MOTOR CONTROL

REGAL

MD100G Series, Low Voltage Variable Frequency Drive

Brief Manual

marathon™ Drives

A Regal Brand

REGAL

www.regalaustralia.com.au

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

* Marathon Drives 100G is the official name for the MD100G.

* Visit us at http://www.regalaustralia.com.au for detailed user manual (Standard).

Safety Information

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

Safety symbols in this manual

⚠ Danger

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

⚠ Warning

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

⚠ Caution

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

Safety information

⚠ Danger

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

⚠ Warning

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

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

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

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

ⓘ Caution

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

Note

Maximum allowed prospective short-circuit current at the input power connection is defined in IEC 60439-1 as 100 kA. Depending on the selected MCCB, the MARATHON DRIVE-MD100G 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 MARATHON DRIVE-MD100G 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 Preparing the Installation

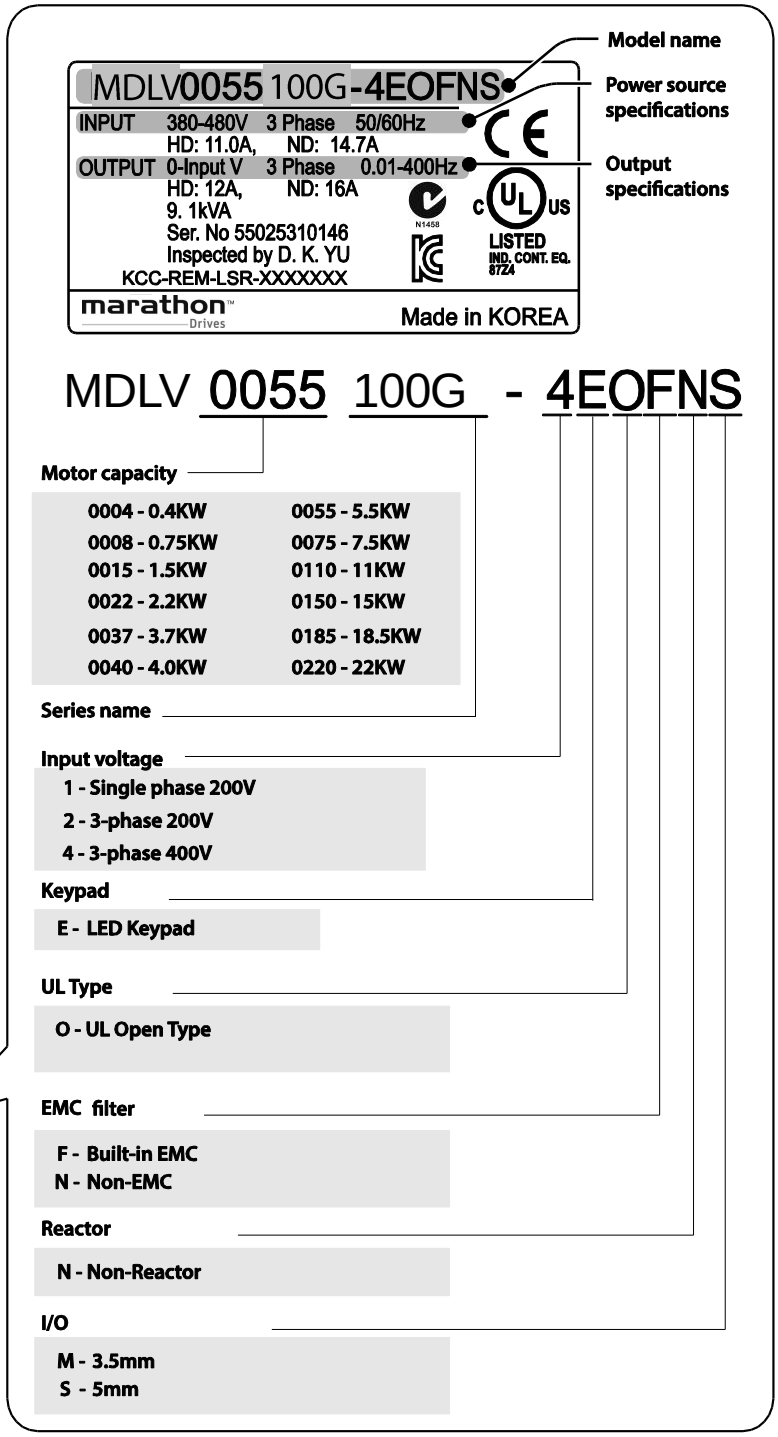
This chapter provides details on product identification, part names, correct installation and cable specifications. To install the inverter correctly and safely, carefully read and follow the instructions.

1.1 Product Identification

The MD100G 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 *242*.

Note

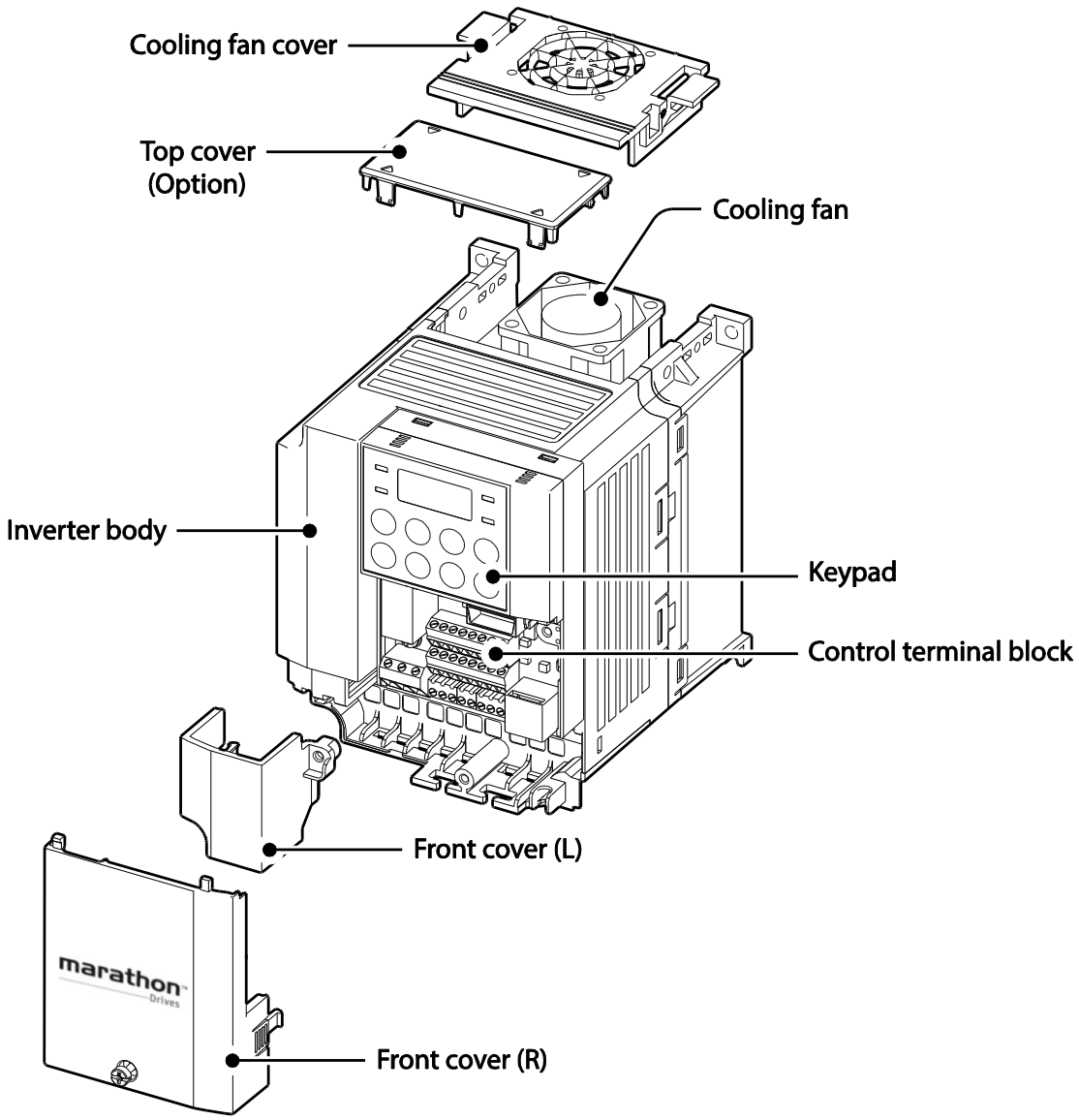
Check the product name, open the packaging, and then confirm that the product is free from defects. Contact your supplier if you have any issues or questions about your product.


Model name
Power source specifications
Output specifications
MDLV0055 100G-4EOFNS
INPUT 380-480V 3 Phase 50/60Hz
HD: 11.0A, ND: 14.7A
OUTPUT 0-Input V 3 Phase 0.01-400Hz
HD: 12A, ND: 16A
9. 1kVA
Ser. No 55025310146
Inspected by D. K. YU
KCC-REM-LSR-XXXXXXX
LISTED
IND. CONT. EQ.
8T24
marathon Drives
Made in KOREA
MDLV 0055 100G - 4EOFNS
Motor capacity
0004 - 0.4KW
0008 - 0.75KW
0015 - 1.5KW
0022 - 2.2KW
0037 - 3.7KW
0040 - 4.0KW
0055 - 5.5KW
0075 - 7.5KW
0110 - 11KW
0150 - 15KW
0185 - 18.5KW
0220 - 22KW
Series name
Input voltage
1 - Single phase 200V
2 - 3-phase 200V
4 - 3-phase 400V
Keypad
E - LED Keypad
UL Type
O - UL Open Type
EMC filter
F - Built-in EMC
N - Non-EMC
Reactor
N - Non-Reactor
I/O
M - 3.5mm
S - 5mm

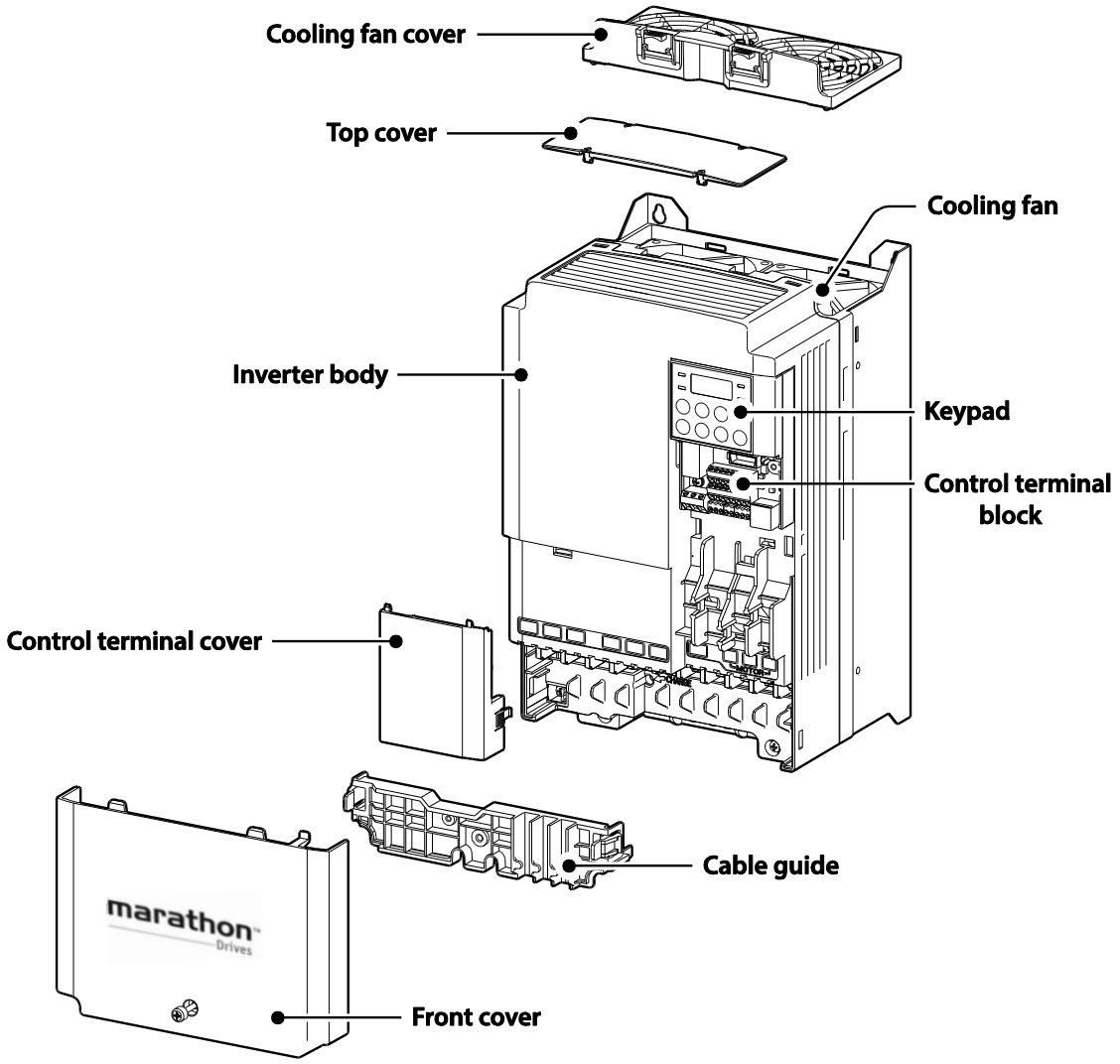
1.2 Part Names

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

0.4~2.2kW (Single Phase) and 0.4~4.0kW (3–Phase)



5.5–22kW(3–Phase)

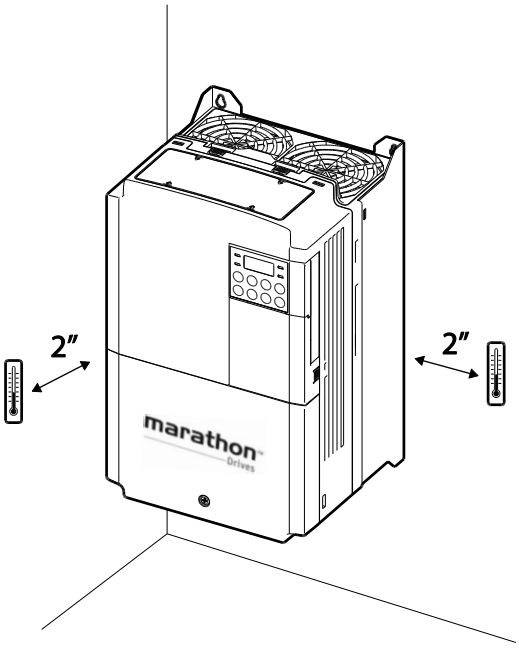


1.3 Installation Considerations

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

Items	Description
Ambient Temperature*	Heavy Duty: 14–104°F (-10–50°C) Normal Duty: 14–122°F (-10– 40°C)
Ambient Humidity	90% relative humidity (no condensation)
Storage Temperature	- 4–149°F (-20–65°C)
Environmental Factors	An environment free from corrosive or flammable gases, oil residue or dust
Altitude/Vibration	Lower than 3,280 ft (1,000 m) above sea level/less than 1G (9.8m/sec^2)
Air Pressure	70 –106kPa

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



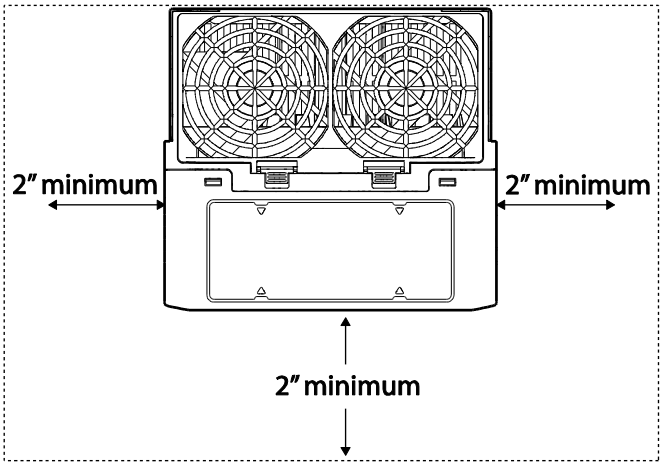
Caution

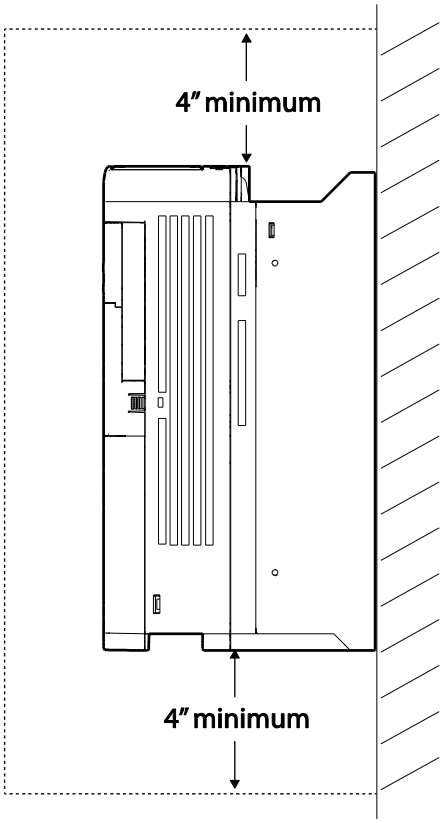
Do not allow the ambient temperature to exceed the allowable range while operating the inverter.

1.4 Selecting and Preparing a Site for Installation

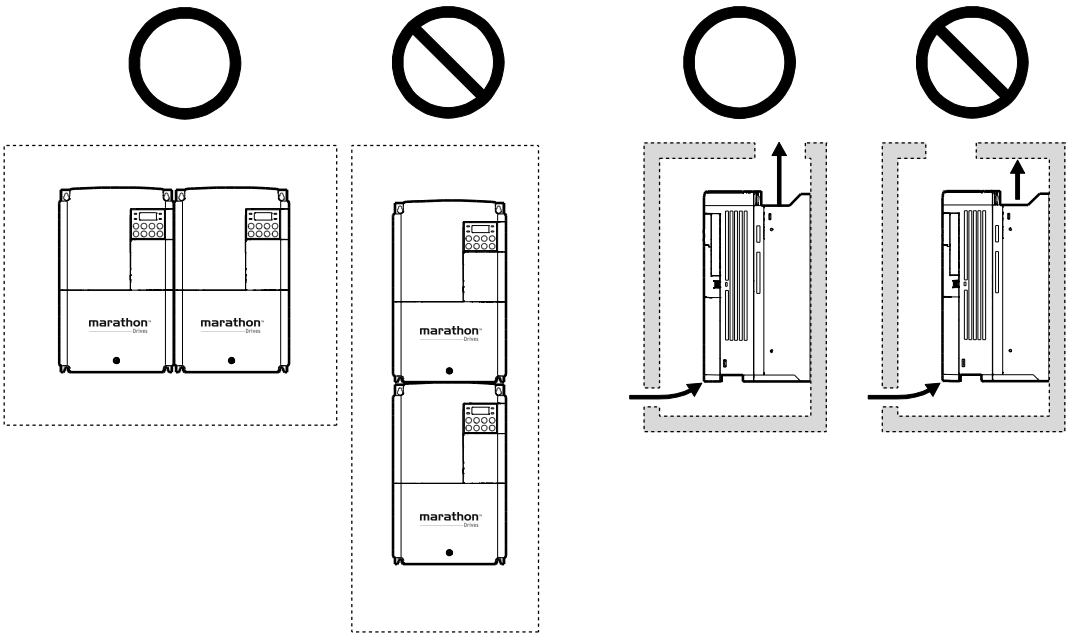
When selecting an installation location consider the following points:

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

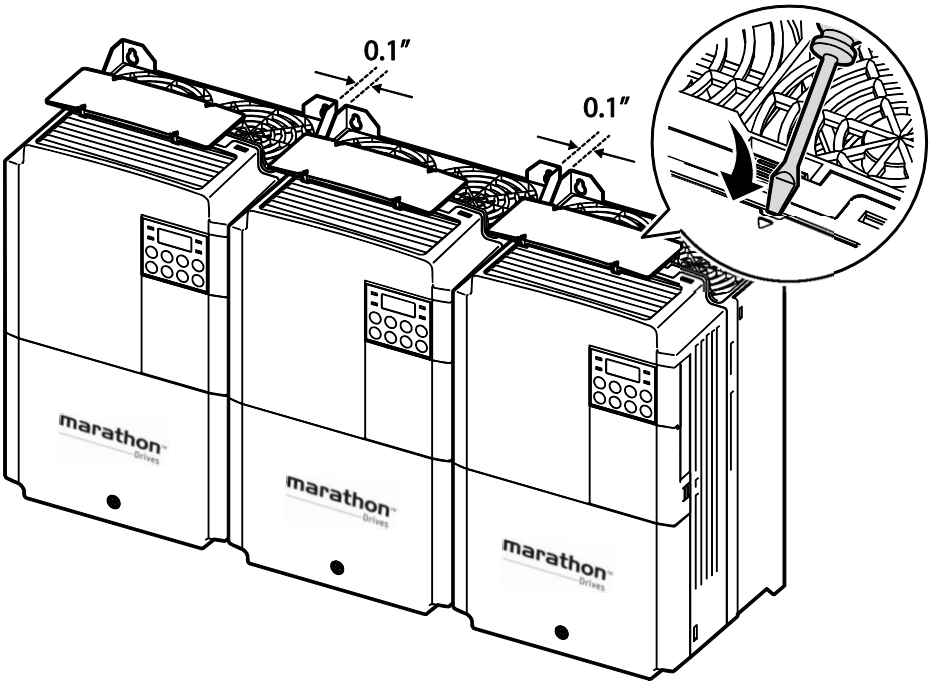




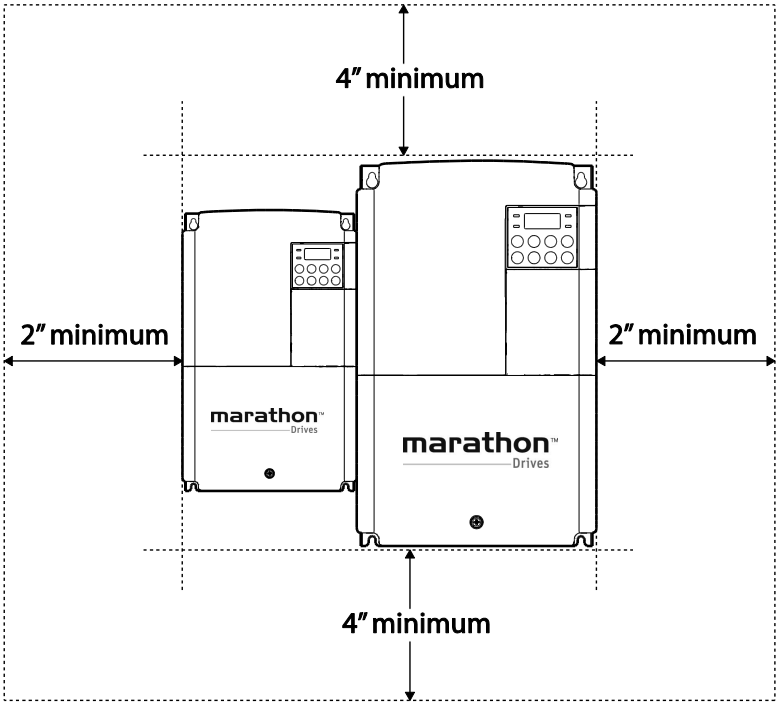
- Ensure sufficient air circulation is provided around the inverter when it is installed. If the inverter is to be installed inside a panel, enclosure, or cabinet rack, carefully consider the position of the inverter's cooling fan and the ventilation louver. The cooling fan must be positioned to efficiently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



- If you are installing multiple inverters in one location, arrange them side-by-side and remove the top covers. The top covers MUST be removed for side-by-side installations. Use a flat head screwdriver to remove the top covers.



- If you are installing multiple inverters, of different ratings, provide sufficient clearance to meet the clearance specifications of the larger inverter.



1.5 Cable Selection

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

ⓘ Caution

- Wherever possible use cables with the largest cross-sectional area for mains power wiring, to ensure that voltage drop does not exceed 2%.
- Use copper cables rated for 600V, 75°C for power terminal wiring.
- Use copper cables rated for 300V, 75°C for control terminal wiring.

Ground Cable and Power Cable Specifications

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

Load (kW)		Ground		Power I/O			
	22						

Signal (Control) Cable Specifications

Terminals	Signal Cable			
	Without Crimp Terminal Connectors (Bare wire)		With Crimp Terminal Connectors (Bootlace Ferrule)	
	mm^2	AWG	mm^2	AWG
P1~P7*/CM/VR/V1/I2 /AO/Q1/EG/24/TI/TO* /SA,SB,SC/S+,S-,SG	0.75	18	0.5	20
A1/B1/C1	1.0	17	1.5	15

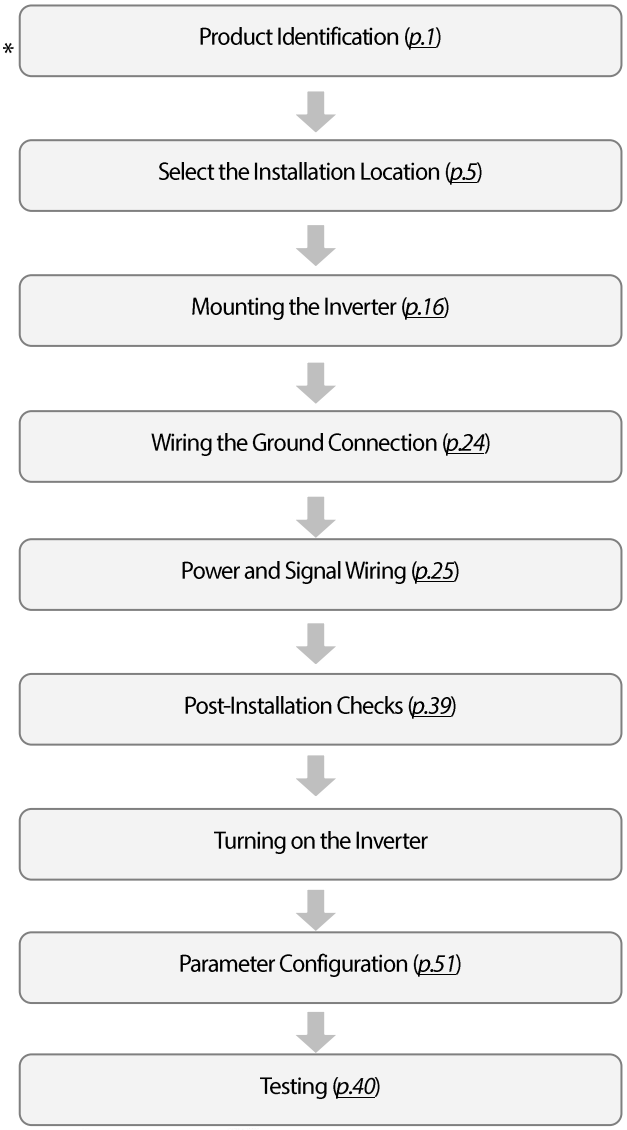
* Standard I/O doesn't support P6/P7/TI/TO terminal. Refer to *Step 4 Control Terminal Wiring* on page *27*.

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

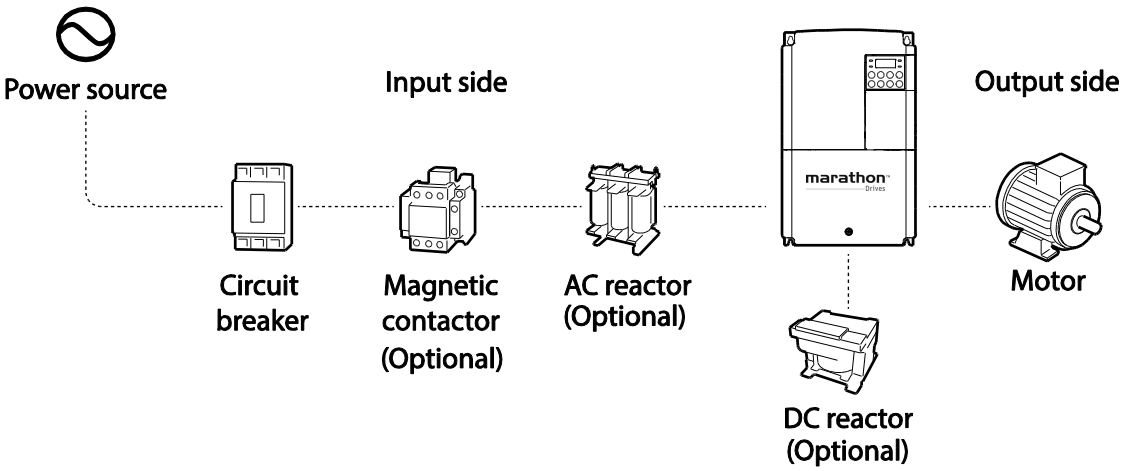
The flowchart lists the sequence to be followed during installation. The steps cover equipment installation and testing of the product. More information on each step is referenced in the steps.



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 *9.4 Peripheral Devices* on page *255*.



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 *9.5 Fuse and Reactor* Specifications on page *256* and carefully select a reactor that meets the requirements.

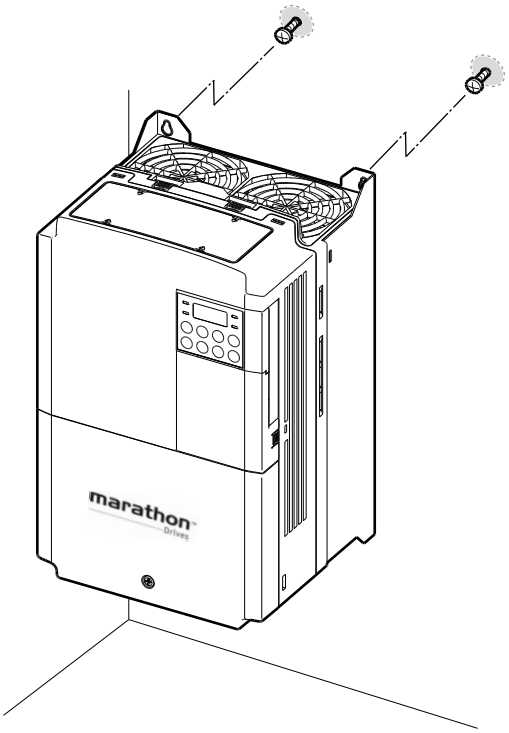
2.1 Mounting the Inverter

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.

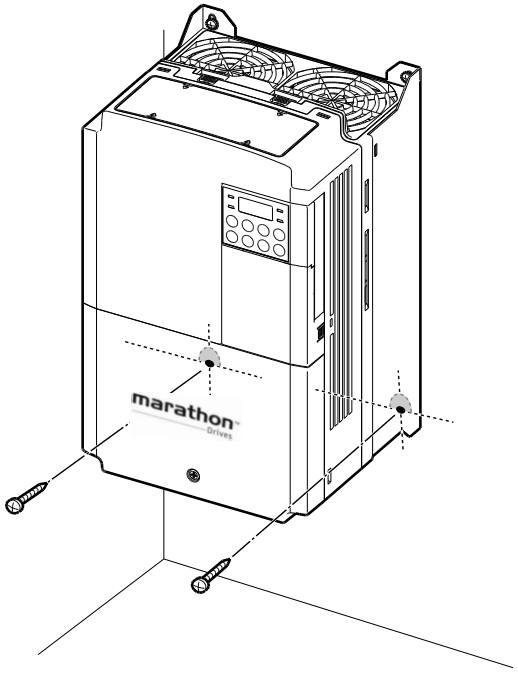
Select a wall or panel suitable to support the installation. Refer to *9.3 External Dimensions (IP 20 Type)* on page *249* and check the inverter's mounting bracket dimensions.

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.

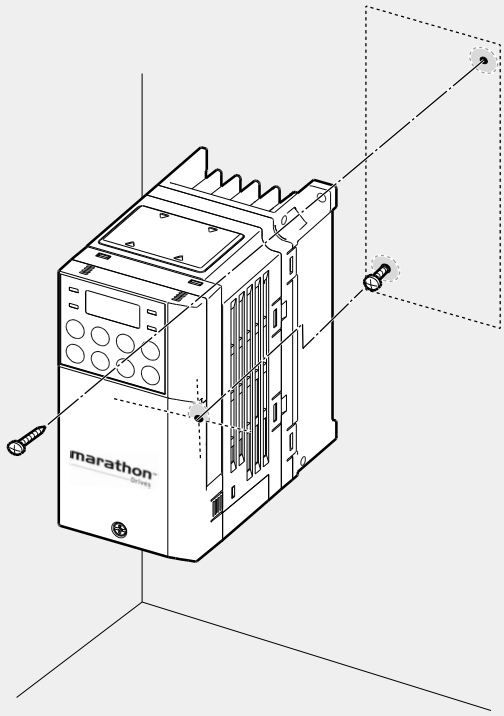


3 Mount the inverter on the wall or inside a panel using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the inverter is placed flat on the mounting surface, and that the installation surface can securely support the weight of the inverter.



Note

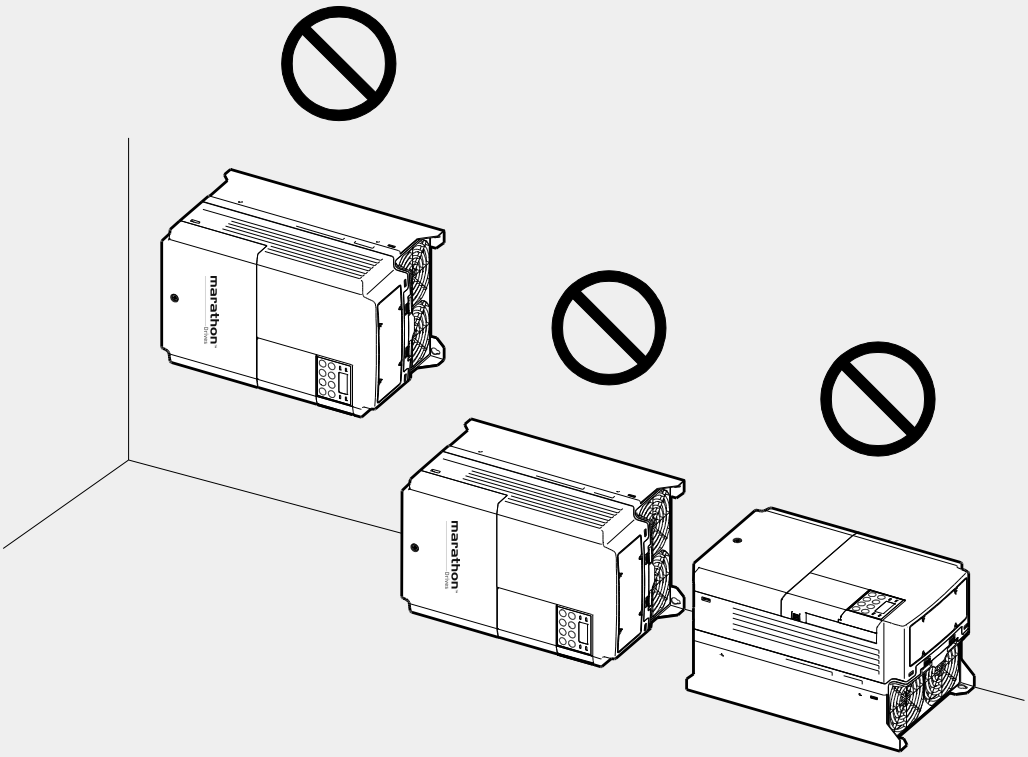
The quantity and dimensions of the mounting brackets vary based on frame size. Refer to *9.3 External Dimensions (IP 20 Type)* on page *249* for detailed information about your model.



Inverters with small frames (0.4–0.8kW) have only two mounting brackets. Inverters with large frames have 4 mounting brackets.

Caution

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



2.2 Cable Wiring

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

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

ⓘ Caution

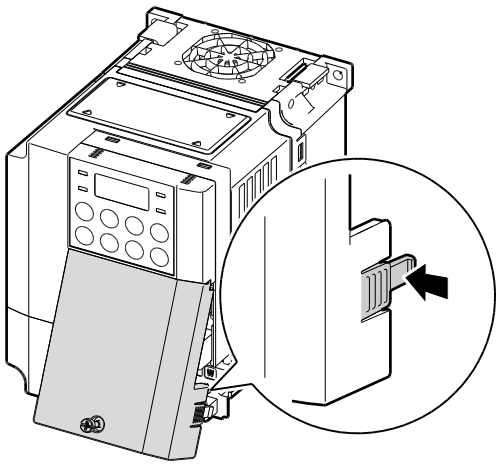
- Install the inverter before carrying out wiring connections.
- Ensure that no small metal debris, such as wire cut-offs, remain inside the inverter. Metal debris in the inverter may cause inverter failure.
- Tighten terminal screws to their specified torque. Loose terminal block screws may allow the cables to disconnect and cause short circuit or inverter failure. Refer to *9.6 Terminal Screw Specification* on page *257* 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℃ for power terminal wiring.
- Use copper cables rated at 300V, 75℃ 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, Control Terminal Cover and Cable Guide

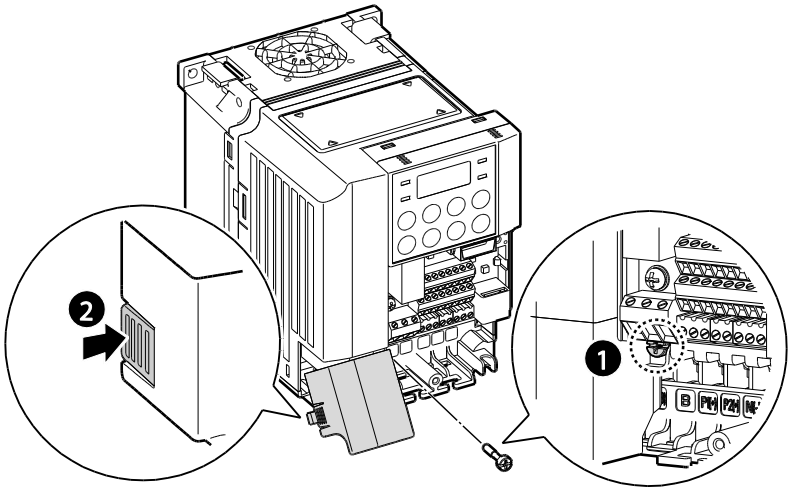
The front cover, control terminal cover and cable guide must be removed to install cables. Refer to the following procedures to remove the covers and cable guide. The steps to remove these parts may vary depending on the inverter model.

0.8–1.5kW (single phase), 1.5–2.2kW (3-phase)

1 Loosen the bolt that secures the front cover (right side). Push and hold the latch on the right side of the cover. Then remove the cover by lifting it from the bottom and moving it away from the front of the inverter.



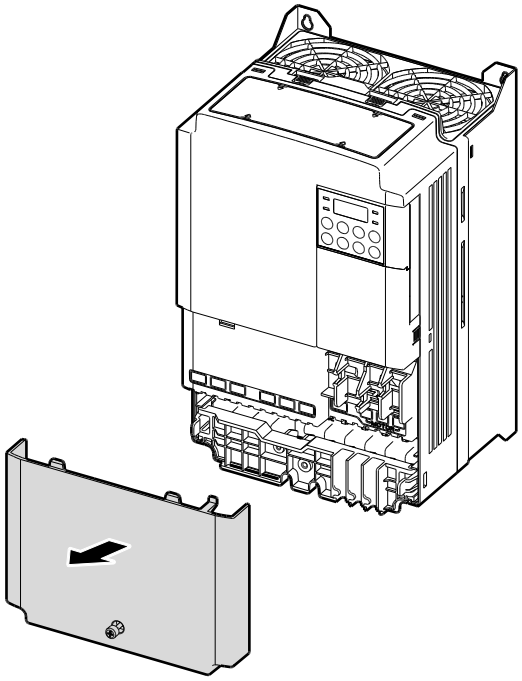
2 Remove the bolt that secures the front cover (left side) (❶). Push and hold the latch on the left side of the cover. Then remove the cover by lifting it from the bottom and moving it away from the front of the inverter (❷).



