	0-0	)xFFFF	0	X/A	0	I/P	p.105
		input1-B	Input1-B							
04	0h1E04	User function	User	0-0	)xFFFF	0	X/A	0	I/P	<u>p.105</u>
05	0h1E05	input1-C User function	Input1-C User	-32767-32767		0	-/A	0	I/P	p.105
05	OITILOS	output1	Output1	-52	.707-32707		7/1		1/ Γ	<u>p.103</u>
06	0h1E06	User function 2	User	0	NOP	0:NOP	X/A	0	I/P	p.105
			Func2	1	ADD	-				
				2	SUB	-				
				3	ADDSUB					
				4	MIN	-				
				5	MAX	1				
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ	-				
				12	COMPARE-	-				
					EQUAL					
				13	COMPARE-					
				1/1	NEQUAL TIMER	-				
					LIMIT					
					AND	-				
				17						
					XOR	-				
					ANDOR	-				
					SWITCH	-				
					BITTEST	1				
					BITSET	1				
					BITCLEAR					
				23	DITCLEAN				L	<u></u>

Code	Comm.	Name	LCD	Set	tting Range	Initial	Property*	V/F	SL	Ref.
	Address		Display			Value	,			
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
07	0h1E07	User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
	01.4500	input2-A	Input2-A				2//2			107
08	0h1E08	User function input2-B	User Input2-B	0-0	)xFFFF	0	X/A	0	I/P	<u>p.105</u>
09	0h1E09	User function	User	0-0	)xFFFF	0	X/A	0	I/P	p.105
		input2-C	Input2-C						,,,	
10	0h1E0A	User function	User	-32	2767-32767	0	-/A	0	I/P	<u>p.105</u>
11	0l-1F0D	output2	Output2	_	NOD	ONOD	V/A		I/D	105
11	0h1E0B	User function3	User Func3	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			Taries	1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10						
				11	~					
				12	COMPARE- EQUAL					
				13						
					NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST		<u></u>			

Code	Comm.	Name	LCD	Set	ting Range	Initial	Property*	V/F	SL	Ref.
	Address		Display			Value				
					BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
12	0h1E0C	User function	User	0-0	xFFFF	0	X/A	0	I/P	p.105
		input3-A	Input3-A							
13	0h1E0D	User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
14	0h1E0E	input3-B User function	Input3-B User	0.0	)xFFFF	0	X/A	0	I/P	p.105
14	OTTLOE	input3-C	Input3-C	0-0	XFFFF	0	MA		1/ F	<u>p.103</u>
15	0h1F0F	User function	User	-32	767-32767	0	-/A	0	I/P	p.105
	0h1E0F	output3	Output3							
16		User function4	User	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			Func4	1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
	0h1E10			10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-					'
					EQUAL					
				13	COMPARE-					
					NEQUAL					
					TIMER					
					LIMIT					
					AND					
					OR					
					XOR					
				19	ANDOR					

Code	Comm.	Name	LCD	Set	ting Range	Initial	Property*	V/F	SL	Ref.
	Address		Display			Value				
					SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
17	0h1E11	User function	User	0-0	xFFFF	0	X/A	0	I/P	p.105
	OIIIEII	input4-A	Input4-A							
18	0h1E12	User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
10		input4-B	Input4-B	0.0		0	V/A	_	I/D	n 105
19	0h1E13	User function input4-C	User Input4-C	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
20		User function	User	-32	767-32767	0	-/A	0	I/P	p.105
20	0h1E14	output4	Output4		., 0, 32, 0,		// \		., .	<u> </u>
21		User function5	User	0	NOP	0:NOP	X/A	0	I/P	p.105
			Func5	1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
	0h1E15			10	COMPARE-GT					
	UIILIS			11	COMPARE-GEQ					
				12	COMPARE-					
				12	EQUAL					
				13	COMPARE- NEQUAL					
				14	TIMER	-				
					LIMIT					
					AND					
					OR					
					XOR					
				19	ANDOR					

_	-71
മ,	בׁ'
O	⋽
$\mathbf{\Phi}$	뭐
	<u>o</u> .
	ž

Code	Comm.	Name	LCD	Set	tting Range	Initial	Property*	V/F	SL	Ref.
	Address		Display			Value				
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
22	0h1E16	User function	User	0-0	xFFFF	0	X/A	0	I/P	p.105
	OTTLIO	input5-A	Input5-A				2//4			107
23	0h1E17	User function input5-B	User Input5-B	0-0	)xFFFF	0	X/A	0	I/P	<u>p.105</u>
24	01.4540	User function	User	0-0	)xFFFF	0	X/A	0	I/P	p.105
	0h1E18	input5-C	Input5-C							
25	0h1E19	User function	User	-32	2767-32767	0	-/A	0	I/P	<u>p.105</u>
26		output5 User function6	Output5 User	0	NOP	0:NOP	X/A	0	I/P	p.105
20		User fullctions	Func6	1	ADD	U.INOP	NA		1/ F	<u>p.103</u>
			- direc		SUB					
				2						
				3	ADDSUB					
				4	MIN	<u> </u>				
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
	0h1E1A			9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-					
					EQUAL					
				13	COMPARE-					
					NEQUAL	<u> </u>				
					TIMER					
					LIMIT					
					AND					
				17	OR					

Code	Comm.	Name	LCD	Setting Range		Initial	Property*	V/F	SL	Ref.
	Address		Display			Value				
					XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
27	0h1E1B	User function	User	0-0xFFFF		0	X/A	0	I/P	<u>p.105</u>
	OITILIB	input6-A	Input6-A				144		. ,_	
28	0h1E1C	User function input6-B	User Input6-B	0-0xFFFF		0	X/A	0	I/P	<u>p.105</u>
29	_	User function	User	0-0xFFFF		0	X/A	0	I/P	p.105
	0h1E1D	input6-C	Input6-C				7,47.		,,,	<u> </u>
30	0h1E1E	User function	User -32		2767-32767	0	-/A	0	I/P	<u>p.105</u>
	OTTE	output6	Output6	O NOD		ONOD	\//A	_	1/0	. 105
31		User function7	User Func7	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			T dile/	1	ADD					
	0h1E1F			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-					
				14	TIMER	1				

Code	Comm.	Name	LCD	Set	tting Range	Initial	Property*	V/F	SL	Ref.
	Address		Display		L	Value				
					AND					
				17	OR					
					XOR					
					ANDOR					
					SWITCH					
				21						
				22	BITSET					
					BITCLEAR					
					LOWPASSFILTER					
					PI_CONTORL					
					PI_PROCESS					
					UPCOUNT					
					DOWNCOUNT					
32	0h1E20	User function	User	0-0xFFFF		0	X/A	0	I/P	<u>p.105</u>
33		input7-A User function	Input7-A User	0-0xFFFF		0	X/A	0	I/P	p.105
33	0h1E21	input7-B	Input7-B				7471		1/1	<u>p. 103</u>
34	0h1E22	User function	User	0-0xFFFF		0	X/A	0	I/P	p.105
		input7-C	Input7-C							
35	0h1E23	User function	User	-32767-32767		0	-/A	0	I/P	p.105
	OTTLES	output7	Output7				200			
36		User function8	User Func8	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			Funco	1	ADD					
				2	SUB					
	0h1E24			3	ADDSUB					
				4	MIN					
				5	MAX					
					ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
					COMPARE-GT					
					COMPARE-GEQ					
				12	COMPARE-					
				12	EQUAL COMPARE-					
				13	NEQUAL					
			1	<u> </u>	1120112	L	<u> </u>	<u> </u>	<u> </u>	Ь

Code	Comm.	Name	LCD	Setting Range		Initial	Property*	V/F	SL	Ref.
	Address		Display		9	Value	,	-/-		
				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					
37	0h1E25	User function input8-A	User Input8-A	0-0xFFFF		0	X/A	0	I/P	<u>p.105</u>
38	0h1E26	User function input8-B	User Input8-B	0-0xFFFF		0	X/A	Ο	I/P	<u>p.105</u>
39	0h1E27	User function input8-C	User Input8-C	0-0xFFFF		0	X/A	0	I/P	<u>p.105</u>
40	0h1E28	User function output8	User Output8	-32767-32767		0	-/A	0	I/P	<u>p.105</u>
41	0h1E29	User function9	User	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			Func9	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					

Table	Function

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   PL_CONTORL   26   PL_PROCESS   27   UPCOUNT   28   DOWNCOUNT   29   DOWNCOUNT	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 BTCLEAR   24 LOWPASSFILTER   25 PL_CONTORL   26 PL_PROCESS   27 UPCOUNT   28 DOWNCOUNT   28 DOWNCOUNT   29 DOWNCOUNT   29 DOWNCOUNT   29 DOWNCOUNT   20 OVERFIFF   0 X/A O I/P P.105   10 OVERFIFF   10 OVERF		Addless		- Ызріау - <u>- </u>	13		-value-				
15   LIMIT   16   AND   17   OR   18   XOR   19   ANDOR   20   SWITCH   21   BITTEST   22   BITSET   23   BITCLEAR   24   LOWPASSFILTER   25   P_CONTORL   26   P_PROCESS   27   UPCOUNT   28   DOWNCOUNT   29   DOWNCOUNT   20   DOWNCOUNT   29					14						
16 AND											
18   XOR   19   ANDOR   20   SWITCH   21   BITTEST   22   BITSET   23   BTICLEAR   24   LOWPASSFILTER   25   PL_CONTORL   26   PL_PROCESS   27   UPCOUNT   28   DOWNCOUNT   29   DOWNCOUNT   29					16	AND					
19   ANDOR   20   SWITCH   21   BITTEST   22   BITSET   23   BITCLEAR   24   LOWPASSFILTER   25   PL_CONTORL   26   PL_PROCESS   27   UPCOUNT   28   DOWNCOUNT   DOWNCOUNT   DOWNCOUNT   USER Input9-B   Input9-B   Input9-B   Input9-B   Input9-B   Input9-C   DOWNCOUNT   D					17	OR					
20   SWITCH					18	XOR					
21 BITTEST   22 BITSET   23 BITCLEAR   24 LOWPASSFILTER   25 PL_CONTORL   26 PL_PROCESS   27 UPCOUNT   28 DOWNCOUNT   28 DOW					19	ANDOR					
22 BITSET   23 BITCLEAR   24 LOWPASSFILTER   25 PL_CONTORL   26 PL_PROCESS   27 UPCOUNT   28 DOWNCOUNT   29 DOWNCOUNT   20 D					20	SWITCH					
23 BITCLEAR   24 LOWPASSFILTER   25 PL_CONTORL   26 PL_PROCESS   27 UPCOUNT   28 DOWNCOUNT   20 DOWNCOUNT   28 DOWNCOUNT   28 DOWNCOUNT   28 DOWNCOUNT   28 DOWNCOUNT   20 DOWNCOUNT   2					21	BITTEST					
24   LOWPASSFILTER   25   PI_CONTORL   26   PI_PROCESS   27   UPCOUNT   28   DOWNCOUNT   DOWN					22	BITSET					
25   PI_CONTORL   26   PI_PROCESS   27   UPCOUNT   28   DOWNCOUNT   DOWNCOUN					23	BITCLEAR					
26   PL   PROCESS   27   UPCOUNT   28   DOWNCOUNT   DOW					24	LOWPASSFILTER					
27   UPCOUNT   28   DOWNCOUNT					25	PI_CONTORL					
28   DOWNCOUNT					26	PI_PROCESS					
1					27	UPCOUNT					
On   EZA   input9-A   Input9-A					28	DOWNCOUNT					
Input9-A   Input9-A   Input9-A   Input9-A   Input9-B   Input9-B   Input9-B   Input9-B   Input9-B   Input9-B   Input9-B   Input9-C    42	0h1F2A			0-0	xFFFF	0	X/A	0	I/P	p.105	
Onlead   Input9-B   Input9-B   Input9-B		OTTLEZA	•					2//2		1.0	105
Oh1E2C   input9-C   Input9-C	43	0h1E2B			0-0	XFFFF	0	X/A	O	I/P	<u>p.105</u>
Oh1E2D	44	0h1E2C			0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
User function 10	45	0h1E2D	User function	User	-32	767-32767	0	-/A	0	I/P	<u>p.105</u>
Punc10  1 ADD 2 SUB 3 ADDSUB 4 MIN 5 MAX 6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT	46				0	NOP	0·NOP	Χ/Δ	0	I/P	n 105
2 SUB 3 ADDSUB 4 MIN 5 MAX 6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT	10		oser ranetion ro				0101	,,,,		., .	<u> </u>
3 ADDSUB 4 MIN 5 MAX 6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT											
0h1E2E  4 MIN  5 MAX  6 ABS  7 NEGATE  8 MPYDIV  9 REMAINDER  10 COMPARE-GT					_						
5 MAX 6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT											
0h1E2E  6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT					5						
7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT		0h1E2E									
9 REMAINDER 10 COMPARE-GT					7						
10 COMPARE-GT					8	MPYDIV					
					9						
11 COMPARE-GEQ					10	COMPARE-GT					
					11	COMPARE-GEQ					