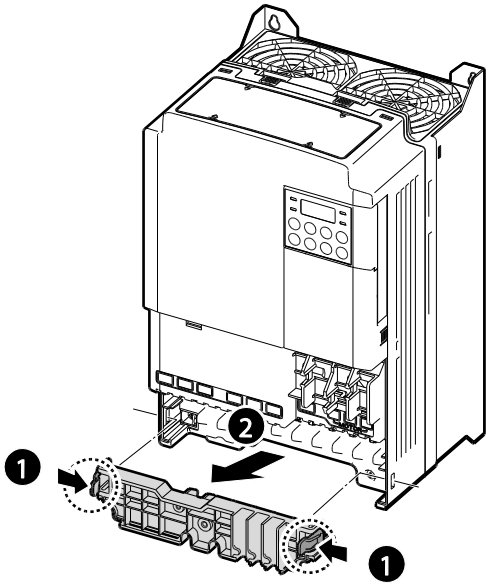
3 Connect the cables to the power terminals and the control terminals. For cable specifications, refer to *1.5 Cable Selection* on page *11*.

5.5–22kW (3-phase)

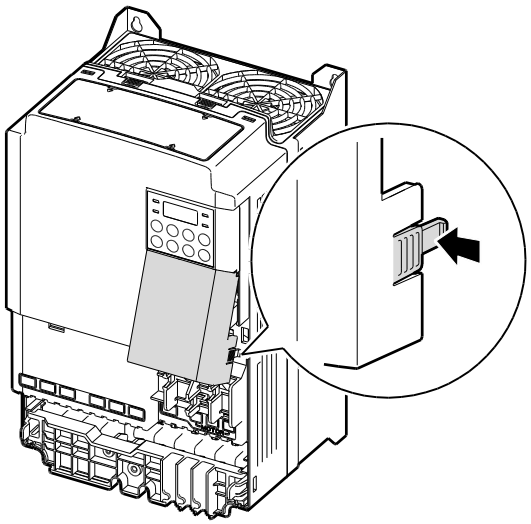
1 Loosen the bolt that secures the front cover. Then remove the cover by lifting it from the bottom and away from the front.



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



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



4 Connect the cables to the power terminals and the control terminals. For cable specifications, refer to *1.5 Cable Selection* on page *11*.

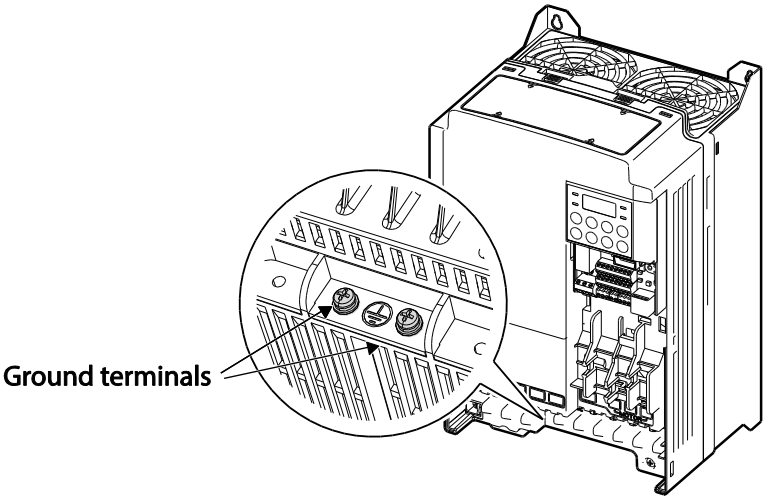
Note

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 *1.5 Cable Selection* on page *11* 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 < 100Ω.
- 400 V products require Special Class 3 grounding. Resistance to ground must be < 10Ω.

⚠ Warning

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

Step 3 Power Terminal Wiring

The following illustration shows the terminal layout on the power terminal block. Refer to the detailed descriptions to understand the function and location of each terminal before making wiring connections. Ensure that the cables selected meet or exceed the specifications in *1.5 Cable Selection* on page *11* before installing them.

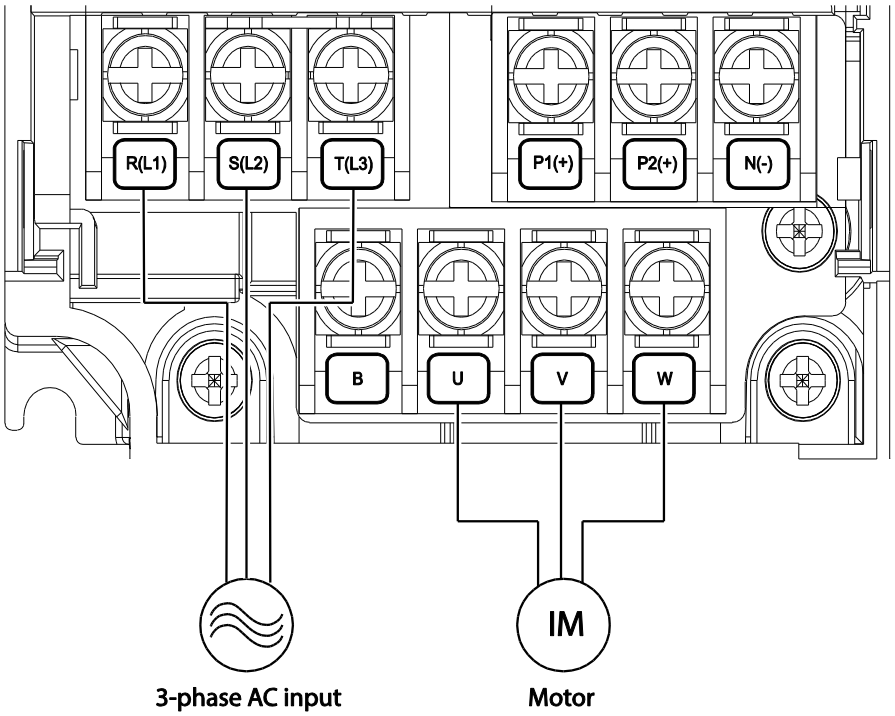
⚠ Caution

- 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°Crating 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.

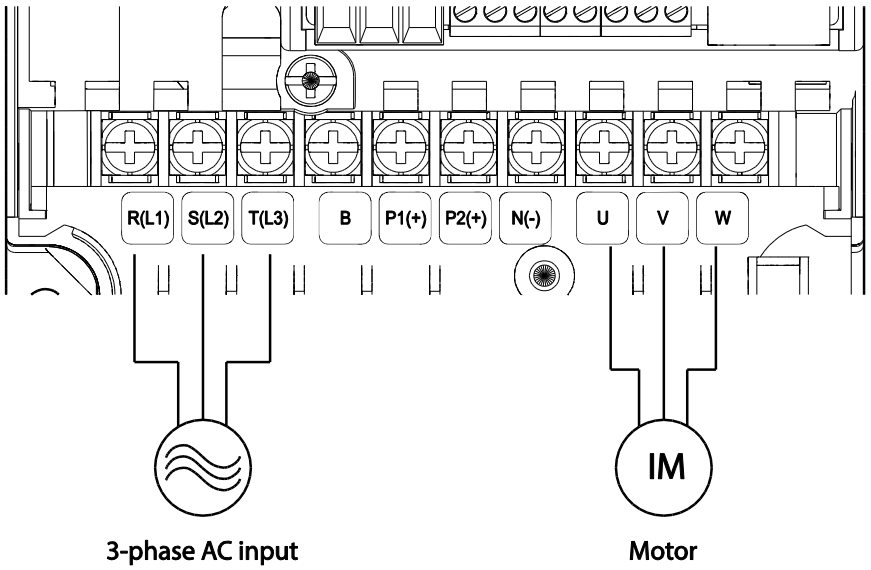
Attention

- 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.

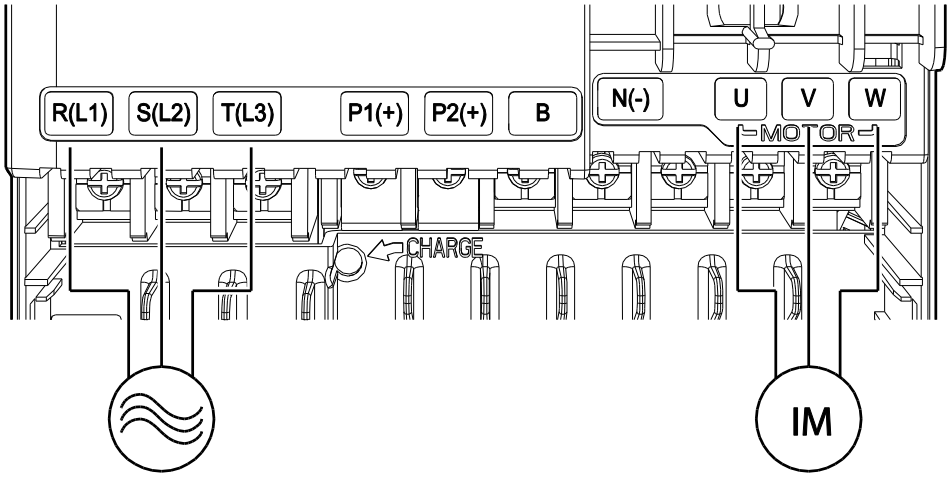
0.4kW (single phase), 0.4~0.8kW (3-phase)



0.8–2.2kW (single phase), 1.5–4.0kW (3-phase)



5.5–22kW (3-phase)



3-phase AC input

Motor

Power Terminal Labels and Descriptions

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

Note

- Use STP (Shielded Twisted Pair) cables to connect a remotely located motor with the inverter. Do not use 3 core cables.
- Make sure that the total cable length does not exceed 665ft (202m). 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 cable resistance (mΩ/m) X cable length (m) X current(A)] / 1000

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

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

⚠ Warning

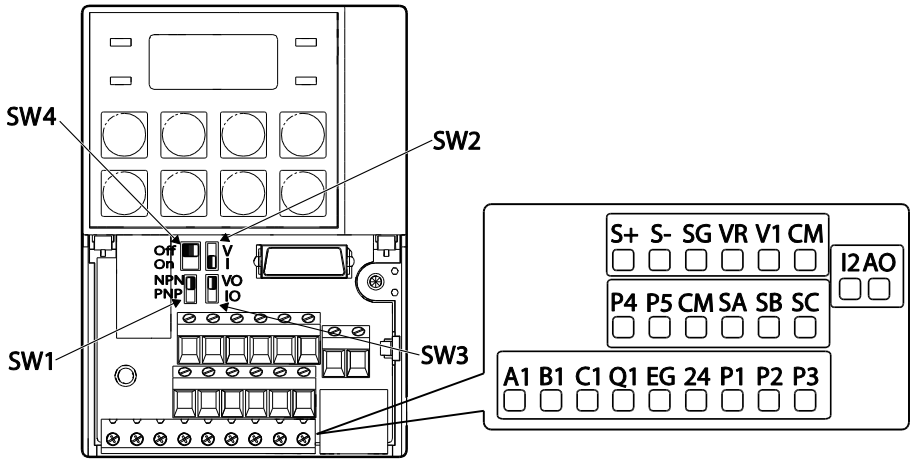
Do not connect power to the inverter until installation has been fully completed and the inverter is ready to be operated. Doing so may result in electric shock.

ⓘ Caution

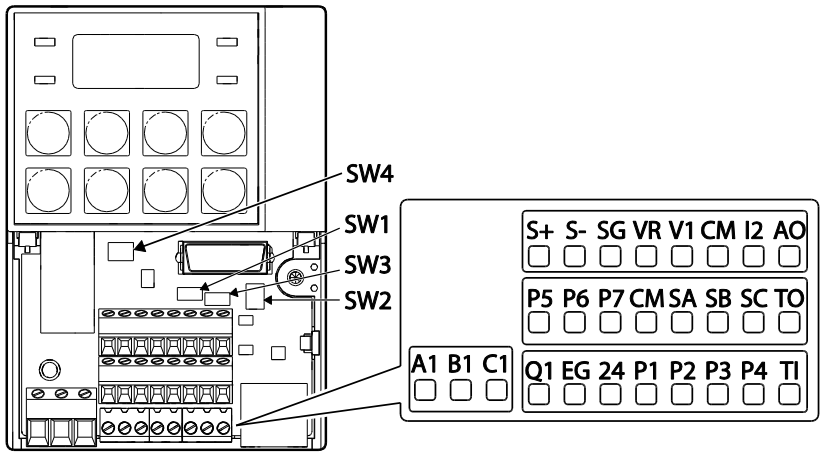
- Power supply cables must be connected to the R, S, and T terminals. Connecting power cables to other terminals will damage the inverter.
- Use insulated ring lugs when connecting cables to R/S/T and U/V/W terminals.
- The inverter's power terminal connections can cause harmonics that may interfere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

Step 4 Control Terminal Wiring

The illustrations below show the detailed layout of control wiring terminals, and control board switches. Refer to the detailed information provided below and *1.5 Cable Selection* on page *11* before installing control terminal wiring and ensure that the cables used meet the required specifications.



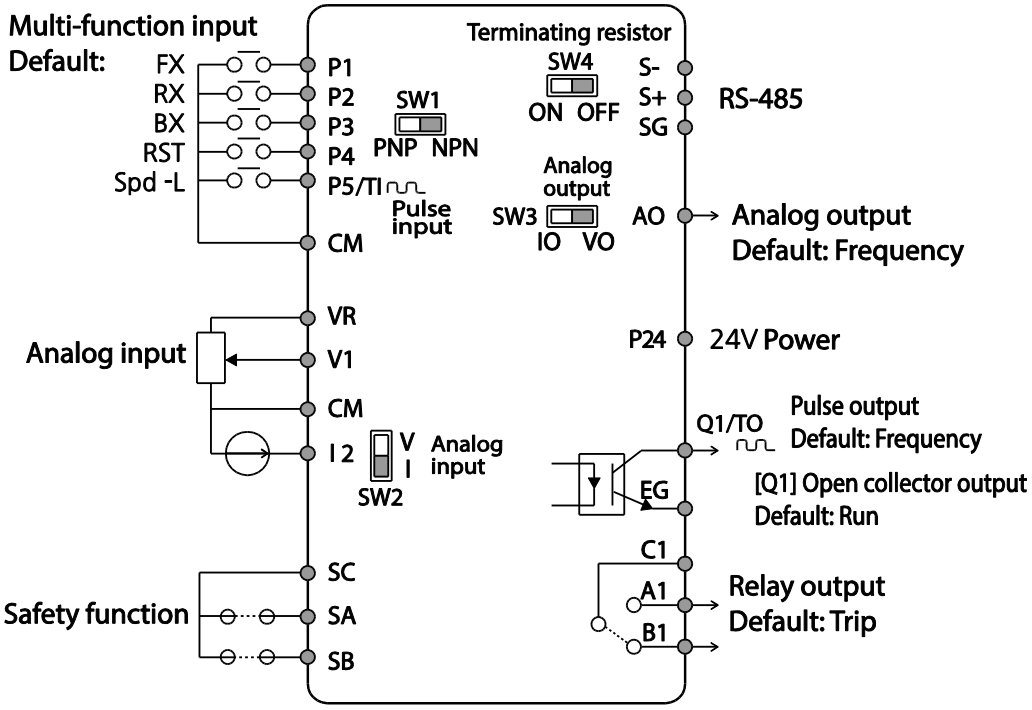
<Standard I/O>



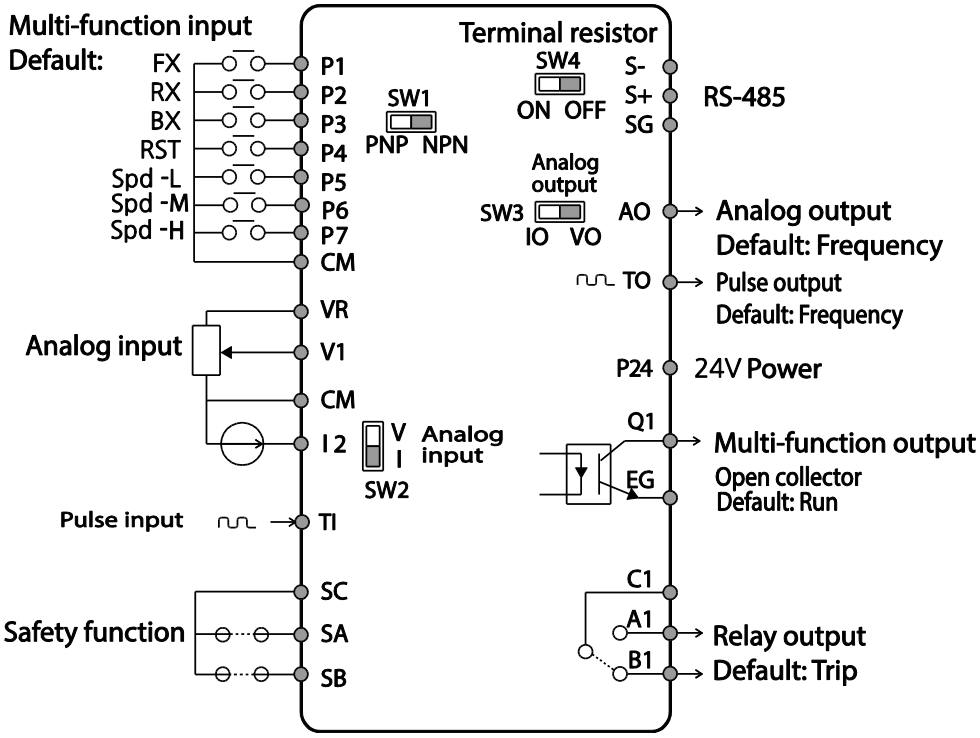
<Multiple I/O>

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



<Standard I/O>



<Multiple I/O>

Input Terminal Labels and Descriptions

Function	Label	Name	Description
Multi-function terminal configuration	P1–P7	Multi-function Input 1-7	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 • P6: Speed-M • P7: Speed-H Standard I/O is only provided for P5.
	CM	Common Sequence	Common terminal for analog terminal inputs and outputs.
Analog input configuration	VR	Potentiometer frequency reference input	Used to setup or modify a frequency reference via analog voltage or current input. • Maximum Voltage Output: 12V • Maximum Current Output: 100mA, • Potentiometer: 1–5kΩ
	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.)
	I2	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
	TI	Pulse input for frequency reference input (pulse train)	Setup or modify frequency references using pulse inputs from 0 to 32kHz. • Low Level: 0–0.8V • High Level: 3.5–12V (In case of Standard I/O, Pulse input TI and Multi-function terminal P5 share the same terminal. Set the

Function	Label	Name	Description
			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: • Normal Operation: Both the SA and SB terminals are connected to the SC terminal. • Output Block: One or both of the SA and SB terminals lose connection with the SC terminal.
	SB	Safety input B	
	SC	Safety input power source	DC 24V, < 25mA

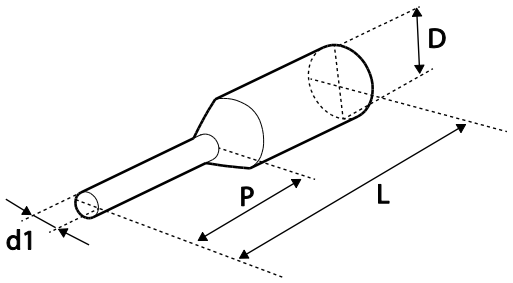
Output/Communication Terminal Labels and Descriptions

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
	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 (In case of Standard I/O, Pulse output TO and Multi-function output Q1 share the same terminal. Set the OU.33Q1 Define to 38(TO).)
Digital output	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)
	24	External 24V	Maximum output current: 150mA

Function	Label	Name	Description
		power source	
	A1/C1/B1	Fault signal output	Sends out alarm signals when the inverter's safety features are activated (AC 250V <1A, DC 30V < 1A). • Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection) • Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection)
Communication	S+/S-/SG	RS-485 signal line	Used to send or receive RS-485 signals. Refer to 5 *RS-485 Communication Features* on page *123* for more details.

Preinsulated Crimp Terminal Connectors (Bootlace Ferrule) .

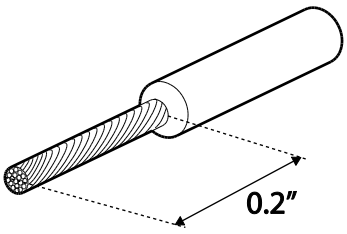
Use preinsulated crimp terminal connectors to increase reliability of the control terminal wiring. Refer to the specifications below to determine the crimp terminals to fit various cable sizes.



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

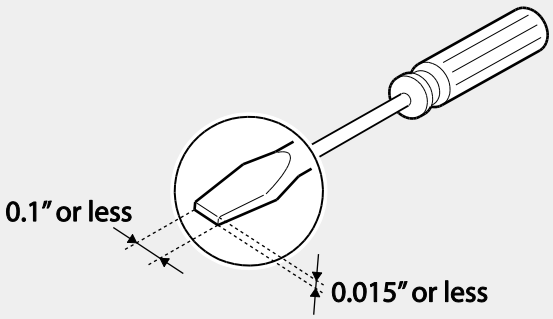
* If the length (L) of the crimp terminals exceeds 0.5" (12.7mm) after wiring, the control terminal cover may not close fully.

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



Note

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



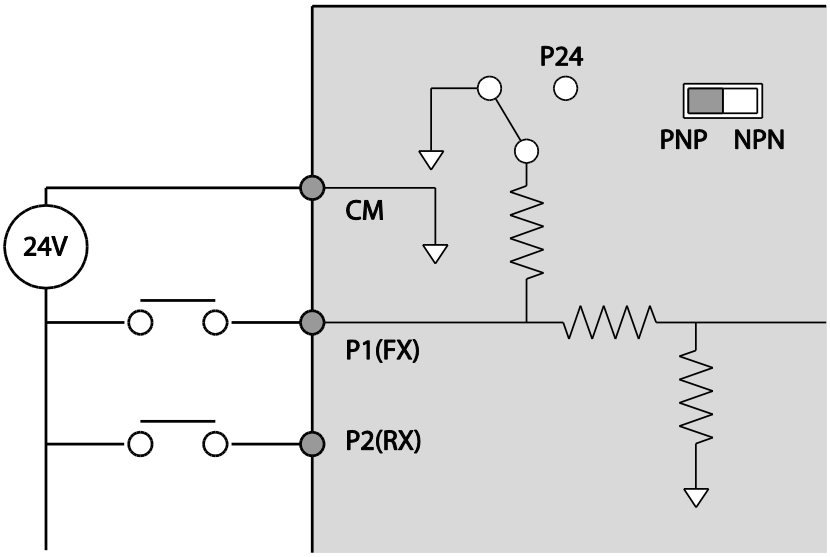
Step 5 PNP/NPN Mode Selection

The MD100G 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)

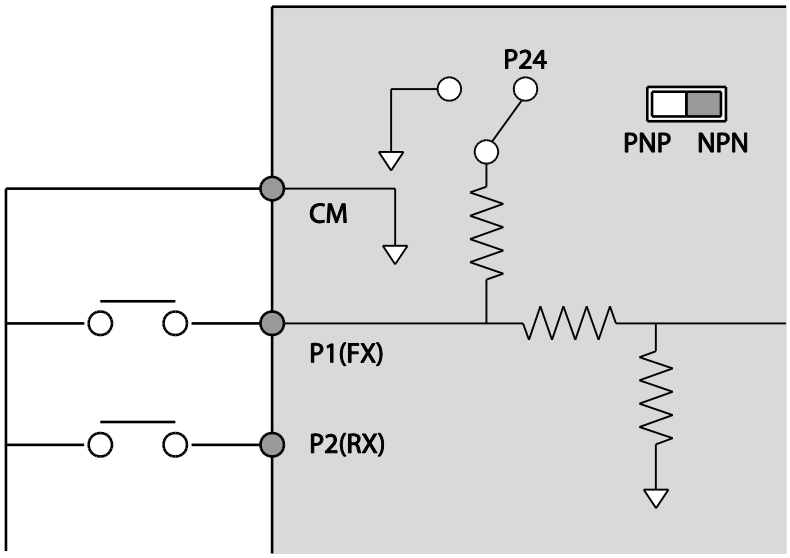
Select PNP using the PNP/NPN selection switch (SW1). Note that the factory default setting is NPN

mode. CM is 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.



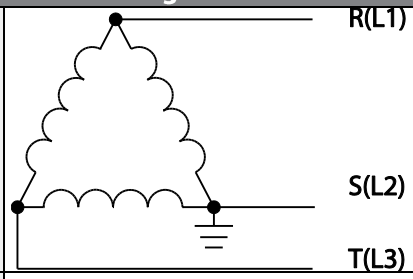
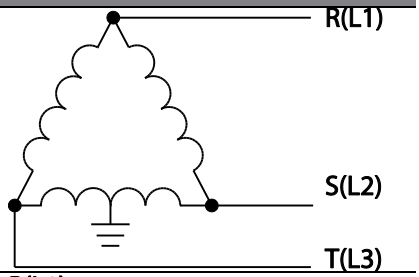
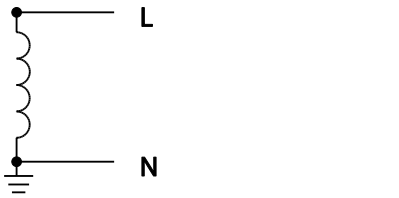
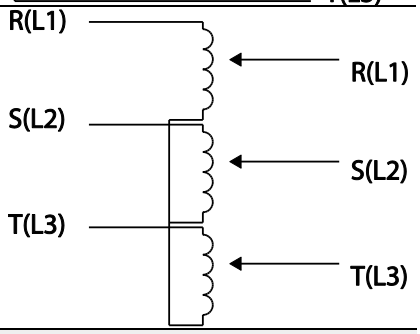
NPN Mode (Sink)

Select NPN using the PNP/NPN selection switch (SW1). Note that the factory default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal, and P24 is 24V internal source.



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

EMC filter is built in the next two products. MD100G 200V single-phase built-in EMC filter and the 400V class. An EMC filter prevents electromagnetic interference by reducing radio emissions from the inverter. EMC filter use is not always recommended, as it increases leakage current. If an inverter uses a power source with an asymmetrical grounding connection, the EMC filter MUST be turned off.

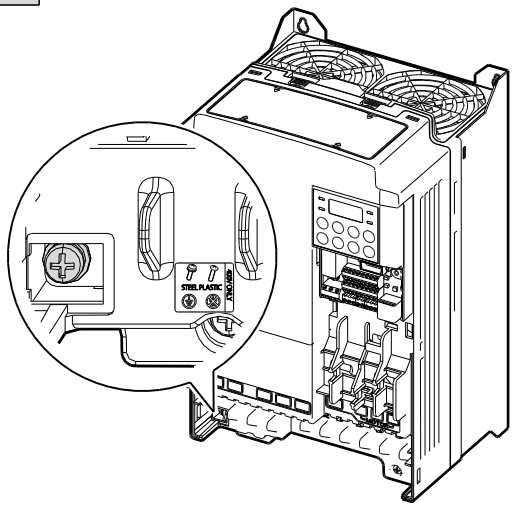
Asymmetrical Grounding Connection			
One phase of a delta connection is grounded		Intermediate grounding point on one phase of a delta connection	
The end of a single phase is grounded		A 3-phase connection without grounding	

⚠ Danger

- Do not activate the EMC filter if the inverter uses a power source with an asymmetrical grounding structure, for example a grounded delta connection. Personal injury or death by electric shock may result.
- Wait at least 10 minutes before opening the covers and exposing the terminal connections. Before starting work on the inverter, test the connections to ensure all DC voltage has been fully discharged. Personal injury or death by electric shock may result.

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

Steel bolt	Plastic bolt
	
EMC ON	EMC OFF



Step 7 Re-assembling the Covers and Routing Bracket

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

2.3 Post-Installation Checklist

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

Items	Check Point	Ref.	Result
Installation Location/Power I/O Verification	Is the installation location appropriate?	p.5	
	Does the environment meet the inverter's operating conditions?	p.6	
	Does the power source match the inverter's rated input?	p.242	
	Is the inverter's rated output sufficient to supply the equipment? (Degraded performance will result in certain circumstances. Refer to *9.8 Continuous Rated Current Derating* on page *260* for details.	p.242	
Power Terminal Wiring	Is a circuit breaker installed on the input side of the inverter?	p.15	
	Is the circuit breaker correctly rated?	p.2427	
	Are the power source cables correctly connected to the R/S/T terminals of the inverter? (Caution: connecting the power source to the U/V/W terminals may damage the inverter.)	p.25	
	Are the motor output cables connected in the correct phase rotation (U/V/W)? (Caution: motors will rotate in reverse direction if three phase cables are not wired in the correct rotation.)	p.25	
	Are the cables used in the power terminal connections correctly rated?	p.11	
	Is the inverter grounded correctly?	p.24	
	Are the power terminal screws and the ground terminal screws tightened to their specified torques?	p. 25	
	Are the overload protection circuits installed correctly on the motors (if multiple motors are run using one inverter)?	-	
	Is the inverter separated from the power source by a magnetic contactor (if a braking resistor is in use)?	p.15	
	Are advanced-phase capacitors, surge protection and electromagnetic interference filters installed correctly? (These devices MUST not be installed on the output side of the inverter.)	p.25	
Control Terminal Wiring	Are STP (shielded twisted pair) cables used for control terminal wiring?	-	
	Is the shielding of the STP wiring properly grounded?	-	
	If 3-wire operation is required, are the multi-function input terminals defined prior to the installation of the control wiring connections?	p.29	

Items	Check Point	Ref.	Result
	Are the control cables properly wired?	p29	
	Are the control terminal screws tightened to their specified torques?	p.20	
	Is the total cable length of all control wiring < 165ft (100m)?	p.35	
	Is the total length of safety wiring < 100ft (30m)?	p.35	
Miscellaneous	Are optional cards connected correctly?	-	
	Is there any debris left inside the inverter?	p.20	
	Are any cables contacting adjacent terminals, creating a potential short circuit risk?	-	
	Are the control terminal connections separated from the power terminal connections?	-	
	Have the capacitors been replaced if they have been in use for > 2 years?	-	
	Have the fans been replaced if they have been in use for > 3 years?	-	
	Has a fuse been installed for the power source?	p.256	
	Are the connections to the motor separated from other connections?	-	

Note

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

2.4 Test Run

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

1 Turn on the power supply to the inverter. Ensure that the keypad display light is on.

2 Select the command source.

3 Set a frequency reference, and then check the following:

- If 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.
-

Note

If the forward command (Fx) is on, the motor should rotate counterclockwise when viewed from the load side of the motor. If the motor rotates in the reverse direction, switch the cables at the U and V terminals.

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

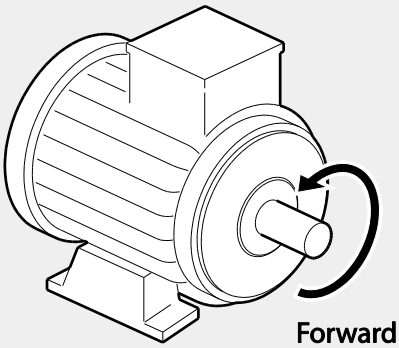
1 On the keypad, set the drv (Frequency reference source) code in the Operation group to 0 (Keypad).

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.



Forward operation

Caution

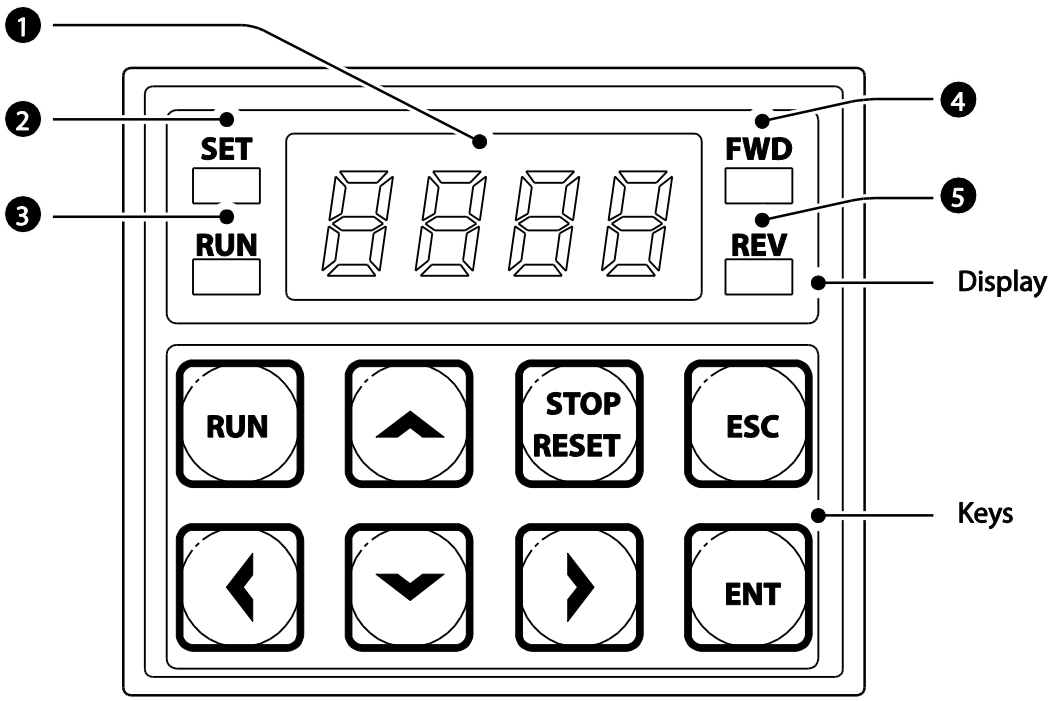
- Check the parameter settings before running the inverter. Parameter settings may have to be adjusted depending on the load.
- To avoid damaging the inverter, do not supply the inverter with an input voltage that exceeds the rated voltage for the equipment.
- Before running the motor at maximum speed, confirm the motor's rated capacity. As inverters can be used to easily increase motor speed, use caution to ensure that motor speeds do not accidently exceed the motor's rated capacity.

3 Learning to Perform Basic Operations

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

3.1 About the Keypad

The keypad is composed of 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
❶	7-Segment Display	Displays current operational status and parameter information.
❷	SET Indicator	LED flashes during parameter configuration and when the ESC key operates as the multi-function key.
❸	RUN Indicator	LED turns on (steady) during an operation, and flashes during acceleration or deceleration.
❹	FWD Indicator	LED turns on (steady) during forward operation.
❺	REV Indicator	LED turns on (steady) during reverse operation.

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

0	0	A	A	K	K	U	U
1	1	B	B	L	L	V	V
2	2	C	C	M	M	W	W
3	3	D	D	N	N	X	X
4	4	E	E	O	O	Y	Y
5	5	F	F	P	P	Z	Z
6	6	G	G	Q	Q	-	-
7	7	H	H	R	R	-	-
8	8	I	I	S	S	-	-
9	9	J	J	T	T	-	-

3.1.2 Operation Keys

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.
▲, ▼	[▲] key, [▼] key	Switch between codes, or to increase or decrease parameter values.
◄, ►	[◄] key, [►] key	Switch between groups, or to move the cursor during parameter setup or modification.
ENT	[ENT] key	Used to select, confirm, or save a parameter value.
ESC	[ESC] key	A multi-function key used to configure different functions, such as: • Jog operation • Remote/Local mode switching • Cancellation of an input during parameter setup

ⓘ 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 MD100G 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	BA	Configures basic parameters, including motor-related parameters and multi-step frequencies.
Advanced	AD	Configure acceleration or deceleration patterns and to setup frequency limits.
Control	CN	Configures sensorless vector - related features.
Input Terminal	IN	Configures input terminal–related features, including digital multi–functional inputs and analog inputs.
Output Terminal	OU	Configures output terminal–related features such as relays and analog outputs.
Communication	CM	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)	M2	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.71) has been set to 26 (Secondary motor).
User Sequence	US	Used to implement simple sequences with various function blocks.
User Sequence Function	UF	

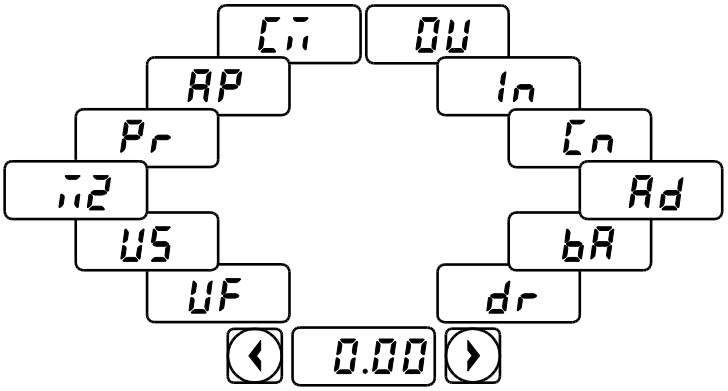
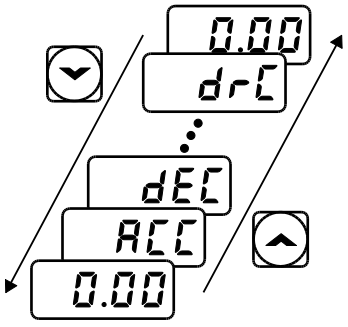
3.2 Learning to Use the Keypad

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 *Table of Functions* on page *153* 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.	-

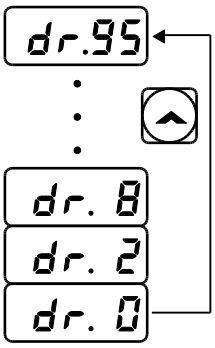
Note

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

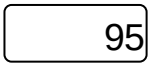
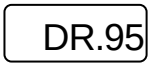
As an example, if Ad.24 (Frequency Limit) is set to 0 (No), the next codes, Ad.25 (Freq Limit Lo) and Ad.26 (Freq Limit Hi), will not be displayed. If you set code Ad.24 to 1 (Yes) and enable the frequency limit feature, codes Ad.25 and 26 will appear to allow the maximum and minimum frequency limitations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

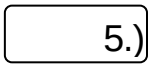
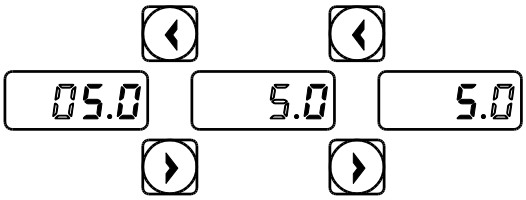
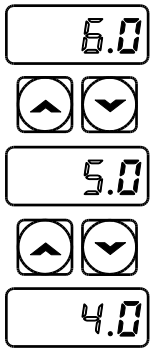


Step	Instruction	Keypad Display
1	Ensure that you are currently at the first code of the Drive group (dr.0).	DR.0
2	Press the [ENT] key. Number '9' will flash.	(
3	Press the [▼] key to display '5,' the first 1s' place of the group destination, '95.'	%
4	Press the [◄] key to move to the 10s' place. The cursor will move to the left and '05' will be displayed. This time,	)5

Step	Instruction	Keypad Display
	the number '0' will be flashing.	
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.	