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
	Madiess		Display		COMPARE- EQUAL COMPARE- NEQUAL	Value				
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21						
				22	BITSET					
					BITCLEAR					
				24	LOWPASSFILTER					
					PI_CONTORL					
					PI_PROCESS					
					UPCOUNT					
47	0h1E2F	User function input10-A	User Input10- A	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
48	0h1E30	User function input10-B	User Input10- B	0-0	xFFFF	0	X/A	Ο	I/P	<u>p.105</u>
49	0h1E31	User function input10-C	User Input10- C	0-0	xFFFF	0	X/A	Ο	I/P	<u>p.105</u>
50	0h1E32	User function output 10	User Output10	-32	767-32767	0	-/A	0	I/P	<u>p.105</u>
51		User function 11	User	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			Func11	1	ADD					
				2	SUB					
	0h1E33			3	ADDSUB					
				4	MIN					
			6	5	MAX					
				6	ABS					
				7	NEGATE					

unction able
-----------------

Code	Comm. Address	Name	LCD Display	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
				8	MPYDIV					
				9	REMAINDER	1				
				10	COMPARE-GT	1				
				11	COMPARE-GEQ	1				
				12	COMPARE-	1				
					EQUAL	1				
				13	COMPARE- NEQUAL					
				14	TIMER	-				
					LIMIT	-				
					AND	_				
					OR	_				
					XOR	1				
					ANDOR	_				
					SWITCH	_				
					BITTEST	_				
					BITSET	_				
					BITCLEAR	_				
					LOWPASSFILTER					
				25	PI_CONTORL	-				
				26	PI_PROCESS	1				
				27	UPCOUNT	1				
				28	DOWNCOUNT					_
52		User function	User	0-0	)xFFFF	0	X/A	0	I/P	<u>p.105</u>
	0h1E34	input11-A	Input11-							
		User function	A	0.0		0	)//A	_	1/0	
53	0h1E35	input11-B	User Input11-	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
	OTTL	Input i b	В							
54		User function	User	0-0	xFFFF	0	X/A	0	I/P	p.105
	0h1E36	input11-C	Input11-							
55		User function	C User	_21	767-22767	0	-/A	0	I/P	n 105
23	0h1E37	output11	Output11	-32767-32767		١٥	-/A		1/1/	<u>p.105</u>
56		User function 12	User	0 NOP		0:NOP	X/A	0	I/P	p.105
			Func12	1 ADD		1				
	0h1E38			2	SUB	1				
				3 ADDSUB		1				
	1	l			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Code	Comm. Address	Name	LCD	Set	ting Range	Initial Value	Property*	V/F	SL	Ref.
	Address		Display	4	MIN	value				
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
					COMPARE-GT					
				11	~					
				12	COMPARE-					
				12	EQUAL COMPARE-					
				13	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					
					PI_PROCESS					
				27	UPCOUNT					
					DOWNCOUNT					
57		User function	User		)xFFFF	0	X/A	0	I/P	p.105
	0h1E39	input12-A	Input12-							
			Α			_		_		
58	051524	User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
	0h1E3A	input12-B	Input12- B							
59		User function	User	0-0	)xFFFF	0	X/A	0	I/P	p.105
	0h1E3B	input12-C	Input12-							
			C							
60	0h1E3C	User function	User		767-32767	0	-/A	0	I/P	<u>p.105</u>
		output12	Output12							<u></u>

Code	Comm.	Name	LCD	Sei	tting Range	Initial	Property*	V/F	SL	Ref.																
Code	Address		Display			Value	110pcity			i ici																
61		User function 13	User	0	NOP	0:NOP	X/A	0	I/P	p.105																
			Func13	1	ADD																					
				2	SUB																					
				3	ADDSUB																					
				4	MIN																					
				5	MAX																					
				6	ABS																					
				7	NEGATE																					
				8	MPYDIV																					
				9	REMAINDER																					
				10	COMPARE-GT																					
				11	11 COMPARE-GEQ 12 COMPARE-																					
				12																						
					EQUAL																					
				13	COMPARE-																					
	0h1E3D			1.4	NEQUAL																					
					TIMER																					
					AND																					
				17		<u> </u>																				
					XOR																					
					ANDOR																					
										SWITCH					Į.											
										BITTEST																
				22																						
																				23						
					LOWPASSFILTER																					
					PI_CONTORL																					
					PI_PROCESS																					
							UPCOUNT																			
					DOWNCOUNT																					
62	0h1E3E	User function input13-A	User Input13- A	0-0	)xFFFF	0	X/A	0	I/P	<u>p.105</u>																
63		User function	User	0-0xFFFF		0	X/A	0	I/P	p.105																
	0h1E3F	input13-B	Input13- B																							

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	X/A	0	I/P	<u>p.105</u>
65	0h1E41	User function output 13	User Output13	-32	767-32767	0	-/A	0	I/P	<u>p.105</u>
66		User function 14	User	0	NOP	0:NOP	X/A	0	I/P	p.105
			Func14	1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
					COMPARE-GT					
					COMPARE-GEQ					
				12	Compare- Equal					
				13	COMPARE-					
	0h1E42				NEQUAL					
	0111212			14	TIMER					
					LIMIT					
				16	AND					
				17						
					XOR					
					ANDOR					
				20	SWITCH					
					BITTEST					
					BITSET					
					BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
67	0h1E43	User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>

Address   Input14-A	Code	Comm.	Name	LCD	Setting Range		Initial	Property*	V/F	SL	Ref.								
A						·····g······g-		,,											
Oh1E44   input14-B   Input14-B   B			input14-A	-															
B	68				0-0	xFFFF	0	X/A	0	I/P	p.105								
Oh1E45   input14-C		0h1E44		В															
Oh1E46   User function output14   Output15   Output16   Output16	69	01.4545			0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>								
On 1E45   Output 14		0h1E45		C															
User function   Ser   Func   Ser   Sub	70	0h1E46				767-32767	0	-/A	0	I/P	<u>p.105</u>								
Func15 1 ADD 2 SUB 3 ADDSUB 4 MiN 5 MAX 6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT 11 COMPARE-GQ 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	71					NOP	O·NIOP	Υ/Δ	0	I/D	n 105								
2 SUB 3 ADDSUB 4 MIN 5 MAX 6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT 11 COMPARE-GEQ 12 COMPARE-GEQ 12 COMPARE-NEQUAL 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	<i>/</i> I		Oser function 13				U.INOF	~~		1/ [	<u>p.103</u>								
3 ADDSUB 4 MIN 5 MAX 6 ABS 7 NEGATE 8 MPYDIV 9 REMAINDER 10 COMPARE-GT 11 COMPARE-GQ 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							-												
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																			
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																			
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							1												
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							_												
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																			
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																			
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					9	REMAINDER													
0h1E47  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					10	COMPARE-GT													
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					11	COMPARE-GEQ													
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													12	COMPARE-					
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		0b1F47																	
14 TIMER 15 LIMIT 16 AND 17 OR 18 XOR 19 ANDOR 20 SWITCH 21 BITTEST 22 BITSET 23 BITCLEAR 24 LOWPASSFILTER		OITTE 17			13														
15 LIMIT 16 AND 17 OR 18 XOR 19 ANDOR 20 SWITCH 21 BITTEST 22 BITSET 23 BITCLEAR 24 LOWPASSFILTER					14		_												
16 AND 17 OR 18 XOR 19 ANDOR 20 SWITCH 21 BITTEST 22 BITSET 23 BITCLEAR 24 LOWPASSFILTER																			
17 OR 18 XOR 19 ANDOR 20 SWITCH 21 BITTEST 22 BITSET 23 BITCLEAR 24 LOWPASSFILTER																			
18 XOR 19 ANDOR 20 SWITCH 21 BITTEST 22 BITSET 23 BITCLEAR 24 LOWPASSFILTER							1												
19 ANDOR 20 SWITCH 21 BITTEST 22 BITSET 23 BITCLEAR 24 LOWPASSFILTER																			
21 BITTEST 22 BITSET 23 BITCLEAR 24 LOWPASSFILTER					19	ANDOR													
22 BITSET 23 BITCLEAR 24 LOWPASSFILTER							1												
23 BITCLEAR 24 LOWPASSFILTER					21	BITTEST	1												
24 LOWPASSFILTER					22	BITSET	1												
					23	BITCLEAR	1												
25 PI_CONTORL					24	LOWPASSFILTER	LTER												
					25	PI_CONTORL	1												