3.2.3 Setting Parameter Values

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

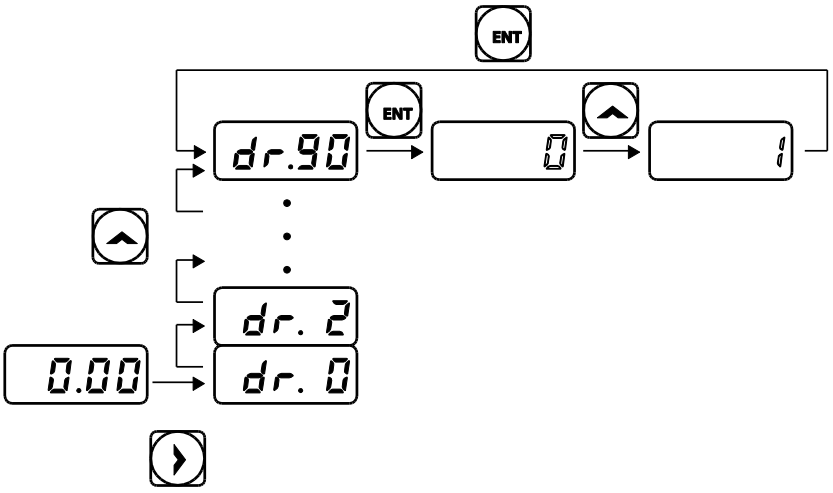
Step	Instruction	Keypad Display
1	Select the group and code to setup or modify parameter settings, and then press the [ENT] key. The first number on the right side of the display will flash.	
2	Press the [◂] or [▸] key to move the cursor to the number that you would like to modify.	
3	Press the [▲] or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

Note

- A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes will be saved when the [ENT] key is pressed while the number is flashing. The setting change will be canceled if you press any other key.
- Each code's parameter values have default features and ranges specified. Refer to 6 *Table of Functions* on page *153* 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 *4.6 Local/Remote Mode Switching* on page *84* 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.0
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 [▲] 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.	-

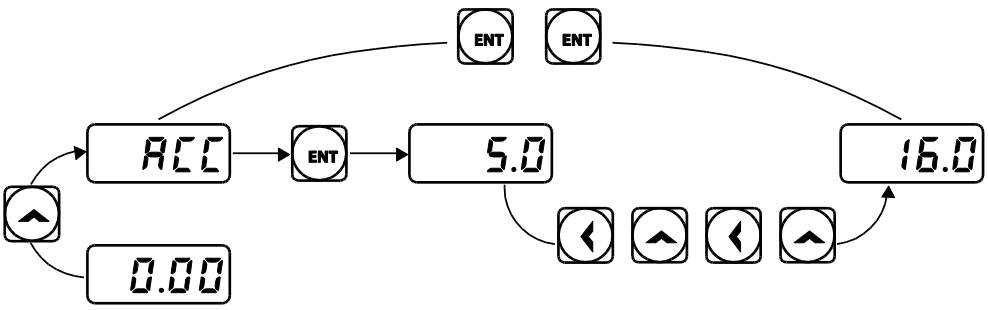
Note

- 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.	0.00
2	Press the [▲] key. The display will change to the second code in the Operation group, the ACC (Acceleration Time) code.	ACC
3	Press the [ENT] key. The number '5.0' will be displayed, with '0' flashing. This indicates that the current acceleration time is set to 5.0 seconds. The flashing value is ready to be modified by using the keypad.	5.)
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.	%.0
5	Press the [▲] key to change the number '5' into '6', the first place value of the target number '16.'	^.0
6	Press the [◄] key to move to the 10s, place value. The number in the 10s position, '0' in '06' will start to flash	)6.0
7	Press the [▲] key to change the number from '0' to '1', to match the 10s place value of the target number'16,' and then press the [ENT] key. Both digits will flash on the display.	!^,)
8	Press the [ENT] key once again to save changes. 'ACC' will be displayed. The change to the acceleration time setup has been completed.	ACC

3.3.2 Frequency Reference Configuration

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

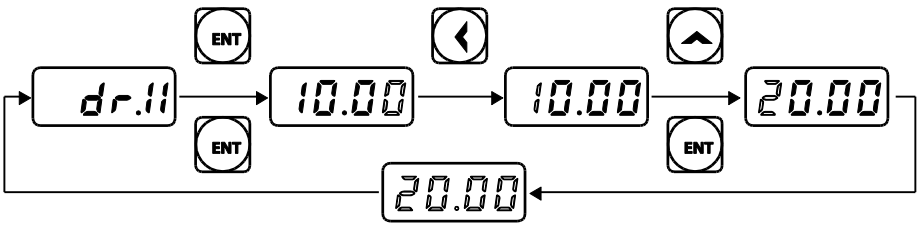
Step	Instruction	Keypad Display
1	Ensure that the first code of the Operation group is selected, and the code 0.00 (Command Frequency) is displayed.	0.00
2	Press the [ENT] key. The value, 0.00 will be displayed with the '0' in the 1/100s place value flashing.	0.0)
3	Press the [◂] key 3 times to move to the 10s place value. The '0' at the 10s place value will start to flash.	)0.00
4	Press the [▴] key to change it to '3,' the 10s place value of the target frequency, '30.05.'	#0.00
5	Press the [▸] key 3 times. The '0' at the 1/100s place position will flash.	30.0)
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

Note

- A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes are saved when the [ENT] key is pressed while the value is flashing. Changes will be canceled if any other key is pressed.
- The MD100G 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

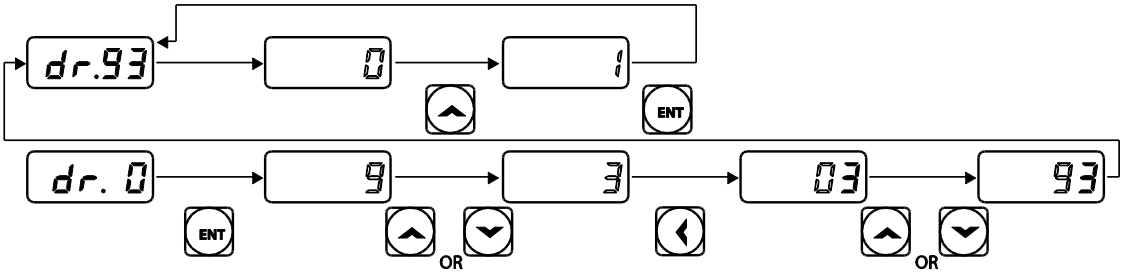
The following example demonstrates how to configure Jog Frequency by modifying code 11 in the Drive group (Jog Frequency) from 10.00(Hz) to 20.00(Hz). You can configure the parameters for different codes in any other group in exactly the same way.



Step	Instruction	Keypad Display
1	Go to code 11(Jog Frequency) in the Drive group.	DR.11
2	Press the [ENT] key. The current Jog Frequency value (10.00) for code dr.11 is displayed.	10.0)
3	Press the [◂] key 3 times to move to the 10s place value. Number '1' at the 10s place position will flash.	!0.00
4	Press the [▲] 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.



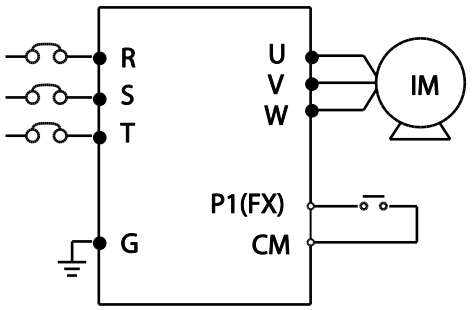
Step	Instruction	Keypad Display
1	Go to code 0 (Jog Frequency) in the Drive group.	DR.0
2	Press the [ENT] key. The current parameter value (9) will be displayed.	(
3	Press the [q] key to change the first place value to '3' of the target code, '93.'	#
4	Press the [◂] key to move to the 10s place position. '03' will be displayed.	)3
5	Press the [▲] or [▼] key to change the '0' to '9' of the target code, '93.'	(3
6	Press the [ENT] key. Code dr.93 will be displayed.	DR.93
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 [▲] key to change the value to 1 (All Grp), and then press the [ENT] key. The parameter value will flash.	!
9	Press the [ENT] key once again. Parameter initialization begins. Parameter initialization is complete when code dr.93 reappears on the display.	DR.93

Note

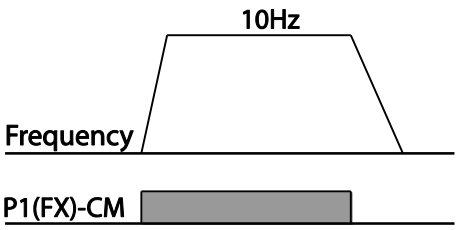
Following parameter initialization, all parameters are reset to factory default values. Ensure that parameters are reconfigured before running the inverter again after an initialization.

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.	0.0)
3	Press the [◂] key 3 times to go to the 10s place position. The number '0' at the 10s place position will flash.	)0.00
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 RUN 10.00 FWD REV
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 RUN 10.00 FWD REV



[Wiring Diagram]



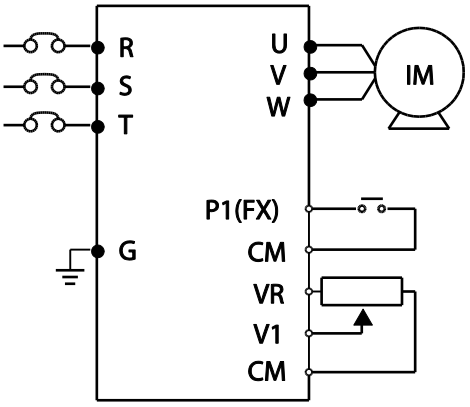
[Operation Pattern]

Note

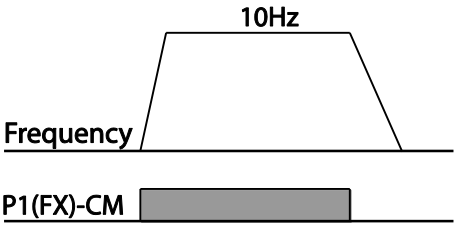
The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the values to factory default parameter settings before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

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

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.	0.00
3	Press the [▲] key 4 times to go to the Frq (Frequency reference source) code.	FRQ
4	Press the [ENT] key. The Frq code in the Operation group is currently set to 0 (keypad).	)
5	Press the [▲] key to change the parameter value to 2 (Potentiometer), and then press the [ENT] key. The new parameter value will flash.	@
6	Press the [ENT] key once again. The Frq code will be displayed again. The frequency input has been configured for the potentiometer.	FRQ
7	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
8	Adjust the potentiometer to increase or decrease the frequency reference to 10Hz.	-
9	Refer to the wiring diagram at the bottom of the table, and close the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	SET RUN 10.00 FWD REV
10	When the frequency reference is reached (10Hz), open the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0Hz, the RUN and FWD indicators turn off, and the frequency reference (10.00Hz) is displayed again.	SET RUN 10.00 FWD REV



[Wiring Diagram]



[Operation Pattern]

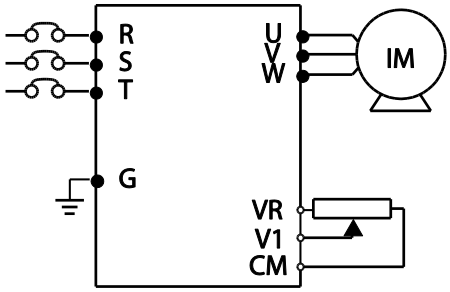
Note

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

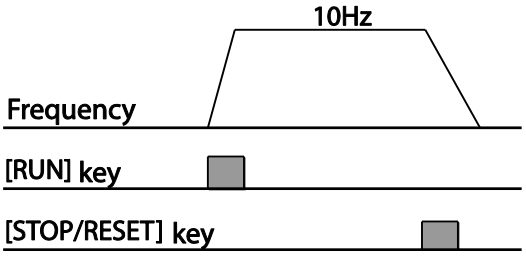
3.3.7 Frequency Setting (Potentiometer) and Operation (Keypad)

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.	0.00
3	Press the [▲] key 4 times to go to the drv code.	DRV
4	Press the [ENT] key. The drv code in the Operation group is currently set to 1 (Analog Terminal).	1
5	Press the [▼] key to change the parameter value to 0 (Keypad), and then press the [ENT] key. The new parameter value will flash.	0
6	Press the [ENT] key once again. The drv code is displayed again. The frequency input has been configured for the keypad.	DRV
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 [▲] 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.	FRQ
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 RUN 10.00 FWD REV
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 RUN 10.00 FWD REV



[Wiring Diagram]



[Operation Pattern]

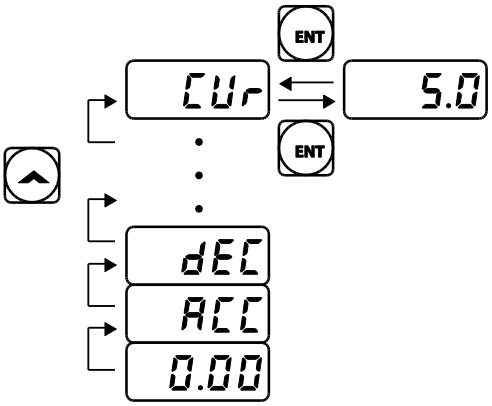
Note

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

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.



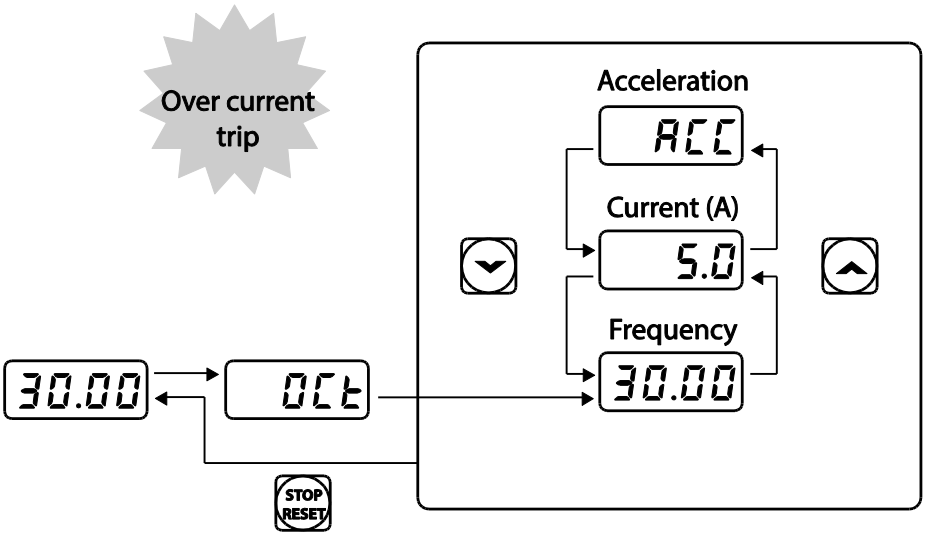
Step	Instruction	Keypad Display
1	Ensure that the first code of the Operation group is selected, and the code 0.00 (Command Frequency) is displayed.	0.00
2	Press the [▲] or [▼] key to move to the Cur code.	CUR
3	Press the [ENT] key. The output current (5.0A) is displayed.	5.0
4	Press the [ENT] key again.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

Note

You can use the dCL (DC link voltage 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

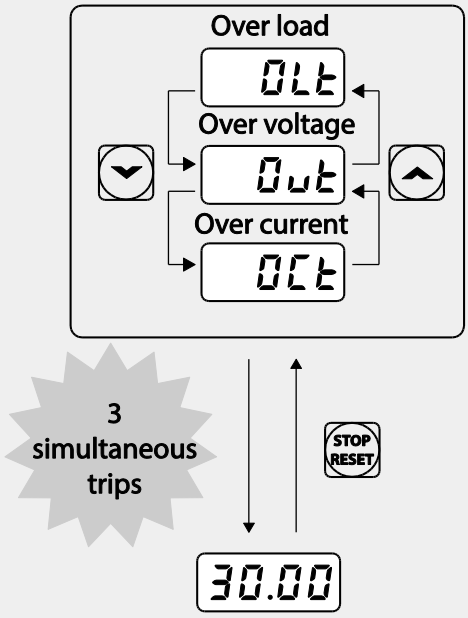
The following example demonstrates how to monitor fault trip conditions in the Operation group using the keypad.



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

Note

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



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

4 Learning Basic Features

This chapter describes the basic features of the MD100G inverter. Check the reference page in the table to see the detailed description for each of the advanced features.

Basic Tasks	Description	Ref.
Frequency reference source configuration for the keypad	Configures the inverter to allow you to setup or modify frequency reference using the Keypad.	p.68
Frequency reference source configuration for the terminal block (input voltage)	Configures the inverter to allow input voltages at the terminal block (V1, V2) and to setup or modify a frequency reference.	p.69, p.76
Frequency reference source configuration for the terminal block (input current)	Configures the inverter to allow input currents at the terminal block (I2) and to setup or modify a frequency reference.	p.74
Frequency reference source configuration for the terminal block (input pulse)	Configures the inverter to allow input pulse at the terminal block (TI) and to setup or modify a frequency reference.	p.76
Frequency reference source configuration for RS-485 communication	Configures the inverter to allow communication signals from upper level controllers, such as PLCs or PCs, and to setup or modify a frequency reference.	p.78
Frequency control using analog inputs	Enables the user to hold a frequency using analog inputs at terminals.	p.78
Motor operation display options	Configures the display of motor operation values. Motor operation is displayed either in frequency (Hz) or speed (rpm).	p.79
Multi-step speed (frequency) configuration	Configures multi-step frequency operations by receiving an input at the terminals defined for each step frequency.	p.79
Command source configuration for keypad buttons	Configures the inverter to allow the manual operation of the [FWD], [REV] and [Stop] keys.	p.82
Command source configuration for terminal block inputs	Configures the inverter to accept inputs at the FX/RX terminals.	p.82
Command source configuration for RS-485 communication	Configures the inverter to accept communication signals from upper level controllers, such as PLCs or PCs.	p.84
Local/remote switching via the [ESC] key	Configures the inverter to switch between local and remote operation modes when the [ESC] key is pressed. When the inverter is operated using remote inputs (any input other than one from the keypad), this configuration can be used to perform maintenance on the inverter, without losing or altering saved parameter settings. It can also be used to override remotes and use the keypad immediately in emergencies.	p.84

Basic Tasks	Description	Ref.
Motor rotation control	Configures the inverter to limit a motor's rotation direction.	p.86
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.87
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.87
Acc/Dec time configuration based on the Max. Frequency	Configures the acceleration and deceleration times for a motor based on a defined maximum frequency.	p.88
Acc/Dec time configuration based on the frequency reference	Configures acceleration and deceleration times for a motor based on a defined frequency reference.	p.90
Multi-stage Acc/Dec time configuration using the multi-function terminal	Configures multi-stage acceleration and deceleration times for a motor based on defined parameters for the multi-function terminals.	p.91
Acc/Dec time transition speed (frequency) configuration	Enables modification of acceleration and deceleration gradients without configuring the multi-functional terminals.	p.92
Acc/Dec pattern configuration	Enables modification of the acceleration and deceleration gradient patterns. Basic patterns to choose from include linear and S-curve patterns.	p.93
Acc/Dec stop command	Stops the current acceleration or deceleration and controls motor operation at a constant speed. Multi-function terminals must be configured for this command .	p.97
Linear V/F pattern operation	Configures the inverter to run a motor at a constant torque. To maintain the required torque, the operating frequency may vary during operation.	p.97
Square reduction V/F pattern operation	Configures the inverter to run the motor at a square reduction V/F pattern. Fans and pumps are appropriate loads for square reduction V/F operation.	p.98
User V/F pattern configuration	Enables the user to configure a V/F pattern to match the characteristics of a motor. This configuration is for special-purpose motor applications to achieve optimal performance.	p.99
Manual torque boost	Manual configuration of the inverter to produce a momentary torque boost. This configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	p.100
Automatic torque boost	Automatic configuration of the inverter that provides "auto tuning" that produces a momentary torque boost. This	p.101

Basic Tasks	Description	Ref.
	configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	
Output voltage adjustment	Adjusts the output voltage to the motor when the power supply to the inverter differs from the motor's rated input voltage.	p.101
Accelerating start	Accelerating start is the general way to start motor operation. The typical application configures the motor to accelerate to a target frequency in response to a run command, however there may be other start or acceleration conditions defined.	p.102
Start after DC braking	Configures the inverter to perform DC braking before the motor starts rotating again. This configuration is used when the motor will be rotating before the voltage is supplied from the inverter.	p.103
Deceleration stop	Deceleration stop is the typical method used to stop a motor. The motor decelerates to 0Hz and stops on a stop command, however there may be other stop or deceleration conditions defined.	p.103
Stopping by DC braking	Configures the inverter to apply DC braking during motor deceleration. The frequency at which DC braking occurs must be defined and during deceleration, when the motor reaches the defined frequency, DC braking is applied.	p.104
Free-run stop	Configures the inverter to stop output to the motor using a stop command. The motor will free-run until it slows down and stops.	p.105
Power braking	Configures the inverter to provide optimal, motor deceleration, without tripping over-voltage protection.	p.106
Start/maximum frequency configuration	Configures the frequency reference limits by defining a start frequency and a maximum frequency.	p.107
Upper/lower frequency limit configuration	Configures the frequency reference limits by defining an upper limit and a lower limit.	p.107
Frequency jump	Configures the inverter to avoid running a motor in mechanically resonating frequencies.	p.108
2nd Operation Configuration	Used to configure the 2nd operation mode and switch between the operation modes according to your requirements.	p.109
Multi-function input terminal control configuration	Enables the user to improve the responsiveness of the multi-function input terminals.	p.110
P2P communication configuration	Configures the inverter to share input and output devices with other inverters.	p.111
Multi-keypad configuration	Enables the user to monitor multiple inverters with one monitoring device.	p.112
User sequence configuration	Enables the user to implement simple sequences using various function blocks.	p.113

4.1 Setting Frequency Reference

The MD100G inverter provides several methods to setup and modify a frequency reference for an operation. The keypad, analog inputs [for example voltage (V1, V2) and current (I2) signals], or RS-485 (digital signals from higher-level controllers, such as PC or PLC) can be used.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Frq	Frequency reference source	Ref Freq Src	0	KeyPad-1	0–12	-
				1	KeyPad-2		
				2	V1		
				4	V2		
				5	I2		
				6	Int 485		
				8	Field Bus		
				12	Pulse		

4.1.1 Keypad as the Source (KeyPad-1 setting)

You can modify frequency reference by using the keypad and apply changes by pressing the [ENT] key. To use the keypad as a frequency reference input source, go to 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	Parameter 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

* 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 [▲] and [▼] keys to modify a frequency reference. To use this as a second option, set the keypad as the source of the frequency reference, by going to the Frq (Frequency 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 [▲] and [▼] 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

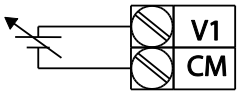
* You cannot set a frequency reference that exceeds the Max. Frequency, as configured with dr.20.

4.1.3 V1 Terminal as the Source

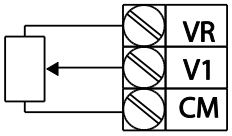
You can set and modify a frequency reference by setting voltage inputs when using the V1 terminal. Use voltage inputs ranging from 0 to 10V (unipolar) for forward only operation. Use voltage inputs ranging from -10 to +10V (bipolar) for both directions, where negative voltage inputs are used reverse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

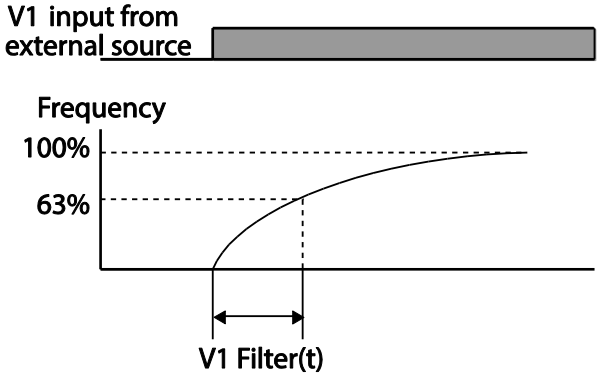
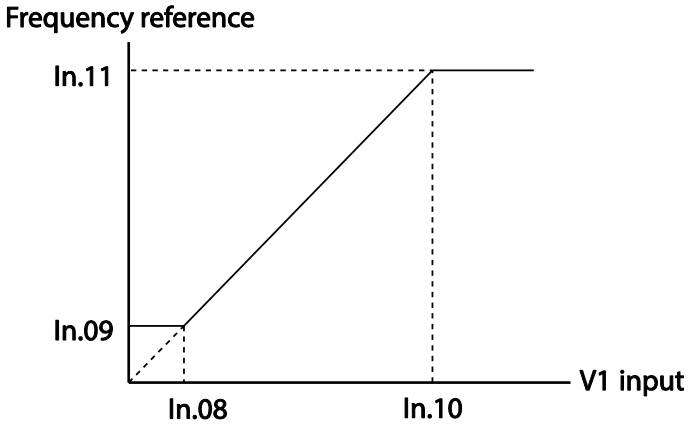
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	2	V1	0–12	-
In	01	Frequency at maximum analog input	Freq at 100%	Maximum frequency		0.00–Max. Frequency	Hz
	05	V1 input monitor	V1 Monitor [V]	0.00		0.00–12.00	V
	06	V1 polarity options	V1 Polarity	0	Unipolar	0–1	-
	07	V1 input filter time	V1 Filter	10		0–10000	ms

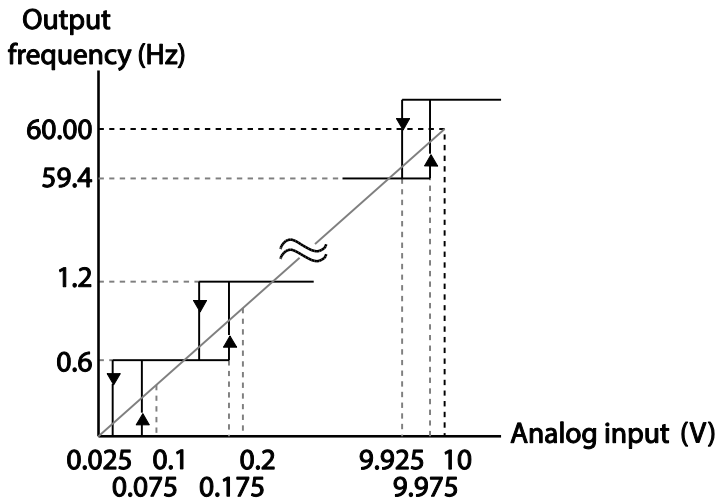
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
		constant					
	08	V1 minimum input voltage	V1 volt x1	0.00		0.00–10.00	V
	09	V1 output at minimum voltage (%)	V1 Perc y1	0.00		0.00–100.00	%
	10	V1 maximum input voltage	V1 Volt x2	10.00		0 .00– 12.00	V
	11	V1 output at maximum voltage (%)	V1 Perc y2	100.00		0–100	%
	16	Rotation direction options	V1 Inverting	0	No	0–1	-
	17	V1 Quantizing level	V1 Quantizing	0.04		0.00*, 0.04–10.00	%

* Quantizing is disabled if'0'is selected.

0–10V Input Voltage Setting Details

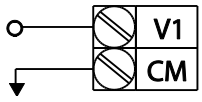
Code	Description
In.01 Freq at 100%	Configures the frequency reference at the maximum input voltage when a potentiometer is connected to the control terminal block. A frequency set with code In.01 becomes the maximum frequency only if the value set in code In.11 (or In.15) is 100(%). • Set code In.01 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. • 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–50Hz) when a 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.

Code	Description
	 [V1 Filter]
In.08 V1 Volt x1– In.11 V1 Perc y2	These parameters are used to configure the gradient level and offset values of the Output Frequency, based on the Input Voltage.  [Volt x1–In.11 V1 Perc y2]
In.16 V1 Inverting	Inverts the direction of rotation. Set this code to 1 (Yes) if you need the motor to run in the opposite direction from the current rotation.
In.17.V1 Quantizing	Quantizing may be used when the noise level is high in the analog input (V1 terminal) signal. Quantizing is useful when you are operating a noise-sensitive system, because it suppresses any signal noise. However, quantizing will diminish system sensitivity (resultant power of the output frequency will decrease based on the analog input). You can also turn on the low-pass filter using code In.07 to reduce the noise, but increasing the value will reduce responsiveness and may cause pulsations (ripples) in the output frequency.

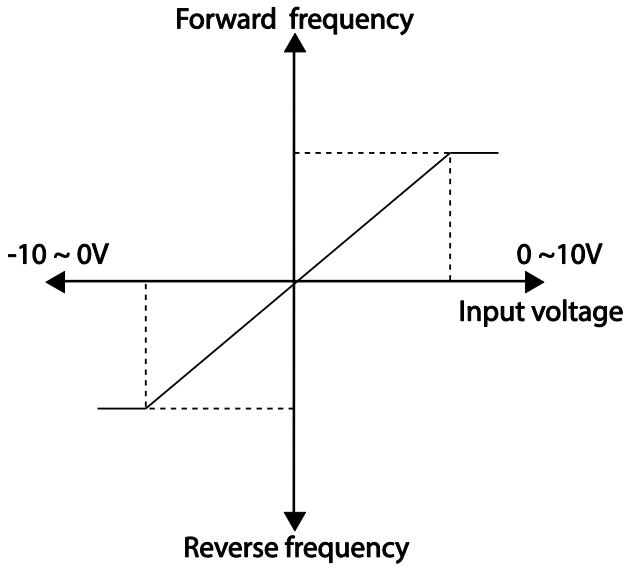
Code	Description
	Parameter values for quantizing refer to a percentage based on the maximum input. Therefore, if the value is set to 1% of the analog maximum input (50Hz), the output frequency will increase or decrease by 0.6Hz per 0.1V difference. When the analog input is increased, an increase to 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.  [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]



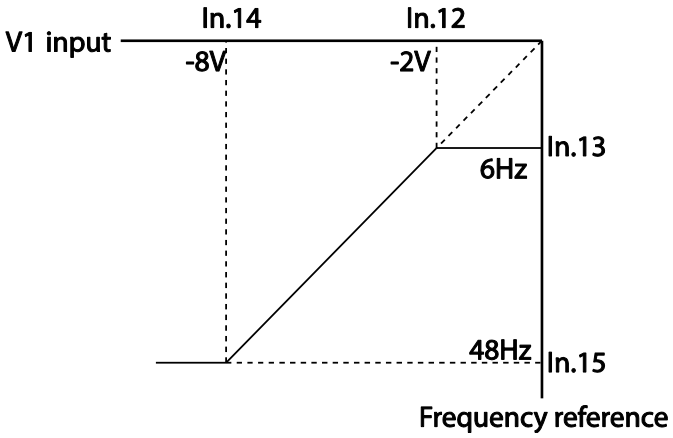
[Bipolar input voltage and output frequency]

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	2	V1	0–12	-
In	01	Frequency at maximum analog input	Freq at 100%	50.00		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	-
	12	V1 minimum input voltage	V1- volt x1	0.00		10.00–0.00V	V
	13	V1 output at minimum voltage (%)	V1- Perc y1	0.00		-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	Input voltage	
	0–10V	-10–0V
FWD	Forward	Reverse
REV	Reverse	Forward

-10–10V Voltage Input Setting Details

Code	Description
In.12 V1- volt x1– In.15 V1- Perc y2	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.  [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 71.

4.1.3.3 Setting a Reference Frequency using Input Current (I2)

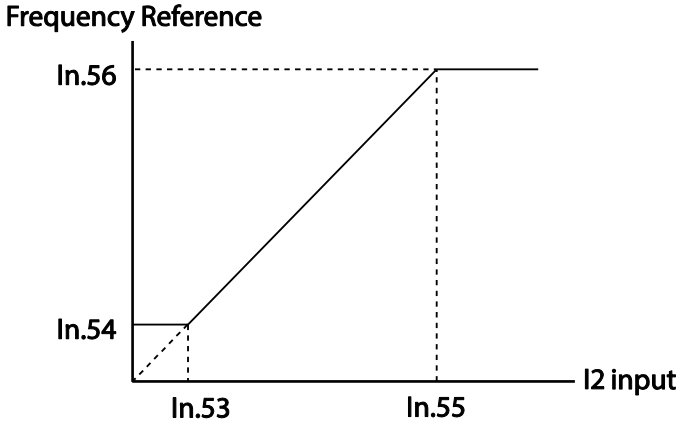
You can set and modify a frequency reference using input current at the I2 terminal after selecting current input at SW 2. Set the Frq (Frequency reference source) code in the Operation group to 5 (I2) and apply 4–20mA input current to I2.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	5	I2	0–12	-
In	01	Frequency at maximum analog input	Freq at 100%	50.00		0– Maximum Frequency	Hz
	50	I2 input monitor	I2 Monitor	0.00		0.00–24.00	mA
	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	I2 rotation direction options	I2 Inverting	0	No	0–1	-
	62	I2 Quantizing level	I2 Quantizing	0.04		0*, 0.04–10.00	%

* Quantizing is disabled if '0' is selected.

Input Current (I2) Setting Details

Code	Description
In.01 Freq at 100%	Configures the frequency reference for operation at the maximum current (when In.56 is set to 100%). • 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. • If In.56 is set to 50.00 (%), and default settings are used for In.01 (50Hz) and In.53–55, 20mA input current (max) to I2 will produce a frequency reference of 25.00Hz (50% of 50Hz).
In.50 I2 Monitor	Used to monitor input current at I2.
In.52 I2 Filter	Configures the time for the operation frequency to reach 63% of target frequency based on the input current at I2.
In.53 I2 Curr x1– In.56 I2 Perc y2	Configures the gradient level and off-set value of the output frequency.  [Gradient and off-set configuration based on output frequency]

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

Set and modify a frequency reference using input voltage at I2 (V2) terminal by setting SW2 to V2. Set the Frq (Frequency reference source) code in the 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		Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	4	V2	0–12	-
In	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	%
	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	%

* 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). In case of Standard I/O, 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		Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	12	Pulse	0–12	-
In	69	P5 terminal function setting	P5 Define	54	TI	0-54	-
	01	Frequency at maximum analog	Freq at 100%	50.00		0.00–Maximum	Hz

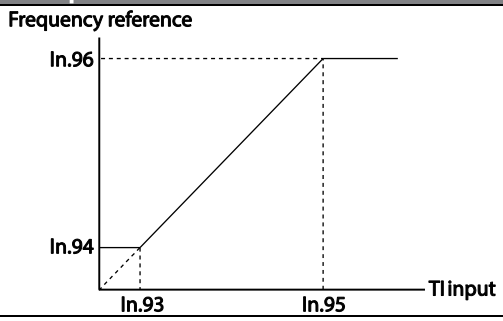
Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
		input			frequency	
	91	Pulse input display	Pulse Monitor	0.00	0.00–50.00	kHz
	92	TI input filter time constant	TI Filter	10	0–9999	ms
	93	TI input minimum pulse	TI Pls x1	0.00	0.00–32.00	kHz
	94	Output% at TI minimum pulse	TI Perc y1	0.00	0.00–100.00	%
	95	TI Input maximum pulse	TI Pls x2	32.00	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	%

* Data shaded in grey is applied only for Standard I/O.

*Quantizing is disabled if '0' is selected.

TI Pulse Input Setting Details

Code	Description
In.69 P5 Define	In case of Standard I/O, Pulse input TI and Multi-function terminal P5 share the same therminal. Set the In.69 P5 Define to 54(TI).
In.01 Freq at 100%	Configures the frequency reference at the maximum pulse input. The frequency reference is based on 100% of the value set with In.96. • If In.01 is set to 40.00 and codes In.93–96 are set at default, 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.92 TI Filter	Sets the time for the pulse input at TI to reach 63% of its nominal frequency (when the pulse frequency is supplied in multiple steps).
In.93 TI Pls x1– In.96 TI Perc y2	Configures the gradient level and offset values for the output frequency.

Code	Description
	
In.97 TI Inverting– In.98 TI Quantizing	Identical to In.16–17 (refer to In.16 V1 Inverting/In.17.V1 Quantizing on page *71*).

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 5 *RS-485 Communication Features* on page *123*.

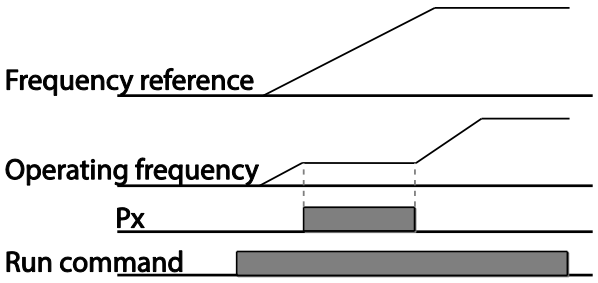
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Frq	Frequency reference source	Freq Ref Src	6	Int 485	0–12	-
In	01	Integrated RS-485 communication inverter ID	Int485 St ID	-	1	1–250	-
	02	Integrated communication protocol	Int485 Proto	0	ModBus RTU	0–2	-
				1	Reserved		
				2	LS Inv 485		
	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0–7	-
	04	Integrated communication frame configuration	Int485 Mode	0	D8/PN/S1	0–3	-
				1	D8/PN/S2		
				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 source	Freq Ref Src	0	Keypad-1	0–12	-
				1	Keypad-2		
				2	V1		
				4	V2		
				5	I2		
				6	Int 485		
				8	Field Bus		
				12	Pulse		
In	65–71	Px terminal configuration	Px Define(Px: P1–P7)	21	Analog Hold	0–54	-



4.3 Changing the Displayed Units (Hz↔Rpm)

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

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
dr	21	Speed unit selection	Hz/Rpm Sel	0	Hz Display	0–1	-
				1	Rpm Display		

4.4 Setting Multi-step Frequency

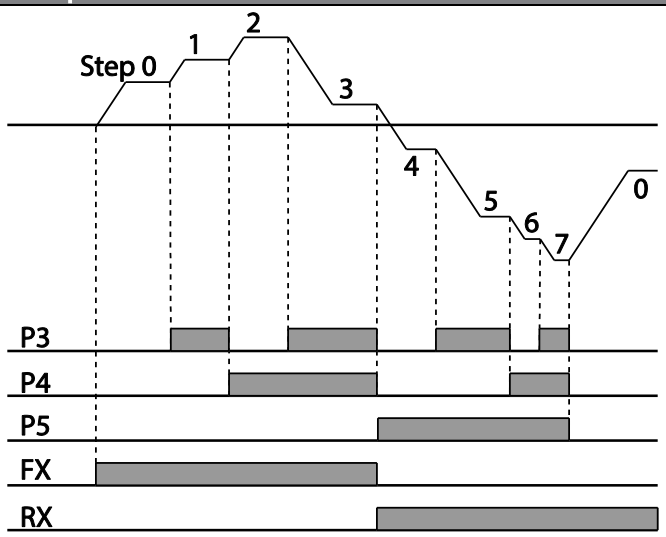
Multi-step operations can be carried out by assigning different speeds (or frequencies) to the Px terminals. Step 0 uses the frequency reference source set with the Frq code in the Operation group. Px terminal parameter values 7 (Speed-L), 8 (Speed-M) and 9 (Speed-H) are recognized as binary commands 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		Setting Range	Unit
Operation	St1–St3	Multi-step frequency 1–3	Step Freq - 1–3	-		0–Maximum frequency	Hz
bA	53–56	Multi-step frequency 4–7	Step Freq - 4–7	-		0–Maximum frequency	Hz
In	65–71	Px terminal configuration	Px Define (Px: P1–P7)	7	Speed-L	0–54	-
				8	Speed-M		-
				9	Speed-H		-
	89	Multi-step command delay time	InCheck Time	1		1–5000	ms

Multi-step Frequency Setting Details

Code	Description
Operation group St 1–St3 Step Freq - 1–3	Configure multi-step frequency1–3. If an LCD keypad is in use, bA.50–52 is used instead of St1–St3 (multi-step frequency 1–3).
bA.53–56 Step Freq - 4–7	Configure multi-step frequency 4–7.
In.65–71 Px Define	Choose the terminals to setup as multi-step inputs, and then set the relevant codes (In.65–71) to 7(Speed-L), 8(Speed-M), or 9(Speed-H). Provided that terminals P3, P4 and P5 have been set to Speed-L, Speed-M and Speed-H respectively, the following multi-step operation will be available.

Code	Description
	 [An example of a multi-step operation]
In.89 InCheck Time	Set a time interval for the inverter to check for additional terminal block inputs after receiving an input signal. After adjusting In.89 to 100ms and an input signal is received at P5, the inverter will search for inputs at other terminals for 100ms, before proceeding to accelerate or decelerate based on P5's configuration.

Speed	Fx/Rx	P5	P4	P3
0	✓	-	-	-
1	✓	-	-	✓
2	✓	-	✓	-
3	✓	-	✓	✓
4	✓	✓	-	-
5	✓	✓	-	✓
6	✓	✓	✓	-
7	✓	✓	✓	✓

4.5 Command Source Configuration

Various devices can be selected as command input devices for theMD100G 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
Operation	drv	Command Source	Cmd Source*	0	Keypad	0–4	-
				1	Fx/Rx-1		
				2	Fx/Rx-2		
				3	Int 485		
				4	Field Bus		

* 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	0–4	-

* Displayed under DRV-06 on the LCD keypad.

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

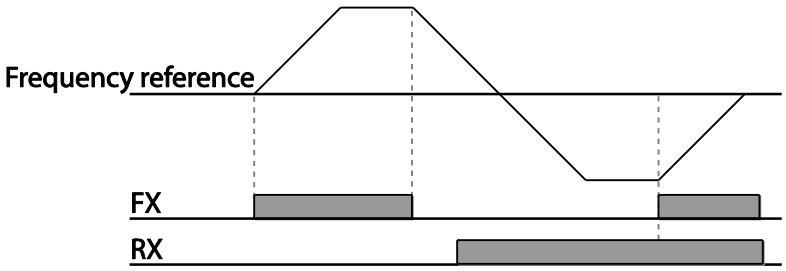
Multi-function terminals can be selected as a command input device. This is configured by setting the drv (command source) code in the Operation group to 1(Fx/Rx). Select 2 terminals for the forward and reverse operations, and then set the relevant codes (2 of the 5 multi-function terminal codes, In.65–71 for P1–P7) to 1(Fx) and 2(Rx) respectively. This application enables both terminals to be turned on or off at the same time, constituting a stop command that will cause the inverter to stop operation.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	drv	Command source	Cmd Source*	1	Fx/Rx-1	0–4	-
In	65–71	Px terminal configuration	Px Define(Px: P1–P7)	1	Fx	0–54	-
				2	Rx		

* 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.65–71 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.65–71 for P1–P7) to 1(Fx) and 2(Rx) respectively. This application uses an Fx input as a run command, and an Rx input to change a motor's rotation direction (On-Rx, Off-Fx).

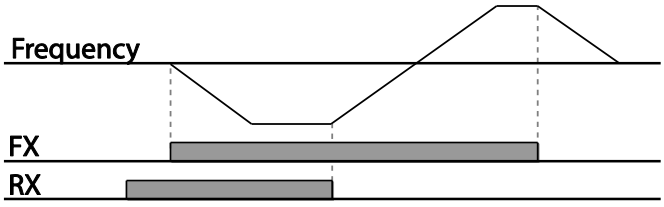
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	Drv	Command source	Cmd Source*	2	Fx/Rx-2	0–4	-
In	65–71	Px terminal configuration	Px Define (Px: P1 – P7)	1	Fx	0–54	-
				2	Rx		

* 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).

Code	Description
In.65–71 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 5 *RS-485 Communication Features* on page *123*.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	drv	Command source	Cmd Source*	3	Int 485	0–4	-
CM	01	Integrated communication inverter ID	Int485 St ID	1		1–250	-
	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	-

* 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 *50*.

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 Source*	1	Fx/Rx-1	0–4	-

* 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 drv code configuration.

Note

Local/Remote Operation

- Full control of the inverter is available with the keypad during local operation (local operation).
- During local operation, jog commands will only work if one of the P1–P7 multi-function terminals (codes In.65–71) is set to 13(RUN Enable) and the relevant terminal is turned on.
- During remote operation (remote operation), the inverter will operate according to the previously set frequency reference source and the command received from the input device.
- If 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 0(No), a command through the input terminals will work ONLY AFTER all the terminals listed above have been turned off and then turned on again.

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

been turned off.

Inverter Operation During Local/Remote Switching

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

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

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	Parameter Setting		Setting Range	Unit
Ad	09	Run prevention options	Run Prevent	0	None	0–2	-
				1	Forward Prev		
				2	Reverse Prev		

Forward/Reverse Run Prevention Setting Details

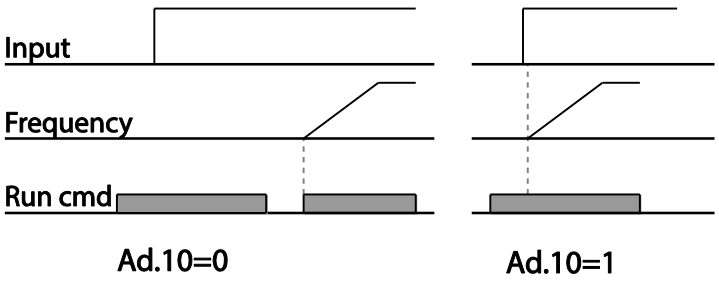
Code	Description		
Ad.09 Run Prevent	Choose a direction to prevent.		
	Setting		Description
	0	None	Do not set run prevention.
	1	Forward Prev	Set forward run prevention.
	2	Reverse Prev	Set reverse run prevention.

4.8 Power-on Run

A power-on command can be setup to start an inverter operation after powering up, based on terminal block operation commands (if they have been configured). To enable power-on run set the drv (command source) code to 1 (Fx/Rx-1) or 2 (Fx/Rx-2) in the Operation group.

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

* 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.

⚠ Caution

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

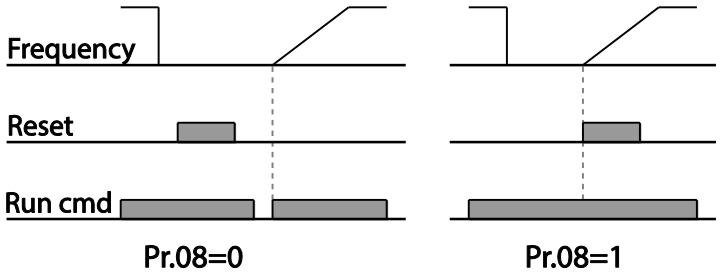
4.9 Reset and Restart

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 Source*	1 2	Fx/Rx-1 or Fx/Rx-2	0–4	-
Pr	08	Reset restart setup	RST Restart	1	Yes	0–1	
	09	No. of auto restart	Retry Number	0		0–10	
	10	Auto restart delay time	Retry Delay	1.0		0–60	sec

* 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.

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.

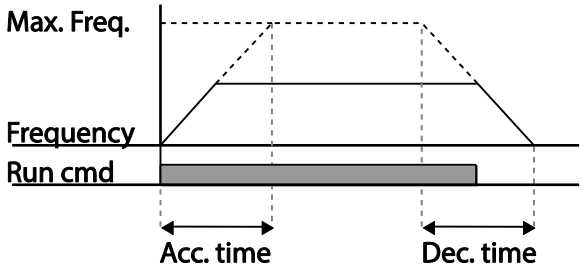
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	ACC	Acceleration time	Acc Time	20.0		0.0–600.0	sec
	dEC	Deceleration time	Dec Time	30.0		0.0–600.0	sec
	20	Maximum frequency	Max Freq	50.00		40.00–400.00	Hz
bA	08	Acc/Dec reference frequency	Ramp T Mode	0	Max Freq	0–1	-
	09	Time scale	Time scale	1	0.1sec	0–2	-

Acc/Dec Time Based on Maximum Frequency – Setting Details

Code	Description
bA.08 Ramp T Mode	Set the parameter value to 0 (Max Freq) to setup Acc/Dec time based on maximum frequency.

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

If, for example, maximum frequency is 50.00Hz, the Acc/Dec times are set to 5 seconds, and the frequency reference for operation is set at 30Hz (half of 50Hz), the time required to reach 25Hz therefore is 2.5 seconds (half of 5 seconds).



bA.09 Time scale	Use the time scale for all time-related values. It is particularly useful when a more

Code	Description
	accurate Acc/Dec times are required because of load characteristics, or when the maximum time range needs to be extended.

Configuration		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.

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).

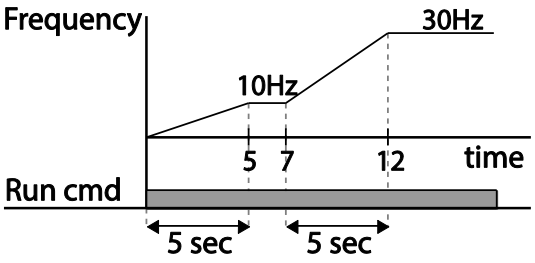
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	ACC	Acceleration time	Acc Time	20.0		0.0–600.0	sec
	dEC	Deceleration time	Dec Time	30.0		0.0–600.0	sec
bA	08	Acc/Dec reference	Ramp T Mode	1	Delta Freq	0–1	-

Acc/Dec Time Based on Operation Frequency – Setting Details

Code	Description
bA.08 Ramp T Mode	Set the parameter value to 1 (Delta Freq) to set Acc/Dec times based on Maximum frequency.

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

Code	Description
	1 | Delta Freq | Set the Acc/Dec time based on Operation frequency.
	If Acc/Dec times are set to 5 seconds, and multiple frequency references are used in the operation in 2 steps, at 10Hz and 30 Hz, each acceleration stage will take 5 seconds (refer to the graph below).



4.10.3 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
	dEC	Deceleration time	Dec Time	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	65–71	Px terminal configuration	Px Define (Px: P1–P7)	11 XCEL-L 12 XCEL-M 49 XCEL-H	0–54	-
	89	Multi-step command delay time	In Check Time	1	1–5000	ms

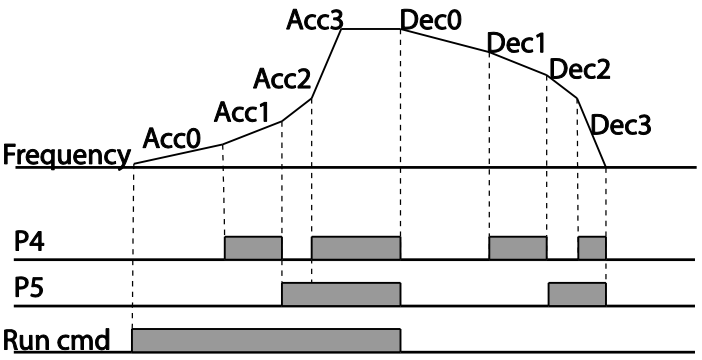
Acc/Dec Time Setup via Multi-function Terminals – Setting Details

Code	Description
bA. 70–82 Acc Time 1–7	Set multi-step acceleration time1–7.

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>bA.71–83 Dec Time 1–7</td><td>Set multi-step deceleration time1–7.</td></tr>
<tr><td>In.65–71
Px Define (P1–P7)</td><td>Choose and configure the terminals to use for multi-step Acc/Dec time inputs.

<table>
<tr><td colspan="2">Configuration</td><td>Description</td></tr>
<tr><td>11</td><td>XCEL-L</td><td>Acc/Dec command-L</td></tr>
<tr><td>12</td><td>XCEL-M</td><td>Acc/Dec command-M</td></tr>
<tr><td>49</td><td>XCEL-H</td><td>Acc/Dec command-H</td></tr>
</table>

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.



<table>
<tr><th>Acc/Dec time</th><th>P5</th><th>P4</th></tr>
<tr><td>0</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>✓</td></tr>
<tr><td>2</td><td>✓</td><td>-</td></tr>
<tr><td>3</td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>In.89 In Check Time</td><td>Set the time for the inverter to check for other terminal block inputs. If In.89 is set to 100ms and a signal is supplied to the P4 terminal, the inverter searches for other inputs over the next 100ms. When the time expires, the Acc/Dec time will be set based on the input received at P4.</td></tr>
</table>

4.10.4 Configuring Acc/Dec Time Switch Frequency

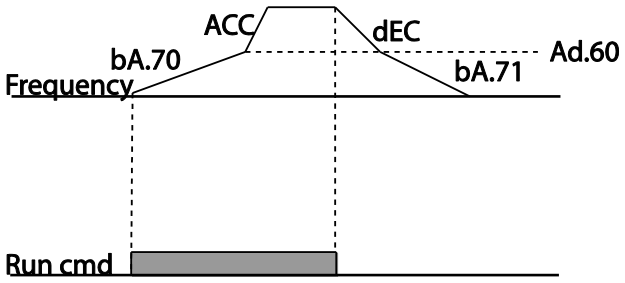
You can switch between two different sets of Acc/Dec times (Acc/Dec gradients) by configuring

the switch frequency without configuring the multi-function terminals.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
Operation	ACC	Acceleration time	Acc Time	10.0	0.0–600.0	sec
	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–P7 multi-function input terminals for multi-step Acc/Dec gradients (XCEL-L, XCEL-M, XCEL-H), the inverter will operate based on the Acc/Dec inputs at the terminals instead of the Acc/Dec switch frequency configurations.



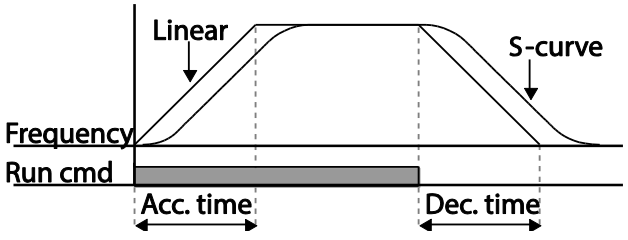
4.11 Acc/Dec Pattern Configuration

Acc/Dec gradient level patterns can be configured to enhance and smooth the inverter's acceleration and deceleration curves. Linear pattern features a linear increase or decrease to the output frequency, at a fixed rate. For an S-curve pattern a smoother and more gradual increase or decrease of output frequency, ideal for lift-type loads or elevator doors, etc. S-curve gradient level can be adjusted using codes Ad. 03–06 in the Advanced group.

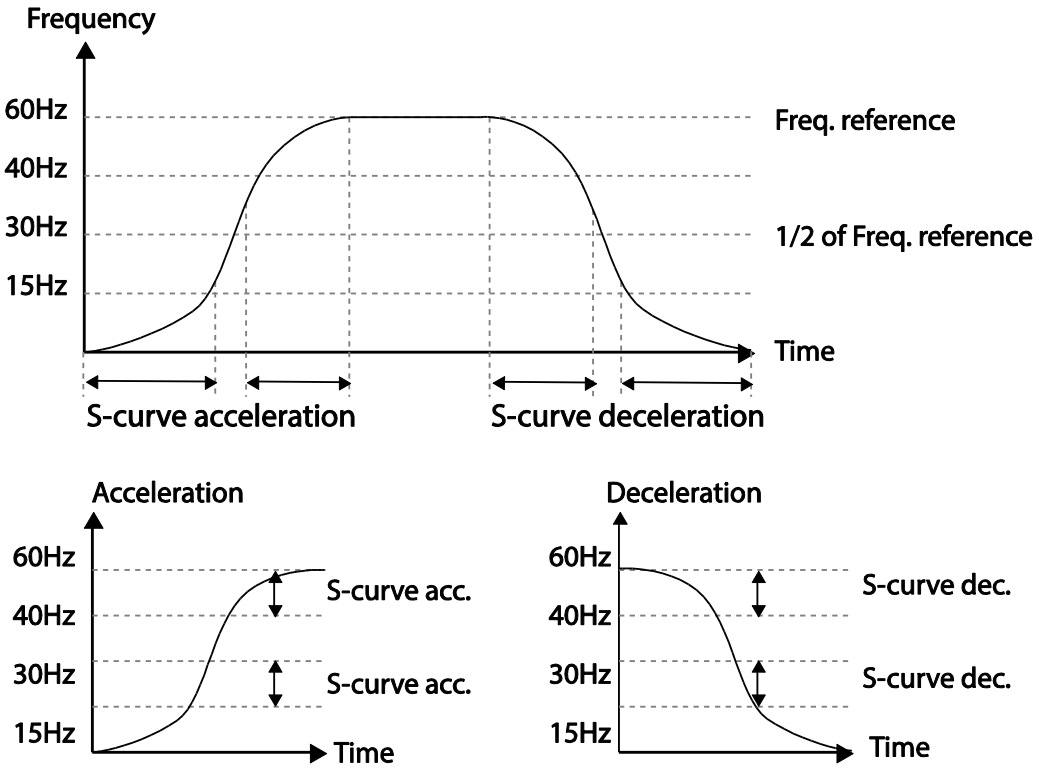
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
bA	08	Acc/Dec reference	Ramp T mode	0	Max Freq	0–1	-
Ad	01	Acceleration pattern	Acc Pattern	0	Linear	0–1	-
	02	Deceleration pattern	Dec Pattern	1	S-curve		-
	03	S-curve Acc start gradient	Acc S Start	40		1–100	%
	04	S-curve Acc end gradient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

Acc/Dec Pattern Setting Details

Code	Description
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 50Hz and Ad.03 is set to 50%, Ad. 03 configures acceleration up to 25Hz (half of 50Hz).The inverter will operate S-curve acceleration in the 0-15Hz frequency range (50% of 25Hz). Linear acceleration will be applied to the remaining acceleration within the 15–25Hz frequency range.
Ad.04 Acc S End	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. If the frequency reference and the maximum frequency are set at 50Hz and Ad.04 is set to 50%, setting Ad. 04 configures acceleration to increase from 25Hz (half of 50Hz) to 50Hz (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 45–50Hz frequency range.
Ad.05 Dec S Start – Ad.06 Dec S End	Sets the rate of S-curve deceleration. Configuration for codes Ad.05 and Ad.06 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.

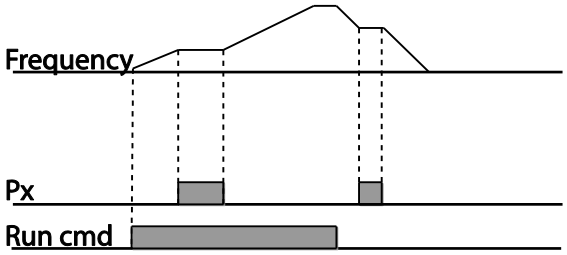
Caution

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	Parameter Setting		Setting Range	Unit
In	65–71	Px terminal configuration	Px Define(Px: P1–P7)	25	XCEL Stop	0–54	-



4.13 V/F(Voltage/Frequency) Control

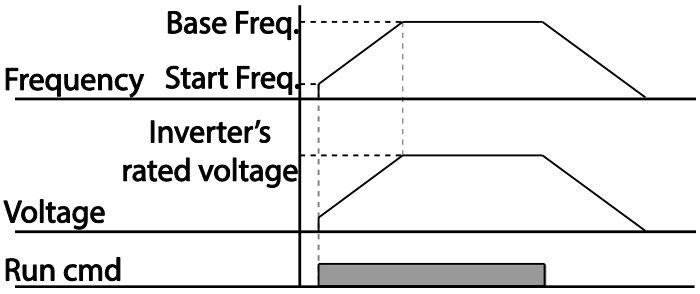
Configure the inverter's output voltages, gradient levels and output patterns to achieve a target output frequency with V/F control. The amount of of torque boost used during low frequency operations can also be adjusted.

4.13.1 Linear V/F Pattern Operation

A linear V/F pattern configures the inverter to increase or decrease the output voltage at a fixed rate for different operation frequencies based on V/F characteristics. A linear V/F pattern is partcularly useful when a constant torque load is applied.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
dr	09	Control mode	Control Mode	0	V/F	0–4	-
	18	Base frequency	Base Freq	50.00		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). 

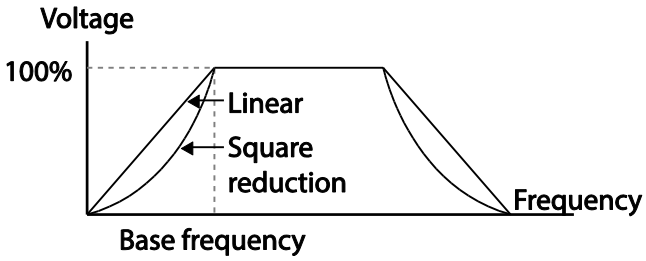
4.13.2 Square Reduction V/F pattern Operation

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/F pattern	V/F Pattern	1	Square	0–3	-
				3	Square2		

Square Reduction V/F pattern Operation - Setting Details

Code	Description		
bA.07 V/F Pattern	Sets the parameter value to 1(Square) or 3(Square2) according to the load's start characteristics.		
	Setting		Function
	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

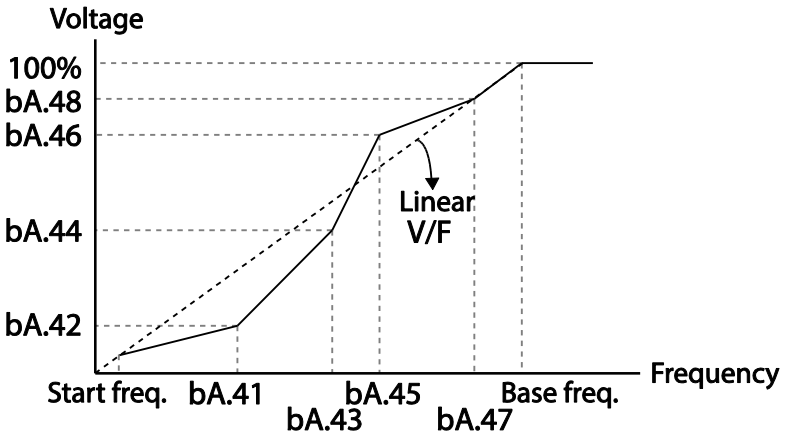
The MD100G inverter allows the configuration of user-defined V/F patterns to suit the load characteristics of special motors.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
bA	07	V/F pattern	V/F Pattern	2	User V/F	0–3	-
	41	User Frequency1	User Freq 1	15.00		0–Maximum frequency	Hz
	42	User Voltage1	User Volt 1	25		0–100	%
	43	User Frequency2	User Freq 2	30.00		0–Maximum frequency	Hz
	44	User Voltage2	User Volt 2	50		0–100	%
	45	User Frequency3	User Freq 3	45.00		0–Maximum frequency	Hz
	46	User Voltage3	User Volt 3	75		0–100	%
	47	User Frequency4	User Freq 4	Maximum frequency		0–Maximum frequency	Hz
	48	User Voltage4	User Volt 4	100		0–100%	%

User V/F pattern Setting Details

Code	Description
bA.41 User Freq 1–bA.48 User Volt 4	Set the parameter values to assign arbitrary frequencies (User Freq 1–4) for start and maximum frequencies. Voltages can also be set to correspond with each 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.



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

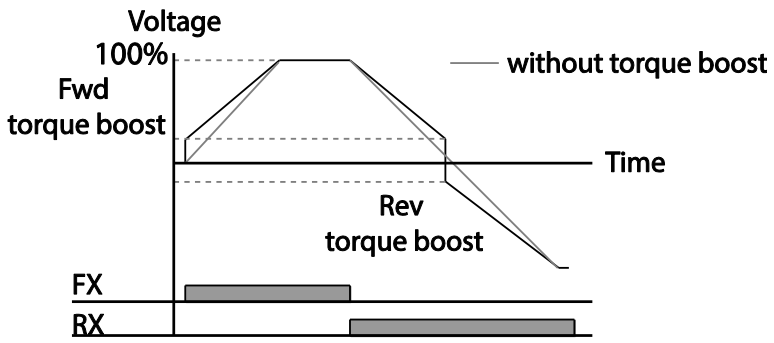
4.14.1 Manual Torque Boost

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
Dr	15	Torque boost options	Torque Boost	0	Manual	0–1	-
	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.



Caution

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

4.14.2 Auto Torque Boost

Auto torque boost enables the inverter to automatically calculate the amount of output voltage required for torque boost based on the entered motor parameters. Because auto torque boost requires motor-related parameters such as stator resistance, inductance, and no-load current, auto tuning (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	Parameter Setting		Setting Range	Unit
Dr	15	torque boost mode	Torque Boost	1	Auto	0–1	-
bA	20	auto tuning	Auto Tuning	3	Rs+Lsigma	0–6	-

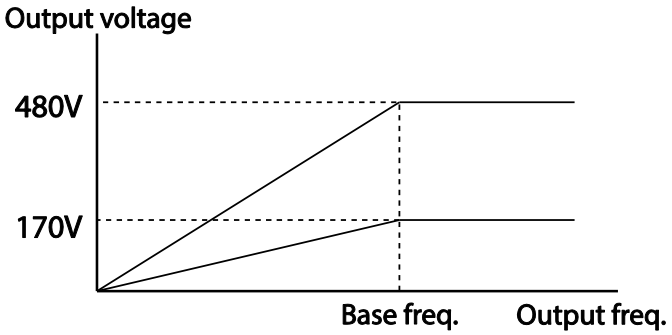
4.15 Output Voltage Setting

Output voltage settings are required when a motor's rated voltage differs from the input voltage to the inverter. Set 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

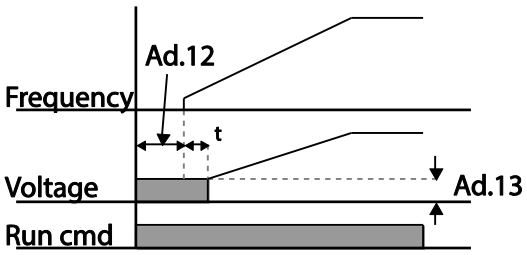
Acceleration start is a general acceleration mode. If there are no extra settings applied, the motor accelerates directly to the frequency reference when the command is input.

Group	Code	Name	LCD Display	Parameter 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
Ad	07	Start mode	Start Mode	1	DC-Start	0–1	-
	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	%



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.

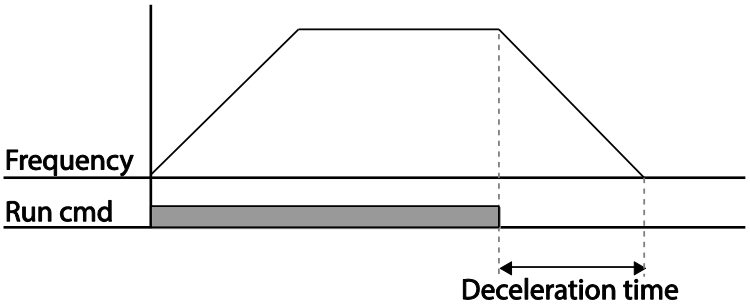
4.17 Stop Mode Setting

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	-



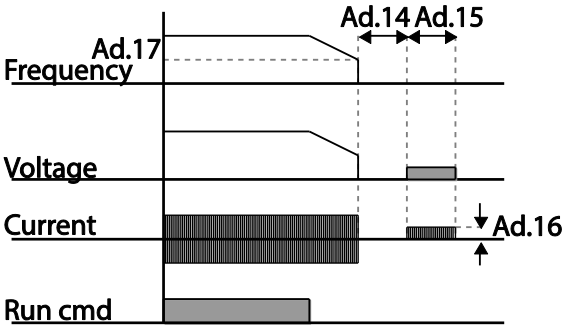
4.17.2 Stop After DC Braking

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		Setting Range	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		0.00–50.00	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.



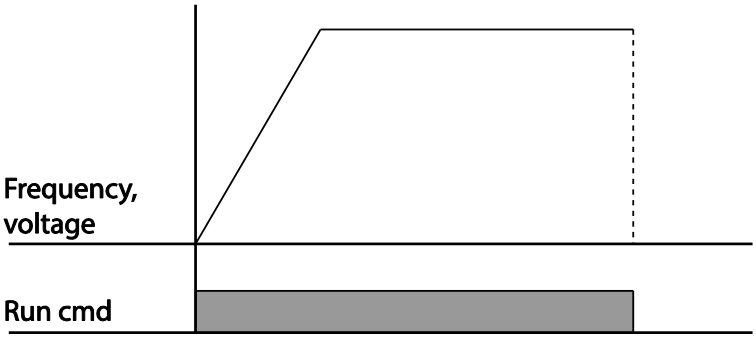
Caution

- 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	Parameter Setting		Setting Range	Unit
Ad	08	Stop Method	Stop Mode	2	Free-Run	0–4	-



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	Parameter Setting		Setting Range	Unit
Ad	08	Stop mode	Stop Mode	4	Power Braking	0–4	-

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	Parameter Setting	Setting Range	Unit
dr	19	Start frequency	Start Freq	0.50	0.01–10.00	Hz
	20	Maximum frequency	Max Freq	50.00	40.00–400.00	Hz

Frequency Limit Using Maximum Frequency and Start Frequency - Setting Details

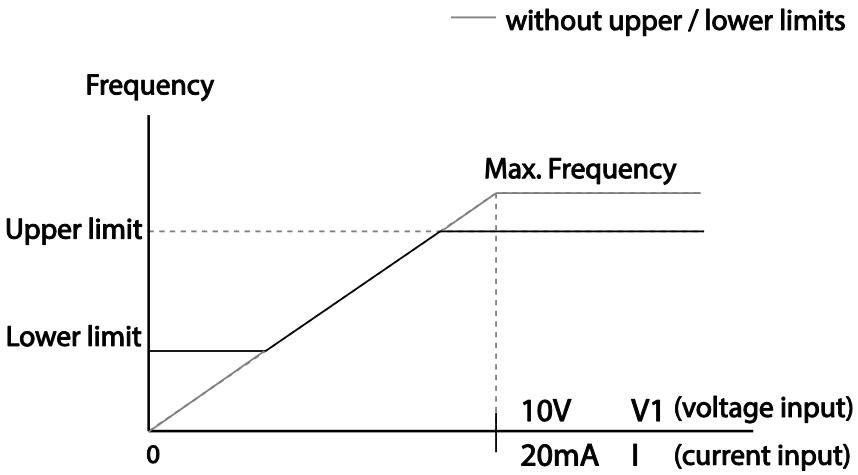
Code	Description
dr.19 Start Freq	Set the lower limit value for speed unit parameters that are expressed in Hz or rpm. If an input frequency is lower than the start frequency, the parameter value will be 0.00.
dr.20 Max Freq	Set upper and lower frequency limits. All frequency selections are restricted 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
Ad	24	Frequency limit	Freq Limit	1	Yes	0–1	-
	25	Frequency lower limit value	Freq Limit Lo	0.50		0.0–maximum frequency	Hz
	26	Frequency upper limit value	Freq Limit Hi	Maximum frequency		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.

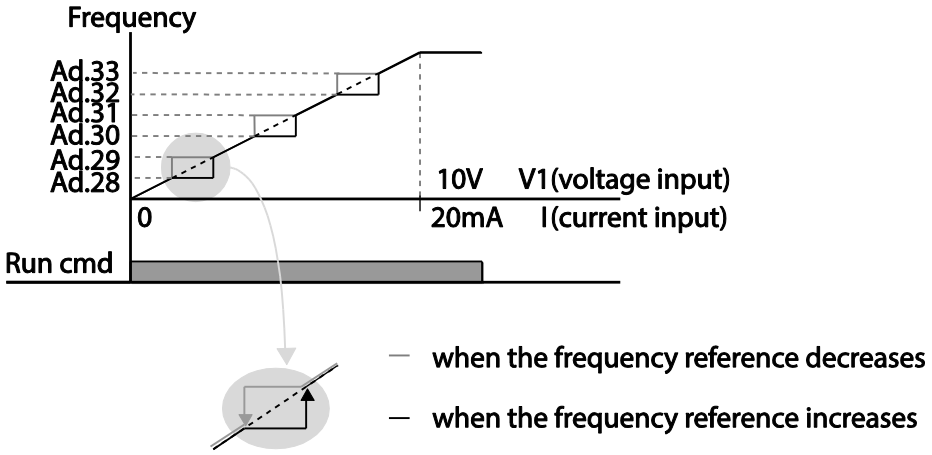


4.18.3 Frequency Jump

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
Ad	27	Frequency jump	Jump Freq	0	No	0–1	-
	28	Jump frequency lower limit1	Jump Lo 1	10.00		0.00–Jump frequency upper limit 1	Hz
	29	Jump frequency upper limit1	Jump Hi 1	15.00		Jump frequency lower limit 1–Maximum frequency	Hz
	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 2nd 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 multi-function input terminal. Mode swiching can be used to stop remote control during an operation using the communication option and to switch operation mode to operate via the local panel, or to operate the inverter from another remote control location.

Select one of the multi-function terminals from codes In. 65–71 and set the parameter value to 15 (2nd Source).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
Operation	drv	Command source	Cmd Source*	1	Fx/Rx-1	0–4	-
	Frq	Frequency reference source	Freq Ref Src	2	V1	0–12	-
bA	04	2nd Command source	Cmd 2nd Src	0	Keypad	0–4	-
	05	2nd Frequency reference source	Freq 2nd Src	0	KeyPad-1	0–12	-
In	65–71	Px terminal configuration	Px Define (Px: P1–P7)	15	2nd Source	0–54	-

* Displayed under DRV-06 in an LCD keypad.

2nd Operation Mode Setting Details

Code	Description
bA.04 Cmd 2nd Src bA.05 Freq 2nd Src	If signals are provided to the multi-function terminal set as the 2nd command source (2nd Source), the operation can be performed using the set values from

Code	Description
	bA.04-05 instead of the set values from the drv and Frq codes in the Operation group. The 2nd command source settings cannot be changed while operating with the 1st command source (Main Source).

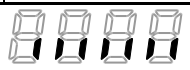
Caution

- When setting the multi-function terminal to the 2nd 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 2nd command. Before shifting input to the multi-function terminal, ensure that the 2nd command is correctly set. Note that if the deceleration time is too short or inertia of the load is too high, an overvoltage fault trip may occur.
- Depending on the parameter settings, the inverter may stop operating when you switch the command modes.

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
In	85	Multi-function input terminal On filter	DI On Delay	10	0–10000	ms
	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*	-	-
	90	Multi-function input terminal status	DI Status	0 0000*	-	-

* Displayed as  on the keypad.

Multi-function Input Terminal Control Setting Details

Code	Description
In.85 DI On Delay, In.86 DI Off Delay	If the input terminal's state is not changed during the set time, when the terminal receives an input, it is recognized as On or Off.
In.87 DI NC/NO Sel	Select terminal contact types for each input terminal. The position of the indicator light corresponds to the segment that is on as shown in the table below. With the bottom segment on, it indicates that the terminal is configured as a A

Code	Description
	terminal (Normally Open) contact. With the top segment on, it indicates that the terminal is configured as a B terminal (Normally Closed) contact. Terminals are numbered P1–P7, from right to left.

Type	B terminal status (Normally Closed)	A terminal status (Normally Open)
Keypad		
LCD keypad		

Code	Description
In.90 DI Status	Display the configuration of each contact. When a segment is configured as A terminal using dr.87, the On condition is indicated by the top segment turning on. The Off condition is indicated when the bottom segment is turned on. When contacts are configured as B terminals, the segment lights behave conversely. Terminals are numbered P1–P7, from right to left.

Type	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	Parameter Setting		Setting Range	Unit
CM	95	P2P Communication selection	Int 485 Func	1	P2P Master	0–3	-
US	80	Analog input1	P2P In V1	0		0–12,000	%

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	81	Analog input2	P2P In I2	0	-12,000–12,000	%
	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	Parameter 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).
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.

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	Parameter Setting		Setting Range	Unit
CM	95	P2P Communication selection	Int 485 Func	3	KPD-Ready	0–3	-
CNF	03	Multi-keypad ID	Multi KPD ID	3		3–99	-
	42	Multi-function key selection	Multi Key Sel	4	Multi KPD	0–4	-

Slave Parameter

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
CM	01	Station ID	Int485 St ID	3		3–99	-
	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.
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) .

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	Setting Range	Unit
AP	02	User sequence activation	User Seq En	0	0–1	-
US	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	-
	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
UF	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–	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
					32767	
	16	Uer function 4	User Func4	0	0–28	-
	17	User function input 4-A	User Input 4-A	0	0–0xFFFF	-
	18	User function input 4-B	User Input 4-B	0	0–0xFFFF	-
	19	User function input 4-C	User Input 4-C	0	0–0xFFFF	-
	20	User function output 4	User Output 4	0	-32767–32767	-
	21	User function 5	User Func5	0	0–28	-
	22	User function input 5-A	User Input 5-A	0	0–0xFFFF	-
	23	User function input 5-B	User Input 5-B	0	0–0xFFFF	-
	24	User function input 5-C	User Input 5-C	0	0–0xFFFF	-
	25	User function output 5	User Output 5	0	-32767–32767	-
	26	User function 6	User Func6	0	0–28	-
	27	User function input 6-A	User Input 6-A	0	0–0xFFFF	-
	28	User function input 6-B	User Input 6-B	0	0–0xFFFF	-
	29	User function input 6-C	User Input 6-C	0	0–0xFFFF	-
	30	User function output 6	User Output 6	0	-32767–32767	-
	31	User function 7	User Func7	0	0–28	-
	32	User function input 7-A	User Input 7-A	0	0–0xFFFF	-
	33	User function input 7-B	User Input 7-B	0	0–0xFFFF	-
	34	User function input 7-C	User Input 7-C	0	0–0xFFFF	-
	35	User function output 7	User Output 7	0	-32767–32767	-
	36	User function 8	User Func8	0	0–28	-
	37	User function input 8-A	User Input 8-A	0	0–0xFFFF	-
	38	User function input8-B	User Input 8-B	0	0–0xFFFF	-
	39	User function input 8-C	User Input 8-C	0	0–0xFFFF	-
	40	User function output 8	User Output 8	0	-32767–32767	-
	41	User function 9	User Func9	0	0–28	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	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	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	69	User function input 14-C	User Input 14-C	0	0–0xFFFF	-
	70	User function output14	User Output 14	0	-32767–32767	-
	71	User function 15	User Func15	0	0–28	-
	72	User function input 15-A	User Input 15-A	0	0–0xFFFF	-
	73	User function input 15-B	User Input 15-B	0	0–0xFFFF	-
	74	User function input 15-C	User Input 15-C	0	0–0xFFFF	-
	75	User function output 15	User Output 15	0	-32767–32767	-
	76	User function 16	User Func16	0	0–28	-
	77	User function input 16-A	User Input 16-A	0	0–0xFFFF	-
	78	User function input 16-B	User Input 16-B	0	0–0xFFFF	-
	79	User function input 16-C	User Input 16-C	0	0–0xFFFF	-
	80	User function output 16	User Output 16	0	-32767–32767	-
	81	User function 17	User Func17	0	0–28	-
	82	User function input 17-A	User Input 17-A	0	0–0xFFFF	-
	83	User function input 17-B	User Input 17-B	0	0–0xFFFF	-
	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.
US.01 User Seq Con	Set Sequence Run and Sequence Stop with the keypad. Parameters cannot be adjusted during an operation. To adjust parameters, the operation must be stopped.

Code	Description
US.02 User Loop Time	Set the user sequence Loop Time. User sequence loop time can be set to 0.01s/0.02s/ 0.05s/0.1s/0.5s/1s.
US.11–28 Link UserOut1–18	Set parameters to connect 18 Function Blocks. If the input value is 0x0000, an output value cannot be used. To use the output value in step 1 for the frequency reference (Cmd 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 needed in the user function block.
UF.01–90	Set user defined functions for the 18 function blocks. If the function block setting is invalid, the output of the User Output@ is -1. 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

Type	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.

* @ is the step number (1-18).

User Function Operation Condition

Number	Type	Description
0	NOP	No Operation.
1	ADD	Addition operation, (A + B) + C If the C parameter is 0x0000, it will be recognized as 0.
2	SUB	Subtraction operation, (A - B) − C If the C parameter is 0x0000, it will be recognized as 0.
3	ADDSUB	Addition andsubtraction compound operation, (A + B) − C 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). 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). If the C parameter is 0x0000, operate only with A, B.
6	ABS	Output the absolute value of the A parameter, | A |. 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.

Number	Type	Description
8	REMAINDER	Remainder operation of A and B, A % B This operation does not use the C parameter.
9	MPYDIV	Multiplication, division compound operation, (A x B)/C. If the C parameter is 0x0000, output the multiplication operation of (A x B).
10	COMPARE-GT (greater than)	Comparison operation: if (A > B) the output is C; if (A </=B) the output is 0. 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).
11	COMPARE-GTEQ (great than or equal to)	Comparison operation; if (A >/= B) output is C; if (A<B) the output is 0. 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).
12	COMPARE-EQUAL	Comparison operation, if(A == B) then the output is C. For all other values the output is 0. 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).
13	COMPARE-NEQUAL	Comparison operation, if(A != B) then the output is C. For all other values the output is 0. 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).
14	TIMER	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. If input of C is 1, output the current timer value. If input of C is 0, output 1 when timer value exceeds A(Max) value. If the C parameter is 0x0000, C will be recognized as 0. Timer overflow Initializes the timer value to 0.
15	LIMIT	Sets a limit for the A parameter. If input to A is between B and C, output the input to A. 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. 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.
20	SWITCH	Output a value after selecting one of two inputs, if (A) then B otherwise C. If the input at A is 1, the output will be B. If the input at A is 0, the output

Number	Type	Description
		parameter will be C.
21	BITTEST	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. 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.
22	BITSET	Set the B bit of the A parameter, BITSET(A, B). Output the changed value after setting 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.
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.

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
Ad	80	Fire Mode selection	Fire Mode Sel	2	Fire Mode	0–2	-
	81	Fire Mode frequency	Fire Mode Freq	0-50		0–50	
	82	Fire Mode run direction	Fire Mode Dir	0		0–1	
	83	Fire Mode operation count	Fire Mode Cnt	Not configurable		-	-
In	65–71	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 multi-function terminal (In. 65-71) 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.

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

<table>
<tr><th>Code</th><th>Description</th><th>Details</th></tr>
<tr><td>Ad.81 Fire Mode frequency</td><td>Fire mode frequency reference</td><td>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.</td></tr>
<tr><td>Dr.03 Acc Time / Dr.04 Dec Time</td><td>Fire mode Acc/Dec times</td><td>When Fire mode operation is turned on, the inverter accelerates for the time set at Dr.03 (Acc Time), and then decelerates based on the deceleration time set at Dr.04 (Dec Time). It stops when the Px terminal input is turned off (Fire mode operation is turned off).</td></tr>
<tr><td>PR.10 Retry Delay</td><td>Fault trip process</td><td>Some fault trips are ignored during Fire mode operation. The fault trip history is saved, but trip outputs are disabled even when they are configured at the multi-function output terminals.

Fault trips that are ignored in Fire mode
BX, External Trip, Low Voltage Trip, Inverter Overheat, Inverter Overload, Overload, Electrical Thermal Trip, Input/Output Open Phase, Motor Overload, Fan Trip, No Motor Trips, and other minor fault trips.