Code	Comm.	Name	LCD	Setting Range		Initial	Property*	V/F	SL	Ref.
- Goule	Address		Display			Value				
				26	PI_PROCESS					
				27	UPCOUNT	1				
				28	DOWNCOUNT	1				
72		User function	User	0-0	xFFFF	0	X/A	0	I/P	p.105
	0h1E48	input15-A	Input15-							
73		User function	A User	0-0	)xFFFF	0	X/A	0	I/P	p.105
75	0h1E49	input15-B	Input15-		WIIII		7,77		1/1	<u>p.105</u>
		<b>,</b>	В							
74		User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
	0h1E4A	input15-C	Input15-							
75		User function	User	-32	767-32767	0	-/A	0	I/P	p.105
, 5	0h1E4B	output15	Output15		., 0, 32, 0,		// \		., .	<u>p.103</u>
76		User function 16	User	0	NOP	0:NOP	X/A	0	I/P	p.105
			Func16	1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
	0h1E4C			11	COMPARE-GEQ					
				12	COMPARE-					
				12	EQUAL	_				
				13	COMPARE- NEQUAL					
				14	TIMER	-				
					LIMIT	-				
				16	AND	-				
					OR	1				
					XOR	1				
					ANDOR	1				
					SWITCH	1				
					BITTEST	†				
		1	1	<u> </u>	I				1	<u> </u>

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/A	0	I/P	<u>p.105</u>
78	0h1E4E	User function input16-B	User Input16- B	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
79	0h1E4F	User function input16-C	User Input16- C	0-0	xFFFF	0	X/A	Ο	I/P	<u>p.105</u>
80	0h1E50	User function output 16	User Output16	-32	767-32767	0	-/A	Ο	I/P	<u>p.105</u>
81		User function 17	User	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			Func17	1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
	0h1E51			9	REMAINDER					
					COMPARE-GT					
					COMPARE-GEQ					
					COMPARE- EQUAL					
				13	COMPARE- NEQUAL					
					TIMER					
					LIMIT					
					AND					
				17	OR					

Code	Comm.	Name	LCD	Set	ting Range	Initial	Property*	V/F	SL	Ref.
	Address		Display			Value				
					XOR					
				19	ANDOR					
				20						
				21						
					BITSET					
					BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
82		User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
	0h1E52	input17-A	Input17-							
83		User function	A User	0-0	)xFFFF	0	X/A	0	I/P	p.105
03	0h1E53	input17-B	Input17-	0-0	/AI I I I		~~		1/ [	<u>p.103</u>
			В							
84		User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
	0h1E54	input17-C	Input17-							
85		User function	C User	-32	767-32767	0	-/A	0	I/P	p.105
03	0h1E55	output17	Output17	32	.707 32707		//\		.,.	<u>p.103</u>
86		User function 18	User	0	NOP	0:NOP	X/A	0	I/P	<u>p.105</u>
			Func18	1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
	0h1E56			7	NEGATE					
	0111230			8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				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					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
87		User function	User	0-0	xFFFF	0	X/A	0	I/P	p.105
	0h1E57	input18-A	Input18- A							
88		User function	User	0-0	xFFFF	0	X/A	0	I/P	p.105
	0h1E58	input18-B	Input18-							<u> </u>
			В							
89	0h1E59	User function	User	0-0	xFFFF	0	X/A	0	I/P	<u>p.105</u>
	UNIESS	input18-C	Input18- C							
90	0h1E5A	User function	User	-32	767-32767	0	-/A	0	I/P	p.105
	UNTESA	output18	Output18							

## **6.14 Groups for LCD Keypad Only**

## 6.14.1 Trip Mode (TRP Last-x)

Code	Name	LCD Display		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			-	-
05	NTC temperature	Temperature	-		-	-
06	Input terminal state	DI Status	-		0000 0000	-
07	Output terminal state	DO Status	-		000	-
08	Trip time after Power on	Trip On Time	-		0/00/00 00:00	-
09	Trip time after operation start	Trip Run Time			0/00/00 00:00	_
10	Delete trip history	Trip Delete?	0 1	No Yes	-	

### 6.14.2 Config Mode (CNF)

Code	Name	LCD Display		ting Range	Initial Value	Ref.
00	Jump code	Jump Code		9	42	<u>p.42</u>
01	Keypad language selection	Language Sel		English	0 : English	-
02	LCD constrast adjustment	LCD Contrast			-	-
03	Multi keypad ID	Multi KPD ID		9	3	<u>p.104</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			-	-
20	Status window display item	Anytime Para	0	Frequency	0: Frequency	-

Code	Name	LCD Display	Set	tting Range	Initial Value	Ref.
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		
			4	Output Power		
			5	WHour		
			6	DCLink		
			7	DI State		
			8	DO State		
			9	V1 Monitor(V)		
			10	V1 Monitor(%)		
	MA : t		13	V2 Monitor(V)	20. 44	
23	Monitor mode display item3	Monitor Line-3	14	V2 Monitor(%)	3:Output Voltage	-
	items		15	12	Voltage	
			16	I2 Monitor(%)		
			17	PID Output		
			18	PID Ref Value		
			19	PID Fdb Value		
			20	Torque		
			21	Torque Limit		
			23	Speed Limit		
			24	Load Speed		
24	Monitor mode	Mon Mode Init	0	No	0:No	
	initialization	Monwodeniit	1	Yes	0.110	
30	Option slot 1 type display	Option-1 Type	0	None	0:None	-
31	Option slot 2 type display	Option-2Type	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		_
<del>-1</del> 0	i didificte i ilitidiization	i didirictei IIIIt	4	ADV Grp		
			5	CON Grp		
			6	IN Grp		
			7	OUT Grp		

Code	Name	LCD Display		ting Range	Initial Value	Ref.
			8	COM Grp		
			9	APP Grp		
			11	APO Grp <sup>69</sup>		
			12	PRT Grp		
			13	M2 Grp		
41	Display changed	Changed Para	0	View All	0:View All	_
	Parameter	Changearara	1	View Changed	0.VICW 7 (II	
			0	None		
			1	JOG Key		
42	Multi key item	Multi Key Sel	2	Local/Remote	0:None	_
12	Water Rey Rem	Walta Key Sei	3	UserGrp SelKey	o vone	
			4	Multi KPD		
43	Macro function item	Macro Select	0	None	0:None	-
44	4 Trip history deletion	Erase All Trip		No	O.N	-
44				Yes	0:No	
45	User registration code	UserGrp AllDel		No	0:No	-
<del></del>	deletion			Yes	0.110	
46	Read parameters	Parameter Read		No	0:No	-
<del></del>	nead parameters			Yes	0.110	
47	Write parameters	Parameter		No	0: No	
4/	write parameters	Write	1	Yes	0.110	_
48	Save parameters	Parameter Save	0	No	0:No	
<del>-1</del> 0	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	1		999	Password	-
60	Additional title undete	AddTitleLle	0	No	ONG	
60	Additional title update	Add Title Up	1	Yes	0:No	-
61	Simple parameter setting	Eacy Start On	0	No	1.Voc	
61	Simple parameter setting	Easy Start On	1	Yes	1:Yes	

<sup>&</sup>lt;sup>69</sup> Supported only Extension I/O(Option)

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

# Troubleshooting

## 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, the keypad displays the information briefly. If the LCD keypad is used, detailed information is shown on the LCD display. Users can read the warning message at Pr.90. When more than 2 trips occur at roughly the same time, the keypad (basic keypad with 7-segment display) displays the higher priority fault trip information, while 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>Keypad Display</b>	LCD Display	Туре	Description
<u> </u>	Over Load	Latch	Displayed when the motor overload trip is activated and the actual load level exceeds the set level. Operates when Pr.20 is set to a value other than 0.
<u> </u>	Under Load	Latch	Displayed when the motor underload trip is activated and the actual load level is less than the set level. Operates when Pr.27 is set to a value other than 0.
	Over Current1	Latch	Displayed when inverter output current exceeds 200% of the rated current.

<b>Keypad Display</b>	LCD Display	Туре	Description
	Over Voltage	Latch	Displayed when internal DC circuit voltage exceeds the specified value.
Lut	Low Voltage	Level	Displayed when internal DC circuit voltage is less than the specified value.
777	Low Voltage2	Latch	Displayed when internal DC circuit voltage is less than the specified value during inverter operation.
<u> </u>	Ground Trip*	Latch	Displayed when a ground fault trip occurs on the output side of the inverter and causes the current to exceed the specified value. The specified value varies depending on inverter capacity.
EEH	E-Thermal	Latch	Displayed based on inverse time-limit thermal characteristics to prevent motor overheating. Operates when Pr.40 is set to a value other than 0.
PüŁ	Out Phase Open	Latch	Displayed when a 3-phase inverter output has one or more phases in an open circuit condition. Operates when bit 1 of Pr.05 is set to 1.
( ; P[]	In Phase Open	Latch	Displayed when a 3-phase inverter input has one or more phases in an open circuit condition. Operates only when bit 2 of Pr.05 is set to 1.
	Inverter OLT	Latch	Displayed when the inverter has been protected from overload and resultant overheating, based on inverse time-limit thermal characteristics. 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.
חווב	No Motor Trip	Latch	Displayed when the motor is not connected during inverter operation. Operates when Pr.31 is set to 1.

<sup>\* \$100</sup> inverters rated for 4.0kW 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**

Keypad Displa	LCD Display	Туре	Description
[]HE	Over Heat	Latch	Displayed when the tempertature of the inverter heat sink exceeds the specified value.
	Over Current2	Latch	Displayed when the DC circuit in the inverter detects a specified level of excessive, short circuit current.
Eht	External Trip	Latch	Displayed when an external fault signal is provided by the multi-function terminal. Set one of the multi-function input terminals at In.65-69 to 4 (External Trip) to enable external trip.

Keypad Display	LCD Display	Туре	Description
keypad Display	BX	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.65-69 to 5 (BX) to enable input block function.
H!'E	H/W-Diag	Fatal	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).  EEP Err: An error in reading/writing parameters due to keypad or memory (EEPRom) fault.  ADC Off Set: An error in the current sensing circuit (U/V/W terminal, current sensor, etc.).
	NTC Open	Latch	Displayed when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT).
FAn	Fan Trip	Latch	Displayed when an error is detected in the cooling fan. Set Pr.79 to 0 to activate fan trip (for models below 22kW capacity).
الم الم	Pre-PID Fail	Latch	Displayed when pre-PID is operating with functions set at AP.34–AP.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.
ات ا	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 Ad.41. Set either OU.31 or OU.32 to 35 (BR Control).
5FA 5Fb	Safety A(B) Err	Latch	Displayed when at least one of the two safety input signals is off.

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

Keypad Display	LCD Display	Туре	Description
LUr	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 Pr.12 to any value other than 0.
HOTA TOF	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.