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

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, MD100G products exchange data with a PLC and computer. The RS-485 communication standards support the Multi-drop Link System and offer an interface that is strongly resistant to noise. Please refer to the following table for details about the communication standards.

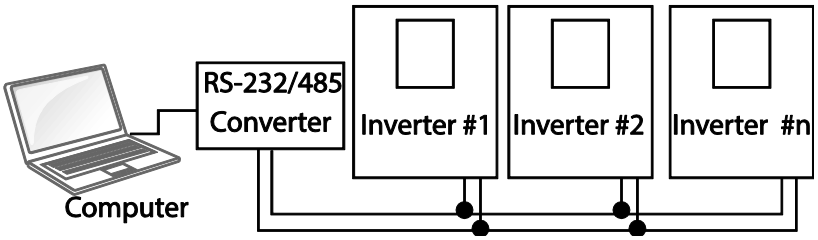
Item	Standard
Communication method/ Transmission type	RS-485/Bus type, Multi-drop Link System
Inverter type name	MD100G
Number of connected inverters/ Transmission distance	Maximum of 16 inverters / Maximum1,200m (recommended distance: within 700m)
Recommended cable size	0.75mm², (18AWG), Shielded Type 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.

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

Communication Parameters Setting Details

Code	Description
CM.01 Int485 St ID	Set the inverter station ID between 1 and 250.
CM.02 Int485 Proto	Select one of the two built-in protocols: Modbus-RTU or LS INV 485.

Setting		Function
0	Modbus-RTU	Modbus-RTU compatible protocol
2	LS INV 485	Dedicated protocol for the LS inverter

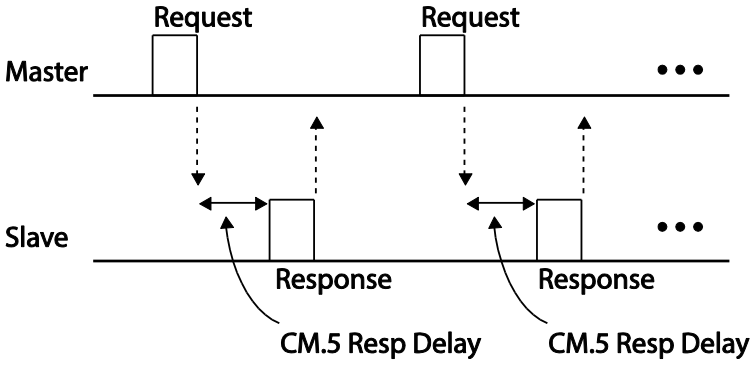
CM.03 Int485 BaudR	Set a communication setting speed up to 115,200 bps.

Setting	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	Set a communication configuration. Set the data length, parity check method, and the number of stop bits.

Setting		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 stop bit

CM.05 Resp Delay	Set the response time for the slave (inverter) to react to the request from the

Code	Description
	master. Response time is used in a system where the slave device response is too fast for the master device to process. Set this code to an appropriate value for smooth master-slave communication. 

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	Parameter 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 Command	0-35	-
	33	Multi-function output 1	Q1 Define				

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

* 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

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>Pr.12 Lost Cmd Mode,
Pr.13 Lost Cmd Time</td><td>Select the operation to run when a communication error has occurred and lasted exceeding the time set at Pr. 13.
<table>
<tr><th colspan="2">Setting</th><th>Function</th></tr>
<tr><td>0</td><td>None</td><td>The speed command immediately becomes the operation frequency without any protection function.</td></tr>
<tr><td>1</td><td>Free-Run</td><td>The inverter blocks output. The motor performs in free-run condition.</td></tr>
<tr><td>2</td><td>Dec</td><td>The motor decelerates and then stops at the time set at Pr.07 (Trip Dec Time).</td></tr>
<tr><td>3</td><td>Hold Input</td><td>The inverter calculates the average input value for 10 seconds before the loss of the speed command and uses it as the speed reference.</td></tr>
<tr><td>4</td><td>Hold Output</td><td>The inverter calculates the average output value for 10 seconds before the loss of the speed command and uses it as the speed reference.</td></tr>
<tr><td>5</td><td>Lost Preset</td><td>The inverter operates at the frequency set at Pr. 14 (Lost Preset F).</td></tr>
</table></td></tr>
</table>

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.65-71 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	Parameter Setting		Setting range	Unit
CM	70-77	Communication multi-function input x	Virtual DI x (x: 1-8)	0	None	0-49	-
	86	Communication multi-function input monitoring	Virt DI Status	-	-	-	-

Example: When sending an Fx command by controlling virtual multi-function input in the common area via Int485, set 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		

*Available on an LCD keypad only.

5.2.7 Total Memory Map for Communication

Communication Area	Memory Map	Details
Communication common compatible area	0h0000-0h00FF	iS5, iP5A, iV5, iG5A compatible area
Parameter registration type area	0h0100-0h01FF	Areas registered at CM.31–38 and CM.51–58
	0h0200-0h023F	Area registered for User Group
	0h0240-0h027F	Area registered for Macro Group
	0h0280-0h02FF	Reserved
MD100G communication common area	0h0300-0h037F	Inverter monitoring area
	0h0380-0h03DF	Inverter control area
	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	Parameter 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
0h0100-0h0107	Status Parameter-1-Status Parameter-8	Parameter communication code value registered at CM.31-38 (Read-only)
0h0110-0h0117	Control Parameter-1-Control Parameter-8	Parameter communication code value registered at CM.51-58 (Read/Write access)

Note

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

5.2.9 Parameter Group for User/Macro Group

By defining user/macro parameter groups, communication can be carried out using the user defined group (USR Grp) and macro group (MAC Grp) addresses that are registered at the U&M mode. Parameter groups can only be defined when using an LCD keypad.

Currently Registered User Group Parameters

Address	Parameter	Assigned Content by Bit
0h0200	User Grp. Code 1	Parameter value registered at U&M > USR → 1 (Read/Write access)
0h0201	User Grp. Code 2	Parameter value registered at U&M > USR → 2 (Read/Write access)
0h023E	User Grp. Code 63	Parameter value registered at U&M > USR → 63 (Read/Write access)
0h023F	User Grp. Code 64	Parameter value registered at U&M > USR → 64 (Read/Write access)

Currently Registered Macro Group Parameters

Address	Parameter	Assigned Content by Bit
0h0240	Macro Grp. Code 1	Parameter value registered at U&M > MC → 1
0h0241	Macro Grp. Code 2	Parameter value registered at U&M > MC → 1
0h02A2	Macro Grp. Code 98	Parameter value registered at U&M > MC → 98
0h02A3	Macro Grp. Code 99	Parameter value registered at U&M > MC → 99

5.3 Communication Protocol

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

5.3.1 LS INV 485 Protocol

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

Request

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

Normal Response

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

Error Response

NAK	Station ID	CMD	Error code	SUM	EOT
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

- A request starts with ENQ and ends with EOT.
- A normal response starts with ACK and ends with EOT.
- An error response starts with NAK and ends with EOT.
- A station ID indicates the inverter number and is displayed as a two-byte ASCII-HEX string that uses characters 0-9 and A-F.
- CMD: Uses uppercase characters (returns an IF error if lowercase characters are encountered)—please refer to the following table.

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

- Data: ASCII-HEX (for example, when the data value is 3000: 3000 → '0"B"B"8'h → 30h 42h 42h 38h)

- Error code: ASCII-HEX (refer to *5.3.1.4 Error Code* on page *135*)
- 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**A7**h (the control value is not included: ENQ, ACK, NAK, etc.).

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

Note

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

5.3.1.1 Detailed Read Protocol

Read Request: Reads successive n words from address XXXX.

ENQ	Station ID	CMD	Address	Number of Addresses	SUM	EOT
05h	'01'-'FA'	'R'	'XXXX'	'1'-'8' = n	'XX'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

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

Read Normal Response

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

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

Read Error Response

NAK	Station ID	CMD	Error code	SUM	EOT
15h	'01'-'FA'	'R'	'**'	'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* x 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* x 4): a maximum of 39

Write Error Response

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-'FA'	'W'	'**'	'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* x 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'	'**'	'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'	'Y'	'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'	'Y'	'XXXX…'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

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

Monitor Registration Execution Error Response

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-'FA'	'Y'	'**'	'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
A	41	q	71	@	40
B	42	r	72	[	5B
C	43	s	73	\	5C
D	44	t	74	]	5D
E	45	u	75		5E
F	46	v	76		5F
G	47	w	77		60
H	48	x	78	{	7B
I	49	y	79	|	7C
J	4A	z	7A	}	7D
K	4B	0	30	-	7E
L	4C	1	31	BEL	07
M	4D	2	32	BS	08
N	4E	3	33	CAN	18
O	4F	4	34	CR	0D
P	50	5	35	DC1	11
Q	51	6	36	DC2	12
R	52	7	37	DC3	13
S	53	8	38	DC4	14
T	54	9	39	DEL	7F

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

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 *140*.

Function Code #03: Read Holding Register

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

Response Field Name
Station ID
Function (0x03)
Byte Count
Data Hi
Data Lo
…
…
Data Hi
Data Lo
CRC Lo
CRC Hi

number of Points

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
…
…
Data Hi
Data Lo
CRC Lo
CRC Hi

number of Points

Function Code #06: Preset Single Register

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

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

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

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

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

number of Points

Exception Code

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

Response

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

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

Example of Modbus-RTU Communication in Use

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

Frame Transmission from Master to Slave (Request)

Item	Station ID	Function	Starting Address	# of Register	Byte Count	Data 1	Data 2	CRC
Hex	0x01	0x10	0x1102	0x0002	0x04	0x0032	0x0064	0x1202
Description	CM.01 Int485 St ID	Preset Multiple Register	Starting Address -1 (0x1103-1)	-	-	50 (ACC time 5.0sec)	100 (DEC time 10.0sec)	-

Frame Transmission from Slave to Master (Response)

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

5.4 Compatible Common Area Parameter

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

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
0h0000	Inverter model	-	-	R	6: MD100G	
0h0001	Inverter capacity	-	-	R	0: 0.75 kW, 1: 1.5 kW, 2: 2.2 kW 3: 3.7 kW, 4: 5.5 kW, 5: 7.5 kW 6: 11 kW, 7: 15 kW, 8: 18.5 kW 9: 22 kW 256: 0.4 kW, 257: 1.1 kW, 258: 3.0 kW 259: 4.0 kW	
0h0002	Inverter input voltage	-	-	R	0: 240V product	
					1: 415V product	
0h0003	Version	-	-	R	Example 0h0100: Version 1.00	
					Example 0h0101: Version 1.01	
0h0004	Reserved	-	-	R/W		
0h0005	Command frequency	0.01	Hz	R/W		
0h0006	Operation command (option)	-	-	R	B15	Reserved
					B14	0: Keypad Freq, 1: Keypad Torq 2-16: Terminal block multi-step 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
					B13	
					B12	
					B11	
					B10	
					B9	
					B8	0: Keypad 1: Fx/Rx-1 2: Fx/Rx-2 3: Built-in 485 4: Communication option
					B7	
					B6	
				R/W	B5	Reserved
					B4	Emergency stop
					B3	W: Trip initialization (0→1), R: Trip status
					B2	Reverse operation (R)
					B1	Forward operation (F)
					B0	Stop (S)
0h0007	Acceleration time	0.1	s	R/W	-	

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
0h0008	Deceleration time	0.1	s	R/W	-	
0h0009	Output current	0.1	A	R	-	
0h000A	Output frequency	0.01	Hz	R	-	
0h000B	Output voltage	1	V	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 Pr.30 setting
					B2	Operating in reverse direction
					B1	Operating in forward direction
					B0	Stopped
0h000F	Fault trip information	-	-	R	B15	Reserved
					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
					B1	Reserved

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
					B0	Latch Type trip
0h0010	Input terminal information	-	-	R	B15-B7	Reserved
					B6	P7
					B5	P6
					B4	P5
					B3	P4
					B2	P3
					B1	P2
					B0	P1
0h0011	Output terminal information	-	-	R	B15	Reserved
					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	I2	0.01	%	R	I2 input current	
0h0015	Motor rotation speed	1	rpm	R	Displays existing motor rotation speed	
0h0016 - 0h0019	Reserved	-	-	-	-	
0h001A	Select Hz/rpm	-	-	R	0: Hz unit, 1: rpm unit	
0h001B	Display the number of poles for the selected motor	-	-	R	Display the number of poles for the selected motor	

5.5 MD100G Expansion Common Area Parameter

5.5.1 Monitoring Area Parameter (Read Only)

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
0h0300	Inverter model	-	-	MD100G: 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 voltage/power (Single phase, 3-phase)/cooling method	-	-	100 V single phase self cooling: 0120h, 200 V 3-phase forced cooling: 0231h	
				100 V single phase forced cooling: 0121h, 400 V single phase self cooling: 0420h	
				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 version	-	-	(Ex) 0h0100: Version 1.00	
				0h0101: Version 1.01	
0h0304	Reserved	-	-	-	
0h0305	Inverter operation state	-	-	B15	0: Normal state 4: Warning occurred 8: Fault occurred [operates according to Pr. 30 (Trip Out Mode) setting.]
				B14	
				B13	
				B12	
				B11 -	-
				B8	
				B7	1: Speed searching 2: Accelerating 3: Operating at constant rate 4: Decelerating
				B6	
				B5	

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
				B4	5: Decelerating to stop 6: H/W OCS 7: S/W OCS 8: Dwell operating
				B3	0: Stopped 1: Operating in forward direction 2: Operating in reverse direction 3: DC operating (0 speed control)
				B2	
				B1	
				B0	
0h0306	Inverter operation frequency command source	-	-	B15	Operation command source 0: Keypad 1: Communication option 3: Built-in RS 485 4: Terminal block
				B14	
				B13	
				B12	
				B11	
				B10	
				B9	
				B8	
				B7	Frequency command source 0: Keypad speed 1: Keypad torque 2-4: Up/Down operation speed 5: V1, 7: V2, 8: I2 9: Pulse 10: Built-in RS 485 11: Communication option 13: Jog 14: PID 25-39: Multi-step speed frequency
				B6	
				B5	
				B4	
				B3	
				B2	
				B1	
				B0	
0h0307	LCD keypad S/W version	-	-	(Ex.) 0h0100: Version 1.00	
0h0308	LCD keypad title version	-	-	(Ex.) 0h0101: Version 1.01	
0h0309 -0h30F	Reserved	-	-	-	
0h0310	Output current	0.1	A	-	
0h0311	Output frequency	0.01	Hz	-	
0h0312	Output rpm	0	rpm	-	
0h0313	Motor feedback speed	0	rpm	-32768 rpm-32767 rpm (directional)	
0h0314	Output voltage	1	V	-	
0h0315	DC Link voltage	1	V	-	
0h0316	Output power	0.1	kW	-	
0h0317	Output torque	0.1	%	-	
0h0318	PID reference	0.1	%	-	

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
0h0319	PID feedback	0.1	%	-	
0h031A	Display the number of poles for the 1st motor	-	-	Displays the number of poles for the first motor	
0h031B	Display the number of poles for the 2nd motor	-	-	Displays the number of poles for the 2nd motor	
0h031C	Display the number of poles for the selected motor	-	-	Displays the number of poles for the selected motor	
0h031D	Select Hz/rpm	-	-	0: Hz, 1: rpm	
0h031E - 0h031F	Reserved	-	-	-	
0h0320	Digital input information			BI5	Reserved
				-	-
				B7	Reserved
				B6	P7(I/O board)
				B5	P6(I/O board)
				B4	P5(I/O board)
				B3	P4(I/O board)
				B2	P3(I/O board)
				B1	P2(I/O board)
				B0	P1(I/O board)
0h0321	Digital output information	-	-	BI5	Reserved
				-	Reserved
				B4	Reserved
				B3	Reserved
				B2	Reserved
				B1	Q1
				B0	Relay 1
0h0322	Virtual digital input information	-	-	B15	Reserved
				-	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)
0h0323	Display the	-	-	0: 1st motor/1: 2nd motor	

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
	selected motor				
0h0324	AI1	0.01	%	Analog input V1 (I/O board)	
0h0325	Reserved	0.01	%		
0h0326	AI3	0.01	%	Analog input V2 (I/O board)	
0h0327	AI4	0.01	%	Analog input I2 (I/O board)	
0h0328	AO1	0.01	%	Analog output 1 (I/O board)	
0h0329	AO2	0.01	%	Analog output 2 (I/O board)	
0h032A	AO3	0.01	%	Reserved	
0h032B	AO4	0.01	%	Reserved	
0h032C	Reserved	-	-	-	
0h032D	Reserved	-	-	-	
0h032E	Reserved	-	-	-	
0h032F	Reserved	-	-	-	
0h0330	Latch type trip information - 1	-	-	BI5	Fuse Open Trip
				BI4	Over Heat Trip
				BI3	Arm Short
				BI2	External Trip
				BI1	Overvoltage Trip
				BI0	Overcurrent Trip
				B9	NTC Trip
				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 information - 2	-	-	BI5	Reserved
				BI4	Reserved
				BI3	Safety option to block inverter output at the terminal block input (only for products rated at 90 kW and above).
				BI2	Reserved
				BI1	Reserved
				BI0	Bad option card
				B9	No motor trip
				B8	External brake trip
				B7	Bad contact at basic I/O board
				B6	Pre PID Fail
				B5	Error while writing parameter

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
				B4	Reserved
				B3	FAN Trip
				B2	PTC (Thermal sensor) Trip
				B1	Reserved
				B0	MC Fail Trip
0h0332	Level type trip information	-	-	B15	Reserved
				-	-
				B8	Reserved
				B7	Reserved
				B6	Reserved
				B5	SafetyB
				B4	SafetyA
				B3	Keypad Lost Command
				B2	Lost Command
				B1	LV
				B0	BX
0h0333	H/W Diagnosis Trip information	-	-	B15	Reserved
				-	Reserved
				B6	Reserved
				B5	Queue Full
				B4	Reserved
				B3	Watchdog-2 error
				B2	Watchdog-1 error
				B1	EEPROM error
				B0	ADC error
0h0334	Warning information	-	-	B15	Reserved
				-	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
				B1	Underload
				B0	Overload
0h0335 -0h033F	Reserved	-	-	-	

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

5.5.2 Control Area Parameter (Read/Write)

Comm. Address	Parameter	Scale	Unit	Assigned Content by Bit	
0h0380	Frequency command	0.01	Hz	Command frequency setting	
0h0381	RPM command	1	rpm	Command rpm setting	
0h0382	Operation command	-	-	B7	Reserved
				B6	Reserved
				B5	Reserved
				B4	Reserved
				B3	0 → 1: Free-run stop
				B2	0 → 1: Trip initialization
				B1	0: Reverse command, 1: Forward command
				B0	0: Stop command, 1: Run command
				Example: Forward operation command 0003h, Reverse operation command 0001h.	
0h0383	Acceleration	0.1	s	Acceleration time setting	

Comm. Address	Parameter	Scale	Unit	Assigned Content by Bit	
	time				
0h0384	Deceleration time	0.1	s	Deceleration time setting	
0h0385	Virtual digital input control (0: Off, 1:On)	-	-	BI5	Reserved
				-	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)
0h0386	Digital output control (0:Off, 1:On)	-	-	BI5	Reserved
				BI4	Reserved
				BI3	Reserved
				BI2	Reserved
				BI1	Reserved
				BI0	Reserved
				B9	Reserved
				B8	Reserved
				B7	Reserved
				B6	Reserved
				B5	Reserved
				B4	Reserved
				B3	Reserved
				B2	Reserved
				B1	Q1 (I/O board, OU.33: None)
				B0	Relay 1 (I/O board, OU.31: None)
0h0387	Reserved	-	-	Reserved	
0h0388	PID reference	0.1	%	PID reference command	
0h0389	PID feedback value	0.1	%	PID feedback value	
0h038A	Motor rated current	0.1	A	-	
0h038B	Motor rated voltage	1	V	-	
0h038C-0h038F	Reserved			-	
0h0390	Torque Ref	0.1	%	Torque command	
0h0391	Fwd Pos Torque Limit	0.1	%	Forward motoring torque limit	

Comm. Address	Parameter	Scale	Unit	Assigned Content by Bit
0h0392	Fwd Neg Torque Limit	0.1	%	Forward regenerative torque limit
0h0393	Rev Pos Torque Limit	0.1	%	Reverse motoring torque limit
0h0394	Rev Neg Torque Limit	0.1	%	Reverse regenerative torque limit
0h0395	Torque Bias	0.1	%	Torque bias
0h0396- 0h399	Reserved	-	-	-
0h039A	Anytime Para	-	-	Set the CNF.20* value
0h039B	Monitor Line-1	-	-	Set the CNF.21* value
0h039C	Monitor Line-2	-	-	Set the CNF.22* value
0h039D	Monitor Line-3	-	-	Set the CNF.23* value

* 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. Address	Parameter	Scale	Unit	Changeable During Operation	Function
0h03E0	Save parameters	-	-	X	0: No, 1:Yes
0h03E1	Monitor mode initialization	-	-	O	0: No, 1:Yes
0h03E2	Parameter initialization	-	-	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

Comm. Address	Parameter	Scale	Unit	Changeable During Operation	Function
					fault trip interruptions.
0h03E3	Display changed parameters	-	-	O	0: No, 1: Yes
0h03E4	Reserved	-	-	-	-
0h03E5	Delete all fault history	-	-	O	0: No, 1: Yes
0h03E6	Delete user-registrated codes	-	-	O	0: No, 1: Yes
0h03E7	Hide parameter mode	0	Hex	O	Write: 0-9999
					Read: 0: Unlock, 1: Lock
0h03E8	Lock parameter mode	0	Hex	O	Write: 0-9999
					Read: 0: Unlock, 1: Lock
0h03E9	Easy start on (easy parameter setup mode)	-	-	O	0: No, 1: Yes
0h03EA	Initializing power consumption	-	-	O	0: No, 1: Yes
0h03EB	Initialize inverter operation accumulative time	-	-	O	0: No, 1: Yes
0h03EC	Initialize cooling fan accumulated operation time	-	-	O	0: No, 1: Yes

Note

- When setting parameters in the inverter memory control area, the values are reflected to the inverter operation and saved. Parameters set in other areas via communication are reflected to the inverter operation, but are not saved. All set values are cleared following an inverter power cycle and revert back to its previous values. When setting parameters via communication, ensure that a parameter save is completed prior to shutting the inverter down.
- Set parameters very carefully. After setting a parameter to 0 via communication, set it to another value. If a parameter has been set to a value other than 0 and a non-zero value is entered again, an error message is returned. The previously-set value can be identified by reading the parameter when operating the inverter via communication.
- The addresses 0h03E7 and 0h03E8 are parameters for entering the password. When the password is entered, the condition will change from Lock to Unlock, and vice versa. When the same parameter value is entered continuously, the parameter is executed just once. Therefore, if the same value is entered again, change it to another value first and then re-enter

the previous value. For example, if you want to enter 244 twice, enter it in the following order: 244 → 0 → 244.

ⓘ 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 MD100G 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)

*__O/X__: Write-enabled during operation, **7/L/A**: Keypad/LCD keypad/Common

Code	Comm. Address	Name	Keypad Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
	0h1F00	Target frequency	0.00	0-Maximum frequency(Hz)		0.00	O/7	O	O	p.48
-	0h1F01	Acceleration time	ACC	0.0-600.0(s)		20.0	O/7	O	O	p.88
-	0h1F02	Deceleration time	dEC	0.0-600.0(s)		30.0	O/7	O	O	p.88
-	0h1F03	Command source	drv	0	Keypad	1: Fx/Rx-1	X/7	O	O	p.82
				1	Fx/Rx-1					
				2	Fx/Rx-2					
				3	Int 485					
				4	Field Bus[1]					
-	0h1F04	Frequency reference source	Frq	0	Keypad-1	2: V1	X/7	O	O	p.68
				1	Keypad-2					
				2	V1					
				4	V2					
				5	I2					
				6	Int 485					

[1] 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	Field Bus					
				12	Pulse					
-	0h1F05	Multi-step speed frequency 1	St1	0.00-Maximum frequency(Hz)		10.00	O/7	O	O	p.79
-	0h1F06	Multi-step speed frequency 2	St2	0.00-Maximum frequency(Hz)		20.00	O/7	O	O	p.79
-	0h1F07	Multi-step speed frequency 3	St3	0.00-Maximum frequency(Hz)		30.00	O/7	O	O	p.79
-	0h1F08	Output current	CUr				-/7	O	O	p.62
-	0h1F09	Motor revolutions per minute	Rpm				-/7	O	O	-
-	0h1F0A	Inverter direct current voltage	dCL	-		-	-/7	O	O	p.62
-	0h1F0B	Inverter output voltage	vOL				-/7	O	O	p.62
-	0h1F0C	Out of order signal	nOn				-/7	O	O	-
-	0h1F0D	Select rotation direction	drC	F	Forward run	F	O/7	O	O	-
				r	Reverse run					

6.2 Drive group (PAR→dr)

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

SL: Sensorless vector control (dr.09)

*__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	9	O/A	O	O	p.48
01[2]	0h1101	Target frequency	Cmd Frequency	Start frequency - Maximum frequency(Hz)	0.00	O/L	O	O	p.52

[2] Displayed when an LCD keypad is in use.

Code	Comm. Address	Name	LCD Display	Setting Range		Initial value	Property*	V/F	SL	Ref.
02	0h1102	Torque command	Cmd Torque	-180~180[%]		0.0	O/A	X	O	-
03[2]	0h1103	Acceleration time	Acc Time	0.0-600.0(s)		20.0	O/L	O	O	p.88
04[2]	0h1104	Deceleration time	Dec Time	0.0-600.0(s)		30.0	O/L	O	O	p.88
06[2]	0h1106	Command source	Cmd Source	0	Keypad	1: Fx/Rx-1	X/L	O	O	p.82
				1	Fx/Rx-1					
				2	Fx/Rx-2					
				3	Int 485					
				4	Field Bus					
07[2]	0h1107	Frequency reference source	Freq Ref Src	0	Keypad-1	2:V1	X/L	O	O	p.68
				1	Keypad-2					
				2	V1					
				4	V2					
				5	I2					
				6	Int 485					
				8	Field Bus					
				12	Pulse					
08	0h1108	Torque reference setting	Trq Ref Src	0	Keypad-1	2:V1	X/A	X	O	-
				1	Keypad-2					
				2	V1					
				4	V2					
				5	I2					
				6	Int 485					
				8	FieldBus					
				12	Pulse					
09	0h1109	Control mode	Control Mode	0	V/F	0: V/F	X/A	O	O	-
				2	Slip Compen					
				4	IM Sensorless					
10	0h110A	Torque Control	Torque Control	0	No	0: No	X/A	X	O	-
				1	Yes					
11	0h110B	Jog frequency	Jog Frequency	0.00, Start frequency-Maximum frequency(Hz)		10.00	O/A	O	O	-
12	0h110C	Jog run acceleration time	Jog Acc Time	0.0-600.0(s)		20.0	O/A	O	O	-
13	0h110D	Jog run deceleration	Jog Dec Time	0.0-600.0(s)		30.0	O/A	O	O	

Code	Comm. Address	Name	LCD Display	Setting Range	Initial value	Property*	V/F	SL	Ref.
		time							
14	0h110E	Motor capacity	Motor Capacity	0: 0.2kW, 1: 0.4kW 2: 0.75kW, 3: 1.1kW 4: 1.5kW, 5: 2.2kW 6: 3.0kW, 7: 3.7kW 8: 4.0kW, 9: 5.5kW 10: 7.5kW, 11: 11.0kW 12: 15.0kW, 13: 18.5kW 14: 22.0kW, 15: 30.0kW	Varies by Motor capacity	X/A	O	O	-
15	0h110F	Torque boost options	Torque Boost	0 Manual 1 Auto	0: Manual	X/A	O	X	-
16[3]	0h1110	Forward Torque boost	Fwd Boost	0.0-15.0(%)	2.0	X/A	O	X	p.100
17[3]	0h1111	Reverse Torque boost	Rev Boost	0.0-15.0(%)	2.0	X/A	O	X	p.100
18	0h1112	Base frequency	Base Freq	30.00-400.00(Hz)	50.00	X/A	O	O	p.97
19	0h1113	Start frequency	Start Freq	0.01-10.00(Hz)	0.50	X/A	O	O	p.97
20	0h1114	Maximum frequency	Max Freq	40.00-400.00(Hz)[V/F, Slip Compen] 40.00-120.00(Hz)[IM Sensorless]	50.00	X/A	O	O	p.106
21	0h1115	Select speed unit	Hz/Rpm Sel	0 Hz Display 1 Rpm Display	0:Hz Display	O/L	O	O	p.79
22[4]	0h1116	(+)Torque gain	(+)Trq Gain	50.0 ~ 150.0[%]	100.0	O/A	X	O	-
23[4]	0h1117	(-)Torque gain	(-)Trq Gain	50.0 ~ 150.0[%]	80.0	O/A	X	O	-

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

[4] Displayed when dr.10 is set to 1 (YES)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial value	Property*	V/F	SL	Ref.
24[4]	0h1118	(-)Torque gain 0	(-)Trq Gain0	50.0 ~ 150.0[%]	80.0	O/A	X	O	-
25[4]	0h1119	(-)Torque offset	(-)Trq Offset	0.0 ~ 100.0[%]	40.0	O/A	X	O	-
80[5]	0h1150	Select ranges at power input	-	Select ranges inverter displays at power input	0: run frequency	O/7	O	O	-
				0 Run frequency					
				1 Acceleration time					
				2 Deceleration time					
				3 Command source					
				4 Frequency reference source					
				5 Multi-step speed frequency 1					
				6 Multi-step speed frequency 2					
				7 Multi-step speed frequency 3					
				8 Output current					
				9 Motor RPM					
				10 Inverter DC voltage					
				11 User select signal (dr.81)					
				12 Currently out of					

[5] Will not be displayed when an LCD keypad is in use

Code	Comm. Address	Name	LCD Display	Setting Range		Initial value	Property*	V/F	SL	Ref.
					order					
				13	Select run direction					
				14	output current2					
				15	Motor RPM2					
				16	Inverter DC voltage2					
				17	User select signal2 (dr.81)					
81[5]	0h1151	Select monitor code	-	Monitors user selected code		0: output voltage	O/7	O	O	-
				0	Output voltage(V)					
				1	Output electric power(kW)					
				2	Torque(kgf · m)					
89[5]	0h03E3	Display changed parameter	-	0	View All	0: View All	O/7	O	O	-
				1	View Changed					
90[5]	0h115A	[ESC] key functions	-	0	Move to initial position	0: None	X/7	O	O	p50, p.84,
				1	JOG Key					
				2	Local/Remote					
93[5]	0h115D	Parameter initialization	-	0	No	0:No	X/7	O	O	-
				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					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial value	Property*	V/F	SL	Ref.
				16	run Grp					
94[5]	0h115E	Password registration		0-9999			O/7	O	O	-
95[5]	0h115F	Parameter lock settings		0-9999			O/7	O	O	-
97[5]	0h1161	Software version	-				-/7	O	O	-
98	0h1162	Display I/O board version	IO S/W Ver				-/A	O	O	-
99	0h1163	Display I/O board H/W version	IO H/W Ver	0	Multiple IO	Standard IO	-/A	O	O	-
				1	Standard IO					
				2	Standard IO (M)					

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)

***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		20	O	O	O	p.48
01	0h1201	Auxiliary reference source	Aux Ref Src	0	None	0:None	X/A	O	O	-
				1	V1					
				3	V2					
				4	I2					
				6	Pulse					
02[6]	0h1202	Auxiliary command calculation type	Aux Calc Type	0	M+(G*A)	0: M+(GA)	X/A	O	O	-
				1	Mx (G*A)					
				2	M/(G*A)					
				3	M+[M*(G*A)]					
				4	M+G*2(A-					

[6] Displayed if bA.01 is not set to 0 (None).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property *	V/F	SL	Ref.
					50%)					
				5	Mx[G*2(A-50%)					
				6	M/[G*2(A-50%)]					
				7	M+M*G*2(A-50%)					
03[6]	0h1203	Auxiliary command gain	Aux Ref Gain	-200.0-200.0(%)		100.0	O/A	O	O	-
04	0h1204	2nd command source	Cmd 2nd Src	0	Keypad	1: Fx/Rx-1	X/A	O	O	p.109
				1	Fx/Rx-1					
				2	Fx/Rx-2					
				3	Int 485					
				4	FieldBus					
05	0h1205	2nd frequency source	Freq 2nd Src	0	Keypad-1	0: Keypad-1	O/A	O	O	p.109
				1	Keypad-2					
				2	V1					
				4	V2					
				5	I2					
				6	Int 485					
				8	FieldBus					
				12	Pulse					
06[7]	0h1206	2nd Torque command source	Trq 2nd Src	0	Keypad-1	0: Keypad-1	O/A	X	O	
				1	Keypad-2					
				2	V1					
				4	V2					
				5	I2					
				6	Int 485					
				8	FieldBus					
				12	Pulse					
07	0h1207	V/F pattern options	V/F Pattern	0	Linear	0: Linear	X/A	O	X	p.97
				1	Square					
				2	User V/F					
				3	Square 2					
08	0h1208	Acc/dec standard frequency	Ramp T Mode	0	Max Freq	0: Max Freq	X/A	O	O	p.88
				1	Delta Freq					
09	0h1209	Time scale settings	Time Scale	0	0.01 sec	1:0.1 sec	X/A	O	O	p.88
				1	0.1 sec					
				2	1 sec					

[7] Displayed when dr.09 is set to 4(IM Sensorless)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property *	V/F	SL	Ref.
10	0h120A	Input power frequency	60/50 Hz Sel	0 60Hz 1 50Hz	1:50Hz	X/A	O	O	-
11	0h120B	Number of motor poles	Pole Number	2-48	Dependent on motor setting	X/A	O	O	-
12	0h120C	Rated slip speed	Rated Slip	0-3000(Rpm)		X/A	O	O	-
13	0h120D	Motor rated current	Rated Curr	1.0-1000.0(A)		X/A	O	O	-
14	0h120E	Motor noload current	Noload Curr	0.0-1000.0(A)		X/A	O	O	-
15	0h120F	Motor rated voltage	Rated Volt	170-480(V)	0	X/A	O	O	p.101
16	0h1210	Motor efficiency	Efficiency	70-100(%)	Dependent on motor setting	X/A	O	O	-
17	0h1211	Load inertia rate	Inertia Rate	0-8		X/A	O	O	-
18	0h1212	Trim power display	Trim Power %	70-130(%)		O/A	O	O	-
19	0h1213	Input power voltage	AC Input Volt	170-480V	240/415 V	O/A	O	O	-
20	-	Auto Tuning	Auto Tuning	0 None 1 All (Rotation type) 2 ALL (Static type) 3 Rs+Lsigma (Rotation type) 6 Tr (Static type)	0:None	X/A	X	O	-
21	-	Stator resistance	Rs	Dependent on motor setting	Dependent on motor setting	X/A	X	O	-
22	-	Leakage inductance	Lsigma			X/A	X	O	-
23	-	Stator inductance	Ls			X/A	X	O	-
24[7]	-	Rotor time constant	Tr	25-5000(ms)	-	X/A	X	O	-
25[7]	-	Stator inductance scale	Ls Scale	50 ~ 150[%]	100	X/A	X	O	-

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property *	V/F	SL	Ref.
26[7]	-	Rotor time constant scale	Tr Scale	50 ~ 150[%]	100	X/A	X	O	-
31[7]		Regeneration inductance scale	Ls Regen Scale	70 ~ 100[%]	80	X/A	X	O	-
41[8]	0h1229	User frequency1	User Freq 1	0.00-Maximum frequency(Hz)	15.00	X/A	O	X	p.99
42[8]	0h122A	User voltage1	User Volt 1	0-100(%)	25	X/A	O	X	p.99
43[8]	0h122B	User frequency2	User Freq 2	0.00-0.00-Maximum frequency(Hz)	30.00	X/A	O	X	p.99
44[8]	0h122C	User voltage2	User Volt 2	0-100(%)	50	X/A	O	X	p.99
45[8]	0h122D	User frequency3	User Freq 3	0.00-Maximum frequency(Hz)	45.00	X/A	O	X	p.99
46[8]	0h122E	User voltage3	User Volt 3	0-100(%)	75	X/A	O	X	p.99
47[8]	0h122F	User frequency4	User Freq 4	0.00-Maximum frequency(Hz)	Maximum frequency	X/A	O	X	p.99
48[8]	0h1230	User voltage4	User Volt 4	0-100(%)	100	X/A	O	X	p.99
50[9]	0h1232	Multi-step speed frequency1	Step Freq-1	0.00-Maximum frequency(Hz)	10.00	O/L	O	O	p.79
51[9]	0h1233	Multi-step speed frequency2	Step Freq-2	0.00-Maximum frequency(Hz)	20.00	O/L	O	O	p.79
52[9]	0h1234	Multi-step speed frequency3	Step Freq-3	0.00-Maximum frequency(Hz)	30.00	O/L	O	O	p.79
53[10]	0h1235	Multi-step speed frequency4	Step Freq-4	0.00-Maximum frequency(Hz)	40.00	O/A	O	O	p.79
54[10]	0h1236	Multi-step speed frequency5	Step Freq-5	0.00-Maximum frequency(Hz)	50.00	O/A	O	O	p.79

[8] Displayed if either bA.07 or M2.25 is set to 2 (User V/F).

[9] Displayed when an LCD keypad is in use.

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

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property *	V/F	SL	Ref.
55[10]	0h1237	Multi-step speed frequency6	Step Freq-6	0.00-Maximum frequency(Hz)	Maximum frequency	O/A	O	O	p.79
56[10]	0h1238	Multi-step speed frequency7	Step Freq-7	0.00-Maximum frequency(Hz)	Maximum frequency	O/A	O	O	p.79
70	0h1246	Multi-step acceleration time1	Acc Time-1	0.0-600.0(s)	20.0	O/A	O	O	p.91
71	0h1247	Multi-step deceleration time1	Dec Time-1	0.0-600.0(s)	20.0	O/A	O	O	p.91
72[11]	0h1248	Multi-step acceleration time2	Acc Time-2	0.0-600.0(s)	30.0	O/A	O	O	p.91
73[11]	0h1249	Multi-step deceleration time2	Dec Time-2	0.0-600.0(s)	30.0	O/A	O	O	p.91
74[11]	0h124A	Multi-step acceleration time3	Acc Time-3	0.0-600.0(s)	40.0	O/A	O	O	p.91
75[11]	0h124B	Multi-step deceleration time3	Dec Time-3	0.0-600.0(s)	40.0	O/A	O	O	p.91
76[11]	0h124C	Multi-step acceleration time4	Acc Time-4	0.0-600.0(s)	50.0	O/A	O	O	p.91
77[11]	0h124D	Multi-step deceleration time4	Dec Time-4	0.0-600.0(s)	50.0	O/A	O	O	p.91
78[11]	0h124E	Multi-step acceleration time5	Acc Time-5	0.0-600.0(s)	40.0	O/A	O	O	p.91
79[11]	0h124F	Multi-step deceleration time5	Dec Time-5	0.0-600.0(s)	40.0	O/A	O	O	p.91
80[11]	0h1250	Multi-step acceleration time6	Acc Time-6	0.0-600.0(s)	30.0	O/A	O	O	p.91

[11] 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.
81[11]	0h1251	Multi-step deceleration time6	Dec Time-6	0.0-600.0(s)	30.0	O/A	O	O	p.91
82[11]	0h1252	Multi-step acceleration time7	Acc Time-7	0.0-600.0(s)	20.0	O/A	O	O	p.91
83[11]	0h1253	Multi-step deceleration time7	Dec Time-7	0.0-600.0(s)	20.0	O/A	O	O	p.91

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)

***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		24	O/A	O	O	p.48
01	0h1301	Acceleration pattern	Acc Pattern	0	Linear	0: Linear	X/A	O	O	p.93
02	0h1302	Deceleration pattern	Dec Pattern	1	S-curve		X/A	O	O	p.93
03[12]	0h1303	S-curve acceleration start point gradient	Acc S Start	1-100(%)		40	X/A	O	O	p.93
04[12]	0h1304	S-curve acceleration end point gradient	Acc S End	1-100(%)		40	X/A	O	O	p.93
05[13]	0h1305	S-curve deceleration start point gradient	Dec S Start	1-100(%)		40	X/A	O	O	p.93

[12] Displayed when Ad. 01 is set to 1 (S-curve).

[13] Displayed when Ad. 02 is set to 1 (S-curve).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
06[13]	0h1306	S-curve deceleration end point gradient	Dec S End	1-100(%)		40	X/A	O	O	p.93
07	0h1307	Start Mode	Start Mode	0	Acc	0:Acc	X/A	O	O	p.102
				1	DC-Start					
08	0h1308	Stop Mode	Stop Mode	0	Dec	0:Dec	X/A	O	O	p.103
				1	DC-Brake					
				2	Free-Run					
				4	Power Braking					
09	0h1309	Selection of prohibited rotation direction	Run Prevent	0	None	0: None	X/A	O	O	p.86
				1	Forward Prev					
				2	Reverse Prev					
10	0h130A	Starting with power on	Power-on Run	0	No	0:No	O/A	O	O	p.87
				1	Yes					
12[14]	0h130C	DC braking time at startup	DC-Start Time	0.00-60.00(s)		0.00	X/A	O	O	p.102
13	0h130D	Amount of applied DC	DC Inj Level	0-200(%)		50	X/A	O	O	p.102
14[15]	0h130E	Output blocking time before DC braking	DC-Block Time	0.00- 60.00(s)		0.10	X/A	O	O	p.103
15[15]	0h130F	DC braking time	DC-Brake Time	0.00- 60.00(s)		1.00	X/A	O	O	p.103
16[15]	0h1310	DC braking rate	DC-Brake Level	0-200(%)		50	X/A	O	O	p.103
17[15]	0h1311	DC braking frequency	DC-Brake Freq	Start frequency-50Hz		5.00	X/A	O	O	p.103
20	0h1314	Dwell frequency on acceleration	Acc Dwell Freq	Start frequency-Maximum frequency(Hz)		5.00	X/A	O	O	-
21	0h1315	Dwell operation time on acceleration	Acc Dwell Time	0.0-60.0(s)		0.0	X/A	O	O	-
22	0h1316	Dwell frequency on deceleration	Dec Dwell Freq	Start frequency-Maximum		5.00	X/A	O	O	-

[14] Displayed when Ad. 07 is set to 1 (DC-Start).

[15] Displayed when Ad. 08 is set to 1 (DC-Brake).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				frequency(Hz)					
23	0h1317	Dwell operation time on deceleration	Dec Dwell Time	0.0-60.0(s)	0.0	X/A	O	O	-
24	0h1318	Frequency limit	Freq Limit	0 No 1 Yes	1:Yes	X/A	O	O	p.107
25[16]	0h1319	Frequency lower limit value	Freq Limit Lo	0.00-Upper limit frequency(Hz)	0.50	O/A	O	O	p.107
26[16]	0h131A	Frequency upper limit value	Freq Limit Hi	Lower limit frequency-Maximum frequency(Hz)	maximum frequency	X/A	O	O	p.107
27	0h131B	Frequency jump	Jump Freq	0 No 1 Yes	0:No	X/A	O	O	p.108
28[17]	0h131C	Jump frequency lower limit1	Jump Lo 1	0.00-Jump frequency upper limit1(Hz)	10.00	O/A	O	O	p.108
29[17]	0h131D	Jump frequency upper limit1	Jump Hi 1	Jump frequency lower limit1-Maximum frequency(Hz)	15.00	O/A	O	O	p.108
30[17]	0h131E	Jump frequency lower limit2	Jump Lo 2	0.00-Jump frequency upper limit2(Hz)	20.00	O/A	O	O	p.108
31[17]	0h131F	Jump frequency upper limit2	Jump Hi 2	Jump frequency lower limit2-Maximum frequency(Hz)	25.00	O/A	O	O	p.108
32[17]	0h1320	Jump frequency lower limit3	Jump Lo 3	0.00-Jump frequency upper limit3(Hz)	30.00	O/A	O	O	p.108
33[17]	0h1321	Jump frequency upper limit3	Jump Hi 3	Jump frequency lower limit3-Maximum frequency(Hz)	35.00	O/A	O	O	p.108
41[18]	0h1329	Brake release current	BR Rls Curr	0.0-180.0(%)	50.0	O/A	O	O	-

[16] Displayed when Ad. 24 is set to 1 (Yes).

[17] Displayed when Ad. 27 is set to 1 (Yes).

[18] 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.
42[18]	0h132A	Brake release delay time	BR Rls Dly	0.00-10.00(s)	1.00	X/A	O	O	-
44[18]	0h132C	Brake release Forward frequency	BR Rls Fwd Fr	0.00-Maximum frequency(Hz)	1.00	X/A	O	O	-
45[18]	0h132D	Brake release Reverse frequency	BR Rls Rev Fr	0.00-Maximum frequency(Hz)	1.00	X/A	O	O	-
46[18]	0h132E	Brake engage delay time	BR Eng Dly	0.00-10.00(s)	1.00	X/A	O	O	-
47[18]	0h132F	Brake engage frequency	BR Eng Fr	0.00-Maximum frequency(Hz)	2.00	X/A	O	O	-
50	0h1332	Energy saving operation	E-Save Mode	0 None 1 Manual 2 Auto	0:None	X /A	O	X	-
51[19]	0h1333	Energy saving level	Energy Save	0-30(%)	0	O/A	O	X	-
60	0h133C	Acc/Dec time transition frequency	Xcel Change Fr	0.00-Maximum frequency(Hz)	0.00	X/A	O	O	p.92
64	0h1340	Cooling fan control	FAN Control	0 During Run 1 Always ON 2 Temp Control	0:During Run	O/A	O	O	-
65	0h1341	Up/down operation frequency save	U/D Save Mode	0 No 1 Yes	0:No	O/A	O	O	-
66	0h1342	Output contact On/Off control options	On/Off Ctrl Src	0 None 1 V1 3 V2 4 I2 6 Pulse	0:None	X/A	O	O	-
67	0h1343	Output contact On level	On-Ctrl Level	Output contact off level-100.00%	90.00	X/A	O	O	-
68	0h1344	Output contact Off level	Off-Ctrl Level	-100.00-output contact on level (%)	10.00	X/A	O	O	-
70	0h1346	Safe operation	Run En Mode	0 Always	0:Alway	X/A	O	O	-

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

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		selection			Enable	s Enable				
				1	DI Dependent					
71[20]	0h1347	Safe operation stop options	Run Dis Stop	0	Free-Run	0:Free-Run	X/A	O	O	-
				1	Q-Stop					
				2	Q-Stop Resume					
72[20]	0h1348	Safe operation deceleration time	Q-Stop Time	0.0-600.0(s)		5.0	O/A	O	O	-
74	0h134A	Selection of regeneration evasion function for press	RegenAvd Sel	0	No	0:No	X/A	O	O	-
				1	Yes					
75	0h134B	Voltage level of regeneration evasion motion for press	RegenAvd Level	200V : 300-400V		350	X/A	O	O	-
				400V : 600-800V		700				
76[21]	0h134C	Compensation frequency limit of regeneration evasion for press	CompFreq Limit	0.00- 10.00Hz		1.00	X/A	O	O	-
77[21]	0h134D	Regeneration evasion for press P gain	RegenAvd Pgain	0.0- 100.0%		50.0	O/A	O	O	-
78[21]	0h134E	Regeneration evasion for press I gain	RegenAvd Igain	20-30000(ms)		500	O/A	O	O	-
80	0h1350	Fire mode selection	Fire Mode Sel	0	None	0:None	X/A	O	X	p.121
				1	Fire Mode					
				2	Fire Mode Test					
81[22]	0h1351	Fire mode frequency	Fire Mode Freq	0.00~50.00(Hz]		50.00	X/A	O	X	p.121
82[22]	0h1352	Fire mode	Fire Mode Dir	0	Forward	0:	X/A	O	X	p.121

[20] Displayed when Ad.70 is set to 1 (DI Dependent).

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

[22] Displayed when Ad.80 is set to 1 (Yes).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		direction		1	Reverse	Forward				
83[22]		Fire Mode Count	Fire Mode Cnt	Can not be modified						p.121

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)

*__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		4	O/A	O	O	p.48
04	0h1404	Carrier frequency	Carrier Freq	Heavy Duty	V/F: 1.0-15.0(kHz) [23] SL: 2.0-15.0(kHz)	3.0	O/A	O	O	-
				Normal Duty	V/F: 1.0-5.0(kHz) [24] SL: 2.0-5.0(kHz)	2.0				-
05	0h1405	Switching mode	PWM Mode	0	Normal PWM	0:Normal PWM	X/A	O	O	-
				1	Lowleakage PWM					
09	0h1409	Initial excitation time	PreExTime	0.00-60.00(s)		1.00	X/A	X	O	-

[23] In case of 0.4~4.0kW, the setting range is 2.0~15.0(kHz).

[24] In case of 0.4~4.0kW, the setting range is 2.0~5.0(kHz).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
10	0h140A	Initial excitation amount	Flux Force	100.0-300.0(%)	100.0	X/A	X	O	-
11	0h140B	Continued operation duration	Hold Time	0.00-60.00(s)	0.00	X/A	X	O	-
20	0h1414	Sensorless 2nd gain display setting	SL2 G View Sel	0 No 1 Yes	0:No	O/A	X	O	-
21	0h1415	Sensorless speed controller proportional gain1	ASR-SL P Gain1	0-5000(%)	Dependent on motor setting	O/A	X	O	-
22	0h1416	Sensorless speed controller integral gain1	ASR-SL I Gain1	10-9999(ms)		O/A	X	O	-
23[25]	0h1417	Sensorless speed controller proportional gain2	ASR-SL P Gain2	1.0-1000.0(%)	Dependent on motor setting	O/A	X	O	-
24[25]	0h1418	Sensorless speed controller integral gain2	ASR-SL I Gain2	1.0-1000.0(%)		O/A	X	O	-
25[25]	0h1419	Sensorless speed controller integral gain 0	ASR-SL I Gain0	1.0~999.9(ms)		O/A	X	O	-
26[25]	0h141A	Flux estimator proportional gain	Flux P Gain	10-200(%)		O/A	X	O	-
27[25]	0h141B	Flux estimator integral gain	Flux I Gain	10-200(%)		O/A	X	O	-
28[25]	0h141C	Speed estimator proportional gain	S-Est P Gain1	0-32767		O/A	X	O	-
29[25]	0h141D	Speed estimator integral gain1	S-Est I Gain1	100-1000		O/A	X	O	-
30[25]	0h141E	Speed estimator integral gain2	S-Est I Gain2	100-10000		O/A	X	O	-
31[25]	0h141F	Sensorless current controller proportional gain	ACR SL P Gain	10-1000		O/A	X	O	-
32[25]	0h1420	Sensorless current controller	ACR SL I Gain	10 -1000		O/A	X	O	-

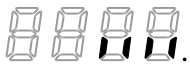
[25] Displayed when dr.09 is set to 4 (IM Sensorless) and Cn.20 is set to 1 (YES).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		integral gain							
48	-	Current controller P gain	ACR P Gain	0-10000	1200	O/A	X	O	-
49	-	Current controller I gain	ACR I Gain	0-10000	120	O/A	X	O	-
52	0h1434	Torque controller output filter	Torque Out LPF	0-2000(ms)	0	X/A	X	O	-
53	0h1435	Torque limit setting options	Torque Lmt Src	0 Keypad-1 1 Keypad-2 2 V1 4 V2 5 I2 6 Int 485 8 FieldBus 12 Pulse	0: Keypad -1	X/A	X	O	-
54[26]	0h1436	Positive-direction reverse torque limit	FWD +Trq Lmt	0.0-200.0(%)	180	O/A	X	O	-
55[26]	0h1437	Positive-direction regeneration torque limit	FWD –Trq Lmt	0.0-200.0(%)	180	O/A	X	O	-
56[26]	0h1438	Negative-direction reverse torque limit	REV +Trq Lmt	0.0-200.0(%)	180	O/A	X	O	-
57[26]	0h1439	Negative-direction regeneration torque limit	REV –Trq Lmt	0.0-200.0(%)	180	O/A	X	O	-
62[26]	0h143E	Speed limit Setting	Speed Lmt Src	0 Keypad-1 1 Keypad-2 2 V1 4 V2 5 I2 6 Int 485 7 FieldBus	2: Keypad -1	X/A	X	O	-
63[26]	0h143F	Positive-direction speed limit	FWD Speed Lmt	0.00~ Maximum frequency (Hz)	50.00	O/A	X	O	-
64[26]	0h1440	Negative-	REV Speed	0.00~	50.00	O/A	X	O	-

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

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		direction speed limit	Lmt	Maximum frequency (Hz)						
65[26]	0h1441	Speed limit operation gain	Speed Lmt Gain	100~5000[%]		500	O/A	X	O	-
70	0h 1446	Speed search mode selection	SS Mode	0	Flying Start-1[27]	0: Flying Start-1	X/A	O	O	-
				1	Flying Start-2					
71	0h1447	Speed search operation selection	Speed Search	bit	0000- 1111	0000[28]	X/A	O	O	-
				00 01	Selection of speed search on acceleration					
				00 10	When starting on initialization after fault trip					
				01 00	When restarting after instantaneous power interruption					
				10 00	When starting with power on					
72[29]	0h1448	Speed search reference current	SS Sup-Current	80-200(%)		150	O/A	O	O	-
73[30]	0h1449	Speed search	SS P-Gain	0-9999		Flying	O/A	O	O	-

[27] Will not be displayed if dr.09 is set to 4 (IM Sensorless).

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

[29] Displayed when any of the Cn.71 code bits are set to 1 and Cn70 is set to 0 (Flying Start-1).

[30] Displayed when any of the Cn.71 code bits are set to 1.

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		proportional gain			Start-1 : 100 Flying Start-2 : 600[31]				
74[30]	0h144A	Speed search integral gain	SS I-Gain	0-9999	Flying Start-1 : 200 Flying Start-2 : 1000	O/A	O	O	-
75[30]	0h144B	Output blocking time before speed search	SS Block Time	0.0-60.0(s)	1.0	X/A	O	O	-
76[30]	0h144C	Speed search Estimator gain	Spd Est Gain	50-150(%)	100	O/A	O	O	-
77	0h144 D	Energy buffering selection	KEB Select	0 No 1 Yes	0:No	X/A	O	O	-
78[32]	0h144E	Energy buffering start level	KEB Start Lev	110.0-140.0(%)	125.0	X/A	O	O	-
79[32]	0h144F	Energy buffering stop level	KEB Stop Lev	125.0-145.0(%)	130.0	X/A	O	O	-
80[32]	0h1450	Energy buffering gain	KEB Gain	1-20000	1000	O/A	O	O	-
85[33]	0h1455	Flux estimator proportional gain1	Flux P Gain1	100-700	370	O/A	X	O	-
86[33]	0h1456	Flux estimator proportional gain2	Flux P Gain2	0-100	0	O/A	X	O	-
87[33]	0h1457	Flux estimator proportional gain3	Flux P Gain3	0-500	100	O/A	X	O	-
88[33]	0h1458	Flux estimator integral gain1	Flux I Gain1	0-200	50	O/A	X	O	-
89[33]	0h1459	Flux estimator integral gain2	Flux I Gain2	0-200	50	O/A	X	O	-

[31] The initial value is 1200 when the motor-rated capacity is less than 7.5 kW

[32] Displayed when Cn.77 is set to 1 (Yes).

[33] Displayed when Cn.20 is set to 1 (Yes).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
90[33]	0h145A	Flux estimator integral gain3	Flux I Gain3	0-200	50	O/A	X	O	-
91[33]	0h145B	Sensorless voltage compensation1	SL Volt Comp1	0-50	Dependent on motor setting	O/A	X	O	-
92[33]	0h145C	Sensorless voltage compensation2	SL Volt Comp2	0-50		O/A	X	O	-
93[33]	0h145D	Sensorless voltage compensation3	SL Volt Comp3	0-50		O/A	X	O	-
94[33]	0h145E	Sensorless field weakening start frequency	SL FW Freq	80.0-110.0(%)	100.0	X/A	X	O	-
95[33]	0h145F	Sensorless gain switching frequency	SL Fc Freq	0.00-8.00(Hz)	2.00	X/A	X	O	-

6.6 Input Terminal Block Function group (PAR→In)

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

SL: Sensorless vector control (dr.09)

*__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	O	O	p.48
01	0h1501	Frequency for maximum analog input	Freq at 100%	Start frequency-Maximum frequency(Hz)		Maximum frequency	O/A	O	O	p.69
02	0h1502	Torque at maximum analog input	Torque at100%	0.0-200.0(%)		100.0	O/A	X	X	-
05	0h1505	V1 input voltage display	V1 Monitor(V)	-12.00-12.00(V)		0.00	-/A	O	O	p.69
06	0h1506	V1 input polarity	V1 Polarity	0	Unipolar	0: Unipola	X/A	O	O	p.69
				1	Bipolar					

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		selection			r				
07	0h1507	Time constant of V1 input filter	V1 Filter	0-10000(ms)	10	O/A	O	O	p.69
08	0h1508	V1 Minimum input voltage	V1 Volt x1	0.00-10.00(V)	0.00	O/A	O	O	p.69
09	0h1509	V1 output at Minimum voltage (%)	V1 Perc y1	0.00-100.00(%)	0.00	O/A	O	O	p.69
10	0h150A	V1 Maximum input voltage	V1 Volt x2	0.00-12.00(V)	10.00	O/A	O	O	p.69
11	0h150B	V1 output at Maximum voltage (%)	V1 Perc y2	0.00-100.00(%)	100.00	O/A	O	O	p.69
12[34]	0h150C	V1 Minimum input voltage	V1 –Volt x1'	-10.00- 0.00(V)	0.00	O/A	O	O	p.72
13[34]	0h150D	V1output at Minimum voltage (%)	V1 –Perc y1'	-100.00-0.00(%)	0.00	O/A	O	O	p.72
14[34]	0h150E	V1 Maximum input voltage	V1 –Volt x2'	-12.00- 0.00(V)	-10.00	O/A	O	O	p.72
15[34]	0h150F	V1 output at Maximum voltage (%)	V1 –Perc y2'	-100.00-0.00(%)	-100.00	O/A	O	O	p.72
16	0h1510	V1 rotation direction change	V1 Inverting	0 No 1 Yes	0: No	O/A	O	O	p.69
17	0h1511	V1 quantization level	V1 Quantizing	0.00[35], 0.04-10.00(%)	0.04	X/A	O	O	p.69
35[36]	0h1523	V2 input voltage display	V2 Monitor(V)	0.00-12.00(V)	0.00	-/A	O	O	p.76
37[36]	0h1525	V2 input filter time constant	V2 Filter	0-10000(ms)	10	O/A	O	O	p.76
38[36]	0h1526	V2 Minimum input voltage	V2 Volt x1	0.00-10.00(V)	0.00	O/A	X	X	p.76

[34] Displayed when In.06 is set to 1 (Bipolar).

[35] Quantizing is not used when set to 0.

[36] Displayed when V is selected on the analog current/voltage input circuit selection switch (SW2).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
39[36]	0h1527	V2 output at Minimum voltage (%)	V2 Perc y1	0.00-100.00(%)		0.00	O/A	O	O	p.76
40[36]	0h1528	V2 Maximum input voltage	V2 Volt x2	0.00-10.00(V)		10	O/A	X	X	p.76
41[36]	0h1529	V2 output at Maximum voltage (%)	V2 Perc y2	0.00-100.00(%)		100.00	O/A	O	O	p.76
46[36]	0h152E	V2 rotation direction change	V2 Inverting	0	No	0:No	O/A	O	O	p.76
				1	Yes					
47[36]	0h152F	V2 quantization level	V2 Quantizing	0.00[35], 0.04-10.00(%)		0.04	O/A	O	O	p.76
50[37]	0h1532	I2 input current display	I2 Monitor (mA)	0-24(mA)		0.00	-/A	O	O	p.74
52[37]	0h1534	I2 input filter time constant	I2 Filter	0-10000(ms)		10	O/A	O	O	p.74
53[37]	0h1535	I2 minimum input current	I2 Curr x1	0.00-20.00(mA)		4.00	O/A	O	O	p.74
54[37]	0h1536	I2 output at Minimum current (%)	I2 Perc y1	0.00-100.00(%)		0.00	O/A	O	O	p.74
55[37]	0h1537	I2 maximum input current	I2 Curr x2	0.00-24.00(mA)		20.00	O/A	O	O	p.74
56[37]	0h1538	I2 output at Maximum current (%)	I2 Perc y2	0.00-100.00(%)		100.00	O/A	O	O	p.74
61[37]	0h153D	Changing rotation direction of I2	I2 Inverting	0	No	0:No	O/A	O	O	p.74
				1	Yes					
62[37]	0h153E	I2 quantization level	I2 Quantizing	0.00[35],0.04-10.00(%)		0.04	O/A	O	O	p.74
65	0h1541	P1 terminal function setting	P1 Define	0	None	1:Fx	X/A	O	O	p.82
				1	Fx					
66	0h1542	P2 terminal	P2 Define	2	Rx	2:Rx	X/A	O	O	p.82

[37] Displayed when I is selected on the analog current/voltage input circuit selection switch (SW2).

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		function setting								
67	0h1543	P3 terminal function setting	P3 Define	3	RST	5:BX	X/A	O	O	-
68	0h1544	P4 terminal function setting	P4 Define	4	External Trip	3:RST	X/A	O	O	-
69	0h1545	P5 terminal function setting	P5 Define	5	BX	7:Sp-L	X/A	O	O	-
70	0h1546	P6 terminal function setting	P6 Define	6	JOG	8:Sp-M	X/A	O	O	-
71	0h1547	P7 terminal function setting	P7 Define	7	Speed-L	9:Sp-H	X/A	O	O	p.79
				8	Speed-M					p.79
				9	Speed-H					p.79
				11	XCEL-L					p.91
				12	XCEL-M					p.91
				13	RUN Enable					-
				14	3-Wire					-
				15	2nd Source					p.109
				16	Exchange					-
				17	Up					-
				18	Down					-
				20	U/D Clear					-
				21	Analog Hold					p.78
				22	I-Term Clear					-
				23	PID Openloop					-
				24	P Gain2					-
				25	XCEL Stop					p.97
				26	2nd Motor					-
				34	Pre Excite					-
				38	Timer In					-
				40	dis Aux Ref					-
				46	FWD JOG					-
				47	REV JOG					-
				49	XCEL-H					p.91
				50	User Seq					p.113
				51	Fire Mode					p.121

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				54	TI[38]					p.76
85	0h1555	Multi-function input terminal On filter	DI On Delay	0-10000(ms)		10	O/A	O	O	p.110
86	0h1556	Multi-function input terminal Off filter	DI Off Delay	0-10000(ms)		3	O/A	O	O	p.110
87	0h1557	Multi-function input contact selection	DI NC/NO Sel	P7 – P1		0 0000[39]	X/A	O	O	p.110
				0	A contact (NO)					
				1	B contact (NC)					
89	0h1559	Multi-step command delay time	InCheck Time	1-5000(ms)		1	X/A	O	O	p.79
90	0h155A	Multi-function input terminal status	DI Status	P7 – P1		0 0000[39]	-/A	O	O	p.110
				0	release(Off)					
				1	Connection (On)					
91	0h155B	Pulse input amount display	Pulse Monitor (kHz)	0.00-50.00(kHz)		0.00	-/A	O	O	p.76
92	0h155C	TI input filter time constant	TI Filter	0-9999(ms)		10	O/A	O	O	p.76
93	0h155D	TI Minimum input pulse	TI Pls x1	0.00-32.00(kHz)		0.00	O/A	O	O	p.76
94	0h153E	TI output at Minimum pulse (%)	TI Perc y1	0.00-100.00(%)		0.00	O/A	O	O	p.76
95	0h155F	TI Maximum input pulse	TI Pls x2	0.00-32.00(kHz)		32.00	O/A	O	O	p.76
96	0h1560	TI Output at Maximum pulse (%)	TI Perc y2	0-100(%)		100.00	O/A	O	O	p.76
97	0h1561	TI rotation direction change	TI Inverting	0	No	0:No	O/A	O	O	p.76
				1	Yes					
98	0h1562	TI quantization	TI Quantizing	0.00[35], 0.04-		0.04	O/A	O	O	p.76

[38] Displayed when P5 is selected on Px terminal function.

[39] The initial value 0000 will be displayed on the keypad as 0.0.0.0.

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		level		10.00(%)						
99	0h1563	SW1(NPN/PNP) SW2(V1/V2[I2]) status	IO SW State	Bit	00~11	00	-/A	O	O	-
				00	V2, NPN					
				01	V2, PNP					
				10	I2, NPN					
				11	I2, PNP					

6.7 Output Terminal Block Function group (PAR→OU)

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

SL: Sensorless vector control (dr.09)

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

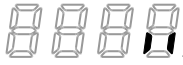
Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	JumpCode	1-99		30	O/A	O	O	p.48
01	0h1601	Analog output 1 item	AO1 Mode	0	Frequency	0:Frequency	O/A	O	O	-
				1	Output Current					
				2	Output Voltage					
				3	DCLink Voltage					
				4	Torque					
				5	Output Power					
				6	Idse					
				7	Iqse					
				8	Target Freq					
				9	Ramp Freq					
				10	Speed Fdb					
				12	PID Ref Value					
				13	PID Fdb Value					
				14	PID Output					
				15	Constant					
02	0h1602	Analog output 1 gain	AO1 Gain	-1000.0-1000.0(%)		100.0	O/A	O	O	-
03	0h1603	Analog output 1 bias	AO1 Bias	-100.0-100.0(%)		0.0	O/A	O	O	-
04	0h1604	Analog output 1 filter	AO1 Filter	0-10000(ms)		5	O/A	O	O	-
05	0h1606	Analog	AO1	0.0-100.0(%)		0.0	O/A	O	O	-

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		constant output 1	Const %							
06	0h1606	Analog output 1 monitor	AO1 Monitor	0.0-1000.0(%)		0.0	-/A	O	O	-
30	0h161E	Fault output item	Trip Out Mode	bit	000-111	010[40]	O/A	O	O	-
				1	Low voltage					
				2	Any faults other than low voltage					
				3	Automatic restart final failure					
31	0h161F	Multi-function relay 1 item	Relay 1	0	None	29:Trip	O/A	O	O	-
				1	FDT-1					
				2	FDT-2					
				3	FDT-3					
				4	FDT-4					
				5	Over Load					
				6	IOL					
				7	Under Load					
				8	Fan Warning					
				9	Stall					
				10	Over Voltage					
				11	Low Voltage					
				12	Over Heat					
				13	Lost Command					
				14	Run					
				15	Stop					
				16	Steady					
				17	Inverter Line					
				18	Comm Line					
				19	Speed Search					
				22	Ready					
				28	Timer Out					
				29	Trip					
				31	DB Warn%ED					

[40] The initial value 0010 will be displayed on the keypad as  .

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

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		On delay							
51	0h1633	Multi-function output Off delay	DO Off Delay	0.00-100.00(s)	0.00	O/A	O	O	-
52	0h1634	Multi-function output contact selection	DO NC/NO Sel	Q1, Relay1 0 A contact (NO) 1 B contact (NC)	00[41]	X/A	O	O	-
53	0h1635	Fault output On delay	TripOut OnDly	0.00-100.00(s)	0.00	O/A	O	O	-
54	0h1636	Fault output Off delay	TripOut OffDly	0.00-100.00(s)	0.00	O/A	O	O	-
55	h1637	Timer On delay	TimerOn Delay	0.00-100.00(s)	0.00	O/A	O	O	-
56	0h1638	Timer Off delay	TimerOff Delay	0.00-100.00(s)	0.00	O/A	O	O	-
57	0h1639	Detected frequency	FDT Frequency	0.00-Maximum frequency(Hz)	30.00	O/A	O	O	-
58	0h163A	Detected frequency band	FDT Band	0.00-Maximum frequency(Hz)	10.00	O/A	O	O	-
61	0h163D	Pulse output gain	TO Mode	0 Frequency 1 Output Current 2 Output Voltage 3 DCLink Voltage 4 Torque 5 Output Power 6 Idse 7 Iqse 8 Target Freq 9 Ramp Freq 10 Speed Fdb 12 PID Ref Value 13 PID Fdb Value 14 PID Output 15 Constant	0: Frequency	O/A	O	O	-
62	0h163E	Pulse output gain	TO Gain	-1000.0-1000.0(%)	100.0	O/A	O	O	-

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

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
63	0h163F	Pulse output bias	TO Bias	-100.0-100.0(%)	0.0	O/A	O	O	-
64	0h1640	Pulse output filter	TO Filter	0-10000(ms)	5	O/A	O	O	-
65	0h1641	Pulse output constant output 2	TO Const %	0.0-100.0(%)	0.0	O/A	O	O	-
66	0h1642	Pulse output monitor	TO Monitor	0.0-1000.0(%)	0.0	-/A	O	O	-

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)

***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		20	O/A	O	O	p.48
01	0h1701	Built-in communication inverter ID	Int485 St ID	1-250		1	O/A	O	O	p.124
02[42]	0h1702	Built-in communication protocol	Int485 Proto	0	ModBus RTU	0: ModBus RTU	O/A	O	O	p.124
				2	LS Inv 485					
03[42]	0h1703	Built-in communication speed	Int485 BaudR	0	1200 bps	3: 9600 bps	O/A	O	O	p.124
				1	2400 bps					
				2	4800 bps					
				3	9600 bps					
				4	19200 bps					
				5	38400 bps					
				6	56 Kbps					
				7	115 Kbps[43]					

[42] Will not be displayed when P2P and MultiKPD is set.

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
04[42]	0h1704	Built-in communication frame setting	Int485 Mode	0 1 2 3	D8/PN/S1 D8/PN/S2 D8/PE/S1 D8/PO/S1	0: D8/PN/S1	O/A	O	O	p.124
05[42]	0h1705	Transmission delay after reception	Resp Delay	0-1000(ms)		5ms	O/A	O	O	p.124
06[44]	0h1706	Communication option S/W version	FBus S/W Ver	-		0.00	O/A	O	O	-
07[44]	0h1707	Communication option inverter ID	FBus ID	0-255		1	O/A	O	O	-
08[44]	0h1708	FIELD BUS communication speed	FBUS BaudRate	-		12Mbps	-/A	O	O	-
09[44]	0h1709	Communication option LED status	FieldBus LED	-		-	O/A	O	O	-
30	0h171E	Number of output parameters	ParaStatus Num	0-8		3	O/A	O	O	p.130
31[45]	0h171F	Output Communication address1	Para Stauts-1	0000-FFFF Hex		000A	O/A	O	O	p.129
32[45]	0h1720	Output Communication address2	Para Stauts-2	0000-FFFF Hex		000E	O/A	O	O	p.129
33[45]	0h1721	Output Communication address3	Para Stauts-3	0000-FFFF Hex		000F	O/A	O	O	p.129
34[45]	0h1722	Output Communication address4	Para Stauts-4	0000-FFFF Hex		0000	O/A	O	O	p.129
35[45]	0h1723	Output Communication address5	Para Stauts-5	0000-FFFF Hex		0000	O/A	O	O	p.129

[43] 115,200bps

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

[45] Only the range of addresses set at COM-30 is displayed.

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
36[45]	0h1724	Output Communication address6	Para Stauts-6	0000-FFFF Hex	0000	O/A	O	O	p.129
37[45]	0h1725	Output Communication address7	Para Stauts-7	0000-FFFF Hex	0000	O/A	O	O	p.129
38[45]	0h1726	Output Communication address8	Para Stauts-8	0000-FFFF Hex	0000	O/A	O	O	p.129
50	0h1732	Number of input parameters	Para Ctrl Num	0-8	2	O/A	O	O	p.130
51[46]	0h1733	Input Communication address1	Para Control-1	0000-FFFF Hex	0005	X/A	O	O	p.129
52[46]	0h1734	Input Communication address2	Para Control-2	0000-FFFF Hex	0006	X/A	O	O	p.129
53[46]	0h1735	Input Communication address3	Para Control-3	0000-FFFF Hex	0000	X/A	O	O	p.129
54[46]	0h1736	Input Communication address4	Para Control-4	0000-FFFF Hex	0000	X/A	O	O	p.129
55[46]	0h1737	Input Communication address5	Para Control-5	0000-FFFF Hex	0000	X/A	O	O	p.129
56[46]	0h1738	Input Communication address6	Para Control-6	0000-FFFF Hex	0000	X/A	O	O	p.129
57[46]	0h1739	Input Communication address7	Para Control-7	0000-FFFF Hex	0000	X/A	O	O	p.129
58[46]	0h173A	Input Communication address8	Para Control-8	0000-FFFF Hex	0000	X/A	O	O	p.129
68	0h1744	Field bus data swap	FBus Swap Sel	0 No 1 Yes	0	X/A	O	O	p.129
70	0h1746	Communication multi-function input	Virtual DI 1	0 None	0:None	O/A	O	O	p.149

[46] 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.
		1								
71	0h1747	Communication multi-function input 2	Virtual DI 2	1	Fx	0:None	O/A	O	O	p.149
72	0h1748	Communication multi-function input 3	Virtual DI 3	2	Rx	0:None	O/A	O	O	p.149
73	0h1749	Communication multi-function input 4	Virtual DI 4	3	RST	0:None	O/A	O	O	p.149
74	0h174A	Communication multi-function input 5	Virtual DI 5	4	External Trip	0:None	O/A	O	O	p.149
75	0h174B	Communication multi-function input 6	Virtual DI 6	5	BX	0:None	O/A	O	O	p.149
76	0h174C	Communication multi-function input 7	Virtual DI 7	6	JOG	0:None	O/A	O	O	p.149
77	0h174D	Communication multi-function input 8	Virtual DI 8	7	Speed-L	0:None	O/A	O	O	p.149
				8	Speed-M					
				9	Speed-H					
				11	XCEL-L					
				12	XCEL-M					
				13	RUN Enable					
				14	3-Wire					
				15	2nd Source					
				16	Exchange					
				17	Up					
				18	Down					
				20	U/D Clear					
				21	Analog Hold					
				22	I-Term Clear					
				23	PID Openloop					
				24	P Gain2					
				25	XCEL Stop					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				26	2nd Motor					
				34	Pre Excite					
				38	Timer In					
				40	dis Aux Ref					
				46	FWD JOG					
				47	REV JOG					
				49	XCEL-H					
86	0h1756	Communication multi-function input monitoring	Virt DI Status	-		0	X/A	O	O	p.127
90	0h175A	Selection of data frame communication monitor	Comm Mon Sel	0	Int485	0	O/A	O	O	-
				1	KeyPad					
91	0h175B	Data frame Rev count	Rcv Frame Num	0~65535		0	O/A	O	O	-
92	0h175C	Data frame Err count	Err Frame Num	0~65535		0	O/A	O	O	-
93	0h175D	NAK frame count	NAK Frame Num	0~65535		0	O/A	O	O	-
94[47]	-	Communication data upload	Comm Update	0	No	0:No	-/A	O	O	-
				1	Yes					
95	0h1760	P2P communication selection	Int 485 Func	0	Disable All	0: Disable All	X/A	O	O	p.111
				1	P2P Master					
				2	P2P Slave					
				3	KPD-Ready					
96[48]	-	DO setting selection	P2P OUT Sel	Bit	000~111	0:No	O/A	O	O	p.111
				001	Analog output					
				010	Multi-function relay					
				100	Multi-function output					

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

[48] 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)
*__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	20	O/A	O	O	p.48
01	0h1801	Application function selection	App Mode	0 None 1 - 2 Proc PID	0: None	X/A	O	O	-
02	-	Enable user sequence	User Seq En	0 No 1 Yes	0:No	X/A	O	O	p.113
16[49]	0h1810	PID output monitor	PID Output	(%)	0.00	-/A	O	O	-
17[49]	0h1811	PID reference monitor	PID Ref Value	(%)	50.00	-/A	O	O	-
18[49]	0h1812	PID feedback monitor	PID Fdb Value	(%)	0.00	-/A	O	O	-
19[49]	0h1813	PID reference setting	PID Ref Set	-100.00-100.00(%)	50.00	O/A	O	O	-
20[49]	0h1814	PID reference source	PID Ref Source	0 Keypad 1 V1 3 V2 4 I2 5 Int 485 7 FieldBus 11 Pulse	0: Keypad	X/A	O	O	-
21[49]	0h1815	PID feedback source	PID F/B Source	0 V1 2 V2 3 I2 4 Int 485 6 FieldBus 10 Pulse	0:V1	X/A	O	O	-
22[49]	0h1816	PID controller proportional gain	PID P-Gain	0.0-1000.0(%)	50.0	O/A	O	O	-
23[49]	0h1817	PID controller integral time	PID I-Time	0.0-200.0(s)	10.0	O/A	O	O	-

[49] 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.
24[49]	0h1818	PID controller differentiation time	PID D-Time	0-1000(ms)	0	O/A	O	O	-
25[49]	0h1819	PID controller feed-forward compensation gain	PID F-Gain	0.0-1000.0(%)	0.0	O/A	O	O	-
26[49]	0h181A	Proportional gain scale	P Gain Scale	0.0-100.0(%)	100.0	X/A	O	O	-
27[49]	0h181B	PID output filter	PID Out LPF	0-10000(ms)	0	O/A	O	O	-
28[49]	0h181C	PID Mode	PID Mode	0 Process PID 1 Normal PID	0	X/A	O	O	-
29[49]	0h181D	PID upper limit frequency	PID Limit Hi	PID lower limit frequency-300.00(Hz)	50.00	O/A	O	O	-
30[49]	0h181E	PID lower limit frequency	PID Limit Lo	-300.00 -PID upper limit frequency(Hz)	-50.00	O/A	O	O	-
31[49]	0h181F	PID output inverse	PID Out Inv	0 No 1 Yes	0:No	X/A	O	O	-
32[49]	0h1820	PID output scale	PID Out Scale	0.1-1000.0(%)	100.0	X/A	O	O	-
34[49]	0h1822	PID controller motion frequency	Pre-PID Freq	0.00-Maximum frequency(Hz)	0.00	X/A	O	O	-
35[49]	0h1823	PID controller motion level	Pre-PID Exit	0.0-100.0(%)	0.0	X/A	O	O	-
36[49]	0h1824	PID controller motion delay time	Pre-PID Delay	0-9999(s)	600	O/A	O	O	-
37[49]	0h1825	PID sleep mode delay time	PID Sleep DT	0.0-999.9(s)	60.0	O/A	O	O	-
38[49]	0h1826	PID sleep mode frequency	PID Sleep Freq	0.00-Maximum frequency(Hz)	0.00	O/A	O	O	-
39[49]	0h1827	PID wake-up level	PIDWakeUp Lev	0-100(%)	35	O/A	O	O	-
40[49]	0h1828	PID wake-up mode setting	PID WakeUp Mod	0 Below Level 1 Above Level	0:Below Level	O/A	O	O	-

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property *	V/F	SL	Ref.
				2	Beyond Level					
42[49]	0h182A	PID controller unit selection	PID Unit Sel	0	%	0:%	O/A	O	O	-
				1	Bar					
				2	mBar					
				3	Pa					
				4	kPa					
				5	Hz					
				6	rpm					
				7	V					
				8	I					
				9	kW					
				10	HP					
				11	°C					
				12	°F					
43[49]	0h182B	PID unit gain	PID Unit Gain	0.00-300.00(%)		100.00	O/A	O	O	-
44[49]	0h182C	PID unit scale	PID Unit Scale	0	x100	2:x 1	O/A	O	O	-
				1	x10					
				2	x 1					
				3	x 0.1					
				4	x 0.01					
45[49]	0h182D	PID 2nd proportional gain	PID P2-Gain	0.0-1000.0(%)		100.0	X/A	O	O	-

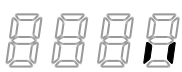
6.10 Protection Function group (PAR→Pr)

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

SL: Sensorless vector control (dr.09)

*__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	40	O/A	O	O	p.48
04	0h1B04	Load level setting	Load Duty	0 Normal Duty 1 Heavy Duty	1:Heavy Duty	X/A	O	O	-
05	0h1B05	Input/output open-phase protection	Phase Loss Chk	bit 00-11 01 Output open phase 10 Input open phase	00[50]	X/A	O	O	-
06	0h1B06	Input voltage range during open-phase	IPO V Band	1-100(V)	15	X/A	O	O	-
07	0h1B07	Deceleration time at fault trip	Trip Dec Time	0.0-600.0(s)	3.0	O/A	O	O	-
08	0h1B08	Selection of startup on trip reset	RST Restart	0 No 1 Yes	0:No	O/A	O	O	-
09	0h1B09	Number of automatic restarts	Retry Number	0-10	0	O/A	O	O	-
10[51]	0h1B0A	Automatic restart	Retry Delay	0.0-60.0(s)	1.0	O/A	O	O	-

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

[51] Displayed when Pr.09 is set higher than 0.