<b>Keypad Display</b>	LCD Display	Туре	Description
Err			Displayed when the error code continues for more than 5 sec.  ('Errc'->'-rrc'-> E-rc'-> 'Er-c'-> 'Er'-> 'Er'
			-> 'Errc'->)
PAr	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.
[ [PE	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

<b>Keypad Display</b>	LCD Display	Description
	Over Load	Displayed when the motor is overloaded. Operates when Pr.17 is set to 1. To operate, select 5. Set the digital output terminal or relay (OU.31 or OU.33) to 5 (Over Load) to receive overload warning output signals.
	Under Load	Displayed when the motor is underloaded. Operates when Pr.25 is set to 1. Set the digital output terminal or relay (OU.31 or OU.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 (OU.31 or OU.33) to 6 (IOL) to receive inverter overload warning output signals.
	Lost Command	Lost command warning alarm occurs even with Pr.12 set to 0. The warning alarm occurs based on the condition set at Pr.13-15. Set the digital output terminal or relay (OU.31 or OU.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''	Fan Warning	Displayed when an error is detected from the cooling fan while Pr.79 is set to 1. Set the digital output terminal or relay (OU.31 or OU.33) to 8 (Fan Warning) to receive fan warning output signals
[EFAn]	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).
(ECAb)	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).

K	eypad Display	LCD Display	Description
	ָ ֖֖֖֖֖֖֖֖֖֖֖֖֖֓֞֝֞֝֞֞֞֞֞֞	DB	Displayed when the DB resistor usage rate exceeds the set value. Set
	00_	Warn %ED	the detection level at Pr.66.
FLEL		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.

Туре	Cause	Remedy	
Over Load	The load is greater than the motor's rated capacity.	Ensure that the motor and inverter have appropriate capacity ratings.	
	The set value for the overload trip level (Pr.21) is too low.	Increase the set value for the overload trip level.	
Under Load	There is a motor-load connection problem.	Replace the motor and inverter with models with lower capacity.	
	The set value for underload level (Pr.29, Pr.30) is less than the system's minimum load.	Reduce the set value for the underload level.	
Over Current1	Acc/Dec time is too short, compared to load inertia (GD2).	Increase Acc/Dec time.	
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.	
	The inverter supplied an output while the motor was idling.	Operate the inverter after the motor has stopped or use the speed search function (Cn.60).	
	The mechanical brake of the motor is operating too fast.	Check the mechanical brake.	
Over Voltage	Deceleration time is too short for the load inertia (GD2).	Increase the acceleration time.	
	A generative load occurs at the inverter output.	Use the braking unit.	
	The input voltage is too high.	Determine if the input voltage is above the specified value.	
Low Voltage	The input voltage is too low.	Determine if the input voltage is below the specificed value.	
	A load greater than the power capacity is connected to the system (e.g., a welder, direct motor connection, etc.)	Increase the power capacity.	
	The magnetic contactor connected to the power source has a faulty connection.	Replace the magnetic contactor.	

Туре	Cause	Remedy	
Low Voltage2	The input voltage has decreased during the	Determine if the input voltage is above	
	operation.	the specified value.	
	An input phase-loss has occurred.	Check the input wiring.	
	The power supply magnetic contactor is	Replace the magnetic contractor.	
	faulty.		
Ground Trip	A ground fault has occurred in the inverter	Check the output wiring.	
·	output wiring.	, ,	
	The motor insulation is damaged.	Replace the motor.	
E-Thermal	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	
	capacity.	has increased capacity.	
	The set value for electronic thermal	Set an appropriate electronic thermal	
	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.	
Input Phase	The magnetic contactor on the input side	Check the magnetic contactor on the	
Open	has a connection fault.	input side.	
	The input wiring is faulty.	Check the input wiring.	
	The DC link capacitor needs to be replaced.	Replace the DC link capacitor. Contact	
		the retailer or the LSIS customer service	
		center.	
Inverter OLT	The load is greater than the rated motor	Replace the motor and inverter with	
	capacity.	models that have increased capacity.	
	The torque boost level is too high.	Reduce the torque boost level.	
Over Heat	There is a problem with the cooling system.	Determine if a foreign object is	
		obstructing the air inlet, outlet, or vent.	
	The inverter cooling fan has been operated	Replace the cooling fan.	
	for an extended period.	Kanatha arabiant tananantuna balau.	
	The ambient temperature is too high.	Keep the ambient temperature below	
		50℃.	
Over Current2	Output wiring is short-circuited.	Check the output wiring.	
	There is a fault with the electronic	Do not operate the inverter. Contact the	
	semiconductor (IGBT).	retailer or the LSIS customer service	
NTCO	The amplitude to the second of	center.	
NTC Open	The ambient temperature is too low.	Keep the ambient temperature above -	
		10℃.	
	There is a fault with the internal	Contact the retailer or the LSIS customer	
	temperature sensor.	service center.	
FAN Lock	A foreign object is obstructing the fan's air	Remove the foreign object from the air	
	vent.	inlet or outlet.	

Туре	Cause	Remedy
	The cooling fan needs to be replaced.	Replace the cooling fan.
IP54 FAN Trip	The fan connector is not connected.	Connect the fan connector.
	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
Parameters	The inverter is in operation (driving	Stop the inverter to change to program
cannot be set.	mode).	mode and set the parameter.
	The parameter access is incorrect.	Check the correct parameter access level and set the parameter.
	The password is incorrect.	Check the password, disable the parameter lock and set the parameter.
	Low voltage is detected.	Check the power input to resolve the low voltage and set the parameter.
The motor does not rotate.	The frequency command source is set incorrectly.	Check the frequency command source setting.
	The operation command source is set incorrectly.	Check the operation command source setting.
	Power is not supplied to the terminal R/S/T.	Check the terminal connections R/S/T and U/V/W.
	The charge lamp is turned off.	Turn on the inverter.
	The operation command is off.	Turn on the operation command (RUN).
	The motor is locked.	Unlock the motor or lower the load level.
	The load is too high.	Operate the motor independently.
	An emergency stop signal is input.	Reset the emergency stop signal.
	The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
	The input option for the frequency command is incorrect.	Check the input option for the frequency command.
	The input voltage or current for the frequency command is incorrect.	Check the input voltage or current for the frequency command.
	The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode setting.
	The frequency command value is too low.	Check the frequency command and input a value above the minimum frequency.

Туре	Cause	Remedy
,	The [STOP/RESET] key is pressed.	Check that the stoppage is normal, if so
		resume operation normally.
	Motor torque is too low.	Change the operation modes (V/F, IM, and Sensorless). If the fault remains, replace the inverter with a model with
		increased capacity.
The motor	The wiring for the motor output cable is	Determine if the cable on the output
rotates in the	incorrect.	side is wired correctly to the phase
opposite		(U/V/W) of the motor.
direction to the	The signal connection between the	Check the forward/reverse rotation
command.	control circuit terminal (forward/reverse	wiring.
	rotation) of the inverter and the	
	forward/reverse rotation signal on the	
	control panel side is incorrect.	
The motor only	Reverse rotation prevention is selected.	Remove the reverse rotation
rotates in one	T	prevention.
direction.	The reverse rotation signal is not	Check the input signal associated with
	provided, even when a 3-wire sequence is selected.	the 3-wire operation and adjust as
The motor is	The load is too heavy.	necessary.  Reduce the load.
overheating.	The load is too heavy.	Increase the Acc/Dec time.
overneating.		Check the motor parameters and set
		the correct values.
		Replace the motor and the inverter with
		models with appropriate capacity for
		the load.
	The ambient temperature of the motor is	Lower the ambient temperature of the
	too high.	motor.
	The phase-to-phase voltage of the	Use a motor that can withstand phase-
	motor is insufficient.	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	Check the motor fan and remove any
	obstructed with debris.	foreign objects.
The motor stops	The load is too high.	Reduce the load.
during		Replace the motor and the inverter with
acceleration or		models with capacity appropriate for
when connected		the load.
to load.		

Туре	Cause	Remedy
The motor does not accelerate.	The frequency command value is low.	Set an appropriate value.
/The acceleration time is too long.	The load is too high.	Reduce the load and increase the acceleration time. Check the mechanical brake status.
	The acceleration time is too long.	Change the acceleration time.
	The combined values of the motor properties and the inverter parameter are incorrect.	Change the motor related parameters.
	The stall prevention level during acceleration is low.	Change the stall prevention level.
	The stall prevention level during operation is low.	Change the stall prevention level.
	Starting torque is insufficient.	Change to vector control operation mode. If the fault is still not corrected, replace the inverter with a model with increased capacity.
Motor speed varies during	There is a high variance in load.	Replace the motor and inverter with models with increased capacity.
operation.	The input voltage varies.	Reduce input voltage variation.
	Motor speed variations occur at a specific frequency.	Adjust the output frequency to avoid a resonance area.
The motor rotation is different from the setting.	The V/F pattern is set incorrectly.	Set a V/F pattern that is suitable for the motor specification.
The motor	The deceleration time is set too long.	Change the setting accordingly.
deceleration time is too long even with Dynamic Braking (DB)	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.
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	Noise occurs due to switching inside the inverter.	Change the carrier frequency to the minimum value.
operation, a control unit malfunctions or noise occurs.		Install a micro surge filter in the inverter output.

Туре	Cause	Remedy
When the inverter is	An earth leakage breaker will interrupt the supply if current flows to ground	Connect the inverter to a ground terminal.
operating, the earth leakage		Check that the ground resistance is less than $100\Omega$ for $200V$ inverters and less
breaker is		than $10\Omega$ for 400V inverters.
activated.		Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter.
		Lower the carrier frequency.
		Make the cable length between the inverter and the motor as short as possible.
The motor vibrates severely	Phase-to-phase voltage of 3-phase power source is not balanced.	Check the input voltage and balance the voltage.
and does not rotate normally.		Check and test the motor's insulation.
The motor makes humming, or loud noises.	Resonance occurs between the motor's natural frequency and the carrier frequency.	Slightly increase or decrease the carrier frequency.
	Resonance occurs between the motor's natural frequency and the inverter's	Slightly increase or decrease the carrier frequency.
	output frequency.	Use the frequency jump function to avoid the frequency band where resonance occurs.
The motor vibrates/hunts.	The frequency input command is an external, analog command.	In situations of noise inflow on the analog input side that results in command interference, change the input filter time constant (In.07).
	The wiring length between the inverter and the motor is too long.	Ensure that the total cable length between the inverter and the motor is less than 200m (50m for motors rated 3.7 kW or lower).
The motor does	It is difficult to decelerate sufficiently,	Adjust the DC braking parameter.
not come to a complete stop	because DC braking is not operating normally.	Increase the set value for the DC braking current.
when the inverter output stops.		Increase the set value for the DC braking stopping time.
The output frequency does	The frequency reference is within the jump frequency range.	Set the frequency reference higher than the jump frequency range.
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.

Туре	Cause	Remedy	
	Because the load is too heavy, the stall	Replace the inverter with a model with	
	prevention function is working.	increased capacity.	
The cooling fan	The control parameter for the cooling fan	Check the control parameter setting for	
does not rotate.	is set incorrectly.	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.

#### ① 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>5</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	Refer to <u>9.1</u> <u>Input and</u> <u>Output</u> <u>Specification</u> on page <u>241</u> .	Digital multimeter tester

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
			terminal block.		
Input/Output circuit	Smoothing capacitor	Is there any leakage from the inside? Is the capacitor swollen?	Visual inspection	No abnormality	-
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
Input/Output circuit	nput/Output All		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? Is there any	Tighten up all screws.  Visual	No abnormality	

Inspection	Inspection item	Inspection	Inspection	Judgment	Inspection	
area	inspection item	details	method	standard	equipment	
		evidence of parts overheating?	inspection			
	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	-	
			Measure with capacity meter.	Rated capacity over 85%	Capacity meter	
	Relay	Is there any chattering noise during operation? Is there any	Visual inspection	No abnormality	-	
		damage to the contacts?	inspection			
	Braking resistor	damage from resistance?	Visual inspection	No abnormality	Digital multimeter / anaog tester	
		Check for disconnection.	Disconnect one side and measure with a tester.	Must be within ±10% of the rated value of the resistor.		
Control circuit Protection circuit	Operation check	Check for output voltage imbalance while the inverter is in operation.	Measure voltage between the inverter output terminal U/V/ W.	Balance the voltage between phases: within 4V for 200V series and within 8V for 400V series.	Digital multimeter or DC voltmeter	
		Is there an error in the display circuit after the	Test the inverter ouput protection in	The circuit must work according to		

Inspection	Inspection item	Inspection	Inspection	Judgment	Inspection
area		details	method	standard	equipment
		sequence	both short and	the sequence.	
		protection test?	open circuit		
			conditions.		
Cooling	Cooling fan	Are any of the	Check all	No	-
system		fan parts loose?	connected	abnormality	
			parts and		
			tighten all		
			screws.		
Display	Display device	Is the display	Check the	Specified and	Voltmeter,
		value normal?	command	managed	Ammeter, etc.
			value on the	values must	
			display device.	match.	

### 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 M $\Omega$	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 Storage and Disposal

#### 8.2.1 Storage

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

• Store the product in the same environmental conditions as specified for operation (refer to <u>1.3</u> <u>Installation Considerations</u> on page <u>5</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.

#### 8.2.2 Disposal

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

#### 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 200V (0.4-4 kW)

Model			0004	8000	0015	0022	0037	0040	
Applied motor	Heavy load	НР	0.5	1.0	2.0	3.0	5.0	5.4	
		kW	0.4	0.75	1.5	2.2	3.7	4.0	
Rated output	Rated apacity (kVA)	Heavy load	1.0	1.9	3.0	4.2	6.1	6.5	
	Rated current (A)	Heavy load	2.5	5.0	8.0	11.0	16.0	17.0	
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)						
	Output voltage (V)		3-phase 200-240 V						
Rated	Working voltage (V)		3-phase 200-240 VAC (-15% to +10%)						
input	Input frequency		50-60 Hz (±5%)						
	Rated current (A)	Heavy load	2.2	4.9	8.4	11.8	17.5	18.5	
Weight (lb /kg)		7.9/3.6	7.9/3.6	11.5/5.2	11.9/5.4	12.13/5.5	12.13/5.5		

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage.
- The rated output current is limited based on the carrier frequency set at Cn.04.
- The output voltage becomes 20~40% lower during no-load operations to protect the inverter from the impact of the motor closing and opening (0.4~4.0kW models only).

#### 3 Phase 200V (5.5-15 kW)

Model			0055	0075	0110	0150	
Applied motor	Heavy load	НР	7.5	10	15	20	
		kW	5.5	7.5	11	15	
Rated output	Rated capacity (kVA)	Heavy load	9.1	12.2	17.5	22.9	
	Rated current (A)	Heavy load	24.0	32.0	46.0	60.0	
	Output frequency		0-400 Hz (IM Sensorless : 0-120 Hz)				
	Output voltage (V)		3 phase 200-240V				
Rated input	Working voltage (V)		3 phase 200-240VAC (-15% to +10%)				
	Input frequency		50-60 Hz (±5%)				
	Rated current (A)	Heavy load	25.8	34.9	50.8	66.7	
Weight (lb /kg)		19.4/8.8	19.4/8.8	20.7/9.4	26.2/11.9		

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage.
- The rated output current is limited based on the carrier frequency set at Cn.04.

### 3-Phase 400V (0.4-4 kW)

Model □□	□□\$100-4□□		0004	8000	0015	0022	0037	0040			
Applied motor	Heavy load	НР	0.5	1.0	2.0	3.0	5.0	5.4			
motor	neavy load	kW	0.4	0.75	1.5	2.2	3.7	4.0			
Rated output	Rated capacity	Heavy load	1.0	1.9	3.0	4.2	6.1	6.5			
	Rated current (A)	Heavy load	1.3	2.5	4.0	5.5	8.0	9.0			
	Output freque	0-400 Hz	0-400 Hz (IM Sensorless: 0-120 Hz)								
	Output voltag	Output voltage (V)		3-phase 380-480V							
Rated	Working volta	ge (V)	3-phase 380-480VAC (-15% to +10%)								
input	Input frequence	СУ	50-60 Hz	(±5%)							
	Rated current (A)	Heavy load	1.1	2.4	4.2	5.9	8.7	9.8			
Weight (lb /kg) (Non EMC Filter type)			8.2/3.7 (7.9/3.6)	8.2/3.7 (7.9/3.6)	11.7/5.3 (11.5/5.2)	12.1/5.5 (11.9/5.4)	12.3/5.6 (12.13/5.5)	12.3/5.6 (12.13/5.5)			

- The standard motor capacity is based on a standard 4-pole motor
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage.
- The rated output current is limited based on the carrier frequency set at Cn.04.
- The output voltage becomes 20~40% lower during no-load operations to protect the inverter from the impact of the motor closing and opening (0.4~4.0kW models only).

### 3-Phase 400V (5.5-22 kW)

Model □□	□□S100-4□□	0055	0075	0110	0150	0185	0220				
Applied motor	Heavy load	HP	7.5	10	15	20	25	30			
motor	i leavy load	kW	5.5	7.5	11	15	18.5	22			
Rated output			9.1	12.2	18.3	22.9	29.7	34.3			
	Rated current (A)	Heavy load	12.0	16.0	24.0	30.0	39.0	45.0			
	Output freque	ency	0-400 Hz (	0-400 Hz (IM Sensorless: 0-120 Hz)							
	Output voltag	je (V)	3-phase 380-480V								
Rated	Working volta	ge (V)	3-phase 3	3-phase 380-480VAC (-15% to +10%)							
input	Input frequen	су	50-60 Hz (	(±5%)							
	Rated current (A)	Heavy load	12.9	17.5	26.5	33.4	43.6	50.7			
Weight (lb /	_		19.4/8.8	19.6/8.9	21.2/9.6	21.6/9.8	27.3/12.4	27.3/12.4			
(Non EMC F	ilter type)		(18.9/8.6)	(19.2/8.7)	(20.7/9.4)	(21.2/9.6)	(26.9/12.2)	(26.9/12.2)			

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 220 V supply voltage, and for 400V inverters is based on a 440 V supply voltage.
- The rated output current is limited based on the carrier frequency set at Cn.04.

# pecification

# **9.2 Product Specification Details**

Items			Description	
Control	Control m	ethod	V/F control, slip compensation	on, sensorless vector
	Frequency power reso Frequency V/F pattern	olution accuracy	Digital command: 0.01 Hz Analog command: 0.06 Hz (6 1% of maximum output fred Linear, square reduction, use	juency
	Overload	capacity	Heavy load rated current: 15	0% 1 min
	Torque bo		Manual torque boost, autom	
Operation	Operation Frequency	settings	Analog type: -10~10V, 0~10V Digital type: key pad, pulse t	rain input
	Input Multi function	Multi	<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> <li>Select PNP (Source) or NPN (according to In.65- In.69 cod</li> <li>Forward direction operate</li> </ul>	Automatic tuning     Energy buffering     Flux braking     Fire Mode  Sink) mode. Functions can be set les and parameter settings.  To Reverse direction
	Output	Pulse train Multi function open	<ul> <li>Reset</li> <li>Emergency stop</li> <li>Multi step speed frequent high/med/low</li> <li>DC braking during stop</li> <li>Frequency increase</li> <li>3-wire</li> <li>Local/remote operation in transition</li> <li>Select acc/dec/stop</li> </ul> 0-32 kHz, Low Level: 0-2.5V, Fault output and inverter operation status output	<ul> <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>

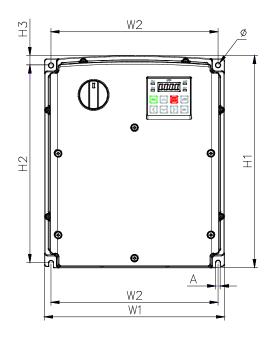
Items			Description		
		collector terminal			
		Multi function relay terminal			nan (N.O., N.C.) AC250V 1A, nan DC 30V, 1A
		Analog output Pulse train	0-12Vdc (0-24mA): Select free voltage, DC terminal voltage Maximum 32 kHz, 10-12V		
Protection function	Trip	ruise traiii	Over current trip External signal trip ARM short circuit current Over heat trip Input imaging trip Ground trip Motor over heat trip I/O board link trip No motor trip Parameter writing trip Emergency stop trip Command loss trip External memory error CPU watchdog trip Motor normal load trip	trip	<ul> <li>Over voltage trip</li> <li>Temperature sensor trip</li> <li>Inverter over heat</li> <li>Option trip</li> <li>Output imaging trip</li> <li>Inverter overload trip</li> <li>Fan trip</li> <li>Pre-PID operation failure</li> <li>External break trip</li> <li>Low voltage trip during operation</li> <li>Low voltage trip</li> <li>Safety A(B) trip</li> <li>Analog input error</li> <li>Motor overload trip</li> </ul>
	Alarm Instantane	ous	Command loss trip alarm, ov inverter overload alarm, fan o rate alarm, number of correc Heavy load less than 15 ms: c	operati	ion alarm, resistance braking on rotor tuning error
	blackout		(must be within the rated in range) Heavy load more than 15 ms	nput vo s: auto	oltage and rated output
Structure/ working environme	Cooling ty		Forced fan cooling structure Forced cooling type: 0.4-15 k some models)		V/0.4-22 kW 400V (excluding
nt	Protection	structure	IP66(NEMA 4X Indoor Only)		
	Ambient te	emperature	Heavy load: -10-40°C (14-10- No ice or frost should be pre-		
	Ambient h	umidity	Relative humidity less than 9 forming)		(to avoid condensation
	Storage te	mperature.	-20°C-65°C (-4-149°F)		

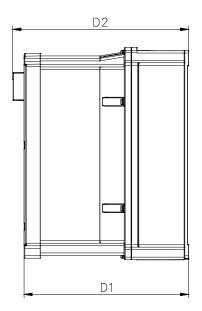
<u>က</u>
$\mathbf{z}$
റ്റ
=
ᇊ.
뫅
ᅙ.
ĭ.