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property *	V/F	SL	Ref.
		delay time								
12	0h1B0C	Motion at speed command loss	Lost Cmd Mode	0	None	0:None	O/A	O	O	-
				1	Free-Run					
				2	Dec					
				3	Hold Input					
				4	Hold					
				5	Lost Preset					
13[52]	0h1B0D	Time to decide speed command loss	Lost Cmd Time	0.1-120(s)		1.0	O/A	O	O	-
14[52]	0h1B0E	Operation frequency at speed command loss	Lost Preset F	Start frequency-Maximum frequency(Hz)		0.00	O/A	O	O	-
15[52]	0h1B0F	Analog input loss decision level	AI Lost Level	0	Half x1	0:Half of x1	O/A	O	O	-
				1	Below x1					
17	0h1B11	Overload warning selection	OL Warn Select	0	No	0:No	O/A	O	O	-
				1	Yes					
18	0h1B12	Overload alarm level	OL Warn Level	30-180(%)		150	O/A	O	O	-
19	0h1B13	Overload warning time	OL Warn Time	0.0-30.0(s)		10.0	O/A	O	O	-
20	0h1B14	Motion at overload fault	OL Trip Select	0	None	1:Free-Run	O/A	O	O	-
				1	Free-Run					
				2	Dec					
21	0h1B15	Overload fault level	OL Trip Level	30-200(%)		180	O/A	O	O	-
22	0h1B16	Overload fault time	OL Trip Time	0.0-60.0(s)		60.0	O/A	O	O	-
25	0h1B19	Underload warning selection	UL Warn Sel	0	No	0:No	O/A	O	O	-
				1	Yes					

[52] Displayed when Pr.12 is not set to 0 (NONE).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property *	V/F	SL	Ref.
26	0h1B1A	Underload warning time	UL Warn Time	0.0-600.0(s)	10.0	O/A	O	O	-
27	0h1B1B	Underload fault selection	UL Trip Sel	0 None 1 Free-Run 2 Dec	0:None	O/A	O	O	-
28	0h1B1C	Underload fault time	UL Trip Time	0.0-600.0(s)	30.0	O/A	O	O	-
29	0h1B1D	Underload lower limit level	UL LF Level	10-30(%)	30	O/A	O	O	-
30	0h1B1E	Underload upper limit level	UL BF Level	30-100(%)	30	O/A	O	O	-
31	0h1B1F	No motor motion at detection	No Motor Trip	0 None 1 Free-Run	0:None	O/A	O	O	-
32	0h1B20	No motor detection current level	No Motor Level	1-100(%)	5	O/A	O	O	-
33	0h1B21	No motor detection delay	No Motor Time	0.1-10.0(s)	3.0	O/A	O	O	-
40	0h1B28	Electronic thermal fault selection	ETH Trip Sel	0 None 1 Free-Run 2 Dec	0:None	O/A	O	O	-
41	0h1B29	Motor cooling fan type	Motor Cooling	0 Self-cool 1 Forced-cool	0:Self-cool	O/A	O	O	-
42	0h1B2A	Electronic thermal 1 minute rating	ETH 1min	120-200(%)	150	O/A	O	O	-
43	0h1B2B	Electronic thermal continuous rating	ETH Cont	50-150(%)	120	O/A	O	O	-
45	0h1B2D	BX trip mode	BX Mode	0 Free-Run 1 Dec	0	X/A	O	O	-
50	0h1B32	Stall prevention motion and flux braking	Stall Prevent	bit 0000-1111 00 01 Acceleratin g 00 10 At constant speed	1000	X/A	O	O	-

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property *	V/F	SL	Ref.
				0100	At deceleration					
				1000	FluxBraking					
51	0h1B33	Stall frequency1	Stall Freq 1	Start frequency-Stall frequency2(Hz)		50.00	O/A	O	O	-
52	0h1B34	Stall level1	Stall Level 1	30-250(%)		180	X/A	O	O	-
53	0h1B35	Stall frequency2	Stall Freq 2	Stall frequency1-Stall frequency3(Hz)		50.00	O/A	O	O	-
54	0h1B36	Stall level2	Stall Level 2	30-250(%)		180	X/A	O	O	-
55	0h1B37	Stall frequency3	Stall Freq 3	Stall frequency2-Stall frequency4(Hz)		50.00	O/A	O	O	-
56	0h1B38	Stall level3	Stall Level 3	30-250(%)		180	X/A	O	O	-
57	0h1B39	Stall frequency4	Stall Freq 4	Stall frequency3-Maximum frequency(Hz)		50.00	O/A	O	O	-
58	0h1B3A	Stall level4	Stall Level 4	30-250(%)		180	X/A	O	O	-
59	0h1B3B	Flux braking gain	Flux Brake Kp	0 ~ 150[%]		0	O/A	O	O	-
60	0h1B3C	CAP diagnosis level	CAP. Diag Perc	10 ~ 100[%]		0	O/A	O	O	-
61[53]	0h1B3D	CAP diagnosis mode	CAP. Diag	0	None	0	X/A	O		-
				1	Ref Diag					
				2	Pre Diag					
				3	Init Diag					
62[53]	0h1B3E	CAP Exchange Level	CAP Exchange Level	50.0~95.0(%)		0	X/A	O	O	-
63[53]	0h1B3F	CAP Diag Level	CAP Diag Level	0.0~100.0(%)		100.0	-/A	O	O	-

[53] The Pr.61-63 codes are displayed when the Pr.60(CAP.DiagPrec) is set to more than 0.

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property *	V/F	SL	Ref.
66	0h1B42	DB resistor warning level	DB Warn %ED	0-30(%)	0	O/A	O	O	-
73	0h1B22	Speed deviation trip	Speed Dev Trip	0 No 1 Yes	0:No	O/A	O	O	
74	0h1B23	Speed deviation band	Speed Dev Band	1 ~ 20	5	O/A	O	O	
75	0h1B24	Speed deviation time	Speed Dev Time	0 ~ 120	60	O/A	O	O	
79	0h1B4F	Cooling fan fault selection	FAN Trip Mode	0 Trip 1 Warning	0:Trip	O/A	O	O	-
80	0h1B50	Motion selection at option trip	Opt Trip Mode	0 None 1 Free-Run 2 Dec	1:Free-Run	O/A	O	O	-
81	0h1B51	Low voltage fault decision delay time	LVT Delay	0.0-60.0(s)	0.0	X/A	O	O	-
82	0h1B52	LV2 Selection	LV2 Enable	0 No 1 Yes	0	X/A	O	O	-
86	0h1B56	Accumulated percent of fan usage	Fan Time Perc	0.0~100.0[%]	0.0	-/A	O	O	-
87	0h1B57	Fan exchange warning level	Fan Exchange level	0.0~100.0[%]	90.0	O/A	O	O	-
88[54]	0h1B58	Fan reset time	Fan Time Rst	0 No 1 Yes	0	X/A	O	O	-
89	0h1B59	CAP, FAN Status	CAP, FAN State	Bit 00~10 00 - 01 CAP Warning 10 FAN Warning	00	-/A	O	O	-
90[54]	0h1B5A	Warning information	-	-	-	-/7	O	O	-
91[54]	0h1B5B	Fault history 1	-	-	-	-/7	O	O	-
92[54]	0h1B5C	Fault history 2	-	-	-	-/7	O	O	-

[54] Will not be displayed when an LCD keypad is in use.

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property *	V/F	SL	Ref.
93[54]	0h1B5D	Fault history 3	-	-	-	-/7	O	O	-
94[54]	0h1B5E	Fault history 4	-	-	-	-/7	O	O	-
95[54]	0h1B5F	Fault history 5	-	-	-	-/7	O	O	-
96[54]	0h1B60	Fault history deletion	-	0 No 1 Yes	0:No	-/7	O	O	-

6.11 2nd Motor Function group (PAR→M2)

The 2nd Motor function group will be displayed if any of In.65-71 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)

*__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	14	O/A	O	O	p.48
04	0h1C04	Acceleration time	M2-Acc Time	0.0-600.0(s)	20.0	O/A	O	O	-
05	0h1C05	Deceleration time	M2-Dec Time	0.0-600.0(s)	30.0	O/A	O	O	-
06	0h1C06	Motor capacity	M2-Capacity	0 0.2 kW 1 0.4 kW 2 0.75 kW 3 1.1 kW 4 1.5 kW 5 2.2 kW 6 3.0 kW 7 3.7 kW 8 4.0 kW 9 5.5 kW 10 7.5 kW 11 11.0 kW 12 15.0 kW 13 18.5 kW 14 22.0 kW 15 30.0 kW	-	X/A	O	O	-
07	0h1C07	Base frequency	M2-Base Freq	30.00-400.00(Hz)	50.00	X/A	O	O	-

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
08	0h1C08	Control mode	M2-Ctrl Mode	0 V/F 2 Slip Compen 4 IM Sensorless	0:V/F	X/A	O	O	-
10	0h1C0A	Number of motor poles	M2-Pole Num	2-48	Dependent on motor settings	X/A	O	O	-
11	0h1C0B	Rated slip speed	M2-Rated Slip	0-3000(rpm)		X/A	O	O	-
12	0h1C0C	Motor rated current	M2-Rated Curr	1.0-1000.0(A)		X/A	O	O	-
13	0h1C0D	Motor no-load current	M2-Noload Curr	0.5-1000.0(A)		X/A	O	O	-
14	0h1C0E	Motor rated voltage	M2-Rated Volt	170-480(V)		X/A	O	O	-
15	0h1C0F	Motor efficiency	M2-Efficiency	70-100(%)		X/A	O	O	-
16	0h1C10	Load inertia rate	M2-Inertia Rt	0-8		X/A	O	O	-
17	-	Stator resistance	M2-Rs	Dependent on motor settings		X/A	O	O	-
18	-	Leakage inductance	M2-Lsigma			X/A	O	O	-
19	-	Stator inductance	M2-Ls			X/A	O	O	-
20[55]	-	Rotor time constant	M2-Tr	25-5000(ms)		X/A	O	O	-
25	0h1C19	V/F pattern	M2-V/F Patt	0 Linear 1 Square 2 User V/F	0: Linear	X/A	O	O	-
26	0h1C1A	Forward Torque boost	M2-Fwd Boost	0.0-15.0(%)	2.0	X/A	O	O	-
27	0h1C1B	Reverse Torque boost	M2-Rev Boost	0.0-15.0(%)		X/A	O	O	-
28	0h1C1C	Stall prevention level	M2-Stall Lev	30-150(%)	150	X/A	O	O	-
29	0h1C1D	Electronic thermal 1 minute rating	M2-ETH 1min	100-200(%)	150	X/A	O	O	-

[55] Displayed when M2.08 is set to 4 (IM Sensorless).

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
30	0h1C1E	Electronic thermal continuous rating	M2-ETH Cont	50-150(%)	100	X/A	O	O	-

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)

*__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	31	O/A	O	O	p.48
01	0h1D01	User sequence operation command	User Seq Con	0 Stop 1 Run 2 Digital In Run	0:Stop	X/A	O	O	p.113
02	0h1D02	User sequence operation loop time	US Loop Time	0 0.01s 1 0.02s 2 0.05s 3 0.1s 4 0.5s 5 1s	1:0.02s	X/A	O	O	p.113
11	0h1D0B	Output address link1	Link UserOut1	0-0xFFFF	0	X/A	O	O	p.113
12	0h1D0C	Output address link2	Link UserOut2	0-0xFFFF	0	X/A	O	O	p.113
13	0h1D0D	Output address link3	Link UserOut3	0-0xFFFF	0	X/A	O	O	p.113
14	0h1D0E	Output address link4	Link UserOut4	0-0xFFFF	0	X/A	O	O	p.113
15	0h1D0F	Output address link5	Link UserOut5	0-0xFFFF	0	X/A	O	O	p.113
16	0h1D10	Output address link6	Link UserOut6	0-0xFFFF	0	X/A	O	O	p.113
17	0h1D11	Output address link7	Link UserOut7	0-0xFFFF	0	X/A	O	O	p.113
18	0h1D12	Output address	Link UserOut8	0-0xFFFF	0	X/A	O	O	p.113

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		link8							
19	0h1D13	Output address link9	Link UserOut9	0-0xFFFF	0	X/A	O	O	p.113
20	0h1D14	Output address link10	Link UserOut10	0-0xFFFF	0	X/A	O	O	p.113
21	0h1D15	Output address link11	Link UserOut11	0-0xFFFF	0	X/A	O	O	p.113
22	0h1D16	Output address link12	Link UserOut12	0-0xFFFF	0	X/A	O	O	p.113
23	0h1D17	Output address link13	Link UserOut13	0-0xFFFF	0	X/A	O	O	p.113
24	0h1D18	Output address link14	Link UserOut14	0-0xFFFF	0	X/A	O	O	p.113
25	0h1D19	Output address link15	Link UserOut15	0-0xFFFF	0	X/A	O	O	p.113
26	0h1D1A	Output address link16	Link UserOut16	0-0xFFFF	0	X/A	O	O	p.113
27	0h1D1B	Output address link17	Link UserOut17	0-0xFFFF	0	X/A	O	O	p.113
28	0h1D1C	Output address link18	Link UserOut18	0-0xFFFF	0	X/A	O	O	p.113
31	0h1D1F	Input constant setting1	Void Para1	-9999-9999	0	X/A	O	O	p.113
32	0h1D20	Input constant setting2	Void Para2	-9999-9999	0	X/A	O	O	p.113
33	0h1D21	Input constant setting3	Void Para3	-9999-9999	0	X/A	O	O	p.113
34	0h1D22	Input constant setting4	Void Para4	-9999-9999	0	X/A	O	O	p.113
35	0h1D23	Input constant setting5	Void Para5	-9999-9999	0	X/A	O	O	p.113
36	0h1D24	Input constant setting6	Void Para6	-9999-9999	0	X/A	O	O	p.113
37	0h1D25	Input constant setting7	Void Para7	-9999-9999	0	X/A	O	O	p.113
38	0h1D26	Input constant setting8	Void Para8	-9999-9999	0	X/A	O	O	p.113
39	0h1D27	Input constant setting9	Void Para9	-9999-9999	0	X/A	O	O	p.113
40	0h1D28	Input constant setting10	Void Para10	-9999-9999	0	X/A	O	O	p.113
41	0h1D29	Input constant setting11	Void Para11	-9999-9999	0	X/A	O	O	p.113

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
42	0h1D2A	Input constant setting12	Void Para12	-9999-9999	0	X/A	O	O	p.113
43	0h1D2B	Input constant setting13	Void Para13	-9999-9999	0	X/A	O	O	p.113
44	0h1D2C	Input constant setting14	Void Para14	-9999-9999	0	X/A	O	O	p.113
45	0h1D2D	Input constant setting15	Void Para15	-9999-9999	0	X/A	O	O	p.113
46	0h1D2E	Input constant setting16	Void Para16	-9999-9999	0	X/A	O	O	p.113
47	0h1D2F	Input constant setting17	Void Para17	-9999-9999	0	X/A	O	O	p.113
48	0h1D30	Input constant setting18	Void Para18	-9999-9999	0	X/A	O	O	p.113
49	0h1D31	Input constant setting19	Void Para19	-9999-9999	0	X/A	O	O	p.113
50	0h1D32	Input constant setting20	Void Para20	-9999-9999	0	X/A	O	O	p.113
51	0h1D33	Input constant setting21	Void Para21	-9999-9999	0	X/A	O	O	p.113
52	0h1D34	Input constant setting22	Void Para22	-9999-9999	0	X/A	O	O	p.113
53	0h1D35	Input constant setting23	Void Para23	-9999-9999	0	X/A	O	O	p.113
54	0h1D36	Input constant setting24	Void Para24	-9999-9999	0	X/A	O	O	p.113
55	0h1D37	Input constant setting25	Void Para25	-9999-9999	0	X/A	O	O	p.113
56	0h1D38	Input constant setting26	Void Para26	-9999-9999	0	X/A	O	O	p.113
57	0h1D39	Input constant setting27	Void Para27	-9999-9999	0	X/A	O	O	p.113
58	0h1D3A	Input constant setting28	Void Para28	-9999-9999	0	X/A	O	O	p.113
59	0h1D3B	Input constant setting29	Void Para29	-9999-9999	0	X/A	O	O	p.113
60	0h1D3C	Input constant setting30	Void Para30	-9999-9999	0	X/A	O	O	p.113
80	0h1D50 S	Analog input 1	P2P In V1	0-12,000		-/A	O	O	p.113
81	0h1D51	Analog input2	P2P In I2	-12,000-12,000		-/A	O	O	p.113
82	0h1D52	Digital input	P2P In DI	0-0x7F		-/A	O	O	p.113

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
85	0h1D55	Analog output	P2P OutAO1	0-10,000	0	X/A	O	O	*p.113*
89	0h1D58	Digital output	P2P OutDO	0-0x03	0	X/A	O	O	*p.113*

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)
*__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		41	O/A	O	O	p.48
01	0h1E01	User function1	User Func1	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
02	0h1E02	User function input1-A	User Input1-A	0-0xFFFF		0	X/A	O	O	*p.113*
03	0h1E03	User function input1-B	User Input1-B	0-0xFFFF		0	X/A	O	O	*p.113*
04	0h1E04	User function input1-C	User Input1-C	0-0xFFFF		0	X/A	O	O	*p.113*
05	0h1E05	User function output1	User Output1	-32767-32767		0	-/A	O	O	*p.113*
06	0h1E06	User function 2	User Func2	0	NOP	0:NOP	X/A	O	O	*p.113*
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
07	0h1E07	User function input2-A	User Input2-A	0-0xFFFF		0	X/A	O	O	p.113
08	0h1E08	User function input2-B	User Input2-B	0-0xFFFF		0	X/A	O	O	p.113
09	0h1E09	User function input2-C	User Input2-C	0-0xFFFF		0	X/A	O	O	p.113
10	0h1E0A	User function output2	User Output2	-32767-32767		0	-/A	O	O	p.113
11	0h1E0B	User function3	User Func3	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
12	0h1E0C	User function input3-A	User Input3-A	0-0xFFFF		0	X/A	O	O	p.113
13	0h1E0D	User function input3-B	User Input3-B	0-0xFFFF		0	X/A	O	O	p.113
14	0h1E0E	User function input3-C	User Input3-C	0-0xFFFF		0	X/A	O	O	p.113
15	0h1E0F	User function output3	User Output3	-32767-32767		0	-/A	O	O	p.113
16	0h1E10	User function4	User Func4	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
17	0h1E11	User function input4-A	User Input4-A	0-0xFFFF		0	X/A	O	O	p.113
18	0h1E12	User function input4-B	User Input4-B	0-0xFFFF		0	X/A	O	O	p.113
19	0h1E13	User function input4-C	User Input4-C	0-0xFFFF		0	X/A	O	O	p.113
20	0h1E14	User function output4	User Output4	-32767-32767		0	-/A	O	O	p.113
21	0h1E15	User function5	User Func5	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
22	0h1E16	User function input5-A	User Input5-A	0-0xFFFF		0	X/A	O	O	p.113
23	0h1E17	User function input5-B	User Input5-B	0-0xFFFF		0	X/A	O	O	p.113
24	0h1E18	User function input5-C	User Input5-C	0-0xFFFF		0	X/A	O	O	p.113
25	0h1E19	User function output5	User Output5	-32767-32767		0	-/A	O	O	p.113
26	0h1E1A	User function6	User Func6	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				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					
27	0h1E1B	User function input6-A	User Input6-A	0-0xFFFF		0	X/A	O	O	p.113
28	0h1E1C	User function input6-B	User Input6-B	0-0xFFFF		0	X/A	O	O	p.113
29	0h1E1D	User function input6-C	User Input6-C	0-0xFFFF		0	X/A	O	O	p.113
30	0h1E1E	User function output6	User Output6	-32767-32767		0	-/A	O	O	p.113
31	0h1E1F	User function7	User Func7	0	NOP	0:NOP	X/A	O	O	p.113
				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	TIMER					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				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					
32	0h1E20	User function input7-A	User Input7-A	0-0xFFFF		0	X/A	O	O	*p.113*
33	0h1E21	User function input7-B	User Input7-B	0-0xFFFF		0	X/A	O	O	*p.113*
34	0h1E22	User function input7-C	User Input7-C	0-0xFFFF		0	X/A	O	O	*p.113*
35	0h1E23	User function output7	User Output7	-32767-32767		0	-/A	O	O	*p.113*
36	0h1E24	User function8	User Func8	0	NOP	0:NOP	X/A	O	O	*p.113*
				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					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
37	0h1E25	User function input8-A	User Input8-A	0-0xFFFF		0	X/A	O	O	p.113
38	0h1E26	User function input8-B	User Input8-B	0-0xFFFF		0	X/A	O	O	p.113
39	0h1E27	User function input8-C	User Input8-C	0-0xFFFF		0	X/A	O	O	p.113
40	0h1E28	User function output8	User Output8	-32767-32767		0	-/A	O	O	p.113
41	0h1E29	User function9	User Func9	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
42	0h1E2A	User function input9-A	User Input9-A	0-0xFFFF		0	X/A	O	O	p.113
43	0h1E2B	User function input9-B	User Input9-B	0-0xFFFF		0	X/A	O	O	p.113
44	0h1E2C	User function input9-C	User Input9-C	0-0xFFFF		0	X/A	O	O	p.113
45	0h1E2D	User function output9	User Output9	-32767-32767		0	-/A	O	O	p.113
46	0h1E2E	User function10	User Func10	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
47	0h1E2F	User function input10-A	User Input10-A	0-0xFFFF		0	X/A	O	O	p.113
48	0h1E30	User function input10-B	User Input10-B	0-0xFFFF		0	X/A	O	O	p.113
49	0h1E31	User function input10-C	User Input10-C	0-0xFFFF		0	X/A	O	O	p.113
50	0h1E32	User function output10	User Output10	-32767-32767		0	-/A	O	O	p.113
51	0h1E33	User function11	User Func11	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
52	0h1E34	User function input11-A	User Input11-A	0-0xFFFF		0	X/A	O	O	p.113
53	0h1E35	User function input11-B	User Input11-B	0-0xFFFF		0	X/A	O	O	p.113
54	0h1E36	User function input11-C	User Input11-C	0-0xFFFF		0	X/A	O	O	p.113
55	0h1E37	User function output11	User Output11	-32767-32767		0	-/A	O	O	p.113
56	0h1E38	User function12	User Func12	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
57	0h1E39	User function input12-A	User Input12-A	0-0xFFFF		0	X/A	O	O	p.113
58	0h1E3A	User function input12-B	User Input12-B	0-0xFFFF		0	X/A	O	O	p.113
59	0h1E3B	User function input12-C	User Input12-C	0-0xFFFF		0	X/A	O	O	p.113

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
60	0h1E3C	User function output12	User Output12	-32767-32767		0	-/A	O	O	p.113
61	0h1E3D	User function13	User Func13	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
62	0h1E3E	User function input13-A	User Input13-A	0-0xFFFF		0	X/A	O	O	p.113
63	0h1E3F	User function	User	0-0xFFFF		0	X/A	O	O	p.113

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		input13-B	Input13-B							
64	0h1E40	User function input13-C	User Input13-C	0-0xFFFF		0	X/A	O	O	p.113
65	0h1E41	User function output13	User Output13	-32767-32767		0	-/A	O	O	p.113
66	0h1E42	User function14	User Func14	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				28	DOWNCOUNT					
67	0h1E43	User function input14-A	User Input14-A	0-0xFFFF		0	X/A	O	O	p.113
68	0h1E44	User function input14-B	User Input14-B	0-0xFFFF		0	X/A	O	O	p.113
69	0h1E45	User function input14-C	User Input14-C	0-0xFFFF		0	X/A	O	O	p.113
70	0h1E46	User function output14	User Output14	-32767-32767		0	-/A	O	O	p.113
71	0h1E47	User function15	User Func15	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
72	0h1E48	User function input15-A	User Input15-A	0-0xFFFF		0	X/A	O	O	p.113
73	0h1E49	User function input15-B	User Input15-B	0-0xFFFF		0	X/A	O	O	p.113
74	0h1E4A	User function input15-C	User Input15-C	0-0xFFFF		0	X/A	O	O	p.113
75	0h1E4B	User function output15	User Output15	-32767-32767		0	-/A	O	O	p.113
76	0h1E4C	User function 16	User Func16	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				20	SWITCH					
				21	BITTEST					
				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	0-0xFFFF		0	X/A	O	O	p.113
78	0h1E4E	User function input16-B	User Input16-B	0-0xFFFF		0	X/A	O	O	p.113
79	0h1E4F	User function input16-C	User Input16-C	0-0xFFFF		0	X/A	O	O	p.113
80	0h1E50	User function output16	User Output16	-32767-32767		0	-/A	O	O	p.113
81	0h1E51	User function 17	User Func17	0	NOP	0:NOP	X/A	O	O	p.113
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				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					
82	0h1E52	User function input17-A	User Input17-A	0-0xFFFF		0	X/A	O	O	p.113
83	0h1E53	User function input17-B	User Input17-B	0-0xFFFF		0	X/A	O	O	p.113
84	0h1E54	User function input17-C	User Input17-C	0-0xFFFF		0	X/A	O	O	p.113
85	0h1E55	User function output17	User Output17	-32767-32767		0	-/A	O	O	p.113
86	0h1E56	User function 18	User Func18	0	NOP	0:NOP	X/A	O	O	p.113
				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-					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
					EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
87	0h1E57	User function input18-A	User Input18-A	0-0xFFFF		0	X/A	O	O	p.113
88	0h1E58	User function input18-B	User Input18-B	0-0xFFFF		0	X/A	O	O	p.113
89	0h1E59	User function input18-C	User Input18-C	0-0xFFFF		0	X/A	O	O	p.113
90	0h1E5A	User function output18	User Output18	-32767-32767		0	-/A	O	O	p.113

6.14 Groups for LCD Keypad Only

6.14.1 Trip Mode (TRP Last-x)

Code	Name	LCD Display	Setting 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 10	Trip time after operation start	Trip Run Time	-		0/00/00 00:00	-
10	Delete trip history	Trip Delete?	0	No		
			1	Yes		

6.14.2 Config Mode (CNF)

Code	Name	LCD Display	Setting Range		Initial Value	Ref.
00	Jump code	Jump Code	1-99		42	p.48
01	Keypad language selection	Language Sel	0 : English		0 : English	-
02	LCD constrast adjustment	LCD Contrast	-		-	-
03	Multi keypad ID	Multi KPD ID	3-99		3	p.112
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	Setting 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	-
23	Monitor mode display item3	Monitor Line-3	3	Output	3:Output Voltage	-
			4	Output Power		
			5	WHour		
			6	DCLink		
			7	DI State		
			8	DO State		
			9	V1 Monitor(V)		
			10	V1 Monitor(%)		
			13	V2 Monitor(V)		
			14	V2 Monitor(%)		
			15	I2		
			16	I2 Monitor(%)		
			17	PID Output		
			18	PID Ref Value		
			19	PID Fdb Value		
			20	Torque		
			21	Torque Limit		
			23	Speed Limit		
24	Monitor mode initialization	Mon Mode Init	0	No	0:No	-
			1	Yes		
30	Option slot 1 type display	Option-1 Type	0	None	0:None	-
31	Option slot 2 type display	Option-2 Type	6	Ethernet	0:None	-
32	Option slot 3 type display	Option-3 Type	9	CANopen	0:None	-
40	Parameter initialization	Parameter Init	0	No		
			1	All Grp		
			2	DRV Grp		
			3	BAS Grp		
			4	ADV Grp		
			5	CON Grp		
			6	IN Grp		
			7	OUT Grp		

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

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

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 MARATHON DRIVES 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 MARATHON DRIVES customer service center.

7.1.1 Fault Trips

Protection Functions for Output Current and Input Voltage

Keypad Display	LCD Display	Type	Description
OLT	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.
ULT	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.
OCT	Over Current1	Latch	Displayed when inverter output current exceeds 200% of the rated current.

Keypad Display	LCD Display	Type	Description
OVT	Over Voltage	Latch	Displayed when internal DC circuit voltage exceeds the specified value.
LVT	Low Voltage	Level	Displayed when internal DC circuit voltage is less than the specified value.
LV2	Low Voltage2	Latch	Displayed when internal DC circuit voltage is less than the specified value during inverter operation.
GFT	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.
ETH	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.
POT	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.
IPO	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.
IOL	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.
NMT	No Motor Trip	Latch	Displayed when the motor is not connected during inverter operation. Operates when Pr.31 is set to 1.

* MD100G 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 low-resistance ground fault.

Protection Functions Using Abnormal Internal Circuit Conditions and External Signals

Keypad Display	LCD Display	Type	Description
OHT	Over Heat	Latch	Displayed when the tempertature of the inverter heat sink exceeds the specified value.
OC2	Over Current2	Latch	Displayed when the DC circuit in the inverter detects a specified level of excessive, short circuit current.
EXT	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.65-71 to 4 (External Trip) to enable external trip.

Keypad Display	LCD Display	Type	Description
BX	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.65-71 to 5 (BX) to enable input block function.
HWT	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	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).
PID	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.
XBR	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).
SFA SFB	Safety A(B) Err	Level	Displayed when at least one of the two safety input signals is off.

Protection Functions for Communication Options

Keypad Display	LCD Display	Type	Description
LOR	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.
IOT MD100	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.

Keypad Display	LCD Display	Type	Description
ERRC			Displayed when the MD100 error code continues for more than 5 sec. ('Errc' -> '-rrc' -> E-rc' -> 'Er-c' -> 'Err-' -> '- -rc' -> '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.
OPT	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

Keypad Display	LCD Display	Description
OLW	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.
ULW	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.
IOLW	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.
LCW	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.
FANW	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).
ECAP	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).
DBW	DB Warn %ED	Displayed when the DB resistor usage rate exceeds the set value. Set the detection level at Pr.66.

Keypad Display	LCD Display	Description
TRTR	Retry Tr Tune	Tr tune error warning alarm is activated when Dr.9 is set to 4. The warning alarm occurs when the motor's rotor time constant (Tr) is either too low or too high.

7.2 Troubleshooting Fault Trips

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

Type	Cause	Remedy
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.
Low Voltage2	The input voltage has decreased during the	Determine if the input voltage is above

Type	Cause	Remedy
	operation.	the specified value.
	An input phase-loss has occurred.	Check the input wiring.
	The power supply magnetic contactor is faulty.	Replace the magnetic contractor.
Ground Trip	A ground fault has occurred in the inverter output wiring.	Check the output wiring.
	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 capacity.	Replace the inverter with a model that has increased capacity.
	The set value for electronic thermal protection is too low.	Set an appropriate electronic thermal level.
	The inverter has been operated at low speed for an extended duration.	Replace the motor with a model that supplies extra power to the cooling fan.
Output Phase Open	The magnetic contactor on the output side has a connection fault.	Check the magnetic contactor on the output side.
	The output wiring is faulty.	Check the output wiring.
Input Phase Open	The magnetic contactor on the input side has a connection fault.	Check the magnetic contactor on the 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 MARATHON DRIVES customer service center.
Inverter OLT	The load is greater than the rated motor capacity.	Replace the motor and inverter with 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 for an extended period.	Replace the cooling fan.
	The ambient temperature is too high.	Keep the ambient temperature below 50°C.
Over Current2	Output wiring is short-circuited.	Check the output wiring.
	There is a fault with the electronic semiconductor (IGBT).	Do not operate the inverter. Contact the retailer or the MARATHON DRIVES customer service center.
NTC Open	The ambient temperature is too low.	Keep the ambient temperature above -10°C.
	There is a fault with the internal temperature sensor.	Contact the retailer or the MARATHON DRIVES customer service center.
FAN Lock	A foreign object is obstructing the fan's air vent.	Remove the foreign object from the air inlet or outlet.
	The cooling fan needs to be replaced.	Replace the cooling fan.

Type	Cause	Remedy
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.

Type	Cause	Remedy
Parameters cannot be set.	The inverter is in operation (driving mode).	Stop the inverter to change to program mode and set the parameter.
	The parameter access is incorrect.	Check the correct parameter access level and set the parameter.
	The password is incorrect.	Check the password, disable the parameter lock and set the parameter.
	Low voltage is detected.	Check the power input to resolve the low voltage and set the parameter.
The motor does not rotate.	The frequency command source is set incorrectly.	Check the frequency command source setting.
	The operation command source is set incorrectly.	Check the operation command source setting.
	Power is not supplied to the terminal R/S/T.	Check the terminal connections R/S/T and U/V/W.
	The charge lamp is turned off.	Turn on the inverter.
	The operation command is off.	Turn on the operation command (RUN).
	The motor is locked.	Unlock the motor or lower the load level.
	The load is too high.	Operate the motor independently.
	An emergency stop signal is input.	Reset the emergency stop signal.
	The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
	The input option for the frequency command is incorrect.	Check the input option for the frequency command.
	The input voltage or current for the frequency command is incorrect.	Check the input voltage or current for the frequency command.
	The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode setting.
	The frequency command value is too low.	Check the frequency command and input a value above the minimum frequency.
	The [STOP/RESET] key is pressed.	Check that the stoppage is normal, if so resume operation normally.

Type	Cause	Remedy
	Motor torque is too low.	Change the operation modes (V/F, IM, and Sensorless). If the fault remains, replace the inverter with a model with increased capacity.
The motor rotates in the opposite direction to the command.	The wiring for the motor output cable is incorrect.	Determine if the cable on the output side is wired correctly to the phase (U/V/W) of the motor.
	The signal connection between the control circuit terminal (forward/reverse rotation) of the inverter and the forward/reverse rotation signal on the control panel side is incorrect.	Check the forward/reverse rotation wiring.
The motor only rotates in one direction.	Reverse rotation prevention is selected.	Remove the reverse rotation prevention.
	The reverse rotation signal is not provided, even when a 3-wire sequence is selected.	Check the input signal associated with the 3-wire operation and adjust as necessary.
The motor is overheating.	The load is too heavy.	Reduce the load. Increase the Acc/Dec time.
		Check the motor parameters and set the correct values.
		Replace the motor and the inverter with models with appropriate capacity for the load.
	The ambient temperature of the motor is too high.	Lower the ambient temperature of the motor.
	The phase-to-phase voltage of the motor is insufficient.	Use a motor that can withstand phase-to-phase voltages surges greater than the maximum surge voltage.
		Only use motors suitable for apllications with inverters.
		Connect the AC reactor to the inverter output (set the carrier frequency to 2 kHz).
	The motor fan has stopped or the fan is obstructed with debris.	Check the motor fan and remove any foreign objects.
The motor stops during acceleration or when connected to load.	The load is too high.	Reduce the load.
		Replace the motor and the inverter with models with capacity appropriate for the load.
The motor does not accelerate. /The acceleration	The frequency command value is low.	Set an appropriate value.
	The load is too high.	Reduce the load and increase the acceleration time. Check the

Type	Cause	Remedy
time is too long.		mechanical brake status.
	The acceleration time is too long.	Change the acceleration time.
	The combined values of the motor properties and the inverter parameter are incorrect.	Change the motor related parameters.
	The stall prevention level during acceleration is low.	Change the stall prevention level.
	The stall prevention level during operation is low.	Change the stall prevention level.
	Starting torque is insufficient.	Change to vector control operation mode. If the fault is still not corrected, replace the inverter with a model with increased capacity.
Motor speed varies during operation.	There is a high variance in load.	Replace the motor and inverter with models with increased capacity.
	The input voltage varies.	Reduce input voltage variation.
	Motor speed variations occur at a specific frequency.	Adjust the output frequency to avoid a resonance area.
The motor rotation is different from the setting.	The V/F pattern is set incorrectly.	Set a V/F pattern that is suitable for the motor specification.
The motor deceleration time is too long even with Dynamic Braking (DB) resistor connected.	The deceleration time is set too long.	Change the setting accordingly.
	The motor torque is insufficient.	If motor parameters are normal, it is likely to be a motor capacity fault. Replace the motor with a model with increased capacity.
	The load is higher than the internal torque limit determined by the rated current of the inverter.	Replace the inverter with a model with increased capacity.
Operation is difficult in underload applications.	The carrier frequency is too high.	Reduce the carrier frequency.
	Over-excitation has occurred due to an inaccurate V/F setting at low speed.	Reduce the torque boost value to avoid over-excitation.
While the inverter is in operation, a control unit malfunctions or noise occurs.	Noise occurs due to switching inside the inverter.	Change the carrier frequency to the minimum value.
		Install a micro surge filter in the inverter output.
When the inverter is operating, the earth leakage	An earth leakage breaker will interrupt the supply if current flows to ground during inverter operation.	Connect the inverter to a ground terminal.
		Check that the ground resistance is less than 100Ω for 200V inverters and less

Type	Cause	Remedy
breaker is activated.		than 10Ω for 400V inverters.
		Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter.
		Lower the carrier frequency.
		Make the cable length between the inverter and the motor as short as possible.
The motor vibrates severely and does not rotate normally.	Phase-to-phase voltage of 3-phase power source is not balanced.	Check the input voltage and balance the voltage.
		Check and test the motor's insulation.
The motor makes humming, or loud noises.	Resonance occurs between the motor's natural frequency and the carrier frequency.	Slightly increase or decrease the carrier frequency.
	Resonance occurs between the motor's natural frequency and the inverter's output frequency.	Slightly increase or decrease the carrier frequency.
		Use the frequency jump function to avoid the frequency band where resonance occurs.
The motor vibrates/hunts.	The frequency input command is an external, analog command.	In situations of noise inflow on the analog input side that results in command interference, change the input filter time constant (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 not come to a complete stop when the inverter output stops.	It is difficult to decelerate sufficiently, because DC braking is not operating normally.	Adjust the DC braking parameter.
		Increase the set value for the DC braking current.
		Increase the set value for the DC braking stopping time.
The output frequency does not increase to the frequency reference.	The frequency reference is within the jump frequency range.	Set the frequency reference higher than the jump frequency range.
	The frequency reference is exceeding the upper limit of the frequency command.	Set the upper limit of the frequency command higher than the frequency reference.
	Because the load is too heavy, the stall prevention function is working.	Replace the inverter with a model with increased capacity.
The cooling fan does not rotate.	The control parameter for the cooling fan is set incorrectly.	Check the control parameter setting for the cooling fan.

8 Maintenance

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

Caution

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

8.1 Regular Inspection Lists

8.1.1 Daily Inspections

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
All	Ambient environment	Is the ambient temperature and humidity within the design range, and is there any dust or foreign objects present?	Refer to *1.3 Installation Considerations* on page *5*.	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 *9.1 Input and Output Specification* on page *242*.	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?	Visual inspection	No abnormality	-
		Is the capacitor swollen?			
Cooling system	Cooling fan	Is there any abnormal vibration or noise?	Turn off the system and check operation by rotating the fan manually.	Fan rotates smoothly	-
Display	Measuring device	Is the display value normal?	Check the display value on the panel.	Check and manage specified values.	Voltmeter, ammeter, etc.
Motor	All	Is there any abnormal vibration or noise?	Visual inspection	No abnormality	-
		Is there any abnormal smell?	Check for overheating or damage.		

8.1.2 Annual Inspections

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
Input/Output circuit	All	Megger test (between input/output terminals and and earth terminal)	Disconnect inverter and short R/S/T/U/V/W terminals, and then measure from each terminal to the ground terminal using a Megger.	Must be above 5 MΩ	DC 500 V Megger
		Is there anything loose in the device?	Tighten up all screws.	No abnormality	
		Is there any	Visual		

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

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

8.1.3 Bi-annual Inspections

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
Motor	Insulation resistance	Megger test (between the input, output and earth terminals).	Disconnect the cables for terminals U/V/W and test the wiring.	Must be above 5 MΩ	DC 500 V Megger

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 *1.3 Installation Considerations* on page 5).

- 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.