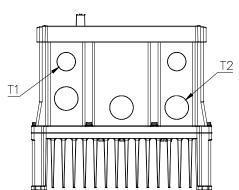
Items		Description
	Surrounding environment	Prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants (Pollution Degree 3 Environment).
	Operation altitude/oscillation	No higher than 3280ft (1,000m). Less than 9.8m/sec <sup>2</sup> (1G).
	Pressure	70-106 kPa

# 9.3 External Dimensions (IP 66 Type)

### 0.4~4.0kW (3-Phase)







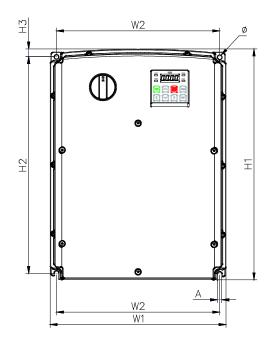
Items	Items		W2	H1	H2	НЗ	D1	D2	A	Φ	T1	T2
3-	0004S100-2	180	170	256.6	245	8.2	174.2	188.2	4.5	4.5	22.3	
phase	0008S100-2	(7.09)	(6.69)	(1010)	(9.65)	(0.32)	(6.86)	(7.41)	(0.18)	(0.18)	(0.88)	_

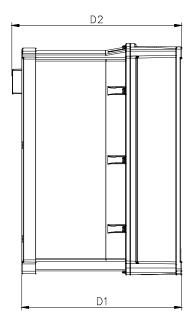
C	Λ
Ø	3
a	D
	٦.
_	ы
7	51
9	Ü
G	4
d	5
6	3
	4

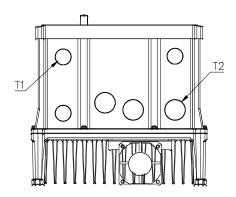
Items		W1	W2	H1	H2	Н3	D1	D2	Α	Φ	T1	T2
200V	0015S100-2											
	0022S100-2	220	204	258.8	241	11.8	201	215	5.5	5.5	22.3	28.6
	0037S100-2	(8.66)	(8.03)	(10.19)	(9.49)	(0.46)	(7.91)	(8.46)	(0.22)	(0.22)	(0.88)	(1.13)
	0040S100-2											
	0004S100-4	180	170	256.6	245	8.2	174.2	188.2	4.5	4.5	22.3	
_	0008S100-4	(7.09)	(6.69)	(1010)	(9.65)	(0.32)	(6.86)	(7.41)	(0.18)	(0.18)	(0.88)	
3- phase	0015S100-4											
400V	0022S100-4	220	204	258.8	241	11.8	201	215	5.5	5.5	22.3	28.6
	0037S100-4	(8.66)	(8.03)	(10.19)	(9.49)	(0.46)	(7.91)	(8.46)	(0.22)	(0.22)	(0.88)	(1.13)
	0040S100-4											

Units: mm (inches)

### 5.5~7.5Kw (3-Phase)





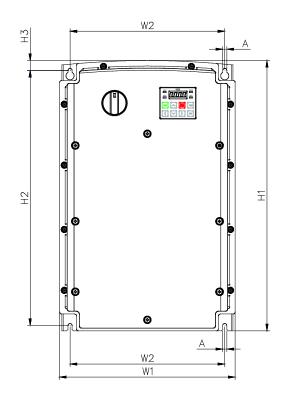


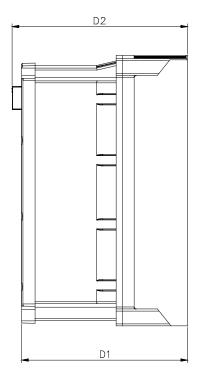
Items	ems		W2	H1	H2	НЗ	D1	D2	A	Φ	T1	T2
3- phase	0055S100-2		232	328	308	11		241.2	_	6	22.3	28.6
200V	0075S100-2	(9.84)	(9.13)	(12.91)	(12.13)	(0.43)	(8.94)	(9.50)	(0.24)	(0.24)	(0.88)	(1.13)
3- phase	0055S100-4	250	232	328	308	11		241.2	6	6	22.3	28.6
400V	0075S100-4	(9.84)	(9.13)	(12.91)	(12.13)	(0.43)	(8.94)	(9.50)	(0.24)	(0.24)	(0.88)	(1.13)

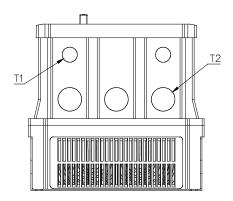
Units: mm (inches)

# pecification

### 11.0~22.0kW (3 Phase)







### **Technical Specification**

Items		W1	W2	H1	H2	НЗ	D1	D2	A	Φ	T1	T2
3- phase 200V	0110S100-2	260 (10.24)	229 (9.02)	399.6 (15.73)	377 (14.84)	14.6 (0.57)	245.4 (9.66)	259.6 (10.22)	6 (0.24)	-	22.3 (0.88)	34.9 (1.37)
	0150S100-2	300 (11.81)	270.8 (10.66)	460 (18.11)	436.5 (17.19)	15.5 (0.61)	250 (9.84)	264 (10.39)	6 (0.24)	-	22.3 (0.88)	44.5 (1.75)
2	0110S100-4	260	229	399.6	377	14.6	245.4	259.6	6	_	22.3	34.9
3- phase	0150S100-4	(10.24)	(9.02)	(15.73)	(14.84)	(0.57)	(9.66)	(10.22)	(0.24)		(0.88)	(1.37)
400V	0185S100-4	300	270.8	460	436.5	15.5	250	264	6		22.3	44.5
	0220S100-4	(11.81)	(10.66)	(18.11)	(17.19)	(0.61)	(9.84)	(10.39)	(0.24)	-	(0.88)	(1.75)

Units: mm (inches)

# **9.4 Peripheral Devices**

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

	(1.110)	Circuit Bre	eaker			Leakage B	Breaker	Magnetic	Contactor
Product	t (KW)	Model	Current (A)	Model	Current (A)	Model	Current (A)	Model	Current (A)
3-	0.4		5				5	МС-ба	9
phase 200V	0.75		10		15		10	MC-9a, MC-9b	11
	1.5	ABS33c	15			EBS33c	15	MC-18a, MC-18b	18
	2.2		20	UTE100	20		20	MC-22b	22
	3.7		30	OTETOO	30	-	30	MC-32a	32
	5.5	ABS53c	50		50	EBS53c	50	MC-50a	55
	7.5	ABS63c	BS63c 60 60 EBS63c		60	MC-65a	65		
	11	ABS103c	100		90	EBS103c	100	MC-85a	85
	15	AD3103C	125	UTS150	125	ED3103C	125	MC-130a	130
3-	0.4		3				5	МС-ба	7
phase 400V	0.75		5		15	EBS33c	3	МС-ба	/
4000	1.5		10				10	MC-9a, MC-9b	9
	2.2	ABS33c	10				10	MC-12a, MC-12b	12
	3.7		15				15	MC-18a,	18
	4		20	UTE100	20		20	MC-18b	10
	5.5		30		30		30	MC-22b	22
	7.5		30		30		30	MC-32a	32
		ABS53c	50		50	EBS53c	50	MC-50a	50
	15	ABS63c	60		60	EBS63c	60	MC-65a	65
	18.5	ABS103c	75		80	EBS103c	75	MC-75a	75
	22	ADSTOSE	100		90	LDJ103C	100	MC-85a	85

### 9.5 Fuse and Reactor Specifications

Product (kW)	Product (kW)		e	AC Reactor		DC Reactor		
			Voltage (V)	Inductance (mH)	Current(A)	Inductance (mH)	Current (A)	
	0.4 0.75	10		1.20	10	4	8.67	
	1.5	15		0.88	14	3	13.05	
	2.2	20		0.56	20		18.45	
3-phase 200V	3.7	32 50		0.39	30	1.33	26.35	
	5.5	50	600	0.30	34	1.60	32	
	7.5	63		0.22	45	1.25	43	
	11	80		0.16	64	0.95	61	
	15	100		0.13	79	0.70	75	
	0.4 0.75	10		4.81	4.8	16	4.27	
	1.5			3.23	7.5	12	6.41	
	2.2	15	=	2.34	10	8	8.9	
3-phase	3.7	20	1	1.22	15	5.4	13.2	
400V	5.5	32		1.12	19	3.20	17	
	7.5	35	1	0.78	27	2.50	25	
	11	50	-	0.59	35	1.90	32	
	15	63	1	0.46	44	1.40	41	
	18.5	70		0.40	52	1.00	49	
	22	100		0.30	68	0.70	64	

### 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.

### ① Attention

Utiliser UNIQUEMENT des fusibles d'entrée homologués de Classe H ou RK5 UL et des disjoncteurs UL. Se reporter au tableau ci-dessus pour la tension et le courant nominal des fusibless et des disjoncteurs.

# Speci

# **9.6 Terminal Screw Specification**

### **Input/Output Terminal Screw Specification**

Product (kW)		Terminal Screw Size	Screw Torque (Kgf·cm/Nm)		
	0.4				
	0.75	M3.5			
3-phase	1.5	1013.3			
	2.2		2.1-6.1/0.2-0.6		
	3.7		2.1-0.1/0.2-0.0		
200V	4	M4			
	5.5	IVI <del>4</del> 			
	7.5				
	11	M5	4.0-10.2/0.4-1.0		
	15	CIVIS	4.0-10.2/0.4-1.0		
	0.4				
	0.75	M2.5			
	1.5	M3.5	21.51/92.95		
	2.2				
	3.7		2.1-6.1/0.2-0.6		
3-phase	4				
400V	5.5	M4			
	7.5				
	11				
	15				
	18.5	M5	4.0-10.2/0.4-1.0		
	22				

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

Terminal	Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
P1-P5/	M2	2.2-2.5/0.22-0.25
CM/VR/V1/I2/AO/Q1/EG/24/		
SA,SB,SC/S+,S-,SG		
A1/B1/C1	M2.6	4.0/0.4

### **Technical Specification**

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

### ① Attention

Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courtscircuits 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 °C pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 ℃ pour le câblage de la borne de commande.

## 9.7 Braking Resistor Specification

Product (kW)		Resistance ( $\Omega$ )	Rated Capacity (W)
3-phase	0.4	300	100
200V	0.75	150	150
	1.5	60	300
	2.2	50	400
	3.7	33	600
	4	33	600
	5.5	20	800
	7.5	15	1,200
	11	10	2,400
	15	8	2,400
3-phase	0.4	1,200	100
400V	0.75	600	150
	1.5	300	300
	2.2	200	400
	3.7	130	600
	4	130	600
	5.5	85	1,000
	7.5	60	1,200
	11	40	2,000
	15	30	2,400
	18.5	20	3,600
	22	20	3,600

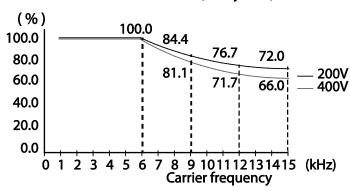
<sup>•</sup> The standard for braking torque is 150% and the working rate (%ED) is 5%. If the working rate is 10%, the rated capacity for braking resistance must be calculated at twice the standard.

### 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.

### Continuous rated current (heavy load)

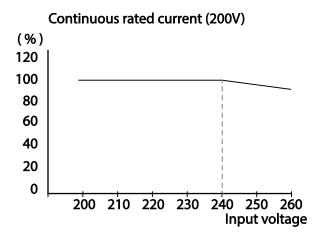


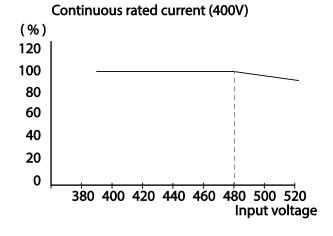
200V		400V	
<b>Carrier Frequency</b>	Constant-rated	<b>Carrier Frequency</b>	Constant-rated
(kHz)	Current (%)	(kHz)	Current (%)
1-6	100	1-6	100
9	84.4	9	81.1
12	76.7	12	71.7
15	72.0	15	66.0

# pecification

### **Derating by Input Voltage**

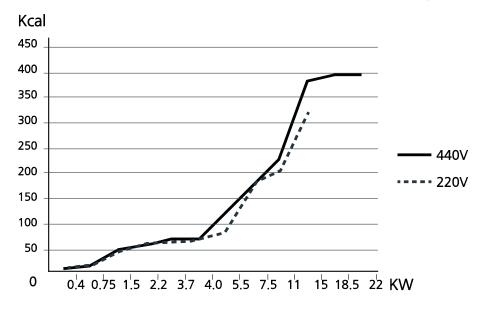
The continuous rated current of the inverter is limited based on the input voltage. Refer to the following graph.





### 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 frequency settings, under normal operating conditions.

## **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)	
Customer Info	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, 127, LS-ro, Dongan-gu,

Anyang-si, Gyeonggi-do,

Korea

Manufacturer: LSIS Co., Ltd.

Address: 56, Samseong 4-gil, Mokcheon-eup,

Dongnam-gu, Cheonan-si, Chungcheongnam-do,

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:

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

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

Based on the following specifications applied:

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

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

Place: Cheonan, Chungnam,

Korea

Mr. Sang Chun Moon / General Manager

5 4 m 2016.1.13

(Full name / Position)

LS'IS

263

### **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.

Suitable for Installation in a compartment Handing Conditioned Air

# **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.

### **EAC** mark



The EAC (EurAsian Conformity) mark is applied to the products before they are placed on the market of the Eurasian Customs Union member states.

It indicates the compliance of the products with the following technical regulations and requirements of the Eurasian Customs Union:

Technical Regulations of the Customs Union 004/2011 "On safety of low voltage equipment" Technical Regulations of the Customs Union 020/2011 "On electromagnetic compatibility of technical products"

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

LSIS inverters, S100 series



#### RFI FILTERS

THE LS RANGE OF POWER LINE FILTERS FEB ( Standard.) and FF (Footprint) SERIES, HAVE BEEN SPECIFICALLY DESIGNED WITH HIGH FREQUENCY LSIS INVERTERS. THE USE OF LS FILTERS, WITH THE INSTALLATION ADVICE OVERLEAF HELP TO ENSURE TROUBLE FREE USE ALONG SIDE SENSITIVE DEVICES AND COMPLIANCE TO CONDUCTED EMISSION AND IMMUNITY STANDARS TO EN 50081.

#### CAUTION

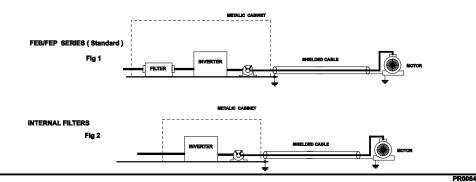
IN CASE OF A LEAKAGE CURRENT PROTECTIVE DEVICES IS USED ON POWER SUPPLY, IT MAY BE FAULT AT POWER-ON OR OFF. IN AVOID THIS CASE, THE SENSE CURRENT OF PROTECTIVE DEVICE SHOULD BE LARGER

#### 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.



LSLV serie	s /	Standard	Filters								
INVERTER	POWER	CODE	CURRENT	VOLTAGE	LEA KAGE CURRENT	DIMENSIONS L W H	MOUNTING Y X	WEIGHT	MOUNT	FIG.	OUTPUT CHOKES
THREE PHASE	THREE PHASE NOM. MAX.										
LSLV0004S100-2	0.4kW	FLD 3 007	7A	220-480VAC	0.5m A 27mA	255 x 50 x 126	25 x 240	1.1Kg		Α	FS - 1
LSLV0008S100-2	0.75kW	FLD 3007	//	220-400VAO	udilA 27iliA	200 X 00 X 120	23 X 240	1. IN		^	F0 - 1
LSLV0015S100-2	1.5kW	FLD 3 016	16A	220-480VAC	0.5mA 27mA	305 x 55 x 142	30 x 290	1.7Ka		Α	FS – 1
LSLV0022S100-2	2.2kW	1 LD 3010	10/	220-4 00 VAC	CONTA ZINIA	303 X 30 X 142	30 X 230	1.710		^	13-1
LSLV0037S100-2	3.7kW	FLD 3 020	20A	220-480VAC	0.5mA 27mA	335 x 60 x 150	35 x 320	1.8Kg		Α	FS - 2
LSLV0040S100-2	4kW	FLD 3020	20A	220-400VAC	udilA 27iliA	33 X 60 X 130	33 X 320	1.013	-	А	10-2
LSLV0055S100-2	5.5kW	FLD 3 042	42A	220-480VAC	0.5mA 27mA	330 x 70 x 185	45 x 314	2.8Kg		Α	FS – 2
LSLV0075S100-2	7.5kW	FLD 3 055	55A	220-480VAC	0.5mA 27mA	330 x 80 x 185	55 x 314	3.1Kg	-	Α	FS - 2
LSLV0110S100-2	11kW	FLD 3075	75A	220-480VAC	0.5mA 27mA	330 x 80 x 220	55 x 314	4Kg		Α	FS – 2
LSLV0150S100-2	15kW	FLD 3100	100A	220-480VAC	0.5m A 27mA	380 x 90 x 220	65 x 364	5.5Kg		Α	FS - 3

LSLV0004~0040 S100-2 EN 55011 CLASS B IEC/EN 61800-3 C2 LSLV0055~0220 S100-2 EN 55011 CLASS A IEC/EN 61800-3 C3

LSLV ser	ies /	Inte	rnal Filters
INVERTER	POWER	FIG.	OUTP UT CHOKES
THREE PHASE			
LSLV0004S100-4	0.4kW	2	FS -1
LSLV0008S100-4	0.75kW	2	FS-1
LSLV0015S100-4	1.5kW	2	FS-1
LSLV0022S100-4	2.2kW	2	FS-1
LSLV0037S100-4	3.7kW	2	FS-2
LSLV0040S100-4	4.0kW	2	FS-2
LSLV 00 55 S 100-4	5.5kW	2	FS -2
LSLV0075S100-4	7.5kW	2	FS-2
LSLV0110S100-4	11kW	2	FS-2
LSLV 01 50 S 100-4	15kW	2	FS-3
LSLV0185S100-4	18.5kW	2	FS-3
LSLV 02 20 S 100-4	22kW	2	FS-3

LSLV0004~0220 S100-4 EN 55011 CLASS A IEC/EN 61800-3 C3

# FEB SERIES ( Standard ) FIG.A W 4 0 н





Vector Motor Control Ibérica S.L. C/ Mar del Carth, 10 Pol. Ind. La Torre del Rector 08/130 Santa Perpètus de Mogoda (BARCELONA) ESPAÑA Tel. (+34) 935 748 206 Fax (+34) 935 748 248 Info@ymcs.s www.vmc.es



FS	SERIES	(	output chokes)

CODE	٥	W	Н	Х	Ø
F8-1	21	85	50	22	4
F8-2	28.5	105	62	90	- 5
FS-3	48	150	110	125 x 30	- 5

PR0064

# **Manual Revision History**

## **Revision History**

No	Date	Edition	Changes
1	2013.09	First Release	-
2	2014.11	2 <sup>nd</sup> Edition	S/W Version up(V2.0)
3	2015.06	3 <sup>rd</sup> Edition	S/W Version up(V2.3)
4	2016.09	4 <sup>th</sup> Edition	S/W Version up(V2.5)

# Index

2	Acc/Dec time	80
Z	Acc/Dec time switch frequency	84
2 square reducion58	configuration via multi-function terminal	
24 terminal28, 30	maximum frequency	
2nd Motor groupRefer to <i>M2(2nd Motor) group</i>	operation frequency	
3 1	Ad (Expanded function group)	
2 <sup>nd</sup> Operation mode100 2 <sup>nd</sup> command source101	Ad(Advanced) group	
Shared command (Main Source)101	Advanced groupRefer to Ad/Advance	d) group
Stated communic (Main Source)	analog frequency hold	
3	Analog Hold	
3	Analog HoldRefer to <i>analog freque</i>	ncy hold
3-phase 200V (0.4~4k W)242	analog input	26, 40
3-phase 200V (5.5~15 kW)243	I2 current input	
3-phase 400V (0.4~4 kW)244	I2 voltage input	
) pridse 400V (0.4 4 KVV)244	TI Pulse inputV1 voltage input	
<b>A</b>	analog input selection switch(SW2)	
4	- ·	
1-pole standard motor241, 244	analog output AO terminal	
Fore 3ta load a 1110tol	analog output selection switch(SW3)	
7	AO terminal	
/		
7-segment display38	analog output selection switch(SW3) AP(Application Function group)	
letters38		
numbers38	AP(Application group)	
	Application groupRefer to AP(Application	
Α	ASCII code	
	asynchronous communications system	115
A terminal (Normally Open)102	auto torque boost	92, 93
A1/C1/B1 terminal28	auto tuning	92
AC power input terminalRefer to R/S/T terminal	Auto Tuning	153
Acc/Dec pattern58, 85		
linear pattern85	В	
S-curve pattern85		
Acc/Dec reference82	B terminal (Normally Closed)	
Delta Freq80	bA(Basic function group)	151
Max Freq80	bA(Basic group)	40
Acc/Dec reference frequency80	basic configuration diagram	12
Ramp T Mode80	Basic groupRefer to bA(Basi	ic) group
Acc/Dec stop 88		

basic operation	37	keypad	73
bit 102		Command source	
bit (Off)	102	fwd/rev command terminal	
bit (On)	102	RS-485	
bit setting	102	run command/rotational direction	-
multi-function input setting	102	common terminal Re	eter to <i>EG terminal</i>
Bootlace Ferrule	29	communication	115
brake resistor	23	command loss protective operat	
braking resistance		communication address	
braking torque	257	communication line connection	
braking resistors	12	communication parameters communication speed	
broadcast		communication standards	
built-in communication		memory map	
	Neier to 115 405	PLC	115
BX225		protocol	123
		saving parameters defined by co	
C		setting virtual multi-function inp	
		Communication group	CM(Reter to
cable		Communication) group	
selection		compatible common area paran	neter132
shielded twisted pairsignal(control) cable specifications.		Considerations for the installation	n
Cable	10	Air Pressure	5
	0	Altitude/Vibration	5
Ground Specifications Power I/O Cable Specifications		Ambient Humidity	
cable tie		Environmental Factors	
		Considerations for the installation	
carrier frequency		Ambient Temperature	
derating		Control groupRefer to	Cn(Control) group
charge indicator		control terminal board wiring	24
charge lamp			
cleaning	235	D	
CM terminal	26, 30	_	
CM(communication function group	0)179	DC braking after start	94
CM(Communication group)	40	DC braking after stop	95
Cn (Control Function group)	162	DC braking frequency	95
Cn(Control) group	40	digital source	77
code number input	42	disposal	235, 239
command	73	dr(Drive group)	40, 146
configuration	73	Drive groupRefer	to <i>dr(Drive) group</i>
Command			- '
Cmd Source	73		
command source			