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

Single Phase 200V (0.4-2.2 kW)

Model □□□□MD100G–1□□□			0004	0008	0015	0022
Applied motor	Heavy load	HP	0.5	1.0	2.0	3.0
		kW	0.4	0.75	1.5	2.2
	Normal load	HP	1.0	2.0	3.0	5.0
		kW	0.75	1.5	2.2	3.7
Rated output	Rated capacity (kVA)	Heavy load	1.0	1.9	3.0	4.2
		Normal load	1.2	2.3	3.8	4.6
	Rated current (A)	Heavy load	2.5	5.0	8.0	11.0
		Normal load	3.1	6.0	10.0	12.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)			
	Output voltage (V)		3-phase 200-240 V			
Rated input	Working voltage (V)		Single phase 200-240 V AC (-15% to +10%)			
	Input frequency		50-60 Hz (±5%)			
	Rated current (A)	Heavy load	4.4	9.3	15.6	21.7
		Normal load	5.8	11.7	19.7	24.0
Weight (lb /kg) (Built-in EMC filter)			2/0.9 (2.5/1.14)	2.86/1.3 (3.9/1.76)	3.3/1.5 (3.9/1.76)	4.4/2.0 (4.9/2.22)

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 240 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 200V (0.4-4 kW)

Model □□□□MD100G–2□□□			0004	0008	0015	0022	0037	0040
Applied motor	Heavy load	HP	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
	Normal load	HP	1.0	2.0	3.0	5.0	5.4	7.5
		kW	0.75	1.5	2.2	3.7	4.0	5.5
Rated output	Rated apacity (kVA)	Heavy load	1.0	1.9	3.0	4.2	6.1	6.5
		Normal load	1.2	2.3	3.8	4.6	6.9	6.9
	Rated current (A)	Heavy load	2.5	5.0	8.0	11.0	16.0	17.0
		Normal load	3.1	6.0	10.0	12.0	18.0	18.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)					
	Output voltage (V)		3-phase 200-240 V					
Rated input	Working voltage (V)		3-phase 200-240 VAC (-15% to +10%)					
	Input frequency		50-60 Hz (±5%)					
	Rated current (A)	Heavy load	2.2	4.9	8.4	11.8	17.5	18.5
		Normal load	3.0	6.3	10.8	13.1	19.4	19.4
Weight (lb /kg)			2/0.9	2/0.9	2.86/1.3	3.3/1.5	4.4/42.0	4.4/2.0

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 240 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 200V (5.5-15 kW)

Model □□□□MD100G–2□□□			0055	0075	0110	0150
Applied motor	Heavy load	HP	7.5	10	15	20
		kW	5.5	7.5	11	15
	Normal load	HP	10	15	20	25
		kW	7.5	11	15	18.5
Rated output	Rated capacity (kVA)	Heavy load	9.1	12.2	17.5	22.9
		Normal load	11.4	15.2	21.3	26.3
	Rated current (A)	Heavy load	24.0	32.0	46.0	60.0
		Normal load	30.0	40.0	56.0	69.0
	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
		Normal load	32.7	44.2	62.3	77.2
Weight (lb /kg)			7.3/3.3	7.3/3.3	10/4.6	16/7.1

- The standard motor capacity is based on a standard 4-pole motor
- The standard used for 200 V inverters is based on a 240 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 □□□□MD100G–4□□□			0004	0008	0015	0022	0037	0040
Applied motor	Heavy load	HP	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
	Normal load	HP	1.0	2.0	3.0	5.0	5.4	7.5
		kW	0.75	1.5	2.2	3.7	4.0	5.5
Rated output	Rated capacity (kVA)	Heavy load	1.0	1.9	3.0	4.2	6.1	6.5
		Normal load	1.5	2.4	3.9	5.3	7.6	7.6
	Rated current (A)	Heavy load	1.3	2.5	4.0	5.5	8.0	9.0
		Normal load	2.0	3.1	5.1	6.9	10.0	10.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)					
	Output voltage (V)		3-phase 380-480V					
Rated input	Working voltage (V)		3-phase 380-480VAC (-15% to +10%)					
	Input frequency		50-60 Hz (±5%)					
	Rated current (A)	Heavy load	1.1	2.4	4.2	5.9	8.7	9.8
		Normal load	2.0	3.3	5.5	7.5	10.8	10.8
Weight (lb /kg) (Built-in EMC filter)			2/0.9 (2.6/1.18)	2/0.9 (2.6/1.18)	2.86/1.3 (3.9/1.77)	3.3/1.5 (4/1.80)	4.4/2.0 (4.9/2.23)	4.4/2.0 (4.9/2.23)

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 240 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 (5.5-22 kW)

Model □□□□MD100G–4□□□			0055	0075	0110	0150	0185	0220
Applied motor	Heavy load	HP	7.5	10	15	20	25	30
		kW	5.5	7.5	11	15	18.5	22
	Normal load	HP	10	15	20	25	30	40
		kW	7.5	11	15	18.5	22	30
Rated output	Rated capacity (kVA)	Heavy load	9.1	12.2	18.3	22.9	29.7	34.3
		Normal load	12.2	17.5	22.9	29.0	33.5	44.2
	Rated current (A)	Heavy load	12.0	16.0	24.0	30.0	39.0	45.0
		Normal load	16.0	23.0	30.0	38.0	44.0	58.0
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)					
	Output voltage (V)		3-phase 380-480V					
Rated input	Working voltage (V)		3-phase 380-480VAC (-15% to +10%)					
	Input frequency		50-60 Hz (±5%)					
	Rated current (A)	Heavy load	12.9	17.5	26.5	33.4	43.6	50.7
		Normal load	17.5	25.4	33.4	42.5	49.5	65.7
Weight (lb /kg)			7.3/3.3	7.5/3.4	10.1/4.6	10.5/4.8	16.5/7.5	16.5/7.5

- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 200 V inverters is based on a 240 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.

9.2 Product Specification Details

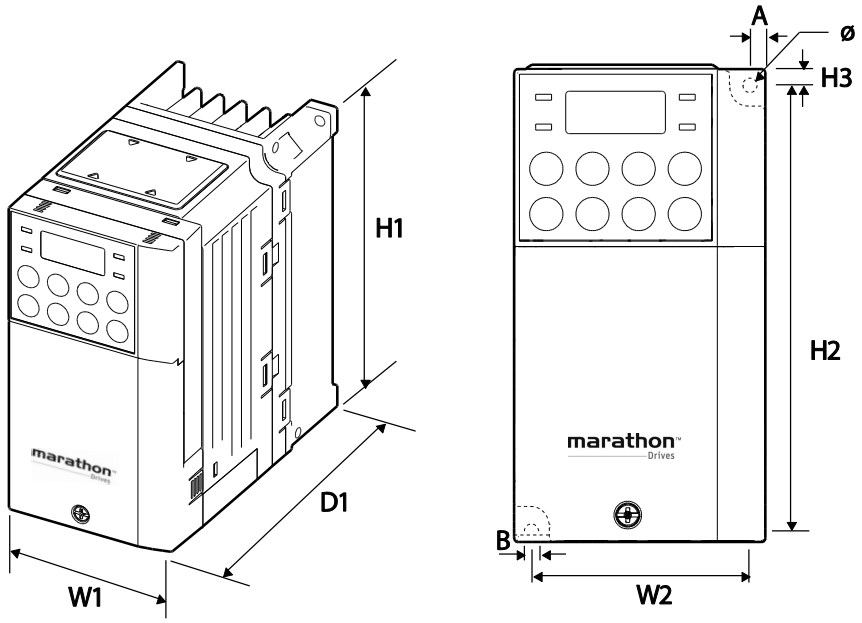
Items			Description	
Control	Control method		V/F control, slip compensation, sensorless vector	
	Frequency settings power resolution		Digital command: 0.01 Hz Analog command: 0.06 Hz (50 Hz standard)	
	Frequency accuracy		1% of maximum output frequency	
	V/F pattern		Linear, square reduction, user V/F	
	Overload capacity		Heavy load rated current: 150% 1 min, normal load rated current: 120% 1 min	
	Torque boost		Manual torque boost, automatic torque boost	
Operation	Operation type		Select key pad, terminal strip, or communication operation	
	Frequency settings		Analog type: -10~10V, 0~10V, 4~20mA Digital type: key pad, pulse train input	
	Operation function		• PID control • 3-wire operation • Frequency limit • Second function • Anti-forward and reverse direction rotation • Commercial transition • Speed search • Power braking • Leakage reduction	• Up-down operation • DC braking • Frequency jump • Slip compensation • Automatic restart • Automatic tuning • Energy buffering • Flux braking • Fire mode
	Input	Multi function terminal (7EA) P1-P7	Select PNP (Source) or NPN (Sink) mode. Functions can be set according to In.65- In.71 codes and parameter settings. (Standard I/O is only provided for P5.)	
			• Forward direction operation • Reset • Emergency stop • Multi step speed frequency-high/med/low • DC braking during stop • Frequency increase • 3-wire • Local/remote operation mode transition • Select acc/dec/stop	• Reverse direction operation • External trip • Jog operation • Multi step acc/dec-high/med/low • Second motor selection • Frequency reduction • Fix analog command frequency • Transtion from PID to general operation

Items			Description	
		Pulse train	0-32 kHz, Low Level: 0-0.8V, High Level: 3.5-12V	
	Output	Multi function open collector terminal	Fault output and inverter operation status output	Less than DC 24V, 50mA
		Multi function relay terminal		Less than (N.O., N.C.) AC250V 1A, Less than DC 30V, 1A
		Analog output	0-12Vdc (0-24mA): Select frequency, output current, output voltage, DC terminal voltage and others	
		Pulse train	Maximum 32 kHz, 10-12V	
Protection function	Trip		• Over current trip • External signal trip • ARM short circuit current trip • 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	• Over voltage trip • Temperature sensor trip • Inverter over heat • Option trip • Output imaging trip • Inverter overload trip • Fan trip • Pre-PID operation failure • External break trip • Low voltage trip during operation • Low voltage trip • Safety A(B) trip • Analog input error • Motor overload trip
	Alarm		Command loss trip alarm, overload alarm, normal load alarm, inverter overload alarm, fan operation alarm, resistance braking rate alarm, number of corrections on rotor tuning error	
	Instantaneous blackout		Heavy load less than15 ms (normal load less than 8 ms): continue operation (must be within the rated input voltage and rated output range) Heavy load more than 15 ms (normal load more than 8 ms): auto restart operation	
Structure/ working environment	Cooling type		Forced fan cooling structure Forced cooling type: 0.4-15 kW 200V/0.4-22 kW 400V (excluding some models)	
	Protection structure		IP 20 , UL Open Type	

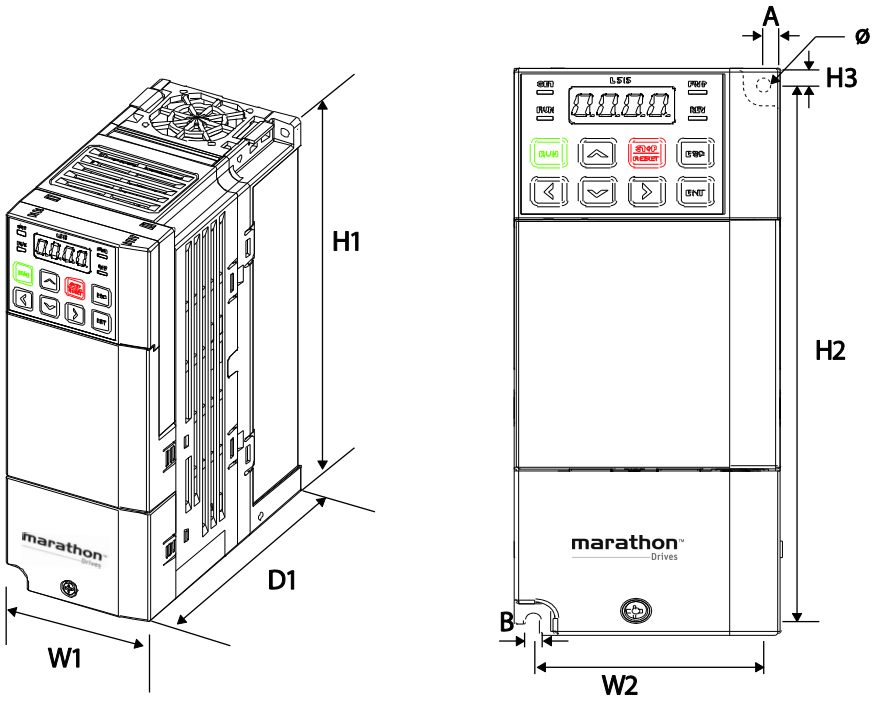
Items		Description
		(UL Enclosed Type 1 is satisfied by conduit installation option.)
	Ambient temperature	Heavy load: -10-50℃ (14–122°F), normal load: -10-40℃ (14–104°F) No ice or frost should be present. Working under normal load at 50℃ (122°F), it is recommended that less than 80% load is applied.
	Ambient humidity	Relative humidity less than 90% RH (to avoid condensation forming)
	Storage temperature.	-20℃-65℃ (-4–149°F)
	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^2 (1G).
	Pressure	70-106 kPa

9.3 External Dimensions (IP 20 Type)

0.4 kW (Single Phase), 0.4-0.8 kW (3-Phase)



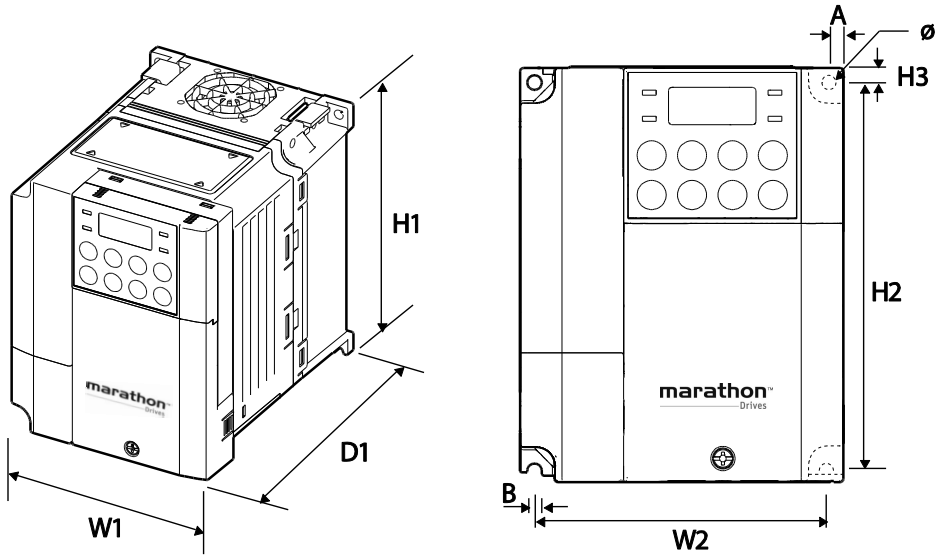
0.8kW~1.5kW(Single Phase 200V), 1.5kW~2.2kW(3-Phase 400V) EMC filter Type



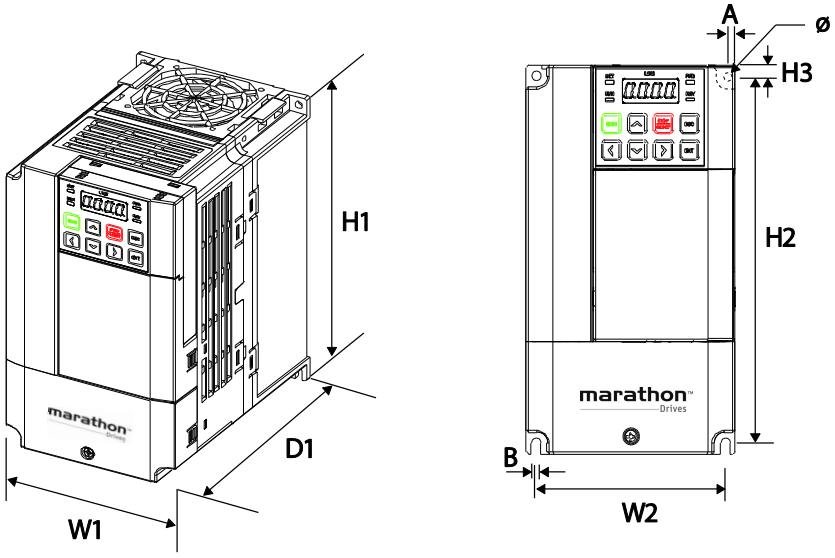
Items	W1	W2	H1	H2	H3	D1	A	B	Φ
0004MD100G-1, 0008MD100G-2, 0008MD100G-4	68 (2.68)	61.1 (2.41)	128 (5.04)	119 (4.69)	5 (0.20)	128 (5.04)	3.5 (0.14)	4 (0.16)	4 (0.16)
0004MD100G-2, 0004MD100G-4	68 (2.68)	61.1 (2.41)	128 (5.04)	119 (4.69)	5 (0.20)	123 (4.84)	3.5 (0.14)	4 (0.16)	4.2 (0.17)
0004MD100G-1, 0004MD100G-4, 0008MD100G-4 EMC Type	68 (2.68)	63.5 (2.50)	180 (7.09)	170.5 (6.71)	5 (0.20)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	4.2 (0.17)

Units: mm (inches)

0.8-1.5 kW (Single Phase), 1.5-2.2 kW(3-Phase)



0.8kW~1.5kW(Single Phase 200V), 1.5kW~2.2kW(3-Phase 400V) EMC filter Type

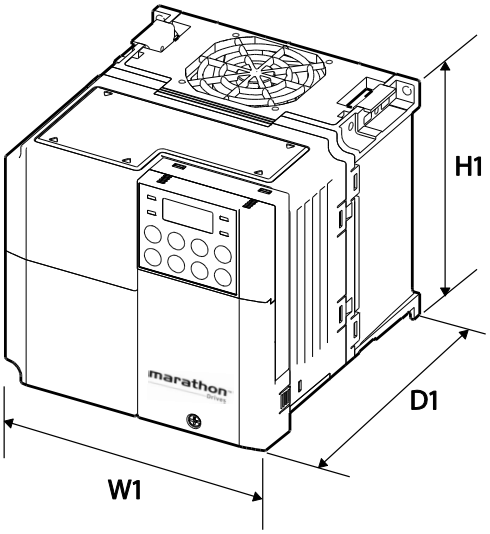


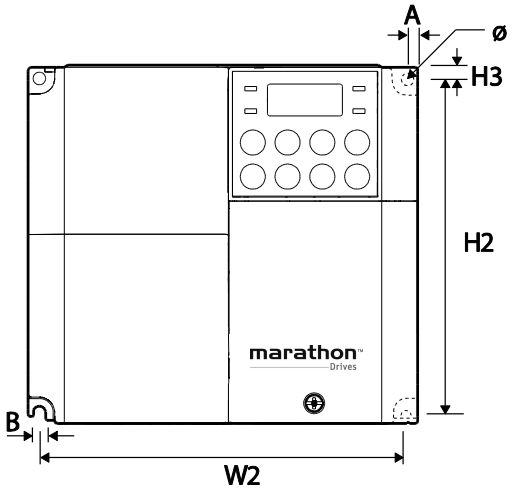
Items	W1	W2	H1	H2	H3	D1	A	B	Φ
0008MD100G-1, 0015MD100G-2, 0015MD100G-4	100 (3.94)	91 (3.58)	128 (5.04)	120 (4.72)	4.5 (0.18)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)

Items	W1	W2	H1	H2	H3	D1	A	B	Φ
0015MD100G-1, 0022MD100G-2, 0022MD100G-4	100 (3.94)	91 (3.58)	128 (5.04)	120 (4.72)	4.5 (0.18)	145 (5.71)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
0008MD100G-1, 0015MD100G-1, 0015MD100G-4, 0022MD100G-4 EMC Type	100 (3.94)	91 (3.58)	180 (7.09)	170 (6.69)	5 (0.20)	140 (5.51)	4.5 (0.18)	4.5 (0.18)	4.2 (0.17)

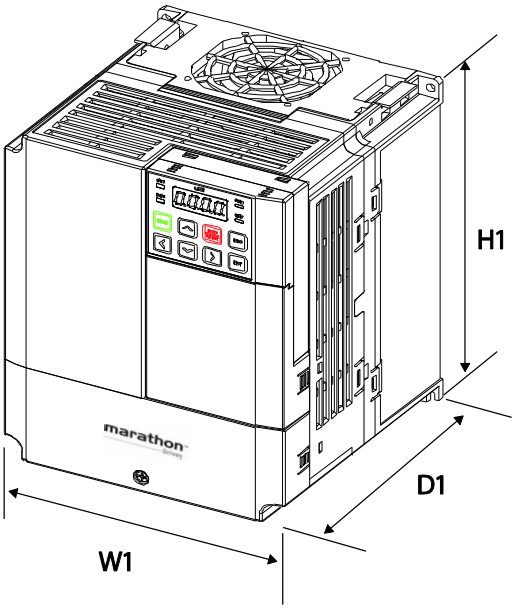
Units: mm (inches)

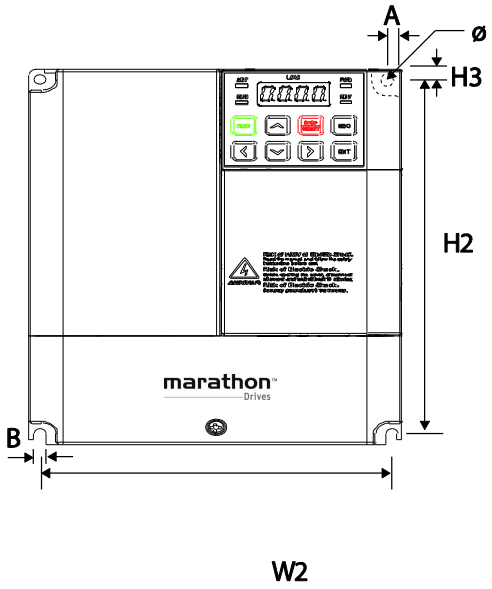
2.2 kW (Single Phase), 3.7-4.0 kW (3 Phase)





2.2kW(Single Phase 200V), 3.7~4.0kW(3-Phase 400V) EMC filter Type

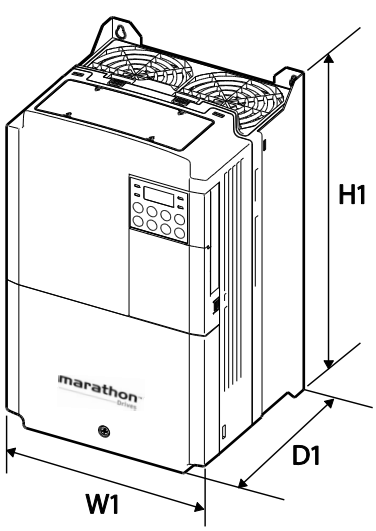


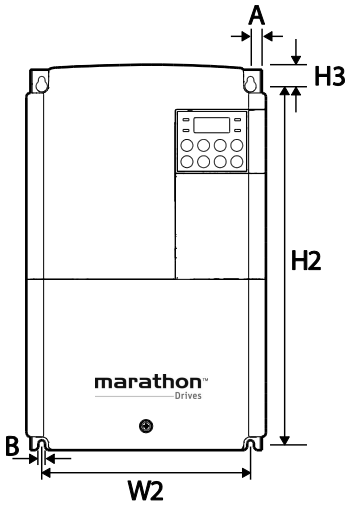


Items	W1	W2	H1	H2	H3	D1	A	B	Φ
0022MD100G-1 0037MD100G-2 0040MD100G-2 0037MD100G-4 0040MD100G-4	140 (5.51)	132.2 (5.20)	128 (5.04)	120.7 (4.75)	3.7 (0.15)	145 (5.71)	3.9 (0.15)	4.4 (0.17)	4.5 (0.18)
0022MD100G-1, 0037MD100G-4, 0040MD100G-4 EMC Type	140 (5.51)	132 (5.20)	180 (7.09)	170 (6.69)	5 (0.20)	140 (5.51)	4 (0.16)	4 (0.16)	4.2 (0.17)

Units: mm (inches)

5.5-22 kW (3-Phase)





Items		W1	W2	H1	H2	H3	D1	A	B	Φ
3-phase 200V	0055MD100G-2	160 (6.30)	137 (5.39)	232 (9.13)	216.5 (8.52)	10.5 (0.41)	140 (5.51)	5 (0.20)	5 (0.20)	-
	0075MD100G-2									
	0110MD100G-2	180 (7.09)	157 (6.18)	290 (11.4)	273.7 (10.8)	11.3 (0.44)	163 (6.42)	5 (0.20)	5 (0.20)	-
	0150MD100G-2	220 (8.66)	193.8 (7.63)	350 (13.8)	331 (13.0)	13 (0.51)	187 (7.36)	6 (0.24)	6 (0.24)	-
3-phase 400V	0055MD100G-4	160 (6.30)	137 (5.39)	232 (9.13)	216.5 (8.52)	10.5 (0.41)	140 (5.51)	5 (0.20)	5 (0.20)	-
	0075MD100G-4									
	0110MD100G-4	180 (7.09)	157 (6.18)	290 (11.4)	273.7 (10.8)	11.3 (0.44)	163 (6.42)	5 (0.20)	5 (0.20)	-
	0150MD100G-4									
	0185MD100G-4	220 (8.66)	193.8 (7.63)	350 (13.8)	331 (13.0)	13 (0.51)	187 (7.36)	6 (0.24)	6 (0.24)	-
	0220MD100G-4									

Units: mm (inches)

9.4 Peripheral Devices

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

Product (kW)		Circuit Breaker				Leakage Breaker		Magnetic Contactor	
		Model	Current (A)	Model	Current (A)	Model	Current (A)	Model	Current (A)
Single phase 200V	0.4	ABS33c	5	UTE100	15	EBS33c	5	MC-6a	9
	0.75		10				10	MC-9a, MC-9B	11
	1.5		15				15	MC-18a, MC-18B	18
	2.2		20		20		20	MC-22b	22
3-phase 200V	0.4	ABS33c	5	UTE100	15	EBS33c	5	MC-6a	9
	0.75		10				10	MC-9a, MC-9b	11
	1.5		15				15	MC-18a, MC-18b	18
	2.2		20		20		20	MC-22b	22
	3.7		30		30		30	MC-32a	32
	4								
	5.5	ABS53c	50		50	EBS53c	50	MC-50a	55
	7.5	ABS63c	60		60	EBS63c	60	MC-65a	65
	11	ABS103c	100		90	EBS103c	100	MC-85a	85
	15		125	UTS150	125		125	MC-130a	130
3-phase 400V	0.4	ABS33c	3	UTE100	15	EBS33c	5	MC-6a	7
	0.75		5					MC-6a	
	1.5		10				10	MC-9a, MC-9b	9
	2.2							MC-12a, MC-12b	12
	3.7		15				15	MC-18a, MC-18b	18
	4		20		20		20		
	5.5		30		30		30	MC-22b	22

Product (kW)		Circuit Breaker				Leakage Breaker		Magnetic Contactor	
	7.5							MC-32a	32
	11	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		100		90		100	MC-85a	85

9.5 Fuse and Reactor Specifications

Product (kW)		AC Input Fuse		AC Reactor		DC Reactor	
		Current (A)	Voltage (V)	Inductance (mH)	Current(A)	Inductance (mH)	Current (A)
Single phase 200V	0.4	10	600	1.20	10	4	8.67
	0.75						
	1.5	15		0.88	14	3	13.05
	2.2	20		0.56	20	1.3	18.45
3-phase 200V	0.4	10		1.20	10	4	8.67
	0.75						
	1.5	15		0.88	14	3	13.05
	2.2	20		0.56	20	1.33	18.45
	3.7	32		0.39	30		26.35
	4	50					
	5.5	50		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
3-phase 400V	0.4	10		4.81	4.8	16	4.27
	0.75						
	1.5			3.23	7.5	12	6.41
	2.2	15		2.34	10	8	8.9
	3.7	20		1.22	15	5.4	13.2
	4	32					
	5.5			1.12	19	3.20	17
	7.5	35		0.78	27	2.50	25
	11	50		0.59	35	1.90	32

Product (kW)		AC Input Fuse		AC Reactor		DC Reactor	
	15	63		0.46	44	1.40	41
	18.5	70		0.40	52	1.00	49
	22	100		0.30	68	0.70	64

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.

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.

9.6 Terminal Screw Specification

Input/Output Terminal Screw Specification

Product (kW)		Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
Single phase 200V	0.4	M3.5	2.1-6.1/0.2-0.6
	0.75		
	1.5		
	2.2	M4	
3-phase 200V	0.4	M3.5	
	0.75		
	1.5		
	2.2		
	3.7	M4	
	4		
	5.5		
	7.5		
	11	M5	4.0-10.2/0.4-1.0
	15		
3-phase 400V	0.4	M3.5	2.1-6.1/0.2-0.6
	0.75		

Product (kW)		Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
	1.5		
	2.2		
	3.7	M4	
	4		
	5.5		
	7.5		
	11	M5	4.0-10.2/0.4-1.0
	15		
	18.5		
	22		

Control Circuit Terminal Screw Specification

Terminal	Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
P1-P7/ CM/VR/V1/I2/AO/Q1/EG/24/TI /TO/ SA,SB,SC/S+,S-,SG	M2	2.2-2.5/0.22-0.25
A1/B1/C1	M2.6	4.0/0.4

* Standard I/O doesn't support P6/P7/TI/TO terminal. Refer to *Step 4 Control Terminal Wiring* on page *27*.

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.

Attention

Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risque d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements. Utiliser uniquement des fils de cuivre avec une valeur nominale de 600 V, 75 ℃ pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 ℃ pour le câblage de la borne de commande.

9.7 Braking Resistor Specification

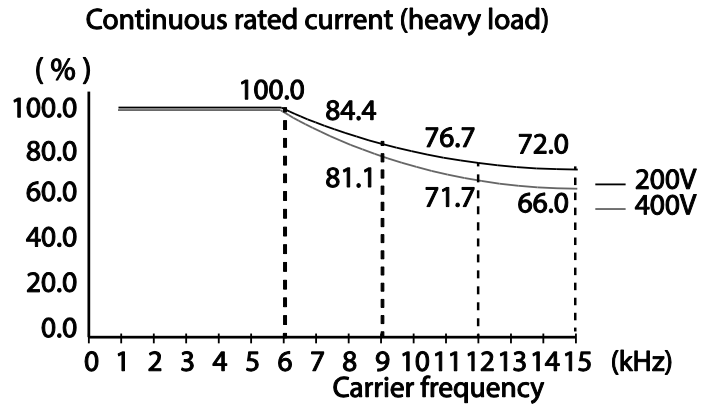
Product (kW)		Resistance (Ω)	Rated Capacity (W)
Single phase 200V	0.4	300	100
	0.75	150	150
	1.5	60	300
	2.2	50	400
3-phase 200V	0.4	300	100
	0.75	150	150
	1.5	60	300
	2.2	50	400
	3.7	33	600
	4	33	600
	5.5	20	800
	7.5	15	1,200
	11	10	2,400
	15	8	2,400
3-phase 400V	0.4	1,200	100
	0.75	600	150
	1.5	300	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

- 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.

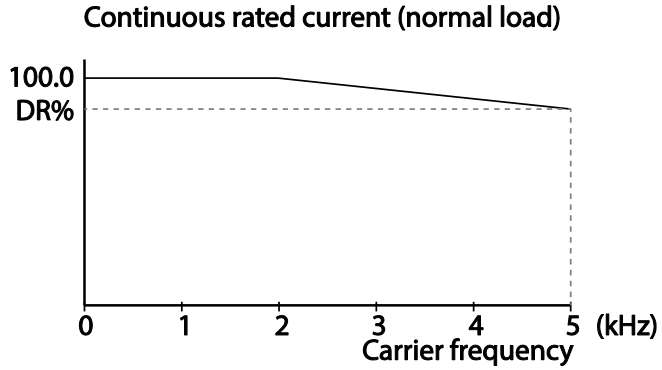
9.8 Continuous Rated Current Derating

Derating by Carrier Frequency

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



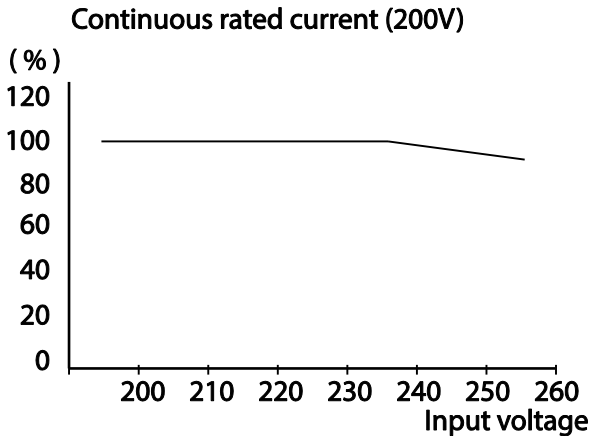
200V		400V	
Carrier Frequency (kHz)	Constant-rated Current (%)	Carrier Frequency (kHz)	Constant-rated Current (%)
1-6	100	1-6	100
9	84.4	9	81.1
12	76.7	12	71.7
15	72.0	15	66.0

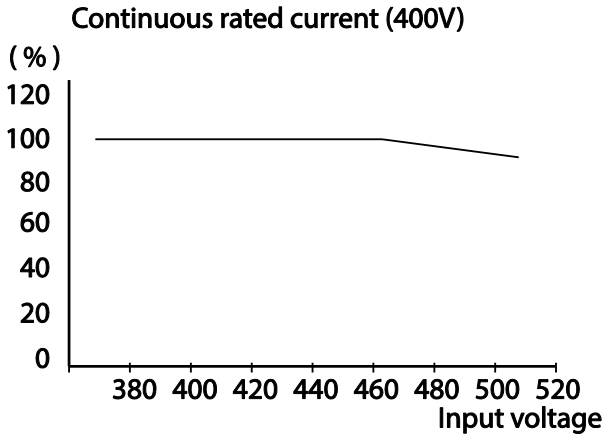


200V		400V	
Product (kW)	DR (%)	Product (kW)	DR (%)
5.5	85	5.5	81.3
7.5	85	7.5	77.2
11	86.6	11	85
15	90.2	15	84.2
		18.5	91.5
		22	83.2

Derating by Input Voltage

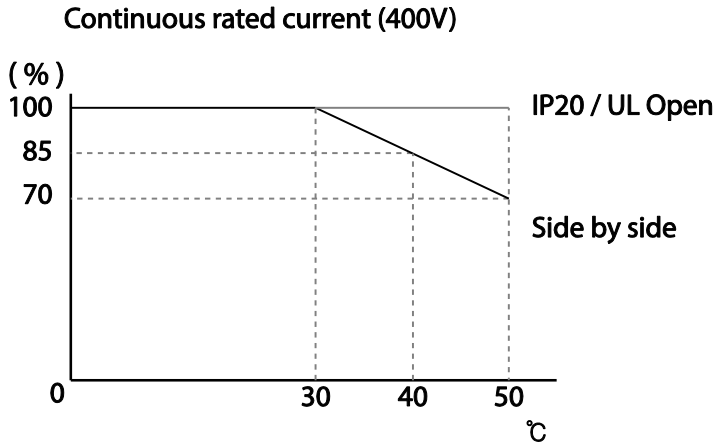
The continuous rated current of the inverter is limited based on the input voltage. Refer to the following graph.





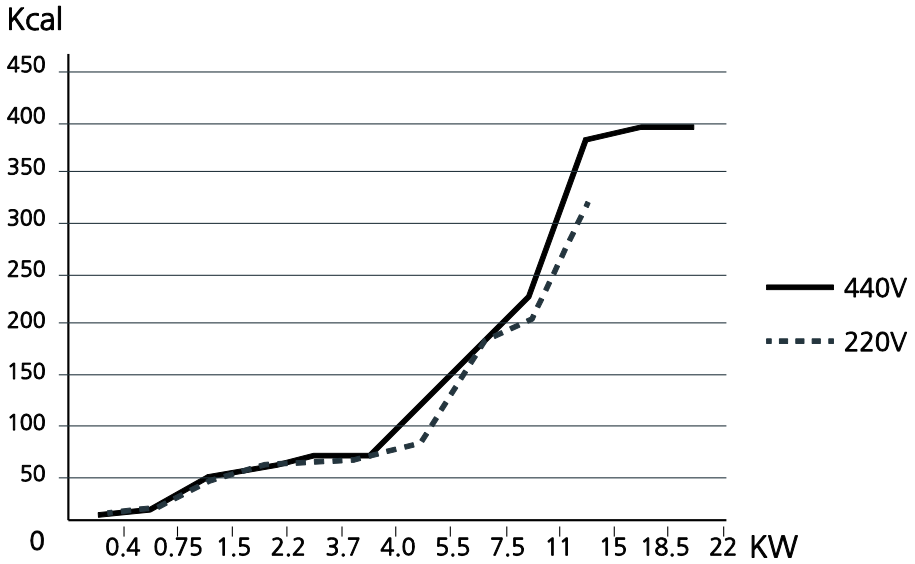
Derating by Ambient Temperature and Installation Type

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



9.9 Heat Emmission

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



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

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	Marathon Drive	**Date of Installation**	
Model Name	MD100G	**Warranty Period**	
Customer Info	Name (or company)		
	Address		
	Contact Info.		
Retailer Info	Name		
	Address		
	Contact info.		

Warranty Period

The product warranty covers product malfunctions, under normal operating conditions, for 12 months from the date of sale, subject to Regal Australia terms and conditions of sale

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 MARATHON DRIVES 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 MARATHON DRIVES rating plates
- expired warranty period

Visit Our Website

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

EC DECLARATION OF CONFORMITY

We, the undersigned,

Representative:	**Regal Beloit Australia Pty Ltd**
Address:	**19 Corporate Rd, Rowville**
	Victoria 3178, Australia
Manufacturer:	**LSIS Co., Ltd.**
Address:	**181, Samsung-ri, Mokchon-Eup,**
	Chonan, Chungnam, 330-845,
	Korea

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

Type of Equipment: **Inverter (Power Conversion Equipment)**

Model Name: ***MVLD*100G series**

Trade Mark: **Marathon Drive**

conforms with the essential requirements of the directives:

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

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

based on the following specifications applied:

EN 61800-3:2004

EN 61800-5-1:2007

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

Place: **Chonan, Chungnam,**

Korea

(Signature /Date) 2012.8.23

Mr. In Sik Choi / General Manager

(Full name / Position)

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.

EMI / RFI POWER LINE FILTERS

LSIS inverters, S100 series

marathon™ Drives VMC vector motor control

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 STANDARDS 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.

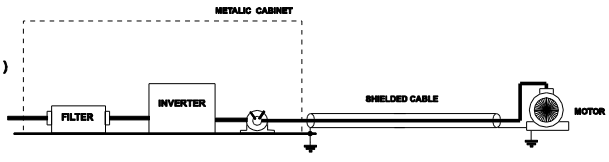
6-) Connect the motor and fit the ferrite core (output chokes) as close to the inverter as possible. Armoured or screened cable should be used with the 3 phase conductors only threaded twice through the center of the ferrite core. The earth conductor should be securely earthed at both inverter and motor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

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

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

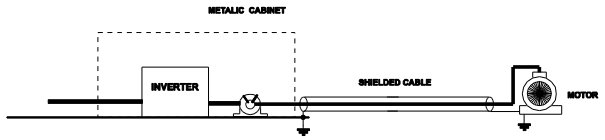
FEB/FEP SERIES (Standard)

Fig 1



INTERNAL FILTERS

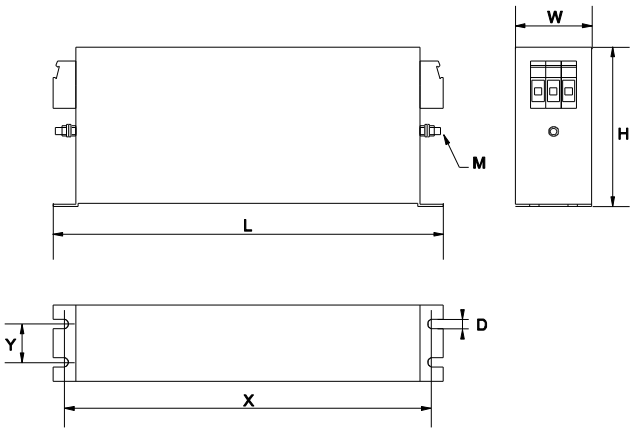
Fig 2



PR0064

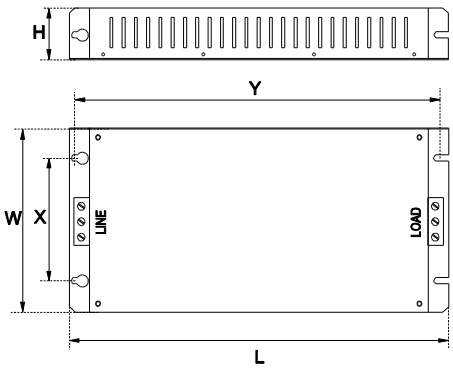
FEB SERIES (Standard)

FIG.A



FF SERIES (Footprint)

FIG. B



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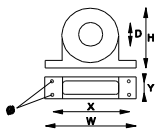
Fax (+34) 935 748 248
info@vmc.es
www.vmc.es

FS SERIES (output chokes)



CODE	D	W	H	X	Ø
FS- 1	21	85	50	22	4
FS- 2	28,5	105	62	90	5
FS- 3	48	150	110	125 x 30	5

PR0064

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V

W

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