E	filter time constant62
_	filter time constant number101
earth leakage breaker232	free run stop96
EG terminal28	frequency jump99
error code127	frequency limit98
FE(frame error)127	frequency jump99
IA(illegal data address)127	frequency upper and lower limit value98
ID(illegal data value)127	maximum/start frequency98
IF(illegal function)127	frequency reference
WM(write mode error)127	•
ESC key39	frequency setting60
[ESC] key setup76	I2 current input66
cancel input39	I2 voltage input68
Jog key44	keypad60
local/remote switching76	RS-485
multi-function key76	TI Pulse input
remote / local operation switching77	V1 voltage input61
external 24V power terminal Refer to 24 terminal	variable resistor51 frequency setting (Pulse train) terminalRefer to $\pi$
external dimensions	terminal
0.8~1.5kW(Single Phase), 1.5~2.2kW(3 Phase)250	
External dimensions248	frequency setting(voltage) terminalRefer to V1
External dimensions	terminal
0.4kW(Single Phase), 0.4~0.8kW(3 Phase)248	fuse254
External Trip	
External IIIp224	G
<u>_</u>	9
F	ground20
forton defect	class 3 ground20
factory default52, 53	class 3 ground20
Fan Trip225	ground terminal20
Fan Warning226	Ground
fatal223	Ground Cable Specifications9
fault	Ground Trip224
fatal223	ground fault trip224
latch223	·
level223	ш
fault signal output terminal Refer to A1/C1/B1	н
terminal	half duplex system115
FE(FRAME ERROR)127	Heavy Duty5
ferrite	
fieldbus	I
communication option100	•
Fieldbus	I2 27, 66
i iciadasReiei (U <i>Heladus</i>	1 = =

analog input selection switch(5w2)2/	keypad display	38
frequency setting(current/voltage) terminal27	keypad key	39
IA(illegal data address)127	[▲]/[▼]/[▲]/[▶] key	
ID(illegal data value)127	[ESC] key	
IF(illegal function)127	[RUN] key	
In Phase Open224	[STOP/RESET] key	39
In(Input Terminal Block Function group)169		
In(Input Terminal) group40	L	
input terminal26	1.1	222
CM terminal26	latch	
12 terminal27	LCD keypad	
P1–P7 terminal26	wiring length	
SA terminal27	leakage breaker	253
SB terminal27	level	223
SC terminal27	lift-type load	85, 91, 92
TI terminal27	linear pattern	
V1 terminal26	·	
VR terminal	linear V/F pattern operation	
Input Terminal groupRefer to In(input terminal)	linear V/F pattern Operation	
group	base frequency	
inspection	start frequency	89
annual inspection236	local operation	
bi-annual inspection)238	[ESC] key	
installation11	Local/Remote Mode Switching remote peration	
basic configuration diagram12		
Installation flowchart11	local Operation	
wiring17	locating the installation site	
Installation	location	
Mounting the Inverter13	loop	
installation considerations5, 235, 238	loop time	108
	Lost Command	225, 226
J	Low Voltage	224
Jog Operation	LS INV 485 protocol	123
[ESC] key configuration44		
jump frequency99	M	
Jamp requertey	M2(2nd Motor Function group)	100
K	M2(2nd Motor Function group)	
IX.	M2(2nd Motor) group	
keypad37	magnetic contactor	
display37	Magnetic contactor	
operation keys37	maintenance	235

manual torque boost91	multi-step frequency71
Master115	setting71
master inverter104	Speed-L/Speed-M/Speed-H72
master unit103	
megger test236	N
micro surge filter23	N- terminal(- DC link terminal)23
monitor54	No Motor Trip224
monitor registration protocol details125	,
motor output voltage adjustment93	noise
motor rotational direction34	NPN mode(Sink)31
mounting bolt13	
mounting bracket15	O
multi function input terminal	oOut Phase Open224
In.65~71171	
Px terminal function setting171	Operation frequency Refer to frequency setting
multi function input terminal	operation group145
Px Define171	Operation group40
multi keypad	operation noise
Multi KPD105	frequency jump99
multi keypad(Multi-keypad)	OU(Output Terminal Block Function group)174
slave parameter104	OU(Output Terminal) group40
multi-drop Link System115	output terminalRefer to R/S/T terminal
Multi-function (open collector) output terminal	Output Terminal groupRefer to OU(output
Multi-function output item1(Q1 Define)176	terminal) group
Multi-function relay 1 item(Relay 1)175	output/communication terminal27
multi-function input terminal26	24 terminal28
factory default26	A1/C1/B1 terminal28
multi-function input terminal Off filter101	AO terminal27
multi-function input terminal On filter101	EG terminal28
P1-P7Refer	Q1 terminal28
multi-function input terminal control101	S+/S-/SG terminal28
multi-function key38, 44	TO terminal
[ESC] key44	Over Current1223
Multi Key Sel220	Over Current2224
multi-function key options220	Over Heat224
multi-function(open collector) output terminal	Over Load223
Refer to <i>Q1 terminal</i>	overload warning226
multi-keypad104	Over Voltage224
master parameter104	
multi-keypad)	
setting104	

Р	quantizingRefer to <i>Quantizir</i>	ng
•	Quantizing6	53
P1+ terminals(+ DC link terminals)23	noise6	53
P2P103		
communication function103	R	
master parameter103		
setting	R/S/T terminal2	
slave parameter103	R/S/T terminals23, 22	29
parameter	rated24	11
part names3	braking resistance rated capacity25	
parts illustrated3	rated input24	<del>1</del> 1
	Rated	
password	rated output24	
Peripheral devices253	reactor12, 25	
phase-to-phase voltage230	regenerated energy9	
PID control	remote operation7	77
PID feedback225	[ESC] key	
PNP mode(Source)30	local operation	
PNP/NPN mode selection switch(SW1)25	Local/Remote Mode Switching Reset Restart <i>refer to restarting after a tr</i>	
NPN mode(Sink)31		•
PNP mode(Source)30	resonance frequency	
post-installation checklist32	frequency jump	
power terminal23	restarting after a trip	
N- terminal	RS-23211	
P2+/B terminal23 U/V/W terminal23	communication17 RS-48511	
power terminal board wiring21	communication1	
power terminals	converter11	
R/S/T terminals23	integrated communication	
Power-on RunRefer to start at power-on	signal terminal28, 7	70
Pr(Protection Function group)187	RS-485 signal input terminal Refer to S+/S-/S	īG
	terminal	
Pr(Protection) group40	run prevention	
Preinsulated Crimp Terminal29	Fwd	78
Protection groupRefer to Pr(Protection) group	Rev	78
protocol123		
LS INV 485 protocol	S	
Pulse output terminal Refer to TO terminal		
_	S+/S-/SG terminal2	28
Q	S100 expansion common area parameter	
O1 towning	control area parameter(Read/Write)14	
Q1 terminal28	memory control area parameter(Read/Write)14	ŧZ

monitor area parameter (read only)135	surge killer24
SA terminal27	SW1Refer to PNP/NPN mode selection
safety informationii	switch(SW1), Refer to PNP/NPN mode
safety input power terminalRefer to SC terminal	selection switch(SW1)
safety inputA terminalRefer to SA terminal	SW2Refer to analog input selection switch(SW2)
Safety inputB terminalRefer to SB terminal	SW3 Refer to analog output selection switch(SW3)
SB terminal27	switch25
SC terminal27	analog input selection switch(SW2)25
screw specification	analog output selection switch(SW3)25
control circuit terminal screw255	PNP/NPN mode selection switch(SW1)25
input/output terminal screw255	
screw size255	Т
screw torque255	·
S-curve pattern85	target frequency
actual Acc/Dec time87	Cmd Frequency146
sequence common terminalReftrer to CM	technical specification241
terminal	terminal102
serge killer32	A terminal102
setting virtual multi-function input119	B terminal102
single phase 200V (0.4~2.2 kW)241	terminal for frequency reference settingRefer to
Slave115	VR terminal
slave inverter	test run33
slave unit	П terminal27, 68
speed unit selection (Hz or Rpm)71	time scale
	0.01sec81
Square reduction	0.1sec81
Square reduction load89	1sec81
V/F pattern Operation89	time scale setting80
start at power-on78	TO terminal28
start mode94	torque23
acceleration start94	torque boost91
start after DC braking94	auto torque boost92, 93
Station104	manual torque boost91
Station ID128	overexcitation92
stop mode95	trip223
DC braking after stop95	trip condition monitor55
deceleration stop95	Trip
free run stop96	troubleshooting227
power braking97	troubleshooting223
storage238	other faults229
Storing Temperature5	troubleshooting fault trips227

U

U/V/W terminal	23, 24
U/V/W terminals	229
UF198	
UF(User Sequence Function) group	40
Under Load	
underload trip	223
underload warning	226
update	125
US194	
US(User Sequence) group	40
user sequence	105
function block parameter	109
setting	105
UF group	105
US group	
user function operation condition	
void parameter	
User Sequence Function groupRefer to	UF(User
Sequence Function) group	
User Sequence groupRefer to <i>US(user se</i>	equence)
group	
user V/F pattern Operation	90
using the keypad	41
groups/codes	41
Jog Operation key	44
moving directly to a code	42
using the using the keypad	
parameter setting	43

V/F control	88
linear V/F pattern operation	88
Square reductionV/F pattern Operation	89
user V/F pattern Operation	
V1 terminal26	5, 61
V2	
analog input selection switch(SW2)	27
V2 input	68
12 voltage input	68
variable resistor	51
variable torque load	89
voltage drop	23
voltage/current output terminalRefer to	
terminal	
VR terminal	5, 61
W	
warning	.223
wiring	17
circuit breaker	253
control terminal board wiring	24
copper cable	17
cover disassembly	18
ferrite	
ground	
power terminal board wiring	21

signal wiring .....29 torque......17 wiring length.....23, 29 WM(write mode error).....127